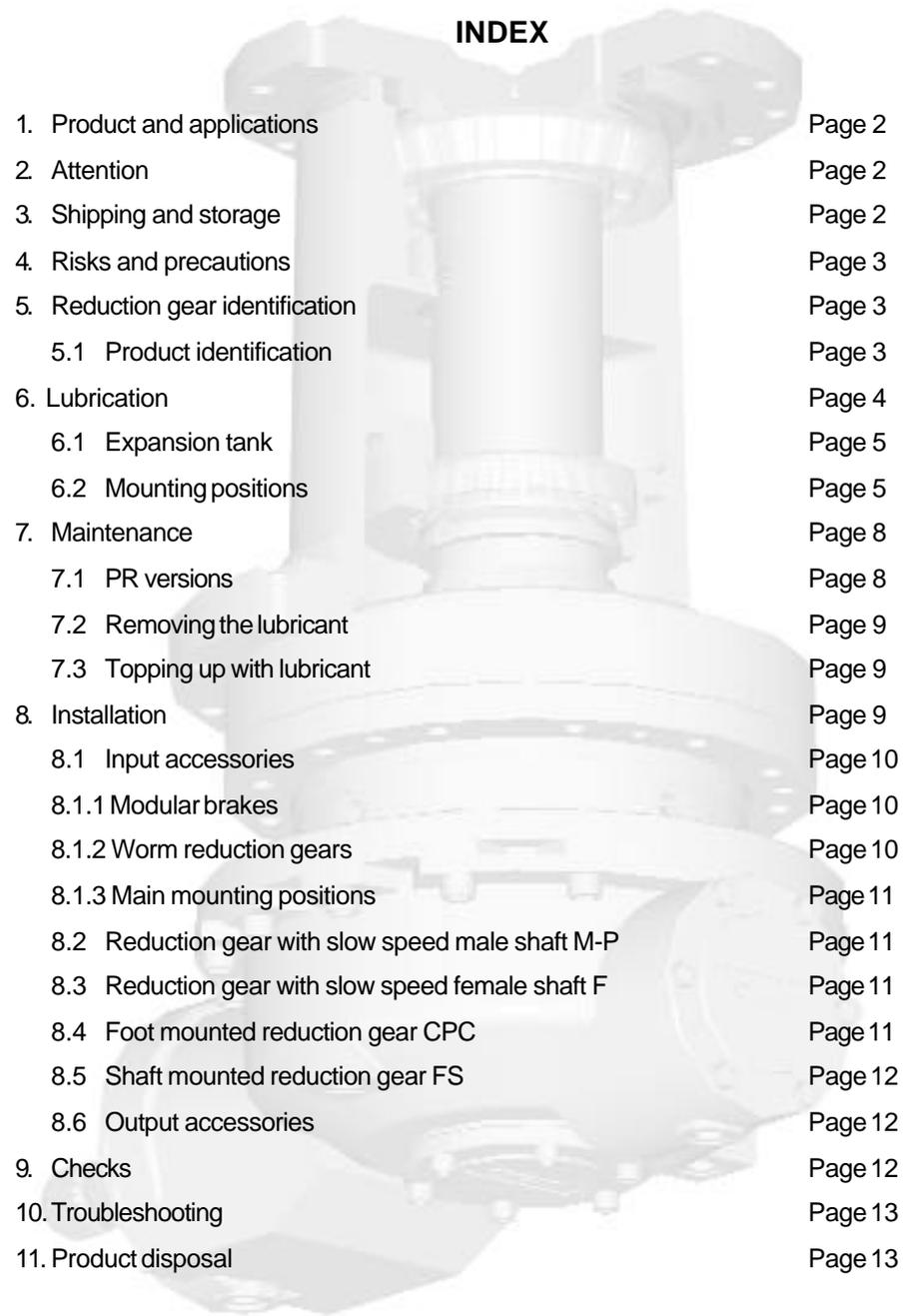


Installation and maintenance manual





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1• Product and applications

Thanks to the modularity of the PG/PGA series of reduction gears, bevel gears, worm gears, negative hydraulic brakes, input shafts and flanges for direct coupling to hydraulic or electric motors can be fitted directly on the planetary reduction gears. The different output shaft and flanging options make it easier to install the reduction gear on both fixed and mobile industrial applications.

Applications on chemical plants, machine tools, marble working machines, transportation and hoisting systems, food and ecological plants and industrial machinery in general, are becoming more and more frequent.

