



Service Manual

Spicer® Compact Series

DSSM-0120 AUS

July 2021

General Information

General Information

The description and specifications contained in this service publication are current at the time of printing. Dana reserves the right to discontinue or to modify its models and/or procedures and to change specifications at any time without notice.

Any reference to brand names in this publication is made simply as an example of the types of tools and materials recommended for use and should not be considered an endorsement. Equivalents, if available, may be used.

Important Notice

This symbol is used throughout this manual to call attention to procedures where carelessness or failure to follow specific instructions may result in personal injury and/or component damage.

Departure from the instructions, choice of tools, materials and recommended parts mentioned in this publication may jeopardize the personal safety of the service technician or vehicle operator.



 **WARNING:** Failure to follow indicated procedures creates a high risk of personal injury to the servicing technician.

 **CAUTION:** Failure to follow indicated procedures may cause component damage or malfunction.

 **IMPORTANT:** Highly recommended procedures for proper service of this unit.

Note: Additional service information not covered in the service procedures.

TIP: Helpful removal and installation procedures to aid in the service of this unit.

Always use genuine Spicer replacement parts.

Warnings and Cautions

1. **ALWAYS** wear safety glasses when performing maintenance or service. Failure to wear safety glasses can result in personal injury and/or partial or complete vision loss.
2. **NEVER** go under a vehicle while the engine is running. Be sure the vehicle's engine is off, and keys are removed from ignition.
3. **NEVER** go under or work on a vehicle that is not on a level or flat surface.
4. **NEVER** work on a driveshaft without blocking the vehicle's wheels and releasing all parking brakes. See warning below.
5. **NEVER** lift a vehicle without the appropriate weightrated, vehicle-support equipment.
6. **NEVER REMOVE** a driveshaft from the vehicle without keeping the vehicle's transmission in neutral. See above warning.

CAUTION:

Spicer Compact Series Driveshaft assemblies can weigh in excess of 50kgs. Be sure to use proper lifting techniques when handling Spicer Compact Series Driveshafts. More than one person may be needed when handling driveshaft assemblies.

7. **ALWAYS** use support straps to prevent the driveshaft from falling, causing injury and/or damage during the loosening or removal of any driveshaft hardware.
8. **NEVER** heat components or use sledgehammers or floor jacks to remove the driveshaft from vehicle.

Note: For driveshaft applications that have pillow blocks, dampers, parking brakes or retarders, refer to these component manufacturers' or the original equipment vehicle manufacturers' service manuals for proper procedures.

Warnings and Cautions

-  **WARNING:** Failure to replace damaged driveline components can cause driveline failure, which can result in separation of the driveline from the vehicle. A separated driveline can result in property damage, serious personal injury, or death.
-  **WARNING:** Reassembly of a driveline out of original phase can cause vibration and failure of the driveline and attaching components.
-  **WARNING:** Driveshaft assemblies can weigh in excess of 100 pounds(46 kilograms). Be sure to use proper lifting techniques when handling driveshafts. More than one person may be needed when handling driveshaft assemblies.
-  **WARNING:** Never heat components, never use sledge hammers, and never use floor jacks to disassemble driveshafts. This can result in damaged, weakened, or bent components.

End Fitting

-  **WARNING:** A loose end-fitting can result in driveline failure, which can in turn lead to separation of the driveline from the vehicle. A separated driveline can lead to property damage, serious personal injury, or death.

Universal Joint

-  **WARNING:** Excessive looseness across the end of universal joint bearing cup assemblies can cause imbalance or vibration in the driveshaft assembly. Imbalance or vibration can cause component wear, which can result in separation of the driveline.
-  **WARNING:** **DO NOT** reuse bolts or use inferior grade bolts. Reuse of bolts and/or use of inferior bolts can cause driveline failure, which can result in separation of the driveline from the vehicle.
-  **WARNING:** Failure to torque bolts to specification can cause driveline failure, which can result in separation of the driveline from the vehicle.
-  **CAUTION:** Use a journal locator to avoid nicking journal cross trunnions or damaging oil seal slingers.
-  **CAUTION:** If a bearing assembly or journal cross is worn or damaged, the universal joint assembly must be replaced.
-  **CAUTION:** Be sure the snap rings are properly seated in the snap ring grooves.

