

**BREVINI[®]***Motion Systems*

Service Manual

MT-7106-0411 R09

Gear units for environments with potentially explosive atmospheres, according to ATEX 2014/34/UE



II 2G Ex h IIC T4 Gb



II 2G Ex h IIB T4 Gb



II 2D Ex h IIIC T108°C Db



II 3G Ex h IIC T4 Gc



II 3G Ex h IIB T4 Gc



II 3D Ex h IIIC T108°C Dc

IMM-0010EN**October 2022**

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1 STANDARDS OBSERVED AND TYPE OF MANUAL

Installation and maintenance manual for explosion-proof gear units, in potentially explosive atmosphere according to:

Table 1:

ATEX 2014/34/UE
EN ISO 80079-36:2016
EN ISO 80079-37:2016
EN 1127-1:2011



2 VERSION TRACKING

Table 2:

File name	Revision	Date	Changes description
MT-7106-0411_IT_EN_rev_00	00	01/03/2011	First issue
MT-7106-0411_IT_EN_rev_01	01	01/10/2011	totally revised
MT-7106-0411_IT_EN_rev_02	02	02/08/2013	Multi-disk brakes added
MT-7106-0411_IT_EN_rev_03	03	20/04/2016	Update to 2014/34/EU
MT-7106-0411_IT_EN_rev_04	04	27/04/2017	Update Legal Identity, Logo and Declaration of Conformity
MT-7106-0411_IT_EN_rev_05	05	14/02/2018	Update Legal Identity, Logo and Declaration of Conformity
MT-7106-0411_IT_EN_rev_06	06	15/11/2018	Update Legal Identity
MT-7106-0411_IT_EN_rev_07	07	24/01/2019	Update name plate layout
IMM-0010EN_Rev.08 MT-7106-0411	08	16/03/2020	Changed layout and complete revision
IMM-0010EN_Rev.09 MT-7106-0411	09	24/10/2022	Update Table 15: (pag. 28) Update Table 16: (pag. 30)

2.1 MANUAL APPLICABILITY AND SUPPORTED MODELS

Table 3:

Models
Industrial Planetary Gearboxes
High Torque Planetary Gearboxes
Slewing Drives

3 INTRODUCTION

3.1 CONSULTING THE MANUAL

Consulting this manual is facilitated by the table of contents given on the first page, which allows the subject of interest to be located at a glance. The chapters are arranged in a progressive way that facilitates finding the required information.

3.2 SCOPE OF THE MANUAL

This manual provides the gearbox user with the information necessary for its proper installation, use, maintenance and possible storage in compliance with the safety limits laid down by the current regulations.

This manual is produced in English by Dana Motion Systems Italia S.r.l.; on request, it can also be made available in other languages to meet the legislative and/or commercial requirements of the relevant European country.

We decline any responsibility for translations, in other languages, that do not comply with the original meaning.

For better understanding of this manual, given below are the terms and symbols used in it:

Danger Zone

An area inside or near the machine where the presence of an exposed person poses a risk to the safety and health of that person.

Exposed person

Any person who is wholly or partially in a danger zone.

Operator

A person in charge of installing, operating, adjusting, performing routine maintenance and cleaning the machine as a whole.

Qualified technician

A specialised person assigned to perform extraordinary maintenance or repairs that require special knowledge of the machine, its operation, the safety devices and how they work.

WARNING

Possibility of damage to the machine and/or its components.

CAUTION

Accident-prevention regulations for Operator and Qualified Technician.



Specific notes on safety against the danger of explosion.

IMPORTANT:

ADDITIONAL INFORMATION ABOUT THE OPERATION IN PROGRESS.

NOTE:

Provides useful information.

This Manual for installation and maintenance of gearboxes for places with potentially explosive atmospheres, according to ATEX 2014/34/UE,

- II 2G Ex h IIC T4 Gb
- II 2G Ex h IIB T4 Gb
- II 2D Ex h IIIC T108°C Db
- II 3G Ex h IIC T4 Gc
- II 3G Ex h IIB T4 Gc
- II 3D Ex h IIIC T108°C Dc

and its dedicated "Dimensional Drawing SI referred to in the Declaration of Conformity Certificate", must be kept in the immediate vicinity of the gearbox and easy to consult.

For any doubts and in case of damage or loss of the manual, please contact the Dana Motion Systems Italia S.r.l. Technical Service.



INTRODUCTION

3.3 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. 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, (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, (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.

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Storage on any kind of support (magnetic, magnetic-optical, optical, micro-film, photocopy, etc.) is also not permitted.

3.4 REVISIONS

Dana Motion Systems Italia S.r.l. is not responsible for any kind of printing error in the manual. This manual is deemed valid at the invoicing date of the product to which it refers. The manual refers to the revision level printed on it. In case of a new revision of this manual, in the parts regarding regulations and spare parts, Dana Motion Systems Italia S.r.l. will update it and indicate a new revision index for the manual, pointing out its non-liability (direct or indirect) for improper use of the manual with revision index not matching in serial number, invoicing date and date of revision.

NOTE:

Images, documents and drawings are introduced for the purpose of instruction, for safe and proper handling of the products and maintenance operations. There may be minor differences between the drawings in this manual and the delivered product. However, these differences are not significant for the main features of the product, or maintenance instructions.

4 STATE OF SUPPLY

The gearboxes supplied undergo a specific ATEX painting cycle to prevent electrostatic charges, and therefore must not be repainted; in case of supply of gearboxes that are not painted according to ATEX specifications (only possible for Category 3 gearboxes), the customer must take charge of the painting.

Unless otherwise stated in the contract, all the gearboxes are supplied without lubricant.

The machined outer parts of the gearbox, such as the hollow and solid shafts, support surfaces, spigots, etc., are protected with antioxidant oil (tectyl).

NOTE:

Avoid damaging the paintwork (mechanical, e.g. scratches; chemical, e.g. acid solvent; thermal, e.g. flames or sparks) so as not to compromise the protective effect.

5 PACKING, HANDLING, RECEIPT

5.1 PACKING

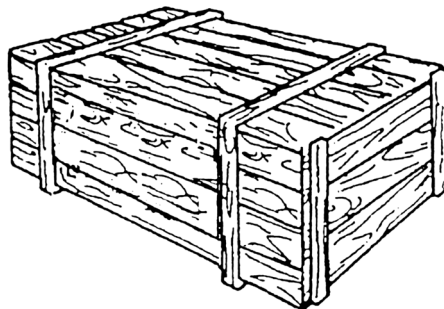


Fig. 1

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.

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.

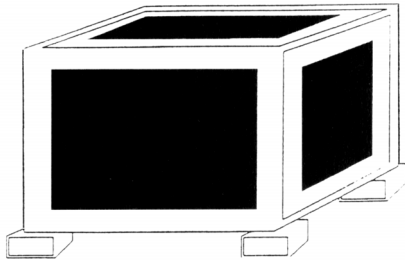
For transport, the product can be protected (in its most exposed parts) with impermeable materials or placed on a wooden pallet and fixed to it by straps or fastenings in order to obtain a single rigid body.

PACKING, HANDLING, RECEIPT

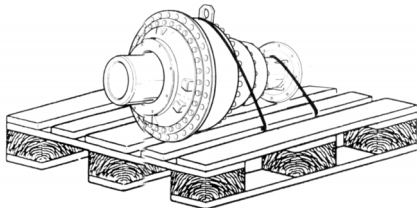
5.2 HANDLING

NOTE:

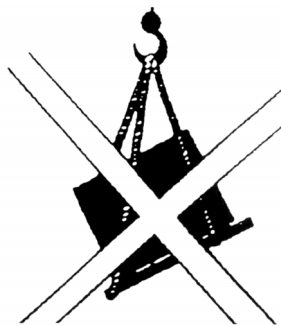
The weight of the packed products is given in the Transport Documents or Packing List.



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



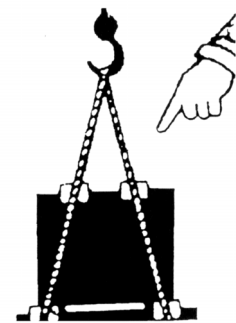
For handling, use lifting equipment suitable for the type of packing and of adequate capacity, given on the same.



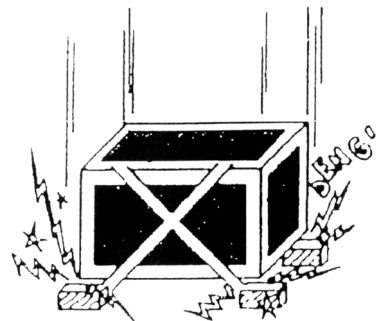
Never tilt or turn over the packing during transport.



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.

PACKING, HANDLING, RECEIPT

5.3 RECEPTION

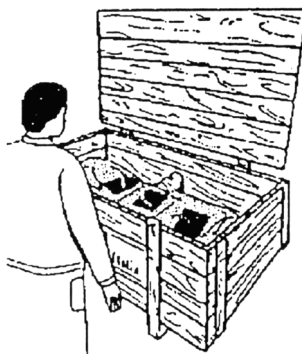


Fig. 2

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.

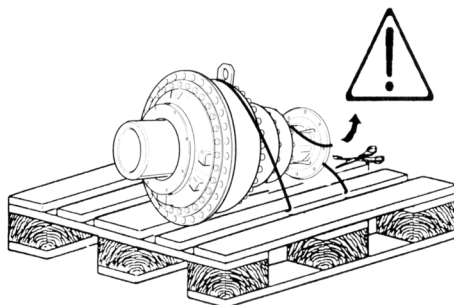


Fig. 3

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.

WARNING



Do not put damaged gearboxes into service, even if only slightly damaged or if deemed unsuitable for their intended use; in this case contact Dana Motion Systems Italia S.r.l..

PACKING, HANDLING, RECEIPT

5.4 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.

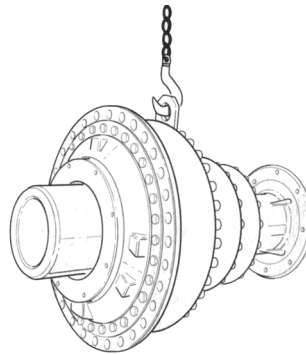


Fig. 4

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 machine, 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.

6 STORAGE

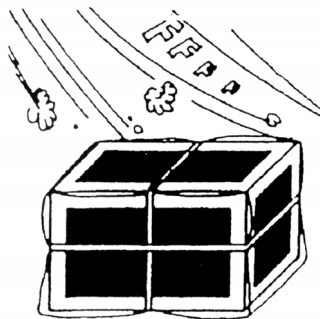
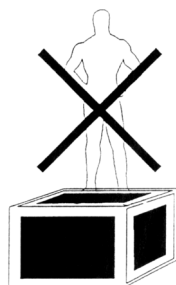


Fig. 5

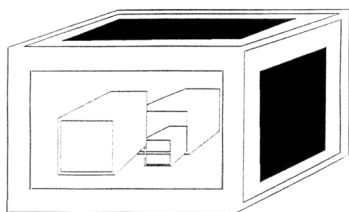
If the product needs to be stored for more than 2 months:

- Protect the shafts and spigots with film of grease and/or anticorrosion protective fluids.
- Fill the gearbox with suitable oils, see 9 Lubrication (pag. 50), 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.

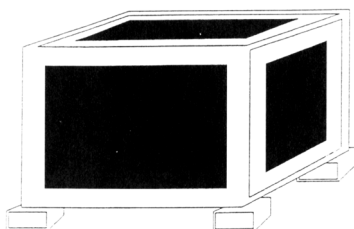


Do not stack gearboxes.

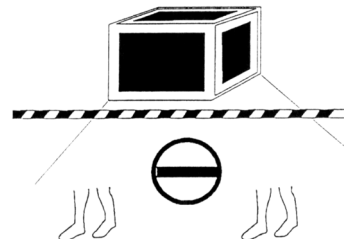
Do not walk on or place weights on the packing.



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.

WARNING



Precautions for reinstatement of the gearbox after storage:

- Degrease the outer coupling surfaces and remove the antioxidant using the usual solvents, paying attention to the sealing rings which must never come into contact with the solvent. This operation must be done outside of the explosion risk area.
- If, for storage, it is filled with oil different from that necessary for operation, flush the inside the gearbox before filling it with the required oil.
- After a very long period of storage it is advisable to replace the rotating rings before starting.

7 DATA PLATE

Every gearbox has a **Data Plate** and a **EU Declaration of Conformity** in accordance with Directive 2014/34/EU. The Data Plate gives the main technical information regarding the functional and construction characteristics of the gearbox; it must therefore be kept intact and visible by providing for regular cleaning. Use the data given on the plate when contacting the Dana Motion Systems Italia S.r.l. service centres.

 Via L. Brevini 1 / A 42124 Reggio Emilia / Italy			
S.N.		$n_1 \max(\text{rpm})$	
Family		$P \max(\text{kW})$	
$i =$		Input	

MARCATURA
MARKING

Fig. 6

- 1 - Bar code
- 2 - Manufacturing date
- 3 - Serial number
- 4 - Max. input rpm (with Duty cycle, see drawing SI)
- 5 - Family name
- 6 - Max. operating power (with Duty Cycle, see drawing SI)
- 7 - Total ratio
- 8 - Input type
- 9 - Atex signature
 - II 3G Ex h IIC T4 Gc
 - II 3G Ex h IIB T4 Gc
 - II 3D Ex h IIIC T108°C Dc
 - II 2G Ex h IIC T4 Gb
 - II 2G Ex h IIB T4 Gb
 - II 2D Ex h IIIC T108°C Db
 - X : Special conditions of use

The operating conditions must not exceed the values of the design duty cycle, given on Dimensional Drawing SI referred to in the Conformity Declaration Certificate.
In case of malfunction of the system that controls the working power delivered, the machine must be stopped immediately and the gearbox sent to the Dana Motion Systems Italia S.r.l. Assistance Service for overhaul.

CAUTION	
	<p>The gear motors (gear unit with motor) must have two separate rating plates with ATEX-compliant marking. The marking of the motor must correspond to the design specifications of the system or machine.</p> <p>For gear motors, the lowest Atex protection rating among those indicated on the gear unit and motor is valid.</p>



DATA PLATE

7.1 CONDITIONS OF USE AND OPERATING LIMITS

The permissible ambient operating temperature is between -20°C and +40°C

WARNING

The rating plate values relevant to maximum surface temperatures refer to measurements in normal ambient conditions and normal and proper installation. Operation of the gearbox in a small compartment considerably reduces the ability to dissipate the thermal power, and therefore has significant effects on the generation of heat.

8 INSTALLATION AND ACCESSORIES

Installation of the gearboxes must be carried out with care and professionalism by technically qualified and adequately trained personnel.

Personnel should be informed about the following matters regarding safety in machine use:

- General accident-prevention regulations or those envisaged by international directives and the laws of the country where the machine is used.
- Specific accident-prevention regulations:
 - 1 - European Directive 2014/34/EU deals with prevention systems to be implemented on equipment and therefore, in the present specific case, it is the reference directive for gearboxes.
 - 2 - European Directive 1999/92/EC (ATEX 153) deals with the safety of personnel during installation, operation or maintenance of potentially explosive systems.
- Accident risks.
- Equipment provided for the safety of operators PPE (personal protection equipment: goggles, gloves, helmet, etc.).

