



BREVINI[®]

Motion Systems

Service Manual

Industrial S-Series Slewing (MTF011000-2015)

IMM-0001EN
May 2021

DISCLAIMER

The official language chosen by the Product manufacturer is English. No liability is assumed as a result of translations in other languages not in compliance with the original meaning. In case of conflicting language versions of this document, the English original prevails. Dana shall not be liable for any misinterpretation of the content here into. Photos and illustrations might not represent the exact product.

© Copyright 2021 Dana Incorporated

All content is subject to copyright by Dana and may not be reproduced in whole or in part by any means, electronic or otherwise, without prior written approval.

THIS INFORMATION IS NOT INTENDED FOR SALE OR RESALE, AND THIS NOTICE MUST REMAIN ON ALL COPIES.

INDEX

INTRODUCTION	5
HOW TO CONSULT THE MANUAL	5
SCOPE OF THE MANUAL	5
WARRANTY CONDITIONS	6
GENERAL WARNINGS	6
REPRODUCTION AND COPYRIGHT RESTRICTIONS	6
REVISIONS	6
VERSION TRACKING	6
MODELS	6
TECHNICAL DATA	7
CODE DESCRIPTION	8
CONFIGURATIONS	8
VERSIONS OF GEAR-COUPLING UNIT WITH ACTIVE CLUTCH SAFETY SYSTEM	11
SUPPLY CONDITION	13
PACKING, HANDLING, RECEIVING, STORAGE	15
PACKING	15
HANDLING	15
RECEIVING	17
HANDLING THE MACHINE WITHOUT PACKING	19
STORAGE	19
INSTALLATION	21
GENERAL INSTRUCTIONS	21
INSTALLATION INSTRUCTIONS FOR FLANGE MOUNTED GEAR UNIT	21
INSTALLATION INSTRUCTIONS FOR A FOOT MOUNTED GEAR UNIT	22
INSTALLATION INSTRUCTIONS FOR A SHAFT MOUNTED GEAR UNIT	22
MOUNTING THE REACTION ARM ON THE GEAR UNIT	22
INSTALLING THE GEAR UNIT WITH AN FS OUTPUT	22
DISASSEMBLING THE COUPLING AND THE GEAR UNIT	23
INSTALLING THE GEAR UNIT WITH AN FP OUTPUT	24
DISASSEMBLING THE GEAR UNIT WITH AN FP OUTPUT	24
INSTALLING THE GEAR UNIT TYPE "RPR"	25
INSTALLATION INSTRUCTIONS FOR GEAR UNIT-COUPLER ASSEMBLY WITH ACTIVE CLUTCH SAFETY SYSTEM	26
ACCESSORY INSTALLATION INSTRUCTIONS	26
START-UP OF AUXILIARIES (BRAKES - CLUTCHES- ETC.)	27
NEGATIVE MULTI-DISK BRAKE	27
DISK BRAKE	27
GEAR UNIT-COUPLER ASSEMBLY WITH ACTIVE CLUTCH SAFETY SYSTEM	28
LUBRICATION	29
GEAR UNIT LUBRICATION	29
VISCOSITY	29
ADDITIVES	29
EXPANSION TANK	31
BRAKE LUBRICATION	32
GREASE FEATURES	32
LUBRICANT TABLE	33
DIAGRAMS AND OIL CHECKING WITH AUXILIARY COOLING SYSTEM	35
CHECKS	37
FIRST START-UP CHECKS	37
VALUES TABLE TORQUE SETTING BOLTS	38
NO-LOAD TESTS	38
MAINTENANCE	39
ROUTINE MAINTENANCE	39
OIL CHANGE	39
UNSCHEDULED MAINTENANCE	39

INDEX

MAINTENANCE OF AUXILIARIES (BRAKES - CLUTCHES- ETC.)	41
PROCEDURE TO REPLACE DISKS OR SEALS FOR MULTI DISK BRAKES	41
PROCEDURE TO REPLACE PADS FOR DISK BRAKES	41
MAINT. PROC. FOR HYDR. POWER PACK ON GEAR UNIT-COUPLER ASSEMBLY WITH ACTIVE CLUTCH	
SAFETY SYSTEM	42
SCRAP DISPOSAL	43
MACHINE DEMOLITION	43
ECOLOGY INFORMATION	43
PROBLEMS AND RELATIVE SOLUTIONS	45
“S” SERIE	47
INSTALLATION OF GEAR UNIT WITH FS OUTPUT	47
DISASSEMBLING THE COUPLING AND GEAR UNIT	49

INTRODUCTION

Dana Incorporated. 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.

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.

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 machine 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 machine.

SKILLED TECHNICIAN:

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

CAUTION

Operator accident-prevention standards.

WARNING

The machine and/or its parts may be damaged.

WARNING

Additional information regarding the operation being carried out.

NOTE:

Provides useful information.

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

WARRANTY CONDITIONS

WARRANTY CONDITIONS

Dana Incorporated. warrants that its products shall be free from defects for a period of 12 months from the date the product is shown to have been placed

in operation by original user and/or in any case for a period of maximum 18 months from the date of shipment.

The warranty shall not be valid if the defect or not conformity will prove to be depending on not correct on not suitable applications of the product, or if the product has been uncorrectly placed in operation.

- The warranty by Dana Incorporated. is expressly limited to the repair or replacement of the defected product, which is returned our factory after notification of failure, and thereafter if the product is found by Dana Incorporated RIDUTTORI S.p.A. to be, in fact, defective.
- Dana Incorporated. shall not be liable for any damages, either material or economic, resulting from or caused by any defects. Dana Incorporated. will only be liable for repair or replacement of the product.
- The gearbox is intended to be used in suitable environment and for suitable applications in appliance with what has been foreseen at the moment the project has been studied.
- Improper use of the gearbox is forbidden.
- Any change or replacement of machine parts, which has not been authorized by Dana Incorporated. , may represent an accident risk and therefore releases the manufacturer from any civil or penal liabilities, and makes the warranty invalid.

GENERAL WARNINGS

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

- a - Accident risks.
- b - D.P.I. devices designed to ensure operator safety (individual protection devices: goggles, gloves, hard-hat, etc.).
- c - General accident-prevention rules or those set forth by international directives and by the laws of the country where the machine will be used.
- d - When delivered, check that the Gear unit has not been damaged during transport and that any accessories are complete.
- e - Before standing to work, the operator must be familiar with machine features and must have read this entire manual.

REPRODUCTION AND COPYRIGHT RESTRICTIONS

Dana Incorporated.reserves all rights.

It is prohibited to reproduce all or a portion of the structure and contents of this manual, unless expressly authorized by Dana Incorporated.. Furthermore, it is prohibited to store such information on any type of support (magnetic, magnetic-optical, microfilm, photocopies, etc.).

REVISIONS

Subsequent revisions of the manual will be issued as a result of machine functional changes or replacements.

VERSION TRACKING



FILE NAME	REV.	DATE	DESCRIPTION
Manual Industrial and Slewing	Rev. 00	23/10/2014	Document issued
IMM-0001EN Industrial _S-Series_Slewing (MTF011000-2015)	Rev.01	10/10/2018	- Changed layout - Added Version tracking p. 6 - Changed Technical data p. 7

MODELS

--

TECHNICAL DATA

Each gear unit is supplied with an identification nameplate and a manufacture's declaration (as per the enclosure II B) which have been prepared according to EEC directive 392 and subsequent amendments. The identification nameplate contains the main technical data regarding the functional and construction features of the gear unit. Therefore, it must always be visible and undamaged.

 BREVINI[®] <i>Motion Systems</i>		2	
<i>Item 1</i>		<i>Family</i>	3
 8	<i>Out</i>	4	
	<i>i=</i>	5	
	<i>In</i>	6	
<i>S.N.</i>	9	<i>Info</i>	7

- 1 - Type or gear unit
- 2 - Date of production: month/year - country of production
- 3 - Description
- 4 - Gear unit output
- 5 - Reduction ratio
- 6 - Gear unit input
- 7 - Info
- 8 - Bar code
- 9 - Serial number

CODE DESCRIPTION

CODE DESCRIPTION

ED	2090	MR	20	FL350	B3
Gear unit family	Reduction Size	Gear Unit Output	Reduction Ratio	Gear Unit Input	Construction Form

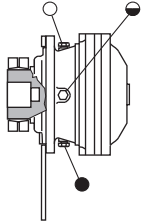
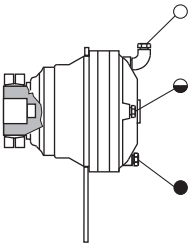
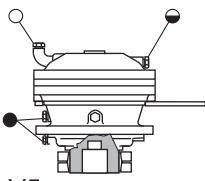
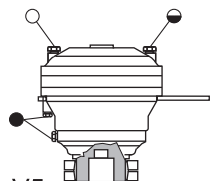
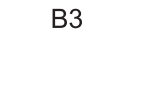
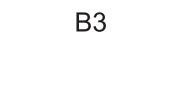
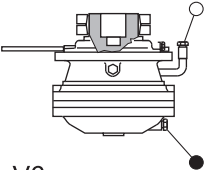
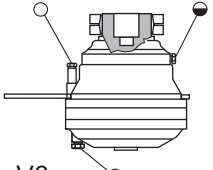
CONFIGURATIONS

SYMBOL	DESCRIPTION
●	Magnetic pug drain oil
◐	Oil level plug
○	Breather and filling plug
□	Brake opening control coupling

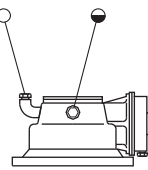
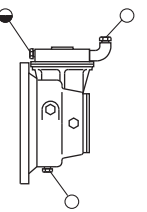
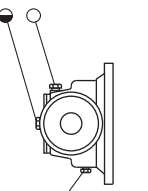
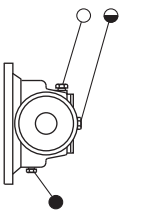
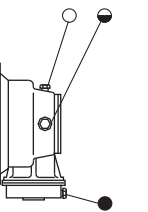

