

# Flat DC-Micromotors

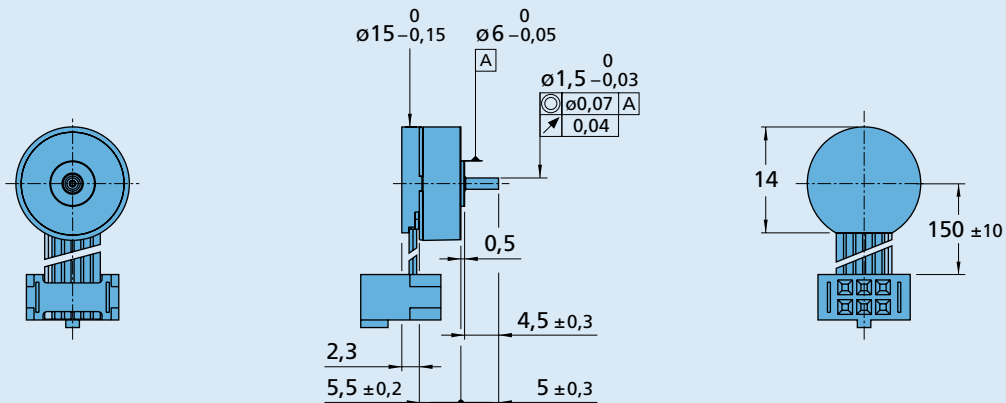
## Precious Metal Commutation with integrated Encoder

### 0,3 mNm

For combination with  
Drive Electronics:  
Speed controller

### Series 1506 ... SR IE2-8

	1506 N	003 SR	006 SR	012 SR	IE2-8
Nominal voltage	U <sub>N</sub>	3	6	12	Volt
Terminal resistance	R	10,4	50,5	130	Ω
Output power	P <sub>2 max.</sub>	0,19	0,17	0,26	W
Efficiency	η <sub>max.</sub>	68	66	70	%
No-load speed	n <sub>0</sub>	13 400	14 300	15 500	rpm
No-load current (with shaft ø 0,8 mm)	I <sub>0</sub>	0,010	0,005	0,003	A
Stall torque	M <sub>H</sub>	0,54	0,46	0,64	mNm
Friction torque	M <sub>R</sub>	0,02	0,02	0,02	mNm
Speed constant	k <sub>n</sub>	4 640	2 480	1 340	rpm/V
Back-EMF constant	k <sub>E</sub>	0,216	0,403	0,749	mV/rpm
Torque constant	k <sub>M</sub>	2,06	3,84	7,15	mNm/A
Current constant	k <sub>I</sub>	0,486	0,260	0,140	A/mNm
Slope of n-M curve	Δn/ΔM	24 700	31 400	24 200	rpm/mNm
Rotor inductance	L	175	720	2 100	μH
Mechanical time constant	τ <sub>m</sub>	24	30	23	ms
Rotor inertia	J	0,09	0,09	0,09	gcm <sup>2</sup>
Angular acceleration	α <sub>max.</sub>	58	50	71	·10 <sup>3</sup> rad/s <sup>2</sup>
Thermal resistance	R <sub>th 1</sub> / R <sub>th 2</sub>	36 / 61			K/W
Thermal time constant	τ <sub>w1</sub> / τ <sub>w2</sub>	5,4 / 190			s
Operating temperature range:		0 ... + 70			°C
Shaft bearings		sintered sleeves bearings			
Shaft load max.:					
– with shaft diameter		0,8			mm
– radial at 3000 rpm (3 mm from bearing)		0,5			N
– axial at 3000 rpm		0,1			N
– axial at standstill		10			N
Shaft play:					
– radial	≤	0,03			mm
– axial	≤	0,2			mm
Housing material		plastic			
Weight		7,1			g
Direction of rotation		clockwise, viewed from the front face			
<b>Recommended values - mathematically independent of each other</b>					
Speed up to	n <sub>e max.</sub>	10 000	10 000	10 000	rpm
Torque up to	M <sub>e max.</sub>	0,3	0,3	0,3	mNm



1506 N ... SR IE2-8

Integrated optical Encoder		IE2-8	
Lines per revolution	N	8	
Signal output, square wave		2	channels
Supply voltage	U <sub>DD</sub>	3,2 ... 5,5	V DC
Current consumption, typical (U <sub>DD</sub> = 5V DC)	I <sub>DD</sub>	typ. 8, max. 15	mA
Output current, max. allowable (at U <sub>out</sub> < 1,5V)	I <sub>OUT</sub>	5	mA
Pulse width <sup>1)</sup>	P	180 ± 45	°e
Phase shift, channel A to B <sup>1)</sup>	Φ	90 ± 45	°e
Signal rise/fall time, max. (C <sub>LOAD</sub> = 50 pF)	tr/tf	2,5/0,3	µs
Frequency range <sup>2)</sup> , up to	f	4,5	kHz

<sup>1)</sup> Ambient temperature 22°C (tested at 1kHz)

<sup>2)</sup> Velocity (rpm) = f(Hz) x 60/N

### Features

In this version, the DC-Micromotors have an optical encoder with two output channels. A code wheel on the shaft is optically captured and further processed. At the encoder outputs, two 90° phase-shifted rectangular signals are available with 8 impulses per motor revolution.

The encoder is suitable for the monitoring and regulation of the speed and direction of rotation and for positioning the drive shaft.

The supply voltage for the encoder and the DC-Micromotor as well as the two channel output signals are interfaced through a ribbon cable with connector.

### Full product description

■ Examples:

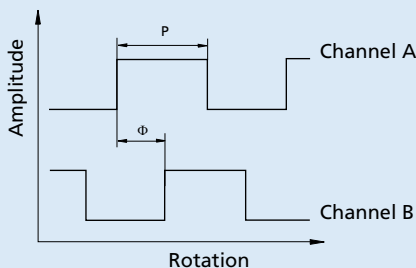
1506N003SR IE2-8

1506N012SR IE2-8

### Output signals / Circuit diagram / Connector information

#### Output signals

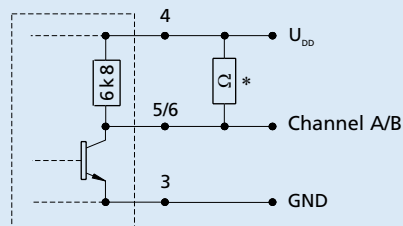
with clockwise rotation as seen from the shaft end



Admissible deviation of phase shift:

$$\Delta\Phi = \left| 90^\circ - \frac{\Phi}{P} * 180^\circ \right| \leq 45^\circ$$

#### Output circuit



\* An additional external pull-up resistor can be added to improve the rise time. Caution: I<sub>OUT</sub> max. 5 mA must not be exceeded!

