# ASYNCHRONOUS THREE-PHASE MOTORS FOR ROLLER TABLES

(TTM RANGE)

ELETTROMECCANICA

COSTRUZIONI ELETTROMECCANICHE s.r.l.

## 1. INTRODUCTION

Based on a twenty-year experience TTM range motors for roller tables have been studied and designed to be used in auxiliary services within the rolling mill industry involving heavy duty conditions with multiple start-ups, braking and reversal and the possibility for the machine to be under permanent power with blocked rotor.

## 2. GENERAL FEATURES

The following duties can be identified:

A) **“SIF” INTERMITTENT DUTY**

The machine is subjected to periodical operating cycles at a rated voltage followed by subsequent no-load operations.

B) **“SIR” INTERMITTENT DUTY**

The machine is subjected to working phases at a rated voltage followed by subsequent periods at rest.

C) **“SIF” INTERMITTENT DUTY WITH REVERSAL**

D) **“SIR” INTERMITTENT DUTY WITH REVERSAL**

In the case of C and D the motor overheating is predominantly due to the starting and braking current.

The four types of duties above mentioned are characterized by the intermittent ratio (ratio between the working length and the operating cycle overall length) and the number of hourly cycles.
Intermittent ratio rated values are 20-40-60-100%.
The intermittent rate is estimated at 100% only when no disconnection occurs. In the catalogue tables only 40% and 100% values are taken into consideration. These values can be obtained by the means of a simple linear interpolation.
Values indicated in the tables are referred to a “**SIR**” intermittent duty. In the case of a “SIP” duty, values can be communicated upon request.
In the course of the “**SIF**” and “**SIR**” duty and during the reversal, motors are submitted to heavier forces than continuous duty and one-direction rated motors.
Roller table motors are characterized by frequent reversal phases at full load and abrupt and frequent counter-current braking.
Thus, they need to have a special electrical and mechanical mounting position which can endure heavy conditions.
They are proved to be particularly efficient for single roller table control given their mounting simplicity, the safety of use and the almost total lack of maintenance required. Furthermore, **TTM** range motors can be supplied at a variable frequency also by the means of an inverter in order to adapt the number of tours at any type of rolling program.

Depending on the operation, a distinction is made between **roller tables** whose direction of rotation changes at each rolling - and **conveyor roller tables** that turns at a constant speed with rare reversal phases.

## 2.1 ROLLER TABLE MOTORS

The starting of roller table motors requires specific ratings of the motor which needs to provide acceleration and braking moments with high and complex dynamic phases and with the right number of manoeuvres.
In these conditions, the heat of the windings doesn't have to exceed the limit set by the rules. The acceleration of the mass of inertia needs to occur as soon as possible. Therefore, at the starting a high accelerating torque is delimited, at the top, by the rollers which don't have to slide under the bar that needs to be accelerated.
Furthermore, the direction of the motor torque needs to be so that if there is any sudden overload, the motor shall not stop but it just has to slow down keeping on providing the torque. This document describes the motors belonging to the range **TTM**, Torque Table Motors, with a cage rotor, which have been developed on the basis of a highly reliable technology. Motor features are illustrated in the tables of the price list that can be used to choose the right motor according to the duty conditions.

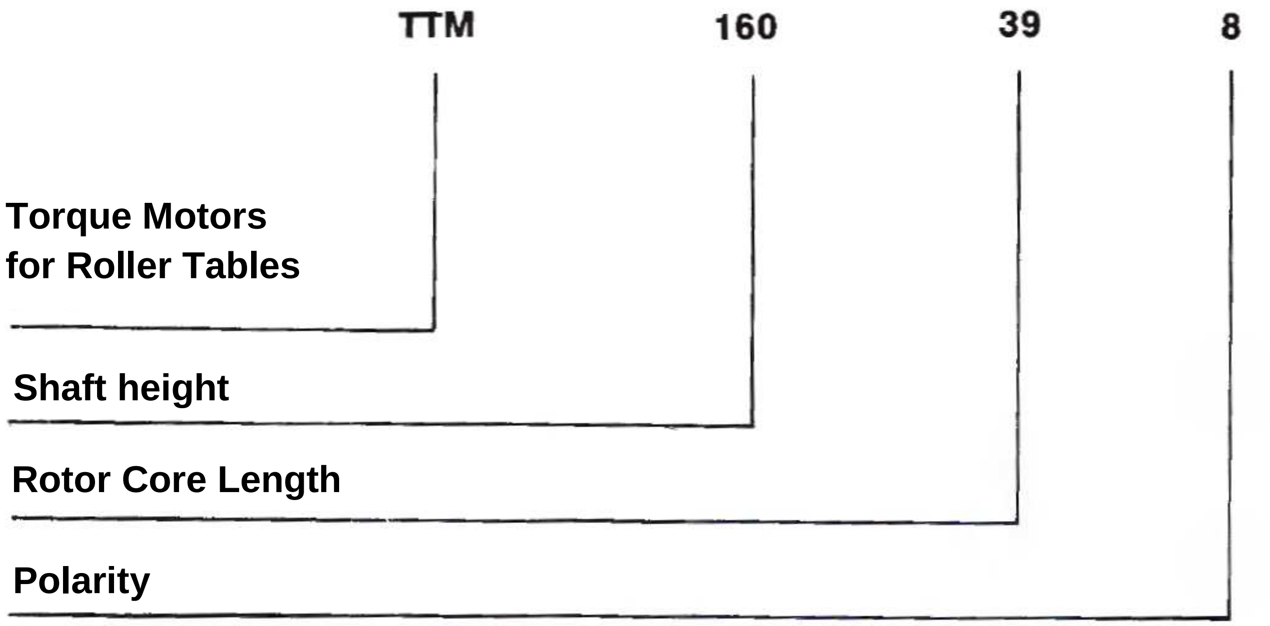
## 2.2. CONVEYOR ROLLER MOTORS

For conveyor roller control a standard electromagnetic motor can be adopted, the choice is strongly dependent on the continuous or intermittent duty conditions. The choice is thus greatly simplified.

## 3. MOTOR DENOMINATIONS

Motors are defined by the means of letters and codes as follow:

Example:



## 4. REGULATIONS

Motors in this price list are in compliance with CEI 2-3 brochure 355 regulating rotating electrical machines. They are also in accordance with IEC 34-5, 34-6, 34-7 and 34-8 recommendations.
As far as the acceleration constants are concerned, as underlined by the tables in the paragraph 7.2, “H” insulation class is considered with an overheating up to 125°C compared to the ambient temperature of 40°C.
As for ambient motors operating at higher temperatures, specific ratings can be communicated according to circumstances. In the case of installation in wet or tropical ambient, specific varnishes need to be used on windings.

## 5. MECHANICAL FEATURES

### 5.1 ENCLOSURES

IP44 protection is needed in compliance with UNEL 05515171 standards and IEC 345 and 346 recommendations. Totally enclosed motors, with no external blower, are protected against the penetration of solid bodies which are superior to 1mm and against water splash.

### 5.2 CONSTRUCTION FORMS

IM 1001 (foot mounting) and IM 3001 (flange mounting) are typical construction forms. Upon request motors with non-standard design and features can be provided.

### 5.3 FRAME AND SHIELDS

**TTM** motors are designed and manufactured with spheroid and cast iron frame and shields in order to be extremely robust. The ring ribs of the frame and of the shields increase the rigidity and the cooling surface improving this way the heat dispersion.
The external frame diameter is as small as possible and this is particularly significant when motors are mounted under roller table platforms.
These ways need to be well ventilated in order to have continuous air exchange.
If necessary, flange mounted shields can be supplied with a smoothed top side.

**COMPLETE STATOR TTM 132**

## 5.4 ROTOR

**TTM** range rotors are the most highly stressed part and, consequently, are submitted to a particular attention both in terms of electromagnetic and mechanic frame sizes.
There are special sheets for the rotor core which is preformed according to the socket. The wound rotor core is then heated and mounted, with an eligible interference on the shaft which is always produced with non-standard steel.
The rotor is thus submitted to a simultaneous adjustment of the rotor core in order to ensure maximum precision air gap of the bearing seats and of the coupling ends.
It’s also dynamically balanced.

**TTM COMPLETE ROTOR 132**

## 5.5 BEARINGS

All **TTM** motors are designed with grease-lubricated bearings as pointed out in Table n.1.
The TTM 200 type is provided, on the coupling side, with a rolling-element bearing.

