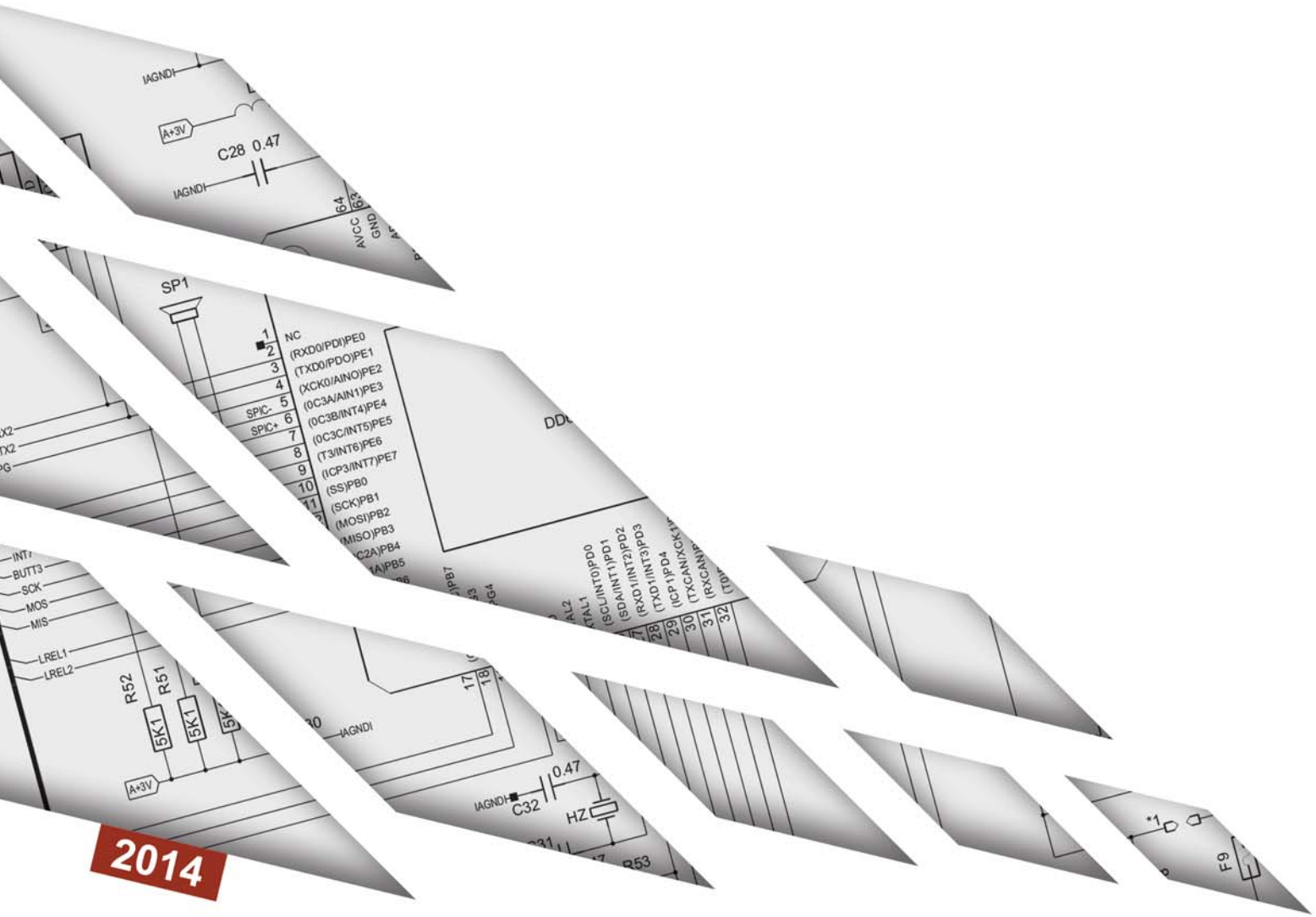
FOR YOUR BUSINESS

SMART MOTOR DEVICES



STEP BRUSH BRUSHLESS MOTORS DRIVERS CONTROLS

Smart Motor Devices Ltd. is Estonian private owned company founded in Tallinn on 2011.

We are a professional motor drivers and controllers manufacturer in Europe. We sell tens of thousands of smart devices for various areas of the industry worldwide in a year.

Our company offer five major series of products: simple drivers and controllers for stepping motors, integrated drivers with stepping motors, brush motor controllers, brushless motor controllers, brushless motor controllers with feedback (with optical encoder).

We provide our smart products to wide range of companies for the following applications: the packing machines, the CNC machines, the robotics, the vending machines, the textile machines, the metal working and wood machines, the health care equipment, household appliance product and etc. of the industry of automation.

We have an engineering team with many years of experience in application engineering, design engineering with the latest advances equipment in Smart Control Device's area. Our engineering staff provides the finest quality product with service after the product is delivered to our Customers.

We have our own production line in Estonia and factory in China for mass production to cut the price and to make the best price suggestion. We have the European quality with price level Asian companies. We can make the customization for your industrial application. Our engineering staff is able to develop hardware, firmware and software. We can make the special product for OEM customers.

We have distributors practically in next countries:

Germany, Ott GmbH & Co. KG

Sweden, Nordela

Sweden, Promoco Scandinavia AB

Brazil, Kalatec Automação Industrial LTDA

Israel, Ledico Technologies Ltd.

We make efforts for that each our visitor became our regular customer, and each our client could recommend responsibly us to the partners and colleagues. These relations with clients are established thanks to strict performance of tasks which we undertake.

Brush servo motor controller

BMSD-Servo is a speed and position controller for DC brush servo motors with feedback and rated current up to 20Amp.

Controller supports manual mode, standalone mode or controlling by commands from computer via USB (virtual COM-port) in real time.

Technical parameters:

Voltage: 12 – 48VDC
Maximum motor voltage: 0.98·U_{sup}
Maximum operation motor current: 20Amp
Current protection: 30Amp
Maximum acceleration and deceleration setting, V/sec: 3·U_{sup}
Minimum acceleration and deceleration setting, V/sec: $U_{sup/8}$

BMSD-Servo

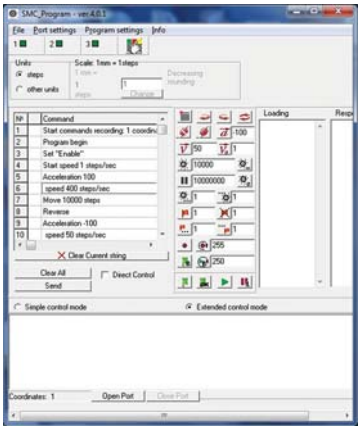
BMSD-Servo operates with DC brush servo motor with encoder with 500pps. Controller has two operation modes:
- manual mode;
- controller mode: standalone and "direct control" (via USB interface).

