

Blackbrick



Introduction :

The Blackbrick is a device designed to control the travel of the moving parts of Lego® series models, in combination with the Power Function accessories.

There are many advantages the installation of one (or more) Blackbricks gives to our Lego® model :

- It prevents a possible damage to the transmission elements existing between the motor and the moving mechanism of the model (as gears, shafts, joints ...), when it reaches its mechanical end-stroke.
- It prevents the motor to take unnecessary efforts in an attempt to go beyond the limit of the mechanics that manages the movement, preserving motor durability and reliability.
- Allows to create customized motion travel for each model movement, making it even more realistic.
- While playing with the model you no longer have to worry about to control the end-stroke of the excursion of the movements but you can just focus on the movements themselves.

Handling of the excursion of the movements is achieved through the installation of special sensors designed to use for construction of Lego® Technic models, housed in original Lego® bricks to seamlessly integrate them.

Sensors, connected to the Blackbrick, control the motor connected to it, running as end-travel switches and arresting the rotation, independently in both directions (clockwise - **CW** and counterclockwise - **CCW**).

The terms **CW** (clockwise) and **CCW** (counter-clockwise) mentioned in this manual, ALWAYS make reference to the direction of motor rotation (seen from the front, where the output shaft is) which drives the mechanism that the Blackbrick is associated to, NOT to the direction of the mechanism itself.

- **Figure 1 .**



Fig. 1

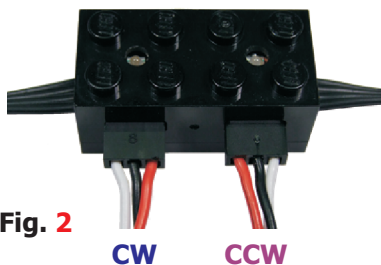


Fig. 2

The Blackbrick has two "ports" to which are connected the sensors, through the supplied plugs.

View from the front, the left one controls the clockwise rotation (**CW**), the right one the counterclockwise (**CCW**) - **Figure 2**

All traditional Power Function motors can be connected to the Blackbrick **except** the #88004 Servo Motor, as below :



88003 (L Motor)



8883 (M Motor)



8882 (XL Motor)



88004 (S Motor)

Description :

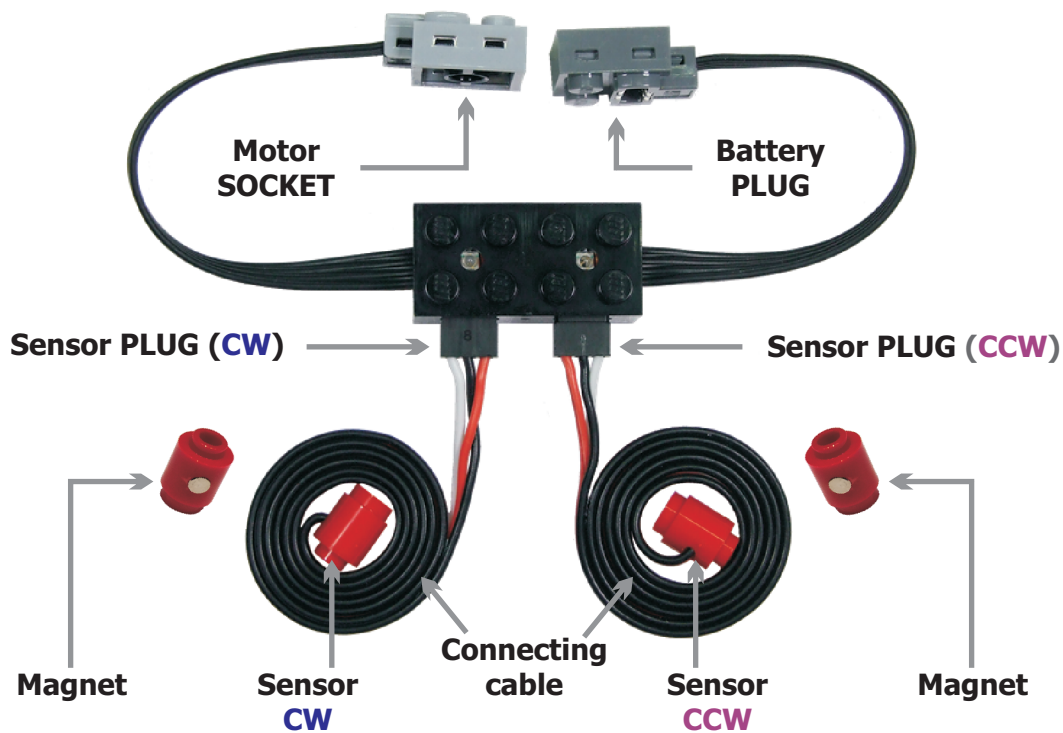


Fig.3

In **Figure 3** you can see the elements composing a complete Blackbrick system :

