

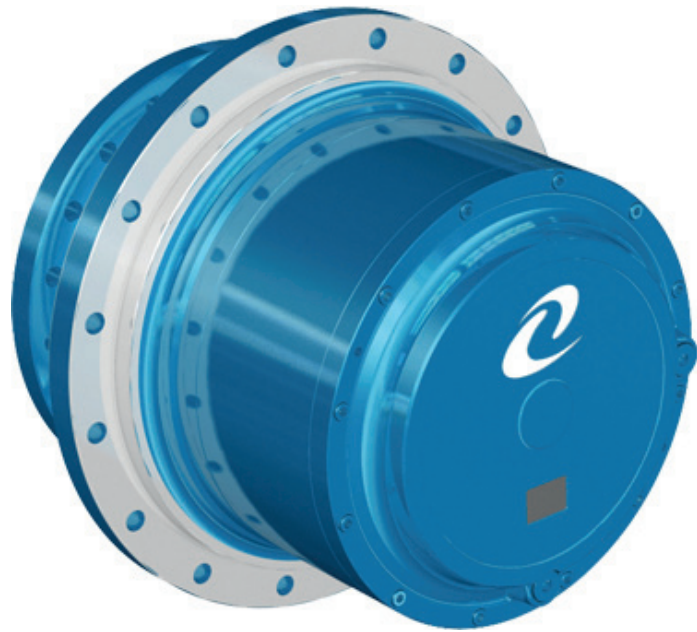


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SERVICE MANUAL



PGRF
series



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This manual :

- **provides** all information about ordinary maintenance, installation and use for this unit,
- **must** be read and understood by the authorized people/operators before any kind of intervention,
- **must** be kept handy, in a safe place and must always be clear and legible for future reference whenever needed.

SYMBOLS USED



OBLIGATION
Operation to be observed



PROHIBITION
Do not work with machines in movement



WARNING
Operation must be carried out with extreme care with personal injury if proper procedures are not followed



DANGER
Be careful of hanging loads



PROTECTIVE CLOTHING
Protective clothing must always be worn by personnel authorized to work with reduction gears.



SAFETY GLASSES
Safety glasses must be worn by all authorized people to work on the reduction gear



SAFETY GLOVE
Safety glove must be worn by all authorized people to work on the reduction gear



SAFETY SHOES
Safety shoes must be worn by all authorized people to work on the reduction gear



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GENERAL INFORMATION

GEARBOX UNIT IDENTIFICATION

All the data which characterize the gear unit are reported on the name plate attached on the unit.

RISKS AND PRECAUTIONS

Safety of authorized **workers** must be guarantee.

Provide all authorized worker with all necessary and specific **IPG**.

Example: Slip-proof shoes should be worn, because there is oil in the reduction gear and during maintenance some of it may leak in the working area.

Always handle the units with adequate lifting means.



ADDITIONAL PRECAUTIONS

- Guarantee an effective **prevention** system by constantly monitoring cleaning and integrity of the structures.
- Actuate a specific **periodical cleaning** and maintenance plan of the unit.
- In case of accidental overloads or damage to the unit, **stop functioning unit** and carry out a **repairing procedure**.



Do not work with machines in movement.

TRANSFER AND STORAGE

The unit is best stored in closed and covered environments.

Do not store the unit outside or directly onto the ground.

If the unit is stored for long periods (over 3 month), these must be externally protected with anti-oxidizing products and filled with oil to protect the internal components.

Care should also be used to avoid violent impact.

HANDLING



Handling, lifting and transportation must be carried out by qualified, authorized and appropriately trained personnel.



Before and during unit handling:

- check the stability of the unit;
- verify that the lifting means and its accessories (ropes, hooks, etc.) are suitable to lift and handle the unit;
- follow strictly the regulations in force for security and prevention of industrial injuries.

Manual loads:

If the unit or its parts must be handled manually, limit the load to 10Kg.

We recommend lifting the load by keeping it as close as possible to the body and bending the knees and not the back.

