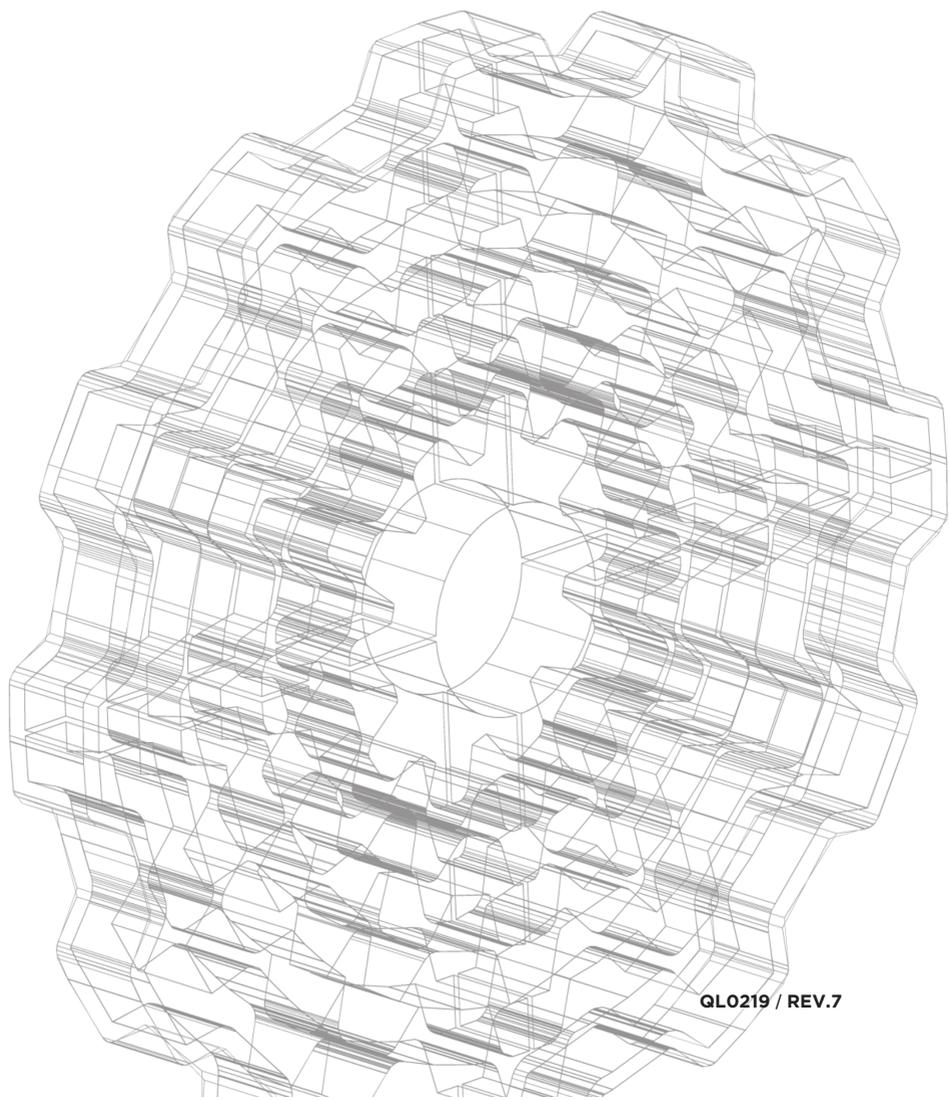


# Instructions for installation, use and maintenance Electric motors



## **ENGLISH TRANSLATION OF THE ORIGINAL ITALIAN VERSION**

**IMPORTANT!** The data and information given in this document substitute those given in previous editions which are thus to be considered obsolete; periodically consult the technical documentation available on Motovario web site for up-to-date performance information and specifications. For the motor section relating to motorvariators and geared motors, consult the motors manual available on Motovario web site.

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## 1. INTENDED USE OF THE MANUAL

### INSTALLATION, USE AND MAINTENANCE INSTRUCTIONS FOR ELECTRIC MOTORS MOTOVARIO

The following instructions apply to electric motors manufactured by MOTOVARIO S.p.A. from the following series:

- TS (asynchronous three-phase, single polarity, standard efficiency);
- TH (asynchronous three-phase, single polarity, high efficiency);
- TP (asynchronous three-phase, single polarity, premium efficiency);
- TP-SL (SELF POWER three-phase, single polarity, premium efficiency);
- TSP-SL (SELF POWER three-phase, single polarity, super premium efficiency);
- TBS (asynchronous three-phase, self-braking, single polarity, standard efficiency);
- TBH (asynchronous three-phase, self-braking, single polarity, high efficiency);
- TBP (asynchronous three-phase, self-braking, single polarity, premium efficiency);
- TBP-SL (SELF POWER three-phase, self-braking, single polarity, premium efficiency);
- TBSP-SL (SELF POWER three-phase, self-braking, single polarity, super premium efficiency);
- TS-CD/A, TS-CD/B (asynchronous three-phase, single polarity, standard efficiency, CLEAN DUTY);
- TH-CD/A, TH-CD/B (asynchronous three-phase, single polarity, high efficiency, CLEAN DUTY);
- TP-CD/A, TP-CD/B (asynchronous three-phase, single polarity, premium efficiency, CLEAN DUTY);
- TSX, THX, TPX (asynchronous three-phase, single polarity for aggressive / corrosive / food-processing environments);
- TBSX, TBHX, TBPX (asynchronous three-phase, self-braking, single polarity for aggressive / corrosive / food-processing environments);
- D (asynchronous three-phase, double polarity);
- DB (asynchronous three-phase, self-braking, double polarity);
- S (asynchronous single-phase);
- HSE (asynchronous single-phase, high starting torque with electronic circuit breaker).

Specialist products (i.e. different to those present in our catalogues and/or product offers) or specialist applications (e.g. power supply from inverters) require additional information to be provided.

***"ORIGINAL VERSION IN ITALIAN"***

#### IMPORTANT!

The data and updated information given in this technical catalogue substitute those given in previous editions, which are thus to be considered obsolete; periodically consult the technical documentation available on Motovario website for up-to-date performance information and specifications.

## 2. GENERAL INFORMATION

### 2.1 PURPOSE

This manual has been provided by Motovario to give information to authorized persons regarding transport, handling, installation, maintenance, repair, disassembly and scrapping of the unit. Failure to follow the instructions is a health and safety hazard and can result in economic damages. The information must be kept carefully by the person charged with doing so and be available at all times for reference in good condition. In case of damage or loss, the documentation can be requested directly from Motovario.

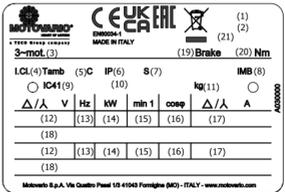
### 2.2 SYMBOLS

	<p><b>CAUTION - DANGER</b> Indicates a serious personal health and safety hazard.</p>
	<p><b>CAUTION - HOT PARTS</b> Indicates a serious thermal hazard which may endanger personal health and safety.</p>
	<p><b>CAUTION - HIGH VOLTAGE</b> Indicates a serious personal health and safety hazard due to the presence of dangerous voltage.</p>
	<p><b>IMPORTANT INFORMATION</b> Indicates important technical information.</p>

### 2.3 PRODUCT IDENTIFICATION

Electric motor can feature a metal silk-screen printed and/or punched nameplate or an adhesive label glued on metal support. The nameplate must not be removed and must be kept intact and readable. In case you need a copy of it just contact MOTOVARIO TECHNICAL SERVICE.

**THREE-PHASE MOTOR NAMEPLATE LAYOUT**



**MOTOVARIO** **CEYKERE** (1)

MADE IN ITALY (2)

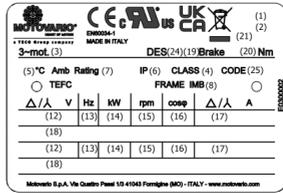
**3-mot** (3) (19) Brake (20) Nm

I <sub>CL</sub> (4)	T <sub>amb</sub> (5)	C IP(6)	S (7)	IMB (8)
○	IC41(9)	(10)		kg(11) ○
Δ/Δ	V	Hz	KW	min 1
(12)	(13)	(14)	(15)	cosφ (16)
				Δ/Δ A
(17)				
(18)				
(12)	(13)	(14)	(15)	(16)
(17)				
(18)				

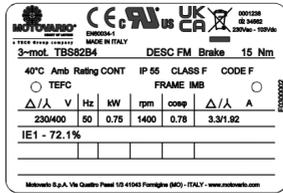
Motovario S.p.A. Via Quattro Piani 1/3 41040 Formigine (MO) - ITALY - www.motovario.com



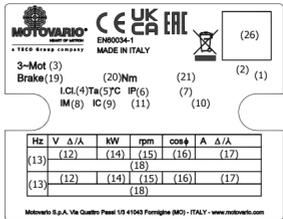
**UL/CSA MOTOR NAMEPLATE**



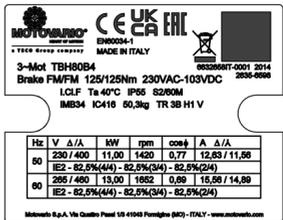
**UL/CSA MOTOR - FILLED-OUT**



**THREE-PHASE MOTOR LABEL**



**THREE-PHASE MOTOR - FILLED-OUT EXAMPLE**



**SINGLE-PHASE MOTOR LABEL**

MOTOMANIPRO EN60034-1 MADE IN ITALY  
 CE UK CA ERIC (26)

1-Mot (3) Nm (2) (1)  
 Brake (3) IP (6) (7)  
 LCI(4)Tc(5)C IP (6) (7)  
 IM (8) IC (9) (11)

Hz	V	kW	rpm	cosφ	A
(13)	(12)	(14)	(15)	(16)	(17)

Cap. run. (22)µF Cap. start. (23)µF

Motomani S.p.A. Via Quattro Piani 15 41043 Fontighe (MO) - ITALY - www.motomani.com