- The Black Brick, with original Lego® cable (with plug & socket) to connect it to the motor and battery box (or IR Receiver)
- Magnetic proximity sensors with cable and plug as well as the related Magnets

Features :

Let's review now in detail the features, visible in **Figure 4** :

- The electronics section is contained in a 2x4 black brick (#3001), closed at the bottom by a 2x4 black "plate" (#3020). In this way it maintains all the typical coupling characteristics of the components of Lego® series and is thus possible to integrate it seamlessly into our model.
- Two End-Stroke LEDs, a GREEN one (CW) and a RED one (CCW), which light up when the Sensors are active and the movement has reached the position that is predetermined, in the respective direction of rotation.
- Original Lego® cable complete with battery socket and motor plug.
- Two Sensors sockets, one for the clockwise (CW), the other for the counterclockwise (CCW)
- Polarity reference hole, helping to respect the polarity of the the sensors plugs.

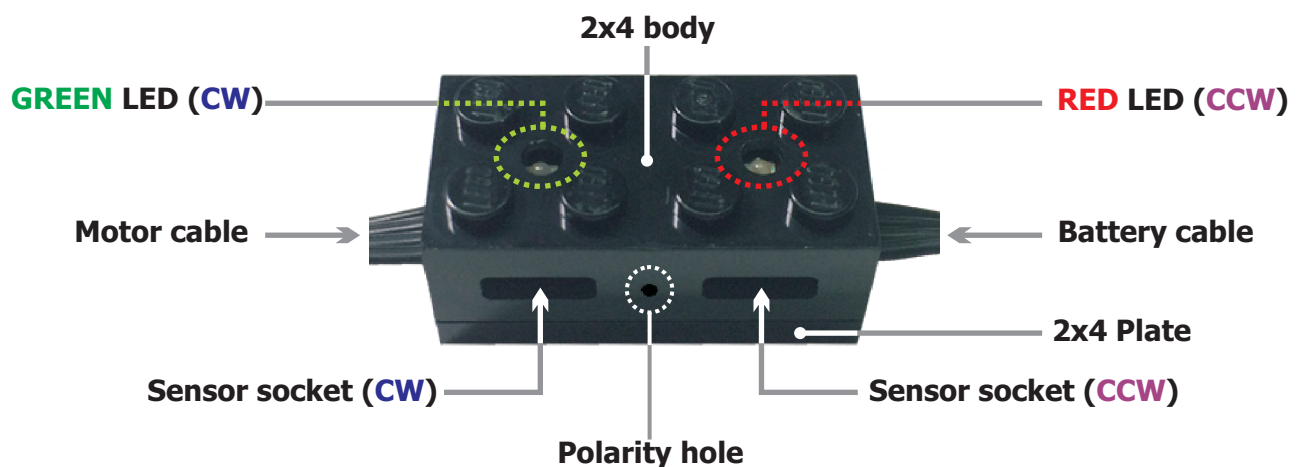
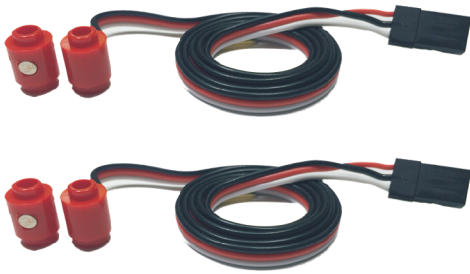


Fig.4

Connecting Sensors :

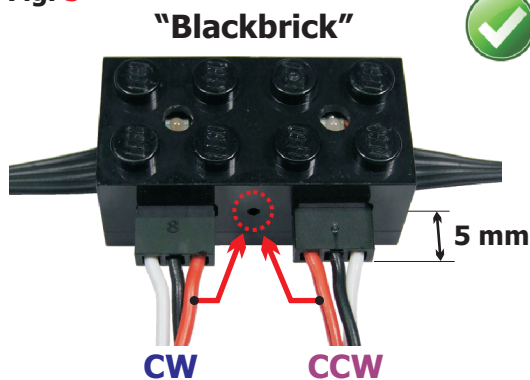


Here, on left, are a pair of magnetic sensors, complete of their Magnet, both encapsulated in a 1x1 round brick, all available in different colors.

