



ECO-TOP POWER



GENERAL CATALOGUE
english

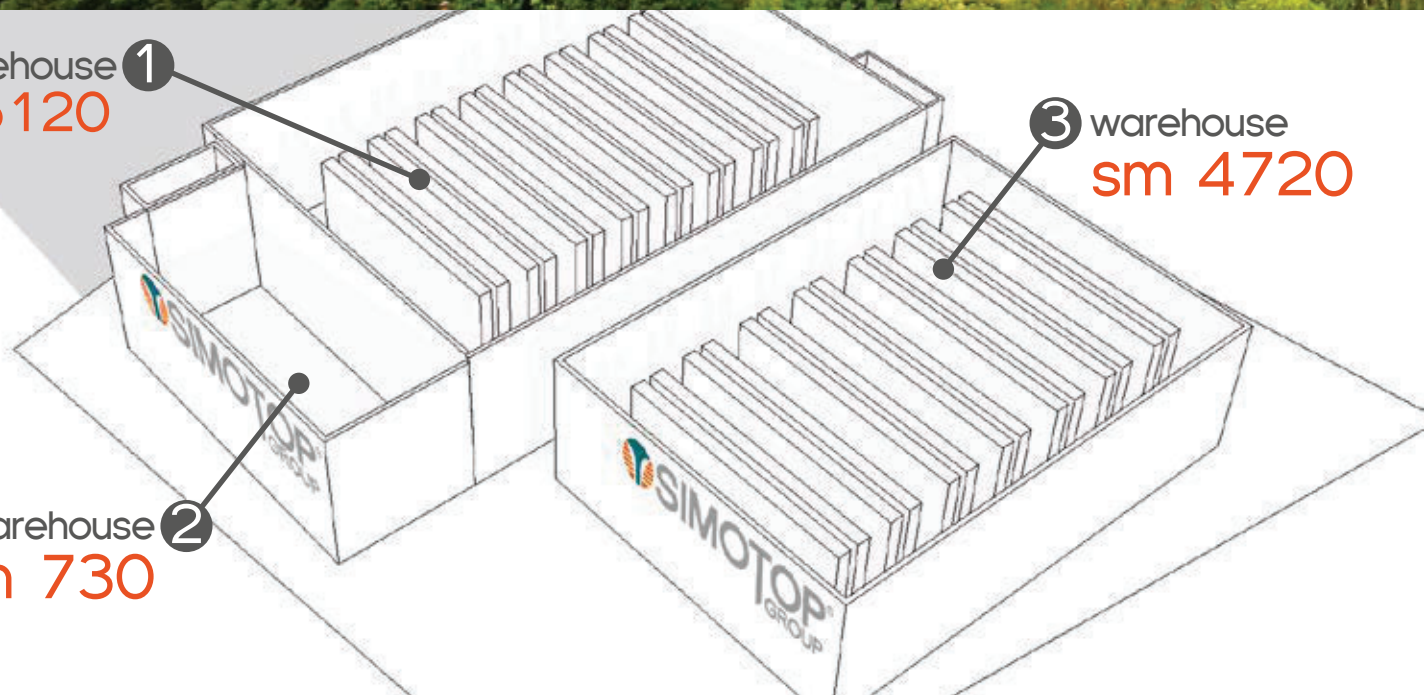
electric motors



warehouse ①
sm 5120

warehouse ②
sm 730

warehouse ③
sm 4720



THE LARGEST “JUST IN TIME” STOCK IN EUROPE



A GREAT "VALUE CREATING" COMPANY





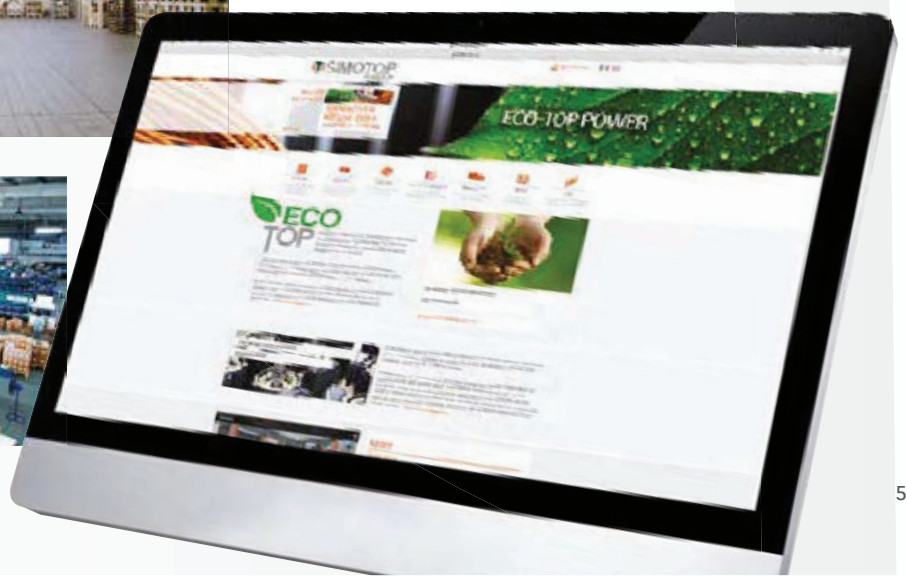
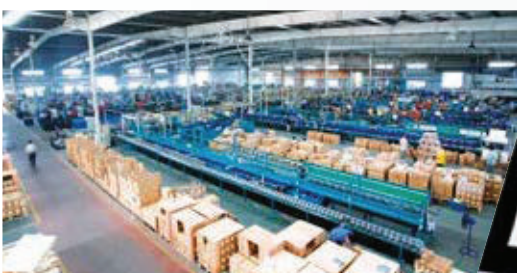
ECO-TOP

POWER

The Company

A SKILLED AND PROFESSIONAL
INTERNATIONAL TEAM AT DISPOSAL OF CUSTOMERS

Two of the most important international companies,
Shanghai Top Motor Corporation Ltd and **Simo Import & Export
Corporation Ltd** wanted to satisfy the demands of the European
Market, offering top quality products as well as a skilled
professional team.



A close-up photograph of a dark grey electric motor. The motor has a cooling fan with a grid pattern on the front. The terminal box is visible on top. The background is a blurred orange and yellow gradient.

WIDE RANGE OF ELECTRIC MOTORS

01. GENERAL FEATURES

High efficiency motors

The Techtot motors are designed in accordance to the new european standard for high efficiency.

MS series, is designed and manufactured in accordance to the parameters of the new european classification standard for high efficiency IE1, IE2.

TA and TC series, are designed and manufactured in accordance to the parameters of the new european classification standard for high efficiency IE1, IE2, IE3, IE4.

The motors are totally enclosed, fan cooled, with squirrel cage rotor.

MS and TA series, from frame 56 to frame 200, are provided with aluminium housing.

TC series, from frame 132 to frame 560, is provided with cast iron housing.

IEC 60034-30 standard defines three IE (International Efficiency) efficiency classes of single speed three-phase cage induction motors; 50Hz and 60Hz; 2-4-6 poles; rated voltage up to 1000V; duty type S1 or S3 with a rated cyclic duration factor of 80% or higher operating direct on line.

- IE1 standard efficiency
- IE2 high efficiency from 0,75 to 375 kW, obligatory in Europe from 16.07.2012
- IE3 premium efficiency from 7,5 to 375 kW, obligatory in Europe from 01.01.2015 and from 0,75 to 375 kW obligatory in Europe from 01.01.2017

| RATED POWER (kW) | STANDARD EFFICIENCY (IE1) STANDARD POLES | | | STANDARD EFFICIENCY (IE2) HIGH POLES | | | STANDARD EFFICIENCY (IE3) PREMIUM POLES | | | STANDARD EFFICIENCY (IE4) SUPER PREMIUM POLES | | |
|---------------------|--|------|------|--|------|------|---|------|------|---|------|------|
| | 2 | 4 | 6 | 2 | 4 | 6 | 2 | 4 | 6 | 2 | 4 | 6 |
| 0,75 | 72,1 | 72,1 | 70,0 | 77,4 | 79,6 | 75,9 | 80,7 | 82,5 | 78,9 | 83,5 | 85,7 | 82,7 |
| 1,1 | 75,0 | 75,0 | 72,9 | 79,6 | 81,4 | 78,1 | 82,7 | 84,1 | 81,0 | 85,2 | 87,2 | 84,5 |
| 1,5 | 77,2 | 77,2 | 75,2 | 81,3 | 82,8 | 79,8 | 84,2 | 85,3 | 82,5 | 86,5 | 88,2 | 85,9 |
| 2,2 | 79,7 | 79,7 | 77,7 | 83,2 | 84,3 | 81,8 | 85,9 | 86,7 | 84,3 | 88,0 | 89,5 | 87,4 |
| 3 | 81,5 | 81,5 | 79,7 | 84,6 | 85,5 | 83,3 | 87,1 | 87,7 | 85,6 | 89,2 | 90,4 | 88,6 |
| 4 | 83,1 | 83,1 | 81,4 | 85,8 | 86,6 | 84,6 | 88,1 | 88,6 | 86,8 | 90,0 | 92,2 | 89,5 |
| 5,5 | 84,7 | 84,7 | 83,1 | 87,0 | 87,7 | 86,0 | 89,2 | 89,6 | 88,0 | 90,9 | 92,9 | 90,5 |
| 7,5 | 86,0 | 86,0 | 84,7 | 88,1 | 88,7 | 87,2 | 90,1 | 90,4 | 89,1 | 91,7 | 92,6 | 91,3 |
| 11 | 87,6 | 87,6 | 86,4 | 89,4 | 89,8 | 88,7 | 91,2 | 91,4 | 90,3 | 92,6 | 93,3 | 92,3 |
| 15 | 88,7 | 88,7 | 87,7 | 90,3 | 90,6 | 89,7 | 91,9 | 92,1 | 91,2 | 93,3 | 93,9 | 92,9 |
| 18,5 | 89,3 | 89,3 | 88,6 | 90,9 | 91,2 | 90,4 | 92,4 | 92,6 | 91,7 | 93,7 | 94,2 | 93,4 |
| 22 | 89,9 | 89,9 | 89,2 | 91,3 | 91,6 | 90,9 | 92,7 | 93,0 | 92,2 | 94,0 | 94,5 | 93,7 |
| 30 | 90,7 | 90,7 | 90,2 | 92,0 | 92,3 | 91,7 | 93,3 | 93,6 | 92,9 | 94,5 | 94,9 | 94,2 |
| 37 | 91,2 | 91,2 | 90,8 | 92,5 | 92,7 | 92,2 | 93,7 | 93,9 | 93,3 | 94,8 | 95,2 | 94,5 |
| 45 | 91,7 | 91,7 | 91,4 | 92,9 | 93,1 | 92,7 | 94,0 | 94,2 | 93,7 | 95,0 | 95,4 | 94,8 |
| 55 | 92,1 | 92,1 | 91,9 | 93,2 | 93,5 | 93,1 | 94,3 | 94,6 | 94,1 | 95,3 | 95,7 | 95,1 |
| 75 | 92,7 | 92,7 | 92,6 | 93,8 | 94,0 | 93,7 | 94,7 | 95,0 | 94,6 | 95,6 | 96,0 | 95,4 |
| 90 | 93,0 | 93,0 | 92,9 | 94,1 | 94,2 | 94,0 | 95,0 | 95,2 | 94,9 | 95,8 | 96,1 | 95,6 |
| 110 | 93,3 | 93,3 | 93,3 | 94,3 | 94,5 | 94,3 | 95,2 | 95,4 | 95,1 | 96,0 | 96,3 | 95,8 |
| 132 | 93,5 | 93,5 | 93,5 | 94,6 | 94,7 | 94,6 | 95,4 | 95,6 | 95,4 | 96,2 | 96,4 | 96,0 |
| 160 | 93,8 | 93,8 | 93,8 | 94,8 | 94,9 | 94,8 | 95,6 | 95,8 | 95,6 | 96,3 | 96,6 | 96,2 |
| 200 | 94,0 | 94,0 | 94,0 | 95,0 | 95,1 | 95,0 | 95,8 | 96,0 | 95,8 | 96,5 | 96,7 | 96,3 |
| 250 | 94,0 | 94,0 | 94,0 | 95,0 | 95,1 | 95,0 | 95,8 | 96,0 | 95,8 | 96,5 | 96,7 | 96,5 |
| 315-375 | 94,0 | 94,0 | 94,0 | 95,0 | 95,1 | 95,0 | 95,8 | 96,0 | 95,8 | 96,5 | 96,7 | 96,6 |

02. STANDARDS

Motors MS, TA, TC Series are compliant with the following Standards:

RATING AND PERFORMANCES

IEC 60034-1 CEI EN 60034-1

METHODS FOR DETERMINING LOSSES AND EFFICIENCY IEC 60034-2 CEI EN 60034-2

ROTATING ELECTRICAL MACHINES, PART 30, EFFICIENCY CLASSES OF SINGLE SPEED, THREE-PHASE INDUCTION MOTORS (IE CODE)
IEC 60034-30-2

CLASSIFICATION OF DEGREES OF PROTECTION (IP CODE) IEC 60034-5 CEI EN 60034-5

METHODS OF COOLING (IC CODE) IEC 60034-6 CEI EN 60034-6

CLASSIFICATION OF TYPE OF CONSTRUCTION MOUNTING ARRANGEMENTS (IM CODE) IEC 60034-7 CEI EN 60034-7

TERMINAL MARKINGS AND DIRECTION OF ROTATION IEC 60034-8 CEI 2-8

NOISE LIMITS IEC 60034-9 CEI EN 60034-9

BUILT-IN THERMAL PROTECTIONS IEC 60034-11

STARTING PERFORMANCE OF ROTATING ELECTRICAL MACHINES IEC 60034-12 CEI EN 60034-12

MECHANICAL VIBRATIONS IEC 60034-14 CEI EN 60034-14

DIMENSIONS AND OUTPUTS FOR ELECTRICAL MACHINES CEI EN 50347 IEC 60072-1 IEC60072-2

Mechanical standard dimensions are given in accordance to the following norms:

UNEL 13113-71 for B3 shape and its derivatives

UNEL 13117-71 for B5 shape and its derivatives

UNEL norms are compliant with the international rules IEC, issuing 72, and its relative amendment n. 1

CEI 16-8 - IEC1293 ELECTRICAL APPAREL MARKING

IEC TS 60034-25 GUIDE FOR THE DESIGN AND PERFORMANCE OF CAGE INDUCTION MOTORS SPECIFICALLY DESIGNED FOR CONVERTER SUPPLY

IEC TS 60034-18-41 PARTIAL DISCHARGE FREE ELECTRICAL INSULATION SYSTEMS (TYPE I) USED IN ROTATING ELECTRICAL MACHINES FED FROM
VOLTAGE CONVERTERS - QUALIFICATION AND QUALITY CONTROL TESTS

UNI ISO 2768/1-2 GENERAL TOLERANCES

UNI 321 SHAFT DIMENSIONS

2014/35/UE LOW VOLTAGE DIRECTIVE

2014/30/UE (EMC) DIRECTIVE OF ELECTROMAGNETIC COMPATIBILITY

2006/42/CE MACHINERY DIRECTIVE

UL-CSA Norms

ECOENERGY DESIGN 2009/125/EC

The motors described into this catalogue satisfy the requirements of the UL Norms

1004-1 Rotating Electric Machines - General Requirements, First

Edition, and of the Norms CSA C22.2 No. 100-04, Motors and Generators,

Sixth Edition. Certificate CSA-UL n. 2073480-E323353 master 224693

High efficiency motors described into this catalogue are compliant with the American standard for high efficiency Nem Premium - Certification of compliance with Energy Efficiency standards for electric motors in accordance with the requirements listed in the Title 10 of the Code of Federal Regulations, Part 431(10CFR Part 431), Energy Conservation Program for Certain Commercial and Industrial Equipment and Part C of the Energy Policy and Conservation Act., 42 U.S.C. 6311 et seq. U.S. Department of Energy (DOE) Compliance Certification Number N. CC 096A.

EAC Conformity Declaration:

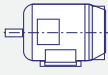

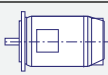
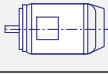
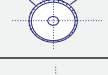
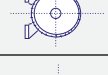


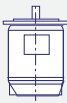
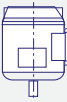
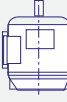

Motors are compliant with the following Technical Rules of the Russian, Bielorussian, Kazakhstani Custom Union.

- TP TC 004/2001 Low Voltage

- TP TC 020/2011 EMC

03. MOUNTING AND POSITIONS

Frame according to IEC 60034-7, are defined in the following table:

| FIGURE | STANDARDS | | | FRAME SIZES | | |
|---|-----------|-------------|---------|--------------|--------------|--------------|
| | CEI 2-14 | IEC 60034-7 | | 56-160 | 180-280 | 315-355 |
| | | Code I | Code II | | | |
|  | B 3 | IM B 3 | IM 1001 | standard | | |
|  | B 3/B 5 | IM B 35 | IM 2001 | standard | | |
|  | B 5 | IM B 5 | IM 3001 | standard | standard | upon request |
|  | B14 | IM B14 | IM 3601 | standard | - | - |
|  | B 8 | IM B 8 | IM 1071 | standard | upon request | upon request |
|  | B 6 | IM B 6 | IM 1051 | standard | upon request | upon request |
|  | B 7 | IM B 7 | IM 1061 | standard | upon request | upon request |
|  | V 1 | IM V 1 | IM 3011 | standard | | |
|  | V 3 | IM V 3 | IM 3031 | standard | standard | upon request |
|  | V 5 | IM V 5 | IM 1011 | upon request | upon request | upon request |
|  | V 6 | IM V 6 | IM 1031 | upon request | upon request | upon request |
|  | V 1 / V 5 | IM V 15 | IM 2011 | standard | standard | upon request |

04. INGRESS PROTECTION

The ingress protection degrees according to IEC 60034-5 standards, are:

IP 55 (standard) totally enclosed motors, fan cooled, protected against penetration of dust and water splashes coming from any direction.
IP 56 (upon request) totally enclosed motors, protected against dust penetration and against sea waves, for use on deck.

Normally IP56 motors are supplied with external fan (IC 411 - IC 416 or IC 418).

Upon request they can be supplied without fan (IC410). In this case the features, outputs and technical data will be supplied upon request.
The external fan is covered by a fan cover with IP 20 protection degree, in line with safety standards.

Motors for vertical mounting V1, V5, V1N5, are supplied with rain cover.

The terminal box, in aluminium or cast iron, has IP55 or IP56 protection degree.

05. GENERAL COSTRUCTION FEATURES

Motors have been designed and manufactured in compliance with international standards.

TA and MS series are available from frame size 56 to frame size 200.

Frames and terminal boxes are in aluminum, fan cover is in steel sheet, flanges and shields are in aluminum.

TC serie is available from frame size 132 to frame size 355.

Frame and terminal box are in cast iron, fan cover is in steel sheet, flanges and shields are in cast iron.

The terminal box is as standard on the top of the motor. From frame size 56 to 280 it can be rotated in step of 90°, to easily transform motors to configuration with terminal box on the left or on the right.

Fans are in nylon, upon request can be supplied with fans in aluminium or in steel sheet.

Feet are removable, on all series, from frame size 56 to frame size 280.

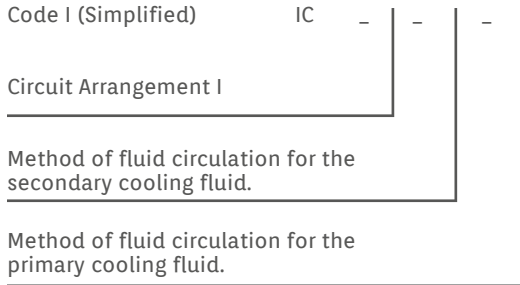
| Components | Series | Shaft height | | | | | | | | | | | | | | | |
|----------------|--------|---------------|-----------|----|----|-----|-----|-----|-----|-----|-----|-----------|-----|-----|-----|-----|----|
| | | 63 | 71 | 80 | 90 | 100 | 112 | 132 | 160 | 180 | 200 | 225 | 250 | 280 | 315 | 355 | |
| Shield | D-end | MS | Aluminum | | | | | | | | | | | | | | |
| | | TA | Aluminum | | | | | | | | | | | | | | |
| | | TC | Cast iron | | | | | | | | | | | | | | |
| | ND-end | MS | Aluminum | | | | | | | | | | | | | | |
| | | TA | Aluminum | | | | | | | | | | | | | | |
| | | TC | Cast iron | | | | | | | | | | | | | | |
| Flange | B5 | MS | Aluminum | | | | | | | | | | | | | | |
| | | TA | Aluminum | | | | | | | | | | | | | | |
| | | TC | Cast iron | | | | | | | | | | | | | | |
| | B14 | MS | Aluminum | | | | | | | | | | | | | | |
| | | TA | Aluminum | | | | | | | | | | | | | | |
| | | TC | Cast iron | | | | | | | | | | | | | | |
| Cover fan | MS | Sheet metal | | | | | | | | | | | | | | | |
| | TA | Sheet metal | | | | | | | | | | | | | | | |
| | TC | Sheet metal | | | | | | | | | | | | | | | |
| Fan | MS/TA | Polypropylene | | | | | | | | | | | | | | | |
| | TC | Polypropylene | | | | | | | | | | Polyamide | | | | | |
| Terminal box | MS/TA | Aluminum | | | | | | | | | | | | | | | |
| | TC | Cast iron | | | | | | | | | | | | | | | |
| Removable feet | MS/TA | Yes | | | | | | | | | | Yes | | | | | No |

MECHANICAL TOLERANCES

| Component | Dimensions | | Tolerance |
|-------------|-------------------------|---------|-----------|
| Axis Height | H up to frame 250 | | -0,5 mm |
| | H bigger than frame 250 | | -1 mm |
| Shaft-end | DE-NDE | Ø 11-28 | j6 |
| | | Ø 38-48 | k6 |
| | | Ø ≥ 55 | m6 |
| Key | DE-NDE | | h9 |
| Flange | N | Ø < 250 | j6 |
| | | Ø ≥ 250 | h6 |

06. COOLING

The designation of cooling method is given by the IC (International Cooling) code, according to IEC 60034-6



Motors in standard execution of frame sizes from 56 to 355 are supplied with IC 411 cooling systems, incorporating a bidirectional fan. All frame sizes can be supplied with cooling system IC 416 on request. In this case a proper fan is fitted inside the fan cover, suitably reinforced, in order to make the ventilation independent on the rotational speed.

| IC CODE | FIGURE | DESCRIPTION | NOTE |
|---------|--------|--|--------------|
| IC 411 | | Self ventilating motor. Enclosed machine. Externally finned. External shaft-mounted fan. | Standard |
| IC 416 | | Motor with assisted ventilation. Enclosed machine. Externally finned. Independent external fan mounted inside the fan cover. | Upon request |
| IC 418 | | Motor with external ventilation. Enclosed machine. Externally finned ventilation provided by air flowing from the driven system. | Upon request |
| IC 410 | | Motor with natural ventilation. Enclosed machine. | Upon request |

07. BEARINGS

Motors TA and MS series from frame size 56 to frame size 200 have sealed pre-lubricated ball bearings, DE and NDE side, C3 type.
 Motors TC series frame from size 132 to frame size 200 have sealed pre-lubricated ball bearings, DE and NDE side, C3 type.
 Motors TC series from frame size 225 to frame size 280 (including 315 2-poles) have ball bearings, DE and NDE side, C3 type.
 Motors TC series from frame size 315 (4-6-8-poles) to frame size 355, have roller bearings DE side and ball bearings NDE side.
 All non pre-lubricated bearings need to be periodically re-lubricated according to the data given in the motors maintenance manual.
 Motor with axially constrained bearing have an arrangement with a spring in order to absorb vibrations.
 The lifetime of bearings (in accordance with supplier data and ideal working conditions) is on 40.000 hours, for motors with direct coupling.

