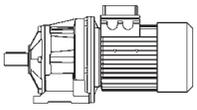


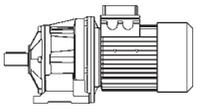


Maintenance and operational instructions for helical geared motors and helical gear reduction units

HA







## Warehouse storage

When moving the unit, care should be taken to protect external parts from breakage or damage due to accidental knocks or falls.

If the unit is to be stored in a hostile atmosphere or for a long period of time (2/4 months), it is important to apply protective and waterproofing products to avoid deterioration of shafts and rubber parts.

Before starting up the unit, carry out the following checks:

Check the data shown on the name plate of the reduction unit and/or the electric motor;

Check for any leaks of lubricant

If possible, remove any traces of dirt from the shaft and from the areas around the oil seal.

If the oil seal is not immersed in the lubricant inside the assembly during particularly long storage periods (4/6 months) it is recommended that it should be replaced as the rubber might stick to the shaft or even have lost the elasticity it needs to work.

## Installation

Particular care must be taken when installing drives, as this often the source of damage and of down time. Careful choice of the type of drive and mounting position can often avoid the need for protection of sensitive areas, particularly underneath the unit from oil leaks, however limited they may be.

- The machine must be firmly fastened in place in order to prevent any vibrations.
- Whenever possible, protect the reduction unit from direct sunlight and bad weather, especially when it is mounted on its vertical axis.
- Make sure the air intake on the fan side is unobstructed in order to ensure that the motor is correctly cooled.
- In the case of temperatures of  $< -5\text{ }^{\circ}\text{C}$  or  $> +40\text{ }^{\circ}\text{C}$ , contact Technical Assistance.
- If the motor is to be started up very often under load, the use of a heat probe inserted into the motor is recommended.
- The various machine members (pulleys, gear wheels, couplings, etc.) must be mounted on the shafts using special threaded holes or other systems that ensure correct operation without risk of causing damage to the bearings or the external parts of the assemblies (fig.1).
- Lubricate the surfaces that come into contact in order to prevent oxidation or seizure.

## Installation

Example of a pulley mounted correctly on the slow shaft of a reduction unit

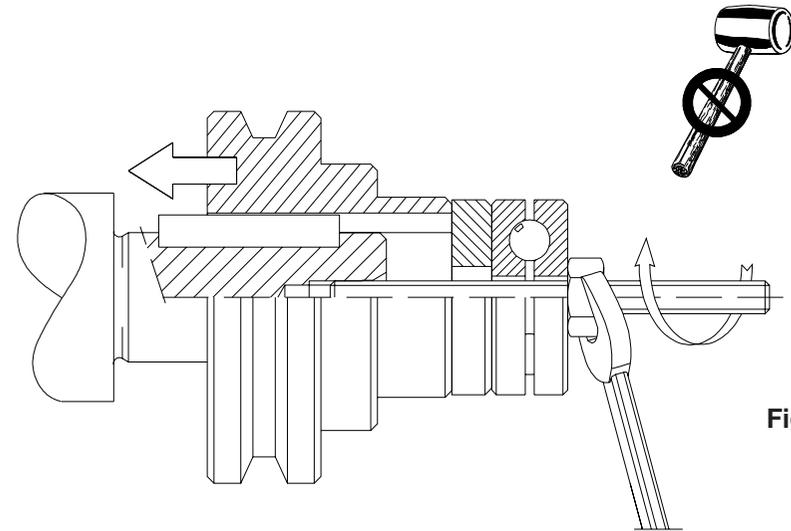


Fig.1

Correct and incorrect examples of pulleys mounted on the main shaft of a reduction unit.

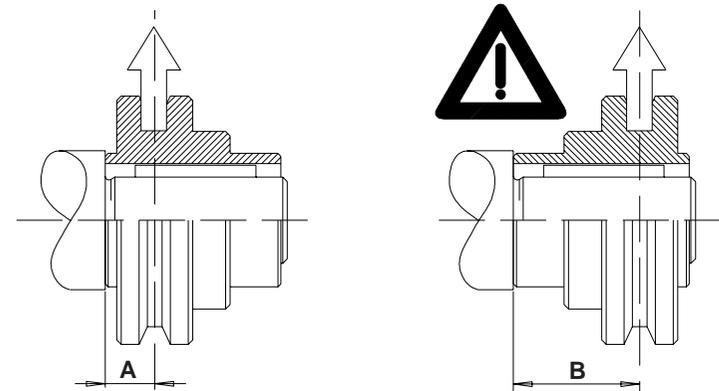
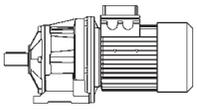


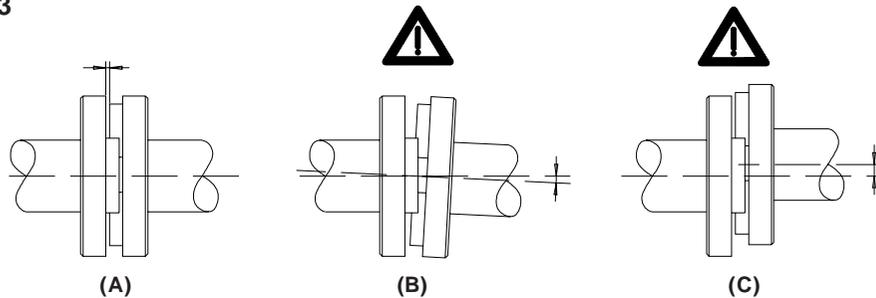
Fig.2



## Installation

### Correct and incorrect examples of coupling connections

Fig.3



The pulley must be mounted on the main shaft as close as possible to the shoulder so that it does not cause excessive radial load on the bearings (fig. 2). Great care must be taken when connecting the couplings to ensure that they are well aligned, so as not to cause excessive radial load on the bearings (fig.3). When it is applied, paint must never be used on rubber parts: oil seal, etc. It must never be applied to any breather holes in plugs if they are mounted on the unit. In the case of assemblies with oil plugs, remove the closed cap used for transport and fit it with the breather plug that is supplied with the reduction unit. When the assembly is supplied without a motor, the following precautions must be followed in order to ensure that connections are properly made

#### Mounting the motor on the pam B5/B14 flange

Check that the tolerance of the motor shaft and the motor flange comply with at least one 'normal' class of quality. Carefully clean off any trace of dirt or paint from the shaft, the spigot and the face of the flange. Carry out mounting operations making sure not to use force. If this is not possible, check the tolerance of the motor key and ensure that it is correctly fitted. Apply assembly grease to the shaft in order to prevent oxidation or seizure caused by contact. Good quality motors should be used in order to ensure that the unit works correctly, without vibrations or noise.

Before mounting the unit on the machine, check that the principal shaft of the reduction unit rotates in the right direction.

*Use the oil window, if present, to check that the lubricant reaches the correct level required for the mounting position used.*

## Starting up

The unit should be started up gradually: do not immediately apply the maximum load the machine is able to take ; look for and correct any malfunction that may be caused by incorrect mounting.

Running-in is not essential for the reduction unit to run properly since modern construction techniques for the gears and castings, the extreme cleanliness of the internal parts, and the excellent qualities of the lubricants used, ensure that the internal parts receive a high degree of protection even during the first moments.

## Servicing

The high degree of finish of the internal parts ensures that the unit will work correctly with only a minimum amount of servicing

Generally speaking, the following rules should be followed: periodically check that the exterior of the assembly is clean, especially in the cooling areas; periodically check to see if there are any leaks, especially in the areas around the oil seals.

Assemblies that are lubricated for life and thus do not have any oil plugs do not require any special maintenance except as stated above.

For other assemblies, low maintenance is required with an oil change at 8/10,000 hours of use. The change of oil naturally depends on the type of environment and use to which the unit is put.

Apart from the normal maintenance rules given above, make sure the breather hole in the plug is clean and, using the oil window, periodically check that there is sufficient lubricant.

Should it be necessary to top up with lubricant, use the same type that is already in the reducer or one that is compatible with it.

In case of doubtful incompatibility between lubricants, we recommend you empty out the oil from the gearbox completely and, before refilling with new oil, wash out the unit to remove any residue.

When changing the oil, follow the previous instructions.

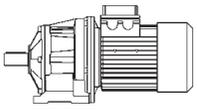
## Troubleshooting

If any problems should arise when starting up the unit or during its first few hours of operation, contact the after sales service unit of Motovario.

The table shows a series of problems with a description of possible remedies.

It should be borne in mind however that the information given is for reference only as all the drives manufactured by Motovario are thoroughly tested and checked before they leave the factory.

Please note that tampering with the assembly without prior authorization from Motovario immediately invalidates the warranty and often makes it impossible to ascertain the causes of a defect or malfunction.

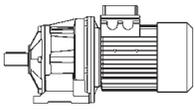


### Troubleshooting

PROBLEMS	CAUSES	ACTION (1)	ACTION (2)
<i>The motor does not start.</i>	Problems with power supply. Defective motor. Wrong size of motor.	Check power supply.	Replace electric motor.
<i>Current absorbed by the motor is greater than shown on the data plate.</i>	Wrong size of motor.	Check the application.	Replace the electric motor and, if necessary, the reduction unit.
<i>Temperature of the motor housing is very high.</i>	Defective motor. Wrong size of motor. Incorrect mounting of motor	Check the application.	Replace the electric motor and, if necessary, the reduction unit.
<i>Temperature of the reduction unit housing is very high.</i>	Wrong size of reduction unit. Mounting position does not comply with the order. Incorrect mounting of motor	Check the application.	Correct the working conditions: mounting position and/or lubricant level.
<i>Incorrect rotation speed of the main reducer unit shaft.</i>	Incorrect reduction ratio. Incorrect polarity of motor.	Check reduction ratio. Check polarity of motor.	Replace reduction unit and/or electric motor.
<i>Oil leak from oil seal.</i>	Defective oil seal. Oil seal damaged during shipment. Defective motor shaft.	Replace the oil seal. Repair motor shaft (if possible).	Replace the part or return the assembly to Motovario.
<i>Oil leak from joint.</i>	Flat gasket or O-ring damaged.	Replace damaged gasket or O-ring.	Return the assembly to Motovario.
<i>The main shaft rotates the wrong way.</i>	Incorrect connection of the electric motor.	Swap two phases of the motor supply.	
<i>Intermittent noise from the gears.</i>	Dents in the gear wheels.	No practical problem if the noise has no effect on the application.	Return the assembly to Motovario if there is significant noise when loaded.