Each sensor has an about 50 cm length cable, terminated with a 3 pole plug.

If the sensors are installed on complex models, at a greater distance from Blackbrick, extension cables are available.

Fig. 5



For the correct operation of the system, it is very important to respect the polarity of the sensors plugs .

As shown in **Figure 5**, the plugs must be inserted into the Blackbrick's sockets oriented as to have the RED cable facing to the central reference hole.

If the polarity is correct, when operating the motor, it will run respecting the direction of rotation imposed by the battery or IR receiver.

On the contrary, will lit the corresponding Sensor LED that was reversed the plug and the motor remains hold.

Also check the plugs are inserted all the way in, up to protrude about 5mm from the Blackbrick body.

Wrong Sensor plug polarity :

Fig. 6



In case the plug of the **CCW** sensor is not correctly inserted, at the moment you turn on the motor in this direction of rotation, the LED of the sensor will turn on - **Figure 6**.

The motor will never run in the direction of travel corresponding to the one of the incorrectly connected sensor, until the plug will not be correctly reinserted.

Fig. 7



In case the plug of the **CW** sensor is not correctly inserted, at the moment you turn on the motor in this direction of rotation, the LED of the sensor will turn on - **Figure 7**.

The motor will never run in the direction of travel corresponding to the one of the incorrectly connected sensor, until the plug will not be correctly reinserted.

Reversing the polarity of the Sensors plugs does not cause any damage to sensors or Blackbrick electronics, simply re-insert it properly to resume operation.

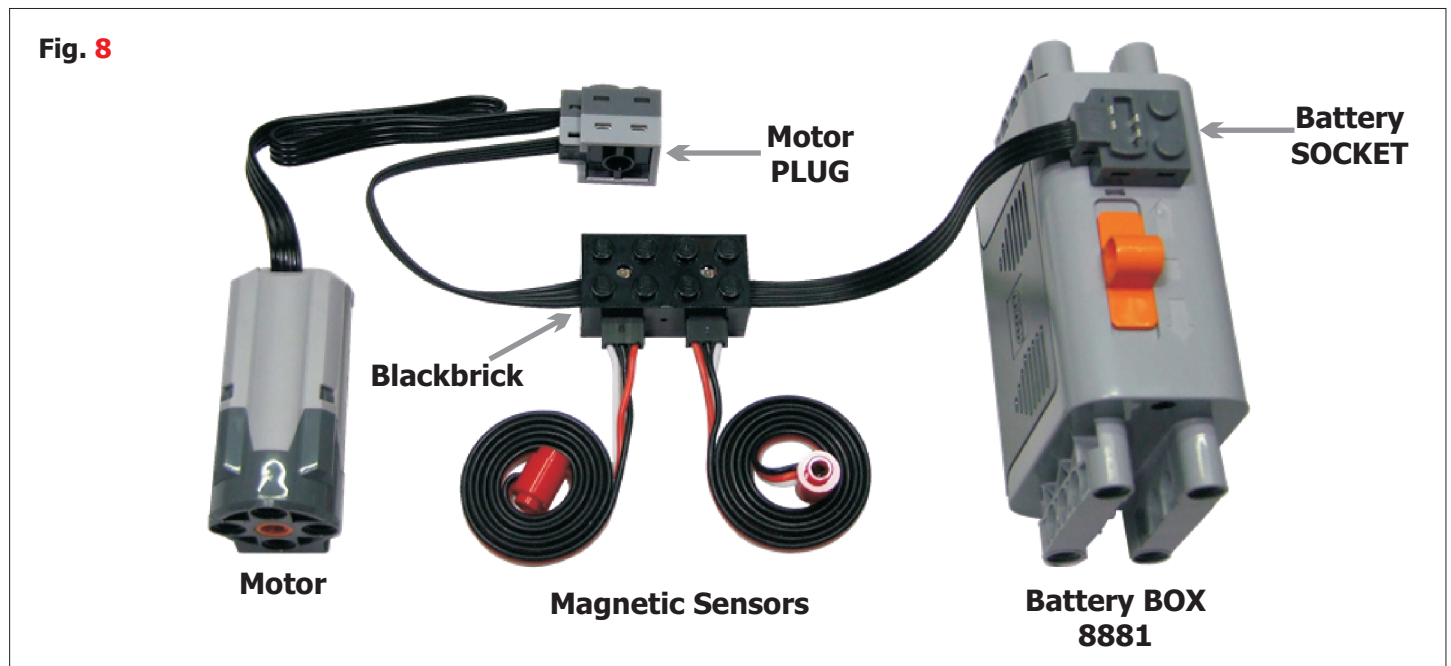
Connecting Motor and Battery :

