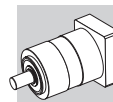


TR



BONFIGLIOLI



SUMMARY

Chapter Contents

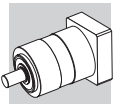


| | | |
|----------|---|-----------|
| 1 | General information | 2 |
| 1.1 | Symbols and units of measurement | 2 |
| 1.2 | Features of TR series | 3 |
| 1.3 | Versions | 4 |
| 1.4 | Selecting the gear unit | 5 |
| 1.5 | Service life of bearings | 6 |
| 1.6 | Ordering code | 8 |
| 2 | Gearbox rating chart | 9 |
| 2.1 | TR 053 | 9 |
| 2.2 | TR 060 | 10 |
| 2.3 | TR 080 | 11 |
| 2.4 | TR 105 | 12 |
| 2.5 | TR 130 | 13 |
| 2.6 | TR 160 | 14 |
| 2.7 | TR 190 | 15 |
| 2.8 | Permitted axial and radial forces for version TR...MB | 16 |
| 2.9 | Mass moment of inertia | 17 |
| 2.9.1 | TR 053 | 17 |
| 2.9.2 | TR 060 | 18 |
| 2.9.3 | TR 080 | 19 |
| 2.9.4 | TR 105 | 20 |
| 2.9.5 | TR 130 | 21 |
| 2.9.6 | TR 160 | 22 |
| 2.9.7 | TR 190 | 23 |
| 3 | Dimensions | 24 |
| 3.1 | TR 053 | 24 |
| 3.2 | TR 060 | 25 |
| 3.3 | TR 080 | 26 |
| 3.4 | TR 105 | 28 |
| 3.5 | TR 130 | 30 |
| 3.6 | TR 160 | 32 |
| 3.7 | TR 190 | 34 |
| 3.8 | Gearbox without motor adapter | 35 |

Revisions

Refer to page 36 for the catalogue revision index.

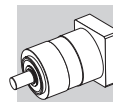
Visit www.tecnoingranaggi.it to search for catalogues with up-to-date revisions.



1 GENERAL INFORMATION

1.1 SYMBOLS AND UNITS OF MEASUREMENT

| | | |
|-------------|----------------------|---|
| A_n | [N] | The admissible thrust force can be applied axially to the shaft under study along. The catalogue value is calculated for an output speed $n_2 = 100 \text{ min}^{-1}$ |
| C_t | [Nm/arcmin] | Torsional stiffness |
| | | Gear ratio is expressed as the relationship of the input speed to the output speed: |
| i | - | $i = \frac{n_1}{n_2}$ |
| I | - | Intermittence is defined as the relationship of the operating time to the cycle time |
| f_c | - | Cycle factor. An adjusting factor that is to be accounted for when selecting gear unit operating under continuous duty S1 |
| f_z | - | Service factor |
| M_{a2} | [Nm] | Maximum acceleration torque acceptable for a duty with $I < 60\%$ |
| M_{n2} | [Nm] | Nominal output torque |
| M_{p2} | [Nm] | Emergency stop torque. The value cannot apply more than 1000 times over the entire life of the gear unit and should not recur in normal operating conditions |
| J | [Kgcm ²] | Mass moment of inertia of the gear unit |
| L_{10} | [h] | Average service life of bearings |
| n_1 | [min ⁻¹] | Nominal input speed (continuous duty S1). It is the reference speed for duties with intermittence $I \geq 60\%$ and/or operating time $\geq 20 \text{ min}$ |
| n_{1max} | [min ⁻¹] | Maximum momentary input speed. The speed the unit can be driven at occasionally and in non-repetitive conditions. For cyclic duty, type S5, it cannot be applied continuously for more than 30 seconds |
| R_n | [N] | The admissible radial force must be equal to, or greater than, the radial force actually applying onto the shaft. Catalogue value is based on output speed $n_2 = 100 \text{ min}^{-1}$ |
| T_c | [°C] | Housing temperature. Under no circumstances it should exceed 90°C |
| φ_s | [arcmin] | Standard backlash is calculated in static conditions and with the application of a torque equal to 2% of the nominal torque for the gear unit |
| φ_R | [arcmin] | Reduced backlash is calculated in static conditions and with the application of a torque equal to 2% of the nominal torque for the gear unit |
| | | Dynamic efficiency is calculated through the relationship of output torque to torque applied to input shaft under nominal conditions: |
| η | [%] | $\eta_d = \frac{M_2}{M_1 \times i} \times 100$ |
| Z | - | Number of accelerations/switches per hour |



1.2 FEATURES OF TR SERIES

- Their limited backlash, up to 5' in the **standard** execution, can be optionally further **reduced** to 3', for applications where maximum precision and repeatability are mandatory.
- Bearings are rated for an average service life of 20,000 hours under nominal operating conditions. As standard, frame sizes 053, 060 feature rigid ball bearings while sizes 080, 105, 130, 160 and 190 feature taper roller bearings.
- The gearbox is filled in the factory with a lubricant suitable for ambient temperatures in the 0°C to 40°C range. Because the quantity of lubricant required depends on the mounting position, this must be specified in the order. The lubricant does not normally require changing unless it becomes contaminated from outside. The type of lubricant used (grease or synthetic oil) and the material used for the seals also vary according to duty rating and gearbox size. The chart below illustrates the various combinations:

| duty | 053 | 060 | 080 | 105 | 130 | 160 | 190 |
|------|---------|---------|---------|---------|---------|---------|---------|
| S1 | G / V | G / V | O / V | O / V | O / V | O / V | O / V |
| S5 | G / NBR | G / NBR | G / NBR | G / NBR | G / NBR | G / NBR | G / NBR |

Legend:

S1 = Continuous duty

S5 = Intermittent duty

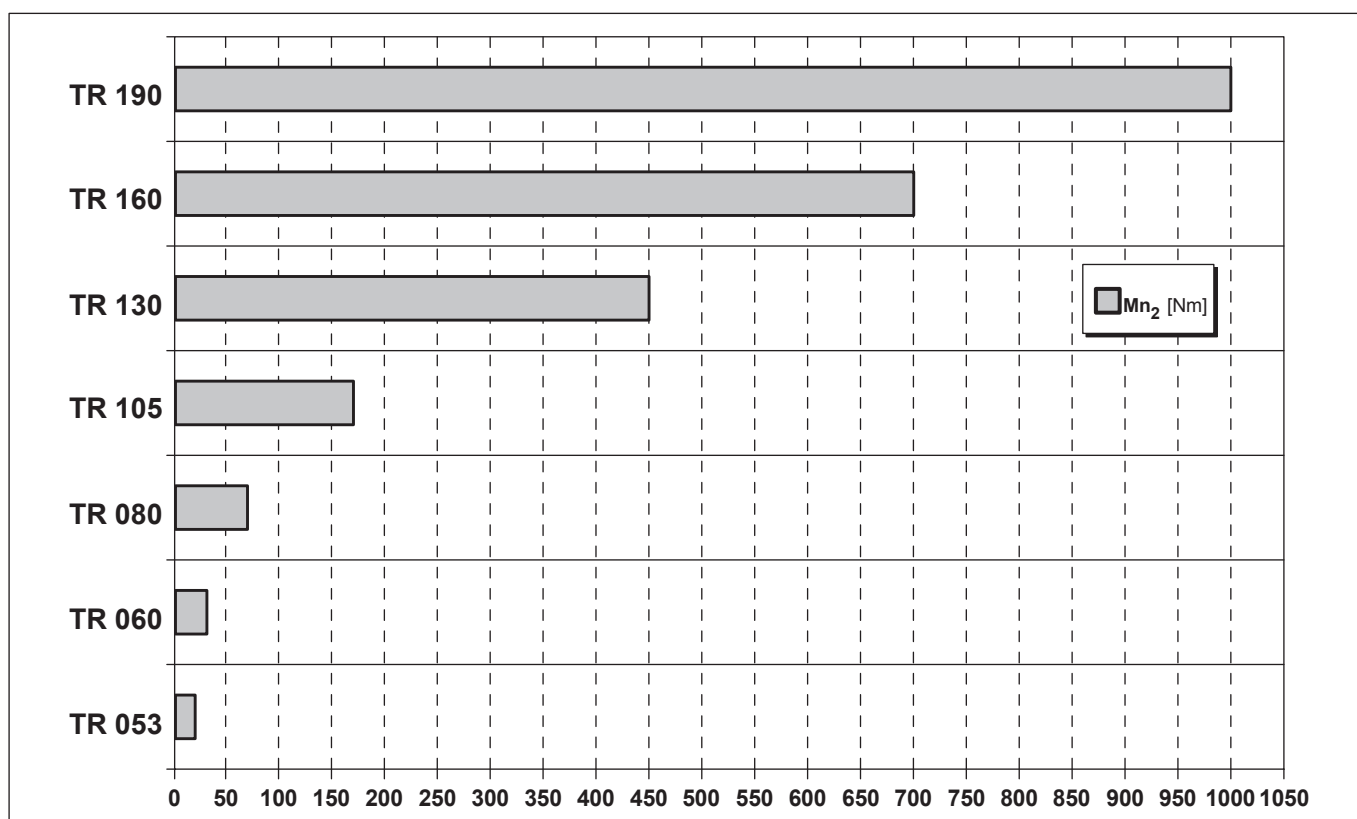
O = Synthetic oil, viscosity ISO VG 220

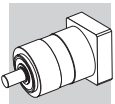
G = Grease, consistency 00

V = Viton® seals

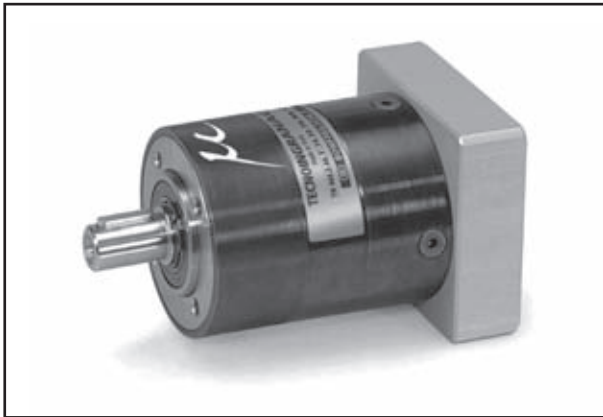
NBR = Nitrile rubber seals

- Degree of protection IP65
- Noise level $L_p \leq 70$ dB(A) - $n_1 = 3000$ min⁻¹
- Numerous input options
- Ratio $i = 10$ available for single-reduction units ($i=9$ for frame size 053 alone)





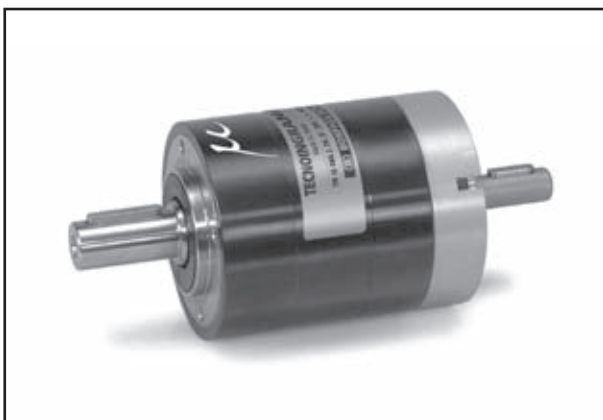
1.3 VERSIONS



—

Coaxial gear unit

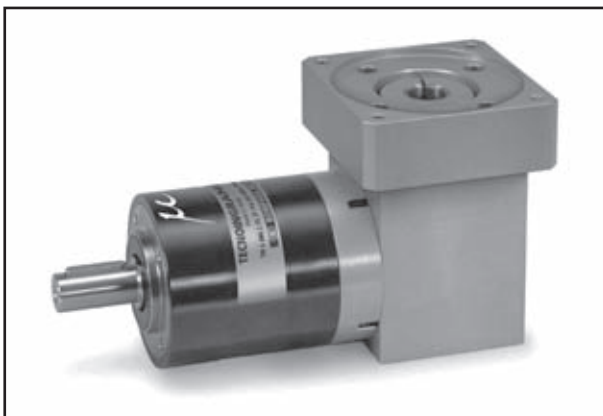
053...190



IS

Gear unit with solid input shaft

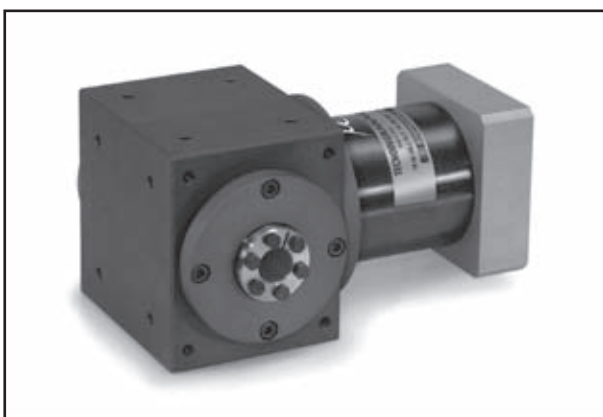
053...160



G

Right-angle gear unit

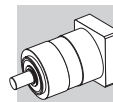
053...160



MB

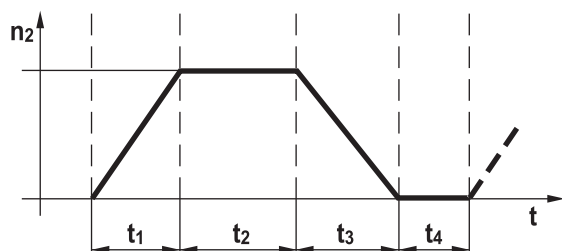
Right angle gear unit with through hollow shaft

080...160



1.4 SELECTING THE GEAR UNIT

- Determine intermittence I:



$$I [\%] = \frac{t_1 + t_2 + t_3}{t_1 + t_2 + t_3 + t_4}$$

- t_1 = starting time
- t_2 = operating time at constant speed
- t_3 = stopping time
- t_4 = rest time

- 1) Determine the applicable duty for the application:

| | Z ≤ 1000 | Z > 1000 |
|---------|----------|----------|
| I < 60% | S5 | S1 |
| I ≥ 60% | S1 | S1 |

S5 cyclic duty

- 2) Search the gear unit for which the condition is verified:

$$M_{a2} \geq M_{1max} \times i \times \eta$$

M_{1max} = Maximum acceleration torque of motor

S1 continuous duty

- 2) Determine service factor f_z :

| Z | f_z |
|-----------------|------------|
| Z ≤ 1000 | 1.00 |
| 1000 < Z ≤ 1500 | 1.25 |
| 1500 < Z ≤ 2000 | 1.50 |
| 2000 < Z ≤ 2500 | 1.75 |
| 2500 < Z ≤ 3000 | 2.00 |
| Z > 3000 | Contact us |

- 3) Determine cycle factor f_c :

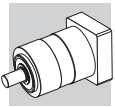
| I | 20%...60% | 80% | 100% |
|-------|-----------|-----|------|
| f_c | 1.0 | 1.2 | 1.4 |

- 4) Search the gear unit for which the condition is verified:

$$M_{n2} \geq M_{1max} \times i \times \eta \times f_z \times f_c$$



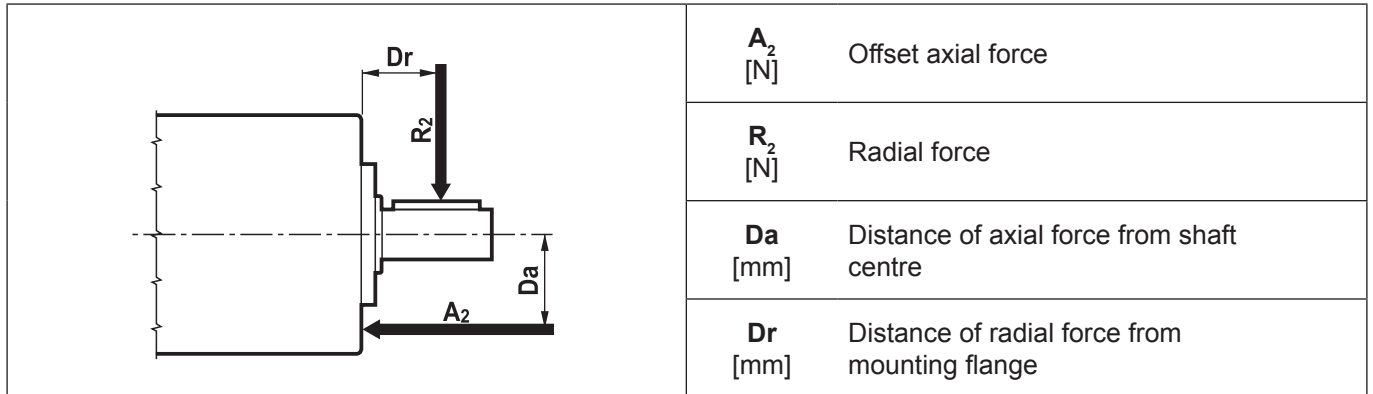
If, under particular operating conditions, a housing temperature higher than usual is to be expected, it is recommended that Viton® seals are specified at the time of order through option **S1**. Under no circumstances the maximum speed [n_{1max}] permitted for the gear unit should be exceeded. Should the surface temperature exceed 90°C it is recommended that speed is reduced, or an auxiliary cooling system is provided.



1.5 SERVICE LIFE OF BEARINGS

Whether bearings are ball type (**CS**) or taper roller type (**CR**), their service life can be calculated through the equations where actual radial and axial forces are accounted for.

