

P - Pt/A

S E R I E S

MAINTENANCE AND OPERATION INSTRUCTIONS

NRW[®]
DRIVE TECHNOLOGIES

Shaft Mounted Speed Reducer, (P - Pt/A)
GEARBOXES WITHOUT MOTORS



Doc. No : P - Pt/A
MOI : 3 / 19



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1.1 Important Warnings

Take into consideration the listed safety warnings and information signs below!



ATTENTION !

Dangerous position and possible result
Slight and unimportant woundings



NOTE !

Advices and necessary informations for the user



DANGER !

Harmful position and possible result
Damage in gear unit and environment



DANGER OF ELECTRICITY !

Danger of electrical shock and possible result
Death and heavy woundings



DANGER !

Danger possible result
Death and heavy woundings



1.2 General Information

This user guide is prepared by our firm to provide information about safety of gearboxes as well as storage, installation/mounting, connection, operating, maintenance and repair processes. All the purchase and technical data are positioned at product catalogues. Beside engineering applications, the information which is placed in this instruction, should be well read and applied. The documents must be protected and to get ready for controlling by authorized person.

1.3 Correct Use

NRW gearboxes are designed to use in commercial plants and are operated convenient to the current standards and directions. Technical data and allowed usage conditions are placed in product's power tab and usage guidance. Should be conformed to all the values.

This usage guidance is prepared by our firm according to 2006/42/EC The European Union Machinery Safety Instructions and is not be in placed 2014/34/EU "The direction about tools used in possible explosive environment and protective systems".

1.4 Safety Information

In gearboxes, there could be materials subjected to voltage, movable pieces and hot areas. During all the works to be done; transportation, storage, placing, mounting, connection, operating, maintenance-repair processes could be implemented by qualified employees and responsible managers.

All the processes to be implemented during the working period;

- Related usage and maintenance instructions,
- Warning and safety tags in gearboxes,
- Instructions and Requirements related to the system,
- Local and International requirements for safety and accidental protection.

Our Firm is not responsible where the listed items are implemented below:

- Violation of work health and safety rules in gearboxes,
- Improper use (Any use outside the limits specified in the User's Manual and outside the name label/catalog values; especially at high moment and at different speeds) and incorrect installation or use of the gearbox in operation,
- Extremely dirty and maintenance free of gearboxes,
- Unlubricated usage,
- Take out of the necessary protective plugs,
- Disuse of original pieces in gearboxes,
- The using, mounting, maintaining and taking place of the uneducated, unauthorized and unqualified persons.

1.5 Responsibility

NRW, declines any responsibility in case of:

- Use of the reducer not compliant with national laws on safety and accident prevention,
- Work done by unqualified personnel,
- Incorrect installation,
- Tampering with the product,
- Incorrect or failure to follow the instructions in the manual,
- Incorrect or failure to follow the indications marked on the identification labels fixed on the units,
- Incorrect connections and/or use of temperature sensors (when present),
- Use of gearbox under unlubricated conditions,
- The contents of this manual were reviewed to ensure consistency with the catalogues and etc. documents. We cannot guarantee full consistency since the changes cannot be completely prevented. However, the informations in this manual are reviewed regularly and necessary revisions are made in next editions.

The products supplied by NRW are intended to be incorporated into "complete machines", so it is prohibited to put them into service until the entire machine has not been declared compliant.



ATTENTION !

The configurations provided in the catalogue of the unit are the only ones allowed. Do not use the product in contrast with the indications provided in it. The instructions provided in this manual do not replace but compensate the obligations of current laws concerning safety regulations.

1.6 Transportation

1.6.1 Transportation And Freightage;

- Take into consideration of the article stated on package during the product delivery.
- During the delivery, product should be controlled about possible damages in carrying period.
- The firm should be informed about possible damages.
- The damaged products should not be put into use.
- Lifting eyebolts must be tightened. These eyebolts sized to carry the weight of only gearboxes. The additional weight should not be added. The flanged eyebolts must be suitable to the DIN 580 norm.
- If the gearbox has two lifting eyes, both can be used depending on the size of the gearbox during transport. A suitable and sufficiently large sized carrier must be used, when required.
- Carrying safeties should be removed before the start of operating.
- The weights of the movable gearboxes are placed in product catalogues.
- The dangerous area should be got into the secure to prevent damage to the persons.
- During the carrying process, to stand under the gear unit could cause danger of death.
- The damage of gear unit must be prevented. The crushes to the free input shafts could damaged into the gear unit.

1.6.2 Package Transportation;

- There could be no loads on packages or the shelved surfaces should be prepared.
- The necessary carrying equipments should be prepared.
- The carrying and lifting equipments should be larged - enough to the sufficient capacity.
- The calculations should be made to the connection points and center of gravity.
- If necessary, this information should be written on the package.
- The carrying equipments (steel rope, belt, chain etc.) must be robust and suitable to the applied weight.
- During the carrying process, the load centering could be done without oscillation.

1.6.3 Equipment Transportation

- The connection carrying point should be appointed.
- The carrying equipments (hook, chain, belt) must be prepared. To the alternative, pallet must be used for the load - lifting.
- If the Crane will be used, it could be lifted perpendicular from inside to the outside of the package.
- If the forklift or palletized carrying equipment will be used, the product which removed from package should be placed on the pallet.
- The fork of the equipment should be carried out the way that gripped the pallet.
- The weight must be lifted both with slowly and constant speed and must take measure to the sudden oscillation.



ATTENTION !

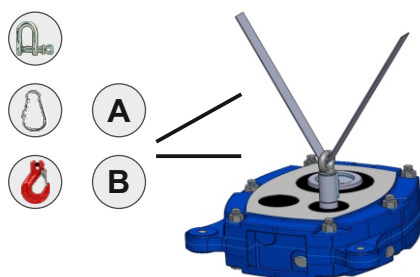
During the carrying process, the fixings like the lifting lug, hook, belt, rope, locked hook must be sufficient to the load and have conformity certificate. The weights of the movable gear unit/gear unit with motor have given in product catalogue.




NOTE !


In all carrying processes, there should be avoided from both sudden movements and sudden liftings.

P SERIES




A Hoop equipped (swab)

 Load hook

 Locked hook

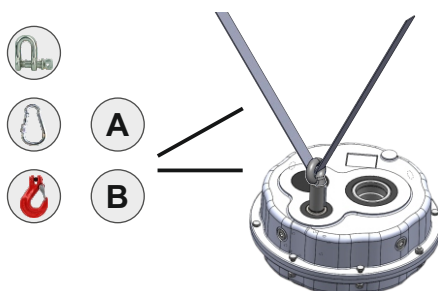
B Hoop equipped (chain)

 Screw hook


 Lifting eyebolts

Manuel lifting (Weight ≤ 15 kg)(ref. ILO Contract)
Not: valid for the continuous carrying.

Pt/A SERIES




A Hoop equipped (swab)

 Load hook

 Locked hook

B Hoop equipped (chain)

 Screw hook

 Lifting eyebolts

Manuel lifting (Weight ≤ 15 kg)(ref. ILO Contract)
Not: valid for the continuous carrying.



1.7 Storage

The certain suggestions have given about storage conditions of the gearboxes below.

- In clear and moist-airs, the storage should not be made.
- The gearboxes should not be directly contacted to the ground.
- The place must be moveless where the gearboxes are contacted. Otherwise there could be damage during the movement.
- The gear unit should be got into the secure to the falling.
- The processed surfaces of the gear units and both solid and hollow shafts must be lubricated with protective oil.
- Gearboxes must be in place where there will be no big temperature differences between 0 and 40.
- Relative humidity must be less than %60.
- Not directly be exposed to sunlight and infraded light.
- Must be kept away from the abrasive materials which causes corrosion (dirty weather, ozon, gases, solvents, acids, salts, radioactivity, etc.) in environment.
- The protective oil SHELL ENSIS or similar product should be used on the corrodible pieces.
- If the gear unit is without oil, it must be filled with lubrication oil.

1.7.1 Long Term Storage Suggestions;

	NOTE ! <ul style="list-style-type: none">- In the long-term storage or during the short-term storage, if the excessive temperature differences occur, the oil in the gear unit must be changed before the operating.- In the fully oil filled gear unit, the oil level should be reduced according to the mounting position.
	ATTENTION ! <ul style="list-style-type: none">- The incorrect and excessive long storage could cause the gearbox getting defected.- Please control not to exceed allowed storage period before starting up the gearbox.
	NOTE ! <ul style="list-style-type: none">- NRW, recommends long-term storage option for periods of more than 9 months holding and pausing times.- By paying attention both to the long-term storage option and precautions which listed below, the holding of goods up to 2 years could be possible. Because of real efficiency of gearboxes depending on local conditions widely, these periods could be seen solely guide values.

Long term storage suggestions;

- Mineral oil or synthetic oil according to mounting position is filled of getting available for operating. Despite this, the oil level should be controlled before operating.
- The VCI Corrosion protected tool are mixed into the gear unit's oil.
- The carrying safety of the ventilation plug must not be removed during the storage.
- The gear unit must be closed to the shape of unleaked.



2.1 Gear Unit Label

Important technical informations are found on gearbox's label.

NRW [®] DRIVE TECHNOLOGIES		Tel : 0256 231 19 12 (pbx) Fax : 0256 231 19 17 www.nrwdrivetechologies.com	
Type :	①		
		②	
Serial Number :	③		
M ₂ :	④	Nm i :	⑤
P ₁ :	⑥	kW n ₂ :	⑦ min ⁻¹
f _B :	⑧	⚖ ⑨	kg
🔧 ⑩	📖 i		

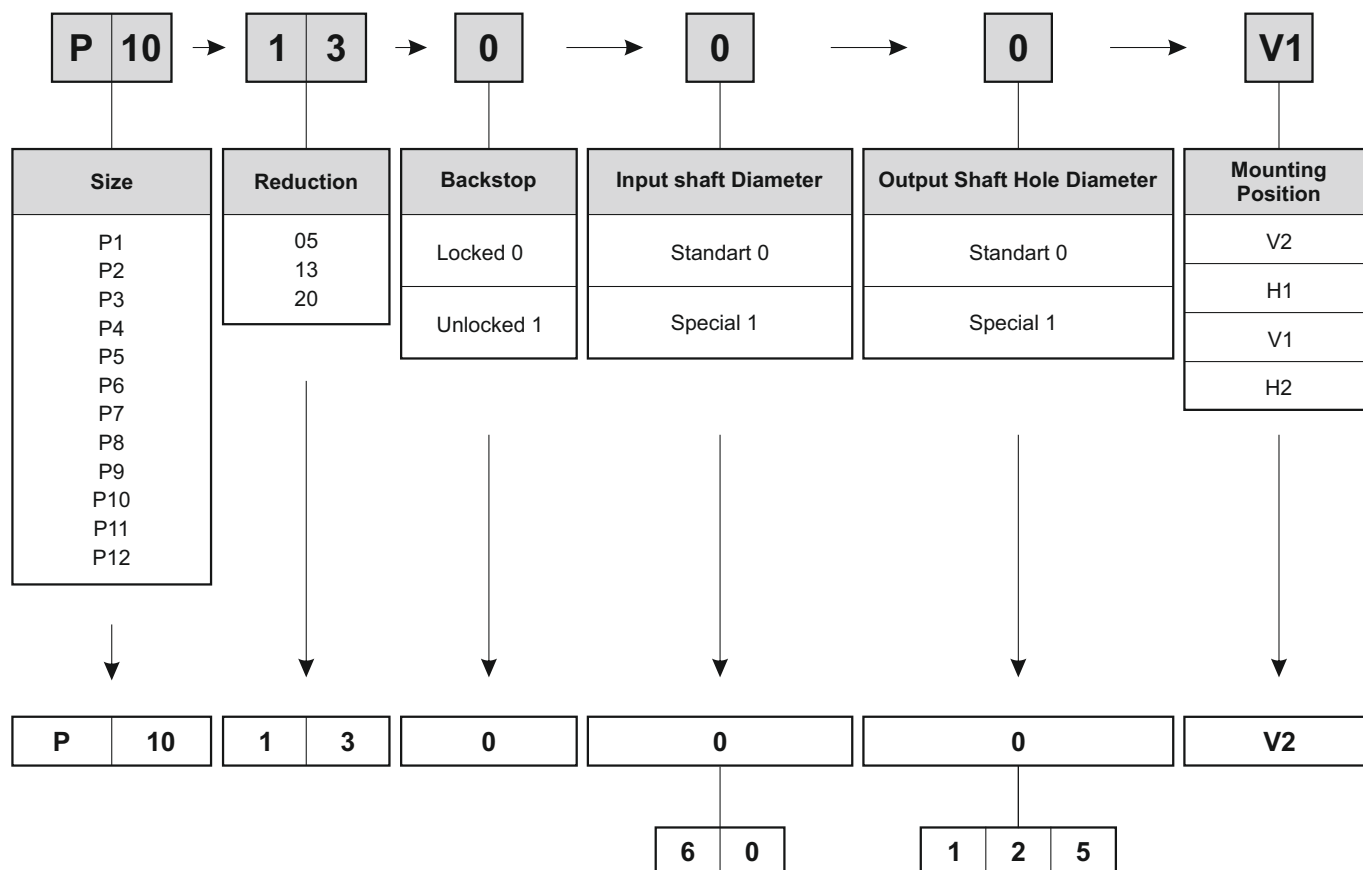
- ① Type
- ② Mounting position
- ③ Serial number
- ④ Output torque (Nm)
- ⑤ Reduction ratio
- ⑥ Rated power of motor [kW]
- ⑦ Output speed [d/dk]
- ⑧ Service factor
- ⑨ Weight of the geared motor (kg)
- ⑩ Used oil kind and amount (Lt)



2. PRODUCT DESCRIPTION

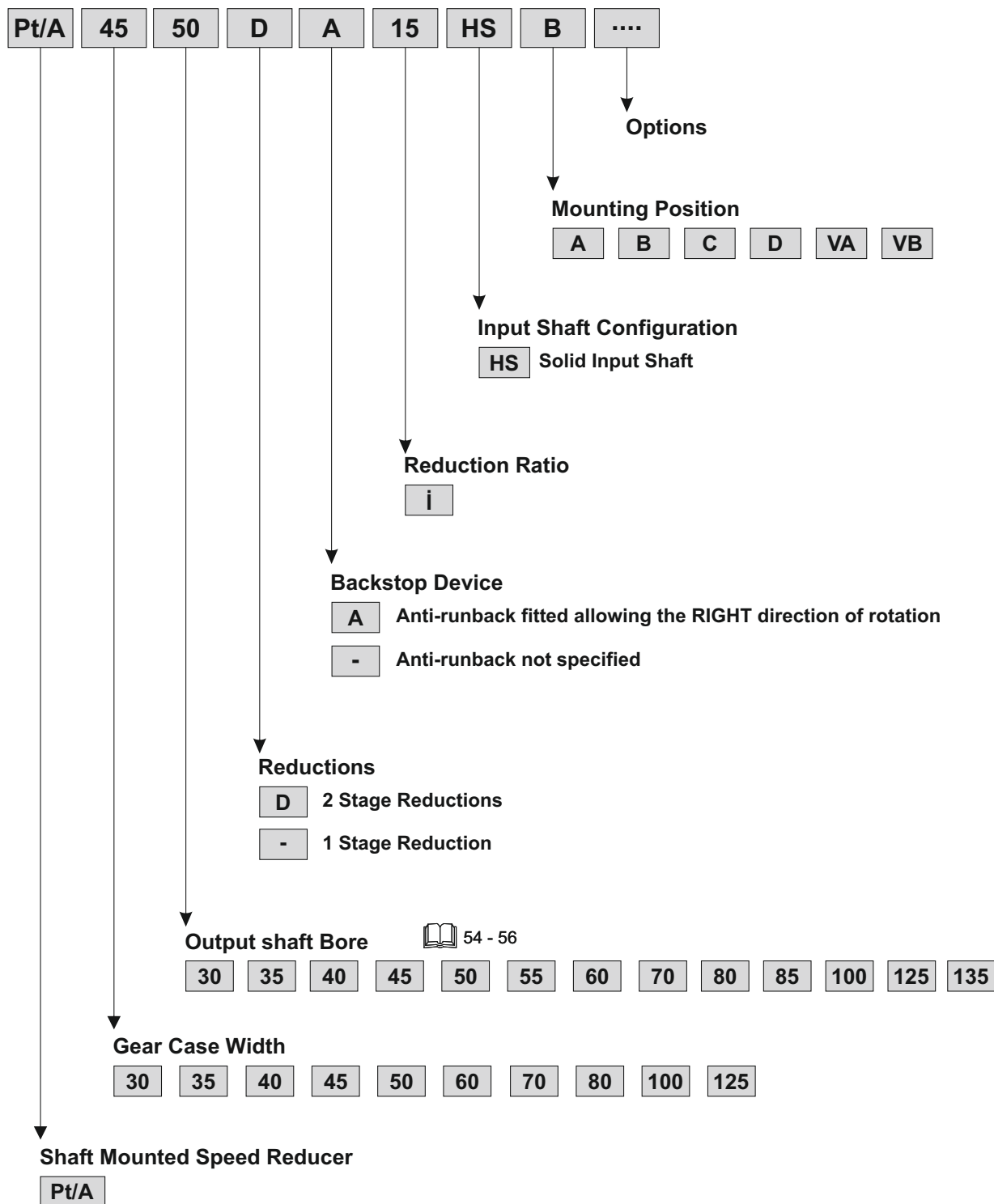
2.2 Explanations

P SERIES (Shaft Mounted Speed Reducer)





Pt/A SERIES (Shaft Mounted Speed Reducer)





3.1 Prerequisites Of Assembly

Take into the consideration which listed below;

- There could be no damage in the gear unit.
At standard gear units;
- The ambient temperature should be fitted temperature values given in the 'Lubricant' part.



DANGER !

The Gear unit must not be mounted in the ambient conditions listed below:

- Explosive atmosphere, high corrosive and/or oils, acids, gases, steams, radiation,
- Places directly contacted to the food.

