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**BREVINI<sup>®</sup>**

*Motion Systems*

# Installation and Maintenance Manual

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Pump Drives BZ

IMM-0007EN  
March 2022

## **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.

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# 1 INTRODUCTION

Dana Incorporated would like to 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 gearbox 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 gearbox.

**SKILLED TECHNICIAN:**

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

 **CAUTION**

Operator accident-prevention standards

 **WARNING**

The gearbox and/or its parts may be damaged

**NOTICE**

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 / LIABILITY

## 1.3 WARRANTY / LIABILITY

Upon delivery, Products shall be free from defects in material and workmanship and comply with agreed technical specifications. The warranty period shall be (i) 12 months or 2000 operating hours (whichever occurs earlier) for Spicer® branded driveline Products, or (ii) 12 months for all other Products, starting in each case from the date of Customer's invoice to the end user or dealer, provided that the warranty period ends in any case latest 18 months after the date of Dana's invoice to Customer. In case of defects, Dana will either (i) if the repair is performed by Customer with Dana's prior written consent, reimburse Customer for costs of spare parts as per Dana's official spare parts list, including the applied discount, and within the limit of the purchase price of the Product in question, or (ii) repair the Product free of charge at its own premises or authorized service center, provided that Customer shall send the defective Product, at its own expense, to the repair location chosen by Dana in its sole discretion. The handling of warranty claims will follow Dana's Standard Warranty Conditions, as updated from time to time, which are available upon request by contacting [dana\\_oh\\_product\\_service\\_support@dana.com](mailto:dana_oh_product_service_support@dana.com). All further claims and remedies with regard to defects of Products, regardless of their nature, amount or legal basis, are hereby expressly excluded unless in case of gross negligence and willful misconduct by Dana. Except as stated herein, there are no representations or warranties, express or implied, with regard to the Products.

The warranty does not cover (a) Products or components thereof not purchased directly from Dana; (b) products supplied as prior to production approval; or (c) Products that have experienced (i) maintenance and/or repairs which are not executed in accordance with Dana's official service manual available upon request by contacting [dana\\_oh\\_product\\_service\\_support@dana.com](mailto:dana_oh_product_service_support@dana.com), (ii) storage or transport conditions which are not in accordance with Dana's requirements available upon request by contacting [dana\\_oh\\_product\\_service\\_support@dana.com](mailto:dana_oh_product_service_support@dana.com), (iii) non-professional installation of the Products or of ancillaries, (iv) damage caused by normal wear and tear, (v) damage caused during reassembly or installation, (vi) operation of the Product or application which is not in accordance with agreed application requirements or agreed Product specifications and/or (vii) the use of components, lubricants or ancillary products that are not approved by Dana.

To the extent permitted by law, neither party shall under any circumstances whatever be liable to the other, whether in contract, tort or restitution, or for breach of statutory duty or misrepresentation, or otherwise, for any loss of profit, loss of goodwill, loss of business, loss of business opportunity, loss of anticipated saving, special, indirect or consequential damage suffered by the other party that arises under or in connection with the contractual relationship between the parties. Nothing herein shall limit or exclude the liability of either party for death or personal injury, or for damages resulting from gross negligence, intentional breach or willful misconduct.

## 1.4 GENERAL WARNINGS

Personnel must be informed about the following subjects regarding machine 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 machine 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 machine 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 gearbox parts, which has not been authorized by Dana Incorporated, may represent an accident risk and releases the manufacturer from any civil or penal liabilities, and will always invalidate the warranty.

## 1.5 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.).

## 1.6 REVISIONS

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

## 1.7 TRACKING LIST

Table 1:

File Name	Rev.	Date	Description
IMM-0007EN - Pump Drives BZ	00	14/03/2022	Document issued

## 1.8 MODELS

Pump Drives BZ
----------------

## 2 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.

- 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

### 2.1 CODE DESCRIPTION:

Table 2:

BZ3-340	00	1,35	CS1
Pump drive size	Pump drive output	Ratio	Pump drive input

2.2 CONFIGURATIONS:

Table 3:

Pump drive: BZ1-204		Pump drive: BZ2-204	
As per view		As per view	
A		Oil dipstick	
C		Drain - Magnetic plug	
F		Filler - Breather plug	
Rotated 90°			
B,E		Filler - Breather plug	
C,F		Level (no dipstick)	
B,E		Drain - Magnetic plug	
Rotated 180°			
D		Oil dipstick	
F	Drain - Magnetic plug		
C	Filler - Breather plug		
Pump drive: BZ3-204		Pump drive: BZ1-290	
As per view		As per view	
A		Oil dipstick	
C		Drain - Magnetic plug	
D		Filler - Breather plug	
Rotated 180°			
C		Filler - Breather plug	
B	Oil dipstick		
D	Drain - Magnetic plug		
		Rotated 180°	
C	Oil dipstick	C	Oil dipstick
B	Oil dipstick	B	Drain - Magnetic plug
D	Drain - Magnetic plug	D	Filler - Breather plug

# CONFIGURATIONS:

Table 4:

Pump drive: BZ2-265 / 290 / 340		Pump drive: BZ3-265 / 290	
As per view		As per view	
A	Oil dipstick	B	Filler - Breather plug - Forced circulation
B	Filler - Breather plug	C	Drain - Magnetic plug - Forced circulation
C	Drain - Magnetic plug	D	Oil dipstick
D	Level	Rotated 180°	
Rotated 90°		A	Level
B	Filler - Breather plug	B	Drain - Magnetic plug - Forced circulation
C	Level	C	Filler - Breather plug - Forced circulation
D	Drain - Magnetic plug		
Pump drive: BZ2-470		Pump drive: BZ3-470	
As per view		As per view	
A	Oil dipstick	A	Filler - Breather plug
B	Filler - Breather plug - Forced circulation	B	Forced circulation
D	Forced circulation	C	Level
E	Drain - Magnetic plug	D	Drain - Magnetic plug
F	Level	E	Forced circulation
Rotated 90°		F	Oil dipstick
C	Filler - Breather plug - Forced circulation	Rotated 180°	
D	Level	A	Drain - Magnetic plug - Forced circulation
F	Drain - Magnetic plug - Forced circulation	B	Level
Pump drive: BZ4-470		D	Filler - Breather plug
A	Oil dipstick	E	Forced circulation
B, C	Filler - Breather plug - Forced circulation		
C	Level		
D, E, F	Drain - Magnetic plug - Forced circulation		

---

### **3 SUPPLY CONDITION**

The exterior of the gear units are painted with a synthetic epoxy primer (“RAL 5012” 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 gearbox 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. 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.

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## 4 PACKING, HANDLING, RECEIPT

### 4.1 PACKING

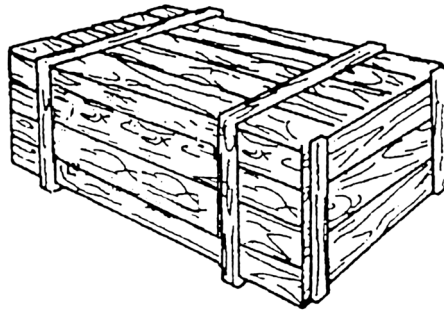


Fig. 1

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#### **NOTE:**

**Depending on the arrangements with the customer at the time of sale, the product can be packed in a wooden box, in completely closed cardboard packing, or on pallets.**

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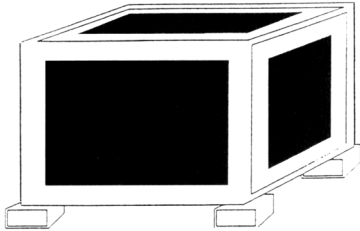
To ensure that no part inside the packing can be damaged in any way during transport, the mobile parts are blocked and the more delicate parts are specially protected.

For transport, the product can be protected (in its most exposed parts) with impermeable materials or placed on a wooden pallet and fixed to it by straps or fastenings in order to obtain a single rigid body.

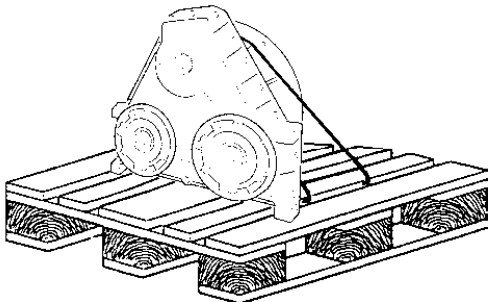
## 4.2 HANDLING

**NOTE:**

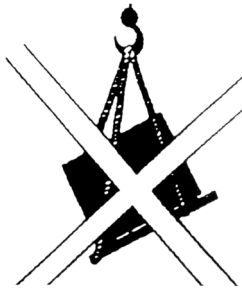
The weight of the packed products is given in the Transport Documents or Packing List.