**SINGLE-PHASE MOTOR - FILLED-OUT EXAMPLE**

MOTOMANIPRO EN60034-1 MADE IN ITALY  
 CE UK CA ERIC (26)

1-Mot TBH80B4  
 Brake FM/FM 125/125Nm 230VAC-103VDC  
 LCI.F Tc 40°C IP65 S2/60M  
 IMB34 IC416 60,3kg TR 3B H1 V

Hz	V	kW	rpm	cosφ	A
50	230	11,00	1420	0,77	12,63
		IE2 - 82,6%(44) - 82,6%(34) - 82,6%(24)			

Cap. run. 100µF Cap. start. 100µF

Motomani S.p.A. Via Quattro Piani 15 41043 Fontighe (MO) - ITALY - www.motomani.com

**UL/CSA MOTOR LABEL**

MOTOMANIPRO EN60034-1 MADE IN ITALY  
 CE UK CA ERIC (26)

3-Mot (3) (20)Nm (21) (2) (1)  
 Brake (19) (5)°C Amb Rating(7) IP(6)  
 CLASS(4) CODE(24) DES (25)  
 (9) FRAME IM (8) (10)

Hz	V	Δ/A	kW	rpm	cosφ	A	Δ/A
(13)	(12)	(14)	(15)	(16)	(17)	(18)	(17)

Cap. run. (22)µF Cap. start. (23)µF

Motomani S.p.A. Via Quattro Piani 15 41043 Fontighe (MO) - ITALY - www.motomani.com

**UL/CSA MOTOR - FILLED-OUT**

MOTOMANIPRO EN60034-1 MADE IN ITALY  
 CE UK CA ERIC (26)

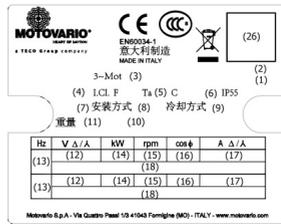
3-Mot TBH80B4  
 Brake FM/FM 125/125Nm 230VAC-103VDC  
 40°C Amb Rating 81 IP65  
 CLASS F CODE G DES C  
 TEFC FRAME IMB36

Hz	V	Δ/A	kW	rpm	cosφ	A	Δ/A
50	230/400	11,00	1420	0,77	12,63 / 11,56		
		IE2 - 82,6%(44) - 82,6%(34) - 82,6%(24)					
60	208 / 480	13,00	1862	0,68	15,68 / 14,88		
		IE2 - 82,6%(44) - 82,6%(34) - 82,6%(24)					

Cap. run. 100µF Cap. start. 100µF

Motomani S.p.A. Via Quattro Piani 15 41043 Fontighe (MO) - ITALY - www.motomani.com

CCC MOTOR LABEL



MOTOVARIO  
E TECNO GROUP COMPANY  
EM00234-3  
意大利制造  
MADE IN ITALY

CE CCC

3-Mot (3) (2)  
(1)

(4) I.C.I. F Ta (5) C (6) IP55  
(7) 安装方式 (8) 冷却方式 (9)

重量 (11) (10)

Hz	V Δ / A	kW	rpm	cos φ	A Δ / A
(13)	(12)	(14)	(15)	(16)	(17)
			(18)		
(13)	(12)	(14)	(15)	(16)	(17)
			(18)		

Motovario S.p.A. - Via Quattro Piani 10 41043 Formigine (MO) - ITALY - www.motovario.com

CCC MOTOR - FILLED-OUT



MOTOVARIO  
E TECNO GROUP COMPANY  
EM00234-1  
意大利制造  
MADE IN ITALY

CE CCC

三相异步电动机 3-Mot TS80A2 603205811-0001 2014 2039-6998

绝缘等级 I.C.I. F 温度 T<sub>40</sub> C 防护等级 IP55  
S2/60M 安装方式 IMB34 冷却方式 IC416

重量 50,3kg TR 3B H1 V

Hz	V Δ / A	kW	rpm	cos φ	A Δ / A
50	230 / 400	11,00	1420	0,77	12,63 / 11,56
		IE2 - 82,5%(4/4) - 82,5%(3/4) - 82,5%(2/4)			
60	205 / 460	13,00	1652	0,68	15,55 / 14,89
		IE2 - 82,5%(4/4) - 82,5%(3/4) - 82,5%(2/4)			

Motovario S.p.A. - Via Quattro Piani 10 41043 Formigine (MO) - ITALY - www.motovario.com

1. Serial number
2. Year of manufacture - order number
3. Motor type code (series/size/n. poles)
4. Insulation class
5. Maximum ambient operating temperature
6. Protection rating
7. Duty
8. Mounting position
9. Cooling system (\*)
10. Additional options (see below)
  11. Motor weight (only for > 30 kg)
  12. Motor voltage (depending on connection)
  13. Power frequency [Hz]
  14. Nominal power delivery [kW]
  15. Nominal speed [rpm]
  16. Nominal power factor
  17. Nominal current (depending on connection) [A]
  18. Code IE1, IE2 or IE3 (depending on type of motor and whether applicable) followed by efficiency value at 4/4, 3/4 and 2/4 of nominal power.

#### Brake motors only

19. Brake type
20. Nominal braking moment [Nm]
21. Brake power supply

#### Single-phase version only

22. Running capacitor [ $\mu$ F]
23. Starting capacitor [ $\mu$ F]

#### UL/CSA version only

24. Current identification with rotor blocked (ANSI/NFPA 70-1996)
25. "NEMA Electrical Design Classification"
26. QR code

#### **ADDITIONAL OPTIONS (10)**

- H1 condensation heaters for voltage 110V
- H2 condensation heaters for voltage 230V
- LT low temperature construction
- HT high temperature construction
- 3B n. 3 bimetal cutouts
- 3P n. 3 thermistors (PTC)
- A backstop device (counterclockwise rotation permitted)
- B backstop device (clockwise rotation permitted)
- E encoder
- V flywheel
- HC rapid connection

(\*) For motors in UL/CSA versions, the cooling system is indicated with the following codes:

TEFC = (T)otally (E)nclosed (F)an (C)ooled - corresponds to IC411 (self-ventilation)

TENV = (T)otally (E)nclosed (N)ot (V)entilated - corresponds to IC410 (non-ventilated)

TEBC = (T)otally (E)nclosed (B)lower (C)ooled - corresponds to IC416 (forced ventilation)

## 2.4 SERVICE

For any service request please contact the Motovario sales network directly indicating the data on the nameplate.

## 3. COMPLIANCE

### 3.1.1 Compliance with EU directives – CE marking

Electric motors with a standard three-phase (TS, TH, TP, TP-SL, TSP-SL, TSX, THX, TPX, TS-CD/A, TS-CD/B, TH-CD/A, TH-CD/B, TP-CD/A, TP-CD/B, D series) and single-phase version (S and HSE series) comply with harmonised manufacturing standard IEC 60034-1 and are therefore in line with Low Voltage Directive 2014/35/EU. The electric motor, considered as a component, complies with the following directives:

- Directive ROHS 2011/65/EU relating to the prohibition or the limitation of the use of noxious substances in electrical and electronic equipment.
- Directive ErP 2009/125/EC on the ecodesign of energy-related products and in particular EU Regulation no. 1781/2019 on the ecodesign of electric motors.
- Directive EMC 2014/30/EU relating to intrinsic characteristics in relation to emissions and levels of immunity.

All standard mounting position motors in continuous operation and powered from the mains are compliant with general standards EN 61000-6-2, EN 61000-6-3, 61000-6-4 on electromagnetic emission and immunity; in the case of brake motors (TBS, TBH, TBP, TBP-SL, TBSP-SL, TBSX, TBHX, TBPX, DB RRSD series) or full wave rectifier (DBR) the filter is implemented by connecting a 440Vac 0.22 $\mu$ F class X2 condenser in parallel to the AC power, as per EN132400; the half-wave rectifier type RV6 has no integral filter and is thus suited to installation with the filter upline of the machine (to be done by the client). Follow the instructions of the devices' manufacturers in case of intermittent malfunctions and interferences generated by the triggering devices, power supplies with inverters, systems with encoders, etc. All electric motors are intended to be integrated in equipment and complete systems and must never be started until the equipment they are installed in is compliant with Machinery Directive (Certificate of Integration - Directive 2006/42/EC Ann. II B). The compliance of a complete installation with the "Machinery Directive" and the EMC Directive is the responsibility of the machine's manufacturer.

### 3.1.2 Compliance with UK directives (Statutory Instruments) - UKCA Marking

Standard execution electric motors carry the UKCA marking on the plate because they comply with the following United Kingdom Statutory Instruments (UKSI):

- The Electrical Equipment (Safety) Regulations 2016.;
- Electromagnetic Compatibility Regulations 2016;
- The Ecodesign for Energy-Related Products and Energy Information (Amendment) (EU Exit) Regulations 2019;
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012.

## 4. TECHNICAL INFORMATION

### 4.1.1 Incremental encoder

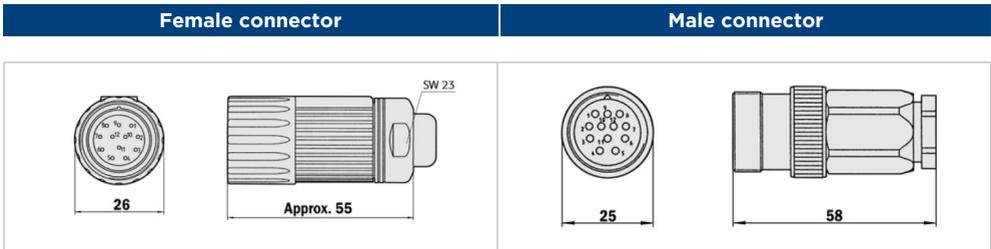
Motors can (optionally) be supplied with standard or low-resolution incremental encoders (for further information see product catalogue).