At special applications the configuration of gearboxes are realized convenient to the ambient conditions. Output shafts, processed surfaces, corrosion preventive material on the solid shaft/hallow shaft, jerks etc. must be cleaned.

Extensive usage-solvent must be used. The solvent should not be contacted to the bearing houses and sealing components.

In the abrasive ambient conditions, both output shaft, sealing components must be protected to the wearing Connection flanges must be attached to the hollow shaft/solid shaft according to DIN 332.

The situations where the wrong direction of rotation could caused to damages and dangers, before the mounting, the test work should implemented to the gear unit so the right direction of rotation could be determined and must got into the secure for the next operating.

In the one-way locked gear units, nibs are placed at the entry and exit side of the gear unit. The ends of the nibs shows the direction of rotation of the gear unit.



DANGER !

In the one-way locked gear units, the gear unit must be operated at the direction of lock rotation, otherwise the damage could be occurred.

Around the mounting position, there must be sured that there are not any materials fused to metal, lubricating tool or elastomers which causes corrosion or will not be emerged.

3.2 Gear Unit Mounting

The lifting eyebolts screwed to gear unit must be used in gear unit mounting.

- Mounting of gearboxes to the machine and selection of mounting place are crucial.
- The convenient connection points must be determined for gear unit type.
- Ventilation plug must be opened after the carrying process.
- The connection tools which attached during the mounting to the machine must be tightened convenient to the torc given at the table.
- Because of the voltage, for to avoid transferring additional forces to the gear unit, both the gear unit and driven machine shaft must be aligned.
- There should not be any welding process on the gear unit. In the welding processes, the gear unit must not be used as a bracket. Otherwise bearing and gear part could damaged.
- The gearboxes only could be mounted according to determined mounting position. After the delivery, in the case of changing mounting position the change of lubrication level and other precautions could be needed.
Any failures to comply to the determined mounting position could damaged gear unit.
Please consult to NRW.
- Gearbox should be constructed to endure against operating voltage. The surface which gearbox is going to be fixed could be smooth, vibrationless and should be protected against torsion.
- The machine which gearboxes will be connected, must be sured that it is closed and not to be operated without intention. akinanın kapalı olduğundan ve istemsiz çalıştırılmayacağından emin olunmalıdır.



- The sphere of the movable pieces out of the gear unit must be closed with the safety cabinet kit.
- During the gearbox mounting to the machines in the external environment, it should be prevented from being affected by weather conditions and direct sunshine. Besides, air circulation should be provided to the unit.


NOTE !

The opportunity of the easy access must be provided to the oil level plug, drain plug and ventilation plug.

The proper oil filling should be controlled according to mounting position. (Could be viewed on 'lubricators/oil filling quantities' part or the values written on gear unit) The necessary amount of oil has filled to the gearboxes by our firm. The slight deviations in oil level plug are resulted because of the mounting position and within the production tolerances.

If there is any danger of the electro-chemical corrosion between gear unit and machine, plastic pieces (2-3 mm) must be mounted between the connections. The electrical discharge resistance of used plastic material must be <10 Ω.

Electro-chemical corrosion could be occurred between the different metals like cast iron and stainless steel. Also plastic washer should be used in bolts!

3.2.1 Bolt Tightening Torque Value

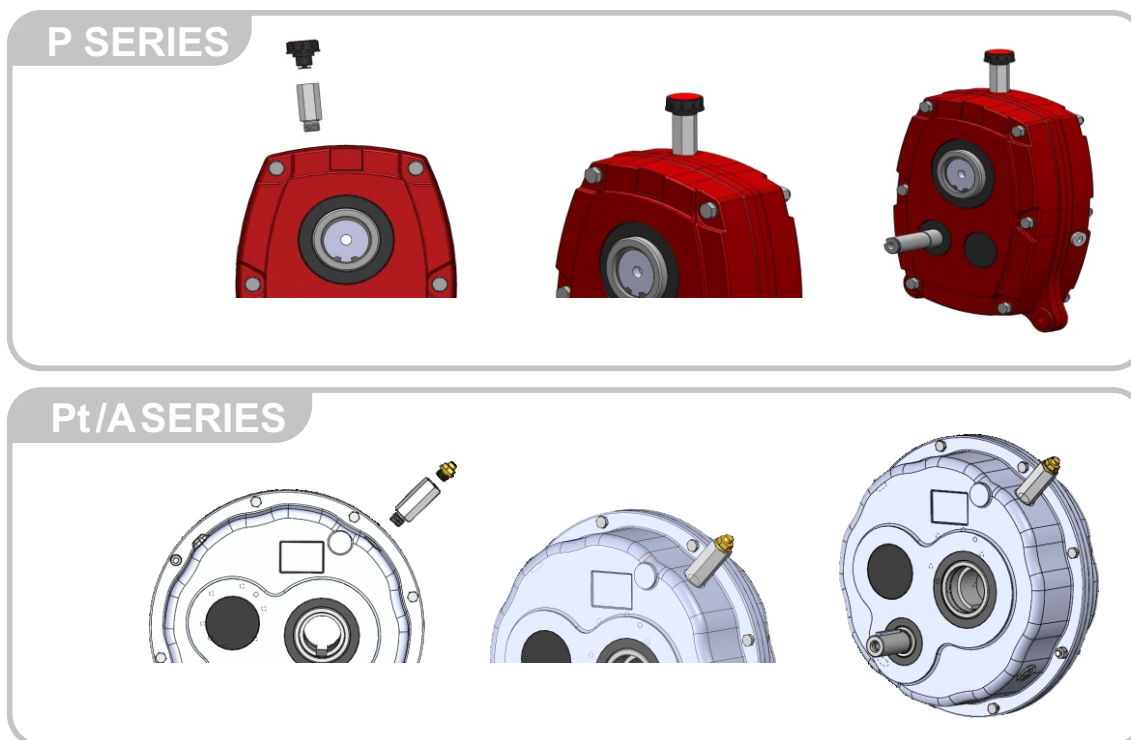
Bolt Tightening Moments [Nm]						
Dimensions	Bolt Quality			Cover Bolts	Coupling Bolts	Protective Cover Connection Bolts
	8.8	10.9	12.9			
M4	3.2	5	6	-	-	-
M5	6.4	9	11	-	2	-
M6	11	16	19	-	-	6.4
M8	27	39	46	11	10	11
M10	53	78	91	11	17	27
M12	92	135	155	27	40	53
M16	230	335	390	35	-	92
M20	460	660	770	-	-	230
M24	790	1150	1300	80	-	460
M30	1600	2250	2650	170	-	-
M36	2780	3910	4710	-	-	1600
M42	4470	6290	7540	-	-	-
M48	6140	8640	16610	-	-	-
M56	9840	13850	24130	-	-	-
G½	-	-	-	75	-	-
G¾	-	-	-	110	-	-
G1	-	-	-	190	-	-
G1¼	-	-	-	240	-	-
G1½	-	-	-	300	-	-



3.3 Gear Unit Ventilation

In moist places or in open air usage, the gear unit which is resistant to corrosion is recommended. The damages in paint (in ventilation plug) must soon be corrected.

The carrying safety of the ventilation plug on the gear unit is to be remove. If ventilation plug was sent separately, it has to be inserted.



3.4 Retrospective Paintwork

In the situation of painting gearboxes completely or partially, the painting process should be made via bonding surface of both ventilation plug, seal, oil covers and label with bands.

3.5 Gear Unit Operating

- The gear unit is tested firstly at our firm. (leakproofing test, noise test, torc test)
- For the confirmation of direction of rotation of gear unit, it is needed to be operated before machine mounting.
- The mounting of gear unit to the machine is needed to be convenient to 2006/42/EC and other safety standards.
- The mounting position of the gear unit should be as same as tag values.
- The datas in power units should be tolerated (plus, minus) %10 according to values specified in tag.
- There must not be any oil leakage in gear unit.
- There must not be extremely vibration and must not exceed acceptable voice decibel for gear units.
- In the situation of long-term non-usage, the storage conditions are needed to be implemented.
- The oil position must be controlled for the mounting position specified in catalogue.
- The oil level must be controlled.
- Before the operating, the carrying safety of the ventilation plug on the gear unit is needed to be removed.
- If the gear unit is dispatched without oil, the first oil filling must be loaded according to oil quantity stated in oil tables.



4.1 Control And Periodic Maintenance

	<p>NOTE !</p> <p>The maintenance and periodic maintenance works are performed by qualified person/ operator who is well-educated and is sufficient in electric and mechanic issues; the rules convenient to job health and safety and specific environmental problems are performed as protected.</p>
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	<p>DANGER !</p> <p>Before the start of the maintenance work of the gear unit, gear unit should be closed at first (get into the voltage-free position), be sure service-free, needed to take measures against any accident or spinning items with the help of unexpected external load. Also all environmental safety precautions must be taken.</p>
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- Before the maintenance process, all safety equipments are needed to get ready and if necessary the outside personal should be warned. The border around the unit must be specified and must prevent equipment entrance to the area. If any failures to comply to these conditions, the situations which causes harm to health and safety could be occurred.
- Worn items only must be changed with original and unused items.
- The lubricators, which recommended by our company, should be used. (see. 6.3 **Lubricant Table**, page 25)
- The leakproofing items on the gear unit must be changed with original items.
- If the bearing is needed to be changed please contact to our firm.
- After the maintenance work, we recommend to change the lubrication oil.

All above informations were given for the purpose of efficient and confidential operating of gearboxes. Our firm is not responsible for substitute product and unroutined maintenance that causes damages and woundings. When purchasing gear unit, should be noted that it is original product and has technical informations written in catalogue.

	<p>NOTE !</p> <p>The polluted oil and rusted items must not be left to the environment after the maintenance. These items must be disposed convenient to the regulations.</p>
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Control and Periodic Maintenance Ranges	Control and Periodic Maintenance Works
Once at every 3000 work hours or once at every 6-months until the	<ul style="list-style-type: none"> - Visual inspection - Check for running noises - Check oil level
80 work heat. Once at every 10.000 work hours or once at least in two years (the synthetic oil is once at every 20.000 work hours or once at every four years)	<ul style="list-style-type: none"> - Change the oil - The change of the ventilation plug
At least every 10 years	<ul style="list-style-type: none"> - General overhaul.



4.2 Visual Inspection

There must be controlled whether there is a leaking or not in gear unit.

There must be controlled that if there is oil filled or not in gear unit. Should be controlled that if there is any damage in gear unit's items and whether if the connection spots are rusted.

Also must be controlled that if any cracks could emerge in hose connection lines and in rubber wedges.

Leakproofing likes of dripping of gear unit's oil or dripping of cooling water and in damages and cracks, repair of the gear unit must be provided. Like these situations please get in contact with NRW.

Because of the storage and carrying, before the operation of gear unit and during at first operation, low amount of grease could flow out from bearing, this type of oil leak could not create any technical failure, the safety of gear unit and bearing operation could not be effected.

4.3 Check for Running Noises

The emerge of unusual operation voice or vibrations in gear units could mean damages. In this type of situations, the gear unit must be stopped and overall revision must be made.

4.4 Control of the Lubricant and Lubricant Level

- Regular oil level controlling must be made.
- For preventing incorrectly reactivation of system, it should be secured.
- Must be waited until the gear unit got cooled.
- If the mounting position is changed, the section of "the mounting of gear unit" must be got into attention.
- A little amount of oil must be taken out of the oil drain plug. The quality of oil must be controlled.
- The oil must be changed when the sign of extremely oil pollution is seen.

4.5 Changing the Oil

To prevent the emergence of the danger of burning, must be waited until the gear unit got cooled. The oil level, draining and position of ventilation plugs are dependent on mounting position. For the mounting position, related pages from catalogue could be seen. When the oil-changing process, the gear unit should be at operating temperature. Connection of driving unit must be cut and be secured for incorrectly reactivation.



NOTE !

Because of the coldness of oil will affected the flowing and venting, the gear unit must not be cooled fully.

Changing the Oil;

- Oil level plug, oil draining plug and ventilation plug must be removed.
- Both the oil is completely drained and the cleaning of gear unit must be made with proper solvent.
- The leakproofing elements on gear unit must be changed with original items.
- The oil draining plug must be put back to it's own place again.
- If the oil draining and level plug's gear part are damaged, instead of these, the new plug must be used.
- Before putting on the plugs, the sticky must be applied to the gear part like Loctite 242. If the aluminum washer is damaged, the new one must be used.
- The aluminum washer must be put lower and oil draining bolt must be bolted with proper moment.
- The oil according to mounting position must be filled from the vent hole with the proper draining device to the amount which is shown in catalogue. (could be filled from hole which is on the oil level). If the oil type is changed. Must be consulted to our firm.
- After the filling process, all plugs should be closed.
- 30 minutes after the oil filling, oil level must be controlled.



At high temperatures or at hard working conditions (high humidity, corrosive environment or high temperature fluctuations), the oil changing ranges must be reduced by half.


NOTE !

In standard helical gear units glassed oil level plug is not available. At this place the oil filling is made from the ventilation plug.

4.6 Oil Plugs Squeezing Torc Chart

Plug	Torc [Nm]
1/4"	7
3/8"	7
1/2"	12

4.7 Change Of The Ventilation Plug

In excessive pollution situations, ventilation plug must be dismantled and got cleaned or with aluminum washer, the new ventilation plug must be mounted.

4.8 Change of the Oil Seal And Oil Cover

- Connection of driving unit must be cut and be secured for incorrectly reactivation.
- At the time oil seal is changing, the sufficient amount of grease must be found between leakproofing lips and should be paid attention that the surface is not dirty and dusty.
- When the double seal is used, 3/2 of the part which remained between two seal must be filled with grease convenient to the oil type inside the gear unit.
- During the change of the oil seal the proper devices must be used for not to harm the body and shaft.
- During the change of the oil seal and oil filler cup, the original product must be used.

4.9 The Bearing Greases

- To the bearings of gearboxes, the greases must be use which were given by our company at the chart.
- Our company (NRW) recommends also replacing of grease while changing lubricant at the greased bearings.

4.10 General Overhaul

The gear unit must fully be dismantled and works written below have to be done respectively.

- All parts of the gear unit must be cleaned.
- The damage control must be done to all parts of the gear unit.
- The damaged parts must be changed with original part.
- All roller bearings must be changed.
- If there are, locks must be changed.
- All oil seals and nilos caps must be changed.


NOTE !

The general revision should be made by the qualified personnel with considering the international laws and regulations in the plants which has the required equipments. We recommend that the general revision has to be made at the NRW service.

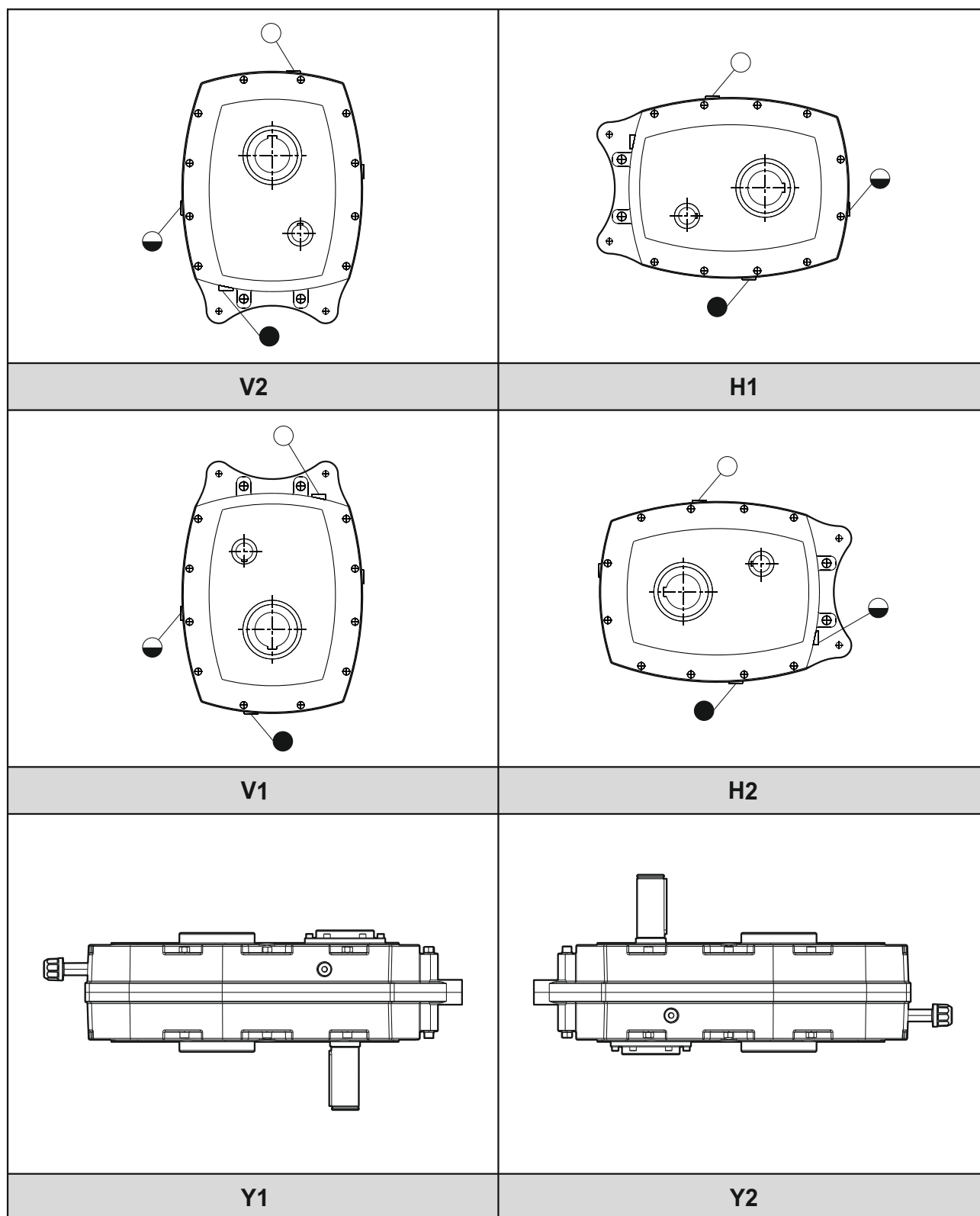


5. MOUNTING POSITIONS

5.1 Mounting Positions

Install the gearbox at the projected mountage position. For the other mountage positions except this one, please consult to our Technical Service.