2• Attention

Read this manual through carefully before embarking on any maintenance work and prior to installing the PG/PGA series of reduction gears.

- When the units are delivered, check the reduction gear carefully to make sure it was not damaged during transportation.

- The reduction gear is to be used in the situations and for the applications defined in the project specifications.

- Any other use is absolutely forbidden.

- Any alterations to or removal of the reduction gear components that are not authorised by Comer

3• Shipping and storage

Industries S.p.A. can lead to damage of the reduction gear and even injure people in which case Comer Industries S.p.A. waives all liability both civil and penal.

The reduction gears are usually packed and placed either in crates or on pallets.

The reduction gears should be stored on closed, sheltered premises and raised from the ground to avoid oxidation.

In addition, if the reduction gears are stored for long periods of time (longer than 3 months) they must be protected externally with an antioxidant and filled with oil to protect the internal components.

The PG/PGA series of reduction gears are normally supplied unvarnished and without oil.

As far as concerns the reduction gears complete with hydraulic motor, whether they are the orbital or axial piston type, the motors should be filled with oil too (ISO VG150 type) to prevent oxidation, using metal plugs and washers to close the motor pilot and drain ports.

If the holes are not sealed, dirt, water or other substances can get inside and would undermine correct operation of the reduction gear.

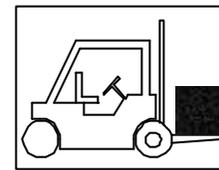
4• Risks and precautions

Always take the necessary measures to guarantee the safety of the people authorised to work on the reduction gear, supplying them with the necessary IPG.

There is oil in the reduction gear and during maintenance some of it may leak in the working area. For this reason slip-proof shoes should be worn.

When "Removing the Lubricant" use the appropriate protection gear because it is very hot and could burn.

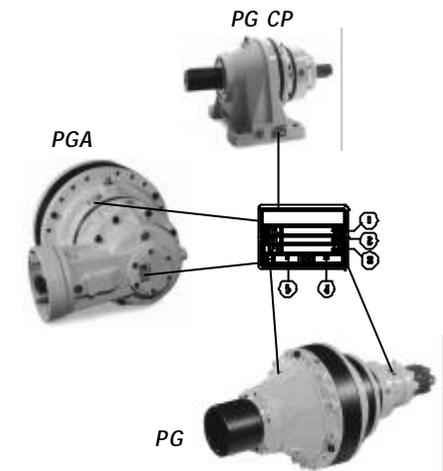
Always handle the units with adequate lifting means never manually as there is an injury hazard.



5• Reduction gear identification

All the reduction gear identification data can be found on the plate as indicated below:

- 1) Type of product
- 2) Comer code
- 3) Serial number
- 4) Series number
- 5) Ratio



5.1• Product identification

The following table gives an example with the indications for identifying the product.

PG	1600	5	MS	1013.16	BS	RA254706...	SAEA4702...	V1
Reduction gear family	Size	Number of stages	Output shaft version	Reduction ratio	Output accessories	Input setup	Electric/hydraulic motor setup	Mounting position

6. Lubrication

Reduction gears of PG/PGA series feature a splash lubrication system.

Use a mineral oil with an ISO VG220 viscosity and EP additives. The following table gives the types of oil that you can buy from leading lubricant manufacturers.

* Continuous duty reduction gears are subject to overheating because of the considerable quantity of oil they contain: in these cases we suggest using a lower viscosity oil.

During operation, the temperature of the outer surfaces should not go above 80°C. If the temperature goes higher then contact our Technical-Commercial Service Centre.

Correct lubrication is essential to guarantee correct operation of the reduction gears for which reason we recommend checking the following conditions during the installation phase:

- check that, in relation to the assembly position specified when ordering, the service plugs are mounted correctly, according to the indications given in Chapter 6.2 (Mounting Positions).
- when the reduction gear is mounted horizontally, it must be filled to the halfway line, regardless of

whether it is a linear or angular configuration. Visually check the level of the oil by unscrewing the plug in that area or just above it.

- in the case of angular reduction gears, the bevel gear is connected so the oil can circulate freely. It is, however, advisable to fill up on the ground, maintaining the correct assembly position, putting oil in in both parts (but not simultaneously) which will not only speed up filling but you will also know that you have put the right quantity of oil in as it takes time to go from one chamber to the next.
- Pay particular attention to vertically mounted reduction gears: they have to be filled right up, using elbows and extensions that are supplied with the reduction gear. For these positions we advise the use of an expansion tank (Chapter 6.1).