Now let's see how to connect the Blackbrick to the Power Function accessory, as the Battery box (or IR receiver) and the Motor.

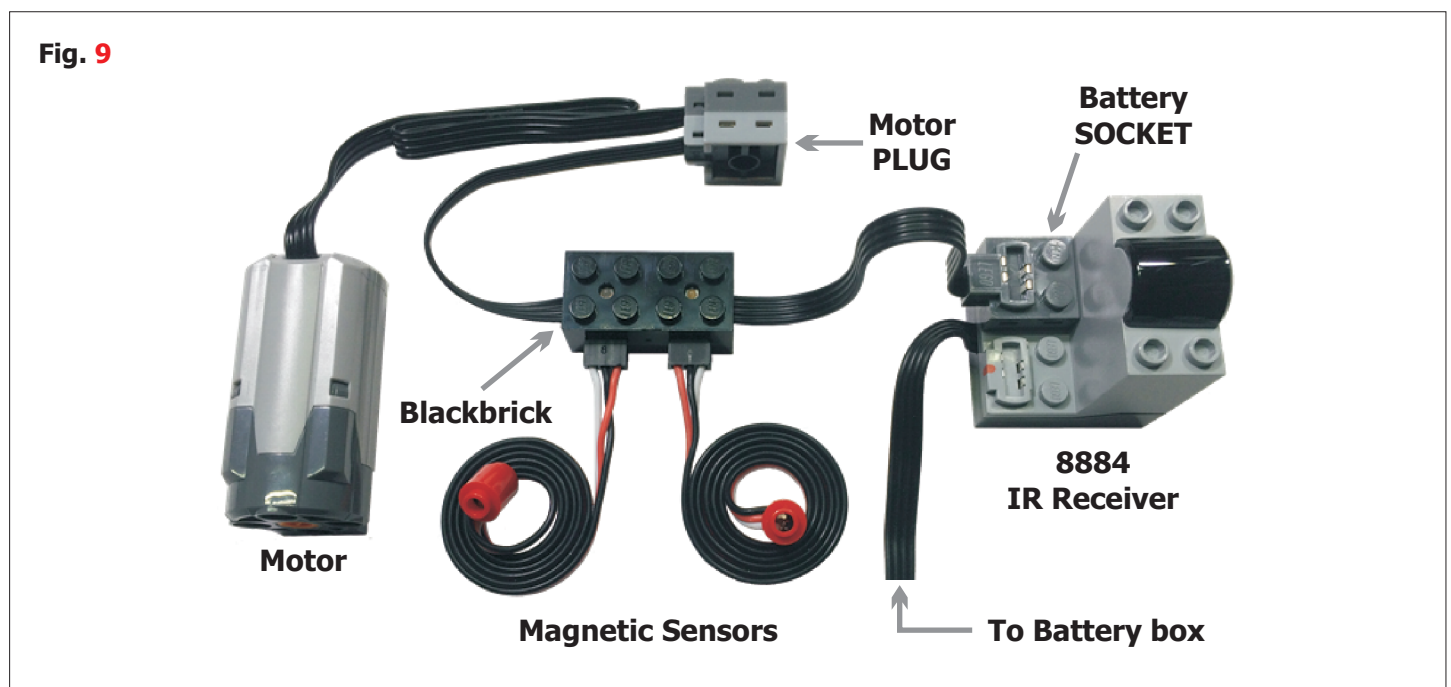
The Blackbrick must be connected exactly as if it were a Lego® 8886 extension cable, complete with original plug and socket, to be interposed between the Battery box (or IR receiver) and the Motor.