P SERIES



○ Vent (Filler) plug

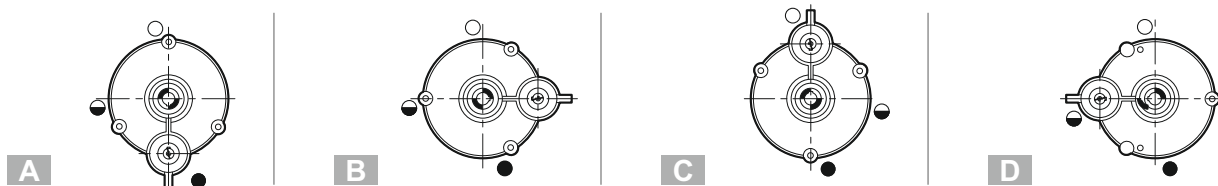
◐ Level plug

● Drain plug

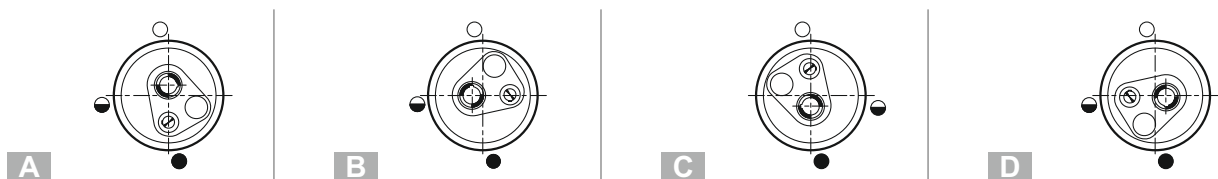


Pt / A SERIES

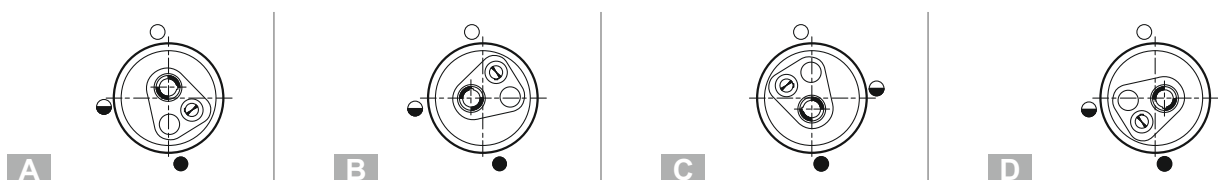
Pt/A 30



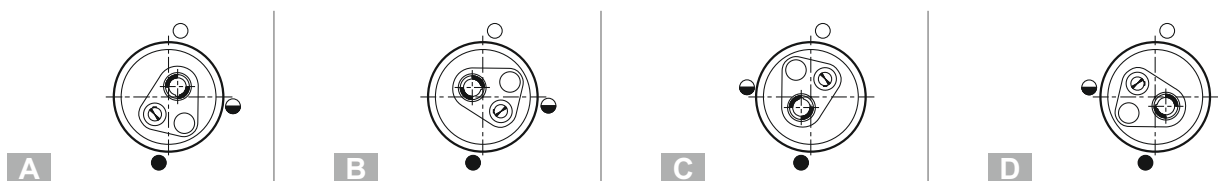
Pt/A 35



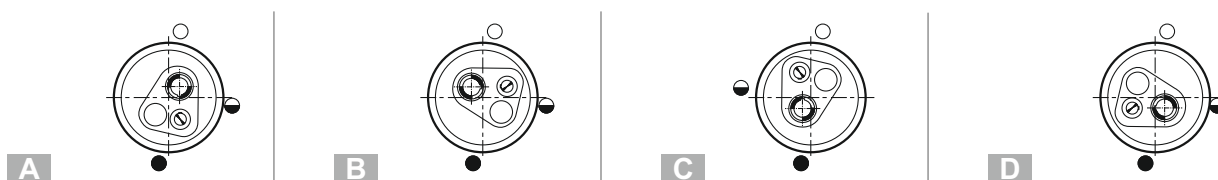
Pt/A 35_D



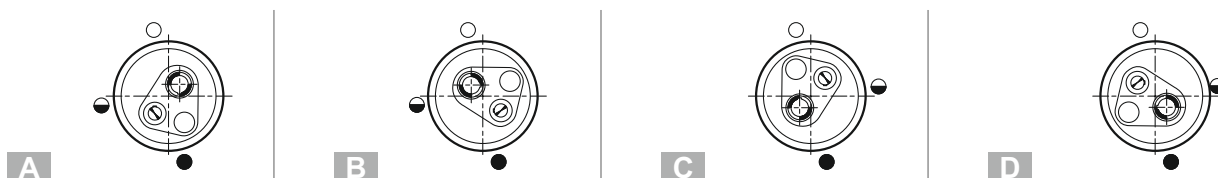
Pt/A 40



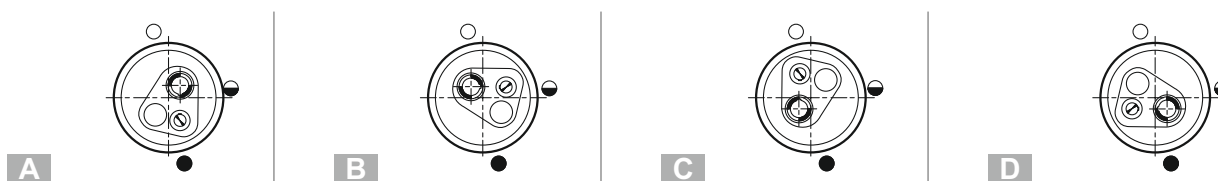
Pt/A 40_D



Pt/A 45



Pt/A 45_D



○ Vent (Filler) plug

◐ Level plug

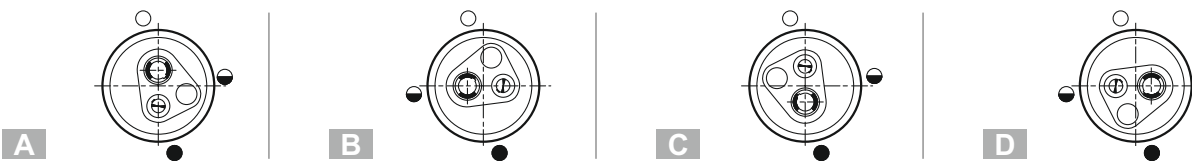
● Drain plug



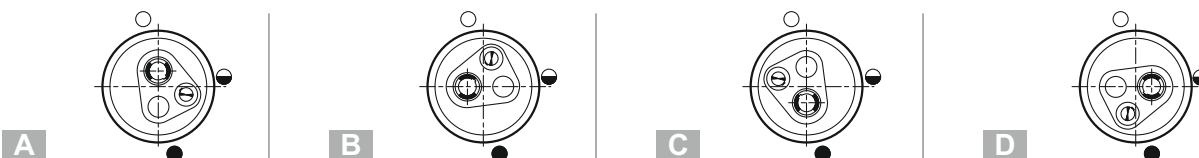
5. MOUNTING POSITIONS

Pt / A SERIES

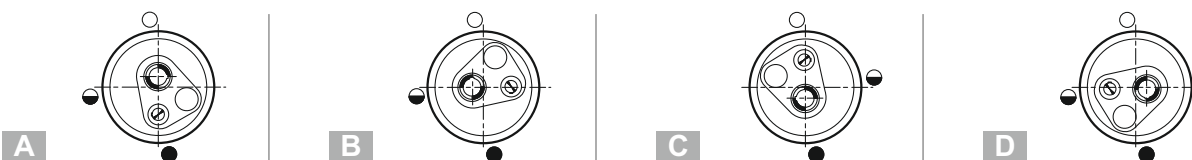
Pt/A 50



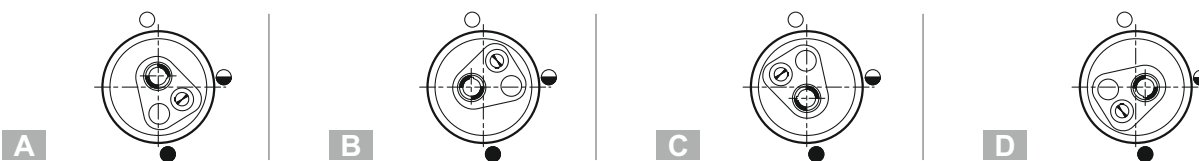
Pt/A 50_D



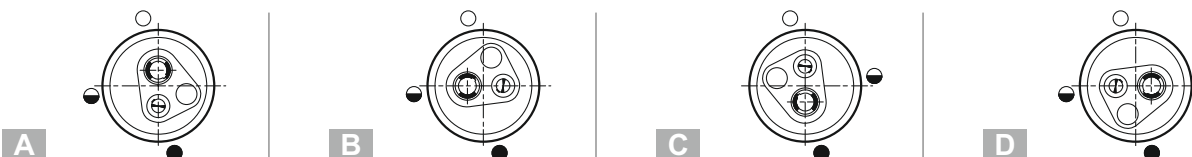
Pt/A 60



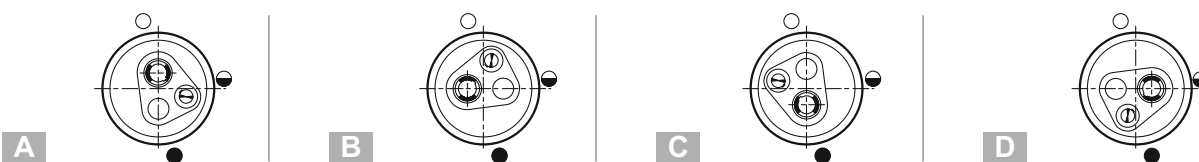
Pt/A 60_D



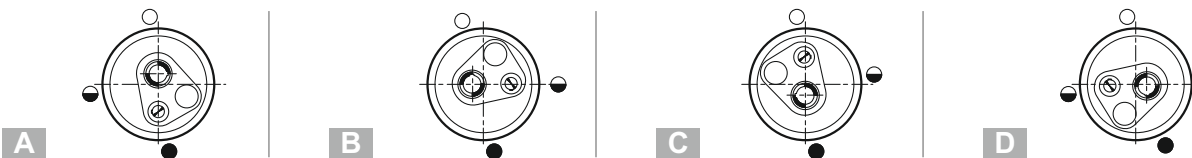
Pt/A 70



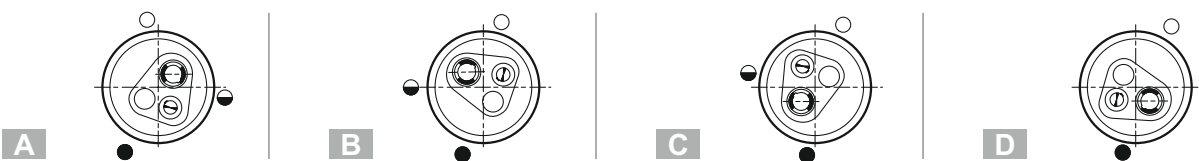
Pt/A 70_D



Pt/A 80



Pt/A 80_D



○ Vent (Filler) plug

◐ Level plug

● Drain plug



Pt / A SERIES

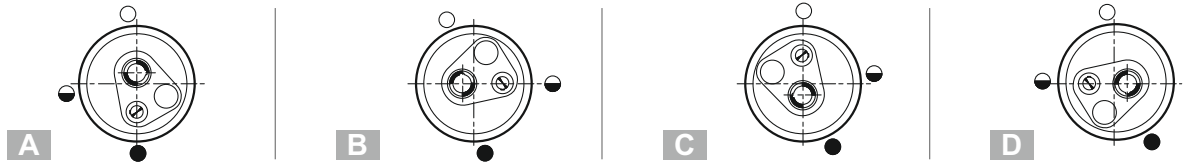
Pt/A 100



Pt/A 100_D



Pt/A 125



Pt/A 125_D



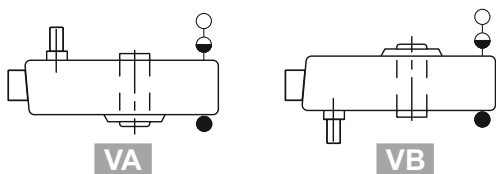
○ Vent (Filler) plug

◐ Level plug

● Drain plug

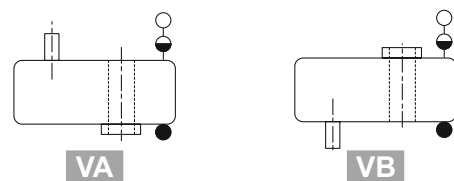
5.2 Mounting Positions For Where Input Shaft Is Vertical

Pt/A 30



Pt/A 35 & Pt/A 125

Pt/A 35_D & Pt/A 125_D





5. MOUNTING POSITIONS

5.3 V Belt and Torc Arm Connection

The V belt could be placed to every suitable position. If the torc arm is going to be used for tighten the belt, the angle between input and output shafts would be 90°. If it is wanted, V belt could be placed to right side.

The pulley must be mounted as nearest as possible to the gearbox's input shaft. If it is not made, the excessive load could occur at the input shaft and because of this reason they could be deteriorated very early.

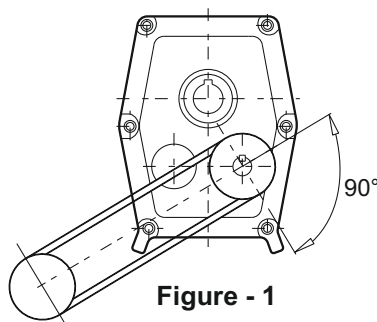


Figure - 1

If the output shafts work opposite to the clockwise, torc arm should be placed to the right side.

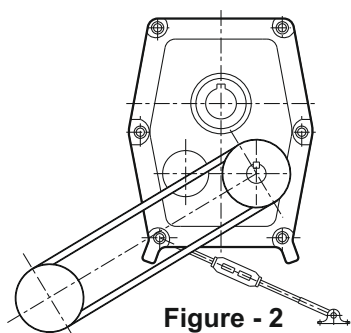
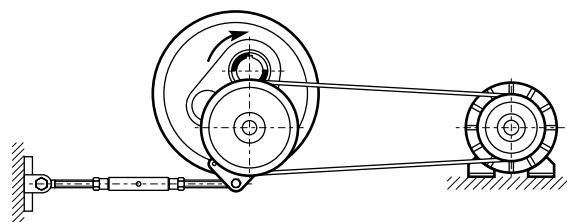


Figure - 2

TORC TENSION ARM



NOTE !

Torc arms should be mounted without tension. (Please look at P series catalogue).
For enabling optimum mountage the paste should be used to absorb vibration.
(LOCTITE 510 or equivalent product)

The torc arm supported-tappet is connected to fixed hinge. It must also be placed in such a way that the angle between the output shaft and torc arm connection screw is going to be placed vertical angle. It differs up to maximum 15 degree. If it is wanted, torc arm could be placed to the right side too.

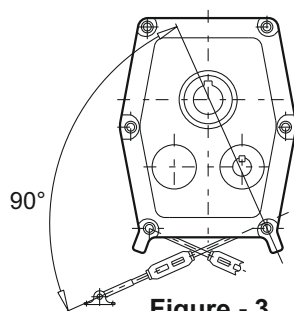


Figure - 3



NOTE !

Our firm is not responsible of the misuse of the original parts of the gearboxes.
The supply of the torc arm belongs to customer.



6.1 Lubrication

The gearboxes are sent with oil unless the customer wants contrary. The oil added gearboxes are supplied with ventilation, level and draining plugs. The certain mounting positions must be determined in customer orders.

The inner pieces of gearboxes are lubricated within the oil or by spillage. At the given tables oil amounts which must be put according to different mountage positions and in respect to that plug positions are determined. In particular situations a probability of small quantity of oil-loss could exist apart from the oil amounts given from table.



DANGER !

In the situations of not using the stated amount of oil out of the table the probability of emerging a damage at the gearbox could be high.

6.2 Lubricant Fill Quantities

P SERIES

LITRE (L)	V2	H1	V1	H2	V2	H1	V1	H2
	5:1				13:1 / 20:1			
P1	0.5	0.5	0.5	0.6	0.4	0.6	0.5	0.6
P2	0.8	0.9	0.8	1.0	0.7	0.9	0.8	0.9
P3	1.2	1.7	1.4	1.8	1.0	1.8	1.4	1.6
P4	2.5	2.6	2.4	2.5	2.3	2.6	2.4	2.2
P5	3.3	3.2	3.2	3.3	3.0	3.2	3.2	3.2
P6	4.1	5.3	4.1	5.8	3.8	5.5	4.2	5.1
P7	5.7	8.6	5.9	8.6	5.4	8.5	5.9	8.3
P8	10.9	18.4	13.6	18.4	9.1	16.4	12.6	15.4
P9	—	—	—	—	12.7	21.7	15.7	19.2
P10	—	—	—	—	12.5	13.5	24.0	11.5
P11	—	—	—	—	22.5	34.5	52.0	27.0
P12	—	—	—	—	36.0	50.0	79.0	45.0

Pt / A SERIES

Pt/A 30	Pt/A 35	Pt/A 40	Pt/A 45	Pt/A 50	Pt/A 60	Pt/A 70	Pt/A 80	Pt/A 100	Pt/A 125
0.50	1.2	2.1	3.1	8.0	7.5	11.0	17.0	20.0	27.0
	Pt/A 35_D	Pt/A 40_D	Pt/A 45_D	Pt/A 50_D	Pt/A 60_D	Pt/A 70_D	Pt/A 80_D	Pt/A 100_D	Pt/A 125_D
	1.1	1.8	3.6	7.3	10.0	14.0	11.0	18.0	27.0



6. LUBRICATION

6.3 Lubricant Selection

P SERIES

Mineral Oils												
	Room temperature	0-100 min ⁻¹	101-200 min ⁻¹	201- 400 min		0-20 min ⁻¹	21- 50 min ⁻¹		51-120 min ⁻¹		0-50 min ⁻¹	51-80 min ⁻¹
		P1 P2 P3 P5 P6 P7 P8	P1 P2 P3 P5 P6 P7 P8	P1 P2 P2	P3 P4 P5 P6 P7 P8	P1 P2 P3 P4 P5 P6 P7 P8 P9	P1 P2 P3	P4 P5 P6 P7 P8 P9	P1 P2 P3	P4 P5 P6 P7 P8 P9	P10 P11 P12	P10 P11 P12
I.S.O. Viscosity	-10 / +5	100	100	100	68	150	150	150	100	100	100	100
	6 / 25	460	320	320	220	680	680	460	460	320	320	220
	26 / 40	800	680	680	460	800	800	800	680	460	460	320
		5 : 1				13 : 1			20 : 1			

Pt / A SERIES

Type of Loads	Pt/A 0 °C - 20 °C		Pt/A 20 °C - 40 °C	
	Mineral Oil ISO VG	Synthetic Oil ISO VG	Mineral Oil ISO VG	Synthetic Oil ISO VG
Uniform load	150	150	220	220
Medium Load	150	150	320	220
Heavy Load	200	200	460	320



6.4 Lubricant Table

At below table, registered brands or names of goods have been showed according to gearbox lubricant type which stated on product label. (Please also see Part "2.1 Gearbox Label". This situation means that just a product should be used convenient to the lubricant type that shown on the label. In particular situations, stated product's name is shown on gearbox product label.