If necessary, place wooden wedges of wood under the package to facilitate lifting.



For handling, use lifting equipment suitable for the type of packing and of adequate capacity, given on the same.



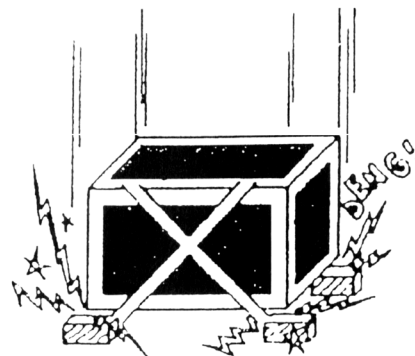
Never tilt or turn over the packing during transport.



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



If the packages are unloaded with a hoist or hook, make sure the load is balanced and use approved lifting accessories for the sling. For packages shipped on pallets, make sure the lifting accessories do not damage the products.



When lifting and positioning of the package, be careful to avoid violent impacts.



**IMPORTANT:**

The packages are not stackable.

# RECEPTION

## 4.3 RECEPTION

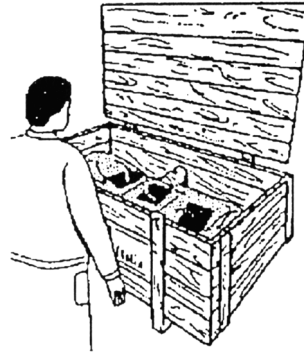


Fig. 2

### **NOTE:**

On arrival of the packages, check the good condition of their contents in the presence of the carrier. Check the supply by means of the packing list enclosed with the product (transport documents), making sure the supply matches the order specifications.

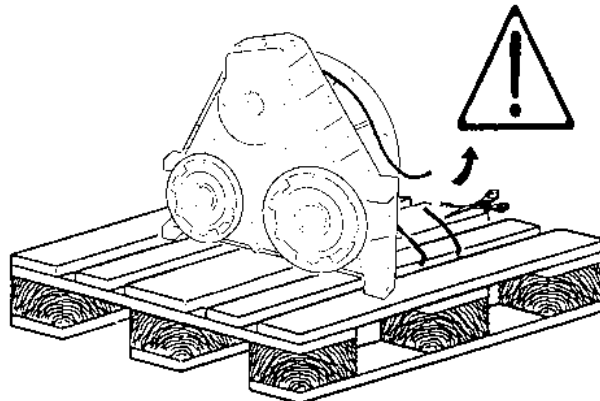


Fig. 3

### **CAUTION**

The strap fixing of the product to the packing is sharp; during unpacking it could strike the operator. The packing must be removed as follows.

- Cut the straps with scissors (pay attention to the ends, which could strike the operator).
- Cut or remove the outer packing.
- Cut the inner strap (pay attention to the ends, which could strike the operator).
- Remove the gearbox from the pallet.

If any damage, defects or shortages are detected, immediately notify the Dana Motion Systems Italia S.r.l. Assistance Service.

# HANDLING THE GEARBOX WITHOUT PACKING

## 4.4 HANDLING THE GEARBOX WITHOUT PACKING

### IMPORTANT:

The weight of gearboxes to be handled may be given on Dimensional Drawing SI referred to in the Conformity Declaration Certificate.

### ⚠ CAUTION

Lifting, transport and handling operations must only be carried out by the maintenance technician and trained personnel (slingers, crane operators, etc.) coordinated by a qualified person on the ground, able to give the necessary signals.

### ⚠ CAUTION

Make sure the lifting device to be used for transport and handling is adequate for the total weight of the gearbox, given on Dimensional Drawing SI referred to in the Conformity Declaration Certificate.

Any other system used for lifting, transport and handling of the gearbox, not included among those recommended by the manufacturer, invalidates the insurance guarantee for damage to the gearbox and/or optional units linked to it.

If the size of the gearbox obstructs the operator's view during lifting, transport and handling operations, use two operators on the ground who check for possible hazards or hindrances. Also make sure there are no unauthorised personnel in the transport area and that any accessories connected to the gearbox do not hinder movements or make transport manoeuvres dangerous.