**TABLE N. 1**

| MOTOR TYPE | COUPLING SIDE | OPPOSITE SIDE |
|---|---|---|
| **TTM 80** | 62052RS | 62052RS |
| **TTM 100** | 62072RS | 62062RS |
| **TTM 132** | 63092RS | 62092RS |
| **TTM 160** | 6311 | 6310 |
| **TTM 200** | NU 313 | 6313 |

## 5.6 TERMINAL BOARD COVER

1P55 protection is needed. The box is normally fitted on the right, seen from the coupling side. Terminals are marked according to the IEC 348 and DIN 42401 recommendations.

**TABLE N. 2**

| | NEW DENOMINATION | OLD DENOMINATION |
|---|---|---|
| STARTING | U1 V1 W1 | U V W |
| END | U2 V2 W2 | X Y Z |
| AT THE NETWORK | L1 L1 L1 | R S |

# 6. ELECTRICAL FEATURES

## 6.1 VOLTAGE

Rated voltages are normally at 220 V. 380 V. 500 V. Motors can be wound also for other voltages as long as they are inferior or equal to 500 V which represents the maximum limit of voltage at the frequency of 50 Hz allowed for wound motors. A tolerance within ± 5% on the voltage nameplate is also admitted, when the motor operates at a rated frequency.

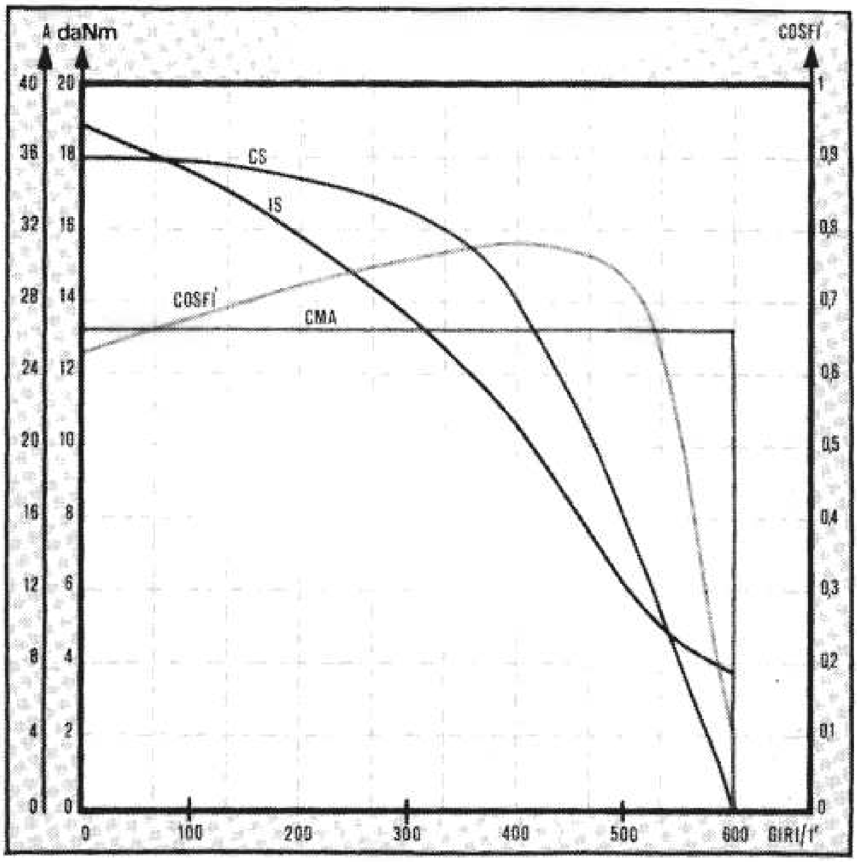
## 6.2 FREQUENCY

Motor speed in the tables is referred to frequency line of 50 Hz. Frequency ensures a tolerance within ±5%, when the motor is under rated voltage.

## 7. TORQUE AND TYPICAL FEATURES

The figure shows the typical features of a TTM 160-41-10 motor, that's to say the coupling (decreasing as the tours increase) and the current way as well as the power factor. Motors can be calculated with torque features different to the ones indicated in the graph in order to adapt them according to the duty required.

FIG. 1




**TTM CURVE MOTOR FEATURES 160-41-10 - 380V 50Hz- 10 POLES**
**600 REV/1'- Cs = 18 daNm.**

**Cs =** Starting torque
**Is =** Starting current
**Cma =** Starting Average Torque (0,7 Ca)

## 8. MOTOR TYPE CHOICE

In the choice of roller table motors, a different criterion must be followed compared to the choice of conveyor roller motors, which run constantly into one direction.
The term reversal is normally referred to the speed transfer close to the synchronism in one direction and resulting into the same speed in the opposite direction. During each reversal a quantity of heat is engendered. The heat needs to be dissipated by the external surface of the motor. The quantity of heat is directly proportional to the acceleration constant ($A_0$).
During the reversal, the temperature limit established by the rules shall not be exceeded.
Thermal solicitations are not due, as for normal motors, to the constant torque but rather to the constant and frequent speed change. That is the reason why roller motors don't have a rated voltage in Kw. As a matter of fact acceleration can't be easily drawn to a rated voltage of the motor.

### 8.1 CALCULATION OF THE TOTAL $PD^2$ REFERRED TO THE MOTOR SHAFT

Following features are taken into consideration:

| | |
|---|---|
| D = roller diameter | (m) |
| G = bar weight | (Kg) |
| $PD^2R$ = $PD^2$ rotating parts (rotor + joint + roller) | (Kgm2) |
| $PD^2L$ = $PD^2$ bar | (Kgm2) |
| $PD^2T$ = total $PD^2$ | (Kgm2) |

Assuming that the bar always rests on the two rollers, $PD^2$ of the bar for the roller is referred to the motor shaft as explained by the following expression:

$$PD^2L = 1/2\ G\ D^2$$

Assuming that the roller reversal occurs simultaneously on both parts of the roller cylinders, each roller will have a reversal with $PD^2$ equal to $PD^2R + PD^2L$ and a reversal with total $PD^2$ equal to $PD^2R$.

The set of the two reversals, one for each bar run, is equivalent to two identical reversals with a total $PD^2$ equal to $PD^2R + 1/2\ PD^2L$.

Thus, the operating cycle consists of a number of reversals equal to the number of bar tours with a total $PD^2$ referred to the motor shaft given by the expression:

$$PD^2T = PD^2R + 1/4\ GD^2.$$

## 8.2 CALCULATION OF THE ACCELERATION CONSTANT

The distinguishing feature of a duty requiring frequent manoeuvres (given that the output power determines the continuous duty) is the **"acceleration constant".**
The acceleration constant corresponding to a "certain type of motor" can be defined as the product of the total $PD^2$ referred to the motor shaft multiplied for the number of admissible complete hourly start-ups at heat effect.
The acceleration constant corresponding to a "certain type of duty" can be defined as the product of the total $PD^2$ referred to the motor shaft multiplied for the number of complete hourly start-ups equivalent to the dissipated power in the overall manoeuvres defined by the duty, as it results from the expression:

**Nae** = Na (sai2 **-** sa22) **+** Nf (sf12 **-** sf22)

where:

**Nae =** n° of hourly equivalent start-ups

**Na and Nf** = n° of start-ups and n° of hourly braking

**Sa1 and sa 2** = Sliding at the beginning and at the end of each start-up

**sf1 and sf2** = Sliding at the beginning and at the end of each braking

In the case of N manoeuvres, as herby mentioned, the following values can be traced:

**TABLE N. 3**

| TYPE OF MANOEUVRE | sa1 | sa2 | sf1 | sf2 | $\alpha$=Nae/N |
|---|---|---|---|---|---|
| START-UP COMPLTE | 1 | 0 | - | - | 1 |
| START-UP INCOMPLETE | 1 | s | - | - | $1-s^2$ |
| BRAKING COMPLTE | - | - | 2 | 1 | 3 |
| BRAKING INCOMPLETE | - | - | 2-s | 1 | $4(1-s)-(1-s^2)$ |
| REVERSAL COMPLTE | 1 | 0 | 2 | 1 | 4 |
| REVERSAL INCOMPLETE | 1 | s | 2-s | 1 | 4(1-s) |

By indicating with N the number of manoeuvres, the number of equivalent hourly start-ups is given by the expression:

Nae = α N

Therefore, the general expression for the calculation of the acceleration constant is given by:

Ao = α N PD2T

from which:

$$N = \frac{Ao}{\alpha PD^2\,T} \quad \text{or} \quad N = \frac{Ao}{PD^2\,T}\;\frac{1}{s1^2 - s2^2}.$$

Where α= 1 in the case of complete start-ups
Where α = 3 in the case of complete braking
Where α = 4 in the case of complete reversals
Where S1= sliding at the beginning of each manoeuvre
Where S2 = sliding at the end of each manoeuvre

**8.3 EXAMPLE OF MOTOR TYPE**

When choosing the suitable motor for the duty, the following system can be taken into consideration
Given: $PD^2$ (roller +bar) - number of tours – maximum torque.
We look for: motor type – number of complete reversals.
Example: $PD^2$ (roller + bar) = 1,2 $kgm^2$ – number of tours = 1000.
Maximum torque = 3 daNm.
The TTM motor type 100.25/6 is chosen, with starting torque 3 daNm and $PD^2$ motor = 0,03 $Kgm^2$
The motor chosen is suitable for the following complete reversals:

$$N= \frac{Ao}{4.PD^2\,T} = \frac{Ao}{4(1.2+0{,}03)} = \frac{Ao}{4.92}.$$

There will be:
Intermittence 100%: N = 153
Intermittence 40%:   N = 192
It's clear that if the time of the intermittence is shorter, the number of motor reversal is higher.
In the case of simple complete start-ups, the same motor would allow the following hourly manoeuvres:

$$N= \frac{Ao}{1PD^2} = \frac{Ao}{1.2+0{,}03} = \frac{Ao}{1.23}.$$

There will be:
Intermittence 100% : N = 610
Intermittence 40% :   N = 765

## 9. QUESTIONNAIRE

If it is hard to identify the motor type because of the high number of manoeuvres, because of the coupling of the $PD^2$ or because of the high intermittence you shall contact us and provide the following information contained in the questionnaire.

*1) Use of the roller (roller, conveyor etc.)*
*2) Type of the material transferred*
*3) Maximum weight of the material transported*
*4) Minimum weight of the material transported*
*5) Maximum length of the material transported*
*6) Moment of inertia of the material transported (referred to the motor shaft)*
*7) Temperature of the material transported*
*8) Ambient temperature close to the motor*
*9) Starting torque and maximum torque required to the roller*
*10) Roller speed (rev/1') (or peripheral roller speed)*
*11) Roller typology and size*
*12) Roller moment of inertia ($Kgm^2$)*
*13) Quantity of motorized roller*
*14) Subdivision of non-motorized rollers*
*15) Subdivision of rollers according to the cage*
*16) Distance between rollers*
*17) Number of start-up/hour*
*18) Number of reversals/hour*
*19) Number of braking/hour*
*20) Ambient and climate conditions*
*21) Braking type*
*- in counter-current*
*- in direct current*
*- other types of frequency*
*22) Time of acceleration required sec.*
*23) Time of reversals required sec.*
*24) Time of braking required sec.*
*25) Time of insertion into the network sec.*
*26) Motor speed rev/1'*
*27) Motor polarity*
*28) Motor mounting type*
**-** *IM 1001*
**-** *IM 3001*
*-Non-standard forms (provide drawings)*
*29) Possible ratio of transmission between the roller and the motor.*
*30) Line voltage and frequency. Inverter supply*
*31) Other useful information*

## 10. TABLES OF TECHNICAL DATA

The following tables indicate the ratings of TTM range motors with:

- CONSTRUCTION FORM: **M 1001iM3001**
- ENCLOSURE: **P45 E P55**
- VOLTAGE: **380V**
- FREQUENCY: **50 Hz**
- CLASS INSULATION: **H**
- BLOWER: **C00**

Note: Types, polarity and mechanical executions of this price list are in common use.
Other types, polarities (also superior) and executions can be manufactured upon request.

## 10.1 MOTORS WITH 6 POLES

| VELOCITÀ SINCRONA GIRI/IMIN. | COPPIA DI SPUNTO daNm | MOTORE TIPO | COEFFICIENTE DI ACCELERAZIONE $KGM^2H$ ISOL. CLASSE t'I INT.100% | INT4O% | CORRENTE DI AVVIAMENTO A 380V -50 H | ROTORE KGW | MASSA KG |
|---|---|---|---|---|---|---|---|
| 1000 | 1.6 | TTM 80-25-6 | 550 | 700 | 4.6 | 0.011 | 26 |
| 1000 | 2.1 | TTM 80-29-6 | 660 | 860 | 6.3 | 0.015 | 32 |
| 1000 | 3 | TTM100-25-6 | 740 | 935 | 9.1 | 0.029 | 44 |
| 1000 | 4 | TTM100-29-6 | 850 | 1080 | 11.7 | 0.038 | 52 |
| 1000 | 5.5 | TTM100-37-6 | 1150 | 1530 | 18 | 0.062 | 61 |
| 1000 | 7.5 | TTM132-33-6 | 1250 | 1580 | 26 | 0.125 | 93 |
| 1000 | 10 | TTM132-37-6 | 1450 | 1830 | 32 | 0.156 | 105 |
| 1000 | 15 | TTM160-33-6 | 1860 | 2180 | 44 | 0.309 | 154 |
| 1000 | 20 | TTM160-39-6 | 2280 | 2730 | 61 | 0.428 | 175 |
| 1000 | 30 | TTM160-45-6 | 2940 | 3500 | 88 | 0.590 | 210 |

## 10.2 MOTORS WITH 8 POLES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 750 | 1.5 | TTM 80-29-8 | 950 | 1320 | 4.5 | 0.015 | 32 |
| 750 | 2 | TTM 80-33-8 | 1130 | 1635 | 5.2 | 0.0187 | 34 |
| 750 | 3 | TTM100-29-8 | 1350 | 1820 | 8.2 | 0.045 | 49 |
| 750 | 4 | TTM100-33-8 | 1600 | 2100 | 10.5 | 0.0575 | 57 |
| 750 | 5.5 | TTM132-29-8 | 1980 | 2380 | 13 | 0.132 | 80 |
| 750 | 7.5 | TTM132-35-8 | 2420 | 2850 | 17.5 | 0.188 | 96 |
| 750 | 10 | TTM132-39-8 | 2850 | 3480 | 22.5 | 0.231 | 115 |
| 750 | 15 | TTM160-39-8 | 3950 | 4720 | 39 | 0.428 | 176 |
| 750 | 20 | TTM160-45-8 | 4980 | 5950 | 53 | 0.590 | 210 |
| 750 | 25 | TTM200-37-8 | 4980 | 5950 | 62 | 1.250 | 270 |
| 750 | 30 | TTM200-41-8 | 5730 | 6850 | 77 | 1.560 | 296 |

## 10.3 MOTORS WITH 10 POLES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 600 | 1.2 | TTM 80-25-10 | 1250 | 1900 | 2.5 | 0.011 | 26 |
| 600 | 1.6 | TTM 80-33-10 | 1650 | 2520 | 3.7 | 0.0187 | 34 |
| 600 | 2.1 | TTM100-25-10 | 1700 | 2520 | 4.25 | 0.0350 | 44 |
| 600 | 3 | TTM100-31-10 | 2150 | 3050 | 6.20 | 0.0525 | 54 |
| 600 | 4 | TTM100-35-10 | 2450 | 3400 | 7.50 | 0.065 | 60 |
| 600 | 5 | TTM132-31-10 | 3050 | 3900 | 9.50 | 0.149 | 87 |
| 600 | 6.5 | TTM132-35-10 | 3700 | 4500 | 12 | 0.188 | 96 |
| 600 | 8 | TTM132-39-10 | 4300 | 5350 | 15 | 0.231 | 112 |
| 600 | 10 | TTM160-33-10 | 4700 | 5900 | 25 | 0.448 | 146 |
| 600 | 15.5 | TTM160-41-10 | 6300 | 7950 | 37.5 | 0.700 | 185 |
| 600 | 20 | TTM200-35-10 | 7100 | 8700 | 44.5 | 1.080 | 255 |
| 600 | 25 | TTM200-39-10 | 7850 | 9650 | 57 | 1.350 | 285 |
| 600 | 30 | TTM200-43-10 | 9000 | 11300 | 72 | 1.700 | 325 |