Type of gearbox	Type of Lubricant	Ambient Temp. °C	ISO viscosity class	Shell	Mobil	bp	Esso	DEA	ARAL	Castrol	TRIBOL	KLÜBER LUBRICATION
Helical Gear-boxes	Mineral oil	- 5...40 Normal	ISO VG 220	Shell Omala Oel 220	Mobilgear 600 XP 220	Energol GR-XP 220	Spartan EP 220	Deagear DX SAE 85W-90 Falcon CLP 220	Degol BG 220	Alpha SP 220 Alpha MW 220 Alpha MAX 220	Tribol 1100/220	Klüberoil GEM 1-220
		-15...25	ISO VG 100	Shell omala Oel 100	Mobilgear 600 XP 150	Energol GR-XP 100	Spartan EP 100	Deagear DX SAE 80W Falcon CLP 150 Alrkraft Hydraulic Oil 15	Degol BG 100	Alpha SP 100 Alpha MW 100 Alpha MAX 220	Tribol 1100/100	Klüberoil GEM 1-100
		# - 50...-15	ISO VG 15	Shell Tellus Oel T 15	Mobil DTE 10 Excel 15	Bartran HV 15	Univis J 13		Vitamol 1010	Hyspin AWS 15 Hyspin SP 15 Hyspin ZZ 15	Tribol 770	Isoflex MT 30 rot
	Synthetic oil	- 25...80	ISO VG 220	Shell Tivela Oel WB	Mobil Glygoyle 30	Enersyn SG-XP 220	ESSO Glycolube 220	Polydea PGLP 220	Degol GS 220	Alphasyn PG 220	Tribol 800/220	Klübersynth GH 6 - 220
	Bio-degradable oil	- 25...80	ISO VG 220					Plantogear 220 S	Bio-Degol S 220	Carelube GES 220	Tribol Bio Top1418/220	Klüber - Bio GM 2 - 220
Anti Friction Bearings	Food - grade oil	- 25...80	ISO VG 220	Cassida 220	Mobil SHC Cibus 220		GEAR OIL FM 220	Renolin 220	Degol FG 220	OPTIMOL optileb GE 220	Tribol Food Proof 1810/220	Klüberoil 4UH1 - 220
	Synthetic fluid grease	- 35...60		Shell Tivela compound A		Enersyn GSF	Fliessfett S 420	Glissando 6833 EP 00	Aralub SKA 00	Alpha Gel 00	Tribol 800/1000	Klübersynth GE 46 -1200
Anti Friction Bearings	Mineral oil grease	- 30...60 Normal		Alvania Fett R 3 oder	Mobil SHC Polyrex 005	Energrease LS 3	Beacon 3	Glissando 30 Glissando 20	Aralub HL 3 Aralub HL 2	Speherol AP 3 Speherol AP 2 LZV - EP	Tribol 3030/100-2	Centoplex 3 Centoplex 2
		# 50...110		Alvania Fett RL 3	Mobilux 3 Mobilux 2	Energrease LS 2	Beacon 2	Glissando FT 3	Aralub BAB EP 2	Speherol EPL 2	Tribol 4020/220-2 Tribol 3785	
	Synthetic grease	# - 50...110		Aero Shell Grease 16 oder 7	Mobiltemp SHC 32		Beacon 325	Discor 8 - EP 2	Aralub SKL 2	Product 783/46	Tribol 3499	Isoflex Topas NB52



DANGER !

The synthetic and mineral oils must not be mixed with eachother.



NOTE !

At ambient temperatures under -30° degree and above 60° degree for leakproofing element inside the shaft, special quality material must be used.

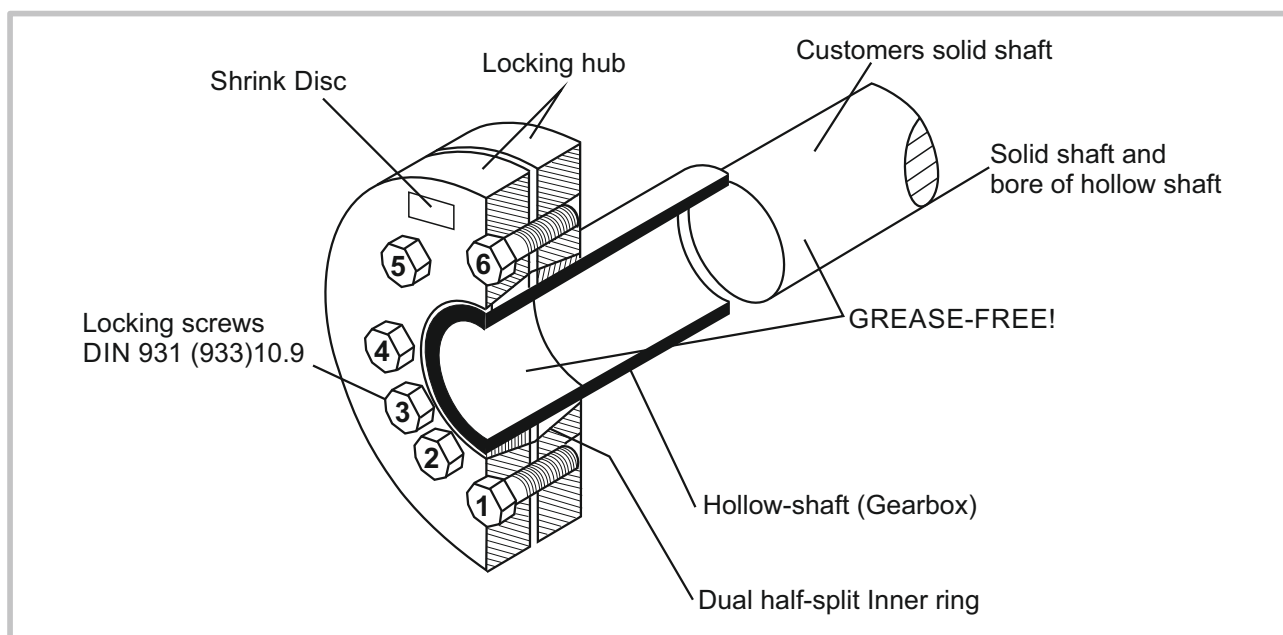


NOTE !

This table lists compatible lubricants of different suppliers. Within the same viscosity class and type of lubricant the supplier can be chosen freely. In case you change the viscosity class resp. The type of lubricant you should contact us in advance otherwise we cannot assure the proper function of our drive and the warranty becomes void.



7.1 Shrink Disc



NOTE !

Shrink disc would be sent ready to assembly by manufacturer. Please do not segment the shrink disc into pieces before assembly process. There could be wounding risk during both assembly and disassembly. Please obey instructions given below.



NOTE !

Do not tighten screws on the shrink disc without installing the shaft. If it is tightened, hollow shaft could be damaged.

7.1.1 Mounting Position Of The Shrink Disc;

- If there is, the shrink disc must be removed from the package.
- The clamping bolts are loosened but must not be removed. Must be squeezed with the help of hand until to get the space out of between the flanges and inner loop.
- The external clamping flange connected to the gear unit's shaft, shrink disc must be pushed on to the output shaft. Soft grease must applied to the hole at inner ring. (for easining the pushing process).
- The soft grease must be applied to the spacer side of customer applications solid shaft. The oil must not be touched the compressed side of the shrink disc. For not creating that kind of risk, the grease should not be applied directly on the spacer.
- The grease both on the gear unit's shaft and customer's application shaft must be fully cleaned and be ungreased.
- The Customer's applications solid shaft must be mounted completely to the hollow shaft to the shrink disc's shrinking area.
- To positioned the shrink disc, the clamping bolts must slightly tightened.
- The clamping bolts must be tightened at clockwise a few times respectively (approximately ¼ bolt tour per tour). Never be tightened diagonally.
- After tightened the clamping bolts, there should be an equal space between the clamping bolts. If this space is not ensured, the gear unit must be dismantled and the sensibility of the external tightened flange of the shrink disc must be controlled.



7.1.2 Demounting Position Of The Shrink Disc;

- The clamping bolts must be loosened respectively a few times. (approximately ¼ bolt tour per tour) But clamping bolts must not be fully removed.
- The shrink disc should not be separated from the gear unit's shaft.
- The gear unit must be removed from customer's applications solid shaft.

	DANGER !
	If the shrink disc are mounted and dismantled incorrectly, the wounding danger could exist.

7.1.3 Cleaning Of The Shrink Disc;

- Dismantled shrink disc before remounting, is not needed to subject the cracking process.
- Only the polluted surfaces of the shrink disc must be cleaned.
- The conical surfaces must be lubricated with one of the the solid material lubricants listed below.

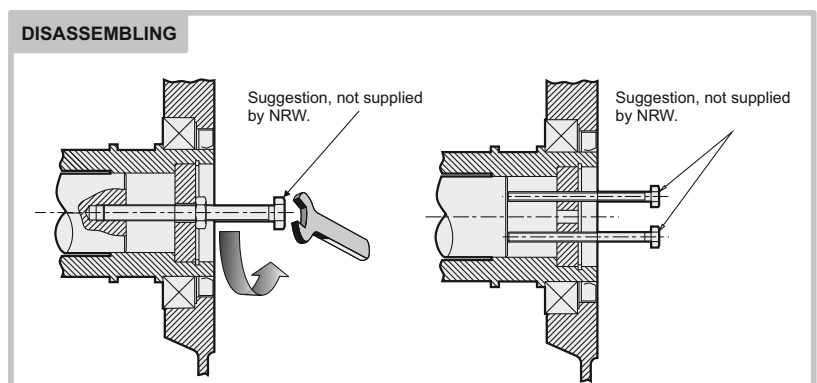
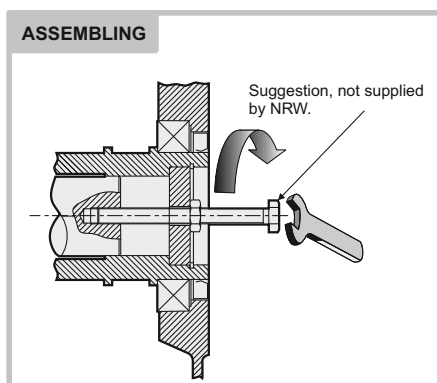
Lubricant (Mo S2)	Type
Molykote 321 (Slippery lac)	Spray
Molykote Spray (Powder spray)	Spray
Molykote G Rapid	Spray or paste
Aemasol MO 19P	Spray or paste
Aemasol DIO-setral 57 N (Slippery lac)	Spray

For the lubricating of clamping screws Molykote BR 2 or similar material must be used.

7.2 Fixing Elements

- Fixing elements are available as standard on P and Pt/A type of gear units.
- A hole should be opened in accordance with DIN 322/2 standarts at the center of the customer's solid shaft to use.

* Before installation sufficient protection must be supplied for protect against rust, abrasion and blocking, like figure which is shown on below.

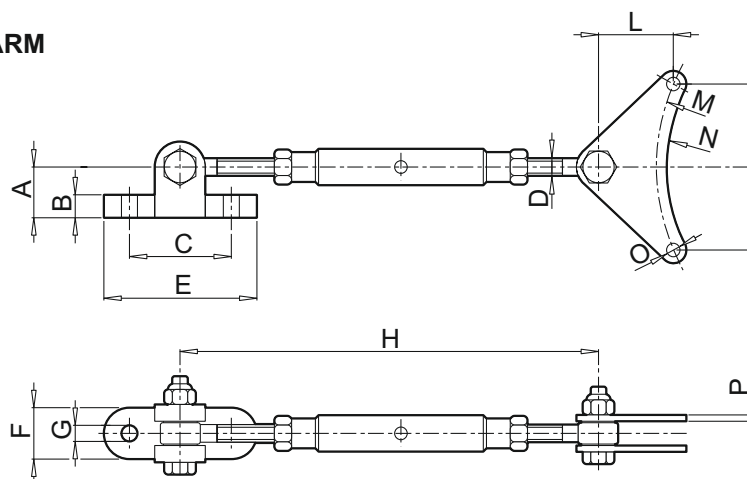





7. ACCESSORIES

7.3 Torque Arm Pt/A SERIES

TORC TENSION ARM



		C	F	G	E	D	I	M	N	P	L	B	O	A	H _{Min.}	H _{Max.}
Pt/A 35	35	50	25	8.5	75	M10	92	120	111	4	45	10	8.5	25	200	300
Pt/A 40	40 45	70	35	10.5	105	M12	115.5	151	143	4	51	16	8.5	35	210	310
Pt/A 45	45 50 55	70	35	10.5	105	M12	132	172	164	5	57	16	8.5	35	210	310
Pt/A 50	50 55 60	75	40	12.5	115	M14	157	205	195	5	70	18	10.5	40	240	360
Pt/A 60	60 70	75	40	12.5	115	M14	179	234	221	5	84	18	12.5	40	240	360
Pt/A 70	70 85	85	50	14.5	135	M16	199	260	247	6	100	20	12.5	45	260	410
Pt/A 80	80 100	85	50	14.5	135	M16	218	285	272	6	102	20	13	45	260	410
Pt/A 100	100 125	150	70	25	220	M20	258.5	337	324	10	115	30	17	65	340	560
Pt/A 125	125 135	150	70	25	220	M20	306	402.5	382	10	135	30	17	65	340	560




7.4 Backstop

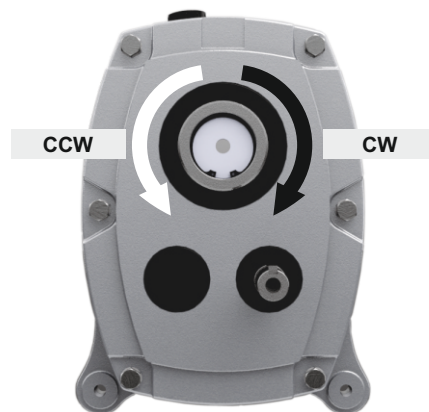
P SERIES

Backstop system is available for all type of helical gear unit. Backstop system permits just one direction rotation it resists another direction rotation. Rotation speed is important for abration. Nearly 900 min and greater rotation speed influece abration.

Please, determine direction of rotation when you offer. Direction of rotation should be determined according to output shaft.

Arrows which is designated by 'CW' or 'CCW' shows locking direction from viewing at face of output shaft end.

	NOTE !
	<p>The action of the motor in locking direction could cause fracturing of the lock.</p> <ul style="list-style-type: none"> - The motor absolutely must not rotated to the direction of locking. To provide specified direction of rotation, it must be careful that the motor is supplied by direct current. - For the purpose of controlling gear unit's output solid shaft/gear unit's output hollow shaft could be operated by half tour to the opposite direction of locking once.



Arrows show that direction of rotation.