It's easy to establish the function of the Lego® plug and socket; the **dark-gray** one must be connected to the Battery box (or IR Receiver) and the **light-gray** one to the motor - **Figure 8 - 9.**

8881 Battery box connections :



8884 IR Receiver connections :



Blackbrick operation :

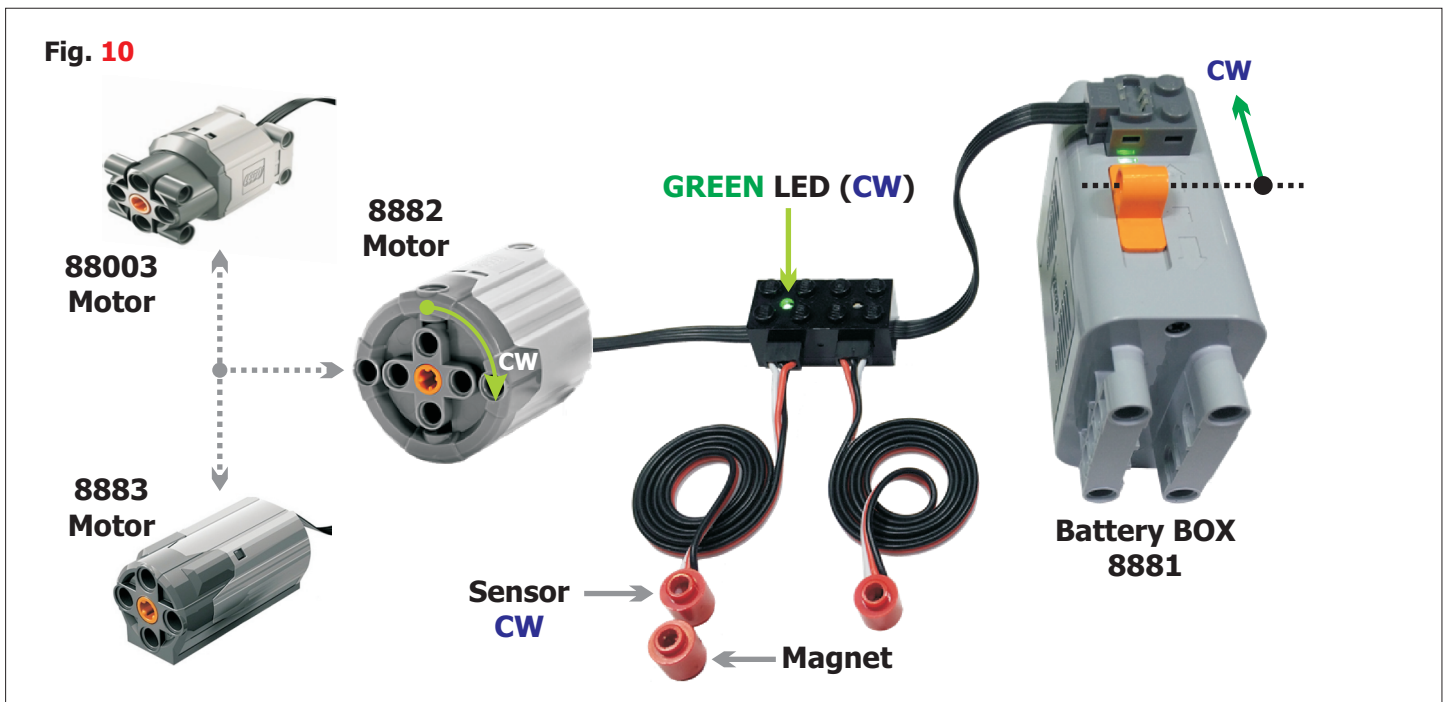
We can now verify the operation of Blackbrick, after connecting it to sensors, battery (or IR receiver) and motor.

If we operate the switch on the battery (or the IR transmitter lever) in both direction of rotation, the motor will rotate freely until the magnets get closer to the respective sensor.