In manual mode it is possible to adjust speed by internal potentiometer or external analog signal 0...5VDC, acceleration/deceleration by internal potentiometer and to control direction of rotation.

In controller mode it is possible control speed, acceleration/deceleration and position (relative and absolute mode).

Controlling of brush servo motor with encoder via USB interface

Program can be loaded to EEPROM of the unit or to operational buffer. Also BMSD-Servo can be controlled by commands in real time.



Opportunities of BMSD-Servo controlling via USB interface:

- speed adjusting;
- direction control;
- moving the specified number of encoder pulses or moving to specified coordinate;
- acceleration;
- deceleration;
- controlling two outputs “open-collector” type;
- two inputs status analysis;
- “home” position searching.

Brush servo motors

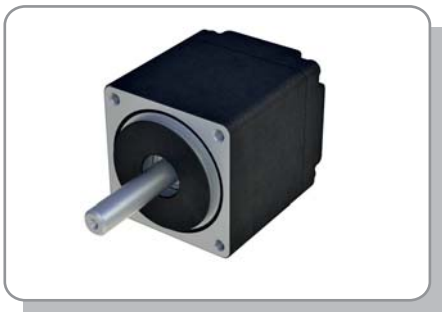
DC motor	Power, W	Reducer		Torque, kgf*cm	Rated speed, rpm	Current, Amp	Encoder
		Reducer type	Reduction ration				
SMS5946W30	60	Worm	1/30	30	80	<5	500 PPS
SMS6551W65	70		1/65	78	54	<2,9	
SMS7152W50	150		1/50	104,5	49	<6,3	
SMS7165W30	200		1/30	110	100	<8,3	
SMS7185W15	240		1/15	75	215	<10	

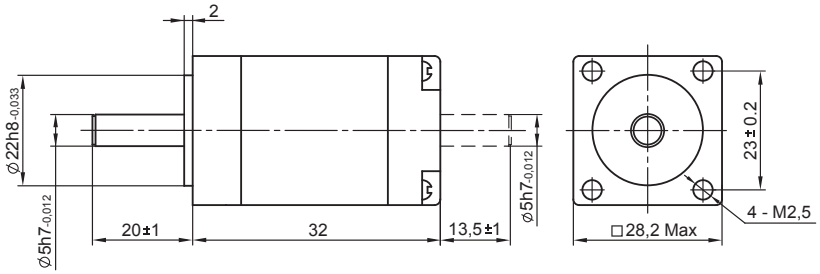
Stepper motors

The hybrid stepper motor provides better performance with respect to step resolution, torque and speed.
The main resolution of stepmotors 200 steps per revolution can be increased in few times by step dividing (microstepping mode) of a controller or a driver. The operation of stepper motors is easy to control and doesn't require feedback and expensive complicated devices. Step motors can be a good choice in applications where it is needed to control rotation angle, speed and position. Because of the inherent advantages stepper motors have found their places in many different applications, such as CNC machines, laser machines and so on.

Stepper motor	Driver / Controller	Holding torque, kgf*cm (N*m)	Max. current per phase, Amp	Resistance per phase, Ohm	Inductance per phase, mH	Rotor inertia, g*cm^2	Dimensions, mm
SM2832	SMD-1.8 / SMSD-1.5	0.4 (0.04)	0.95	2.8	1	9	28x28x32
SM4247	SMD-1.8 / SMSD-1.5	4.4 (0.43)	1.68	1.65	2.8	68	42x42x48
SM5776	SMD-4.2 / SMSD-4.2	18.9 (1.85)	2.8	1.13	3.6	480	56x56x76
SM8680	SMD-4.2 / SMSD-4.2 SMD-9.0 / SMSD-9.0	46 (4.51)	4.2	0.75	3.4	1400	86x86x80
SM86118	SMD-9.0 / SMSD-9.0	87 (8.53)	6.0	0.6	6.5	2700	86x86x118
SM110201	SMD-9.0 / SMSD-9.0	280 (27.45)	8.0	0.67	12	16200	110x110x201

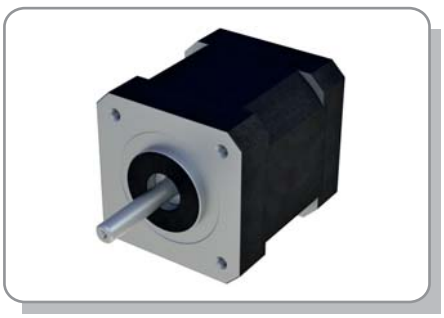
SM2832

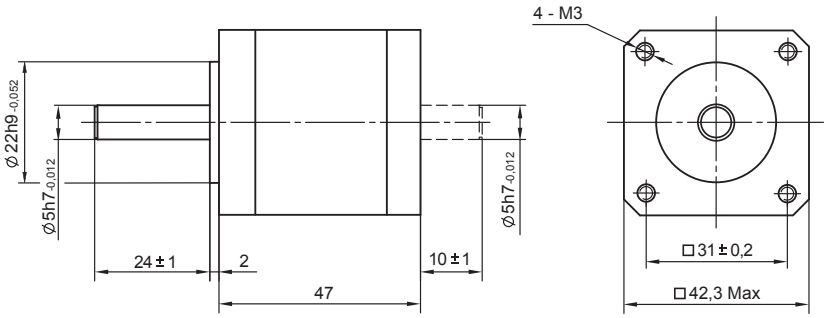




SM2832 is one of the smallest hybrid stepper motors. Although the size is small, the output torque is high enough for the range of applications, such as disk drives, fax machines, printing devices, copying machines, appliances. It can be used also in fine mechanics devices, optical devices, instrumentation, sorting automatic machines, automatic feeders, microsized dosing units and many others. The stepper motor SM2832 has low rotor inertia, which result to excellent dynamics and high maximum rotation speed.

