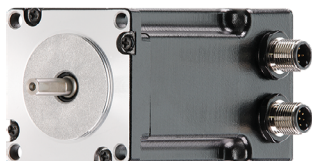


Picking the right motor for your application: Stepper Motors, DC Motors & Brushless DC motors

When picking a motor for your application, you want to be sure that you are getting one that will provide you with the right specs, but you also would like to maintain the most cost-effective option. So how can you select the right motor? Some questions and thoughts to consider before picking your motor: What motor type do you need? How much load will the motor be moving? How fast does the motor need to go? Will it be mounted vertically or horizontally? Linear or rotary motion? All of these questions are necessary to consider in order to get your application to run as smoothly as possible.



Stepper Motor



DC Motor



Brushless DC Motor

The different types of motors

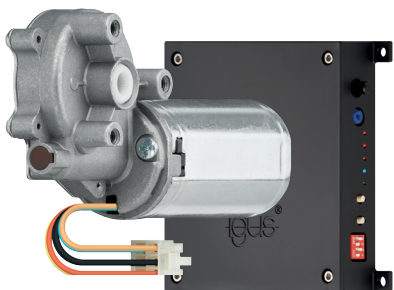
igus® offers three different types of motors: Stepper, DC, and Brushless DC. There are a few different characteristics between these three types of motors, which determine the areas of application each is best suited for.

Stepper Motors

There are three different types of stepper motors: permanent magnet (PM) stepper motors, variable reluctance (VR) stepper motors, and hybrid stepper motors — the only kind that igus offers. Hybrid stepper motors combine the advantages of PM and VR motors; those being the ability to apply high and full torque at standstill and have an accurate step angle. Furthermore, stepper motors have a holding torque.

The disadvantage of a stepper motor is its high energy requirement, as it always operates at maximum current. However, this can be counteracted by means of a motor control system. Due to a rotary encoder and the closed loop, both of which are adapted to the application, only the required current is consumed. Hybrid stepper motors are mainly used for positioning tasks that require precise motion control.

	Lifetime	Price	Voltages
Stepper	up to 20,000 hours	\$60-1,300 (the most amount of options to choose from)	24-48V
DC	up to 3,000 hours	\$60-200	24V
Brushless DC	up to 20,000 hours	\$150-500	48V



DC Motors

DC motors are simple electric motors that are operated with DC voltages. This means that they can also be operated with simple batteries. DC motors have two terminals, one for positive and one for negative. Therefore, for a different direction of rotation of the shaft of the DC motor, only the connections of the supply line must be swapped.

This allows the DC motors to be used in a wide range of applications. Typical

applications are toothbrushes, children's toys or fans. However, they are also used in cars as drives for the windshield wipers or seat adjusters. Furthermore, simple screen adjustments can be implemented in the area of access control. DC motors are also used in furniture construction and caravans to adjust TV sets.

DC motors are cost-effective because of their simple design. The disadvantage of DC motors without a motor control system is that they do not switch off automatically at increased torque, but draw more and more current until they come to a standstill. If a blockage is permanently present, the motor could become thermally defective.

Brushless DC (Brushless DC) Motors

Brushless DC motors, also called Brushless DC motors, are motors that do not have carbon brushes. Brushless DC motors operate in principle like three-phase synchronous motors. This is achieved by an electrical circuit that controls the coils one after the other.

The advantage of Brushless DC motors is that they have a much longer service life due to the lack of carbon brushes and are maintenance-free. In general, Brushless DC motors are ideal for dynamic applications and higher speeds. The disadvantage of Brushless DC motors is the higher cost compared to stepper and DC motors.

Typical applications are model airplanes, hard disc drives and PC fans. In the trade, Brushless DC motors are gradually replacing DC motors in cordless screwdrivers and hand-held circular saws. In the industry or in the field of automation technology, Brushless DC motors are used for actuators, pick and place applications and in joints of industrial robots.



D1 motor controller and GUI

Motor Controllers

With these motors, you will also need some type of controller, or driver, in order to operate them. There are a few options when it comes to motor controllers: AC, DC, servo, stepper, brushless, and others. igus offers a few different types of drivers, the first of them being the D1. This controller offers compatibility with stepper, DC, and Brushless DC motors, while also offering the ability to use custom motors by inputting custom

specifications. There is a GUI (graphical user interface) that allows for easy modifications and automation of your motor to allow for simple use and provide offline access via ethernet connection. It has CANopen and modbus TCP as a gateway for communication if needed to be used with a PLC or master controller. There is also the ability of choosing open vs closed loop for smoother operation, essentially turning a stepper motor into a servo.