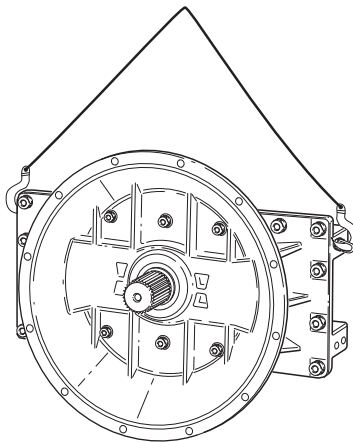


Fig. 4

### ⚠ CAUTION

The gearboxes are components that are not perfectly balanced and must be lifted with suitable devices.

Before removing the gearbox from its packing, secure it with the lifting accessories so that it cannot slip or tip over. Before handling the gearbox, remove the wooden chocks placed in the packing to ensure its stability during shipping.

- Proceed with caution during handling, avoiding sudden movements and violent impacts.
- Lift the gearbox, being careful not to unbalance the load during manoeuvres. In this phase, two operators must guide the gearbox at the sides during lifting, to avoid sudden movements or swaying which could create extremely dangerous situations.
- In case of excessive swaying, it is advisable to stop and repeat the gearbox lifting operations.
- After lifting the gearbox, take it to the place intended for positioning.

### Transport

Always make sure the transported product is balanced, securing it firmly to the means of transport by means of slings, ropes and/or hooks complying with the current standards. During transport, avoid dangerous swaying of the load which could become unbalanced and fall.

Do not place anything on top of the gearbox during transport, as some parts could get permanently damaged.

## 5 STORAGE

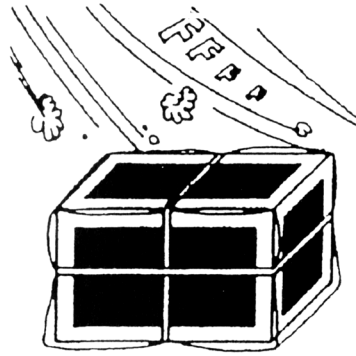
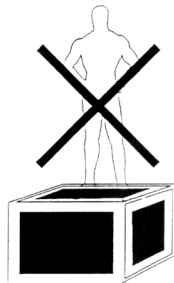


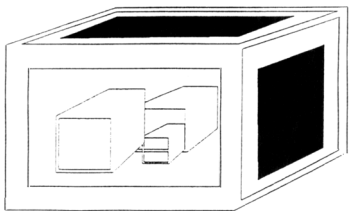
Fig. 5

If the product needs to be stored for more than 2 months:

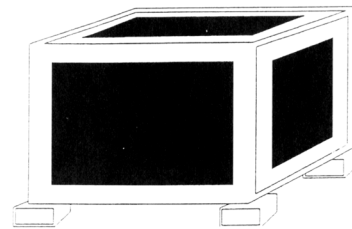
- Protect the shafts and spigots with film of grease and/or anticorrosion protective fluids.
- Fill the gearbox with suitable oils, see "Lubrication" page 20, and orient the gearbox so that the breather plug is at the top.
- Store in a dry place with temperature between - 5°C and + 30°C.
- Protect the packages from dirt and dust.
- Avoid very damp places or exposed to the weather (no outdoor areas).
- Avoid direct contact of the gearbox with the ground.
- Place the gearbox on a stable support base and make sure there is no risk of sudden shifting.



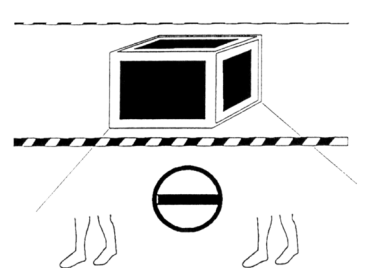
Do not stack gearboxes.  
Do not walk on or place weights on the packing.



Do not store any other materials inside the packing.



If possible position wooden wedges between the bottom of the packing and the floor.



Store the packing well away from pedestrian or vehicular traffic routes.

**NOTE:**

The efficiency of the rotary seals will deteriorate in case of storage exceeding 6 months. It is advisable to do a periodical check by rotating the internal gears by hand, turning the input shaft.

---

## 6 INSTALLATION

### 6.1 GENERAL INSTRUCTIONS:

Install the Product carefully following the steps listed below:

- When mounting the pump drive, make sure that the breather, level and drain plugs are in the correct position. They will vary in relation to the assembly position as indicated in paragraph "Configurations:" page 9.
- The pump drive is normally supplied with a flange for coupling the hydraulic pumps.
- The customer is responsible for installing suitable guards on the input shafts to protect couplings, universal joints, exposed rotating parts, etc. according to the current safety standards in force in the country where the machine is used.
- For pump drives installed in unprotected environments, use rust-inhibitor paint and protect the oil guard with water-repellent grease.