Preparation for operation must occur in compliance with all the technical indications given on the dedicated Dimensional Drawing SI.

All installation operations must ensure maximum safety regarding:

- 1 - the safety of operators and third parties
- 2 - proper working of the gearbox
- 3 - safe operation

Any arbitrary manipulation of the gear unit and of any accessories that may have been provided at the origin is strictly forbidden.



The gear units supplied by Dana Motion System Italia are intended to be integrated into complete equipment or systems, therefore they must not be put into operation until the machine or system has been declared compliant with the provisions of the directives in force (Machinery Directive 2006/42/EC and subsequent amendments).



Before starting installation, check the consistency between the data given on the data plate and that regarding the place where the gearbox is to be installed.

The gearboxes do not have to be repainted if already supplied painted by Dana Motion Systems Italia S.r.l..

When it is absolutely necessary to apply an additional protective layer, the risk of ignition caused by electrostatic charges must be prevented.



CAUTION

Any installation or maintenance work must be done with the gearbox stopped, therefore it is advisable to make sure unintentional activation of the driving force cannot occur.

INSTALLATION AND ACCESSORIES

WARNING



The structures the gearboxes are fixed to must be rigid, with flat machined support surfaces free of paint, perpendicular to the driven shaft, and centring with adequate tolerance.

The contact surfaces must be perfectly degreased.

Check that the coupling with the flange of the electric or hydraulic motor (motion input side) is such as to prevent dust or foreign bodies from entering.

As a precaution use Loctite 510 sealant.

Care must be taken with the alignment of the gearbox and the driven shaft, especially with gearboxes with splined female output, which cannot take external radial or axial loads.

For the correct machining tolerances of the structure and machine shaft, comply with that given on Dimensional Drawing SI referred to in the Conformity Declaration Certificate.

Before tightening the bolts connecting the gearbox to the structure and the motor to the gearbox, make sure the coupling between the male shafts and female shafts is precise, but without interference.

The drive parts to be coupled on the output shaft must be machined according to the instructions given in the following sections, for the respective types of fixing and output shafts.

In the connection between the gearbox input shafts and motor it is advisable to use couplings able to recover any misalignment, whereas if mechanical parts unable to recover misalignment are used, pay particular attention to the alignment of gearbox and motor during assembly.

In case of right-angle gear units with male input shaft, the input shaft may be deviated with respect to its ideal position.

To remedy this situation, the following is advisable:

- with connections by means of couplings able to recover misalignments, to measure the existing misalignment, check the misalignment tolerable by the coupling and, if the value is greater, shim the motor to come within the permissible play
- with connection by means of mechanical parts that do not allow the recovery of play, align the motor by shimming.

For mounting, use class 10.9 screws with tightening to 75% yield and plain washers ISO 7089 hardness HV300.

For tightening, refer to Table 4: Tightening torques (pag. 19).

NOTE:



For mounting Category 2 GD gearboxes, use LOCTITE 243 on the bolts for fixing to the structure of the machine.

During the assembly make sure to avoid violent axial impacts which could damage the inner bearings.

Lubricate the splined input and output couplings with anti-seize compounds such as LOCTITE 8150, MOLYKOTE GN PLUS, CHESTERTON 710-785.

It is absolutely forbidden to do welding work on the gearboxes.

It is absolutely forbidden to confine the gearboxes inside closed enclosures, in narrow spaces or near heat sources.

Provide for lubrication in accordance with the instructions given in Chap.9 Lubrication (pag. 50).

INSTALLATION AND ACCESSORIES

Table 4: Tightening torques

Preload and tightening torque for bolts with ISO metric threads											
d x p mm	Sr mm ²	4.8		5.8		8.8		10.9		12.9	
		F kN	M N·m	F kN	M N·m	F kN	M N·m	F kN	M N·m	F kN	M N·m
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



INSTALLATION AND ACCESSORIES

8.1 ⚡ EARTHING

WARNING



Carry out an equipotential connection of the gearbox and possible machine crankcase using one of the free holes of the gearbox casing, making sure to:

- remove the paint in the contact area;
- use wires of adequate section in accordance with the current regulations, see Table 5 of Standard EN 60079-0, considering as a cross-sectional area for the installation phase wires that of the motor power supply cables;
- use anti-loosening and anti-rotation fastening in the connection cables;
- mark the place used for the earth connection on the gearbox with appropriate symbols (⚡);
- check the equipotentiality between the gearbox and systems connected to its input and output.

INSTALLATION AND ACCESSORIES

8.2 FLANGE MOUNTING WITH SPLINED HOLLOW OUTPUT SHAFT (FE)

FE - High Torque Planetary Gearboxes

Splined female output

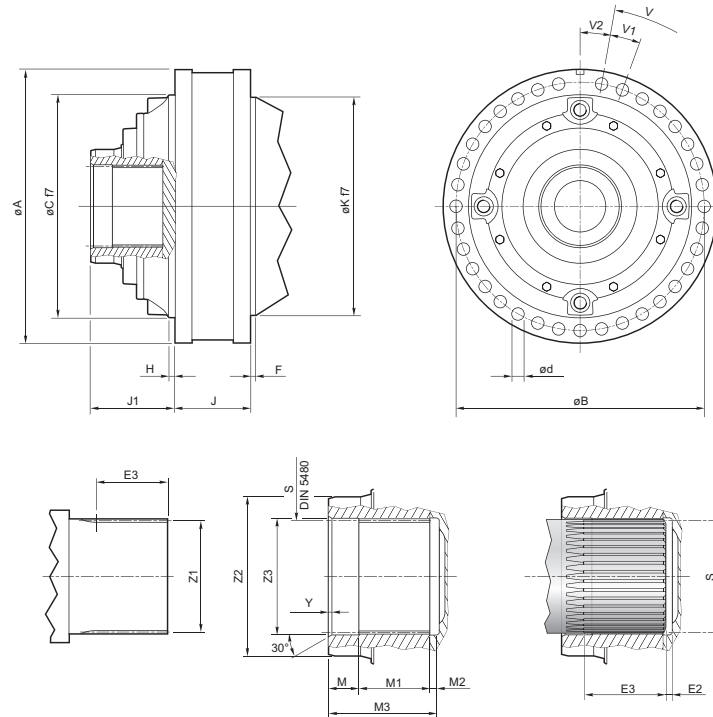


Fig. 7

Table 5:

	A	B	C	d	E2	E3	F	H	J	J1	K	M	M1	M2	M3
S300	445	400	370	15.5	2	>90	12	10	124	117	365	15	90	—	105
S400	445	400	370	15.5	10	>92	12	10	124	140	365	15	90	10	115
S600	510	460	410	22	10	>87	12	12	142	160	415	45	85	10	140
S850	565	510	460	26	10	>107	10	11	156	174	450	45	105	10	160
S1200	635	575	520	26	15	>125	15	12	175	205	520	45	120	15	180
S1800	710	650	595	26	15	>135	16	14	185	213	595	45	130	15	190
S2500	810	735	665	33	15	>145	15	12	195	227	665	50	140	15	205
S3500	885	810	740	33	17	>178	14	14	235	260	740	50	170	17	237
S5000	980	900	810	39	17	>208	14	14	265	338	810	60	200	17	277
S7500	1160	1070	970	40	15	>245	20	20	285	413	970	60	235	15	310

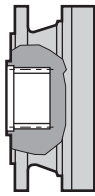
Table 6:

	S	V	V1	V2	Y	Z1	Z2	Z3
S300	N120x5x30x22x9H	n°35x10°	10°	10°	1x45°	W120x5x30x22	165	122
S400	N140x5x30x26x9H	n°35x10°	10°	10°	3x30°	W140x5x30x26	185	142
S600	N150x5x30x28x9H	n°28x12.857°	12.857°	6.428°	5x30°	W150x5x30x28	218	152
S850	N170x5x30x32x9H	n°28x12.857°	12.857°	6.428°	5x30°	W170x5x30x32	235	172
S1200	N200x5x30x38x9H	n°32x11.25°	11.25°	5.625°	5x30°	W200x5x30x38	275	202
S1800	N210x5x30x40x9H	n°32x11.25°	11.25°	5.625°	5x30°	W210x5x30x40	297	212
S2500	N240x5x30x46x9H	n°32x11.25°	11.25°	5.625°	5x30°	W240x5x30x46	338	242
S3500	N280x8x30x34x9H	n°36x10°	10°	5°	5x30°	W280x8x30x34	358	282
S5000	N340x8x30x41x9H	n°32x11.25°	11.25°	5.625°	5x30°	W340x8x30x41	435	342
S7500	N400x8x30x48x9H	n°40x9°	9°	4.5°	7x30°	W400x8x30x48	548	402

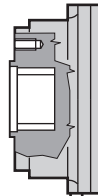
INSTALLATION AND ACCESSORIES

FE - Industrial Planetary Gearboxes

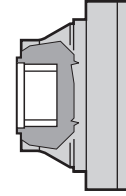
Mounting flange and female splined shaft



010-065-067-090-091



020-030-045



150-155-250-255-320

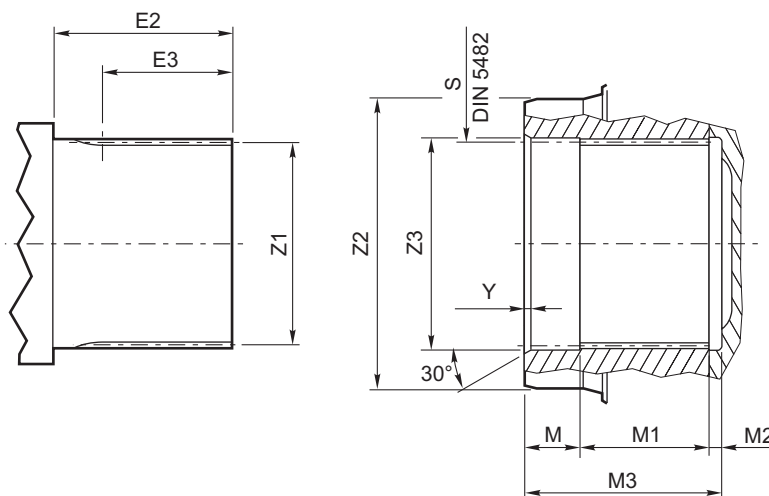


Fig. 8

Table 7:

	M3	M	M1	M2	Y	S	Z2	Z3	Z1	E2	E3
010	34.7	5	24.7	5	0.5	A40x36 H10	50 f8	36 H11	B40x36 c9	2	>30
020	51.5	8	43.6	-	1.0	A58x53 H10	75 f7	60 H7	B58x53 c9	2	>44
030	44	8	36	-	1.5	A58x53 H10	75 f7	60 H7	B58x53 c9	2	>36
045	44	8	36	-	1.5	A58x53 H10	75 f7	60 H7	B58x53 c9	2	>36
065-067	67	9	50	8	1.0	A70x64 H10	90 g7	72 H7	B70x64 c9	2	>58
090-091	75	5	62	8	1.0	A70x64 H10	90 h8	72 H7	B70x64 c9	2	>70
150-155	77	7	70	-	1.5	A80x74 H10	100 f7	88 H7	B80x74 c9	2	>70
250-255	85	7	78	-	1.5	A100x94 H10	130 f7	102 H7	B100x94 c9	2	>78
320	85	7	78	-	1.5	A100x94 H10	130 f7	102 H7	B100x94 c9	2	>78

INSTALLATION AND ACCESSORIES

8.3 FLANGE MOUNTING WITH SPLINED MALE OUTPUT SHAFT (MN - MR - MP)

MP- High Torque Planetary Gearboxes

Splined male output

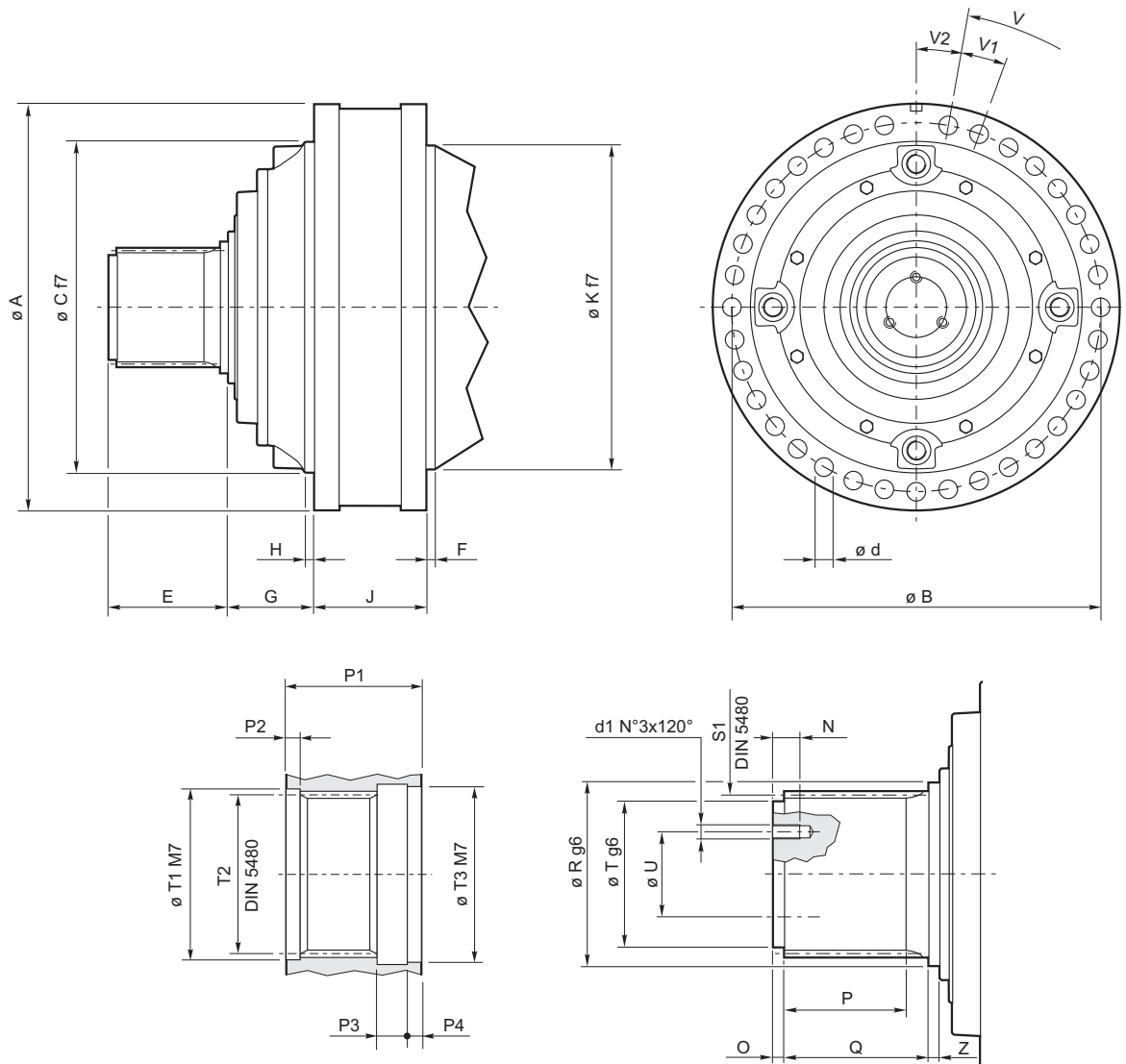


Fig. 9

Table 8:

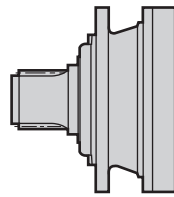
	A	B	C	d	d1	E	F	G	H	J	K	N	O	P
S300	445	400	370	15.5	M14	130	12	117	10	132	365	27	10	85
S400	445	400	370	15.5	M14	140	12	145	10	124	365	27	13	90
S600	510	460	410	22	M14	150	12	152	12	145	415	27	12	95
S850	565	510	460	26	M14	170	10	163	11	156	450	27	15	115

Table 9:

	P1	P2	P3	P4	Q	R	S1	T	T1	T2	T3	U	V	V1	V2	Z
S300	130	10	15	21	105	120	W120x3x30x38x8f	100	121	N120x3x9H	120	75	n°35x10°	10°	10°	15
S400	140	13	20	18	109	130	W130x3x30x42x8f	110	131	N130x3x9H	130	85	n°35x10°	10°	10°	18
S600	150	12	18	27	123	151	W150x5x30x28x8f	120	151	N150x5x9H	151	95	n°28x12.857°	12.857°	6.428°	15
S850	170	15	17	25	140	171	W170x5x30x32x8f	140	171	N170x5x9H	171	112	n°28x12.857°	12.857°	6.428°	15

INSTALLATION AND ACCESSORIES

MN - Industrial Planetary Gearboxes Mounting flange and splined shaft



010 - 091

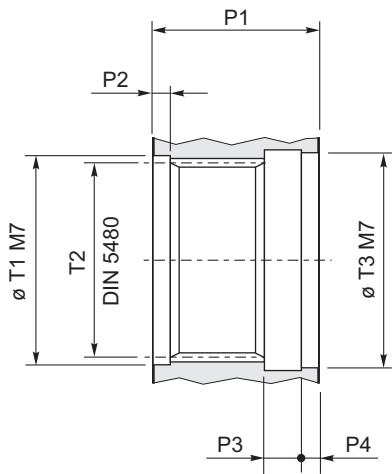
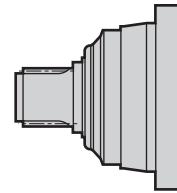


Fig. 10

MR - Industrial Planetary Gearboxes Mounting flange and heavy duty splined shaft



150 - 255

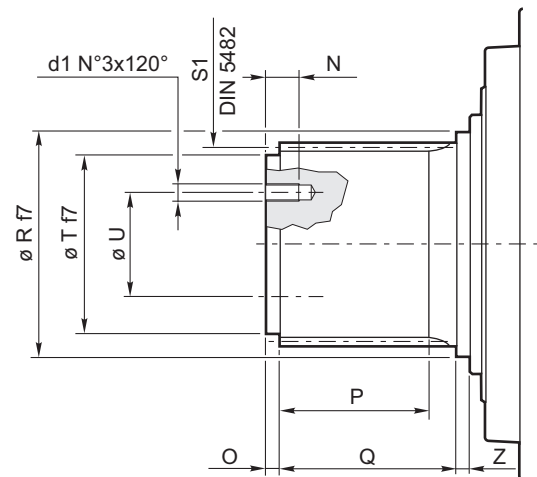


Fig. 11

Table 10:

		d1	N	O	P	P1	P2	P3	P4	Q	R	S1	T	T1	T2	T3	U	Z
010	MN-MR	M6	20	5	30	55	5	14	7	43	42 f7	B40x36 c9	35 f7	42 M7	A40x36	42 M7	24	7
020	MR	M10	20	8	38	68	8	13	10	58	60 f7	B58x53 c9	50 f7	60 M7	A58x53	60 M7	32	8
030	MR	M10	20	8	38	68	8	13	10	58	60 f7	B58x53 c9	50 f7	60 M7	A58x53	60 M7	32	8
040	MN	M10	20	8	50	68	8	13	10	58	60 f7	B58x53 c9	50 f7	60 M7	A58x53	60 M7	32	8
045	MR	M10	20	8	38	68	8	13	10	58	60 f7	B58x53 c9	50 f7	60 M7	A58x53	60 M7	32	8
046	MN	M10	20	8	50	80	8	16	7	73	60 f7	B58x53 c9	50 f7	60 M7	A58x53	60 M7	32	7
065-067	MR	M10	20	10	50	90	10.5	21	10	80	72 f7	B70x64 c9	62 f7	72 M7	A70x64	72 M7	40	10
090-091	MN-MR	M10	25	10	50	90	10.5	22	10	80	85 f7	B80x74 c9	70 f7	80 M7	A80x74	85 M7	45	10
150-155	MN	M10	25	10	50	90	10.5	22	10	80	85 f7	B80x74 c9	70 h7	80 M7	A80x74	85 M7	45	10
	MR	M14	30	12	65	110	12	22	15	98	105 f7	B100x94 c9	85 h7	105 M7	A100x94	105 M7	52	12
250-255	MN	M14	25	12	65	110	12	22	15	97	105 f7	B100x94 c9	85 f7	105 M7	A100x94	105 M7	52	13

INSTALLATION AND ACCESSORIES

8.4 FLANGE MOUNTING WITH KEYED SOLID OUTPUT SHAFT (MN1 - MR1 - MP1)

MP1- High Torque Planetary Gearboxes

Cylindrical male output

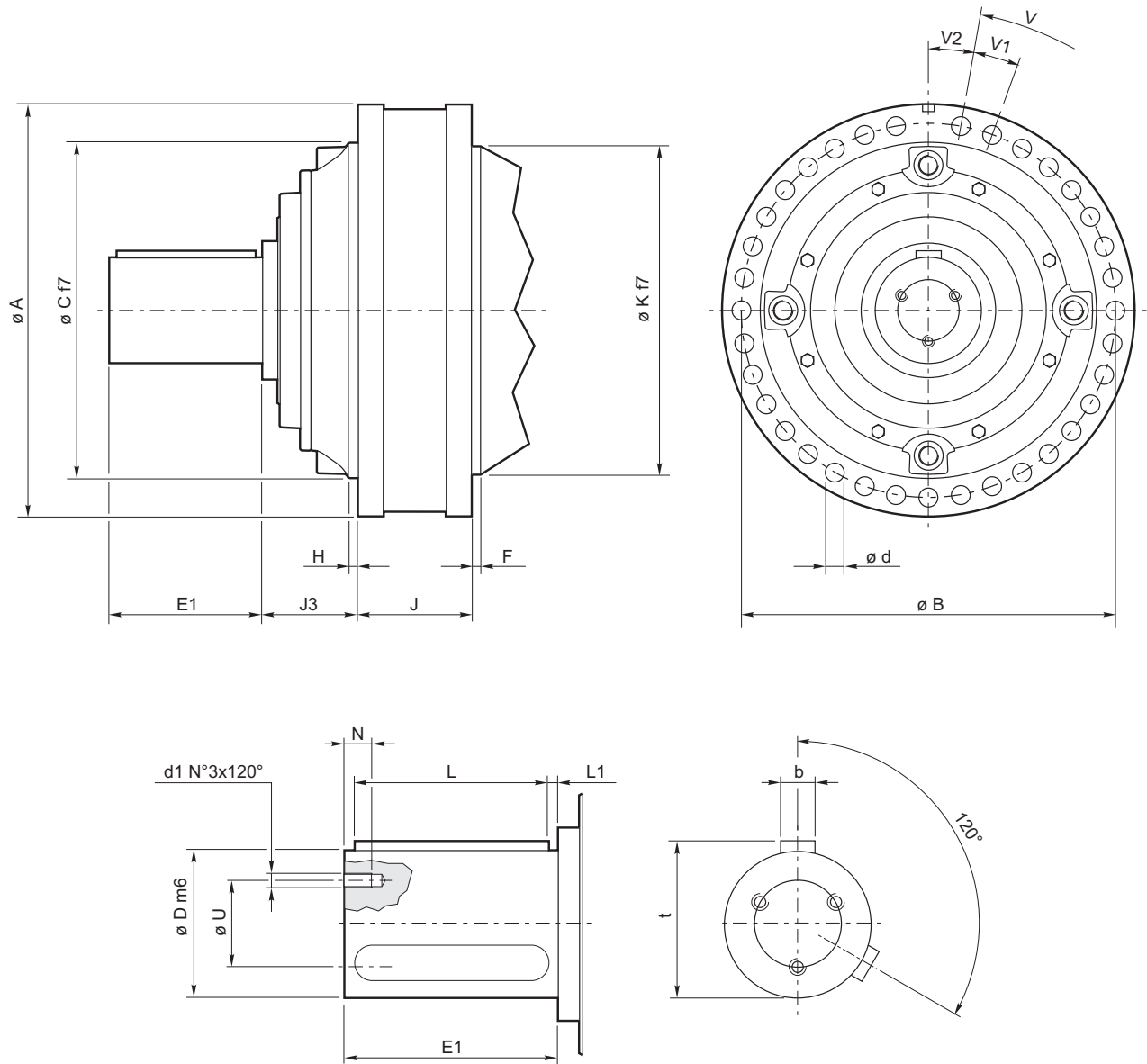


Fig. 12

Table 11:

	A	B	b	C	D	d	d1	E1	F	H	J	J3	K	L	L1	N	t	U	V	V1	V2
S300	445	400	32	370	120	15.5	M14	210	12	10	132	117	365	200	5	27	127	75	n°35x10°	10°	10°
S400	445	400	32	370	130	15.5	M14	220	12	10	124	145	365	200	10	27	137	85	n°35x10°	10°	10°
S600	510	460	40	410	160	22	M14	240	12	12	145	152	415	220	10	27	169	120	n°28x12.857°	12.857°	6.428°
S850	565	510	40	460	170	26	M14	240	10	11	156	163	450	220	10	27	179	125	n°28x12.857°	12.857°	6.428°

INSTALLATION AND ACCESSORIES

MN1 - Industrial Planetary Gearboxes

Mounting flange and keyed cylindrical shaft

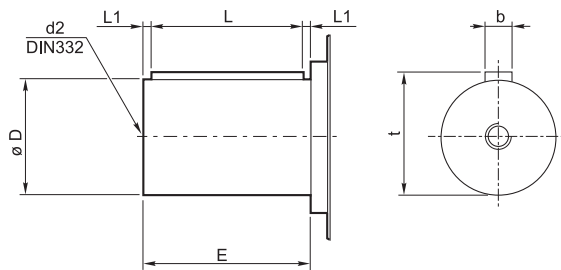


Fig. 13

MR1 - Industrial Planetary Gearboxes

Mounting flange and heavy duty keyed cylindrical shaft

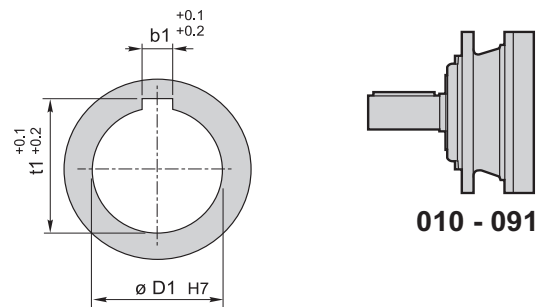


Fig. 14

010 - 091

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Table 12:

		D	E	L	L1	t	b	d2	D1	t1	b1
010	MN1-MR1	42 k6	82	70	6	45	12	M16	42	45	12
020	MR1	65 m6	105	90	7.5	69	18	M20	65	69	18
030	MR1	65 m6	105	90	7.5	69	18	M20	65	69	18
040	MN1	65 m6	105	90	7.5	69	18	M20	65	69	18
045	MR1	65 m6	105	90	7.5	69	18	M20	65	69	18
046	MN1	65 m6	105	90	7.5	69	18	M20	65	69	18
065-067	MR1	80 m6	130	110	10	85	22	M20	80	85	22
090-091	MN1-MR1	90 m6	170	160	5	95	25	M24	90	95	25
150-155	MN1	100 m6	210	200	5	106	28	M24	100	106	28
	MR1	100 m6	210	200	5	106	28	M24	100	106	28
250-255	MN1	110 m6	210	200	5	116	28	M24	100	116	28

INSTALLATION AND ACCESSORIES

8.5 SHAFT-MOUNTING WITH HOLLOW OUTPUT SHAFT FOR SHRINK DISC (FS)

FS - High Torque Planetary Gearboxes

Female output for friction couplings

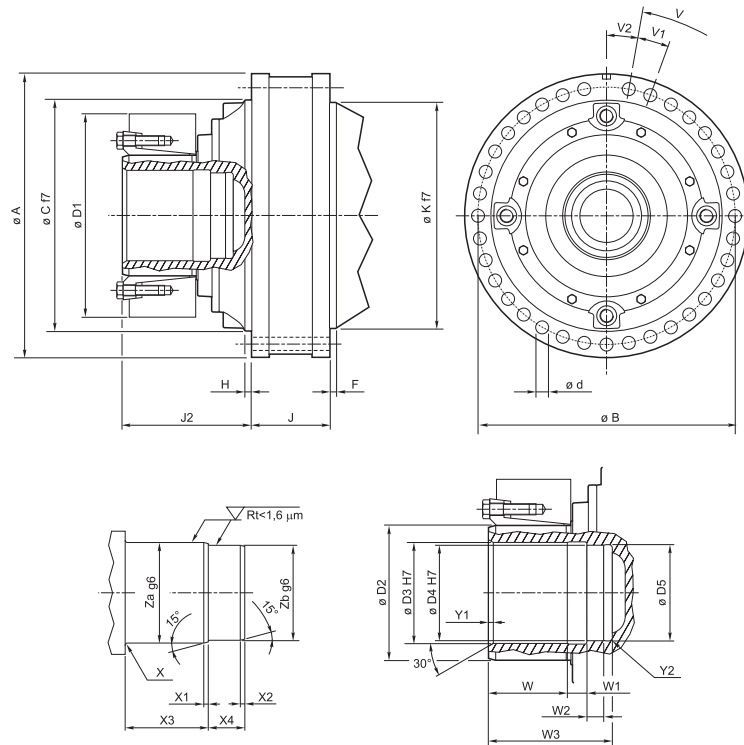


Fig. 15

Table 13:

	A	B	C	d	D1	D2	D3	D4	D5	F	H	J	J2	K
S300	445	400	370	15.5	320	185	140	130	132	12	10	124	178	365
S400	445	400	370	15.5	320	185	140	130	132	12	10	124	208	365
S600	510	460	410	22	370	220	165	155	157	12	12	142	235	415
S850	565	510	460	26	405	240	180	170	172	10	11	156	257	450
S1200	635	575	520	26	460	280	220	210	212	15	12	175	315	520
S1800	710	650	595	26	485	300	240	230	232	16	14	185	322	595
S2500	810	735	665	33	570	340	260	250	252	15	12	195	358	665
S3500	885	810	740	33	590	360	290	280	282	14	14	235	368	740
S5000	980	900	810	39	680	420	340	330	332	14	14	265	438	810
S7500	1160	1070	970	40	850	500	400	390	392	20	20	285	530	970