#### Safety information

1. Wiring must always be done by fully qualified specialist personnel.
2. Shut off the power to all equipment/machinery involved in the wiring process.
3. Do not connect or disconnect the encoder when powered up as this may irrevocably damage it.
4. A suitable ground connection must be in place for the encoder to work properly. The cable screen must be grounded at both ends to ensure the right shielding from EMC interference.
5. Do not bang or knock the encoder shaft in any way.

#### Standard incremental encoder

The standard incremental encoder either comes with or without connectors. If connectors are included, the male connector should already be connected to the encoder, whereas the female connector is supplied separately and it is the responsibility of the customer to connect it.



#### Description of terminals

PIN, 12-pin Connettore M23	Colore dei cavi	Segnale TTL, HTL	Spiegazione
6	Brown		Signal line
5	White	A	Signal line
1	Black		Signal line
8	Pink	B	Signal line
4	Yellow		Signal line
3	Lilac	Z	Signal line
10	Blue	GND	Ground connection of the encoder
12	Red	+US	Supply voltage 1)
9	Screen	Screen	Screen 2)
2	-	-	-
11	-	-	-

1) Potential free to housing.

2) Screen on the encoder side connected to the housing. On the control side connected to earth.

Please note: if the encoder is not supplied with a connector, refer to the color code for the wiring.

## Low-resolution incremental encoder

Technical characteristics	
Supply Range	10 - 30 Vcc
24 V Absorbed current	15 mA
Output	NPN (PNP or Push-Pull on request)
Max load per output	25 mA per output
Number of output	2 incremental (K1, K2)
Output wave displacement	90° determined by the teathed disk
Max pulse frequency	12,6 KHz
Operating temperature	- 40 / + 90 °C
Dimensions	55 x 22,5 mm
Encoder board thickness	6 ± 0.5 mm
Encoder board weight	52 g, cable included
Connection/output cable	4 leads shielded cable
Duty Cycle per output	50 %, determined by the teathed disk

Connections	
BLUE	Power supply - negative (ground)
BROWN	Power supply - positive
BLACK	K1 output channel
WHITE	K2 output
SCREEN	Connect to negative (ground)

## Output channels

- 13 pulses per rev. as a standard feature for motor size 63
- 15 pulses per rev. as a standard feature for motor sizes 71÷100



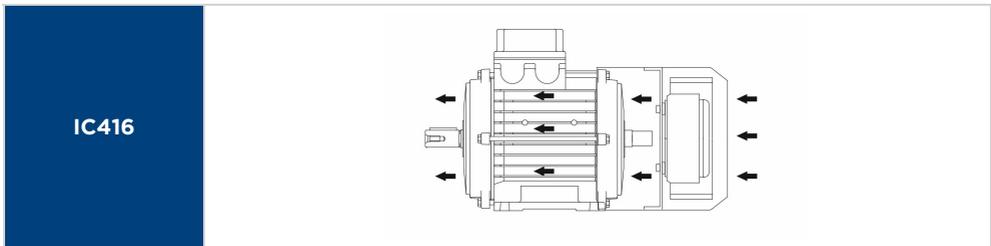
### 4.1.2 Forced ventilation

It may be necessary on all model sizes to resort to forced ventilation (cooling method IC416), obtained by means of an axial flow servo-fan whose air flow rate is independent of the speed of rotation of the drive shaft. The supply, independent from the electric motor, is given by means of a connector applied directly on fan cover (single phase version 230V 50-60Hz, sizes 63-90), or by means of a separate terminal box cover applied on fan cover (single-phase 230V 50-60Hz sizes 100-132 and three-phase 380/420-380/480V 50-60Hz sizes 100-132). Forced ventilation has been designed as a kit; therefore it is possible to modify a standard selfventilated electric motor (IC411) into a motor with forced ventilation (IC416) by following these simple instructions:

- disassemble the standard fan cover, unscrewing the fastening screws from the motor casing;
- remove the fastening bush of the plastic fan and remove the fan with the help of a tool;
- assemble the forced ventilation kit by tightening to the motor casing with the fastening screws of the fan cover just disassembled.

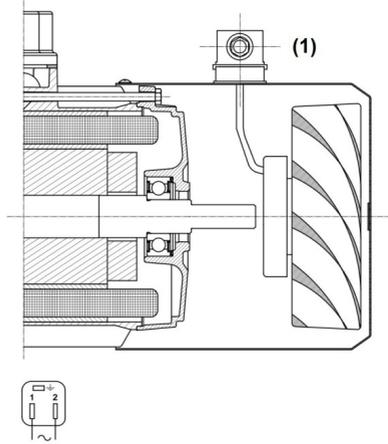
The application of the forced ventilation kit determines a length variation of the motor (see dimensional tables on catalogue).

The technical specifications and power details are listed below.

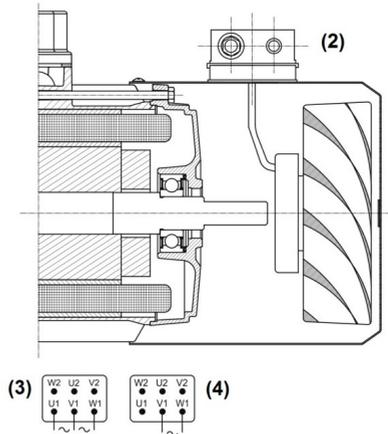


	[V] / [Hz]	[W]	[A]
<b>63</b>	230V/50-60Hz	14-16	0,09-0,11
<b>71</b>	230V/50-60Hz	14-16	0,09-0,11
<b>80</b>	230V/50-60Hz	33-36	0,20-0,24
<b>90</b>	230V/50-60Hz	33-36	0,20-0,24
<b>100</b>	230V/50-60Hz	33-36	0,20-0,24
<b>112</b>	230V/50-60Hz	76-90	0,35-0,40
<b>132</b>	230V/50-60Hz	76-90	0,35-0,40
<hr/>			
<b>100</b>	380-420V/50Hz 380-480V/60Hz	55-60	0,21-0,20
<b>112</b>	380-420V/50Hz 380-480V/60Hz	55-60	0,21-0,20
<b>132</b>	380-420V/50Hz 380-480V/60Hz	55-60	0,21-0,20

Single-phase power  
sizes 63-71-80-90



Single- and three-phase power  
sizes 100-112-132



1. Connector mPm B202000N2 DIN 43650-A/ISO 4400
2. Cable gland M16x1.5 - Cable entry diameter 5-10 mm
3. Three-phase power 400V
4. Single-phase power 230V

### 4.1.3 Electric motor protection

All electrical equipment must be protected against damage deriving from trouble or abnormal operation. The following phenomena must be taken into consideration:

- overcurrents deriving from short-circuiting;
- overload currents;
- break or dip in supply voltage;
- motor overspeed.

In addition, for the purposes of safety, there needs to be protection against direct contact with live parts and indirect contact with parts normally not live but which could become live in the event of insulation failure.

• **Overcurrents deriving from short-circuiting.** Protection can take the form of: fuses, overcurrent relays or thermal cutouts. Fuses interrupt the electric current, while the over-current relays and thermal cutouts open the circuit via automatic switches or contactors. These protective devices must be installed upline from the conductors to be protected. Overload and short circuit protection can take the form of: an automatic magnetothermic switch which must have sufficient interrupting capacity to interrupt the short circuit current, capable of protecting an electrical circuit from both overloads and short circuits; or switches which, although capable of protecting electrical circuits from overloads, require additional fuses to be installed further upline to prevent damage from short circuits. These must be time-delay fuses since motors draw larger than normal currents for up to several seconds while coming up to speed.

• **Overload currents.** Overload protection must feature in all motors with a power rating over 0.5kW which are normally in constant operation; however, it is recommended for all other motors as well. Protection normally takes the form of thermal cutouts installed on all live conductors except for neutral; in single-phase motors only one ungrounded live conductor is permitted. The time constant of the protective device must be as close as possible to that of the motor; if this stringent requirement is not met, then the safety device may become inefficient or circuit interruption ill-timed. This is especially the case for intermittent motors or motors which are subjected to a high number of operational processes (start-up, stop, reversing); here it is advisable to use temperature sensors incorporated into the motor (PTC thermistors or bimetal thermal fuses) that can interrupt the current if the internal motor temperature exceeds a certain level. These devices are also recommended in reduced cooling circumstances and all other situations where the motor may overheat, but not necessarily because of an overload current. Please bear in mind that such devices may not be sufficient to protect the motor if the rotor is locked; in this case it may be worthwhile to connect them to the thermal ones on the phases. In general, equipment must be designed so that the motor does not automatically restart after the thermal protective device has been triggered. In certain production cycles, the sudden halting of a motor (especially if not coordinated with other motors in the cycle) may damage it; in this instance, the thermal protective devices can initially send a visual or audio warning signal to the operator, and then eventually shut down the motor if no action has been taken. The level of action to be taken and the relevant time delays must be set so as to avoid any kind of potential hazard. If the motor is powered via a converter (i.e. inverter), then it can also be protected by limiting the absorbed current; this limit is generally set at a value superior to the nominal current so that the motor can withstand predicted peak loads and have a sufficient starting torque. As a result, the motor must be connected to another device capable of intervening if overload conditions persist over a certain period of time.

• **Break or dip in supply voltage.** In situations where a dip or interruption in the supply voltage may result from faulty wiring, an undervoltage device must be in place that guarantees suitable protection (i.e. machine shut off) at a set voltage level. If machine operation can withstand a voltage interruption or dip for a short period, an undervoltage time delay device can be fitted. The operation of the undervoltage protective device must not interfere with any machine shutdown commands.

• **Motor overspeed.** Motor overspeed can occur if the converter used to power the motor is faulty, or if the brake action is insufficient or absent, causing the load to drag the shaft. Protection against this is vital in that overspeed can be hazardous. Preventive measures can be taken, such as motor speed sensors (centrifugal circuit breakers or voltage relays connected to tachymetric dynamos) which cut off the power supply to the motor, and braking devices, which are necessary where the interruption of the electric current is not enough to stop the driven load (e.g. lifting).

