GREEN GEAR TRASMISSIONI SRL

UNIVERSAL SHAFT
MAINTENANCE MANUAL

SAFETY SPECIFICATIONS

Warning notices

For your safety, warning notices are used throughout these Operating Instructions. These warning notices are found in conjunction with the instructions for the respective operation. Different danger levels are assigned on the basis of the probability of occurrence and the consequences of failing to heed the notice. Throughout there are a number of HAZARD WARNINGS that must be read and adhered to in order to prevent possible loss of equipment and/or loss of life. The three warning words are: **DANGER, WARNING, CAUTION**.

DANGER: Denotes the most serious injury hazard and is used when SERIOUS INJURY OR DEATH WILL result from misuse or failure to follow the specific instructions sit forth in this manual.
WARNING: Denotes when SERIOUS INJURY MAY result from misuse or failure to follow the specific instructions sit forth in this manual.
CAUTION: Denotes when SERIOUS INJURY OR PRODUCT OR EQUIPMENT DAMAGE MAY result from the misuse or failure to follow the specific instructions sit forth in this manual.

About the Operating Instructions

Before using universal joint shaft, it is necessary to carefully read and understand the OPERATING INSTRUCTION. These operating instructions are part of the product and are intended to familiarize you with basic operations involving the universal joint shaft – from installation to disposal. They contain information on the safe and correct use of the universal joint shaft

Designated use

The universal joint shaft transmits torques between defined drive and machines components; for this reason, the universal joint shaft is to be installed only in the specific machine/equipment for which it was selected.
Any other use (i.e. installing in other machines) is prohibited.
Any non-designed use, or any activities involving universal joint shaft that are not described in the Operating Instructions are considered misuse beyond the legal limits of liability of the manufacturer.
Observe the following in order to avoid misuse:

DANGER. Universal shafts in operation may be dangerous units, so the user must provide for adequate protection devices in compliance with the safety regulations in effect at the time of introduction.
WARNING. The operation of handling, installation, lubrication and maintenance must be carried out by qualified personnel only.
DANGER. While performing the operations of handling, installation, lubrication and maintenance, wear garments which cannot get entangled with the mechanical components, and employ appropriate individual protection devices.

DANGER. Make sure the machines connected by the universal shaft are off and cannot restart throughout the different operations.
CAUTION. Never exceed, in operation, the load data defined in the order (torque, speed, working angles, etc.).
WARNING. Operate the universal joint shaft only in permissible areas.
WARNING. Do not make any arbitrary alterations of modifications that affect the safety of the universal joint shaft and the system.
WARNING. Observe the manufacturer's guidelines with regard to operation, maintenance and repair.
WARNING. Have any necessary work on the universal joint shaft performed by the manufacturer or factory-authorized service technicians.

Remaining danger

Before beginning design and planning, the remaining dangers associated with universal joint shaft were analysed and assessed.
Remaining dangers, which are unavoidable due to design during the overall life cycle of universal joint shaft are:

- Risk of injury or death due to
  - Misuse
  - Improper handling
  - Improper transport
  - Missing protective equipment
  - Defective or damaged mechanical component
- Risk to the environment, for instance, due to
  - Improper handling of preservatives of lubricants
- Physical damage to the joint shaft due to
  - Improper handling
  - Detrimental environmental effects and operating conditions
  - Non-compliance with operating specifications
  - Unsuitable operating materials (i.e. bearing grease)
- Damage to other property due to improper handling
- Restrictions in performance or function due to
  - Improper handling
  - Improper maintenance or repairs
  - Subsequent damage due to overload

Any existing remaining dangers are avoided by the practical implementation and observation of safety information and warning notices in these operating instructions.
Safety information regarding operation

- Ensure compliance and supervision:
  - Designated use
  - Laws and regulations intended to prevent accidents and protect the environment
  - Safety regulations regarding the handling of hazardous substances
  - Applicable standards and guidelines in the country where used

Activity	Protective equipment
Installation	-Safety helmet -Wear safety shoes with non-slip oil resistant soles -Protective gloves
Commissioning and operation	-Closely fitting clothing -Wear safety shoes with non-slip oil-resistant soles
Transport	-Safety helmet -Wear safety shoe with non-slip oil-resistant soles
Preservation	-Protective goggles -Protective gloves
Maintenance	-Safety helmet -Protective glove -Wear safety shoes with non-slip oil-resistant soles

- In the event that sliding shafts do not have a profile guard:
  - Provide a guard for the equipment