In the table are mentioned all specifications concerning bearings installed on motors frame sizes 56-355

| MOTOR TYPE | POLES | MOUNTING B3 | | MOUNTING B5/B14 | |
|------------|---------|--------------------------|------------------------------------|--------------------------|------------------------------------|
| | | Bearing coupling side DE | Bearing opposite coupling side NDE | Bearing coupling side DE | Bearing opposite coupling side NDE |
| TA/MS 56 | 2-4-6-8 | 6201-2RS-C3 | 6201-2RS-C3 | 6201-2RS-C3 | 6201-2RS-C3 |
| TA/MS 63 | 2-4-6-8 | 6201-2RS-C3 | 6201-2RS-C3 | 6201-2RS-C3 | 6201-2RS-C3 |
| TA/MS 71 | 2-4-6-8 | 6202-2RS-C3 | 6202-2RS-C3 | 6202-2RS-C3 | 6202-2RS-C3 |
| TA/MS 80 | 2-4-6-8 | 6204-2RS-C3 | 6204-2RS-C3 | 6204-2RS-C3 | 6204-2RS-C3 |
| TA/MS 90 | 2-4-6-8 | 6205-2RS-C3 | 6205-2RS-C3 | 6205-2RS-C3 | 6205-2RS-C3 |
| TA/MS 100 | 2-4-6-8 | 6206-2RS-C3 | 6206-2RS-C3 | 6206-2RS-C3 | 6206-2RS-C3 |
| TA/MS 112 | 2-4-6-8 | 6306-2RS-C3 | 6206-2RS-C3 | 6306-2RS-C3 | 6206-2RS-C3 |
| TA/MS 132 | 2-4-6-8 | 6308-2RS-C3 | 6208-2RS-C3 | 6308-2RS-C3 | 6208-2RS-C3 |
| TA/MS 160 | 2-4-6-8 | 6309-2RS-C3 | 6209-2RS-C3 | 6309-2RS-C3 | 6209-2RS-C3 |
| TA/MS 180 | 2-4-6-8 | 6311-2RS-C3 | 6211-2RS-C3 | 6311-2RS-C3 | 6211-2RS-C3 |
| TA/MS 200 | 2-4-6-8 | 6312-2RS-C3 | 6212-2RS-C3 | 6312-2RS-C3 | 6212-2RS-C3 |
| TC 132 | 2-4-6-8 | 6308ZZ-C3 | 6308ZZ-C3 | 6308ZZ-C3 | 6308ZZ-C3 |
| TC 160 | 2-4-6-8 | 6309ZZ-C3 | 6309ZZ-C3 | 6309ZZ-C3 | 6309ZZ-C3 |
| TC 180 | 2-4-6-8 | 6311ZZ-C3 | 6311ZZ-C3 | 6311ZZ-C3 | 6311ZZ-C3 |
| TC 200 | 2-4-6-8 | 6312ZZ-C3 | 6312ZZ-C3 | 6312ZZ-C3 | 6312ZZ-C3 |
| TC 225 | 2-4-6-8 | 6313-C3 | 6313-C3 | 6313-C3 | 6313-C3 |
| TC 250 | 2-4-6-8 | 6314-C3 | 6314-C3 | 6314-C3 | 6314-C3 |
| TC 280 | 2-4-6-8 | 6316-C3 | 6316-C3 | 6316-C3 | 6316-C3 |
| TC 315 | 2 | 6317-C3 | 6317-C3 | 6317-C3 | 6317-C3 |
| TC 315 | 4-6-8 | NU319 | 6319-C3 | NU319 | 6319-C3 |
| TC 355 | 2 | 6319-C3 | 6319-C3 | 6319-C3 | 6319-C3 |
| TC 355 | 4-6-8 | NU322 | 6322-C3 | NU322 | 6322-C3 |

Upon request it can be mounted roller bearings (at DE side), where non-standard, insulated bearings (at NDE side), and reinforced bearings (at NDE side).

08. TERMINAL BOX

The terminal board is normally equipped with 6 terminals and is made with non hygroscopic and mildew resistance material.

Terminal box for TA and MS series is made in aluminum, for TC series in cast iron.

Terminal box has IP55 standard protection degree or IP56 (upon request).

In the series TA and MS from size 56 to size 90 terminal box is equipped with one cable gland and one plug; from size 100 to size 200 is equipped with two cable glands; from size 160 and up it is also available one cable gland M16x1,5 for PTC connection.

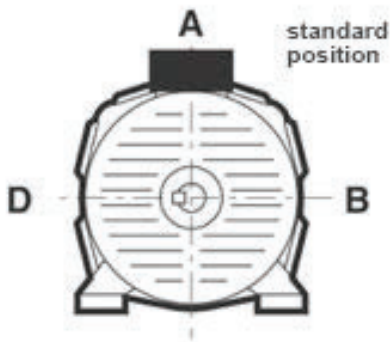
In the TC series terminal box is equipped with two cable glands on all sizes. From size 160 and up it is also available one cable gland M16x1,5 for PTC connection.

The following table resumes the available configurations:

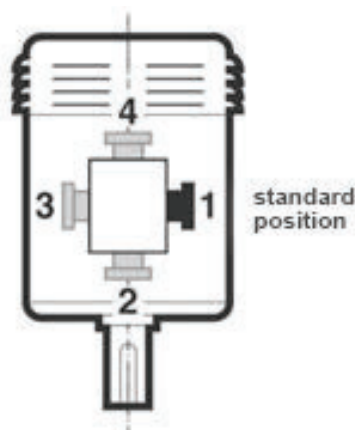
| FRAME | CABLE GLAND |
|-----------|---------------------|
| TA/MS 56 | 1-M16x1,5 |
| TA/MS 63 | 1-M16x1,5 |
| TA/MS 71 | 1-M20x1,5 |
| TA/MS 80 | 1-M20x1,5 |
| TA/MS 90 | 1-M20x1,5 |
| TA/MS 100 | 2-M20x1,5 |
| TA/MS 112 | 2-M25x1,5 |
| TA/MS 132 | 2-M25x1,5 |
| TA/MS 160 | 2-M32x1,5+1-M16x1,5 |
| TA/MS 180 | 2-M40x1,5+1M16x1,5 |
| TA/MS 200 | 2-M40x1,5+1M16x1,5 |
| TC 132 | 2-M25x1,5 |
| TC 160 | 2-M32x1,5+1M16x1,5 |
| TC 180 | 2-M32x1,5+1M16x1,5 |
| TC 200 | 2-M40x1,5+1M16x1,5 |
| TC 225 | 2-M50x1,5+1M16x1,5 |
| TC 250 | 2-M50x1,5+1M16x1,5 |
| TC 280 | 2-M50x1,5+1M16x1,5 |
| TC 315 | 2-M63x1,5+1M16x1,5 |
| TC 355 | 2-M63x1,5+1M16x1,5 |



TERMINAL BOX POSITION AND CABLE GLAND POSITION



Terminal box position respect to the motor shaft end

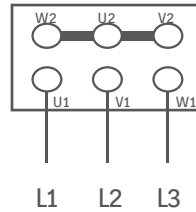


Cable gland position respect to the motor shaft end

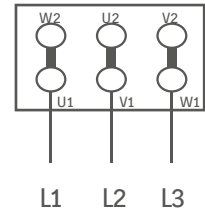
09. CONNECTION

Single speed motors

connection star Y
highest voltage on plate

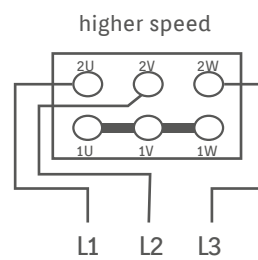
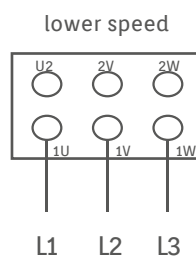


connection delta Δ
lower voltage on plate

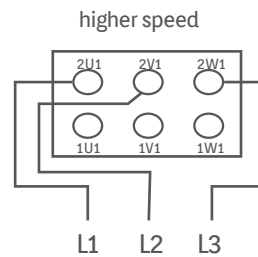
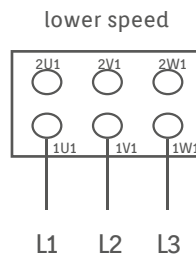


Double speed motors

Dahlander
single winding
6 terminals



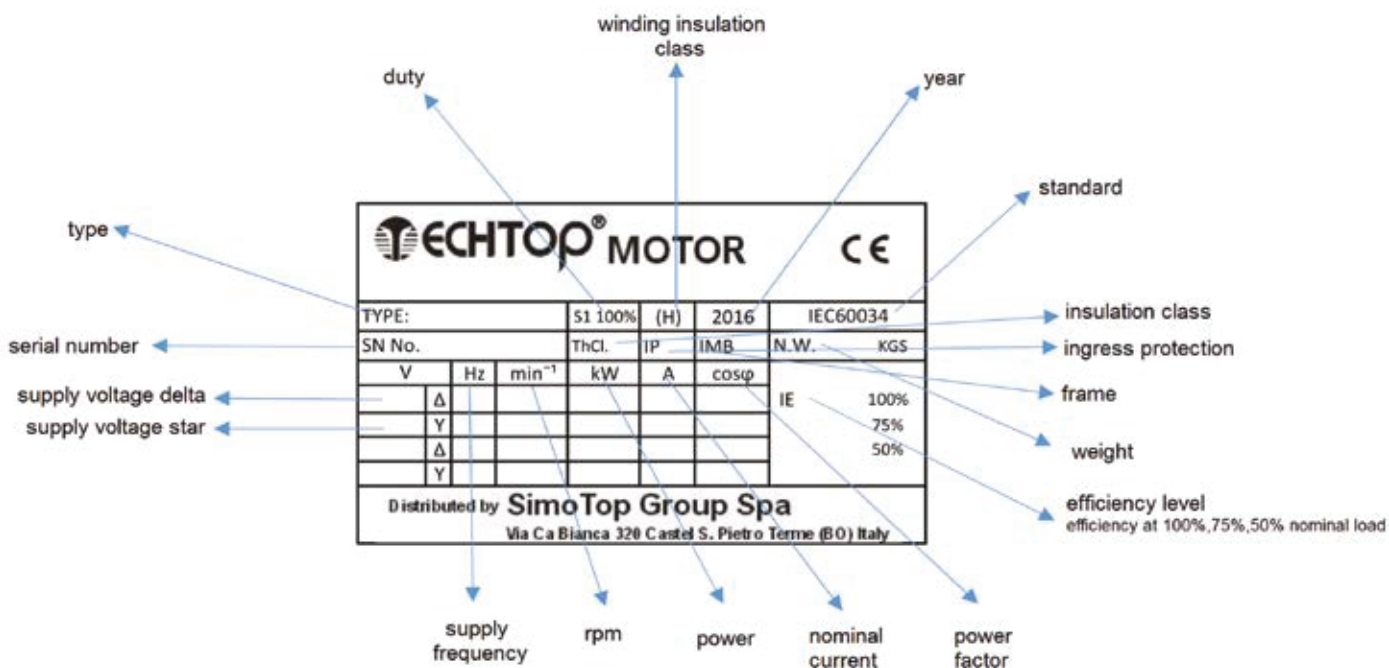
Two separate windings
6 terminals



10. NAMEPLATE

Efficiency of motors not subject to the norms (up to 0,55kW power) or in IE1 class is provided at 100% of the rated load.

Motors subject to the efficiency classification level IE2, IE3 and IE4, in accordance to the standard IEC 60034-30-2 and to the European commission regulation No. 640/2009, on the plate will report the nominal efficiency level at full, 3/4 and 2/4 of the rated load.



FORCED VENTILATION PLATE

| | | |
|--|--|--|
| ECHTOP MOTOR | | CE |
| Type G | <input type="text"/> | No <input type="text"/> |
| Power | <input type="text"/> W | Electric current <input type="text"/> A |
| Rotating speed <input type="text"/> r/min | | |
| Frequency | <input type="text"/> Hz | Voltage <input type="text"/> |
| Capacity | <input type="text"/> m ³ /h | Pressure <input type="text"/> Pa |
| Noise | <input type="text"/> dB(A) | Diameter <input type="text"/> mm |
| Insulation Class | <input type="text"/> | Protection Class (IP) <input type="text"/> |
| Distributed by Simo Top Group Spa Via Ca Bianca 320 Castel S. Pietro Terme (BO) Italy | | |

ATEX 3GD PLATE

| | | |
|--|----|--|
| ECHTOP MOTOR | | CE |
| Ex TüV 12 ATEX 111822X | | II 3 G Ex Na IIC T4 Gc II 3 D Ex tc IIC T125°C Dc |
| ECHTOP MOTOR | | CE |
| TYPE: | | S1 100% (H) IEC60034 |
| SN No. | | ThCl. IP IMB N.W. KGS |
| V | Hz | min ⁻¹ kW A cosφ |
| Δ | | |
| Y | | |
| Δ | | 100% |
| Y | | 75% |
| Δ | | 50% |
| Y | | |
| Distributed by Simo Top Group Spa Via Ca Bianca 320 Castel S. Pietro Terme (BO) Italy | | |

CSA/UL PLATE

| | | |
|--|----|-----------------------------|
| ECHTOP MOTOR | | CE |
| TYPE: | | S1 100% (H) IEC60034 |
| SN No. | | ThCl. IP IMB N.W. KGS |
| V | Hz | min ⁻¹ kW A cosφ |
| Δ | | |
| Y | | |
| Δ | | 100% |
| Y | | 75% |
| Δ | | 50% |
| | | inverter duty 15:1 constant |
| Distributed by Simo Top Group Spa Via Ca Bianca 320 Castel S. Pietro Terme (BO) Italy | | |

CSA/UL NEMA PREMIUM PLATE

| | | |
|--|----|-----------------------------|
| ECHTOP MOTOR | | CE |
| TYPE: | | S1 100% (H) IEC60034 |
| SN No. | | ThCl. IP IMB N.W. KGS |
| V | Hz | min ⁻¹ kW A cosφ |
| Δ | | |
| Y | | |
| Δ | | 100% |
| Y | | 75% |
| Δ | | 50% |
| | | |
| Distributed by Simo Top Group Spa Via Ca Bianca 320 Castel S. Pietro Terme (BO) Italy | | |

11. INSULATION, WINDING

The motors of the series MS, TA, TC are made in F insulation class.

The soft copper electrolytic wire is insulated by using a special enamel (double enamel). Such enamel is classified as H insulation class. All insulating materials used to produce motors are in F or H insulation class.

The winding undergoes a treatment as follows: it is impregnated by soaking it in oven-curing F class resins, it is tropicalized following a process including a spraying of anti-salty enamel and, finally, it is coated using a spray with heatproof, humidity-proof, chemical agent and sea-ambient corrosive action resistant characteristics.

The impregnation cycle is carried out under vacuum.

12. RATINGS AND TECHNICAL DATA

Power and data reported in the Technical Data Tables are for continuous duty (S1) at an ambient temperature of 40 °C, max. altitude 1000 meters a.s.l., with supply at 400V-50Hz.

In such conditions, the temperature rise reached by the motors is lower than the one provided by the B insulation class.

The operating characteristics are guaranteed within the tolerances defined by the CEI EN 60034-1 Standards and the IEC 60034-1 Recommendations, reported in the table:

| CHARACTERISTICS | TOLERANCES |
|----------------------|--|
| Efficiency | Motor power < 50 kW -15% di (1 - η) Motor power > 50 kW -10% di (1 - η) |
| Power factor | +1/6 (1- cosφ) Min 0.02 Max 0.07 |
| Locked rotor current | +20% of guaranteed value |
| Locked rotor torque | -15% + 25% of guaranteed value |
| Pull out torque | -10% of guaranteed value |
| Slip | ± 20% of guaranteed value |

13. SUPPLY VOLTAGE

Motors series MS, TA, TC from frame size 56 to frame size 250 are designed to be used with a power supply at rated voltages from 220V to 690V respectively at 50Hz and at 60Hz; from frame size 280 to frame size 355 are designed to be used with a power supply at rated voltages from 400V to 690V respectively at 50Hz and at 60 Hz.

Standard rated voltages of the motors usually in stock are:

- 230/400V 50Hz from frame size 56 to frame size 100;
- 400/690V 50Hz from frame size 112 to frame size 355.

Lower voltage is made with delta connection while the higher voltage is made with star connection.

In these supply conditions efficiencies are in compliance with the IEC 60034-30.

14. VOLTAGE AND FREQUENCY VARIATIONS

Motors can work without failures if the supply voltage variations are limited as stated in the Classification Society Standards. In particular, motors can run with voltage variations of 10% and frequency variations of 5% with a maximum combined variation of 10% with temperature rise in compliance with the provisions of the Classification Society Standards.

15. OPERATION AT 60Hz FREQUENCY

The motors can run with a supply frequency of 60Hz with differences in performances. Adjustment in the motor features can be obtained by applying the multiplicative coefficients as described in the following table. For motors made at 50Hz and supplied at 60Hz, efficiency class of the motor at 50Hz is no longer valid.

| PLATE VOLTAGE | PLATE VOLTAGE | NOMINAL POWER | NOMINAL CURRENT | NOMINAL TORQUE | RPM | STARTING CURRENT | STARTING TORQUE | MAX TORQUE |
|---------------|---------------|---------------|-----------------|----------------|-----|------------------|-----------------|------------|
| 50 Hz | 60 Hz | | | | | | | |
| 230 +/- 10% | 220 +/- 5% | 1 | 1 | 0.83 | 1.2 | 0.83 | 0.83 | 0.83 |
| 230 +/- 10% | 230 +/- 10% | 1 | 0.95 | 0.83 | 1.2 | 0.83 | 0.83 | 0.83 |
| 230 +/- 10% | 254 +/- 5% | 1.15 | 1.02 | 0.96 | 1.2 | 0.93 | 0.93 | 0.93 |
| 230 +/- 10% | 277 +/- 5% | 1.2 | 1 | 1 | 1.2 | 1 | 1 | 1 |
| 400 +/- 10% | 380 +/- 5% | 1 | 1 | 0.83 | 1.2 | 0.83 | 0.83 | 0.83 |
| 400 +/- 10% | 400 +/- 10% | 1 | 0.95 | 0.83 | 1.2 | 0.83 | 0.83 | 0.83 |
| 400 +/- 10% | 440 +/- 5% | 1.15 | 1.02 | 0.96 | 1.2 | 0.93 | 0.93 | 0.93 |
| 400 +/- 10% | 460 +/- 10% | 1.15 | 1 | 0.96 | 1.2 | 0.96 | 0.96 | 0.96 |
| 400 +/- 10% | 480 +/- 5% | 1.2 | 1 | 1 | 1.2 | 1 | 1 | 1 |

16. DERATINGS

The tables of the technical data are referred to an ambient temperature of 40°C and an altitude up to 1000 meters a.s.l. In different environmental conditions output ratings vary, and are obtainable by applying the factors as mentioned in the following table, maintaining the temperature rise provided by the B insulation class.

| ALTITUDE (m) a.s.l | AMBIENT TEMPERATURE (°C) | | | | | |
|-----------------------|--------------------------|-------|----|----|----|----|
| | 30 | 30-40 | 45 | 50 | 55 | 60 |

| | | | | | | |
|---------|------|------|------|------|------|------|
| <= 1000 | 1.06 | 1 | 0.97 | 0.94 | 0.90 | 0.87 |
| 1500 | 1.04 | 0.97 | 0.94 | 0.91 | 0.87 | 0.84 |
| 2000 | 1 | 0.95 | 0.92 | 0.88 | 0.84 | 0.81 |
| 3000 | 0.96 | 0.89 | 0.86 | 0.82 | 0.78 | 0.74 |
| 4000 | 0.91 | 0.84 | 0.80 | 0.76 | 0.72 | 0.67 |

In case the temperature rise permitted for the F insulation class is used, the corrective factors are the same mentioned in the following table:

| ALTITUDE (m) a.s.l | AMBIENT TEMPERATURE (°C) | | | | | |
|-----------------------|--------------------------|-------|----|----|----|----|
| | 30 | 30-40 | 45 | 50 | 55 | 60 |

| | | | | | | |
|---------|------|------|------|------|------|------|
| <= 1000 | 1.17 | 1.12 | 1.09 | 1.06 | 1.03 | 1 |
| 1500 | 1.15 | 1.10 | 1.07 | 1.04 | 1.01 | 0.97 |
| 2000 | 1.13 | 1.07 | 1.04 | 1.01 | 0.98 | 0.95 |
| 3000 | 1.08 | 1.02 | 0.99 | 0.96 | 0.93 | 0.89 |
| 4000 | 1.04 | 0.97 | 0.94 | 0.91 | 0.87 | 0.84 |

17. SERVICES

IEC 60034-1 Norms defines nine different kind of services for the electrical machines, which correspond to the most common working conditions that can be found in all the field of application.

Among these nine cases it is always possible to identify all the practical cases that could occur, generally by means of a proper thermal equivalence.

Technical data reported in the tables are relative to the continuous service S1.

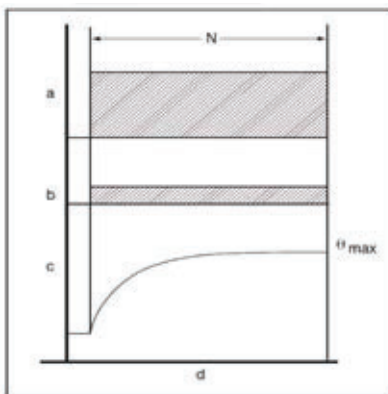
Motors have been designed to operate in continuous service S1 at the nominal power.

In the real cases motors works mostly in a non-continuous service and can operate few minutes a day, or all day long. Working cycles can strongly vary with the kind of application. In all these cases the motor reaches a temperature which differs from the case of a continuous service.

In such cases to avoid damages to the stator winding or to the rotor due to overheating, will have to be considered the hereunder mentioned operational intermittent cycles foreseen by the IEC 60034-1 Norms.

Service S1

Continuous service. The motor is running with a constant load lasting long enough to let the motor reaching its thermal equilibrium conditions. This kind of service can be recognised when the machine works under a constant load for a time bigger than 3-4 times the value of the machine thermal time constant.



- a = Load
- b = Electrical losses
- c = Motor temperature
- d = Time
- N = Motor running time with constant load
- θ_{max} = Maximal reached motor temperature

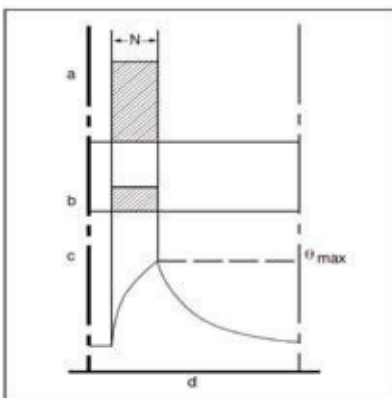
Service S2

Limited duration service. The motor is running with a constant load and a duration which prevents the motor to reach its thermal equilibrium conditions.

This kind of service can be recognised when the machine works under a constant load for a period of time lower than 3 times the value of the machine thermal time constant, followed by a pause lasting at least 3-4 times the value of the machine thermal time constant, that has to be enough to cool down the machine to the ambient temperature.

During the pause time the machine is disconnected from the power supply network. In accordance to the norms, the standard time interval that can be specified are 0,5/1/3/5/10/30/60/90 minutes.

In order to define the service on the motor nameplate, it has to be specified S2 followed by the time interval and the relative power (es. S2 10min. 20kW).



- a = Load
- b = Electrical losses
- c = Motor temperature
- d = Time
- N = Motor running time with constant load
- θ_{max} = Maximal reached motor temperature

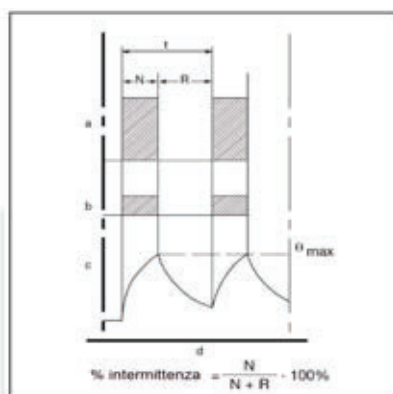
POWER

Service S3

Intermittent and Periodical service. The motor is running with a periodical loading cycle, composed by a time interval of constant load and a steady period with disconnection from the power supply network. The above mentioned running time intervals are not long enough to let motor reaching its thermal equilibrium conditions.

It is allowed to state such kind of service only in case the starting current does not affect the over-temperature significantly. In order to define the service on the motor nameplate, it has to be specified S3 followed by the intermittence ratio $N/(N+R)*100\%$, by the cycle duration t in minutes and the relative power (es. S3 25% 45min. 20kW).

If the cycle duration is not specified, the standard cycle is headed on 10 minutes.



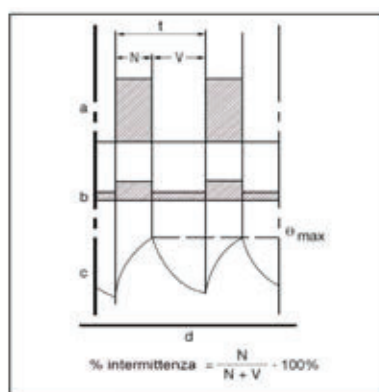
- a = Load
- b = Electrical losses
- c = Motor temperature
- d = Time
- N = Motor running time with constant load
- Θ_{max} = Maximal reached motor temperature
- R = Pause time
- t = Cycle duration

Service S6

Uninterrupted Periodical service with Intermittent load. The motor is running in accordance to a periodical cycle, composed by a time interval of constant load and a period of operation with no-load.

In this case no resting period is granted as the machine is always connected to the power supply network. In order to define the service on the motor nameplate, like for the S3 service,

it has to be specified S6 followed by the intermittence ratio $N/(N+R)*100\%$, by the cycle duration t in minutes and the relative power (es. S6 25% 45min. 20kW). If the cycle duration is not specified, the standard cycle is headed on 10 minutes.



- a = Load
- b = Electrical losses
- c = Motor temperature
- d = Time
- N = Motor running time with constant load
- Θ_{max} = Maximal reached motor temperature
- t = Cycle duration
- V = Motor running time with no-load

The additional type of services are:

- S4 periodical intermittent service with starting
- S5 periodical intermittent service with electrical braking
- S7 uninterrupted service with electrical braking
- S8 periodical uninterrupted service with load and speed related variations
- S9 service with non-periodical load and speed variations

For such kind of services kindly contact the technical department of Simotop Group Spa

18. OVERLOADS

Continuous duty motors can withstand the following overloads:

| OVERLOAD % | DURATION MINUTES | TIME INTERVAL MINUTES |
|------------|------------------|-----------------------|
| 10 | 10 | 15 |
| 20 | 6 | 15 |
| 30 | 4 | 15 |
| 40 | 3 | 15 |
| 50 | 2 | 15 |

In these operating overload conditions, the considered over temperature limit is the one of F insulation class.

