**Rossi**
Habasit Group

آتور صنعت
ATOORSANAT

# EP

## Planetary gear reducers and gearmotors

Edition March 2013

# Contents

This page is intentionally left blank

### Who we are

In brief:

1953    Year of foundation as family business and today still privately owned

70's    First in Italy to adopt a complete modular system for gear reducers with cylindrical and bevel gears; first in



Rossi in the 70's

Italy to adopt case-hardened, tempered, ground gear pairs on parallel and right angle shaft gear reducers

80's    Worm gear reducers and gearmotors with universal mounting, single-piece housing and ZI involute profile; extension of the direct sales organization abroad with the facilities of the German, English, French and Spanish subsidiaries.

90's    Parallel and right angle shaft gear reducers and gearmotors with universal mounting and single-piece housing; first transmission manufacturer in Italy and second in Europe to obtain Quality System Certification ISO 9001.

1994    The only one to offer 3-year-warranty

1997    Acquisition of Seimec (Rossi Motor Division)



Rossi Motor Division

2002    Acquisition of SMEI (Rossi Planetary Gear Reducer Division, WIND)



Rossi Planetary Gear Reducer Division

2003    ISO 9001 – 2000 Standard (Vision 2000)

2004    New affiliated company in U.S.A.
Habasit acquires important share in Rossi, to reinforce global presence and develop growth strategy

2009    (July) Habasit Holding owns 100% Rossi

2010    Logo and Company name change: from "Rossi Motoriduttori" to "Rossi S.p.A."



Rossi Industrial Gear Reducer Division, today

For more than 50 years Rossi has been developing its business in the most demanding applications to become one of the world's leading gearmotor manufacturers suitable for critical machines. Even in the toughest environment, Rossi is recognized for providing state of the art technology, solid value, and commitment to its customers.

## What we do

Rossi wide standard product range and design, allowing a universal and flexible application, means we can provide the right solution for every application and grant a 3 year warranty worldwide.

### Gearmotors

| Type of gear | | Catalog |
|---|---|---|
| Worm gearmotors | | A |
| Standardfit worm gearmotors | | AS |
| Coaxial gearmotors | | E |
| Standardfit coaxial gearmotors | | ES |
| Helical and bevel-helical gearmotors | | G |
| Planetary (coaxial and right angle shaft) gearmotors | | EP |

### Gear reducer

| Type of gear | | Catalog |
|---|---|---|
| Worm gear units | | A |
| Helical gear units | | G |
| Bevel-Helical gear units | | G |
| Heavy duty helical gear units | | H |
| Heavy duty bevel-helical gear units | | H |
| Planetary (coaxial and right angle shaft) gear units | | EP |
| Right angle shaft gear units | | L |
| Shaft mounted helical gear units | | P |

## Motors

| Type | | Catalog |
|---|---|---|
| Asynchronous three-phase high efficiency and premium efficiency motors | | TX |
| Standard and high efficiency brake motors | | TX |
| Heavy duty roller table motors | | S |

## Motion control

| Type | | Catalog |
|---|---|---|
| Worm, coaxial, parallel and right angle shaft servo gear units | | SR |
| Low backlash planetary servo gear units | | SM |

## Specific industrial segments

| Type | | Catalog |
|---|---|---|
| Extruders, Parallel shaft gear reducers and gearmotors | | GX |
| Wind drives, Pitch and Yaw drives | | EPW |
| Slewing drives | | EPS |
| Combined gear reducer | | EP |
| Heavy duty, Drive units on swing base | | RE |
| HyCLEAN solution (food and beverage, chemical) | | HyCLEAN |
| Heavy duty roller table motors | | S |

## Where you can find us

Close to our customers in all five continents, with a direct sales system granting excellence in service: visit our new website for your country reference.
We are where you need us to be.

## What we believe in

Choosing the drive with the right technical specifications is vital for reliability and economy.
We believe in integrity, ethical behavior, knowledge, imagination, innovation, good teamwork and above all customer focus: these are some of Rossi's major key success factors.
Rossi is a reliable company with the right flexibility and know-how to respond to all market requests, all over the world, in all application fields, without leaving aside its commitment for the environment and value on human safety, to protect everyone's future.