### Troubleshooting

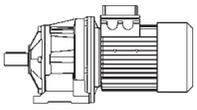
PROBLEMS	CAUSES	ACTION (1)	ACTION (2)
<i>No intermittent noise from the gears.</i>	Dirty inside the gearbox.	No practical problem if the noise has no effect on the application.	Return the assembly to Motovario if there is significant noise when loaded.
<i>Noise (whine) from the drive assembly.</i>	Bearings incorrectly adjusted. Gears with mesh errors. Insufficient lubricant.	Check correct quantity of lubricant.	Return the assembly to Motovario.
<i>Electric motor vibrates.</i>	Measurement of the assembly coupling.	Check geometric tolerance of flange on electric motor. Check tolerance and geometry of key on motor shaft.	Replace electric motor.



## Lubrication

- The reduction units HA series with 1, 2, 3 stages all sizes are supplied complete with lubricant, have no oil plugs and need no maintenance.
- For the reduction units HA series with 2, 3 stages 50 and 60 it is always necessary to specify the envisaged position.

<b>Mineral oil</b>		
<b>T°C ISO VG...</b>	<b>(-5) ÷ (+40) ISO VG220</b>	<b>(-15) ÷ (+25) ISO VG150</b>
<b>AGIP</b>	BLASIA 220	BLASIA 150
<b>SHELL</b>	OMALA OIL220	OMALA OIL150
<b>ESSO</b>	SPARTAN EP220	SPARTAN EP150
<b>MOBIL</b>	MOBILGEAR 630	MOBILGEAR 629
<b>CASTROL</b>	ALPHA MAX 220	ALPHA MAX 150
<b>BP</b>	ENERGOL GR-XP220	ENERGOL GR-XP150



## Critical applications

The performance given in the catalogue correspond to mounting position B3 or similar, ie. when the first stage is not entirely immersed in oil. For other mounting positions and/or particular input speeds, refer to the above tables that highlight different critical situations for each size of reduction unit.

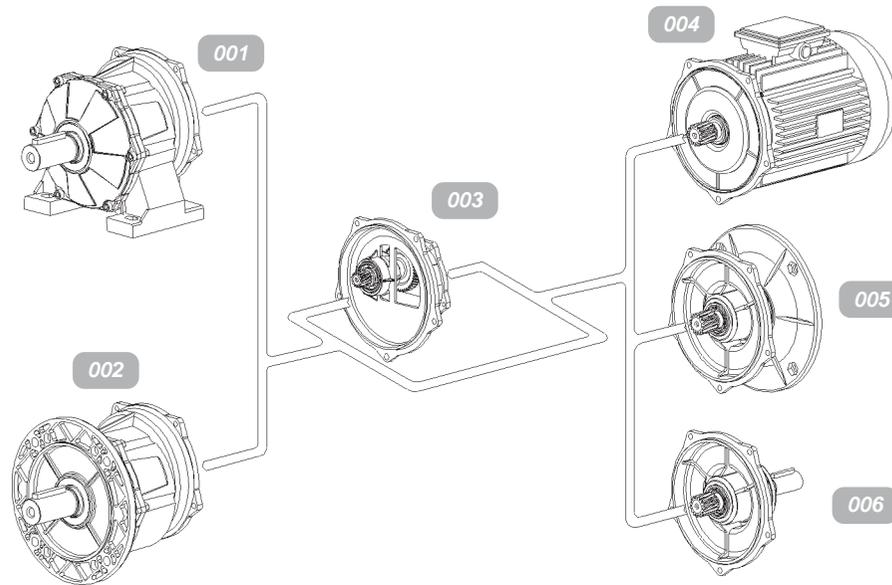
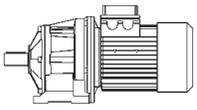
It is also necessary to take due consideration of and carefully assess the following applications by calling our Technical Service.

- As a speed increasing.
- Use in services that could be hazardous for people if the reduction unit fails.
- Applications with especially high inertia.
- Use as a lifting winch.
- Applications with high dynamic strain on the case of the reduction unit.
- In places with T° under -5°C or over 40°C.
- Use in chemically aggressive environments.
- Use in a salty environment.
- Mounting positions not envisaged in the catalogue.
- Use in radioactive environments.
- Use in environments pressures other than atmospheric pressure.
- Avoid applications where even partial immersion of the reduction unit is required.

<b>H</b>	<b>A30</b>	<b>A40</b>	<b>A50</b>	<b>A60</b>
V5 - V1: 1500 < n1 < 3000	-	-	-	-
n1 > 3000	B	B	B	B
V3 - V6	B	B	B	B