In Line

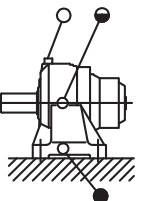
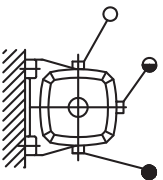
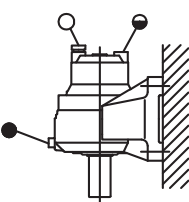
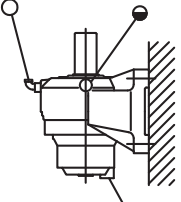
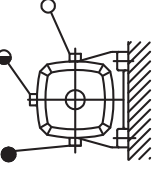
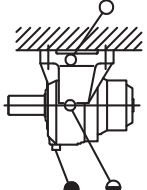
	HORIZONTAL POSITION		VERTICAL POSITION	
	010 - 091	150 - 320	010 - 091	150 - 320
MN-MR-MN1-MR1				
FE				

CONFIGURATIONS

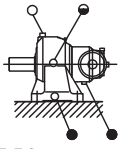
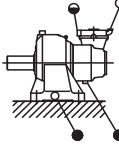
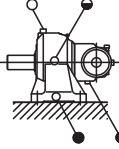
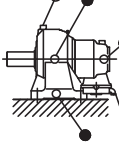

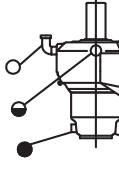
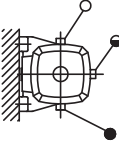
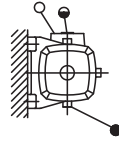
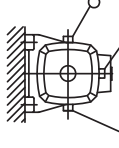
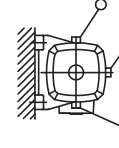
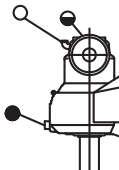
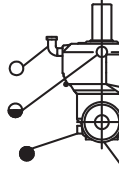
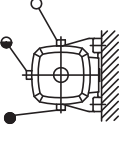
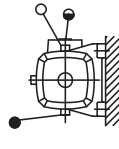
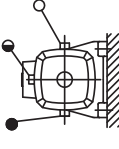
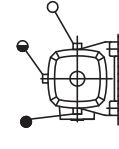
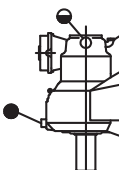
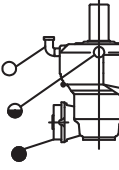
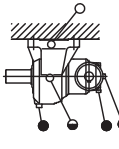
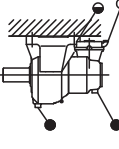
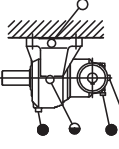
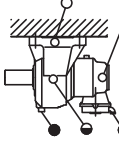
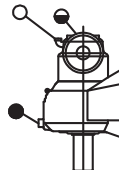
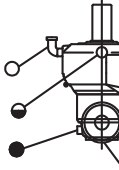
HORIZONTAL POSITION			VERTICAL POSITION	
FS				
				

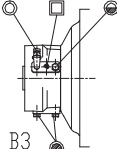
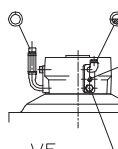
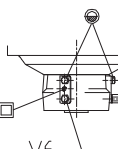
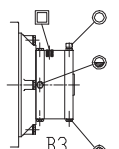
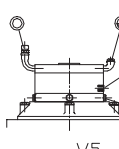
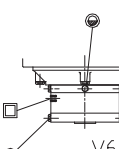
Right Angle

					
V5B	B3D	B3C	B3A	B3B	V6B

HORIZONTAL POSITION			VERTICAL POSITION	
In Line				
				

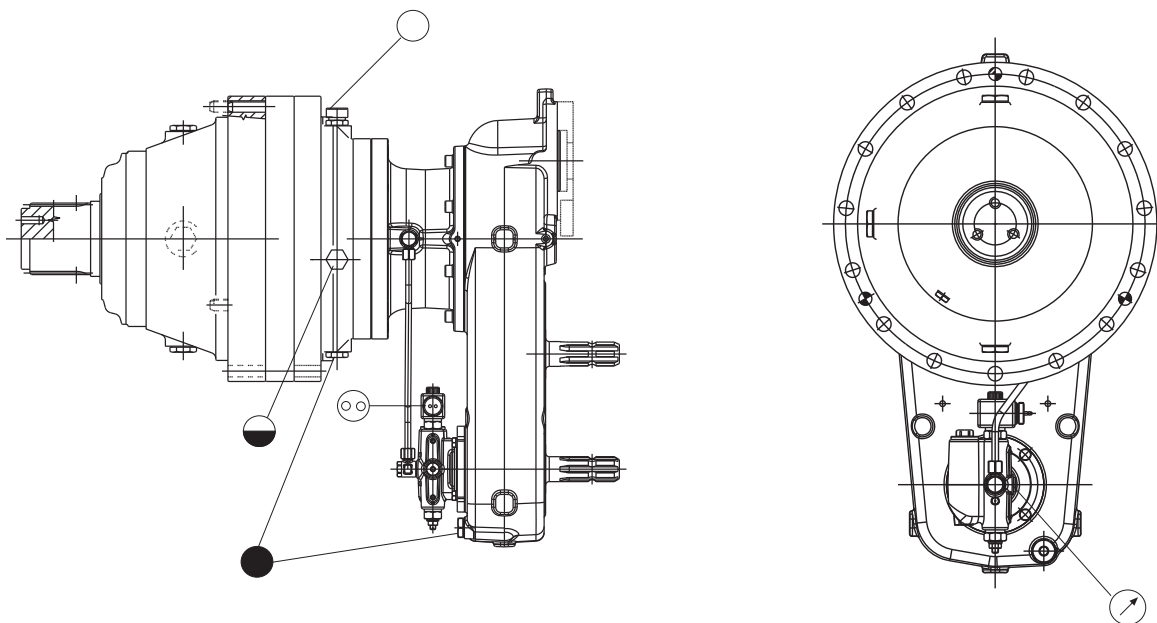
CONFIGURATIONS

		HORIZONTAL POSITION				VERTICAL POSITION	
Right Angle		 B3C	 B3D	 B3A	 B3B	 V5B	 V6B
		 B6B	 B6C	 B6D	 B6A	 V5A	 V6A
		 B7B	 B7A	 B7D	 B7C	 V5D	 V6D
		 B8A	 B8B	 B8C	 B8D	 V5C	 V6C

BRAKES FL620 - FL635			5" AND 9" BRAKES		
 B3	 V5	 V6	 B3	 V5	 V6

VERSIONS OF GEAR-COUPLING UNIT WITH ACTIVE CLUTCH SA-

VERSIONS OF GEAR-COUPLING UNIT WITH ACTIVE CLUTCH SAFETY SYSTEM



SYMBOL	DESCRIPTION
○	BREATHER AND FILLING PLUG
●	MAGNETIC DRAIN PLUG
◐	OIL LEVEL PLUG
○○	SOLENOID VALVE CONTROL SOCKET
⊙	CIRCUIT PRESSURE GAUGE SOCKET (1/4 Gas plug)

SUPPLY CONDITION

The exterior of the gear units are painted with a synthetic epoxy primer (“RAL 5021” water blue), 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.

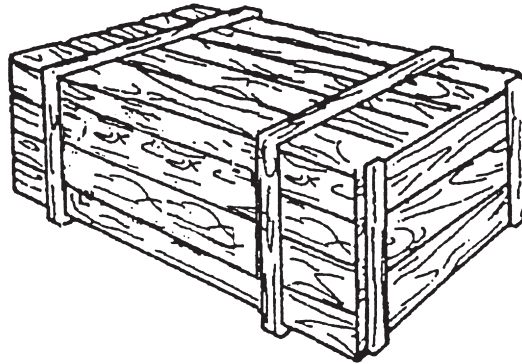
The machined external parts of the gear unit, such as the ends of the hollow and non-hollow shafts, support surfaces, spigots, etc. are protected with rust-inhibitor oil (tectyl). The internal parts of the gear unit casings and drives are also protected with rust-inhibitor oil.

NOTE:

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).

PACKING, HANDLING, RECEIVING, STORAGE

PACKING



CAUTION

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

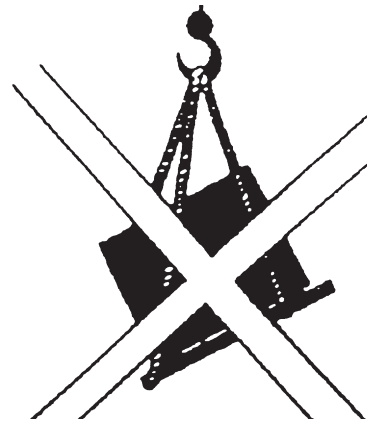
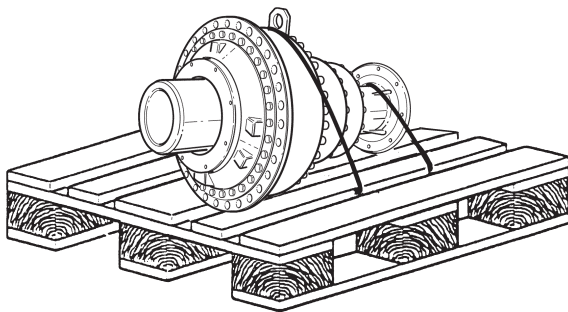
HANDLING

NOTE:

the weight shown on the nameplate does not include any accessories: such as brakes, motor flanges, wheel flanges, etc.; consequently, to obtain the gear unit + accessories total weight, please add, depending on the gear unit size, a max approximate extra weight of 40 kg. for input accessories; for output accessories, please calculate a max value equal to approx. the 8% of the gear unit weight depending on the unit size.

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.

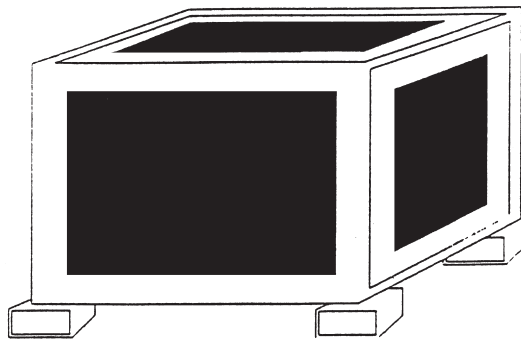


HANDLING

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



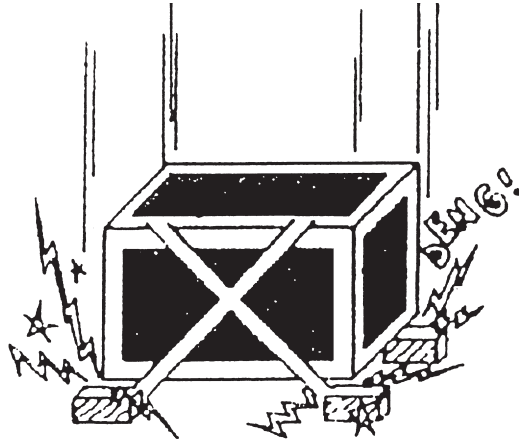
If necessary, place wooden wedges under the package to make lifting easier.