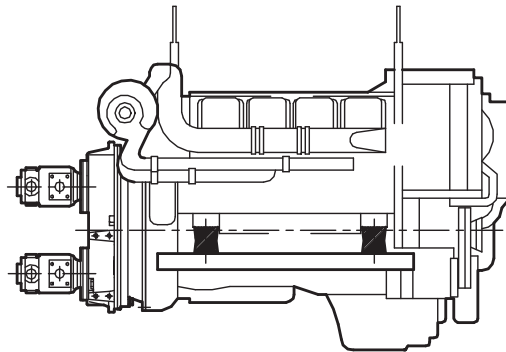
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#### **NOTE:**

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

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### 6.2 INSTALLATION INSTRUCTIONS FOR PUMP DRIVE WITH SAE FLANGE AND RDB COUPLING:



- Check that the spigots and coupling surfaces of the pump drive and the motor are clean and have not been dented.
- Use grease or oil to lubricate the coupling spigots and the housing seat.
- Position the outer ring on the flywheel and attach it using class 8.8 bolts.

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#### **NOTE:**

**use a hardened washer (R80) between the screw head and the ring to ensure correct tightening.**

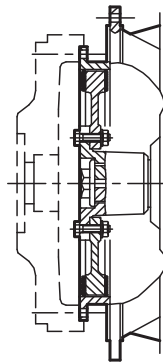
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- Tighten the bolts by applying torque as indicated in the paragraph "Bolt Tightening Torque Table:" page 23.
- Check that the rubber blocks are perfectly inserted and are not incorrectly positioned; this may occur due to impacts during transport or handling operations.
- Install the pump drive making sure that the blocks fit into the impressions on the ring mounted on the flywheel and that the spigot of the SAE housing correctly matches the motor spigot.
- Insert all the bolts into the housing (class 8.8) and tighten them applying a torque as indicated in the paragraph "Bolt Tightening Torque Table:" page 23

# INSTALLATION INSTRUCTIONS FOR PUMP DRIVE WITH SAE

## 6.3 INSTALLATION INSTRUCTIONS FOR PUMP DRIVE WITH SAE FLANGE AND FP FLEX-PLATE COUPLING:

- Check that the spigots and coupling surfaces of the pump drive and the motor are clean and have not been dented.
- Use grease or oil to lubricate the coupling spigots and the housing seat.
- Pull out the Flexplate from the pump drive shaft.
- Attach the Flexplate on the flywheel using class 8.8 bolts and tighten them applying a torque as indicated in the paragraph "Bolt Tightening Torque Table:" page 23. - Install the pump drive making sure that the shaft fits correctly into the hub that is already fastened on the flywheel and that the spigot of the housing correctly matches the motor spigot.
- Insert all the bolts into the housing (class 8.8) and tighten them applying a torque as indicated in the paragraph "Bolt Tightening Torque Table:" page 23.



### **NOTE:**

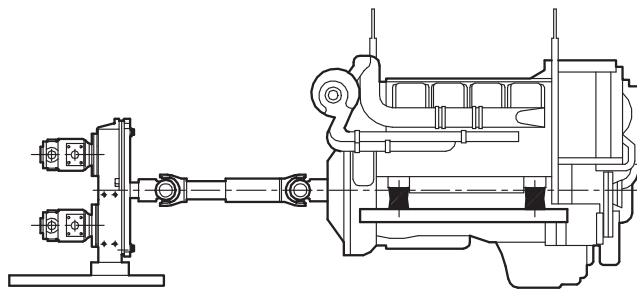
The Flexplate hub must not be attached to the pump drive shaft but must be free to slide.

### **NOTE:**

with regard to assembly, to install Dana Incorporated supplies without Couplings or Flexplate refer to the relative manufacturer's handbook.

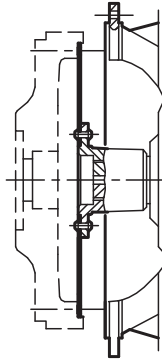
## 6.4 INSTALLATION INSTRUCTIONS FOR ADI PUMP DRIVES:

Check that the pump drive is solidly attached to brackets or support structures: for this purpose it should be recalled that the pump drive should never be fastened using vibration-damping elements. Use bolts with a minimum class 8.8 and tighten them applying a torque as indicated in the paragraph "Bolt Tightening Torque Table:" page 23.