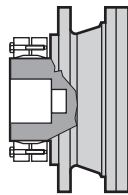
Table 14:

	V	V1	V2	W	W1	W2	W3	X	X1	X2	X3	X4	Y1	Y2	Za	Zb
S300	n°35x10°	10°	10°	83	27	30	150	R 2 max	4	4	87	57	4	R 3.5	140	130
S400	n°35x10°	10°	10°	110	25	22	167	R 2.5 max	4	4	114	47	5	R 3.5	140	130
S600	n°28x12.857°	12.857°	6.428°	132	28	25	200	R 4 max	5	5	137	53	6	R 5	165	155
S850	n°28x12.857°	12.857°	6.428°	140	35	30	220	R 4 max	5	5	145	65	5	R 6	180	170
S1200	n°32x11.25°	11.25°	5.625°	179	40	32	269	R 4 max	5	5	184	72	8	R 10	220	210
S1800	n°32x11.25°	11.25°	5.625°	181	40	32	271	R 4 max	5	5	186	72	8	R 10	240	230
S2500	n°32x11.25°	11.25°	5.625°	211	45	37	311	R 4 max	5	5	216	82	8	R 10	260	250
S3500	n°36x10°	10°	5°	218	45	40	323	R 4 max	5	5	223	85	8	R 12	290	280
S5000	n°32x11.25°	11.25°	5.625°	260	45	40	365	R 4 max	5	5	265	85	8	R 12	340	330
S7500	n°40x9°	9°	4.5°	230	100	55	410	R 4 max	5	5	235	160	10	R 12	400	390

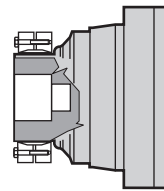
INSTALLATION AND ACCESSORIES

FS - Industrial Planetary Gearboxes

Shaft mounted



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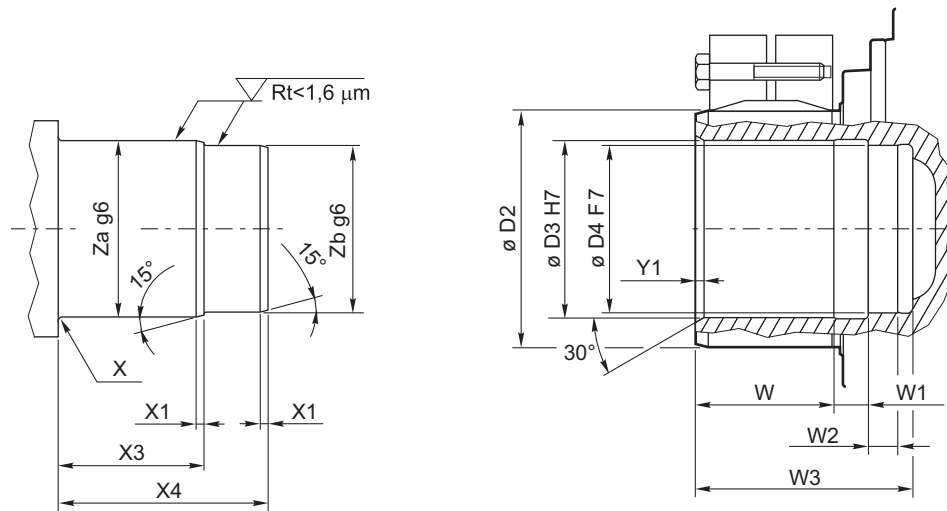


Fig. 16

Table 15:

	W	W1	W2	W3	D2	D3	D4	Y1	X	X1	X3	X4	Za	Zb
010	29	9	10	50	62 f7	50 H7	30 F7	2	R 2	3	33	48	50	30
020	54	16	23	95	100 f7	75 H7	40 F7	2	R 2	3	52	92	75	40
030	54	16	23	95	100 f7	75 H7	40 F7	2	R 2	3	52	92	75	40
045	54	16	23	95	100 f7	75 H7	40 F7	2	R 2	3	52	92	75	40
065-067	80	20	33	135	125 f7	90 H7	50 F7	2	R 2	3	62	132	90	50
090-091	80	20	38	140	140 f7	100 H7	60 F7	2	R 2	3	69	135	100	60
150-155	79	6	47	135	165 f7	120 H7	80 F7	5	R 2	3	79	130	120	80
250-255	80	20	47	150	175 f7	130 H7	80 F7	2	R 1.5	5	81	145	130	80

INSTALLATION AND ACCESSORIES

8.5.1 INSTALLATION OF GEARBOX WITH OUTPUT (FS)

NOTE:

The couplings are supplied ready to be installed, therefore they must not be removed before initial installation.

- Slightly tighten three screws of the clamping coupling placed at 120° so that the inner ring can be rotated by hand (overtightening could deform the inner ring).
- Fit it over the gearbox shaft whose outer surface has been previously lubricated.
- Degrease the inner surface of the gearbox shaft and the shaft of the machine.
- Fit the gearbox on the shaft of the machine or vice versa (excessive axial force must not be necessary).
- Position the centreline of the coupling on the centreline of the useful section of the shaft, see Fig. 17 (pag. 29); for this, comply with dimension "a", which will vary depending of the size of the coupling, as given in the tables below.

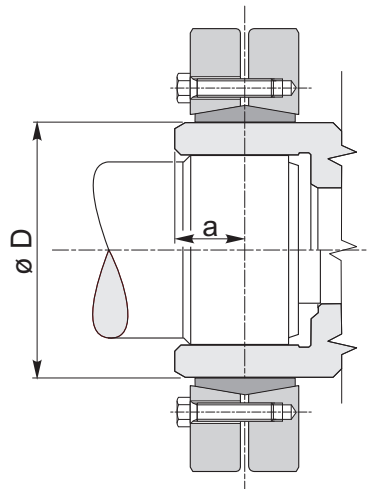


Fig. 17

- Tighten all the screws of the coupling gradually with a torque wrench, in a clockwise order and not diametrically opposed, until completely tightened with a torque corresponding to a value given in Table 17: (pag. 31) or Table 18: (pag. 33) depending on the size of the gearbox: M_a = tightening torque [N·m], T = tightening torque [N·m].
- Check that the 2 rings remain parallel and concentric, bearing in mind that the maximum error of parallelism allowed is 0.25 - 0.35% the external diameter of the couplings.

NOTE:

Excessive pulling can cause permanent deformation of the inner ring; comply with the torque values given in the table. Protect the area of the coupling with a suitable plate guard, if it is expected that stones, sand or other material may damage the coupling or the seals of the gearbox.



The guard must be properly sized to satisfy the impact test as required by EN ISO 80079-36.

INSTALLATION AND ACCESSORIES

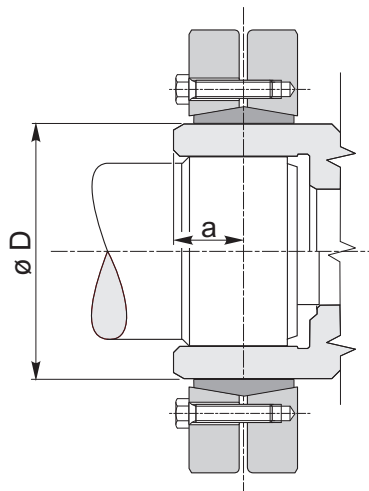


Fig. 18

Table 16:

	Dimension		Screws			a
	d. sh.	dxD	n°	Type	Ma [N·m]	
010	50	62x110	10	M6x25	12	17
020-030-045	75	100x170	12	M8x35	30	30
065-067	90	125x215	12	M10x40	59	35
090-091	100	140x230	10	M12x45	100	40
150-155	120	165x290	8	M16x55	250	45
250-255	130	175x300	8	M16x55	250	45

Ma = Tightening torque N·m

INSTALLATION AND ACCESSORIES

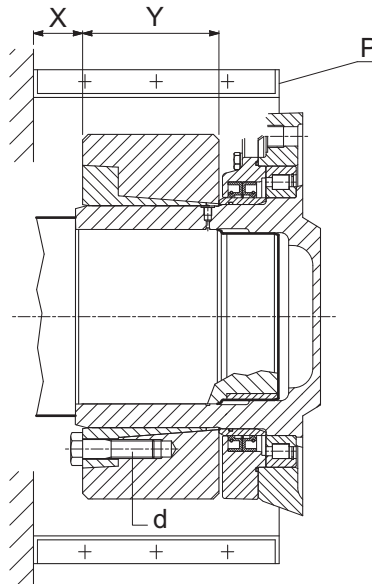
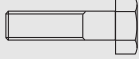
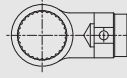
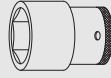
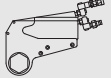


Fig. 19

Table 17:

	Coupling type	Y			X [mm] for wrench type		
			d	T [N·m]			
S300	185x320	85	M16	290	50	100	58
S400	185x320	112	M20	490	55	115	58
S600	220x370	134	M20	490	55	115	58
S850	240x405	144	M20	490	55	115	58
S1200	280x460	172	M24	840	65	120	70
S1800	300x485	176	M24	840	65	120	70
S2500	340x570	206	M27	1250	—	125	85
S3500	360x590	210	M27	1250	—	125	85
S5000	420x680	246	M27	1250	—	125	85
S7500	500x850	213	M30	1970	—	—	90

T = Tightening torque N·m

INSTALLATION AND ACCESSORIES

8.5.2 TORQUE ARM ASSEMBLY

The torque arm and connecting rod may have different design solutions from those proposed on the next pages, but the following must be observed:

- The torque arm must be perfectly straight.
- If welded parts are foreseen, any deformation must be sandblasted, normalised and corrected by machine tool.
- The torque arm contact surface at the flanging to the gearbox must be perfectly flat.
- Before connecting the torque arm to the gearbox, carefully remove all traces of grease from the contact surfaces.

WARNING



Do not carry out any welding work that involves the gearbox, or even earthing!

- Always use the torque wrench to tighten the connection screws.
- The drawing only gives an illustrative example, since the correct configuration depends on the direction of rotation of the gearbox. In fact, during work it is advisable for the connecting rod to be in tension and not in compression. Therefore mounting on the opposite side, in relation to that illustrated, may be convenient. If necessary, due to specific dimensions, the connecting rod can be mounted upward.
- When doing an assembly with shrink disk coupling and torque arm, remember that the weights of the gearbox, torque arm and all the elements connected to them induce loads and tilting moments that are borne by the output stage planet carrier bearings. Therefore the relative position of all the masses that contribute to the transmission of power must be appraised in the design stage in order to minimise the resulting value on the bearings. For the same reasons the weight of the components connected to the gearbox must be limited as much as possible, by carefully appraising the thickness of the structures actually necessary for withstanding the stresses and decentralising all the elements not functional to power transmission.

WARNING



An inadequate design can shorten the life of the gearboxes, causing early failure of the bearings and gears due to possible excessive elastic deformation of the stages, and determine the possibility of slipping and seizing of the shrink disc.

- Check that the spigots of the gearbox and torque arm are clean and free of dents, and that there are no traces of paint.
- Lubricate the couplings and fit the torque arm on the gearbox spigot, then insert any reference pins required.
- Fix the torque arm using bolts of at least class 8.8.
- It is advisable to use class 10.9 or 12.9 screws when the application involves heavy impacts, frequent starts and stops, reversing, or when 70% of gearbox maximum torque is exceeded.
- Make sure the torque arm anchoring system does not block the gearbox, but allows it to move in order to absorb the movements exerted on it by the machine shaft; for tightening torques see Table 4: Tightening torques (pag. 19), ensuring that they are compatible with the counterpart (fixing structures and nuts).

INSTALLATION AND ACCESSORIES

Indications for torque arm construction and anchoring

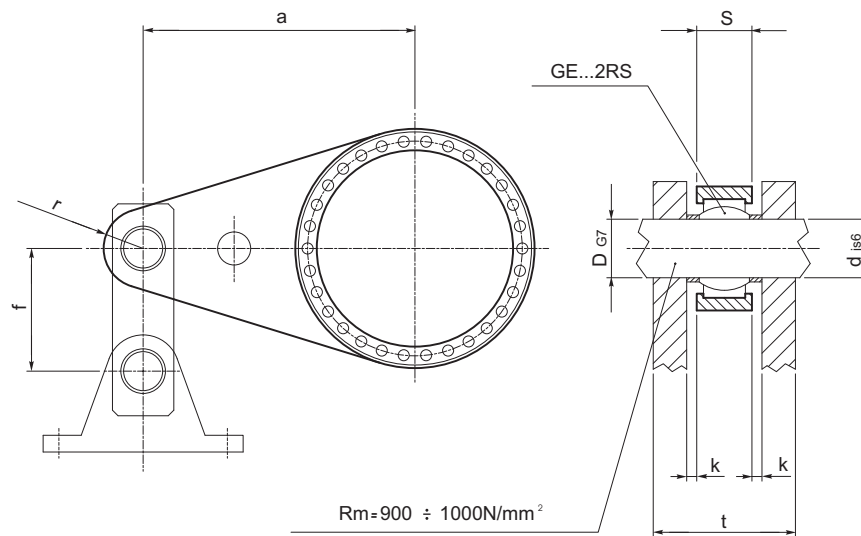


Fig. 20

Table 18:

	a min [mm]	s [mm]	r min. [mm]	f min [mm]	Spherical joint type GE-UK-2RS	D d [mm]	k [mm]	t min [mm]
S300	600	30	45	150	35	35	4	70
S400	700	32	50	160	40	40	4	72
S600	800	35	50	230	40	40	6.5	86
S850	1000	40	55	250	45	45	7.5	92
S1200	1000	45	65	270	50	50	7.5	108
S1800	1200	55	75	300	60	60	8.5	120
S2500	1400	60	85	350	70	70	9.5	137
S3500	1600	65	95	400	80	80	10.5	144
S5000	2000	70	105	450	90	90	9.5	147
S7500	2500	80	120	550	100	100	19	178

Table 19:

	a min [mm]	s [mm]	r min [mm]	f min [mm]	GE...2RS	D d [mm]	k [mm]	t min [mm]
010	200	15	30	80	20	20	2	35
020	300	15	30	80	20	20	2	35
030-045	300	20	35	100	25	25	3	46
065-067	400	20	35	100	25	25	3	46
090-091	500	25	40	150	30	30	3	55
150-155	600	25	40	150	30	30	3	55
250-255	700	30	45	150	35	35	4	66

- 1 - The torque arm anchor point must be floating in all directions. Therefore, use of ball joints in all the connections.
- 2 - It is advisable to use long life ball joints with friction surfaces protected with PTFE. Alternatively, "steel on steel" joints, with the possibility periodical lubrication, can be used.
- 3 - The anchoring connecting rod must be parallel to the torque arm to ensure, with no load, side play K which guarantees freedom of movement to the structure in case of deformation.
- 4 - The fixed support to which the second end of the connecting rod is connected must ensure anchoring suitable for the load.



Check the equipotentiality between the gearbox and torque arm.