- Continuous duty reduction gears are subject to overheating because of the considerable quantity of oil they contain: in these cases we suggest using a lower viscosity oil.

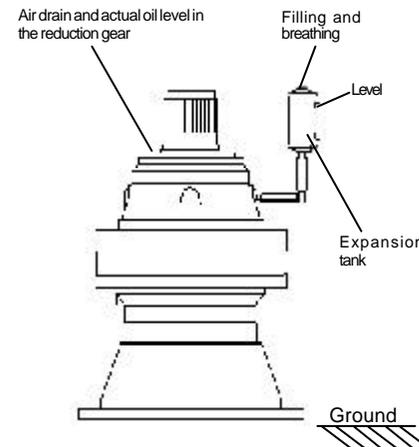
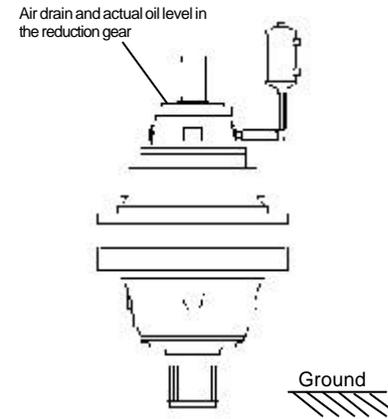
Ambient temperature				
	-20°C / +5°C - IV 95	+5°C / +40°C - IV 95	+40°C / +55°C - IV 95	-30°C / +65°C - IV 165
ISO 3448	VG 100	VG 150	VG 320	VG 150-200
MOBIL	Mineral oil	Mobilgear XMP 150	Mobilgear XMP 320	
	Synthetic oil PAO, EP, ISO VG220	Mobilgear SHC XMP 220		
AGIP	Blasia 100	Blasia 150	Blasia 320	Blasia S 220
ARAL	Degol BG 100	Degol BG 150	Degol BG 320	Degol GS 220
BP MACH	GR XP 100	GR XP 150	GR XP 320	Enersyn HTX 220
CASTROL	Alpha SP 100	Alpha SP 150	Alpha 320	Alpha SN 150
CHEVRON	non leaded gear compound 100	non leaded gear compound 150	non leaded gear compound 320	
ESSO	Spartan EP 100	Spartan EP 150	Spartan EP 320	
Q8	Goya 100	Goya 150	Goya 320 EI	Greco 228
IP	Mellana 100	Mellana 150	Mellana 320	Telesia Oil 150
SHELL	Omala oil 100	Omala oil 150	Omala oil 320	Tivela Oil SA
TOTAL	Carter EP 100 N	Carter EP 150	Carter EP 320 N	
KLUEBER	Gem 1-100	Gem 1-150	Gem 1-320	Synteso D 220 EP
ELF	Reductelf SP 100	Reductelf SP 150	Reductelf SP 320	Elf ORITIS 125 MS Elf Syntherma P 30
FINA	Giran 100	Giran 150	Giran 320	Giran 220

It is forbidden to use different types of oil unless approved by the Technical-Commercial Service Centre.

6.1 Expansion tank

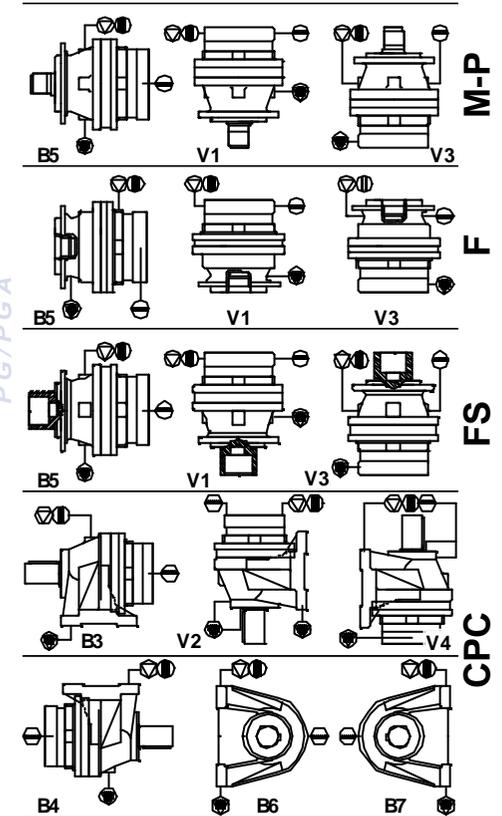
We suggest using an expansion tank when mounting is vertical, situated beyond the highest point of the reduction gear, its job being to hold any expansions of oil or to guarantee topping up in inaccessible points.