PRODUCT DISPOSAL

The disposal of waste material deriving from machine/components demolition must be done with respect for the environment, without polluting land, air or water.

Dismantling: parts and components must be disassembled and separated in according to the materials they are made of: iron, aluminium, copper, plastic, rubber, etc.

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

Packages (pallets, carton boxes, paper, plastic, etc.) to lead into regeneration/recycling circuits as far as possible, by delivering separate waste classes to authorized compaines.

Waste oil/grease: to dispose of waste oil abide by the laws for protecting the environment and the laws in force in the Country where the machine is used.



Environmental protection:

Local rules must be complied with in regard to the laws existing in the country where the machine is used



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GENERAL INFORMATION

GEARBOX UNIT

Most **materials** of these gearboxes are made of high quality steel and cast iron that have to comply with the increasingly strict requirements on workability, resistance to distortion, to fatigue failures and to wear, safety and durability.
All technical information are described in the documents referred to the specific unit code.

Brake unit:

the unit could be equipped with hydraulics negative brakes with oil-bath disks, expressly designed for static or parking braking.
Correct braking values are described on the specific external drawing.

WARNING: It is strictly forbidden to use it as a dynamic brake.

Hydraulic motor:

to select the hydraulic motor take into consideration the maximum performance of the reduction gear.

INTENDED USE AND LIMITATIONS

This gearbox unit **must be**:

- used only for industrial application;
- used with correct type and quantities of lubricants;
- handled, assembled, installed, used and maintained in compliance with this manual;
- handled, assembled, installed, used and maintained only by authorized workers/operator.

It is **forbidden**:

- to use the gearbox unit in a way that does not conform to the technical specifications and the intended use described in this manual;
- to install and use this gearbox unit in environments with explosion risks;
- to use the gearbox unit with safety devices removed or disabled.

External drawing and documents annexed to the unit, report:

- technical informations;
- dimensions and characteristics;
- maximum number of input/output speed (rpm);
- maximum functioning values (torque, dimensions, etc...).

LUBRICANT

Gearboxes normally are **supplied without lubricant**.

Type and **quantity** of lubricant are indicated on the specific external drawing.

All fluids used must be compatible with all the components, elastomers and seals.

Oil type Example

	Oil Type	Ambient temperature t°C (min / max)					
		Mineral		Synthetic			
				PAO		PG	
Viscosity	ISO VG 150	- 10°C	+ 30°C				
	ISO VG 220	+ 10°C	+ 45°C	- 20°C	+ 60°C	- 20°C	+ 60°C
	ISO VG 320	+ 30°C	+ 60°C				

Oil name Example

Producer	Lubricants		
	Mineral	Synthetic	
		PAO	PG
SHELL	Omala S2G	Omala S4GX	Omala S4 WE
EXXON MOBIL	Mobilgear XMP	Mobil SHC Gear	Glygoyle
KLÜBER	Kluberoil GEM1	Klubersynth EG4	Klubersynth GH6
AGIP	Blasia	Blasia SX	Blasia S
BP	Energol GR-XP	Enersyn EPX	Enersyn SG XP
CASTROL	Alpha SP	Aphasyn EP	Alphasyn PG
CHEVRON	Ultra Gear	Tegra Synthetic Gear	HiPerSYN
TOTAL	Carter EP	Carter SH	Carter SY



ORDINARY MAINTENANCE

Maintenance operations must be carried out by qualified, trained and authorised personnel



MAINTENANCE

To guarantee long life and excellent performance to the gear unit, maintenance operations must be done on a regular basis.

Before maintenance operations, authorized people must disconnect the unit power supply, putting it “out of order”, taking all the necessary precautions to ensure it cannot be restarted accidentally or any of its moving parts.

During maintenance operations:

- it is forbidden to work with machines in movement,
- wear suitable protection (IPG),
- avoid accidental restart of the unit ,
- oil leaks should not be a source of danger,
- do not handle units that are still very hot.

ORDINARY MAINTENANCE includes:

- check of oil level and oil leaks,
- oil topping off,
- oil replacement,
- grease topping off,
- periodical inspection.