19. STARTING

Motors are suitable for the following types of starting:

- Direct
- Star-Delta
- By autotransformer
- Soft-start (*)
- By inverter (**)

(*) When the starting ramp is completed soft-start should be by-passed. Precaution must be used also when the motor will be powered with inverter.

(**) See the relative recommendations in the paragraph n. 23 ("Inverter Supply")

20. BALANCING AND VIBRATION GRADES

Techtop motors are dynamically balanced with one half key applied to the shaft extension in accordance to the standard ISO 8821. In the standard execution vibration severity grade is A, in accordance to the standard IEC 60034-14:2003, for motors with nominal speed from 600 rpm/min to 3600 rpm/min.

Grade A applies to motors with no special vibration requirements, for special vibration requirements applies grade B.

Highest vibrations level can occur on motors installed on site, due to various factors not usually attributable to the motor but to the uncorrect installation.

| VIBRATION GRADE | MOUNTING | SHAFT HEIGHT (mm) | | | SHAFT HEIGHT (mm) | | | SHAFT HEIGHT (mm) | | |
|-----------------|----------|--------------------|-----------------|------------------------------------|--------------------|-----------------|------------------------------------|--------------------|-----------------|------------------------------------|
| | | 56 ≤ H ≤ 132 | | | 132 < H ≤ 280 | | | H > 280 | | |
| | | Displacement μm | Speed mm/sec | Acceleration m/sec ² | Displacement μm | Speed mm/sec | Acceleration m/sec ² | Displacement μm | Speed mm/sec | Acceleration m/sec ² |

| | | | | | | | | | | |
|---|-----------------|--|-----|-----|----|-----|-----|----|-----|-----|
| A | Free suspension | | 1.6 | 2.5 | 35 | 2.2 | 3.5 | 45 | 2.8 | 4.4 |
| | Rigid mounting | | 1.3 | 2.0 | 29 | 1.8 | 2.8 | 37 | 2.3 | 3.6 |
| B | Free suspension | | 0.7 | 1.1 | 18 | 1.1 | 1.7 | 29 | 1.8 | 2.8 |
| | Rigid mounting | | | | 14 | 0.9 | 1.4 | 24 | 1.5 | 2.4 |

(*) Rigid mounting is not considered acceptable for machines with shaft heights less than 132

Instrumentation can have a measurement tolerance of ± 10%

Free suspension condition is achieved by suspending the machine on a spring or by mounting on a elastic support (spring, rubber, etc..)

Motors, on request, can be supplied also with vibration grade B.

Limits for the maximum shaft vibration and the maximum run-out, according to ISO 7919-1 Standard, provided in the table below:

| VIBRATION GRADE | SPEED RANGE MIN ⁻¹ | MAXIMUM RELATIVE SHAFT DISPLACEMENT | MAXIMUM COMBINED MECHANICAL AND ELECTRICAL RUN-OUT μm |
|-----------------|-------------------------------|-------------------------------------|---|
| A | > 1800 | 65 | 16 |
| | ≤ 1800 | 90 | 23 |
| B | > 1800 | 50 | 12,5 |
| | ≤ 1800 | 65 | 16 |

21. NOISE

The technical features table lists the values of A-sound Pressure level (LpA) and A-sound Power level (LwA), measured at a one meter distance. Sound levels are measured in no-load conditions and have tolerances of 3 dB(A).

| FRAME SIZE | A-sound pressure level (LpA) - A-sound power level (LwA) dB(A) | | | | | | | |
|------------|---|-----|---------|-----|---------|-----|---------|-----|
| | 2-POLES | | 4-POLES | | 6-POLES | | 8-POLES | |
| | LpA | LwA | LpA | LwA | LpA | LwA | LpA | LwA |

| | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|
| 56 | 69 | 78 | 63 | 72 | 58 | 67 | 54 | 63 |
| 63 | 75 | 84 | 67 | 76 | 61 | 70 | 58 | 67 |
| 71 | 75 | 84 | 67 | 76 | 61 | 70 | 58 | 67 |
| 80 | 75 | 84 | 70 | 79 | 63 | 72 | 61 | 70 |
| 90 | 75 | 85 | 70 | 80 | 66 | 76 | 66 | 76 |
| 100 | 77 | 87 | 70 | 80 | 66 | 76 | 66 | 76 |
| 112 | 78 | 88 | 73 | 83 | 66 | 76 | 66 | 76 |
| 132 | 69 | 78 | 63 | 72 | 58 | 67 | 54 | 63 |
| 160 | 75 | 84 | 67 | 76 | 61 | 70 | 58 | 67 |
| 180 | 75 | 84 | 67 | 76 | 61 | 70 | 58 | 67 |
| 200 | 75 | 84 | 70 | 79 | 63 | 72 | 61 | 70 |
| 225 | 75 | 85 | 70 | 80 | 66 | 76 | 66 | 76 |
| 250 | 77 | 87 | 70 | 80 | 66 | 76 | 66 | 76 |
| 280 | 78 | 88 | 73 | 83 | 66 | 76 | 66 | 76 |
| 315 | 80 | 90 | 77 | 87 | 73 | 83 | 69 | 79 |
| 355 | 86 | 97 | 84 | 96 | 82 | 94 | 79 | 91 |

The values of the Sound Pressure (LpA) and of the Sound Power (LwA) in the table are related to the operation at 50Hz. If the power supply frequency changes these values have to be adjusted as indicated in the following table:

| SUPPLY FREQUENCY Hz | % VALUE OF THE NOISE LEVEL COMPARED TO THE 50Hz VALUE |
|---------------------|---|
|---------------------|---|

| | |
|----|------|
| 10 | 60% |
| 20 | 60% |
| 30 | 70% |
| 40 | 100% |
| 50 | 100% |
| 60 | 100% |
| 80 | 120% |

22. THERMAL PROTECTIONS

All the Techtop motors IE2, IE3, IE4 from frame size 80 to frame size 355 are equipped with the Positive Temperature Coefficient thermistors PTC. These protections are featured by variable resistance that changes with their actual temperature. This kind of protections, upon request, can be installed also on frame size 56 to frame size 132.

Resistance of PTC, for nominal operating temperature (TK), will be satisfying the following values:

- < 250 Ohm from temperature from -20°C to TK-20°C
- < 550 Ohm at a temperature of TK-5°C
- > 1330 Ohm at a temperature of TK+5°C
- > 4000 Ohm at a temperature of TK+15°C

In accordance to the standards, our motors are supplied with n. 3 PTC installed in series. Actual resistance value range to be considered for disengagement of the power supply is between 1650 Ohm and 4000 Ohm, and takes place in the temperature range from TK-5°C to TK+5°C.

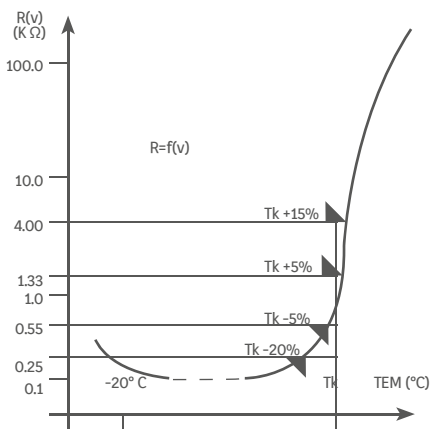
Values of TK related with the class of insulation are the following:

| CLASS OF INSULATION | OPERATING TEMPERATURE LIMIT OF THE INSULATION °C | TK °C |
|---------------------|--|-------|
|---------------------|--|-------|

| | | |
|---|-----|---------|
| A | 105 | 95-100 |
| E | 120 | 110-115 |
| B | 130 | 120-125 |
| F | 155 | 145-150 |
| H | 180 | 170-175 |

The nominal operating temperature of the thermistors PTC, mounted on the Techtop motors is 150°C. Maximum supply voltage of the PTC thermistors is 2,5V.

Below the characteristic resistance/temperature curve of the PTC thermistors:



Upon request, the following thermal protections can be installed on the motors:

Bimetallic devices

Motor protectors with contact normally closed. The contact opens when the winding temperature reaches limits dangerous to the insulation system of the motor.

Platinum resistance thermometers PT100

Variable linear resistance changing with the winding temperature. Device particularly suitable for a continuous winding temperature monitoring.

The protection is normally made by 3 sensitive elements, one for each phase, connected in series. The sensor terminals are led to a specially provided terminal board located in the main or in an auxiliary terminal box.

23. ANTICONDENSATION HEATERS

Motors subject to atmospheric condensation, either through standing idle in damp environments or because of wide ambient temperature variations, may be fitted with anticondensation heaters.

They are of tape form and are normally mounted on the stator winding head.

Anticondensation heaters are normally switched on automatically when the supply to the motor is interrupted, heating the motor to avoid water condensation.

Normal supply voltage is 115 V or 220/240V.

Anticondensation heater terminals are led to a specially provided terminal board located in the main terminal box. Upon request they can be led to a terminal board located in an auxiliary terminal box.

The power values normally used are shown in the table :



| FRAME SIZE | SUPPLY VOLTAGE (V) | LENGTH mm | POWER (W) |
|------------|--------------------|-----------|-----------|
| 80 | 110 | 203 | 8 |
| | 220/240 | 203 | 8 |
| 90 | 110 | 305 | 22 |
| | 220/240 | 305 | 25 |
| 100 | 110 | 432 | 27 |
| | 220/240 | 432 | 26 |
| 112 | 110 | 686 | 21 |
| | 220/240 | 686 | 21 |
| 132/160 | 110 | 686 | 40 |
| | 220/240 | 686 | 40 |
| 180/200 | 110 | 762 | 25 |
| | 220/240 | 762 | 26 |
| 225/250 | 110 | 1016 | 39 |
| | 220/240 | 1016 | 42 |
| 280 | 110 | 1067 | 50 |
| | 220/240 | 1067 | 54 |
| 315 | 110 | 1702 | 103 |
| | 220/240 | 1702 | 99 |
| 355 | 110 | 1702 | 103 |
| | 220/240 | 1702 | 99 |

Drainage hole

Motors of series MS, TA, TC are provided with holes for the discharge of condensate closed with a plug to guarantee the degree of protection IP reported on plate. As a function of the operating conditions such plugs can be removed to allow the discharge of condensate that may form inside the motor.

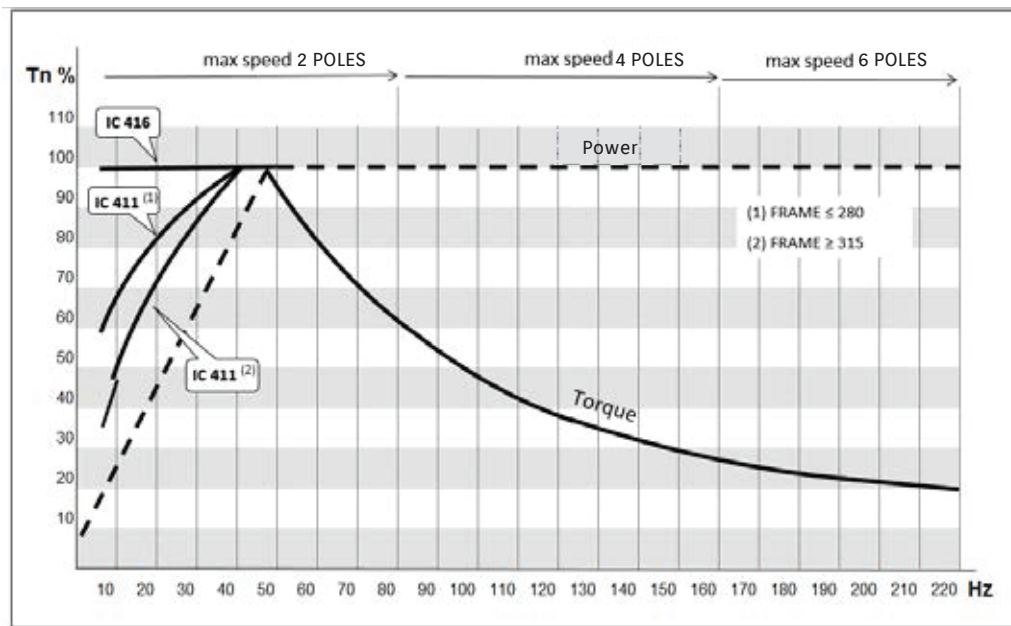


TC series motors from size 160 to size 355 are fitted with a special brass drainage cap that guarantees the degree of protection IP55 allows the condensation to drain without having to remove the cap.

24. INVERTER SUPPLY

The motors of the TA,TC and MS series are designed to be powered by inverter, in particular the stator winding has a vacuum pressure impregnation cycle (VPI system) and phase separators are provided in the winding heads.

Motors powered by inverters up to a frequency of 50 Hz (motor winding at 50Hz) and rated voltage have constant torque operation (constant flow field), over 50Hz the torque starts to drop and the motor runs at constant power (weakening range of the flow).



It must be considered that for frequencies below 50Hz (motor winding at 50Hz) the motor ventilation is reduced, for this reason if the application requires it, TA,TC and MS series motors, on request, can be equipped with an auxiliary fan (cooling system IC 416); in this configuration the motors are able to supply the nominal torque in continuous duty S1 even at low speed.

Generally self-ventilated motors (IC411 cooling system) are suitable for loads with quadratic trend respect to the speed, the typical cases are centrifugal pumps and fans.

In the diagram shown in fig. 1 it is possible to establish the motor performance based on speed.

In fig. 1 the motor performance is indicated starting from 5Hz, for lower frequency values, performance is strongly conditioned by the type of control and the quality of the inverter. The inverter is a device that feeds the motor with a non-sinusoidal voltage with a certain harmonic content, this feature added to the influence of the supply powers cables, can significantly affect the performance of the motor in this area.

When the inverters are used, particular attention must be given to the insulation of the motor, the fast voltage fronts present at the motor supply terminals ($dV / dT = V_{pk}$ peak voltage) caused by the reduced IGBT switching times, produce considerable stresses on the insulating materials. The supply voltage and the length of the motor supply power cables contribute to amplifying the voltage peaks transmitted to the motor. There are several solutions to this problem, which can also be applied in combination with each other, to increase their effectiveness. The most common solutions to the problem presented are:

- 1) Insertion of a reactance at the inverter output.
- 2) Reduction of inverter switching frequency (caution; this solution increases motor noise).
- 3) Winding with reinforced insulation.
- 4) Insert dV / dT (peak voltage, V_{pk} , filters) filters in inverter output.
- 5) Insertion of sinusoidal filters at the inverter output.

| FRAME | SUPPLY VOLTAGE $\leq 500V$ | |
|----------------|--|--|
| | PEAK VOLTAGE | PRECAUTIONS |
| ≤ 250 | $V_{pk} \leq 800V$, time of voltage front $\geq 1\mu s$ | None |
| $280 \div 315$ | $V_{pk} \leq 1.000V$, time of voltage front $\geq 1\mu s$ | To evaluate by analyzing the application |
| ≥ 355 | $V_{pk} \leq 1.350V$, time of voltage front $\geq 1\mu s$ | To evaluate by analyzing the application |

Motors powered by inverters may be affected by eddy current phenomena caused by induced magnetic fields. The magnitude of these currents depends on the powers involved and on the characteristics of the inverter, normally motors with a power $\leq 75kW$ do not require special measures.

Eddy currents are the main cause of bearing damage in a short time, especially regarding the NDE bearing.

In the case of motors powered by inverters with power $> 75kW$ to avoid the problem caused by eddy currents, Simotop recommends the use of an insulated bearing (normally provided on the NDE side of the motor), or alternatively brush devices able to protect the bearings from this phenomenon.

To avoid any damage to the motor when the motor is powered by an inverter, it is recommended to provide in the windings of the PTC type temperature sensors to be connected to the inverter protections or to a special motor protection device.

The above, together with a correct grounding of the motor - inverter - operating machine system, guarantees the best results.

25. MAXIMUM SPEED

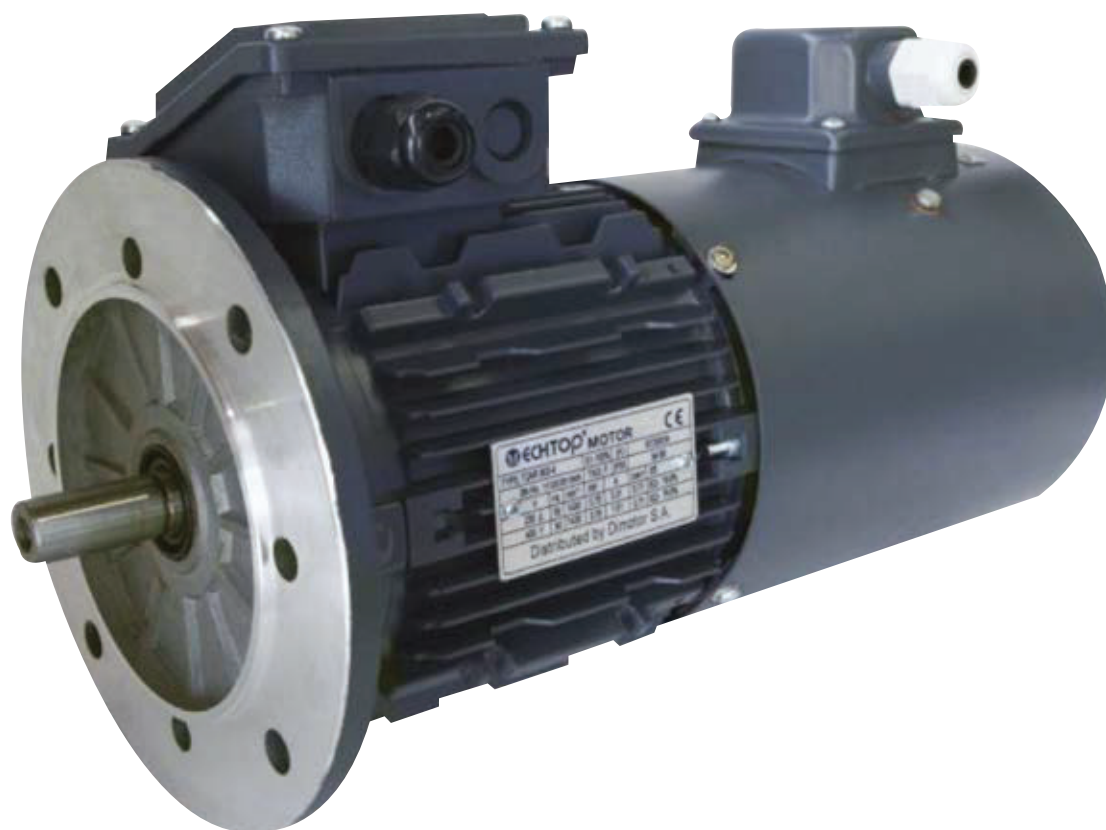
Motors powered by inverters can operate at frequencies higher than the nominal one, supplying the nominal power up to the maximum frequency indicated in the table below. In these conditions the engine torque is reduced as indicated in the diagram of fig. 1. In any case the motor maximum speeds, also at no load operation or dragged by the machine, must never exceed the limit mentioned in the following table:

| FRAME SIZE | MAX PERMISSIBLE SPEED | | | |
|------------|-----------------------|---------|---------|---------|
| | 2 POLES | 4 POLES | 6 POLES | 8 POLES |
| 132 | 5000 | 5000 | 4500 | 4500 |
| 160 | 5000 | 5000 | 4500 | 4500 |
| 180 | 5000 | 5000 | 4500 | 4500 |
| 200 | 5000 | 5000 | 4500 | 4500 |
| 225 | 4500 | 4500 | 4000 | 4000 |
| 250 | 4000 | 4000 | 3800 | 3800 |
| 280 | 4000 | 3000 | 3000 | 3000 |
| 315 | 3600 | 2600 | 2600 | 2600 |
| 355 | 3600 | 2600 | 2600 | 2600 |

Maximum allowable curves, continuous duty S1, 2-4-6 poles motor with forced ventilation (IC416)

26. AUXILIARY FANS

All frame sizes can be supplied with cooling system IC 416 (forced ventilation) on request. In this case a proper fan is fitted inside the fan cover, suitably reinforced.
Consequently the ventilation is independent on the rotational speed of the motor itself.
This solution is particularly suitable for inverter supplied motors.



26. AUXILIARY FANS

Auxiliary fans three phases

| Motor size | Voltage | Output(W) | Current (A) | Speed (rpm) | Air Volume(m3/h) | Air Pressure (Pa) | Noise dB(A) |
|------------|---------------|-----------|-------------|-------------|------------------|-------------------|-------------|
| 63 | 230/400V/50HZ | 24 | 0,065 | 2800 | 45 | 40 | 62 |
| | 230/400V/60HZ | 25 | 0,06 | 3300 | | | |
| | 460-480V/60HZ | 32 | 0,07 | 3400 | | | |
| 71 | 230/400V/50HZ | 35 | 0,1 | 2800 | 52 | 50 | 62 |
| | 230/400V/60HZ | 25 | 0,07 | 3300 | | | |
| | 460-480V/60HZ | 33 | 0,07 | 3300 | | | |
| 80 | 230/400V/50HZ | 37 | 0,1 | 2700 | 58 | 60 | 62 |
| | 230/400V/60HZ | 30 | 0,07 | 3100 | | | |
| | 460-480V/60HZ | 35 | 0,08 | 3400 | | | |
| 90 | 230/400V/50HZ | 45 | 0,1 | 2500 | 91 | 80 | 65 |
| | 230/400V/60HZ | 45 | 0,08 | 2800 | | | |
| | 460-480V/60HZ | 50 | 0,08 | 3200 | | | |
| 100 | 230/400V/50HZ | 72 | 0,185 | 2750 | 142 | 80 | 67 |
| | 230/400V/60HZ | 69 | 0,14 | 3150 | | | |
| | 460-480V/60HZ | 75 | 0,13 | 3250 | | | |
| 112 | 230/400V/50HZ | 85 | 0,175 | 2600 | 229 | 80 | 67 |
| | 230/400V/60HZ | 95 | 0,16 | 2800 | | | |
| | 460-480V/60HZ | 110 | 0,21 | 3000 | | | |
| 132 | 230/400V/50HZ | 50 | 0,195 | 1450 | 337 | 35 | 69 |
| | 230/400V/60HZ | 50 | 0,155 | 1650 | | | |
| | 460-480V/60HZ | 60 | 0,2 | 1700 | | | |
| 160 | 230/400V/50HZ | 60 | 0,2 | 1400 | 609 | 40 | 72 |
| | 230/400V/60HZ | 72 | 0,18 | 1600 | | | |
| | 460-480V/60HZ | 110 | 0,29 | 1600 | | | |
| 180 | 230/400V/50HZ | 80 | 0,22 | 1350 | 686 | 55 | 72 |
| | 230/400V/60HZ | 100 | 0,2 | 1500 | | | |
| | 460-480V/60HZ | 145 | 0,32 | 1600 | | | |
| 200 | 230/400V/50HZ | 110 | 0,23 | 1250 | 1679 | 65 | 72 |
| | 230/400V/60HZ | 140 | 0,25 | 1300 | | | |
| | 460-480V/60HZ | 155 | 0,32 | 1600 | | | |
| 225 | 230/400V/50HZ | 170 | 0,37 | 1350 | 1786 | 70 | 74 |
| | 230/400V/60HZ | 250 | 0,43 | 1500 | | | |
| | 460-480V/60HZ | 240 | 0,45 | 1550 | | | |
| 250 | 230/400V/50HZ | 200 | 0,55 | 1400 | 1813 | 80 | 75 |
| | 230/400V/60HZ | 260 | 0,55 | 1600 | | | |
| | 460-480V/60HZ | 300 | 0,59 | 1650 | | | |
| 280 | 230/400V/50HZ | 200 | 0,5 | 1350 | 2415 | 85 | 78 |
| | 230/400V/60HZ | 280 | 0,55 | 1500 | | | |
| | 460-480V/60HZ | 270 | 0,6 | 1700 | | | |
| 315 | 230/400V/50HZ | 350 | 0,75 | 1400 | 2820 | 110 | 81 |
| | 230/400V/60HZ | 500 | 0,95 | 1550 | | | |
| | 460-480V/60HZ | 400 | 1,2 | 1650 | | | |
| 355 | 230/400V/50HZ | 280 | 1,4 | 960 | 3500 | 80 | 85 |
| | 230/400V/60HZ | 350 | 1,1 | 1100 | | | |
| | 460-480V/60HZ | 400 | 1,4 | 1050 | | | |

Auxiliary fans three phases

| Motor size | Voltage | Output(W) | Current (A) | Speed (rpm) | Air Volume(m3/h) | Air Pressure (Pa) | Noise dB(A) |
|------------|---------------|-----------|-------------|-------------|------------------|-------------------|-------------|
| 112 | 400/690V 50HZ | 90 | 0.25/0.14 | 2600 | 229 | 80 | 67 |
| 132 | 400/690V 50HZ | 60 | 0.21/0.12 | 1450 | 337 | 35 | 69 |
| 160 | 400/690V 50HZ | 80 | 0.25/0.14 | 1400 | 609 | 40 | 72 |
| 180 | 400/690V 50HZ | 90 | 0.27/0.15 | 1400 | 686 | 55 | 72 |
| 200 | 400/690V 50HZ | 130 | 0.30/0.17 | 1400 | 1679 | 65 | 72 |
| 225 | 400/690V 50HZ | 100 | 0.38/0.22 | 1450 | 1786 | 70 | 74 |
| 250 | 400/690V 50HZ | 150 | 0.52/0.30 | 1420 | 1813 | 80 | 75 |
| 280 | 400/690V 50HZ | 220 | 0.55/0.32 | 1400 | 2415 | 85 | 78 |
| 315 | 400/690V 50HZ | 450 | 0.90/0.50 | 1300 | 2820 | 110 | 81 |
| 355 | 400/690V 50HZ | 300 | 1.25/0.70 | 900 | 3500 | 80 | 85 |