Warnings and Cautions

Slip Member

Excessive radial looseness in the slip member in the slip member assembly can cause imbalance or vibration in the driveshaft. Imbalance or vibration can cause components to wear, which in turn can result in separation of the driveline from the vehicle. A separated driveline can cause property damage, serious personal injury or death.

Yoke (Includes Slip Yoke, Yoke Shaft, and Tube Yoke)

-  **WARNING:** A loose or damaged slip yoke seal allows contaminants to invade the slip member assembly. Invasion of contaminants into the slip member assembly can degrade the grease, and damage slip member components, which can result in driveline separation.
-  **WARNING:** DO NOT deform yoke cross holes by removing excessive metal. Raised metal or deformed yoke cross holes can be a cause of cross and bearing failure, which can result in separation of driveline from the vehicle.
-  **WARNING:** Yoke shaft assemblies can weigh in excess of 50 pounds (23 kilograms). Be sure to use proper lifting techniques when handling yoke shafts.

Tubing

-  **WARNING:** Bent or dented tubing can cause imbalance or vibration in the driveshaft assembly. Imbalance or vibration can cause component wear, which can result in separation of the driveline from the vehicle.
-  **CAUTION:** Do not bend or dent the tube when handling or servicing driveshaft.

Midship Nut

-  **WARNING:** DO NOT reuse the midship nut. Reuse of the midship nut can cause driveline failure, which can result in separation of the driveline from the vehicle.
-  **WARNING:** DO NOT touch or disturb the micro-encapsulated adhesive found on the midship nut threads. Doing so may initiate the curing process and impair the installation of the nut. Premature curing of the micro-encapsulated adhesive will result in improper installation of the midship nut. Improper installation of this nut can cause driveline failure, which can result in separation of the driveline from the vehicle.
-  **WARNING:** Failure to torque the midship nut to required specifications can cause driveline failure, which can result in separation of the driveline from the vehicle.
-  **WARNING:** A loose midship nut can result in driveline failure, which can result in separation of the driveline from the vehicle.

Center Bearing

-  **WARNING:** Loose center bearing bracket bolts can result in driveline failure, which can result in separation of the driveline from the vehicle.
-  **WARNING:** Damaged center bearings or center bearing components can cause imbalance or vibration in the driveshaft assembly. Imbalance or vibration can cause component wear, which can result in separation of the driveline from the vehicle.

Warnings and Cautions

Foreign Material

-  **WARNING:** Build-up of foreign material, excessive paint, or undercoating on a driveshaft can cause imbalance or vibration in the driveshaft assembly. Imbalance or vibration can cause component wear, which can result in separation of the driveline from the vehicle.
-  **WARNING:** A contaminated slip member can result in separation from the vehicle. A separated driveline can result in property damage, serious personal injury or death.

Hardware

-  **WARNING:** Loose, missing, or damaged bearing retainers or stamped straps, retaining bolts, nuts, end fitting tangs, snap rings, or rotating bearing cups can result in driveline failure.
-  **WARNING:** A separated driveline can lead to property damage, serious personal injury, or death.
-  **WARNING:** **DO NOT** reuse bolts, straps, nuts, or damaged bearing retainers or inferior grade bolts. Reuse of bolts, straps, nuts, or damaged bearing retainers, or use of inferior grade bolts can cause driveline failure.
-  **CAUTION:** If loosening or removing bolts, always install a new strap and bolts and torque bolts to specification.