INSTALLATION AND ACCESSORIES

8.5.3 REMOVAL OF COUPLING AND GEARBOX

- Undo the fixing screws gradually, in a clockwise order.
- Initially, each screw must be undone only a 1/4 turn to avoid inclination and blocking of the fixing elements.

See Table 16: (pag. 30) M_a = tightening torque [N·m], or Table 17: (pag. 31) T = tightening torque [N·m], depending on the gearbox size.

- Remove the gearbox from the driven shaft. For this purpose, a hole has been provided on the gearbox shaft through which it is also possible to pump oil at low pressure to obtain gradual removal.
- Remove the coupling from the gearbox shaft.

8.6 SHAFT-MOUNTING WITH SPLINED FEMALE OUTPUT SHAFT (FAR)

FAR - High Torque Planetary Gearboxes

Splined female output

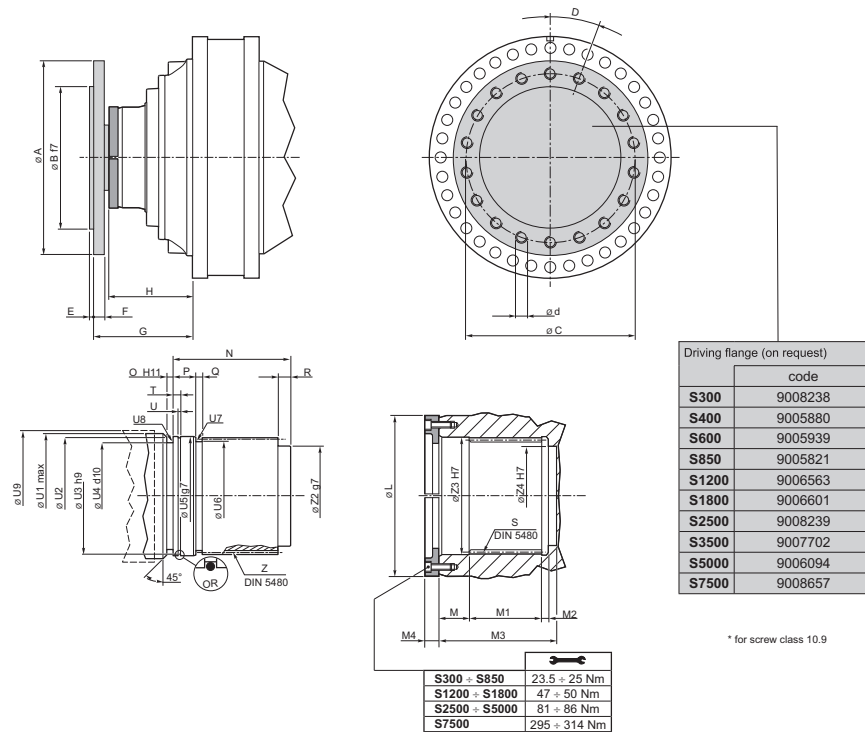


Fig. 21

Table 20:

	A	B	C	d*	D	E	F	G	H	L	M	M1	M2	M3	M4	N	O	OR
S300	360	220	300	M30	12x30°	10	30	177	137	165	15	90	—	117	20	115	9	113.97x2.62
S400	360	220	300	M30	14x25.71°	10	30	200	160	185	15	90	10	135	20	133	9	133.02x2.62
S600	400	260	340	M30	18x20°	10	30	220	180	218	45	85	10	157	20	155	9	145.72x2.62
S850	450	310	395	M30	22x16.36°	10	35	260	194	235	45	105	10	173	20	171	9	164.77x2.62
S1200	510	375	450	M30	22x16.36°	10	35	280	225	275	45	120	15	198	20	196	9	190.9x3.53
S1800	585	445	530	M30	30x12°	10	40	294	233	300	45	130	15	208	20	206	9	202.79x3.53
S2500	655	480	580	M36	24x15°	10	40	317	257	324	50	140	15	227	30	225	11	234.54x3.53
S3500	730	545	650	M36	30x12°	10	50	360	290	358	50	170	17	259	30	257	12	266.29x3.53
S5000	800	620	730	M36	36x10°	10	50	425	368	430	60	200	17	320	30	318	13	304.39x3.53
S7500	960	650	880	M39	30x12°	10	60	533	449	540	60	235	15	350	36	348	20	380.37x5.33

Table 21:

	P	Q	R	S	T	U	U1	U2	U3	U4	U5	U6	U7	U8	U9	Z	Z2	Z3	Z4
S300	14	8	11.5	N120x5x30x22x9H	8.6	3.6	120	115	117.8	102	122	107	R 1.2	R 1.2	123	W120x5x30x22	105	122	105
S400	14	10	26	N140x5x30x26x9H	8.6	3.6	140	130	137.8	122	142	127	R 1.2	R 1.2	143	W140x5x30x26	120	142	120
S600	33	10	22	N150x5x30x28x9H	11	3.6	160	150	147.8	134	152	137	R 1.2	R 1.2	160	W150x5x30x28	122	152	122
S850	33	10	18	N170x5x30x32x9H	11	3.6	180	170	167.8	154	172	157	R 1.2	R 1.2	180	W170x5x30x32	145	172	145
S1200	33	10	28	N200x5x30x38x9H	12	4.8	220	206	196.4	189	202	187	R 1.2	R 1.2	220	W200x5x30x38	170	202	170
S1800	33	10	28	N210x5x30x40x9H	12	4.8	240	226	206.4	199	212	197	R 1.2	R 1.2	240	W210x5x30x40	180	212	180
S2500	38	10	36	N240x5x30x46x9H	12	4.8	260	246	236.4	228	242	227	R 1.2	R 1.2	260	W240x5x30x46	220	242	220
S3500	38	10	34	N280x8x30x34x9H	12	4.8	300	280	276.4	264	282	260	R 1.2	R 1.2	300	W280x8x30x34	235	282	235
S5000	45	15	58	N340x8x30x41x9H	14	4.8	360	340	336.4	320	342	320	R 1.2	R 1.2	360	W340x8x30x41	320	342	320
S7500	45	15	53	N400x8x30x48x9H	20	7.2	420	405	393.3	370	402	380	R 4.0	R 4.0	420	W400x8x30x48	380	402	380



INSTALLATION AND ACCESSORIES

8.6.1 INDICATION FOR TORQUE ARM CONSTRUCTION AND ANCHORING

NOTE:

For the torque arm torque arm mounting instructions, see Torque arm assembly (pag. 32).

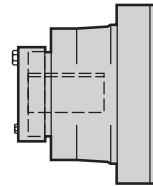


Check the equipotentiality between the gearbox and torque arm.

8.7 SHAFT-MOUNTING WITH OUTPUT SHAFT WITH KEYWAY (FP)

FP - Industrial Planetary Gearboxes

Hollow-shaft with keyway



020 - 255

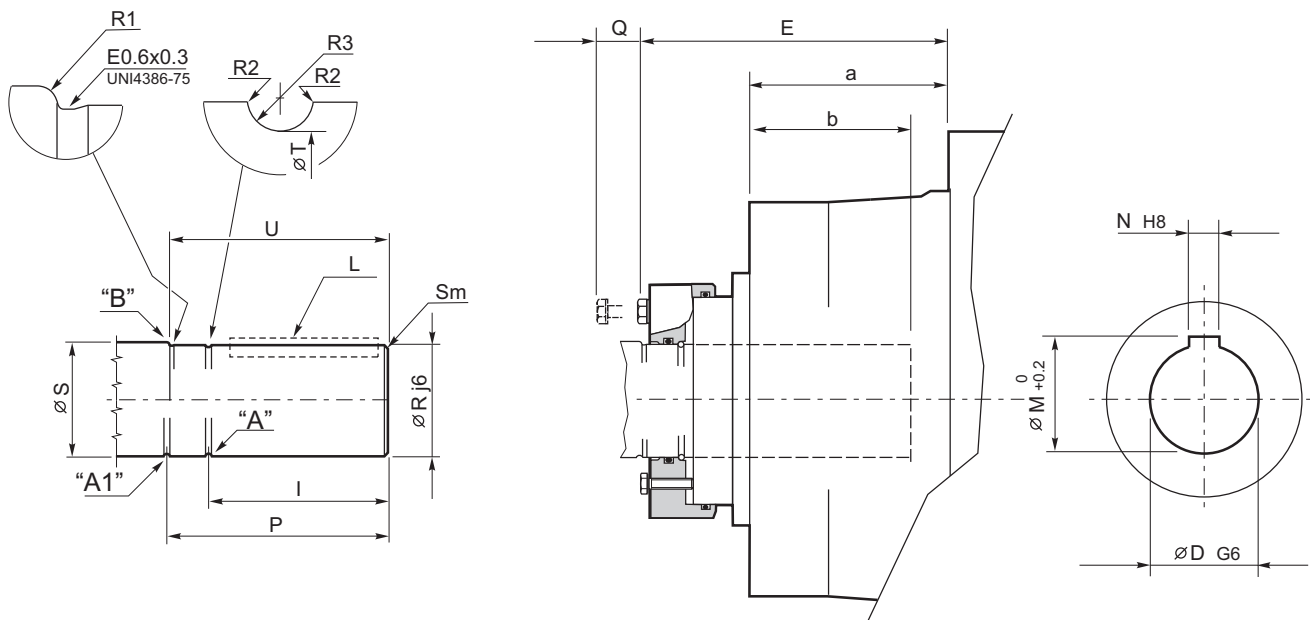


Fig. 22

"A" Obligatory locking groove

"A1" or "B" alternative extraction grooves

Table 22:

	D	M	N	R	R1	R2	R3	S	T	I	P	L	U	E	Q	a	b	Sm
020	50	53.8	14	50	1.3	0.4	1.4	53 ^{-0.3 / -0.5}	47.5	97.5	119.5	14x9x70	118	130	70	87	72	1.5-2
030	65	69.4	18	65	1.6	0.4	1.8	68 ^{+0.2 / +0.1}	63.8	107.5	131.5	18x11x90	130	143	70	90	80	1.5-2
045	65	69.4	18	65	1.6	0.4	1.8	68 ^{+0.2 / +0.1}	63.8	107.5	131.5	18x11x91	130	143	70	90	80	1.5-3
065-067	80	85.4	22	80	1.6	0.4	1.8	83 ^{+0.2 / -0.1}	76.8	138	162.5	22x14x110	161	173	70	101	94	2
090-091	90	95.4	25	90	1.6	0.4	1.8	93 ^{+0.2 / +0.1}	86.8	158	183.5	25x14x125	182	196	70	121.5	114	2
150-155	100	106.4	28	100	1.6	0.4	1.8	103 ^{+0.2 / +0.1}	96.8	180	206	28x16x140	204	236.5	80	149	122	2
250-255	110	116.4	28	110	3	0.3	3.4	116 ^{+0.2 / +0.1}	104	159	186	28x16x125	183	253	80	192	130	2

INSTALLATION AND ACCESSORIES

8.7.1 INSTALLATION OF GEARBOX WITH OUTPUT (FP)

- Fit the circlip pos. no.1 (if required) in its seat on the shaft.
- Grease the seats of the O-rings pos. no. 2 and 3 on the cover pos. no. 4, fit the respective O-rings in their seats, then fit the cover on the shaft.

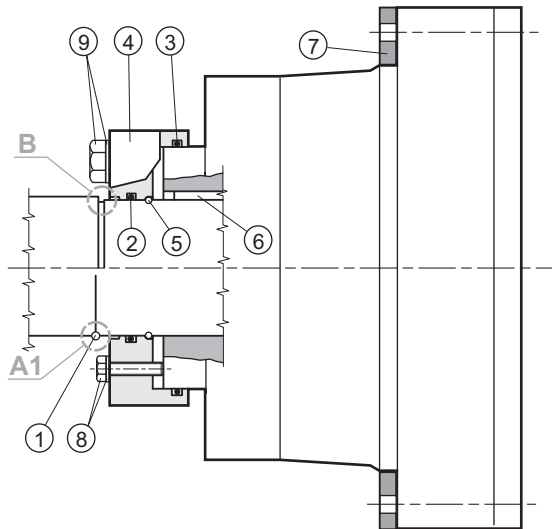


Fig. 23

- Fit the other circlip pos. no. 5, then the key pos. no. 6 in their respective seats on the shaft.
- Fit the torque arm pos. no. 7 on the gearbox (see details below for torque arm).
- Suitably lubricate the shaft and its seat (gearbox female shaft), then carry out the coupling between the shaft and gearbox (do not force).
- Position the cover pos. no 4 and tighten it with the screws and respective dowty washers pos. no 8 (supplied with all the accessories), making sure to tighten the screws gradually in a clockwise order (not diametrically opposed) until completely tightened, applying a torque as given in Table 4: Tightening torques (pag. 19) (class 8.8 screws) and using medium strength threadlocker.
- Fit all the other screws and respective dowty washers pos. no 9 (less one in top position), add more lubricant through this hole left open, then fit the last screw, thereby closing the coupling in a lubricated sealed chamber, using medium strength threadlocker.

INSTALLATION AND ACCESSORIES

8.7.2 INSTRUCTIONS FOR TORQUE ARM CONSTRUCTION AND ANCHORING

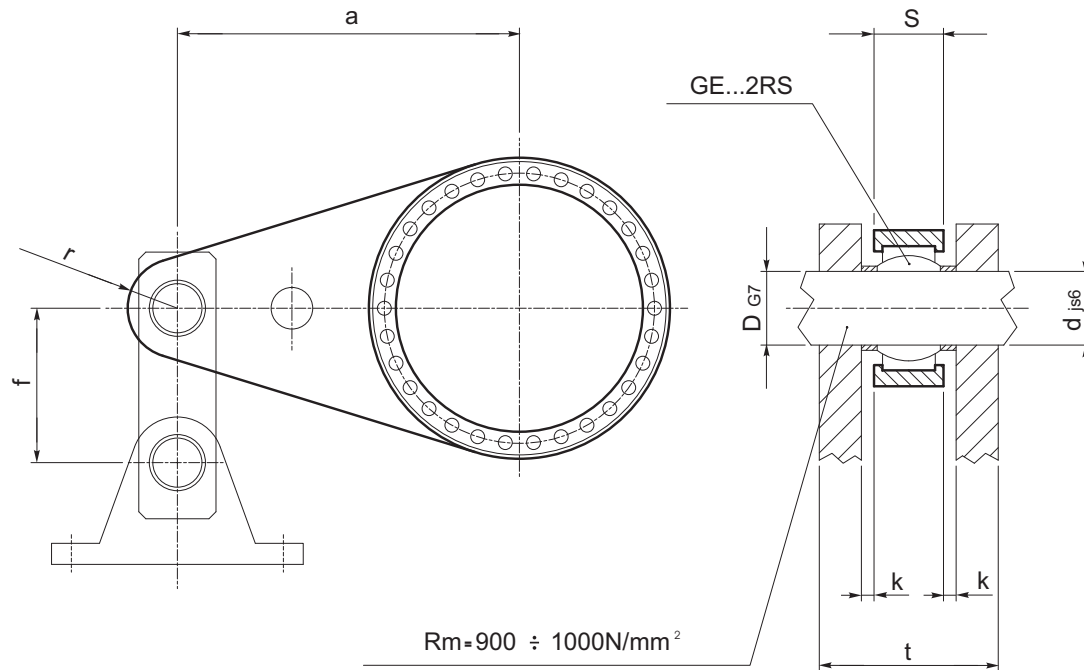


Fig. 24

Table 23:

	a min [mm]	s [mm]	r min [mm]	f min [mm]	GE...2RS	D, d [mm]	k [mm]	t min [mm]
010	200	15	30	80	20	20	2	35
020	300	15	30	80	20	20	2	35
030-045	300	20	35	100	25	25	3	46
065-067	400	20	35	100	25	25	3	46
090-091	500	25	40	150	30	30	3	55
150-155	600	25	40	150	30	30	3	55
250-255	700	30	45	150	35	35	4	66

NOTE:

For the torque arm torque arm mounting instructions, see point Torque arm assembly (pag. 32).