## ACCESSORY INSTALLATION INSTRUCTIONS:

To connect to the motor, it is first recommended to use universal joints, couplings and/or elements which can compensate for misalignments. For mounting accessories, always refer to the manufacturer's handbook.



### 6.5 ACCESSORY INSTALLATION INSTRUCTIONS:

#### Pumps Assembly:

#### CAUTION

all pump drives reverse the rotation direction; if the motor rotation is right-hand, the pump rotation will be left-hand.

While assembling the pumps to the pump drive, the coupling must be lubricated with a generous layer of grease or with a no-grip lubricant. Carefully insert the motor shaft into the coupling and make sure that the spigot perfectly matches the spigot of the flange attached to the pump drive. After checking that the pump is properly centered, tighten all the attachment bolts applying a torque as indicated in the paragraph "Bolt Tightening Torque Table:" page 23.

## 7 LUBRICATION

### 7.1 PUMP DRIVE LUBRICATION:

**NOTE:**

Dana Incorporated pump drives are supplied without oil, therefore the user must select the lubricant according to what is indicated in the table shown in paragraph "Lubricant table:" page 20.

#### 7.1.1 FILLING AND LEVEL

- The pump drives are equipped with oil lever, breather, filler and drain plugs and their position varies in relation to the installation configuration.
- Check the exact position of the plugs by referring to the diagrams shown in paragraph "Configurations:" page 9.
- Unscrew the level plug (a dipstick is supplied with min. and max. notches in the standard assembly position), the filler plug and put in oil. When the oil flows out of the level plug (or the level corresponds on the dipstick to the min. and max.) re-assemble the plugs.

### 7.2 LUBRICANT TABLE:

Table 5:

Lubrificant	Mineral oil		
	ISO VG 150	ISO VG 220	ISO VG 320
Agip	Blasia 150	Blasia 220	Blasia 320
Aral	Drgol BG 150	Drgol BG 220	Drgol BG 320
BP	Energol GR-XP 150	Energol GR-XP 150	Energol GR-XP 150
Castrol	Alphamax 150	Alphamax 220	Alphamax 320
Cepsa	Engranajes HP 150	Engranajes HP 220	Engranajes HP 320
Dea	Falcon CLP 150	Falcon CLP 220	Falcon CLP 320
Elf LubMarine	Epona Z 150	Epona Z 220	Epona Z 320
Esso	Spartan EP 150	Spartan EP 220	Spartan EP 320
Fuchs	Renep Compound 104	Renep Compound 106	Renep Compound 108
Fuchs Lubritech	Gearmaster CLP 150	Gearmaster CLP 220	Gearmaster CLP 320
Klüber	Klüberoil GEM 1-150	Klüberoil GEM 1-220	Klüberoil GEM 1-320
Mobil	Mobilgear XMP 150	Mobilgear XMP 220	Mobilgear XMP 320
Nils	Ripress EP 150	Ripress EP 220	Ripress EP 320
Omv	Gear HST 150	Gear HST 220	Gear HST 320
Optimol	Optigear BM 150	Optigear BM 220	Optigear BM 320
Q8	Goya NT 150	Goya NT 220	Goya NT 320
Repsol	Super Tauro 150	Super Tauro 220	Super Tauro 320
Shell	Omala 150	Omala 220	Omala 320
Texaco	Meropa 150	Meropa 220	Meropa 320
TotalFinaElf	Carter EP 150	Carter EP 220	Carter EP 320
Tribol	1100 - 150	1100 - 220	1100 - 320