## What we can do for you

A highly skilled specialist team in different fields, Industry Segment Managers providing customers with the right support to find the best solution suitable for your demands, and accompany you step by step alongside the whole supply.

## Who you can call

A well-organized after-sale service providing problem solving in the quickest possible way
Rossi for You portal, allowing customers to have 24/7 access to all the documentations concerning Rossi supplies, news and order tracking in real time.
Worldwide standard certified to:
IEC, UNEL, UNI, DIN, ATEX, UL, CSA, NEMA, MEPS, EISA, ErP (IE2, IE3)...

## What you can do for us

You are at the center for Rossi: that's why we want you to give us suggestions on our work, to inform us about news in your sector and anything that allows us to give you better service, from all points of view.
You are for us a partner which can contribute to our ever evolving improvements in all fields.

Page intentionally left blank.

# Features and benefits

Rational, modern, and essential design, high stiffness

Design and calculation of every single component
Wide range of possible versions and low speed shaft designs

Regular and closer size steps

IEC, NEMA and main hydraulic motor adapters



- **High performance, guaranteed for long life, extremely easy maintenance for the end user**
- **Torque unit cost reduction**
- **Innovative solutions responding to the real application needs of most demanding industrial sectors**
- **Customer-tailored solutions for easiest and most cost-effective design and installation for repairs (revamping and new installations)**
- **Precise and aimed selections for important energy efficiency saving**



Wide range of accessories and designs, specifically studied for every single size

Fluorinated seal rings
Lifting hooks as standard
Magnetic plugs with OR
Enhanced internal lubrication
New support of planet gears

- **The application solution is facilitated by several designs foreseen in the catalog, also studied in order not to limit performance**
- **Improved reliability of oil seals**
- **Easy and safe handling**
- **Nearly maintenance-free**
- **Reduction of running temperatures**
- **Increased smooth and even running**



Rational position of oil level and drain plugs

Extra-Large plugs

Improved thermal capacity

- **Simplified and optimized installation and maintenance**
- **Limited use of expansion tanks**
- **Possibility to install integrated or independent oil cooling devices**
- **Brand new solutions for synchronized and counter revolving applications**
- **Enhanced oil circulation**

# Features and benefits

Competent assistance and technical support
during design/selection activities

- **Skilled pre and after-sale service**
- **Calculation and selection tools**
- **Selection optimization: performance,
  reliability, cost-efficiency**

---

Product tested at assembly line end
All external gears are ground

Gear reducer supplied filled with PAO
(polyalphaolefin) synthetic oil up to size 021A

- **High quality and reliability standard**
- **High performance**
- **Low noise**
- **Reduced angular backlash**
- **Gear reducers ready to use**
- **For longer lubrication intervals and higher
  reliability**

