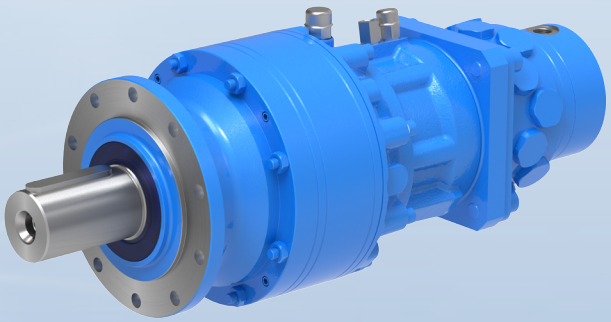
DÜSTERLOH Fluidtechnik

Planetary Gear Units



Planetary Gear Units
Multi Discs Brakes FL

Standard serial EM - ED - ET - EQ - EC - PD - PDA
S-serial SL - SC

Assembly and Operating Instructions

PG1-010 EN Edition 2022.06 / 10

Contents

1. Introduction

DUESTERLOH would like thank you for choosing one of its products and is pleased to include you among its preferred Customers. The company hopes you will be satisfied when using the gear unit.

1.1 How to consult the manual

It is easy to consult this manual by referring to the table of contents which can be used to find the subject of interest very quickly. The chapters are organized into a hierarchical structure that makes it easier to find the required information.

1.2 Scope of the manual

This manual provides the Gear unit user with all the information necessary to ensure correct installation, use and maintenance in compliance with the safety restrictions set forth by current standards. To understand this manual even better, we would like to describe the following terms used in the document:

HAZARDOUS AREA:
area within or in proximity to the drive unit in which the presence of an exposed person represents a risk to the safety and health of that person.

EXPOSED PERSON:
any person who is inside all or part of a hazardous area.

OPERATOR:
person assigned to install, operate, adjust, perform routine maintenance and clean the drive unit.

SKILLED TECHNICIAN:
a specialized person who performs unscheduled maintenance or pairs requiring special knowledge of the drive unit, its operation, safety devices and relative operating methods.

For any doubts or if the manual has been damaged or lost, please do not hesitate to contact the DUESTERLOH Technical Service Department.

1.3 Warranty

The warranty will ,no longer be invalid if the problem or malfunction is due to incorrect or unsuitable product applications if said product dues not conform at the time the machine is started for which such start-up must be carried out no later than 6 months from the date of shipment.

1.4 General warnings

Personnel must be informed about the following subjects regarding drive unit operating safety:

- Accident risks.
- D.P.I. devices designed to ensure operator safety (individual protection devices: goggles, gloves, hard hat, etc.).
- General accident-prevention rules or those set forth by international directives and by the laws of the country where the drive unit will be used. When delivered, check that the Gear unit has not been damaged during transport and that any accessories are complete.
- Before standing to work, the operator must be familiar with drive unit features and must have read this entire manual.
- It's understood that the Gear unit will be used in an environment and for application that comply with what is indicated in the design phase.
- Any improper use of the gear unit is prohibited.
- Any change or replacement of drive unit parts, which has not been authorized by DUESTERLOH, may represent an accident risk and releases the manufacturer from any civil or penal liabilities, and will always invalidate the warranty.

2. Technical data

Each gear unit is supplied with an identification nameplate that contains the main technical data regarding the functional and construction features of the gear unit. Therefore, it must always be visible and undamaged.

3. Supply condition

The exterior of the gear units are painted with a zinc-phosphat ground coat, unless otherwise indicated in the contracts. Such protection can withstand normal industrial environments, including outdoor sites, while additional synthetic top coats can also be applied. If the machine will be used under particularly aggressive environmental conditions, special types of paints can also be applied. The machined external parts of the gear unit, such as the ends of the hollow and non-hollow shafts, support surfaces, spigots, etc. are protected with rust-inhibitor oil (tectyl). The internal parts of the gear unit casings and drives are also protected with rust-inhibitor oil. All the gear units, unless otherwise indicated in the contracts, are supplied without lubrication (as indicated by a special adhesive sticker attached to the gear unit to notify the user of such a supply condition).

4. Packing, handling, receiving and storage

4.1 Packing

The products are packed and shipped in crates or on pallets, depending on the specific case.
- All products, unless otherwise indicated in the contracts, are packed with wrapping that can withstand normal industrial environments.

4.2 Handling

To move packages, use lifting equipment that is suitable for the type of packing and for which the capacity is indicated on such equipment.

Do not tilt or turn the package upside down while lifting or during transport.

If the packages are unloaded from a fork-lift truck, make sure the weight is balanced on the forks.

If necessary, place wooden wedges under the package to make lifting easier.

If the packages are unloaded with a hoist and, in any case, with a hook, make sure that the load is balanced and for slinging use lifting accessories that are legally certified. For packages shipped on pallets, make sure that the lifting accessories do not damage the machine.

While lifting and positioning the package, avoid any violent impacts or bumps.

4.3 Receiving

When the drive unit is receiving, make sure the supply corresponds to what is specified in the order. Also check that the package and its contents have not been damaged during transport.

The strap holding the product to the packing is sharp. It may hit the operator while the product is being unloaded. The packing must be eliminated as follows:

- use a pair of shears to cut the straps (warning: the ends may hit the operator)
- cut or remove the external packing
- cut the internal strap (warning: the ends may hit the operator)
- remove the drive unit from the pallets.

4.4 Handling the drive unit without packing

Before removing the drive unit from its packing make sure it is solidly attached to the lifting accessories so that it cannot slide or flip over. Before handling the drive unit, remove the wood blocks inserted in the packing to keep it stable during shipment.
Lift the drive unit making sure the load remains balanced during the various operations.

4.5 Storage

If the product must be stored for more than 2 months, do the following:

- Protect the shafts and the spigots with a film or grease and/or rust-inhibitor liquids
- Completely fill the gear unit with suitable oil (see page 8, section 6.3)
- Store the machine in a dry place at a temperature ranging from -5°C to +30°C
- Protect the packages against dirt, dust and moisture.

NOTE:
For extended storage of more than 6 months, the rotating seals will no longer be efficient. It is recommended to check them periodically by turning the internal gears and by rotating the input shaft. It is recommended to replace the gaskets when the machine is started.

- Do not stacks pieces on top of each other .
- Do not walk on or place pieces on top of the package.
- Do not store any material inside the package.
- Keep the package away from any passage areas.
- If possible, insert wooden wedges between the package and the floor.

5. Installation

5.1 General instructions

Install the Product carefully following the steps listed below:

- When installing the gear unit, make sure the oil, breather, level and drain plugs are in the correct position. Their position will vary according to the assembly position
- When installing RPR or MDU series gear units, be very careful not to damage any grease pipes or those used to empty the oil in the gear unit (located on the side of the gear unit support). They should be positioned so that it is easy to access the grease gun and any oil expansion tank (during installation protect the pipes and the tank).
- The gear unit is normally supplied with a flange for coupling the electric, hydraulic and air motors.
- The customer is responsible for installing suitable guards for the input shafts, as well as couplings, pulleys, belts, etc., according to the current safety standards in force in the country where the machine is used.
- For gear units installed outdoors, use rust-inhibitor paint and protect the oil guard and relative sliding guides with water-repellent grease and provide protection against bad weather.