# LUBRICANT TABLE:

**Table 6:**

Lubricant	Synthetic oil with polyalphaolephines		
	ISO VG 150	ISO VG 220	ISO VG 320
Agip	-	Blasia SX 220	Blasia SX 320
Aral	Drgol PAS 150	Drgol PAS 220	Drgol PAS 320
BP	Enersyn EXP 150	Enersyn EXP 220	Enersyn EXP 320
Castrol	Alphasyn EP 150	Alphasyn EP 220	Alphasyn EP 320
Cepsa	Engranajes HPX 150	Engranajes HPX 220	Engranajes HPX 320
Dea	Intor HCLP 150	Intor HCLP 220	Intor HCLP 320
Elf LubMarine	-	Epona SA 220	Epona SA 320
Esso	Spartan SEP 150	Spartan SEP 220	Spartan SEP 320
Fuchs	Renolin unisyn CLP 150	Renolin unisyn CLP 220	Renolin unisyn CLP 320
Fuchs Lubritech	Gearmaster SYN 150	Gearmaster SYN 220	Gearmaster SYN 320
Klüber	Klübersynth EG 4-150	Klübersynth EG 4-220	Klübersynth EG 4-320
Mobil	MobilgearSHC XMP 150	MobilgearSHC XMP 150	MobilgearSHC XMP 150
Nils	-	Atoil synth 220	-
Omv	-	Gear SHG 220	Gear SHG 320
Optimol	Optigear synthetic A 150	Optigear synthetic A 150	Optigear synthetic A 150
Q8	El Greco 150	El Greco 220	El Greco 320
Shell	Omala HD 150	Omala HD 220	Omala HD 320
Texaco	Pinnacle EP 150	Pinnacle EP 220	Pinnacle EP 320
TotalFinaElf	Carter SH 150	Carter SH 220	Carter SH 320
Tribol	1510 - 150	1510 - 220	1510 - 320

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## 8 CHECKS

### 8.1 FIRST START-UP CHECKS:

Before starting the pump drive, check the following:

- Check that the rotation direction of the pumps corresponds to the direction of the pump drive outputs.
- Check that all oil plugs are in the correct position (see paragraph "Configurations:" page 9).
- Check that all oil levels are correct.

#### CAUTION

The pump drives are shipped without oil. The customer is responsible for filling such devices (see paragraph "Lubrication" page 20).

- Check that all the bolts with ISO metric threads are correctly tightened (see bolt tightening torque table "Bolt Tightening Torque Table:" page 23).

# BOLT TIGHTENING TORQUE TABLE:

## 8.2 BOLT TIGHTENING TORQUE TABLE:

Table 7: Tightening torques table

Preloads and tightening moments for ISO metric thread screws											
d x p mm	Sr mm <sup>2</sup>	4.8		5.8		8.8		10.9		12.9	
		F kN	M Nm	F kN	M Nm	F kN	M Nm	F kN	M Nm	F kN	M Nm
3 x 0.5	5.03	1.2	0.9	1.5	1.1	2.3	1.8	3.4	2.6	4.0	3.0
4 x 0.7	8.78	2.1	1.6	2.7	2.0	4.1	3.1	6.0	4.5	7.0	5.3
5 x 0.8	14.2	3.5	3.2	4.4	4.0	6.7	6.1	9.8	8.9	11.5	10.4
6 x 1	20.1	4.9	5.5	6.1	6.8	9.4	10.4	13.8	15.3	16.1	17.9
7 x 1	28.9	7.3	9.3	9.0	11.5	13.7	17.2	20.2	25	23.6	30
8 x 1.25	36.6	9.3	13.6	11.5	16.8	17.2	25	25	37	30	44
8 x 1	39.2	9.9	14.5	12.2	18	18.9	27	28	40	32	47
10 x 1.5	58	14.5	26.6	18	33	27	50	40	73	47	86
10 x 1.25	61.2	15.8	28	19.5	35	30	53	43	78	51	91
12 x 1.75	84.3	21.3	46	26	56	40	86	59	127	69	148
12 x 1.25	92.1	23.8	50	29	62	45	95	66	139	77	163
14 x 2	115	29	73	36	90	55	137	80	201	94	235
14 x 1.5	125	32	79	40	98	61	150	90	220	105	257
16 x 2	157	40	113	50	141	76	214	111	314	130	368
16 x 1.5	167	43	121	54	150	82	229	121	336	141	393
18 x 2.5	192	49	157	60	194	95	306	135	435	158	509
18 x 1.5	216	57	178	70	220	110	345	157	491	184	575
20 x 2.5	245	63	222	77	175	122	432	173	615	203	719
20 x 1.5	272	72	248	89	307	140	482	199	687	233	804
22 x 2.5	303	78	305	97	376	152	592	216	843	253	987
22 x 1.5	333	88	337	109	416	172	654	245	932	286	1090
24 x 3	353	90	383	112	474	175	744	250	1060	292	1240
24 x 2	384	101	420	125	519	196	814	280	1160	327	1360
27 x 3	459	119	568	147	703	230	110	328	1570	384	1840
27 x 2	496	131	615	162	760	225	1200	363	1700	425	1990
30 x 3.5	561	144	772	178	955	280	1500	399	2130	467	2500
30 x 2	621	165	859	204	1060	321	1670	457	2370	535	2780

## 8.3 NO-LOAD TESTS:

After a brief period of no-load operation (2-3 minutes) check the oil levels, topping up those levels which have gone down and check that all nuts and bolts of the various attachments are properly tightened.