INSTALLATION, LUBRIFICATION, USE AND MAINTENANCE

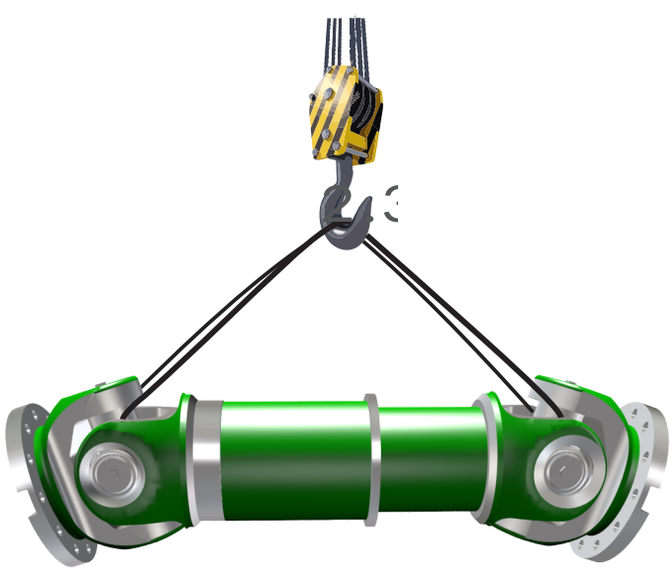
1. STATUS AT DELIVERY

1.1 Green Gear universal shaft are usually supplied assembled, balanced (if necessary) and, unless otherwise requested, painted (primer + final colour)

1.2 A proper surface protection coat normally ensures protection against corrosion on yokes and companion flanges. Any different anticorrosion treatment shall be requested in the order.

2. SUGGEST FOR HANDLING AND STORAGE

2.1 **DANGER** The shafts should be transported in a horizontal position. For vertical handling, the two halves must be held together by suitable means so that the shaft cannot fall apart. Use ropes of sufficient load carrying capacity. Synthetic fiber ropes are preferred. Ensure adequate edge protection when using wire ropes.



2.2 **DANGER** Transport and store in horizontal position.

2.3 **DANGER** Select the lifting equipment according to the weights shown in our drawings or in our catalogue.

2.4 **DANGER** Risk of serious to fatal injuries due to swinging or falling universal joint shaft. For sliding shafts: risk of serious to fatal injuries due to falling parts. Secure the telescoping section against being pulled apart, e.g. using rope.

2.5 **DANGER** Do not stand under an elevated universal joint shaft.

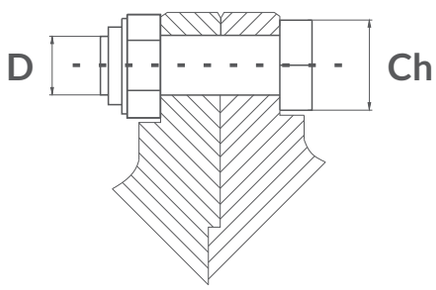
2.6 **DANGER** Risk of serious to fatal injuries by a joint shaft is rolling away.

2.7 **DANGER** Do not hang or transport in vertical position. Vertical transport requires a special protection preventing the telescopic unit from slipping out.

2.8 Packing must be adequate to avoid any impact to the universal shaft and must protect it from any environmental event, from humidity and condensation.

Normally the bolts are inserted from the companion flange side, by fitting the tightening nuts on the universal shaft flange. In special cases, you can screw the bolts from the joint side or you can use stud bolts.

NOTE: Do not lubricate screw and nuts with lubricants containing MoS2.



D	[mm]	M16	M18	M20	M22	M24	M27	M30	M33	M36
Ch	[mm]	24	27	30	32	36	41	46	50	55
Ma	[Nm]	287	396	560	745	967	1415	1920	2600	3330

3.6 The bearings and the telescopic unit are not pre-lubricated at our shop and need being greased before installation or their storage.

3.7 If the start-up takes place 3 months after the assembly, check the preservation state of the universal shaft and lubricate

CAUTION Once everything is ready for the start-up and after verifying everything is properly assembled, tightened and lubricated, you can turn the machine on. We suggest a slow start-up, while checking that no interference is generated in rotation, and that everything is ok. In case the universal shaft is directly connected to the electric motor shafts, carefully check the insulation from eddy currents generated by the remarkable electrostatic fields created by the motor magnetism.

VERTICAL UNIVERSAL SHAFTS

Vertical universal shafts are usually delivered assembled and equipped with companion flanges (top and bottom ones). For a correct universal shaft assembly, perform the following operations:

- Unscrew the companion flange locking screw from their nuts and washers, and put them in a box, to avoid any possible loss.
- Release the companion flanges (top and bottom ones) from their universal shafts.
- Fit the companion flanges (top and bottom ones) onto their related shaft ends.
- Secure the universal shaft vertically, by a steel sling as shown in the picture, with the bottom flange aligned with the related companion flange.

