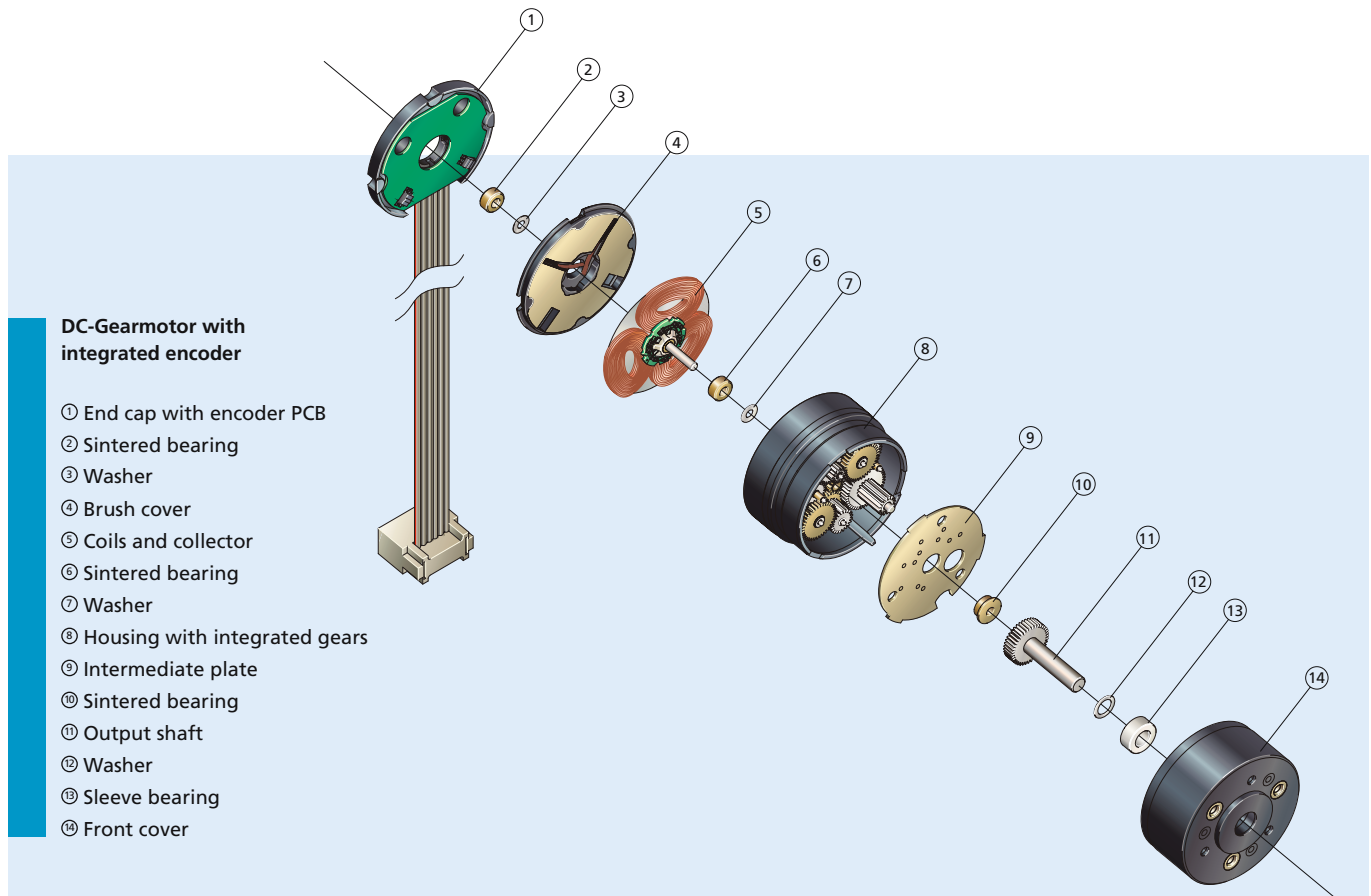


Flat DC-Micromotors

Precious Metal Commutation



DC-Gearmotor with integrated encoder

- ① End cap with encoder PCB
- ② Sintered bearing
- ③ Washer
- ④ Brush cover
- ⑤ Coils and collector
- ⑥ Sintered bearing
- ⑦ Washer
- ⑧ Housing with integrated gears
- ⑨ Intermediate plate
- ⑩ Sintered bearing
- ⑪ Output shaft
- ⑫ Washer
- ⑬ Sleeve bearing
- ⑭ Front cover

Features

The heart of these Flat DC-Micromotors is the ironless rotor made up of three flat self supporting coils. The rotor coil has exceptionally low inertia and inductance and rotates in an axial magnetic field.

Motor torque can be increased by the addition of an integrated reduction gearhead. This also reduces the speed to fit the specifications in the application.