Lubrication

-  **WARNING:** A missing, loose, or fractured grease zerk (nipple) fitting or plug eliminates the ability to lubricate the universal joint. Improper or inadequate lubrication can cause driveline failure, which can result in separation of the driveline from the vehicle.
-  **WARNING:** Improper lubrication techniques can cause driveline failure, which can result in separation of the driveline from the vehicle.
-  **WARNING:** A missing, loose, damaged, or fractured plug or grease zerk (nipple) fitting can allow contaminants to invade the universal joint. Invasion of contaminants into the universal joint can degrade grease and cause universal joint damage, which can result in separation of the driveline from the vehicle.
-  **WARNING:** Incompatible greases that are applied to universal joints and/or slip members can result in driveline failure and can result in separation of the driveline from the vehicle.
-  **WARNING:** Hand tightening of grease zerk (nipple) fitting or plugs is **NOT** recommended. Failure to torque grease zerk (nipple) fittings to specifications can result in separation of the driveline from the vehicle.
-  **WARNING:** Maximum grease gun pressure should not exceed 60 psi. Excessive grease gun pressures may cause seal damage.
-  **CAUTION:** In cold temperatures, be sure to drive the vehicle immediately after lubrication. This activates the slip spline and removes excess grease. Failure to do so could cause excess grease to stiffen in the cold weather and force the plug out. The end of the spline would then be open to collect contaminants and cause the spline to wear and/or seize.
-  **CAUTION:** All slip yoke and universal joint seals should be completely purged.

Installation/dismantling

Whenever people or material might be endangered by rotating driveshafts, the user must take for the corresponding safety measures.

- Safety relevant components of the vehicle and brake lines, electric lines, hydraulic and fuel lines must be arranged in such a way that they cannot be damaged by a defective driveshaft.

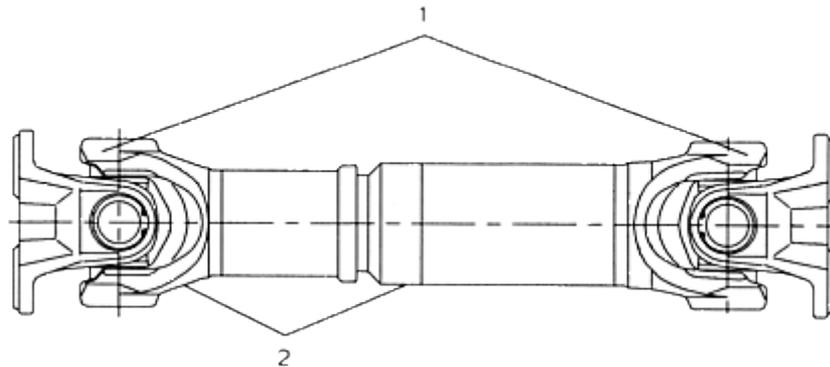
Danger of breakdown of important units!

Danger of fire!

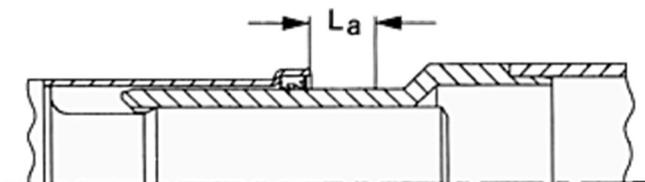
- Suitable safety devices (e.g. catch bows, solid safety guards) must be provided to prevent the parts of the shaft from being thrown around and to prevent damage to other parts of the unit if the driveshaft should become defective. In the view of DANA such safety devices may be dispensed with provided that a comparable form of security is guaranteed during operation of the vehicle through suitable engineering measures taken by the vehicle manufacturer.

Danger to life!

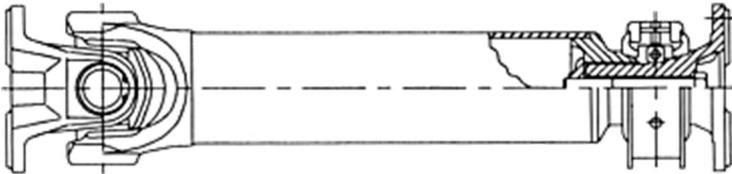
- The fronts of the DIN and SAE shaft flanges and companion flanges must be free of dust, grease or paint in order to guarantee a safe connection. The anti-corrosive on cross-Serration flange teeth need not be removed. Other particles must be removed.
- Be careful when handling the driveshaft.
Freely moving yokes may cause injuries!
- Check position of the yokes (1) of the shaft. Observe the arrow markings (2). (They must be in alignment.) The spline components are matched for a smooth fitting and must not be interchanged or remounted at a different angle.