Note: DUESTERLOH advises against filling its products with oil prior to installation.

5.2 Installation instructions for flange mounted gear unit

- They must be attached to a rigid structure with a clean and unvarnished support surface that is perpendicular to the drive axis. The centering shoulder usually has the tolerance of H8.
- The spigots and the coupling surfaces of the gear unit must be clean without any dents. The checks described above are particularly important ensure perfect alignment between the driven shaft and the output shaft of the gear unit. This is even more important for gear units with a splined female output shaft which cannot bear any radial or axial loads.

- Lubricate all the spigots of the gear unit and the housing seat with grease or oil.
- After having inserted the gear unit into its housing and having placed it in the correct position, fit in the standard series from size of gear 150 to 320 the reference pins in their seats. In the s-series, there are no dowel pins. Then tighten the attachment bolts (recommended minimum class 10.9), applying torque as indicated in the table „torque setting“ section 7.2 or 75% of the yield strength, making sure that such torque settings are compatible with the other parts (nuts and/or structure).

NOTE:
It is recommended to use class 12.9 bolts where the application involves severe impacts, frequent stops, starts, reversals or when it exceeds 70% of the maximum tolerated torque.

NOTE:
During installation, for right angle gear units with a male input shaft, the input axis may not be in the ideal position. To solve this problem, it is recommended to do the following:

- for connections using couplings which can compensate for the misalignments, measure the existing misalignment, check the acceptable misalignment from the coupling and, if the value is greater, shim the motor to obtain the acceptable clearances
- for a connection with mechanical devices that cannot be used to compensate for the clearances, align the motor using shims.

5.3 Installation instructions for foot mounted gear unit

- Make sure that the assembly feet rest on a flat surface. If not, shim them so that all are level.
- An improper support for the feet may break the unit.
- Attach the unit using bolts with a minimum class 10.9 tightened at the torque settings indicated in section 7.2.

5.4 Installation instructions for shaft mounted gear units

Particular attention is required when installing these gear units, therefore follow the instructions described below.

5.4.1 Mounting the reaction arm on the gear unit

- For welds have any deformation, sandblasted and refinished with normal tools.
- Check that spigots of the gear unit and the reaction arm are clean, not dented and that there are no traces if paint.
- Lubricate the couplings and insert the reaction arm on the gear unit spigot, then insert any dowels.
- Attach the reaction arm using minimum class 10.9 bolts.
- It is recommended to use class 12.9 bolts where the application involves severe impacts, frequent stops or starts, reversals or when it exceeds 70% of the maximum gear unit torque.
- Check that the reaction arm anchor system does not lock the gear unit, but allows it to move freely in space in order to absorb the movements imposed in it by the shaft.
  For torque settings refer to the table „torque setting“ section 7.2, making sure that such settings are compatible with the other parts (nuts and/or attachment structures).
- The fixed point of the torque arm must be floating in all directions.
  The fixed storage must have adequate load bearing guarantee.

5.5 Accessory installation instructions

Motor assembly

While assembling the gear unit on the motor, the coupling must be lubricated with a thin layer of grease or with a no-grip lubricant. Carefully insert the motor shaft in to the coupling and make sure that the motor spigot perfectly matches the gear unit spigot.
After checking that the motor is properly centered, tighten all the attachment bolts applyng the torque indicated in the table „torque setting“ section 7.2.

Accessories assembling

To assemble the pinion, pully or coupling using a tool intended just to avoid fixing phenomena. Alternatively, the workpiece can be heated to 80°C - 100°C. The grooves with a thin layer of fat or with a lubricant to coat sticking. The mounting bolts as shown in section 7.2 "Values Table Torque Setting Bolts" moments tighten.

6. Lubrication

6.1 Gear unit lubrication

The DUESTERLOH gear units are supplied without oil, therefore the user must the lubricant according to what is indicated in the table shown in section 6.3.

6.2 Filling and level

- The gear units are equipped with oil level, breather, filer and drain plugs and their position changes according to the installation configuration.
- Check the exact position of the plugs using the plans.
- Unscrew the level-filler plugs, put oil into the Gear unit and when this oil flows out of the level hole, replace the plugs.
- Turn the gear unit a few times to eliminate any air pockets and then check the various levels the plug.

6.3 Lubrication table

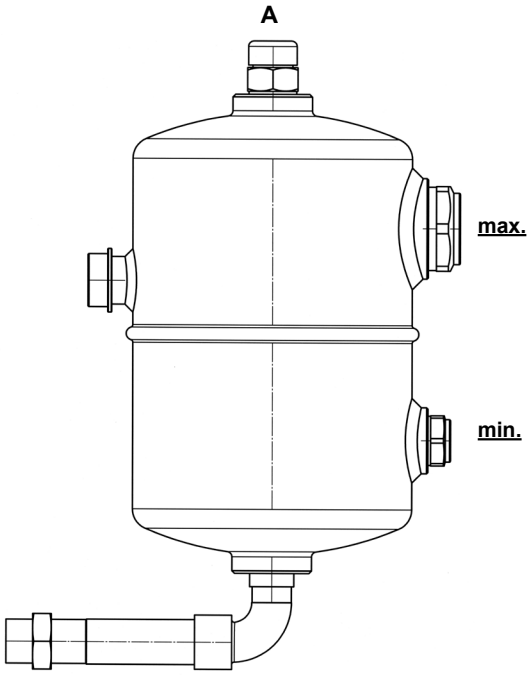
Ambient- temperature DIN 51517-3 viscosity-index	-20°C +5°C CLP 100 VI 95 min	+5°C +30°C CLP 150 VI 95 min	+5°C +40°C CLP 220 VI 95 min	+30°C +50°C CLP 320 VI 95 min	-30°C +65°C CLP PG150 VI 165 min	-30°C +75°C CLP PG220 VI 165 min
AGIP/Eni	Agip BLASIA 100	Agip BLASIA 150	Agip BLASIA 220	Agip BLASIA 320	Agip BLASIA S 320	Agip BLASIA S 320
ARAL	Degol BG 100	Degol BG 150	Degol BG 220	Degol BG 320	Degol GS 150	Degol GS 220
BP	Energol GR-XP 100	Energol GR-XP 150	Energol GR-XP 220	Energol GR-XP 320	Energol SG-XP 150	Energol SG-XP 220
CASTROL	Alpha SP 100 Optigear BM 100 Tribol 1100/100	Alpha SP 150 Optigear BM 150 Tribol 1100/150	Alpha SP 220 Optigear BM 220 Tribol 1100/220	Alpha SP 320 Optigear BM 320 Tribol 1100/320	Alphasyn PG 150 Tribol 800/150	Alphasyn PG 220 Tribol 800/220
CHEVRON	Meropa 100 Meropa WM 100	Meropa 150 Meropa WM 150	Meropa 220 Meropa WM 220	Meropa 320 Meropa WM 320	Synlube WS 150	Synlube WS 220
KLÜBER	Klüberoil GEM 1-100 N	Klüberoil GEM 1-150 N	Klüberoil GEM 1-220 N	Klüberoil GEM 1-320 N	Klübersynth GH 6-150	Klübersynth GH 6-220
MOBIL	Mobilgear 600 XP 100	Mobilgear 600 XP 150	Mobilgear 600 XP 220	Mobilgear 600 XP 320	Mobil Glygoyle 150	Mobil Glygoyle 220
Q8	Q8 Goya 100 Q8 Goya NT 100	Q8 Goya 150 Q8 Goya NT 150	Q8 Goya 220 Q8 Goya NT 220	Q8 Goya 320 Q8 Goya NT 320	Q8 Gade 150	Q8 Gade 220
SHELL	Omala S2 GX 100 Omala S4 GXV 100	Omala S2 GX 150 Omala S4 GXV 150	Omala S2 GX 220 Omala S4 GXV 220	Omala S2 GX 320 Omala S4 GXV 320	Omala S4 WE 150	Omala S4 WE 150
TOTAL	Carter EP 100 Carter XEP 100	Carter EP 150 Carter XEP 150	Carter EP 220 Carter XEP 220	Carter EP 320 Carter XEP 320	Carter SY 150 Carter SG 150	Carter SY 220 Carter SG 220