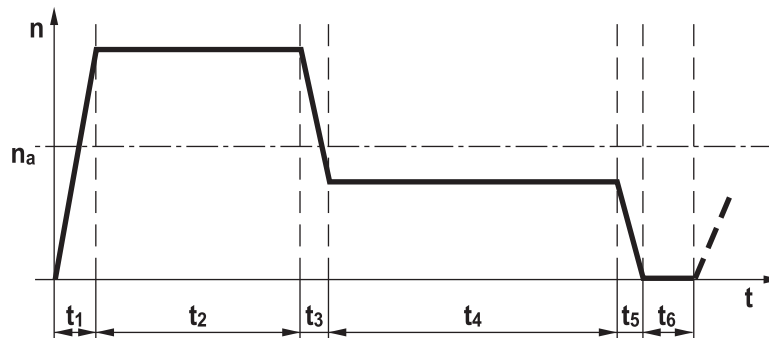
| | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| TR 053 | TR 060 | TR 080 | TR 105 | TR 130 | TR 160 | TR 190 |
| CS | CS | CR | CR | CR | CR | CR |



SERVICE LIFE CALCULATION FOR RIGID BALL BEARINGS (CS)

$$F_{eq} = \frac{A_2 \times D_a + R_2 \times (D_r + b)}{a}$$

$$n_a = \frac{n_1 \times t_1 + n_2 \times t_2 + \dots + n_5 \times t_5}{t_1 + t_2 + t_3 + t_4 + t_5 + t_6}$$



$$L_{10}(h) = \frac{16666}{n_a} \times \left(\frac{c}{F_{eq}} \right)^3$$

| Load location factor | TR 053 | TR 060 |
|----------------------|--------|--------|
| a | 15.5 | 14.4 |
| b | 17 | 17.4 |
| c | 5600 | 9550 |

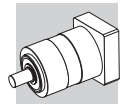
F_{eq} [N] = Equivalent force resulting from radial and axial forces applying simultaneously

n_a [min⁻¹] = Mean output speed

$L_{10}(h)$ = Theoretical service life of bearings

Calculate $e = A_2/F_{eq}$, and check that condition $e \leq 0.19$ is verified.

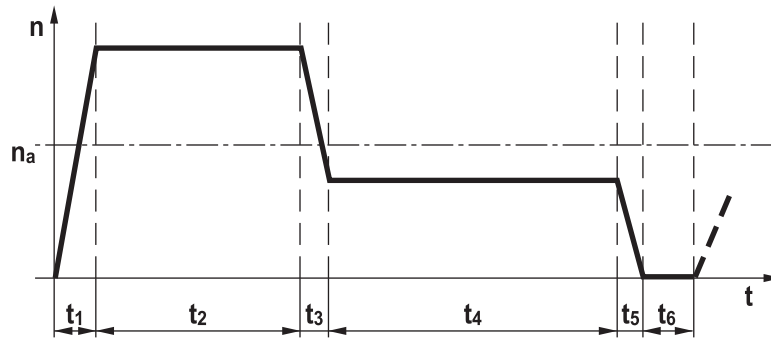
If $e > 0.19$ contact our Technical Service.



SERVICE LIFE CALCULATION FOR TAPER ROLLER BEARING (CR)

$$F_{eq} = \frac{A_2 \times D_a + R_2 \times (D_r + b)}{a}$$

$$n_a = \frac{n_1 \times t_1 + n_2 \times t_2 + \dots + n_5 \times t_5}{t_1 + t_2 + t_3 + t_4 + t_5 + t_6}$$



$$L_{10}(h) = \frac{16666}{n_a} \times \left(\frac{c}{F_{eq}} \right)^{10/3}$$

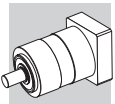
| Load location factor | TR 080 | TR 105 | TR 130 | TR 160 | TR 190 |
|----------------------|--------|--------|--------|--------|--------|
| a | 28 | 35 | 45 | 52 | 62 |
| b | 35.55 | 41.25 | 51.75 | 56.75 | 64.25 |
| c | 30800 | 51200 | 76500 | 99000 | 14000 |

F_{eq} [N] = Equivalent force resulting from radial and axial forces applying simultaneously

n_a [min⁻¹] = Mean output speed

$L_{10}(h)$ = Theoretical service life of bearings

Calculate $e = A_2/F_{eq}$, and check that condition $e \leq 0.4$ is verified.
If $e > 0.4$ contact our Technical Service.



1.6 ORDERING CODE

TR G 080 2 70 10' 14 30 60 75 S1 O TH

— TH: MOTOR WITH THREADED HOLES

MOUNTING POSITION:
O (horizontal)
VS (vertical - motor up)
VI (vertical - motor down)

— S1: continuous duty setting

PCD OF MOTOR ADAPTER HOLES

PILOT DIAMETRE OF MOTOR ADAPTER

MOTOR SHAFT LENGTH

MOTOR SHAFT DIAMETER

| | TR 053 | TR 060 | TR 080 | TR 105 | TR 130 | TR 160 | TR 190 |
|----------|-----------|-----------|-------------|-------------|-------------|-------------|---------|
| D | 6 - 6.35 | 6 - 6.35 | 8 - 9 | 11 - 12 | 14 - 15.875 | 14 - 15.875 | 14 - 16 |
| | 7 - 8 | 7 - 8 | 9.52 - 11 | 12.7 - 14 | 16 - 19 | 16 - 19 | 19 - 22 |
| | 9 - 9.52 | 9 - 9.52 | 12 - 12.7 | 15 - 15.875 | 22 - 24 | 22 - 24 | 24 - 28 |
| | 10 - 11 | 10 - 11 | 14 - 15.875 | 16 - 19 | 28 - 32 | 28 - 32 | 32 - 35 |
| | 12 - 12.7 | 12 - 12.7 | 16 - 17 | 22 - 24 | 35 - 38 | 35 - 38 | 38 - 42 |
| | 14 | 14 | 19 - 19.05 | 28 - 32 | | | 45 - 48 |

BACKLASH

| | 1-stage | 2-stage | 3-stage |
|---------------------------------|-----------|-----------|-----------|
| Standard (TR053...TR190) | 5' | 5' | 7' |
| Reduced (TR060...TR190) | 3' | 3' | 5' |

GEAR RATIO

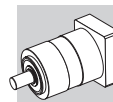
REDUCTIONS
1, 2, 3

FRAME SIZE
053, 060, 080, 105, 130, 160, 190

VERSIONS
 — = coaxial
IS = solid input shaft
G = right angle gear unit
MB = right angle gear unit with through hollow shaft

SERIES
TR

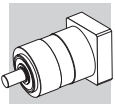
Optional variant



2 GEARBOX RATING CHART

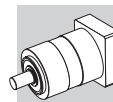
2.1 TR 053

| TR 053 | | | | | | | | | | | | |
|--------------|-------------------------|-------------------------|-------------------------|--|---|----------------------------|----------------------------|-------------------------------|------------------------|------------------------|------------------------|--------|
| i | M _{n2} [Nm] | M _{a2} [Nm] | M _{p2} [Nm] | n ₁ [min ⁻¹] | n _{1max} [min ⁻¹] | φ _S [arcmin] | φ _R [arcmin] | C _t [Nm/arcmin] | R _{n1} [N] | R _{n2} [N] | A _{n2} [N] | η % |
| TR 053 1_3 | 12 | 22 | 40 | 3300 | 4000 | 5' | - | 1 | 200 | 500 | 600 | 97 |
| TR 053 1_4 | 15 | 28 | 45 | 3500 | 5000 | 5' | - | 1 | 200 | 500 | 600 | 97 |
| TR 053 1_5 | 15 | 28 | 45 | 3500 | 5000 | 5' | - | 1 | 200 | 500 | 600 | 97 |
| TR 053 1_6 | 15 | 28 | 45 | 3500 | 5000 | 5' | - | 1 | 200 | 500 | 600 | 97 |
| TR 053 1_7 | 15 | 28 | 45 | 4000 | 6000 | 5' | - | 1 | 200 | 500 | 600 | 97 |
| TR 053 1_9 | 12 | 22 | 40 | 4000 | 6000 | 5' | - | 1 | 200 | 500 | 600 | 97 |
| TR 053 2_12 | 20 | 30 | 60 | 3300 | 4000 | 5' | - | 0.9 | 200 | 500 | 600 | 94 |
| TR 053 2_15 | 20 | 30 | 60 | 3300 | 4000 | 5' | - | 0.9 | 200 | 500 | 600 | 94 |
| TR 053 2_16 | 20 | 30 | 60 | 3500 | 5000 | 5' | - | 0.9 | 200 | 500 | 600 | 94 |
| TR 053 2_20 | 20 | 30 | 60 | 3500 | 5000 | 5' | - | 0.9 | 200 | 500 | 600 | 94 |
| TR 053 2_25 | 20 | 30 | 60 | 3500 | 5000 | 5' | - | 0.9 | 200 | 500 | 600 | 94 |
| TR 053 2_28 | 20 | 30 | 60 | 4000 | 6000 | 5' | - | 0.9 | 200 | 500 | 600 | 94 |
| TR 053 2_35 | 20 | 30 | 60 | 4000 | 6000 | 5' | - | 0.9 | 200 | 500 | 600 | 94 |
| TR 053 2_36 | 15 | 28 | 45 | 4000 | 6000 | 5' | - | 0.9 | 200 | 500 | 600 | 94 |
| TR 053 2_45 | 20 | 30 | 60 | 4000 | 6000 | 5' | - | 0.9 | 200 | 500 | 600 | 94 |
| TR 053 3_60 | 20 | 30 | 60 | 3500 | 5000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 2_81 | 12 | 22 | 40 | 4000 | 6000 | 5' | - | 0.9 | 200 | 500 | 600 | 94 |
| TR 053 3_48 | 20 | 30 | 60 | 3500 | 5000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_64 | 20 | 30 | 60 | 3500 | 5000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_75 | 20 | 30 | 60 | 3500 | 5000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_80 | 20 | 30 | 60 | 3500 | 5000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_84 | 20 | 30 | 60 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_100 | 20 | 30 | 60 | 3500 | 5000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_112 | 20 | 30 | 60 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_125 | 20 | 30 | 60 | 3500 | 5000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_140 | 20 | 30 | 60 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_144 | 20 | 30 | 60 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_175 | 20 | 30 | 60 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_180 | 20 | 30 | 60 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_216 | 20 | 30 | 60 | 3500 | 5000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_225 | 20 | 30 | 60 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_245 | 20 | 30 | 60 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_252 | 20 | 30 | 60 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_324 | 20 | 30 | 60 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_405 | 20 | 30 | 60 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_567 | 20 | 30 | 60 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |
| TR 053 3_729 | 12 | 22 | 40 | 4000 | 6000 | 7' | - | 0.7 | 200 | 500 | 600 | 90 |



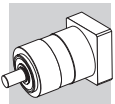
2.2 TR 060

| TR 060 | | | | | | | | | | | | |
|---------------|-------------------------|-------------------------|-------------------------|--|---|----------------------------|----------------------------|-------------------------------|------------------------|------------------------|------------------------|--------|
| i | M _{n2} [Nm] | M _{a2} [Nm] | M _{p2} [Nm] | n ₁ [min ⁻¹] | n _{1max} [min ⁻¹] | φ _S [arcmin] | φ _R [arcmin] | C _t [Nm/arcmin] | R _{n1} [N] | R _{n2} [N] | A _{n2} [N] | η % |
| TR 060 1_3 | 18 | 35 | 70 | 3300 | 4000 | 5' | 3' | 3.0 | 200 | 600 | 700 | 97 |
| TR 060 1_4 | 25 | 40 | 90 | 3500 | 5000 | 5' | 3' | 3.0 | 200 | 600 | 700 | 97 |
| TR 060 1_5 | 25 | 40 | 90 | 3500 | 5000 | 5' | 3' | 3.0 | 200 | 600 | 700 | 97 |
| TR 060 1_6 | 25 | 40 | 90 | 3500 | 5000 | 5' | 3' | 3.0 | 200 | 600 | 700 | 97 |
| TR 060 1_7 | 25 | 40 | 90 | 4000 | 6000 | 5' | 3' | 3.0 | 200 | 600 | 700 | 97 |
| TR 060 1_10 | 18 | 35 | 70 | 4000 | 6000 | 5' | 3' | 3.0 | 200 | 600 | 700 | 97 |
| TR 060 2_9 | 18 | 35 | 70 | 3300 | 4000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_12 | 30 | 45 | 100 | 3300 | 4000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_15 | 30 | 45 | 100 | 3300 | 4000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_16 | 30 | 45 | 100 | 3500 | 5000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_20 | 30 | 45 | 100 | 3500 | 5000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_25 | 30 | 45 | 100 | 3500 | 5000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_28 | 30 | 45 | 100 | 4000 | 6000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_30 | 18 | 35 | 70 | 4000 | 6000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_35 | 30 | 45 | 100 | 4000 | 6000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_36 | 25 | 40 | 90 | 3500 | 5000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_40 | 30 | 45 | 100 | 4000 | 6000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_50 | 30 | 45 | 100 | 4000 | 6000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_70 | 30 | 45 | 100 | 4000 | 6000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 2_100 | 18 | 35 | 70 | 4000 | 6000 | 5' | 3' | 2.5 | 200 | 600 | 700 | 94 |
| TR 060 3_48 | 30 | 45 | 100 | 3500 | 5000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_64 | 30 | 45 | 100 | 3500 | 5000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_75 | 30 | 45 | 100 | 3500 | 5000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_80 | 30 | 45 | 100 | 3500 | 5000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_84 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_90 | 18 | 35 | 70 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_120 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_125 | 30 | 45 | 100 | 3500 | 5000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_140 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_150 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_160 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_175 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_200 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_210 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_216 | 30 | 45 | 100 | 3500 | 5000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_250 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_280 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_350 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_400 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_500 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_700 | 30 | 45 | 100 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |
| TR 060 3_1000 | 18 | 35 | 70 | 4000 | 6000 | 7' | 5' | 2.0 | 200 | 600 | 700 | 90 |



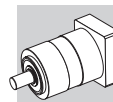
2.3 TR 080

| TR 080 | | | | | | | | | | | | |
|---------------|-------------------------|-------------------------|-------------------------|--|---|----------------------------|----------------------------|-------------------------------|------------------------|------------------------|------------------------|--------|
| i | M _{n2} [Nm] | M _{a2} [Nm] | M _{p2} [Nm] | n ₁ [min ⁻¹] | n _{1max} [min ⁻¹] | φ _S [arcmin] | φ _R [arcmin] | C _t [Nm/arcmin] | R _{n1} [N] | R _{n2} [N] | A _{n2} [N] | η % |
| TR 080 1_3 | 40 | 80 | 180 | 2900 | 3500 | 5' | 3' | 8.0 | 400 | 2500 | 3000 | 97 |
| TR 080 1_4 | 50 | 80 | 200 | 3100 | 4500 | 5' | 3' | 8.0 | 400 | 2500 | 3000 | 97 |
| TR 080 1_5 | 50 | 80 | 200 | 3200 | 4500 | 5' | 3' | 8.0 | 400 | 2500 | 3000 | 97 |
| TR 080 1_6 | 50 | 80 | 200 | 3200 | 4500 | 5' | 3' | 8.0 | 400 | 2500 | 3000 | 97 |
| TR 080 1_7 | 50 | 80 | 200 | 4000 | 6000 | 5' | 3' | 8.0 | 400 | 2500 | 3000 | 97 |
| TR 080 1_10 | 40 | 80 | 180 | 4000 | 6000 | 5' | 3' | 8.0 | 400 | 2500 | 3000 | 97 |
| TR 080 2_9 | 40 | 80 | 180 | 2900 | 3500 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_12 | 70 | 100 | 250 | 2900 | 3500 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_15 | 70 | 100 | 250 | 2900 | 3500 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_16 | 70 | 100 | 250 | 3100 | 4500 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_20 | 70 | 100 | 250 | 3200 | 4500 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_25 | 70 | 100 | 250 | 3200 | 4500 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_28 | 70 | 100 | 250 | 4000 | 6000 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_30 | 40 | 80 | 180 | 4000 | 6000 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_35 | 70 | 100 | 250 | 4000 | 6000 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_36 | 50 | 80 | 200 | 3200 | 4500 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_40 | 70 | 100 | 250 | 4000 | 6000 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_50 | 70 | 100 | 250 | 4000 | 6000 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_70 | 70 | 100 | 250 | 4000 | 6000 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 2_100 | 40 | 80 | 180 | 4000 | 6000 | 5' | 3' | 6.5 | 400 | 2500 | 3000 | 94 |
| TR 080 3_48 | 70 | 100 | 250 | 3100 | 4500 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_64 | 70 | 100 | 250 | 3100 | 4500 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_75 | 70 | 100 | 250 | 3200 | 4500 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_80 | 70 | 100 | 250 | 3100 | 4500 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_84 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_90 | 40 | 80 | 180 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_120 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_125 | 70 | 100 | 250 | 3200 | 4500 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_140 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_150 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_160 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_175 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_200 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_210 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_216 | 70 | 100 | 250 | 3200 | 4500 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_250 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_280 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_350 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_400 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_500 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_700 | 70 | 100 | 250 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |
| TR 080 3_1000 | 40 | 80 | 180 | 4000 | 6000 | 7' | 5' | 5.5 | 400 | 2500 | 3000 | 90 |