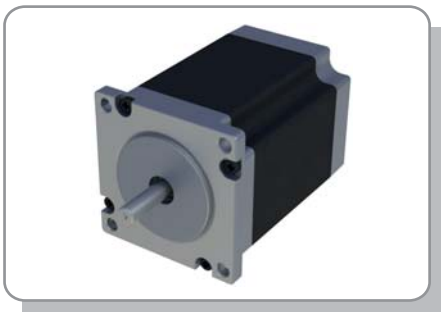
SM4247

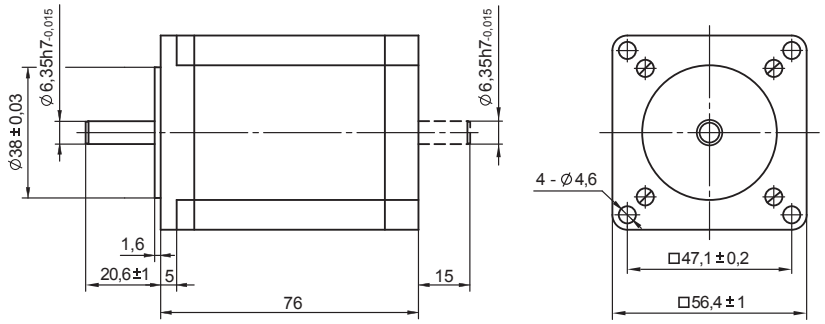




SM4247 is a compact hybrid stepper motor. The optimal geometry of toothed area of rotor and stator leads to hight frequency characteristics of step drive. The optimal balance of size and torque make usage of this step motor the best solution for micromanipulators, positioners, semi-automatic machines of multi parameter control, and devices for analysis of oil products.

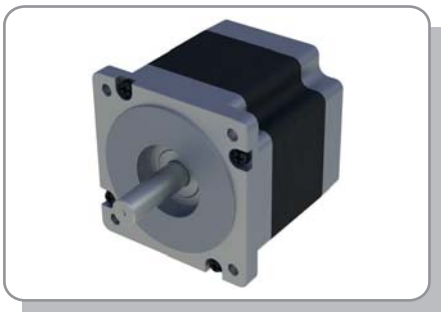
SM5776

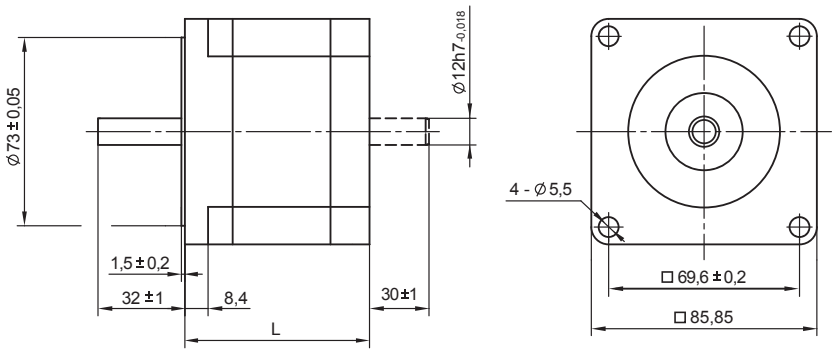




SM5776 is the most popular stepper motor for all kinds' equipment. As an example these motors can be used in robots, inspection machines, machine vision systems, pressure control devices, mini sized CNC machines and positioning stages.

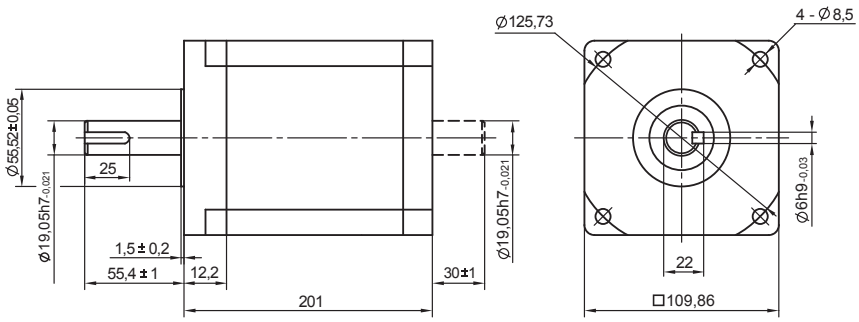
SM8680&118





SM8680 and **SM86118** are a prosperous solution for woodworking, plastic working, widely used with aluminium alloy materials. These stepper motors operate in CNC machines, electrical discharge machines, milling systems, grading machines. The stepper motors SM86 are applied in automatic labeling machines, label dispensers, automatic printers, laser cutting machines and so on and others. These motors are successful in robotic laser beam machines in automotive industry. SM86118 are good solution for automatic welders, drive executive mechanism of assembly lines and conveyors. This is just a short range of usage examples of the SM8680 and SM86118 stepper motors.

SM110201



SM110201 is a high torque stepper motor, it is the one of the most powerful in hybrid stepmotor range.
The motors are applied in turning lathes, milling and grinding machines, multi-axis boring cnc systems. SM110201 stepmotors operate in autofeed equipment, pressure control and flow control devices. These stepper motors are successfully used in automatic welders, in laser beam machines, in specific machine industry and in metal industry. The motors are applied as actuators for outdoor billboards as well.

Step motor drivers SMD

SMD are step motor drivers, designed by our company to control bipolar 2 and 4-phase stepper motors. All SMD drivers support micro stepping mode, have the “Enable” input to enable/disable motion, provide current reduction possibility in holding mode (this mode can be turned On or Off by customer).

The SMD stepper driver control speed, direction and position of a step motor by receiving and processing of logic signals: step (pulse), direction (level) and enable (level). The SMD drivers use external devices as a logic signals source – it could be a simple frequency generator, PLC, a computer with LPT-port or others.

We offer 3 dimension and power types of step motor drivers: SMD-1.8, SMD-4.2 and SMD-9.0, which cover a broad operating voltage range from 12 to 120VDC and control stepper motors in torque range from 0.18 kgf*cm up to 300 kgf*cm.

The SMD stepper drivers have full-step, half-step and MICRO step operation modes. Half-step mode gives smoother movement and can be used to reduce resonances at low speeds. MICRO step mode provides the smoothest movement at low frequencies. This mode can also be used to increase stop position accuracy beyond the normal motor limits.