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.

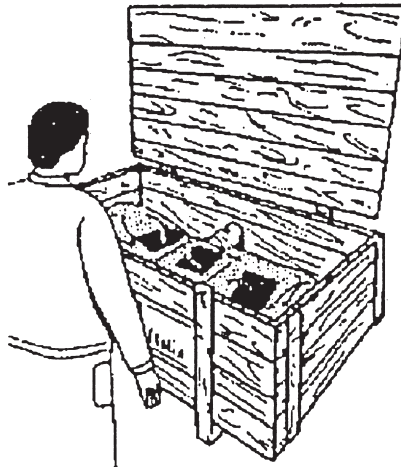


While lifting and positioning the package, avoid any violent impacts or bumps.

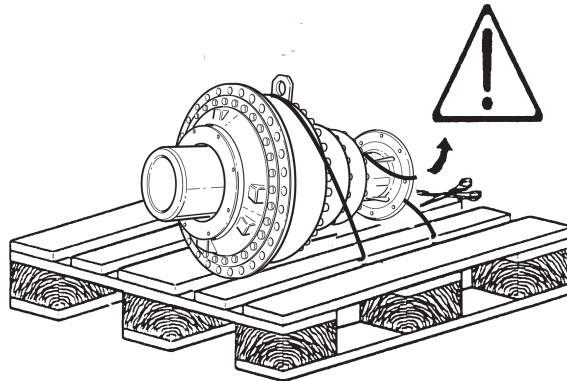


RECEIVING

When the Machine 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.



RECEIVING



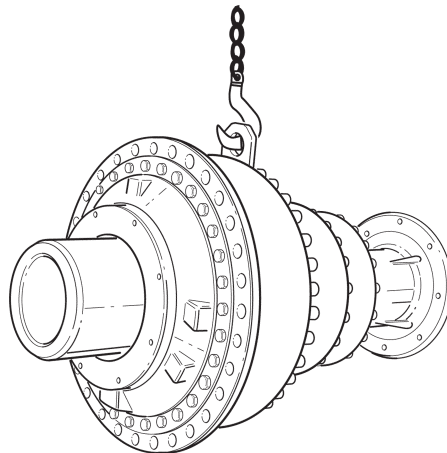
CAUTION

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 machine from the pallets.

If the machine has been damaged or if there are any defects or missing parts, immediately notify the Dana Incorporated. Service department: Tel. ++3905229281, Fax ++390522928300.

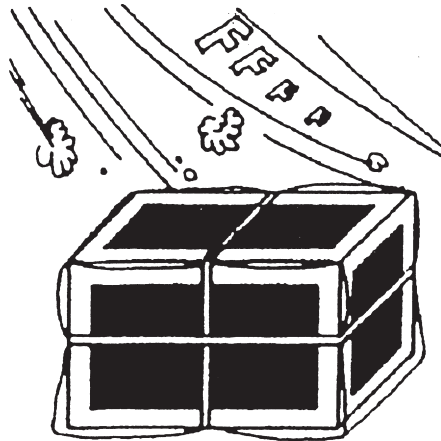


HANDLING THE MACHINE WITHOUT PACKING

HANDLING THE MACHINE WITHOUT PACKING

CAUTION

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



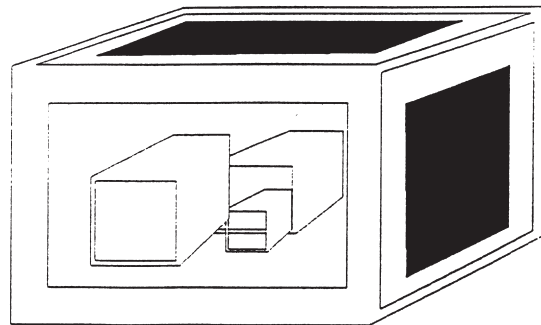
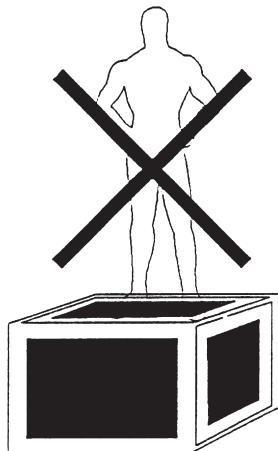
STORAGE

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

- 1 - Protect the shafts and the spigots with a film or grease and/or rust-inhibitor liquids
- 2 - Completely fill the gear unit and any multi-disk brake with suitable oil (see paragraph 7.4)
- 3 - Store the machine in a cool place at a temperature ranging from -5°C to $+30^{\circ}\text{C}$
- 4 - Protect the packages against dirt, dust and moisture.

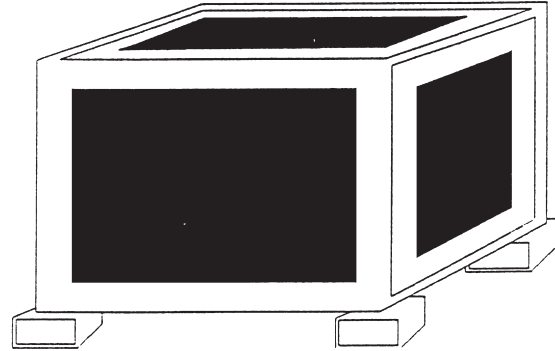
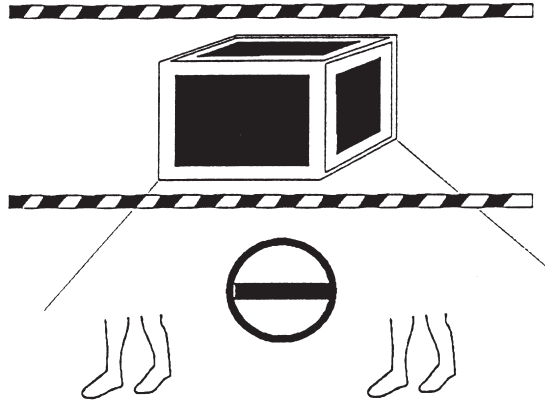
NOTE:

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 by and rotating the input shaft. For a negative multi-disk brake, release the brake by using a hydraulic pump or similar device (see paragraph 8.1 for the brake opening pressure). It is recommended to replace the gaskets when the machine is started.



STORAGE

- 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.
- Deep the package away from any passage areas.
- If possible, insert wooden wedges between the package and the floor.



INSTALLATION

GENERAL INSTRUCTIONS

Install the Product carefully following the steps listed below:

- a** - 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 (see paragraph Configurations p. 8 Configurations).
- b** - If the gear unit is supplied in the multi-disk brake configuration, make sure that the brake oil, breather, level and drain plugs are in the correct position?. Their position will vary according to the assembly position (see paragraph Configurations p. 8 Configurations).
- c** - The brakes in general must be correctly connected to their specific control circuits and, for hydraulically controlled brakes, they must be bled like the hydraulic circuit.
- d** - 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).
- e** - The Gear unit is normally supplied with a flange for coupling the electric, hydraulic and air motors.
- f** - 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.
- g** - 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:

Dana Incorporated. advises against filling its products with oil prior to installation.

INSTALLATION INSTRUCTIONS FOR FLANGE MOUNTED GEAR UNIT

- They must be attached to a rigid structure with a clean support surface that is perpendicular to the drive axis.
- 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 the reference pins in their seats, then tighten the attachment bolts (recommended minimum class 8.8), applying torque as indicated in the table “torque setting” paragraph Values Table Torque Setting Bolts p. 38, making sure that such torque settings are compatible with the other parts (nuts and/or structure).

NOTE:

It is recommended to use class 10.9 or 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.

INSTALLATION INSTRUCTIONS FOR A FOOT MOUNTED GEAR

INSTALLATION INSTRUCTIONS FOR A FOOT MOUNTED GEAR UNIT

- a - Make sure that the assembly feet rest on a flat surface. If not, shim them so that all are level.
- b - An improper support for the feet may break the unit.
- c - Attach the unit using bolts with a minimum class 8.8 tightened at the torque settings indicated in paragraph Values Table Torque Setting Bolts p. 38.

INSTALLATION INSTRUCTIONS FOR A SHAFT MOUNTED GEAR UNIT

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

MOUNTING THE REACTION ARM ON THE GEAR UNIT

- 1 - Check that spigots of the gear unit and the reaction arm are clean, not dented and that there are no traces of paint.
- 2 - Lubricate the couplings and insert the reaction arm on the gear unit spigot, then insert any dowels.
- 3 - Attach the reaction arm using minimum class 8.8 bolts.
- 4 - It is recommended to use class 10.9 or 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.
- 5 - 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.
- 6 - For torque settings refer to the table "torque setting" paragraph Values Table Torque Setting Bolts p. 38, making sure that such settings are compatible with the other parts (nuts and/or attachment structures).

INSTALLING THE GEAR UNIT WITH AN FS OUTPUT

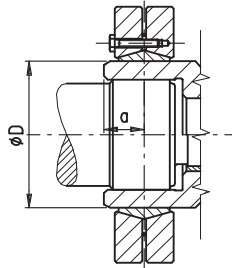
NOTE:

the connection couplings are supplied ready for installation, therefore they need not be disassembled prior to the initial installation.

- 1 - Slightly unscrew three bolts of the torque coupling located at 120° until the inner ring can just be turned by hand (excessive tightening might deform the inner ring).
- 2 - Insert it above the shaft of the gear unit whose external surface was previously lubricated.
- 3 - degrease the internal surface of the gear unit shaft and the machine shaft.
- 4 - Insert the gear unit on the machine shaft or vice versa (excessive axial force should not be necessary).
- 5 - Position the center line of the coupling on the center line of the useful section of the machine shaft (see fig. No. 1). During this operation refer to dimension "a" which will vary according to the size of the coupling, as indicated here in the table No. 1 Disassembling the coupling and the gear unit p. 23.
- 6 - Use a torque wrench and gradually tighten all the bolts in the coupling in a circular direction (not diametrically opposed) until they are fully tightened at a torque setting corresponding to the value reported in the table No. 1 Disassembling the coupling and the gear unit p. 23.
- 7 - Check that the 2 rings remain concentric and parallel while tightening, keeping in mind that the maximum tolerated parallelism error is 0.25-0.35% of the external diameter of the couplings.