Auxiliary fans three phases

| Motor size | Voltage | Output(W) | Current (A) | Speed (rpm) | Air Volume(m3/h) | Air Pressure (Pa) | Noise dB(A) |
|------------|-----------|-----------|-------------|-------------|------------------|-------------------|-------------|
| 71 | 415V/50HZ | 40 | 0,1 | 2850 | 52 | 50 | 62 |
| | 415V/60HZ | 35 | 0,08 | 3400 | | | |
| 80 | 415V/50HZ | 40 | 0,1 | 2800 | 58 | 60 | 62 |
| | 415V/60HZ | 35 | 0,08 | 3300 | | | |
| 90 | 415V/50HZ | 40 | 0,1 | 2700 | 91 | 80 | 65 |
| | 415V/60HZ | 40 | 0,08 | 3100 | | | |
| 100 | 415V/50HZ | 95 | 0,24 | 2800 | 142 | 80 | 67 |
| | 415V/60HZ | 80 | 0,17 | 3250 | | | |
| 112 | 415V/50HZ | 100 | 0,24 | 2700 | 229 | 80 | 67 |
| | 415V/60HZ | 105 | 0,19 | 3000 | | | |

26. AUXILIARY FANS



Auxiliary fans single phase

| Motor size | Voltage | Output (W) | Current (A) | Speed (rpm) | Air Volume (m ³ /h) | Air Pressure (Pa) | Capacitor μ F | Noise dB(A) |
|------------|-----------|------------|-------------|-------------|--------------------------------|-------------------|-------------------|-------------|
| 63 | 230V/50HZ | 17 | 0,12 | 2800 | 45 | 40 | 1 | 62 |
| 71 | 230V/50HZ | 18 | 0,13 | 2800 | 52 | 50 | 1 | 62 |
| 80 | 230V/50HZ | 19 | 0,15 | 2800 | 58 | 60 | 1 | 62 |
| 90 | 230V/50HZ | 20 | 0,14 | 2800 | 91 | 80 | 1 | 65 |
| 100 | 230V/50HZ | 55 | 0,3 | 2700 | 142 | 80 | 2 | 67 |
| 112 | 230V/50HZ | 65 | 0,37 | 2400 | 229 | 80 | 2 | 67 |
| 132 | 230V/50HZ | 55 | 0,35 | 1400 | 337 | 35 | 2 | 69 |
| 160 | 230V/50HZ | 70 | 0,4 | 1400 | 609 | 40 | 4 | 72 |
| 180 | 230V/50HZ | 80 | 0,4 | 1200 | 686 | 55 | 4 | 72 |
| 200 | 230V/50HZ | 85 | 0,4 | 1200 | 1679 | 65 | 4 | 72 |
| 225 | 230V/50HZ | 150 | 0,7 | 1300 | 1786 | 70 | 8 | 74 |
| 250 | 230V/50HZ | 195 | 0,98 | 1350 | 1813 | 80 | 10 | 75 |
| 280 | 230V/50HZ | 170 | 0,95 | 1400 | 2415 | 85 | 10 | 78 |
| 315 | 230V/50HZ | 500 | 2,5 | 1400 | 2820 | 110 | 12 | 81 |
| 355 | 230V/50HZ | 500 | 2,6 | 950 | 3500 | 80 | 16 | 85 |

Auxiliary fans single phase

| Motor size | Voltage | Output (W) | Current (A) | Speed (rpm) | Air Volume (m ³ /h) | Air Pressure (Pa) | Capacitor μ F | Noise dB(A) |
|------------|-----------|------------|-------------|-------------|--------------------------------|-------------------|-------------------|-------------|
| 71 | 240V/50HZ | 35 | 0,15 | 2800 | 52 | 50 | 1,2 | 62 |
| 80 | 240V/50HZ | 35 | 0,15 | 2750 | 58 | 60 | 1,2 | 62 |
| 90 | 240V/50HZ | 40 | 0,15 | 2550 | 91 | 80 | 1,2 | 65 |
| 100 | 240V/50HZ | 75 | 0,36 | 2800 | 142 | 80 | 2 | 67 |
| 112 | 240V/50HZ | 80 | 0,37 | 2600 | 229 | 80 | 2 | 67 |
| 112 | 230V/50HZ | 65 | 0,37 | 2400 | 229 | 80 | 2 | 67 |

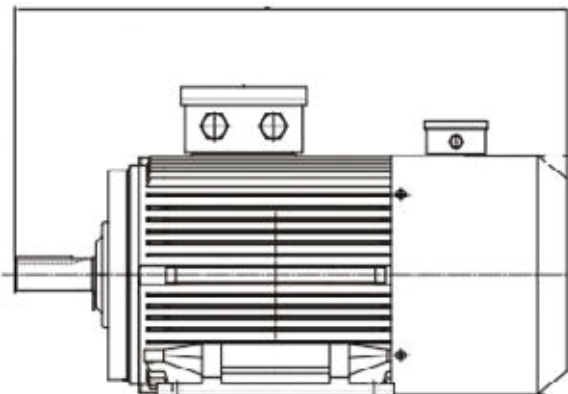
| Motor size | Voltage | Output (W) | Current (A) | Speed (rpm) | Air Volume (m ³ /h) | Air Pressure (Pa) | Capacitor μ F | Noise dB(A) |
|------------|-----------|------------|-------------|-------------|--------------------------------|-------------------|-------------------|-------------|
| 71 | 240V/60HZ | 35 | 0,14 | 3300 | 52 | 50 | 1,2 | 62 |
| 80 | 240V/60HZ | 35 | 0,14 | 3250 | 58 | 60 | 1,2 | 62 |
| 90 | 240V/60HZ | 40 | 0,15 | 2900 | 91 | 80 | 1,2 | 65 |
| 100 | 240V/60HZ | 75 | 0,35 | 3250 | 142 | 80 | 2 | 67 |
| 112 | 240V/60HZ | 95 | 0,42 | 2900 | 229 | 80 | 2 | 67 |

26. AUXILIARY FANS

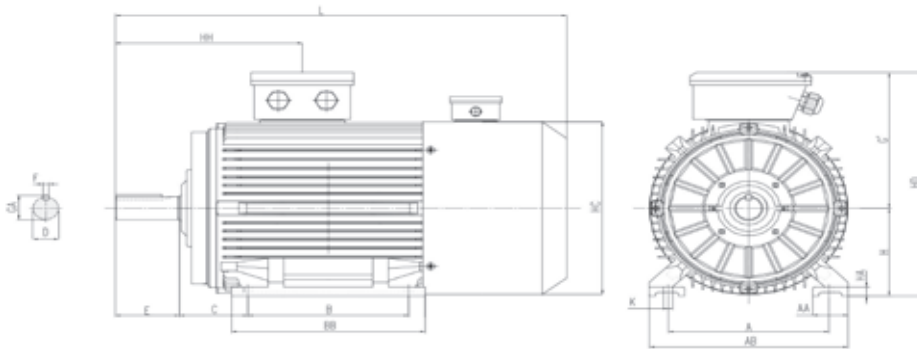
All frame sizes can be supplied with cooling system IC 416 (forced ventilation) on request. In this case a proper fan is fitted inside the fan cover, suitably reinforced. Consequently the ventilation is independent on the rotational speed of the motor itself. This solution is particularly suitable for inverter supplied motors.

In the following table are listed the total lengths L for motors equipped with auxiliary ventilation. If encoder is also fit on the motor, the total L dimension does not change.

L measure of standard motor + measure showed in the table below



| Type | Poles | MS Series mm | TA Series mm | TC Series mm |
|------|---------|--------------|--------------|--------------|
| 71 | 2,4,6,8 | 92 | 105 | |
| 80 | 2,4,6,8 | 94 | 94 | |
| 90S | 2,4,6,8 | 99 | 99 | |
| 90L | 2,4,6,8 | 99 | 99 | |
| 100 | 2,4,6,8 | 108 | 108 | |
| 112 | 2,4,6,8 | 95 | 95 | |
| 132S | 2,4,6,8 | 104 | 104 | 70,5 |
| 132M | 2,4,6,8 | 104 | 104 | 70,5 |
| 160M | 2,4,6,8 | | 145 | 91 |
| 160L | 2,4,6,8 | | 145 | 101 |
| 180M | 2,4,6,8 | | | 67 |
| 180L | 2,4,6,8 | | | 67 |
| 200L | 2,4,6,8 | | | 58 |
| 225S | 2,4,6,8 | | | 121 |
| 225M | 2 | | | 121 |
| 225M | 4,6,8 | | | 121 |
| 250M | 2 | | | 116 |
| 250M | 4,6,8 | | | 116 |
| 280S | 2 | | | 114 |
| 280S | 4,6,8 | | | 114 |
| 280M | 2 | | | 114 |
| 280M | 4,6,8 | | | 114 |
| 315S | 2 | | | 95 |
| 315S | 4,6,8 | | | 95 |
| 315M | 2 | | | 95 |
| 315M | 4,6,8 | | | 95 |
| 315L | 2 | | | 95 |
| 315L | 4,6,8 | | | 95 |
| 355M | 2 | | | 95 |
| 355M | 4,6,8 | | | 95 |
| 355L | 2 | | | 95 |
| 355L | 4,6,8 | | | 95 |



TA Series aluminum:

| | | Dimensions | | | | | | | | | | | | | | | | | | |
|--------|---------|------------|----|-----|-----|-----|----|-----|-----|----|-----|-----|-----|----|-----|----|----|----|------|---------------|
| TYPE | Poles | A | AA | AB | B | BB | C | G' | H | HA | HC | HD | HH | K | L | D | E | F | GA | Threaded hole |
| TA80 | 2,4,6,8 | 125 | 35 | 159 | 100 | 125 | 50 | 139 | 80 | 11 | 158 | 219 | 109 | 9 | 374 | 19 | 40 | 6 | 21.5 | M6 |
| TA90 | 2,4,6,8 | 140 | 37 | 175 | 100 | 130 | 56 | 150 | 90 | 13 | 176 | 240 | 119 | 9 | 411 | 24 | 50 | 8 | 27 | M8 |
| TA90L | 2,4,6,8 | 140 | 37 | 175 | 125 | 155 | 56 | 150 | 90 | 13 | 176 | 240 | 119 | 9 | 436 | 24 | 50 | 8 | 27 | M8 |
| TA100 | 2,4,6,8 | 160 | 45 | 200 | 140 | 180 | 63 | 190 | 100 | 14 | 198 | 290 | 140 | 12 | 488 | 28 | 60 | 8 | 31 | M10 |
| TA112 | 2,4,6,8 | 190 | 45 | 224 | 140 | 180 | 70 | 202 | 112 | 14 | 222 | 314 | 147 | 12 | 500 | 28 | 60 | 8 | 31 | M10 |
| TA132S | 2,4,6,8 | 216 | 44 | 264 | 140 | 190 | 89 | 222 | 132 | 16 | 262 | 354 | 166 | 12 | 571 | 38 | 80 | 8 | 41 | M10 |
| TA132M | 2,4,6,8 | 216 | 44 | 264 | 178 | 228 | 89 | 222 | 132 | 16 | 262 | 354 | 166 | 12 | 609 | 38 | 80 | 10 | 41 | M10 |

TC series cast iron:

| | | Dimensions | | | | | | | | | | | | | | | | | | |
|------|---------|------------|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|----|-------|----|-----|----|------|---------------|
| TYPE | Poles | A | AA | AB | B | BB | C | G' | H | HA | HC | HD | HH | K | L | D | E | F | GA | Threaded hole |
| 132S | 2.4.6.8 | 216 | 46 | 255 | 140 | 190 | 89 | 200 | 132 | 16 | 259 | 332 | 168 | 12 | 537.5 | 38 | 80 | 10 | 41 | M12 |
| 132M | 2.4.6.8 | 216 | 46 | 255 | 178 | 228 | 89 | 200 | 132 | 16 | 259 | 332 | 168 | 12 | 575.5 | 38 | 80 | 10 | 41 | M12 |
| 160M | 2.4.6.8 | 254 | 60 | 314 | 210 | 262 | 108 | 242 | 160 | 17 | 313 | 402 | 282 | 15 | 696 | 42 | 110 | 12 | 45 | M16 |
| 160L | 2.4.6.8 | 254 | 60 | 314 | 254 | 306 | 108 | 242 | 160 | 17 | 313 | 402 | 282 | 15 | 751 | 42 | 110 | 12 | 45 | M16 |
| 180M | 2.4.6.8 | 279 | 75 | 348 | 241 | 300 | 121 | 259 | 180 | 27 | 360 | 439 | 351 | 15 | 754 | 48 | 110 | 14 | 51,5 | M16 |
| 180L | 2.4.6.8 | 279 | 75 | 348 | 279 | 338 | 121 | 259 | 180 | 27 | 360 | 439 | 371 | 15 | 792 | 48 | 110 | 14 | 51,5 | M16 |
| 200L | 2.4.6.8 | 318 | 80 | 388 | 305 | 358 | 133 | 297 | 200 | 25 | 399 | 497 | 395 | 19 | 826 | 55 | 110 | 16 | 59 | M20 |
| 225S | 4.6.8 | 356 | 85 | 436 | 286 | 361 | 149 | 328 | 225 | 28 | 465 | 553 | 423 | 19 | 935 | 60 | 140 | 18 | 64 | M20 |
| 225M | 2 | 356 | 85 | 436 | 311 | 386 | 149 | 328 | 225 | 28 | 465 | 553 | 405 | 19 | 930 | 55 | 110 | 16 | 59 | M20 |
| 225M | 4.6.8 | 356 | 85 | 436 | 311 | 386 | 149 | 328 | 225 | 28 | 465 | 553 | 435 | 19 | 960 | 60 | 140 | 18 | 64 | M20 |
| 250M | 2 | 406 | 90 | 484 | 349 | 443 | 168 | 366 | 250 | 30 | 506 | 616 | 482 | 24 | 1034 | 60 | 140 | 18 | 64 | M20 |
| 250M | 4.6.8 | 406 | 90 | 484 | 349 | 443 | 168 | 366 | 250 | 30 | 506 | 616 | 482 | 24 | 1034 | 65 | 140 | 18 | 69 | M20 |
| 280S | 2 | 457 | 100 | 557 | 368 | 459 | 190 | 388 | 280 | 34 | 559 | 668 | 514 | 24 | 1098 | 65 | 140 | 18 | 69 | M20 |
| 280S | 4.6.8 | 457 | 100 | 557 | 368 | 459 | 190 | 388 | 280 | 34 | 559 | 668 | 514 | 24 | 1098 | 75 | 140 | 20 | 79,5 | M20 |
| 280M | 2 | 457 | 100 | 557 | 419 | 510 | 190 | 388 | 280 | 34 | 559 | 668 | 514 | 24 | 1149 | 65 | 140 | 18 | 69 | M20 |
| 280M | 4.6.8 | 457 | 100 | 557 | 419 | 510 | 190 | 388 | 280 | 34 | 559 | 668 | 514 | 24 | 1149 | 75 | 140 | 20 | 79,5 | M20 |
| 315S | 2 | 508 | 120 | 628 | 406 | 590 | 216 | 530 | 315 | 45 | 651 | 845 | 432 | 28 | 1300 | 65 | 140 | 18 | 58 | M20 |
| 315S | 4.6.8 | 508 | 120 | 628 | 406 | 590 | 216 | 530 | 315 | 45 | 651 | 845 | 462 | 28 | 1330 | 80 | 170 | 22 | 71 | M20 |
| 315M | 2 | 508 | 120 | 628 | 457 | 672 | 216 | 530 | 315 | 45 | 651 | 845 | 432 | 28 | 1460 | 65 | 140 | 18 | 58 | M20 |
| 315M | 4.6.8 | 508 | 120 | 628 | 457 | 672 | 216 | 530 | 315 | 45 | 645 | 845 | 462 | 28 | 1480 | 80 | 170 | 22 | 71 | M20 |
| 315L | 2 | 508 | 120 | 628 | 508 | 672 | 216 | 530 | 315 | 45 | 651 | 845 | 432 | 28 | 1450 | 65 | 140 | 18 | 58 | M20 |
| 315L | 4.6.8 | 508 | 120 | 628 | 508 | 672 | 216 | 530 | 315 | 45 | 651 | 845 | 462 | 28 | 1480 | 80 | 170 | 22 | 71 | M20 |

27. PERMISSIBLE LOAD ON THE BEARINGS

The theoretical basic fatigue life for bearings is calculated according to the provisions of the ISO R 281-1 Standard. Life of bearing is calculated assuming that motors are running under normal environmental conditions, without abnormal vibrations, without axial or radial loads beyond the ones mentioned in the following tables and with operating temperatures of the bearings ranging between -30°C and +85°C.

Lasting life calculated in this way is called basic life (L10h) expressed in hours of operation.

50% of bearings reaches a life equal to five times the basic life resulting from such calculation.

In the tables below are mentioned the maximum permitted axial and radial loads for a basic life (L10h), calculated according to the provisions of the ISO Standards, equal to 20.000 and 40.000 hours of operation.

Values of the radial loads are given both for loads applied to the shaft limit extension (Xmax) and in correspondence of the face on the shaft hub (X0).

Radial loads on the bearing change linearly with the position of the application point. Therefore for loads placed at a distance X on the shaft the maximum load that can be applied is given by the following expression:

$$Fra_x = \frac{C_{x0} - C_{xmax}}{X_{max}} \times X + C_{xmax}$$

Where:

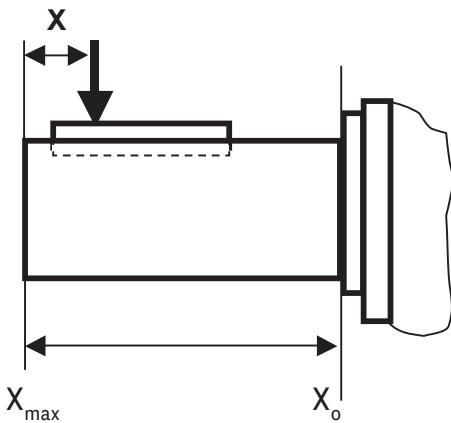
Fra_x = permitted radial load at point X

C_{x0} = permitted radial load at point X0

C_{xmax} = permitted radial load at point Xmax

X_{max} = shaft extension

X = distance from the shaft limit extension to the load application point



To verify that the belt pull does not exceed the maximum value allowed the following formula can be used:

$$F = \frac{19100 \times P \times K}{n \times D}$$

F= radial force in Nm

P= power transmitted in kW

n= numbers of revs. per minute

D= pulley diameter in meters

K= constant



Constant values K:

X increase when Fra_x moves from X_{max} to X_0 , X is maximum when Fra_x is applied in X_0 and $X=X_{max}$

| | |
|-------|--|
| 2 | for flat pulley with tension roller |
| 2,25 | for sheaves with V belt |
| 2,5-3 | for flat belts without tension roller, or for heavy duty with any type of pulley |

28. MAXIMUM RADIAL AND AXIAL LOADS PERMISSIBLE

MS, TA series mounting IM B3 (50Hz)

| Poles | Frame size | Radial load (Nm) | | | | Shaft length mm | Maximum Axial force (N) | |
|-------|------------|----------------------|-----------|----------------------|-----------|-----------------|---|---|
| | | (L10h) = 20000 hours | | (L10h) = 40000 hours | | |  |  |
| | | X_0 | X_{max} | X_0 | X_{max} | | | |

| | | | | | | | | |
|---|-----|------|------|------|------|-----|------|------|
| 2 | 63 | 450 | 390 | 324 | 281 | 23 | 380 | 190 |
| | 71 | 530 | 450 | 382 | 324 | 30 | 460 | 230 |
| | 80 | 720 | 590 | 519 | 425 | 40 | 620 | 310 |
| | 90 | 800 | 640 | 576 | 461 | 50 | 660 | 330 |
| | 100 | 1100 | 900 | 792 | 648 | 60 | 930 | 465 |
| | 112 | 1100 | 870 | 792 | 627 | 60 | 900 | 450 |
| | 132 | 1800 | 1400 | 1296 | 1008 | 80 | 1450 | 725 |
| | 160 | 3000 | 2350 | 2160 | 1692 | 110 | 2000 | 1000 |
| | 180 | 3000 | 2400 | 2160 | 1728 | 110 | 2000 | 950 |
| | 200 | 1390 | 350 | 1001 | 252 | 110 | 2650 | 710 |
| 4 | 63 | 570 | 490 | 411 | 353 | 23 | 510 | 255 |
| | 71 | 690 | 580 | 497 | 418 | 30 | 620 | 310 |
| | 80 | 920 | 750 | 663 | 540 | 40 | 850 | 425 |
| | 90 | 1000 | 810 | 720 | 584 | 50 | 890 | 445 |
| | 100 | 1350 | 1080 | 972 | 778 | 60 | 1200 | 600 |
| | 112 | 1300 | 1050 | 936 | 756 | 60 | 1170 | 585 |
| | 132 | 2100 | 1690 | 1512 | 1217 | 80 | 1850 | 925 |
| | 160 | 3600 | 2000 | 2592 | 1440 | 110 | 2500 | 1200 |
| | 180 | 3650 | 2500 | 2628 | 1800 | 110 | 2500 | 1300 |
| | 200 | 1390 | 950 | 1001 | 684 | 110 | 3350 | 850 |
| 6 | 63 | 630 | 540 | 454 | 389 | 23 | 600 | 300 |
| | 71 | 750 | 630 | 540 | 454 | 30 | 720 | 360 |
| | 80 | 1080 | 880 | 778 | 634 | 40 | 1030 | 515 |
| | 90 | 1130 | 920 | 814 | 663 | 50 | 1040 | 520 |
| | 100 | 1570 | 1260 | 1131 | 908 | 60 | 1430 | 715 |
| | 112 | 1500 | 1200 | 1080 | 864 | 60 | 1400 | 700 |
| | 132 | 2300 | 1900 | 1656 | 1368 | 80 | 2150 | 1075 |
| | 160 | 4200 | 2000 | 3024 | 1440 | 110 | 2900 | 1450 |
| | 180 | 4300 | 2500 | 3096 | 1800 | 110 | 2900 | 1500 |
| | 200 | 1390 | 950 | 1001 | 684 | 110 | 3850 | 850 |
| 8 | 63 | 770 | 660 | 555 | 476 | 23 | 700 | 350 |
| | 71 | 900 | 770 | 648 | 555 | 30 | 840 | 420 |
| | 80 | 1300 | 1040 | 936 | 749 | 40 | 1200 | 600 |
| | 90 | 1300 | 1050 | 936 | 756 | 50 | 1220 | 610 |
| | 100 | 1900 | 1550 | 1368 | 1116 | 60 | 1950 | 975 |
| | 112 | 1900 | 1550 | 1368 | 1116 | 60 | 1920 | 960 |
| | 132 | 2800 | 2250 | 2016 | 1620 | 80 | 2540 | 1270 |
| | 160 | 4500 | 2000 | 3240 | 1440 | 110 | 3300 | 1650 |
| | 180 | 4900 | 2500 | 3528 | 1800 | 110 | 3200 | 1700 |
| | 200 | 1390 | 950 | 1001 | 684 | 110 | 4300 | 850 |

28. MAXIMUM RADIAL AND AXIAL LOADS PERMISSIBLE

MS, TA series mounting IM V1 (50Hz)

| Poles | Frame size | Maximum Axial force (N) in downwards direction | | Maximum Axial force (N) in upwards direction | |
|-------|------------|--|----------------------|--|----------------------|
| | | (L10h) = 20000 hours | (L10h) = 40000 hours | (L10h) = 20000 hours | (L10h) = 40000 hours |

| | | | | | |
|---|-----|------|------|------|------|
| 2 | 63 | 225 | 135 | 400 | 240 |
| | 71 | 300 | 180 | 480 | 288 |
| | 80 | 450 | 270 | 670 | 402 |
| | 90 | 500 | 300 | 720 | 432 |
| | 100 | 650 | 390 | 1000 | 600 |
| | 112 | 620 | 372 | 1000 | 600 |
| | 132 | 980 | 588 | 1100 | 660 |
| | 160 | 2000 | 1200 | 1970 | 1182 |
| | 180 | 2130 | 1278 | 1800 | 1080 |
| | 200 | 3200 | 1920 | 1650 | 990 |
| 4 | 63 | 390 | 234 | 540 | 324 |
| | 71 | 400 | 240 | 650 | 390 |
| | 80 | 690 | 414 | 900 | 540 |
| | 90 | 730 | 438 | 970 | 582 |
| | 100 | 900 | 540 | 1300 | 780 |
| | 112 | 860 | 516 | 1300 | 780 |
| | 132 | 1320 | 792 | 1500 | 900 |
| | 160 | 2040 | 1224 | 1660 | 996 |
| | 180 | 1990 | 1194 | 1820 | 1092 |
| | 200 | 2750 | 1650 | 1300 | 780 |
| 6 | 63 | 460 | 276 | 610 | 366 |
| | 71 | 470 | 282 | 750 | 450 |
| | 80 | 860 | 516 | 1060 | 636 |
| | 90 | 870 | 522 | 1150 | 690 |
| | 100 | 1100 | 660 | 1550 | 930 |
| | 112 | 1050 | 630 | 1550 | 930 |
| | 132 | 1700 | 1020 | 2500 | 1500 |
| | 160 | 2470 | 1482 | 1880 | 1128 |
| | 180 | 2340 | 1404 | 2050 | 1230 |
| | 200 | 3140 | 1884 | 1560 | 936 |
| 8 | 63 | 550 | 330 | 610 | 366 |
| | 71 | 560 | 336 | 750 | 450 |
| | 80 | 1050 | 630 | 1060 | 636 |
| | 90 | 1060 | 636 | 1150 | 690 |
| | 100 | 1400 | 840 | 1600 | 960 |
| | 112 | 1500 | 900 | 1600 | 960 |
| | 132 | 2000 | 1200 | 1900 | 1140 |
| | 160 | 2930 | 1758 | 2020 | 1212 |
| | 180 | 2680 | 1608 | 2230 | 1338 |
| | 200 | 3660 | 2196 | 1380 | 828 |