6.4 Expansion tank

ATTENTION: make sure the expansion tank is installed higher than the top part of the gear unit.

For applications with an expansion tank, do the following:

- Remove the plug „A“
- To enhance gear unit ventilation (only during the filling phase) it is also possible to remove one of the top of the gear unit.



- As the oil rises to the top of the open plug in the top part of the gear unit, replace the plug.
- Continue filling until the oil reaches the min. visual level plug on the tank which should not to be exceeded to provide space for the volume of the hot oil to expand.
- Replace the plug.
- With the gear unit running under steady-state thermal conditions, and the oil at its maximum expansion temperature, never exceed the max. level.

7. Checks

7.1 First start-up checks

Before starting the drive unit check the following:

- Check that all the oil plug are in the correct position.
- Check that all oil levels are correct.
- The grease nipples must be filled with grease.

ATTENTION:
The gear units are shipped without oil. The customer is responsible for filling such devices (see lubrication section 6).

- Check that all the bolts with ISO metric threads are correctly tightened (see table „torque setting values“ 7.2).

7.2 Values Table Torque Setting Bolts

d x p	4.8		5.8		8.8		10.9		12.9	
mm	kN	Nm	kN	Nm	kN	Nm	kN	Nm	kN	Nm
3 x 0,5	1,2	0,9	1,5	1,1	2,3	1,8	3,4	2,6	4,0	3,0
4 x 0,7	2,1	1,6	2,7	2	4,1	3,1	6,0	4,5	7,0	5,3
5 x 0,8	3,5	3,2	4,4	4	6,7	6,1	9,8	8,9	11,5	10,4
6 x 1,0	4,9	5,5	6,1	6,8	9,4	10,4	13,8	15,3	16,1	17,9
7 x 1,0	7,3	9,3	9,0	11,5	13,7	17,2	20,2	25	23,6	30
8 x 1,0	9,3	13,6	11,5	16,8	17,2	25	25	37	30	44
9 x 1,25	9,9	14,5	12,2	18	18,9	27	28	40	32	47
10 x 1,5	14,5	26,6	18	33	27	50	40	73	47	86
10 x 1,25	15,8	28	19,5	35	30	53	43	78	51	91
12 x 1,75	21,3	46	26	56	40	86	50	127	69	148
12 x 1,25	23,8	50	29	62	45	95	65	139	77	163
14 x 2,0	29	73	36	90	55	137	80	201	94	235
14 x 1,5	32	79	40	96	61	150	90	220	105	257
16 x 2,0	40	113	50	141	76	214	111	314	130	369
16 x 1,5	43	121	54	150	82	229	121	336	141	393
18 x 2,5	49	157	60	194	95	306	135	435	158	509
18 x 1,5	57	178	70	220	110	345	157	491	184	575
20 x 2,5	63	222	77	275	122	432	173	615	203	719
20 x 1,5	72	248	89	307	140	482	199	687	233	804
22 x 2,5	78	305	97	376	152	502	216	843	253	987
22 x 1,5	88	337	109	416	172	654	245	932	266	1090
24 x 3,0	90	383	112	474	175	744	250	1080	292	1240
24 x 2,0	101	420	125	519	196	814	280	1160	327	1360
27 x 3,0	119	568	147	703	230	1100	328	1570	384	1840
27 x 2,0	131	615	162	760	225	1200	363	1700	425	1990
30 x 3,5	144	772	178	955	280	1500	300	2130	467	2500
30 x 2,0	165	850	204	1060	321	1670	457	2370	535	2700
36 x 4,0	- - -	- - -	- - -	- - -	432	2610	615	3720	720	4350
36 x 3,0	- - -	- - -	- - -	- - -	460	2750	658	3930	770	4600

d = bolt diameter
p = bolt pitch
kN = axial pre-loading
Nm = torque setting bolts

7.3 No-load tests

- After a brief period of operation (5-10 minutes) check the oil levels under no-load conditions, topping up those levels which have gone down check that nuts and bolts of the various attachments are properly tightened.

8. Maintenance

Introduction
Maintenance can be „routine or unscheduled“.

ATTENTION:
All maintenance activities must be carried out under safety conditions.

8.1 Routine maintenance

The operator is responsible for routine maintenance and must carry out the following activities.

- After a brief operating period of about 100 hours (breaking-in), change the oil in the gear unit and wash the interior of the unit with cleaning liquid.
- Check that there are no metallic parts with unusual dimension at the magnetic plug of the gear unit.
- Change the oil in the gear unit while it is hot so that it is easier to drain.
- Subsequent oil changes will be made every 200-2500 hours of operation or, in any case, each year.
- Do not mix different types of oil.

ATTENTION:
when checking the oil levels in gear units equipped with a multi-disk brake or hydraulic motor or both, if the levels have risen, this means that oil is penetrating either from the brake seals or from the motor rotary seal. Contact DUESTERLOH.

- For each unit it is recommended to keep a chart that will be duly filled out and updated each time maintenance in performed.

8.2 Oil change

- Use the diagrams to identify the oil plug according to the gear unit configuration and always for the multi-disk brake configuration.
  Unscrew the drain plug and the filler plug to help drain the oil from the gear unit. Once the oil has been emptied, replace the drain plug. If the gear unit is equipped with a multi-disk brake, repeat the same operation with the multi-disk brake.
- In the MDU series, starting with size „550“, a pipe is supplied to empty the oil in the gear unit, therefore it must be emptied using a suction pump, removing the plug from the emptying pipe located on the flange attaching the gear unit and fitting to it.
- Wash the interior of the gear unit with a suitable cleaning liquid that is recommended by the lubricant manufacturer. If the gear unit is equipped with a multi-disk brake, repeat the same operation with the multi-disk brake, as follows:
  Put liquid into the gear unit and the multi-disk brake (if any), then replace the filter plugs; run the device for a few minutes at a low speed, then remove the cleaning liquid again from the gear unit and the multi-disk brake. (if any).
- See section6 lubrication for filling instructions.

8.3 Unscheduled maintenance

DUESTERLOH prohibits the gear unit to be opened to carry out any operation that is not included in routine maintenance procedures. DUESTERLOH do not undertake any liability for all those operations out of routine maintenance which may have caused damages to people or things.