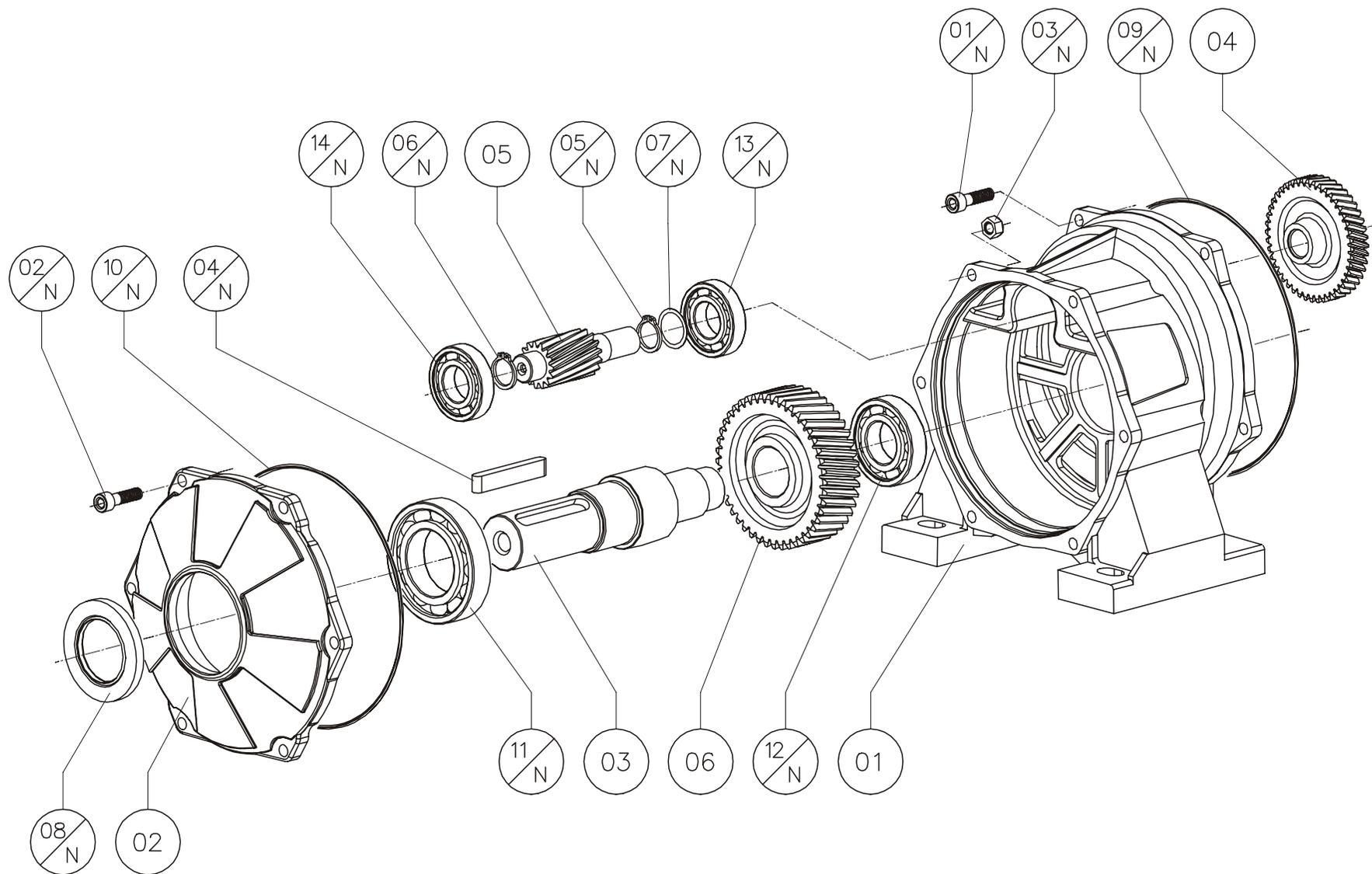
**A** - Application not recommended

**B** - Check the application and/or call our technical service



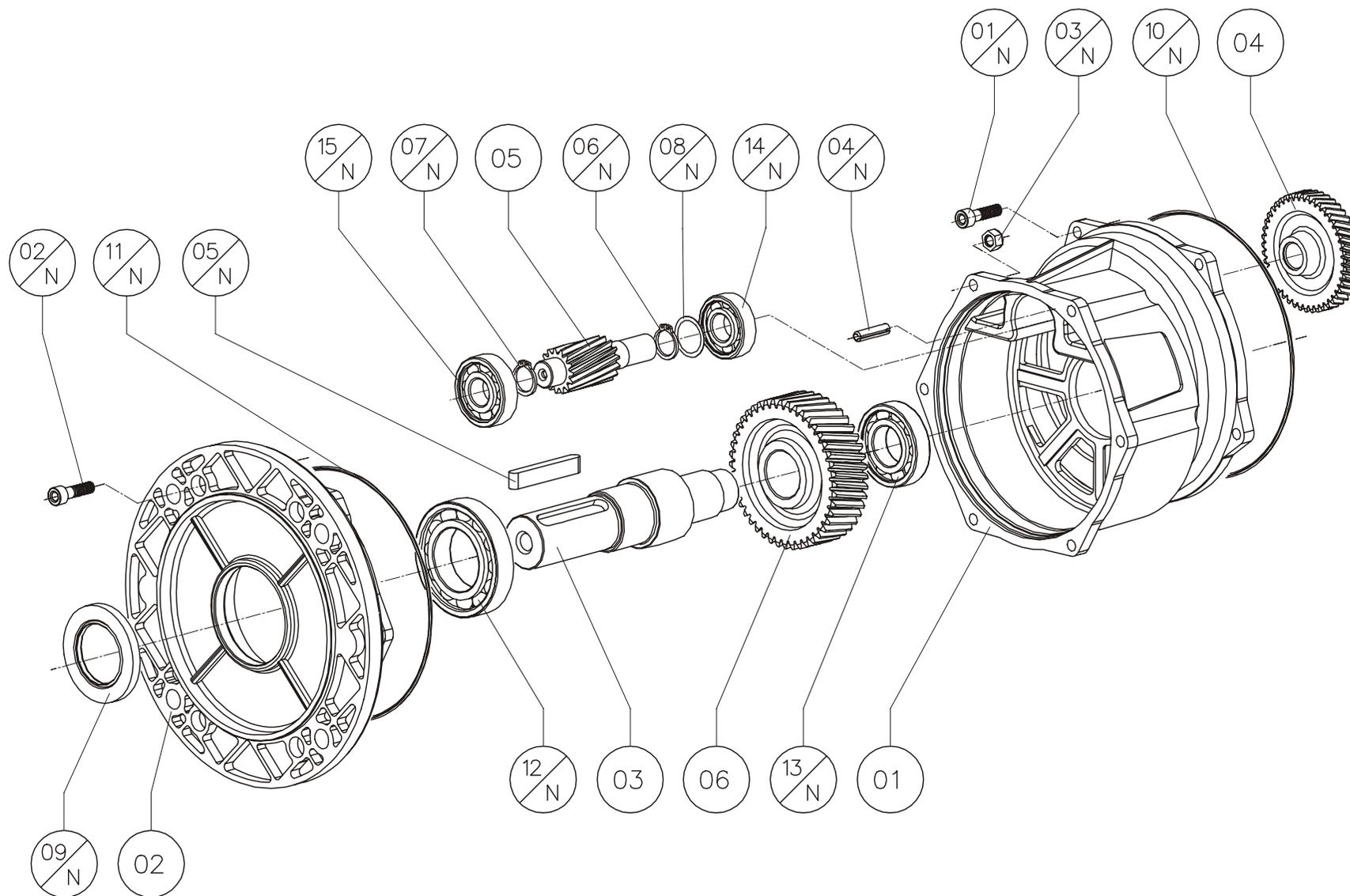
001	pag.10,11	007	pag.30,31
002	pag.12,13	008	pag.32,33
003	pag.14,15	009	pag.34÷37
004	pag.16÷17	010	pag.38÷41
005	pag. 18÷27		
006	pag. 28,29		

P = Project of pertinence  
T = Reference table  
C = Part number



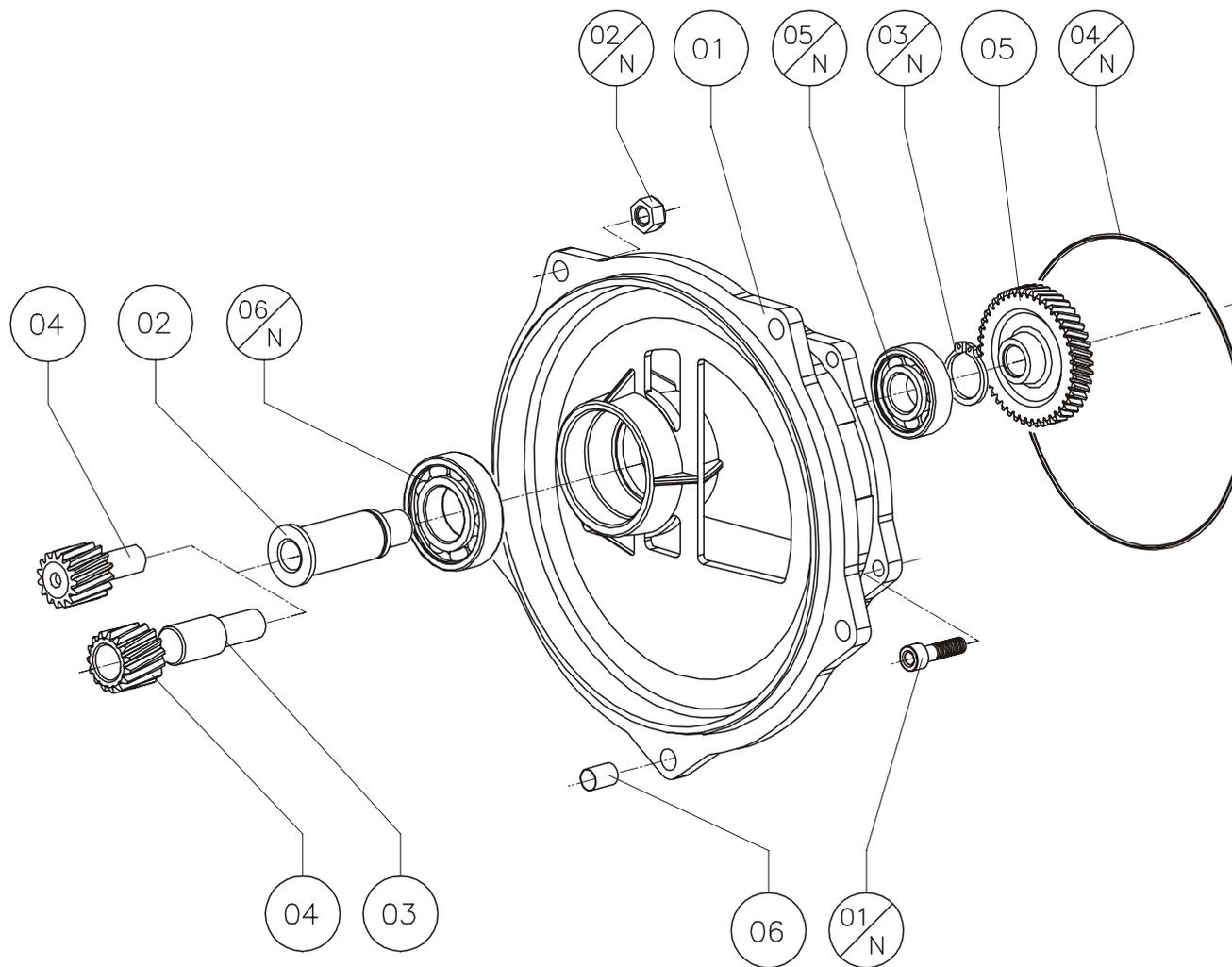
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0	001	01	Casing	0.030.01	0.040.01	0.050.01	0.060.01
0	001	02	Cover	0.030.05	0.040.05	0.050.05	0.060.05
0	001	03	Output shaft	0.030.18	0.040.18	0.050.18	0.060.18
0	001	04	Gear	0.030.24	0.030.24	0.050.24	0.050.24
0	001	05	Pinion	0.030.25	0.030.25	0.050.25	0.060.25
0	001	06	Gear	0.030.26	0.030.26	0.050.26	0.060.26

<i>P</i>	<i>T</i>	<i>C</i>	<i>Commercial</i>	<i>030</i>		<i>040</i>		<i>050</i>		<i>060</i>	
0	001	01 N	Screw DIN 912	M6x20	5	M6x20	5	M8x30	5	M8x30	5
0	001	02 N	Screw DIN 912	M6x25	5	M6x25	5	M8x30	6	M8x30	6
0	001	03 N	Nut DIN 934/6	M6	5	M6	5	M8	6	M8	6
0	001	04 N	Key DIN 6885	A 6x6x30	1	A 8x6x35	1	A 8x7x50	1	A 12x8x70	1
0	001	05 N	Circlip DIN 471	15	1	15	1	20	1	-	-
0	001	06 N	Circlip DIN 471	15	1	15	1	-	-	-	-
0	001	07 N	Spacer DIN 988	-	-	-	-	20x28x1	1	-	-
0	001	08 N	Oil seal DIN 3760	AS 25x40x7	1	AS 30x47x7	1	AS 35x62x7	1	AS 45x72x8	1
0	001	09 N	O-ring	2500	1	2500	1	3725	1	3725	1
0	001	10 N	O-ring	2450	1	2500	1	3600	1	3700	1
0	001	11 N	Bearing	6205	1	6206	1	6207	1	6209	1
0	001	12 N	Bearing	6203	1	6204	1	6205	1	6206	1
0	001	13 N	Bearing	6002	1	6202	1	6004	1	6204	1
0	001	14 N	Bearing	6202	1	6302	1	6303	1	6304	1

