Brushless motors
Technical information

Brushless motor technology combines the advantages of DC motors with those of AC motors; a high starting torque and long life expectancy. The switching or commutation of the motor phases is obtained through the use of electronics which replace such mechanical parts such as collectors and brushes.

A brushless DC motor (BLDC) consists of a revolving magnet with 2 or 4 poles and a fixed stator, with 3 or 4 windings that is controlled by an electronic circuit and that causes rotation. The electronics uses Hall effect sensors driven by separate magnets on the rotor to efficiently switch power to the different phases in sequence which means that a brushless motor has the same positive characteristics as a normal DC motor.

The electronics can either be placed inside a low-power motor or be supplied as a separate card or module. The use of brushless motors is particularly well-adapted to applications which require long life expectancies, high speeds or use in dirty or hostile environments.

The following information is given as a guide to choosing a motor:

❒ TYPE

4 phases

These are well suited to industrial applications where there are space or other limitations and are easily integrated into drive and servomechanism applications. Many accessories are also available; gearboxes, brakes, encoders, etc.

3 phases

Completely adapted to applications requiring very dynamic characteristics (acceleration, starting torque, etc.). Use of rare earth magnets means their size is reduced. Different accessories adapted to the motor provide an adequate solution to all servomechanism applications.

Integrated electronic commutation motors

This range of smaller sized products is suitable for applications where life expectancy, simplified power arrangements and small size are important criteria.

❒ COMMUTATION

All commutation is controlled electronically, the mechanical parts (collector-brushes) being replaced by electronic systems, hence the names "electronic commutation motor" or more commonly "brushless motor" being used.

❒ LIFE EXPECTANCY

With fewer moving parts, this is principally limited by life expectancy of the bearings.

❒ OVERHEATING

The maximum working temperature of the windings of a motor is limited and it is the current in the windings that is the principal cause of overheating. It is therefore important to limit the operating current to a safe value.

❒ CHARACTERISTICS

The operation of a brushless motor produces a performance curve identical to that of a normal DC motor.

❒ ELECTRONICS

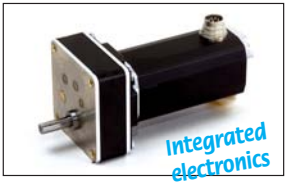
The primary function of electronics associated with a brushless motors is to ensure that the motor rotates smoothly and constantly in the correct direction. By analysing the signals from the Hall effect sensors mounted on the stator, the electronics manage the switching of the phases and generates performance similar to that of a normal DC motor.
The other use of the electronics is for speed control of the motor, this can be achieved either by using the same Hall effect sensors or with an encoder or resolver-type sensor. The latter solution offers a better level of control, especially at low speeds
There are two types of electronic control systems for brushless motors:
- for 3-phase brushless motors
- for 4-phase brushless motors

Control based on Hall effect sensors and encoders/resolvers resembles R x I mode compensation and DC electronics encoder control respectively.

DUN44B 24V DC Brushless motor gearbox

Torque from 1.1Nm to 6 Nm

- **Electronic commutation**
- No of phases: 3
- Magnets: Néodyne rare earth, iron core
- Bearings: Self lubricating
- Max axial load: 30N
- Max axial backlash: 0.3mm
- Max radial load: 60N at 10 mm from face
- Radial backlash: 0.2mm
- Rotates in both directions
- Encoder output: 6 points/revolution
- Working Temp: -10° to +80°C
- Weight: 990g



Avantages

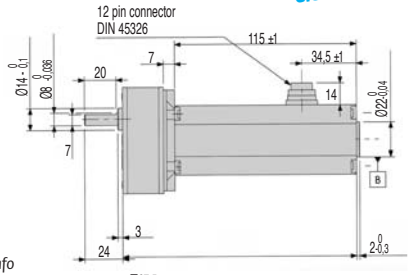
- Speed control signal 0-10V
- Long design life
- **Integrated 4Q electronics**