Possibility to reduce holding current by 30% provides less motor heating.

Operation mode of step motor drivers SMD:

Pulse/Dir mode – the step motor driver receives voltage pulses as Step signals and voltage levels as Direction signals. The motion displacement depends on a pulses number, the motion speed is proportional to a pulses frequency. The direction depends on a voltage level on the DIR input. This mode is wide-spread by host controllers and accepted to control via LPT port of a computer (for CNC machines, as an example).

SMD-1.8

Voltage: **12 - 30V**
Current: **0.2 - 1.8A**
Microstepping: **1, 1/2, 1/4, 1/8, 1/16**

SMD-1.8 drivers are suitable for low current stepper motors and have small dimensions, so it is very convenient to use them in mini sized CNC machines and positioning stages.

Use with stepper motors series:

SM2832, SM4247

SMD-4.2

Voltage: **12 - 48V**
Current: **1.2 - 4.2A**
Microstepping: **1, 1/2, 1/4, 1/16**

SMD-4.2 drivers are suitable for middle current stepper motors that can be used, for example, in CNC machines for wood and plastic processing.

Use with stepper motors series:

SM5776, SM8680

SMD-9.0

Voltage: **24 - 120V**
Current: **2.5 - 9.0A**
Microstepping: **1, 1/2, 1/4, 1/16**

SMD-9.0 drivers are suitable for high current step motors and are successfully used in machine industry and in metal processing industry.

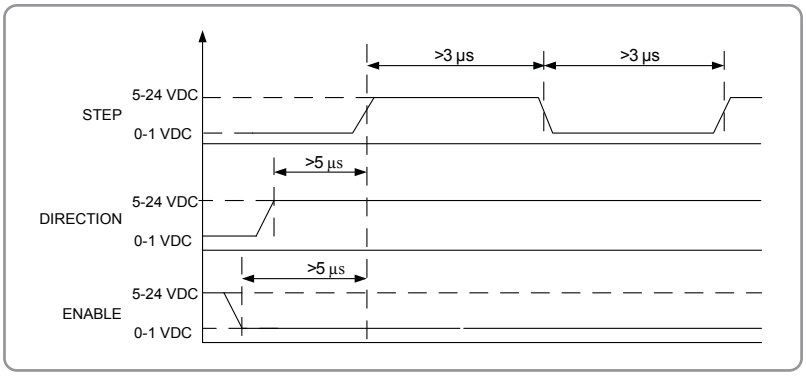
Use with stepper motors series:

SM8680, SM86118, SM110201

Step motor drivers SMD mini

Integrated control unit SMD mini is electronic device mounted on the motor housing and is intended for this motor control. Stepper motor is intended for transformation of control signals in angular movement of the rotor with its fixation in the given position without feedback devices. Drivers SMD mini provide high accuracy, speed and low vibration.

Oscillograms of control signals



SMD-1.6 mini

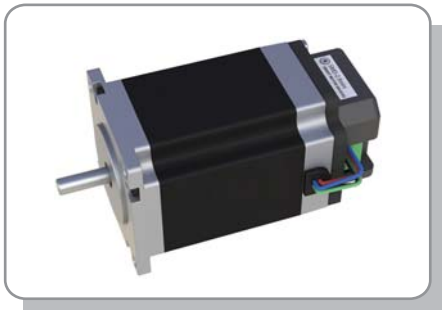
Voltage: **12-48V**
Current: **0.1-1.5A**
Microstepping: **1, 1/2, 1/4, 1/16**

This device is a stepper motor SM4247 with integrated control unit SMD-1.6 mini. SMD-1.6 mini is controlled by logic signals “STEP” (pulse), “DIR” (level), “EN” (level).

Use with stepper motors series:

SM4247

SMD-2.8 mini



Voltage: **12-48V**
Current: **0.54-2.8A**
Microstepping: **1, 1/2, 1/4, 1/16**

This device is a stepper motor SM5776 with integrated control unit SMD-2.8 mini. SMD-2.8 mini is controlled by logic signals “STEP” (pulse), “DIR” (level), “EN” (level).

Use with stepper motors series:

SM5776

3-channel stepmotor driver

SMD-303

Voltage: **10-30V**
Current: **0.5-2.8A**
Microstepping: **1, 1/2, 1/8, 1/16**

SMD-303 driver is designed to control of three two-phase or four-phase hybrid stepper motors with current up to 2,8A.
It can be used in three-axis CNC machines with low and medium power.

Use with stepper motor series:

SM2832, SM4247, SM5776

Tallinn Science Park Tehnopol, Mäealuse st. 4, Tallinn 12618, Estonia

Step motor programmable controllers SMSD

The SMSD step motor controller is our development, which includes in one case a driver for stepper motor commutation and a logic controller for realizing different types of motion. The SMSD step motor controllers provide 3 main types of motor control:

1) **Driver mode with logic signals STEP/DIR.** The SMSD stepper controller can operate as a simple stepper driver. Logic signals STEP (Pulse) and DIR (voltage level) are assign motion of a stepper motor. In this mode the motion distance depends on a number of STEP signals (voltage pulses), velocity of a stepper motor is proportional to the STEP signals frequency. The motion direction depends on the voltage level on the DIR input – 0VDC is low level and 5-24VDC is high level.

2) **"Synchro" mode.** The SMSD stepper controller operates as a driver. As control signals two-phase pulse signal with 90° phase differential (phase A+B) is used. The motion distance depends on a number of pulses; velocity of a stepper motor is proportional to the pulses frequency. Direction is defined by leading phase.

3) **Manual operation mode** of the SMSD stepper controller provides analog speed control. A step motor rotates permanently, the motion speed is adjusted by the internal or an external potentiometer or is proportional to the analog voltage signal 0-5VDC.
For system integration digital inputs are provided in the SMSD step motor controllers in the manual mode:

- one digital reverse input;
- one digital enable input.