FAULHABER specializes in the modification of their drive systems to fit the customer's particular application requirements. Common modifications include vacuum compatibility, extreme temperature compatibility, modified shaft geometry, additional voltage types, custom motor leads and connectors, and much more.

Benefits

- No cogging
- Extremely low current consumption – low starting voltage
- Highly dynamic performance due to a low inertia, low inductance coil
- Light and compact
- Precise speed control
- Simple to control due to the linear performance characteristics

Product Code



| | |
|-----|--------------------------------------|
| 26 | Motor diameter [mm] |
| 19 | Motor length [mm] |
| S | Shaft type |
| 012 | Nominal voltage [V] |
| S | Type of commutation (precious metal) |
| R | Version (rare earth magnet) |

2619 S 012 SR

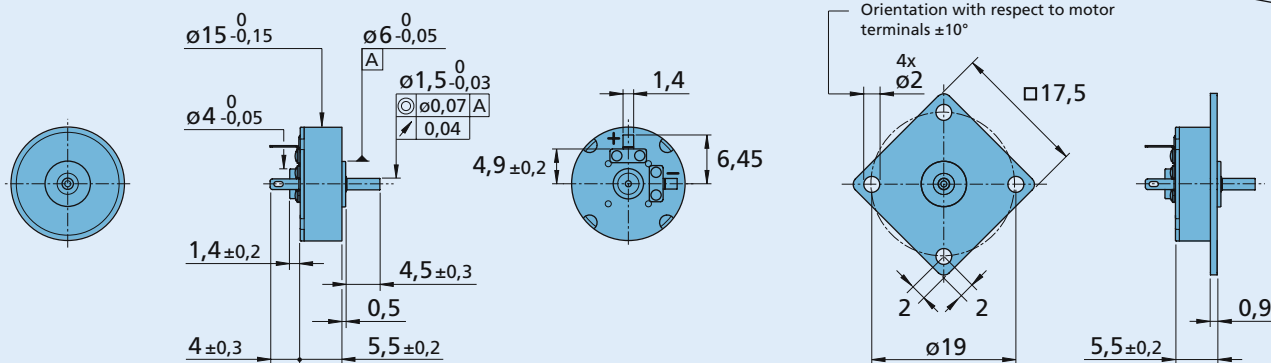
Flat DC-Micromotors

Precious Metal Commutation

0,3 mNm

Series 1506 ... SR

| 1506 N | | 003 SR | 006 SR | 012 SR | |
|--|-------------------------|---------------------------------------|--------|--------|---------------------------------|
| 1 Nominal voltage | U_N | 3 | 6 | 12 | V |
| 2 Terminal resistance | R | 13,5 | 54,7 | 155 | Ω |
| 3 Output power | $P_{2 \max.}$ | 0,15 | 0,15 | 0,22 | W |
| 4 Efficiency, max. | $\eta_{\max.}$ | 62 | 63 | 67 | % |
| 5 No-load speed | n_0 | 11 100 | 11 800 | 12 800 | rpm |
| 6 No-load current (with shaft \varnothing 0,8 mm) | I_0 | 0,01 | 0,005 | 0,003 | A |
| 7 Stall torque | M_H | 0,52 | 0,49 | 0,64 | mNm |
| 8 Friction torque | M_R | 0,02 | 0,02 | 0,02 | mNm |
| 9 Speed constant | k_n | 3 884 | 2 053 | 1 107 | rpm/V |
| 10 Back-EMF constant | k_E | 0,257 | 0,487 | 0,903 | mV/rpm |
| 11 Torque constant | k_M | 2,46 | 4,65 | 8,63 | mNm/A |
| 12 Current constant | k_I | 0,407 | 0,215 | 0,116 | A/mNm |
| 13 Slope of n-M curve | $\Delta n/\Delta M$ | 21 333 | 24 135 | 19 947 | rpm/mNm |
| 14 Rotor inductance | L | 275 | 1 157 | 3 550 | μ H |
| 15 Mechanical time constant | τ_m | 17 | 19 | 16 | ms |
| 16 Rotor inertia | J | 0,08 | 0,08 | 0,08 | gcm ² |
| 17 Angular acceleration | $\alpha_{\max.}$ | 68 | 63 | 83 | $\cdot 10^3$ rad/s ² |
| 18 Thermal resistance | $R_{th 1} / R_{th 2}$ | 25 / 35 | | | K/W |
| 19 Thermal time constant | τ_{w1} / τ_{w2} | 4,5 / 48,4 | | | s |
| 20 Operating temperature range: | | | | | |
| - motor | | -25 ... +80 | | | $^{\circ}$ C |
| - rotor, max. permissible | | +85 | | | $^{\circ}$ C |
| 21 Shaft bearings | | sintered bearings | | | |
| 22 Shaft load max.: | | | | | |
| - with shaft diameter | | 0,8 | | | mm |
| - radial at 3 000 rpm (3 mm from bearing) | | 0,5 | | | N |
| - axial at 3 000 rpm | | 0,1 | | | N |
| - axial at standstill | | 10 | | | N |
| 23 Shaft play | | | | | |
| - radial | \leq | 0,03 | | | mm |
| - axial | \leq | 0,2 | | | mm |
| 24 Housing material | | plastic | | | |
| 25 Weight | | 4,3 | | | g |
| 26 Direction of rotation | | clockwise, viewed from the front face | | | |
| Recommended values - mathematically independent of each other | | | | | |
| 27 Speed up to | $n_{e \max.}$ | 10 000 | 10 000 | 10 000 | rpm |
| 28 Torque up to | $M_{e \max.}$ | 0,3 | 0,3 | 0,3 | mNm |
| 29 Current up to (thermal limits) | $I_{e \max.}$ | 0,122 | 0,064 | 0,035 | A |