INSTALLATION INSTRUCTIONS FOR A SHAFT MOUNTED GEAR

Fig. 1



NOTE:

Excessive tightening may permanently deform the inner ring, thus refer to the torque settings indicated in the table.

DISASSEMBLING THE COUPLING AND THE GEAR UNIT

1 - Gradually release the attachment bolts in a circular direction. Initially each bolt must be backed off only a quarter of a turn to prevent the attachment elements from seizing and to avoid tilting.

Table No. 1

DISK TYPE	DIMENSIONS			BOLTS			A
	d. sh.	d x D	H2	n	Type	Ma	
SD 62 M	50	62 x 110	29	10	M6 x 25	12	17
SD 100 M	75	100 x 170	43	12	M8 x 35	29	30
SD 125 M	90	125 x 215	52	12	M10 x 40	58	35
SD 140 M	100	140 x 230	58	10	M12 x 45	100	40
SD 165 M	120	165 x 290	68	8	M16 x 55	240	45
SD 175 M	130	175 x 300	68	8	M16 x 55	240	45
SD 185 M	140	185 x 330	85	10	M16 x 65	240	55
SD 185 H	140	185 x 330	112	15	M16 x 80	240	55
SD 220 H	165	220 x 370	134	20	M16 x 90	240	67
SD 240 H	180	240 x 405	144	15	M20 x 100	490	72
SD 280 H	220	280 x 460	172	20	M20 x 120	490	87
SD 340 H	260	340 x 570	200	20	M24 x 120	820	102
SD 390 H	300	390 x 660	212	24	M24 x 140	820	120

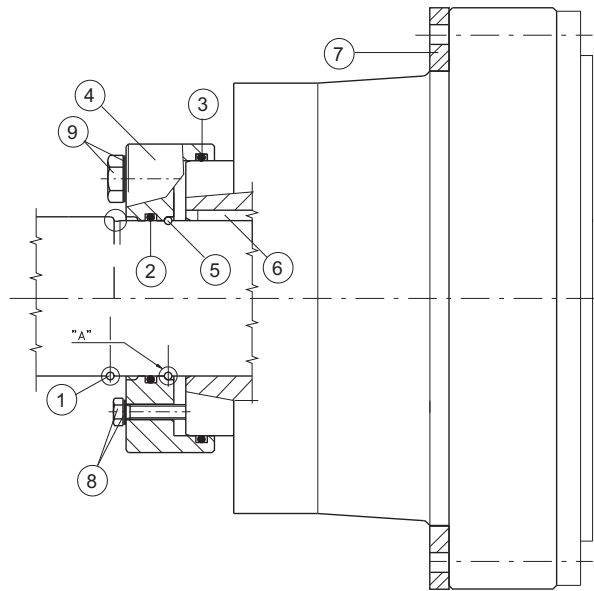
Ma = Tightening torque [N·m]

- 2 - Remove the gear unit from the driven shaft. To do this a hole on the gear unit shaft can also be used to pump oil under low pressure so that it can be pulled off gradually.
- 3 - remove the coupling from the gear unit shaft.

INSTALLATION INSTRUCTIONS FOR A SHAFT MOUNTED GEAR

INSTALLING THE GEAR UNIT WITH AN FP OUTPUT

- 1 - Insert the stop ring, if provided, in its housing on the shaft pos.n°1.
- 2 - Grease the seats of the o-rings pos. N°2 and 3 on the cover pos.n°4; then insert the respective o-rings in their seats; then insert the cover on the shaft.
- 3 - Insert the other stop ring pos.n°5, then the tongue pos.n°6 in their respective seats on the shaft.
- 4 - Assemble the torque arm pos. N°7 on the reduction gear.
- 5 - Suitably lubricate both the shaft and its seat (reduction gear female shaft); then carry out coupling of the shaft and the reduction gear (do not force).
- 6 - Place the cover pos. n°4, clamping it with the screws and the respective dowty washers pos. n°8 (supplied with accessories), taking care to gradually screw the screws in a circular direction (not in the diametrically opposite direction) until completely clamped using a torque given in the "tightening torque" table, paragraph "Values Table Torque Setting Bolts p. 38 (screw classes 8.8), by means of medium loctyte.
- 7 - Assemble all the other screws and relative dowty washers pos.n°9 (omitting one at the top),insert further lubricant in the hole which has been left open; then assemble this last screw as well to thus close the coupling in a lubricated hermetic chamber, by means of medium loctyte.



DISASSEMBLING THE GEAR UNIT WITH AN FP OUTPUT

- 1 - Whilst suitably supporting the reduction gear free the torque arm
- 2 - Remove the screws pos.n°9 replacing them with longer screws, suitable for the room available.
- 3 - Remove the screws pos. N°8; then screw the screws pos. n°9 gradually in a circular direction (not in the diametrically opposite direction) until the reduction gear is unlocked.

CAUTION

the dowty type washers in pos. N°8 and 9 cannot be reused when reassembling the reduction gear after repairs or any other type of operation; they must always be replaced with new washers.

INSTALLING THE GEAR UNIT TYPE “RPR”

INSTALLING THE GEAR UNIT TYPE “RPR”

- The units must be fixed to a rigid structure and the supporting surface should be thoroughly clean, with no trace of soldering waste, at right angles to the driving axes.
- The centring and coupling surfaces of the gear unit must be clean and dent free.

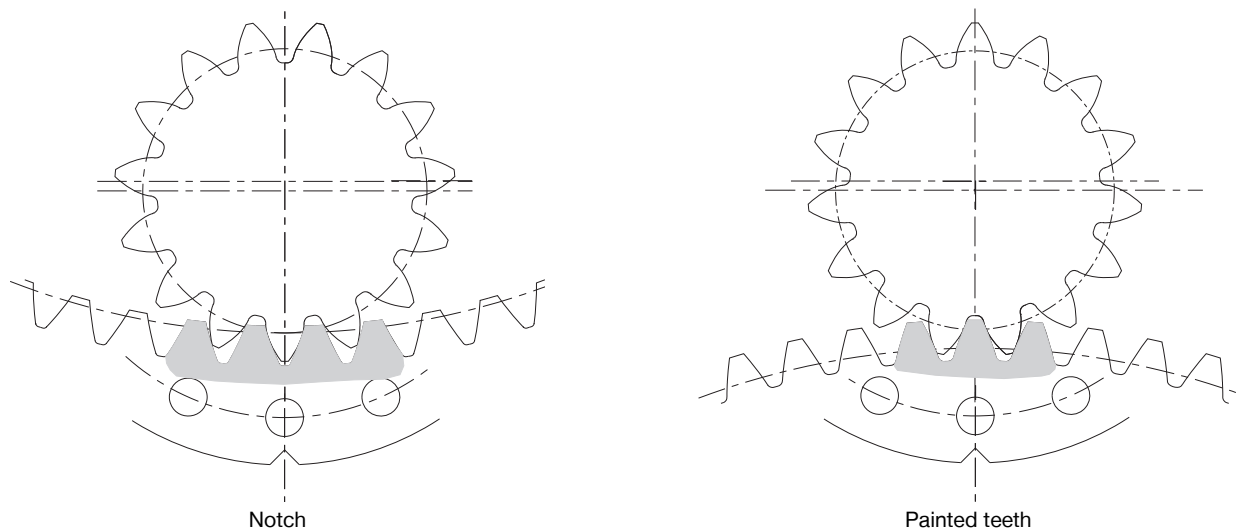
The measures described above are essential for ensuring perfect meshing between the gear pinion and the fifth wheel. Fifth wheel constructors usually mark three teeth of the fifth wheel green; the point of major ovality of the pitch \emptyset used for positioning the gear unit.

CAUTION

It is advisable to contact the constructors of the fifth wheel direct if there are no coloured (usually green) teeth on the fifth wheel, or other distinguishing marks.

If the gear unit is of the type with a rest and an eccentric to regulate the clearance between the pinion and the ring gear, then there should be a notch on the fifth wheel (see fig.) which indicates the point of major eccentricity, corresponding to the maximum meshing reached between the pinion and the fifth wheel; whether the gear unit is placed inside or outside the fifth wheel. (see fig.)

The value of clearance between the sides of the pinion teeth and the fifth wheel, is obtained by multiplying the value of the teething module by the two fixed values of 0.03 and 0.04.



Example:

for teething of $m = 20$, simply multiply $20 \times 0.03 = 0.6$ and $20 \times 0.04 = 0.8$, to obtain two values of 0.6 and 0.8; this means that the clearance of the sides of the teeth for perfect meshing must have a value which falls between 0.6 and 0.8 mm., thus the gear unit is placed with the notch in correspondence with the three coloured teeth, (usually green), of the fifth wheel, turn the gear unit to move it closer to the fifth wheel, inserting the shim value as resulting from the described calculation in the sides of the teeth which are meshed with the fifth wheel or the pinion; then clamp the gear unit.

Check the clearance between the sides at different points around the pitch circle of the fifth wheel a second time.

After having positioned the gear unit and checked the situation, tighten the fixing screws (minimum recommended class 8.8) by applying a tightening torque as shown in the “tightening torque” table, paragraph Values Table Torque Setting Bolts p. 38, making sure that they are compatible with their counterparts (nuts and/ or fixing structure).

CAUTION

when positioning gear unit with eccentric, all the holes for oil level, load and discharge, engine controls, laminated brake etc .etc.- will be moved out of place with respect to the “Dana Incorporated” drawings.

INSTALLATION INSTRUCTIONS FOR GEAR UNIT-COUPLER AS-

INSTALLATION INSTRUCTIONS FOR GEAR UNIT-COUPLER ASSEMBLY WITH ACTIVE CLUTCH SAFETY SYSTEM

When preparing to install this kind of assembly, the first thing to remember is that the whole internal drive is held in place by the clutch on the assembly.

Consequently, if the output shaft doesn't rotate, it will be difficult to install the assembly in its housing if the gear unit fitting holes do not coincide with the holes in the interface on the vehicle itself.

To line up these holes, you have to release the clutch so that the output shaft can rotate freely.

To do this, use a hand-operated hydraulic pump, as the clutch can be opened with a minimum pressure of 3 to 5 bar, then proceed carefully with the steps listed below:

(for the location of the symbols see chapter Code description p. 8)

- 1 - lift the assembly with suitable lifting equipment and fit the gear unit output shaft into its housing on the vehicle, keeping it supported all the time and trying to mate the fitting holes in the assembly with those in the vehicle.
- 2 - connect the hand-operated hydraulic pump to the assembly via the 1/4 gas hole
- 3 - power up (12 Volt) the solenoid valve on the on the power pack so that the valve is excited.
- 4 - Using the pump, increase the pressure on the assembly slowly and gradually it can be rotated by hand.