---

Easier to fit

- **Clearance for bolts**
- **Hoisting lugs**

---
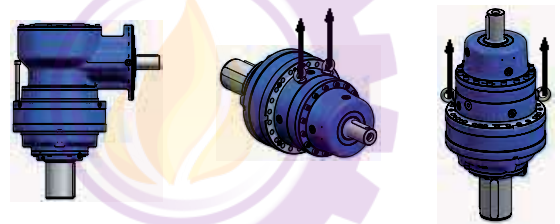
Easy to service

- **Full oil replacement design**
- **Push off oil port**

Oil      Oil

Oil      Oil

Oil

---
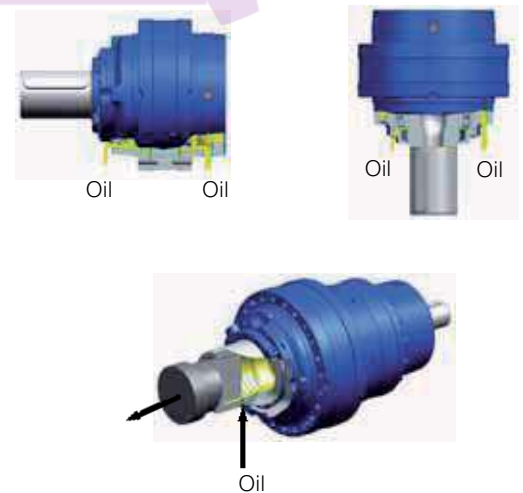
Reduced maintenance

- **Double seal output**

---

# Product range
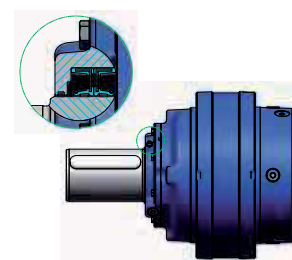
## Size

$M_{N2}$ [N m], $M_{2max}$ [N m]
$F_{r2}{}^{1)}$ [N] (C ...), $F_{r2}{}^{1)}$ [N] (S ...)

## Train of gears -  Planetary In Line

$i_N$

| Size | 1EL | 2EL | 3EL | 4EL |
|---|---|---|---|---|
| | 3,55 ... 7,1 | 12,5 ... 50 | 50 ... 250 | 180 ... 3550 |
| **001A** 1 600, 1 900 17 000, 20 000 | | | | |
| **002A** 2 240, 2 650 20 000, 23 600 | | | | |
| **003A** 3 150, 3 750 28 000, 33 500 | | | | |
| **004A** 4 500, 5 300 35 500, 40 000 | | | | |
| **006A** 6 300, 7 500 42 500, 47 500 | | | | |
| **009A** 9 000, 10 600 56 000 ,63 000 | | | | |
| **012A** 12 500, 15 000 71 000, 80 000 | | | | |
| **015A** 15 000, 18 000 63 000, 80 000 | | | | |
| **018A** 18 000, 21 200 85 000, 106 000 | | | | |
| **021A** 21 200, 28 000 85 000, 106 000 | | | | |
| **030A** 31 500, 45 000 100 000, 106 000 | | | | |
| **042A** 45 000, 67 000 132 000, 140 000 | | | | |
| **060A** 63 000, 90 000 140 000, 160 000 | | | | |
| **085A** 90 000, 140 000 200 000, 224 000 | | | | |

1) Radial loads valid for cylindrical shaft end (C ...) and splined shaft end (S ...), respectively.

# Product range

## Size

$M_{N2}$ [N m], $M_{2max}$ [N m]
$F_{r2}{}^{1)}$ [N] (C ...), $F_{r2}{}^{1)}$ [N] (S ...)

## Train of gears - Planetary Bevel Helical

$i_N$

| Size | 2EB<br>9 ... 31,5 | 3EB<br>31,5 ... 200 | 4EB<br>160 ... 2240 |
|---|---|---|---|
| **001A**<br>**1 600, 1 900**<br>17 000, 20 000 | | | |
| **002A**<br>**2 240, 2 650**<br>20 000, 23 600 | | | |
| **003A**<br>**3 150, 3 750**<br>28 000, 33 500 | | | |
| **004A**<br>**4 500, 5 300**<br>35 500, 40 000 | | | |
| **006A**<br>**6 300, 7 500**<br>42 500, 47 500 | | | |
| **009A**<br>**9 000, 10 600**<br>56 000 ,63 000 | | | |
| **012A**<br>**12 500, 15 000**<br>71 000, 80 000 | | | |
| **015A**<br>**15 000, 18 000**<br>63 000, 80 000 | | | |
| **018A**<br>**18 000, 21 200**<br>85 000, 106 000 | | | |
| **021A**<br>**21 200, 28 000**<br>85 000, 106 000 | | | |
| **030A**<br>**31 500, 45 000**<br>100 000, 106 000 | | | |
| **042A**<br>**45 000, 67 000**<br>132 000, 140 000 | | | |
| **060A**<br>**63 000, 90 000**<br>140 000, 160 000 | | | |
| **085A**<br>**90 000, 140 000**<br>200 000, 224 000 | | | |

1) Radial loads valid for cylindrical shaft end (C ...) and splined shaft end (S ...), respectively.

# Symbols

**Danger**

The paragraphs marked with symbols shown below contain dispositions to be strictly respected in order to assure personal **safety** and to avoid any **heavy damages** to the machine or to the system (e.g.: works on live parts, on lifting machines, etc.); the responsible for the installation or maintenance must scrupulously **follow all instructions contained in present handbook**.