1506 N ... SR

1506 N ... SR X3697

Flat DC-Micromotors

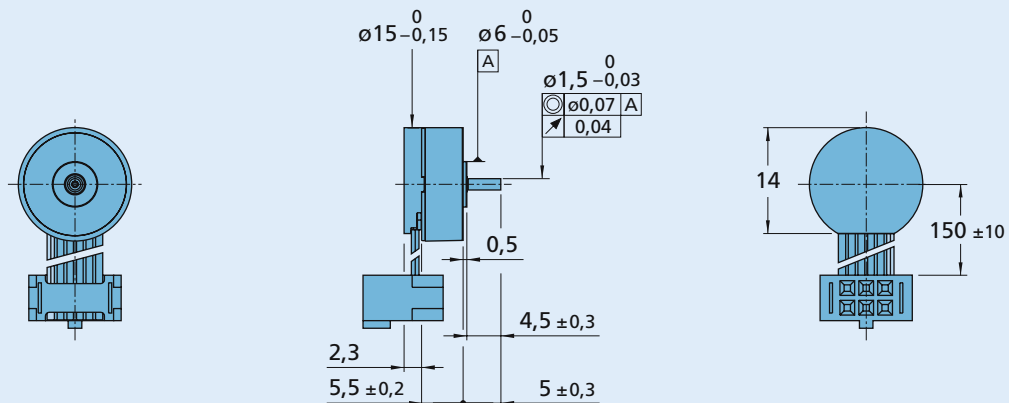
Precious Metal Commutation
with integrated Encoder

0,3 mNm

For combination with
Drive Electronics:
SC 1801

Series 1506 ... SR IE2-8

| | 1506 N | 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 |
| Output power | P _{2 max.} | 0,19 | 0,17 | 0,26 | W |
| Efficiency | η _{max.} | 68 | 66 | 70 | % |
| No-load speed | n ₀ | 13 400 | 14 300 | 15 500 | rpm |
| No-load current (with shaft ø 0,8 mm) | I ₀ | 0,010 | 0,005 | 0,003 | A |
| Stall torque | M _H | 0,54 | 0,46 | 0,64 | mNm |
| Friction torque | M _R | 0,02 | 0,02 | 0,02 | mNm |
| Speed constant | k _n | 4 640 | 2 480 | 1 340 | rpm/V |
| Back-EMF constant | k _E | 0,216 | 0,403 | 0,749 | mV/rpm |
| 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 | Δn/ΔM | 24 700 | 31 400 | 24 200 | rpm/mNm |
| Rotor inductance | L | 175 | 720 | 2 100 | μH |
| Mechanical time constant | τ _m | 24 | 30 | 23 | ms |
| Rotor inertia | J | 0,09 | 0,09 | 0,09 | gcm ² |
| Angular acceleration | α _{max.} | 58 | 50 | 71 | ·10 ³ rad/s ² |
| Thermal resistance | R _{th 1} / R _{th 2} | 36 / 61 | | | K/W |
| Thermal time constant | τ _{w1} / τ _{w2} | 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 | | | |
| Recommended values - mathematically independent of each other | | | | | |
| Speed up to | n _{e max.} | 10 000 | 10 000 | 10 000 | rpm |
| Torque up to | M _{e max.} | 0,3 | 0,3 | 0,3 | mNm |
| Current up to (thermal limits) | I _{e max.} | 0,206 | 0,098 | 0,060 | A |



1506 N... SR IE2-8

| 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} = 5V 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 (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:

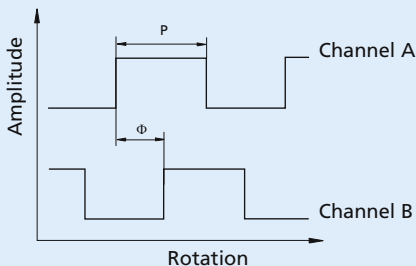
1506N003SR IE2-8

1506N012SR IE2-8

Output signals / Circuit diagram / Connector information

Output signals

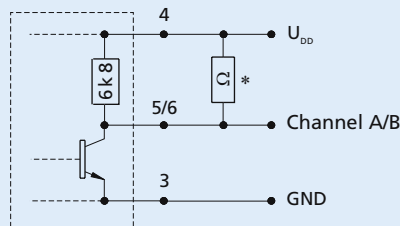
with clockwise rotation as seen from the shaft end



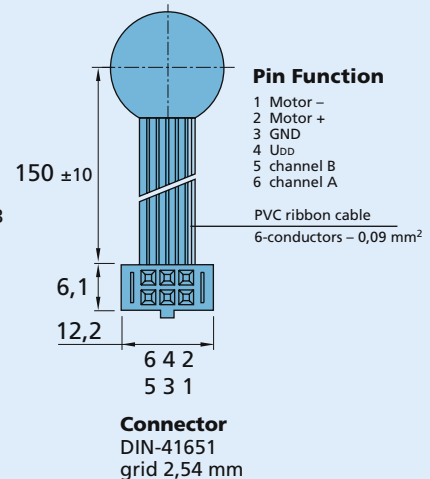
Admissible deviation of phase shift:

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

Output circuit



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



DC-Gearmotors

30 mNm

Precious Metal Commutation

DC-Motors


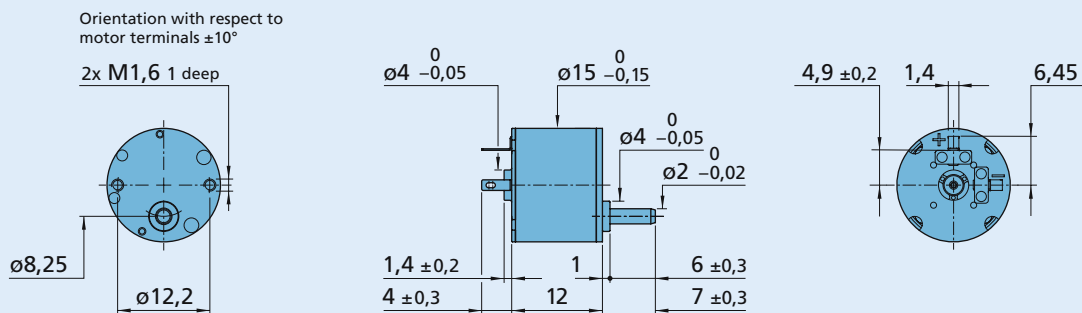
Series 1512 ... SR

| | 1512 U | 003 SR | 006 SR | 012 SR | |
|-----------------------|---------------------|--------|--------|--------|----------|
| Nominal voltage | U_N | 3 | 6 | 12 | Volt |
| Terminal resistance | R | 13,6 | 60,5 | 156 | Ω |
| Output power | $P_{2 \max}$ | 0,15 | 0,15 | 0,22 | W |
| No-load speed (motor) | n_0 | 11 100 | 11 980 | 12 800 | rpm |
| Speed constant | k_n | 3 884 | 2 053 | 1 107 | rpm/V |
| Back-EMF constant | k_E | 0,257 | 0,487 | 0,903 | mV/rpm |
| Torque constant | k_M | 2,46 | 4,65 | 8,63 | mNm/A |
| Current constant | k_I | 0,407 | 0,215 | 0,116 | A/mNm |
| Slope of n-M curve | $\Delta n/\Delta M$ | 21 330 | 24 135 | 19 947 | rpm/mNm |
| Rotor inductance | L | 275 | 1 157 | 3 550 | μH |
| Rotor inertia | J | 0,08 | 0,08 | 0,08 | gcm^2 |

| | | | |
|------------------------------------|--------|-------------------------|------------|
| Housing material | | plastic | |
| Geartrain material | | metal | |
| Backlash, at no-load | \leq | 4 | $^\circ$ |
| Bearings on output shaft | | plastic / brass bearing | |
| Shaft load max.: | | | N |
| – radial (5 mm from mounting face) | \leq | 1,4 | N |
| – axial | \leq | 1 | N |
| Shaft press fit force, max. | \leq | 15 | N |
| Shaft play: | | | |
| – radial (5 mm from mounting face) | \leq | 0,08 | mm |
| – axial | \leq | 0,25 | mm |
| Operating temperature range | | - 25 ... + 80 | $^\circ C$ |