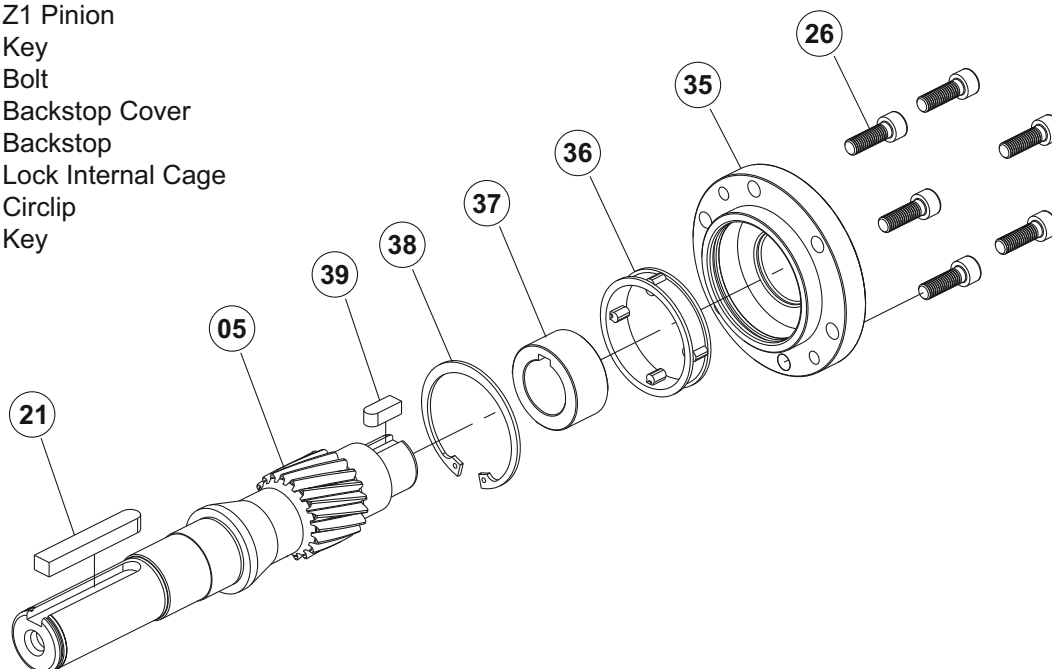


7. ACCESSORIES

7.5 Lock Blasting

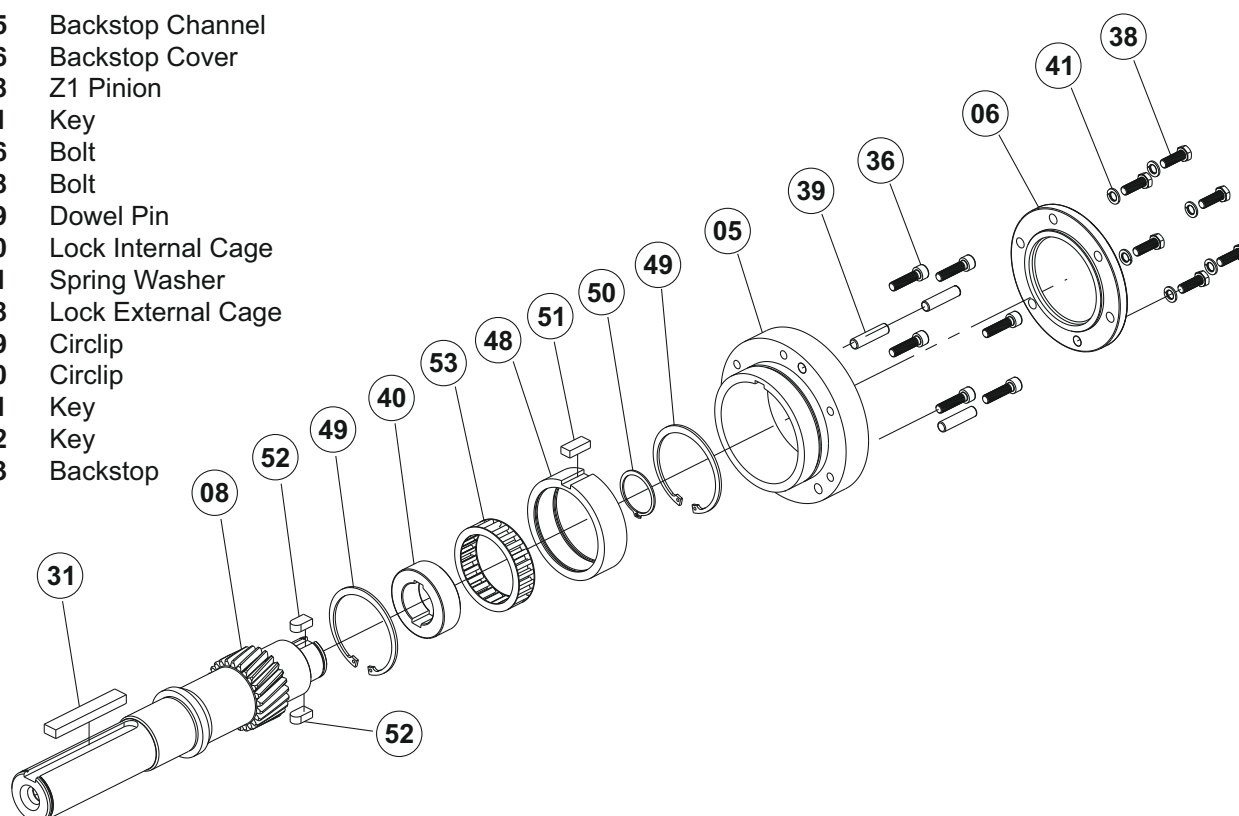
P1 ... P9

- 05 Z1 Pinion
- 21 Key
- 26 Bolt
- 35 Backstop Cover
- 36 Backstop
- 37 Lock Internal Cage
- 38 Circlip
- 39 Key



P9 ... P12

- 05 Backstop Channel
- 06 Backstop Cover
- 08 Z1 Pinion
- 31 Key
- 36 Bolt
- 38 Bolt
- 39 Dowel Pin
- 40 Lock Internal Cage
- 41 Spring Washer
- 48 Lock External Cage
- 49 Circlip
- 50 Circlip
- 51 Key
- 52 Key
- 53 Backstop



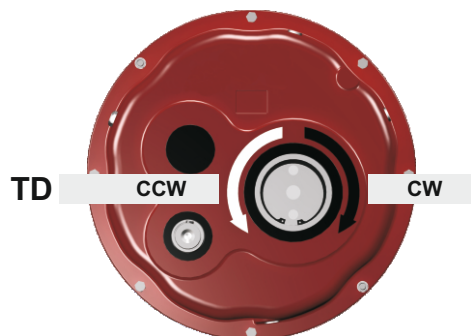
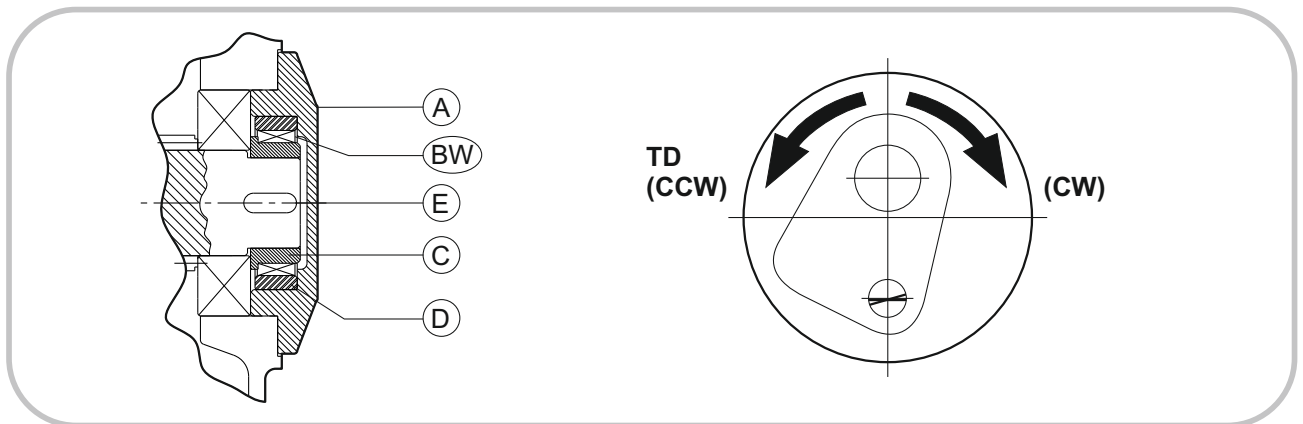


Backstop

Pt/A SERIES

If it is demanded, in gearboxes the lock up system which permitted just only to rotate to one side is available. (Pt/A, Pt/A_D) The side choice must be defined at the order because of it is optional (right-left). The gearboxes sizes which are 40-45-50-100-125 (except 25-35/5-30-38) are designed for accepting BW lock as a standard. Sizes which are 35-60-70-80 are required to lock-up supporting element (A). The lock-up element could easily be mounted and demounted with following simple procedure below.

1. Take off cap A.
2. To place wedge E (except Pt/A 35.....Pt/A 45).
3. For the sizes 40-45-50-100-125 put liner bushing.
4. Put BW lock-up element to the seating part of locking placed inside of the cap. (or to the hinge cap).
5. Push to the lock-up element with both spreading a thick grease around of circle and implementing press onto the exterior part.
6. Place as a manuel (support cap) and turn for aligning around itself.
7. Control the rightness of the direction of rotation with spinning the input shaft and if it is not true mount lockup element reverse with repeating steps listed above.



TD: CCW revolution of output shaft.

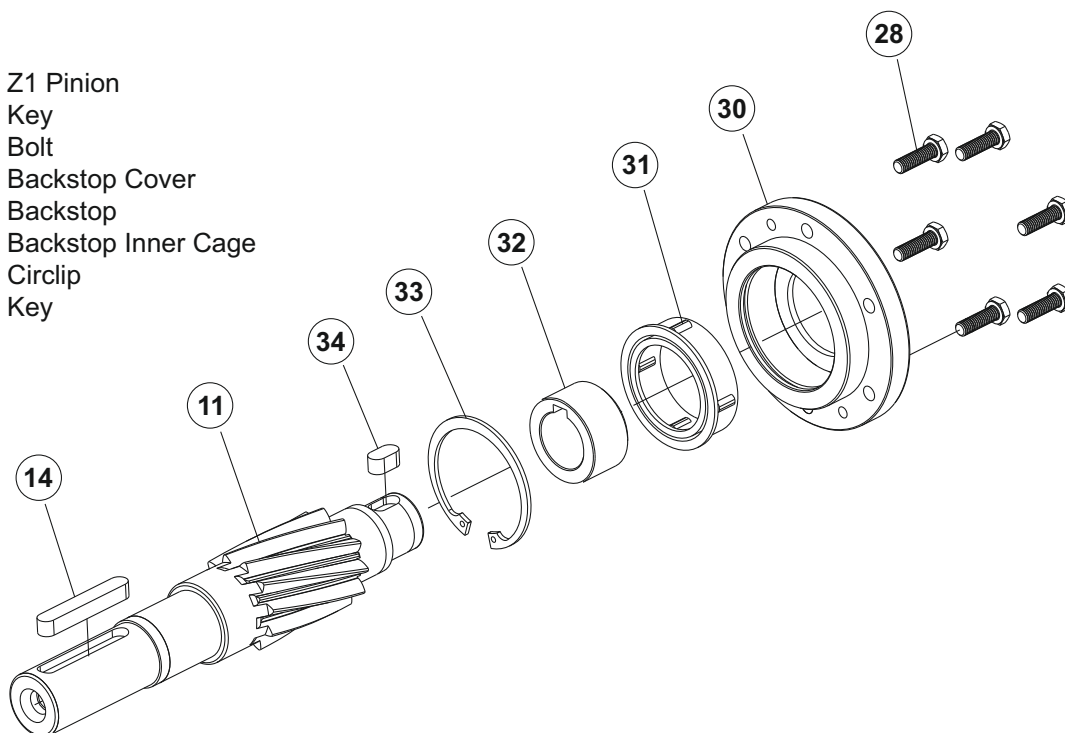


7. ACCESSORIES

Lock Blasting

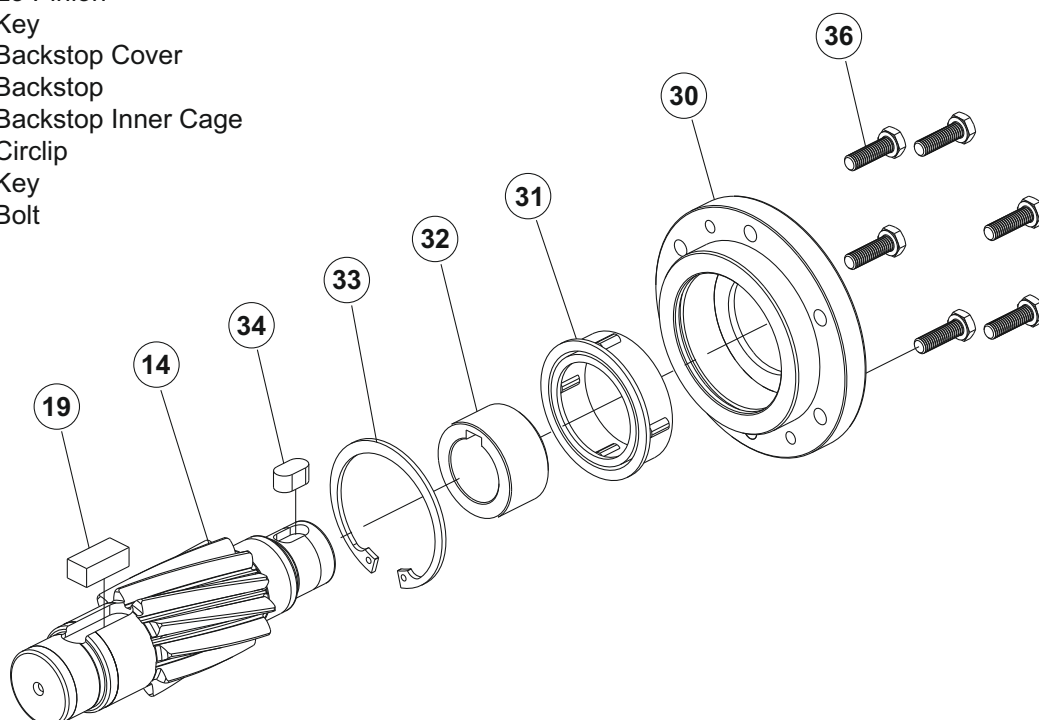
Pt/A SINGLE STAGE

- 11 Z1 Pinion
- 14 Key
- 28 Bolt
- 30 Backstop Cover
- 31 Backstop
- 32 Backstop Inner Cage
- 33 Circlip
- 34 Key



Pt/A DOUBLE STAGE

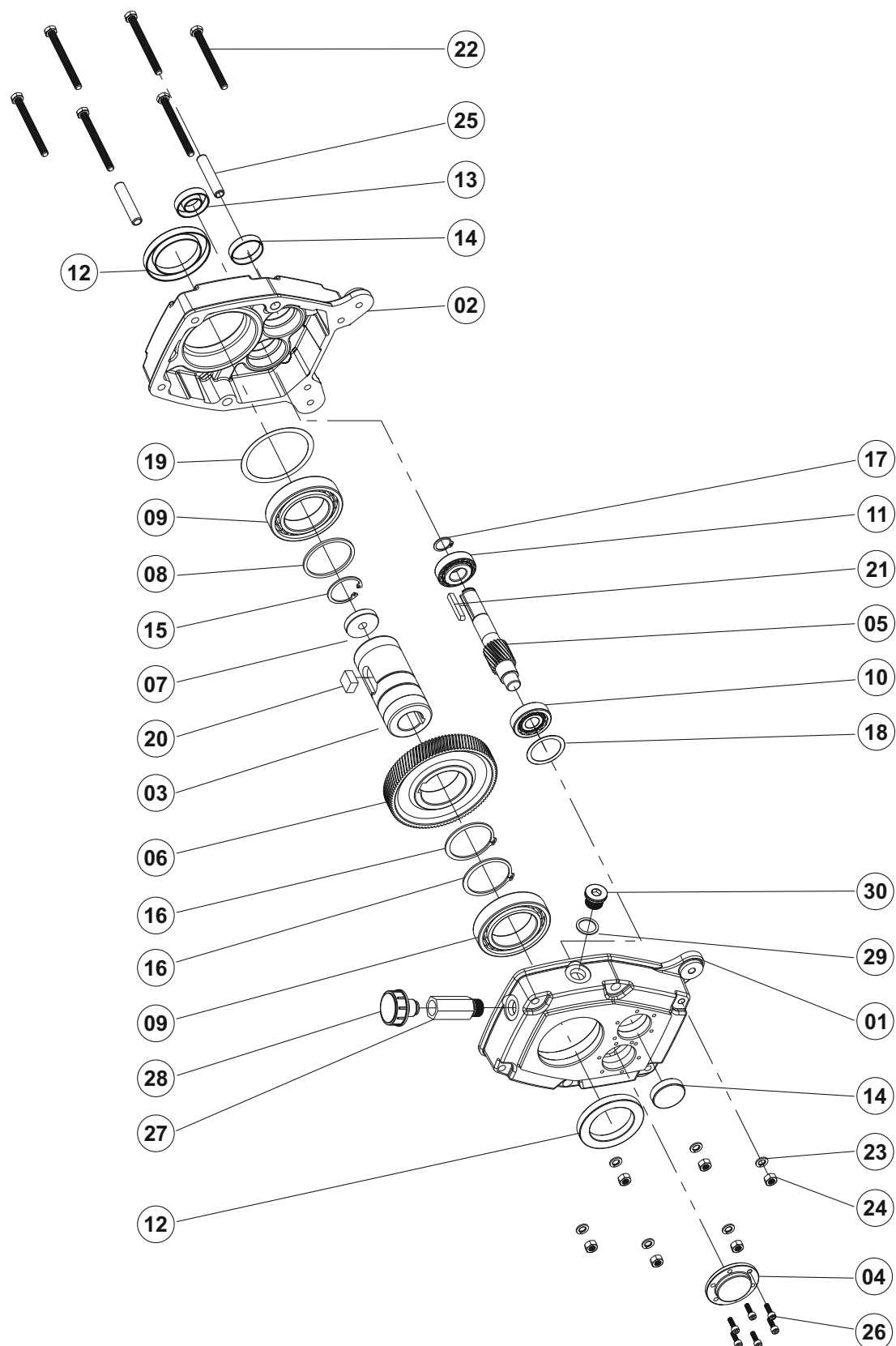
- 14 Z3 Pinion
- 19 Key
- 30 Backstop Cover
- 31 Backstop
- 32 Backstop Inner Cage
- 33 Circlip
- 34 Key
- 36 Bolt





7.6 Part List

P SINGLE STAGE



P1 ... P8



7. ACCESSORIES

P Series

P SINGLE STAGE

P1

- 01 P1 Case A
- 02 P1 Case B
- 03 Output Shaft
- 04 Case Cover
- 05 Z1 Pinion
- 06 Z2 Pinion
- 07 Socket Head Screw
- 08 Washer
- 09 Bearing
- 10 Bearing
- 11 Bearing
- 12 Lubricating Seal
- 13 Lubricating Seal
- 14 Locking Cap
- 15 Circlip (DIN 472)
- 16 Circlip (DIN 471)
- 17 Circlip (DIN 471)
- 18 Shim
- 19 Shim
- 20 Key B
- 21 Key AB
- 22 Bolt (DIN 933)
- 23 Spring Washer
- 24 Jacking Nut (DIN 934)
- 25 Centering Pin
- 26 Bolt (DIN 912)
- 27 Extension Plug
- 28 Vent Plug
- 29 Plug Washer
- 30 Oil Plug

