### 2.8.1 Version with roof

In the case of positioning the motor vertically in outdoor applications, with the end of the shaft on the driving side facing downwards, it is recommended to use a fan guard with a roof to shelter it from the rain. This version is generally recommended in all cases where entry of water or solid bodies is such as to jeopardise the correct operation of the motor, due to infiltration of water, partial blockage of the air grille, or an obstruction preventing the fan and the shaft from turning correctly. The roof not only protects against rain, but may be supplied for use in the textile industry; in this case the fan cover has the same roof as the rain cover, but without grille, to prevent blocking by textile processing fragments. The cover does not significantly alter the winding overtemperature. The application of the cover determines a height variation of the motor (see dimensional specifications). The presence of the roof is incompatible with the double extension shaft and/or with the recessed rear hexagon.



## 2.8.2 Backstop device

In applications where reverse motor rotation must be prevented, caused by the dragging action of the load, it is possible to have a backstop device applied directly on the motor on the fan side. This device is composed of eccentric cams with single spring guided by an inner and outer cage, themselves incorporated into two cylindrical tracks. When the inner track rotates with the motor shaft, the cams lift off the track due to the centrifugal force, thus allowing the shaft to rotate freely in the direction of rotation of the motor; when the shaft is rotated in the opposite direction, the cams lock down and prevent the shaft rotating. In consideration of the high speed of rotation, it is not recommended to use this device on 2 pole motors. For correct assembly of the backstop device, the direction of rotation of the motor must be specified in the order; a sticker on the fan cover shows the allowed direction of rotation. The backstop device, sized so as to be able to withstand the maximum torque transmitted by the motor and to work at the nominal speed of rotation of the motor without excessive wear, is lubricated for life with specific grease. The device's construction is such as not to increase the axial length of standard motors. The backstop device is not available for sizes 63 and 71.



## 2.8.3 Rapid connection power supply

It is possible to supply motors with incorporated connector, for quick and safe power cable hookup. The connector has a modular structure, therefore it is possible to adapt the voltage values and the current capacities according to the motor type where the connector is applied. The motor is connected with fixed part (A) incorporated into the terminal block box and connections cabled directly to the connector and a piggyback part (B) supplied hooked on to the fixed part. As far as the application is concerned following solutions are suggested:

- 10 pole connector for three-phase motor in standard version (TS, TH, TP and D versions) or brake versions (series TBS, TBH, TBP and DB) with or without thermal cutout, excluding AC brake and separate supply. For the three-phase motors it is possible to prearrange the detachable part with double connection in order to do the star-delta connection;
- 10 pole connector for single-phase motor in standard version (S series) or self-braking version (SB series, upon request) with or without thermal protector;
- 5 pole connector for single-phase motor (series S) with or without thermal cutout. With thermal cutout version it is necessary to know the direction of rotation beforehand.

Rapid connection power supply is available for motors up to nominal power 4 kW and sizes 112 inclusive. Brake motors (TBS, TBH, TBP and DB series) with Hartling connection are only available with a protection level IP54. Higher protection levels can be confirmed on request.



	5 (*)		10 (**)	
	d [mm]	d1 [mm]	d [mm]	d1 [mm]
63	96	120	122	160
71	108	132	134	172
80	119	143	145	183
90	127	151	157	195
100	136	160	166	204
112	-	-	181	219

(\*) 5 pole connector

(\*\*) 10 pole connector

**M Series** / Standard / IEC

# **2.8 OTHER OPTIONAL CONSTRUCTIONS**

TECHNICAL CATALOGUE



C - Temperature sensor

D - Separate power DC brake

E - Motor power supply

## 2.8.4 Incremental encoder

Incremental encoders are used when the motor speed must be known with precision, for example when used as a feedback signal for an inverter or indirect angular position signal or speed signal for a component of the machine to which the motor is coupled. Motovario supplies two distinct incremental encoder solutions.

#### 1. Standard incremental encoder

The encoder, available in the version with hollow through shaft, is mounted by locking the rotor directly onto the motor shaft, while its fixed part (stator) is held in place by locking pawl secured to the motor shield or directly to the brake; the pawl is then fitted into a slot in the encoder's reaction arm which has a certain axial elasticity to compensate for play and dampen vibrations. It can be supplied in the following versions:

- Three-phase motor (TS, TH and D series) and three-phase brake motor (TBS, TBH and DB series) with FM and MS brakes;
- Non-ventilated (IC410), self-ventilated (IC411), forced ventilation (IC416).

We give below the various constructions with standard incremental encoder without connector in the case of motor:

- Fig.A three-phase (TS, TH, TP and D) without ventilation (IC410);
- Fig.B three-phase (TS, TH, TP and D) self-ventilated (IC411);
- Fig.C three-phase (TS, TH, TP and D) forced ventilation (IC416);
- Fig.D three-phase brake (TBS, TBH, TBP and DB MS and FM brake) without ventilation (IC410);
- Fig.E three-phase brake (TBS, TBH, TBP and DB MS and FM brake) self-ventilated (IC410);
- Fig.F three-phase brake (TBS, TBH, TBP and DB MS and FM brake) forced ventilation (IC410).



Mounting the standard incremental encoder changes the overall external dimensions of the motor (see dimensional tables).

#### Technical characteristics:

- standard resolution: 1024 pulse/cycle;
- Push-Pull (HTL) with 10-32 V power or Line Driver (TTL) with 5 V power;
- version without connector (free cable 0.5 m);
- version (optional) with male connector M23 12 pin cabled at the end of the wire 0.5 m; female connector supplied
- protection rating equal to that of the motor up to IP65;
- maximum speed: 9000 rpm;
- operating temperature: -30°C / +100°C;
- maximum current absorption under load: 30 mA;
- maximum current absorption under no load: 40 mA;
- maximum operating frequency: 300kHz.

On request, incremental encoders can be provided with any logic (HTL or TTL) and pulse/cycle resolution (1 to 65536) desired.

#### 2. Low resolution incremental encoder

Motovario low resolution incremental encoders are available on three-phase motors in the sizes 63-71-80-90, in brake and brakeless versions. On request, they can also be mounted to three-phase motors in the sizes 100-112-132/160S. They are composed of an encoder board to read the speed and a magnetic stainless steel phonic wheel. The board uses two Hall effect sensors to read the fins of the phonic wheel mounted to the motor shaft (see diagram). The 2 output signals are dephased by 90° to determine the direction of rotation. The logic is of the NPN type. Mounting a low resolution incremental encoder does not affect the overall external dimensions of the motor.

Technical characteristics:

- standard resolution: 13 pulses/cycle for size 63, 15 pulses/cycle for sizes 71-80-90;
- NPN version with 10-30 V power; PNP and Push-Pull versions available on request;
- version without connector (free cable 1.2 m);
- protection rating equal to that of the motor up to IP65;
- operating temperature: -40°C / +90°C;
- maximum current absorption under load: 25 mA;
- maximum operating frequency: 12.6 kHz.





- 1. Encoder board
- 2. Phonic wheel