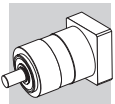
2.4 TR 105

| TR 105 | | | | | | | | | | | | |
|---------------|-------------------------|-------------------------|-------------------------|--|---|----------------------------|----------------------------|-------------------------------|------------------------|------------------------|------------------------|--------|
| i | M _{n2} [Nm] | M _{a2} [Nm] | M _{p2} [Nm] | n ₁ [min ⁻¹] | n _{1max} [min ⁻¹] | φ _S [arcmin] | φ _R [arcmin] | C _t [Nm/arcmin] | R _{n1} [N] | R _{n2} [N] | A _{n2} [N] | η % |
| TR 105 1_3 | 100 | 180 | 360 | 2500 | 3500 | 5' | 3' | 24 | 600 | 3800 | 4000 | 97 |
| TR 105 1_4 | 140 | 210 | 450 | 2800 | 4500 | 5' | 3' | 24 | 600 | 3800 | 4000 | 97 |
| TR 105 1_5 | 140 | 210 | 450 | 3000 | 4500 | 5' | 3' | 24 | 600 | 3800 | 4000 | 97 |
| TR 105 1_6 | 140 | 210 | 450 | 3000 | 4500 | 5' | 3' | 24 | 600 | 3800 | 4000 | 97 |
| TR 105 1_7 | 140 | 210 | 450 | 3500 | 5000 | 5' | 3' | 24 | 600 | 3800 | 4000 | 97 |
| TR 105 1_10 | 100 | 180 | 360 | 3500 | 5000 | 5' | 3' | 24 | 600 | 3800 | 4000 | 97 |
| TR 105 2_9 | 100 | 180 | 360 | 2500 | 3500 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_12 | 170 | 250 | 600 | 2500 | 3500 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_15 | 170 | 250 | 600 | 2500 | 3500 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_16 | 170 | 250 | 600 | 2800 | 4500 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_20 | 170 | 250 | 600 | 3000 | 4500 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_25 | 170 | 250 | 600 | 3000 | 4500 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_28 | 170 | 250 | 600 | 3500 | 5000 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_30 | 100 | 180 | 360 | 3500 | 5000 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_35 | 170 | 250 | 600 | 3500 | 5000 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_36 | 140 | 210 | 450 | 3000 | 4500 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_40 | 170 | 250 | 600 | 3500 | 5000 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_50 | 170 | 250 | 600 | 3500 | 5000 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_70 | 170 | 250 | 600 | 3500 | 5000 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 2_100 | 100 | 180 | 360 | 3500 | 5000 | 5' | 3' | 21.5 | 600 | 3800 | 4000 | 94 |
| TR 105 3_48 | 170 | 250 | 600 | 2800 | 4500 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_64 | 170 | 250 | 600 | 2800 | 4500 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_75 | 170 | 250 | 600 | 3000 | 4500 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_80 | 170 | 250 | 600 | 2800 | 4500 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_84 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_90 | 100 | 180 | 360 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_120 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_125 | 170 | 250 | 600 | 3000 | 4500 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_140 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_150 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_160 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_175 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_200 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_210 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_216 | 170 | 250 | 600 | 3000 | 4500 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_250 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_280 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_350 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_400 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_500 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_700 | 170 | 250 | 600 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |
| TR 105 3_1000 | 100 | 180 | 360 | 3500 | 5000 | 7' | 5' | 18 | 600 | 3800 | 4000 | 90 |



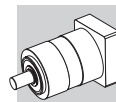
2.5 TR 130

| TR 130 | | | | | | | | | | | | |
|---------------|-------------------------|-------------------------|-------------------------|--|---|----------------------------|----------------------------|-------------------------------|------------------------|------------------------|------------------------|--------|
| i | M _{n2} [Nm] | M _{a2} [Nm] | M _{p2} [Nm] | n ₁ [min ⁻¹] | n _{1max} [min ⁻¹] | φ _S [arcmin] | φ _R [arcmin] | C _t [Nm/arcmin] | R _{n1} [N] | R _{n2} [N] | A _{n2} [N] | η % |
| TR 130 1_3 | 215 | 400 | 800 | 2100 | 3000 | 5' | 3' | 45 | 800 | 5500 | 6500 | 97 |
| TR 130 1_4 | 380 | 600 | 1100 | 2400 | 3500 | 5' | 3' | 45 | 800 | 5500 | 6500 | 97 |
| TR 130 1_5 | 380 | 600 | 1100 | 2900 | 3500 | 5' | 3' | 45 | 800 | 5500 | 6500 | 97 |
| TR 130 1_6 | 380 | 600 | 1100 | 2900 | 3500 | 5' | 3' | 45 | 800 | 5500 | 6500 | 97 |
| TR 130 1_7 | 380 | 600 | 1100 | 3200 | 4000 | 5' | 3' | 45 | 800 | 5500 | 6500 | 97 |
| TR 130 1_10 | 215 | 400 | 800 | 3200 | 4000 | 5' | 3' | 45 | 800 | 5500 | 6500 | 97 |
| TR 130 2_9 | 215 | 400 | 800 | 2100 | 3000 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_12 | 450 | 700 | 1300 | 2100 | 3000 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_15 | 450 | 700 | 1300 | 2100 | 3000 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_16 | 450 | 700 | 1300 | 2400 | 3500 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_20 | 450 | 700 | 1300 | 2900 | 3500 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_25 | 450 | 700 | 1300 | 2900 | 3500 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_28 | 450 | 700 | 1300 | 3200 | 4000 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_30 | 215 | 400 | 800 | 3200 | 4000 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_35 | 450 | 700 | 1300 | 3200 | 4000 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_36 | 380 | 600 | 1100 | 2900 | 3500 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_40 | 450 | 700 | 1300 | 3200 | 4000 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_50 | 450 | 700 | 1300 | 3200 | 4000 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_70 | 450 | 700 | 1300 | 3200 | 4000 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 2_100 | 215 | 400 | 800 | 3200 | 4000 | 5' | 3' | 38.5 | 800 | 5500 | 6500 | 94 |
| TR 130 3_48 | 450 | 700 | 1300 | 2400 | 3500 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_64 | 450 | 700 | 1300 | 2400 | 3500 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_75 | 450 | 700 | 1300 | 2900 | 3500 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_80 | 450 | 700 | 1300 | 2400 | 3500 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_84 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_90 | 215 | 400 | 800 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_120 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_125 | 450 | 700 | 1300 | 2900 | 3500 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_140 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_150 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_160 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_175 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_200 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_210 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_216 | 450 | 700 | 1300 | 2900 | 3500 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_250 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_280 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_350 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_400 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_500 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_700 | 450 | 700 | 1300 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |
| TR 130 3_1000 | 215 | 400 | 800 | 3200 | 4000 | 7' | 5' | 30 | 800 | 5500 | 6500 | 90 |



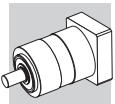
2.6 TR 160

| TR 160 | | | | | | | | | | | | |
|---------------|-------------------------|-------------------------|-------------------------|--|---|----------------------------|----------------------------|-------------------------------|------------------------|------------------------|------------------------|--------|
| i | M _{n2} [Nm] | M _{a2} [Nm] | M _{p2} [Nm] | n ₁ [min ⁻¹] | n _{1max} [min ⁻¹] | φ _S [arcmin] | φ _R [arcmin] | C _t [Nm/arcmin] | R _{n1} [N] | R _{n2} [N] | A _{n2} [N] | η % |
| TR 160 1_3 | 350 | 660 | 1200 | 1900 | 3000 | 5' | 3' | 90 | 1200 | 6500 | 7500 | 97 |
| TR 160 1_4 | 500 | 750 | 1400 | 2200 | 3500 | 5' | 3' | 90 | 1200 | 6500 | 7500 | 97 |
| TR 160 1_5 | 500 | 750 | 1400 | 2500 | 3500 | 5' | 3' | 90 | 1200 | 6500 | 7500 | 97 |
| TR 160 1_6 | 500 | 750 | 1400 | 2500 | 3500 | 5' | 3' | 90 | 1200 | 6500 | 7500 | 97 |
| TR 160 1_7 | 500 | 750 | 1400 | 3000 | 4000 | 5' | 3' | 90 | 1200 | 6500 | 7500 | 97 |
| TR 160 1_10 | 350 | 660 | 1200 | 3000 | 4000 | 5' | 3' | 90 | 1200 | 6500 | 7500 | 97 |
| TR 160 2_9 | 350 | 660 | 1200 | 1900 | 3000 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_12 | 700 | 950 | 1800 | 1900 | 3000 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_15 | 700 | 950 | 1800 | 1900 | 3000 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_16 | 700 | 950 | 1800 | 2200 | 3500 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_20 | 700 | 950 | 1800 | 2500 | 3500 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_25 | 700 | 950 | 1800 | 2500 | 3500 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_28 | 700 | 950 | 1800 | 3000 | 4000 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_30 | 350 | 660 | 1200 | 3000 | 4000 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_35 | 700 | 950 | 1800 | 3000 | 4000 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_36 | 500 | 750 | 1400 | 2500 | 3500 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_40 | 700 | 950 | 1800 | 3000 | 4000 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_50 | 700 | 950 | 1800 | 3000 | 4000 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_70 | 700 | 950 | 1800 | 3000 | 4000 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 2_100 | 350 | 660 | 1200 | 3000 | 4000 | 5' | 3' | 83.5 | 1200 | 6500 | 7500 | 94 |
| TR 160 3_48 | 700 | 950 | 1800 | 2200 | 3500 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_64 | 700 | 950 | 1800 | 2200 | 3500 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_75 | 700 | 950 | 1800 | 2500 | 3500 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_80 | 700 | 950 | 1800 | 2200 | 3500 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_84 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_90 | 350 | 660 | 1200 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_120 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_125 | 700 | 950 | 1800 | 2500 | 3500 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_140 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_150 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_160 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_175 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_200 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_210 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_216 | 700 | 950 | 1800 | 2500 | 3500 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_250 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_280 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_350 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_400 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_500 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_700 | 700 | 950 | 1800 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |
| TR 160 3_1000 | 350 | 660 | 1200 | 3000 | 4000 | 7' | 5' | 60 | 1200 | 6500 | 7500 | 90 |

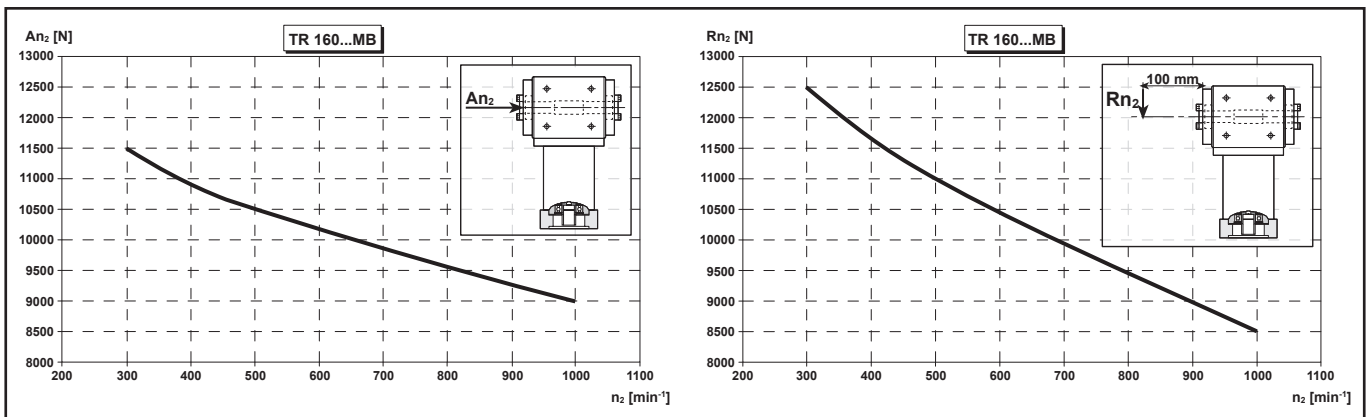
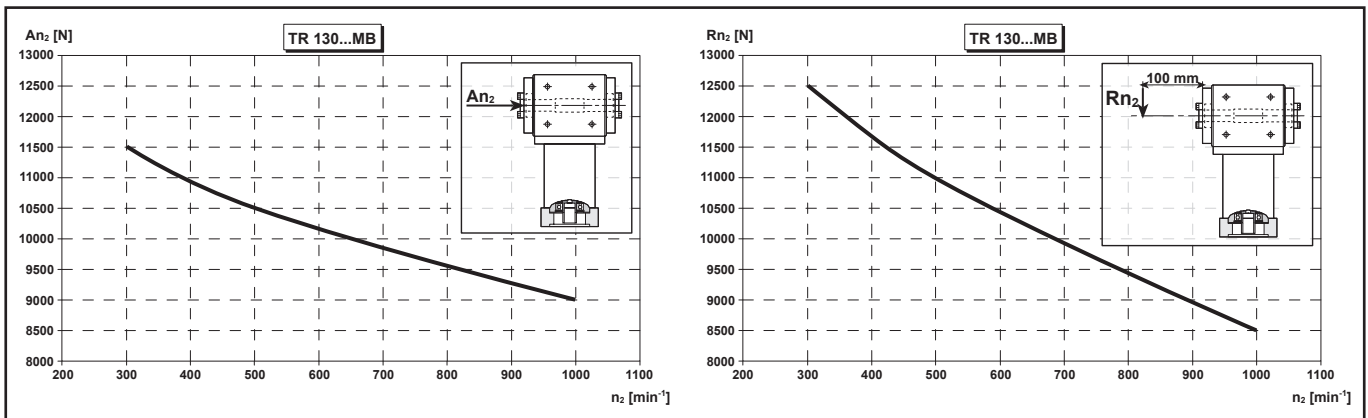
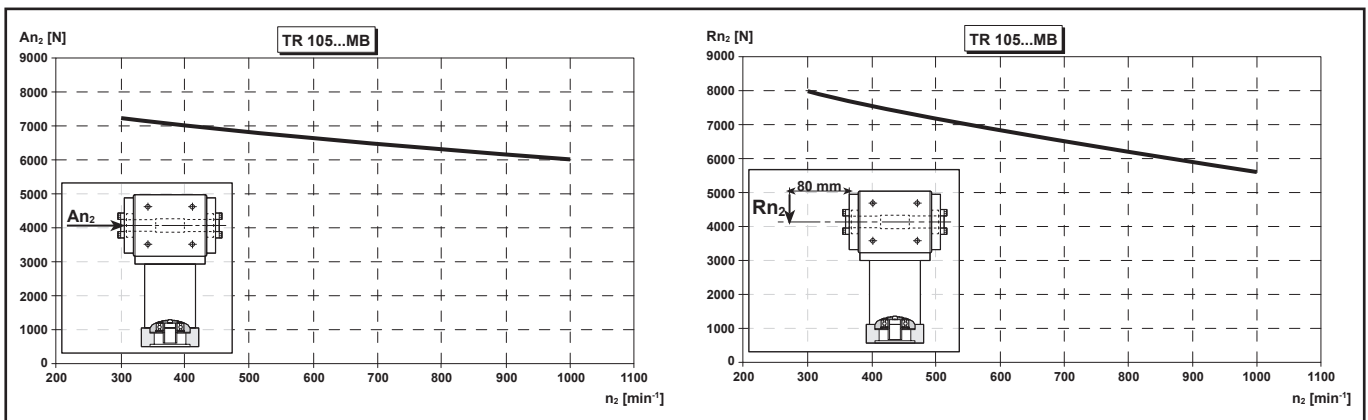
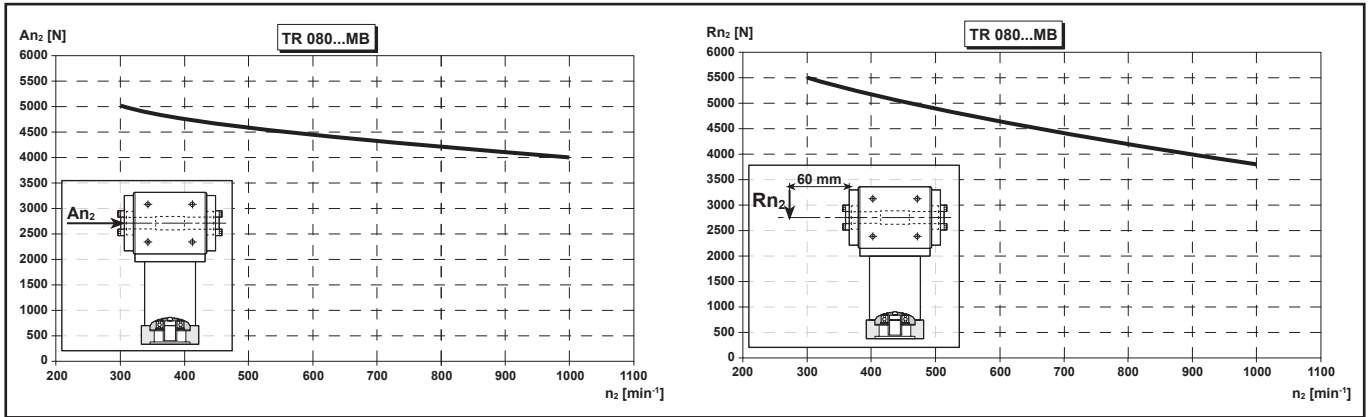