2.9 Pay attention to the ambient conditions in the storage room:
- dry
- frost-free
- relative humidity of max. 70%
- uniform temperature

2.10 **WARNING** The racks must be designed to prevent rolling away or – in case of vertical storage – falling down of the shafts.

2.11 If not specified otherwise, the packaging is designed for a storage period of max. 4 weeks. For long term storage, protect machined parts against corrosion.

2.12 For long time storage (exceeding three months), relubricate bearings and length compensator, before installation.

3. ASSEMBLY

3.1.1 Unpack the universal shaft and check its state of preservation.

3.1.2 Before assembling, thoroughly clean any machined surface on yokes and companion flanges, so to assure a perfect contact as well as an optimal torque transmission.

3.1.2.1 Do not remove the balance weights.

3.1.3 Do not remove the telescopic splined components, to avoid confusing them with others, so generating misalignment, inconstant velocity and unbalance of the unit.

3.1.4 The inner universal shaft yokes must be aligned. Check the arrow marking.

3.1.5 In the companion flanges, the coaxial tolerance of centering and the perpendicular position must be included within a restricted range.

3.1.6 Uniformly heat the companion flanges at 100÷150 °C for the shrink fitting, before assembling them onto the shafts.
WARNING Wait for their complete cooling before assembling the universal flanges.

3.2 The companion flanges must keep firmly fixed and centered onto the shaft.
Check the absence of:
- backlash between bore and shaft,
- axial and float, possibility of movement,
- clearance on key or spline flanks.

3.3 Check that the distance between shaft ends comply with Green Gear drawings.

NOTE: Whenever installing fixed length universal shafts, one of the units must be free to move in order to compensate for slight length variation resulting from manufacturing tolerances or temperature changes

3.4 Before fitting the flanges, accurately clean their surfaces. They must be free from grease, coat or rust.

3.5 Complete bolting sets for companion flange connection are available on request. Green Gear normally provides:
- Hexagon or cylindrical headed bolts (in accordance to DIN 931 – 12.9 or 10.9)
- Self-locking nuts (according to DIN 980 – 10 or 8). Tighten the bolts by a dynamometrical wrench or another similar device, according to the torque table 1 or to our drawings. The self-locking nuts, after a certain number of operations (about 6 screwing and unscrewing), lose their features and must be replaced.

5. LUBRICATION

5.1 CAUTION Risk of slipping from lubricant escaping.

5.2 The bearings and the length compensator require being greased ALWAYS before installation.

5.3 If the setting at work takes place months after the assembly, check the universal shaft condition and lubricate.

5.4 The universal shaft performance and working life basically depend on a correct lubrication program. Do not let the spline slide before lubricating it.

5.5 GGT recommend the following lubrication intervals:

- First year

Every 200÷350 hours of actual operation time

- After the first year

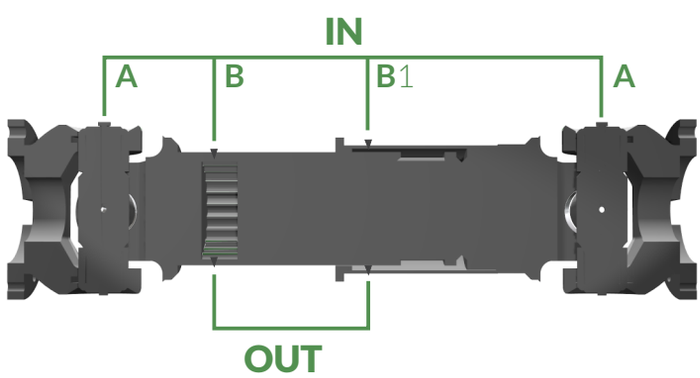
For normal applications: every 2000÷3000 hours or every six months.

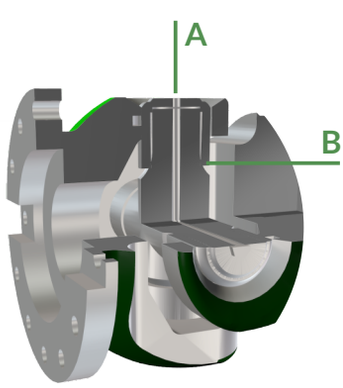
For heavy duty applications: every 500÷1000 hours, or every two or three months.

The intervals depend on impact frequency, load level, environmental conditions, rotating, speed, reversing operation, operating angle, seal condition, shaft movement frequency, compensation length, under/no load movements.

Adjust intervals to the particular operating conditions. Particularly unfavourable working conditions may require shorter grease intervals.

5.6 The lubrication points for a standard universal shaft are respectively placed:
- on each bearing bottom (A) or in the journal cross centre, to lubricate the bearings - on the spacer (B) and on the protection tube (B1), to lubricate the length compensator.





