

Features

- Piezoelectric motor technology
- Integrated control electronics and position sensor
- Micrometer positioning
- Fast response times
- Compact form factor and simple mechanical mounting

General Description

The Elliptec Module R2K is a fully integrated rotary motion solution for Elliptec’s piezoelectric motor technology. The module contains an actuated 40mm wheel, the complete motor control electronics with position feedback and an integrated UART interface. An additional optical sensor is used as a position reference.



Mechanical and Electrical Specification

(T_A = 25° C unless otherwise noted.)

| Parameter | Ratings | | | Unit |
|-----------------------------|---------------|---------|------|------|
| | min. | typ. | max. | |
| Motor | Elliptec X15G | | | |
| Unpowered Holding Torque | 10 | 16 | | mNm |
| No-Load Speed | 500 | 720 | | ° /s |
| Motor Driving Torque | figure 1 | | | |
| Supply Voltage | 4,5 | 5 | 5,5 | V |
| Supply Current | | 0,45 | 0,9 | A |
| Peak Current | | | 1,5 | A |
| Optimal ambient Temperature | | 25 | | °C |
| rotary Resolution | | 0,0014 | | ° |
| Bidirectional Repeatability | | 0,007 | | ° |
| Revolution Counter Maximum | | +/- 511 | | Revs |

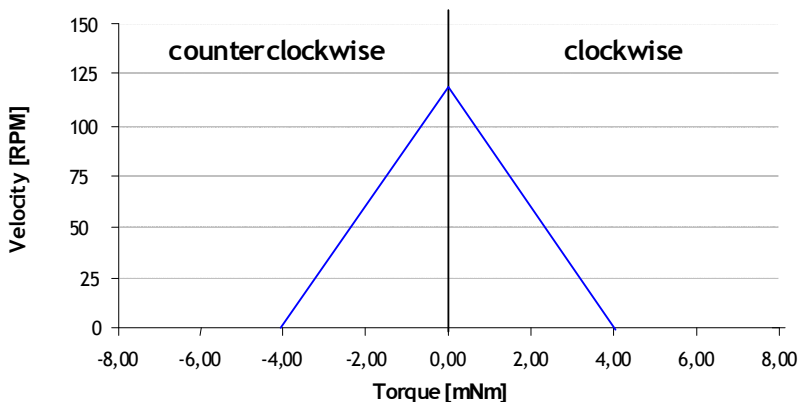
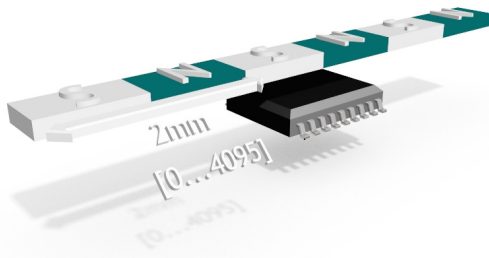


figure 1 typical velocity and torque

Specification of the Internal Position Sensor



The internal position sensor operates with multi-pole magnetic ring. A pair of poles builds a segment $5,625^\circ$. Using the change of polarity the sensor system divides a pole pair into 4096 steps. The resulting resolution is thus $0,0014^\circ$. The variation of the pole pair length has an effect on the linearity of the feedback system but not on its repeatability.

If required, the available space permits alternative high linear sensor feedback systems.

Connector Pin Assignments

| Pin No. | Name | Description |
|---------|------------|--|
| 1 | VCC | supply voltage ¹⁾ |
| 2 | μ C1 | optional input/output pin for customized firmware ¹⁾ |
| 3 | μ C2 | optional input/output pin for customized firmware |
| 4 | μ C3 | optional input/output pin for customized firmware |
| 5 | Reset | module reset |
| 6 | UART TX | serial output from device (SCK) |
| 7 | UART RX | serial input to device (ISP prog. SCK) |
| 8 | μ C4 | optional input/output pin for customized firmware (ISP prog. MISO) |
| 9 | μ CVCC | supply voltage (for programming onboard microcontroller) |
| 10 | GND | supply ground |

¹⁾ If customized firmware is required please contact info@elliptec.de

Serial Commands to Module:

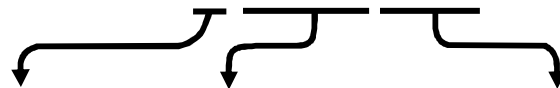
To control the module a serial connection has to be established³.