## 10.4 MOTORS WITH 12 POLES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 500 | 1.6 | TTM100-23-12 | 2250 | 3250 | 3 | 0.0318 | 36 |
| 500 | 2 | TTM100-27-12 | 2650 | 3700 | 3.6 | 0.0390 | 45 |
| 500 | 3.1 | TTM100-33-12 | 3300 | 4700 | 5.2 | 0.0575 | 57 |
| 500 | 4.2 | TTM100-37-12 | 3900 | 5650 | 6.2 | 0.0728 | 62 |
| 500 | 5.1 | TTM132-33-12 | 4750 | 5900 | 7.6 | 0.162 | 92 |
| 500 | 6.2 | TTM132-37-12 | 5700 | 7100 | 9.6 | 0.203 | 105 |
| 500 | 8 | TTM160-31-12 | 6000 | 7200 | 17 | 0.458 | 140 |
| 500 | 10 | TTM160-35-12 | 6800 | 8300 | 21 | 0.566 | 158 |
| 500 | 12.6 | TTM160-39-12 | 7850 | 9650 | 26 | 0.700 | 175 |
| 500 | 15.2 | TTM160-43-12 | 9800 | 12300 | 33 | 0.900 | 195 |
| 500 | 20 | TTM200-37-12 | 10500 | 13100 | 37 | 1.430 | 268 |
| 500 | 25 | TTM200-41-12 | 12300 | 15300 | 46 | 1.780 | 296 |
| 500 | 30 | TTM200-45-12 | 14800 | 18300 | 57 | 2.250 | 340 |

TTM

## 10.5 MOTORS WITH 16 POLES

| VELOCITÀ SINCRONA GIRI/IMIN. | COPPIA DI SPUNTO daNm | MOTORE TIPO | COEFFICIENTE DI ACCELERAZIONE KGM²H ISOL. CLASSE t'I INT.100% | INT4O% | CORRENTE DI AVVIAMENTO A 380V -50 H | ROTORE KGW | MASSA KG |
|---|---|---|---|---|---|---|---|
| 375 | 1.3 | TTM100-23-16 | 3200 | 5050 | 2 | 0.0318 | 37 |
| 375 | 1.7 | TTM100-29-16 | 3950 | 6400 | 2.5 | 0.0465 | 52 |
| 375 | 2.5 | TTM100-35-16 | 4950 | 7950 | 3.5 | 0.0650 | 62 |
| 375 | 3.6 | TTM132-29-16 | 6400 | 9100 | 4.5 | 0.132 | 80 |
| 375 | 4.2 | TTM132-33-16 | 7300 | 10600 | 5.5 | 0.162 | 93 |
| 375 | 5.1 | TTM132-37-16 | 8600 | 12250 | 6.7 | 0.203 | 104 |
| 375 | 7.6 | TTM160-33-16 | 11150 | 14650 | 12 | 0.507 | 148 |
| 375 | 10.2 | TTM160-37-16 | 12650 | 16650 | 15 | 0.625 | 166 |
| 375 | 12.6 | TTM160-41-16 | 14900 | 19300 | 19 | 0.790 | 186 |
| 375 | 16.2 | TTM200-37-16 | 16350 | 21900 | 27 | 1.430 | 268 |
| 375 | 21 | TTM200-41-16 | 18900 | 25250 | 31 | 1.780 | 300 |
| 375 | 26 | TTM200-45-16 | 22300 | 29800 | 39 | 2.250 | 342 |

## 10.6 MOTORS WITH 20 POLES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 300 | 2.7 | TTM132-31-20 | 9400 | 14350 | 3 | 0.149 | 85 |
| 300 | 4.1 | TTM132-37-20 | 12350 | 18350 | 4.2 | 0.203 | 102 |
| 300 | 5.6 | TTM160-33-20 | 17150 | 23150 | 5.5 | 0.507 | 148 |
| 300 | 7.7 | TTM160-37-20 | 19900 | 26650 | 7.6 | 0.628 | 165 |
| 300 | 10.5 | TTM160-41-20 | 23000 | 31000 | 10.2 | 0.790 | 186 |
| 300 | 15 | TTM200-41-20 | 30100 | 39900 | 15.1 | 1.780 | 300 |
| 300 | 20 | TTM200-45-20 | 35650 | 47300 | 20.5 | 2.250 | 342 |

## 10.7 MOTORS WITH 24 POLES

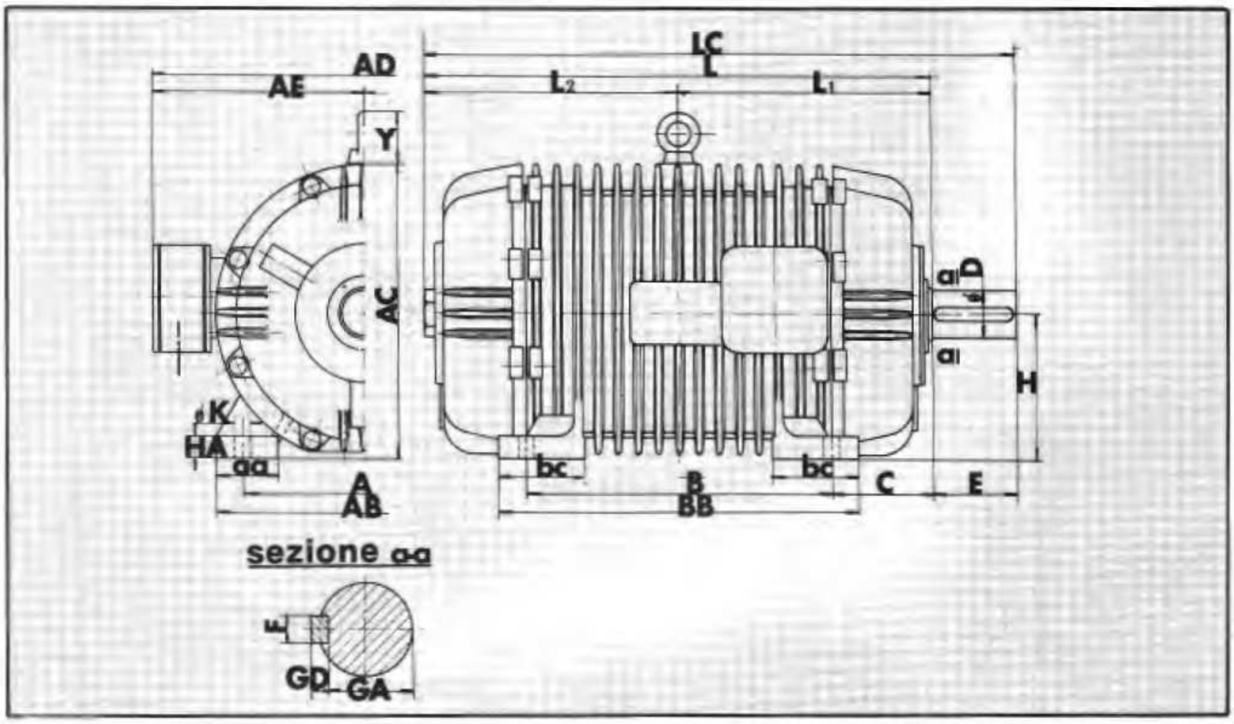
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 250 | 3.2 | TTM132-35-24 | 17250 | 27250 | 5.5 | 0.188 | 96 |
| 250 | 5.3 | TTM160-33-24 | 25300 | 33300 | 7.5 | 0.507 | 150 |
| 250 | 8.2 | TTM160-41-24 | 33650 | 44300 | 12 | 0.790 | 186 |

## 10.8 MOTORS WITH 30 POLES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 200 | 5.2 | TTM160-35-30 | 34900 | 52300 | 5.2 | 0.565 | 158 |
| 200 | 7.6 | TTM160-41-30 | 42800 | 64800 | 7.6 | 0.790 | 186 |