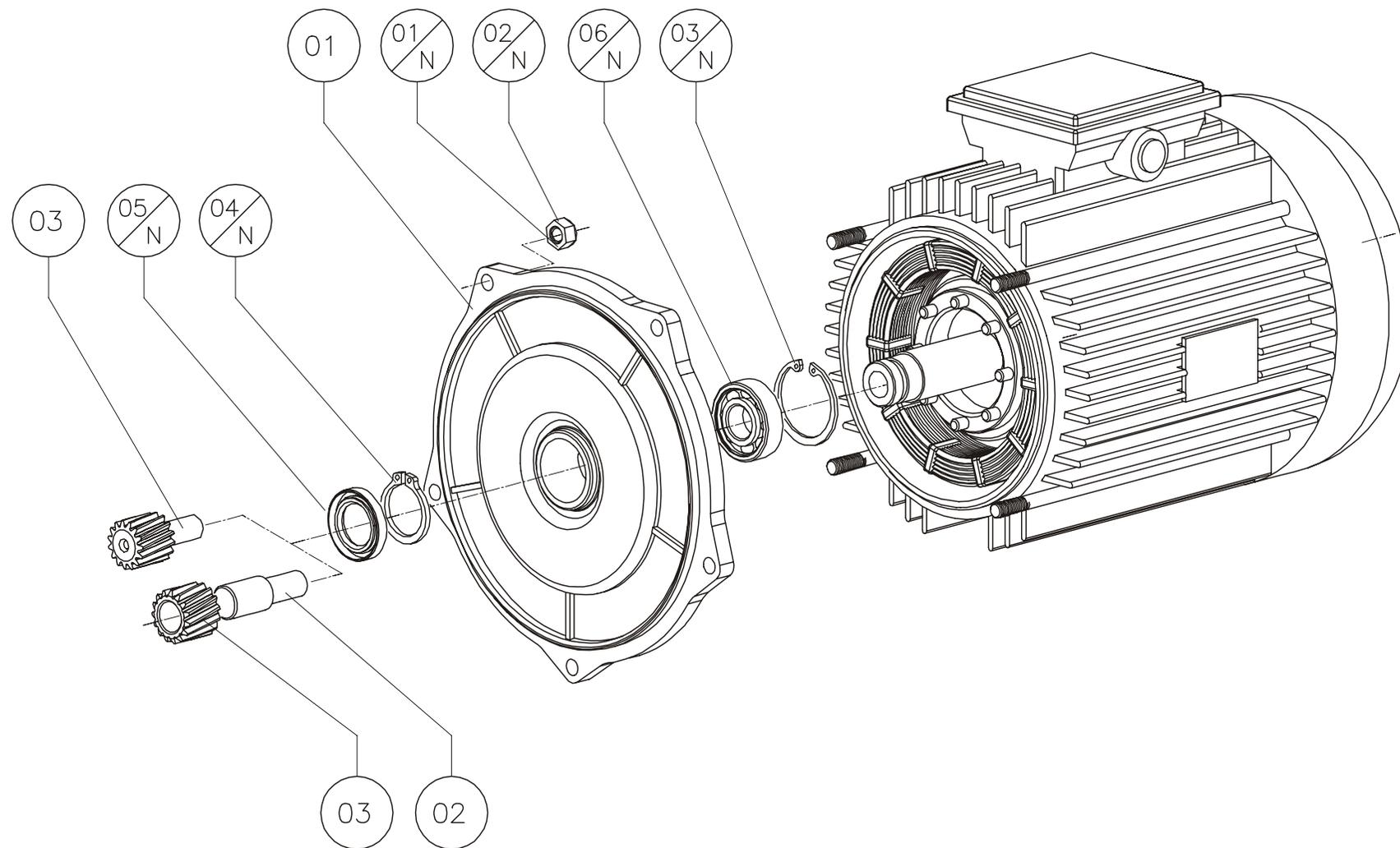


<i>P</i>	<i>T</i>	<i>C</i>	<i>Built</i>	<i>030</i>	<i>040</i>	<i>050</i>	<i>060</i>
0	002	01	Casing	0.030.02	0.040.02	0.050.02	0.060.02
0	002	02	Cover	0.030.06	0.040.06	0.050.06	0.060.06
0	002	03	Output shaft	0.030.18	0.040.18	0.050.18	0.060.18
0	002	04	Gear	0.030.24	0.030.24	0.050.24	0.050.24
0	002	05	Pinion	0.030.25	0.030.25	0.050.25	0.060.25
0	002	06	Gear	0.030.26	0.030.26	0.050.26	0.060.26

<i>P</i>	<i>T</i>	<i>C</i>	<i>Commercial</i>	<i>030</i>		<i>040</i>		<i>050</i>		<i>060</i>	
0	002	01 N	Screw DIN 912	M6x20	5	M6x20	5	M8x30	5	M8x30	5
0	002	02 N	Screw DIN 912	M6x25	5	M6x25	5	M8x30	6	M8x30	6
0	002	03 N	Nut DIN 934/6	M6	5	M6	5	M8	6	M8	6
0	002	04 N	Dowel pin DIN 7344	5x25	1	5x20	1	6x26	1	6x26	1
0	002	05 N	Key DIN 6885	A 6x6x30	1	A 8x6x35	1	A 8x7x50	1	A 12x8x70	1
0	002	06 N	Circlip DIN 471	15	1	15	1	20	1	-	-
0	002	07 N	Circlip DIN 471	15	1	15	1	-	-	-	-
0	002	08 N	Spacer DIN 988	-	-	-	-	20x28x1	1	-	-
0	002	09 N	Oil seal DIN 3760	AS 25x40x7	1	AS 30x47x7	1	AS 35x62x7	1	AS 45x72x8	1
0	002	10 N	O-ring	2500	1	2500	1	3725	1	3725	1
0	002	11 N	O-ring	2450	1	2500	1	3600	1	3700	1
0	002	12 N	Bearing	6205	1	6206	1	6207	1	6209	1
0	002	13 N	Bearing	6203	1	6204	1	6205	1	6206	1
0	002	14 N	Bearing	6002	1	6202	1	6004	1	6204	1
0	002	15 N	Bearing	6202	1	6302	1	6303	1	6304	1