NOTE:
a.When regreasing, use an appropriate lubricant.
b. Clean the grease nipples before greasing.
c. Do not lubricate with too high pressure:
MAXIMUM PERMISSIBLE GREASE PRESSURE 15 BAR

5.7 Pump the grease in the bearings (point A) until the old lubricant continuously flows out of the seals (point B).

- Fit any screw and nut, by tightening them at the required torque.
- Support the universal shaft in vertical position, by means of stay rod able to exert an axial hold upwards.
- Release the universal shaft from the sling.
- Gradually apply a vertical force upwards, by slowly taking the male spline out of the female spline, until you have the top flange aligned with the related companion flange.
- Fit any screw and nut, by tightening them at the require torque.
- Lubricate the universal shaft following the procedure described in the present instruction manual.
- Rotate the universal shaft at low speed (about 20% of the nominal rotating speed) for 30 minutes and check the situation, to verify there is no anomaly.
- Rotate the universal shaft at the nominal rotating speed for 30 minutes and check its condition, to verify there is no anomaly.

4. OPERATION CHECKS

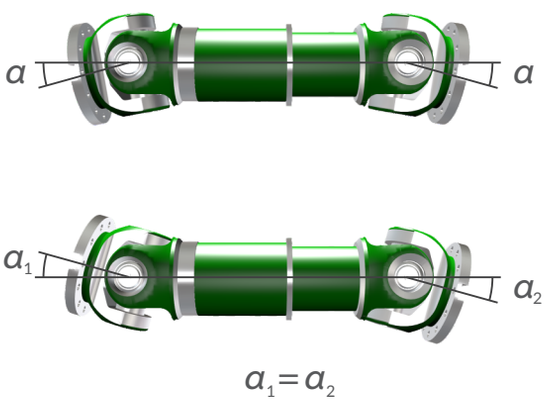
4.1 **CAUTION** The universal shafts must operate within the limits indicated in the catalogue, in the drawings or in any other document.

4.2 **WARNING** The universal shaft rated design torque Tn must always be higher than the maximum operating torque. This means that you need to verify to have proper service factor SF and life factor KL, and that the maximum torque transmitted in the acceleration or deceleration transient period is lower than the limit torque Tcs.

4.3 **WARNING** The values of maximum allowed rotation speed, depending on the working angle, must be 20% lower than the universal shaft critical bending speed.

4.4 **WARNING** The working and the no-load angles stated in the project must never be exceeded (while making maintenance, in relation to the opening max allowed limits). Green Gear standard universal shafts allow a maximum deflection of 15°, corresponding to the composed sum of the angles in the two planes.

4.5 The two half angles of the universal joint must be equal. For rotation speed lower than 300 rpm a difference of 2÷3° is permitted; for higher speed such difference must be limited within 1÷1.5°.



$\alpha_1 = \alpha_2$

For misalignment in the two planes:

$$\tan\alpha_1 = \tan\alpha_2 = \sqrt{(\tan\alpha_v)^2 + (\tan\alpha_h)^2}$$

α v = vertical plane angle

α h = horizontal plane angle

4.6 If the universal shaft connects the motor with the reducer and if the reducer is too noisy and pounding, verify the shaft alignment in the two planes, in order to check that the half angles are equal. The higher the rotation speed and the misalignment angle are, the bigger this problem may be.

4.7 Due to the obvious alignment difficulties resulting from the distance between two shafts, and for the above mentioned reasons, industrial applications require working angles between 1 and 10°, reaching 15° only in special applications. The higher the angle is, the stronger the reaction on the shaft support sustaining the universal shaft will be.

4.8 In order to facilitate the bearing lubrication and to limit the static brinelling phenomena of their races, we suggest working angles of 1°/2° minimum.

4.9 CAUTION In case of rolling mill plant applications, check the roll change spindle supports are correctly positioned, with easy and appreciable adjustments, not forcing against the universal spindles. Check they have safe supports able to assure an optimal alignment of the sleeves with the roll necks; they do not block rotation and allow, with no interference, both the maximum and the maintenance openings of the rolls; finally, check they are correctly dimensioned to support the universal shaft weight without any deformation.

4.10 WARNING Verify that no axial impact is generated during the roll change with engagement/disengagement of the sleeves onto the roll neck. For this purpose, check the tangential positioning of the flat keys, employ telescopic universal shafts equipped with an axial compensator device, having also function of shock absorber, as well as sleeves equipped with big and rounded chamfers on bore and key borders. In these cases, in order to avoid the universal shaft slipping off during the roll change, proper axial stopping devices on the spindle support or on the universal itself should be provided.