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## 9 MAINTENANCE

Maintenance can be “routine or unscheduled”.

### CAUTION

All maintenance activities must be carried out under safety conditions.

#### 9.1 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 (run-in phase), change the oil.
- Check that there are no metallic parts with unusual dimensions in the magnetic plug of the gear unit.
- Change the oil in the pump drive while it is hot so that it is easier to drain.
- Clean the inside of the pump drive with a liquid cleaner that is suitable and recommended by the lubricant manufacturer.
- Subsequent oil changes will be made every 2000-2500 hours of operation or, in any case, each year.
- Do not mix different types of oil.
- Periodically check the levels (about once a month) and top up if necessary.
- Please check the oil level when the pump drive does not work.
- For each unit it is recommended to keep a chart that will be duly filled out and updated each time maintenance is performed.

#### 9.2 OIL CHANGE:

- Identify the pump drive from paragraph "Configurations:" page 9 and as a consequence the oil drain plug, according to the pump drive configuration.
- Unscrew the drain plug and breather plug to help the oil drain from the gear unit, and once emptied, re-assemble the drain plug.
- Wash the interior of the pump drive with a suitable cleaning liquid that is recommended by the lubricant manufacturer as follows:

Place the liquid in the pump drive and then re-assemble the filler plugs, turn it for a few minutes at a high speed, then empty the cleaning liquid again from the pump drive.

- See paragraph "Pump drive lubrication:" page 20 for filling instructions.

#### 9.3 RBD COUPLING MAINTENANCE:

No specific maintenance is required for the RBD couplings. Just periodically inspect the rubber blocks.

- They must be replaced when the first signs of wear are detected. Do not wait until they have broken.

#### 9.4 FP FLEXPLATE COUPLING MAINTENANCE:

No specific maintenance is required for the FP Flexplate couplings. Just periodically inspect the coupling making sure that the metal disk is undamaged and keep the groove of the disk holder hub greased.

#### 9.5 UNSCHEDULED MAINTENANCE:

Dana Incorporated prohibits the pump drive to be opened to carry out any operation that is not included in routine maintenance procedures.

Dana Incorporated will not be held responsible for all those operations carried out that are not included in routine maintenance procedures, which have caused damage to property or injured persons. When the need arises, contact the nearest Dana Incorporated service centers.

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## **10 SCRAP DISPOSAL:**

### **10.1 GEARBOX DISPOSAL:**

If the gearbox must be scrapped, it should become nonoperational:

- Disassemble the various parts.
- Disconnect any motor unit.
- But first after having completely emptied all the oil from the pump drive.

### **10.2 ECOLOGY INFORMATION:**

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

#### **10.2.1 INSTRUCTIONS FOR SUITABLE WASTE TREATMENT**

- Iron, aluminum, copper materials: these are recyclable materials which must be sent 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 Olii Esausti).

## 11 PROBLEMS AND RELATIVE SOLUTIONS

If malfunctions occur, consult the following table. If the problems continue, contact the nearest Dana Incorporated service centers.

**Table 8:**

PROBLEM	POSSIBLE CAUSE	SOLUTION
With motor running the pump shafts don't turn	1) Incorrect motor assembly	1) Check coupling between pump drive and motor
	2) Internal malfunction	2) Contact a Service Center
Excessive vibration	1) Incorrect pump drive installation	1) Verify fixing points
	2) Pump drive structure too weak	2) Strengthen the structure
	3) Internal malfunction	3) Contact a Service Center
Excessive heating	1) No ventilation	1) Remove fairing
	2) High thermal power	2) Insert oil recirculation
	3) No lubricant	3) Add lubricant
Oil leak from seals	1) Breather plug clogged	1) Unscrew and thoroughly clean the plug
	2) Stiffening of seals due to prolonged storage	2) Clean the area and check for leakage after a few days
	3) Damaged or worn seals	3) Contact a Service Center
Excessive noise	1) Internal malfunction	2) Contact a Service Center
Oil leakage from breather during operation	1) Level too high	1) Lower oil level
	2) Breather in incorrect position	2) Check breather position



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