- Before installation remove any transport retainer device. If in doubt, please contact the supplier.
- Check the side and radial runout as well as the fit of the mounted flanges and the connected units (see companion flanges for driveshafts).
- Do not turn the joints of the driveshafts with assembly levers because this may damage the grease nipples or seal arrangement on the bearings.
- When painting ensure that the sliding range of the seal (length compensation L_a) is protected.



- Protect rilsan coated splines (sleeve muff or sleeve yoke) against
 - heat
 - solvents
 - mechanical damage
- When cleaning driveshafts, do not use aggressive chemical agents or pressurized water or steam jets because the seals may be damaged, and dirt or water may penetrate.
- If driveshafts are subjected to higher temperatures, e.g. due to noise-reduction measures or retarders, suitable means should be provided to ensure that the limit values are not exceeded.



Installation of drive lines

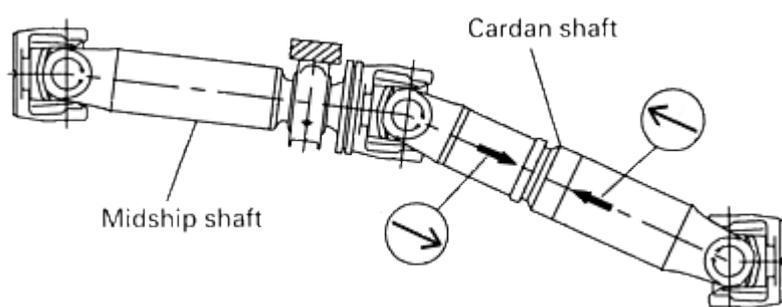
Midship shafts are supplied complete with centre bearings ready for installation.

The centre bearing and the companion flange are fixed on the midship shaft by means of bolts which are secured against working loose.

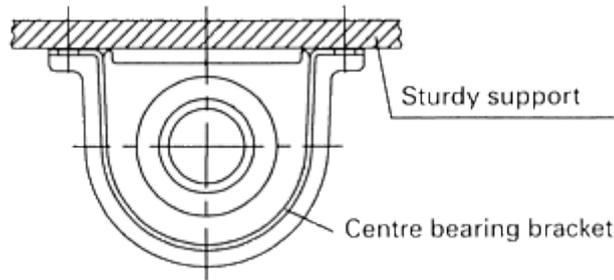
For reasons of safety these bolts must never be loosened or retightened on new shafts. They may only be loosened for repair work, but they must be properly secured again after the repair.

Midship shaft
without length compensation
with centre bearing

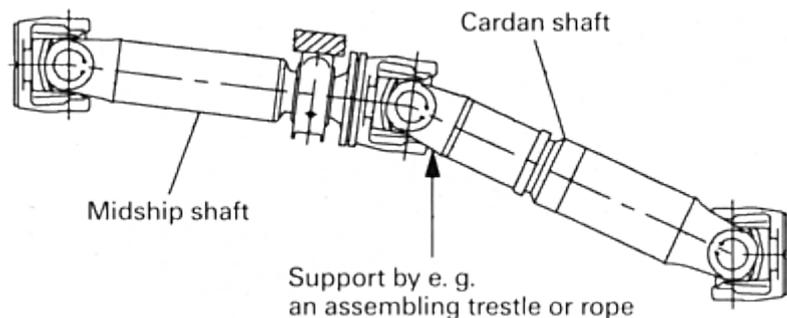
To avoid cases of non-uniformity, drive lines consisting of the midship shaft with the centre bearing and the normal driveshaft must be installed in accordance with the yoke position of the joints prescribed by vehicle manufacturer.



When installed, the centre bearing must be vertical in all directions with regard to the horizontal axis of the midship shaft and be in a central position. Suitable mounting supports must be provided on the frame side. A continuous stable support must be provided between the centre bearing bracket and the mounting support (see illustration).