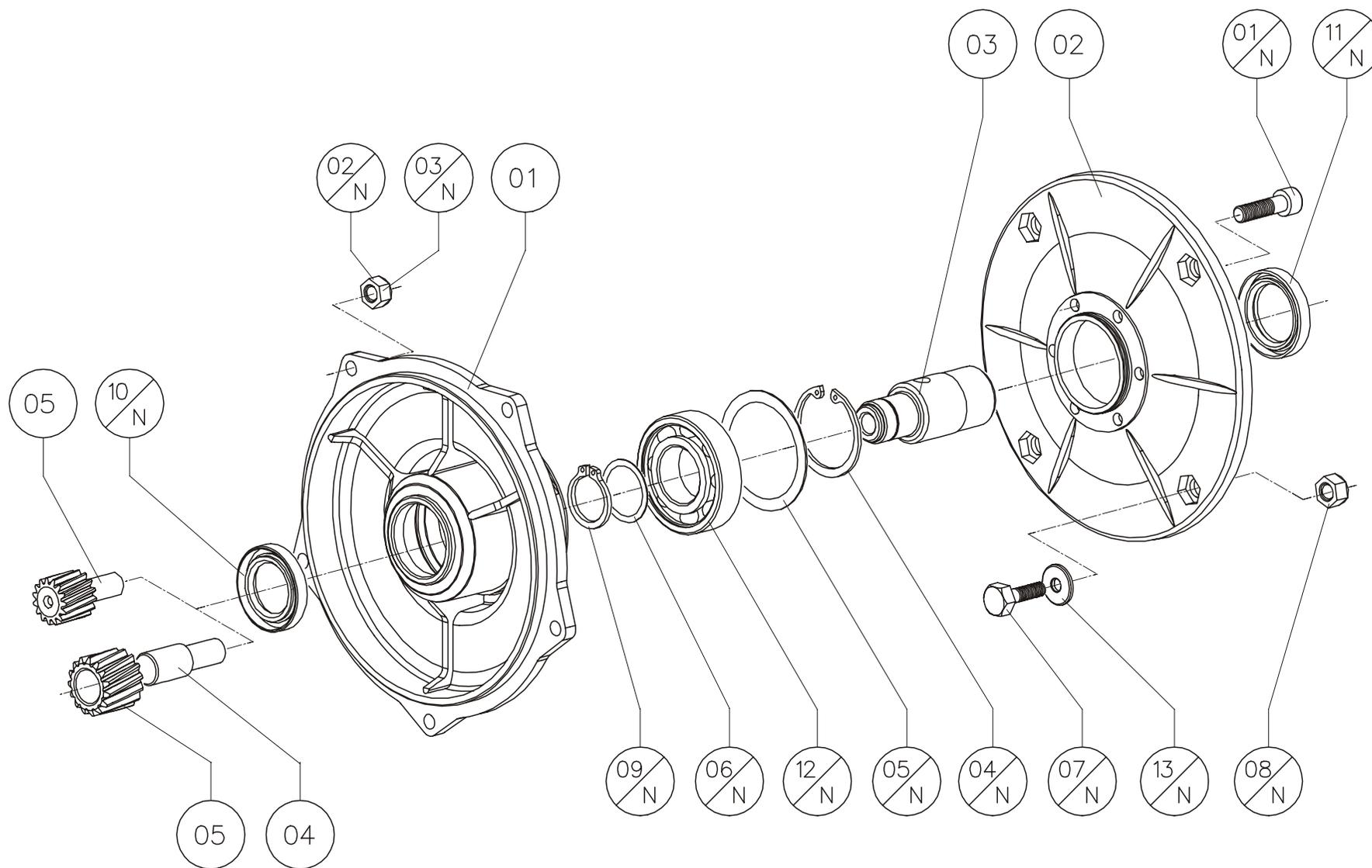






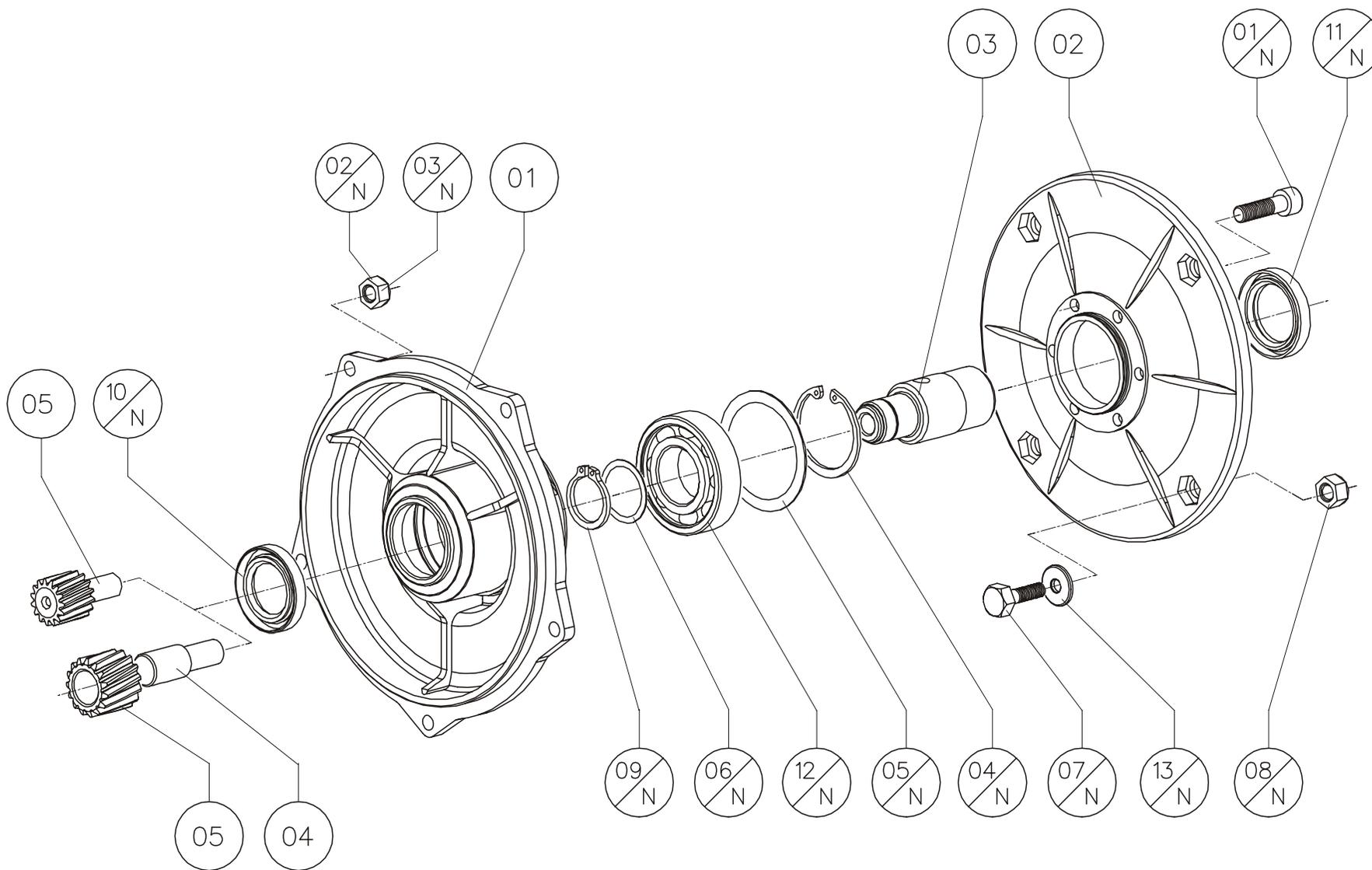
P	T	C	Built	030	040	050	060
0	004	01	Motor shield	0.030.03	0.040.03	0.050.03	0.050.03
0	004	02	Pinion hub	0.030.22	0.030.22	0.050.22	0.050.22
0	004	03	Pinion	0.030.23	0.030.23	0.050.23	0.050.23

pam	P	T	C	Commercial	030		040		050		060	
063 B10	0	004	01 N	Nut DIN 934/6	M6	5	M6	5	-	-	-	-
	0	004	02 N	Nut DIN 934/6	M6	5	M6	5	M6	5	M6	5
	0	004	03 N	Circlip DIN 472	35	1	35	1	35	1	35	1
	0	004	04 N	Circlip DIN 471	15	1	15	1	15	1	15	1
	0	004	05 N	Oil seal DIN 3760	A 15x27x7	1						
	0	004	06 N	Bearing	6202-2Z	1	6202-2Z	1	6202-2Z	1	6202-2Z	1
071 B10	0	004	01 N	Nut DIN 934/6	M6	5	M6	5	-	-	-	-
	0	004	02 N	Nut DIN 934/6	M6	5	M6	5	M6	5	M6	5
	0	004	03 N	Circlip DIN 472	40	1	40	1	40	1	40	1
	0	004	04 N	Circlip DIN 471	17	1	17	1	17	1	17	1
	0	004	05 N	Oil seal DIN 3760	A 17x30x7	1						
	0	004	06 N	Bearing	6203-2Z	1	6203-2Z	1	6203-2Z	1	6203-2Z	1
080 B10	0	004	01 N	Nut DIN 934/6	M6	5	M6	5	M8	5	M8	5
	0	004	02 N	Nut DIN 934/6	M6	5	M6	5	M6	5	M6	5
	0	004	03 N	Circlip DIN 472	47	1	47	1	47	1	47	1
	0	004	04 N	Circlip DIN 471	20	1	20	1	20	1	20	1
	0	004	05 N	Oil seal DIN 3760	A 20x35x7	1						
	0	004	06 N	Bearing	6204-2Z	1	6204-2Z	1	6204-2Z	1	6204-2Z	1
090 B10	0	004	01 N	Nut DIN 934/6	M6	1	M6	1	M8	5	M8	5
	0	004	02 N	Nut DIN 934/6	M6	5	M6	5	M6	5	M6	5
	0	004	03 N	Circlip DIN 472	52	5	52	5	52	1	52	1
	0	004	04 N	Circlip DIN 471	25	1	25	1	25	1	25	1
	0	004	05 N	Oil seal DIN 3760	A 25x40x7	1						
	0	004	06 N	Bearing	6205-2Z	1	6205-2Z	1	6205-2Z	1	6205-2Z	1
100-112 B10	0	004	01 N	Nut DIN 934/6	-	-	-	-	M8	5	M8	5
	0	004	02 N	Nut DIN 934/6	-	-	-	-	-	-	-	-
	0	004	03 N	Circlip DIN 472	-	-	-	-	62	1	62	1
	0	004	04 N	Circlip DIN 471	-	-	-	-	30	1	30	1
	0	004	05 N	Oil seal DIN 3760	-	-	-	-	A 30x47x7	1	A 30x47x7	1
	0	004	06 N	Bearing	-	-	-	-	6206-2Z	1	6206-2Z	1

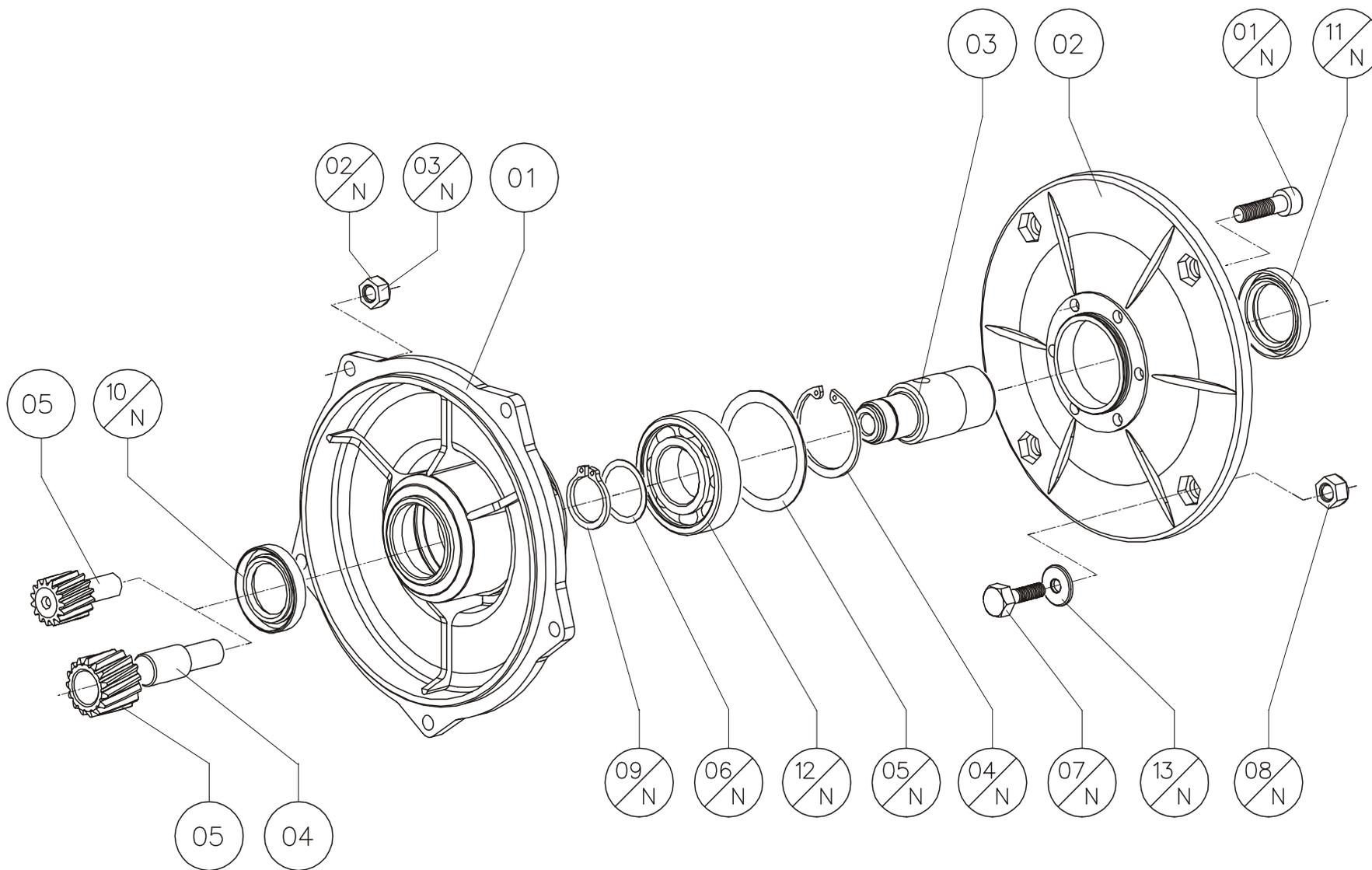


<i>P</i>	<i>T</i>	<i>C</i>	<b>Built</b>	<b>032</b>	<b>042</b>	<b>052</b>	<b>062</b>
0	005	01	Cover	0.030.04	0.030.04	0.050.04	0.050.04
0	005	02	PAM flange	9.063.03	9.063.03	9.075.03	9.075.03
0	005	03	PAM sleeve	0.030.16 ( 11-14-19 )	0.030.16 ( 11-14-19 ) 0.040.16 ( 24 )	0.030.16 ( 19 ) 0.040.16 ( 24 ) 0.050.16 ( 28 )	0.030.16 ( 19 ) 0.040.16 ( 24 ) 0.050.16 ( 28 )
0	005	04	Pinion hub	0.030.22	0.030.22	0.050.22	0.050.22
0	005	05	Pinion	0.030.23	0.030.23	0.050.23	0.050.23