Specifications

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

 M 1:1 

1512 U

DC-Gearmotors

30 mNm

Precious Metal Commutation
with integrated Encoder

For combination with
Drive Electronics:
SC 1801

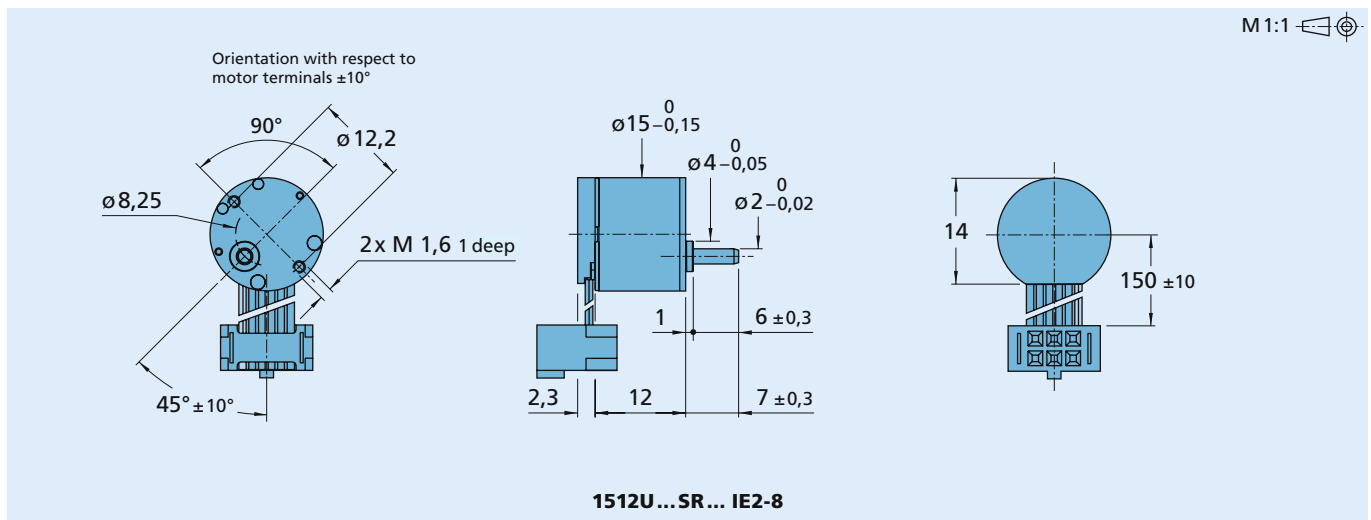
Series 1512 ... SR ... IE2-8

| | 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 |
| Output power | $P_{2 \text{ max.}}$ | 0,19 | 0,17 | 0,26 | W |
| No-load speed (motor) | n_0 | 13 400 | 14 300 | 15 500 | rpm |
| Speed constant | k_n | 4 640 | 2 480 | 1 340 | rpm/V |
| Back-EMF constant | k_E | 0,216 | 0,403 | 0,749 | mV/rpm |
| 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 | rpm/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 | \leq | 4 | $^\circ$ |
| Bearings on output shaft | | plastic / brass bearing | |
| Shaft load max.: | | | N |
| – radial (5 mm from mounting face) | \leq | 1,4 | N |
| – axial | \leq | 1 | N |
| Shaft press fit force, max. | \leq | 15 | N |
| Shaft play: | | | |
| – radial (5 mm from mounting face) | \leq | 0,08 | mm |
| – axial | \leq | 0,25 | mm |
| Operating temperature range | | 0 ... + 70 | $^\circ\text{C}$ |

Specifications

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



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

| 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} = 5V 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 (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:

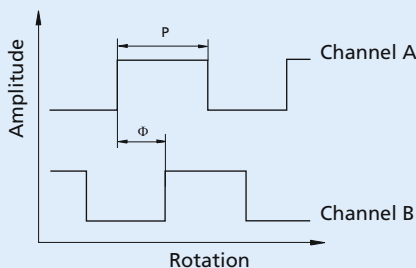
1512U003SR 6:1 IE2-8

1512U012SR 324:1 IE2-8

Output signals / Circuit diagram / Connector information

Output signals

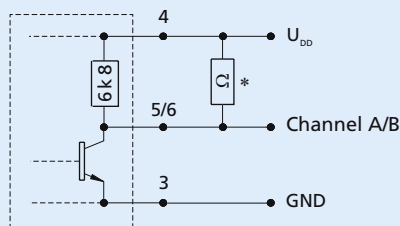
with clockwise rotation as seen from the shaft end