9. Scrap disposal

9.1 Drive unit demolition

If the drive unit must be scrapped, it, should become nonoperational:
- Transmission and engine oils drain
- The various components disassemble

9.2 Ecology information

The disposal of gear unit packaging materials, replaced parts, components or the gear unit and lubricants must comply with environmental restrictions, without polluting the soil, water or air. The party receiving the materials is responsible for carrying out the operation in conformity with the current standards in force in the country in which the machine is used. Instructions for suitable waste treatment:

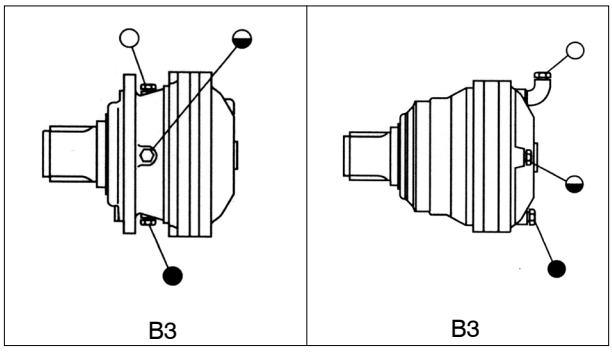
- Iron, aluminium, copper materials: these are recyclable materials which must be sent a to a special authorized collection center.
- Plastic and rubber materials: these materials must be delivered to a dump or to special recycling centers.
- Used oils: deliver to a special C.Di.R.A.

10. Arrangement of the oil drain, oil level and air vents.

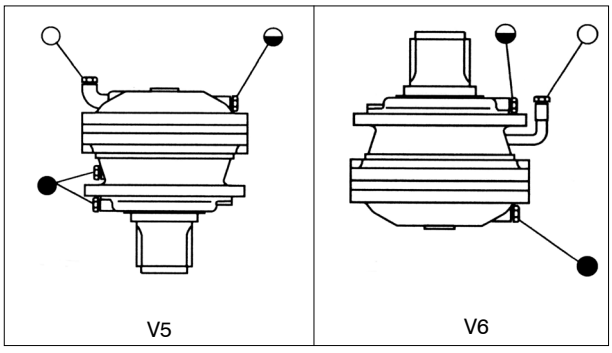
The level for a trouble-free operation for horizontal transmission installation is located on the centerline. For applications with extremely low output speeds ($n_2 \leq 5$ rpm), the level should be higher by approximately 50 to 100mm.

○ = Breather and filling plug ◒ = Oil level plug ● = Drain plug

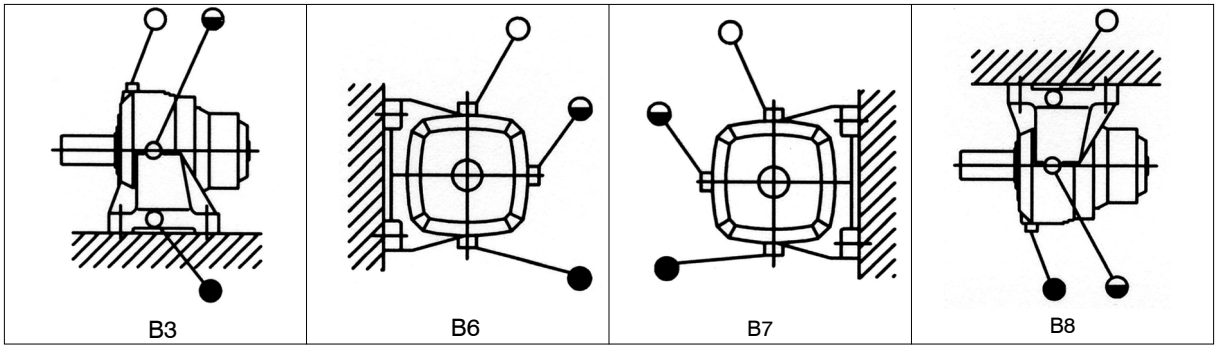
10.1 Flange mounted gears, horizontal position



10.2 Flange mounted gears, vertical position

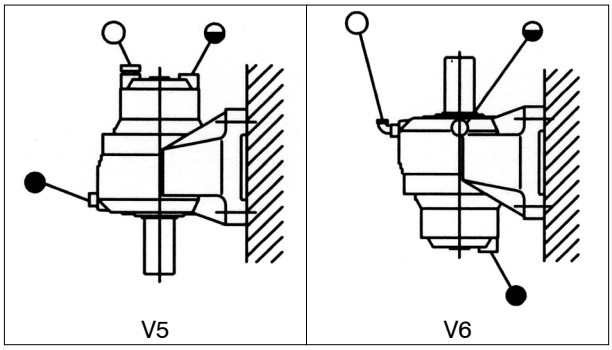


10.3 Foot mounted gears, horizontal position

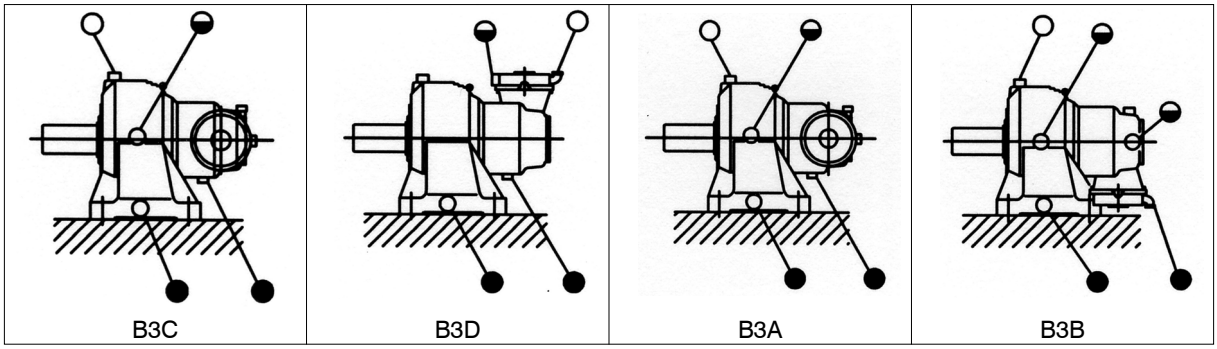


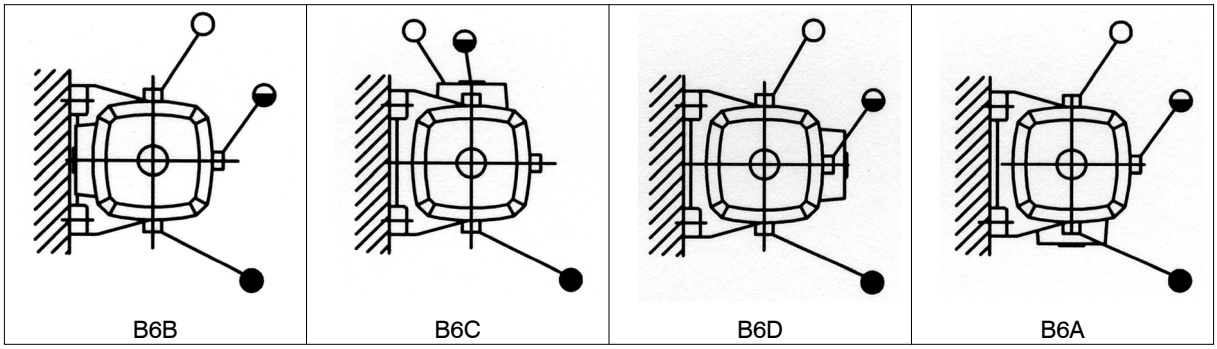
○ = Breather and filling plug ◒ = Oil level plug ● = Drain plug

