**Brushless DC-Flat Motors**

External rotor technology, without housing 9 W

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### Series 2214 ... BXT R

<table>
<thead>
<tr>
<th>Values at 22°C and nominal voltage</th>
<th>2214 S</th>
<th>006 BXT R</th>
<th>012 BXT R</th>
<th>024 BXT R</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Nominal voltage ( U_N )</td>
<td>6 V</td>
<td>12 V</td>
<td>24 V</td>
<td></td>
</tr>
<tr>
<td>2 Terminal resistance, phase-phase ( R )</td>
<td>2.42 ( \Omega )</td>
<td>6.95 ( \Omega )</td>
<td>25.9 ( \Omega )</td>
<td></td>
</tr>
<tr>
<td>3 Efficiency, max. ( \eta_{\text{max}} )</td>
<td>72 %</td>
<td>73 %</td>
<td>70 %</td>
<td></td>
</tr>
<tr>
<td>4 No-load speed ( n_0 )</td>
<td>5.740 ( \text{min}^{-1} )</td>
<td>6.500 ( \text{min}^{-1} )</td>
<td>6.960 ( \text{min}^{-1} )</td>
<td></td>
</tr>
<tr>
<td>5 No-load current, typ. (with shaft Ø 3 mm) ( I_0 )</td>
<td>0.062 A</td>
<td>0.039 A</td>
<td>0.016 A</td>
<td></td>
</tr>
<tr>
<td>6 Starting torque ( M_s )</td>
<td>23.5 mNm</td>
<td>29.1 mNm</td>
<td>29.6 mNm</td>
<td></td>
</tr>
<tr>
<td>7 Speed constant ( k_s )</td>
<td>997</td>
<td>561</td>
<td>296</td>
<td></td>
</tr>
<tr>
<td>8 Back-EMF constant ( k_E )</td>
<td>1 ( \text{mV/min}^{-1} )</td>
<td>1.78 ( \text{mV/min}^{-1} )</td>
<td>3.37 ( \text{mV/min}^{-1} )</td>
<td></td>
</tr>
<tr>
<td>9 Torque constant ( k_M )</td>
<td>9.58</td>
<td>17</td>
<td>32.2</td>
<td></td>
</tr>
<tr>
<td>10 Current constant ( I_0 )</td>
<td>0.104 A</td>
<td>0.0588 A</td>
<td>0.031 A</td>
<td></td>
</tr>
<tr>
<td>11 Slope of n-M curve ( \Delta n/\Delta M )</td>
<td>252 ( \text{min}^{-1}/\text{mNm} )</td>
<td>229 ( \text{min}^{-1}/\text{mNm} )</td>
<td>238 ( \text{min}^{-1}/\text{mNm} )</td>
<td></td>
</tr>
<tr>
<td>12 Terminal inductance, phase-phase ( L )</td>
<td>271 ( \mu \text{H} )</td>
<td>884 ( \mu \text{H} )</td>
<td>3150 ( \mu \text{H} )</td>
<td></td>
</tr>
<tr>
<td>13 Mechanical time constant ( \tau_m )</td>
<td>8.7 ms</td>
<td>7.92 ms</td>
<td>8.22 ms</td>
<td></td>
</tr>
<tr>
<td>14 Rotor inertia ( J )</td>
<td>3.3 gcm²</td>
<td>3.3 gcm²</td>
<td>3.3 gcm²</td>
<td></td>
</tr>
<tr>
<td>15 Angular acceleration ( \omega_{\text{max}} )</td>
<td>71.1 ( \text{rad/s} )</td>
<td>88.2 ( \text{rad/s} )</td>
<td>89.7 ( \text{rad/s} )</td>
<td></td>
</tr>
</tbody>
</table>

### Operating temperature range:
- Motor: -40°C ... +100°C
- Winding, max. permissible: +125°C

### Shaft bearings:
- Ball bearings, preloaded

### Shaft load max.:
- With shaft diameter 3 mm:
  - Radial at 3 000 min⁻¹ (from mounting flange): 3 mm
  - Axial at 3 000 min⁻¹ (push / pull): 2 N
  - Axial at standstill (push / pull): 50 N