This accessory is available upon request, separate from the reduction gear.

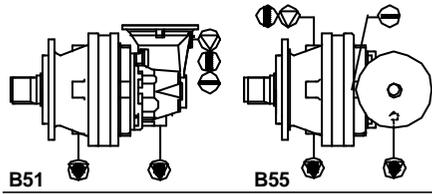


6.2 Mounting positions

- ⊕ Breathing plug
- ⊖ Level plug
- ⊕ Filling up plug
- ⊖ Drainage plug

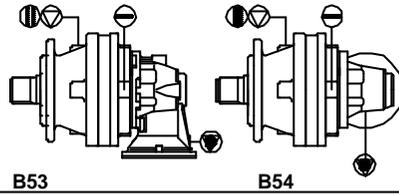


M-P



B51 B55

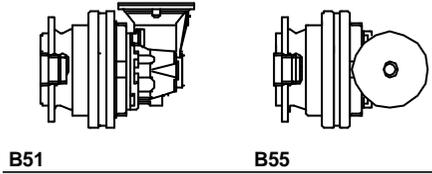
PG/PGA



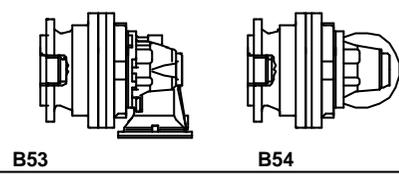
B53 B54

M-P

F



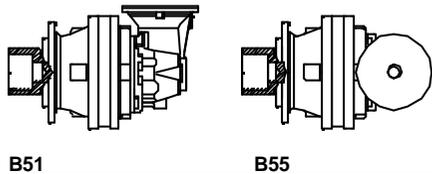
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B53 B54