Dangerous situation, the operator must take all safety measures to avoid serious damage or injury

Do not lifting. Lifting and handling incorrect

Suspended loads. Do not stand under suspended loads

**General**

Alternative output design

Shaft subjected to torque only

Shaft subjected to both torque and radial load

Mass

30 N m    Tightening torque

refer to chapter

reference number

| Symbol | | Units of measure | | Notes |
|---|---|---|---|---|
| | | In the catalog | SI system[1) | |
| | dimensions | mm | – | |
| $C_{t2}$ | gear reducer torsional stiffness referred to the low speed shaft | N m/ ' | | |
| $f$ | frequency | Hz | | |
| $f_s$ | service factor | – | | |
| $f_t$ | thermal factor | – | | |
| $F$ | force | – | N | |
| $F_r, F_a$ | radial loads and axial loads | N | – | |
| $f_L$ | service life factor | – | | |
| $g$ | acceleration of gravity | m/s² | | standard 9,81 m/s² |
| $G$ | weight (weight force) | N | | |
| $i$ | transmission ratio | – | | $i = \dfrac{n_1}{n_2}$ |
| $J$ | moment of inertia | kg m² | | |
| $L_h$ | bearing life | h | – | |
| $m$ | mass | kg | | |
| $M$ | torque | N m | | 1 kgf m ≈ 9,81 N m |
| $M_{N2}$ | nominal output torque of gear reducer, for a specific angular velocity | N m | | |
| $M_{2U}$ | maximum value of output torque, for a specific output design | N m | | |
| $M_{N2max}$ | maximum value of nominal output torque, for a specific transmission ratio | N m | | |
| $M_{N2,ref}$ | nominal output torque referred to $n_2 \times L_h$ | N m | | |
| $M_2$ | nominal output torque of gear reducer, derived from input power applied | N m | | |
| $M_{2max}$ | maximum torque admissible on gear reducer low speed shaft | N m | | |
| $M_{2eq}$ | equivalent torque in the cycle, referred to gear reducer low speed shaft | N m | | |
| $n$ | angular speed | min⁻¹ | – | 1 min⁻¹ ≈ 0,105 rad/s |
| $n_{21} ... n_{2n}$ | low speed shaft in the interval 1 ... $n$ in the operation cycle | min⁻¹ | – | |
| $P$ | power | kW | W | 1 CV ≈ 736 W ≈ 0,736 kW |
| $P_t$ | thermal power | kW | – | |
| $P_1$ | input power applied on gear reducer | kW | – | |
| $P_{N2}$ | nominal power produced by gear reducer, referred to low speed shaft | kW | – | |
| $P_{1th}$ | equival. thermal power in the operation cycle, applied on gear reducer high speed shaft | kW | – | |
| $Q_R$ | gear reducer oil quantity at correct level | l | – | |
| $t$ | Celsius temperature | °C | | |
| $t$ | time | s | | |
| $t_1 ... t_n$ | duration of load cycles 1 ... n | h | | |
| $U$ | voltage | V | | |
| $W$ | work, energy | MJ | J | |
| $z$ | frequency of starting | starts/h | – | |
| $\alpha$ | angular acceleration | – | rad/s² | |
| $V_g$ | displacement per revolution | cm³ | | |
| $q_v$ | input flow | l/min⁻¹ | | |
| $\eta$ | efficiency | | | |
| $\eta_v$ | volumetric efficiency | | | |
| $\eta_{mh}$ | mechanical hydraulic efficiency | | | |
| $\eta_t$ | total efficiency ($\eta_v \cdot \eta_{mh}$) | | | |
| $\varphi$ | plane angle | ° | rad | |
| $\Delta\varphi$ | backlash on gear reducer low speed shaft | | | |
| $\Delta p$ | different pressure | bar | | |
| $\omega$ | angular velocity | – | rad/s | 1 rad/s ≈ 9,55 min⁻¹ |