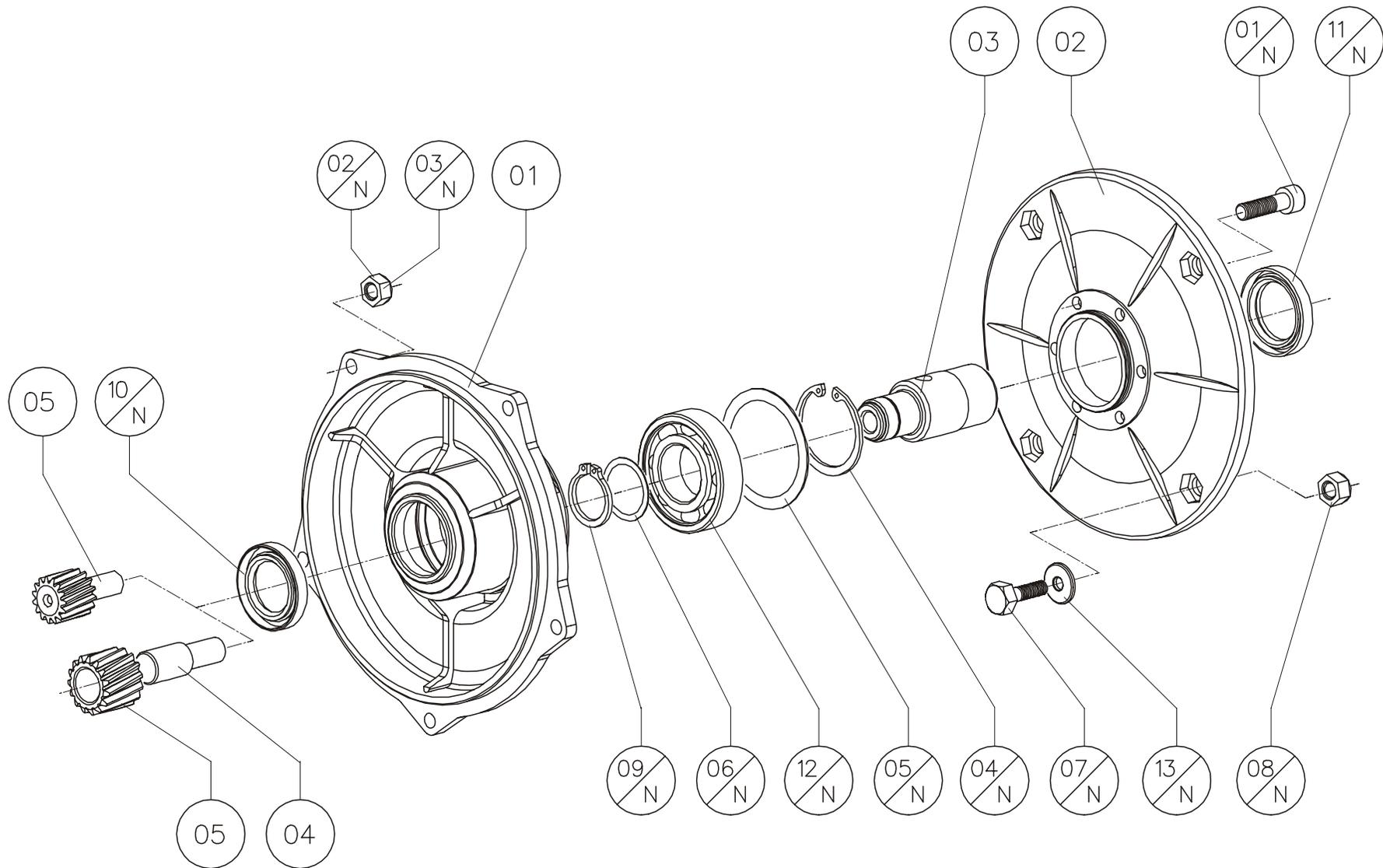
<i>pam</i>	<i>P</i>	<i>T</i>	<i>C</i>	<b>Commercial</b>	<b>032</b>		<b>042</b>		<b>052</b>		<b>062</b>	
	0	005	01 N	Screw DIN 912	M8x18	6	M8x18	6	M8x20	6	M8x20	6
	0	005	02 N	Nut DIN 934/6	M6	5	M6	5	M8	5	M8	5
	0	005	03 N	Nut DIN 934/6	M6	5	M6	5	M6	5	M6	5
	0	005	04 N	Circlip DIN 472	52	1	52	1	62	1	62	1
	0	005	06 N	Spacer DIN 988	25x35x2	1	25x35x2	1	-	-	-	-
	0	005	07 N	Screw DIN 931	M8x25	4	M8x25	4	-	-	-	-
063 B5 140x11	0	005	08 N	Nut DIN 934/6	M8	4	M8	4	-	-	-	-
	0	005	09 N	Circlip DIN 471	25	1	25	1	-	-	-	-
	0	005	10 N	Oil seal DIN 3760	AS 25x42x7	1	AS 25x42x7	1	-	-	-	-
	0	005	11 N	Oil seal DIN 3760	AS 35x52x7	1	AS 35x52x7	1	-	-	-	-
	0	005	12 N	Bearing	6205-2RS1	1	6205-2RS1	1	-	-	-	-
	0	005	07 N	Screw DIN 931	M8x25	4	M8x25	4	-	-	-	-
071 B5 160x14	0	005	08 N	Nut DIN 934/6	M8	4	M8	4	-	-	-	-
	0	005	09 N	Circlip DIN 471	25	1	25	1	-	-	-	-
	0	005	10 N	Oil seal DIN 3760	AS 25x42x7	1	AS 25x42x7	1	-	-	-	-
	0	005	11 N	Oil seal DIN 3760	AS 35x52x7	1	AS 35x52x7	1	-	-	-	-
	0	005	12 N	Bearing	6205-2RS1	1	6205-2RS1	1	-	-	-	-
	0	005	07 N	Screw DIN 931	M6x25	4	M6x25	4	-	-	-	-
071 B14 105x14	0	005	08 N	Nut DIN 934/6	M6	4	M6	4	-	-	-	-
	0	005	09 N	Circlip DIN 471	25	1	25	1	-	-	-	-
	0	005	10 N	Oil seal DIN 3760	AS 25x42x7	1	AS 25x42x7	1	-	-	-	-
	0	005	11 N	Oil seal DIN 3760	AS 35x52x7	1	AS 35x52x7	1	-	-	-	-
	0	005	12 N	Bearing	6205-2RS1	1	6205-2RS1	1	-	-	-	-
	0	005	07 N	Screw DIN 931	M10x30	4	M10x30	4	M10x30	4	M10x30	4
080 B5 200x19	0	005	08 N	Nut DIN 934/6	M10	4	M10	4	M10	4	M10	4
	0	005	09 N	Circlip DIN 471	25	1	25	1	25	1	25	1
	0	005	10 N	Oil seal DIN 3760	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1
	0	005	11 N	Oil seal DIN 3760	AS 35x52x7	1	AS 35x52x7	1	AS 35x60x10	1	AS 35x60x10	1
	0	005	12 N	Bearing	6205-2RS1	1	6205-2RS1	1	6305-2RS1	1	6305-2RS1	1