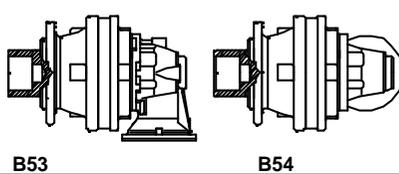
F

FS



B51 B55

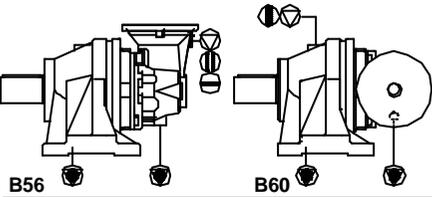
PG/PGA



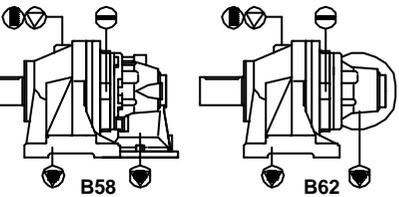
B53 B54

FS

CPC

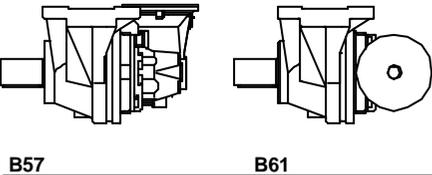


B56 B60

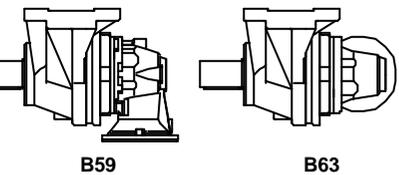


B58 B62

CPC



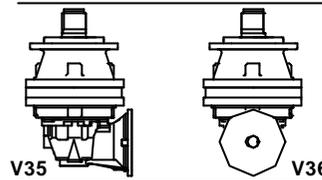
B57 B61



B59 B63

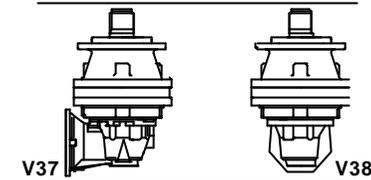
PG/PGA

M-P



V35 V36

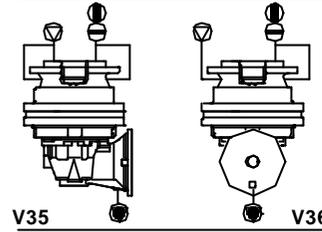
PG/PGA



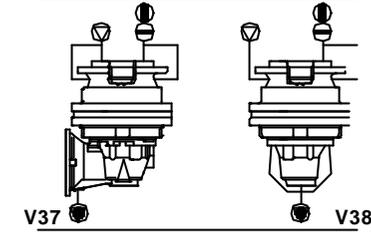
V37 V38

M-P

F



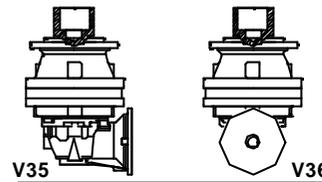
V35 V36



V37 V38

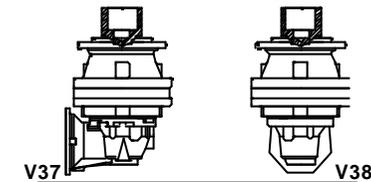
F

FS



V35 V36

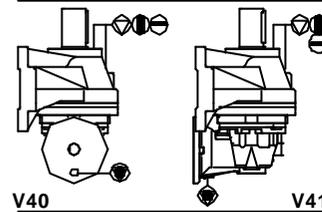
PG/PGA



V37 V38

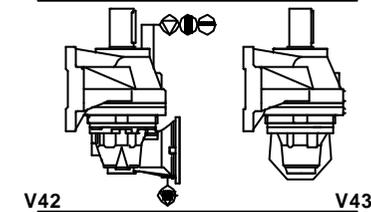
FS

CPC



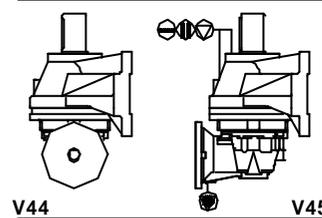
V40 V41

PG/PGA

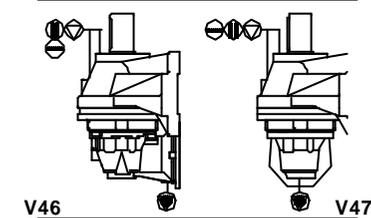


V42 V43

CPC

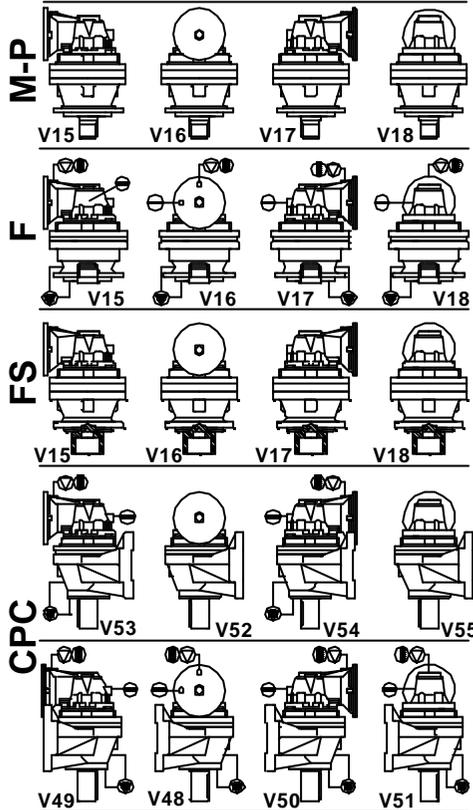


V44 V45



V46 V47





7• Maintenance

The PG/PGA series of reduction gears requires routine maintenance, consisting of changing the lubricant and topping the lubricant up to the correct level as described in the "Removing the Lubricant" and "Topping up with Lubricant" chapters.

Change the oil for the first time after 100 hours. The oil should then be changed after 2,000 hours or at least once a year.

The oil that goes to the motor should be accurately filtered.

Check the level of the lubricant regularly to safeguard correct operation of the reduction gear

approximately every 100 hours of operation, oil already in the reduction gear.

For other maintenance jobs that require removal of reduction gear parts and not specified in this chapter, contact our *Technical-Commercial Service Centre*.

Attention:

If you have to top up more than 10% of the total quantity it could be a sign that the reduction gear is leaking.