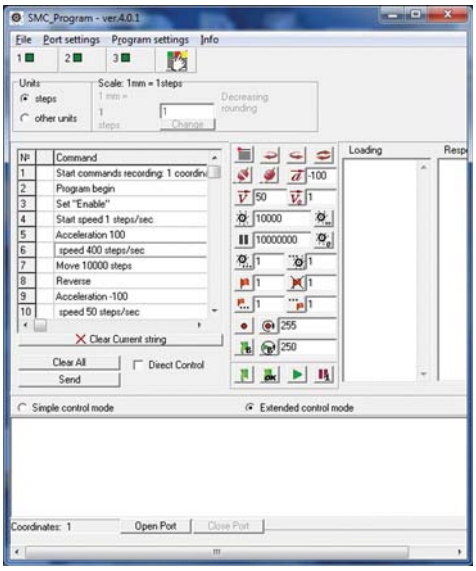
4) **Program mode and preset motion algorithm.** In this mode all operation parameters for SMSD stepper controller are set by commands from a computer: speed, acceleration and deceleration, direction, distance, pauses, cycles, waiting for external signals, turn on/off the internal programmable relay for output signals. In this mode two sub modes are available:

- Standalone mode – the sequence of the commands is stored in EEPROM. After commands are loaded into the memory of stepper controller, it can operate in standalone mode without connection to the computer.
- Direct control – real-time control: every single command is executed as soon as it has been loaded to the controller; SMSD stepper should be connected to the computer during all time of operation.

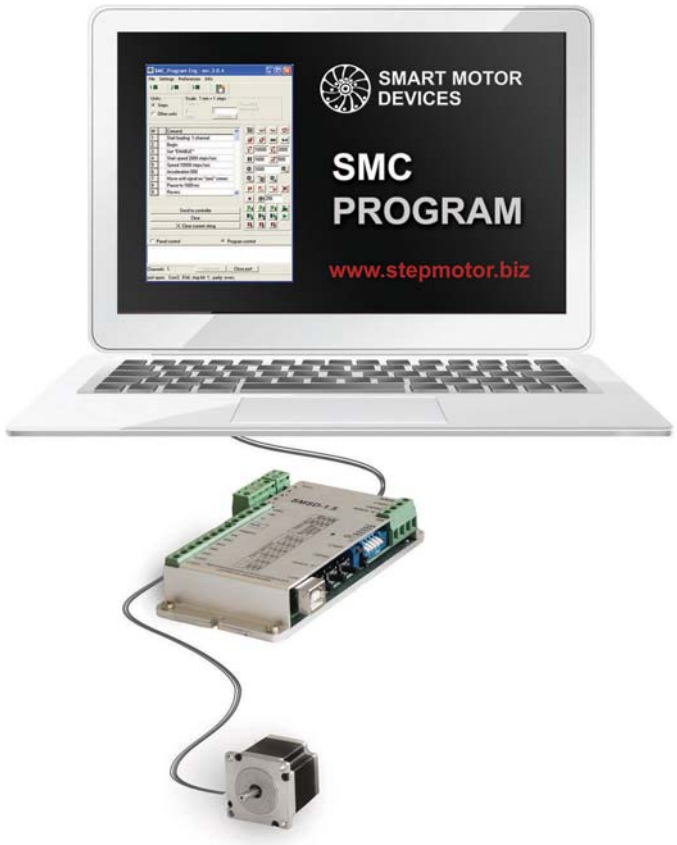
Connection to the computer is provided via USB. The communication interface is RS-232 (virtual COM). The cable and GUI program for windows is included to the package.

5) **Tracking mode** is available only for SMSD-822 controller. This mode provides position control by built-in potentiometer, external potentiometer or by analog signal 0…5V. The scale and velocity are set by commands and are loaded to the memory of the controller.

Window of SMC program



Connection scheme



There are 3D models of all controllers on our website: www.stepmotor.biz

SMSD-1.5

Voltage: **12 - 30V**
Current: **0.16 - 1.6A**
Microstepping: **1, 1/2, 1/4, 1/8, 1/16**

Holding current reduction by 30% manually.
SMSD-1.5 controller is best suited for 2 or 4 phase small size motors, which require little current under 1,6A to deliver good speed and torque result.

Use with stepper motors series:

SM2832, SM4247

SMSD-4.2

Voltage: **12 - 48V**
Current: **0.42 - 4.2A**
Microstepping: **1, 1/2, 1/4, 1/16**

Holding current reduction by 30% manually.
SMSD-4.2 controller is best suitable for stepper motors, which requires middle current.

Use with stepper motors series:

SM5776, SM8680

SMSD-8.0

Voltage: **24- 72V**
Current: **1.5 - 8.0A**
Microstepping: **1, 1/2, 1/4, 1/16**

Holding current reduction by 30% manually.
SMSD-8.0 controller is available to be used with high current and high torque big stepper motors.

Use with stepper motors series:

SM8680, SM86118, SM110201

SMSD-822

Voltage: **110 - 220VAC, 70 - 200VDC**
Current: **1.5 - 8.0A**
Microstepping: **1/2, 1/4, 1/8, 1/16, 1/32, 1/64, 1/128, 1/256**

Best power supply 220V..
SMSD-822 controller is available to be used with high current and high torque big stepper motors.

Use with stepper motors series:

SM86118, SM110201

Brushless motor controllers

We develop brushless motor controllers to operate DC 3-phase motors with Hall sensors. Controllers are designed to control speed, direction, active braking, smooth start and stop.
BLD – operates as a simple brushless motor speed driver
BLSD – additionally provides RS-485 communication

Brushless controller	Rated voltage	Continuous current, A	Max. current, A	Communication	Max. power, W
BLD-20	24 – 48VDC	20	25	-	960
BLSD-20				RS-485	
BLSD-50		50	55	RS-485	1000

BLD

Brushless controllers BLD-20 are electronic devices to operate and control brushless synchronous 3-phase dc motors with Hall sensors. The controllers are designed to control speed, direction, active braking, smooth start and stop of brushless motors with rated current under 20Amp relatively.

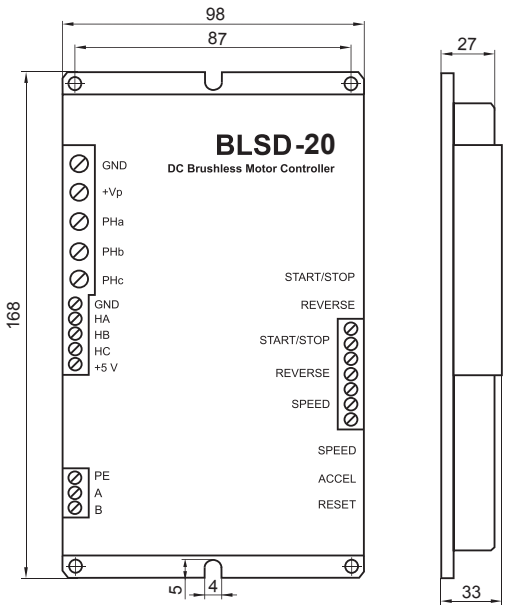
- Speed, acceleration and deceleration time for these brushless controllers are adjusted by the internal potentiometers on the frame of the controller. Speed also can be adjusted by an analog proportional signal 0-5VDC or an external potentiometer.
- Direction is changed by pressing the button or by external signal (clean contact) “REVERSE”.
- To start and stop a motor buttons or external signals are provided.