## 11. SIZE FEATURES

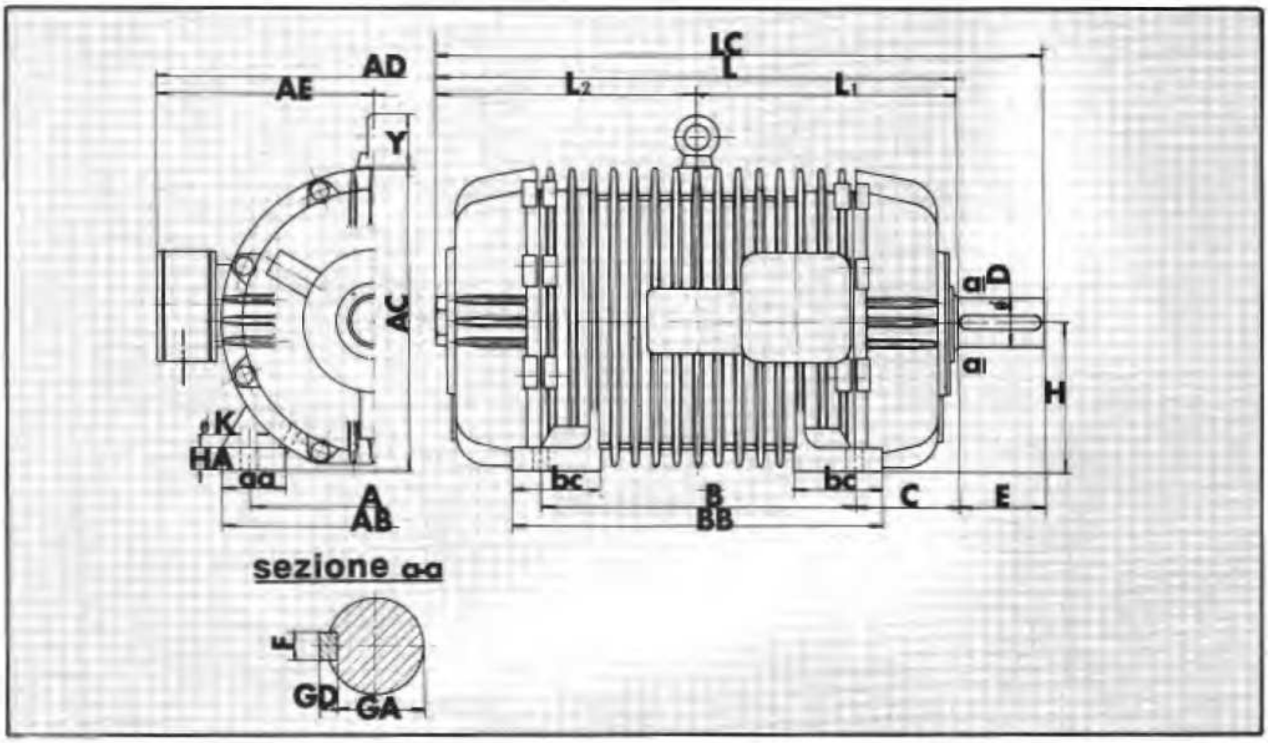
### 11.1 FORM IM 1001




| TIPO TTM | H | A | B | C | D | E | F | GA | GD | K | HA | L | $L_1$ | $L_2$ | LC | AC | BC | AA | AB | BB | AD | AE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 25 | 80 | 125 | 173 | 50 | 24 | 50 | 8 | 20 | 7 | 10 | 12 | 274 | 136,5 | 137,5 | 324 | 165 | 40 | 33 | 160 | 200 | 140 | 225 |
| 80 29 | 80 | 125 | 208 | 50 | 24 | 50 | 8 | 20 | 7 | 10 | 12 | 309 | 154 | 155 | 359 | 165 | 40 | 33 | 160 | 235 | 140 | 225 |
| 80 33 | 80 | 125 | 248 | 50 | 24 | 50 | 8 | 20 | 7 | 10 | 12 | 349 | 174 | 175 | 399 | 165 | 40 | 33 | 160 | 275 | 140 | 225 |
| 100 23<br>100 25 | 100 | 160 | 187 | 63 | 32 | 50 | 10 | 27 | 8 | 12 | 16 | 310 | 156,5 | 153,5 | 360 | 205 | 58 | 40 | 200 | 255 | 160 | 265 |
| 100 27<br>100 29 | 100 | 160 | 222 | 63 | 32 | 50 | 10 | 27 | 8 | 12 | 16 | 345 | 174 | 171 | 395 | 205 | 58 | 40 | 200 | 255 | 160 | 265 |
| 100 31<br>100 33 | 100 | 160 | 262 | 63 | 32 | 50 | 10 | 27 | 8 | 12 | 16 | 385 | 194 | 191 | 435 | 205 | 58 | 40 | 200 | 295 | 160 | 265 |
| 100 35<br>100 37 | 100 | 160 | 312 | 63 | 32 | 50 | 10 | 27 | 8 | 12 | 16 | 435 | 219 | 216 | 485 | 205 | 58 | 40 | 200 | 345 | 160 | 265 |

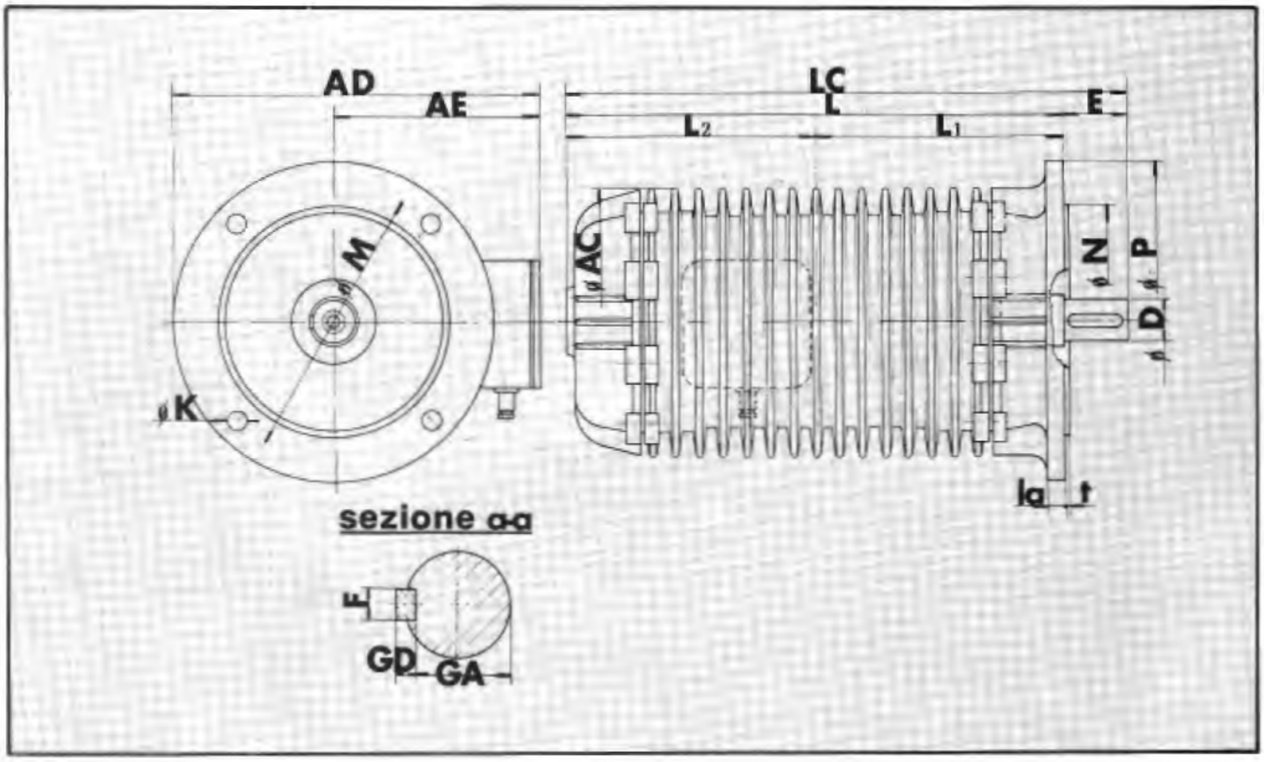
| TIPO TTM | H | A | B | C | D | E | F | GA | GD | K | HA | L | $L_1$ | $L_2$ | LC | AC | Y | BC | AA | AB | BB | AD | AE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 132 29 | 132 | 216 | 232 | 89 | 42 | 75 | 12 | 37 | 8 | 14 | 20 | 412 | 205 | 207 | 487 | 265 | 55 | 77 | 45 | 265 | 280 | 332 | 200 |
| 132 31<br>132 33 | 132 | 216 | 272 | 89 | 42 | 75 | 12 | 37 | 8 | 14 | 20 | 452 | 225 | 227 | 527 | 265 | 55 | 77 | 45 | 265 | 320 | 332 | 200 |
| 132 35<br>132 37 | 132 | 216 | 322 | 89 | 42 | 75 | 12 | 37 | 8 | 14 | 20 | 502 | 250 | 252 | 577 | 265 | 55 | 77 | 45 | 265 | 370 | 332 | 200 |
| 132 39 | 132 | 216 | 387 | 89 | 42 | 75 | 12 | 37 | 8 | 14 | 20 | 567 | 282,5 | 284,5 | 642 | 265 | 55 | 77 | 45 | 265 | 435 | 332 | 200 |