- To guarantee a safe bolting of the centre bearing bracket of the midship shaft to the frame of the vehicle, always use the bolting prescribed by the manufacturer of the vehicle.
- **These bolts must be strictly secured against working loose in accordance with the instructions of the vehicle manufacturer.**
- The centre bearing of the midship shaft must be installed without force. Therefore, the centre bearing must not be bolted to the frame of the vehicle until the drive and the driven sides of the drive line have been bolted down.
- To avoid damage to the joint bearings it is important to protect them against excessive sagging or deflection during the entire installation procedure.



Moreover, the general instructions in our driveshaft catalogues for vehicles and industrial application are to be observed for the dimensioning, arrangement and installation of drive lines and midship shafts.

Installation of centred double driveshafts

When installing the driveshaft, care should be taken not to damage the location bearing by excessively deflecting the joint. This can be achieved by using a mounting rope.

Flange bolting

To connect the driveshaft to the companion flanges it is imperative to use high-tensile bolts of the quality 10.9 and the corresponding all-metal self-locking nuts of the quality 10 or such bolts and nuts that the manufacturer of the vehicle has prescribed. Complete sets of bolting are available for all DIN and cross-Serrations flanges.

The tightening torques T_a given in the table are valid for:

- 90% utilization of the elastic limit
- bolts in a lightly-oiled condition (Friction coefficient $\mu_{ges.} = 0,13$).
- metallic bare surface areas

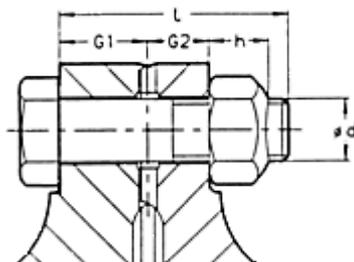
Do not use molycote paste or any other grease on the bolts and nuts.

- For additional information on flange connections, corrosion protection, assembly and dismantling see our specification **GWB-A 100-005**.

Companion flanges

Generally driveshafts are connected to the units by companion flanges. The companion flange material must have an interfacial pressure of min. 700 N/mm²

Cross-Serration flanges (XS)



Joint flange

Hexagon bolt:
similar to DIN 931/10.9
Hexagon nut:
similar to DIN 980/10
self-locking

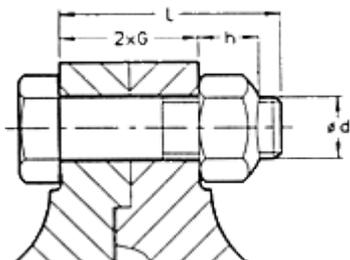
Type of nut: all-metal

Shaft connection	Thread Ød [mm]	Length L [mm]	Wrench size [mm]	Flange thickness G1 [mm]	Flange thickness G2 [mm]	Grip G1 + G2 [mm]	Height of nut h [mm]	Torque 	
								Ta [Nm]	±20%
XS 120	M10	40	17	14	10	24	9	62	
XS 150	M12	45	19	16	12	28	11	105	±20%
XS 180	M14	50	22	18	14	32	12	170	

We recommend a socket for wrenches

Wrench size	Order-No.
17	GETA 197-17 GWB ½
19	GETA 197-19 GWB ½
22	GETA 197-22 GWB ¾

DIN-flanges



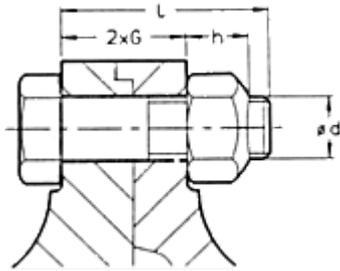
Joint flange

Hexagon bolt:
similar to DIN 931/10.9
Hexagon nut:
similar to DIN 980/10
self-locking