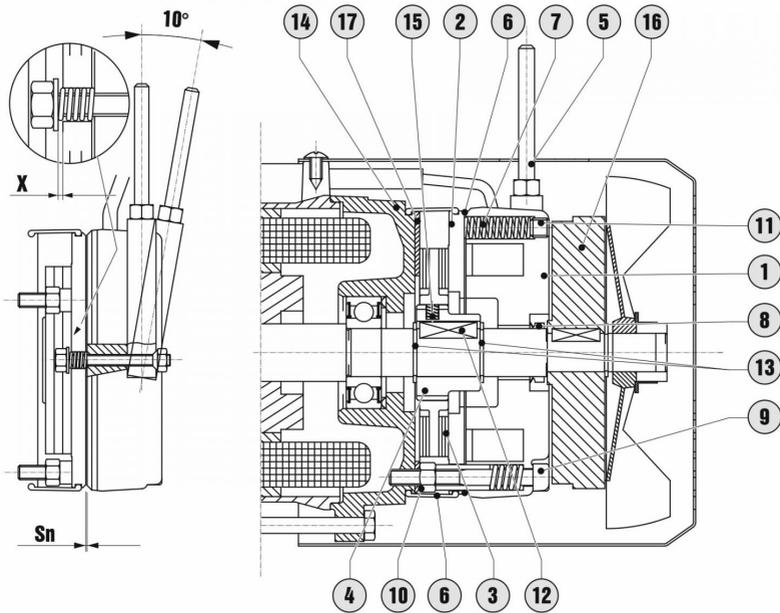
• **Protection against direct contact with live parts.** In order to minimise risk of direct contact with the live parts of the motor, these have been housed in the motor casing; furthermore, the terminal block box can only be opened using a special tool. The removal of the terminal block box cover for maintenance purposes must only be carried out by qualified personnel and the power supply must be visibly shut off, including auxiliary circuits (i.e. for condensation heaters), so that no accessible parts stay live. In the case of live parts that remain energised after power has been shut off, e.g. capacitors in single-phase motors, then discharge these capacitors (with the power supply visibly shut off) before proceeding.

• **Protection against indirect contact with live parts.** Protection against indirect contact, i.e. contact due to insulation faults that bring external metal parts into contact with live parts, is mainly accomplished by connecting all the accessible parts to a protective ground conductor and by using protective devices that act by cutting off the power when, due to a fault in the winding, current flows towards earth. The fundamental principle behind this kind of protection is, in the event of fault, to prevent a flow of voltage between an accessible part and earth or between two simultaneously accessible parts that lasts long enough to cause serious bodily harm if such parts are touched. A distinction can be made between:

- a protective wiring system with a protective conductor grounded independently from the mains. This protection can be effected by means of an overcurrent circuit breaker or a residual current circuit breaker;
  - a protective wiring system with a neutral conductor grounded at origin and used as a protective conductor (in this case it is not possible to use the residual current protection and so overcurrent circuit breakers are necessary).
- Please refer to the relevant regulations and standards.

The operation of protective devices must be both coordinated and allow for individual device selection so as to adequately protect lines and equipment. The automatic reset of protective devices after they have tripped is strictly forbidden as this can be hazardous. In addition, trained personnel must manually reset the system which the electric motor belongs to or is the main component of. When there is a neutral conductor, the installation of protective devices on the various conductors must take into account the type of connection (system) used.

## 4.1.4 FM brake



1. Brake magnet
2. Moving coil
3. Brake disk
4. Drive hub
5. Release lever (optional)
6. Boot (in combination with IP 55)
7. Thrust springs
8. V-ring (in combination with IP 55)
9. Mounting bolt
10. Locknuts
11. Braking torque adjuster screw (on request)
12. Key
13. Circlip
14. Cast iron shield
15. Vibration damping O-ring
16. Flywheel (optional)
17. Anti-seizing stainless steel washer (optional)

**Brake characteristic values**

	T	S <sub>n</sub>	S <sub>max</sub>	X	J <sub>B</sub>	W	W <sub>1</sub>	t <sub>1</sub>	t <sub>11</sub>	t <sub>2</sub>	t <sub>22</sub>	m <sub>B</sub>	P <sub>a</sub>	M <sub>B</sub>	m <sub>F</sub>	J <sub>F</sub>
<b>63</b>	..2	0,2	0,5	0,6	0,6	260	15,6	30	20	100	10	1,5	16	1,8-3,5	0,7	6,1
<b>71</b>	..3	0,2	0,5	0,8	1,1	370	22,4	60	25	120	10	2,2	20	2,5-5-7,5-10	1,1	13
<b>80</b>	..4	0,3	0,6	1	1,6	500	30	100	40	150	10	3,1	30	5-10-15-20	1,7	28
<b>90S-L</b>	..5	0,3	0,6	1	3,5	750	45	120	50	220	15	4,9	40	13-26-40-55	2,3	54
<b>100</b>	..5	0,3	0,6	1	3,5	750	45	120	50	220	15	4,9	40	13-26-40-55	3,1	98
<b>112</b>	..6S	0,35	0,7	1,2	8,8	1000	70	-	80	300	30	8,3	50	20-40-60	4,5	145
<b>132S</b>	..6	0,35	0,7	1,2	10,3	1100	77	-	80	200	20	9,5	65	37-50-75-100	4,8	200
<b>132M</b>	..7	0,4	0,8	1,2	22,5	1650	132	-	100	200	20	12,3	65	50-100-150	6,9	350

T = Type

S<sub>n</sub> = nominal airgap [mm]

S<sub>max</sub> = maximum airgap [mm]

X = release lever play [mm]

J<sub>B</sub> = brake disk moment of inertia [kgcm<sup>2</sup>]

W = maximum energy which can be dissipated by brake [MJ]

W<sub>1</sub> = energy which can be dissipated between two successive adjustments of airgap from S<sub>n</sub> to S<sub>max</sub> [MJ]

t<sub>1</sub>(\*) = brake release time with normal detachment rectifier (NBR, RSD) [ms]

t<sub>11</sub>(\*) = brake release time with rapid detachment rectifier (SBR, RRSD) [ms]

t<sub>2</sub>(\*) = brake response time - AC side opening [ms]

t<sub>22</sub>(\*) = brake response time - DC side opening [ms]

m<sub>B</sub> = weight [kg]

P<sub>a</sub> = power absorption [W]

M<sub>B</sub> = brake moments available [Nm]

m<sub>F</sub> = flywheel weight [kg]

J<sub>F</sub> = flywheel moment of inertia [kgcm<sup>2</sup>]

(\*) NOTE: the effective values may deviate slightly in relation to the ambient temperature and humidity, the brake temperature and wear of the friction surfaces; t<sub>1</sub>, t<sub>11</sub>, t<sub>2</sub> and t<sub>22</sub> refer to a brake calibrated with medium airgap, nominal voltage and separate power; as regards the braking moment, one must allow for running in to allow the ferode to adapt to the braking surface of the motor shield, for a period which depends on the actual braking loads; once running in is completed, in nominal operating conditions one can expect a deviation from the declared value of ±15%.

**Adjustment and maintenance**

The braking moment is fixed and is indicated on the motor nameplate.

**Adjusting the gap**

For correct brake operation, the gap between the brake magnet and the moving coil must be in the range (S<sub>n</sub> - S<sub>max</sub>) shown in the table; it can be adjusted with the mounting bolts and the locknuts, with a feeler gauge to check the actual gap.

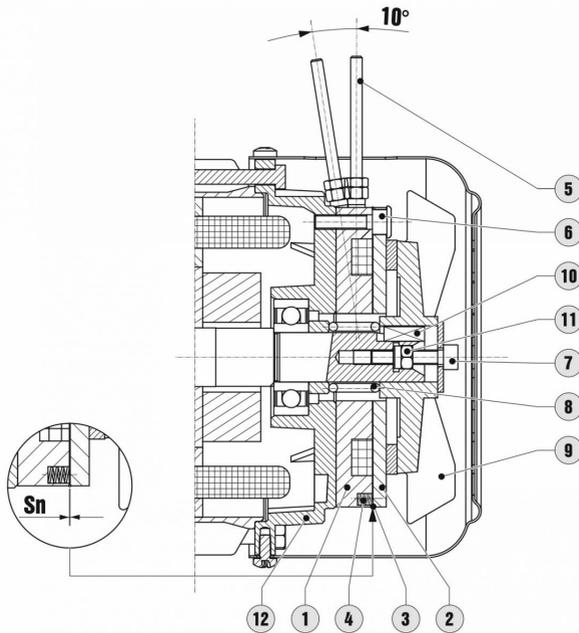
**Release lever play adjustment (if present)**

When there is a manual release lever, adjust the free travel value X of the lever (tightening/loosening the nuts) to a level equal to or greater than the one indicated in the table before releasing.

**Maintenance**

The scheduled maintenance interval will depend on actual braking duty and the work done by the brake between successive adjustments W<sub>1</sub>. When running maintenance, check that the thickness of the friction member is no less than 1 mm (in this case replace the brake disk), adjust the gap, check the braking torque, and check any play due to excessive wear during operation.