4.11 Always check that the fitting of the sleeves onto the roll necks is accurate and precise and that it does not generate vibrations in rotation; for this purpose, always keep flat and round keys in good condition.

4.12 Should high torques or impacts be generated in the plant, or should the absorbed torque constantly be over the limits, provide for a proper overload protection system, with prompt intervention accuracy and a low hysteresis, assuring a good safety margin as regards the universal shaft limit torque.

In addition, greases must:

- contain oxidation inhibitors
- be water-repellent
- be free of alkalis, acids, impurities
- have good thermal stability

6.5 For high operation speed (> 500 rpm), the addition agents must have a good resistance to centrifugation.

6.6 For moderate industrial services, GGT recommend the following greases:

ESSO	BEACON EP2
MOBIL	MOBILUX 2
ARAL	ARALUB HL2
SHELL	ALVANIA EP2
BP	ENERGREASE LS2

Synthetic greases may be employed too.

7. MAINTENANCE

7.1 To ensure the universal shafts a trouble-free life, a maintenance schedule and a lubrication program are essential, after their installation and start-up. The following should be taken as a guide, the frequency of inspections depending on the working conditions and on the type of equipment the universal shafts are installed on.

7.2 INITIAL INSPECTION

Perform visual inspections on a regular basis, e.g. look for damage or unusual occurrences. Check that connecting flanges and bolted connections are tight.

1st check after about 1 week
2nd check after about 2/3 weeks
3rd check after about 4/6 weeks

7.3 REGULAR INSPECTION

Every 1000/2000 working hours or, at least, once a year for light applications and every six months for heavy-duty applications.

Perform the periodical checks as follows:

- Connecting flanges and bolted connections

Tighten when necessary

- Wear

Check:

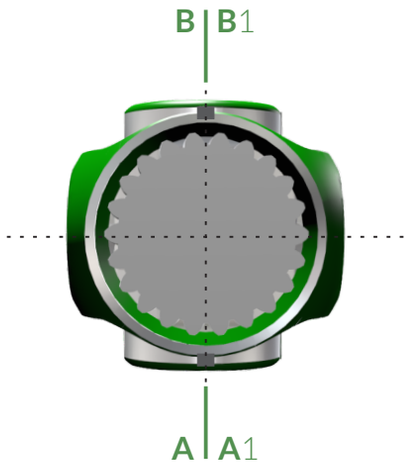
- radial clearance of bearings
- axial clearance of the journal cross
- radial clearance of the spline gear teeth
- torsional clearance of the spline gear teeth

- Noise/Vibration

Any unusual sound or excessive vibration should be located and corrected immediately.

- Temperature

Make sure the bearings with standard seals don't exceed the ambient temperature by more than 35/40°C, and with VITON seals by more 125/140°C.



5.8 Lubricate the telescopic unit in the shortest length position. The part of spacer containing the splined shaft must be thoroughly filled with grease. To let grease in, remove the top grease nipples (points B and B1) and pump grease through the bottom grease nipple (points A and A1). Pump it until it continuously flows out of the top plug. Fill the back chamber first (from point A), then the face chamber (from point A1). After lubricating, make the spline slide once or twice, with caps and relief valves open. Replug top grease nipples.

6. LUBRICANT

6.1 **CAUTION** Risk of slipping from lubricant escaping.
6.2 For normal applications GGT recommend lithium thickened greases.
6.3 For temperature ranging from +90 to -30°C, use grease with penetration 1 or 2, according to DIN 51804. Contact our technical department if the temperature is outside this range.
6.4 For heavy duties, GGT recommend lubricants according to the following technical features:

Thickener	Lithium
Worked penetration	315÷325 possible 265÷295
Dropping point	174÷193 °C possible 165 °C
Thickener percentage	7%
Mineral oil	75%
Oil viscosity at 40°	1000÷1500 cSt
Coil viscosity at 100°C	60÷100 cSt
Addition agents EP type	2%
MoS2 mineral addendum	5÷10%
Timken EP OK load	18 kg
Corrosion	negative

For universal shaft size US.B390 or bigger and for heavy duty conditions (rolling stands), GGT recommend the following greases:

CASTROL	CASTROL MOLUB-ALLOY 870
WULKEN	MOLUBROL W/PA 10
OPTIMOL	LONGTIME PD2
KLUBER	KLUBERLUB BE41-1501
MOBIL	MOBILUX EP111
SIGNAL	MOLYVIS GLA SPECIAL

- Position of the companion flanges

Check that the supports didn't yield following to base settlements or deformations.

- Lubrication

Check there is no grease dripping, for centrifugation or other causes, like wear or breakage of the seals, wear or loss of plugs or relief valves.

7.4 **WARNING** If during these checks any anomaly should come out, as high noise, grease leakage, excessive clearances on the crosses, too high wear on the splines, bolt loss, overheating, you need to disassemble the universal shafts and proceed with the necessary maintenance.