TC series mounting IM B3 (50Hz)

| Poles | Frame size | Radial force (N) | | | | Shaft length mm | Maximum Axial force (N) | |
|-------|------------|----------------------|-----------|----------------------|-----------|--------------------|-------------------------|--|
| | | (L10h) = 20000 hours | | (L10h) = 40000 hours | | | | |
| | | X_0 | X_{max} | X_0 | X_{max} | | | |

| | | | | | | | | |
|---|---------|-------|------|-------|------|-----|------|------|
| 2 | 132S1-2 | 2300 | 1800 | 1656 | 1296 | 80 | 1900 | 890 |
| | 132S2-2 | 2300 | 1800 | 1656 | 1296 | 80 | 1900 | 890 |
| | 160M1-2 | 3000 | 2400 | 2160 | 1728 | 110 | 2000 | 1000 |
| | 160M2-2 | 3000 | 2300 | 2160 | 1656 | 110 | 2000 | 1000 |
| | 160L-2 | 3000 | 2400 | 2160 | 1728 | 110 | 2000 | 1000 |
| | 180M-2 | 3000 | 2400 | 2160 | 1728 | 110 | 2000 | 1050 |
| | 200L1-2 | 1390 | 950 | 1000 | 684 | 110 | 2650 | 1100 |
| | 200L2-2 | 4600 | 3800 | 3312 | 2736 | 110 | 2650 | 1100 |
| | 225M-2 | 4550 | 3800 | 3276 | 2736 | 110 | 3000 | 1750 |
| | 250M-2 | 3260 | 2000 | 2347 | 1440 | 140 | 3400 | 1700 |
| | 280S-2 | 4600 | 3750 | 3312 | 2700 | 140 | 3250 | 1460 |
| | 280M-2 | 4600 | 3750 | 3312 | 2700 | 140 | 3250 | 1460 |
| | 315S-2 | 6100 | 3530 | 4392 | 2541 | 140 | 4000 | 1800 |
| | 315M-2 | 6100 | 3530 | 4392 | 2541 | 140 | 4000 | 1800 |
| | 315L1-2 | 6330 | 4000 | 4557 | 2880 | 140 | 3240 | 1458 |
| | 315L2-2 | 6330 | 4000 | 4557 | 2880 | 140 | 3240 | 1458 |
| 4 | 132S-4 | 2900 | 2300 | 2088 | 1656 | 80 | 2100 | 1050 |
| | 132M-4 | 2800 | 2300 | 2016 | 1656 | 80 | 2100 | 1250 |
| | 160M-4 | 3600 | 2000 | 2592 | 1440 | 110 | 2500 | 1200 |
| | 160L-4 | 3600 | 2000 | 2592 | 1440 | 110 | 2500 | 1200 |
| | 180M-4 | 3650 | 2500 | 2628 | 1800 | 110 | 2500 | 1300 |
| | 180L-4 | 3650 | 2500 | 2628 | 1800 | 110 | 2500 | 1300 |
| | 200L-4 | 1390 | 950 | 1000 | 684 | 110 | 3350 | 1100 |
| | 225S-4 | 5400 | 3800 | 3888 | 2736 | 140 | 3700 | 1100 |
| | 225M-4 | 5400 | 3800 | 3888 | 2736 | 140 | 3700 | 2100 |
| | 250M-4 | 3260 | 2000 | 2347 | 1440 | 140 | 4200 | 2050 |
| | 280S-4 | 6000 | 3500 | 4320 | 2520 | 140 | 4050 | 1820 |
| | 280M-4 | 6000 | 3500 | 4320 | 2520 | 140 | 4050 | 1820 |
| | 315S-4 | 21300 | 8700 | 15336 | 6264 | 170 | 4850 | 2200 |
| | 315M-4 | 21300 | 8700 | 15336 | 6264 | 170 | 4850 | 2200 |
| | 315L1-4 | 16000 | 9500 | 11520 | 6840 | 170 | 3930 | 1768 |
| | 315L2-4 | 16000 | 9500 | 11520 | 6840 | 170 | 3930 | 1768 |

28. MAXIMUM RADIAL AND AXIAL LOAD PERMISSIBLE

TC series mounting IM B3 (50Hz)

| Poles | Frame size | Radial force (N) | | | | Shaft length mm | Maximum Axial force (N) | |
|-------|------------|----------------------|-----------|----------------------|-----------|--------------------|---|---|
| | | (L10h) = 20000 hours | | (L10h) = 40000 hours | | |  |  |
| | | X_0 | X_{max} | X_0 | X_{max} | | | |

| | | | | | | | | |
|---|---------|-------|------|-------|------|-----|------|------|
| 6 | 132M2-6 | 3200 | 2600 | 2304 | 1872 | 80 | 2600 | 1300 |
| | 160M-6 | 4300 | 2000 | 3096 | 1440 | 110 | 2900 | 1450 |
| | 160L-6 | 4300 | 2000 | 3096 | 1440 | 110 | 2900 | 1450 |
| | 180L-6 | 4300 | 2500 | 3096 | 1800 | 110 | 2900 | 1500 |
| | 200L1-6 | 1390 | 950 | 1001 | 684 | 110 | 3850 | 1100 |
| | 200L2-6 | 1390 | 950 | 1001 | 684 | 110 | 3850 | 1100 |
| | 225M-6 | 6300 | 3800 | 4536 | 2736 | 140 | 4300 | 2500 |
| | 250M-6 | 3260 | 2000 | 2348 | 1440 | 140 | 4800 | 2000 |
| | 280S-6 | 6000 | 3500 | 4320 | 2520 | 140 | 4700 | 3100 |
| | 280M-6 | 6000 | 3500 | 4320 | 2520 | 140 | 4700 | 3100 |
| | 315S-6 | 22000 | 8400 | 15840 | 6048 | 170 | 5600 | 2464 |
| | 315M-6 | 22000 | 8400 | 15840 | 6048 | 170 | 5600 | 2464 |
| | 315L1-6 | 16000 | 6500 | 11520 | 4680 | 170 | 4500 | 1980 |
| | 315L2-6 | 16000 | 6500 | 11520 | 4680 | 170 | 4500 | 1980 |
| 8 | 160M2-8 | 4500 | 2000 | 3240 | 1440 | 110 | 3300 | 1650 |
| | 160L-8 | 4500 | 2000 | 3240 | 1440 | 110 | 3300 | 1650 |
| | 180L-8 | 4900 | 2500 | 3528 | 1800 | 110 | 3200 | 1700 |
| | 200L-8 | 1390 | 950 | 1001 | 684 | 110 | 4300 | 1100 |
| | 225S-8 | 7000 | 3800 | 5040 | 2736 | 140 | 4750 | 2750 |
| | 225M-8 | 7000 | 3800 | 5040 | 2736 | 140 | 4750 | 2750 |
| | 250M-8 | 3260 | 2000 | 2348 | 1440 | 140 | 5400 | 2120 |
| | 280S-8 | 6000 | 3500 | 4320 | 2520 | 140 | 5200 | 3250 |
| | 280M-8 | 6000 | 3500 | 4320 | 2520 | 140 | 5200 | 3250 |
| | 315S-8 | 19800 | 8250 | 14256 | 5940 | 170 | 6200 | 2728 |
| | 315M-8 | 19800 | 8250 | 14256 | 5940 | 170 | 6200 | 2728 |
| | 315L1-8 | 15700 | 6350 | 11304 | 4572 | 170 | 6200 | 2728 |
| | 315L2-8 | 15700 | 6350 | 11304 | 4572 | 170 | 6200 | 2728 |

TC series mounting IM V1 (50Hz)

| Poles | Frame size | Maximum Axial force (N) in downwards direction | | Maximum Axial force (N) in upwards direction | |
|-------|------------|---|----------------------|---|----------------------|
| | | (L10h) = 20000 hours | (L10h) = 40000 hours | (L10h) = 20000 hours | (L10h) = 40000 hours |



| | | | | | |
|---|---------|------|------|------|------|
| 2 | 132S1-2 | 1600 | 960 | 1900 | 1140 |
| | 132S2-2 | 1600 | 960 | 1900 | 1140 |
| | 160M1-2 | 1730 | 1038 | 1270 | 762 |
| | 160M2-2 | 1730 | 1038 | 1270 | 762 |
| | 160L-2 | 1730 | 1038 | 1270 | 762 |
| | 180M-2 | 1650 | 990 | 1300 | 780 |
| | 200L1-2 | 2190 | 1314 | 1170 | 702 |
| | 200L2-2 | 2190 | 1314 | 1170 | 702 |
| | 225M-2 | 2380 | 1428 | 2370 | 1422 |
| | 250M-2 | 2700 | 1620 | 2410 | 1446 |
| | 280S-2 | 2130 | 1278 | 4370 | 2622 |
| | 280M-2 | 2130 | 1278 | 4370 | 2622 |
| | 315S-2 | 2560 | 1536 | 5800 | 3480 |
| | 315M-2 | 2560 | 1536 | 5800 | 3480 |
| | 315L1-2 | 2900 | 1740 | 5900 | 3540 |
| | 315L2-2 | 2900 | 1740 | 5900 | 3540 |
| 4 | 132S-4 | 1600 | 960 | 1520 | 912 |
| | 132M-4 | 1600 | 960 | 1520 | 912 |
| | 160M-4 | 2040 | 1224 | 1660 | 996 |
| | 160L-4 | 2040 | 1224 | 1660 | 996 |
| | 180M-4 | 2000 | 1200 | 1820 | 1092 |
| | 180L-4 | 2000 | 1200 | 1820 | 1092 |
| | 200L-4 | 2750 | 1650 | 1310 | 786 |
| | 225S-4 | 2780 | 1668 | 3050 | 1830 |
| | 225M-4 | 2780 | 1668 | 3050 | 1830 |
| | 250M-4 | 3160 | 1896 | 3000 | 1800 |
| | 280S-4 | 2430 | 1458 | 5600 | 3360 |
| | 280M-4 | 2430 | 1458 | 5600 | 3360 |
| | 315S-4 | 1950 | 1170 | 7750 | 4650 |
| | 315M-4 | 1950 | 1170 | 7750 | 4650 |
| | 315L1-4 | 1270 | 762 | 7460 | 4476 |
| | 315L2-4 | 1270 | 762 | 7460 | 4476 |

28. MAXIMUM RADIAL AND AXIAL LOAD PERMISSIBLE

TC series mounting IM V1 (50Hz)

| Poles | Frame size | Maximum Axial force (N) in downwards direction | | Maximum Axial force (N) in upwards direction | |
|-------|------------|---|----------------------|---|----------------------|
| | | (L10h) = 20000 hours | (L10h) = 40000 hours | (L10h) = 20000 hours | (L10h) = 40000 hours |
| 6 | 132M2-6 | 2300 | 1495 | 1650 | 1073 |
| | 160M-6 | 2450 | 1593 | 1880 | 1222 |
| | 160L-6 | 2450 | 1593 | 1880 | 1222 |
| | 180L-6 | 2320 | 1508 | 2060 | 1339 |
| | 200L1-6 | 3100 | 2015 | 1450 | 943 |
| | 200L2-6 | 3100 | 2015 | 1450 | 943 |
| | 225M-6 | 3300 | 2145 | 3500 | 2275 |
| | 250M-6 | 3600 | 2340 | 3250 | 2113 |
| | 280S-6 | 3100 | 2015 | 6300 | 4095 |
| | 280M-6 | 3100 | 2015 | 6300 | 4095 |
| | 315S-6 | 1150 | 748 | 4100 | 2665 |
| | 315M-6 | 1150 | 748 | 4100 | 2665 |
| | 315L1-6 | 900 | 585 | 4300 | 2795 |
| | 315L2-6 | 900 | 585 | 4300 | 2795 |
| 8 | 160M2-8 | 2900 | 1885 | 2020 | 1313 |
| | 160L-8 | 2900 | 1885 | 2020 | 1313 |
| | 180L-8 | 2700 | 1755 | 2240 | 1456 |
| | 200L-8 | 3700 | 2405 | 1650 | 1073 |
| | 225S-8 | 3850 | 2503 | 3700 | 2405 |
| | 225M-8 | 3850 | 2503 | 3700 | 2405 |
| | 250M-8 | 4300 | 2795 | 9600 | 6240 |
| | 280S-8 | 3650 | 2373 | 6700 | 4355 |
| | 280M-8 | 3650 | 2373 | 6700 | 4355 |
| | 315S-8 | 1800 | 1170 | 4250 | 2763 |
| | 315M-8 | 2800 | 1820 | 4250 | 2763 |
| | 315L1-8 | 1800 | 1170 | 4780 | 3107 |
| | 315L2-8 | 1300 | 845 | 4780 | 3107 |

TC series mounting IM B3 (50Hz)

| Poles | Frame size | Radial force (N) | | | | Shaft length mm | Maximum Axial force (N) | |
|-------|------------|----------------------|-----------|----------------------|-----------|--------------------|---|---|
| | | (L10h) = 20000 hours | | (L10h) = 40000 hours | | |  |  |
| | | X_o | X_{max} | X_o | X_{max} | | | |

| | | | | | | | | |
|---|-----|------|------|------|------|-----|------|------|
| 2 | 355 | 4300 | 2200 | 3096 | 1584 | 140 | 2000 | 2000 |
| 4 | 355 | 9000 | 6500 | 6480 | 4680 | 210 | 6000 | 6000 |
| 6 | 355 | 9800 | 3400 | 7056 | 2448 | 210 | 7000 | 7000 |
| 8 | 355 | 9800 | 3000 | 7056 | 2160 | 210 | 8000 | 8000 |

TC series mounting IM V1 (50Hz)

| Poles | Frame size | Maximum Axial force (N) in downwards direction | | Maximum Axial force (N) in upwards direction | |
|-------|------------|---|----------------------|---|----------------------|
| | | (L10h) = 20000 hours | (L10h) = 40000 hours | (L10h) = 20000 hours | (L10h) = 40000 hours |

| | | | | | |
|---|-----|------|------|-------|-------|
| 2 | 355 | 3690 | 2325 | 200 | 126 |
| 4 | 355 | 1880 | 1185 | 14100 | 8883 |
| 6 | 355 | 400 | 252 | 15800 | 9954 |
| 8 | 355 | 400 | 252 | 17100 | 10773 |

**ECO-TOP
POWER**

TA Series

ELECTRICAL AND MECHANICAL DATA



ALUMINUM HOUSING

35. TA SERIES – Three-Phase Asynchronous single speed motors

Electrical data (50Hz) Efficiency IE1 - 2 poles

| Type | Power (kW) | Current (A) | | | Current (A) | | | Current (A) | | | rpm | Eff. (%) | Power factor (Cosφ) | Cs/ Cn | Cmax/ Cn | Cn (Nm) | Cmin/ Cn | Is/In | dB(A) | PD ² Kg ^m ² |
|-------------|------------|-------------|------|------|-------------|-------|-------|-------------|------|------|------|----------|---------------------|--------|----------|---------|----------|-------|-------|--|
| | | 220V | 380V | 660V | 230V | 400V | 690V | 240V | 415V | 720V | | | | | | | | | | |
| T1A 801-2 | 0,75 | 3,37 | 1,95 | 1,12 | 3,22 | 1,85 | 1,07 | 3,09 | 1,78 | 1,03 | 2860 | 72,1 | 0,81 | 2,1 | 2,5 | 2,52 | 1,5 | 5,7 | 67 | 0,000896 |
| T1A 802-2 | 1,1 | 4,70 | 2,72 | 1,57 | 4,5 | 2,58 | 1,5 | 4,31 | 2,49 | 1,44 | 2860 | 75 | 0,82 | 2,6 | 2,8 | 3,70 | 1,8 | 6,5 | 67 | 0,001124 |
| T1A 90S-2 | 1,5 | 6,31 | 3,64 | 2,10 | 6 | 3,46 | 2 | 5,78 | 3,33 | 1,93 | 2870 | 77,2 | 0,81 | 2,3 | 2,8 | 5,04 | 1,4 | 6,6 | 72 | 0,001856 |
| T1A 90L1-2 | 2,2 | 8,75 | 5,05 | 2,92 | 8,31 | 4,8 | 2,77 | 8,01 | 4,63 | 2,67 | 2870 | 79,7 | 0,83 | 2,6 | 2,7 | 7,41 | 1,8 | 7,1 | 72 | 0,002306 |
| T1A 100L1-2 | 3 | 11,8 | 6,82 | 3,94 | 11,27 | 6,48 | 3,76 | 10,8 | 6,25 | 3,61 | 2890 | 81,5 | 0,82 | 2,7 | 3,2 | 10,08 | 2,1 | 7,7 | 76 | 0,003776 |
| T1A 112M1-2 | 4 | 14,5 | 8,4 | 4,85 | 13,82 | 7,98 | 4,61 | 13,3 | 7,69 | 4,44 | 2900 | 83,1 | 0,87 | 2,8 | 3,6 | 13,17 | 1,7 | 9,2 | 77 | 0,006311 |
| T1A 132S1-2 | 5,5 | 19,9 | 11,5 | 6,62 | 18,95 | 10,9 | 6,32 | 18,2 | 10,5 | 6,07 | 2900 | 84,7 | 0,86 | 2,2 | 2,8 | 18,14 | 2,2 | 6,8 | 80 | 0,012058 |
| T1A 132S2-2 | 7,5 | 26,6 | 15,4 | 8,87 | 25,46 | 14,6 | 8,49 | 24,4 | 14,1 | 8,12 | 2910 | 86 | 0,86 | 2,7 | 3,2 | 24,70 | 2,5 | 8,2 | 80 | 0,015212 |
| T1A 160M1-2 | 11 | 38,0 | 21,9 | 12,7 | 36,23 | 20,83 | 12,08 | 34,8 | 20,1 | 11,6 | 2910 | 87,6 | 0,87 | 2,6 | 3,1 | 36,10 | 1,5 | 7,9 | 86 | 0,044380 |
| T1A 160M2-2 | 15 | 51,2 | 29,5 | 17,1 | 48,79 | 28,06 | 16,26 | 46,8 | 27,0 | 15,6 | 2910 | 88,7 | 0,87 | 2,8 | 3,3 | 49,26 | 1,4 | 8,6 | 86 | 0,055805 |
| T1A 160L1-2 | 18,5 | 61,3 | 35,4 | 20,4 | 58,43 | 33,60 | 19,48 | 56,1 | 32,4 | 18,7 | 2910 | 89,3 | 0,89 | 3 | 3,4 | 69,74 | 1,6 | 9,3 | 86 | 0,065593 |
| T1A 180M-2 | 22 | 71,3 | 41,3 | 23,8 | 69,0 | 39,7 | 23,0 | 65,3 | 37,8 | 21,8 | 2920 | 89,9 | 0,89 | 2,3 | 2,6 | 71,95 | 2 | 7,2 | 88 | 0,090185 |
| T1A 200L1-2 | 30 | 96,0 | 55,6 | 32,1 | 93,3 | 53,64 | 31,1 | 88,0 | 50,9 | 29,4 | 2915 | 90,7 | 0,89 | 2,3 | 2,6 | 98,28 | 2 | 7 | 88 | 0,114999 |
| T1A 200L2-2 | 37 | 117 | 67,9 | 39,2 | 114,4 | 65,80 | 38,2 | 108 | 62,2 | 35,9 | 2920 | 91,2 | 0,89 | 2,3 | 2,7 | 121 | 2 | 7,2 | 87 | 0,136738 |

Electrical data (50Hz) Efficiency IE1 - 4 poles

| Type | Power (kW) | Current (A) | | | Current (A) | | | Current (A) | | | rpm | Eff. (%) | Power factor (Cosφ) | Cs/ Cn | Cmax/ Cn | Cn (Nm) | Cmin/ Cn | Is/In | dB(A) | PD ² Kg ^m ² |
|-------------|------------|-------------|------|------|-------------|-------|-------|-------------|------|------|------|----------|---------------------|--------|----------|---------|----------|-------|-------|--|
| | | 220V | 380V | 660V | 230V | 400V | 690V | 240V | 415V | 720V | | | | | | | | | | |
| T1A 801-4 | 0,55 | 2,99 | 1,73 | 1,00 | 2,86 | 1,64 | 0,95 | 2,74 | 1,58 | 0,91 | 1400 | 71 | 0,68 | 2 | 2,3 | 3,86 | 1,6 | 4,8 | 57 | 0,001453 |
| T1A 802-4 | 0,75 | 3,90 | 2,25 | 1,30 | 3,73 | 2,14 | 1,24 | 3,57 | 2,06 | 1,19 | 1400 | 72,1 | 0,7 | 2 | 2,4 | 5,08 | 1,7 | 5 | 58 | 0,001690 |
| T1A 90S-4 | 1,1 | 5,36 | 3,09 | 1,79 | 5,11 | 2,94 | 1,7 | 4,91 | 2,83 | 1,64 | 1400 | 75 | 0,72 | 2,1 | 2,3 | 7,42 | 1,9 | 5 | 61 | 0,002675 |
| T1A 90L1-4 | 1,5 | 6,91 | 3,99 | 2,30 | 6,6 | 3,79 | 2,2 | 6,33 | 3,65 | 2,11 | 1410 | 77,2 | 0,74 | 2,6 | 2,4 | 10,16 | 2,1 | 5,7 | 61 | 0,003519 |
| T1A 100L1-4 | 2,2 | 9,55 | 5,52 | 3,18 | 9,12 | 5,24 | 3,04 | 8,75 | 5,05 | 2,92 | 1430 | 79,7 | 0,76 | 2,2 | 2,8 | 14,79 | 1,9 | 6 | 64 | 0,006775 |
| T1A 100L2-4 | 3 | 12,6 | 7,26 | 4,19 | 12 | 6,9 | 4 | 11,5 | 6,65 | 3,84 | 1430 | 81,5 | 0,77 | 2,5 | 2,8 | 20,17 | 2,1 | 6,7 | 64 | 0,008424 |
| T1A 112M1-4 | 4 | 16,0 | 9,25 | 5,34 | 15,2 | 8,79 | 5,08 | 14,7 | 8,47 | 4,89 | 1440 | 83,1 | 0,79 | 2,3 | 3,3 | 26,81 | 2,1 | 7,8 | 65 | 0,013228 |
| T1A 132S-4 | 5,5 | 21,1 | 12,2 | 7,03 | 20,12 | 11,57 | 6,71 | 19,3 | 11,2 | 6,44 | 1440 | 84,7 | 0,81 | 1,8 | 2,9 | 36,99 | 1,7 | 7,1 | 71 | 0,028012 |
| T1A 132M1-4 | 7,5 | 28,7 | 16,6 | 9,56 | 27,36 | 15,73 | 9,12 | 26,3 | 15,2 | 8,75 | 1440 | 86 | 0,8 | 2,9 | 3,3 | 49,76 | 1,9 | 8,4 | 71 | 0,037145 |
| T1A 160M-4 | 11 | 37,6 | 21,7 | 12,5 | 35,76 | 20,64 | 11,92 | 34,5 | 19,9 | 11,5 | 1460 | 87,6 | 0,87 | 2,3 | 2,8 | 73,46 | 1,3 | 6,8 | 75 | 0,080254 |
| T1A 160L1-4 | 15 | 51,3 | 29,6 | 17,1 | 48,76 | 28,15 | 16,25 | 47,0 | 27,1 | 15,7 | 1460 | 88,7 | 0,87 | 2,4 | 2,6 | 99,82 | 1,4 | 7,5 | 75 | 0,105640 |
| T1A 180M-4 | 18,5 | 62,4 | 36,1 | 20,8 | 59,1 | 33,98 | 19,8 | 57,2 | 33,1 | 19,1 | 1435 | 89,3 | 0,88 | 2,3 | 2,7 | 123,11 | 2 | 7,2 | 78 | 0,155064 |
| T1A 180L-4 | 22 | 73,8 | 42,7 | 24,7 | 70,1 | 40,60 | 23,6 | 67,7 | 39,1 | 22,6 | 1450 | 89,9 | 0,87 | 2,3 | 2,6 | 144,89 | 2 | 7,3 | 78 | 0,173293 |
| T1A 200L-4 | 30 | 99,5 | 57,6 | 33,2 | 93,8 | 53,64 | 31,1 | 91,2 | 52,7 | 30,4 | 1450 | 90,7 | 0,89 | 2,3 | 2,6 | 197,57 | 2 | 7,6 | 80 | 0,224084 |