Additional indexes and other symbols

| ind. | Definition |
|---|---|
| N | nominal |
| 1 | relating to high speed shaft (input) |
| 2 | relating to low speed shaft (output) |
| max | maximum |
| min | minimum |
| eq | equivalent |
| th | thermal |
| c | cycle |
| ÷ | from ... to |
| ≈ | approximately equal to |
| ≥ | greater than or equal to |
| ≤ | less than or equal to |

Planetary gear train



Ring gear (locked)
Planet gear
Planet carrier (low speed shaft)
Sun gear (high speed shaft)
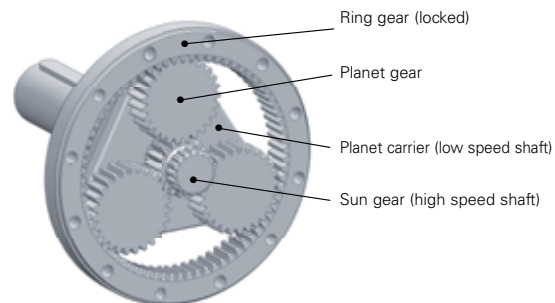
1) SI are the initials of the International Unit System, defined and approved by the General Conference on Weights and Measures as the only system of units of measure.
Ref. CNR UNI 10 003-84 (DIN 1 301-93 NF X 02.004, BS 5 555-93, ISO 1 000-92).
UNI: Ente Nazionale Italiano di Unificazione.    DIN: Deutscher Normenausschuss (DNA).    ISO: International Organization for Standardization.
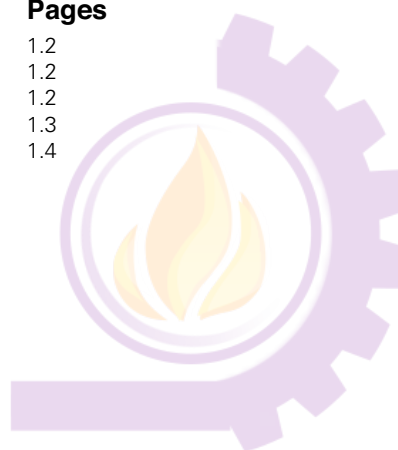
This page is intentionally left blank

# 1. Introduction

1

## Contents

| | Pages |
|---|---|

**1**

## 1.1 Design principles

Rossi planetary gear reducers offer cutting edge technology solutions, exploiting the experience done on all most severe applications, with a comprehensive gear reducer range in every product typology for the industrial sectors. Since over 50 years Rossi is worldwide known for its high quality products.

Applications are studied and developed thinking about the continuous development of the product in terms of:

– flexibility;
– reliability;
– sustainibility;
– total cost of use;
– performance;
– strength;
– user-friendly installation, transport and maintenance;
– service;
– safety.

## 1.2 Main planetary gear reducer features

**General**
– 14 sizes with modular system;
– Nominal torques $M_{N2}$ according to R40/6 (interval by 40%);
– In Line and Bevel Helical execution;
– fastening with through holes flange (B5), integral feet, shaft mounting with torque arm;
– regular size and transmission ratio steps, according to catalog;
– application flexibility more than excepted from catalog;
– modularity and adaptation;
– cylindrical or splined male shafts, cylindrical or splined female shafts, shaft mounting and more;
– comprehensive transmission ratio range from >3,5 to over 10 000;
– comprehensive accessories range (more than 20 different types);
– direct coupling with electric, hydraulic motors, male shaft;
– option combined with other Rossi gear units.

**Finishing**
– rational, clean and easy lines;
– compactness;
– machining quality.

**Design strength**
– torque peaks resistance;
– resistance to radial and axial loads on shafts;
– high torsional stiffness;
– high thermal capacitance in the category.

## 1.3 Competitive advantages

**regular size and transmission ratio steps**
– the realization of a range of machines or plants rationalizing the costs;
– the rational and clean design of our gear units gives a cutting edge technology, quality safety, cleaning, precision and perfection image of the machine on which they are installed.
– facilitating assembly and periodical maintenance;
– improving painting resistance;
– compactness (dimensions and weight);
– reducing the transport costs;
– maximizing the optimization of machine design.