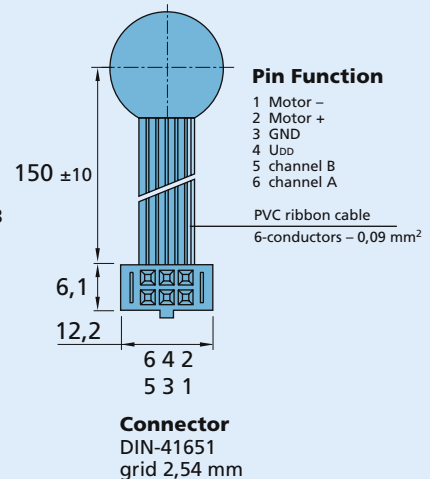
Admissible deviation of phase shift:

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

Output circuit



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



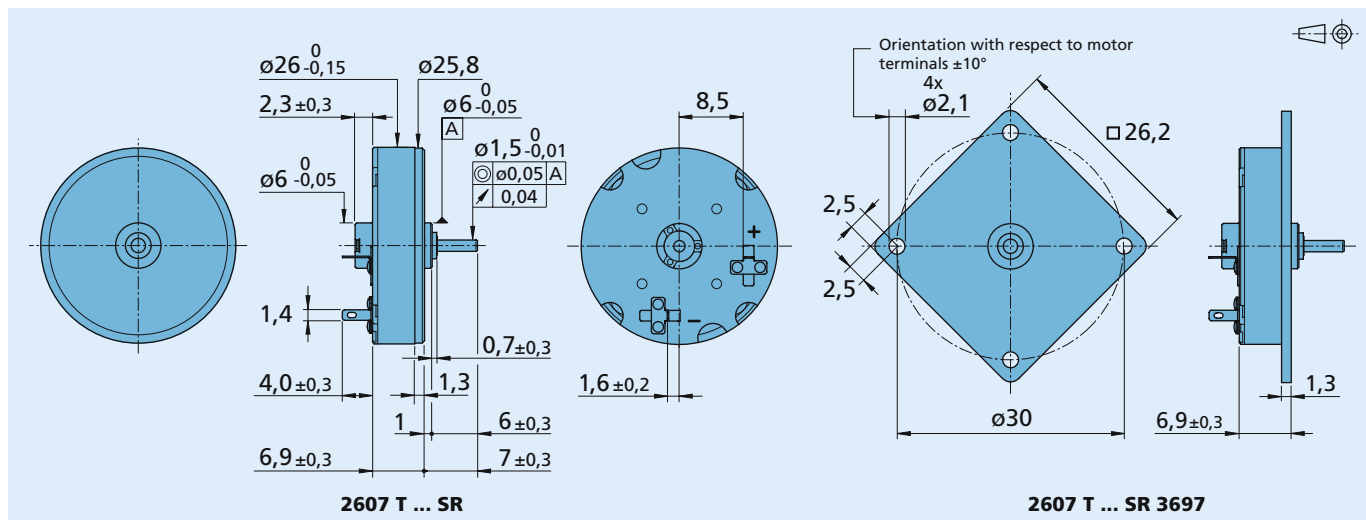
Flat DC-Micromotors

Precious Metal Commutation

3 mNm

Series 2607 ... SR

| | 2607 T | 006 SR | 012 SR | 024 SR | |
|--|-------------------------|---------------------------------------|--------------------|--------|---------------------------------|
| 1 Nominal voltage | U_N | 6 | 12 | 24 | V |
| 2 Terminal resistance | R | 8,2 | 36,5 | 128 | Ω |
| 3 Output power | $P_{2 \max}$ | 1,08 | 0,97 | 1,1 | W |
| 4 Efficiency, max. | η_{\max} | 81 | 80 | 81 | % |
| 5 No-load speed | n_0 | 6 600 | 5 900 | 6 200 | rpm |
| 6 No-load current (with shaft \varnothing 1,5 mm) | I_0 | 0,007 | 0,004 | 0,002 | A |
| 7 Stall torque | M_H | 6,26 | 6,21 | 6,77 | mNm |
| 8 Friction torque | M_R | 0,06 | 0,07 | 0,07 | mNm |
| 9 Speed constant | k_n | 1 111 | 500 | 261 | rpm/V |
| 10 Back-EMF constant | k_E | 0,9 | 2 | 3,83 | mV/rpm |
| 11 Torque constant | k_M | 8,59 | 19,09 | 36,54 | mNm/A |
| 12 Current constant | k_I | 0,116 | 0,052 | 0,027 | A/mNm |
| 13 Slope of n-M curve | $\Delta n / \Delta M$ | 1 055 | 957 | 917 | rpm/mNm |
| 14 Rotor inductance | L | 465 | 2 200 | 8 400 | μ H |
| 15 Mechanical time constant | τ_m | 7,5 | 6,8 | 6,5 | ms |
| 16 Rotor inertia | J | 0,68 | 0,68 | 0,68 | gcm ² |
| 17 Angular acceleration | α_{\max} | 92 | 92 | 100 | $\cdot 10^3$ rad/s ² |
| 18 Thermal resistance | $R_{th 1} / R_{th 2}$ | 2,7 / 24,45 | | | K/W |
| 19 Thermal time constant | τ_{w1} / τ_{w2} | 1,8 / 163 | | | s |
| 20 Operating temperature range: | | | | | |
| – motor | | -25 ... +80 | | | °C |
| – rotor, max. permissible | | +100 | | | °C |
| 21 Shaft bearings | | sintered bearings | ball bearings | | |
| 22 Shaft load max.: | | (standard) | (optional version) | | |
| – with shaft diameter | | 1,5 | 1,5 | mm | |
| – radial at 3 000 rpm (3 mm from bearing) | | 1,2 | 5 | N | |
| – axial at 3 000 rpm | | 0,2 | 0,5 | N | |
| – axial at standstill | | 20 | 10 | N | |
| 23 Shaft play | | | | | |
| – radial | \leq | 0,03 | 0,015 | mm | |
| – axial | \leq | 0,2 | 0,2 | mm | |
| 24 Housing material | | plastic | | | |
| 25 Weight | | 16,1 | | | g |
| 26 Direction of rotation | | clockwise, viewed from the front face | | | |
| Recommended values - mathematically independent of each other | | | | | |
| 27 Speed up to | $n_{e \max}$ | 5 500 | 5 500 | 5 500 | rpm |
| 28 Torque up to | $M_{e \max}$ | 3 | 3 | 3 | mNm |
| 29 Current up to (thermal limits) | $I_{e \max}$ | 0,348 | 0,156 | 0,081 | A |