CAUTION

if the solenoid valve is not excited, the hydraulic pump simply pumps the oil into the assembly.

- 5 - at this point, the assembly can be rotated easily so as to align the fitting holes with the interface on the vehicle; this done, insert the pins (if needed) and attachment bolts (recommended minimum class 8.8) , applying torque as indicated in the "torque setting" table, paragraph Values Table Torque Setting Bolts p. 38, making sure that these settings are compatible with the nuts and/or structure.
- 6 - if this operation is performed with the gear unit output shaft not inserted in its housing, it will be very difficult to get the assembly fitting holes in phase with the shaft spline, and the only way to set the timing will be by trial and error.
- 7 - After fixing the assembly in position, cut off the current to the solenoid valve, disconnect the hand-operated hydraulic pump and refit the 1/4 Gas plug.

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 applying the torque indicated in the table "torque setting" paragraph Values Table Torque Setting Bolts p. 38.

Accessory Assembly:

To mount pinions, pulleys or couplings, use suitable equipment avoid seizing. As an alternative, heat the piece to 80°-100° C. Lubricate the grooves with a thin layer of grease or a no-grip lubricant and tighten attachment bolts applying the torque indicated in the table "torque setting" paragraph Values Table Torque Setting Bolts p. 38.

START-UP OF AUXILIARIES (BRAKES - CLUTCHES- ETC.)

NEGATIVE MULTI-DISK BRAKE

NOTE:

The negative multi-disk brake is used only as a parking brake, or in special situation as an emergency brake.

- 1 - Connect the fittings of the system hydraulic circuit to the brake control hole (see paragraph Configurations p. 8 “configuration”) of all the gear units with these features installed in the system.
- 2 - Pressurize the hydraulic circuit and then bleed all brakes. Slightly unscrew the brake control fitting, and maintain pressure until only oil is expelled without any air. Then re-tighten the fitting.

DISK BRAKE

- 1 - Connect the fittings of the system brake circuit to the brake control hole “A” (see fig. No. 2) of the brake clamp located on the gear unit for all the gear units with these features installed in the system.
- 2 - Bleed The brakes after injecting oil into the circuit (remove the air from the brake circuit).

CAUTION

At least two persons are needed to carry out this operation.

NOTE:

For the bleeding operation it is recommended, after having removed the rubber guard of the bleeder valve “B”, to attach a piece of rubber hose with a length of about 20 cm to collect any oil into a can (which should not be dumped in the environment since such oil is a major pollutant).

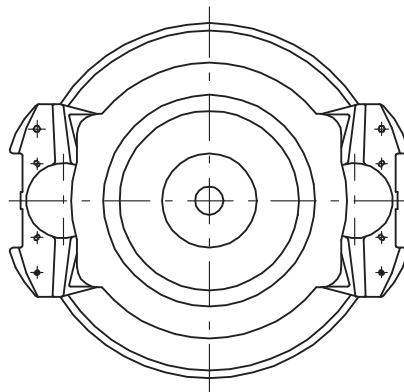
- 3 - Slightly unscrew (1 turn) the bleeder valve “B” and keep activating the brake control until only oil without any air is expelled from the valve. Immediately close the valve and release the brake control.

NOTE:

if oil not expelled the first time the brake control is activated close the bleeder valve and release the brake control. Then open the valve again and activate the brake control and continue in this manner until only oil is expelled.

- 4 - Repeat this operation for all gear units with these features installed in the system, then top-up the oil in the brake circuit.

Fig. 2



GEAR UNIT-COUPLER ASSEMBLY WITH ACTIVE CLUTCH SA-

GEAR UNIT-COUPLER ASSEMBLY WITH ACTIVE CLUTCH SAFETY SYSTEM

NOTE:

the hydraulic pump used by the power pack is reversible, thus guaranteeing the same constant pressure at all times, regardless of the direction of rotation.

CAUTION

the pressure relief valve on the power pack has been pre-set to the right pressure (25.5 ± 2 bar). It is absolutely forbidden to alter this valve setting.

- Power up the solenoid valve with direct current (12 Volt) via the socket on the power pack (see chapter Configurations p. 8 for location of symbol)
- To prime the hydraulic pump (after filling the assembly with lubricating oil), simply start the coupler PTO rotating, as the pump is self-priming.

LUBRICATION

GEAR UNIT LUBRICATION

The Dana Incorporated gear units are supplied without oil, therefore the user must the lubricant according to what is indicated in the table shown in paragraph Lubricant table p. 33.

Basic oil specifications

The basic parameters of the selected oil are:

- viscosity at nominal operating conditions
- additives

The oil must lubricate the bearings and the gears and all these components work inside the same box, in different operating conditions. We will look at these parameters one by one.

VISCOSITY

Nominal viscosity is referred to a temperature of 40 °C, but rapidly decreases with an increase in the temperature of the gear unit.

If the operating temperature is between 50 °C and 70 °C, a nominal viscosity can be chosen according to the following guide table, choosing the highest viscosity if the highest temperature is foreseen.

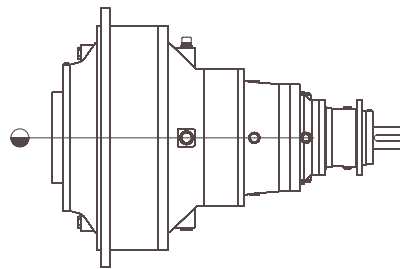
N2 [RPM]	50 °C	70 °C
>20	VG150	VG220
<5	VG220	VG320
<5	VG320	VG460

ADDITIVES

In addition to the normal antifoaming and antioxidant additives, it is important to use lubricating oils with additives that have EP (extreme-pressure) and antiwear properties, according to ISO 6743-6 L-CKC or DIN 51517-3 CLP. Clearly, therefore, products with stronger EP characteristics will have to be found for slower gear unit speeds. It should be remembered that the chemical compounds replacing hydrodynamic lubrication are formed to the detriment of the original EP load. Therefore, with very low speeds and high loads it is important to keep to the maintenance intervals so as not to diminish the lubricating characteristics of the oil excessively

Checking the oil with non-forced lubrication

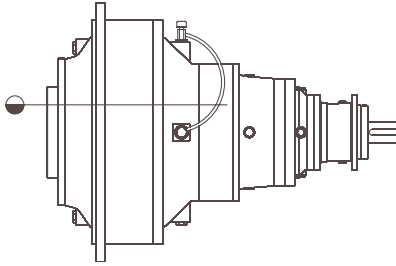
Fig. 7



If the gear unit is fitted horizontally, the oil level should be at the centre if proper lubrication is to be guaranteed (see fig. 7).

GEAR UNIT LUBRICATION

Fig. 8



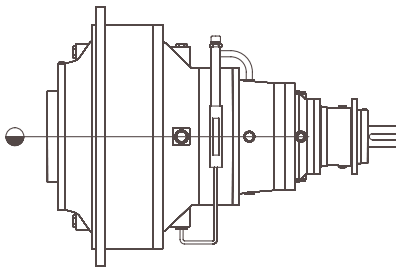
For applications with a very low output rotation speed ($n_2 \leq 5$ rpm) it is advisable to fix the level at a value higher than 50-100 mm (see fig. 8).

To check the oil level, simply use a transparent tube, positioning it as shown in fig. 8.

If the output speed is extremely low ($n_2 \leq 1$ rpm), or if long gear unit downtimes are foreseen, it is advisable to fill the entire casing. In this case, a special “expansion tank” must be fitted.

If a gauge is fitted for checking the level visually (or by means of an electrical signal), this must be fitted as shown in the diagram in fig. 9. Position the breather cap above the level indicator, using a tube of the right length, connecting the upper (empty) part of the gear unit to just below the breather. This will prevent oil from spilling out.

Fig. 9



Filing and level

The gear units are equipped with oil level, breather, filler and drain plugs and their position changes according to the installation configuration.

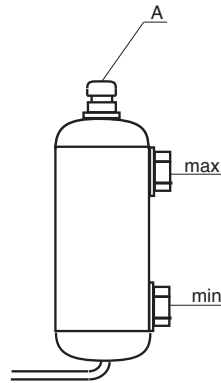
- 1 - Check the exact position of the plugs using the diagrams on paragraph Configurations p. 8. “configuration”.
- 2 - Unscrew the level-filler plugs, put oil into the Gear unit and when this oil flows out of the level hole, replace the plugs.
- 3 - In the RPR or MDU series, one of the support bearings must be lubricated with grease, using the grease gun located above the gear unit attachment flange, and using a generic type of grease with the features indicated in paragraph Brake lubrication p. 32.
- 4 - The lubricant oil used in the gear unit-coupler assembly with active clutch safety system is the same as the oil used in the clutch pump.
- 5 - Turn the gear unit a few times to eliminate any air pockets and then check the various levels

EXPANSION TANK

⚠ CAUTION

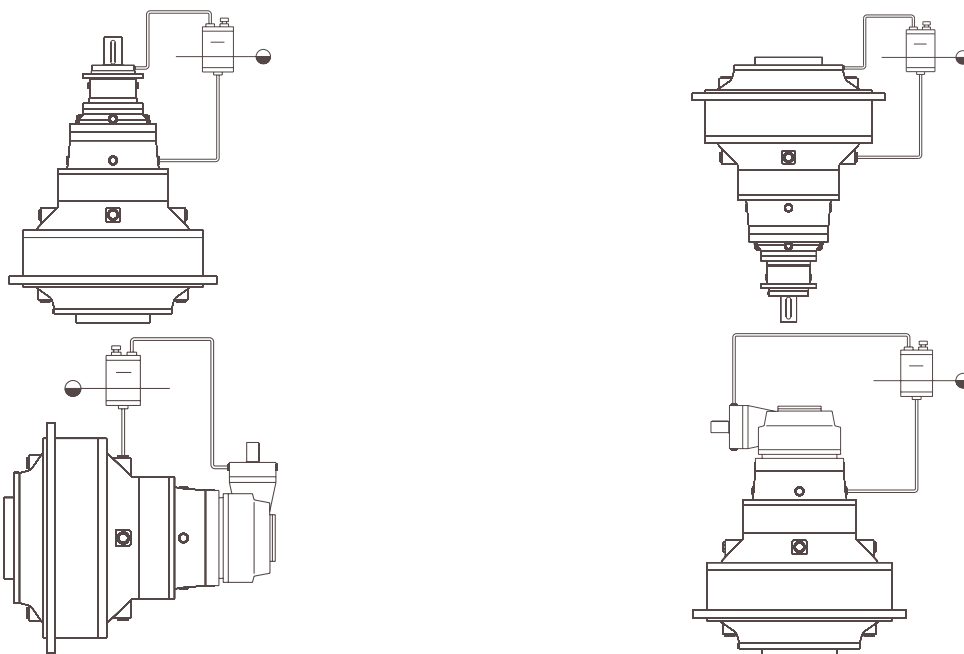
make sure the expansion tank is installed higher than the top part of the gear unit.