## 4.1.5 ML brake



1. Brake magnet
2. Moving coil
3. O-ring
4. Thrust springs
5. Release lever (optional)
6. Mounting bolt
7. Airgap adjuster screw
8. Return spring
9. Steel/cast iron disk + fan
10. Key
11. Self-locking nut
12. Motor shield

**Brake characteristic values**

	T	S <sub>n</sub>	S <sub>max</sub>	J <sub>B</sub>	W	W <sub>1</sub>	t <sub>1</sub>	t <sub>2</sub>	t <sub>22</sub>	m <sub>B</sub>	P <sub>a</sub>	M <sub>B</sub>
<b>63</b>	3	0,2	0,5	3	250	30	30	80	8	1,1	18	3
<b>71</b>	4	0,2	0,6	5	250	40	40	100	10	1,3	18	4
<b>80</b>	7	0,2	0,6	10	375	60	60	150	15	2,1	25	7
<b>90S-L</b>	7	0,2	0,6	11	375	60	60	150	15	2,1	25	7
<b>100</b>	13	0,25	0,65	30	500	80	100	250	15	3,6	35	13
<b>112</b>	13	0,25	0,65	34	500	80	100	250	25	4	35	13
<b>132S-M</b>	30	0,3	0,7	50	1650	132	150	400	40	7,4	60	30

T = Type

S<sub>n</sub> = nominal airgap [mm]

S<sub>max</sub> = maximum airgap [mm]

J<sub>B</sub> = brake disk moment of inertia [kgcm<sup>2</sup>]

W = maximum energy which can be dissipated by brake [MJ]

W<sub>1</sub> = energy which can be dissipated between two successive adjustments of airgap from S<sub>n</sub> to S<sub>max</sub> [MJ]

t<sub>1</sub>(\*) = brake release time [ms]

t<sub>2</sub>(\*) = brake response time - AC side opening [ms]

t<sub>22</sub>(\*) = brake response time - DC side opening [ms]

m<sub>B</sub> = weight [kg]

P<sub>a</sub> = power absorption [W]

M<sub>B</sub> = brake moments available [Nm]

(\*) NOTE: the effective values may deviate slightly in relation to the ambient temperature and humidity, the brake temperature and wear of the friction surfaces; t<sub>1</sub>, t<sub>2</sub> and t<sub>22</sub> refer to a brake calibrated with medium airgap, nominal voltage and separate power; as regards the braking moment, one must allow for running in to allow the ferode to adapt to the braking surface of the motor shield, for a period which depends on the actual braking loads; once running in is completed, in nominal operating conditions one can expect a deviation from the declared value of ±10%.

**Adjustment and maintenance**

The braking moment is given by the value M<sub>B</sub> in the table and on the motor nameplate.

**Adjusting the gap**

For correct brake operation, the gap between the brake magnet and the moving coil must be in the range (S<sub>n</sub> - S<sub>max</sub>) shown in the table; it can be adjusted with the shaft head locknut, with a feeler gauge to check the actual gap.

**Maintenance**

The scheduled maintenance interval will depend on actual braking duty and the work done by the brake between successive adjustments W<sub>1</sub>. When running maintenance, check that the thickness of the friction member is no less than 1mm, adjust the gap, check the braking torque, and check any play due to excessive wear during operation (in particular the play between the fan hole and the motor shaft).

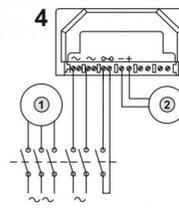
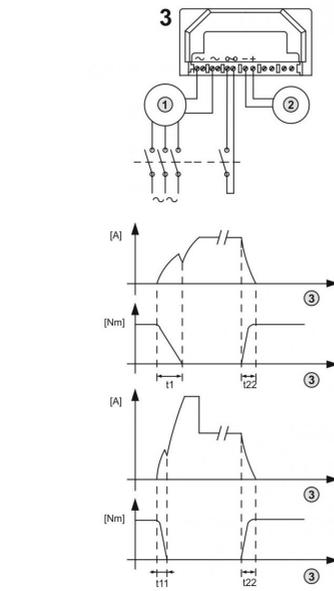
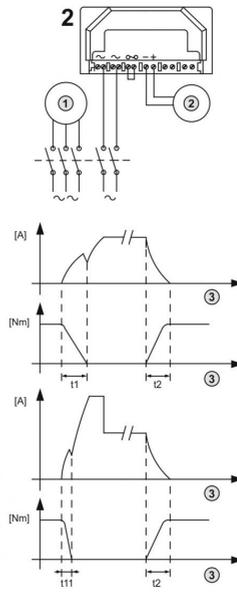
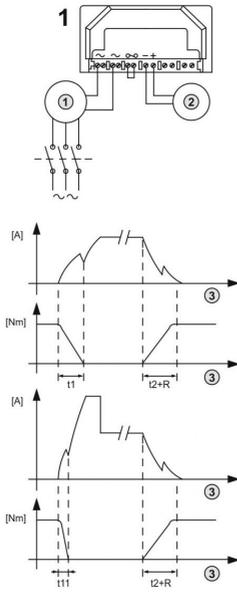
#### 4.1.6 Hookup for FM and ML brakes

If the brake power is derived directly from the motor or is independent, one speaks of direct and separate brake power respectively. In detail, with reference to the figures given below:

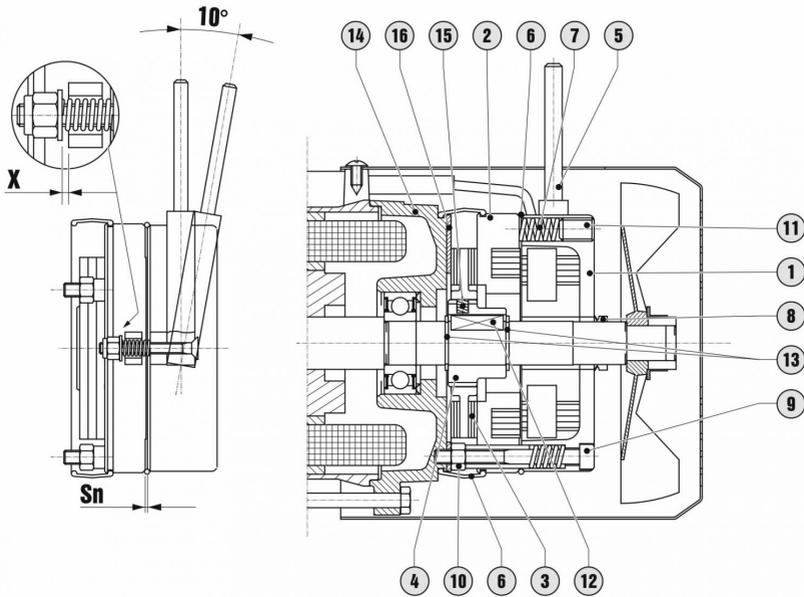
1. Direct brake power: supply cables on the AC side of the rectifier are connected to the motor's power terminal board; when you power up the motor, the brake coil is automatically energised and the brake is released; when power to the motor is shut off, the brake automatically brakes the motor. During this phase, the brake response time  $t_2$  has to be added to the delay R generated by the inertia of the load and by the energy accumulated by the motor. R changes in every motor and – as it depends on the load – cannot be previously calculated.
2. Separate brake power, brake opens only from the AC side: the brake is powered, via the rectifier, off terminals separate from those of the motor. In this case stop time  $t_2$  does not depend on the characteristics of both the motor and load.
3. Direct brake power, DC side opens: connection possible on the basis of type 1, if one can cable the rectifier's rapid braking contact (DC side opening) as shown in figure 3. Despite the direct power supply (see point 1), the braking response time is independent of the characteristics of the motor and load, and is significantly shorter than that of case 2 ( $t_{22} < t_2$ ). This connection is thus an alternative to the use of rapid braking rectifiers (RSD and RRSd).
4. Separate brake power, AC and DC sides open: connection possible on the basis of type 2, if one can cable the rectifier's rapid braking contact (DC side opening) as shown in figure 4. Response time equal to that of type 3, hence this connection is an alternative to the use of rapid braking rectifiers (RSD and RRSd). The advantage over the previous case is that, during braking, the energy accumulated by the motor does not discharge into the rectifier, thus safeguarding its service life.

**Motovario supplies brakes connected as type 1 or 2** when ordered as "direct" or "separate" power supply respectively. Type 3 and 4 connections must be implemented by the client. If SBR rapid release rectifiers are used, the brake release time reduces from  $t_1$  to  $t_{11}$  (see graph below). In case of independent power supply of the brake through direct current, therefore without any rectifier (ex. 24Vdc), the supply cables of the brake are set inside the terminal box and connected in a fly terminal board mammoth type. In this case, not considering the external power supply, for the time of operations you can refer to case 4.

1. Motor
2. Brake
3. Time



## 4.1.7 MS brake



1. Brake magnet
2. Moving coil
3. Brake disk
4. Drive hub
5. Release lever (optional)
6. Boot + O-ring (optional)
7. Thrust springs
8. V-ring (optional - in combination with protective boot + O-ring)
9. Mounting bolt
10. Locknuts
11. Braking torque adjuster screw (on request)
12. Key
13. Circlip
14. Cast iron shield
15. Vibration damping O-ring
16. Anti-seizing stainless steel washer (optional)

**Brake characteristic values**

	T	S <sub>n</sub>	S <sub>max</sub>	X	J <sub>B</sub>	W	W <sub>1</sub>	t <sub>1</sub>	t <sub>2</sub>	m <sub>B</sub>	P <sub>a</sub>	M <sub>B</sub>
<b>63</b>	..2	0,2	0,5	0,6	0,6	260	15,6	4	20	1,3	60	1,8-3,5
<b>71</b>	..3	0,2	0,5	0,8	1,1	370	22,4	4	40	1,9	80	2,5-5-7,5-10
<b>80</b>	..4	0,3	0,6	1	1,6	500	30	6	60	3	110	5-10-15-20
<b>90S-90L-100</b>	..5	0,3	0,6	1	3,5	750	45	8	90	5,6	250	13-26-40
<b>112</b>	..6S	0,35	0,7	1,2	8,8	1000	70	16	120	9,7	470	40-60
<b>132S</b>	..6	0,35	0,7	1,2	10,3	1100	77	16	140	10,3	550	50-75-100
<b>132L-M</b>	..7	0,4	0,8	1,2	22,5	1650	132	16	180	14,7	600	50-100-150

T = Type

S<sub>n</sub> = nominal airgap [mm]

S<sub>max</sub> = maximum airgap [mm]