Flat DC-Micromotors

Precious Metal Commutation
with integrated Encoder

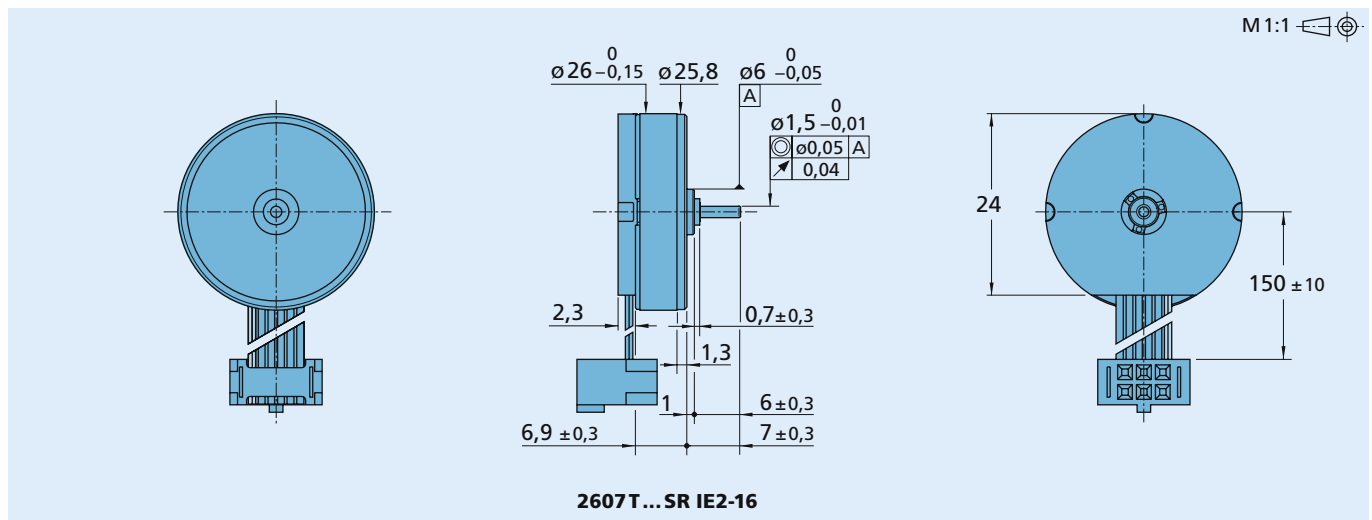
2 mNm

For combination with
Drive Electronics:
SC 1801

DC-Micromotors

Series 2607 ... SR IE2-16

| | 2607 T | 006 SR | 012 SR | 024 SR | IE2-16 |
|--|---------------------------------------|---|-----------------------------|--------|-------------------------------------|
| Nominal voltage | U _N | 6 | 12 | 24 | Volt |
| Terminal resistance | R | 8 | 31,2 | 118,6 | Ω |
| Output power | P _{2 max.} | 1,11 | 1,14 | 1,22 | W |
| Efficiency | η _{max.} | 80 | 80 | 80 | % |
| No-load speed | n ₀ | 6 700 | 6 900 | 7 200 | rpm |
| No-load current (with shaft ø 1,5 mm) | I ₀ | 0,010 | 0,005 | 0,0025 | A |
| Stall torque | M _H | 6,33 | 6,31 | 6,48 | mNm |
| Friction torque | M _R | 0,08 | 0,08 | 0,08 | mNm |
| Speed constant | k _n | 1 130 | 582 | 304 | rpm/V |
| Back-EMF constant | k _E | 0,884 | 1,72 | 3,29 | mV/rpm |
| Torque constant | k _M | 8,44 | 16,4 | 31,4 | mNm/A |
| Current constant | k _I | 0,118 | 0,061 | 0,032 | A/mNm |
| Slope of n-M curve | Δn/ΔM | 1 060 | 1 090 | 1 110 | rpm/mNm |
| Rotor inductance | L | 420 | 1 600 | 5 800 | μH |
| Mechanical time constant | τ _m | 7,5 | 7,8 | 7,9 | ms |
| Rotor inertia | J | 0,68 | 0,68 | 0,68 | gcm ² |
| Angular acceleration | α _{max.} | 94 | 93 | 95 | ·10 ³ rad/s ² |
| Thermal resistance | R _{th 1} / R _{th 2} | 10 / 32 | | | K/W |
| Thermal time constant | τ _{w1} / τ _{w2} | 6 / 250 | | | s |
| Operating temperature range: | | 0 ... + 70 | | | °C |
| Shaft bearings | | sintered sleeves bearings (standard) | ball bearings (optional) | | |
| Shaft load max.: | | | | | |
| – with shaft diameter | | 1,5 | 1,5 | | mm |