BLSD

BLSD-20 and BLSD-50 are the same brushless controllers as BLD series, but the communication interface RS-485 is provided. The controller BLSD has an internal digital rates counter. So there is possibility to know the current position.

Commands via RS-485:

Start and stop;
Set direction;
Set speed;
Set acceleration and deceleration;
Set current position;
Set new communication address;
Get current speed, direction and counter value.



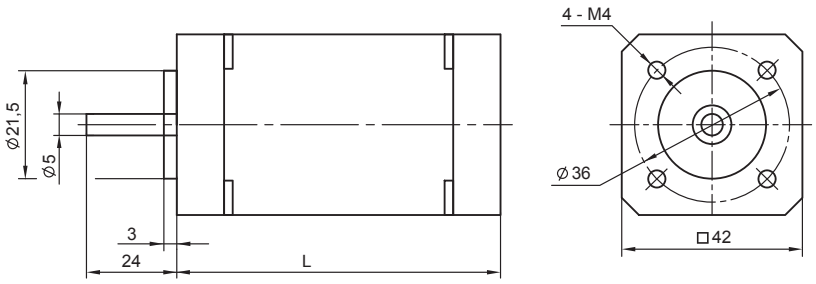
DC Brushless motors

DC brushless motors are 3-phase electromotors with Hall sensors.
We offer power range up to 660W output.

The main advantage of brushless DC motors is an absence of brushes and rubbing parts. Brushless motors are effective, low cost and long life. They are suitable applications for where high speed, high precision, high reliability and low motor noise are requiered.

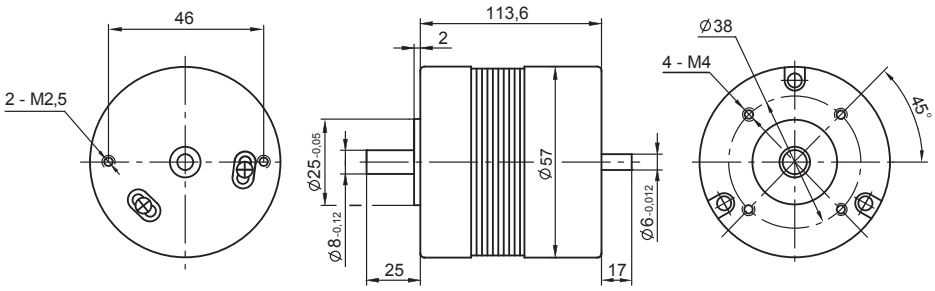
Brushless motor	Power, W	Speed, rpm	Rated torque, N*m	Rated current, A	Torque constant, N*m/A	Max. torque, N*m	Voltage, VDC	Max. current, Amp	Rotor inertia, g*cm²	Poles number	Back EMF, V/rpm*10³
SM42L61	52	4000	0,13	3,5	0,036	3,8	24	10,6	48	8	3,7
SM42L100	105		0,25	7,0		7,5		20	96		3,9
SM57L114	184		0,44	6,9	0,063	12,7	36	20,5	230	4	6,6
SM86L98	440	3000	1,4	12,4	0,113	42,0	48	37	1600	8	9,2
SM86L125	660		2,1	18,8	0,112	63,0		56	2400		9,1

SM42L61 / SM42L100

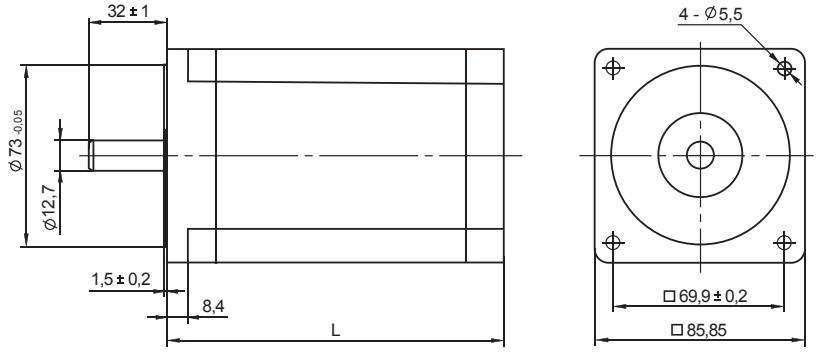


Motor length for SM42L61 is L=61mm, for SM42L100 is L=100mm.

SM57L114



SM86L98 / SM86L125



Motor length for SM86L98 is L=96mm, for SM86L125 is L=123mm.

Brush motor controllers

Two series of DC motor controllers - BMD and BMSD – are designed to operate with DC brush motors.
BMD is a speed driver for DC motors with advanced functionality. It controls speed, direction, acceleration and deceleration time, and provides active braking.

BMSD controller can operate with DC brush motors that are equipped with an encoder and provides speed stabilization. RS-485 communication is provided.

Technical parameters:

Voltage: 7 – 24VDC
Rated current: up to 12Amp
Maximum current: 16Amp
Rated motor power: up to 280W
Maximum motor power: 380W