Fig. 3



For applications with an expansion tank, do the following: (see figure 3).

- 1 - Remove the plug "A"
- 2 - To enhance gear unit ventilation (only during the filling phase) it is also possible to remove one of the top of the gear unit.
- 3 - As the oil rises to the top of the open plug in the top part of the gear unit, replace the plug.
- 4 - 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.
- 5 - Replace the plug.
- 6 - With the gear unit running under steady-state thermal conditions, and the oil at its maximum expansion temperature, never exceed the max. level.
- 7 - Run the gear unit for a few minutes to eliminate any air pockets, then check the various levels.



Vertical in-line fitting and right-angled fitting with expansion tank

BRAKE LUBRICATION

BRAKE LUBRICATION

NOTE:

The Dana Incorporated multi-disk brakes are supplied without oil.

The user must select the lubricant features.

To lubricate the multi-disk brake unit, Dana Incorporated. recommends using mineral oils with enhanced heat and aging resistance and viscosity ISO VG 32, with a viscosity index greater than or equal to 95.

NOTE:

Hydraulic oils are suitable, in general.

Multi-disk brake filling and level

The multi-disk brakes are equipped with oil level, filler and drain plugs and their position changes according to the installation configuration.

- 1 - Check the exact position of the plugs using the diagrams on page Configurations p. 8.
- 2 - Unscrew the level/filler plugs, put oil into the brake and when this oil flows out of the level hole, replace the plugs.
- 3 - Turn the brake a few times to eliminate any air pockets and then check the various levels.

Disk brake

NOTE:

Disk brake do not require any lubrication.

GREASE FEATURES

Type of soap	stearate hydroxide lithium 12 or equivalent
Consistency:	NLGI No. 2
Base Oil:	Mineral oil with viscosity from 100 to 320 cST at 40°C
Additives:	Rust inhibitors
Viscosity index:	80 Minimum
Pour point:	-10° C maximum

LUBRICANT TABLE

Dana Incorporated recommends shell 

LUBRICANT	MINERAL		
	ISO VG 150	ISO VG 220	ISO VG 320
ADDINOL	Eco Gear 150 M	Eco Gear 220 M	Eco Gear 320 M
ARAL	Degol BG 50 Plus	Degol BG 220 Plus	Degol BG 320 Plus
BP	Energol GR-XP 150	Energol GR-XP 220	Energol GR-XP 320
CASTROL	Alpha SP 150	Alpha SP 220	Alpha SP 320
CESPA	Engranajes XMP 150	Engranajes XMP 220	Engranajes XMP 320
ENI	Blasia 150	Blasia 220	Blasia 320
FUCHS	Renolin CLP Gear Oil 150	Renolin CLP Gear Oil 220	Renolin CLP Gear Oil 320
KLÜBER	Klüberoil GEM 1-150 N	Klüberoil GEM 1-220 N	Klüberoil GEM 1-320 N
LUBRITECH	Gearmaster CLP 150	Gearmaster CLP 220	Gearmaster CLP 320
MOBIL	Mobilgear XMP 150	Mobilgear XMP 220	Mobilgear XMP 320
MOLIKOTE	L-0115	L-0122	L-0132
NILS	Ripress EP 150	Ripress EP 220	Ripress EP 320
Q8	Goya NT 150	Goya NT 220	Goya NT 320
REPSOL	Super Tauro 150	Super Tauro 220	Super Tauro 320
SHELL	Omala S2 150	Omala S2 220	Omala S2 320
SUNOCO	Sun EP 150	Sun EP 150	Sun EP 150
TEXACO	Meropa 150	Meropa 220	Meropa 320
TOTAL	Carter EP 150	Carter EP 220	Carter EP 320
TRIBOL	1100 - 150	1100 - 220	1100 - 320

LUBRICANT	SYNTETIC		
	ISO VG 150	ISO VG 220	ISO VG 320
ADDINOL	Eco Gear 150 S	Eco Gear 220 S	Eco Gear 320 S
ARAL	Degol PAS 50	Degol PAS 220	Degol PAS 320
BP	Energol EXP 150	Energol EXP 220	Energol EXP 320
CASTROL	Alphasyn EP 150	Alphasyn EP 220	Alphasyn EP 320
CESPA	-	Aerogear Synt 220	Aerogear Synt 320
CHEVRON	Tegra Syntetic Gear 150	Tegra Syntetic Gear 220	Tegra Syntetic Gear 320
ENI	Blasia SX 150	Blasia SX 220	Blasia SX 320
FUCHS	Renolin unisyn CLP 150	Renolin unisyn CLP 220	Renolin unisyn CLP 320
KLÜBER	Klübersynth GEM 4-150 N	Klübersynth GEM 4-220 N	Klübersynth GEM 4-320 N
LUBRITECH	Gearmaster SYN 150	Gearmaster SYN 220	Gearmaster SYN 320
MOBIL	Mobil SHC Gear 150	Mobil SHC Gear 220	Mobil SHC Gear 320
MOLIKOTE	L-2115	L-2122	L-2132
NILS	Atoil Synth PAO 150	-	Atoil Synth PAO 320
Q8	El Greco 150	El Greco 220	El Greco 320
REPSOL	Super Tauro Sintetico 150	Super Tauro Sintetico 220	Super Tauro Sintetico 320

LUBRICANT TABLE

LUBRICANT	SYNTETIC		
	ISO VG 150	ISO VG 220	ISO VG 320
SHELL	Omala S4 GX 150	Omala S4 GX 220	Omala S4 GX 320
TEXACO	Pinnacle EP 150	Pinnacle EP 220	Pinnacle EP 320
TOTAL	Carter SH 150	Carter SH 220	Carter SH 320
TRIBOL	-	-	1510 / 320

Table of lubricant oils suitable for alimentary use (Approved according to USDA-H1 and NSF-H1 specifications)

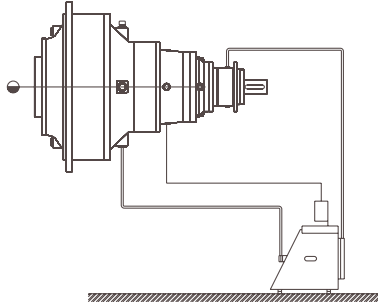
LUBRICANT	HYDRAULIC OILS			GEAR OILS		
	ISO VG 32	ISO VG 46	ISO VG 68	ISO VG 150	ISO VG 220	ISO VG 320
ARAL	Eural Hyd 32	Eural Hyd 46	Eural Hyd 68	Eural Gear 150	Eural Gear 220	Eural Gear 320
CASTROL	Optileb HY 32	Optileb HY 46	Optileb HY 68	Optileb GT 150	Optileb GT 220	Optileb GT 320
CHEVRON	Lubricating Oil FM 32	Lubricating Oil FM 46	Lubricating Oil FM 68	-	Lubricating Oil FM 220	-
ENI	Rocol Foodlube H1 power 32	Rocol Foodlube H1 power 46	Rocol Foodlube H1 power 68	Rocol Foodlube H1-torque 150	Rocol Foodlube H1-torque 220	Rocol Foodlube H1-torque 320
FUCHS	Cassida Fluid HF 32	Cassida Fluid HF 46	Cassida Fluid HF 68	Cassida Fluid GL 150	Cassida Fluid GL 220	Cassida Fluid GL 320
KLÜBER	Klüberfood 4 NH1 - 32	Klüberfood 4 NH1 - 46	Klüberfood 4 NH1 - 68	Klüberfood 4 UH1 - 150N	Klüberfood 4 UH1 - 220N	Klüberfood 4 UH1 - 320N
MOBIL	Mobil SHC Cibus 32	Mobil SHC Cibus 46	Mobil SHC Cibus 68	Mobil SHC Cibus 150	Mobil SHC Cibus 220	Mobil SHC Cibus 320
NILS	Mizar 32	Mizar 46	Mizar 68	Ripress Synt Food 150	Ripress Synt Food 220	Ripress Synt Food 320
TEXACO	Cygnus Hydraulic Oil 32	Cygnus Hydraulic Oil 46	Cygnus Hydraulic Oil 68	Cygnus Gear PAO 150	Cygnus Gear PAO 220	Cygnus Gear PAO 320
TRIBOL	Food Proof 1840 / 32	Food Proof 1840 / 46	Food Proof 1840 / 68	-	Food Proof 1810 / 220	Food Proof 1810 / 320

DIAGRAMS AND OIL CHECKING WITH AUXILIARY COOLING SY-

DIAGRAMS AND OIL CHECKING WITH AUXILIARY COOLING SYSTEM

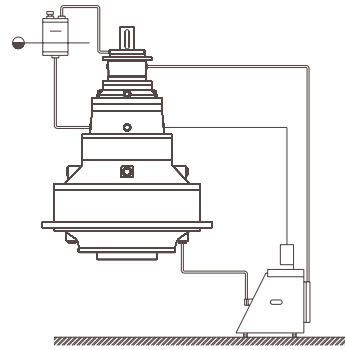
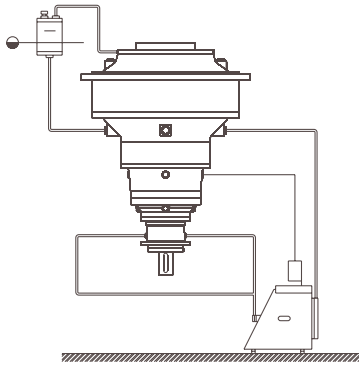
Horizontal gear unit

See paragraph Gear unit lubrication p. 29 for levels.