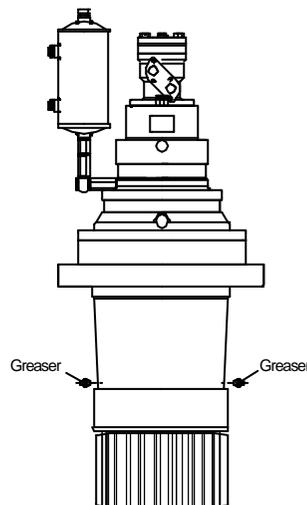
In the PR versions with rotation, top up the level of grease regularly, using a specific greaser, in the chamber between the oil retainer and bearing.

The grease should not be contaminated with any mineral-based oils.

7.1• PR versions

In the PR versions with rotation, top up the level of grease regularly, using a specific greaser, in the chamber between the oil retainer and bearing.

The grease should not be contaminated with any mineral-based oils.



7.2• Removing the lubricant

Locate the breathing/drainage, level and filling plugs, checking the position in which the reduction gear is installed by means of the "Mounting Positions"

To empty the oil, unscrew the drainage plug so the oil can flow out. By unscrewing the breathing/filling plugs as well you will find emptying the oil is even easier.

Drain the oil while it is hot to avoid sludge depositing.

Repeat this also for the brakes (if installed) because their lubrication is separate from that of the planetary reduction gear.

7.3• Topping up with Lubricant

Locate the breathing/drainage, level and filling plugs, checking the position in which the reduction gear is installed by means of the "Mounting Positions" chapter.

Before putting new oil in, wash the insides of the reduction gear with a detergent liquid recommended by the lubricant supplier.

To fill the reduction gear, remove the breathing/filling and level plugs only.

Fill the reduction gear until the oil starts coming out of the level hole and then put the plugs back and tighten them.

In the case of the vertically mounted reduction gear, always use the extensions attached to the reduction gear. When filling up with lubricant the RA or RB brake must also be filled (if used) through the relative oil supply hole on the brake.

Brake lubrication is separate from that of the planetary reduction gear (we recommend ISO VG 32 oil).

Hydraulic oils are normally okay.

8• Installation

Check the correct position of the reduction gear by means of the diagrams in Chapter 7 (Mounting Positions).

To ensure correct operation of the reduction gears and a longer life, correct coupling to the mounting face is an essential factor.

Always ensure that all mounting faces are flat with centrigs and an H8 tolerance also to guarantee perfect perpendicularity with the reduction gear axis.

Make sure there are no dents, rust or other imperfections on and around the coupling surface. To make assembly of the reduction gear on the mounting face even easier, lubricate the centrigs and coupling surface, spreading oil or grease over them.

To fix the reduction gear, use the nuts and bolts indicated under each drawing in the product technical data sheets.

Also use the fixing holes on the reduction gear flanges.

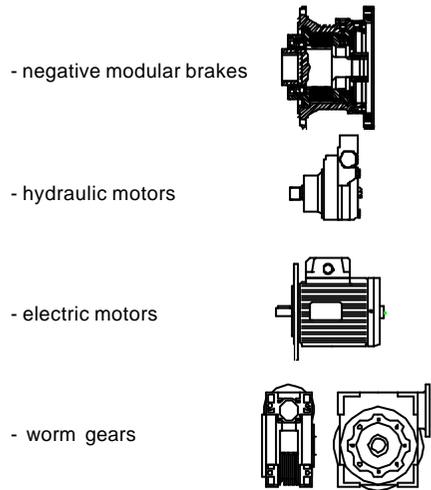
In the case of reduction gears installed outdoors, we suggest – wherever possible – to protect the reduction gears from the weather, to treat them with anticorrosive substances and to protect the oil retainer with water repellent grease.

A safety system must be used in applications where accidental overloads are possible such to compromise the integrity of the transmission (hydraulic, mechanical), so as to safeguard the reduction gear.

8.1. Input accessories

Comer Industries reduction gears can be supplied with different input options.

By means of the input flanges with and without brake, the following accessories can be mounted:



The coupling between reduction gears and motors, mainly electric or hydraulic, is normally done by direct flanging when there are no particularly critical conditions that could cause damage once installed.

Wherever it is necessary to install very heavy motors, weighing more than 100 Kgs., we recommend contacting our *Technical-Commercial Service Centre* to better evaluate the application with reference to the mounting position.

As an alternative, we suggest assembling the two parts separately, connected by way of a joint or pulleys.