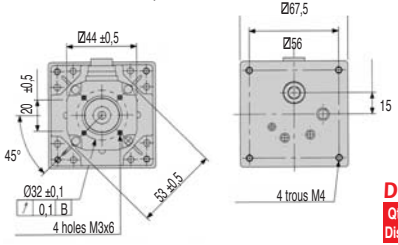
Accessories

- Power Supply **ALIDR60-24**
- Connecting cable **CAB-DUN44B**

Assembly

- Refer to Diagram N° 1 on technical info page (P169)





DISCOUNTS

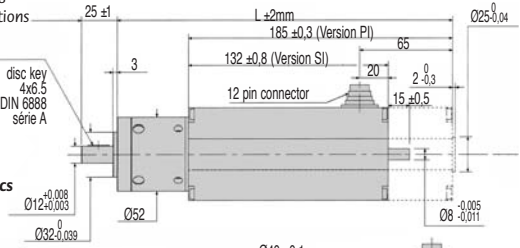
Qty.	1+	6+	10+
Disc.	List	-7%	On request

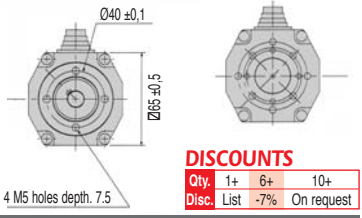
Part number	Reduction ratio	Number of stages	Efficiency (%)	Unloaded speed (rpm)	Loaded speed (rpm)	Nominal torque (Nm)	Nominal current (A)	Price each 1 to 5
DUN44B/0012	12:1	2	85	376	291,0	1,1	2,80	742,90 €
DUN44B/0037	38:1	3	78	120	93,0	3,2	2,80	745,39 €
DUN44B/0050	50:1	3	78	90	70,0	4,3	2,80	745,39 €
DUN44B/0093	94:1	4	72	48	39,0	6,0	2,30	762,85 €
DUN44B/0187	187:1	4	72	24	22,0	6,0	1,30	762,85 €
DUN44B/0375	375:1	5	66	12	11,0	6,0	0,88	782,79 €
DUN44B/0750	750:1	5	66	6	5,9	6,0	0,62	782,79 €

24V DC Brushless motor gearbox DUN65B

Torque from 1Nm to 24Nm

- **Electronic commutation**
- No of phases: 3
- Magnets: Néodyne rare earth, iron core
- Gearbox: Planetary
- Bearings: Ball bearings
- Max axial load: 500N
- Max axial backlash: 0.1mm
- Max radial load: 350N at 12 mm from face
- Press fit force: 500N
- Angular backlash: 1.8°
- Rotates in both directions
- Encoder output: 15 points/revolution
- Working Temp: 0° to +50°C
- Weight: 1.98 kg





Advantages

- Long design life
- **Integrated electronics**

Accessories

- Power Supply **ALIDRP240-24**
- Connecting cable **CAB-DUN65B**

Assembly

- Refer to Diagram N° 3 on technical page (P169)

DISCOUNTS

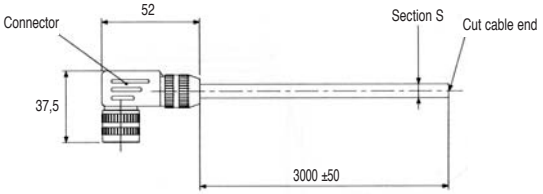
Qty.	1+	6+	10+
Disc.	List	-7%	On request