The critical points to check, in decreasing order of importance, are:

- Cross pin, in the area of transition between the rollers (radius bottom and radius start of the nearest one), and in the radius area where cracks or micro cracks may be generated;
- Weldings of connection on tubes, sleeves and shafts where cracks may arise on the welding cord edges;
- Bearing outer ring and rollers where you may notice crumbling, wear, corrosion, oxidation, pitting, de formation, upsetting, lamination and cracks in the transit area between the flat bottom surface and the ring cylindrical one;
- Spline gear teeth, where you may find tooth breakage or cracks at the tooth root, deformation, scaling, wear or upsetting, seizing, micro-welding, corrosion, erosion;
- Bolts of flange connection, with possible breakage, unscrewing, screw deformation and corrosion; at each disassembly, you'd better replace all the bolts and nuts;
- Yokes, with possible deformation in the bearing seat holes, upsetting in the bolts of flange connection, in the keys, and/or in their seats, or upsetting, wear, dent in the hirth serration or in the face dowel teeth;
- The whole assembly, where you may notice some deformations (torsional or bending), wear in flat and round keys and in the guiding lips of the sleeves, thrust spring yielding, seal lip breakage, splines protection tube breakage, etc.

The components no longer adequate to operate, and not repairable, must be replaced with original spares. In case the journal cross and the bearings need to be replaced proceed with a further dynamical balancing of the universal shaft as shown in the drawing. While repairing the unit, carefully check any critical component by visual, dimensional and non-destructive tests, in order to verify the possibility of reusing them.

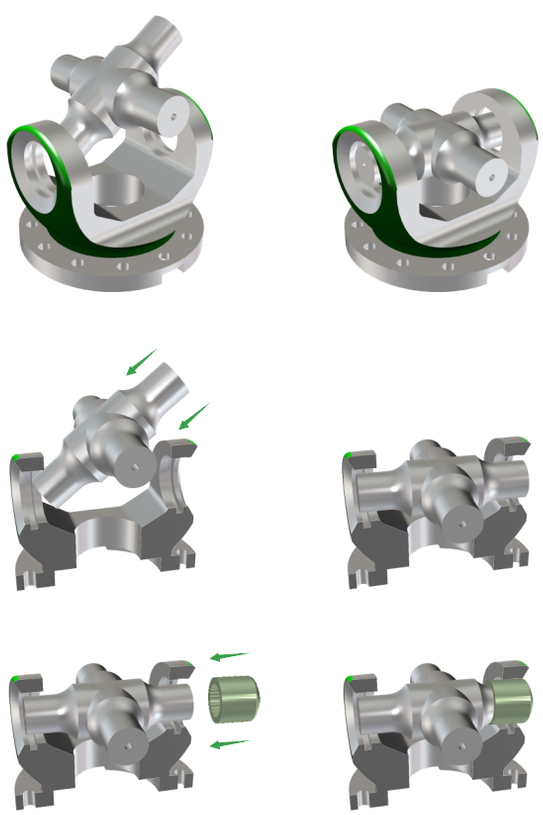
We suggest, especially for big-size universal shafts, to contact GGT for any reconditioning.

8. BEARING REMOVAL AND ASSEMBLY

To remove the bearings smoothly, you need to prepare a proper hollow-type oil-pressure jack, with the related manual pump or electro-hydraulic control. The jack must be equipped with a tubular spacer leaning on the yoke eye surface, to allow the bearing transit. For this purpose, the support spacer inner diameter shall be 5 mm bigger than the yoke hole, and have to allow the complete bearing delivery from its seat. Remove the bearing axial locking retainer rings. If the bearings are still axially pre-loaded, to make the operation easier, you can compress the two bearings of the same arm by a tie-rod passing all through the journal cross. After removing the cap or the grease plug, always paying attention not to force anything, hook the bearing by an

adequate tie-rod to be screwed in the bearing bottom threaded hole. Block the tie-rod on the bearing by a locknut and proceed with the bearing removal by using the hydraulic jack. Should the removal be difficult, as a consequence of oxidation, slightly and uniformly heat the yoke eye by a free flame. In particularly difficult cases, you may heat the yoke eye up to 120÷180°C, while cooling the cross pin by a water jet.