8.1.1 Modular brakes

The negative brakes supplied with the SOM planetary reduction gears are hydraulic with oil bath disks, suitable only for static braking, in other words, parking.

The brakes and assembled motor couplings form a chamber separate from the rest of the reduction gear; for this reason they have to be filled separately from the reduction gear (see Chapter 7.3, Topping up with Lubricant).

Always observe the braking and pressure values given in the relative technical documents (dimensional, technical data sheets) enclosed with the reduction gears. If you do not know these values please contact our *Technical-Commercial Service Centre*.

8.1.2 Worm reduction gears

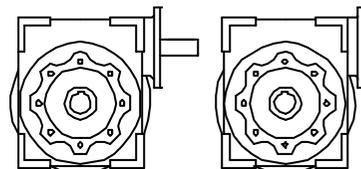
Comer Industries can supply combined reduction gears with the following configurations:

- 1) complete with worm reduction gear
- 2) preset for a worm reduction gear

In addition, please remember that lubrication of the planetary reduction gears is separate from that of the worm gear.

In the reduction gear supplied without oil plugs, lubrication is the permanent type which also means no oil change/maintenance is required.

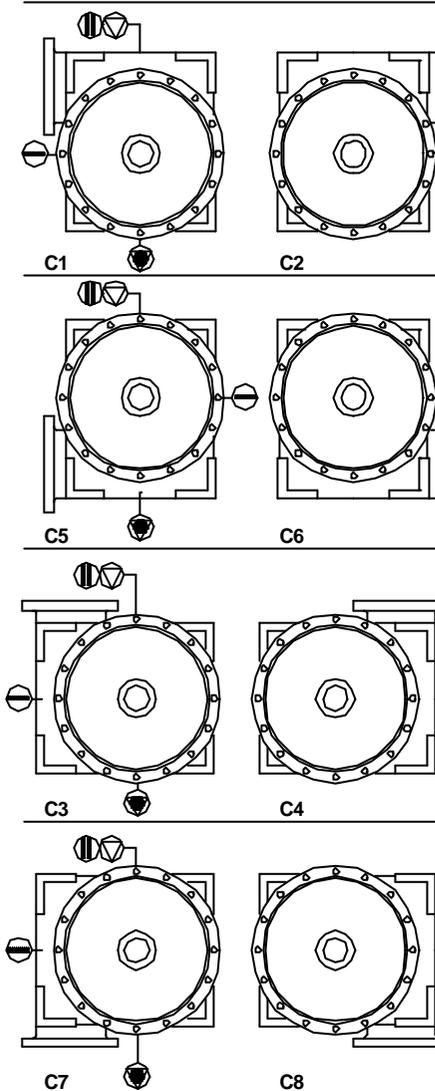
To select the worm reduction gear please contact our *Technical-Commercial Service Centre*.



Worm gear with male input shaft

Worm gear setup for an electric motor (PAM/IEC).

8.1.3 Main mounting positions



For other mounting positions (units with feet, etc.), contact our *Technical-Commercial Service Centre*.

8.2. Reduction gear with slow speed male shaft M-P

For these units, when loads are greater than 50% compared to those indicated in the graphs in the single product technical data sheets, we suggest using both centrings on the output side box.

On the other hand, in all cases the centrings on the splined shafts must be used especially when toothed pinions are mounted.

On applications where there are strong external load conditions acting simultaneously on the output and input, contact our *Technical-Commercial Service Centre*.

8.3. Reduction gear with slow speed female shaft F

Due to the way it is made, this type of reduction gear is ideal for transmitting torque only. It is necessary to pay particular attention to the coaxiality and orthogonality of the connection with the driven shaft.

8.4. Foot mounted reduction gear CPC

Also for this type of reduction gear it is necessary to check fixing conditions as regards coaxiality and orthogonality, listed at the beginning of this chapter.

Unit alignment with the machine to move must also be checked.

If there are any doubts about the success of the above operations, use a non-rigid connection between reduction gear and machine like a flexible coupling for example.

When installing, remember that a reduction gear mounted like this must not be subject to any vibration phenomenon.

8₅ Shaft mounted reduction gear FS

The application of a torque arm is necessary for this kind of installation and must comply with the minimum lengths given in the drawing for each single unit.

In addition, we suggest damping this reaction restraint with rubber elements and/or vibration dampers.