## 11.1 FORM IM 1001



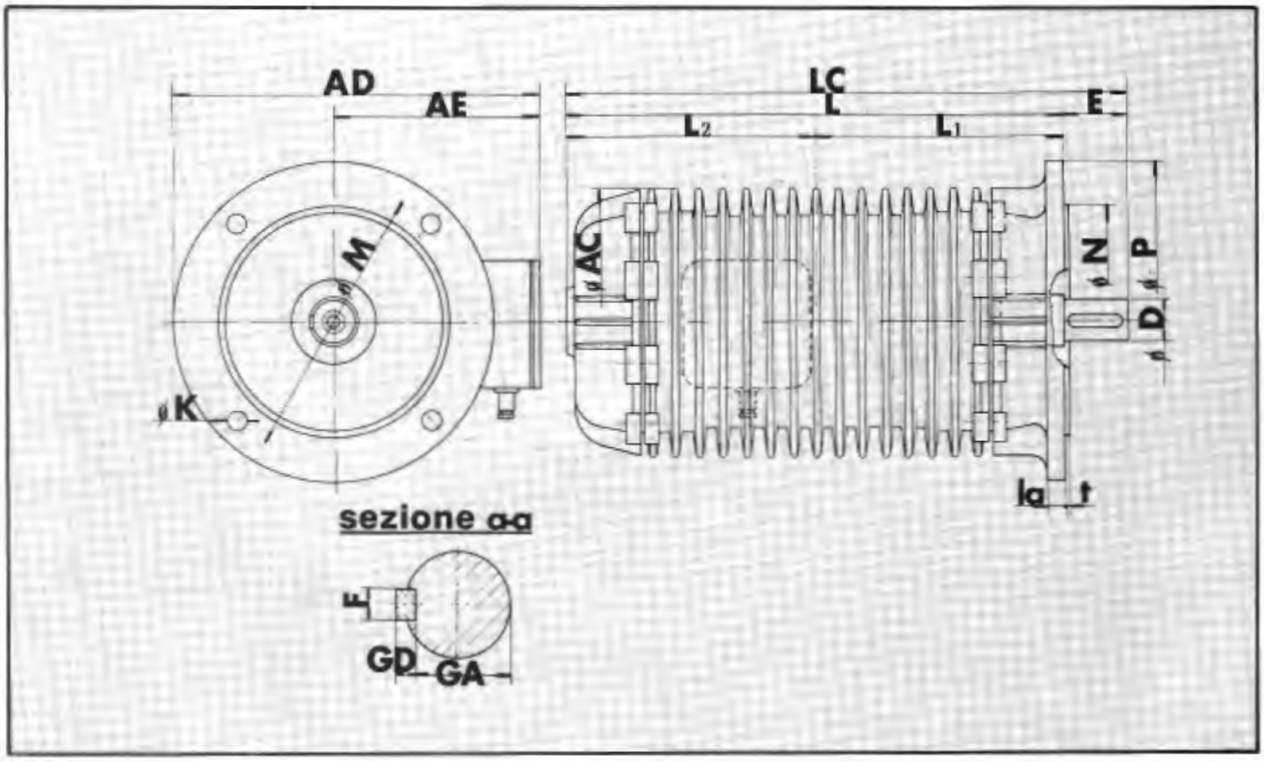

| TIPO TTM | H | A | B | C | D | E | F | GA | GD | K | HA | L | $L_1$ | $L_2$ | LC | AC | Y | BC | AA | AB | BB | AD | AE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160 31<br>160 33 | 160 | 254 | 264 | 108 | 50 | 110 | 14 | 44,5 | 9 | 14 | 22 | 480 | 240 | 240 | 590 | 322 | 54 | 85 | 60 | 310 | 314 | 403 | 242 |
| 160 35<br>160 37 | 160 | 254 | 314 | 108 | 50 | 110 | 14 | 44,5 | 9 | 14 | 22 | 530 | 265 | 265 | 640 | 322 | 54 | 85 | 60 | 310 | 364 | 403 | 242 |
| 160 39<br>160 41 | 160 | 254 | 379 | 108 | 50 | 110 | 14 | 44,5 | 9 | 14 | 22 | 595 | 297,5 | 297,5 | 705 | 322 | 54 | 85 | 60 | 310 | 429 | 403 | 242 |
| 160 43<br>160 45 | 160 | 254 | 464 | 108 | 50 | 110 | 14 | 44,5 | 9 | 14 | 22 | 680 | 340 | 340 | 790 | 322 | 54 | 85 | 60 | 310 | 514 | 403 | 242 |
| 200 35<br>200 37 | 200 | 318 | 294 | 133 | 60 | 110 | 18 | 53 | 11 | 18 | 28 | 560 | 280 | 280 | 670 | 400 | 63 | 100 | 78 | 388 | 350 | 515 | 315 |
| 200 39<br>200 41 | 200 | 318 | 359 | 133 | 60 | 110 | 18 | 53 | 11 | 18 | 28 | 625 | 312,5 | 312,5 | 735 | 400 | 63 | 100 | 78 | 388 | 415 | 515 | 315 |
| 200 43<br>200 45 | 200 | 318 | 444 | 133 | 60 | 110 | 18 | 53 | 11 | 18 | 28 | 710 | 355 | 355 | 820 | 400 | 63 | 100 | 78 | 388 | 500 | 515 | 315 |

## 11.2 FORM IM 3001




| TIPO TTM | M | N | P | D | E | F | GA | K | LA | T | AG | L | $L_1$ | $L_2$ | LC | GD | AE | AD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 25 | 165 | 130 | 200 | 24 | 50 | 8 | 20 | 11,5(4) | 12 | 3,5 | 170 | 274 | 136,5 | 137,5 | 324 | 7 | 140 | 240 |
| 80 29 | 165 | 130 | 200 | 24 | 50 | 8 | 20 | 11,5(4) | 12 | 3,5 | 170 | 309 | 154 | 155 | 359 | 7 | 140 | 240 |
| 80 33 | 165 | 130 | 200 | 24 | 50 | 8 | 20 | 11,5(4) | 12 | 3,5 | 170 | 349 | 174 | 175 | 399 | 7 | 140 | 240 |
| 100 23<br>100 25 | 215 | 180 | 250 | 32 | 50 | 10 | 27 | 14 (4) | 14 | 4 | 210 | 310 | 156,5 | 153,5 | 360 | 8 | 160 | 285 |
| 100 27<br>100 29 | 215 | 180 | 250 | 32 | 50 | 10 | 27 | 14 (4) | 14 | 4 | 210 | 345 | 174 | 171 | 395 | 8 | 160 | 285 |
| 100 31<br>100 33 | 215 | 180 | 250 | 32 | 50 | 10 | 27 | 14 (4) | 14 | 4 | 210 | 385 | 194 | 191 | 435 | 8 | 160 | 285 |
| 100 35<br>100 37 | 215 | 180 | 250 | 32 | 50 | 10 | 27 | 14 (4) | 14 | 4 | 210 | 435 | 219 | 216 | 485 | 8 | 160 | 285 |
| 132 29 | 265 | 230 | 300 | 42 | 75 | 12 | 37 | 14 (4) | 14 | 4 | 265 | 412 | 205 | 207 | 487 | 8 | 200 | 350 |
| 132 31<br>132 33 | 265 | 230 | 300 | 42 | 75 | 12 | 37 | 14 (4) | 14 | 4 | 265 | 452 | 225 | 227 | 527 | 8 | 200 | 350 |
| 132 35<br>132 37 | 265 | 230 | 300 | 42 | 75 | 12 | 37 | 14 (4) | 14 | 4 | 265 | 502 | 250 | 252 | 577 | 8 | 200 | 350 |
| 132 39 | 265 | 230 | 300 | 42 | 75 | 12 | 37 | 14 (4) | 14 | 4 | 265 | 567 | 282,5 | 284,5 | 642 | 8 | 200 | 350 |