2.7 TR 190

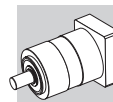
| TR 190 | | | | | | | | | | | |
|---------------|-------------------------|-------------------------|-------------------------|--|---|----------------------------|----------------------------|-------------------------------|------------------------|------------------------|--------|
| i | M _{n2} [Nm] | M _{a2} [Nm] | M _{p2} [Nm] | n ₁ [min ⁻¹] | n _{1max} [min ⁻¹] | φ _S [arcmin] | φ _R [arcmin] | C _t [Nm/arcmin] | R _{n2} [N] | A _{n2} [N] | η % |
| TR 190 1_3 | 500 | 800 | 1400 | 1500 | 2500 | 5' | 3' | 130 | 14000 | 15000 | 97 |
| TR 190 1_4 | 700 | 950 | 1800 | 2100 | 3000 | 5' | 3' | 130 | 14000 | 15000 | 97 |
| TR 190 1_5 | 700 | 950 | 1800 | 2300 | 3000 | 5' | 3' | 130 | 14000 | 15000 | 97 |
| TR 190 1_6 | 700 | 950 | 1800 | 2300 | 3000 | 5' | 3' | 130 | 14000 | 15000 | 97 |
| TR 190 1_7 | 700 | 950 | 1800 | 2900 | 3500 | 5' | 3' | 130 | 14000 | 15000 | 97 |
| TR 190 1_10 | 500 | 800 | 1400 | 2900 | 3500 | 5' | 3' | 130 | 14000 | 15000 | 97 |
| TR 190 2_9 | 500 | 800 | 1400 | 1500 | 2500 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_12 | 1000 | 1200 | 2200 | 1500 | 2500 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_15 | 1000 | 1200 | 2200 | 1500 | 2500 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_16 | 1000 | 1200 | 2200 | 2100 | 3000 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_20 | 1000 | 1200 | 2200 | 2300 | 3000 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_25 | 1000 | 1200 | 2200 | 2300 | 3000 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_28 | 1000 | 1200 | 2200 | 2900 | 3500 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_30 | 500 | 800 | 1400 | 2900 | 3500 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_35 | 1000 | 1200 | 2200 | 2900 | 3500 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_36 | 700 | 950 | 1800 | 2300 | 3000 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_40 | 1000 | 1200 | 2200 | 2900 | 3500 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_50 | 1000 | 1200 | 2200 | 2900 | 3500 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_70 | 1000 | 1200 | 2200 | 2900 | 3500 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 2_100 | 500 | 800 | 1400 | 2900 | 3500 | 5' | 3' | 100 | 14000 | 15000 | 94 |
| TR 190 3_48 | 1000 | 1200 | 2200 | 2100 | 3000 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_64 | 1000 | 1200 | 2200 | 2100 | 3000 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_75 | 1000 | 1200 | 2200 | 2300 | 3000 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_80 | 1000 | 1200 | 2200 | 2100 | 3000 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_84 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_90 | 500 | 800 | 1400 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_120 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_125 | 1000 | 1200 | 2200 | 2300 | 3000 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_140 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_150 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_160 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_175 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_200 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_210 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_250 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_280 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_350 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_400 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_500 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_700 | 1000 | 1200 | 2200 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |
| TR 190 3_1000 | 500 | 800 | 1400 | 2900 | 3500 | 7' | 5' | 90 | 14000 | 15000 | 90 |



2.8 PERMITTED AXIAL AND RADIAL FORCES FOR VERSION TR ... MB



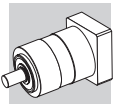
Thrust loads refer to an average duration of 10,000 h



2.9 MASS MOMENT OF INERTIA

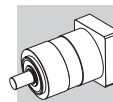
2.9.1 TR 053

| TR 053 | | |
|--------------|------------------------|---------------|
| i | J [kgcm ²] | |
| | D = Ø6...Ø9.52 | D = Ø11...Ø14 |
| TR 053 1_3 | 0.06 | 0.08 |
| TR 053 1_4 | 0.05 | 0.06 |
| TR 053 1_5 | 0.04 | 0.06 |
| TR 053 1_6 | 0.03 | 0.05 |
| TR 053 1_7 | 0.03 | 0.05 |
| TR 053 1_9 | 0.03 | 0.05 |
| TR 053 2_12 | 0.06 | 0.08 |
| TR 053 2_15 | 0.06 | 0.08 |
| TR 053 2_16 | 0.05 | 0.06 |
| TR 053 2_20 | 0.04 | 0.06 |
| TR 053 2_25 | 0.04 | 0.06 |
| TR 053 2_28 | 0.03 | 0.05 |
| TR 053 2_35 | 0.03 | 0.05 |
| TR 053 2_36 | 0.03 | 0.05 |
| TR 053 2_45 | 0.03 | 0.05 |
| TR 053 2_81 | 0.03 | 0.05 |
| TR 053 3_48 | 0.05 | 0.07 |
| TR 053 3_60 | 0.05 | 0.07 |
| TR 053 3_64 | 0.05 | 0.06 |
| TR 053 3_75 | 0.04 | 0.06 |
| TR 053 3_80 | 0.05 | 0.06 |
| TR 053 3_84 | 0.03 | 0.05 |
| TR 053 3_100 | 0.04 | 0.06 |
| TR 053 3_112 | 0.03 | 0.05 |
| TR 053 3_125 | 0.04 | 0.06 |
| TR 053 3_140 | 0.03 | 0.05 |
| TR 053 3_144 | 0.03 | 0.05 |
| TR 053 3_175 | 0.03 | 0.05 |
| TR 053 3_180 | 0.03 | 0.05 |
| TR 053 3_216 | 0.03 | 0.05 |
| TR 053 3_225 | 0.03 | 0.05 |
| TR 053 3_245 | 0.03 | 0.05 |
| TR 053 3_252 | 0.05 | 0.06 |
| TR 053 3_324 | 0.03 | 0.05 |
| TR 053 3_405 | 0.03 | 0.05 |
| TR 053 3_567 | 0.03 | 0.05 |
| TR 053 3_729 | 0.03 | 0.05 |



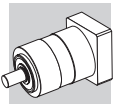
2.9.2 TR 060

| TR 060 | | |
|---------------|------------------------|---------------|
| i | J [kgcm ²] | |
| | D = Ø6...Ø9.52 | D = Ø11...Ø14 |
| TR 060 1_3 | 0.10 | 0.11 |
| TR 060 1_4 | 0.06 | 0.08 |
| TR 060 1_5 | 0.05 | 0.07 |
| TR 060 1_6 | 0.04 | 0.06 |
| TR 060 1_7 | 0.04 | 0.06 |
| TR 060 1_10 | 0.03 | 0.05 |
| TR 060 2_9 | 0.10 | 0.12 |
| TR 060 2_12 | 0.10 | 0.11 |
| TR 060 2_15 | 0.09 | 0.11 |
| TR 060 2_16 | 0.06 | 0.08 |
| TR 060 2_20 | 0.05 | 0.07 |
| TR 060 2_25 | 0.05 | 0.06 |
| TR 060 2_28 | 0.04 | 0.06 |
| TR 060 2_30 | 0.03 | 0.05 |
| TR 060 2_35 | 0.04 | 0.06 |
| TR 060 2_36 | 0.04 | 0.06 |
| TR 060 2_40 | 0.03 | 0.05 |
| TR 060 2_50 | 0.03 | 0.05 |
| TR 060 2_70 | 0.03 | 0.05 |
| TR 060 2_100 | 0.03 | 0.05 |
| TR 060 3_48 | 0.06 | 0.08 |
| TR 060 3_64 | 0.06 | 0.08 |
| TR 060 3_75 | 0.05 | 0.07 |
| TR 060 3_80 | 0.06 | 0.08 |
| TR 060 3_84 | 0.04 | 0.06 |
| TR 060 3_90 | 0.03 | 0.05 |
| TR 060 3_120 | 0.03 | 0.05 |
| TR 060 3_125 | 0.05 | 0.07 |
| TR 060 3_140 | 0.04 | 0.06 |
| TR 060 3_150 | 0.03 | 0.05 |
| TR 060 3_160 | 0.03 | 0.05 |
| TR 060 3_175 | 0.04 | 0.06 |
| TR 060 3_200 | 0.03 | 0.05 |
| TR 060 3_210 | 0.03 | 0.05 |
| TR 060 3_216 | 0.04 | 0.06 |
| TR 060 3_250 | 0.03 | 0.05 |
| TR 060 3_280 | 0.03 | 0.05 |
| TR 060 3_350 | 0.03 | 0.05 |
| TR 060 3_400 | 0.03 | 0.05 |
| TR 060 3_500 | 0.03 | 0.05 |
| TR 060 3_700 | 0.03 | 0.05 |
| TR 060 3_1000 | 0.03 | 0.05 |



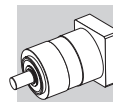
2.9.3 TR 080

| TR 080 | | |
|---------------|------------------------|---------------|
| i | J [kgcm ²] | |
| | D = Ø8...Ø12.7 | D = Ø14...Ø19 |
| TR 080 1_3 | 0.50 | 0.59 |
| TR 080 1_4 | 0.34 | 0.43 |
| TR 080 1_5 | 0.28 | 0.37 |
| TR 080 1_6 | 0.21 | 0.30 |
| TR 080 1_7 | 0.23 | 0.32 |
| TR 080 1_10 | 0.20 | 0.29 |
| TR 080 2_9 | 0.49 | 0.58 |
| TR 080 2_12 | 0.47 | 0.56 |
| TR 080 2_15 | 0.46 | 0.55 |
| TR 080 2_16 | 0.32 | 0.41 |
| TR 080 2_20 | 0.27 | 0.36 |
| TR 080 2_25 | 0.27 | 0.36 |
| TR 080 2_28 | 0.22 | 0.31 |
| TR 080 2_30 | 0.20 | 0.29 |
| TR 080 2_35 | 0.22 | 0.31 |
| TR 080 2_36 | 0.20 | 0.29 |
| TR 080 2_40 | 0.20 | 0.29 |
| TR 080 2_50 | 0.19 | 0.28 |
| TR 080 2_70 | 0.19 | 0.28 |
| TR 080 2_100 | 0.19 | 0.28 |
| TR 080 3_48 | 0.33 | 0.42 |
| TR 080 3_64 | 0.32 | 0.41 |
| TR 080 3_75 | 0.27 | 0.36 |
| TR 080 3_80 | 0.32 | 0.41 |
| TR 080 3_84 | 0.23 | 0.32 |
| TR 080 3_90 | 0.20 | 0.29 |
| TR 080 3_120 | 0.20 | 0.29 |
| TR 080 3_125 | 0.27 | 0.36 |
| TR 080 3_140 | 0.22 | 0.31 |
| TR 080 3_150 | 0.20 | 0.29 |
| TR 080 3_160 | 0.20 | 0.29 |
| TR 080 3_175 | 0.22 | 0.31 |
| TR 080 3_200 | 0.20 | 0.29 |
| TR 080 3_210 | 0.20 | 0.29 |
| TR 080 3_216 | 0.20 | 0.29 |
| TR 080 3_250 | 0.19 | 0.28 |
| TR 080 3_280 | 0.19 | 0.28 |
| TR 080 3_350 | 0.19 | 0.28 |
| TR 080 3_400 | 0.19 | 0.28 |
| TR 080 3_500 | 0.19 | 0.28 |
| TR 080 3_700 | 0.19 | 0.28 |
| TR 080 3_1000 | 0.19 | 0.28 |



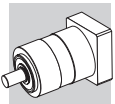
2.9.4 TR 105

| TR 105 | | | | |
|---------------|------------------------|---------------|---------------|---------------|
| i | J [kgcm ²] | | | |
| | D = Ø11...Ø12.7 | D = Ø14...Ø19 | D = Ø22...Ø24 | D = Ø28...Ø32 |
| TR 105 1_3 | 1.7 | 1.8 | 2.2 | 2.6 |
| TR 105 1_4 | 0.99 | 1.1 | 1.5 | 1.9 |
| TR 105 1_5 | 0.72 | 0.79 | 1.23 | 1.6 |
| TR 105 1_6 | 0.36 | 0.43 | 0.88 | 1.2 |
| TR 105 1_7 | 0.47 | 0.55 | 0.99 | 1.4 |
| TR 105 1_10 | 0.33 | 0.41 | 0.85 | 1.2 |
| TR 105 2_9 | 1.6 | 1.6 | 2.1 | 2.4 |
| TR 105 2_12 | 1.5 | 1.6 | 2.0 | 2.4 |
| TR 105 2_15 | 1.5 | 1.5 | 2.0 | 2.4 |
| TR 105 2_16 | 0.87 | 0.95 | 1.4 | 1.8 |
| TR 105 2_20 | 0.86 | 0.93 | 1.4 | 1.7 |
| TR 105 2_25 | 0.63 | 0.71 | 1.1 | 1.5 |
| TR 105 2_28 | 0.43 | 0.51 | 0.95 | 1.3 |
| TR 105 2_30 | 0.32 | 0.40 | 0.84 | 1.2 |
| TR 105 2_35 | 0.43 | 0.50 | 0.95 | 1.3 |
| TR 105 2_36 | 0.32 | 0.39 | 0.84 | 1.2 |
| TR 105 2_40 | 0.31 | 0.39 | 0.83 | 1.2 |
| TR 105 2_50 | 0.31 | 0.39 | 0.83 | 1.2 |
| TR 105 2_70 | 0.31 | 0.38 | 0.83 | 1.2 |
| TR 105 2_100 | 0.31 | 0.38 | 0.83 | 1.2 |
| TR 105 3_48 | 0.91 | 0.98 | 1.4 | 1.8 |
| TR 105 3_64 | 0.87 | 0.94 | 1.4 | 1.7 |
| TR 105 3_75 | 0.66 | 0.74 | 1.2 | 1.5 |
| TR 105 3_80 | 0.86 | 0.94 | 1.4 | 1.7 |
| TR 105 3_84 | 0.44 | 0.52 | 0.96 | 1.3 |
| TR 105 3_90 | 0.32 | 0.39 | 0.84 | 1.2 |
| TR 105 3_120 | 0.32 | 0.39 | 0.84 | 1.2 |
| TR 105 3_125 | 0.63 | 0.70 | 1.1 | 1.5 |
| TR 105 3_140 | 0.43 | 0.51 | 0.95 | 1.3 |
| TR 105 3_150 | 0.32 | 0.39 | 0.84 | 1.2 |
| TR 105 3_160 | 0.31 | 0.39 | 0.83 | 1.2 |
| TR 105 3_175 | 0.43 | 0.50 | 0.95 | 1.3 |
| TR 105 3_200 | 0.31 | 0.39 | 0.83 | 1.2 |
| TR 105 3_210 | 0.32 | 0.39 | 0.84 | 1.2 |
| TR 105 3_216 | 0.31 | 0.39 | 0.83 | 1.2 |
| TR 105 3_250 | 0.31 | 0.39 | 0.83 | 1.2 |
| TR 105 3_280 | 0.31 | 0.38 | 0.83 | 1.2 |
| TR 105 3_350 | 0.31 | 0.38 | 0.83 | 1.2 |
| TR 105 3_400 | 0.31 | 0.38 | 0.83 | 1.2 |
| TR 105 3_500 | 0.31 | 0.38 | 0.83 | 1.2 |
| TR 105 3_700 | 0.31 | 0.38 | 0.83 | 1.2 |
| TR 105 3_1000 | 0.31 | 0.38 | 0.83 | 1.2 |



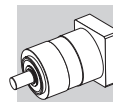
2.9.5 TR 130

| TR 130 | | | | |
|---------------|------------------------|---------------|---------------|---------------|
| i | J [kgcm ²] | | | |
| | D = Ø14...Ø19 | D = Ø22...Ø24 | D = Ø28...Ø32 | D = Ø35...Ø38 |
| TR 130 1_3 | 5.3 | 5.5 | 5.8 | 7.2 |
| TR 130 1_4 | 3.1 | 3.3 | 3.6 | 5.0 |
| TR 130 1_5 | 2.2 | 2.4 | 2.8 | 4.1 |
| TR 130 1_6 | 1.2 | 1.4 | 1.7 | 3.1 |
| TR 130 1_7 | 1.5 | 1.7 | 2.0 | 3.4 |
| TR 130 1_10 | 1.0 | 1.2 | 1.6 | 3.0 |
| TR 130 2_9 | 4.8 | 5.0 | 5.4 | 6.7 |
| TR 130 2_12 | 4.6 | 4.8 | 5.1 | 6.5 |
| TR 130 2_15 | 4.5 | 4.7 | 5.0 | 6.4 |
| TR 130 2_16 | 2.7 | 2.9 | 3.2 | 4.6 |
| TR 130 2_20 | 2.0 | 2.2 | 2.5 | 3.9 |
| TR 130 2_25 | 1.9 | 2.1 | 2.5 | 3.8 |
| TR 130 2_28 | 1.3 | 1.6 | 1.9 | 3.3 |
| TR 130 2_30 | 1.0 | 1.2 | 1.6 | 2.9 |
| TR 130 2_35 | 1.3 | 1.5 | 1.9 | 3.2 |
| TR 130 2_36 | 1.1 | 1.3 | 1.6 | 3.0 |
| TR 130 2_40 | 0.98 | 1.2 | 1.5 | 2.9 |
| TR 130 2_50 | 0.97 | 1.2 | 1.5 | 2.9 |
| TR 130 2_70 | 0.96 | 1.2 | 1.5 | 2.9 |
| TR 130 2_100 | 0.96 | 1.2 | 1.5 | 2.9 |
| TR 130 3_48 | 2.8 | 3.0 | 3.3 | 4.7 |
| TR 130 3_64 | 2.6 | 2.9 | 3.2 | 4.6 |
| TR 130 3_75 | 2.0 | 2.2 | 2.6 | 3.9 |
| TR 130 3_80 | 2.6 | 2.9 | 3.2 | 4.6 |
| TR 130 3_84 | 1.4 | 1.6 | 1.9 | 3.3 |
| TR 130 3_90 | 1.0 | 1.2 | 1.6 | 2.9 |
| TR 130 3_120 | 0.99 | 1.2 | 1.55 | 2.9 |
| TR 130 3_125 | 1.9 | 2.1 | 2.5 | 3.8 |
| TR 130 3_140 | 1.3 | 1.5 | 1.9 | 3.2 |
| TR 130 3_150 | 0.99 | 1.2 | 1.6 | 2.9 |
| TR 130 3_160 | 0.98 | 1.2 | 1.5 | 2.9 |
| TR 130 3_175 | 1.3 | 1.5 | 1.9 | 3.2 |
| TR 130 3_200 | 0.97 | 1.2 | 1.5 | 2.9 |
| TR 130 3_210 | 0.99 | 1.2 | 1.6 | 2.9 |
| TR 130 3_216 | 1.0 | 1.3 | 1.6 | 3.0 |
| TR 130 3_250 | 0.97 | 1.2 | 1.5 | 2.9 |
| TR 130 3_280 | 0.96 | 1.2 | 1.5 | 2.9 |
| TR 130 3_350 | 0.96 | 1.2 | 1.5 | 2.9 |
| TR 130 3_400 | 0.96 | 1.2 | 1.5 | 2.9 |
| TR 130 3_500 | 0.96 | 1.2 | 1.5 | 2.9 |
| TR 130 3_700 | 0.96 | 1.2 | 1.5 | 2.9 |
| TR 130 3_1000 | 0.96 | 1.2 | 1.5 | 2.9 |