If very heavy motors are applied or mounting with a belt on the input side, contact our Technical-Commercial Service Centre to check the installation. In fact, in these cases there are external loads that, summed to those of the transmission, can reduce bearing life considerably, compromise effectiveness of the shrink disc's sealing capacity or influence shaft resistance.

To guarantee effective reduction gear-user coupling, grease the inside surface of the reduction gear shaft and relative male coupling shaft.

For a correct tightening of the shrink disc, "tighten" the screws gradually and evenly in a continuous sequence.

To remove, unscrew the screws gradually in exactly the same way they were tightened (in sequence, continuously and gradually).

Turn each screw 1/3rd of a turn in the first loosening sequence to avoid any possible misalignments.

Then loosen completely, but always gradually without the screws coming completely out of the threads.

We recommend that the coupling male shaft should be made to connect to the Comar Industries units with an h6 tolerance.

Also follow the indications given on the side of each drawing.

8₆ Output accessories

Depending on the different applications, the Comer Industries reduction gears can be supplied with various options in output, such as:

Cylindrical or splined joints, flanges, splined bars and shrink discs.

At the same time, the outputs can also be supplied in the "reinforced" version for heavy-duty applications.

9• Checks

Check that the reduction gear has been filled with oil. In the negative case, please consult the "Topping up with Lubricant" chapter.

Check that the reduction gear components are not damaged in any way and that the centrings and standing parts are not rusty.

Make sure there is no air inside the hydraulic circuit.

Make sure that the reduction gear screws have been tightened to the values given in table 1 and that the plugs have all been tightened to the values given in table 2.

Check correct operation of the reduction gear, making sure that rotation direction is as wanted.

If a parking brake is installed, make sure it is working properly (engaged/disengaged).

Check that the accessories (brake, motors, etc.) are in the ideal condition for a correct operation.

10• Troubleshooting

Problems	Possible cause	Remedies
Oil leaking from the breathing plug	1) Too much oil; 2) Breathing plug installed incorrect;	1) Restore the correct level of oil; 2) Check breathing plug position;
Oil leaks	1) The internal seals are damaged; 2) Breathing plug clogged;	1) Contact a Comer Assistance Centre; 2) Change or clean the breathing plug;
Excessive overheating	1) There is no oil; 2) Internal problem;	1) Restore correct oil level; 2) Contact a Comer Assistance Centre;
Excessive noise	Internal problem;	Contact a Comer Assistance Centre;
The negative brake fails to disconnect	1) Check the hydraulic connection; 2) Internal problem;	1) Remedy the hydraulic connection; 2) Contact a Comer Assistance Centre;
The negative brake fails to brake	Internal problem;	Contact a Comer Assistance Centre;
When pressure is sent to the motor the output shaft fail to turn	1) Motor mounted incorrectly; 2) Internal breakage;	1) Check correct motor fixing; 2) Contact a Comer Assistance Centre;
The reduction gear cannot be assembled on the mounting face	Incorrect dimensioning	Check correct fixing of the reduction gear or contact a Comer Assistance Centre;

If there are problems or malfunctions different to the ones described here contact a Comer Industries Assistance Centre.

11• 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 in force on the matter of dismantling and demolishing industrial waste.

Waste oil: 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.

Tab. 1) Torque wrench setting (Nxm) of screw on iron or steel

dxp	4.8		6.8		8.8		10.9		12.9	
(mm)	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	1.110
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

dxp	4.8		6.8		8.8		10.9		12.9	
(mm)	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

Tab. 2) Torque wrench setting of plugs with a copper washer

Plug size	Plug out diam.	Plug int. diam.	Tightening torque	
			minimum	maximum
	mm	mm	N.m	Nm
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. 3) Torque wrench setting (Nxm) of screw on cast alluminium

d _{xp} (mm)	4.8		6.8		8.8		10.9		12.9	
	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} (mm)	4.8		6.8		8.8		10.9		12.9	
	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. 4) Coupling resistance classes for screws and nuts

When a screw is tightened with a nut, check that the coupling nut's minimum resistance class is the following:

screw class	3.6	5.6				
	4.6	5.8	6.8	8.8	10.9	12.9
4.8						
minimum nut class	4A	4D	5S	6S		
	4	5	6	8	10	12

Maintenancesheet

Date of maintenance work

Operating hours

Comer code

Serial number

Work carried out:

PG/PGA

PG/PGA

PG/PGA

PG/PGA