## 11.2 FORM IM 3001

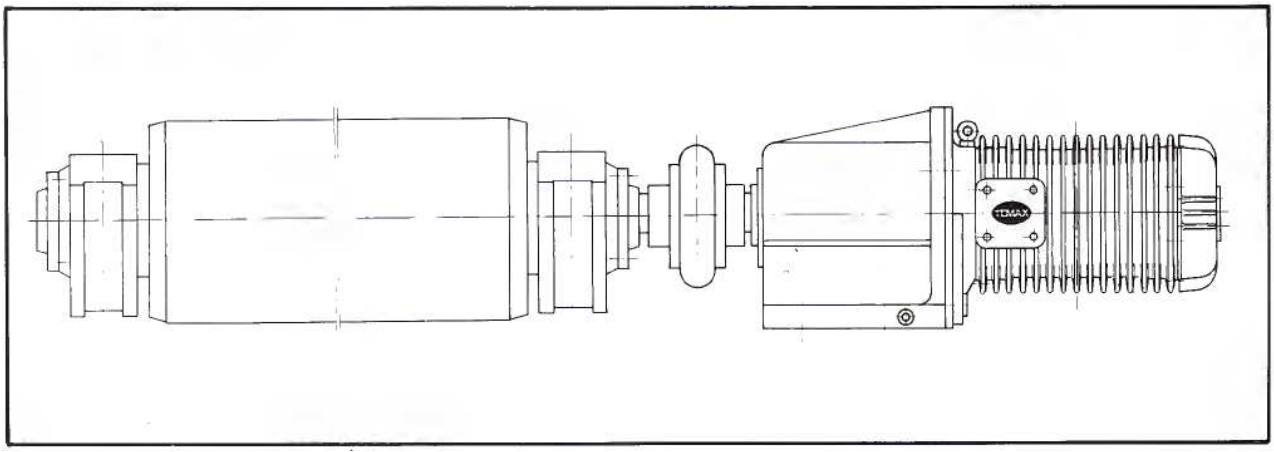



| TIPO TTM | M | N | P | D | E | F | GA | K | LA | T | AC | L | L1 | L2 | LC | GD | AE | AD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160 31<br>160 33 | 300 | 250 | 350 | 50 | 110 | 14 | 44,5 | 14(8) | 16 | 5 | 322 | 480 | 240 | 240 | 590 | 9 | 195 | 420 |
| 160 35<br>160 37 | 300 | 250 | 350 | 50 | 110 | 14 | 44,5 | 14(8) | 16 | 5 | 322 | 530 | 265 | 265 | 640 | 9 | 195 | 420 |
| 160 39<br>160 41 | 300 | 250 | 350 | 50 | 110 | 14 | 44,5 | 14(8) | 16 | 5 | 322 | 595 | 297,5 | 297,5 | 705 | 9 | 195 | 420 |
| 160 43<br>160 45 | 300 | 250 | 350 | 50 | 110 | 14 | 44,5 | 14(8) | 16 | 5 • | 322 | 680 | 340 | 340 | 790 | 9 | 195 | 420 |
| 200 35<br>200 37 | 350 | 300 | 400 | 60 | 110 | 18 | 53 | 14(8) | 16 | 5 | 400 | 560 | 280 | 280 | 670 | 11 | 300 | 500 |
| 200 39<br>220 41 | 350 | 300 | 400 | 60 | 110 | 18 | 53 | 14(8) | 16 | 5 | 400 | 625 | 312,5 | 312,5 | 735 | 11 | 300 | 500 |
| 200 43<br>200 45 | 350 | 300 | 400 | 40 | 110 | 18 | 53 | 14(8) | 16 | 5 | 400 | 710 | 355 | 355 | 820 | 11 | 300 | 500 |

## 12. GEAR SPEED REDUCER COUPLING

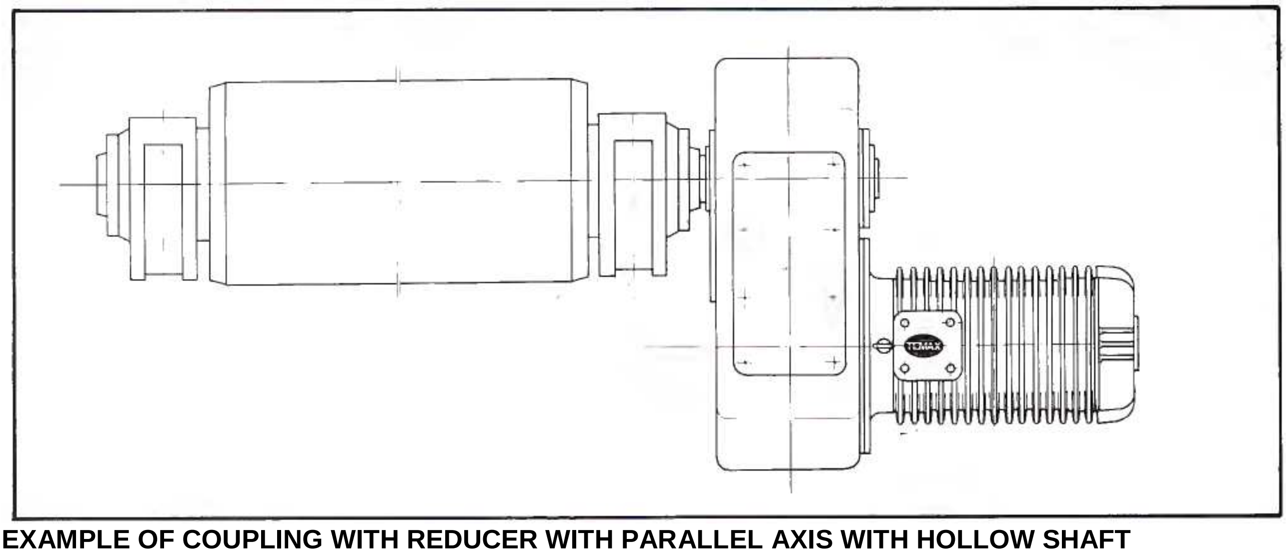
If the motor needs to be coupled to a speed reducer, a mechanical execution can be changed from the catalogue standards in order to create a very composite and economical unit. In this respect, there are different possibilities; from the creation of a coupling flange to the supply of the motor with no coupled side flange but with a non-standard shaft positioned for a direct entry to the reducer body. In these circumstances holding-related issues concerning the lubricator shall be discussed with the manufacturer of the speed reducer. Please contact us where it is necessary as we have already had numerous and very positive experiences with several Manufacturers.

**FIG. 2**



**EXAMPLE OF COUPLING WITH COAXIAL REDUCER BY THE MEANS OF AN ELASTIC JOINT**

**FIG. 3**



**EXAMPLE OF COUPLING WITH REDUCER WITH PARALLEL AXIS WITH HOLLOW SHAFT**

Based on these experiences, we have drawn a range of tables (see tab. 1-2-3 at the following page) which shows, for a wide range of speed of the slow shaft, (from 20 to 500 rpm), the torques that can be obtained with common reducers with one or two gear torques.

The range of torques obtainable with a slow shaft has a size daNm 2,5 to 500 rpm and daNm 315 to 40 rpm. For higher torques or in case of different speed you shall contact your reducer speed manufacturer. With the right reducers coupled to our **TTM** standard motors it is possible to be provided with torques up to 900 daNm at 30 rpm.