P3

- 01 P3 Case A
- 02 P3 Case B
- 03 Output Shaft
- 04 Case Cover
- 05 Z1 Pinion
- 06 Z2 Pinion
- 07 Socket Head Screw
- 08 Washer
- 09 Bearing
- 10-11 Bearing
- 12 Lubricating Seal
- 13 Lubricating Seal
- 14 Locking Cap
- 15 Circlip (DIN 472)
- 17 Circlip (DIN 471)
- 18 Shim
- 20 Key B
- 21 Key AB
- 22 Bolt (DIN 933)
- 23 Spring Washer
- 24 Jacking Nut (DIN 934)
- 25 Centering Pin
- 26 Bolt (DIN 912)
- 27 Extension Plug
- 28 Vent Plug
- 29 Plug Washer
- 30 Oil Plug

P2

- 01 P2 Case A
- 02 P2 Case B
- 03 Output Shaft
- 04 Case Cover
- 05 Z1 Pinion
- 06 Z2 Pinion
- 07 Socket Head Screw
- 08 Washer
- 09 Bearing
- 10-11 Bearing
- 12 Lubricating Seal
- 13 Lubricating Seal
- 14 Locking Cap
- 15 Circlip (DIN 472)
- 17 Circlip (DIN 471)
- 18 Shim
- 19 Shim
- 20 Key B
- 21 Key AB
- 22 Bolt (DIN 933)
- 23 Spring Washer
- 24 Jacking Nut (DIN 934)
- 25 Centering Pin
- 26 Bolt (DIN 912)
- 27 Extension Plug
- 28 Vent Plug
- 29 Plug Washer
- 30 Oil Plug

P4

- 01 P4 Case A
- 02 P4 Case B
- 03 Output Shaft
- 04 Case Cover
- 05 Z1 Pinion
- 06 Z2 Pinion
- 07 Socket Head Screw
- 08 Washer
- 09 Bearing
- 10-11 Bearing
- 12 Lubricating Seal
- 13 Lubricating Seal
- 14 Locking Cap
- 15 Circlip (DIN 472)
- 17 Segman (DIN 471)
- 18 Layner
- 20 Key B
- 21 Key AB
- 22 Bolt (DIN 933)
- 23 Spring Washer
- 24 Jacking Nut (DIN 934)
- 25 Centering Pin
- 26 Bolt (DIN 912)
- 27 Extension Plug
- 28 Vent Plug
- 29 Plug Washer
- 30 Oil Plug


P Series
P SINGLE STAGE
P5

- 01 P5 Case A
- 02 P5 Case B
- 03 Output Shaft
- 04 Case Cover
- 05 Z1 Pinion
- 06 Z2 Pinion
- 07 Socket Head Screw
- 08 Washer
- 09 Bearing
- 10-11 Bearing
- 12 Lubricating Seal
- 13 Lubricating Seal
- 14 Locking Cap
- 15 Circlip (DIN 472)
- 17 Circlip (DIN 471)
- 18 Shim
- 20 Key B
- 21 Key AB
- 22 Bolt (DIN 933)
- 23 Spring Washer
- 24 Jacking Nut (DIN 934)
- 25 Centering Pin
- 26 Bolt (DIN 912)
- 27 Extension Plug
- 28 Vent Plug
- 29 Plug Washer
- 30 Oil Plug

P7

- 01 P7 Case A
- 02 P7 Case B
- 03 Output Shaft
- 04 Case Cover
- 05 Z1 Pinion
- 06 Z2 Pinion
- 07 Socket Head Screw
- 08 Washer
- 09 Bearing
- 10-11 Bearing
- 12 Lubricating Seal
- 13 Lubricating Seal
- 14 Locking Cap
- 15 Circlip (DIN 472)
- 18 Shim
- 19 Shim
- 20 Key B
- 21 Key AB
- 22 Bolt (DIN 933)
- 23 Spring Washer
- 24 Jacking Nut (DIN 934)
- 25 Centering Pin
- 26 Bolt (DIN 912)
- 27 Extension Plug
- 28 Vent Plug
- 29 Plug Washer
- 30 Oil Plug

P6

- 01 P6 Case A
- 02 P6 Case B
- 03 Output Shaft
- 04 Case Cover
- 05 Z1 Pinion
- 06 Z2 Pinion
- 07 Socket Head Screw
- 08 Washer
- 09 Bearing
- 10-11 Bearing
- 12 Lubricating Seal
- 13 Lubricating Seal
- 14 Locking Cap
- 15 Circlip (DIN 472)
- 17 Circlip (DIN 471)
- 18 Shim
- 20 Key B
- 21 Key AB
- 22 Bolt (DIN 933)
- 23 Spring Washer
- 24 Jacking Nut (DIN 934)
- 25 Centering Pin
- 26 Bolt (DIN 912)
- 27 Extension Plug
- 28 Vent Plug
- 29 Plug Washer
- 30 Oil Plug

P8

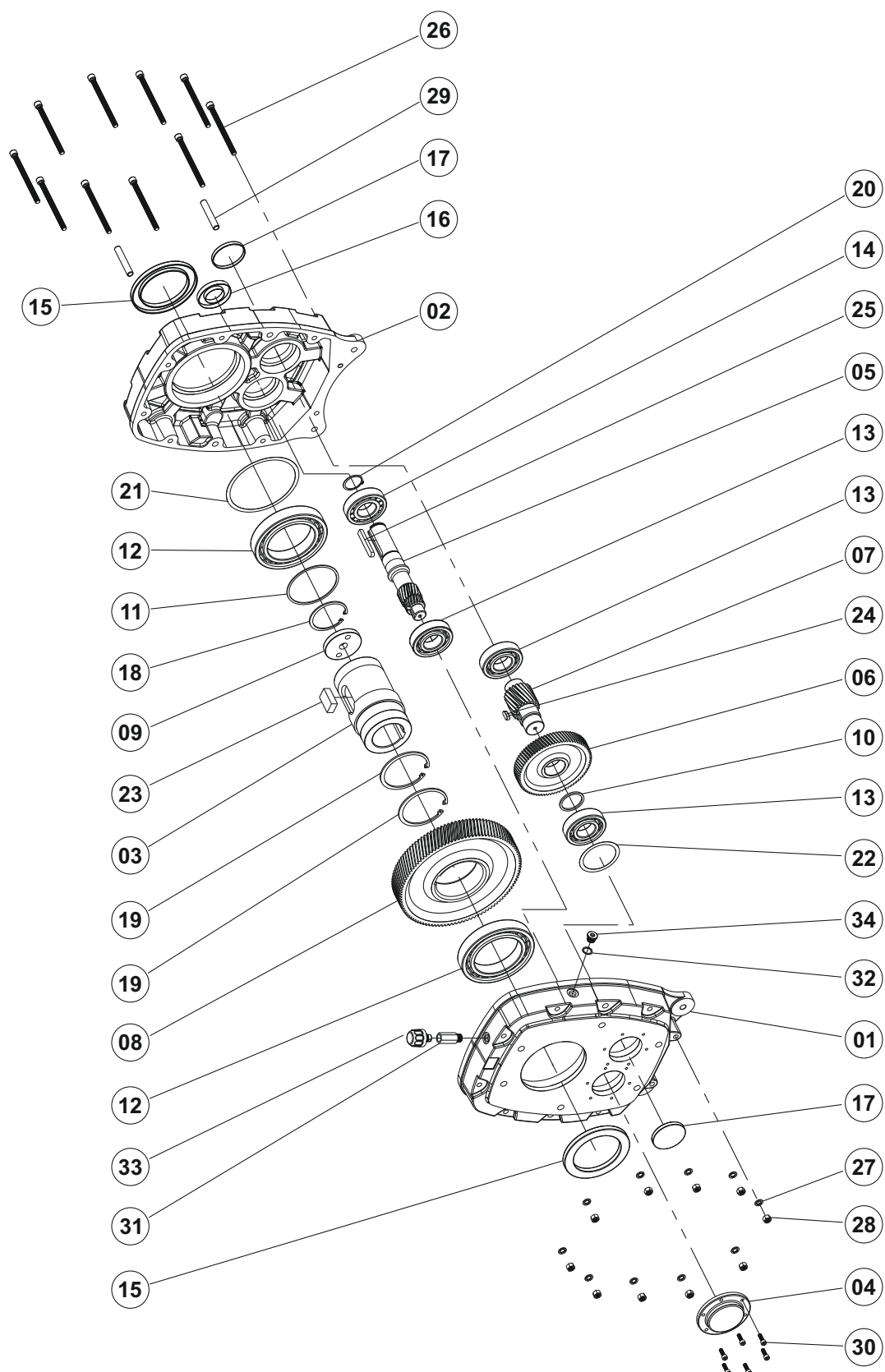
- 01 P8 Case A
- 02 P8 Case B
- 03 Output Shaft
- 04 Case Cover
- 05 Z1 Pinion
- 06 Z2 Pinion
- 07 Socket Head Screw
- 08 Washer
- 09 Bearing
- 10-11 Bearing
- 12 Lubricating Seal
- 13 Lubricating Seal
- 14 Locking Cap
- 15 Circlip (DIN 472)
- 17 Segman (DIN 471)
- 18 Layner
- 20 Key B
- 21 Key AB
- 22 Bolt (DIN 933)
- 23 Spring Washer
- 24 Jacking Nut (DIN 934)
- 25 Centering Pin
- 26 Bolt (DIN 912)
- 27 Extension Plug
- 28 Vent Plug
- 29 Plug Washer
- 30 Oil Plug



7. ACCESSORIES

P Series

P DOUBLE STAGE



P1 ... P9


P Series
P DOUBLE STAGE
P1

01	P1 Case A
02	P1 Case B
03	Output Shaft
04	Case Cover
05	Z1 Pinion
06	Z2 Pinion
07	Z3 Pinion
08	Z4 Pinion
09	Socket Head Screw
10	Spacer
11	Washer
12	Bearing
13	Bearing
14	Bearing
15	Lubricating Seal
16	Lubricating Seal
17	Locking Cap
18	Circlip (DIN 472)
19	Circlip (DIN 471)
20	Circlip (DIN 471)
21	Shim
22	Shim
23	Key B
24	Key A
25	Key AB
26	Bolt (DIN 933)
27	Spring Washer
28	Jacking Nut (DIN 934)
29	Centering Pin
30	Bolt (DIN 912)
31	Extension Plug
32	Plug Washer
33	Vent Plug
34	Oil Plug

P3

01	P3 Case A
02	P3 Case B
03	Output Shaft
04	Case Cover
05	Z1 Pinion
06	Z2 Pinion
07	Z3 Pinion
08	Z4 Pinion
09	Socket Head Screw
10	Spacer
11	Washer
12	Bearing
13	Bearing
14	Bearing
15	Lubricating Seal
16	Lubricating Seal
17	Locking Cap
18	Circlip (DIN 472)
20	Circlip (DIN 471)
23	Key B
24	Key A
25	Key AB
26	Bolt (DIN 933)
27	Spring Washer
28	Jacking Nut (DIN 934)
29	Centering Pin
30	Bolt (DIN 912)
31	Extension Plug
32	Plug Washer
33	Vent Plug
34	Oil Plug

P2

01	P1 Case A
02	P1 Case B
03	Output Shaft
04	Case Cover
05	Z1 Pinion
06	Z2 Pinion
07	Z3 Pinion
08	Z4 Pinion
09	Socket Head Screw
10	Washer
11	Washer
12	Bearing
13	Bearing
14	Bearing
15	Lubricating Seal
16	Lubricating Seal
17	Locking Cap
18	Circlip (DIN 472)
20	Circlip (DIN 471)
21	Shim
22	Shim
23	Key B
24	Key A
25	Key AB
26	Bolt (DIN 933)
27	Spring Washer
28	Jacking Nut (DIN 934)
29	Centering Pin
30	Bolt (DIN 912)
31	Extension Plug
32	Plug Washer
33	Vent Plug
34	Oil Plug

P4

01	P4 Case A
02	P4 Case B
03	Output Shaft
04	Case Cover
05	Z1 Pinion
06	Z2 Pinion
07	Z3 Pinion
08	Z4 Pinion
09	Socket Head Screw
10	Spacer
11	Washer
12	Bearing
13	Bearing
14	Bearing
15	Lubricating Seal
16	Lubricating Seal
17	Locking Cap
18	Circlip (DIN 472)
20	Circlip (DIN 471)
23	Key B
24	Key A
25	Key AB
26	Bolt (DIN 933)
27	Spring Washer
28	Jacking Nut (DIN 934)
29	Centering Pin
30	Bolt (DIN 912)
31	Extension Plug
32	Plug Washer
33	Vent Plug
34	Oil Plug



P Series

P DOUBLE STAGE

P5

01	P5 Case A
02	P5 Case B
03	Output Shaft
04	Case Cover
05	Z1 Pinion
06	Z2 Pinion
07	Z3 Pinion
08	Z4 Pinion
09	Socket Head Screw
10	Spacer
11	Washer
12	Bearing
13	Bearing
14	Bearing
15	Lubricating Seal
16	Lubricating Seal
17	Locking Cap
18	Circlip (DIN 472)
20	Circlip (DIN 471)
23	Key B
24	Key A
25	Key AB
26	Bolt (DIN 933)
27	Spring Washer
28	Jacking Nut (DIN 934)
29	Centering Pin
30	Bolt (DIN 912)
31	Extension Plug
32	Plug Washer
33	Vent Plug
34	Oil Plug

P6

01	P6 Case A
02	P6 Case B
03	Output Shaft
04	Case Cover
05	Z1 Pinion
06	Z2 Pinion
07	Z3 Pinion
08	Z4 Pinion
09	Socket Head Screw
10	Washer
11	Washer
12	Bearing
13	Bearing
14	Bearing
15	Lubricating Seal
16	Lubricating Seal
17	Locking Cap
18	Circlip (DIN 472)
20	Circlip (DIN 471)
22	Shim
23	Key B
24	Key A
25	Key AB
26	Bolt (DIN 933)
27	Spring Washer
28	Jacking Nut (DIN 934)
29	Centering Pin
30	Bolt (DIN 912)
31	Extension Plug
32	Plug Washer
33	Vent Plug
34	Oil Plug


P Series
P DOUBLE STAGE

P7		P8	
01	P7 Case A	01	P8 Case A
02	P7Case B	02	P8 Case B
03	Output Shaft	03	Output Shaft
04	Case Cover	04	Case Cover
05	Z1 Pinion	05	Z1 Pinion
06	Z2 Pinion	06	Z2 Pinion
07	Z3 Pinion	07	Z3 Pinion
08	Z4 Pinion	08	Z4 Pinion
09	Socket Head Screw	09	Socket Head Screw
10	Washer	10	Washer
11	Washer	11	Washer
12	Bearing	12	Bearing
13	Bearing	13	Bearing
14	Bearing	14	Bearing
15	Lubricating Seal	15	Lubricating Seal
16	Lubricating Seal	16	Lubricating Seal
17	Locking Cap	17	Locking Cap
18	Circlip (DIN 472)	18	Circlip (DIN 472)
20	Circlip (DIN 471)	20	Circlip (DIN 471)
21	Shim	22	Shim
22	Shim	23	Key B
23	Key B	24	Key A
24	Key A	25	Key AB
25	Key AB	26	Bolt (DIN 912)
26	Bolt (DIN 912)	27	Spring Washer
27	Spring Washer	28	Jacking Nut (DIN 934)
28	Jacking Nut (DIN 934)	29	Centering Pin
29	Centering Pin	30	Bolt (DIN 912)
30	Bolt (DIN 912)	31	Extension Plug
31	Extension Plug	32	Plug Washer
32	Plug Washer	33	Vent Plug
33	Vent Plug	34	Oil Plug
34	Oil Plug		

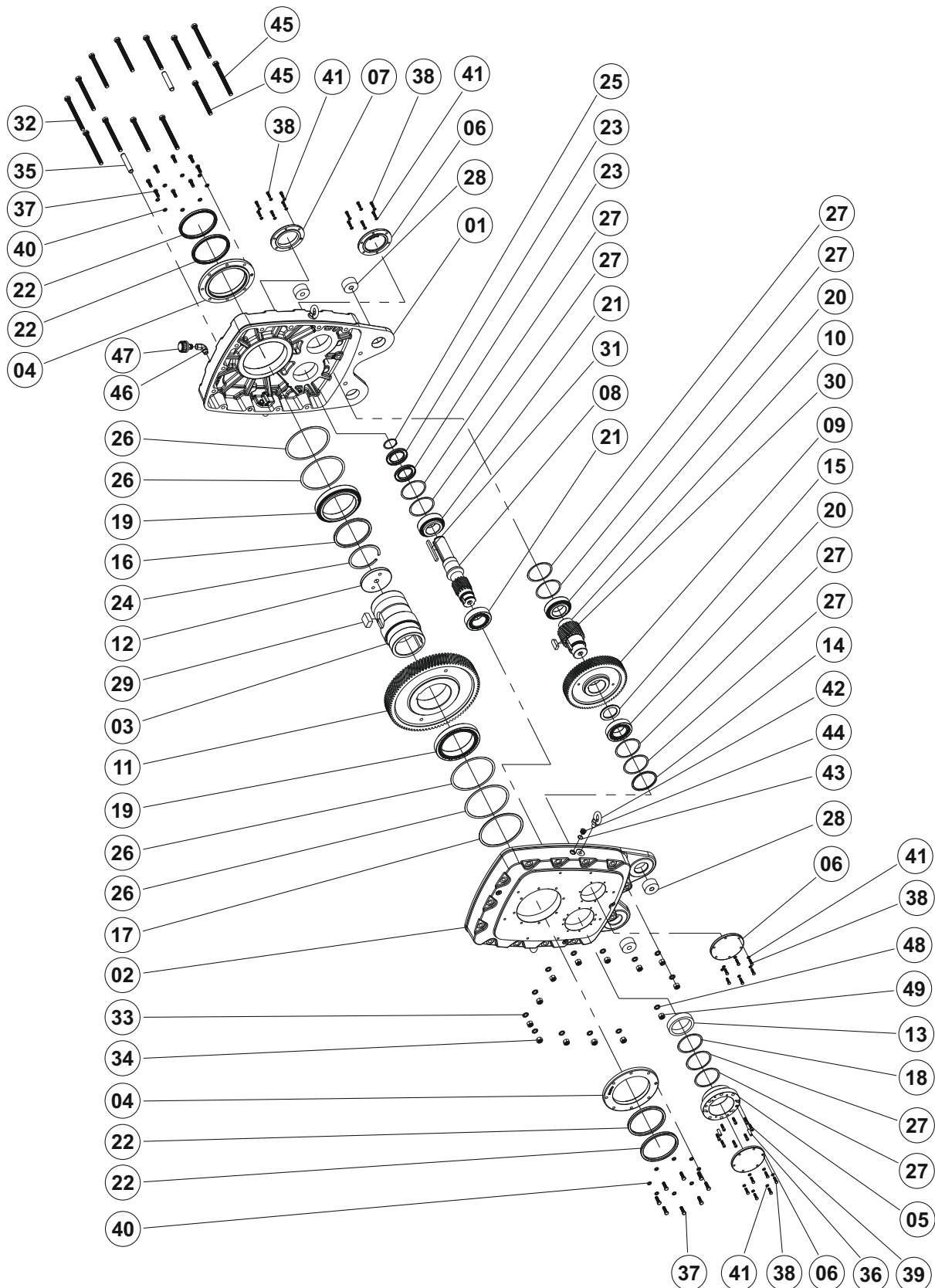
P9	
01	P9 Case A
02	P9 Case B
03	Output Shaft
04	Case Cover
05	Z1 Pinion
06	Z2 Pinion
07	Z3 Pinion
08	Z4 Pinion
09	Socket Head Screw
12	Bearing
13	Bearing
15	Lubricating Seal
16	Lubricating Seal
17	Locking Cap
18	Circlip (DIN 472)
20	Circlip (DIN 471)
22	Shim
23	Key B
24	Key A
25	Key AB
26	Bolt (DIN 933)
27	Spring Washer
28	Jacking Nut (DIN 934)
29	Centering Pin
30	Bolt (DIN 912)
31	Extension Plug
32	Plug Washer
33	Vent Plug
34	Oil Plug