Check the equipotentiality between the gearbox and torque arm.



INSTALLATION AND ACCESSORIES

8.7.3 REMOVAL OF GEARBOX WITH OUTPUT (FP)

- Free the gearbox torque arm, suitably supporting the gearbox.
- Remove the screws pos. no. 9, replacing them with longer ones, compatibly with the available space.
- Remove the screws pos. no. 8, then tighten the screws pos. no. 9 gradually in a clockwise order (not diametrically opposed) until the gearbox is released.

WARNING



When refitting after any repair or other operation, the dowty washers in pos. no. 8 and 9 cannot be reused and must be replaced with new ones.

8.8 INSTALLATION RULES FOR GEARBOX WITH FOOT MOUNTING

- Make sure the mounting feet rest on a flat surface; otherwise shim them so that they are all resting properly.
- Incorrect resting of the feet can cause its breakage.
- For fixing, use at least class 8.8 screws tightened with torque as given in Tightening torques (pag. 19).

8.9 MOUNTING ACCESSORIES ON OUTPUT AND/OR INPUT SHAFTS

For the assembly of pinions, pulleys or couplings, use suitable equipment to prevent seizing; alternatively, heat the part to 80° - 100° C.

Lubricate the grooves with a film of grease or anti-seize lubricant and tighten the fixing screws, applying a tightening torque suitable for class of screws used. For tightening, refer to Tightening torques (pag. 19).

WARNING



For the assembly of pinions, pulleys or couplings and other accessories, do not use hammers or other tools which could damage the shafts or supports of the gearbox.

8.10 TACONITE LABYRINTH SEALS (OPTIONAL ACCESSORY)

Taconite labyrinth seals are designed mainly for use in dusty places. The entry of dust is hindered by a labyrinth between the fixed part and the rotating part united with the shaft, filled with grease.

WARNING



Taconite seals must be lubricated yearly (as indicated in Check and maintenance frequency tables (pag. 57)) with grease containing PTFE, consistency NLGI no. 2, Polymer 400 grease or similar. The dimensional drawings SI give the positions of the greasers to be used.

INSTALLATION AND ACCESSORIES

8.11 ANTI-RETURN DEVICE (OPTIONAL ACCESSORY)

On request, for certain applications the gearbox can be fitted with an anti-return device. This device allows the shaft to rotate in only one direction during the work cycle, blocking it in the opposite direction. The rotation direction is indicated with an arrow on a plate placed near the gearbox input shaft. The anti-return device is incorporated in the gearbox and lubricated with the same oil.

WARNING



To avoid damage to the anti-return device, or the gearbox, the motor must not rotate in the blocking direction. Observe the indication of free rotation given on the gearbox.

NOTE:

Before connecting the electric motor, establish its direction of rotation by the three current phases, using a phase indicator, and connect the motor to obtain the correct direction of rotation required by the anti-return device.



INSTALLATION AND ACCESSORIES

8.12 NEGATIVE MULTI-DISK PARKING BRAKES IN OIL BATH

These brakes work under the thrust of a number of springs on pairs of fixed and movable alternating disks; release occurs through the hydraulic pressure in the piston. They therefore have a "negative" function and are to be used as parking brakes, and not for dynamic braking. These performance values (accuracy +/- 10%) are always calculated with zero back pressure; otherwise the braking torque is reduced in percentage by the ratio of back pressure/min. opening pressure.

Brake selection is made in the design phase and the technical details of the brake used are specified on the Dimensional Drawing SI referred to on the Declaration of Conformity Certificate.

NOTE:

The multi-disk parking brake is only used as a parking brake, or in particular conditions as an emergency brake. Different sizes of brakes fitted on the gearbox input are available according to the following tables:

INSTALLATION AND ACCESSORIES

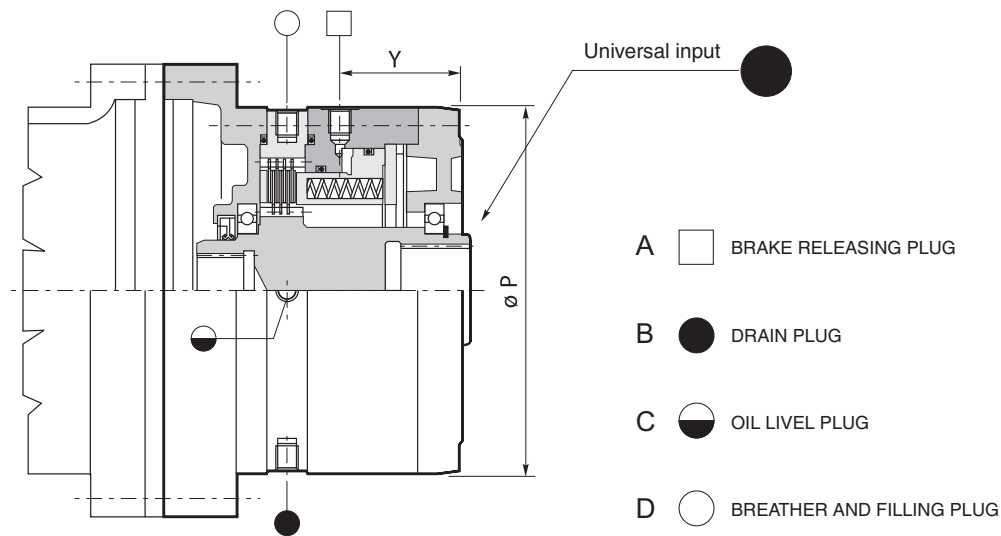


Fig. 25

Table 24:

	P	Y	Plugs				Kg
			A	B	C	D	
FL250	195	67	M12X1.5	R 1/4	R 1/4	R 1/4	24
FL350	195	67	M12X1.5	R 1/4	R 1/4	R 1/4	24
FL450	195	67	M12X1.5	R 1/4	R 1/4	R 1/4	26
FL650	195	67	M12X1.5	R 1/4	R 1/4	R 1/4	36
FL750	195	67	M12X1.5	R 1/4	R 1/4	R 1/4	37
FL960	225	72.5	M12X1.5	R 1/4	R 1/4	R 1/4	42

Table 25:

		T [N·m]	P [bar]	Pmax [bar]	Vo [l]		Va [cm³]
					horizontal	vertical	new discs
FL250	FL 250.4C	181	13.28	315	0.3	0.6	15
	FL 250.6C	278	13.28	315	0.3	0.6	15
FL350	FL 350.6C	417	19.92	315	0.3	0.6	15
	FL 350.8C	571	19.92	315	0.3	0.6	15
FL450	FL 450.6C	540	25.59	315	0.3	0.6	15
	FL 450.8C	737	25.59	315	0.3	0.6	15
FL650	FL 650.10C	642	19.92	315	0.5	1.0	15
	FL 650.12C	792	19.92	315	0.5	1.0	15
	FL 650.14C	949	19.92	315	0.5	1.0	15
FL750	FL 750.10C	834	25.59	315	0.5	1.0	15
	FL 750.12C	1027	25.59	315	0.5	1.0	15
	FL 750.14C	1229	25.59	315	0.5	1.0	15
FL960	FL 960.12C	1528	21.98	315	1.2	2.4	22
	FL 960.14C	1783	21.98	315	1.2	2.4	22
	FL 960.16C	2038	21.98	315	1.2	2.4	22
	FL 960.18C	2293	21.98	315	1.2	2.4	22

T: Medium static torque

P: Brake release pressure

P_{max}: Max pressure

Vo: Oil quantity

Va: Oil quantity for brake release control

INSTALLATION AND ACCESSORIES

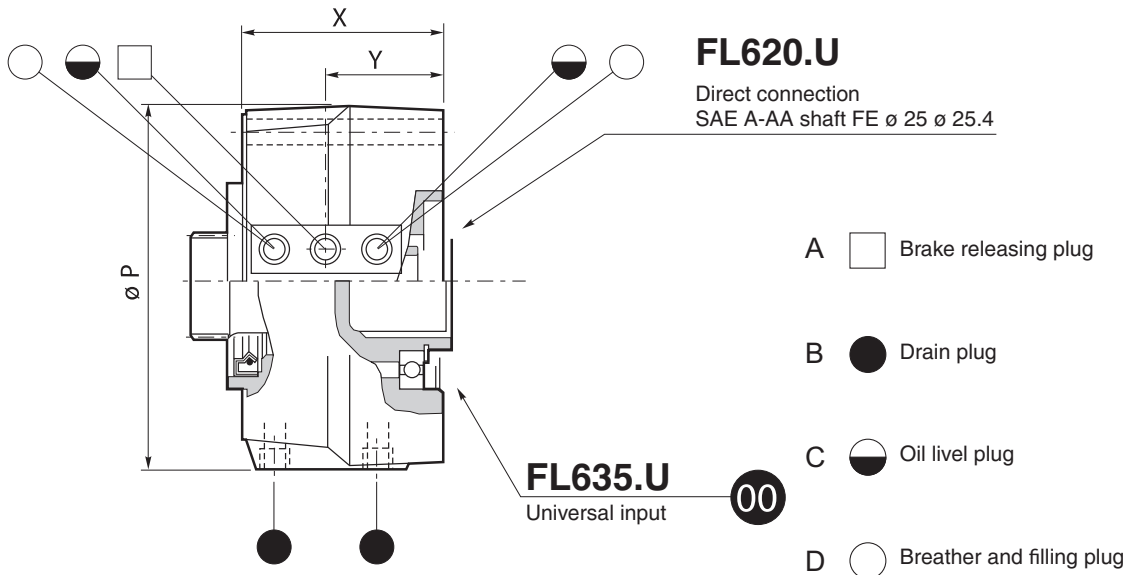


Fig. 26

Table 26:

	P	X	Y	Plugs				Kg	Part number
				A	B	C	D		
FL620.U	161	104.5	46	M10x1	R 1/8	R 1/8	R 1/8	8	C1103704120 (alb. FE ø 25) C1103704130 (alb. FE ø 25.4)
FL635.U	165	91	59	M12x1.5	R 1/4	R 1/4	R 1/4	9	C1109200160

Table 27:

	T [N·m]	P [bar]	P _{max} [bar]	Vo [l]		Va [cm³] new discs
				horizontal	vertical	
FL620.U	271	24.9	210	0.1	0.2	10
FL635.U	377	13.6	315	0.1	0.2	10

T: Medium static torque

P: Brake release pressure

P_{max}: Max pressure

Vo: Oil quantity

Va: Oil quantity for brake release control

⚠ WARNING



High drive shaft rotation speeds can cause rapid heating of the brake. When selecting the gearbox with brake, with hydraulic and electric motors required to work at high speeds it is necessary include a temperature sensor fitted on the brake, able to stop the gearbox when the set temperature is exceeded.

NOTE:

The implementation of a temperature sensor on the brake must be indicated in the order.

NOTE:

When the temperature sensor on the brake is foreseen, refer to chapter Accessories - gear unit monitoring sensors (pag. 46).

INSTALLATION AND ACCESSORIES

WARNING



Brake control operating pressures lower than those given in the table for the respective brakes (brake opening pressure) can cause rapid heating of the brake. To avoid this risk, include a control pressure switch on the brake control hydraulic line.

WARNING



Brake control operating pressures higher than those given in the table for the respective brakes (Max. pressure) can quickly damage the brake piston seals. To avoid this risk, include a control pressure switch on the brake control hydraulic line.



INSTALLATION AND ACCESSORIES

8.13 ACCESSORIES - GEAR UNIT MONITORING SENSORS

When the use of a thermal probe (PT100) and/or "ON-OFF" oil level sensor in the gear unit and/or brake is foreseen and necessary, these accessories can be included in the Dana supply of the gear unit, or are implemented by the Customer. In the latter case, the Customer is responsible for the correct choice of the thermal probe and/or "ON-OFF" oil level sensor mounted on the gear unit.



The thermal probe and/or "ON-OFF" oil level sensor, chosen by the Customer, must comply with ATEX regulations, for the Group, Category and type of atmosphere of the project, specifically approved and marked. The marking of the sensors in accordance with ATEX must correspond to the design specifications of the system or machine.

WARNING



The selection of an inadequate electrical sensor may not perform the correct control for which it is intended, causing damage or breakage to the gear unit and/or the lamellar parking brake.

IMPORTANT:



THE ELECTRICAL CONNECTIONS MUST BE MADE ACCORDING TO EN 60079-14.

8.13.1 TEMPERATURE SENSOR

The temperature sensor (PT100) must be selected with 2 electric thresholds:

- Alarm that indicates an abnormal increase in temperature.
- Stop machine to reach the detected maximum temperature of 80 +/- 3 °C.

NOTE:

The temperature sensor must be installed in the hottest area of the gearbox and/or on the multi-disc parking brake, detected during the first start-up test.

NOTE:

Make sure the temperature sensor is positioned as shown on the Dimensional Drawing SI mentioned on the Conformity Declaration Certificate.

8.13.2 OIL LEVEL INDICATOR "ON-OFF"

The oil level indicator selected, must be installed between the filling and drain oil plugs of the gearbox, positioned at the correct height, to ensure the proper oil level inside the gearbox.

The level indicator should indicate the decrease in oil level more than 5-10mm, of the oil level required for proper operation of the gearbox.

NOTE:

The location of the filling and drain oil plugs and gearbox oil level required, are indicated on the Dimensional Drawing SI, mentioned on the Declaration of Conformity Certificate.

INSTALLATION AND ACCESSORIES

8.14 INSTALLATION STANDARDS FOR ROTARY GEAR UNIT TYPE RPR-RPRC-SLS-SCS-ECS

- The structure to which they are to be fixed must be rigid, with the supporting surface well cleaned, orthogonal to the driven axis and free from welding slag.
- The centring and coupling surfaces of the gear unit must be clean and free from dents.

The checks described above are particularly important to achieve perfect engagement between the gear unit pinion and the fifth wheel coupling. Generally, the manufacturers of fifth wheel couplings mark 3 teeth of the fifth wheel coupling in green; the point of greatest ovality of the primitive diameter of the fifth wheel coupling itself, which will be used for the positioning of the gear unit.

CAUTION

If there are no coloured teeth on the fifth wheel coupling (generally green) or other markings, it is advisable to contact the fifth wheel coupling manufacturer.

If the type of gear unit includes a support with a cam for adjusting the clearance between the pinion and the fifth wheel coupling, there is a notch on the gear unit itself (see dwg.), which indicates the point of greatest eccentricity, corresponding to the maximum achievable clearance between the pinion and the fifth wheel; whether the gear unit is placed inside or outside the fifth wheel (see dwg.).