EXTRAORDINARY MAINTENANCE include:

- disassembly and reassembly;
- replacement of wearing or damaged parts;
- bearing replacement;
- oil seals replacement.

MALFUNCTION AND ANOMALIES

When malfunctions/anomalies are found:

- schedule an immediate/anticipated general overhaul;
- replace damaged or faulty components with new components if necessary.



When

maintenance operations are **finished**, restore all safety conditions of functioning

Note: Instruction for extraordinary maintenance are NOT described in this manual

MAINTENANCE INTERVALS

Inspection and Operations	Intervals
Oil leakage	before functioning
Brake functioning	before functioning
Oil and surface temperature	on functioning
Noise and vibrations	on functioning
FIRST OIL CHANGE	only after initial 100 service hours
Oil level check	every 500 service hours or monthly
Unit and plugs cleaning, oxidation, damage	every 500 service hours
ORDINARY MAINTENANCE	every 2000 service hours or at least once a year
Oil replacement	ordinary maintenance
Presence of water in the oil	after oil draining
Brake test	ordinary maintenance
Screws/plugs tightening torque	ordinary maintenance
EXTRAORDINARY MAINTENANCE	every 5000 service hours
Oil seals replacement	extraordinary maintenance
Bearings replacement	extraordinary maintenance
Brake disks and springs replacement	extraordinary maintenance

Note: described maintenance intervals could be different with different machine duty cycle



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OIL REPLACEMENT PROCEDURE

Maintenance operations must be carried out by qualified, trained and authorised personnel!



OIL DRAINING

PROCEDURE:

- Position the unit with drain plug (▼) placed down.
- **Drain the oil:** unscrew the drain plug (▼) and, to ensure that all the oil has been removed, also unscrew the level plugs.

After oil draining:

- replace all plugs and relatives washers or o-ring,
- refit all plugs and relatives washer on place in their seats.

In order to avoid sludge deposits, change the oil while the gear unit is still warm.

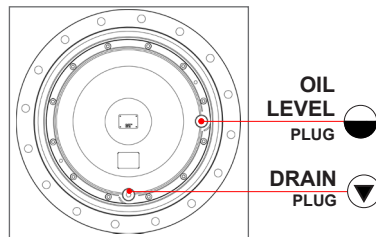


Warning - BURNS

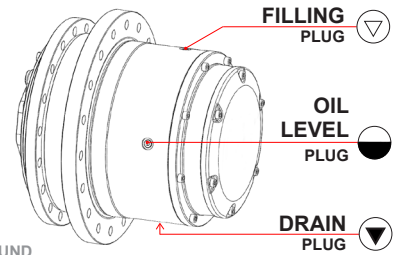
The oil could be very hot and could cause burns

EXAMPLE OF PLUGS LAY OUT

Note:
correct plugs configurations are illustrated on the specific external drawings



GROUND



GROUND

OIL TOPPING OFF

PROCEDURE:

- Remove filling (▽) and level plug (●).
- **Topping up** the unit adding oil lubricant from the upper hole (filling plug hole) until correct **OIL LEVEL** reached: the oil flow out from the OIL LEVEL hole.

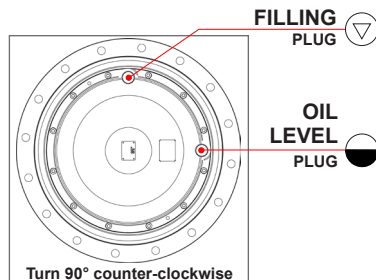
OIL FILLING

PROCEDURE:

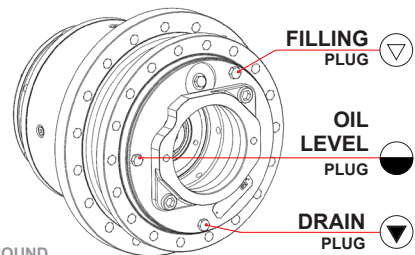
- Remove filling (▽) and level plug (●).
- **Fill** the unit adding oil lubricant from the upper hole (filling plug hole) until correct **OIL LEVEL** reached: the oil flow out from the OIL LEVEL plug hole.
- When the oil filling procedure is finished, replace and tightening all plugs.
- Correct oil quantity is indicated on the specific external drawing.