pam	P	T	C	Commercial	032		042		052		062	
080 B14 120x19	0	005	07 N	Screw DIN 931	M6x25	4	M6x25	4	M6x25	4	M6x25	4
	0	005	08 N	Nut DIN 934/6	M6	4	M6	4	M6	4	M6	4
	0	005	09 N	Circlip DIN 471	25	1	25	1	25	1	25	1
	0	005	10 N	Oil seal DIN 3760	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1
	0	005	11 N	Oil seal DIN 3760	AS 35x52x7	1	AS 35x52x7	1	AS 35x60x10	1	AS 35x60x10	1
	0	005	12 N	Bearing	6205-2RS1	1	6205-2RS1	1	6305-2RS1	1	6305-2RS1	1
090 B5 200x24	0	005	07 N	Screw DIN 931	-	-	M10x30	4	M10x30	4	M10x30	4
	0	005	08 N	Nut DIN 934/6	-	-	M10	4	M10	4	M10	4
	0	005	09 N	Circlip DIN 471	-	-	25	1	25	1	25	1
	0	005	10 N	Oil seal DIN 3760	-	-	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1
	0	005	11 N	Oil seal DIN 3760	-	-	AS 35x52x7	1	AS 35x60x10	1	AS 35x60x10	1
	0	005	12 N	Bearing	-	-	6205-2RS1	1	6305-2RS1	1	6305-2RS1	1
090 B14 140x24	0	005	07 N	Screw DIN 931	-	-	M8x25	4	M8x25	4	M8x25	4
	0	005	08 N	Nut DIN 934/6	-	-	M8	4	M8	4	M8	4
	0	005	09 N	Circlip DIN 471	-	-	25	1	25	1	25	1
	0	005	10 N	Oil seal DIN 3760	-	-	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1
	0	005	11 N	Oil seal DIN 3760	-	-	AS 35x52x7	1	AS 35x60x10	1	AS 35x60x10	1
	0	005	12 N	Bearing	-	-	6205-2RS1	1	6305-2RS1	1	6305-2RS1	1
	0	005	13 N	Washer DIN 125/A	-	-	M8	4	-	-	-	-
100 B5 250x28	0	005	07 N	Screw DIN 931	-	-	-	-	M12x35	4	M12x35	4
	0	005	08 N	Nut DIN 934/6	-	-	-	-	M12	4	M12	4
	0	005	09 N	Circlip DIN 471	-	-	-	-	30	1	30	1
	0	005	05 N	Spacer DIN 988	-	-	-	-	50x62x1	1	50x62x1	1
	0	005	10 N	Oil seal DIN 3760	-	-	-	-	AS 30x42x7	1	AS 30x42x7	1
	0	005	11 N	Oil seal DIN 3760	-	-	-	-	AS 40x60x10	1	AS 40x60x10	1
	0	005	12 N	Bearing	-	-	-	-	6206-2RS1	1	6206-2RS1	1
100 B14 160x28	0	005	07 N	Screw DIN 931	-	-	-	-	M8x25	4	M8x25	4
	0	005	08 N	Nut DIN 934/6	-	-	-	-	M8	4	M8	4
	0	005	09 N	Circlip DIN 471	-	-	-	-	30	1	30	1
	0	005	05 N	Spacer DIN 988	-	-	-	-	50x62x1	1	50x62x1	1
	0	005	10 N	Oil seal DIN 3760	-	-	-	-	AS 30x42x7	1	AS 30x42x7	1
	0	005	11 N	Oil seal DIN 3760	-	-	-	-	AS 40x60x10	1	AS 40x60x10	1
	0	005	12 N	Bearing	-	-	-	-	6206-2RS1	1	6206-2RS1	1
	0	005	13 N	Washer DIN 125/A	-	-	-	-	M8	4	M8	4
112 B5 250x28	0	005	07 N	Screw DIN 931	-	-	-	-	M12x35	4	M12x35	4
	0	005	08 N	Nut DIN 934/6	-	-	-	-	M12	4	M12	4
	0	005	09 N	Circlip DIN 471	-	-	-	-	30	1	30	1
	0	005	05 N	Spacer DIN 988	-	-	-	-	50x62x1	1	50x62x1	1
	0	005	10 N	Oil seal DIN 3760	-	-	-	-	AS 30x42x7	1	AS 30x42x7	1
	0	005	11 N	Oil seal DIN 3760	-	-	-	-	AS 40x60x10	1	AS 40x60x10	1
	0	005	12 N	Bearing	-	-	-	-	6206-2RS1	1	6206-2RS1	1

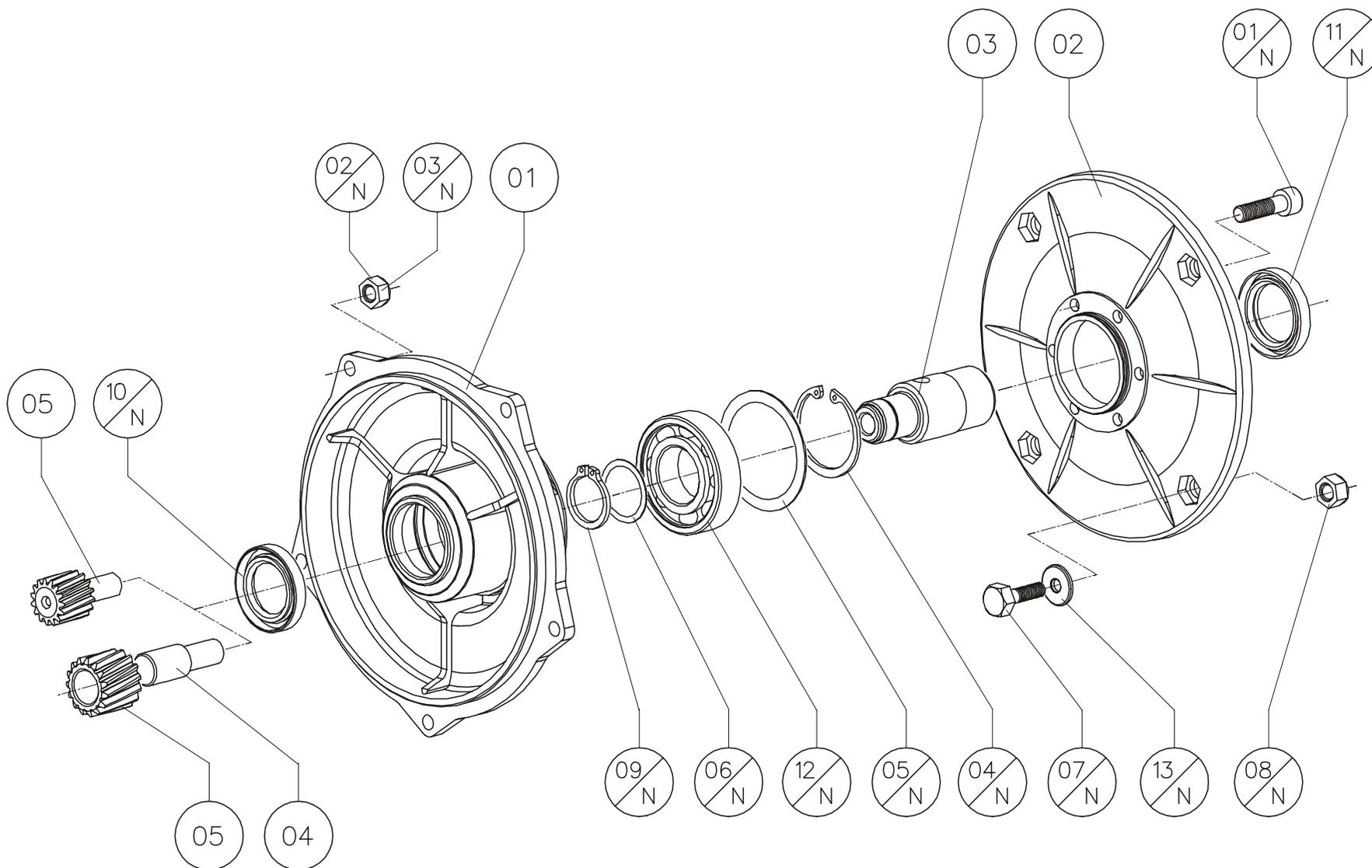


<i>pam</i>	<b>P</b>	<b>T</b>	<b>C</b>	<b>Commercial</b>	<b>032</b>		<b>042</b>		<b>052</b>		<b>062</b>	
112 B14 160x28	<b>0</b>	<b>005</b>	<b>07 N</b>	Screw DIN 931	-	-	-	-	M8x25	4	M8x25	4
	<b>0</b>	<b>005</b>	<b>08 N</b>	Nut DIN 934/6	-	-	-	-	M8	4	M8	4
	<b>0</b>	<b>005</b>	<b>09 N</b>	Circlip DIN 471	-	-	-	-	30	1	30	1
	<b>0</b>	<b>005</b>	<b>05 N</b>	Spacer DIN 988	-	-	-	-	50x62x1	1	50x62x1	1
	<b>0</b>	<b>005</b>	<b>10 N</b>	Oil seal DIN 3760	-	-	-	-	AS 30x42x7	1	AS 30x42x7	1
	<b>0</b>	<b>005</b>	<b>11 N</b>	Oil seal DIN 3760	-	-	-	-	AS 40x60x10	1	AS 40x60x10	1
	<b>0</b>	<b>005</b>	<b>12 N</b>	Bearing	-	-	-	-	6206-2RS1	1	6206-2RS1	1
	<b>0</b>	<b>005</b>	<b>13 N</b>	Washer DIN 125/A	-	-	-	-	M8	4	M8	4