## 1. REDUCERS WITH MOTORS WITH 12 POLES (500 RPM)

| TTM MOTOR | TORQUE IN KGM ON THE SLOW SHAFT AT THE FOLLOWING SPEEDS (RPM) | | | | | | |
|---|---|---|---|---|---|---|---|
| | n = 20 | 25 | 31.5 | 40 | 50 | 63 | 80 |
| 100.23 | 31,5 | 25 | 20 | 16 | 12,5 | 10 | 8 |
| 100.27 | 40 | 31,5 | 25 | 20 | 16 | 12,5 | 10 |
| 100.27 | 50 | 40 | 31,5 | 25 | 20 | 16 | 12,5 |
| 100.33 | 63 | 50 | 40 | 31,5 | 25 | 20 | 16 |
| 100.37 | 80 | 63 | 50 | 40 | 31,5 | 25 | 20 |
| 132.33 | 100 | 80 | 63 | 50 | 40 | 31,5 | 25 |
| 132.37 | | | | 63 | 50 | 40 | 31,5 |
| 160.31 | | | | 80 | 63 | 50 | 40 |
| 160.35 | | | | 100 | 80 | 63 | 50 |
| 160.39 | | | | 125 | 100 | 80 | 63 |
| 160.43 | | | | 160 | 125 | 100 | 80 |
| 200.37 | | | | 200 | 160 | 125 | 100 |
| 200.41 | | | | 250 | 200 | 160 | 125 |
| 200.45 | | | | 315 | 250 | 200 | 160 |

WITH COAXIAL REDUCERS WITH TWO GEAR TORQUES

## 2. REDUCERS WITH MOTOR WITH 8 POLES (750 RPM)

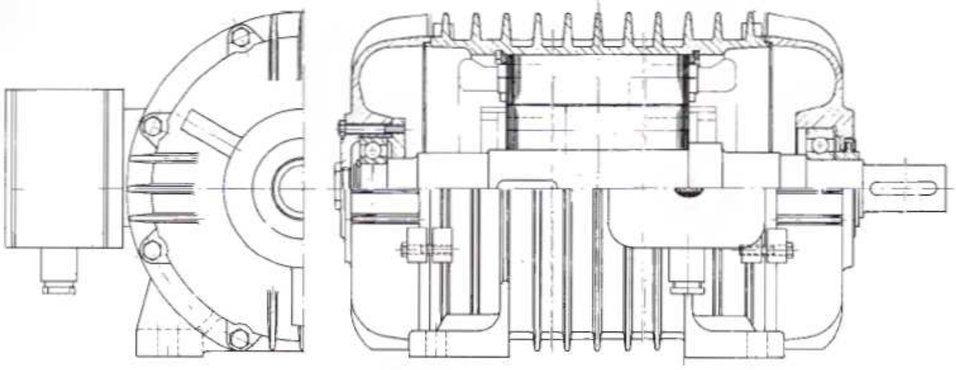
| TTM MOTOR | TORQUE IN KGM ON THE SLOW SHAFT AT THE FOLLOWING SPEEDS (RPM) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | n = 100 | 112 | 125 | 140 | 224 | 250 | 280 | 315 |
| 80.29 | 9,4 | 8,4 | 7,5 | 6,7 | 4,18 | 3,75 | 3,35 | 3 |
| 80.33 | 12 | 10,7 | 9,4 | 8,4 | 5,35 | 4,8 | 4,2 | 3,75 |
| 100.29 | 15 | 13,4 | 12 | 10,7 | 6,7 | 6 | 5,36 | 4,8 |
| 100.29 | 18,8 | 16,8 | 15 | 13,4 | 8,4 | 7,5 | 6,7 | 6 |
| 100.33 | 23,6 | 21 | 18,8 | 16,8 | 10,7 | 9,4 | 8,4 | 7,5 |
| 132.29 | 30 | 26,8 | 23,6 | 21 | 13,4 | 12 | 10,7 | 9,4 |
| 132.29 | 37,5 | 33,5 | 30 | 26,8 | 16,8 | 15 | 13,4 | 12 |
| 132.35 | 48 | 42 | 37,5 | 33,5 | 21 | 18,8 | 16,8 | 15 |
| 132.39 | 60 | 53,6 | 48 | 42 | 26,8 | 23,6 | 21 | 18,8 |
| 160.39 | 75 | 67 | 60 | 53,6 | 33,5 | 30 | 26,8 | 23,6 |
| 160.45 | 120 | 107 | 94 | 84 | 53,6 | 48 | 42 | 37,5 |
| 200.37 | 150 | 134 | 120 | 107 | 67 | 60 | 53,6 | 48 |
| 200.41 | 188 | 168 | 150 | 134 | 84 | 75 | 67 | 60 |
| | WITH COAXIAL REDUCERS WITH TWO GEAR TORQUES | | | | WITH COAXIAL REDUCERS WITH ONE TORQUE | | | |

## 3. REDUCER WITH MOTOR WITH 6 POLES (1000 RPM)

| TTM MOTOR | TORQUE IN KGM ON THE SLOW SHAFT AT THE FOLLOWING SPEEDS (RPM) | | | | | | |
|---|---|---|---|---|---|---|---|
| | n = 160 | 180 | 200 | 355 | 400 | 450 | 500 |
| 80.25 | 8 | 6,9 | 6,3 | 3,5 | 3,15 | 2,77 | 2,5 |
| 80.29 | 10 | 8,9 | 8 | 4,54 | 4 | 3,5 | 3,15 |
| 100.25 | 12,5 | 11 | 10 | 5,55 | 5 | 4,44 | 4 |
| 100.25 | 16 | 13,9 | 12,5 | 6,9 | 6,3 | 5,55 | 5 |
| 100.29 | 20 | 17,5 | 16 | 8,9 | 8 | 6,9 | 6,3 |
| 100.37 | 25 | 22,2 | 20 | 11 | 10 | 8,9 | 8 |
| 132.33 | 31,5 | 27,7 | 25 | 13,9 | 12,5 | 11 | 10 |
| 132.33 | 40 | 35 | 31,5 | 17,5 | 16 | 13,9 | 12,5 |
| 132.37 | 50 | 44,4 | 40 | 22,2 | 20 | 17,5 | 16 |
| 160.33 | 63 | 55,5 | 50 | 27,7 | 25 | 22,2 | 20 |
| 160.33 | 80 | 69 | 63 | 35 | 31,5 | 27,7 | 25 |
| 160.39 | 100 | 89 | 80 | 44,4 | 40 | 35 | 31,5 |
| 160.45 | 125 | 110 | 100 | 55,5 | 50 | 44,4 | 40 |
| 160.45 | 160 | 139 | 125 | 69 | 63 | 55,5 | 50 |
| | WITH COAXIAL REDUCERS WITH TWO GEAR TORQUES | | | WITH COAXIAL REDUCERS WITH ONE GEAR TORQUE | | | |

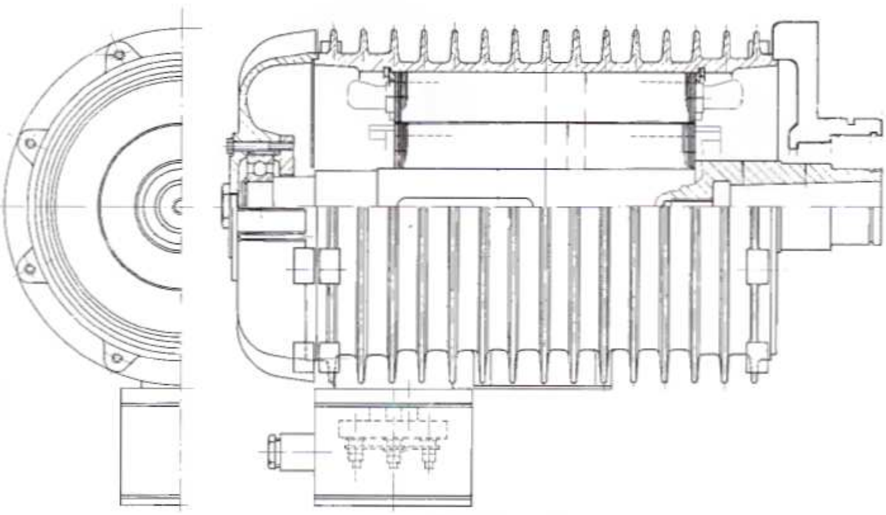
## 13. CONSTRUCTION EXAMPLES

**FIG.4**



**TTM MOTOR TYPE**
**160-33-10**
In normal execution,
IM 1001 form is needed.
Note the particular
holding on the
side coupling

**FIG.5**



**TTM MOTOR TYPE**
**100-27-12**
With non-standard
flange and hollow
shaft fitted on a morse
taper shank.
The SM double holding
with rings can function
on a part of the chrome
plated and rectified
shaft.

## ROLLER TABLE MOTOR WITH DIRECT CURRENT

Furthermore, Temax produces a range of direct current motors which is particularly suitable and experimented for rollers and, in general for heavy duties.
The range, named "**NC**" goes from the shaft length at 100 up to 400, including all intermediate name plates envisaged by the current standards.
The description shows one of these motors, manufactured with a non-standard flange reducer coupling.

**TABLE ROLLER MOTOR C.C**
**TYPE NC 132 VL**
Cn = 3,2 daNm - C max = 6,4 daNm
C – a peak at 25 daNm

Ask for specific documentation. **NC** motor catalogue.