EXAMPLE OF PLUGS LAY OUT

Note:
correct plugs configurations are illustrated on the specific external drawings



GROUND



GROUND



Note:

for an effective oil change, the unit should be flushed through with a liquid detergent recommended by the lubricant supplier



Warning:

if the quantity of oil used during topping off is greater than 10 % of the oil capacity then check again for leaks



Warning:

Do not mix synthetic lubricants with mineral lubricants



INSTALLATION and START UP

Installation and start-up must be carried out by qualified, trained and authorised personnel



PRELIMINARY CHECKS AND INSTALLATION

Before installation **check** and **verify**:

- motor type and connection;
- that unit components are not damaged and that the centering parts are not rusty;
- unit installation diagram;
- oil level/lubricant and type of lubricant;
- correct plug installation and efficiency;
- that the reduction gear screws and plugs have been tightened with correct values ;
- that there are no hazardous atmosphere in the work area.

To guarantee the correct unit **installation**:

- remove dirt and grease from the unit;
- lubricate spigots and coupling surfaces;
- centering and fixing the unit without forcing;
- dents or sparks must not be created/produced;
- friction between moving parts must be absent;
- install and fix the unit and all components correctly;
- take care not to deform the contact surfaces.

START UP

Before start up:

- remove unnecessary keys and tools;
- restore all unit safety system;
- all preliminary checks have been done;
- verify plugs and screws tightening;
- there are no oil leaks;
- make sure no radial or axial forces are applied;
- verify correct unit alignment with the structure;
- verify motor power connection;
- there are no obstacles that can influence the correct operation of the units;

Start-up and running in:

increase gradually torque and rotation values until max values allowed are achieved.

After starting up :

- friction between moving parts must be absent;
- excessive noise and vibration must be absent;
- **carry out functional tests to verify:**
 - correct functioning of the unit;
 - correct functioning of the safety system of the unit;
 - that values functioning are respected.

Brake test:

carry out engage/disengage test to verify correct unlock pressure value and the brake torque value (correct values are described on the specific external drawings).

In case of malfunctioning:

1. interrupt and disable the functioning of the machine,
2. check and verify correct installation,
3. schedule an immediate/anticipated general overhaul of the gearbox unit.

MALFUNCTIONING AND FAILURE

In case of **malfunctioning** or **failure**:

1. disconnect the unit malfunctioning,
2. carry out a maintenance or repair plan,
3. replace the damaged or faulty components with new components.

FUNCTIONING INTERRUPTION

Disconnect unit malfunctioning and avoid accidental run of the unit.

Interrupt and disable the functioning of the machine/vehicle during maintenance operations, general overhaul or revision procedures (e.g. lifting the wheels off the ground, turning off the work procedure...etc...) **to avoid hurting operators and other people.**



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TROUBLESHOOTING

Problems	Possible cause	Remedies
Oil leaks	1) Damaged or worn seals; 2) Breather plug clogged;	1) Contact Comer Industries; 2) Clean or substitute the plug
Excessive overheating	1) There is no oil in the unit; 2) Incorrect level of lubricant; 3) Brake malfunctioning; 4) Excessive layer of dust; 5) Inadequate ventilation; 6) Internal problem.	1) Filling the unit with oil; 2) Restore correct level of lubricant (oil/grease); 3) Verify brake functioning; 4) Clean the unit; 5-6) Contact Comer Industries;
Excessive noise 1	Internal problem	• Restore correct oil level. • Restore correct grease q.ty. • Contact Comer Industries.
Excessive noise 2	External problem	• Verify screws/connection. • Verify unit installation.
Excessive vibration	1) Incorrect installation; 2) Internal problem;	1) Verify installation and screws tightening; 2) Contact Comer Industries;
The unit fail to run	1) Incorrect motor installation; 2) Internal problem	1) Verify motor installation and connection; 2) Contact Comer Industries;
Wrong rotation unit direction	Uncorrect motor connection	Verify unit installation and connection;
The unit does not rotate	1) Incorrect motor installation; 2) Internal problem	1) Verify motor installation and connection; 2) Contact Comer Industries;
Brake malfunctioning	1) Brake components damaged or worn;	1) Replace brake components;
The unit cannot assembled on the structure machine	1) Incorrect dimensioning	• Verify unit scheme. • Contact Comer Industries.