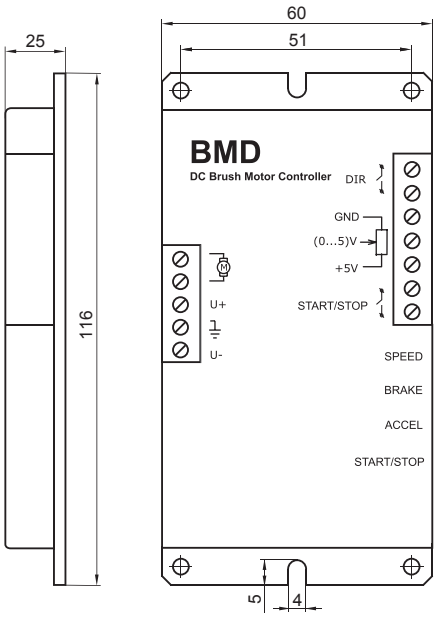
BMD

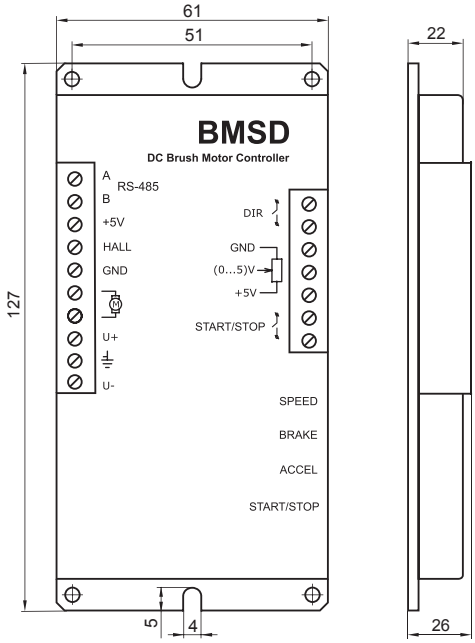
BMD is speed driver for DC brush motors. Speed, acceleration and deceleration time are adjusted by the internal potentiometers on the frame of the driver. Speed also can be adjusted by an external potentiometer or by an analog proportional signal 0 – 5VDC. Direction can be changed by external signal (clean contact) “DIR”.

To start and stop a motor buttons or external signals are provided.

BMSD

BMSD is the same controller, with RS-485 interface and speed stabilization.
Controller BMSD has an internal digital rates counter. So there is possibility to know current speed, direction and position.
There is the speed stabilization function in the BMSD controller for DC motors with an encoder. Speed stabilization allows automatically adjusting speed and making it stable in case of dynamic load.





DC Brush gearmotors

We sell DC motors with gear heads. Brush DC gearmotors are high quality, cost-effective, easy to use and don't require any service. DC gearmotors are applied in industrial machinery, robotics, tools, toys, simulators, electro bikes, transporters and other machines.

If there is no need to control position, and only speed control is required DC brush gearmotors with gear heads are almost the most cost-effective solution. In addition to the diversity of sizes and gear ratio DC brush motors provide high safety and high load capacity. DC motors always guarantee optimal ratio of power and dimensions.

Brush DC motors are widely used in measuring devices, electronic packing equipment and so on.

Rated voltage: 24VDC (except WG5946, which is 12VDC).

On a request DC motors with encoders are available.

DC motor	Power, W	Reducer		Torque, kgf*cm	Rated speed, rpm	Current, Amp
		Reducer type	Reduction ration			
SM35S50 SM35S75 SM35S500	3,2	Spur	1/50	2	100	<0,21
			1/75	3	65	
			1/500	6	11	
SM16P690	1	Planetary	1/690	3	16	<0,9
SM22P3968	1,7		1/3968	6	2	<0,11
SM32P51	4		1/51	2,2	100	<0,25
SM32RP100	8,5	Bevel and planetary	1/100	6,4	65	<0,5
SM42P61 SM42P504	51	Planetary	1/61	18	100	<2,1
			1/504	30	14	
SM71P91	90		1/91	125	20	<3,8
SM90P19 SM90P201	105		1/19	55	100	<4,2
			1/201	180	10	
SMS5946W30	60	Worm	1/30	30	80	<5
SMS6551W65	70		1/65	78	54	<2,9
SMS7152W50	150		1/50	104,5	49	<6,3
SMS7165W30	200		1/30	110	100	<8,3
SMS7185W15	240		1/15	75	215	<10

Other models are on a request:

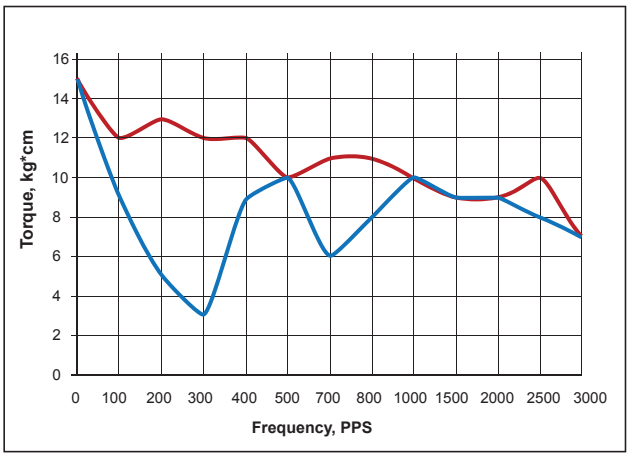
Power: 0,5W up to 600W
Rated speed: 1,8 rpm up to 2500 rpm
Rated torque: 0,02 kgf*cm up to 300 kgf*cm