Vertical gear unit

See paragraph n° Expansion tank p. 31 for definition of levels, also for right angle gear units



CHECKS

FIRST START-UP CHECKS

Before starting the machine check the following:

- a** - Check that all the oil plug are in the correct position (see paragraph Configurations p. 8 “configuration”).
- b** - Check that all oil levels are correct.
- c** - Check that all the grease guns are full of grease.
- d** - Check that the operating pressure (see table on the right) is sufficient to fully open the multi-disk brake to avoid overheating and any premature wear of brake disks.

TYPE OF BRAKE	OPENING PRESSURE (BAR)		STATIC TORQUE (N·M)
	Max.	Min.	
FL620/12	21 Max.	26 Min.	210
FL635/12	12 Max.	15 Min.	315
FL250.4C	10,24 Max.	13,28 Min.	181
FL250.6C	10,53 Max.	13,28 Min.	186
FL350.6C	15,8 Max.	19,92 Min.	278
FL350.8C	16,2 Max.	19,9 Min.	381
FL450.6C	20,48 Max.	25,59 Min.	360
FL450.8C	21,03 Max.	25,59 Min.	492
FL650.10C	14,2 Max.	19,92 Min.	428
FL650.12C	14,56 Max.	19,92 Min.	528
FL650.14C	15 Max.	19,92 Min.	633
FL750.10C	18,4 Max.	25,59 Min.	556
FL750.12C	18,95 Max.	25,59 Min.	684
FL750.14C	19,49 Max.	25,59 Min.	819
FL960.12C	15,56 Max.	21,98 Min.	1019
FL960.14C	15,56 Max.	21,98 Min.	1189
FL960.16C	15,56 Max.	21,98 Min.	1359
FL960.18C	15,56 Max.	21,98 Min.	1528

CAUTION

Given the type of brake, the operating pressure should never drop below the minimum brake opening pressure to avoid the braking action.

CAUTION

The gear units and any multi- disk brakes are shipped without oil. The customer is responsible for filling such devices (see lubrication chapter paragraph LUBRICATION p. 29).

NOTICE

Check that all the bolts with ISO metric threads are correctly tightened (see table “torque setting values” Values Table Torque Setting Bolts p. 38).

Gearboxes can be operated at ambient temperature ranging from -20°C to $+50^{\circ}\text{C}$. When starting a gearbox at low temperature (-20°C to 0°C) the efficiency can be lower due to extreme viscosity of the lubricant. In such cases idle running or limited loading is recommended for some minutes.

For operations at ambient temperature below -20°C , it is advisable to provide adequate countermeasures, such as hoods or oil pre-heating device.

In case of doubt, please contact Dana Incorporated's Sales Application Manager in Reggio Emilia headquarter

NO-LOAD TESTS

VALUES TABLE TORQUE SETTING BOLTS

DXP MM	4,8		5,8		8,8		10,8		12,9	
	kN	N·m	kN	N·m	kN	N·m	kN	N·m	kN	N·m
3x0,5	1.2	0.9	1.5	1.1	2.3	1.8	3.4	2.6	4.0	3
4x0,7	2.1	1.6	2.7	2	4.1	3.1	6.0	4.5	7.0	5.3
5x0,8	3.5	3.2	4.4	4	6.7	6.1	9.8	8.9	11.5	10.4
6x1	4.9	5.5	6.1	6.8	9.4	10.4	13.8	15.3	16.1	17.9
7x1	7.3	9.3	9.0	11.5	13.7	17.2	20.2	25	23.6	30
8x1	9.9	14.5	12.2	18	18.9	27	28	40	32	47
9x1,25	9.3	13.6	11.5	16.8	17.2	25	25	37	30	44
10x1,5	14.5	26.6	18	33	27	50	40	73	47	86
10x1,25	15.8	28	19.5	35	30	53	43	78	51	91
12x1,25	23.8	50	29	62	45	95	65	139	77	163
12x1,75	21.3	46	26	56	40	86	50	127	69	148
14x1,5	32	79	40	96	61	150	90	220	105	257
14x2	29	73	36	90	55	137	80	201	94	235
16x1,5	43	121	54	150	82	229	121	336	141	393
16x2	40	113	50	141	76	214	111	314	130	369
10x2,5	49	157	60	194	95	306	135	435	158	509
18x1,5	57	178	70	220	110	345	157	491	184	575
20x2,5	63	222	77	275	122	432	173	615	203	719
20x1,5	72	248	89	307	140	482	199	687	233	804
22x2,5	78	305	97	376	152	502	216	843	253	987
22x1,5	88	337	109	416	172	654	245	932	266	1090
24x3	90	383	112	474	175	744	250	1080	292	1240
24x2	101	420	125	519	196	814	280	1160	327	1360
27x3	119	568	147	703	230	1100	328	1570	384	1840
27x2	131	615	162	760	225	1200	363	1700	425	1990
30x3,5	144	772	178	955	280	1500	300	2130	467	2500
30x2	165	850	204	1060	321	1670	457	2370	535	2380
d = bolt diameter										
p = bolt pitch										
kN = axiale pre-loading										
N·m = torque setting bolts										

NO-LOAD TESTS

- 1 - 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.
- 2 - Check that the brakes lock and release at the right time and all operate correctly.

MAINTENANCE

NOTE:

Maintenance can be “routine or unscheduled”.

CAUTION

All maintenance activities must be carried out under safety conditions.

ROUTINE MAINTENANCE

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

- 1 - After a brief operating period of about 100 hours (breaking-in), change the oil in the gear unit and the multi-disk brake (if installed) and wash the interior of the unit with cleaning liquid.
- 2 - Check that there are no metallic parts with unusual dimension in the magnetic plug of the gear unit and in any multi-disk brake.
- 3 - Change the oil in the gear unit while it is hot so that it is easier to drain.
- 4 - Subsequent oil changes will be made every 2000-2500 hours of operation or, in any case, each year.
- 5 - Do not mix different types of oil.
- 6 - Periodically check the levels (about once a month) and top up if necessary.

CAUTION

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 the “Dana Incorporated Service Department”.

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

OIL CHANGE

Use the diagrams on paragraph Configurations p. 8 “configuration” to identify the oil plug according to the gear unit configuration and always paragraph 2.2 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.

- 1 - 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.
- 2 - 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 high speed
 - remove the cleaning liquid again from the gear unit and the multi-disk brake. (if any).
- 3 - See paragraph LUBRICATION p. 29 Lubrication for filling instructions

UNSCHEDULED MAINTENANCE

WARNING

Dana Incorporated. prohibits the gear unit to be opened to carry out any operation that is not included in routine maintenance procedures. Dana Incorporated. do not undertake any liability for all those operations out of routine maintenance which may have caused damages to people or things. When the need arises, contact the nearest Dana Incorporated Service Centres as listed on page 117.

MAINTENANCE OF AUXILIARIES (BRAKES - CLUTCHES- ETC.)

PROCEDURE TO REPLACE DISKS OR SEALS FOR MULTI DISK BRAKES

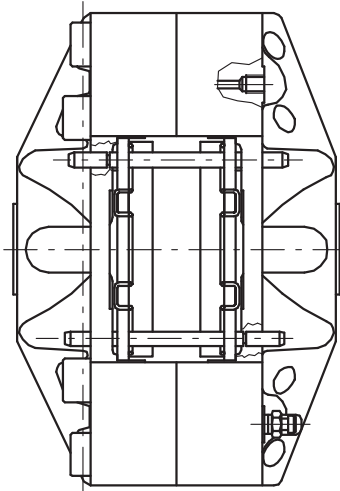
WARNING

Dana Incorporated.” prohibits this operation to be performed on its units, therefore if braking action becomes inefficient contact the nearest Dana Incorporated Service Centres.

PROCEDURE TO REPLACE PADS FOR DISK BRAKES

- 1 - Use a screwdriver or similar tool to pry between the disk and the pad to make the position of the brake clamp retract up to the start of the stroke. Carry out this operation first on one side and then on the other for both pistons.
- 2 - Use a pin remover and hammer to remove one of the two pins “A” from its seat (see fig. 4), remove the two springs “B”, then remove the other pin.
- 3 - With a mechanical clamp pull out the two worn pads, use compressed air to clean away any dust from the pad seats in the brake clamp, then insert the new pads.
- 4 - Mount one of the pins “A” in its seat, place the two springs “B” in their position, put them under tension, then mount the other pin in its seat.
- 5 - Activate the brake a few times to re-position the pistons of the brake clamp with the new pads.
- 6 - Brake a few times to check if bleeding is required.

Fig. 4



MAINT. PROC. FOR HYDR. POWER PACK ON GEAR UNIT-COU-

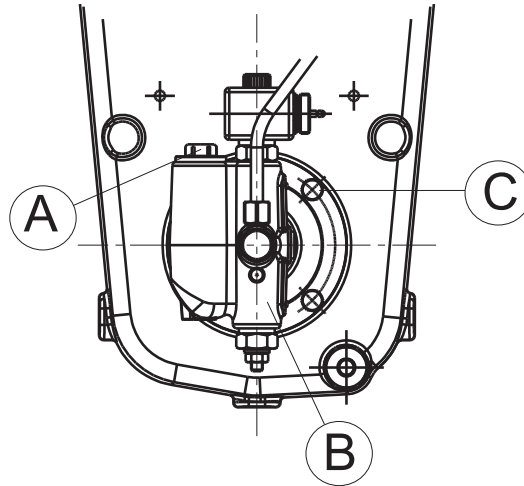
MAINT. PROC. FOR HYDR. POWER PACK ON GEAR UNIT-COUPLER ASSEMBLY WITH ACTIVE CLUTCH SAFETY SYSTEM

The power pack "B" has an inspectable 100 μ bronze filter, upstream of the pressure relief valve

NOTE:

With each routine maintenance job (oil change) on the gear unit-coupler assembly you are advised either to change the power pack filter, by unscrewing the cap "A", or at least to regenerate it by washing thoroughly with solvent and blow-cleaning inside the filter with air.

- 1 - If the power pack "B" has to be replaced: empty the lubricant oil out of the assembly, cut off the current to the solenoid valve, disconnect the oil delivery tube, unscrew and remove the 4 bolts pos. "C" and then withdraw the power pack for replacement.
- 2 - To reassemble, go through the above steps in reverse order; see par. Gear unit-coupler assembly with active clutch safety system p. 28 for resetting the power pack.



SCRAP DISPOSAL

MACHINE DEMOLITION

If the machine must be scrapped, it, should become non-operational:

- Disassemble the various parts.
- Disconnect any motor unit.

NOTE:

But first after having completely emptied all the oil from gear unit.

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. (in Italy the Consorzio Obbligatorio Oli Esausti).