**Modular system**
– quick deliveries and service worldwide.
– excellent ratio in terms of solution reliability / cost.

**Quality and precision:**
– safety;
– nearly maintenance free;
– low use cost;
– low noise;
– increased performance with the same dimensions and weights;
– value and strength perception.

**Easy installation, transport and maintenance**
– reduced machine assembly times;
– reduced maintenance times;
– quickness and safety in case of operation.

## 1.4 Application fields

Rossi planetary gear reducers are used in nearly all application fields requiring:
– high torque values;
– peak resistance;
– high transmission ratio;
– high efficiency;
– reliability and long life;
– reduced weights and overall dimensions.

**Some examples of application fields**

### Construction
– Mixing mills (cement, asphalt, semiliquid materials);
– Dryers;
– Crushing machines;
– Cranes;
– Mobile scaffolds.

### Substructures
– Movable gantries;
– Piling;
– Movable roofs.

### Material handling
– Movable stocks;
– Gantry cranes;
– Bridge cranes;
– Mobile dock cranes.

### Waste and sewage treatment
– Thickeners, clarifiers;
– Agitators;
– Rotating filters;
– Worm hoists.

### Mine and quarry machines
– Selectors;
– Crushing machines;
– Classifiers;
– Worm transport systems;
– Conveyors;
– Rotation gear reducers;
– Drilling and excavation machines.

### Steel processing machines
– Bending rolls;
– Friction calenders;
– Rolling mills;
– Extruders;
– Cutting machines;
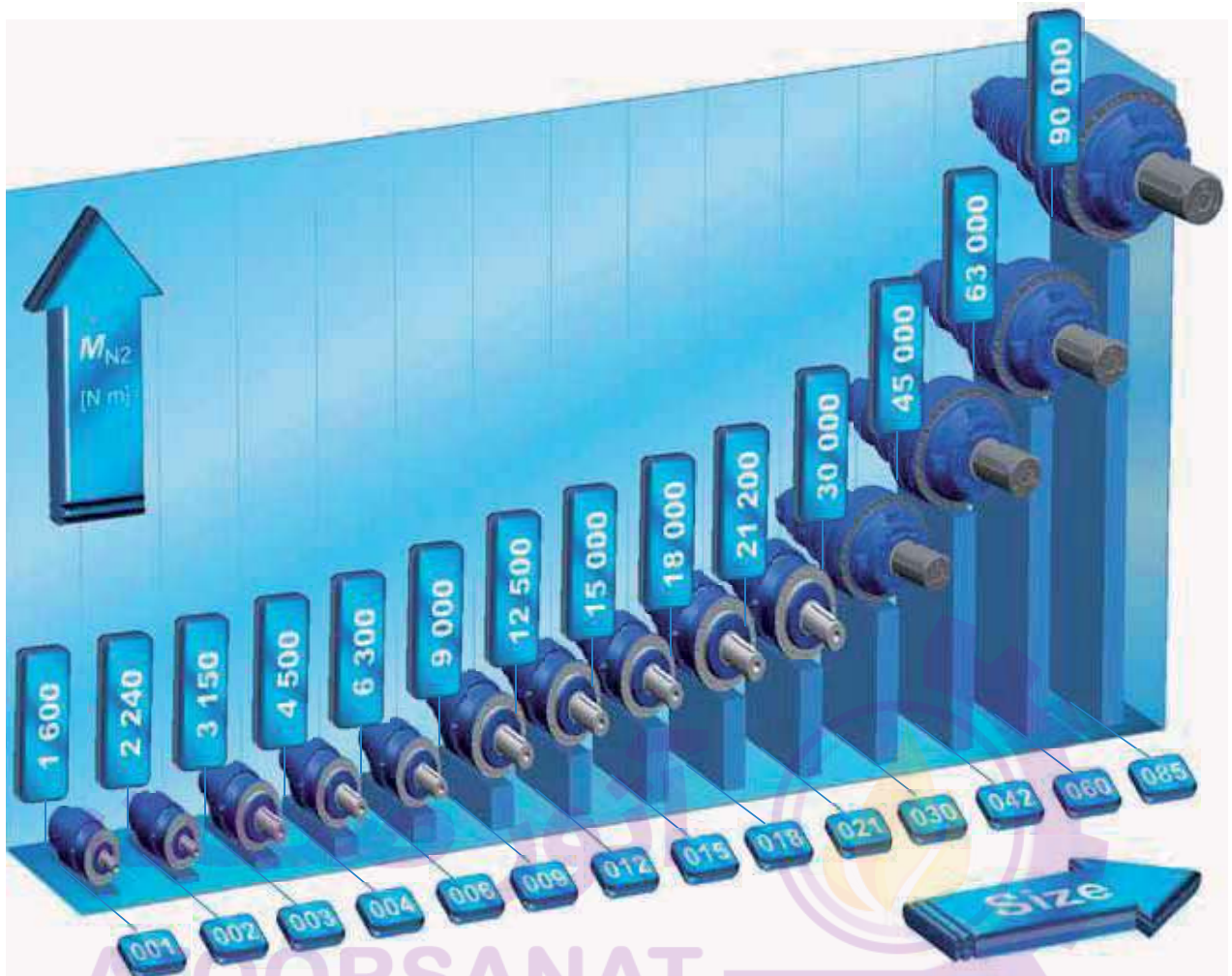– Conveyors.