Motor with planetary reducer

Motor with worm reducer

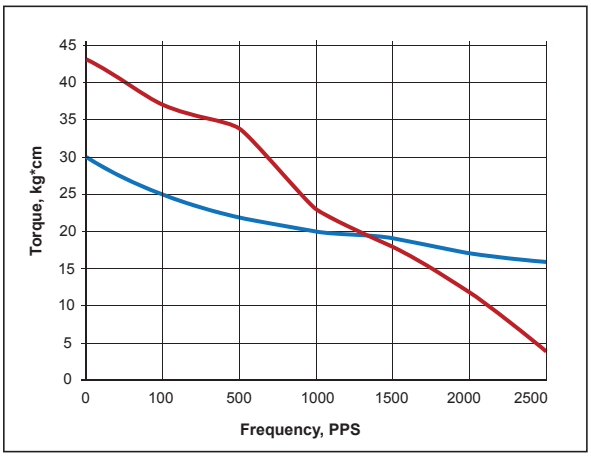
Torque characteristics

SM5776



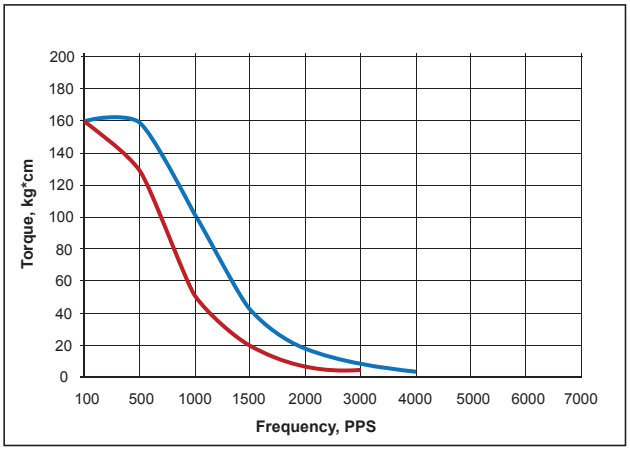
SMD-4.2
SMSD-4.2

SM8680



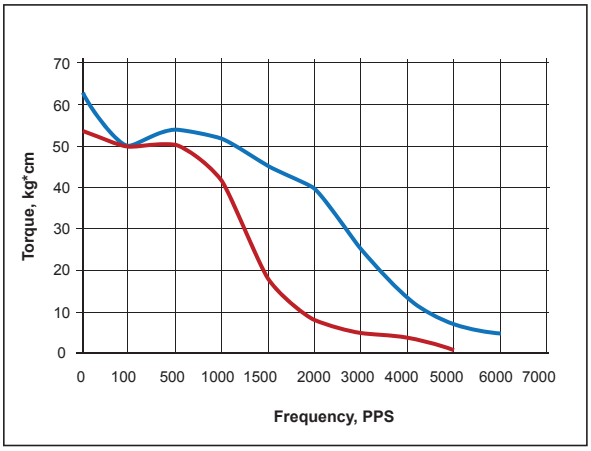
parallel connection (**SMD-4.2**)
series connection (**SMD-4.2**)

SM110201



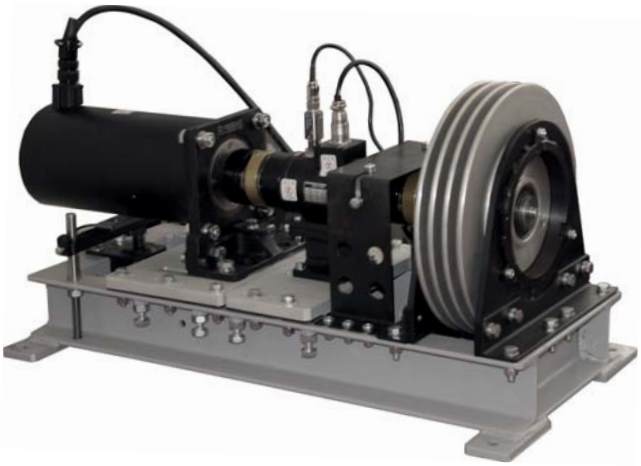
SMSD-9.0
SMD-9.0

SM86118



SMSD-9.0
SMD-9.0

All motors were tested using chassis dynamometer system by Electroprivod Ltd., 2012.



How to choose a motor - basic equations

Calculation of required torque TM [kgf • cm] - The required torque is a sum of load torque and acceleration torque. This is usually multiplied to safety factor K=1.5…3: **TM=K(TA+TL)**

The motor to be used should be selected in the range where the required torque is within the pull-out torque in the pulse rate vs. torque characteristics.

Calculation of acceleration torque Ta [kgf • cm] –Acceleration torque means the necessary torque to operate during acceleration and deceleration.

Case of self-starting operation:

$$T_a = \frac{J_0 + J_L}{g} \times \frac{\pi \theta_S^2 f^2}{648}$$

Case of accelerating or decelerating :

$$T_a = \frac{J_0 + J_L}{g} \times \frac{\pi \theta_S}{180} \times \frac{f_2 \ f_1}{t_1}$$

J_0 - [kg*cm2] – motor's rotor inertia

J_L - [kg*cm2] – system's moment of inertia

f_2 - [pps] - operating pulse frequency

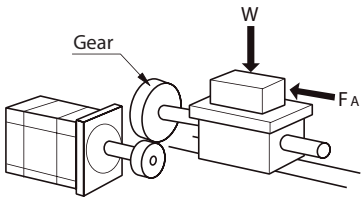
f_1 - [pps] - starting pulse frequency

t_1 - [s] - acceleration (Deceleration) time

Calculation of load torque TL [kgf • cm] – Load torque means the friction resistance occurred at the contact point of driving mechanism and is varied depending on the kind of driving mechanism and the weight of work.

Equation examples of load torque

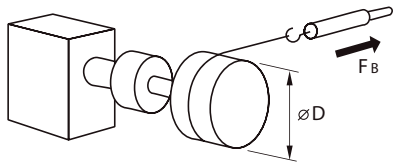
Driving by ball screw



$$T_L = \left(\frac{F \cdot P}{2\pi\eta} + \frac{\mu F_0 P_0}{2\pi}\right)\frac{1}{i}$$

$$F = F_A + W(\sin\alpha + \mu\cos\alpha)$$

Method of direct measurement



$$T_L = \frac{F_B D}{2}$$

T_L - [kgf*cm] – load torque

F - [kgf] - axial load

F^0 - [kgf] - pressurized load

F^A - [kgf] - external force

F^B_0 - [kgf] - starting force of main shaft

μ - fiction coefficient of pressurized nut (0.1 – 0.3)

η - efficiency (0.85 ~ 0.95)

i - reduction gear ratio

P - [cm/rev] – lead pitch

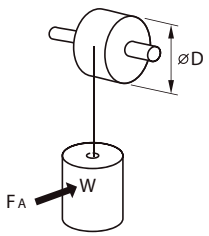
W - [kgf] – total weight of object and table

μ - friction coefficient of slipping surface (0.05)

α - inclination

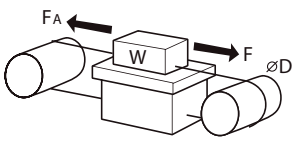
D - [cm] - diameter of final stage pulley

Driving by pulley



$$T_L = \frac{(\mu F_A + W)}{2\pi} \cdot \frac{\pi D}{i} = \frac{(\mu F_A + W)D}{2i}$$

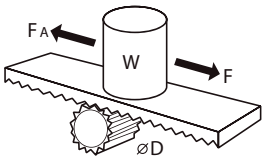
Driving by wire/belt



$$T_L = \frac{F}{2\pi\eta} \cdot \frac{\pi D}{i} = \frac{FD}{2\eta i}$$

$$F = F_A + W(\sin\alpha + \mu\cos\alpha)$$

Driving by rack & pinion



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