X = release lever play [mm]

J<sub>B</sub> = brake disk moment of inertia [kgcm<sup>2</sup>]

W = maximum energy which can be dissipated by brake [MJ]

W<sub>1</sub> = energy which can be dissipated between two successive adjustments of airgap from S<sub>n</sub> to S<sub>max</sub> [MJ]

t<sub>1</sub>(\*) = brake release time with normal detachment rectifier (NBR, RSD) [ms]

t<sub>11</sub>(\*) = brake release time with rapid detachment rectifier (SBR, RRSD) [ms]

t<sub>2</sub>(\*) = brake response time - AC side opening [ms]

t<sub>22</sub>(\*) = brake response time - DC side opening [ms]

m<sub>B</sub> = weight [kg]

P<sub>a</sub> = power absorption [W]

M<sub>B</sub> = brake moments available [Nm]

m<sub>F</sub> = flywheel weight [kg]

J<sub>F</sub> = flywheel moment of inertia [kgcm<sup>2</sup>]

(\*) NOTE: the effective values may deviate slightly in relation to the ambient temperature and humidity, the brake temperature and wear of the friction surfaces; t<sub>1</sub>, t<sub>11</sub>, t<sub>2</sub> and t<sub>22</sub> refer to a brake calibrated with medium airgap, nominal voltage and separate power; as regards the braking moment, one must allow for running in to allow the ferode to adapt to the braking surface of the motor shield, for a period which depends on the actual braking loads; once running in is completed, in nominal operating conditions one can expect a deviation from the declared value of ±10%.

**Adjustment and maintenance**

The braking moment is fixed and is indicated on the motor nameplate.

**Adjusting the gap**

For correct brake operation, the gap between the brake magnet and the moving coil must be in the range (S<sub>n</sub> - S<sub>max</sub>) shown in the table; it can be adjusted with the mounting bolts and the locknuts, with a feeler gauge to check the actual gap.

**Release lever play adjustment (if present)**

When there is a manual release lever, adjust the free travel value X of the lever (tightening/loosening the nuts) to a level equal to or greater than the one indicated in the table before releasing.

**Maintenance**

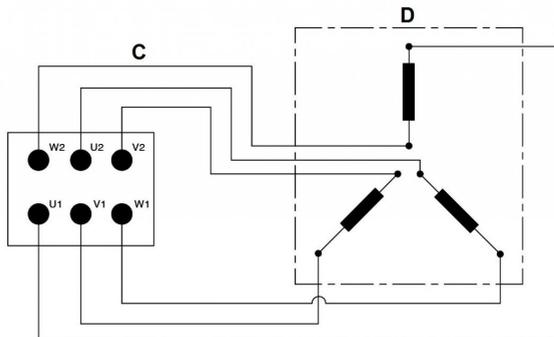
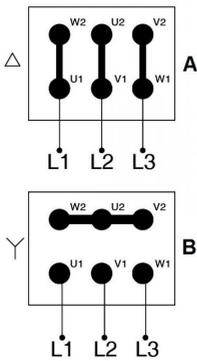
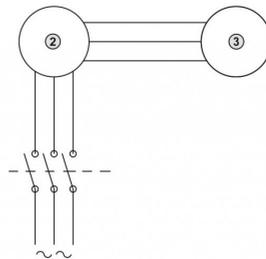
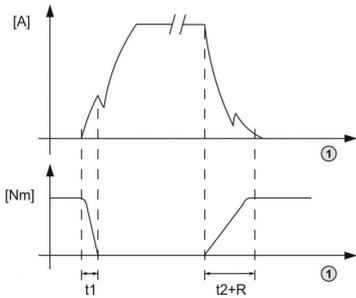
The scheduled maintenance interval will depend on actual braking duty and the work done by the brake between successive adjustments W<sub>1</sub>. When running maintenance, check that the thickness of the friction member is no less than 1 mm (in this case replace the brake disk), adjust the gap, check the braking torque, and check any play due to excessive wear during operation.

4.1.8 Hookup for MS brakes

1. Direct brake power: the brake is powered directly off the motor's terminal block; when the motor is powered up, the brake coil is automatically energised and the brake is released; when power to the motor is shut off, the brake coil is automatically de-energised and the brake brakes the motor. During this phase, the braking response time  $t_2$  has to be added to delay R, generated by the inertia of the load and by the energy accumulated by the motor. R changes in every motor and – as it depends on the load – cannot be previously calculated.

- 1. Time
- 2. Motor
- 3. Brake

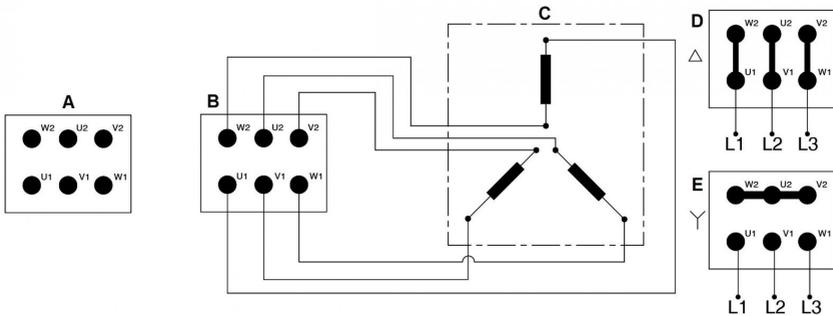
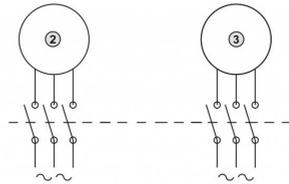
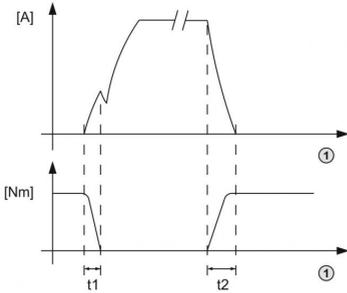
- A. Delta connection
- B. Star connection
- C. Motor terminal board
- D. Brake



2. Separate brake power: the brake is powered off a terminal block separate from the motor's block; in this case  $t_1$  and  $t_2$  depend only on the characteristics of the brake.

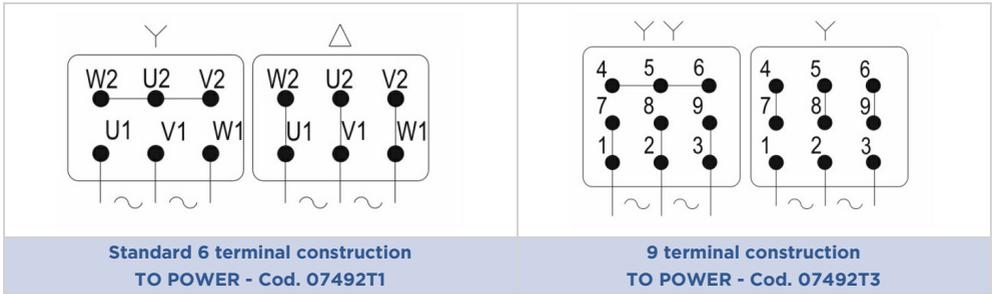
1. Time
2. Motor
3. Brake

- A. Motor terminal board
- B. Auxiliary terminal board
- C. Brake
- D. Delta connection
- E. Star connection



4.1.9 Motor power supply wiring diagram

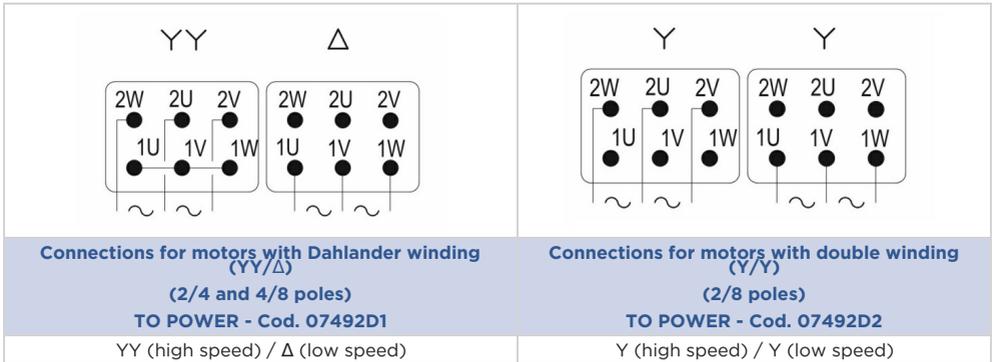
**TS-TH-TP-TSX-THX-TPX series**



**max tightening torque**

M4	2 Nm
M5	3 Nm
M6	4 Nm

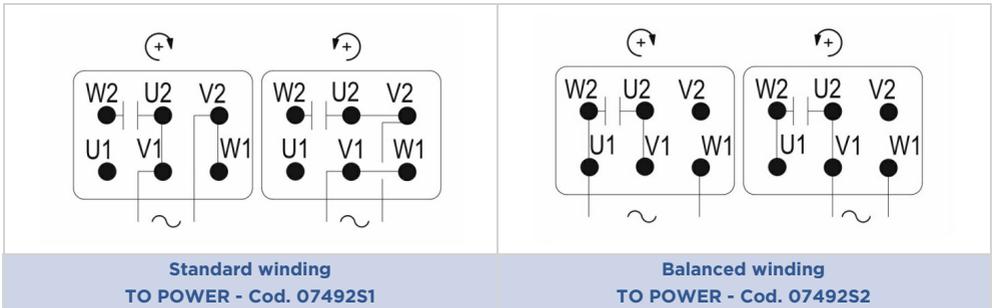
**D series**



**max tightening torque**

M4	2 Nm
M5	3 Nm
M6	4 Nm

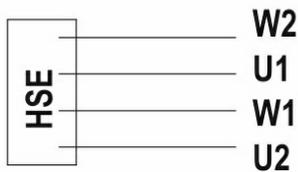
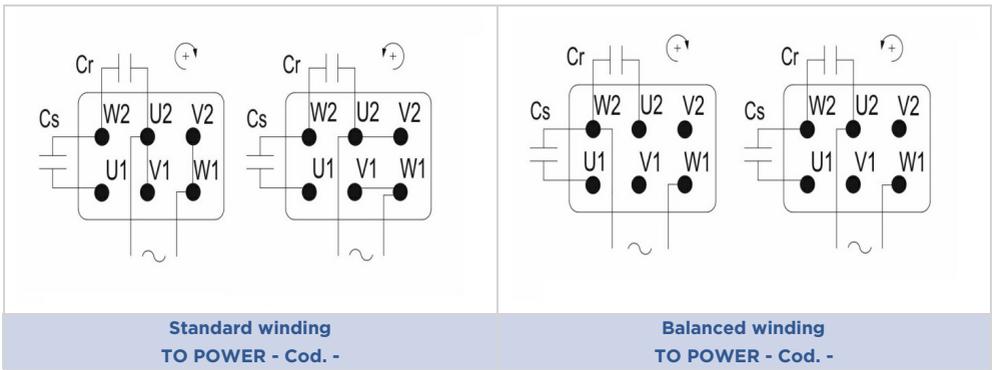
**S series**