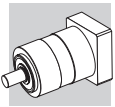
2.9.6 TR 160

| TR 160 | | | | |
|---------------|------------------------|---------------|---------------|---------------|
| i | J [kgcm ²] | | | |
| | D = Ø14...Ø19 | D = Ø22...Ø24 | D = Ø28...Ø32 | D = Ø35...Ø38 |
| TR 160 1_3 | 8.4 | 8.6 | 8.9 | 10.3 |
| TR 160 1_4 | 4.7 | 4.9 | 5.2 | 6.6 |
| TR 160 1_5 | 3.3 | 3.5 | 3.8 | 5.2 |
| TR 160 1_6 | 1.3 | 1.5 | 1.9 | 3.2 |
| TR 160 1_7 | 2.0 | 2.2 | 2.6 | 3.9 |
| TR 160 1_10 | 1.3 | 1.5 | 1.9 | 3.2 |
| TR 160 2_9 | 7.5 | 7.7 | 8.1 | 9.4 |
| TR 160 2_12 | 7.1 | 7.3 | 7.7 | 9.0 |
| TR 160 2_15 | 6.9 | 7.1 | 7.5 | 8.9 |
| TR 160 2_16 | 4.0 | 4.2 | 4.5 | 5.9 |
| TR 160 2_20 | 2.8 | 3.0 | 3.4 | 4.7 |
| TR 160 2_25 | 2.8 | 3.0 | 3.3 | 4.7 |
| TR 160 2_28 | 1.8 | 2.0 | 2.4 | 3.7 |
| TR 160 2_30 | 1.2 | 1.5 | 1.8 | 3.2 |
| TR 160 2_35 | 1.8 | 2.0 | 2.3 | 3.7 |
| TR 160 2_36 | 1.1 | 1.3 | 1.6 | 3.0 |
| TR 160 2_40 | 1.2 | 1.4 | 1.8 | 3.1 |
| TR 160 2_50 | 1.2 | 1.4 | 1.8 | 3.1 |
| TR 160 2_70 | 1.2 | 1.4 | 1.7 | 3.1 |
| TR 160 2_100 | 1.2 | 1.4 | 1.7 | 3.1 |
| TR 160 3_48 | 4.1 | 4.3 | 4.7 | 6.0 |
| TR 160 3_64 | 3.9 | 4.1 | 4.5 | 5.8 |
| TR 160 3_75 | 2.9 | 3.1 | 3.5 | 4.8 |
| TR 160 3_80 | 3.9 | 4.1 | 4.5 | 5.8 |
| TR 160 3_84 | 1.8 | 2.1 | 2.4 | 3.8 |
| TR 160 3_90 | 1.2 | 1.4 | 1.8 | 3.1 |
| TR 160 3_120 | 1.2 | 1.4 | 1.8 | 3.1 |
| TR 160 3_125 | 2.7 | 2.9 | 3.3 | 4.6 |
| TR 160 3_140 | 1.8 | 2.0 | 2.3 | 3.7 |
| TR 160 3_150 | 1.2 | 1.4 | 1.8 | 3.1 |
| TR 160 3_160 | 1.2 | 1.4 | 1.8 | 3.1 |
| TR 160 3_175 | 1.8 | 2.0 | 2.3 | 3.7 |
| TR 160 3_200 | 1.2 | 1.4 | 1.8 | 3.1 |
| TR 160 3_210 | 1.2 | 1.4 | 1.8 | 3.1 |
| TR 160 3_216 | 1.1 | 1.3 | 1.6 | 3.0 |
| TR 160 3_250 | 1.2 | 1.4 | 1.7 | 3.1 |
| TR 160 3_280 | 1.2 | 1.4 | 1.7 | 3.1 |
| TR 160 3_350 | 1.2 | 1.4 | 1.7 | 3.1 |
| TR 160 3_400 | 1.2 | 1.4 | 1.7 | 3.1 |
| TR 160 3_500 | 1.2 | 1.4 | 1.7 | 3.1 |
| TR 160 3_700 | 1.2 | 1.4 | 1.7 | 3.1 |
| TR 160 3_1000 | 1.2 | 1.4 | 1.7 | 3.1 |



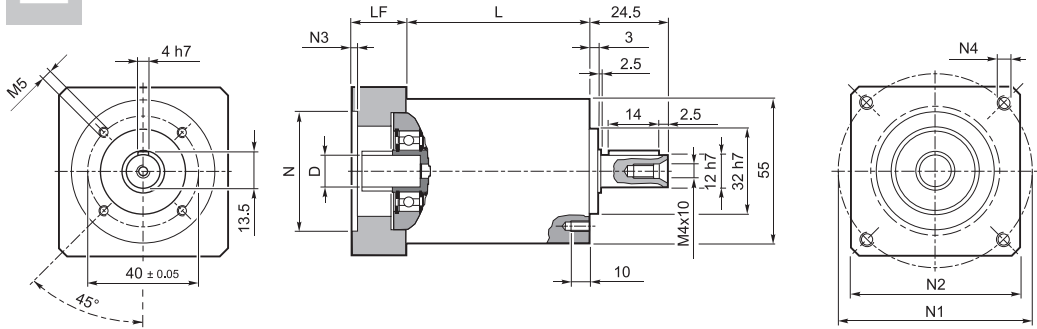
2.9.7 TR 190

| TR 190 | | | | | |
|------------------------|---------------|---------------|---------------|---------|---------------|
| J [kgcm ²] | | | | | |
| i | D = Ø14...Ø24 | D = Ø28...Ø32 | D = Ø35...Ø38 | D = Ø42 | D = Ø45...Ø48 |
| TR 190 1_3 | 24.2 | 24.9 | 25.6 | 29.3 | 29.9 |
| TR 190 1_4 | 13.4 | 14.1 | 14.9 | 18.5 | 19.1 |
| TR 190 1_5 | 9.3 | 10.0 | 10.8 | 14.4 | 15.0 |
| TR 190 1_6 | 2.9 | 3.6 | 4.3 | 8.0 | 8.6 |
| TR 190 1_7 | 5.7 | 6.4 | 7.1 | 10.8 | 11.4 |
| TR 190 1_10 | 3.6 | 4.2 | 5.0 | 8.7 | 9.3 |
| TR 190 2_9 | 23.2 | 23.9 | 24.7 | 28.3 | 28.9 |
| TR 190 2_12 | 22.0 | 22.7 | 23.5 | 27.1 | 27.7 |
| TR 190 2_15 | 21.6 | 22.3 | 23.0 | 26.7 | 27.3 |
| TR 190 2_16 | 12.2 | 12.9 | 13.6 | 17.3 | 17.9 |
| TR 190 2_20 | 8.5 | 9.2 | 10.0 | 13.6 | 14.2 |
| TR 190 2_25 | 8.4 | 9.1 | 9.8 | 13.5 | 14.1 |
| TR 190 2_28 | 5.3 | 6.0 | 6.7 | 10.4 | 11.0 |
| TR 190 2_30 | 3.5 | 4.2 | 4.9 | 8.6 | 9.2 |
| TR 190 2_35 | 5.2 | 5.9 | 6.6 | 10.3 | 10.9 |
| TR 190 2_36 | 2.2 | 2.9 | 3.6 | 7.3 | 7.9 |
| TR 190 2_40 | 3.4 | 4.1 | 4.8 | 8.5 | 9.1 |
| TR 190 2_50 | 3.3 | 4.0 | 4.8 | 8.4 | 9.0 |
| TR 190 2_70 | 3.3 | 4.0 | 4.7 | 8.4 | 9.0 |
| TR 190 2_100 | 3.3 | 4.0 | 4.7 | 8.4 | 9.0 |
| TR 190 3_48 | 12.7 | 13.4 | 14.2 | 17.8 | 18.4 |
| TR 190 3_64 | 12.1 | 12.8 | 13.5 | 17.2 | 17.8 |
| TR 190 3_75 | 8.9 | 9.5 | 10.3 | 14.0 | 14.6 |
| TR 190 3_80 | 12.1 | 12.8 | 13.5 | 17.2 | 17.8 |
| TR 190 3_84 | 5.5 | 6.1 | 6.9 | 10.6 | 11.2 |
| TR 190 3_90 | 3.5 | 4.1 | 4.9 | 8.6 | 9.2 |
| TR 190 3_120 | 3.5 | 4.1 | 4.9 | 8.6 | 9.2 |
| TR 190 3_125 | 8.3 | 9.0 | 9.8 | 13.4 | 14.0 |
| TR 190 3_140 | 5.2 | 5.9 | 6.7 | 10.3 | 10.9 |
| TR 190 3_150 | 3.5 | 4.1 | 4.9 | 8.6 | 9.2 |
| TR 190 3_160 | 3.4 | 4.0 | 4.8 | 8.5 | 9.1 |
| TR 190 3_175 | 5.2 | 5.9 | 6.6 | 10.3 | 10.9 |
| TR 190 3_200 | 3.4 | 4.0 | 4.8 | 8.5 | 9.1 |
| TR 190 3_210 | 3.5 | 4.1 | 4.9 | 8.6 | 9.2 |
| TR 190 3_250 | 3.3 | 4.0 | 4.8 | 8.4 | 9.0 |
| TR 190 3_280 | 3.3 | 4.0 | 4.7 | 8.4 | 9.0 |
| TR 190 3_350 | 3.3 | 4.0 | 4.7 | 8.4 | 9.0 |
| TR 190 3_400 | 3.3 | 4.0 | 4.7 | 8.4 | 9.0 |
| TR 190 3_500 | 3.3 | 4.0 | 4.7 | 8.4 | 9.0 |
| TR 190 3_700 | 3.3 | 4.0 | 4.7 | 8.4 | 9.0 |
| TR 190 3_1000 | 3.3 | 4.0 | 4.7 | 8.4 | 9.0 |

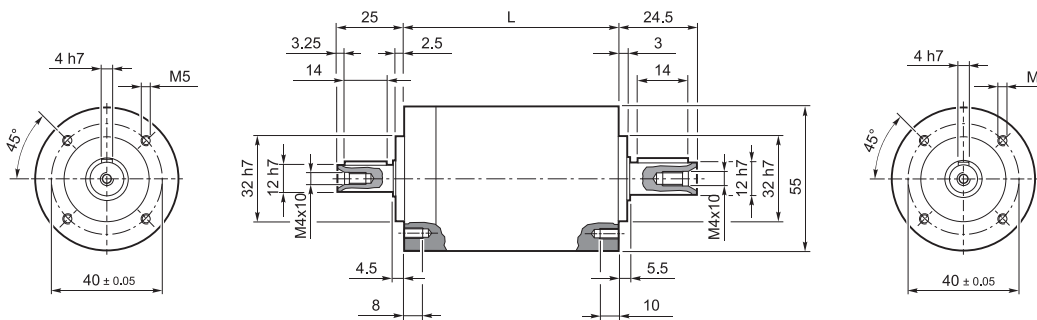
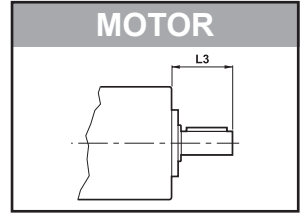


3 DIMENSIONS

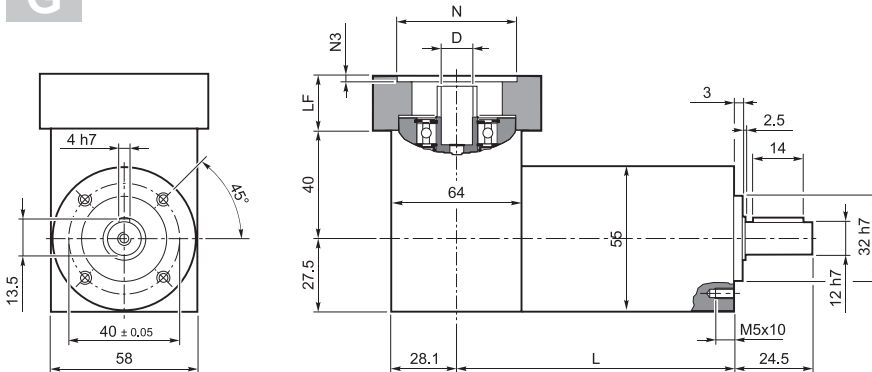
3.1 TR 053



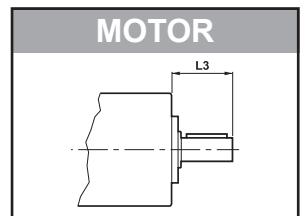
| | L | |
|----------|------|-----|
| TR 053 1 | 53 | 0.8 |
| TR 053 2 | 66.8 | 1.0 |
| TR 053 3 | 80.6 | 1.3 |



| | L | |
|----------|------|-----|
| TR 053 1 | 58.2 | 0.8 |
| TR 053 2 | 72 | 1.0 |
| TR 053 3 | 85.8 | 1.3 |

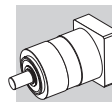


| | L | |
|----------|-------|-----|
| TR 053 1 | 88.9 | 1.3 |
| TR 053 2 | 102.7 | 1.5 |
| TR 053 3 | 116.5 | 1.8 |



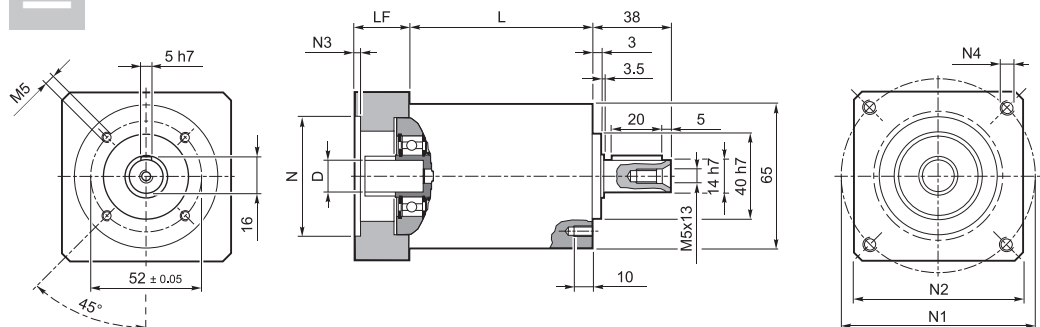
| | D | N | N1 | N2 | N3 | N4 | LF | L3 |
|---------------------------------|---------|---------|---------|----|-------|-------|----|----|
| TR 053_6...9 25 25...40 36...48 | ≤ 9 mm | 25...40 | 36...48 | 55 | 3.5 | 4.5 | 25 | 25 |
| TR 053_6...12 25 38.1 66.6 | ≤ 12 mm | 38.1 | 66.6 | 60 | 3 | M4x10 | 18 | 25 |
| TR 053_6...12 25 40 63 | | 40 | 63 | 60 | 3 | M4x10 | 18 | 25 |
| TR 053_6...12 25 50 60 | | 50 | 60 | 60 | 3 | M4x10 | 18 | 25 |
| TR 053_6...12 23 50 65 TH | | 50 | 65 | 55 | 4 | 5.5 | 16 | 23 |
| TR 053_6...12 25 60 75 | | 60 | 75 | 63 | 3 | M5x12 | 18 | 25 |
| TR 053_6...12 25 60 75 TH* | | 60 | 75 | 65 | 3 | 5.5 | 18 | 25 |
| TR 053_6...14 30 50 65 | ≤ 14 mm | 50 | 65 | 60 | 3 | M5x12 | 23 | 30 |
| TR 053_6...14 30 50 65 TH | | 50 | 65 | 60 | 4 | 5.5 | 23 | 30 |
| TR 053_6...14 30 50 70 | | 50 | 70 | 60 | 3 | M4x10 | 23 | 30 |
| TR 053_6...14 30 60 75 | | 60 | 75 | 63 | 3 | M5x12 | 23 | 30 |
| TR 053_6...14 30 60 75 TH* | | 60 | 75 | 65 | 3 | 5.5 | 23 | 30 |
| TR 053_6...14 30 60 85 | | 60 | 85 | 75 | 3 | M5x12 | 23 | 30 |
| TR 053_6...14 30 60 90 | | 60 | 90 | 75 | 3 | M5x12 | 23 | 30 |
| TR 053_6...14 30 70 85 | | 70 | 85 | 75 | 3 | M6x15 | 23 | 30 |
| TR 053_6...14 30 70 90 | | 70 | 90 | 75 | 3 | M5x12 | 23 | 30 |
| TR 053_6...14 32 73 98.4 | | 73 | 98.4 | 85 | 3 | M5x12 | 25 | 32 |
| TR 053_6...14 30 80 100 | 80 | 100 | 85 | 3 | M6x15 | 23 | 30 | |