In case of different problems from this table, contact the Technical-Commercial Service Comer Industries

Maintenance data sheet

Date of maintenance work

Operating hours

Comer Industries code

Serial number

Work carried out:

Maintenance data sheet

Date of maintenance work

Operating hours

Comer Industries code

Serial number

Work carried out:



TORQUE WRENCH SETTING (N x m)

Screw on steel or cast iron

Tab.1) screw torques (Nxm) screwed on cast iron or steel

d xp	4.8		6.8		8.8		10.9		12.9	
	min	max	min	max	min	max	min	max	min	max
4x0,7	1,5	1,9	2,3	2,8	3,1	3,8	4,4	5,3	5,2	6,3
5x0,8	3,0	3,7	4,5	5,5	6,0	7,3	8,5	10,3	10,2	12,4
6x1	5,2	6,3	7,8	9,5	10,4	12,7	14,7	17,8	17,6	21,4
8x1,25	12,5	15,2	18,7	22,7	25,0	30,3	35,1	42,6	42,1	51,1
10x1,5	25,0	30,3	37,4	45,5	49,9	60,6	70,2	85,2	84,2	102,3
12x1,75	42,5	51,6	63,7	77,4	85,0	103,2	119,5	145,1	143,4	174,2
14x2	67,6	82,1	101,5	123,2	135,3	164,3	190,2	231,0	228,3	277,2
16x2	102,4	124,3	153,6	186,5	204,8	248,6	287,9	349,6	345,5	419,6
18x2,5	142,7	173,3	214,1	259,9	285,4	346,6	401,4	487,4	481,7	584,9
20x2,5	200	243	300	364	400	486	562	683	675	819
22x2,5	268	326	402	489	537	652	755	916	906	1.100
24x3	346	420	518	629	691	839	972	1.180	1.166	1.416
27x3	504	612	756	918	1.008	1.224	1.418	1.721	1.701	2.066
30x3,5	688	835	1.032	1.253	1.375	1.670	1.934	2.349	2.321	2.818

Tab. 3) screw torques (Nxm) screwed on alluminum

d xp	4.8		6.8		8.8		10.9		12.9	
	min	max	min	max	min	max	min	max	min	max
4x0,7	1,5	1,9	2,3	2,8	2,7	3,1	2,7	3,1	2,7	3,1
5x0,8	3,0	3,7	4,5	5,5	5,2	6,0	5,2	6,0	5,2	6,0
6x1	5,2	6,3	7,8	9,5	8,9	10,4	8,9	10,4	8,9	10,4
8x1,25	12,5	15,2	18,7	22,7	21,4	25,0	21,4	25,0	21,4	25,0
10x1,5	25,0	30,3	37,4	45,5	42,8	49,9	42,8	49,9	42,8	49,9
12x1,75	42,5	51,6	63,7	77,4	72,8	85,0	72,8	85,0	72,8	85,0
14x2	67,6	82,1	101,5	123,2	116,0	135,3	116,0	135,3	116,0	135,3
16x2	102,4	124,3	153,6	186,5	175,5	204,8	175,5	204,8	175,5	204,8
18x2,5	142,7	173,3	214,1	259,9	244,7	285,4	244,7	285,4	244,7	285,4
20x2,5	200	243	300	364	343	400	343	400	343	400
22x2,5	268	326	402	489	460	537	460	537	460	537
24x3	346	420	518	629	592	691	592	691	592	691
27x3	504	612	756	918	864	1.008	864	1.008	864	1.008
30x3,5	688	835	1.032	1.253	1.179	1.375	1.179	1.375	1.179	1.375