Electrical data (50Hz) Efficiency IE1 - 6 poles

| Type | Power (kW) | Current (A) | | | Current (A) | | | Current (A) | | | rpm | Eff. (%) | Power factor (Cosφ) | Cs/ Cn | Cmax/ Cn | Cn (Nm) | Cmin/ Cn | ls/ln | dB(A) | PD ² Kgm ² |
|-------------|------------|-------------|-------|------|-------------|-------|------|-------------|------|------|-----|----------|---------------------|--------|----------|---------|----------|-------|-------|----------------------------------|
| | | 220V | 380V | 660V | 230V | 400V | 690V | 240V | 415V | 720V | | | | | | | | | | |
| T1A 801-6 | 0,37 | 2,46 | 1,42 | 0,82 | 2,34 | 1,35 | 0,78 | 2,25 | 1,30 | 0,75 | 910 | 61 | 0,65 | 1,9 | 2,2 | 3,93 | 1,8 | 3,2 | 56 | 0,001596 |
| T1A 802-6 | 0,55 | 3,45 | 1,99 | 1,15 | 3,29 | 1,89 | 1,1 | 3,16 | 1,82 | 1,05 | 910 | 63,6 | 0,66 | 2,1 | 2,3 | 5,84 | 1,9 | 3,5 | 56 | 0,002041 |
| T1A 90S-6 | 0,75 | 4,21 | 2,43 | 1,40 | 4,01 | 2,31 | 1,34 | 3,86 | 2,23 | 1,29 | 930 | 70 | 0,67 | 1,8 | 2,2 | 7,70 | 1,5 | 4,1 | 59 | 0,003266 |
| T1A 90L-6 | 1,1 | 5,93 | 3,42 | 1,98 | 5,65 | 3,25 | 1,88 | 5,43 | 3,13 | 1,81 | 930 | 72,9 | 0,67 | 1,9 | 2,3 | 11,29 | 1,8 | 4,1 | 59 | 0,004281 |
| T1A 100L-6 | 1,5 | 7,40 | 4,27 | 2,47 | 7,52 | 4,06 | 2,35 | 6,78 | 3,91 | 2,26 | 940 | 75,2 | 0,71 | 1,9 | 2,6 | 15,32 | 1,8 | 4,6 | 61 | 0,007543 |
| T1A 112M1-6 | 2,2 | 10,8 | 6,23 | 3,60 | 10,3 | 5,92 | 3,43 | 9,88 | 5,71 | 3,29 | 940 | 77,7 | 0,69 | 1,9 | 2,3 | 22,64 | 1,8 | 4,8 | 64 | 0,013950 |
| T1A 132S-6 | 3 | 13,8 | 7,95 | 4,59 | 13,12 | 7,55 | 4,37 | 12,6 | 7,28 | 4,20 | 960 | 79,7 | 0,72 | 1,9 | 2,5 | 30,64 | 1,4 | 5,7 | 64 | 0,030457 |
| T1A 132M1-6 | 4 | 17,7 | 10,23 | 5,91 | 16,9 | 9,72 | 5,63 | 16,2 | 9,37 | 5,41 | 960 | 81,4 | 0,73 | 2 | 2,6 | 40,64 | 1,5 | 5,9 | 68 | 0,037251 |
| T1A 132M2-6 | 5,5 | 23,9 | 13,8 | 7,96 | 22,76 | 13,09 | 7,59 | 21,9 | 12,6 | 7,28 | 960 | 83,1 | 0,73 | 2,1 | 2,7 | 55,87 | 1,6 | 6,2 | 68 | 0,048966 |
| T1A 160M-6 | 7,5 | 31,1 | 17,9 | 10,4 | 29,5 | 17,0 | 9,84 | 28,4 | 16,4 | 9,48 | 965 | 84,7 | 0,75 | 2,4 | 2,9 | 74,25 | 1,7 | 6,7 | 68 | 0,086226 |
| T1A 160L-6 | 11 | 43,5 | 25,1 | 14,5 | 41,3 | 23,9 | 13,8 | 39,8 | 23,0 | 13,3 | 965 | 86,4 | 0,77 | 2,5 | 2,7 | 108,91 | 1,5 | 6,9 | 73 | 0,116874 |
| T1A 180L-6 | 15 | 54,6 | 31,6 | 18,2 | 54,2 | 31,25 | 18,1 | 50,1 | 28,9 | 16,7 | 955 | 87,7 | 0,79 | 2,3 | 2,7 | 149,99 | 2 | 7,2 | 75 | 0,254063 |
| T1A 200L1-6 | 18,5 | 66,6 | 38,6 | 22,2 | 63,3 | 36,31 | 21,1 | 61,0 | 35,3 | 20,3 | 960 | 88,6 | 0,83 | 2,3 | 2,7 | 184,02 | 2 | 6,9 | 78 | 0,303941 |
| T1A 200L2-6 | 22 | 77,3 | 44,7 | 25,8 | 74,6 | 42,89 | 24,9 | 70,8 | 41,0 | 23,6 | 960 | 89,2 | 0,83 | 2,3 | 2,6 | 218,84 | 2 | 7,3 | 78 | 0,353160 |

Electrical data (50Hz) - 8 poles

| Type | Power (kW) | Current (A) | | | Current (A) | | | Current (A) | | | rpm | Eff. (%) | Power factor (Cosφ) | Cs/ Cn | Cmax/ Cn | Cn (Nm) | Cmin/ Cn | ls/ln | dB(A) | PD ² Kgm ² |
|-------------|------------|-------------|------|------|-------------|------|------|-------------|------|------|-----|----------|---------------------|--------|----------|---------|----------|-------|-------|----------------------------------|
| | | 220V | 380V | 660V | 230V | 400V | 690V | 240V | 415V | 720V | | | | | | | | | | |
| T1A 801-8 | 0,18 | 1,51 | 0,87 | 0,50 | 1,44 | 0,83 | 0,48 | 1,39 | 0,80 | 0,46 | 690 | 54,8 | 0,57 | 2,2 | 2,4 | 2,6 | 2 | 3 | 52 | 0,002021 |
| T1A 802-8 | 0,25 | 1,95 | 1,13 | 0,65 | 1,86 | 1,07 | 0,62 | 1,79 | 1,03 | 0,60 | 690 | 58,2 | 0,58 | 2,3 | 2,4 | 3,6 | 2 | 3,1 | 52 | 0,002323 |
| T1A 90S-8 | 0,37 | 2,57 | 1,48 | 0,86 | 2,45 | 1,41 | 0,82 | 2,35 | 1,36 | 0,78 | 700 | 64 | 0,59 | 1,9 | 2,3 | 5,05 | 1,7 | 3,3 | 56 | 0,003266 |
| T1A 90L-8 | 0,55 | 3,83 | 2,21 | 1,28 | 3,66 | 2,1 | 1,22 | 3,51 | 2,02 | 1,17 | 700 | 65 | 0,58 | 1,9 | 2,3 | 7,6 | 1,7 | 3,4 | 56 | 0,004281 |
| T1A 100L1-8 | 0,75 | 4,69 | 2,71 | 1,56 | 4,47 | 2,57 | 1,49 | 4,29 | 2,48 | 1,43 | 700 | 68 | 0,62 | 1,9 | 1,8 | 10,4 | 2,2 | 3,6 | 59 | 0,006346 |
| T1A 100L2-8 | 1,1 | 6,67 | 3,85 | 2,22 | 6,36 | 3,66 | 2,12 | 6,11 | 3,53 | 2,04 | 700 | 70 | 0,62 | 1,9 | 2,1 | 15,2 | 1,8 | 3,5 | 59 | 0,008340 |
| T1A 112M-8 | 1,5 | 9,23 | 5,33 | 3,08 | 8,8 | 5,06 | 2,93 | 8,45 | 4,88 | 2,82 | 700 | 72,5 | 0,59 | 1,8 | 2,3 | 20,5 | 1,8 | 4 | 61 | 0,013950 |
| T1A 132S-8 | 2,2 | 12,5 | 7,21 | 4,16 | 11,91 | 6,85 | 3,97 | 11,44 | 6,60 | 3,81 | 710 | 78,6 | 0,59 | 1,9 | 2,4 | 29,8 | 1,7 | 4,9 | 64 | 0,032131 |
| T1A 132M-8 | 3 | 16,4 | 9,45 | 5,46 | 15,61 | 8,98 | 5,2 | 15,0 | 8,66 | 5,00 | 710 | 80,4 | 0,6 | 2 | 2,5 | 40,4 | 1,8 | 5,1 | 64 | 0,040598 |
| T1A 160M1-8 | 4 | 18,3 | 10,6 | 6,11 | 17,4 | 10,1 | 5,81 | 16,8 | 9,70 | 5,60 | 715 | 82 | 0,7 | 1,8 | 2,3 | 53,8 | 1,6 | 4,6 | 68 | 0,071036 |
| T1A 160M2-8 | 5,5 | 24,8 | 14,3 | 8,25 | 23,5 | 13,6 | 7,84 | 22,7 | 13,1 | 7,56 | 710 | 83,5 | 0,7 | 1,9 | 2,4 | 73 | 1,8 | 4,8 | 68 | 0,086226 |
| T1A 160L-8 | 7,5 | 33,0 | 19,0 | 11,0 | 31,3 | 18,1 | 10,4 | 30,2 | 17,4 | 10,1 | 715 | 85,5 | 0,7 | 2,5 | 2,8 | 100 | 2 | 5,7 | 68 | 0,113076 |
| T1A 180L-8 | 11 | 45,2 | 26,2 | 15,1 | 26,3 | 24 | 13,2 | 41,5 | 24,0 | 13,8 | 730 | 86 | 0,76 | 2,1 | 2,2 | 144 | 1,8 | 5,1 | 70 | 0,261094 |
| T1A 200L-8 | 15 | 58,9 | 34,1 | 19,6 | 57,4 | 33 | 18,6 | 54,0 | 31,2 | 18,0 | 730 | 87 | 0,76 | 2,1 | 2,2 | 196 | 1,8 | 5,3 | 70 | 0,339098 |

35. TA SERIES – Three-Phase Asynchronous single speed motors

Electrical data (50Hz) Efficiency IE2 - 2 poles

| Type | Power (kW) | Current (A) | | | Current (A) | | | Current (A) | | | rpm | Eff. (%) | Power factor (Cosφ) | Cs/ Cn | Cmax/ Cn | Cn (Nm) | Cmin/ Cn | ls/ln | dB(A) | PD ² Kg ^m ² |
|-------------|------------|-------------|------|------|-------------|-------|-------|-------------|------|------|------|----------|---------------------|--------|----------|---------|----------|-------|-------|--|
| | | 220V | 380V | 660V | 230V | 400V | 690V | 240V | 415V | 720V | | | | | | | | | | |
| T2A 801-2 | 0,75 | 3,15 | 1,82 | 1,05 | 3,00 | 1,73 | 1,00 | 2,88 | 1,66 | 0,96 | 2840 | 77,4 | 0,81 | 2,6 | 2,8 | 2,51 | 2,2 | 6,1 | 67 | 0,000896 |
| T2A 802-2 | 1,1 | 4,43 | 2,56 | 1,48 | 4,21 | 2,43 | 1,40 | 4,06 | 2,34 | 1,35 | 2880 | 79,6 | 0,82 | 2,6 | 2,6 | 3,69 | 1,8 | 7 | 67 | 0,001124 |
| T2A 90S-2 | 1,5 | 5,83 | 3,37 | 1,94 | 5,55 | 3,20 | 1,85 | 5,34 | 3,08 | 1,78 | 2880 | 81,3 | 0,83 | 2,8 | 3 | 5,02 | 2 | 7,2 | 72 | 0,001856 |
| T2A 90L1-2 | 2,2 | 8,28 | 4,78 | 2,76 | 7,87 | 4,54 | 2,63 | 7,58 | 4,38 | 2,53 | 2880 | 83,2 | 0,84 | 2,8 | 3,1 | 7,38 | 1,4 | 7,6 | 72 | 0,002306 |
| T2A 100L1-2 | 3 | 11,1 | 6,41 | 3,70 | 10,55 | 6,09 | 3,51 | 10,17 | 5,87 | 3,39 | 2890 | 84,6 | 0,84 | 3,1 | 3,5 | 10,05 | 2,6 | 8,8 | 76 | 0,004131 |
| T2A 112M1-2 | 4 | 13,8 | 7,96 | 4,60 | 13,09 | 7,56 | 4,36 | 12,6 | 7,29 | 4,21 | 2910 | 85,8 | 0,89 | 3,3 | 3,6 | 13,13 | 2 | 9,6 | 77 | 0,006311 |
| T2A 132S1-2 | 5,5 | 18,7 | 10,8 | 6,23 | 17,75 | 10,25 | 5,92 | 17,1 | 9,9 | 5,70 | 2910 | 87 | 0,89 | 2,4 | 3,4 | 18,08 | 1,9 | 8,3 | 80 | 0,013319 |
| T2A 132S2-2 | 7,5 | 25,2 | 14,5 | 8,39 | 23,9 | 13,8 | 7,97 | 23,0 | 13,3 | 7,68 | 2920 | 88,1 | 0,89 | 3,1 | 3,7 | 24,61 | 2 | 10,3 | 80 | 0,016473 |
| T2A 160M1-2 | 11 | 36,0 | 20,8 | 12,0 | 34,17 | 19,73 | 11,39 | 32,9 | 19,0 | 11,0 | 2950 | 89,4 | 0,9 | 2,6 | 3,4 | 35,97 | 1,5 | 8,4 | 86 | 0,050092 |
| T2A 160M2-2 | 15 | 49,04 | 28,3 | 16,3 | 46,6 | 26,9 | 15,6 | 44,9 | 25,9 | 15,0 | 2960 | 90,3 | 0,89 | 2,6 | 3,4 | 49,09 | 1,8 | 9,4 | 86 | 0,065326 |
| T2A 160L1-2 | 18,5 | 59,5 | 34,4 | 19,8 | 56,5 | 32,6 | 18,8 | 54,5 | 31,5 | 18,2 | 2950 | 90,9 | 0,9 | 2,6 | 3,2 | 60,46 | 1,8 | 9,4 | 86 | 0,077018 |
| T2A 180M-2 | 22 | 71,1 | 41,1 | 23,7 | 68,0 | 39,08 | 22,7 | 65,2 | 37,7 | 21,7 | 2930 | 91,3 | 0,89 | 2,3 | 2,8 | 71,70 | 2 | 7,5 | 86 | 0,095016 |
| T2A 200L1-2 | 30 | 97,2 | 56,3 | 32,4 | 93,0 | 53,49 | 31,0 | 89,1 | 51,6 | 29,7 | 2925 | 92 | 0,88 | 2,4 | 2,7 | 97,94 | 2 | 6,7 | 86 | 0,122246 |
| T2A 200L2-2 | 37 | 116,7 | 67,5 | 38,9 | 111,6 | 64,15 | 37,2 | 107,0 | 61,8 | 35,6 | 2930 | 92,5 | 0,90 | 2,3 | 2,7 | 120,59 | 2 | 6,3 | 86 | 0,148816 |

Electrical data (50Hz) Efficiency IE2 - 4 poles

| Type | Power (kW) | Current (A) | | | Current (A) | | | Current (A) | | | rpm | Eff. (%) | Power factor (Cosφ) | Cs/ Cn | Cmax/ Cn | Cn (Nm) | Cmin/ Cn | ls/ln | dB(A) | PD ² Kg ^m ² |
|-------------|------------|-------------|------|------|-------------|-------|------|-------------|------|------|------|----------|---------------------|--------|----------|---------|----------|-------|-------|--|
| | | 220V | 380V | 660V | 230V | 400V | 690V | 240V | 415V | 720V | | | | | | | | | | |
| T2A 802-4 | 0,75 | 3,48 | 2,01 | 1,16 | 3,31 | 1,91 | 1,10 | 3,19 | 1,84 | 1,06 | 1430 | 79,6 | 0,71 | 2,7 | 2,9 | 5,40 | 2,4 | 5,7 | 58 | 0,001928 |
| T2A 90S-4 | 1,1 | 4,94 | 2,85 | 1,65 | 4,69 | 2,71 | 1,56 | 4,52 | 2,61 | 1,51 | 1430 | 81,4 | 0,72 | 2,9 | 3,1 | 7,30 | 2,2 | 6,8 | 61 | 0,003342 |
| T2A 90L1-4 | 1,5 | 6,44 | 3,72 | 2,15 | 6,12 | 3,53 | 2,04 | 5,90 | 3,41 | 1,97 | 1430 | 82,8 | 0,74 | 3,1 | 3,2 | 9,95 | 2,2 | 6,5 | 61 | 0,004185 |
| T2A 100L1-4 | 2,2 | 8,38 | 4,84 | 2,79 | 7,95 | 4,59 | 2,65 | 7,67 | 4,43 | 2,56 | 1440 | 84,3 | 0,82 | 2,4 | 2,9 | 14,59 | 2 | 6,6 | 64 | 0,007765 |
| T2A 100L2-4 | 3 | 11,5 | 6,66 | 3,85 | 10,96 | 6,33 | 3,65 | 10,6 | 6,10 | 3,52 | 1440 | 85,5 | 0,8 | 2,3 | 3,2 | 20,32 | 2,4 | 7,6 | 64 | 0,009743 |
| T2A 112M1-4 | 4 | 14,8 | 8,56 | 4,94 | 14,0 | 8,13 | 4,69 | 13,6 | 7,84 | 4,52 | 1440 | 86,6 | 0,82 | 2,5 | 3,3 | 26,62 | 2,3 | 7,9 | 65 | 0,013744 |
| T2A 132S-4 | 5,5 | 19,9 | 11,5 | 6,63 | 18,88 | 10,9 | 6,29 | 18,2 | 10,5 | 6,07 | 1460 | 87,7 | 0,83 | 2,1 | 3,5 | 36,73 | 1,9 | 8,6 | 71 | 0,030593 |
| T2A 132M-4 | 7,5 | 26,7 | 15,5 | 8,9 | 25,46 | 14,70 | 8,48 | 24,5 | 14,2 | 8,2 | 1460 | 88,7 | 0,83 | 2,3 | 2,7 | 50,08 | 2 | 7,8 | 71 | 0,035864 |
| T2A 160M-4 | 11 | 38,8 | 22,4 | 12,9 | 36,9 | 21,3 | 12,3 | 35,6 | 20,5 | 11,9 | 1460 | 89,8 | 0,83 | 2,5 | 2,7 | 72,95 | 1,7 | 7 | 75 | 0,089674 |
| T2A 160L1-4 | 15 | 51,9 | 29,9 | 17,3 | 49,3 | 28,4 | 16,4 | 47,5 | 27,4 | 15,8 | 1465 | 90,6 | 0,84 | 2,5 | 2,8 | 99,13 | 1,6 | 8,3 | 75 | 0,118199 |
| T2A 180M-4 | 18,5 | 61,2 | 35,4 | 20,4 | 58,5 | 33,66 | 19,5 | 56,1 | 32,4 | 18,8 | 1445 | 91,2 | 0,87 | 2,4 | 3 | 122,26 | 2,1 | 7,8 | 80 | 0,155064 |
| T2A 180L-4 | 22 | 70,8 | 41,0 | 23,6 | 67,7 | 38,95 | 22,6 | 64,9 | 37,5 | 21,8 | 1460 | 91,6 | 0,89 | 2,3 | 3 | 143,89 | 2 | 7,5 | 80 | 0,173293 |
| T2A 200L-4 | 30 | 96,9 | 56,1 | 32,3 | 92,7 | 53,31 | 30,9 | 88,9 | 51,4 | 29,8 | 1460 | 92,3 | 0,88 | 2,4 | 2,7 | 196,22 | 2 | 7,9 | 83 | 0,242313 |

Electrical data (50Hz) Efficiency IE2 - 6 poles

| Type | Power (kW) | Current (A) | | | Current (A) | | | Current (A) | | | rpm | Eff. (%) | Power factor (Cosφ) | Cs/ Cn | Cmax/ Cn | Cn (Nm) | Cmin/ Cn | ls/ln | dB(A) | PD ² Kgm ² |
|-------------|------------|-------------|------|------|-------------|-------|------|-------------|------|------|-----|----------|---------------------|--------|----------|---------|----------|-------|-------|----------------------------------|
| | | 220V | 380V | 660V | 230V | 400V | 690V | 240V | 415V | 720V | | | | | | | | | | |
| T2A 803-6 | 0,75 | 4,01 | 2,32 | 1,34 | 3,90 | 2,20 | 1,27 | 3,67 | 2,12 | 1,22 | 930 | 75,9 | 0,64 | 2,7 | 2,6 | 7,66 | 2,5 | 4,2 | 58 | 0,003079 |
| T2A 90L-6 | 1,1 | 5,37 | 3,10 | 1,79 | 5,10 | 2,95 | 1,70 | 4,92 | 2,84 | 1,64 | 940 | 78,1 | 0,69 | 2 | 2,4 | 11,23 | 1,8 | 4,9 | 59 | 0,004884 |
| T2A 100L-6 | 1,5 | 6,67 | 3,85 | 2,22 | 6,35 | 3,66 | 2,11 | 6,11 | 3,53 | 2,04 | 940 | 79,8 | 0,74 | 1,7 | 2,2 | 15,24 | 1,6 | 4,8 | 61 | 0,008340 |
| T2A 112M-6 | 2,2 | 9,83 | 5,67 | 3,28 | 9,34 | 5,39 | 3,11 | 9,00 | 5,20 | 3,00 | 955 | 81,8 | 0,72 | 2,1 | 2,7 | 22,35 | 1,8 | 5,5 | 64 | 0,015440 |
| T2A 132S-6 | 3 | 12,5 | 7,23 | 4,18 | 11,9 | 6,87 | 3,96 | 11,5 | 6,62 | 3,82 | 960 | 83,3 | 0,75 | 1,6 | 2,4 | 30,48 | 1,5 | 5,6 | 64 | 0,032131 |
| T2A 132M1-6 | 4 | 16,8 | 9,71 | 5,61 | 16,0 | 9,22 | 5,33 | 15,4 | 8,89 | 5,13 | 960 | 84,6 | 0,74 | 2 | 2,6 | 40,42 | 1,6 | 5,9 | 68 | 0,038925 |
| T2A 132M2-6 | 5,5 | 22,7 | 13,1 | 7,58 | 21,6 | 12,5 | 7,2 | 20,8 | 12,0 | 6,94 | 960 | 86 | 0,74 | 2,4 | 2,6 | 55,58 | 1,8 | 6,6 | 68 | 0,048966 |
| T2A 160M-6 | 7,5 | 29,4 | 17,0 | 9,80 | 27,9 | 16,1 | 9,31 | 26,9 | 15,5 | 8,97 | 965 | 87,2 | 0,77 | 2,5 | 2,9 | 74,99 | 1,8 | 6,9 | 68 | 0,093821 |
| T2A 160L-6 | 11 | 42,9 | 24,8 | 14,3 | 40,8 | 23,6 | 13,6 | 39,3 | 22,7 | 13,1 | 970 | 88,7 | 0,76 | 2,2 | 2,3 | 109,42 | 1,3 | 6,5 | 73 | 0,128267 |
| T2A 180L-6 | 15 | 53,0 | 30,6 | 17,6 | 50,6 | 29,08 | 16,9 | 48,5 | 28,0 | 16,2 | 960 | 89,7 | 0,83 | 2,3 | 2,9 | 149,21 | 2,1 | 7,8 | 79 | 0,254063 |
| T2A 200L1-6 | 18,5 | 63,4 | 36,6 | 21,1 | 60,4 | 34,75 | 20,1 | 57,9 | 33,5 | 19,3 | 965 | 90,4 | 0,85 | 2,4 | 3,2 | 183,07 | 2,1 | 7,8 | 82 | 0,303941 |
| T2A 200L2-6 | 22 | 74,1 | 42,8 | 24,6 | 70,6 | 40,62 | 23,5 | 67,7 | 39,2 | 22,6 | 965 | 90,9 | 0,86 | 2,3 | 3,1 | 217,70 | 1,9 | 7,9 | 82 | 0,353160 |