Type of nut: all-metal

Shaft connection	Thread Ød [mm]	Length L [mm]	Wrench size [mm]	Grip 2 * G [mm]	Height of nut h [mm]	Torque 	
						Ta [Nm]	± 7%
DIN	M8	25	13	12/24	8	35	
	M10	30	17	16	10	70	
	M12	40	19	20	12	120	± 7%
	M16	45	24	24	16	295	
	M16	50	24	30	16	295	

SAE-flanges



Joint flange

Hexagon bolt:
similar to DIN 931/10.9
Hexagon nut:
similar to DIN 980/10
self-locking

Type of nut: all-metal

Shaft connection	Thread	Length	Wrench size	Grip	Height of nut	Torque	
	Ød [mm]	L [mm]	[mm]	2 * G [mm]	h [mm]	Ta [Nm]	
SAE	M8	30	13	16	8	35	± 7%
	M10	30	17	16	10	70	
	M10	35	17	19/21	10	70	
	M12	35	19	16	12	120	
	M12	40	19	21	12	120	

 **When using bolt connections other than those recommended the torque must be adjusted accordingly in order to guarantee the safety of the connection!**

Dismantling

- Before dismantling secure the driveshaft against the sliding elements coming apart.
- Before removing the shaft from the companion flange, make sure it cannot fall down. The yoke may tilt over when removing the driveshaft from the companion flange.
Danger of injury!
- Observe the directions for transport, storage and installation of driveshafts.

Maintenance

Maintenance work on driveshafts used in vehicles and industrial equipment must be done at regular intervals.

The scope and the intervals of maintenance work depend on the individual operating conditions of the vehicle or the equipment.

Maintenance intervals for driveshafts in commercial vehicles

Depending on the type of vehicle, the mileage or the service life and the operating conditions two different scopes and intervals of maintenance are required. These are the "**minor inspection**" and the "**major inspection**".

Use of vehicle	Inspection intervals	
	Minor inspection	Major inspection
Commercial vehicles in long-distance traffic or similarly used vehicles	Every 100.000 km or after 1-year max.	Every 500.000 km or after 5 years max.
Commercial vehicles used on road and off road and in city traffic and similar	Every 50.000 km or after 1-year max.	Every 300.000 km or after 5 years max.
Buses in long-distance traffic	Every 100.000 km or after 1-year max.	Every 300.000 km or after 3 years max.
Buses in city traffic	Every 50.000 km or after 6 months max.	Every 200.000 km or after 2 years max.
Commercial vehicles used on sites, communal vehicles, construction machines, cranes, vehicles used in agriculture and forestry, tractors, military vehicles and similar	Every 25.000 km or after 6 months max.	Every 100.000 km or after 2 years max.

After a change of the vehicle owner or in case of an accident we recommend a "**major inspection**" of the driveshaft.

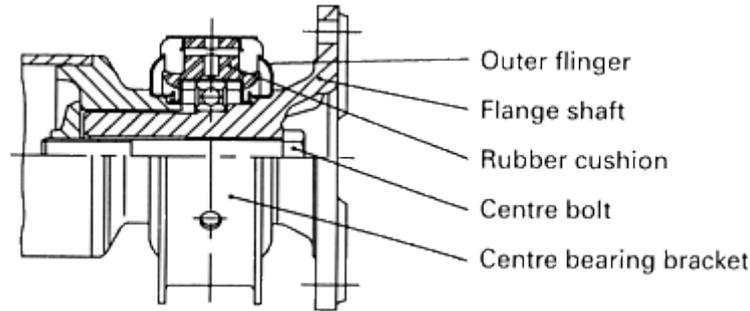
Scope of maintenance

Minor inspection

The "minor inspection" includes checking the driveshaft installed in a vehicle or in an industrial plant.

- Check the bolts of the flanges and of the centre bearing bracket for tightness (e.g. undamaged paint coat). If necessary, retighten the bolts with a suitable torque wrench and the torques prescribed by the manufacturer of the vehicle or equipment.
- Check whether there are snap rings on all bearing bushes.
- Check whether balance weights are loose or missing.
- Check the bottoms of the bearing bushes for change of colour or form due to excessive heat.