PROBLEMS AND RELATIVE SOLUTIONS

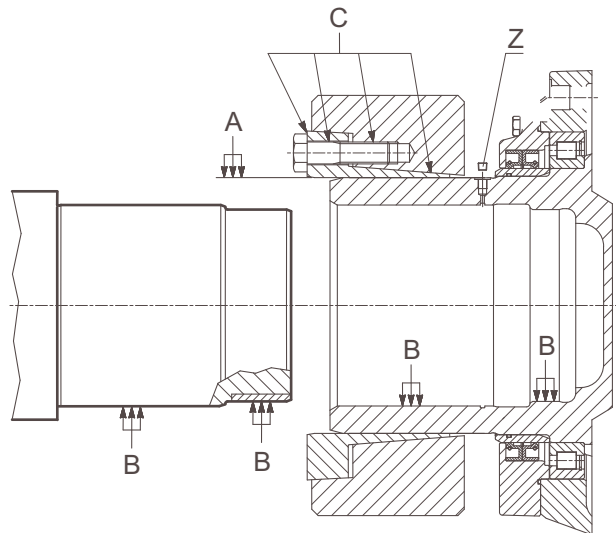
If malfunctions occur, consult the following table.

If the problems continue, contact the nearest Dana Incorporated Service Center.

PROBLEM	POSSIBLE CAUSE	SOLUTION
With motor running the output shaft doesn't turn	Incorrect motor assembly	Check coupling between gear unit/motor
	Internal malfunction malfunction	Contact a Service Center
	Brake blocked	Check hydraulic circuit
Oil leak from breather during operation	Level too high	Lower oil level
	Incorrect breather position	Check breather position
	Possible wear of multidisk brake seals or hydraulic motor	Contact a Service Center
Oil leak from seals	Clogged breather plug	Unscrew and thoroughly clean the plug
	Stiffening of seals due to prolonged storage	Clean the area and check for leakage again after a few days
	Damaged or worn seals	Contact a Service Center
Disk brake doesn't brake	No pressure to the brake	Check hydraulic circuit
	Worn brake pads	Replace brake pads
Excessive vibrations	Gear unit incorrectly installed	Check the connection and in-line configuration
	Coupling structure weak	Strengthen the structure
	Internal malfunction	Contact a Service Center
Excessive noise	Internal malfunction	Contact a Service Center
Excessive heating	No ventilation	Remove fairing
	High thermal power	Insert oil circulation
Multi-disk brake doesn't release	No pressure to the brake	Check connection to hydraulic circuit
	Internal malfunction	Contact a Service Center
	No pressure in the circuit	Check hydraulic circuit
Multi-disk brake doesn't to look	Residual pressure in the hydraulic circuit	Check hydraulic circuit
Multi-disk brake doesn't brake	Pressure delivered to brake	Check hydraulic circuit
	Worn disks	Contact a Service Center

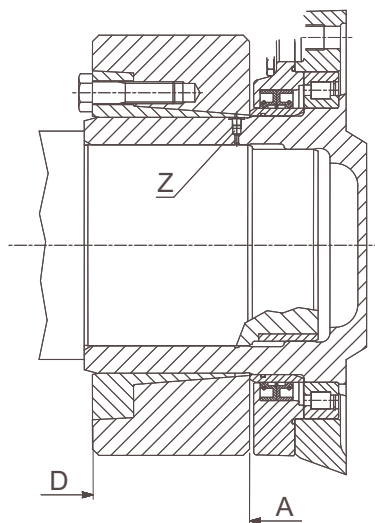
INSTALLATION OF GEAR UNIT WITH FS OUTPUT

- 1 - Clean and degrease the internal surface of the gear unit shaft and machine shaft.
- 2 - Lubricate the coupling housing (fig.1 point A).
- 3 - If the coupling is new there is no need to disassemble it and grease it.
- 4 - If the coupling is being overhauled, disassemble it and grease the zones marked “C” (see fig. 1).
- 5 - Remove cap “Z” (see fig. 1) in order to bleed off the air when fitting the shaft.
- 6 - Fit the coupling on to the gear unit without tightening the bolts, leaving cap “Z” loose (see fig. 1).


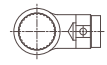

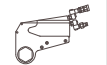


- 7 - If the gear unit is in a vertical working position with the output shaft underneath, make sure the coupling can't come out and fall; in any event, never tighten the coupling bolts before fitting the shaft into its housing.
- 8 - Fit the gear unit on to the machine shaft or vice versa (excessive axial force shouldn't be necessary); there should be no interference when assembling, so make sure the shaft and gear unit are properly aligned.
- 9 - Refit cap “Z” (see fig. 2), then position the coupling (see fig. 2 point A)
- 10 - Using a torque wrench, tighten all the bolts gradually in a circular sequence (i.e. not in a diametrically opposite sequence) until they are all tightened to torque value “T” in table N° 1.
- 11 - Set the torque wrench to 3 - 5% above the setting given in table N° 1, then tighten the coupling bolts to the new setting.

Fig. 2



INSTALLATION OF GEAR UNIT WITH FS OUTPUT

	TYPE OF JOINT	Y			X [MM] TOOLS		
			d	T [N·m]			
S300	3009-185X320	85	M16	290	50	110	58
S400	3208-185X320	112	M20	490	55	115	58
S600	3208-220X370	134	M20	490	55	115	58
S850	3208-240X405	144	M20	490	55	115	58
S1200	3208-280X460	172	M24	840	65	120	70
S1800	3208-300X485	176	M24	840	65	120	70
S2500	3208-340X570	206	M27	1250	-	125	85
S3500	3208-360X590	210	M27	1250	-	125	85

12 - Set the torque wrench again to setting “T” in tab. 1, then

13 - recheck the torque on the coupling bolts, taking care not to tighten the bolts further; if this happens , repeat the torquing procedure.

14 - When the fitting of the coupling has been completed correctly, check the assembly visibly to make sure that the front surfaces of the internal and external rings are on the same plane (see fig. 2 point D).

DISASSEMBLING THE COUPLING AND GEAR UNIT

DISASSEMBLING THE COUPLING AND GEAR UNIT

- 1 - Gradually loosen the attachment bolts, proceeding in a circular direction. Initially, loosen each bolt by just a quarter of a turn to avoid bending and seizing.

⚠ CAUTION

Because of the high axial force, if the bolts are unscrewed totally in one or two turns this could cause the two rings in the coupling to separate violently, putting the operators in danger.

Fig. 3

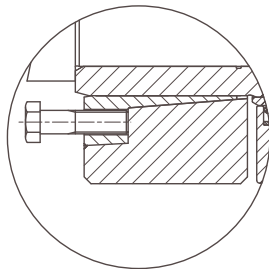
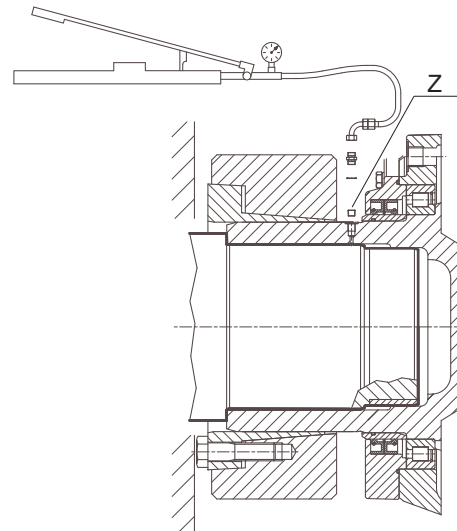
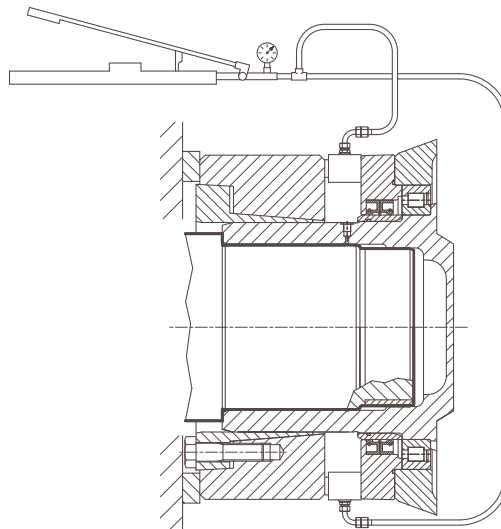


Fig. 4



- 2 - If the coupling rings do not come apart spontaneously after unscrewing the bolts, transfer some of the bolts (two bolts at 180° - four bolts at 90°) into the internal ring extraction holes (see fig. 3).
- 3 - Slide the coupling along its axis to release it and remove cap "Z" (see fig. 4), and introduce pressurised oil (max. 1000 bar) through the 1/8" G hole to facilitate the detachment of the gear unit from the machine shaft.
- 4 - If this method doesn't free the gear unit (because of the shaft coupling being unable to hold the pressure), then, if there is sufficient space, you can try the method illustrated in fig. 5, using hydraulic pushers, pressing against the 2 180° bosses on the gasket holder cover, being careful not to exceed the following axial loads:

Fig. 5



DISASSEMBLING THE COUPLING AND GEAR UNIT

	AXIAL LOAD [N]
S300	30000
S400	30000
S600	45000
S850	50000
S1200	70000
S1800	80000
S2500	100000
S3500	115000
S5000	170000

5 - If the coupling is assembled a long time before it is started up, then you will have to separate the coupling rings (after removing the gear unit) and clean the mating surfaces thoroughly, removing any traces of dirt, rust, etc.

6 - Before reinstalling the overhauled coupling, top up with lubricant in the zones marked "C" (see fig. 2).

CONFORMITY CERTIFICATE - UNI EN 10204 - 2.1

Dana Incorporated, under its own responsibility, on the basis of the results of its standard tests aimed to verify products which are manufactured using the same materials and production method, declares that the products comply fully with the order requirements and with all technical norms corresponding to the official regulations.

MANUFACTURING DIRECTOR

© Copyright 2021 Dana Incorporated

All content is subject to copyright by Dana and may not be reproduced in whole or in part by any means, electronic or otherwise, without prior written approval.

THIS INFORMATION IS NOT INTENDED FOR SALE OR RESALE, AND THIS NOTICE MUST REMAIN ON ALL COPIES.

For product inquiries or support, visit www.dana.com.

For other service publications, visit www.danaaftermarket.com/literature-library

For online service parts ordering, visit www.danaaftermarket.com



BREVINI[®]

Motion Systems