Part number	Reduction ratio	Number of stages	L1 (mm)	Efficiency (%)	Unloaded speed (rpm)	Loaded speed (rpm)	Nominal torque (Nm)	Nominal current (A)	Price each 1 to 5
DUN65B/0004	4,5:1	1	50,0	85	823,0	687,0	0,99	5,6	1081,96 €
DUN65B/0006	6,25:1	1	50,0	85	593,0	508,0	1,20	5,9	1081,96 €
DUN65B/0015	15:1	2	65,5	72	247,0	206,0	2,80	5,6	1164,24 €
DUN65B/0020	20,25:1	2	65,5	72	183,0	153,0	3,80	5,6	1164,24 €
DUN65B/0036	36:1	2	65,5	72	103,0	86,0	6,70	5,6	1164,24 €
DUN65B/0091	91,1:1	3	80,5	61	41,0	34,0	14,00	5,6	1258,96 €
DUN65B/0162	162:1	3	80,5	61	23,0	19,0	24,00	6,2	1258,96 €
DUN65B/0225	225:1	3	80,5	61	16,0	15,0	24,00	4,8	1258,96 €
DUN65B/0288	288:1	3	80,5	61	13,0	12,0	24,00	3,9	1258,96 €
DUN65B/0400	400:1	3	80,5	61	9,3	8,7	24,00	3,1	1258,96 €

CAB-DUN *Connecting cables*

For DUN44B and DUN65B motors

- ***Industrial quality, fast fitting connecting lead***
- *Shielded cable*



Technical specifications for motor version:	DUN44B	DUN65B
1 Unit connected to input N°1	DUN44B	DUN65B
2 Input N°1 connector type	BINDER 423 series dog-leg 90° IP65 8 pins	BINDER dog-leg 90° IP67 12 pins
3 Signals connected to output N°1	Feed + drive	Feed + drive
4 N°1 output connector type	Wire cores not stripped	Wire cores not stripped
5 Type of cable	Unitronic Bus sheath 3 x 2 x 0.25 mm^2 + 3 x 1 mm^2 screened	Bekonflex sheath 4 x 2 x 0.22 mm^2 + 2 x 1 mm^2 screened

DISCOUNTS

Qty.	1+	6+	10+
Disc.	List	-7%	On request

Part number	For motor	Length (m)	S section (mm)	Type of connector	Price each 1 to 5
CAB-DUN44B/30	DUN44B	3,0	Ø7,9	Binder series 423	109,66 €
CAB-DUN65B/30	DUN65B	3,0	Ø7,4 +/-0,9	Binder 99-583D-75-12	109,66 €

Brushless motor

Cabling information

For DUN44B motor			diagram n°1
PIN	Wires	Legend	Description
1	Red ($1mm^2$)	+ Ue	Motor supply 24V DC
2	Blue ($1mm^2$)	GND	GND
3	White	AI+	Speed setting between 0 and 10V DC (+ terminal)
4	Brown	IN 1	Run: between 9 and 44V DC Stop: between 0 and 5V DC
5	Green	IN 2	Direction of rotation: Clockwise: 9 - 44V DC Anticlockwise: 0 - 5V DC
6	Yellow	AI-	Speed setting between 0 and 10V DC (- terminal)
7	Grey	OUT 1	Hall effect sensor output signal: 12 pulses/rotation Pulses 0 to 24V dc
8	Pink	OUT 3	"Ready" signal: High state (+24V): no problem Low state: temperature>120°C or Hall effect sensor defective

For DUN65B motor			diagram n°2
PIN	Wires	Legend	Description
E+F	Red	+ Ue	Motor feed +24V DC
M+G	Black	GND	GND
B	Yellow	IN 1	IN1=0* & IN2=0* : motor stopped without position hold IN1=1* & IN2=1* : motor stopped with holding torque
C	Blue	IN 2	IN1=1* & IN2=0* : anticlockwise rotation IN1=0* & IN2=1* : clockwise rotation
J/H	Pink/ Purple	AI+/AI-	Speed setting between 0 and 10V DC
A	Orange	OUT 1	Hal effect sensor output signall: 15 pulses/rotation Pulses 0 to 24V dc
K	White	OUT 3	"Ready" signal: High report (+24V): no problem Low report: temperature >95°C, under-voltage or over-current
L	Brown	IN3	"Teach" input to adjust pre-calibrated speeds and ramps
D	Green	IN4	Selecting preset speeds High state: speed 1 Low state: speed 2

* = Level 0 0>1.2V dc, Level 1 3.5>24 V dc