d xp	4.8		6.8		8.8		10.9		12.9	
	min	max	min	max	min	max	min	max	min	max
8x1	13,1	15,9	19,7	23,9	26,2	31,8	36,9	44,8	44,2	53,7
10x1,25	26,0	31,5	38,9	47,3	51,9	63,0	73,0	88,6	87,6	106,4
12x1,25	45,3	55,0	67,9	82,4	90,5	109,9	127,3	154,6	152,8	185,5
12x1,5	43,9	53,3	65,8	79,9	87,8	106,6	123,4	149,9	148,1	179,8
14x1,5	71,4	86,7	107,1	130,0	142,8	173,4	200,8	243,8	241,0	292,6
16x1,5	107,2	130,1	160,8	195,2	214,3	260,3	301,4	366,0	361,7	439,2
18x1,5	154,9	188,0	232,3	282,1	309,7	376,1	435,6	528,9	522,7	634,7
20x1,5	215	261	322	391	430	522	604	734	725	881
22x1,5	286	347	429	521	572	695	805	977	966	1.173
24x2	367	446	551	669	734	891	1.032	1.254	1.239	1.504
27x2	531	645	797	968	1.063	1.291	1.495	1.815	1.793	2.178
30x2	739	897	1.108	1.345	1.477	1.794	2.077	2.522	2.493	3.027

d xp	4.8		6.8		8.8		10.9		12.9	
	min	max	min	max	min	max	min	max	min	max
8x1	13,1	15,9	19,7	23,9	22,5	26,2	22,5	26,2	22,5	26,2
10x1,25	26,0	31,5	38,9	47,3	44,5	51,9	44,5	51,9	44,5	51,9
12x1,25	45,3	55,0	67,9	82,4	77,6	90,5	77,6	90,5	77,6	90,5
12x1,5	43,9	53,3	65,8	79,9	75,2	87,8	75,2	87,8	75,2	87,8
14x1,5	71,4	86,7	107,1	130,0	122,4	142,8	122,4	142,8	122,4	142,8
16x1,5	107,2	130,1	160,8	195,2	183,7	214,3	183,7	214,3	183,7	214,3
18x1,5	154,9	188,0	232,3	282,1	265,5	309,7	265,5	309,7	265,5	309,7
20x1,5	215	261	322	391	368	430	368	430	368	430
22x1,5	286	347	429	521	491	572	491	572	491	572
24x2	367	446	551	669	629	734	629	734	629	734
27x2	531	645	797	968	911	1.063	911	1.063	911	1.063
30x2	739	897	1.108	1.345	1.266	1.477	1.266	1.477	1.266	1.477

Tab. 2) plugs with copper washer torques

Plug size	Plug out diam.	Plug int. diam.	Tightening torque	
			minimum	maximum
	mm	mm	N.m	N.m
1/8" GAS	14	10,5	13	16
1/4" GAS	18	13,5	28	36
3/8" GAS	22	17,2	46	59
1/2" GAS	26	21,5	65	83
3/4" GAS	32	27,0	111	141
1" GAS	40	33,0	240	306
3/8" 24UNF	14	10,0	14	18
9/16" 18UNF	19	14,5	32	41
3/4" 16UNF	25	19,5	69	88
M8x1	12	8,4	9	12
M10x1	14	10,5	13	17
M12x1.5	17	12,5	25	32
M14x1.5	19	14,5	32	41
M16x1.5	22	16,5	48	62
M18x1.5	23	18,5	50	63
M20x1.5	25	20,5	60	76
M22x1.5	27	22,5	71	90

Tab. 4) resistance class coupling for screws and nuts

When a screw is fastened with a nut, check that the minimum resistance class of the nut coupled is the following:

screw class	3.6	5.6				
	4.6	5.8	6.8	8.8	10.9	12.9
minimum nut class	4A	4D	5S	6S		
	4	5	6	8	10	12