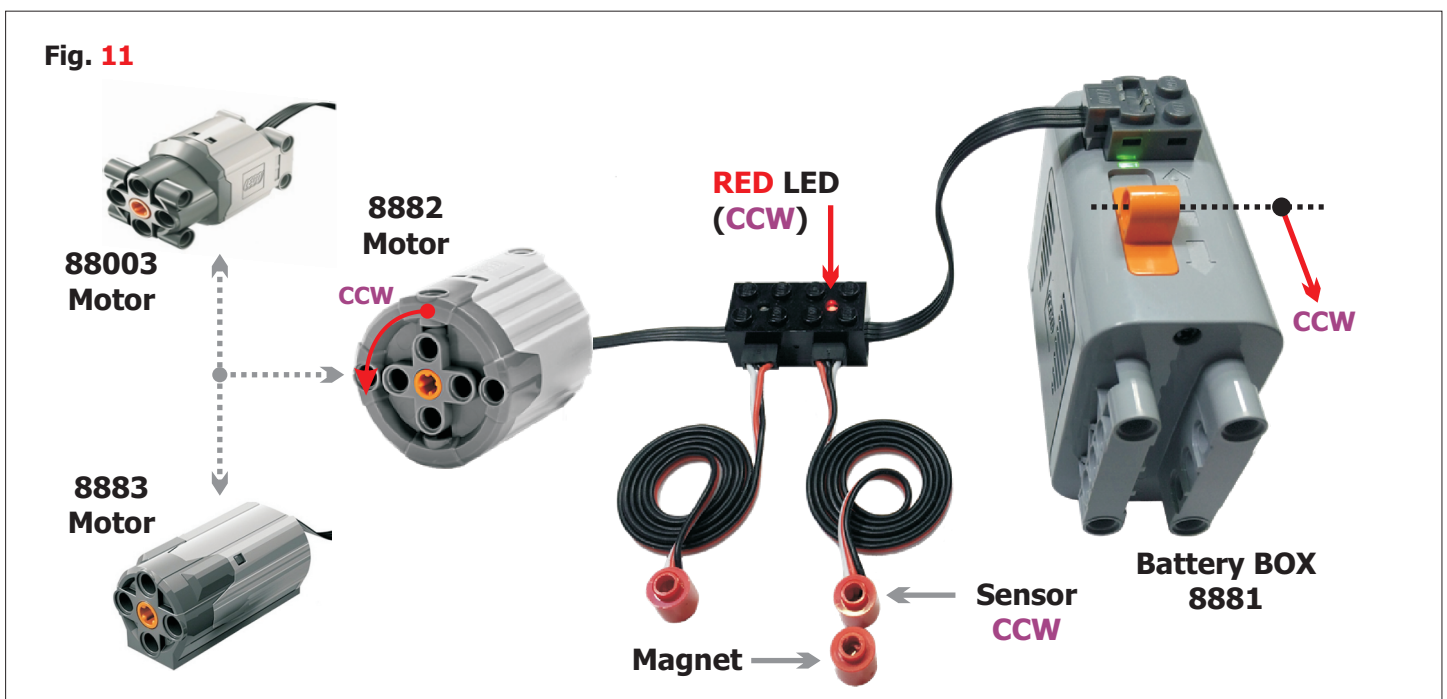
In this case, when the Magnets activate the Sensors, the motor will stop immediately and the LEDs on the Blackbrick will light up, respectively the GREEN one for the clockwise(**CW**) and the RED one for the counter-clockwise (**CCW**) as seen in **Fig. 10** e **11**.

Also maintaining control via the battery (or IR Receiver) the motor will not run more in that direction until the magnet will keep the sensor activated. You have to reverse the direction of rotation of the motor which, not being active the sensor relative to the opposite direction, will be free to run.

Clockwise (CW) operation test :



Counter-clockwise (CCW) operation test :



Power Function devices compatibility :

The Blackbrick has been designed to work with Lego® Power Function control accessories, such as :



8869
Switch with
inversion



8881
AA Battery box
with inversion



88000
AAA Battery box
with inversion



8878
Li-Po rechargeable battery
with inversion and
7-steps speed control



8884
2 Outputs
IR Receiver



8885
IR Transmitter
with inversion



8879
IR Transmitter
with inversion and
7-steps speed control

Unlike the other accessories, the #8878 battery and the #8884 IR receiver (via the #8879 remote control) has the ability to adjust the motor speed, in any direction, in a 7-steps range.

The Blackbrick ensures the control of the end stroke in the entire motor speed range.