35. TA SERIES – Three-Phase Asynchronous single speed motors

Electrical data (50Hz) Efficiency IE3 - 2 poles

| Type | Power (kW) | Current (A) | | | Current (A) | | | Current (A) | | | rpm | Eff. (%) | Power factor (Cosφ) | Cs/ Cn | Cmax/ Cn | Cn (Nm) | Cmin/ Cn | ls/ln | dB(A) | PD ² Kg ^m ² |
|-------------|------------|-------------|------|------|-------------|-------|------|-------------|------|------|------|----------|---------------------|--------|----------|---------|----------|-------|-------|--|
| | | 220V | 380V | 660V | 230V | 400V | 690V | 240V | 415V | 720V | | | | | | | | | | |
| T3A 801-2 | 0,75 | 3,10 | 1,79 | 1,03 | 2,9 | 1,7 | 1,0 | 2,84 | 1,64 | 0,95 | 2890 | 80,7 | 0,81 | 3,1 | 3,2 | 2,51 | 2,3 | 7,4 | 67 | 0,000972 |
| T3A 802-2 | 1,1 | 4,38 | 2,53 | 1,46 | 4,1 | 2,4 | 1,4 | 4,01 | 2,31 | 1,34 | 2890 | 82,7 | 0,82 | 3,4 | 3,4 | 3,69 | 2 | 8,7 | 67 | 0,001275 |
| T3A 90S-2 | 1,5 | 5,65 | 3,26 | 1,88 | 5,5 | 3,1 | 1,8 | 5,18 | 2,99 | 1,73 | 2900 | 84,2 | 0,82 | 3,5 | 3,7 | 5,02 | 2,1 | 8,3 | 72 | 0,002186 |
| T3A 90L1-2 | 2,2 | 8,02 | 4,63 | 2,67 | 7,6 | 4,4 | 2,6 | 7,35 | 4,24 | 2,45 | 2910 | 85,9 | 0,84 | 3,1 | 3,5 | 7,38 | 2,2 | 8,1 | 72 | 0,002636 |
| T3A 100L1-2 | 3 | 10,4 | 6,00 | 3,46 | 9,8 | 5,7 | 3,3 | 9,52 | 5,49 | 3,17 | 2910 | 87,1 | 0,88 | 3,2 | 3,6 | 10,05 | 2,6 | 9,4 | 76 | 0,004842 |
| T3A 112M1-2 | 4 | 13,3 | 7,68 | 4,44 | 12,7 | 7,30 | 4,20 | 12,2 | 7,04 | 4,06 | 2920 | 88,1 | 0,9 | 3,4 | 3,9 | 13,13 | 2,4 | 10,5 | 77 | 0,007505 |
| T3A 132S1-2 | 5,5 | 18,2 | 10,5 | 6,08 | 17,4 | 10,0 | 5,80 | 16,7 | 9,64 | 5,56 | 2930 | 89,2 | 0,89 | 3,2 | 4 | 18,08 | 2,5 | 10 | 80 | 0,015212 |
| T3A 132S2-2 | 7,5 | 24,3 | 14,1 | 8,11 | 23,2 | 13,4 | 7,7 | 22,3 | 12,9 | 7,43 | 2930 | 90,1 | 0,9 | 3,6 | 4,7 | 24,61 | 2,4 | 11,9 | 80 | 0,018996 |
| T3A 160M1-2 | 11 | 36,3 | 20,9 | 12,1 | 34,4 | 19,9 | 11,5 | 33,2 | 19,2 | 11,1 | 2955 | 91,2 | 0,88 | 3,2 | 4 | 35,97 | 1,4 | 10,3 | 86 | 0,059613 |
| T3A 160M2-2 | 15 | 48,3 | 27,9 | 16,1 | 45,8 | 26,5 | 15,3 | 44,2 | 25,5 | 14,7 | 2960 | 91,9 | 0,89 | 3,9 | 4,2 | 49,09 | 1,4 | 11,4 | 86 | 0,076751 |
| T3A 160L1-2 | 18,5 | 57,8 | 33,4 | 19,3 | 54,9 | 31,7 | 18,3 | 52,9 | 30,6 | 17,6 | 2950 | 92,4 | 0,91 | 3 | 3 | 60,46 | 1,5 | 9,1 | 86 | 0,092252 |
| T3A 180M-2 | 22 | 68,6 | 39,6 | 22,9 | 65,2 | 37,6 | 21,7 | 62,8 | 36,3 | 20,9 | 2960 | 92,7 | 0,91 | 2,7 | 3,3 | 71,70 | 1,7 | 9 | 91 | 0,104677 |
| T3A 200L1-2 | 30 | 94,0 | 54,3 | 31,3 | 89,3 | 51,6 | 29,8 | 86,1 | 49,7 | 28,7 | 2960 | 93,3 | 0,9 | 3,5 | 3,8 | 97,94 | 1,8 | 10,2 | 94 | 0,136738 |
| T3A 200L2-2 | 37 | 115,5 | 66,7 | 38,4 | 110,1 | 63,33 | 36,7 | 105,6 | 61,0 | 35,2 | 2930 | 93,7 | 0,90 | 2,3 | 2,7 | 120,59 | 2 | 6,3 | 94 | 0,139543 |

Electrical data (50Hz) Efficiency IE3 - 4 poles

| Type | Power (kW) | Current (A) | | | Current (A) | | | Current (A) | | | rpm | Eff. (%) | Power factor (Cosφ) | Cs/ Cn | Cmax/ Cn | Cn (Nm) | Cmin/ Cn | ls/ln | dB(A) | PD ² Kg ^m ² |
|-------------|------------|-------------|------|------|-------------|-------|------|-------------|------|------|------|----------|---------------------|--------|----------|---------|----------|-------|-------|--|
| | | 220V | 380V | 660V | 230V | 400V | 690V | 240V | 415V | 720V | | | | | | | | | | |
| T3A 802-4 | 0,75 | 3,46 | 2,00 | 1,15 | 3,3 | 1,9 | 1,1 | 3,17 | 1,83 | 1,06 | 1430 | 82,5 | 0,7 | 3,1 | 3,1 | 5,04 | 2,5 | 6,3 | 58 | 0,002285 |
| T3A 90S-4 | 1,1 | 4,74 | 2,74 | 1,58 | 4,6 | 2,6 | 1,5 | 4,34 | 2,51 | 1,45 | 1440 | 84,1 | 0,72 | 4 | 3,4 | 7,37 | 2,5 | 7,1 | 61 | 0,003842 |
| T3A 90L1-4 | 1,5 | 6,56 | 3,79 | 2,19 | 6,2 | 3,6 | 2,1 | 6,01 | 3,47 | 2,00 | 1440 | 85,3 | 0,71 | 3,4 | 3,3 | 10,09 | 2,8 | 7,1 | 61 | 0,004685 |
| T3A 100L1-4 | 2,2 | 8,20 | 4,74 | 2,73 | 7,8 | 4,5 | 2,6 | 7,51 | 4,34 | 2,50 | 1450 | 86,7 | 0,82 | 2,8 | 3,3 | 14,69 | 2,3 | 7,9 | 64 | 0,008754 |
| T3A 100L2-4 | 3 | 11,7 | 6,74 | 3,89 | 11,0 | 6,4 | 3,70 | 10,7 | 6,17 | 3,56 | 1450 | 87,7 | 0,78 | 3,3 | 3,4 | 20,03 | 2,7 | 8,1 | 64 | 0,011063 |
| T3A 112M1-4 | 4 | 14,5 | 8,37 | 4,83 | 13,8 | 8 | 4,6 | 13,3 | 7,66 | 4,42 | 1450 | 88,6 | 0,82 | 3,1 | 3,7 | 26,62 | 2,6 | 8,6 | 65 | 0,015292 |
| T3A 132S-4 | 5,5 | 19,3 | 11,2 | 6,44 | 18,4 | 10,6 | 6,1 | 17,7 | 10,2 | 5,90 | 1460 | 89,6 | 0,84 | 2,3 | 3,5 | 36,73 | 1,9 | 9 | 71 | 0,034464 |
| T3A 132M1-4 | 7,5 | 25,7 | 14,8 | 8,57 | 24,5 | 14,1 | 8,20 | 23,5 | 13,6 | 7,85 | 1460 | 90,4 | 0,85 | 2,6 | 3,4 | 50,08 | 2,2 | 8,9 | 71 | 0,043597 |
| T3A 160M-4 | 11 | 37,1 | 21,5 | 12,4 | 35,5 | 20,40 | 11,8 | 34,0 | 19,7 | 11,4 | 1460 | 91,4 | 0,85 | 2,5 | 2,8 | 72,95 | 2,1 | 7,9 | 73 | 0,089674 |
| T3A 160L1-4 | 15 | 49,8 | 28,7 | 16,6 | 47,3 | 27,3 | 15,8 | 45,6 | 26,3 | 15,2 | 1460 | 92,1 | 0,86 | 3 | 3 | 99,13 | 2 | 9,2 | 75 | 0,137038 |
| T3A 180M-4 | 18,5 | 61,1 | 35,3 | 20,4 | 58,1 | 33,5 | 19,4 | 56,0 | 32,3 | 18,7 | 1470 | 92,6 | 0,86 | 2,8 | 3,3 | 122,26 | 1,9 | 8,8 | 80 | 0,173293 |
| T3A 180L-4 | 22 | 72,4 | 41,8 | 24,1 | 68,8 | 39,7 | 22,9 | 66,3 | 38,3 | 22,1 | 1470 | 93 | 0,86 | 3 | 3,5 | 143,89 | 2,1 | 9,3 | 80 | 0,200637 |
| T3A 200L-4 | 30 | 95,8 | 55,3 | 32,0 | 91,1 | 52,6 | 30,4 | 87,8 | 50,7 | 29,3 | 1470 | 93,6 | 0,88 | 3,2 | 3,7 | 196,22 | 2,1 | 9,7 | 83 | 0,265100 |

Electrical data (50Hz) Efficiency IE3 - 6 poles

| Type | Power (kW) | Current (A) | | | Current (A) | | | Current (A) | | | rpm | Eff. (%) | Power factor (Cosφ) | Cs/ Cn | Cmax/ Cn | Cn (Nm) | Cmin/ Cn | Is/In | dB(A) | PD ² Kg ^m ² |
|-------------|------------|-------------|------|------|-------------|------|------|-------------|------|------|-----|----------|---------------------|--------|----------|---------|----------|-------|-------|--|
| | | 220V | 380V | 660V | 230V | 400V | 690V | 240V | 415V | 720V | | | | | | | | | | |
| T3A 90S-6 | 0,75 | 3,83 | 2,21 | 1,28 | 3,6 | 2,1 | 1,2 | 3,51 | 2,02 | 1,17 | 945 | 78,9 | 0,67 | 2,3 | 2,6 | 7,66 | 2,1 | 4,7 | 59 | 0,004070 |
| T3A 90L-6 | 1,1 | 5,29 | 3,05 | 1,76 | 5,1 | 2,9 | 1,7 | 4,84 | 2,80 | 1,61 | 950 | 81,0 | 0,67 | 2,7 | 2,9 | 11,23 | 2,5 | 5,2 | 59 | 0,005487 |
| T3A 100L-6 | 1,5 | 6,74 | 3,89 | 2,25 | 6,4 | 3,7 | 2,1 | 6,17 | 3,56 | 2,06 | 950 | 82,5 | 0,71 | 2,4 | 2,9 | 15,24 | 2,2 | 5,5 | 61 | 0,009137 |
| T3A 112M-6 | 2,2 | 9,7 | 5,58 | 3,22 | 9,10 | 5,30 | 3,0 | 8,85 | 5,11 | 2,95 | 960 | 84,3 | 0,72 | 2 | 2,5 | 22,35 | 1,8 | 5,5 | 64 | 0,017675 |
| T3A 132S-6 | 3 | 12,6 | 7,26 | 4,19 | 11,9 | 6,90 | 4,00 | 11,5 | 6,65 | 3,84 | 965 | 85,6 | 0,74 | 2 | 2,7 | 30,48 | 1,7 | 6 | 64 | 0,033804 |
| T3A 132M1-6 | 4 | 16,4 | 9,46 | 5,46 | 15,6 | 9 | 5,2 | 15,0 | 8,66 | 5,00 | 970 | 86,8 | 0,74 | 2,3 | 3 | 40,42 | 1,8 | 6,8 | 68 | 0,043946 |
| T3A 132M2-6 | 5,5 | 22,1 | 12,7 | 7,35 | 20,9 | 12,1 | 7 | 20,2 | 11,7 | 6,73 | 970 | 88,0 | 0,75 | 2,9 | 3,5 | 55,58 | 2,2 | 7,4 | 68 | 0,053987 |
| T3A 160M-6 | 7,5 | 29,1 | 16,8 | 9,72 | 27,7 | 16,0 | 9,24 | 26,7 | 15,4 | 8,90 | 970 | 89,1 | 0,76 | 2,2 | 2,9 | 74,99 | 1,8 | 7,3 | 68 | 0,109012 |
| T3A 160L-6 | 11 | 41,1 | 23,7 | 13,7 | 39,0 | 22,5 | 13,0 | 37,6 | 21,7 | 12,5 | 975 | 90,3 | 0,78 | 2,7 | 2,9 | 109,42 | 1,2 | 8,4 | 73 | 0,154850 |
| T3A 180L-6 | 15 | 52,1 | 30,1 | 17,4 | 49,5 | 28,6 | 16,5 | 47,7 | 27,6 | 15,9 | 960 | 91,2 | 0,83 | 2,3 | 2,9 | 149,21 | 2,1 | 7,8 | 79 | 0,275157 |
| T3A 200L1-6 | 18,5 | 66,4 | 38,3 | 22,1 | 63,0 | 36,4 | 21,0 | 60,8 | 35,1 | 20,3 | 980 | 91,7 | 0,8 | 2,7 | 3,7 | 183,07 | 2,2 | 9,8 | 82 | 0,332066 |
| T3A 200L2-6 | 22 | 78,5 | 45,3 | 26,2 | 74,6 | 43,1 | 24,9 | 71,9 | 41,5 | 24,0 | 980 | 92,2 | 0,8 | 2,9 | 3,7 | 217,70 | 2,3 | 10,5 | 82 | 0,388316 |

35. TA SERIES – Three-Phase Asynchronous single speed motors

Electrical data (50Hz) Efficiency IE4 - 2 poles

| Type | Power (kW) | Efficiency (%) | | | Power factor (Cosφ) | Current (A) | | | rpm | Cn (Nm) | Cs/Cn | Cmax/Cn | Cmin/Cn | ls/ln | dB(A) | PD ² Kg/m ² |
|------------|------------|----------------|------|------|---------------------|-------------|------|------|------|---------|-------|---------|---------|-------|-------|-----------------------------------|
| | | 100% | 75% | 50% | | 230V | 400V | 690V | | | | | | | | |
| T4A631-2 | 0,18 | 70,8 | 68,8 | 63,6 | 0,75 | 0,85 | 0,49 | 0,28 | 2870 | 0,6240 | 2,6 | 2,9 | 2 | 5,5 | 61 | 0,000245 |
| T4A632-2 | 0,25 | 74,3 | 73,1 | 68,7 | 0,77 | 1,10 | 0,63 | 0,37 | 2880 | 0,8637 | 2,7 | 3,2 | 2,4 | 6,3 | 61 | 0,000303 |
| T4A711-2 | 0,37 | 78,1 | 77,3 | 73,4 | 0,78 | 1,52 | 0,88 | 0,51 | 2890 | 1,2739 | 2,8 | 3,3 | 2,3 | 6,7 | 64 | 0,000421 |
| T4A712-2 | 0,55 | 81,5 | 81,1 | 77,9 | 0,79 | 2,14 | 1,23 | 0,71 | 2890 | 1,8936 | 2,9 | 3,5 | 2,5 | 6,8 | 64 | 0,000569 |
| T4A801-2 | 0,75 | 83,5 | 83,6 | 81,5 | 0,8 | 2,82 | 1,62 | 0,94 | 2900 | 2,5733 | 3,7 | 3,9 | 2,5 | 8,8 | 67 | 0,001124 |
| T4A802-2 | 1,1 | 85,2 | 85,2 | 83,3 | 0,82 | 3,95 | 2,27 | 1,32 | 2910 | 3,7612 | 4 | 4,2 | 2,6 | 10 | 67 | 0,001508 |
| T4A90S-2 | 1,5 | 86,5 | 86,5 | 84,6 | 0,81 | 5,37 | 3,09 | 1,79 | 2910 | 5,1289 | 3,6 | 2,8 | 4 | 9,6 | 72 | 0,002296 |
| T4A90L-2 | 2,2 | 88 | 88,2 | 86,9 | 0,83 | 7,56 | 4,35 | 2,52 | 2900 | 7,5483 | 4 | 4,2 | 3 | 10,5 | 72 | 0,003086 |
| T4A100L-2 | 3 | 89,1 | 89,4 | 88,4 | 0,9 | 9,39 | 5,4 | 3,13 | 2910 | 10,258 | 3,7 | 2,9 | 3,9 | 11 | 76 | 0,005939 |
| T4A112M-2 | 4 | 90 | 90,4 | 89,7 | 0,91 | 12,3 | 7,05 | 4,09 | 2920 | 13,630 | 3,5 | 2,6 | 3,9 | 10,5 | 77 | 0,009270 |
| T4A132S1-2 | 5,5 | 90,9 | 90,9 | 89,5 | 0,9 | 17,3 | 9,93 | 5,63 | 2940 | 18,614 | 3,4 | 2,3 | 4 | 10,5 | 80 | 0,017735 |
| T4A132S2-2 | 7,5 | 91,7 | 91,7 | 90,7 | 0,91 | 23,1 | 13,3 | 7,52 | 2940 | 25,383 | 3,8 | 2,3 | 4,1 | 10 | 80 | 0,022880 |
| T4A160M1-2 | 11 | 92,6 | 93,2 | 92,1 | 0,91 | 32,6 | 18,8 | 10,9 | 2950 | 37,102 | 3,5 | 2,5 | 3,8 | 10 | 86 | 0,069134 |
| T4A160M2-2 | 15 | 93,3 | 93,8 | 92,8 | 0,92 | 43,9 | 25,2 | 14,6 | 2960 | 50,422 | 3,6 | 2,5 | 3,8 | 10 | 86 | 0,090348 |
| T4A160L-2 | 18,5 | 93,7 | 94,2 | 93,1 | 0,93 | 53,3 | 30,6 | 17,8 | 2960 | 62,188 | 3,8 | 2,5 | 4 | 10,3 | 86 | 0,107485 |

Electrical data (50Hz) Efficiency IE4 - 4 poles

| Type | Power (kW) | Efficiency (%) | | | Power factor (Cosφ) | Current (A) | | | rpm | Cn (Nm) | Cs/Cn | Cmax/Cn | Cmin/Cn | ls/ln | dB(A) | PD ² Kg/m ² |
|------------|------------|----------------|------|------|---------------------|-------------|------|------|------|---------|-------|---------|---------|-------|-------|-----------------------------------|
| | | 100% | 75% | 50% | | 230V | 400V | 690V | | | | | | | | |
| T4A631-4 | 0,12 | 69,8 | 68,2 | 66,5 | 0,66 | 0,65 | 0,38 | 0,22 | 1400 | 0,8529 | 2,3 | 2,7 | 2,3 | 4 | 52 | 0,000336 |
| T4A632-4 | 0,18 | 74,7 | 74,1 | 69,7 | 0,67 | 0,90 | 0,53 | 0,30 | 1400 | 1,2793 | 2,6 | 2,8 | 2,4 | 4,3 | 52 | 0,000430 |
| T4A711-4 | 0,25 | 77,9 | 77 | 72,9 | 0,65 | 1,24 | 0,71 | 0,41 | 1430 | 1,7395 | 3 | 3,4 | 2,8 | 5,6 | 55 | 0,000841 |
| T4A712-4 | 0,37 | 81,1 | 80,5 | 77,2 | 0,66 | 1,74 | 1 | 0,58 | 1430 | 2,5745 | 3,4 | 3,6 | 3 | 6,2 | 55 | 0,001188 |
| T4A801-4 | 0,55 | 83,9 | 83,3 | 80,6 | 0,67 | 2,46 | 1,41 | 0,82 | 1440 | 3,8003 | 3,4 | 3,7 | 3 | 6,8 | 57 | 0,002047 |
| T4A802-4 | 0,75 | 85,7 | 85,3 | 82,8 | 0,67 | 3,28 | 1,97 | 1,09 | 1450 | 5,1466 | 3,7 | 4 | 3,1 | 7,3 | 58 | 0,002646 |
| T4A90S-4 | 1,1 | 87,2 | 87,1 | 84,4 | 0,69 | 4,59 | 2,64 | 1,53 | 1435 | 7,6272 | 4,8 | 3,8 | 4,1 | 8,2 | 61 | 0,004685 |
| T4A90L-4 | 1,5 | 88,2 | 88,1 | 86,1 | 0,71 | 6,01 | 3,46 | 2,00 | 1455 | 10,258 | 4,8 | 3,8 | 4,2 | 9,2 | 61 | 0,005696 |
| T4A100L1-4 | 2,2 | 89,5 | 89,6 | 88,2 | 0,76 | 8,12 | 4,67 | 2,71 | 1460 | 14,993 | 3,5 | 3 | 4,3 | 9,5 | 64 | 0,010435 |
| T4A100L2-4 | 3 | 90,4 | 89,7 | 88,1 | 0,75 | 11,1 | 6,41 | 3,70 | 1460 | 20,445 | 3,8 | 3,4 | 4,5 | 9,5 | 64 | 0,013074 |
| T4A112M-4 | 4 | 91,1 | 91 | 90 | 0,8 | 14,0 | 8,08 | 4,59 | 1460 | 27,260 | 4 | 3 | 4,5 | 9,8 | 65 | 0,019436 |
| T4A132S-4 | 5,5 | 91,9 | 92,2 | 91,5 | 0,8 | 18,8 | 10,9 | 6,26 | 1470 | 37,228 | 3,4 | 2,1 | 4,1 | 10 | 71 | 0,043597 |
| T4A132M-4 | 7,5 | 92,6 | 92,8 | 92,2 | 0,81 | 25,1 | 13,9 | 8,37 | 1470 | 50,765 | 4,4 | 2,2 | 4 | 10,2 | 71 | 0,055210 |
| T4A160M-4 | 11 | 93,3 | 93,5 | 92,8 | 0,82 | 36,1 | 20,7 | 12,0 | 1475 | 74,203 | 2,8 | 2,2 | 3,2 | 9,1 | 75 | 0,127619 |
| T4A160L-4 | 15 | 93,9 | 94,1 | 93,7 | 0,83 | 48,3 | 27,9 | 16,1 | 1475 | 101,19 | 3,2 | 2,2 | 3,5 | 9,2 | 75 | 0,165297 |

Electrical data (50Hz) Efficiency IE4 - 6 poles

| Type | Power (kW) | Efficiency (%) | | | Power factor (Cosφ) | Current (A) | | | rpm | Cn (Nm) | Cs/Cn | Cmax/Cn | Cmin/Cn | ls/ln | dB(A) | PD ² Kg/m ² |
|------|------------|----------------|-----|-----|---------------------|-------------|------|------|-----|---------|-------|---------|---------|-------|-------|-----------------------------------|
| | | 100% | 75% | 50% | | 230V | 400V | 690V | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|------------|------|------|------|------|------|------|------|------|------|--------|-----|-----|-----|------|----|----------|
| T4A711-6 | 0,18 | 70,1 | 66,8 | 60,2 | 0,6 | 1,07 | 0,62 | 0,36 | 940 | 1,9053 | 2,7 | 2,3 | 2,9 | 4,1 | 52 | 0,001020 |
| T4A712-6 | 0,25 | 74,1 | 71,5 | 65,3 | 0,6 | 1,41 | 0,81 | 0,47 | 940 | 2,6463 | 2,8 | 2,4 | 2,9 | 4,5 | 52 | 0,001250 |
| T4A801-6 | 0,37 | 78 | 76,7 | 72,2 | 0,61 | 1,95 | 1,12 | 0,65 | 950 | 3,8753 | 2,7 | 3,1 | 2,5 | 4,8 | 56 | 0,002634 |
| T4A802-6 | 0,55 | 80,9 | 80 | 76,3 | 0,61 | 2,80 | 1,61 | 0,93 | 950 | 5,7605 | 3,2 | 3,5 | 2,8 | 5,3 | 56 | 0,003677 |
| T4A90S-6 | 0,75 | 82,7 | 81,6 | 77,7 | 0,63 | 3,61 | 2,08 | 1,20 | 960 | 7,7734 | 2,8 | 2,4 | 3,2 | 5,7 | 59 | 0,004683 |
| T4A90L-6 | 1,1 | 84,5 | 83,5 | 80,5 | 0,65 | 5,03 | 2,89 | 1,68 | 960 | 11,401 | 3,1 | 2,5 | 3,3 | 5,9 | 59 | 0,006503 |
| T4A100L-6 | 1,5 | 85,9 | 86,2 | 84,5 | 0,72 | 6,09 | 3,5 | 2,03 | 965 | 15,466 | 2,7 | 1,9 | 3 | 6,5 | 61 | 0,012757 |
| T4A112M-6 | 2,2 | 87,4 | 87,2 | 85,4 | 0,69 | 9,16 | 4,98 | 3,05 | 970 | 22,567 | 3 | 2,6 | 3,8 | 7,5 | 64 | 0,022890 |
| T4A132S-6 | 3 | 88,6 | 88,7 | 87,4 | 0,71 | 12,0 | 6,88 | 3,99 | 975 | 30,615 | 2,5 | 1,9 | 3,2 | 7,1 | 64 | 0,043846 |
| T4A132M1-6 | 4 | 89,5 | 89,8 | 88,8 | 0,74 | 15,2 | 8,72 | 5,05 | 975 | 40,821 | 2,8 | 1,8 | 3,4 | 8 | 68 | 0,053987 |
| T4A132M2-6 | 5,5 | 90,5 | 90,7 | 89,7 | 0,75 | 20,3 | 11,7 | 6,78 | 975 | 56,128 | 3,3 | 1,8 | 3,3 | 8,2 | 68 | 0,070723 |
| T4A160M-6 | 7,5 | 91,3 | 91,5 | 90,3 | 0,77 | 26,7 | 15,4 | 8,89 | 980 | 76,148 | 3,3 | 1,8 | 3,3 | 8,5 | 68 | 0,128267 |
| T4A160L-6 | 11 | 92,3 | 92,6 | 91,2 | 0,77 | 38,9 | 22,3 | 12,9 | 980 | 111,68 | 3,4 | 1,8 | 3,4 | 8,5 | 73 | 0,185230 |
| T4A160M2-2 | 15 | 93,3 | 93,8 | 92,8 | 0,92 | 43,9 | 25,2 | 14,6 | 2960 | 50,422 | 3,6 | 2,5 | 3,8 | 10 | 86 | 0,090348 |
| T4A160L-2 | 18,5 | 93,7 | 94,2 | 93,1 | 0,93 | 53,3 | 30,6 | 17,8 | 2960 | 62,188 | 3,8 | 2,5 | 4 | 10,3 | 86 | 0,107485 |