**max tightening torque**

M4	2 Nm
M5	3 Nm
M6	4 Nm

**HSE series**



TO POWER - Cod. 2513041

W2 - Yellow  
 U1 - Brown  
 W1 - Green  
 U2 - White

## 5. SAFETY INFORMATION

Carefully read the manual and any instructions marked directly on the nameplates fixed to the unit.

The personnel operating on the unit itself must have precise technical skills, experience and abilities, in addition to possessing the necessary tools and the necessary PPE (according to the current laws). Failure to comply with these requirements may result in problems to the safety and health of people.

Use the unit only for the purposes specified by Motovario. Improper use poses a health and safety hazard and may cause economic damages. Keep the unit in good running order with programmed maintenance operations. The unit can reach high temperatures in operation. Do not touch the casings with bare hands - use appropriate safety equipment.

**For proper maintenance ensure full safety precautions have been applied, including the use of safety clothing and equipment, as required by current workplace safety legislation.**

Use only original Motovario spare parts. Do not disperse polluting materials in the environment, dispose of them according to environmental regulations.

Electric motors are a source of electrical hazards and consequently their improper use may cause injury and/or damage to people, animals and objects.

Read the following instructions carefully before starting up the motor; all installation, commissioning, maintenance and protection of the electric motor must be done by qualified staff in full compliance with established legislation and technical regulations as well as the safety regulations governing the electrical equipment of machinery as declared by European standard EN60204-1.

Please note that the present literature supplements and does not replace any established legislation, technical regulations or safety regulations governing electric motors; it merely makes practical suggestions that qualified personnel can make use of.

It is forbidden to use electric motors in potentially explosive atmospheres unless expressly foreseen and specified on the nameplate in compliance with European Directive 2014/34/UE.

Motovario is exempt from any responsibility deriving from improper use or failure to follow current safety directives governing electric material.

## 6. HANDLING AND STORAGE

### 6.1 HANDLING

For unit receipt and unload, arrange:

1. A suitable and well ventilated area with flat ground;
2. Handling equipment, taking into account the overall dimensions, weight and gripping points, data present on the unit to be handled (crane, forklifts, eyelets, sling ropes, snap hooks, etc.) in order to avoid personal injury and/or property damage.

Upon receipt of the unit check, consulting the identification nameplate of the product, that it corresponds to the purchase order specifications, and that the application limits mentioned comply with the intended conditions of use. Check that the unit is not damaged and/or malfunctioning. If so please contact the Motovario store. Check that the paint is intact and, if not, provide for its restoration. Dispose of the packaging material in accordance with current rules. Those in charge of the handling of the unit will be required to ensure all necessary safety conditions.



It is not always possible to move the unit manually due to its shape and/or weight; use appropriate handling equipment to avoid personal injury and/or property damage. The weight to be handled is listed in the catalogue and written on the nameplate.  
Proceed carrying out all handling operations with extreme caution. The precautions to be taken during handling are appropriate to ensure the safety of the operator and protect from breakage or damage the external parts due to shocks or accidental falls.



Locate unit gripping points. Never use only the motor grommet.  
Different accessories can modify the centre of gravity. In this case, an additional anchoring point could be necessary. During lifting, do not exceed 15° of load swaying; should this happen, stop and repeat the operation.

### 6.2 STORAGE

The motors must be stored according to the following requirements:

- Must be stored in temperate, dry, clean conditions away from bad weather;
- Be free from vibration and protected from accidental impacts;
- The shaft ends must be protected with rustproofing paint or grease (do not allow such products to come into contact with the seal rings, if present);
- Condensation heaters (where present) should ideally be kept energised.

## 7. INSTALLATION

Pay special attention to the installation conditions as these are the main cause of damage and downtime.

### Before installation please check that:

- the electric motor is not visibly damaged (whether damaged in transit or during storage);
- the information on the nameplate corresponds with the features of the electric motor and its intended use; the power supply voltage matches the mains voltage; the permitted voltage tolerance is  $\pm 10\%$  for 230/400V 50Hz and 265/460V 60Hz, and  $\pm 5\%$  for other voltages and/or single-phase motors;
- the ambient temperature is between  $-15^{\circ}\text{C}$  and  $+40^{\circ}\text{C}$  ( $+50^{\circ}\text{C}$  2- and 4-pole TS motors with nominal power  $\geq 0.75$  kW); in addition, the altitude must be  $< 1000\text{m}$  above sea level; ambient temperatures outside this range and/or higher altitudes require the application of a corrective power factor (see product catalogue);
- If the environment features sudden temperature changes with possible consequent condensate formation, it is recommended to request the condensation heaters and/or the condensate discharge holes;
- the IP protection rating given on the nameplate is suited to the environment under the terms of IEC 60034-5;
- in outdoor installations, protect the motor from the direct sunlight and, if possible, from the atmospheric agents;
- use the provided attachment points to lift the motor; the eyebolts on the motor are for lifting the motor only and not any other equipment coupled to it; ensure that the systems mounted to the motor match the electric motor's specifications.

### Preliminary tasks:

- remove any fastenings and protective material used for shipping (e.g. guards on the ends of the motor shaft) and check that the shaft turns freely (for TBS - TBH - TBP - TBP-SL - TBSX - TBHX - TBPX - DB series brake motors, first release the manual release lever if present);
- carefully clean the ends of the shaft with a normal solvent to remove any rust protection, contaminants and similar matter; take care that the solvent does not get into the bearings or comes into contact with the seal ring lips and damages them;
- check, especially after lengthy storage, that the motor has not absorbed humidity, by measuring the insulation resistance which must be  $< 10\text{M}\Omega$  at  $20^{\circ}\text{C}$ ; take the measurement by applying a direct current of 500V between the phases towards GND; the windings must be discharged immediately after the measurement has been taken. If the insulation resistance is insufficient the motor must be dried with hot air or using an isolation transformer, connecting the windings of each phase in series and applying an auxiliary AC current of 10-20% of the nominal current, until the resistance measurement is satisfactory.

### Installing the motor:

- take care to secure the motor adequately in relation to its weight, mounting type and position;
- assemble the motor on a flat, rigid, vibration-free and deformation-resistant surface; align the motor carefully with the driven machine to avoid inadmissible stresses on the shaft and observe the overhung and axial loading specifications (see product catalogue); misalignments and forced locking can result in hazardous overheating;
- if the motor construction type is IEC B14, the four retaining screws must be screwed in the flange even if they are not necessary. It is recommendable to apply sealant, such as Loctite 242, on the retaining screws thread. The maximum screwing depth in the flange B14 is  $2 \times d$ , where "d" is the threaded hole;
- vertical installations must include measures to prevent foreign bodies falling into the ventilation slots; in such case, we recommend using a fan cover with awning (compulsory in case of self-braking motor);
- during assembly, avoid damaging the bearings by using the shaft as a stop after removing the fan cover; do not knock the end of the shaft;
- the motor shaft is dynamically balanced and complete with half key from size 90 upwards, with normal vibration; make sure that any parts to be locked to the motor shaft are balanced with half key; if using double-ended shaft motors, take care not to start the motor until the unused key has been secured;
- the motor must be mounted in such a way that the nameplate data is legible, the terminal block box can be inspected, the motor compartment can be cleaned, there are no moving parts outside the guards (e.g. fan cover), the assembly is sufficiently ventilated without bottlenecks or machining residue, dust or fluids in the air supply, and that nothing is blocking normal dispersal of heat; finally, ensure that there is sufficient distance between the fan cover holes and any external protective devices which could potentially block the inflow of cooling air;
- in particularly humid conditions: make sure, if possible, that the cables enter the terminal block box from below, and check for condensation; if there is a condensation drain hole, drain the condensation, then refit the plug to restore the box's IP rating. Do this only with the power supply visibly shut off (breaker open). If there are anti-condensation heaters, make sure the motor is not powered up or rotating before turning them on; also make sure the heaters' power supply is compliant with their ratings.

## 8. STARTUP

Before starting up the machine incorporating the unit make sure that:

- The machine is compliant with Machinery Directive 2006/42/EC, in addition to other safety regulations in force;
- It is compliant with regulations EN60204-1;
- That all the supply voltages, motor and auxiliary services match the required ones for that component;
- The facility complies with all applicable standards on safety and health of people at the workplace;
- Remove all the installed safety devices used for handling;
- Check that all the installed devices and accessories are working properly during operation.