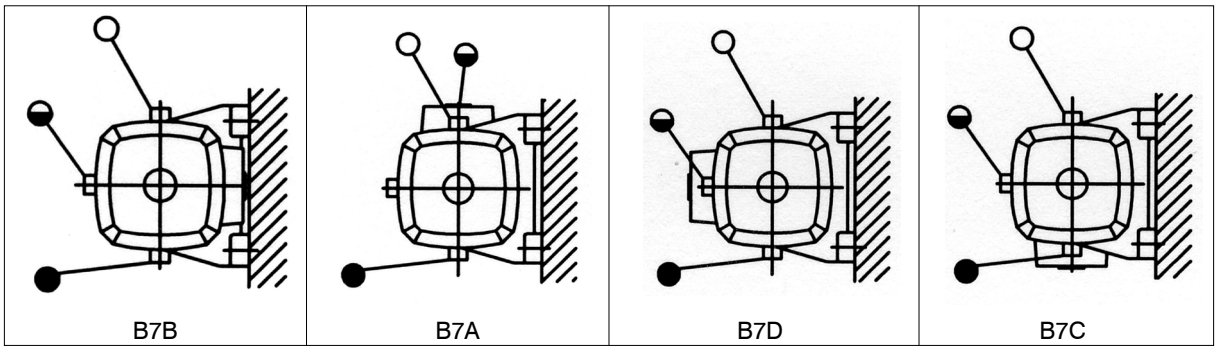
10.4 Foot mounted gears, vertical position



10.5 Right angle foot mounted gears, horizontal position

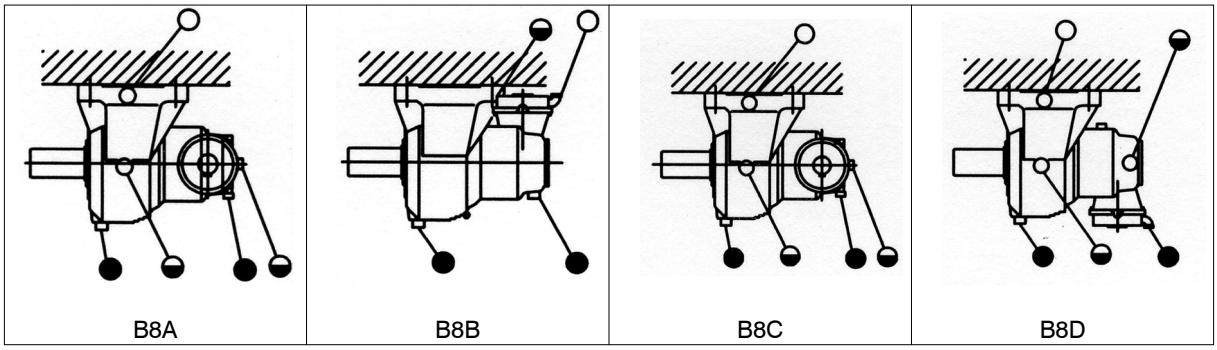




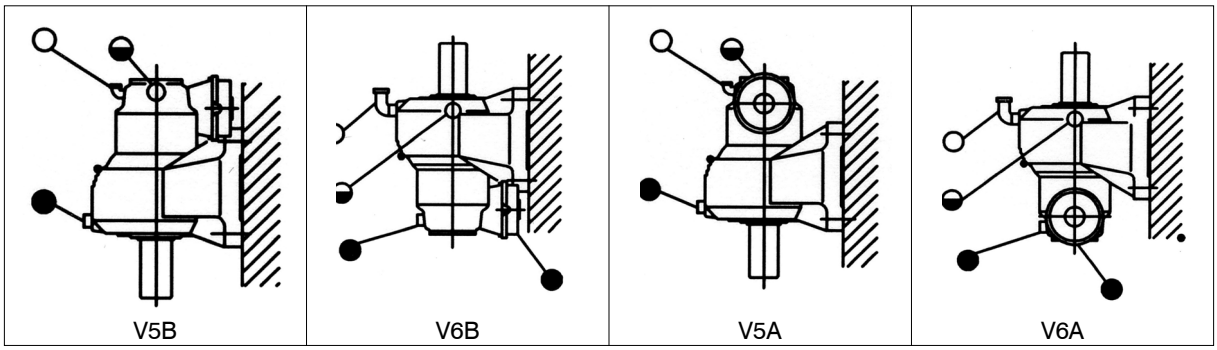


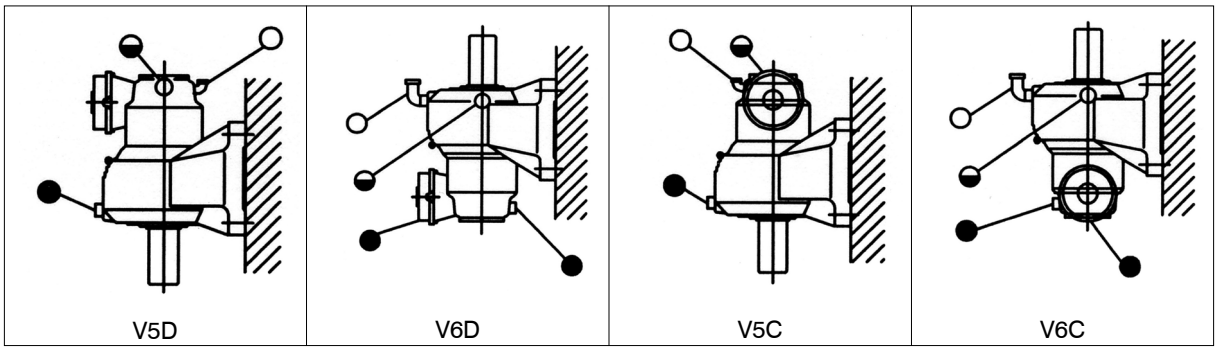
○ = Breather and filling plug ◒ = Oil level plug ● = Drain plug

10.5 Right angle foot mounted gears, horizontal position



10.6 Right angle foot mounted gears, vertical position





11.Weight (kg) and oil quantity table (l):

Mounting position: horizontal - B3; vertical - V5/V6. At vertical mounting position (V5/V6) provide an recompension box (AN: 80.9031.0001)!