* cannot be used with version G

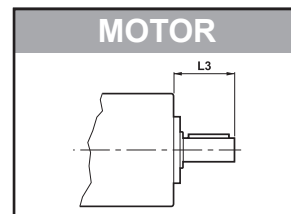


3.2 TR 060

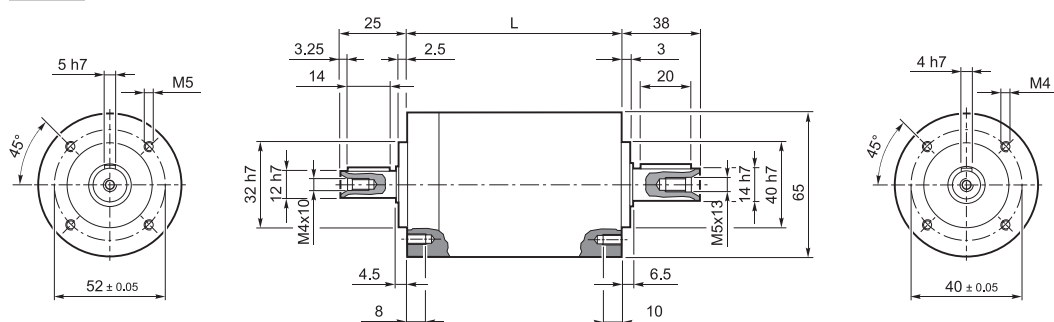
I



| | L | |
|----------|-------|-----|
| TR 060 1 | 57.55 | 1.2 |
| TR 060 2 | 74.25 | 1.7 |
| TR 060 3 | 90.95 | 2.0 |

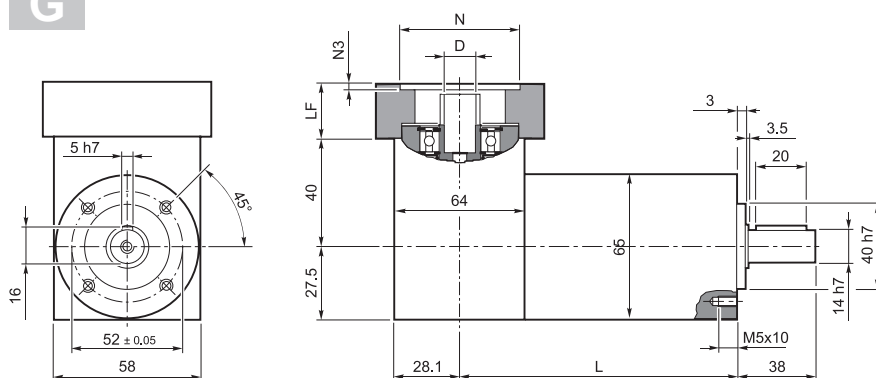


IS

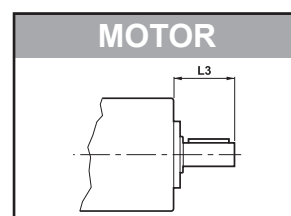


| | L | |
|----------|-------|-----|
| TR 060 1 | 62.75 | 1.2 |
| TR 060 2 | 79.45 | 1.7 |
| TR 060 3 | 96.15 | 2.0 |

G

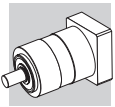


| | L | |
|----------|--------|-----|
| TR 060 1 | 93.45 | 1.7 |
| TR 060 2 | 110.15 | 2.2 |
| TR 060 3 | 126.85 | 2.5 |

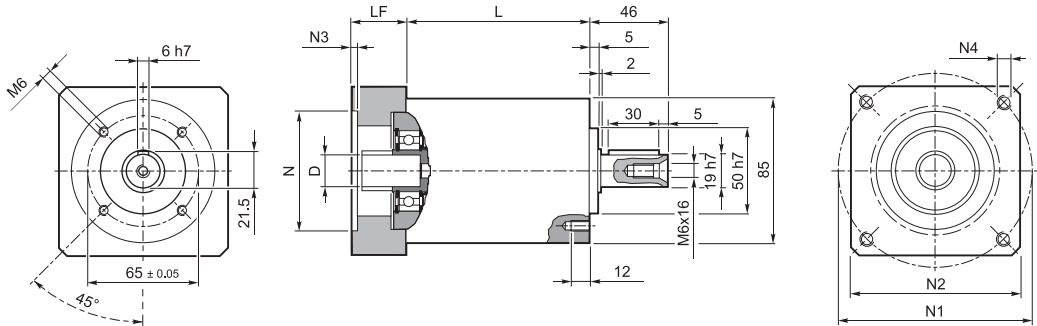


| | D | N | N1 | N2 | N3 | N4 | LF | L3 |
|----------------------------------|---------|---------|---------|----|-------|-------|----|----|
| TR 060_ 6...9 25 25...40 39...56 | ≤ 9 mm | 25...40 | 39...56 | 65 | 3.5 | 4.5 | 25 | 25 |
| TR 060_ 6...12 25 38.1 66.6 | ≤ 12 mm | 38.1 | 66.6 | 60 | 3 | M4x10 | 18 | 25 |
| TR 060_ 6...12 25 40 63 | | 40 | 63 | 60 | 3 | M4x10 | 18 | 25 |
| TR 060_ 6...12 25 50 60 | | 50 | 60 | 60 | 3 | M4x10 | 18 | 25 |
| TR 060_ 6...12 23 55 80 TH | | 55 | 80 | 65 | 2 | 5.5 | 16 | 23 |
| TR 060_ 6...12 25 60 75 | | 60 | 75 | 63 | 3 | M5x12 | 18 | 25 |
| TR 060_ 6...12 25 60 75 TH* | | 60 | 75 | 65 | 3 | 5.5 | 18 | 25 |
| TR 060_ 6...14 30 50 65 | ≤ 14 mm | 50 | 65 | 60 | 3 | M5x12 | 23 | 30 |
| TR 060_ 6...14 30 50 65 TH | | 50 | 65 | 60 | 3 | 5.5 | 25 | 30 |
| TR 060_ 6...14 30 50 70 | | 50 | 70 | 60 | 3 | M4x10 | 23 | 30 |
| TR 060_ 6...14 30 60 75 | | 60 | 75 | 63 | 3 | M5x12 | 23 | 30 |
| TR 060_ 6...14 30 60 75 TH* | | 60 | 75 | 65 | 3 | 5.5 | 23 | 30 |
| TR 060_ 6...14 30 60 85 | | 60 | 85 | 75 | 3 | M5x12 | 23 | 30 |
| TR 060_ 6...14 30 60 90 | | 60 | 90 | 75 | 3 | M5x12 | 23 | 30 |
| TR 060_ 6...14 30 70 85 | | 70 | 85 | 75 | 3 | M6x15 | 23 | 30 |
| TR 060_ 6...14 30 70 90 | | 70 | 90 | 75 | 3 | M5x12 | 23 | 30 |
| TR 060_ 6...14 32 73 98.4 | | 73 | 98.4 | 85 | 3 | M5x12 | 25 | 32 |
| TR 060_ 6...14 30 80 100 | 80 | 100 | 85 | 3 | M6x15 | 23 | 30 | |

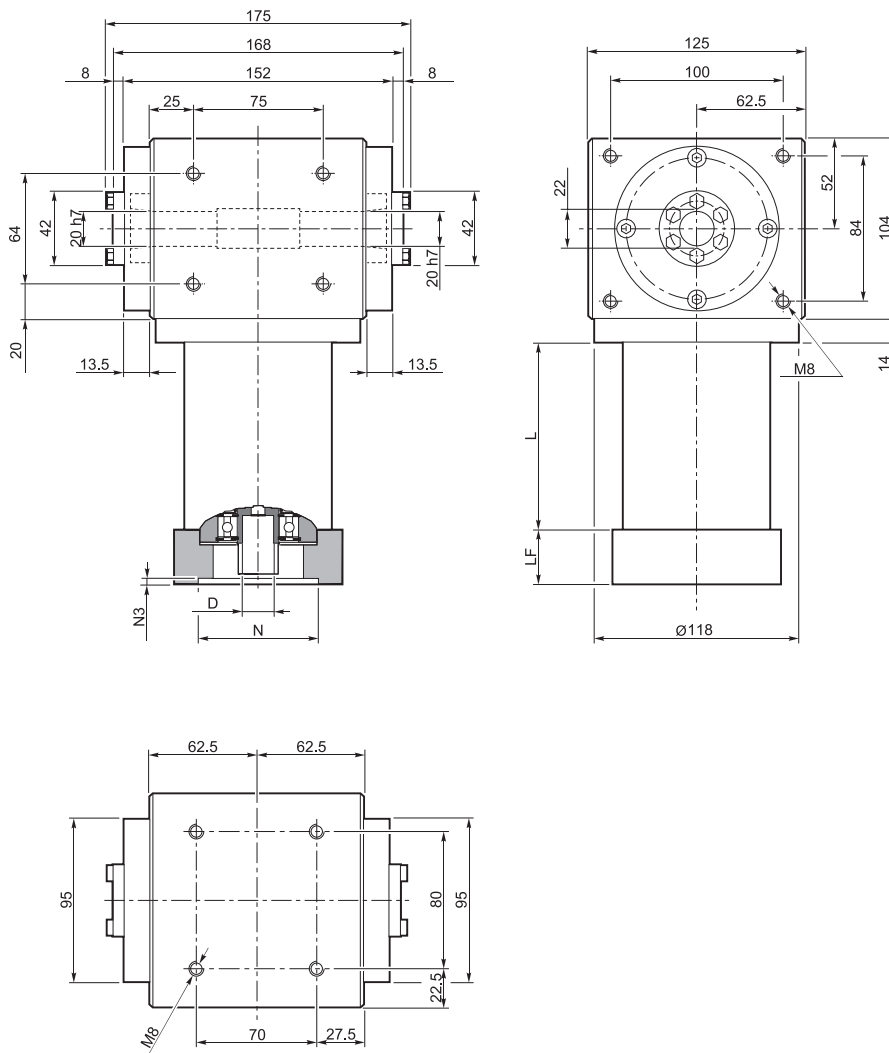
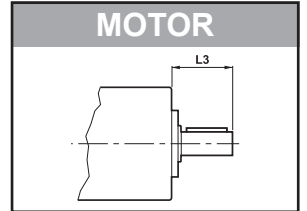
* cannot be used with version G



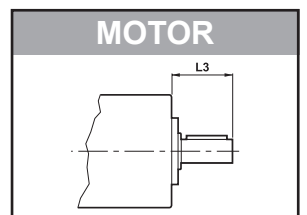
3.3 TR 080

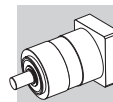


| | L | |
|----------|-------|-----|
| TR 080 1 | 83.5 | 4.0 |
| TR 080 2 | 108 | 4.6 |
| TR 080 3 | 132.5 | 5.2 |

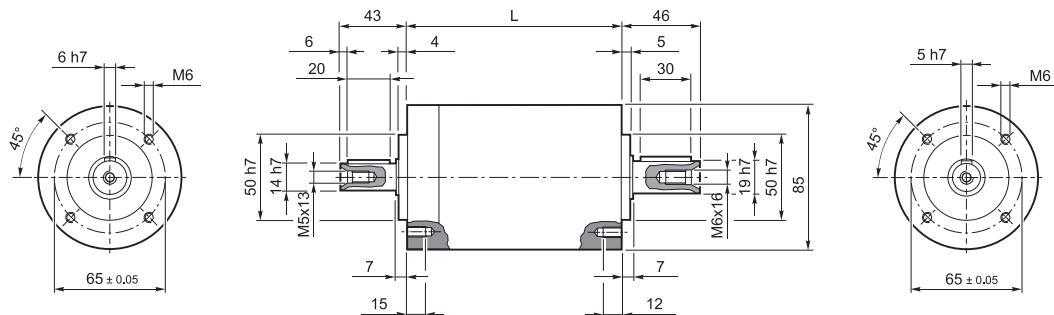


| | L | |
|----------|-------|----|
| TR 080 1 | 83.5 | 14 |
| TR 080 2 | 108 | 15 |
| TR 080 3 | 132.5 | 16 |



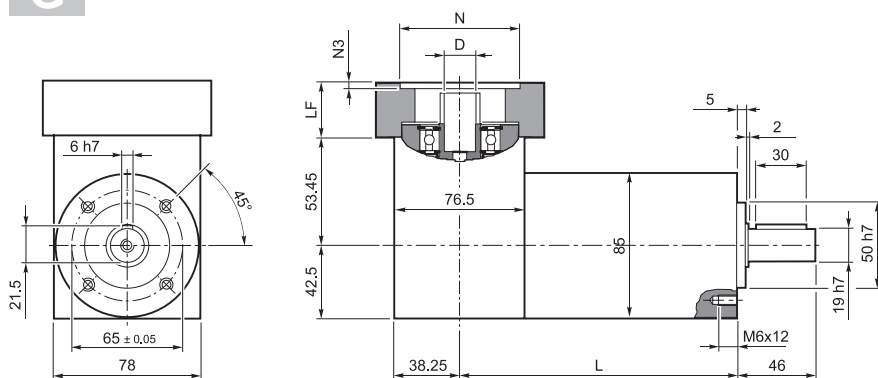


IS

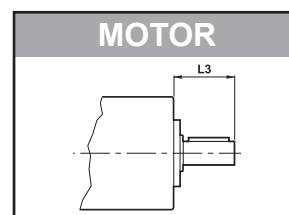


| | L | |
|----------|-------|-----|
| TR 080 1 | 105.3 | 4 |
| TR 080 2 | 129.8 | 4.6 |
| TR 080 3 | 154.3 | 5.2 |

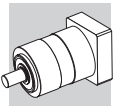
G



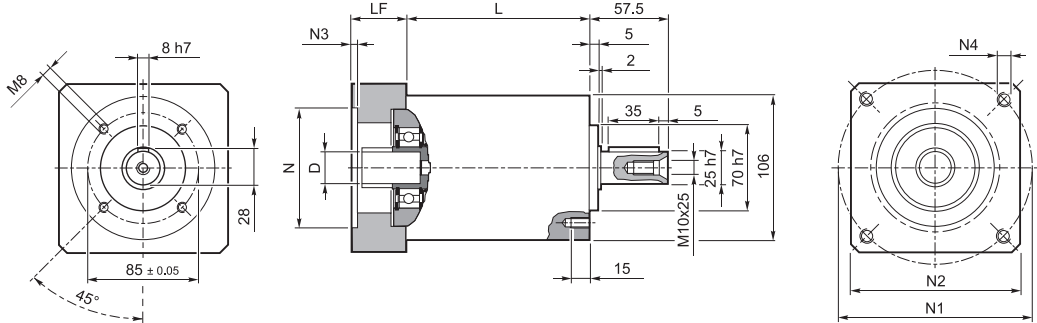
| | L | |
|----------|--------|-----|
| TR 080 1 | 143.55 | 5.2 |
| TR 080 2 | 168.05 | 5.8 |
| TR 080 3 | 192.55 | 6.4 |



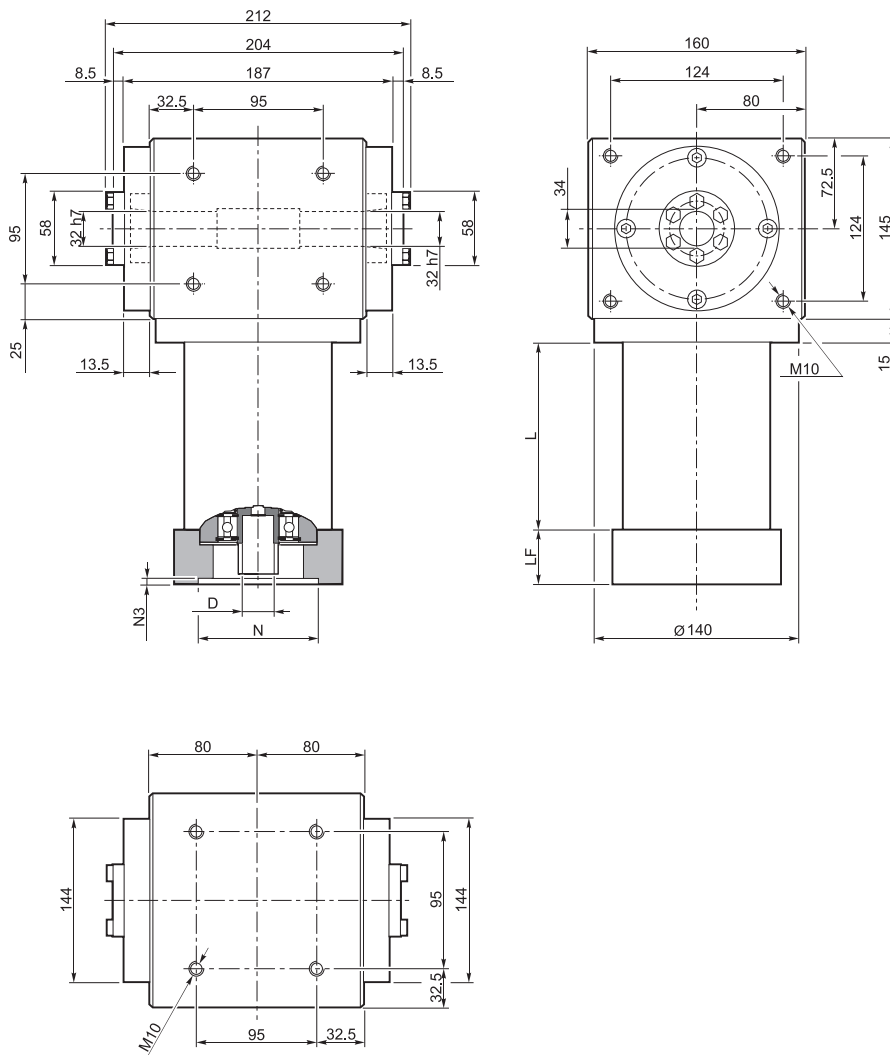
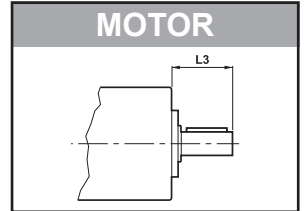
| | D | N | N1 | N2 | N3 | N4 | LF | L3 |
|------------------------------|---------|------|-------|-----|-----|-------|----|----|
| TR 080_ 8...12 40 45 63 | ≤ 12 mm | 45 | 63 | 80 | - | M4x10 | 34 | 40 |
| TR 080_ 8...14 40 40 63 | | 40 | 63 | 80 | - | M4x10 | 34 | 40 |
| TR 080_ 8...14 40 50 65 | | 50 | 65 | 80 | 4 | M5x16 | 34 | 40 |
| TR 080_ 8...14 40 50 65 TH | | 50 | 65 | 80 | 4 | Ø5.5 | 34 | 40 |
| TR 080_ 8...14 40 50 70 | | 50 | 70 | 80 | 4 | M4x10 | 34 | 40 |
| TR 080_ 8...14 40 50 95 | ≤ 14 mm | 50 | 95 | 80 | 4 | M6x10 | 34 | 40 |
| TR 080_ 8...14 40 60 75 | | 60 | 75 | 80 | 4 | M5x16 | 34 | 40 |
| TR 080_ 8...14 40 60 75 TH | | 60 | 75 | 80 | 4 | Ø5.5 | 34 | 40 |
| TR 080_ 8...14 40 73 98.4 | | 73 | 98.4 | 85 | 4 | M5x16 | 34 | 40 |
| TR 080_ 8...14 40 78 63.5 | | 78 | 63.5 | 90 | 4 | Ø6.5 | 34 | 40 |
| TR 080_ 8...16 40 60 85 | ≤ 16 mm | 60 | 85 | 80 | 4 | M5x16 | 34 | 40 |
| TR 080_ 8...16 40 60 90 | | 60 | 90 | 80 | 4 | M5x16 | 34 | 40 |
| TR 080_ 8...19 40 55.5 125.7 | | 55.5 | 125.7 | 105 | 4 | M6x16 | 34 | 40 |
| TR 080_ 8...19 40 70 85 | | 70 | 85 | 80 | 4 | M6x20 | 34 | 40 |
| TR 080_ 8...19 40 70 85 TH | | 70 | 85 | 80 | 4 | Ø6.5 | 34 | 40 |
| TR 080_ 8...19 40 70 90 | | 70 | 90 | 80 | 4 | M5x16 | 34 | 40 |
| TR 080_ 8...19 40 80 100 | | 80 | 100 | 90 | 4 | M6x16 | 34 | 40 |
| TR 080_ 8...19 40 95 115 | ≤ 19 mm | 95 | 115 | 100 | 4 | M8x20 | 34 | 40 |
| TR 080_ 8...19 40 95 130 | | 95 | 130 | 115 | 4 | M8x20 | 34 | 40 |
| TR 080_ 8...19 40 110 130 | | 110 | 130 | 115 | 4 | M8x20 | 34 | 40 |
| TR 080_ 8...19 50 110 145 | | 110 | 145 | 120 | 6.5 | M8x20 | 44 | 50 |
| TR 080_ 8...19 60 110 145 | | 110 | 145 | 120 | 6.5 | M8x20 | 54 | 60 |