### Shaft play:
- Radial: ≤ 0.015 mm
- Axial: ≤ 0

### Mass:
- 25.5 g

### Direction of rotation:
- Electronically reversible

### Number of pole pairs:
- 7

### Hall sensors:
- Digital

### Magnet material:
- NdFeB

---

### Rated values for continuous operation

<table>
<thead>
<tr>
<th>26 Rated torque ( M_N )</th>
<th>9.5 mNm</th>
<th>10 mNm</th>
<th>10.2 mNm</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 Rated current (thermal limit) ( I_N )</td>
<td>1.18 A</td>
<td>0.66 A</td>
<td>0.388 A</td>
</tr>
<tr>
<td>28 Rated speed ( n_N )</td>
<td>1 200 min⁻¹</td>
<td>2 590 min⁻¹</td>
<td>2 600 min⁻¹</td>
</tr>
<tr>
<td>29 Rated slope of n-M curve ( \Delta n/\Delta M )</td>
<td>478 ( \text{min}^{-1}/\text{mNm} )</td>
<td>391 ( \text{min}^{-1}/\text{mNm} )</td>
<td>427 ( \text{min}^{-1}/\text{mNm} )</td>
</tr>
</tbody>
</table>

**Note:** Rated values are measured at nominal voltage and 22°C ambient temperature.

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**Note:**
- The display shows the range of possible operation points of the drives at a given ambient temperature of 22°C.

- The diagram indicates the recommended speed in relation to the available torque at the output shaft. It includes the assembly on a plastic as well as on a metal flange (assembly method: IM B S).

- The nominal voltage linear slope describes the maximal achievable operating points at nominal voltage.

- Any points of operation above this linear slope will require a supply voltage \( U_{\text{mot}} > U_N \).

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

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**Dimensional drawing**

Orientation with respect to motor cable ±5°

- Ø17
- Ø20 ±0,2
- Ø22 ±0,4
- Ø10 ±0,05
- Ø3 ±0,01
- 0,006
- ±0,3
- Ø20 max.15
- ø22 300 ±10
- 7 ±1,5
- max.15,4

**Option, cable and connection information**

Example product designation: 2214S012BXTR-3830

<table>
<thead>
<tr>
<th>Option</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3830</td>
<td>Connector</td>
<td>Standard cable with connector MOLEX Microfit 3.0, 43025-0800, recommended mating connector 43029-0800</td>
</tr>
<tr>
<td>4337</td>
<td>Gearhead combination</td>
<td>For combination with gearhead 20/1R</td>
</tr>
</tbody>
</table>

**Connection**

<table>
<thead>
<tr>
<th>Function</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase C</td>
<td>yellow</td>
</tr>
<tr>
<td>Phase B</td>
<td>orange</td>
</tr>
<tr>
<td>Phase A</td>
<td>brown</td>
</tr>
<tr>
<td>GND</td>
<td>black</td>
</tr>
<tr>
<td>UDD (+5V)</td>
<td>red</td>
</tr>
<tr>
<td>Hall sensor C</td>
<td>grey</td>
</tr>
<tr>
<td>Hall sensor B</td>
<td>blue</td>
</tr>
<tr>
<td>Hall sensor A</td>
<td>green</td>
</tr>
</tbody>
</table>

**Standard cable**

- Single wires, material PVC,
- AWG 26, Phase A/B/C,
- AWG 26, Hall A/B/C, UDD, GND

**Product combination**

<table>
<thead>
<tr>
<th>Precision Gearheads / Lead Screws</th>
<th>Encoders</th>
<th>Drive Electronics</th>
<th>Cables / Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/1R</td>
<td>SC 1801 P</td>
<td>SC 1801 S</td>
<td>To view our large range of accessory parts, please refer to the “Accessories” chapter.</td>
</tr>
<tr>
<td>22F</td>
<td>SC 1801 S</td>
<td>SC 2402 P</td>
<td></td>
</tr>
<tr>
<td>22GPT</td>
<td>SC 2402 P</td>
<td>SC 2804 S</td>
<td></td>
</tr>
<tr>
<td>26/1R</td>
<td>SC 2804 S</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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