Type		kg	B3	V5 / V6
EM 1010	Z / K	13	0,5	1,0
	MR	14	0,5	1,0
	H	12,5	0,5	1,0
	FS	13	0,5	1,0
ED 2010	Z / K	17	0,8	1,6
	MR	18	0,8	1,6
	H	16,5	0,8	1,6
	FS	17	0,8	1,6
ET 3010	Z / K	21	0,9	1,8
	MR	22	0,9	1,8
	H	20	0,9	1,8
	FS	21	0,9	1,8
EM 1020	MR	31	1,0	2,0
	H	23	1,2	2,4
	FS	31	1,0	2,0
ED 2020	MR	30	1,2	2,4
	H	22	1,5	3,0
	FS	30	1,2	2,4
EC 2020	MR	69	2,2	4,4
	H	61	2,3	4,6
	FS	69	2,2	4,4
ET 3020	MR	38	1,6	3,2
	H	26	1,7	3,4
	FS	38	1,6	3,2
EQ 4020	MR	40	1,7	3,4
	H	30	1,8	3,6
	FS	40	1,7	3,4
ED 2030	MR	32	1,3	2,6
	H	26	1,1	2,2
ET 3030	MR	40	1,6	3,2
	H	30	1,6	3,2
EQ 4030	MR	42	1,7	3,4
	H	23	1,7	3,4
ED 2040	Z / K	45	1,7	3,4
ET 3040	Z / K	46	1,7	3,4
EQ 4040	Z / K	48	1,8	3,6
EM 1045	MR	36	1,0	2,0
	H	28	1,1	2,2
	FS	36	1,0	2,0
ED 2045	MR	48	1,6	3,2
	H	38	1,5	3,0
	FS	48	1,6	3,2
EC 2045	MR	71	2,0	4,0
	H	63	2,1	4,2
	FS	71	2,0	4,0

Type		kg	B3	V5 / V6
ET 3045	MR	49	1,6	3,2
	H	40	1,6	3,2
	FS	49	1,6	3,2
EC 3045	MR	83	3,0	6,0
	H	75	3,2	6,4
	FS	83	3,0	6,0
EQ 4045	MR	51	2,2	4,4
	H	44	2,5	5,0
	FS	51	2,2	4,4
EM 1046	Z / K	45	1,2	2,4
ED 2046	Z / K	52	2,0	4,0
EC 2046	Z / K	82	2,5	5,0
ET 3046	Z / K	60	1,8	3,6
EC 3046	Z / K	90	3,3	6,6
EQ 4046	Z / K	62	2,2	4,4
EM 1065	MR	65	1,6	3,2
	FS	65	1,6	3,2
ED 2065	MR	75	2,4	4,8
	H	70	2,6	5,2
	FS	75	2,4	4,8
EC 2065	MR	102	2,7	5,4
	H	97	2,9	5,8
	FS	102	2,7	5,4
ET 3065	MR	78	2,3	4,6
	H	73	2,5	5,0
	FS	78	2,3	4,6
EC 3065	MR	115	3,7	7,4
	H	110	3,8	7,6
	FS	115	3,7	7,4
EQ 4065	MR	80	2,5	5,0
	H	75	2,8	5,6
	FS	80	2,5	5,0
EM 1090	Z / K	100	2,2	4,4
	MR	110	3,0	6,0
	H	95	2,2	4,4
	FS	100	2,2	4,4
ED 2090	Z / K	106	2,2	4,4
	MR	115	3,5	7,0
	H	95	3,2	6,4
	FS	106	2,2	4,4
EC 2090	Z / K	140	5,0	10,0
	MR	148	6,0	12,0
	H	133	5,2	10,4
	FS	140	5,0	10,0

11.Weight (kg) and oil quantity table (l):

Mounting position: horizontal - B3; vertical - V5/V6. At vertical mounting position (V5/V6) provide an recompension box (AN: 80.9031.0001)!

Type		kg	B3	V5 / V6
ET 3090	Z / K	116	3,3	6,6
	MR	125	3,2	6,4
	H	110	3,2	6,4
	FS	116	3,3	6,6
EC 3090	Z / K	145	5,2	10,4
	MR	153	6,2	12,4
	H	146	5,5	11,0
	FS	145	5,2	10,4
EQ 4090	Z / K	119	4,0	8,0
	MR	128	5,0	10,0
	H	113	3,8	7,6
	FS	119	4,0	8,0
EC 4090	Z / K	153	5,5	11,0
	MR	161	6,5	13,0
	H	154	5,8	11,6
	FS	153	5,5	11,0
EM 1150	Z / K	110	2,5	5,0
	MR	135	4,5	9,0
	H	90	1,8	3,6
	FS	110	2,5	5,0
ED 2150	Z / K	123	3,2	6,4
	MR	156	5,0	10,0
	H	108	2,5	5,0
	FS	123	3,2	6,4
EC 2150	Z / K	175	5,0	10,0
	MR	195	7,0	14,0
	H	120	3,0	6,0
	FS	175	5,0	10,0
ET 3150	Z / K	130	3,5	7,0
	MR	165	5,3	10,6
	H	125	3,0	6,0
	FS	130	3,5	7,0
EC 3150	Z / K	158	4,4	8,8
	MR	193	6,0	12,0
	H	130	3,7	7,4
	FS	158	4,4	8,8
EQ 4150	Z / K	133	3,7	7,4
	MR	168	5,5	11,0
	H	128	3,5	7,0
	FS	133	3,7	7,4
EC 4150	Z / K	185	5,5	11,0
	MR	205	6,0	12,0
	H	143	3,5	7,0
	FS	185	5,5	11,0
EM 1250	Z / K	138	3,8	7,0
	H	128	2,5	5,0
	FS	138	3,8	7,0

Type		kg	B3	V5 / V6
ED 2250	Z / K	190	4,5	9,0
	H	160	3,5	7,0
	FS	190	4,5	9,0
EC 2250	Z / K	205	6,5	13,0
	H	195	5,0	10,0
	FS	205	6,5	13,0
ET 3250	Z / K	197	5,0	10,0
	H	180	4,5	9,0
	FA	197	5,0	10,0
EC 3250	Z / K	225	5,7	11,4
	H	200	6,0	12,0
	FS	225	5,7	11,4
EQ 4250	Z / K	200	5,2	10,4
	H	163	4,8	9,6
	FS	200	5,2	10,4
EC 4250	Z / K	235	7,0	14,0
	H	195	5,7	11,4
	FS	235	7,0	14,0
EM 1400	Z / K	198	3,5	7,0
	H	170	3,5	7,0
	FS	198	3,5	7,0
ED 2400	Z / K	231	4,3	8,6
	H	220	4,0	8,0
	FS	231	4,3	8,6
ET 3400	Z / K	257	4,8	9,6
	H	230	4,5	9,0
	FS	257	4,8	9,6
EC 2400	Z / K	290	8,0	14,0
	H	260	7,5	13,0
	FS	290	8,0	14,0
EC 3400	Z / K	270	5,5	11,0
	H	267	6,7	13,4
	FS	270	5,5	11,0
EQ 4400	Z / K	272	5,7	11,4
	H	223	5,5	11,0
	FS	272	5,7	11,4
EC 4400	Z / K	290	6,3	12,6
	H	248	6,0	12,0
	FS	290	6,3	12,6
PD 1010	MRZ	17	1,1	2,0
PD 2010	MRZ	19	1,3	2,3
PD 3010	MRZ	30	1,4	2,5
PD 1020	MRZ	42	3,6	6,8
PD 2020	MRZ	43,5	3,8	7,2
PD 3020	MRZ	45	4,0	7,5
PD 4020	MRZ	46,5	4,3	8,0
PD 2030	MRZ	45	3,6	6,8

11.Weight (kg) and oil quantity table (l):

Mounting position: horizontal - B3; vertical - V5/V6. At vertical mounting position (V5/V6) provide an recompension box (AN: 80.9031.0001)!