The value of the clearance between the tooth flanks between the pinion and the fifth wheel coupling is obtained by multiplying the value of the toothing module by two fixed values 0.03 and 0.04;

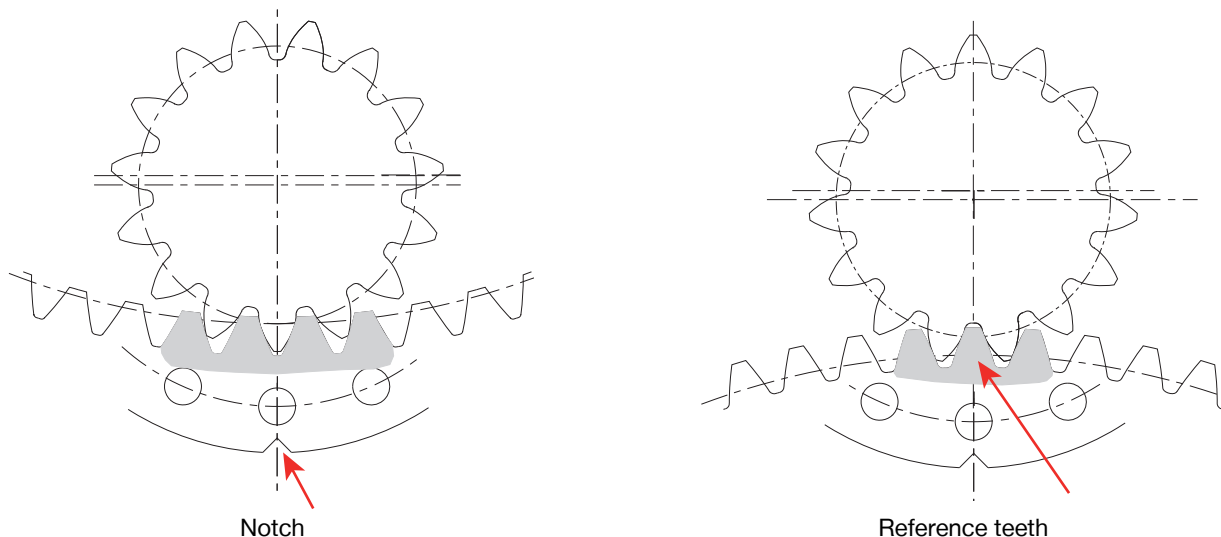


Fig. 27

Example:

If we have a toothing with $m = 20$, it is sufficient to perform $20 \times 0.03 = 0.6$ and $20 \times 0.04 = 0.8$ thus obtaining two values of 0.6 and 0.8; this means that the clearance between the sides of the teeth must be between 0.6 and 0.8 mm for perfect meshing, then position the reduction unit with the notch corresponding to the 3 coloured teeth (generally green) of the fifth wheel coupling, turn the reduction unit bringing it closer to the fifth wheel coupling, entering the thickness value obtained from the calculation described above on the sides of the tooth that is going to mesh; then tighten the reduction unit.

Check again the clearance between the sides at various points, over the entire primitive circumference of the fifth wheel coupling.

After positioning the gear unit and carrying out the necessary checks, tighten the fixing screws (minimum recommended class 8.8) applying a tightening torque according to the table Tightening torques (pag. 19), making sure that they are compatible with the other element (nuts and/or fixing structures).

CAUTION

In the presence of the reduction unit with cam, after it has been positioned, all the holes for level, oil filling, motor control, lamellar brake, etc. could go out of position with respect to the dedicated Dimensional Drawing, SI.

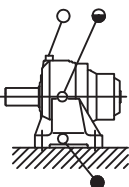
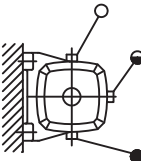
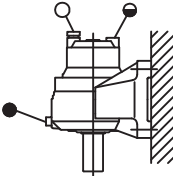
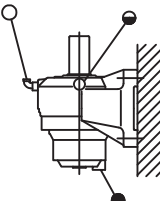
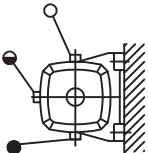
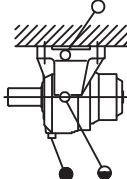
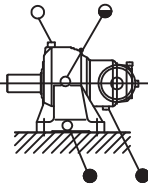
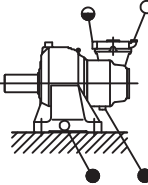
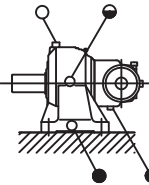
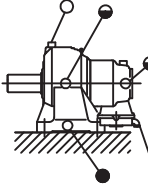
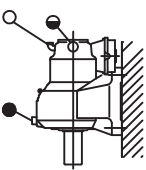
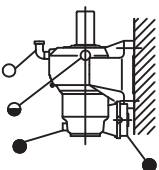
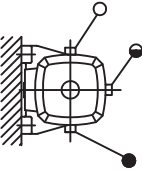
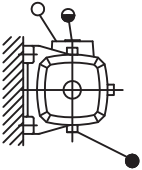
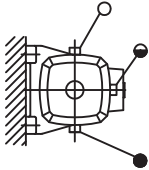
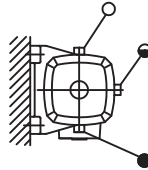
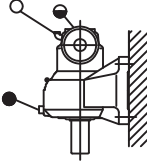
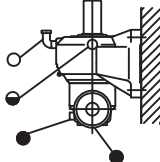
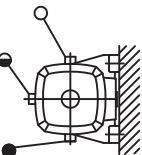
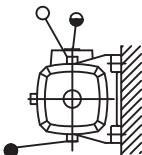
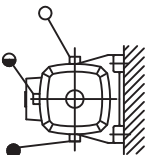
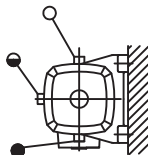
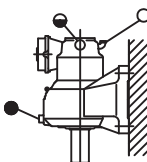
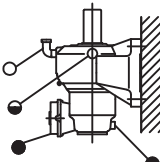
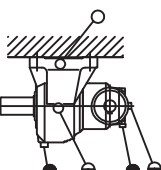
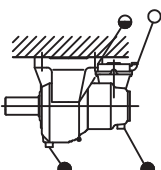
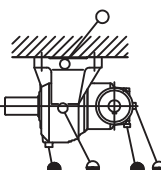
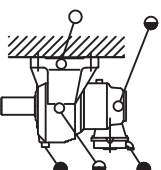
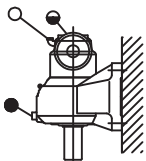
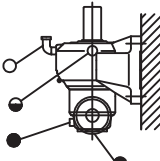
INSTALLATION AND ACCESSORIES

8.15 GEARBOX MOUNTING POSITIONS

The various denominations of possible gearbox mounting positions are given below.

Posizione orizzontale / Horizontal position			Posizione verticale / Vertical position	
COASSIALI / INLINE	MN - MR - MP - MN1 - MR1 - MP1			
		B3	B3	V5
	FE			
		B3	B3	V6
	FS - FAR - FP			
		B3	B3	V5
ORTOGONALI RIGHT ANGLE				
	V5B		B3D	
	B3C		B3A	
	B3B		V6B	

INSTALLATION AND ACCESSORIES

Posizione orizzontale Horizontal position				Posizione verticale Vertical position		
COASSIALI / INLINE	<div>B3</div> 	<div>B6</div> 		<div>V5</div> 	<div>V6</div> 	
	<div>B7</div> 	<div>B8</div> 				
ORTOGONALI / RIGHT ANGLE	<div>B3C</div> 	<div>B3D</div> 	<div>B3A</div> 	<div>B3B</div> 	<div>V5B</div> 	<div>V6B</div> 
	<div>B6B</div> 	<div>B6C</div> 	<div>B6D</div> 	<div>B6A</div> 	<div>V5A</div> 	<div>V6A</div> 
	<div>B7B</div> 	<div>B7A</div> 	<div>B7D</div> 	<div>B7C</div> 	<div>V5D</div> 	<div>V6D</div> 
	<div>B8A</div> 	<div>B8B</div> 	<div>B8C</div> 	<div>B8D</div> 	<div>V5C</div> 	<div>V6C</div> 

NOTE:

Mounting positions of gearboxes inclined with respect to the horizontal axis must be considered as vertical mountings.



9 LUBRICATION

The important parameters to consider when choosing the type of oil are:

- viscosity at nominal operating conditions
- additives
- flashpoint

The same oil must lubricate the bearings and gears, and all these parts are in the same box, in different operating conditions. Consider the individual parameters.

Viscosity

The nominal viscosity refers to a temperature of 40 °C, but decreases rapidly as the temperature increases. With an operating temperature near 100 °C, a nominal viscosity can be chosen according to the following table.

Table 28:

Output rpm	
> 5 (min-1)	VG 150
< 5 (min-1)	VG 220

Additives

In addition to the normal anti-foam and antioxidant additives, it is important to use oils with additives offering EP (extreme-pressure) and anti-wear properties, according to ISO 6743-6 L-CKC or DIN 51517-3 CLP.

Therefore the slower the gearbox speed, the stronger the EP characteristics required (e.g. MOBILGEAR SHC).

It should be remembered that the chemical compounds substitutive of hydrodynamic lubrication are formed at the expense of the original EP load.

Therefore in case of very low speeds and high loads, it is important to observe the maintenance intervals so as not to lower the lubricating properties of the oil excessively.

Oil types

The available oils generally belong to three large families.

1 - Mineral oils

2 - Polyalphaolefin synthetic oils

3 - Polyglycol synthetic oils

The most appropriate choice is generally linked to the conditions of use.

Gearboxes that are not particularly loaded and with intermittent use, without significant temperature changes, can certainly be lubricated with mineral oil.

In case of heavy use, when the gearboxes are expected to be highly loaded and continuously, with consequent foreseeable rise in temperature, it is best to use Polyalphaolefin synthetic lubricants (PAO).

Polyglycol oils (PG) are to be used strictly in case of applications with heavy sliding between contacts; e.g. in worm screws.

They must be used with great attention, since they are not compatible with other oils and are completely mixable with water.

This phenomenon is especially dangerous because it is not noticed, but rapidly lowers the lubricating properties of the oil.

In addition to those already referred to, there are also oils for the food industry, in being special products not harmful to health.

For better protection of the environment, there are several biodegradable types.

Various manufacturers supply oils belonging to all the families with very similar characteristics.

WARNING

For ATEX certified gearboxes, Dana Motion Systems Italia S.r.l. requires the use of polyalphaolefin oils (PAO), see table in Chap. Lubricants for general use (pag. 51).

9.1 LUBRICANTS FOR GENERAL USE

Table 29:

Manufacturer	Poly-Alpha-Olefin synthetic oils (PAO) For gearboxes		
	ISO VG 150	ISO VG 220	ISO VG 320
MOBIL	Mobil SHC Gear 150	Mobil SHC Gear 220	Mobil SHC Gear 320
SHELL	Omala S4 GXV 150	Omala S4 GXV 220	Omala S4 GXV 320
TOTAL	Carter SH 150	Carter SH 220	Carter SH 320

Table 30:

Manufacturer	Poly-Alpha-Olefin oils (PAO) For negative multi-disk brake		
	ISO VG 32	ISO VG 46	ISO VG 68
MOBIL	Mobil DTE24	Mobil DTE25	-
SHELL	Shell Tonna S 32	-	Shell Tonna S 68
TOTAL	Azolla ZS 32	Azolla ZS 46	Azolla ZS 68

Table 31:

Manufacturer	Synthetic Grease - for output support bearing
	Viscosity of Base Oil, ASTM D 445 cSt @ 40°C : 460
SHELL	Shell Gadus S3 460 2

NOTE:

The user can choose oils of other producers with corresponding lubrication characteristics, making sure that the oil has a flashpoint above 200°C.

NOTE:

The user can choose greases made by other manufacturers, with corresponding and adequate lubrication and compatibility characteristics, making sure that the chosen grease has a flash point above 200°C.

WARNING



Do not use oils and greases with a flash point below 200°C.

WARNING



Do not mix oils and greases of different types and characteristics.

WARNING

Fill the gearbox with fresh oil specified in the table, using a filter of max. 25 µm.

10 PREPARING THE GEARBOX

10.1 GEARBOX LUBRICATION

Unless otherwise specified in the contract, all the gearboxes are delivered without lubricant.

The operator must therefore choose the most suitable type of oil from those indicated (or with similar characteristics) and carry out filling and check the oil level before startup, as indicated in point 10.2 Filling and oil level check (pag. 52).

10.2 FILLING AND OIL LEVEL CHECK

Procedure:

- Check the exact position of the plugs and make sure the oil level plug is in an easy to inspect position.
- Locate the position of the filler+breather and level plugs on Dimensional Drawing SI referred to in the Conformity Declaration Certificate.
- Unscrew both plugs, add oil until it comes out the level hole, refit the level plug, wait until the air bubbles have escaped, then refit the filler plug, start the gearbox in order to eliminate the last air pockets and then check the level again, if necessary adding oil to reach the level.

NOTE:

If there is a multi-disk brake, carry out the same oil filling operation as described above.

In case of expansion tank (reservoir), proceed as follows:

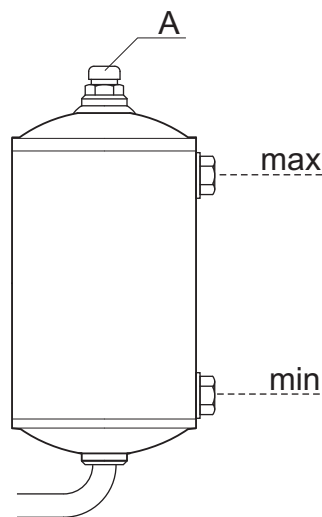


Fig. 28

- Locate the position of the filler+breather and level plugs on Dimensional Drawing SI referred to in the Conformity Declaration Certificate.
- Remove the filler+breather "A" and "min." level plugs.
- To help gearbox ventilation (only during filling), one of the plugs can be removed from the top of the gearbox.
- As the oil rises to the top of the plug opened at the top of the gearbox, refit the plug.
- Continue filling until the oil reaches the "min." level plug on the tank, refit the "min." level plug.
- Refit plug "A".
- Never reach the max. level, in order to leave room for oil expansion.
- Turn the gearbox for a few minutes to eliminate any air pockets inside, then check the level again, if necessary adding oil to reach the "min." level.

NOTE:

Make sure the expansion tank is positioned at the top of the gearbox as shown on Dimensional Drawing SI referred to in the Conformity Declaration Certificate.

PREPARING THE GEARBOX

10.3 DRAINING OIL FROM THE GEARBOX AND MULTI-DISK BRAKE (IF AVAILABLE)

- Locate the oil drain plug of the gearbox and multi-disk brake (if available) on the Dimensional Drawing SI referred to on the Declaration of Conformity Certificate,
- unscrew the drain plug and filler cap to facilitate draining the oil from the gearbox and multi-disk brake (if available),
- after draining the oil, refit the drain plug of the gearbox and multi-disk brake (if available).