### Wind energy
– Yaw drive gear unit;
– Gear reducers for pitch variation.

### Food industry
– Mixing machines;
– Conveyors;
– Fruit extractor machines;
– Mixers.

## 1.5 Main structural features

**Modular system**



– **14 sizes with modular system**:
– Nominal torques $M_{N2}$ according to R40/6 (stepped by 40%);
– fastening with through holes flange (B5), with integral feet, shaft mounting with torque arm;

**Train of gears**
– 1, 2, 3 or 4 reduction stages for coaxial and 2, 3 or 4 stages for bevel helical design (5 stages on request);
– nominal transmission ratios to R 20 (3,55 ... 3 550) for coaxial, R 20 (9 ... 2 240) for bevel helical;
– external gear pair made of casehardened and hardened steel; internal gearing made of nitrided steel;
– cylindrical spur gears with **ground** profile and flank modification;
– GLEASON spiral bevel gear pairs with **ground** profile;
– floating or supported planet carrier in through hardened steel or nodular cast iron according to gear reducer size;

**Bearings**
– **low speed shaft,** according to gear reducer size: taper roller bearings or spherical roller bearings for cylindrical shaft end and splined shaft; taper roller bearing or full complement cylindrical roller bearing for hollow shaft with shrink disc and flange shaft; ball bearings or full complement cylindrical roller bearing for splined hollow shaft and hollow with keyway;
– **high speed shaft**: ball or cylindrical roller bearings according to sizes;
– **planet gears**: full complement roller bearings for the highest support stifness;

**Housing**
– nodular cast iron housing;

**Lubrication**
– internal protection in synthetic paint appropriate for resistance to mineral or to polyalphaolefines synthetic oil (PAO);
– oil bath lubrication; PAO based synthetic oil included in the supply for sizes 001A ... 021A (see ch. 8.6) with filler plug with valve; drain and level plug; sealed;

**Painting**:

Products are painted with single compound ester epoxy or phenolic resin basis primer (pre-painted) and water-soluble polyacrilic dual-compound enamel colour blue RAL 5010 DIN 1843.
Paint resistant to atmospheric and aggressive agents (atmospheric corrosivity category C3 according to ISO 12944-2).

**Normative reference:**

— shaft heights to UNI 2946-68 (DIN 747-76, ISO 496-73);
— nominal transmission ratios and main dimensions according to UNI 2016 standard numbers (DIN 323-74, ISO 3-73);
— toothing profile to UNI 6587-69 (DIN 867-86, ISO 53-74);
— (long or short) cylindrical shaft ends derived from UNI ISO 775-88 (DIN 748, ISO/R 775); splined to DIN 5482 or DIN 5480;
— keys to UNI 6604-69 (DIN 6855-BI.1-68, ISO/R 773-69);
— mounting positions derived from CEI 2-14 (DIN EN 60034-7, IEC 34.7);
— gear load capacity verified to ISO 6336;
— bearing load capacity verified according to ISO 281-2008.

1

This page is intentionally left blank