Type		kg	B3	V5 / V6
PD 3030	MRZ	46,5	3,8	7,1
PD 4030	MRZ	48	4,1	7,6
PD 1045	MRZ	43	3,4	6,5
PD 2045	MRZ	54	4,0	7,6
PD 3045	MRZ	59	4,2	8,0
PD 4045	MRZ	65	4,5	8,2
PD 1065	MRZ	71	5,0	9,0
PD 2065	MRZ	81	5,8	10,5
PD 3065	MRZ	86	6,0	11,0
PD 4065	MRZ	90	6,4	11,8
PD 1090	MRZ	125	5,2	9,5
PD 2090	MRZ	134	6,0	11,0
PD 3090	MRZ	140	6,3	11,6
PD 4090	MRZ	144	7,0	13,0
PD 1150	MRZ	147	5,5	10,2
PD 2150	MRZ	160	6,3	11,6
PD 3150	MRZ	167	6,5	12,0
PD 4150	MRZ	172	7,2	13,4
PDA 2010	MRZ			
PDA 3010	MRZ			
PDA 4010	MRZ			
PDA 2020	MRZ			
PDA 3020	MRZ			
PDA 3030	MRZ			
PDA 4030	MRZ			
PDA 2045	MRZ	77	4,0	8,0
PDA 3045	MRZ	93	5,5	7,5
PDA 4045	MRZ			
PDA 2065	MRZ	108	6,0	11,4
PDA 3065	MRZ	123	7,0	13,8
PDA 4065	MRZ			
PDA 2090	MRZ	168	8,5	14,8
PDA 3090	MRZ	169	9,0	15,4
PDA 4090	MRZ	178	9,5	16,0
PDA 2150	MRZ	212	10,0	15,2
PDA 3150	MRZ	195	9,0	15,7
PDA 4150	MRZ	224	9,0	16,4

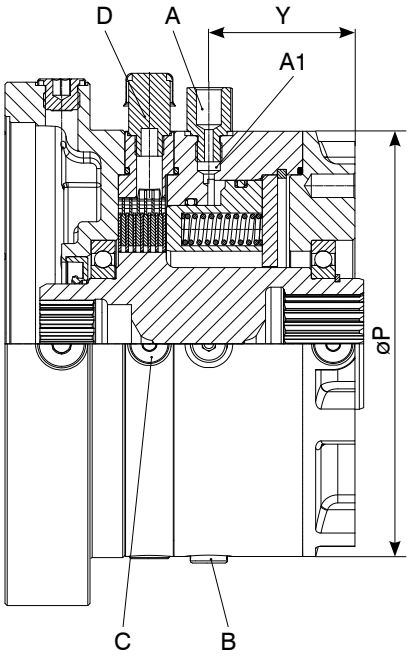
11.Weight (kg) and oil quantity table (l):

Mounting position: horizontal - B3; vertical - V5/V6. At vertical mounting position (V5/V6) provide an recompension box (AN: 80.9031.0001)!

Type		kg	B3	V5 / V6
SL 3001	FE	213	5,7	11,4
	MP	213	6,0	12,0
SL 3002	FE	278	7,2	14,5
	MP	278	8,0	15,9
SL 3003	FE	288	7,7	15,3
	MP	288	8,0	16,0
SL 3004	FE	301	8,3	16,5
	MP	301	8,8	17,6
SC 3002	FE	348		
	MP	348		
SC 3003	FE	328	8,9	17,8
	MP	328	9,9	19,8
SC 3004	FE	335	9,0	18,0
	MP	335	10,0	20,0
SL 4001	FE	227	5,8	11,6
	MP	227	6,2	12,4
SL 4002	FE	290	7,6	15,2
	MP	290	8,0	16,0
SL 4003	FE	305	8,0	16,0
	MP	305	8,6	17,2
SL 4004	FE	317	8,7	17,4
	MP	317	9,0	18,0
SC 4002	FE	366		
	MP	366		
SC 4003	FE	332	10,7	21,3
	MP	332	11,2	22,4
SC 4004	FE	342	11,3	22,6
	MP	342	12,0	24,0
SL 6001	FE			
	MP			
SL 6002	FE	423		
	MP	423		
SL 6003	FE	436	11,6	23,3
	MP	436	10,9	21,8
SL 6004	FE	444	12,5	25,0
	MP	444	11,7	23,4
SC 6003	FE	564	19,0	38,0
	MP	564		
SC 6004	FE	496		
	MP	496		
SL 8501	FE			
	MP			
SL 8502	FE	529	15,8	31,6
	MP	529	16,9	33,8
SL 8503	FE	617	16,2	32,4
	MP	617	17,3	34,6

Type		kg	B3	V5 / V6
SL 8504	FE	617	17,0	34,0
	MP	617	19,0	38,0
SC 8503	FS	670	24,0	48,0
	MP	670	25,0	50,0
SC 8504	FE	662		
	MP	662	22,0	44,0
SL 12001				
SL 12002	FE	666	20,0	40,0
SL 12003	FE	727	22,0	44,0
SL 12004	FE	748	23,0	46,0
SC 12003	FE	827	27,0	54,0
SC 12004	FE	837	18,0	36,0
SL 18001				
SL 18002				
SL 18003	FE	917	29,0	58,0
SL 18004	FE	645	30,0	60,0
SC 18004	FS	1050	39,0	78,0
SL 25001				
SL 25002				
SL 25003	FE	1416	39,0	78,0
SL 25004	FE	1459	41,0	82,0
SC 25004	FS	1596	49,0	98,0
SL 35001				
SL 35002				
SL 35003	FS	1896	51,0	102,0
SL 35004	FE	2009	53,0	106,0
SC 35004	FE	2110	54,0	108,0
SL 50003	FE	2286	51,0	121,5
SL 50004	FE	2324	71,0	142,0
SL 50005	FE	2466	81,0	163,0

12. multi disc brakes:



A = with adapter
A1 = without adapter

Our gear units can be supplied with hydraulically released negative multidisc brakes.

Negative brakes are held on by a series of oil springs pressing together alternate fixed and rotating plates. This means they work as a „negative“ brake and are intended for parking or emergency stopping only. Normal stopping of the machine should be done by the hydraulic system.

The performances, with +/- 10 % accuracy margings, are always calculated without back pressure; otherwise the braking tourque is reduced as a percentage of the ratio back pressure/minimum opening pressure.

