DC-Gearmotors

Precious Metal Commutation
with integrated Encoder

Series 1512 ... SR ... IE2-8

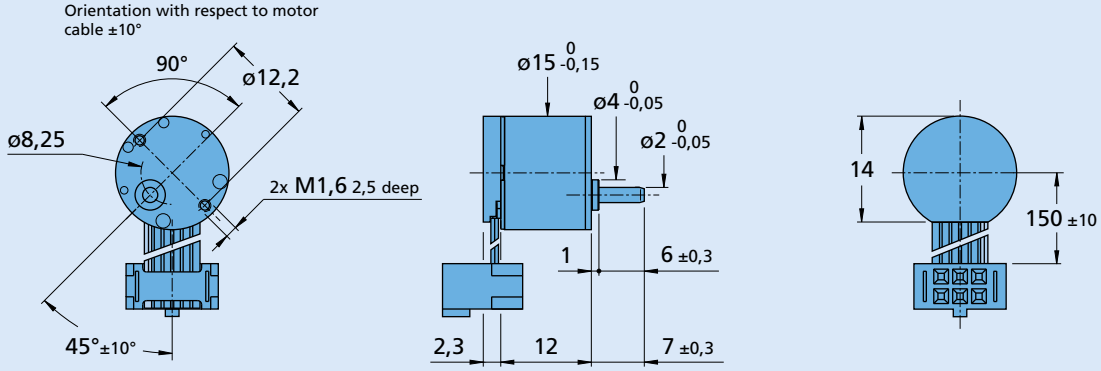
Values at 22°C and nominal voltage	1512 U		003 SR	006 SR	012 SR	IE2-8
Nominal voltage	U_N		3	6	12	Volt
Terminal resistance	R		10,4	50,5	130	Ω
No-load speed (motor)	n_o		13 400	14 300	15 500	min^{-1}
Speed constant	k_n		4 640	2 480	1 340	min^{-1}/V
Back-EMF constant	k_E		0,216	0,403	0,749	mV/min^{-1}
Torque constant	k_M		2,06	3,84	7,15	mNm/A
Current constant	k_I		0,486	0,260	0,140	A/mNm
Slope of n-M curve	$\Delta n/\Delta M$		24 700	31 400	24 200	min^{-1}/mNm
Rotor inductance	L		175	720	2 100	µH
Rotor inertia	J		0,09	0,09	0,09	gcm^2

Housing material		plastic	
Geartrain material		metal	
Backlash, at no-load	≤	4	°
Bearings on output shaft		plastic / brass bearing	
Shaft load max.:			
– radial (5 mm from mounting face)	≤	1,4	N
– axial	≤	1	N
Shaft press fit force, max.	≤	15	N
Shaft play:			
– radial (5 mm from mounting face)	≤	0,08	mm
– axial	≤	0,25	mm
Operating temperature range		0 ... + 70	°C

Specifications

reduction ratio (rounded)	output speed up to n_{max} min^{-1}	weight with motor g	output torque continuous operation M_{max} mNm	output torque intermittent operation M_{max} mNm	direction of rotation (reversible)	efficiency %
6 : 1	779	6,9	1,4	3	=	81
13 : 1	372	7,0	2,8	5	≠	73
39 : 1	129	7,2	7,0	10	=	60
112 : 1	45	7,4	19,8	30	≠	59
324 : 1	15	7,7	30,0	50	=	53

Note: output speed at 5000 min^{-1} input speed. Based on motor 1506 ... SR.



1512 U ... SR ... IE2-8

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

[1] Ambient temperature 22°C (tested at 1kHz)
[2] Velocity (min^{-1}) = 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

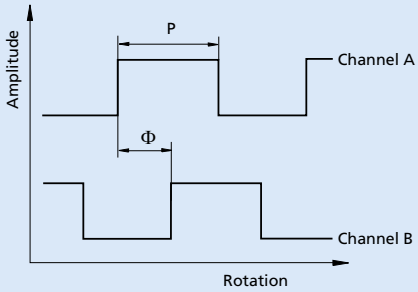
Examples:

1512U003SR 6:1 IE2-8

1512U012SR 324:1 IE2-8

Output signals / Circuit diagram / Connector information

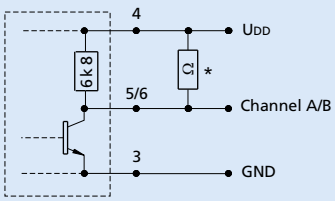
Output signals
with clockwise rotation as seen from the shaft end



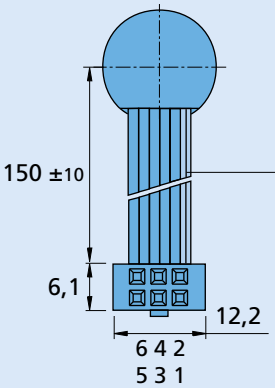
Admissible deviation of phase shift:

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

Output circuit



* An additional external pull-up resistor can be added to improve the rise time. Caution: I_{OUT} max. 5 mA must not be exceeded!



Pin Function

1 Motor –
2 Motor +
3 GND
4 U_{DD}
5 Kanal B
6 Kanal A

PVC-Ribbon cable
6 conductors 0,09 mm²

Connector
EN 60603-13 / DIN-41651.
grid 2,54 mm

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