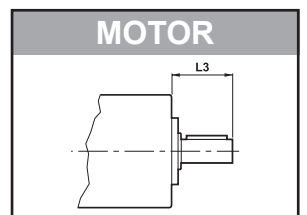
3.4 TR 105

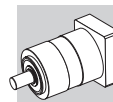


| | L | |
|----------|-------|------|
| TR 105 1 | 107.5 | 6.5 |
| TR 105 2 | 140 | 8.5 |
| TR 105 3 | 172.5 | 10.5 |

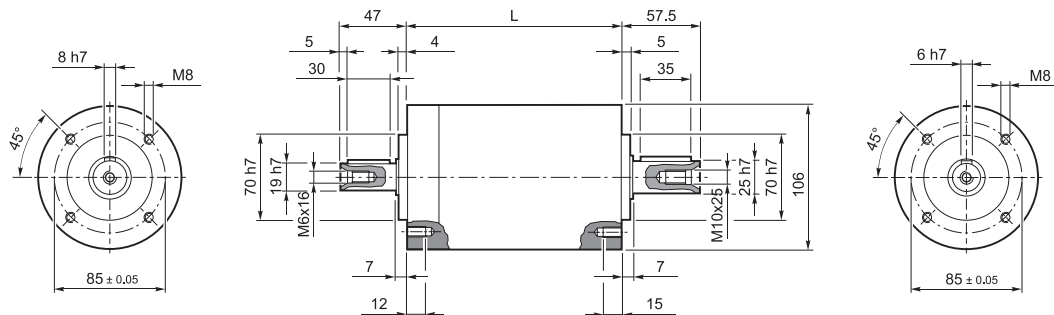


| | L | |
|----------|-------|----|
| TR 105 1 | 107.5 | 32 |
| TR 105 2 | 140 | 34 |
| TR 105 3 | 172.5 | 36 |



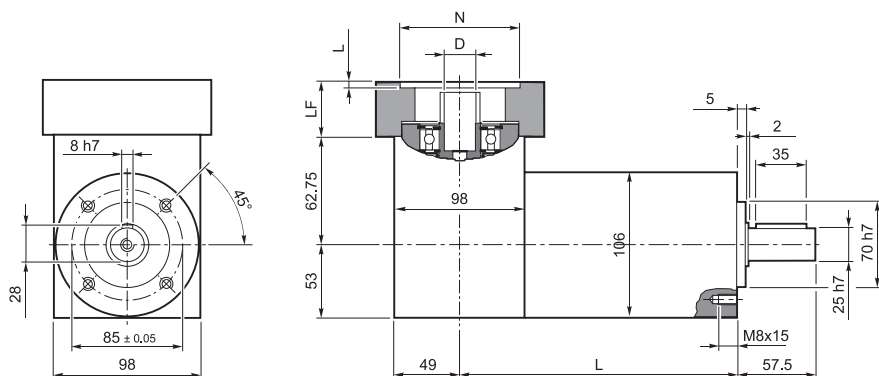


IS



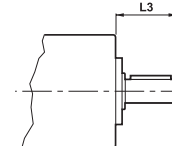
| | L | |
|----------|-------|------|
| TR 105 1 | 121.3 | 6.5 |
| TR 105 2 | 153.8 | 8.5 |
| TR 105 3 | 186.3 | 10.5 |

G

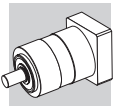


| | L | |
|----------|-------|------|
| TR 105 1 | 170.3 | 8.5 |
| TR 105 2 | 202.8 | 10.5 |
| TR 105 3 | 235.3 | 12.5 |

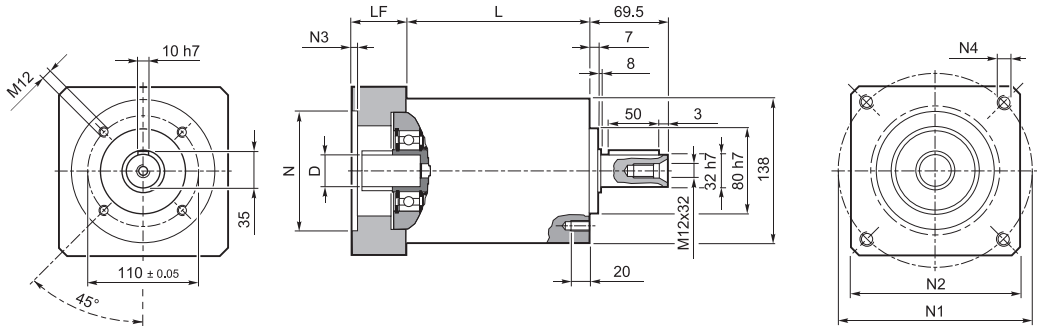
MOTOR



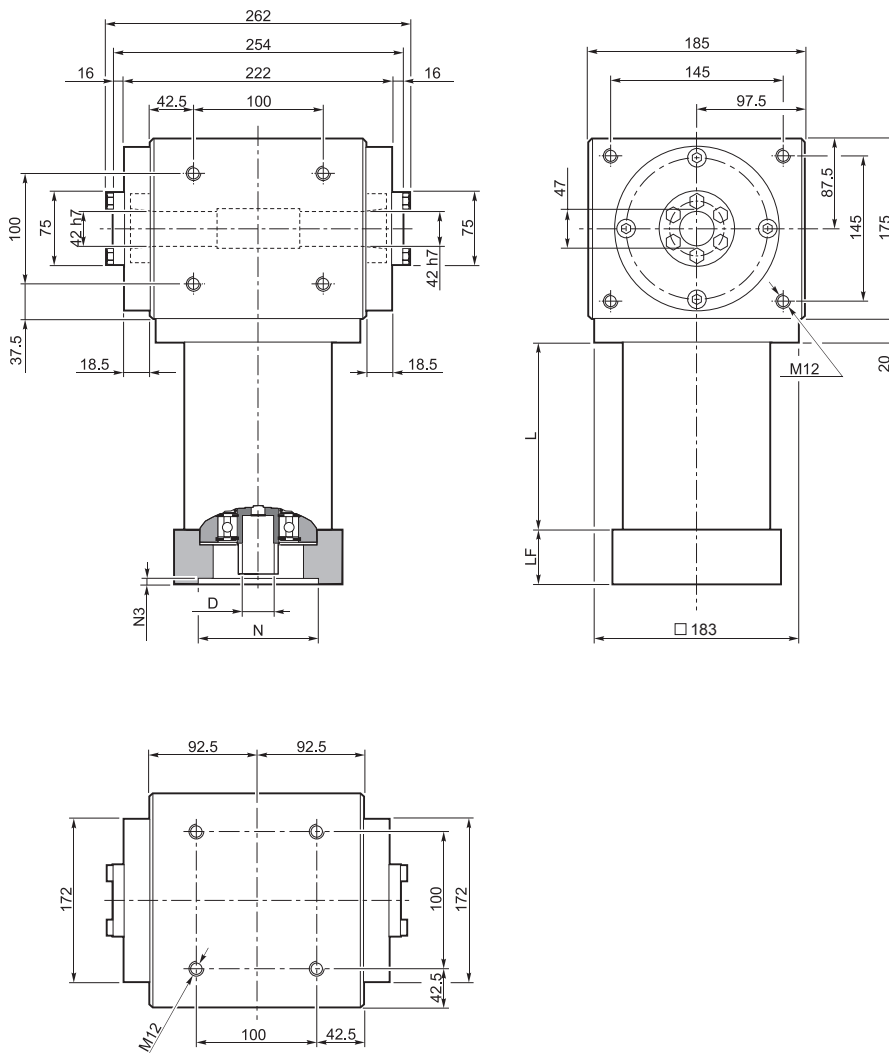
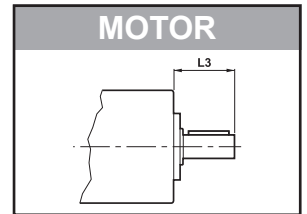
| | D | N | N1 | N2 | N3 | N4 | LF | L3 |
|-------------------------------|---------|------|-------|-----|-----|--------|----|----|
| TR 105_ 11...19 40 50 95 | | 50 | 95 | 100 | 5 | M6x14 | 28 | 40 |
| TR 105_ 11...19 40 55.5 125.7 | | 55.5 | 125.7 | 105 | 5 | M6x16 | 28 | 40 |
| TR 105_ 11...19 40 60 75 | | 60 | 75 | 100 | 5 | M5x14 | 28 | 40 |
| TR 105_ 11...19 40 60 75 TH | | 60 | 75 | 100 | 5 | 5 | 33 | 40 |
| TR 105_ 11...19 40 60 85 | | 60 | 85 | 100 | 6.5 | M5x14 | 28 | 40 |
| TR 105_ 11...19 40 70 85 | | 70 | 85 | 100 | 5 | M6x14 | 28 | 40 |
| TR 105_ 11...19 40 70 85 TH | ≤ 19 mm | 70 | 85 | 100 | 5 | 6 | 33 | 40 |
| TR 105_ 11...19 40 70 90 | | 70 | 90 | 100 | 5 | M5x12 | 28 | 40 |
| TR 105_ 11...19 40 80 100 | | 80 | 100 | 100 | 5 | M6x16 | 28 | 40 |
| TR 105_ 11...19 40 80 100 TH | | 80 | 100 | 100 | 5 | Ø6.5 | 28 | 40 |
| TR 105_ 11...19 40 95 115 | | 95 | 115 | 100 | 5 | M8x18 | 28 | 40 |
| TR 105_ 11...19 40 95 130 | | 95 | 130 | 115 | 5 | M8x18 | 28 | 40 |
| TR 105_ 11...19 40 110 130 | | 110 | 130 | 115 | 5 | M8x18 | 28 | 40 |
| TR 105_ 11...24 50 95 115 | | 95 | 115 | 100 | 5 | M8x18 | 38 | 50 |
| TR 105_ 11...24 50 110 130 | | 110 | 130 | 115 | 6.5 | M8x20 | 38 | 50 |
| TR 105_ 11...24 50 110 145 | ≤ 24 mm | 110 | 145 | 120 | 6.5 | M8x20 | 38 | 50 |
| TR 105_ 11...24 60 110 145 | | 110 | 145 | 120 | 6.5 | M8x20 | 48 | 60 |
| TR 105_ 11...24 50 130 165 | | 130 | 165 | 140 | 6.5 | M10x20 | 38 | 50 |
| TR 105_ 11...32 60 130 165 | ≤ 32 mm | 130 | 165 | 140 | 6.5 | M10x25 | 48 | 60 |



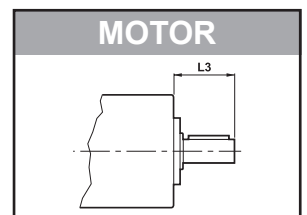
3.5 TR 130

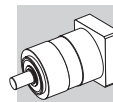


| | L | |
|----------|-------|------|
| TR 130 1 | 126 | 12 |
| TR 130 2 | 165.5 | 15.5 |
| TR 130 3 | 205 | 18.5 |

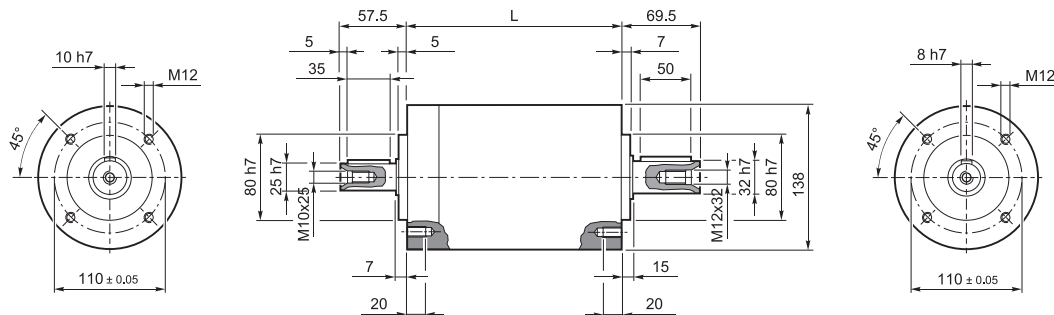


| | L | |
|----------|-------|----|
| TR 130 1 | 126 | 54 |
| TR 130 2 | 165.5 | 58 |
| TR 130 3 | 205 | 61 |



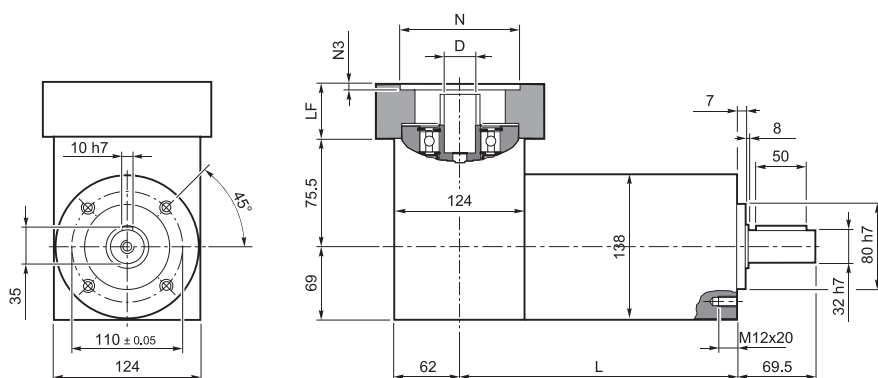


IS



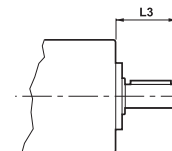
| | L | |
|----------|-------|------|
| TR 130 1 | 151.2 | 12 |
| TR 130 2 | 190.7 | 15.5 |
| TR 130 3 | 230.2 | 18.5 |