When carring out the selection, the following two conditions must be taken into account:

1) Braking torque x i_{eff} > required output torque;
2) Braking torque x i_{eff} < 1,1 · T_{2max}

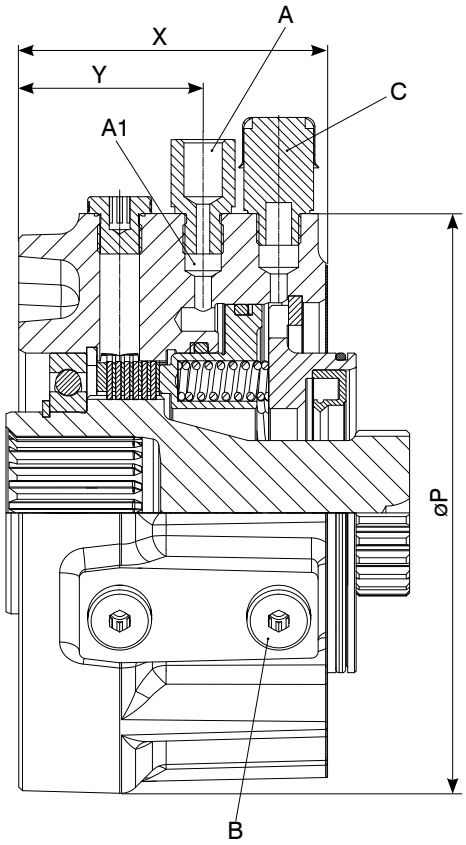
We remind you that high rotation speed, or extended running with vertical axis , can generate considerable temperature increases; in such cases, or when braking of high interial loads is required, please apply to tecnical-office staff for advice.

For lubrication we recommend to use mineral oils, heat and aging resistant, having viscosity ISO VG 32 and viscosity index at least 95; hydraulic oils are usually suitable.

Typ	braking torque T_{max} -static	opening pressure	$p_{max.}$	weight [kg]	oil volume (horizontal)	oil volume (vertical)
FL 250	181 - 278 Nm	12 - 15 bar	315 bar	15	0,3 l	0,6 l
FL 350	417 - 571 Nm	18 - 22 bar	315 bar	15	0,3 l	0,6 l
FL 450	540 - 737 Nm	22 - 28 bar	315 bar	15	0,3 l	0,6 l
FL 650	642 - 949 Nm	18 - 22 bar	315 bar	15	0,5 l	1,0 l
FL 750	834 - 1.229 Nm	22 - 28 bar	315 bar	15	0,5 l	1,0 l
FL 960	1.528 - 2.293 Nm	19 - 25 bar	315 bar	22	1,2 l	2,4 l

Typ	A Brake releasing plug	A1 Brake releasing plug	B Drain plug	C Oil level plug	D Breather and filling plug	Brake release volume (new discs) cm³	Brake release volume (worn out discs) cm³	P [mm]	Y [mm]
FL 250	G 1/4	M12 x 1,5	G 1/4	G 1/4	G 1/4	15	30	195	67
FL 350	G 1/4	M12 x 1,5	G 1/4	G 1/4	G 1/4	15	30	195	67
FL 450	G 1/4	M12 x 1,5	G 1/4	G 1/4	G 1/4	15	30	195	67
FL 650	G 1/4	M12 x 1,5	G 1/4	G 1/4	G 1/4	15	30	195	67
FL 750	G 1/4	M12 x 1,5	G 1/4	G 1/4	G 1/4	15	30	195	67
FL 960	G 1/4	M12 x 1,5	G 1/4	G 1/4	G 1/4	22	45	225	72,5

12. multi disc brakes FL 635:



A = with adapter
A1 = without adapter

Our gear units can be supplied with hydraulically released negative multidisc brakes.

Negative brakes are held on by a series of oil springs pressing together alternate fixed and rotating plates. This means they work as a „negative“ brake and are intended for parking or emergency stopping only. Normal stopping of the machine should be done by the hydraulic system.

The performances, with +/- 10 % accuracy margings, are always calculated without back pressure; otherwise the braking tourque is reduced as a percentage of the ratio back pressure/minimum opening pressure.
When carring out the selection, the following two conditions must be taken into account:

1) Braking torque x i_{eff} > required output torque;
2) Braking torque x i_{eff} < 1,1 · T_{2max}

We remind you that high rotation speed, or extended running with vertical axis , can generate considerable temperature increases; in such cases, or when braking of high interial loads is required, please apply to tecnical-office staff for advice.

For lubrication we recommend to use mineral oils, heat and aging resistant, having viscosity ISO VG 32 and viscosity index at least 95; hydraulic oils are usually suitable.

Typ	braking torque T_{max} -static	opening pressure	$p_{max.}$	weight [kg]	oil volume (horizontal)	oil volume (vertical)
FL 635../ 63	63 Nm	12 - 15 bar	315 bar	9	0,1 l	0,2 l
FL 635../ 80	80 Nm	12 - 15 bar	315 bar	9	0,1 l	0,2 l
FL 635../100	100 Nm	12 - 15 bar	315 bar	9	0,1 l	0,2 l
FL 635../127	127 Nm	12 - 15 bar	315 bar	9	0,1 l	0,2 l
FL 635../150	150 Nm	12 - 15 bar	315 bar	9	0,1 l	0,2 l
FL 635../189	189 Nm	12 - 15 bar	315 bar	9	0,1 l	0,2 l
FL 635../200	200 Nm	12 - 15 bar	315 bar	9	0,11	0,21
FL 635../220	220 Nm	12 - 15 bar	315 bar	9	0,11	0,2 l
FL 635../250	250 Nm	12 - 15 bar	315 bar	9	0,1 l	0,2 l
FL 635../315	315 Nm	12 - 15 bar	315 bar	9	0,1 l	0,2 l
FL 635../380	380 Nm	12 - 15 bar	315 bar	9	0,1 l	0,2 l

Typ	A Brake releasing plug	A1 Brake releasing plug	B Drain plug	C Breather and filling plug	Brake release volume (new discs) cm³	Brake release volume (worn out discs) cm³	X [mm]	P [mm]	Y [mm]
FL 635..	G1/4	M12 x 1,5	G1/4	G1/4	10	20	91	165	55

DÜSTERLOH has been developing fluid technology products for more than 100 years.
The drives, controles and hydraulic power units from Hattingen are appreciated throughout the world for their complete reliability; including under extreme conditions. The owner-managed company´s own development and construction department and the wide range of products cater for distinctive flexibility and customer-orientation.

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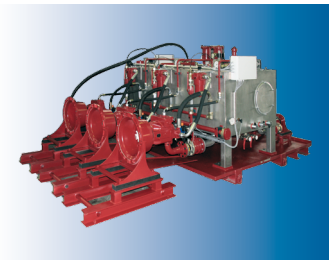
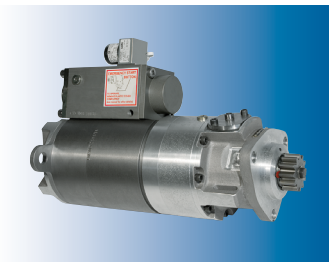
- Hydraulic radial piston motors
- Hydraulic axial piston motors
- Pneumatic motors
- Pneumatic starters
- Hydraulic and pneumatic controls
- Hydraulic power units

Designing controls and hydraulic power units specific to the customer is our company´s major strength. Vast product diversity is also available for standardised products.

Industrial areas of application

- Machine tools
- Smelting and rolling mill equipment
- Foundry machines
- Testing machines
- Shipbuilding (diesel engines)
- Offshore technology
- Printing and paper technology
- Vehicle construction
- Manipulators
- Environmental technology
- Mining equipment
- Materials handling equipment





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