36. TA SERIES - Weight TA IE1

| Frame size | Kw | Weight Kg (*) B3 |
|------------|-------|---------------------|
| 802-2 | 1,10 | 9,8 |
| 90S-2 | 1,50 | 12,1 |
| 90L1-2 | 2,20 | 15,3 |
| 100L1-2 | 3,00 | 19,7 |
| 112M-2 | 4,00 | 25,6 |
| 132S1-2 | 5,50 | 40,5 |
| 132S2-2 | 7,50 | 42,0 |
| 160M1-2 | 11,00 | 68,8 |
| 160M2-2 | 15,00 | 80,4 |
| 160L-2 | 18,50 | 92,2 |
| 180M-2 | 22,00 | 125,4 |
| 200L1-2 | 30,00 | 148,0 |
| 200L2-2 | 37,00 | 165,0 |

| Frame size | Kw | Weight Kg (*) B3 |
|------------|-------|---------------------|
| 802-4 | 0,75 | 9,6 |
| 90S-4 | 1,10 | 12,1 |
| 90L1-4 | 1,50 | 17,2 |
| 100L1-4 | 2,20 | 19,4 |
| 100L2-4 | 3,00 | 22,6 |
| 112M-4 | 4,00 | 29,2 |
| 132S-4 | 5,50 | 42,5 |
| 132M-4 | 7,50 | 49,0 |
| 160M-4 | 11,00 | 76,8 |
| 160L1-4 | 15,00 | 89,2 |
| 180M-4 | 18,5 | 116,4 |
| 180L-4 | 22 | 127,4 |
| 200L-4 | 30 | 149,9 |

(*) Weights are indicative may vary by changing the materials used,
 Simotop Group Spa reserves the right to modify this data at any time and without notice.

| Frame size | Kw | Weight Kg (*) B3 |
|------------|-------|---------------------|
| 802-6 | 0,55 | 9,1 |
| 90S-6 | 0,75 | 11,6 |
| 90L-6 | 1,10 | 14,2 |
| 100L-6 | 1,50 | 18,3 |
| 112M-6 | 2,20 | 24,8 |
| 132S-6 | 3,00 | 35,7 |
| 132M1-6 | 4,00 | 41,4 |
| 132M2-6 | 5,50 | 50,4 |
| 160M-6 | 7,50 | 70,0 |
| 160L-6 | 11,00 | 87,6 |
| 180L-6 | 15 | 121,5 |
| 200L1-6 | 18,5 | 138,2 |
| 200L2-6 | 22 | 154,6 |

| Frame size | Kw | Weight Kg (*) B3 |
|------------|------|---------------------|
| 802-8 | 0,25 | 9,8 |
| 803-8 | 0,37 | 12,1 |
| 90S-8 | 0,37 | 11,4 |
| 90L-8 | 0,55 | 14,3 |
| 100L1-8 | 0,75 | 16,9 |
| 100L2-8 | 1,10 | 20,0 |
| 112M-8 | 1,50 | 24,9 |
| 132S-8 | 2,20 | 36,6 |
| 132M-8 | 3,00 | 47,4 |
| 160M1-8 | 4,00 | 59,8 |
| 160M2-8 | 5,50 | 69,0 |
| 160L-8 | 7,5 | 84,8 |
| 180L-8 | 11 | 128,0 |
| 200L-8 | 15 | 157,0 |

(*) Weights are indicative may vary by changing the materials used, Simotop Group Spa reserves the right to modify this data at any time and without notice.

36. TA SERIES - Weight TA IE2

| Frame size | Kw | Weight Kg (*) B3 |
|------------|-------|---------------------|
| 801-2 | 0,75 | 8,2 |
| 802-2 | 1,10 | 9,5 |
| 90S-2 | 1,50 | 12,2 |
| 90L-2 | 2,20 | 15,9 |
| 100L-2 | 3,00 | 21,3 |
| 112M-2 | 4,00 | 26,2 |
| 132S1-2 | 5,50 | 38,9 |
| 132S2-2 | 7,50 | 44,4 |
| 160M1-2 | 11,00 | 77,4 |
| 160M2-2 | 15,00 | 89,2 |
| 160L-2 | 18,50 | 99,0 |
| 180M-2 | 22,00 | 126,0 |
| 200L1-2 | 30,00 | 152,9 |
| 200L2-2 | 37,00 | 167,7 |

| Frame size | Kw | Weight Kg (*) B3 |
|------------|-------|---------------------|
| 802-4 | 0,75 | 10,2 |
| 90S-4 | 1,10 | 13,6 |
| 90L-4 | 1,50 | 16,1 |
| 100L1-4 | 2,20 | 21,8 |
| 100L2-4 | 3,00 | 25,4 |
| 112M-4 | 4,00 | 29,6 |
| 132S-4 | 5,50 | 44,5 |
| 132M-4 | 7,50 | 51,1 |
| 160M-4 | 11,00 | 78,4 |
| 160L-4 | 15,00 | 101,1 |
| 180M-4 | 18,5 | 116,6 |
| 180L-4 | 22 | 124,5 |
| 200L-4 | 30 | 164,6 |

(*) Weights are indicative may vary by changing the materials used,
Simotop Group Spa reserves the right to modify this data at any time and without notice.

| Frame size | Kw | Weight Kg (*) B3 |
|------------|-------|---------------------|
| 90S-6 | 0,75 | 12,3 |
| 90L-6 | 1,10 | 15,5 |
| 100L-6 | 1,50 | 18,5 |
| 112M-6 | 2,20 | 25,9 |
| 132S-6 | 3,00 | 36,3 |
| 132M1-6 | 4,00 | 42,9 |
| 132M2-6 | 5,50 | 50,8 |
| 160M-6 | 7,50 | 72,5 |
| 160L-6 | 11,00 | 89,1 |
| 180L-6 | 15 | 120,7 |
| 200L1-6 | 18,5 | 141,0 |
| 200L2-6 | 22 | 156,8 |

(*) Weights are indicative may vary by changing the materials used,
Simotop Group Spa reserves the right to modify this data at any time and without notice.

36. TA SERIES - Weight TA IE3

| Frame size | Kw | Weight Kg (*) B3 |
|------------|------|---------------------|
| 801-2 | 0,75 | 8,6 |
| 802-2 | 1,1 | 10,3 |
| 90S-2 | 1,5 | 13,7 |
| 90L-2 | 2,2 | 17,6 |
| 100L-2 | 3 | 23,4 |
| 112M-2 | 4 | 28,5 |
| 132S1-2 | 5,5 | 40,6 |
| 132S2-2 | 7,5 | 48,1 |
| 160M1-2 | 11 | 80,8 |
| 160M2-2 | 15 | 91,7 |
| 160L-2 | 18,5 | 102,6 |
| 180M-2 | 22 | 128,0 |
| 200L1-2 | 30 | 154,8 |
| 200L2-2 | 37 | 169,6 |

| Frame size | Kw | Weight Kg (*) B3 |
|------------|------|---------------------|
| 802-4 | 0,75 | 11,4 |
| 90S-4 | 1,1 | 14,2 |
| 90L-4 | 1,5 | 17,0 |
| 100L1-4 | 2,2 | 26,7 |
| 100L2-4 | 3 | 27,7 |
| 112M-4 | 4 | 31,7 |
| 132S-4 | 5,5 | 46,2 |
| 132M-4 | 7,5 | 53,0 |
| 160M-4 | 11 | 79,2 |
| 160L-4 | 15 | 103,0 |
| 180M-4 | 18,5 | 118,6 |
| 180L-4 | 22 | 126,4 |
| 200L-4 | 30 | 166,6 |

(*) Weights are indicative may vary by changing the materials used,
Simotop Group Spa reserves the right to modify this data at any time and without notice.

| Frame size | Kw | Weight Kg (*) B3 |
|------------|------|---------------------|
| 90S-6 | 0,75 | 13,2 |
| 90L-6 | 1,1 | 16,4 |
| 100L-6 | 1,5 | 19,3 |
| 112M-6 | 2,2 | 26,4 |
| 132S-6 | 3 | 37,0 |
| 132M1-6 | 4 | 43,8 |
| 132M2-6 | 5,5 | 51,7 |
| 160M-6 | 7,5 | 73,3 |
| 160L-6 | 11 | 91,4 |
| 180L-6 | 15 | 122,7 |
| 200L1-6 | 18,5 | 143,0 |
| 200L2-6 | 22 | 158,3 |

(*) Weights are indicative may vary by changing the materials used,
Simotop Group Spa reserves the right to modify this data at any time and without notice.

36. TA SERIES - Weight TA IE4

| Type | Kw | Weight Kg (*) B3 |
|---------|------|---------------------|
| 631-2 | 0,18 | 3,8 |
| 632-2 | 0,25 | 4,5 |
| 711-2 | 0,37 | 5,7 |
| 712-2 | 0,55 | 6,7 |
| 801-2 | 0,75 | 9,0 |
| 802-2 | 1,1 | 10,6 |
| 90S-2 | 1,5 | 14,0 |
| 90L-2 | 2,2 | 18,0 |
| 100L-2 | 3 | 24,1 |
| 112M-2 | 4 | 29,2 |
| 132S1-2 | 5,5 | 41,3 |
| 132S2-2 | 7,5 | 49,2 |
| 160M1-2 | 11 | 89,3 |
| 160M2-2 | 15 | 93,1 |
| 160L-2 | 18,5 | 105,7 |

| Type | Kw | Weight Kg (*) B3 |
|---------|------|---------------------|
| 631-4 | 0,12 | 4,00 |
| 632-4 | 0,18 | 4,80 |
| 711-4 | 0,25 | 6,50 |
| 712-4 | 0,37 | 8,00 |
| 801-4 | 0,55 | 11,00 |
| 802-4 | 0,75 | 11,80 |
| 90S-4 | 1,1 | 14,80 |
| 90L-4 | 1,5 | 17,50 |
| 100L1-4 | 2,2 | 27,00 |
| 100L2-4 | 3 | 30,10 |
| 112M-4 | 4 | 32,30 |
| 132S-4 | 5,5 | 47,10 |
| 132M-4 | 7,5 | 54,10 |
| 160M-4 | 11 | 81,00 |
| 160L-4 | 15 | 108,30 |

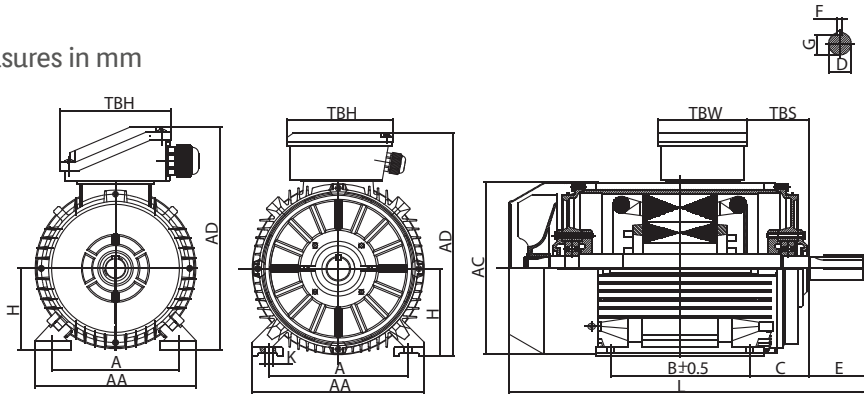
(*) Weights are indicative may vary by changing the materials used,
Simotop Group Spa reserves the right to modify this data at any time and without notice.

| Type | Kw | Weight Kg (*) B3 |
|---------|------|---------------------|
| 711-6 | 0,18 | 6,3 |
| 712-6 | 0,25 | 7,4 |
| 801-6 | 0,37 | 11 |
| 802-6 | 0,55 | 14 |
| 90S-6 | 0,75 | 13,6 |
| 90L-6 | 1,1 | 16,9 |
| 100L-6 | 1,5 | 20,1 |
| 112M-6 | 2,2 | 27,1 |
| 132S-6 | 3 | 38,6 |
| 132M1-6 | 4 | 45,1 |
| 132M2-6 | 5,5 | 52,8 |
| 160M-6 | 7,5 | 75,2 |
| 160L-6 | 11 | 93,8 |

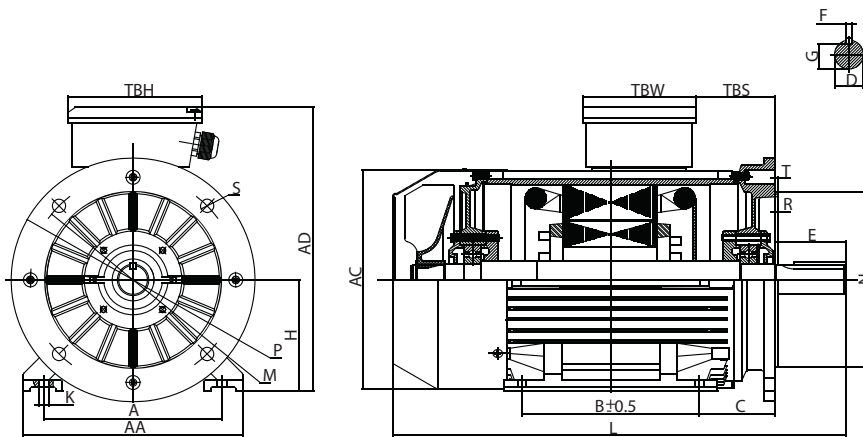
(*) Weights are indicative may vary by changing the materials used,
Simotop Group Spa reserves the right to modify this data at any time and without notice.

37. TA SERIES - Overall and Installation dimensions

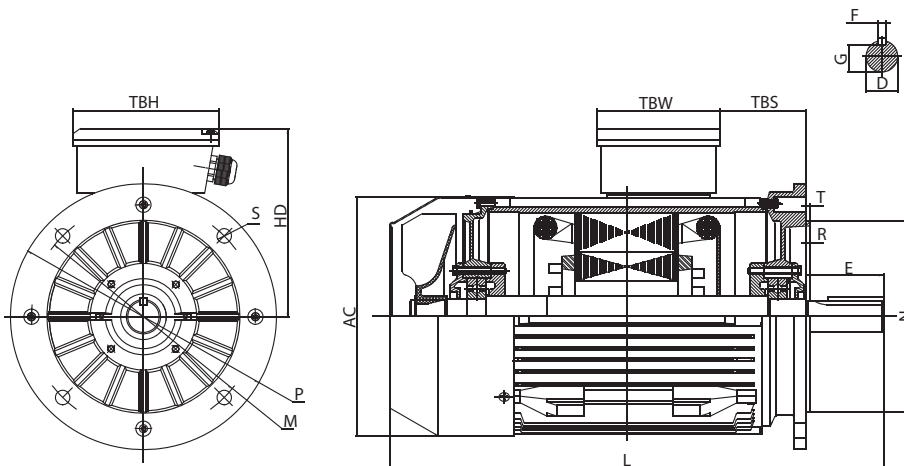
Measures in mm



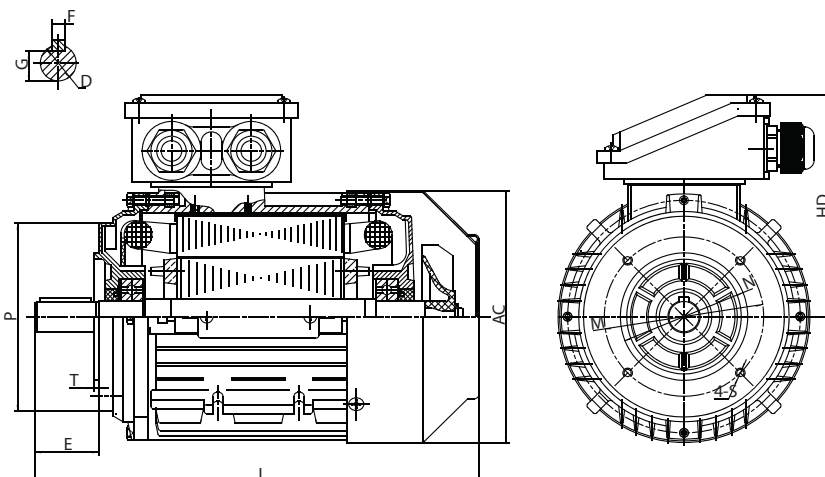
IM B3



IM B3/B5



IM B5



IM B14

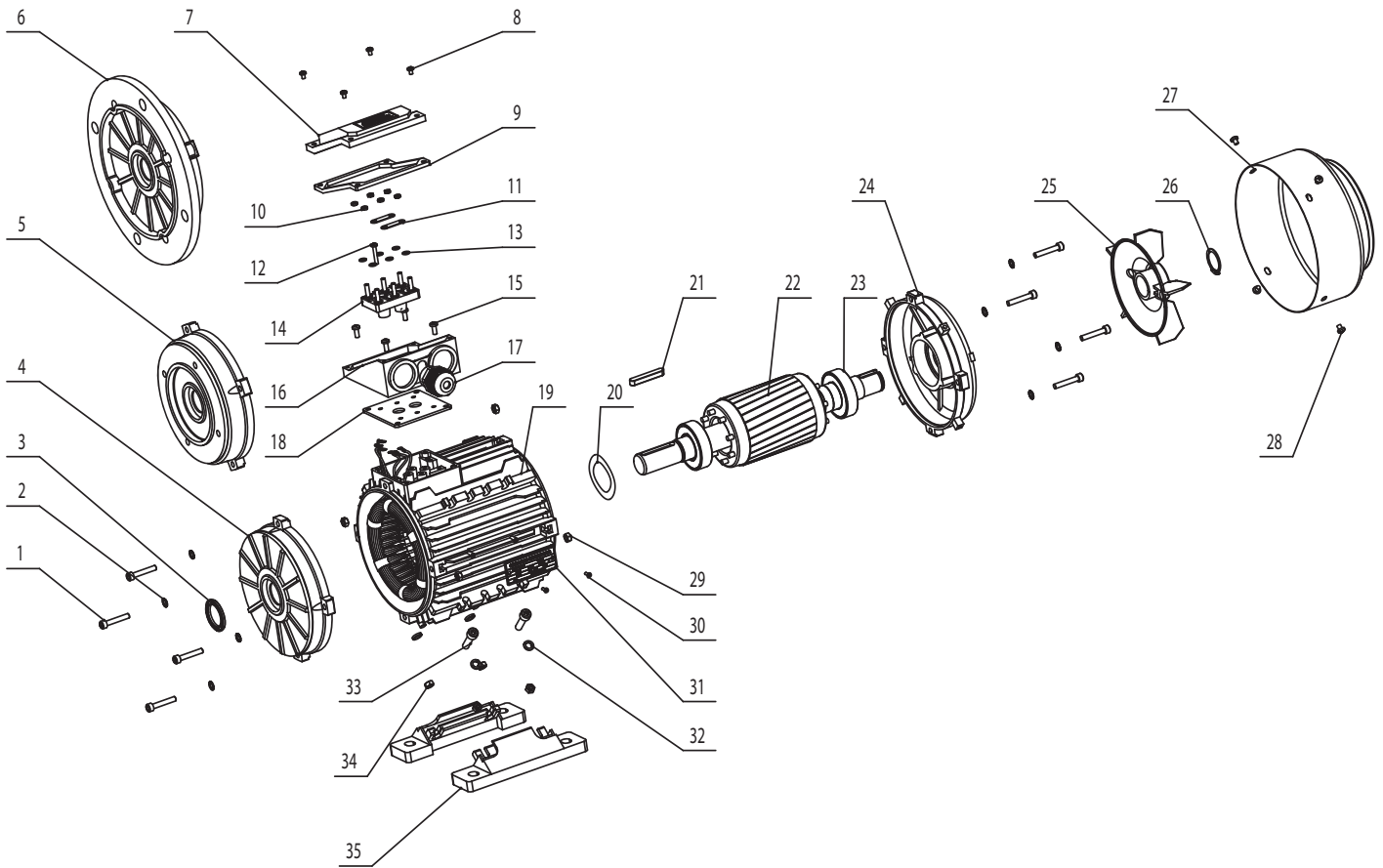
| Frame size | B3 | | | | Shaft | | | | | General | | | | | | | |
|------------|----|---|---|---|-------|---|---|---|---|---------|----|----|----|---|-----|-----|-----|
| | H | A | B | C | D | E | F | G | K | AA | AD | HD | AC | L | TBS | TBW | TBH |

| | | | | | | | | | | | | | | | | | |
|--------|-----|-----|---------|-----|-----|-----|----|------|-----|-----|-----|-----|-----|---------|---------|-----|-----|
| 80 | 80 | 125 | 100 | 50 | Ø19 | 40 | 6 | 15.5 | Ø9 | 160 | 220 | 140 | 158 | 280 | 16 | 97 | 97 |
| 90S/L | 90 | 140 | 100/125 | 56 | Ø24 | 50 | 8 | 20 | Ø10 | 175 | 240 | 150 | 176 | 312/337 | 16 | 97 | 97 |
| 100 | 100 | 160 | 140 | 63 | Ø28 | 60 | 8 | 24 | Ø12 | 200 | 265 | 165 | 199 | 380 | 20 | 118 | 118 |
| 112 | 112 | 190 | 140 | 70 | Ø28 | 60 | 8 | 24 | Ø12 | 230 | 291 | 179 | 220 | 405 | 29 | 118 | 118 |
| 132S/M | 132 | 216 | 140/178 | 89 | Ø38 | 80 | 10 | 33 | Ø12 | 255 | 332 | 200 | 259 | 467/505 | 29 | 118 | 118 |
| 160M/L | 160 | 254 | 210/254 | 108 | Ø42 | 110 | 12 | 37 | Ø15 | 314 | 402 | 242 | 313 | 605/650 | 91 | 162 | 187 |
| 180M/L | 180 | 279 | 241/279 | 121 | Ø48 | 110 | 14 | 42.5 | Ø15 | 348 | 439 | 259 | 360 | 687/725 | 160/180 | 162 | 187 |
| 200L | 200 | 318 | 305 | 133 | Ø55 | 110 | 16 | 49 | Ø19 | 388 | 497 | 297 | 399 | 768 | 192 | 186 | 233 |

| Frame size | B5 | | | | | | B14 | | | | | |
|------------|----|---|---|---|---|---|-----|---|---|---|---|---|
| | N | M | P | S | T | R | N | M | P | S | T | R |

| | | | | | | | | | | | | |
|--------|-----|-----|-----|-------|-----|---|-----|-----|-----|-----|-----|---|
| 80 | 130 | 165 | 200 | 4-Ø12 | 3.5 | 0 | 80 | 100 | 120 | M6 | 3 | 0 |
| 90S/L | 130 | 165 | 200 | 4-Ø12 | 3.5 | 0 | 95 | 115 | 140 | M8 | 3 | 0 |
| 100 | 180 | 215 | 250 | 4-Ø15 | 4 | 0 | 110 | 130 | 160 | M8 | 3.5 | 0 |
| 112 | 180 | 215 | 250 | 4-Ø15 | 4 | 0 | 110 | 130 | 160 | M8 | 3.5 | 0 |
| 132S/M | 230 | 265 | 300 | 4-Ø15 | 4 | 0 | 130 | 165 | 200 | M10 | 3.5 | 0 |
| 160M/L | 250 | 300 | 350 | 4-Ø19 | 5 | 0 | | | | | | 0 |
| 180M/L | 250 | 300 | 350 | 4-Ø19 | 5 | 0 | | | | | | 0 |
| 200L | 300 | 350 | 400 | 4-Ø19 | 5 | 0 | | | | | | 0 |

38. TA SERIES - Exploded view drawings and Spare Parts list



- | | | |
|-------------------------------|--------------------------------|-----------------------------|
| 1. Screw | 13. Terminal shim | 25. Cooling fan |
| 2. Gasket | 14. Terminal board | 26. Fan circlip |
| 3. Oil seal | 15. Terminal box fixing screws | 27. Fan cover |
| 4. DE endshleld | 16. Terminal box case | 28. Fan cover fixing shim |
| 5. B14 Flange | 17. Cable gland | 29. Fan cover fixing screws |
| 6. B5 Flange | 18. Terminal box bottomgasket | 30. Endshiels fixing nut |
| 7. Terminal box case | 19. Frame | 31. Rivet |
| 8. Terminal box fixing screws | 20. Preload washer | 32. Nameplate |
| 9. Terminal box upper gasket | 21. Key | 33. Foot fixing nut |
| 10. Terminal box fixing nut | 22. Rotor | 34. Foot fixing screws |
| 11. Terminal bridge | 23. Bearing | 35. Foot |
| 12. Terminal pin | 24. NDE endshield | |