G

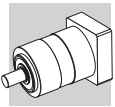


| | L | |
|----------|-------|------|
| TR 130 1 | 213.2 | 16 |
| TR 130 2 | 252.7 | 19.5 |
| TR 130 3 | 292.2 | 22.5 |

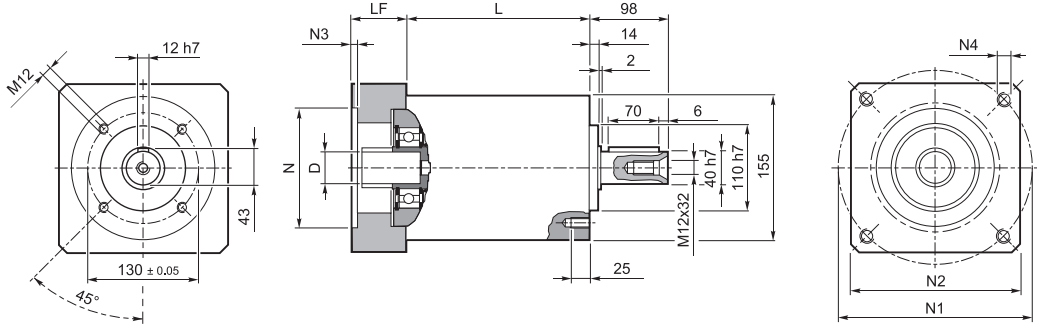
MOTOR



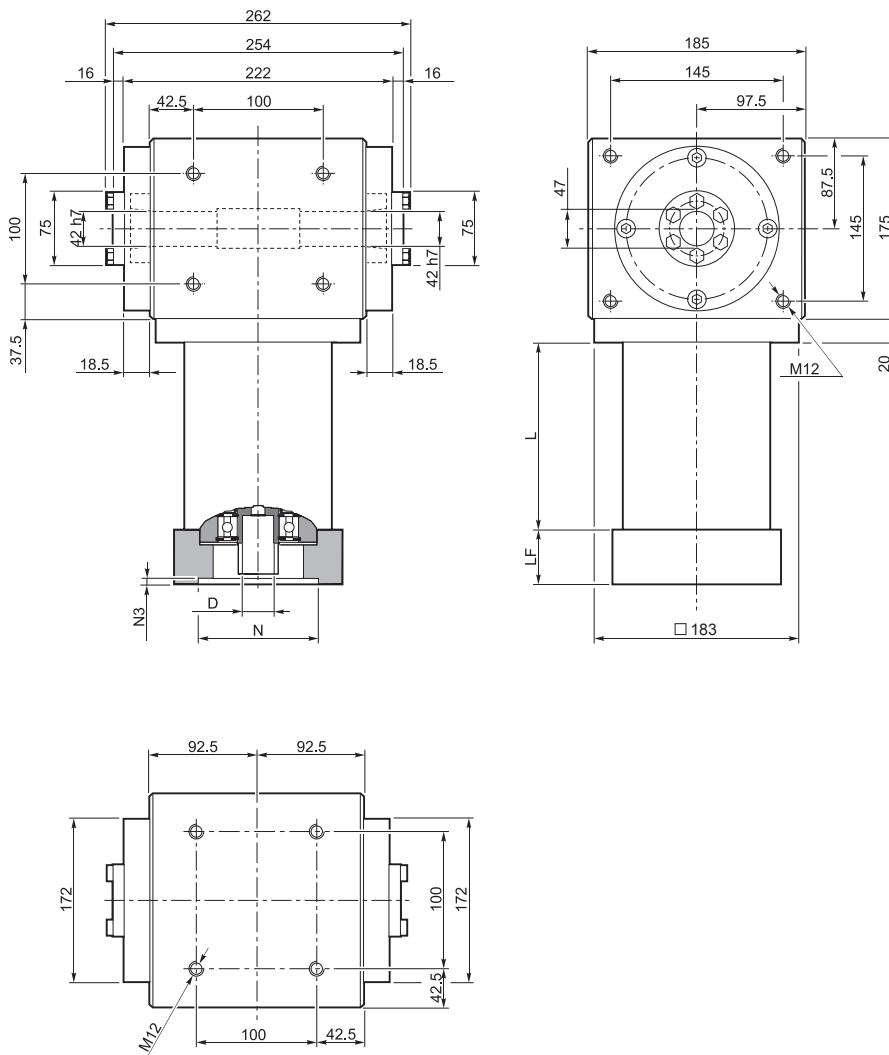
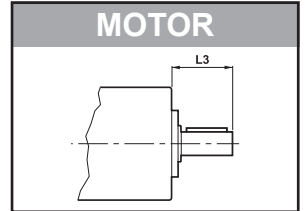
| | D | N | N1 | N2 | N3 | N4 | LF | L3 |
|-------------------------------|---------|-------|-------|-----|-----|--------|------|----|
| TR 130_ 14...19 50 55.5 125.7 | ≤ 19 mm | 55.5 | 125.7 | 130 | 4 | M6x15 | 39.5 | 50 |
| TR 130_ 14...19 50 80 100 | | 80 | 100 | 130 | 4 | M6x15 | 39.5 | 50 |
| TR 130_ 14...24 50 95 115 | | 95 | 115 | 130 | 4 | M8x20 | 39.5 | 50 |
| TR 130_ 14...24 50 110 130 | ≤ 24 mm | 110 | 130 | 130 | 4 | M8x20 | 39.5 | 50 |
| TR 130_ 14...24 60 110 145 | | 110 | 145 | 130 | 6.5 | M8x20 | 49.5 | 60 |
| TR 130_ 14...24 50 130 165 | | 130 | 165 | 140 | 4 | M10x20 | 39.5 | 50 |
| TR 130_ 14...24 80 114.3 200 | | 114.3 | 200 | 170 | 5.5 | M14x25 | 39.5 | 50 |
| TR 130_ 14...32 60 130 165 | ≤ 32 mm | 130 | 165 | 140 | 4 | M10x20 | 49.5 | 60 |
| TR 130_ 14...32 60 180 215 | | 180 | 215 | 190 | 5.5 | M14x25 | 49.5 | 60 |
| TR 130_ 14...38 80 114.3 200 | ≤ 38 mm | 114.3 | 200 | 170 | 5.5 | M12x25 | 69.5 | 80 |
| TR 130_ 14...38 80 180 215 | | 180 | 215 | 190 | 5.5 | M14x25 | 69.5 | 80 |



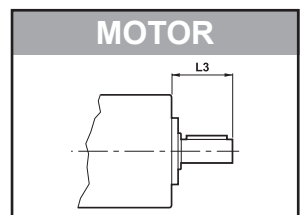
3.6 TR 160

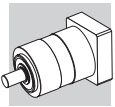


| | L | |
|----------|-------|----|
| TR 160 1 | 130 | 17 |
| TR 160 2 | 169.5 | 21 |
| TR 160 3 | 209 | 28 |

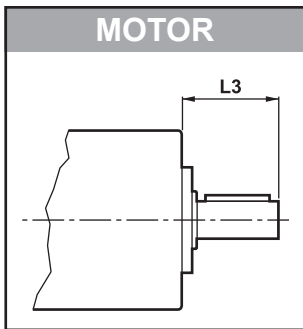
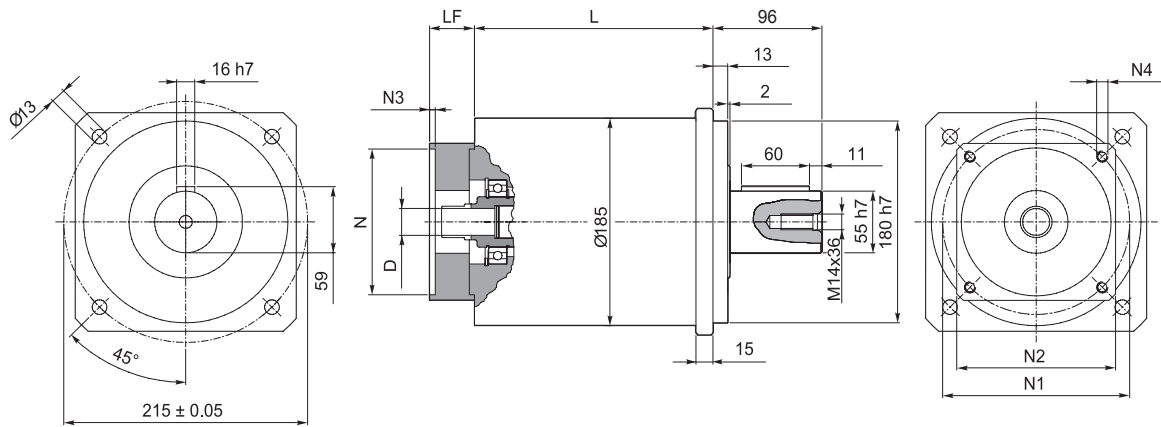


| | L | |
|----------|-------|----|
| TR 160 1 | 130 | 54 |
| TR 160 2 | 169.5 | 58 |
| TR 160 3 | 209 | 61 |



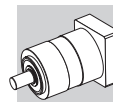


3.7 TR 190

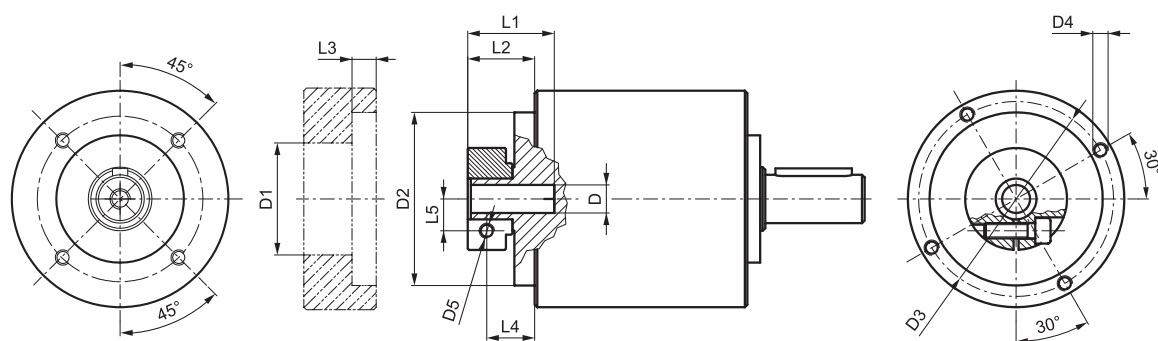


| | L | kg |
|----------|-------|----|
| TR 190 1 | 158.7 | 25 |
| TR 190 2 | 210.4 | 29 |
| TR 190 3 | 262.1 | 34 |

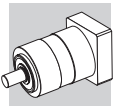
| | D | N | N1 | N2 | N3 | N4 | LF | L3 |
|-------------------------------|---------|-------|-------|-----|-----|--------|------|----|
| TR 190_ 14...19 50 55.5 125.7 | ≤ 19 mm | 55.5 | 125.7 | 140 | 5 | M6x15 | 39.5 | 50 |
| TR 190_ 14...19 50 80 100 | | 80 | 100 | 140 | 5 | M6x15 | 39.5 | 50 |
| TR 190_ 14...24 50 95 115 | ≤ 24 mm | 95 | 115 | 140 | 5 | M8x20 | 39.5 | 50 |
| TR 190_ 14...24 50 110 130 | | 110 | 130 | 140 | 5 | M8x20 | 39.5 | 50 |
| TR 190_ 14...24 60 110 145 | | 110 | 145 | 140 | 6.5 | M8x20 | 49.5 | 60 |
| TR 190_ 14...24 50 130 165 | | 130 | 165 | 140 | 5 | M10x20 | 39.5 | 50 |
| TR 190_ 14...32 60 130 165 | ≤ 32 mm | 130 | 165 | 140 | 5 | M10x20 | 49.5 | 60 |
| TR 190_ 14...32 60 180 215 | | 180 | 215 | 190 | 5.5 | M14x25 | 49.5 | 60 |
| TR 190_ 14...48 80 114.3 200 | ≤ 48 mm | 114.3 | 200 | 170 | 6.5 | M12x25 | 69.5 | 80 |
| TR 190_ 14...48 80 180 215 | | 180 | 215 | 190 | 6.5 | M14x25 | 69.5 | 80 |




3.8 GEARBOX WITHOUT MOTOR ADAPTER



| | D (F7) | D1 | D2 (h7) | D3 | D4 | D5 | L1 | L2 | L3 +0.1 +0.2 | L4 | L5 |
|--------|--------------------|------|------------|-------|-------|-----|------|------|--------------------|------|------|
| TR 053 | 6 -6.35 -7 | 32.5 | 50 | 42.5 | M4x8 | M4 | 21.7 | 13.2 | 3 | 8.2 | 8 |
| | 8 -9 -9.52 -10 | 32.5 | 50 | 42.5 | M4x8 | M4 | 21.7 | 13.2 | 3 | 8.2 | 9 |
| | 11 -12 -12.7 | 35.5 | 50 | 42.5 | M4x8 | M4 | 22 | 13.5 | 3 | 8.5 | 11 |
| | 14 | 35.5 | 50 | 42.5 | M4x8 | M4 | 25 | 17 | 3 | 10.2 | 11.5 |
| TR 060 | 6 -6.35 -7 | 32.5 | 50 | 42.5 | M4x8 | M4 | 21.7 | 13.2 | 3 | 8.2 | 8 |
| | 8 -9 -9.52 -10 | 32.5 | 50 | 42.5 | M4x8 | M4 | 21.7 | 13.2 | 3 | 8.2 | 9 |
| | 11 -12 -12.7 | 35.5 | 50 | 42.5 | M4x8 | M4 | 22 | 13.5 | 3 | 8.5 | 11 |
| | 14 | 35.5 | 50 | 42.5 | M4x8 | M4 | 25 | 17 | 3 | 10.2 | 11.5 |
| TR 080 | 8 -9 -9.52 | 38 | 68 | 76.5 | M6x10 | M6 | 34 | 26.3 | 9.5 | 18.8 | 10.5 |
| | 11 -12 -12.7 | 43 | 68 | 76.5 | M6x10 | M6 | 34 | 26.3 | 9.5 | 18.8 | 12.5 |
| | 14 -15.875 -16 -17 | 48 | 68 | 76.5 | M6x10 | M6 | 34 | 26.3 | 9.5 | 18.8 | 14.5 |
| | 19 -19.05 | 51 | 68 | 76.5 | M6x10 | M6 | 34 | 26.3 | 9.5 | 18.8 | 16.5 |
| TR 105 | 11 -12 -12.7 | 43 | 90 | 98 | M6x15 | M6 | 33.5 | 20 | 7.6 | 12.5 | 12.5 |
| | 14 -15 -15.875 -16 | 48 | 90 | 98 | M6x15 | M6 | 33.5 | 20 | 7.6 | 12.5 | 14.5 |
| | 19 | 51 | 90 | 98 | M6x15 | M6 | 33.5 | 20 | 7.6 | 12.5 | 16.5 |
| | 22 -24 | 56.5 | 90 | 98 | M6x15 | M6 | 36.5 | 23 | 7.6 | 14 | 19 |
| | 28 | 67 | 90 | 98 | M6x15 | M8 | 36.5 | 23 | 7.6 | 14 | 22.5 |
| TR 130 | 32 | 71 | 90 | 98 | M6x15 | M8 | 38 | 24.5 | 7.6 | 15.5 | 24.5 |
| | 14 -15.875 -16 | 48 | 113 | 125.5 | M8x15 | M6 | 40 | 27.5 | 6 | 20 | 14.5 |
| | 19 | 51 | 113 | 125.5 | M8x15 | M6 | 40 | 27.5 | 6 | 20 | 16.5 |
| | 22 -24 | 56.5 | 113 | 125.5 | M8x15 | M6 | 41 | 28.5 | 6 | 19.5 | 19 |
| | 28 | 67 | 113 | 125.5 | M8x15 | M8 | 41 | 28.5 | 6 | 19.5 | 22.5 |
| | 32 | 71 | 113 | 125.5 | M8x15 | M8 | 41 | 28.5 | 6 | 18.5 | 24.5 |
| TR 160 | 35 | 73 | 113 | 125.5 | M8x15 | M8 | 50 | 37.5 | 11.25 | 26 | 26 |
| | 38 | 77.5 | 113 | 125.5 | M8x15 | M8 | 50 | 37.5 | 11.25 | 26 | 28 |
| | 14 -15.875 -16 | 48 | 130 | 142.5 | M8x16 | M6 | 40 | 27.5 | 6 | 20 | 14.5 |
| | 19 | 51 | 130 | 142.5 | M8x16 | M6 | 40 | 27.5 | 6 | 20 | 16.5 |
| | 22 -24 | 56.5 | 130 | 142.5 | M8x16 | M6 | 41 | 28.5 | 6 | 19.5 | 19 |
| | 28 | 67 | 130 | 142.5 | M8x16 | M8 | 41 | 28.5 | 6 | 19.5 | 22.5 |
| TR 190 | 32 | 71 | 130 | 142.5 | M8x16 | M8 | 41 | 28.5 | 6 | 18.5 | 24.5 |
| | 35 | 73 | 130 | 142.5 | M8x16 | M8 | 50 | 37.5 | 11.25 | 26 | 26 |
| | 38 | 77.5 | 130 | 142.5 | M8x16 | M8 | 50 | 37.5 | 11.25 | 26 | 28 |
| | 14 -16 | 48 | 130 | 142.5 | M8x14 | M6 | 45.5 | 27.5 | 6 | 20 | 14.5 |
| | 19 | 51 | 130 | 142.5 | M8x14 | M6 | 45.5 | 27.5 | 6 | 20 | 16.5 |
| | 22 -24 | 56.5 | 130 | 142.5 | M8x14 | M6 | 47 | 29 | 6 | 20 | 19 |
| | 28 | 67 | 130 | 142.5 | M8x14 | M8 | 47 | 29 | 6 | 20 | 22.5 |
| | 32 | 71 | 130 | 142.5 | M8x14 | M8 | 47 | 29 | 6 | 20 | 24.5 |
| TR 190 | 35 | 73 | 130 | 142.5 | M8x14 | M8 | 54.5 | 36.5 | 6 | 25 | 26 |
| | 38 | 77.5 | 130 | 142.5 | M8x14 | M8 | 54.5 | 36.5 | 6 | 25 | 28 |
| | 42 | 92 | 130 | 142.5 | M8x14 | M10 | 60.5 | 40 | 6 | 25 | 33 |
| | 45 | 95 | 130 | 142.5 | M8x14 | M10 | 60.5 | 40 | 6 | 25 | 33 |
| | 48 | 97 | 130 | 142.5 | M8x14 | M10 | 60.5 | 40 | 6 | 25 | 33 |



INDEX OF REVISIONS (R)

| R1 | |
|---|---|
|  | DESCRIPTION |
| 24 ... 35 | Chapter 3 "Dimensions" - the dimensions and the availability of motor mounting flanges have been updated |

100722

This publication supersedes and replaces any previous edition and revision. We reserve the right to implement modifications without notice.
This catalogue cannot be reproduced, even partially, without prior consent.

TR



www.tecnoingranaggi.it

TECNOINGRANAGGI

TECNOINGRANAGGI RIDUTTORI s.r.l.
Via Davia, 5
40017 S. Giovanni in Persiceto
Bologna (ITALY)
Tel. (+39) 0516878111
Fax (+39) 0516878132
www.tecnoingranaggi.it
info@tecnoingranaggi.it