Baud rate: 19200 Baud
 Stop bits: 1
 Parity: no parity
 Flow control: none
 Voltage Level: 0...3.3V

RS232 standard voltage level (-30V ...+30V) has to be converted to TTL voltage (0V...3.3V) otherwise the unit will be damaged. A Command consists of **14 ASCII characters** (according to ANSI X3.4-1968) and can be send by any terminal program or any application that support the protocol.

| | |
|------|-----------------------------------|
| 05 | preamble of command |
| K | Command code |
| PPPP | basic parameters |
| OOO | Additional parameter |
| ZZZ | Not used parameter for future use |
| B | postamble |

05KPPPP0000ZZZB



| Command | Number[K] | parameter [YYYY] | additional parameter [XXX] |
|---|-----------|------------------|----------------------------|
| Send Com Port | 0 | XXXX | XXX |
| Start frequency search | 1 | XXXX | XXX |
| Move to Zero Position | 2 | XXXX | XXX |
| Turn clockwise for indicated period of time | 3 | [0000...9999]* | XXX |
| Turn counter clockwise for the indicated period of time | 4 | [0000...9999]* | XXX |
| Turn to absolute position | 5 | [0001...FFFE]** | [000...FFF] |
| Send Current position | 6 | XXXX | XXX |

X = any ASCII-sign

* = increments in 100μ s steps

***) Position sensor resolution is 0.0014° ($=360^\circ / 65 \cdot 4096$)

The formulae for calculating absolute hexadecimal integer position from the position in [degrees°] and vice versa are:

$$\text{absolute position}[\text{integer}]_{\text{hex}} = 7FFFFFFF_{\text{hex}} + \left[\frac{\text{absolute position}[\text{degrees}^\circ] \cdot 64 \cdot 4096}{360^\circ} \right]_{\text{hex}}$$

$$\text{absolute position}[\text{degrees}^\circ] = \frac{360^\circ}{64 \cdot 4096} [\text{absolute position}[\text{integer}]_{\text{hex}} - 7FFFFFFF_{\text{hex}}]_{\text{dec}}$$

Example 1:

To make the module move to position 181° (7FFFFFFF_{hex} + [(181° · 64 · 4096)/360°]_{hex} = 80202D7_{hex}) clockwise send:

„05580202D7XXXB”

Example 2:

To make the module move to position 181° counter clockwise send (7FFFFFFF_{hex} + [(-181° · 64 · 4096)/360°]_{hex} = 7DFD27_{hex}):

„0557FDFD27XXXB”

Example 3:

To make the module move clockwise for 0.5 seconds (=5000 · 100µs) send:

„0535000XXXXXB”

UART Responses from Module:

After receiving any one of the command codes 1...6 the module returns an ANSI character string of integers separated by semi-colons followed by the string literal ‘Eot’:

fwd_f;bwd_f;new_pos;curr_pos;time;errEot

[fwd_f] Forward frequency: Motor frequency = 16 000 kHz / fwd_f.

[bwd_f] Backward frequency: Motor frequency = 16 000 kHz / bwd_f.

[new_pos] Target position: target sensor position only for command #5 [integer]_{hex}

[curr_pos] Current slider position: unit sends the current position value of the feedback system [integer]_{hex}

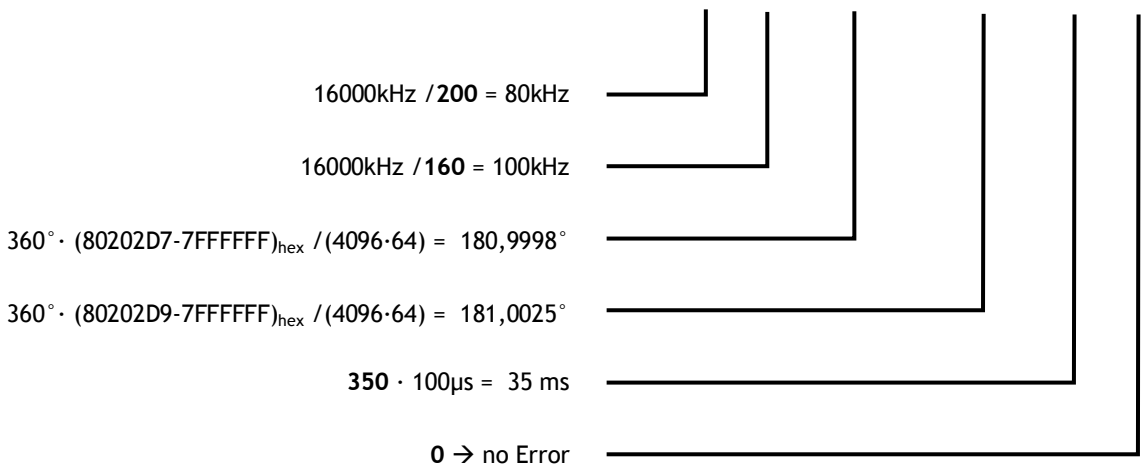
[time] Time of travel: time needed to move to current position [100µs]

[errEot] Error: Error indicator [0: no error, 1: error] An error will occur when user command could not be executed.