After removing the bearings, carefully clean their seats and remove any oxidation. Next, check the integrity of the retainer ring seats and the hole ovalization on the yoke. Clean the new components, by removing the protective wax coating from the machined surfaces of connection and sliding involved in the assembly. Carefully remove any dust from the bearings and from the journal cross, since impurities negatively influence the bearing operation and lifetime. For cleaning solvent, you can use mineral oil of turpentine or acid-free petrol, or benzene added with 5% of oil. To make assembly easier, lubricate by a slight film of pure mineral oil or stringy grease the bearing inner / outer surfaces, the journal cross pins, the yokes holes, the seal lips, and the splined units. The assembly of journal crosses and yokes must be performed in a workshop or in a suitable location sheltered from dust, following the sequence below. Gently shrink fit the bearings into the hole and onto the shaft. Replace the retainer rings every time you replace the bearings. The operations to replace the journal cross and fit the bearings on the universal shafts up to size US.B620 are described below. Up to size US.B225, no lifting device is required; for bigger sizes, you need a small flag-type workshop crane having a capacity of 3000 kg.



a) Start to assemble the journal cross, by positioning the half-universal shaft or the assembled universal in vertical position, and by inserting the cross inside the yoke welded to the male or the female unit by making a Z movement, inserting the pins into the bearing seat holes. Fix the cross onto the yoke by dummy bearings made of plastic or wood. Then, with the universal shaft still in the vertical position, repeat the operation by inserting the cross inside the flange yoke, by handling the yoke by a Z movement. To handle the yoke, employ the flange holes through the eyebolts and their related nuts. Assemble the dummy bearings for positioning (only one, in case the bearings are ready to be assembled).

b) Assemble the bearings by fitting them first into the weld yoke, then into the flange one. Fit one bearing at a time, using on the opposite side of the same cross axis, the first dummy bearing previously fitted as a reaction for assembling the first bearing. To make the operation easier, you can slightly heat the yokes. The pre-heating operation must be made by a large and diffused gas flame, so to make a homogeneous and diffused heating, not exceeding 120°÷150°C. Protect your hands by wearing adequate working gloves. The bearings must be fitted into their seat and onto the shaft at the same time. Fit the first bearing into its seat and place the stop retainer ring, by pulling the bearing against the retainer ring. After inserting the second bearing, employ an oil-pressure jack or suitable tie-rods, to allow the insertion of the second retainer ring and in order to create the correct axial pre-load. The jack must be hollow-shaft type and equipped with a tie-rod bringing the reaction on the opposite bearing. This fitting system allows avoiding any deformation on the yokes ears.

For series from US.B180 to US.B315, use a hydraulic press.

c) Surface grind both retainer rings of each cross arm, until their thickness is equal to the dimension X, so to centre the cross axis with the longitudinal axis of the universal shaft and assure the rotation coaxiality of the cross with the universal shaft intermediate unit. The higher the speed is, the more important the coaxiality is.

NOTE:
If the fitting equipment is not available, it is still possible to perform the fitting; avoid beating or forcing the center of the bearing bottom with a mallet or a steel hammer (use rubber or lead mallets). Always place, between the bearing and the mallet, a washer made of ductile material, which lays on the bearing only in the ring area as close as possible to the outer diameter. If no jack is available, use threaded stay rods, passing from one side to the other of the journal cross unit, by handling the locking nut with manual wrenches or hydraulic screwers. Check the retainer rings are assembled with interference and the journal cross has no radial or axial clearance. Once the assembly is accomplished, the yokes shall not be free to float freely, yet they should move with a certain effort due to the friction torque on the bearings. For small rotations, yokes shall support themselves. Check that, while fitting, the seal lips were not pinched, cut or overturned. Finally, fill the bearings with grease through the proper grease nipples.

Equipment for the assembly:
- Hollow shaft jacks with dimensions and loads adequate to the universal shaft rotation to be serviced, and equipped with control device or manual pump.
- 4 dummy bearings
- 1 stay rod for bearing fitting
- 1 stay rod for bearing removal
- Washers, support plates, locknuts, nuts
- 1 hollow spacer for bearing removal
- 2 thrust rings for bearing fitting

Journal crosses and bearings have holes and threads as shown in the following table (check the drawings or the items, since they may be subject to variations).

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HOLE DIMENSIONS			STAY ROD PERFORMANCES	
SERIES	JOURNAL CROSS HOLE DIAMETER [mm]	BEARING HOLE DIAMETER	STAY ROD DIAMETER CLASS 12.9	AXIAL LOAD [kN]
US.B180	-	M10x1	M10	58
US.B200	-	M14x1	M14	115
US.B225	-	M14x1	M14	115
US.B250	-	M14x1	M14	115
US.B285	-	M20x1.5	M20	245
US.B315	-	M20x1.5	M20	245
US.B350	20	M20x1.5	M20	245
US.B390	20	M20x1.5	M20	245
US.B440	30	M30x1.5	M30	550
US.B490	30	M30x1.5	M30	550
US.B550	30	M30x1.5	M30	550
US.B620	30	M30x1.5	M30	550