Moreover:

- Connect the motor to the mains as shown in the diagram inside the terminal block box (the wiring diagrams are also included at the end of this manual);
- Do not connect up or start the motor if the wiring diagram is absent;
- Do not start the motor with the key unengaged;
- Before making the connections, check that the motor's wires are properly tightened down to the terminal block; to connect the cable, use the parts kit in the bag supplied with the motor, paying particular attention to the maximum tightening torques; the terminals used to hook up the cable must be isolated to ensure the minimum distances between the live parts and inactive metal parts; the cable gland must be suited to the external diameter of the cable used; all unused cable entry points must be sealed to restore the box's IP rating;
- As well as the main power terminals, the terminal block box may also contain the cable terminals for the thermal protective devices and/or condensation heaters and/or the brake (if the motor in question is a brake motor with separate power supply). The cable terminals in the terminal block for thermal protective devices and condensation heaters are usually free. For connecting up brakes with separate power supplies please refer to the relevant section. Motors can also be fitted with incremental encoders and/or an external forced ventilation capacity (servo-ventilation). Please consult the relevant sections;
- The power and GND cables must comply with established practice and standards, and be properly insulated and rated for the current draw; the connection cabling and cable cross sections must comply with EN60204-1;
- All motors are equipped for grounding inside the terminal block box and outside on the motor casing; the GND clamp points are marked with the relevant symbol;
- Secure the GND cable to prevent its slackening (use an elastic washer between the terminal and the bolt) and rotating (use only split cable terminals);
- Before starting up the motor, check its direction of rotation; if it is required to run in the opposite direction from the default direction, for three-phase motors (series TS, TH, TP, TP-SL, TSP-SL, TS-CD/A, TS-CD/B, TH-CD/A, TH-CD/B, TP-CD/A, TP-CD/B, TSX, THX, TPX, TBS, TBH, TBP, TBP-SL, TBSP-SL, TBSX, TBHX, TBPX, D; DB) simply swap 2 phases; for single-phase motors (series S), refer to the wiring diagram. The direction of rotation is clockwise when seen from the drive side;
- If a backstop device is present, do not start the motor in the stop direction; for inspection reasons, the backstop can only be operated once in the stop direction at a voltage less than half the power voltage;
- After wiring the unit, refit the terminal block cover with its gasket;
- For brake motors, check the operation of the brake and its braking torque before starting the motor;
- For motors of the TS-CD/A, TS-CD/B, TH-CD/A, TH-CD/B, TP-CD/A, TP-CD/B, TSX, THX, TPX, TBSX, TBHX, TBPX series, smear sealant (like LOCTITE 5331) on the cable glands and the closing plugs and tighten them correctly; properly seal the cable inlet; thoroughly clean the sealing surface of the terminal block box; in case of installation in particularly aggressive environments, seals (to be replaced if damaged) must be stuck on the terminal block box cover with suitable sealant (like LOCTITE 3020); if present and if necessary, touch-up the anti-corrosion paint with kit that can be supplied upon request;
- Do not touch the motor's housing while it is running as it can reach more than 50°C.



### **Dangerous area**

The dangerous area of the unit is the rotating shaft extension where any person could be subject to mechanical risks from direct contact (cutting, dragging, crushing).  
Make the machine compliant with DIRECTIVE 2006/42/EC providing a safety guard when the unit works in accessible zones.

## 9. MAINTENANCE



Maintenance must be done by a technician familiar with workplace safety legislation and environmental issues.  
Do not dump polluting fluids, replaced parts or maintenance waste into the environment.  
**Never improvise repairs!**



Before working on the unit disconnect its power supply, being careful to be protected against inadvertent reactivation, and in any case against the mobility of the components of the unit itself. Wait until the unit reaches the ambient temperature.  
Inform staff working in the area or nearby, by duly signalling the areas nearby and preventing access.  
Put in place all necessary measures for environmental safety (dust, gas...).

1. Keep the unit in good running order with periodic checks of vibration and noise, absorption and voltage, wear of friction surfaces, lubricant leaks, gaskets, bolted gaskets for wear, deformation and corrosion and restore replace as necessary;
2. Keep the unit clean of dust and process residues (do not use solvents or other products incompatible with the materials of construction, and do not aim high pressure jets of water directly at the unit).

**Following the above mentioned rules ensures the operation of the unit and the required safety level.**

Before working on the motors or in their vicinities, shut off the power supply and wait for all moving parts to come to a halt; ensure that the motor cannot restart as a result of moving parts dragging the shaft; finally, wait for the motor's surface temperature to drop below 50°C (burn hazard).

### Periodic maintenance:

- inspect the motor at regular intervals;
- remove powder, dust, oil and dirt on the fan and fan cover; this helps air to circulate and keep the motor cool;
- check the condition of the seal rings and V-rings;
- check the electrical and mechanical connections and the tightening/anchor nuts and bolts;
- check the condition of the bearings, listening for strange noises or vibrations;

In the event that the motor needs to be disassembled and its internal components examined, then qualified personnel must be enlisted who use appropriate equipment and follow the relevant procedures; Motovario is in no way responsible for any damage or injury that results from the improper use of its parts by unauthorised personnel. Removing parts without the manufacturer's authorisation voids the warranty and the manufacturer is not liable for any claims resulting therefrom.

### Assembly/disassembly instructions

1. **Disassembly:** free the motor from its couplings with the operating part. Take off the fan cover and fan, removing the relative fastenings. Remove the key. Unscrew and remove the screw tie bars holding the motor together. Take out the flange or front shield, extracting it from the casing and from the bearing. Extract the rotor from the support of the opposite shield, taking care not to damage the winding.
2. **Replacing the bearings:** extract the bearings with a special extractor. New bearings must be mounted using a press or buffer resting on the inside ring, or using the heat mounting method. Pre-lubricated shielded bearings that do not require greasing should be used for all kinds of motors.
3. **Stator rewinding:** to be done at qualified workshops only; this however will invalidate the Motovario guarantee.
4. **Assembly:** follow the disassembly instructions in reverse order. The only warning is to take care when mounting the seal rings, after cleaning their seats and turning the rings correctly with their concave surface facing outwards. On completion of maintenance and inspections, run functional and safety checks (thermal protection, brake, etc.).

## 10. PROBLEMS DURING OPERATION

If during start-up or the first running hours there are problems of any kind, please contact MOTOVARIO TECHNICAL SERVICE. The "TROUBLESHOOTING" table lists a series of problems with the description of possible remedies. The descriptions below are merely indicative and are only for information purposes.

Any tampering with the unit without Motovario authorisation voids the warranty.

### TROUBLESHOOTING table

PROBLEM	CAUSE	SOLUTION	INTERVENTION
The motor does not start.	Power supply problems. Faulty motor. Incorrect dimensioning of the motor.	Check power supply.	Replace the electric motor. Check application.
Noise in the mounting area.	Vibration in the mounting area.	Check and correct fasteners and, if necessary, tighten them.	Contact MOTOVARIO TECHNICAL SERVICE.
Motor electric absorption greater than nameplate values.	Incorrect dimensioning of the motor.	Check application.	Replace the electric motor and if necessary also the gear reducer/variator.
The measured temperature on the motor casing is high.	Faulty motor. Incorrect dimensioning of the motor.	Check application.	Replace the electric motor and if necessary also the gear reducer/variator.
Vibrations on the electric motor.	Geometrical errors on the coupling motor/gear reducer/variator.	Check the geometric tolerances of the flange of the electric motor.	Replace the electric motor.
		Check the tolerance and the geometry of the key of the motor shaft.	

## 11. SPARE PARTS TABLES

The spare parts tables of the products are available on Motovario website. For spare parts orders please refer to the data reported on the product nameplate.

## 12. UNIT DISPOSAL

During unit disassembling the plastic material must be separated from the metal or the electric material. The operation may be performed only by skilled operators and in compliance with the current regulations concerning health and safety at the workplace. For determining the consecutive and interconnected stages of the company products (life cycle), from the acquisition of raw materials up to final disposal, the different parts of the products that must be sent to recycling / disposal in compliance with the current environmental laws are listed here below:

Parts of the gear reducer/motor	Material
Gear wheels, shafts, bearings, connecting keys, safety rings, ....	Steel
Casing, parts of the casing	Cast iron
Light alloy casing, parts of the light alloy casing,....	Aluminium
Crowns, bushings,....	Bronze
Sealing rings, covers, rubber parts,...	Elastomers with steel springs
Coupling elements, protection covers, variator knobs, motor terminals....	Plastic
Flat gaskets	Sealing material
Motor terminals, variator screw blocks,...	Brass
Winding	Copper
Stator and rotor	Magnetic steel
Gear reducer oil	Mineral oil
Gear reducer oil	Synthetic oil
Sealants	Resins
Packaging materials	Paper, cardboard



Do not dump in the environment non-biodegradable material, oils, non-ferrous components (PVC, rubber, resins, etc.).



Do not reuse components which may appear in good order on inspection, have them replaced by specialised personnel only.



The crossed out wheelie bin symbol on the nameplate or label indicates that the motor must be collected separately from other waste at the end of its useful life. The separate collection for the delivery of the motor to recycling, to treatment and environmentally compatible disposal helps avoiding possible negative effects on the environment and health and promotes the reuse and/or recycling of materials that make up the motor.

## 13. RESPONSIBILITY

Motovario declines any responsibility in case of:

- Use of the motor not compliant with national laws on safety and accident prevention;
- Work done by unqualified personnel;
- Incorrect installation;
- Tampering with the product;
- Incorrect or failure to follow the instructions in the manual;
- Incorrect or failure to follow the indications marked on the identification labels fixed on the units;
- Wrong delivery of power supply;
- Incorrect connections and/or use of temperature sensors (when present).

The products supplied by Motovario are intended to be incorporated into "complete machines", so it is prohibited to put them into service until the entire machine has not been declared compliant.



The configurations provided in the catalogue of the unit are the only ones allowed. Do not use the product in contrast with the indications provided in it. The instructions provided in this manual do not replace but compensate the obligations of current laws concerning safety regulations

This manual refers to MOTOVARIO products on sale when it is issued. Motovario reserves the right to modify in the future the data of this manual without prior communication.