Example:

After the command „0580202D7XXXB” is sent and its execution is done a possible answer is:

“200;160; 80202D7; 80202D9;350;0Eot”



Electrical Connector

The electrical connector is compatible with SHR-10V-S-B

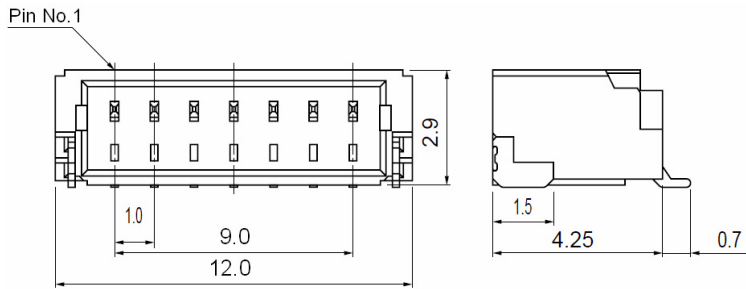


Figure 1: Location of connector pins (Dimensions mm)

Physical Dimensions

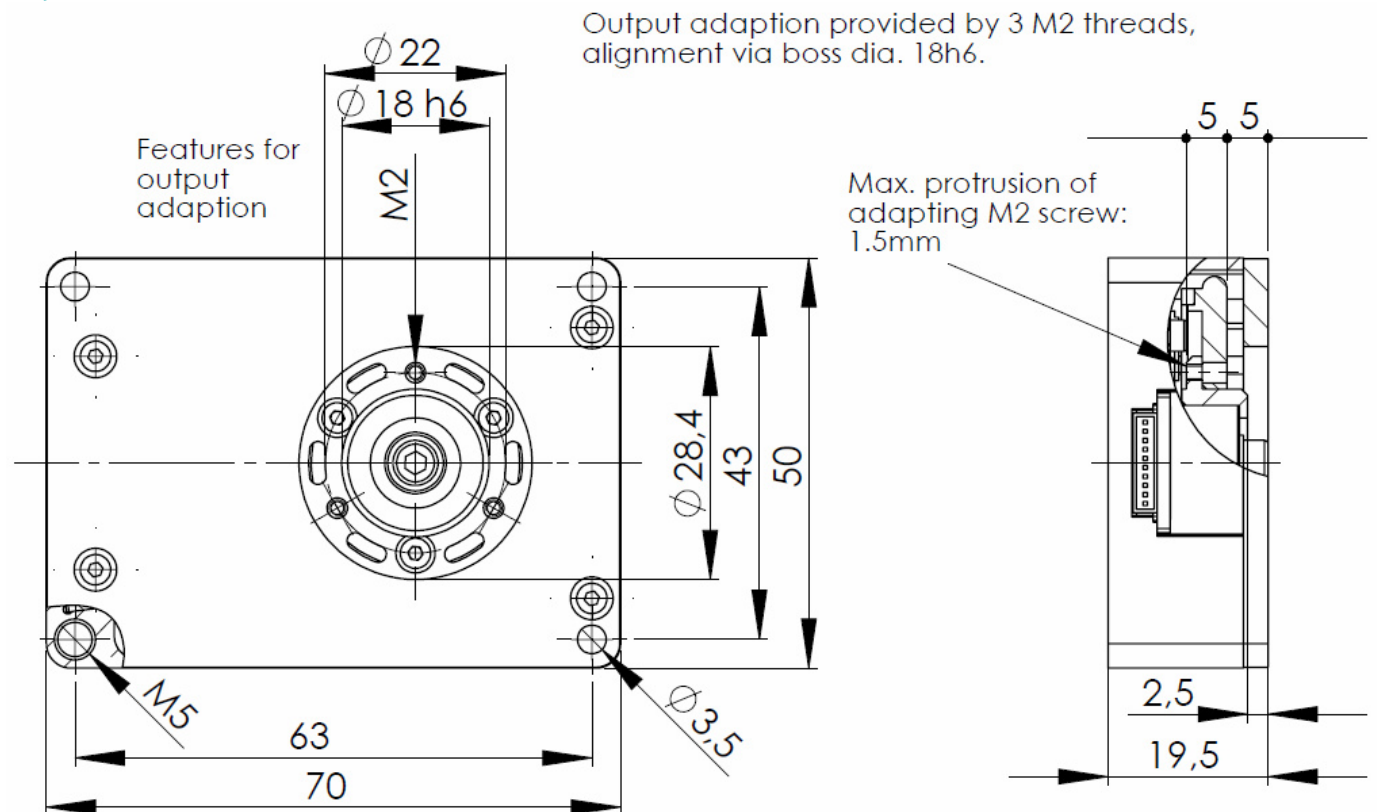


Figure 2: Dimensions in mm

Ordering information: MR2K1-06-001

Appendix

Trademarks

Elliptec™, Elliptec Motor™, Elliptec Minimotor™, Elliptec Actuator™, Elliptec Module™, Elliptec Controller™ are trademarks of Elliptec Resonant Actuator AG.

Attention

The preloaded software and hardware is not suitable for climate tests, please contact Elliptec when required.

For further information please visit our website at www.elliptec.com

Subject to change without notice.

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