- Visual inspection of the seals of bearing bushes and the length compensation. Defective seals may result in excessive grease loss and breakdown of the cardan shaft.
- Check whether there are grease nipples on the journal crosses and whether they are in good condition (exception: maintenance-free joints).
- Check whether the rilsan coat on the sleeve is damaged or shows abrasion.
- Visual inspection of the centre bearings of drive lines with regard to:
 - correct position of the rubber cushion in the centre bearing bracket
 - correct position of the flange shaft



If the distance between the rubber cushion and the outer flinger is too large, the centre bolt may work loose. In this case a check should be made as a part of a major inspection.

- Carry out a visual inspection for possible damage, e.g.:
 - damaged paint coat
 - deformed tubes
 - eccentricity of the length compensation cover tube
 - cracks on components and tube
- Check the joints and the length compensation for visible or tangible backlash.

If the inspection shows that the driveshaft is damaged, it must be removed at once and sent to a repair shop that is authorized either by us or by the manufacturer of the vehicle or the equipment.

Furthermore, the vehicle or the equipment must be immediately taken out of operation in the case of any extraordinary noise, vibration or otherwise abnormal behaviour. Before recommissioning the driveshaft, it must be checked within the scope of a "minor inspection".

Major inspection

Each "major inspection" includes the scope of checking prescribed for a minor inspection. In addition, the driveshaft must be removed from the vehicle or the equipment for the "major inspection".

The following checking or work must be carried out on the driveshaft:

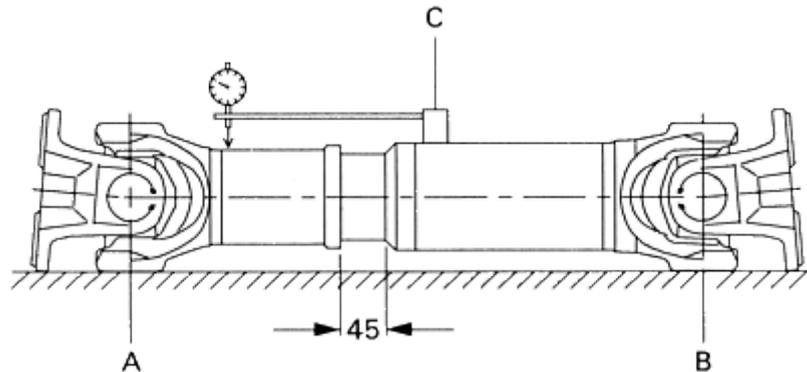
- Checking the joint bearings
 - Check the two flange yokes for tangible backlash or resistance (e.g. hooking) by deflecting them by hand into vertical and horizontal positions (swing them to and fro).
 - Grease the cross assemblies through the grease nipples and check whether the grease escapes from the seals. If no grease escapes from one or more bearing bushes of a cross assembly or if grease escapes together with water, rust or dirt, the driveshaft must be sent to an authorized shop for repair.

If the joints are in proper condition, regrease them through the grease nipples until the grease escapes from the seals.

● Checking the length compensation components

The involute spline is centred and guided on the spline outer dia. This design allows a maximum backlash of 0,2 mm. The radial backlash need not be checked.

- Extend the cardan shaft by approx. 45 mm and place the lugs of the inner yokes at points A and B on a solid support (see illustration).



Fix the dial gauge holder at point C next to the weld on the tube and place the dial gauge directly next to the weld of the protective sleeve (cover tube). Lift the driveshaft at its centre of gravity so that the supports at points A and B become free. Read axial backlash on the dial gauge. The max. permissible value is 0,17 mm.

- Visual checking of the parts:
Extend the driveshaft completely and check the length compensation for damage to the inside and outside areas of the spline muff and the teeth of the yoke shaft.
- Check the seal of the cover tube for damage.