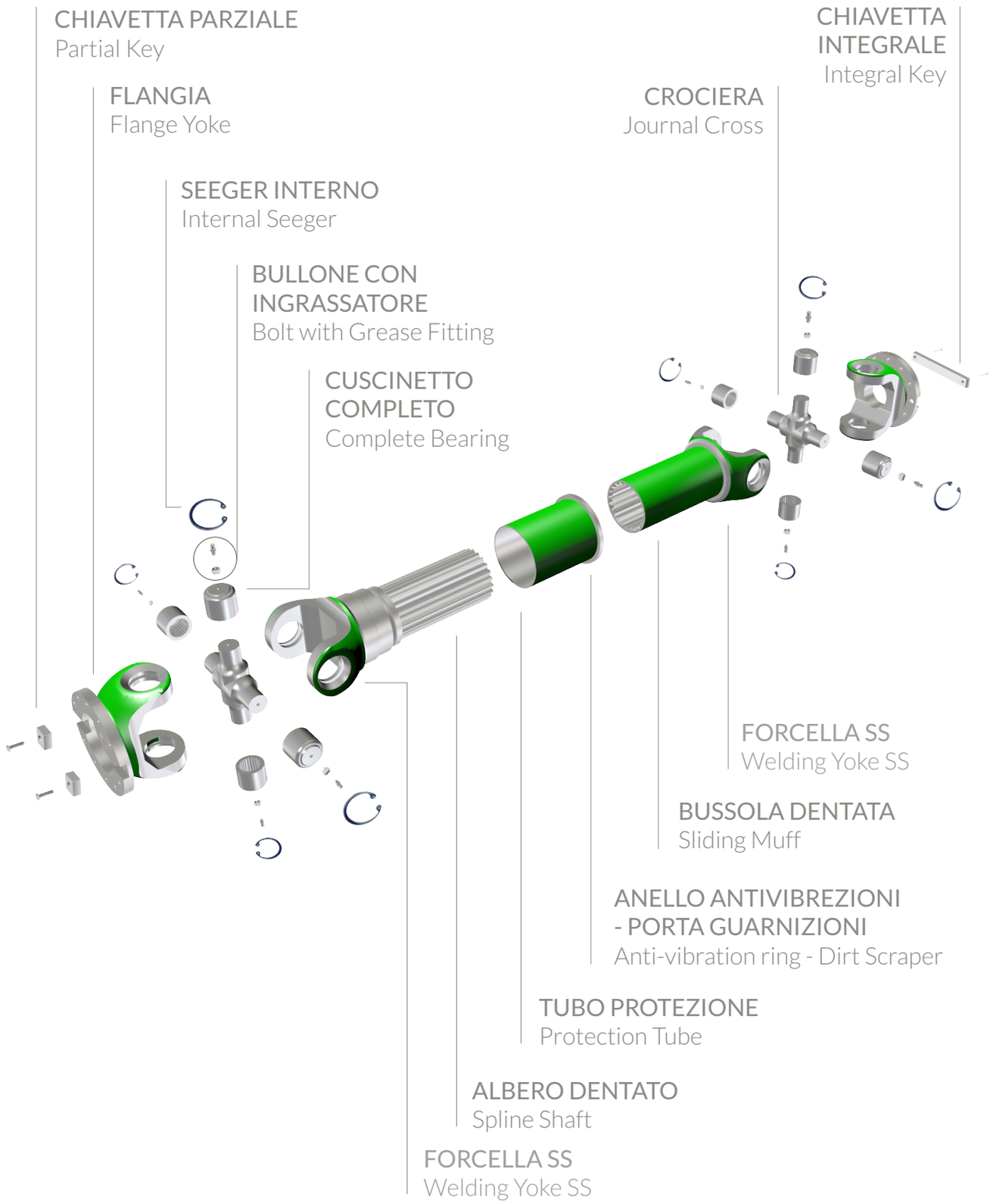
9. IDENTIFICATION, TECHNICAL DATA AND SPARES

Universal shafts are identified by a serial number marked on the outer diameter of an end flange.

To limit the shut-down times, we suggest to keep in stock not only the journal cross sets but also the complete universal shafts, so to replace the installed ones to be overhauled. Reconditioning usually consists of disassembly, cleaning, coat removing from the critical surfaces to allow non-destructive tests (penetrant liquids or MT), component recovering by restoring their defective surfaces, replacing the worn out components, re-assembling and final repainting.

Any technical and working feature are shown in the catalogue and/or in the drawings, in case of design variations. The main components of a standard universal shaft are shown next.

When you need to purchase any spare component, you can mention either its name and code, or its manufacturing code available in the spare component list of the drawing.



GREEN GEAR TRASMISSIONI SRL

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