7. ACCESSORIES

P Series

P DOUBLE STAGE



P10 ... P12


P Series
P DOUBLE STAGE

	P10
01	P10 Case A
02	P10 Case B
03	Output Shaft
04	Shaft Seal Cover
05	Lock External Cage
06	Case Cover
07	Z1 Side Body Cover
08	Z1 Pinion
09	Z2 Pinion
10	Z3 Pinion
11	Z4 Pinion
12	Socket Head Screw
13	Z1 Spacer
14	Z3 Spacer
16	Z4 Spacer
19	Bearing
20	Bearing
21	Bearing
22	Lubricating Seal
23	Lubricating Seal
24	Circlip (DIN 472)
25	Circlip (DIN 471)
29	Key B
30	Key AB
31	Key B
32	Bolt (DIN 933)
33	Spring Washer
34	Jacking Nut (DIN 934)
35	Centering Pin
36	Dowel Pin
37	Bolt (DIN 933)
38	Bolt (DIN 933)
39	Bolt (DIN 912)
40	Spring Washer
41	Spring Washer
43	Plug Washer
44	Oil Plug
45	Bolt (DIN 933)
46	L Extension Plug
47	Vent Plug
48	Spring Washer
49	Jacking Nut (DIN 934)

	P11
01	P11 Case A
02	P11 Case B
03	Output Shaft
04	Shaft Seal Cover
05	Lock External Cage
06	Case Cover
07	Z1 Side Body Cover
08	Z1 Pinion
09	Z2 Pinion
10	Z3 Pinion
11	Z4 Pinion
12	Socket Head Screw
13	Z1 Spacer
15	Z3 Washer
16	Z4 Spacer
19	Bearing
20	Bearing
21	Bearing
22	Lubricating Seal
23	Lubricating Seal
24	Circlip (DIN 472)
27	Shim
28	Rubber Buffer
29	Key B
30	Key B
31	Key AB
32	Bolt (DIN 933)
33	Spring Washer
34	Jacking Nut (DIN 934)
35	Centering Pin
36	Dowel Pin
38	Bolt (DIN 912)
37-38	Bolt (DIN 933)
40-41	Spring Washer
42	Plug
43	Plug Washer
44	Oil Plug
46	L Extension Plug
47	Vent Plug



P Series

P DOUBLE STAGE

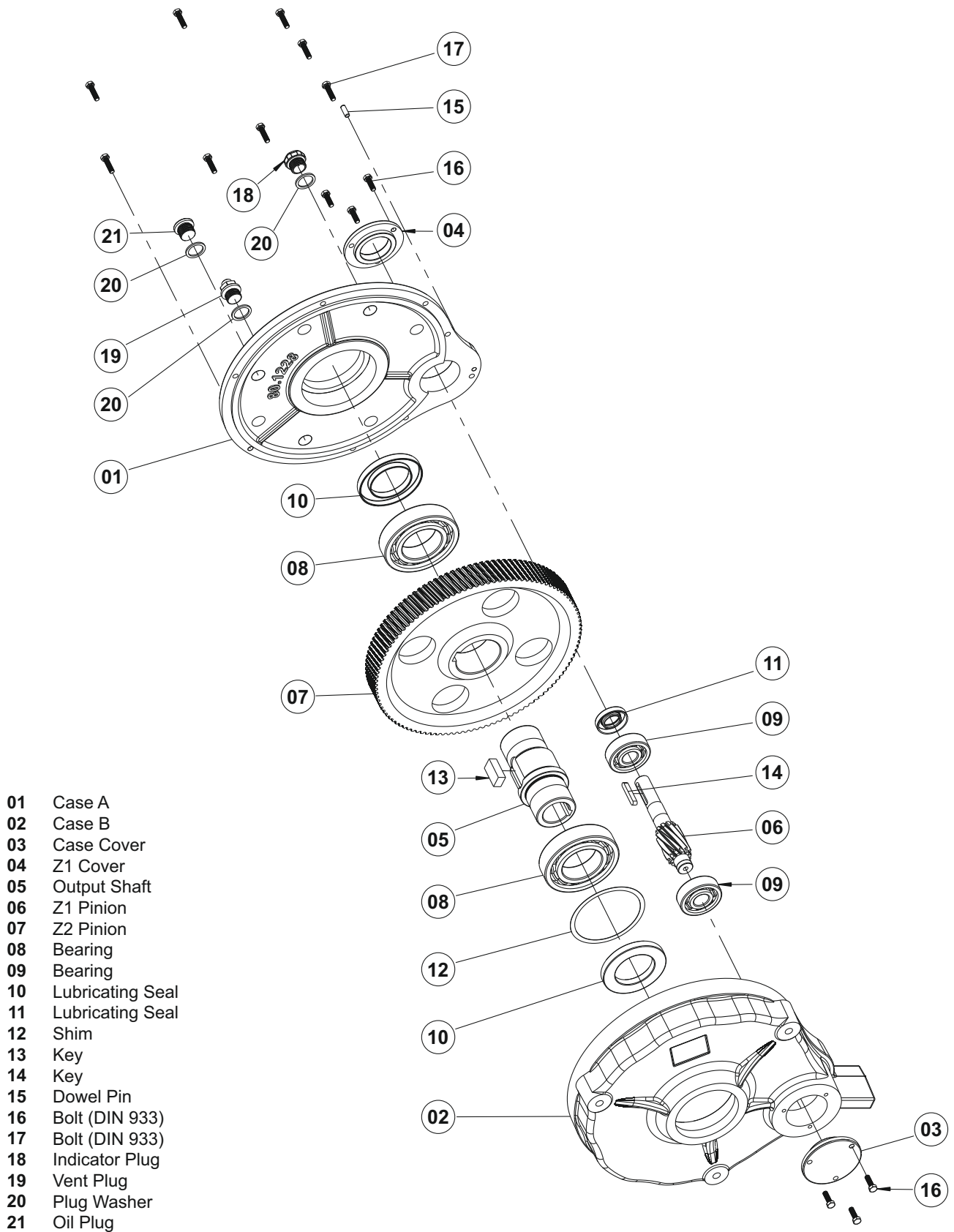
P12

- 01 P12 Case A
- 02 P12 Case B
- 03 Output Shaft
- 04 Shaft Seal Cover
- 05 Lock External Cage
- 06 Case Cover
- 07 Z1 Side Body Cover
- 08 Z1 Pinion
- 09 Z2 Pinion
- 10 Z3 Pinion
- 11 Z4 Pinion
- 12 Socket Head Screw
- 13 Z1 Spacer
- 14 Z3 Spacer
- 15 Z3 Spacer
- 16 Z4 Spacer
- 17 Z4 Washer
- 18 Washer
- 19 Bearing
- 20 Bearing
- 21 Bearing
- 22 Lubricating Seal
- 23 Lubricating Seal
- 24 Circlip (DIN 472)
- 25 Circlip (DIN 471)
- 26 Shim
- 27 Shim
- 28 Rubber Buffer
- 29 Key
- 30 Key
- 31 Key
- 32 Bolt (DIN 933)
- 33 Spring Washer
- 34 Jacking Nut (DIN 934)
- 35 Centering Pin
- 36 Dowel Pin
- 37 Bolt (DIN 933)
- 38 Bolt (DIN 933)
- 39 Bolt (DIN 912)
- 40 Spring Washer
- 41 Spring Washer
- 42 Mapa
- 43 Plug Washer
- 44 Oil Plug
- 46 Extension Plug
- 47 Vent Plug



Pt/A Series

Pt/A 30 SINGLE STAGE



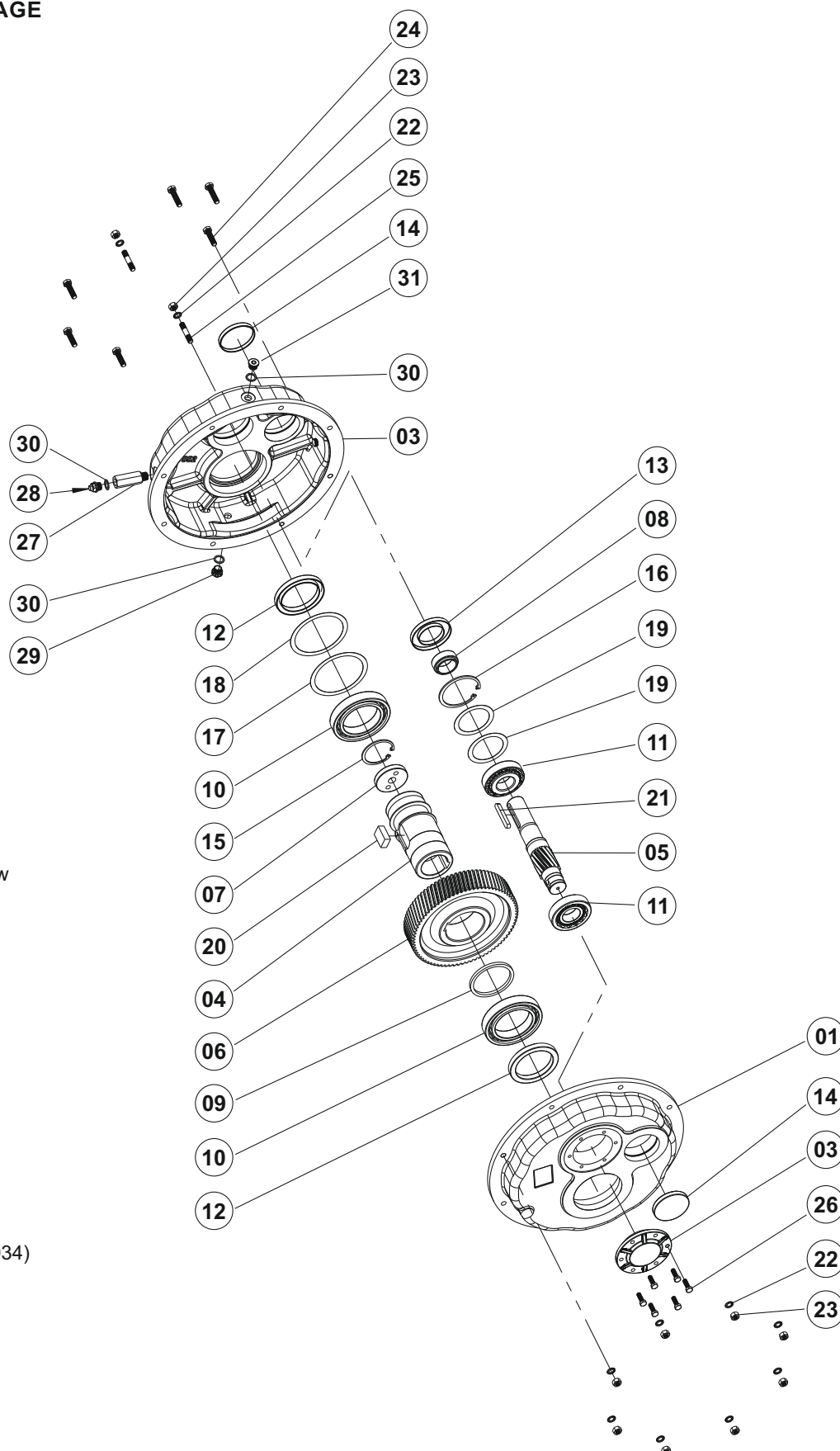


7. ACCESSORIES

Pt/A Series

Pt/A 30 SINGLE STAGE

- 01 PTA 50 Case A
- 02 PTA 50 Case B
- 03 Case Cover
- 04 Output Shaft
- 05 Z1 Pinion
- 06 Z2 Pinion
- 07 Socket Head Screw
- 08 Bush
- 09 Washer
- 10 Bearing
- 11 Bearing
- 12 Lubricating Seal
- 13 Lubricating Seal
- 14 Locking Cap
- 15 Circlip (DIN 472)
- 16 Circlip (DIN 472)
- 17 Shim
- 18 Shim
- 19 Shim
- 20 Key
- 21 Key
- 22 Spring Washer
- 23 Jacking Nut (DIN 934)
- 24 Bolt (DIN 933)
- 25 Stud Bolt
- 26 Bolt (DIN 933)
- 27 Extension
- 28 Vent Plug
- 29 Indicator Plug
- 30 Plug Washer
- 31 Oil Plug



Pt/A 35.....125


Pt/A Series
Pt/A 30 SINGLE STAGE

Pt/A SINGLE STAGE									
Material No	Pt/A 35.35	Pt/A 40.40 Pt/A 40.45	Pt/A 45.45 Pt/A 45.50 Pt/A 45.55	Pt/A 50.50 Pt/A 50.55 Pt/A 50.60	Pt/A 60.60 Pt/A 60.70	Pt/A 70.70 Pt/A 70.85	Pt/A 80.80 Pt/A 80.100	Pt/A 100.100 Pt/A 100.125	Pt/A 125.125 Pt/A 125.135
5	30/52/7	35/62/7	40/72/7	55/90/10	52/72/8	60/80/8	55/90/10	65/90/10	70/110/12
6	50/72/8	60/85/8	75/100/10	85/110/12	100/130/12	120/150/12	140/180/12	160/190/15	170/200/15
7	6010	6012	6015	6017	6020	6024	6028	6032	6034
8	6304	30305	30306	30308	NJ 2209 E	NJ 2210 E	NJ 2211 E	NJ 313 E	NJ 314 E
9	6205	30305	30306	30308	NJ 2209 E	NJ 2211 E	NJ 2211 E	NJ 314 E	NJ 314 E

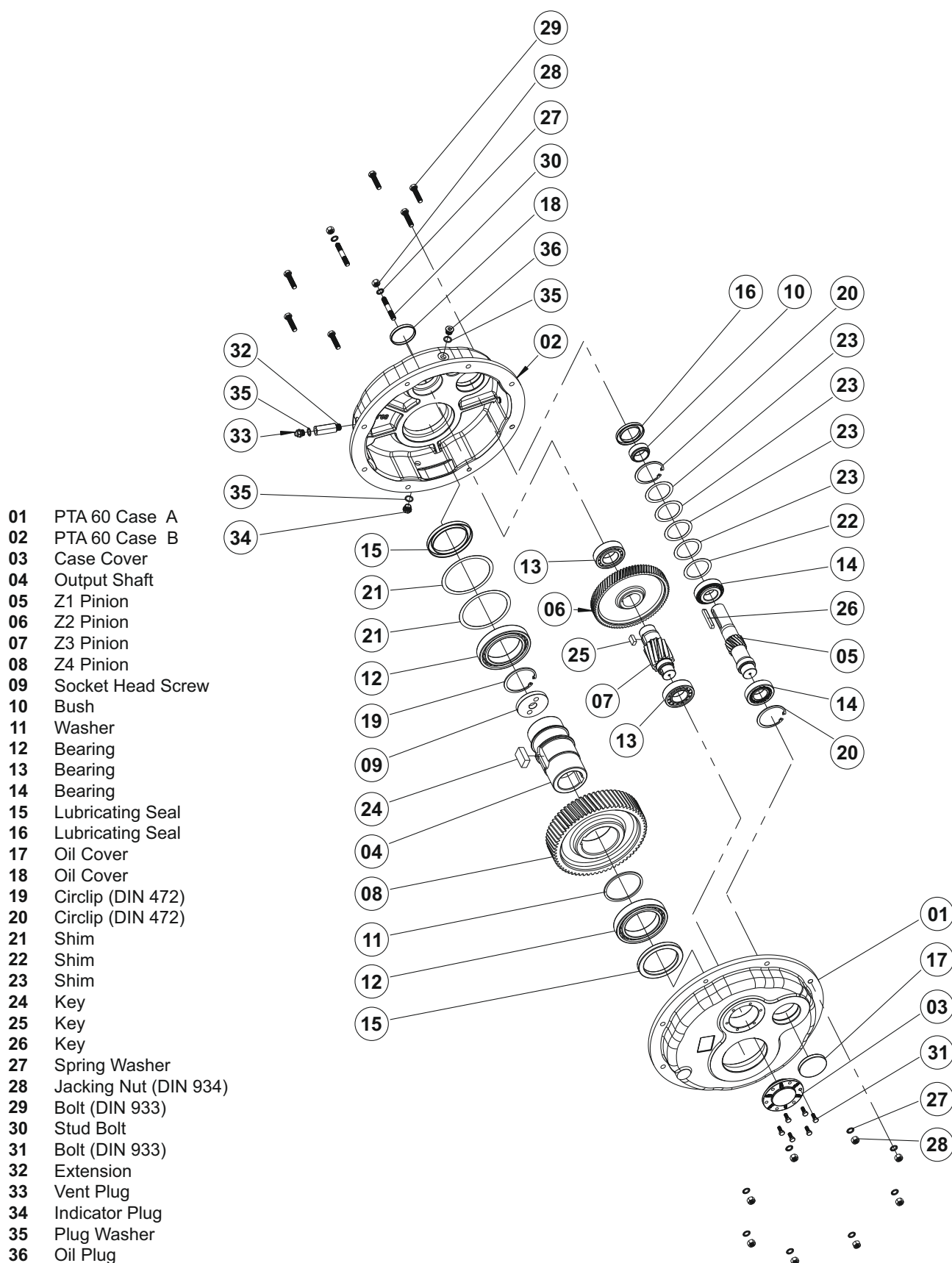
- 01** Case A
- 02** Case B
- 03** Case Cover
- 04** Oil Cover
- 05** Oil Seal
- 06** Oil Seal
- 07** Bearing
- 08** Bearing
- 09** Bearing
- 10** Output Shaft
- 11** Z1 Pinion
- 12** Z2 Pinion
- 13** Key
- 14** Key
- 15** Circlip
- 16** Circlip
- 17** Washer
- 18** Fixing Element
- 19** Bush
- 20** Apparatus for Extension
- 21** Vent Plug
- 22** Oil Level Plug
- 23** Oil Plug
- 24** Hexagonal Head Screw
- 25** Tab Washer
- 26** Jacking Nut (DIN 934)
- 27** Stud Bolt
- 28** Bolt
- 29** Bracket