11 START-UP

11.1 GENERAL INSTRUCTIONS

WARNING



Before starting under load, check the following:

- When starting the engine, the output shaft of the reduction unit is turning;
- The direction of rotation is as planned in the design phase;
- For reduction units fitted with a non-return device, check before starting that there is a correspondence between the direction of free rotation and the directions of rotation of the machine to be driven and the engine;
- For reduction units fitted with a negative lamellar parking brake, make sure before starting that the brake control pipe is connected and that the air bleeding operation in the hydraulic circuit has been carried out correctly.

NOTE:

Air in the hydraulic circuit can cause incomplete opening of the brake, resulting in its rapid heating.

- There must be no leakage of lubricant from the plugs or gaskets (during the first few hours of operation there may be a slight leakage of grease from the sealing rings which does not impair proper operation);
- The breather cap must not be obstructed by dirt or paint;
- There must be no abnormal noise and/or vibration;
- The reduction unit must be sufficiently ventilated and there must be no significant source of heat outside;
- The ambient temperature and cooling air must not exceed 40°C;
- All accessories mounted or connected to the reduction units must be ATEX certified, suitable for the area of use;
- Check that all devices designed for protection between operators and rotating parts are effective.

11.2 SURFACE TEMPERATURE CHECK

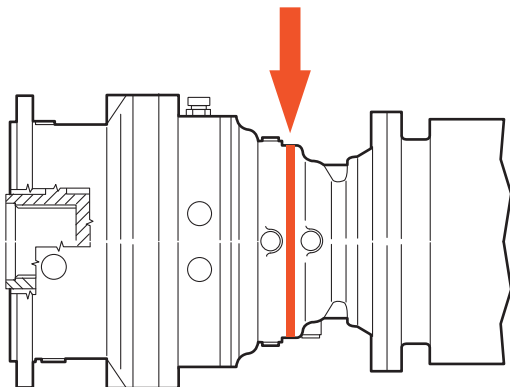
At startup, it is essential to check the surface temperature in normal operating conditions.

The check is to ensure that the requirements relevant to the behaviour of the system, as established in the design stage, are respected.

- The gearbox input area has been identified as the hottest and must be checked with a thermometer at the place indicated in the following figure or otherwise outside of the flanging between the motor and gearbox, on the gearbox side.
- If there is a negative multi-disk parking brake, also measure the temperature on the brake body.
- The temperature measurement must be performed under conditions of maximum load for a period of at least 3 hours.
- If the measured temperature is more than 68 °C above the ambient temperature (e.g. with ambient temperature 30 °C, 30 °C + 68 °C = 98 °C must not be exceeded), stop the testing and contact the Dana Motion Systems Italia S.r.l. Assistance Service.

CAUTION

Hot area



12 CHECKS AND MAINTENANCE

CAUTION

Checking/maintenance operations must be carried out by an expert maintenance technician in compliance with the accident-prevention regulations, to ensure his own safety and that of people in the vicinity.
Before doing any work on the gearbox, make sure the machine is off and cannot be accidentally started.

WARNING



Periodically clean the outer surface of the gearbox of any dust or deposits. In case of use in dusty places, the layer of accumulated dust must not be more than 5 mm. Use equipment suitable for the installation area; do not use compressed air.

CAUTION

It is advisable to change the oil when it is hot, to facilitate the removal of any sludge or deposits. In this case, however, not to exceed 40 °C and always operate with the necessary protective equipment PPE.

WARNING



Do not mix oils of different types and characteristics.

WARNING



Periodically clean the metal filler/breather plug with valve. It must be unscrewed from the gearbox (protecting the gearbox against dust and foreign bodies, etc., entering); check the opening of the valve with spring (it must not be blocked), clean with compressed air and then refit.

WARNING



Check the surface temperature of the gearbox in the area identified as the hottest during startup. The maximum recorded temperature must be lower than that specified on the data plate.

If the measured temperature is above the 108 °C, stop the machine and contact the Dana Motion Systems Italia S.r.l. Assistance Service.

WARNING



At every oil change, check for excessive ferrous material on the magnet in the drain plug. In case of an excessive amount, immediately schedule a machine stop for maintenance purposes.

WARNING



The gearboxes must not be opened for any operation not included in the maintenance and checking activities listed below.

The manufacturer declines any liability for operations carried out and not included in this manual, that have caused injury or damage.

If case of need, contact the Dana Motion Systems Italia S.r.l. Assistance Service.



CHECKS AND MAINTENANCE

12.1 SEALING RINGS

The life of the sealing rings depends on many factors such as operating temperature, sliding speed, oil cleanness, ambient conditions, etc.; therefore they must be replaced periodically to prevent oil leaks which could compromise the parts inside the gearbox and also increase the casing temperature beyond the design values.

For safety reasons, more frequent replacement of the sealing rings is required for gearboxes mounted in vertical and oblique positions (completely or almost completely filled with oil) and less frequent for gearboxes mounted in a horizontal position (filled with oil to the middle).

For mounting positions, refer to Chap. Gearbox mounting positions (pag. 48).

For sealing ring change frequency, refer to (pag. 57).

WARNING



Failure to replace the sealing rings with the frequency specified in Check and maintenance frequency tables (pag. 57), could lead to oil leaks that can completely compromise gearbox operation, with risk of reaching high temperatures on the gearbox.

CHECKS AND MAINTENANCE

12.2 CHECK AND MAINTENANCE FREQUENCY TABLES

Table 32:

Check and operation	Frequency	Notes
Check oil level	Daily and before every startup	See Preparing the gearbox (pag. 52).
Check for oil leaks	Daily	See Troubleshooting (pag. 59) if present.
First oil change	After 100 hours of operation	See Preparing the gearbox (pag. 52).
Subsequent oil changes	Every 2000 hours of operation or once a year	See Preparing the gearbox (pag. 52).
Check the tightening of bolts	After the first 100 hours of operation	For details see Tightening torques (pag. 19).
Check the tightening of bolts	Every 2000 hours of operation or every year	For details see Tightening torques (pag. 19).
Water in the oil	Once a year or at every oil change	If present, replace rotating rings and breather plug
Clean the oil drain magnetic plug	At every oil change	With unusual metal parts on the magnet, see Checks and maintenance (pag. 55).
Clean the breather plug	Every 3 months	See Checks and maintenance (pag. 55).
Check motor absorption	Every 3 months in absence of continuous system	-
Check the surface temperature	Every 3 months	See Checks and maintenance (pag. 55).
Check gearbox noise	Every 3 months	See Troubleshooting (pag. 59) if not normal.
Check gearbox vibration	Every 3 months	See Troubleshooting (pag. 59) if not normal.
Equipotential connection	Every 3 months	See Installation and accessories (pag. 17).
Clean the gearbox	Periodically	See Troubleshooting (pag. 59)Checks and maintenance (pag. 55).
Data plate readability	Yearly	See Data plate (pag. 15).
Grease Taconite seals	Every 2000 hours of operation or once a year	See Taconite labyrinth seals (optional accessory) (pag. 40) and dimensional drawing SI.
Grease seals output support	Every 2000 hours of operation or once a year	See Lubrication (pag. 50) and dimensional drawing SI
Check the braking torque of the multi-disk brake	Every 2000 hours of operation or every year	See Negative multi-disk parking brakes in oil bath (pag. 42) and dimensional drawing SI.
Replace seals of gearbox and multi-disk parking brake (if available) horizontal assembly, to be carried out at Dana Motion Systems Italia Assistance Service	Every 6000 hours of operation or every 3 years	Mounting pos.: B3, B3C, B3A, B6, B7, B8, B6B, B6D, B7B, B7D, B8A, B8C.
Replace seals of gearbox and multi-disk parking brake (if available) vertical or oblique assembly, to be carried out at Dana Motion Systems Italia Assistance Service	Every 2000 hours of operation or every year	Mounting pos.: V5, V6, V5B, B3D, B3B, V6B, B6C, B6A, B7A, B7C, B8B, B8D, V6B, V5A, V6A, V5D, V6D, V5C, V6C
Check gearbox input and output shafts for wear	Once a year	See Installation and accessories (pag. 17) for re-greasing.

CHECKS AND MAINTENANCE

The inspection and maintenance of gearboxes and/or on the multi-disc parking brakes, including electric Sensors, such as temperature sensors and/or oil level indicators "ON-OFF", differ from those above indicated, regarding the seals replacement, as following:

Table 33:

Inspection and measures	Time interval	Notes referred to the Manuals
Replace seals of gearbox and multi-disk parking brake (if available) horizontal assembly, to be carried out at Dana Motion Systems Italia Assistance Service	Each 6.000-10.000 hours of operation or every 3-5 years and during gearbox reconditioning	Mounting positions: B3, B3C, B3A, B6, B7, B8, B6B, B6D, B7B, B7D, B8A, B8C.
Replace seals of gearbox and multi-disk parking brake (if available) vertical or oblique assembly, to be carried out at Dana Motion Systems Italia Assistance Service	Each 6.000-10.000 hours of operation or every 3-5 years and during gearbox reconditioning	Mounting positions: V5, V6, V5B, B3D, B3B, V6B, B6C, B6A, B7A, B7C, B8B, B8D, V6B, V5A, V6A, V5D, V6D, V5C, V6C
Inspection of temperature sensors and oil level indicators	Every 3 months	See Note below

NOTE:

It is user responsibility to check with the right frequency, electric circuits control used by the Sensors, to be always working and properly calibrated for intervene to set parameters.

WARNING



The gearboxes are selected for the service life required by the customer for each specific project, with the specified duty cycle, as given on dimensional drawing SI referred to in the Declaration of Conformity Certificate.

When the working hours indicated in the documentation are reached, the gearbox must be replaced with a new one or sent to a Dana Motion Systems Italia S.r.l. Assistance Service for complete overhaul.

13 TROUBLESHOOTING

Use the following table to troubleshoot any faults or malfunctions.

Contact your nearest Dana Motion Systems Italia S.r.l. Service Centre in the event of persistent faults.

Table 34:

Fault	Possible cause	Corrective action
The output shaft does not turn when the motor is running	Incorrect motor mounting	Check the coupling between the motor and the gearbox
	Parking brake blocked/closed	Check the hydraulic system connected to the brake
	Internal fault	Contact the nearest Service Centre
Oil leaks from the breather during functioning	Oil level too high	Reduce the oil level
	Breather in wrong position	Check the position of the breather
	Breather seal worn	Contact the nearest Service Centre
Oil leaks from the seals	Breather plug blocked	Remove and change the breather plug
	Seals gone hard after extended storage	Clean the area and check for leakage again after a few days. If the leakage persists, contact the nearest Service Centre
	Seals worn or damaged	Contact the nearest Service Centre
Excessive noise	Internal fault	Contact the nearest Service Centre
Excessive vibration	The gearbox is incorrectly installed	Check the fixing bolts and coaxial alignment
	Mounting structure too weak	Strengthen the mounting structure
	Internal fault	Contact the nearest Service Centre
Excessive heating	Lack of ventilation	Make sure there are no enclosures or other hindrances to air circulation. Check external cleanness
	Brake opening incomplete	Check the brake opening minimum pressure
	Work cycle longer than design cycle indicated on dimensional drawing SI	Check loads and power required by the machine
	Ambient temperature higher than 40 °C	Stop the machine until the temperature returns to below 40 °C
	Internal fault	Contact the nearest Service Centre
The negative multi-disk brake does not open/release	No pressure at brake	Check the hydraulic connection to the brake
	Disks stuck due to a period of parking	Apply pressure on the brake, making the gearbox/brake input rotate
	Brake seals leak oil	Contact the nearest Service Centre
The multi-disk brake does not close/lock	Back pressure in the brake circuit	Check the hydraulic circuit
	Worn brake disks	Contact the nearest Service Centre



14 GEARBOX DECOMMISSIONING

The gearbox decommissioning operations must be carried out by expert personnel, in compliance with the current laws on safety in the workplace.

It is advisable to proceed as follows:

- Remove all oils present in the gearbox.
- Disconnect the motorisation at the gearbox input.
- Remove the gearbox

Carry out disposal operations in compliance with the current laws on environmental protection, avoiding contamination of soil and water with non-biodegradable products.

15 EXAMPLE OF EU DECLARATION OF CONFORMITY CERTIFICATE



Dana Incorporated
Dana Motion Systems Italia S.r.l. (a socio unico) - Power –
Transmission Division
Via Luciano Brevini 1/A, 42124 Reggio Emilia – Italy
Tel: +39.0522.9281 Fax: +39.0522.928300
P.I. / VAT 0026275 035 9 REA N° RE75379




DICHIARAZIONE DI CONFORMITA' UE EU DECLARATION OF CONFORMITY

Dana Motion Systems S.r.l.

Dichiara sotto la propria responsabilità che il riduttore epicicloidale sotto indicato, è progettato e costruito in conformità alla **Direttiva 2014/34/UE** e idoneo all'impiego in ambienti con atmosfera potenzialmente esplosiva secondo **Gruppo II, categoria 2G**.

*Declares in sole responsibility, that the planetary gear unit below mentioned, is designed and manufactured in compliance with the **Directive 2014/34/EU** and is suitable for use in potentially explosive atmosphere, according **Group II, category 2G**.*

Marcatura / Marking :  II 2G Ex h IIC T4 Gb

Cliente:

Customer: _____

Riduttore tipo:

Gearbox type: _____

Codice prodotto:

Product code: _____

Conferma d'ordine N°:

Order confirmation N°: _____

Matricola N°:

Serial N°: _____

Disegno dimensionale N°:

Dimensional drawing N°: _____

SI

Norme di riferimento / Applicable standards:

EN ISO 80079-36:2016

EN ISO 80079-37:2016

EN 1127-1:2011

Dana Motion Systems S.r.l.

ha depositato i documenti previsti secondo l'allegato VIII della Direttiva ATEX 2014/34/UE, con numero deposito fascicolo tecnico nr. 0206243, presso:

have archived required documents according to the Annex VIII of the Directive ATEX 2014/34/EU, with identification number no. 0206243, at the following location:

TÜV Cyprus, EU Code 2261

General Manager
Power - Transmission
Matteo Foletti

Head of Engineering
Power - Transmission
Alessandro Vighi

Reggio Emilia, data/date: 17/02/2020

Doc. QCATEX0000 date: 01/11/2019



EXAMPLE OF EU DECLARATION OF CONFORMITY CERTIFICATE



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*Declares in sole responsibility, that the planetary gear unit below mentioned, is designed and manufactured in compliance with the **Directive 2014/34/EU** and is suitable for use in potentially explosive atmosphere, according **Group II, category 3G**.*

Marcatura / Marking :  II 3G Ex h IIC T4 Gc

Cliente:

Customer:

Riduttore tipo:

Gearbox type:

Codice prodotto:

Product code:

Conferma d'ordine N°:

Order confirmation N°:

Matricola N°:

Serial N°:

Disegno dimensionale N°:

Dimensional drawing N°:

SI

Norme di riferimento / Applicable standards:

EN ISO 80079-36:2016

EN ISO 80079-37:2016

EN 1127-1:2011

General Manager
Power - Transmission
Matteo Foletti

Head of Engineering
Power - Transmission
Alessandro Vighi

Reggio Emilia, data/date: 17/02/2020

Doc. QCATEX0010 date: 01/11/2019



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