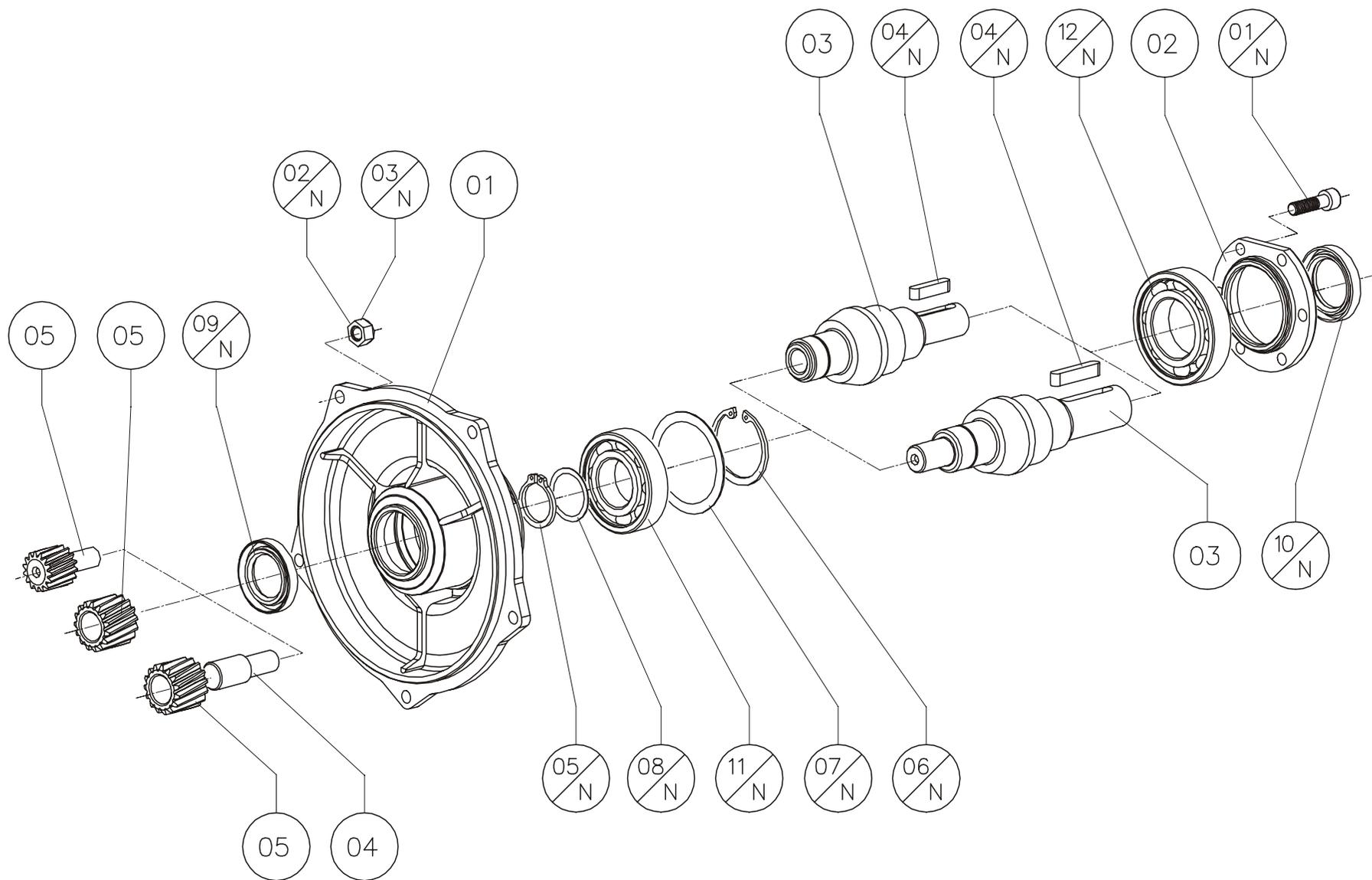


P	T	C	Built	033	043	053	063
0	005	01	Cover	0.030.04	0.030.04	0.050.04	0.050.04
0	005	02	PAM flange	9.063.03	9.063.03	9.063.03	9.063.03
0	005	03	PAM sleeve	0.030.16 ( 11-14-19 )	0.030.16 ( 11-14-19 ) 0.040.16 ( 24 )	0.030.16 ( 14-19 ) 0.040.16 ( 24 )	0.030.16 ( 14-19 ) 0.040.16 ( 24 )
0	005	04	Pinion hub	0.030.22	0.030.22	0.050.22	0.050.22
0	005	05	Pinion	0.030.23	0.030.23	0.050.23	0.050.23

pam	P	T	C	Commercial	033		043		053		063	
	0	005	01 N	Screw DIN 912	M8x18	6	M8x18	6	M8x20	6	M8x20	6
	0	005	02 N	Nut DIN 934/6	M6	5	M6	5	M8	5	M8	5
	0	005	03 N	Nut DIN 934/6	M6	5	M6	5	M6	5	M6	5
	0	005	09 N	Circlip DIN 471	25	1	25	1	30	1	30	1
	0	005	04 N	Circlip DIN 472	52	1	52	1	62	1	62	1
	0	005	05 N	Spacer DIN 988	-	-	-	-	50x62x1	1	50x62x1	1
063 B5 140x14	0	005	07 N	Screw DIN 931	M8x25	4	M8x25	4	M8x25	4	M8x25	4
	0	005	08 N	Nut DIN 934/6	M8	4	M8	4	M8	4	M8	4
	0	005	10 N	Oil seal DIN 3760	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1
	0	005	11 N	Oil seal DIN 3760	AS 35x52x7	1	AS 35x52x7	1	AS 35x52x7	1	AS 35x52x7	1
	0	005	12 N	Bearing	6205-2RS1	1	6205-2RS1	1	6205-2RS1	1	6205-2RS1	1
071 B5 160x14	0	005	07 N	Screw DIN 931	M8x25	4	M8x25	4	M8x25	4	M8x25	4
	0	005	08 N	Nut DIN 934/6	M8	4	M8	4	M8	4	M8	4
	0	005	10 N	Oil seal DIN 3760	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1
	0	005	11 N	Oil seal DIN 3760	AS 35x52x7	1	AS 35x52x7	1	AS 35x52x7	1	AS 35x52x7	1
	0	005	12 N	Bearing	6205-2RS1	1	6205-2RS1	1	6205-2RS1	1	6205-2RS1	1
071 B14 105x14	0	005	07 N	Screw DIN 931	M6x25	4	M6x25	4	M6x25	4	M6x25	4
	0	005	08 N	Nut DIN 934/6	M6	4	M6	4	M6	4	M6	4
	0	005	10 N	Oil seal DIN 3760	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1
	0	005	11 N	Oil seal DIN 3760	AS 35x52x7	1	AS 35x52x7	1	AS 35x52x7	1	AS 35x52x7	1
080 B5 200x19	0	005	12 N	Bearing	6205-2RS1	1	6205-2RS1	1	6205-2RS1	1	6205-2RS1	1
	0	005	07 N	Screw DIN 931	M10x30	4	M10x30	4	M10x30	4	M10x30	4
	0	005	08 N	Nut DIN 934/6	M10	4	M10	4	M10	4	M10	4
	0	005	10 N	Oil seal DIN 3760	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1
	0	005	11 N	Oil seal DIN 3760	AS 35x52x7	1	AS 35x52x7	1	AS 35x60x10	1	AS 35x60x10	1
080 B14 120x19	0	005	12 N	Bearing	6205-2RS1	1	6205-2RS1	1	6305-2RS1	1	6305-2RS1	1
	0	005	07 N	Screw DIN 931	M6x25	4	M6x25	4	M6x25	4	M6x25	4
	0	005	08 N	Nut DIN 934/6	M6	4	M6	4	M6	4	M6	4
	0	005	10 N	Oil seal DIN 3760	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1
	0	005	11 N	Oil seal DIN 3760	AS 35x52x7	1	AS 35x52x7	1	AS 35x52x7	1	AS 35x52x7	1



<i>pam</i>	<b>P</b>	<b>T</b>	<b>C</b>	<b>Commercial</b>	<b>033</b>		<b>043</b>		<b>053</b>		<b>063</b>	
<b>090 B5</b> 200x24	<b>0</b>	<b>005</b>	<b>07 N</b>	Screw DIN 931	-	-	M10x30	4	M10x30	4	M10x30	4
	<b>0</b>	<b>005</b>	<b>08 N</b>	Nut DIN 934/6	-	-	M10	4	M10	4	M10	4
	<b>0</b>	<b>005</b>	<b>10 N</b>	Oil seal DIN 3760	-	-	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1
	<b>0</b>	<b>005</b>	<b>11 N</b>	Oil seal DIN 3760	-	-	AS 35x52x7	1	AS 35x52x7	1	AS 35x52x7	1
	<b>0</b>	<b>005</b>	<b>12 N</b>	Bearing	-	-	6205-2RS1	1	6205-2RS1	1	6205-2RS1	1
<b>090 B14</b> 140x24	<b>0</b>	<b>005</b>	<b>07 N</b>	Screw DIN 931	-	-	M8x25	4	M8x25	4	M8x25	4
	<b>0</b>	<b>005</b>	<b>08 N</b>	Nut DIN 934/6	-	-	M8	4	M8	4	M8	4
	<b>0</b>	<b>005</b>	<b>10 N</b>	Oil seal DIN 3760	-	-	AS 25x42x7	1	AS 25x42x7	1	AS 25x42x7	1
	<b>0</b>	<b>005</b>	<b>11 N</b>	Oil seal DIN 3760	-	-	AS 35x52x7	1	AS 35x52x7	1	AS 35x52x7	1
	<b>0</b>	<b>005</b>	<b>12 N</b>	Bearing	-	-	6205-2RS1	1	6205-2RS1	1	6205-2RS1	1
	<b>0</b>	<b>005</b>	<b>13 N</b>	Washer DIN 125/A	-	-	M8	4	-	-	-	-



<i>P</i>	<i>T</i>	<i>C</i>	<i>Built</i>	<i>030</i>	<i>040</i>	<i>050</i>	<i>060</i>
0	006	01	Cover	0.030.04	0.030.04	0.050.04	0.050.04
0	006	02	Closing cover	9.063.06	9.063.06	9.075.06	9.075.06
0	006	03	Input shaft	0.030.15	0.030.15	0.050.15	0.050.15
0	006	04	Pinion hub	0.030.22	0.030.22	0.050.22	0.050.22
0	006	05	Pinion	0.030.23	0.030.23	0.050.23	0.050.23

<i>P</i>	<i>T</i>	<i>C</i>	<i>Commercial</i>	<i>030</i>		<i>040</i>		<i>050</i>		<i>060</i>	
0	006	01 N	Screw DIN 912	M8x18	6	M8x18	6	M8x20	6	M8x20	6
0	006	02 N	Nut DIN 934/6	M6	5	M6	5	M8	5	M8	5
0	006	03 N	Nut DIN 934/6	M6	5	M6	5	M6	5	M6	5
0	006	04 N	Key DIN 6885	A 5x5x30	1	A 5x5x30	1	A 6x6x30	1	A 6x6x30	1
0	006	05 N	Circlip DIN 471	25	1	25	1	25	1	25	1
0	006	06 N	Circlip Din 472	52	1	52	1	62	1	62	1
0	006	07 N	Spacer DIN 988	-	-	-	-	-	-	-	-
0	006	08 N	Spacer DIN 988	-	-	-	-	-	-	-	-
0	006	09 N	Oil seal DIN 3760	AS 25x42x7	1	AS 25x42x7	1	AS 30x42x7	1	AS 30x42x7	1
0	006	10 N	Oil seal DIN 3760	AS 25x52x7	1	AS 25x42x7	1	AS 30x62x7	1	AS 30x62x7	1
0	006	11 N	Bearing	6205-2RS1	1	6205-2RS1	1	6305-2RS1	1	6305-2RS1	1
0	006	12 N	Bearing	6007-2RS1	1	6007-2RS1	1	6008-2RS1	1	6008-2RS1	1



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