| – radial at 3000 rpm (3 mm from bearing) | | 1,2 | 5 | | N |
| – axial at 3000 rpm | | 0,2 | 0,5 | | N |
| – axial at standstill | | 20 | 10 | | N |
| Shaft play: | | | | | |
| – radial | ≤ | 0,03 | 0,015 | | mm |
| – axial | ≤ | 0,2 | 0,2 | | mm |
| Housing material | | plastic | | | |
| Weight | | 18,6 | | | g |
| Direction of rotation | | clockwise, viewed from the front face | | | |
| Recommended values - mathematically independent of each other | | | | | |
| Speed up to | n _{e max.} | 5 500 | 5 500 | 5 500 | rpm |
| Torque up to | M _{e max.} | 2 | 2 | 2 | mNm |
| Current up to (thermal limits) | I _{e max.} | 0,371 | 0,187 | 0,097 | A |



| Integrated optical Encoder | | IE2-16 | |
|---|------------------|-----------------|----------|
| Lines per revolution | N | 16 | |
| Signal output, square wave | | 2 | channels |
| Supply voltage | U _{DD} | 3,2 ... 5,5 | V DC |
| Current consumption, typical (U _{DD} = 5V 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 (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 16 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:

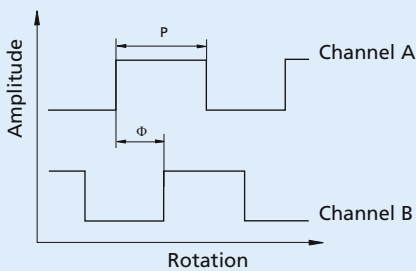
2607T006SR IE2-16

2607T024SR IE2-16

Output signals / Circuit diagram / Connector information

Output signals

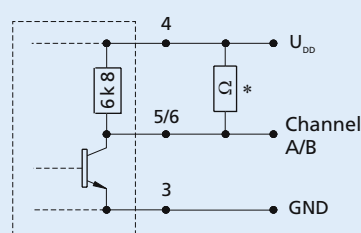
with clockwise rotation as seen from the shaft end



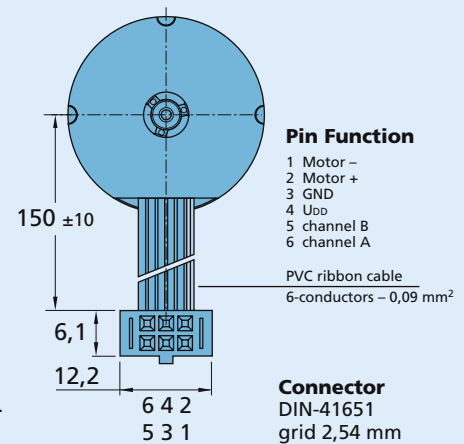
Admissible deviation of phase shift:

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

Output circuit



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



Pin Function

- 1 Motor -
- 2 Motor +
- 3 GND
- 4 U_{DD}
- 5 channel B
- 6 channel A

PVC ribbon cable
6-conductors - 0,09 mm²

Connector
DIN-41651
grid 2,54 mm