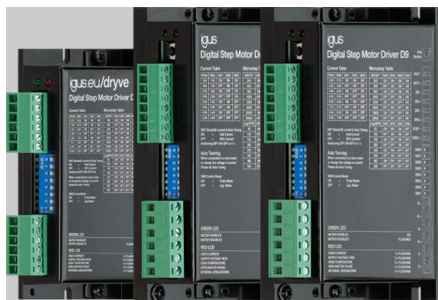


D3 motor controller

We also offer the D3, an even more cost-effective solution that is specifically for DC motors. This driver has dip switches, a couple push buttons, and two potentiometers all for simple control of a DC motor. The dip switches allow for mode selection, and the potentiometers control velocity and force.

A DC motor paired with our D3 motor driver will give you control of how much torque is applied before the driver and motor error out. This can be very useful for certain applications where too much force may damage the system or production they are part of.

The next three controllers are all similar, it just depends on the motor size. The D7 (NEMA 11/17), D8 (NEMA 23/24(23XL)), and the D9 (NEMA 34) are the simplistic drivers for stepper motors. These also use dip switches for various mode control as well as microstepping and RPM selection. These drivers are a great solution for someone who is using a PLC such as a raspberry pi or Siemens device and need to control multiple motors at once.

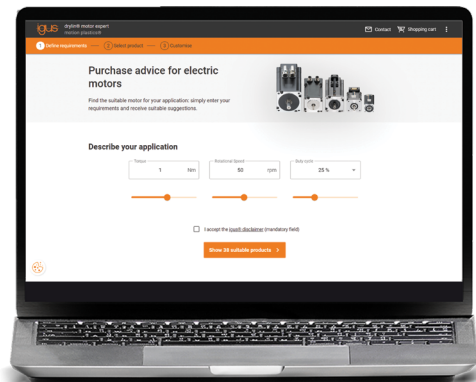


D7,D8,D9 motor controller

igus® Robot Control software

In the past couple of years, we have also been greatly improving our own version of a master controller or PLC, called the iRC (igus Robot Control). This controller allows for control of multiple stepper motors at once, up to 9. It also has the capability of interfacing with our ReBeL robotic arm, which utilizes Brushless DC motors using CANopen. The iRC has the option for a 48V power supply, in a cabinet on a DIN rail, with an emergency stop button. All models come with modules for the motors, as well as one module with 7 inputs and 7 outputs, and a main embedded computer as the master. The iRC software is very easy to use, with a digital twin for a user-friendly interface, and programming in a simple format, plotting each point by typing in the coordinates. The programming also has loops, if-then statements, and matrix functions to simplify the amount of steps needed in the program. It also has options for getting feedback from the digital IOs, such as using a push button (input) or activating a gripper (output). There is the ability of connecting a vision system and utilizing commands from it via variable functions. This control connects via ethernet, but has the ability of projecting a wifi signal as an access point for wireless connection. This is our recommended controller for all gantries, deltas, and articulated arms.

Learn more at www.igus.com/info/stepper-motors



drylin® motor expert

Our team of experts is available to help you at any time, but you can also head over to our drylin motor expert and enter information regarding the required torque, speed, and the duty cycle of your application. With over 200 motors, our expert system filters through and selects the most suitable motor that will benefit you for your application, showing you various options such as motor size, connection type, the percentage for the workload required from the motor with your specs in it, as well as the voltage that the motor would be operating at with these calculations. All of these options can be

sorted and organized from least to greatest. You will also see its gear ratio (whether it has one or not), whether it contains an encoder, hall sensor, or brake, and the cost of the motor. This tool is an efficient way of going through our available motors and providing you with the best options, without having to scroll through pages of motors or read through different technical datasheets until you find the right specs.

You are always welcome to browse and choose your own motors, but if you need any assistance at all in making the right choice or to better calculate your specs, feel free to contact us at any time! We have people working to help make sure that your application is performing to its best standards and in order for that to happen, we need to make sure you have the right components first.

These controllers paired with any of the mentioned motors make for a great combination to create a smooth and powerful system that is easy to set up and use.