7. ACCESSORIES

Pt/A Series

Pt/A DOUBLE STAGE



Pt/A 35.....125


Pt/A Series
Pt/A DOUBLE STAGE

Pt/A DOUBLE STAGE									
Material No	Pt/A 35.35_D	Pt/A 40.40_D Pt/A 40.45_D	Pt/A 45.45_D Pt/A 45.50_D Pt/A 45.55_D	Pt/A 50.50_D Pt/A 50.55_D Pt/A 50.60_D	Pt/A 60.60_D Pt/A 60.70_D	Pt/A 70.70_D Pt/A 70.85_D	Pt/A 80.80_D Pt/A 80.100_D	Pt/A 100.100_D Pt/A 100.125_D	Pt/A 125.125_D Pt/A 125.135_D
6	30/52/7	35/52/7	40/62/7	55/80/10	55/80/8	55/85/10	60/90/8	70/120/10	75/110/12
7	50/72/8	60/85/8	75/100/10	85/110/12	100/130/12	120/150/12	140/180/12	160/190/15	170/200/15
8	6010	6012	6015	6017	6020	6024	6028	6032	6034
9	6304	6305	6306	NJ 308 E	NJ 2209 E	NJ 2210 E	NJ 2211 E	NJ 313 E	NJ 314 E
10	6304	30205	30206	32208	32208	32209	32210	30311 - 32213	32212
11	6205	NJ 305 E	NJ 306 E	NJ 308 E	NJ 2209 E	NJ 211 E	NJ 2211 E	NJ 314 E	NJ 314 E

- 01 Case A
- 02 Case B
- 03 Case Cover
- 04 Oil Cover
- 05 Oil Cover
- 06 Seal
- 07 Seal
- 08 Bearing
- 09 Bearing
- 10 Bearing
- 11 Bearing
- 12 Output Shaft
- 13 Z2 Pinion
- 14 Z3 Pinion
- 15 Z1 Pinion
- 16 Z4 Pinion
- 17 Key
- 18 Key
- 19 Key
- 20 Circlip
- 21 Circlip
- 22 Circlip
- 23 Circlip
- 24 Washer
- 25 Washer
- 26 Fixing Element
- 27 Bush
- 28 Apparatus for Extension
- 29 Vent Plug
- 30 Oil Level Plug
- 31 Oil Plug
- 32 Hexagonal Head Screw
- 33 Spring Washer
- 34 Jacking Nut (DIN 934)
- 35 Stud Bolt
- 36 Bolt
- 37 Bracket



8.1 Product Disposal

Dismantle the machine, separating the parts following the instructions given in this manual.

You must group the parts according to the materials they are made of: iron, aluminium, copper, plastic and rubber.

The parts must be disposed of by the relative centres in full compliance with the laws and force on the matter of dismantling and demolishing industrial waste.

Waste Oil: At the disposal of waste oil, please obey both to the environmental protection laws as well as rules and regulations those are in force into countries which the machine has been using of.

8.1.1 Disposal

The valid regulations must be taken into the consideration for the waste materials.

Gear unit components:	Material
Toothed wheels, shafts, rolling bearings, parallel keys, locking rings, ...	Steel
Gear unit housing, housing components, ...	Grey cast iron
Light alloy gear unit housing, light alloy gear unit housing components, ...	Aluminium
Worm gears, bushes, ...	Bronze
Radial seals, sealing caps, rubber components,...	Elastomers with steel
Coupling components	Plastic with steel
Flat seals	Asbestos-free sealing material
Gear oil	Additive mineral oil
Synthetic gear oil (rating plate code: CLP PG)	Polyglycol-based lubricants
Cooling spiral, embedding material of the cooling spiral, screw fittings	Copper, epoxy, yellow brass



NOTE !

Please do not diffuse any biologically indivisible materials, oil and noninclusive components (PVC, rubber, resins and etc.) to the environment.



ATTENTION !

Do not reuse damaged parts during inspection, only should be changed by expert personnels.


8.2 Troubleshooting

NO	PROBLEM	OBSERVED	SOLUTION
①	Gearbox does not work.	The noise is not coming from gearbox. Output shaft of the gearbox is not rotating. Driver / frequency inverter is not be used.	Check the connection of electric motor, voltage and frequency. The values could be same with the values which are on the motor label. Look at to the motor usage guide. If the solution is not found look to the article 50.
②	Gearbox does not work.	The noise is not coming from gearbox. Output shaft of the gearbox is not rotating. Driver / frequency inverter is used.	Look to the guide of driver / frequency inverter or driver usage guide. Determine that error is not originated from driver / frequency inverter by seperating electric motor either from driver and frequency inverter and making direct connection to the motor.
③	Gearbox does not work.	A different noise is coming out of the gearbox. But gearbox and motor shaft are not rotating. Driver / frequency inverter or magnetic brake are not used.	The first thing that has to be made is to check whether motor connection, voltage and frequency are identical with motor label values. If there is not any problem, to pull out gearbox from the machine and try to operate in neutral. If gearbox works, the power of motor may not be enough to operate system. If the motor which connected to the gearbox is monophase, take off capacitors should be controlled. Even the motor does not work despite all tests and examinations, look at to the article 50.
④	Gearbox does not work.	A different noise is coming out of the gearbox. But gearbox and motor shaft are not rotating. Driver / frequency inverter or magnetic brake are used.	The frequency inverter or driver usage guide should be examined. Determine that error is originated whether from driver / frequency inverter by seperating electric motor either from driver and frequency inverter and making direct connection to the motor. If the gearbox does not work, look at to the article 50.
⑤	Gearbox does not work.	A different noise is coming out of the gearbox. But gearbox and motor shaft are not rotating. Magnetic brake is used.	It is necessary to check whether electric motor connection, voltage and frequency are identical with motor label values. Look at to the motor usage guide. Be sure that brake is working. If the brake is assembled by us to check whether it is made correctly according to the schema at the usage and maintenance instructions. If the error is not found to check whether the brake is operating by making direct connection to the brake appropriate to the brake voltage. When the electric is given, the noise of the opening of brake will come. If the brake is not working even by giving electric, the diode of brake could be in failure. To feed the motor directly according to the informations on the label when the brake is seperated from disc. If the problem is continuing, the power of the motor may not be enough. Look to the article 50.
⑥	Gearbox does not work at low speeds / frequencies.	Use driver / frequency inverter.	The motor feeding frequency is declining at low speeds. For the operating of motor at very low frequencies, it is essential to adjust motor parameters and frequency inverter parameters very well. Besides for the low speeds, there could be big changes even at the gearbox efficiency. To enlarge motor power and inverter or for to reach your requested cycle range, change the gearbox ratio.



8. TROUBLESHOOTING

NO	PROBLEM	OBSERVED	SOLUTION
7	Gearbox does not work after long awaitings or at mornings.	Environmental temperatures are dropping below -5°C.	The gearbox oil is not suitable to the environmental temperatures where it works. It is necessary to use low viscosity oils or to protect gearbox group from cold. To find proper oil look to usage guide or examine lubricating pages from the product catalogs. To work at higher environmental temperatures could be a solution. If the problem is continuing, the motor power should be increased.
8	Gearbox is very heating up.	You use worm screw type gearbox and environmental temperature is under +40°C.	When the gearbox is working under the full load, gauge gearbox surface temperature with heat meter. If it is under +90°C it is normal and no harm to gearbox. All worm screw and ATEX compatible helical gearboxes could be used up to the +120°C surface temperatures. If the temperature is above the +120°C and gearbox is ATEX compatible immediately stop gearbox and inform to NRW. Look to the article 50. If it is the product without ATEX, to check the oil amount according to the mountage position. Be sure that the mounting position written on the label and mounting position which gearbox is working should be identical. If not look to the article 50. To the gearboxes without worm screw types at heatings above +80°C, look to the articles 9 and 50.
9	Gearbox is very heating up.	You use helical gearboxes and environmental temperature is under +40°C.	When the gearbox is working under the full load, gauge gearbox surface temperature with heat meter. If it is under +90°C it is normal and no harm to the gearbox. All gearboxes with ATEX are designed to work at maximum +120°C. If the temperature is above +120°C and gearbox is ATEX compatible immediately stop gearbox and inform to NRW. The gearboxes without ATEX are designed to work at maximum +90°C temperature values. If the gearbox temperature is above the +90°C, control the oil amount according to mounting position. Be sure that the mounting position written on the label and mounting position which gearbox is working should be identical. If there is inconsistency look to the article 50.
10	Gearbox is very heating up.	Environmental temperature is above +40°C.	The standard gearboxes are designed to work at maximum +40°C. Temperatures above +40°C, special applications and additions should be done. In these situations please consult to NRW.
11	Gearbox is working noisy.	Noise is regular and perpetual.	Control the mobile machine elements. Operate gearbox without load by separating from the system. If you hear the same noise, bearings which belong to gearbox or motor could be in failure. Look to the article 50.
12	Gearbox is working noisy.	Noise is irregular.	Control the mobile machine elements. Operate gearbox without load by separating from the system. If the same noise is continuing, foreign objects could be in the oil. Change the oil and control the foreign objects in the oil. If the metal piece is found into the controlled oil, the gearbox could be damaged. Look to the article 50.



NO	PROBLEM	OBSERVED	SOLUTION
13	Gearbox is working noisy.	Noise is regular with clicking.	Control the mobile machine elements. Operate gearbox without load by separating from the system. If the same noise is continuing, gearbox parts could be damaged. Look to the article 50.
14	Gearbox is working noisy.	Noise is regular and fluctuating.	Control the flexure of connection elements which connect to output shaft. Separate element which is connected to output shaft and operate gearbox without load. If the same noise is continuing, look to the article 50.
15	Gearbox is working noisy.	Gearbox has motor with brake and noise is coming from the brake side.	The noises could be coming from the brake like in the shape of low level randomly tickings and it is normal. If the noise level is disturbing, brake could be damaged or there may be a problem at the gap adjustment between lining and disc. Look to the article 50.
16	Gearbox is working noisy.	You use frequency inverter and the noise is changing every time by the change of cycle.	Frequency inverter parameters may not be compatible with your used motor. Examine frequency inverter usage guide and if the same problem is continuing look to the article 50.
17	Oil leakage is existing.	Oil leakage from the seal.	If the environmental temperature is above +40°C and there is continuous working over 16 hours, according to the mounting position pull out a plug which is on the top and use ventilation plug instead of it. If your situation is not suited to this, seal could be damaged. Look to the article 50.
18	Oil leakage is existing.	Oil is leaking from the plug.	If you use the ventilation plug, be sure that the plug is at the right position. According to the mounting position of the gearbox, plug which is on the top could be ventilation plug. The plug may loosen, clean the surface and plug itself and squeeze it again. If the same problem is continuing, look to the article 50.
19	Oil leakage is existing.	Oil is coming out of the the housing.	To observe where the oil is exactly coming from. It is leaking from the oil plug, oil cover or seal and could flow onto the housing. If the situation is like this, look to the article 18 and 19. If you sure that oil is coming out of the housing there could be cracks and fractures at the housing. Look to the article 50.
20	Oil leakage is existing.	Oil is coming out of the the cover.	A gasket that is used between cover and housing is not performing its leaktightness duty. Dismantle the cover clean the bottom side and assemble cover to its place by smearing liquid gasket. If the problem continues look to the article 50.
21	Gearbox is making regular vibrations when it is worked at the assemble point.	You use torc arm.	The reason of the vibration of gearbox is originated from the shaft flexure which gearbox is connected. When the torc arm is used, it has no harm to gearbox and it is usual situation.



8. TROUBLESHOOTING

NO	PROBLEM	OBSERVED	SOLUTION
(22)	Gearbox is making random vibrations when it is worked at the assemble point.	You use torc arm.	The reason of the vibration of gearbox is because of shaft flexure which the gearbox is connected and passing gap between shaft and bushing. Control your shaft hole passing tolerance. When the torc arm is used, it has no harm to gearbox and it is usual situation.
(23)	Motor is warming a lot.	Motor is working above its normal ampere. Environment is clear.	There could be overloading or motor power is insufficient. Motor could be in failure. Look to the article 50.
(24)	Motor is warming a lot.	Environment is dusty.	Be sure of whether motor fan bowl and motor cooler cores are clean for the air passing. If you use extra fan be sure that it is working. If there is invertor usage at the motor and works at low frequencies, the motor fan may not be sufficient. Use extra fan in these situations. If the problem continues look to the article 50.
(25)	Motor shaft is rotating but gearbox shaft is not.	Friction noise is coming from inside of gearbox or only there is motor noise.	There could be a damage at the gearbox parts. Look to the article 50.
(26)	Motor shaft is rotating but gearbox shaft is not.	You use chain geared or pinion geared at the output shaft of gearbox.	The damage could be originated of polygon impact formed by chain geared or from the radial load. Gearbox connection points may not be rigid enough. Be sure that you are able to use proper chain geared and pinion geared for used gearbox. Recalculate maximum allowable radial load according to this position. Look to the article 50.
(27)	Output shaft is cut.	You use either chain geared or pinion geared.	The damage could be originated of polygon impact formed by chain geared or from the radial load. Gearbox connection points may not be rigid enough. Be sure that you are able to use proper chain geared and pinion geared for used gearbox. Recalculate maximum allowable radial load according to this position. Look to the article 50.
(28)	Gearbox is stopping too late.	You use motor with brake	Control the electric connection schema of brake. Be sure that there is not assembled delayed diode onto the brake. If there is delayed diode, it could be changed. (Hoisting gearboxes are excluded PCS)
(50)	Service is required.	Informing of NRW Company.	Please contact with NRW company. Communication informations are given at the usage guides,catalogs. Mechanical parts can only be changed either by NRW or within the knowledge. Any change that is to be made without the knowledge of NRW would cancel both guarantee of product and all certificate decelerations and remove the responsibilities of NRW over the product.

If there are problems or malfunctions different to the onesdescribed here contact a NRW Industries Assistance Centre.



9.1 Authorized Service

They are skill and qualified people, which are determined by company. They have education about electrical and mechanical subject.

	NOTE ! At below; the list took in place decided by our firm, authorized service and customer (user) which is about control and maintenance criterias/applications. Must be obliged to the informations which were given in the list. To the contrary that Usage and Maintenance directions become invalid.
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No	CRITERIA	MANUFACTURER (NRW)	AUTHORIZED SERVICE	CUSTOMER (USER)
1	Disassembly of geared unit	✓	✓	X
1.1	Case changing	✓	✓	X
1.2	Gear changing	✓	✓	X
1.3	Solid/shaft changing	✓	✓	X
1.4	Changing of all consumable material except sealing materials.	✓	✓	X
2	Oil cup changing	✓	✓	✓
3	Seal changing	✓	✓	✓
4	Oil changing	✓	✓	✓
5	Assembly of geared unit with W cylinder type	✓	✓	✓

✓ : **SUITABLE**

X : **NOT SUITABLE**

2-3 : Send to the contaminated waste disposal (licensed firm).

4 : Send to the licensed firm for the purpose of disposal.



10. CONTACT INFORMATION

MANUFACTURER AND SERVICE STATION ADDRESS: (Factory)

ATA MAH. ASTİM ORGANİZE SAN. BÖL. 1.CAD. NO: 4 Efeler / AYDIN / TURKEY

Tel : +90 256 231 19 12 - 16 Pbx
Fax : +90 256 231 19 17
Web : www.pgr.com.tr
e-mail : info@pgr.com.tr - satissonrasi@pgr.com.tr

AREAS

ANKARA AREA

AHI EVRAN CAD. 1203.SK NO:18 D:58-60 İSGEM
Ostim / ANKARA

Tel : +90 312 354 44 08 - +90 312 385 86 68
Fax : +90 312 385 79 27
e-mail : ankara@pgr.com.tr

İSTANBUL AREA

İKİTELLİ O.S.B. METAL-İŞ SANAYİ SİT. 9.BLOK NO: 23
Başakşehir / İSTANBUL

Tel : +90 212 549 80 55
e-mail : istanbul@pgr.com.tr

ALMANYA AREA

IN DER SCHLINGE 6, D-59227
Ahlen / GERMANY

Tel : 0049 / 23828557010-7011-7012-7016
Web : www.nrwdrivetechnologies.com
e-mail : info@nrwdrivetechnologies.com



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