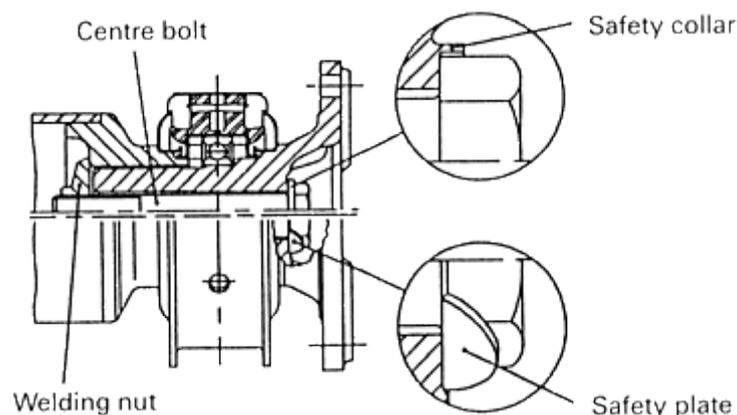
If the length compensation is undamaged:

- Re-grease the parts of the length compensation in the sealing area (*for grease see [Lubrication](#)*) and bring the length compensation together to its original length.

Attention:

Make sure that the marking arrows are opposite one another!

- Check the centre bearing of drive lines with regard to:
 - damage to the rubber cushion
 - firm seat of the ball bearing in the rubber cushion



Retighten the central bolt with a torque of 350 Nm or retighten the twin bolts with a torque of 137Nm

Attention:

Centre bearings of older designs with a central nut or holding plate and two bolts (not shown) must not be retightened because the bonding may become damaged and the securing function of the bolting is no longer guaranteed. After checking (by retightening) or loosening the bolting a completely new bonding is required.

If a major or minor inspection reveals any damage to the shaft, it must be sent to a repair shop that is authorized by either DANA or the manufacturer of the vehicle or equipment.

Attention:

After each repair the driveshaft must be rebalanced dynamically.

When reinstalling the driveshaft, please observe the relevant installation instructions (see [Installation/disassembly](#)).

If the driveshaft is obviously twisted due to over-loading (plastic deformation), it can no longer be used or repaired.

Lubrication

Driveshafts of the series COMPACT are lubricated ready for operation.

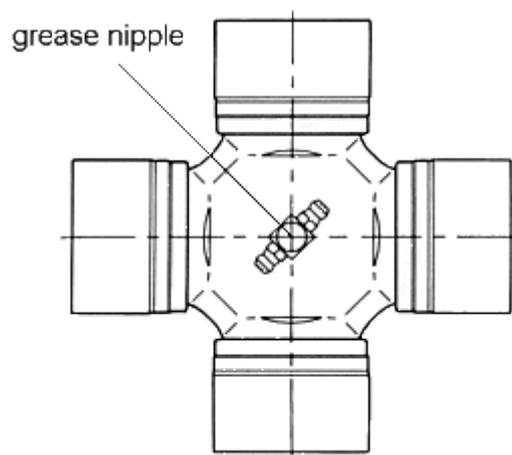
The length compensation of the Standard designs is maintenance-free.

This does not apply to special designs with extra-large length compensation and a large deflection angle (e.g. Driveshafts between tandem axles). Such length compensation requires regreasing through a grease nipple in the sealing sleeve of the spline protection until the grease escapes at the scraper seal of the sealing sleeve.

The centre bearing is protected by a cover and, filled with grease, is service-free.

Cross assemblies must be regreased.

The grease reservoir in the cross assemblies can be replenished through a grease nipple. Regreasing must be carried out until the grease escapes out from the seals of the bearings.



If it is not possible to grease all four bearings of a cross assembly (i.e. no grease escapes out from the seals), the bearings must be assumed to be damaged.

In this case the driveshaft must be removed and the cross assembly must be replaced in an authorized repair shop. We recommend replacing the other cross assemblies at the same time.

- **For the lubrication of driveshafts only that grease may be used, which is defined in our standards 4006-005 corresponding to the different application temperatures (Dana Australia recommends CALTEX ULTRA DUTY EP-2). Do not use lubricants with MoS₂ additives.**

- Clean grease nipples before lubricating.
- Do not lubricate at high pressure or with pressure surges.
- Driveshafts that have been stored for more than 6 months must be regreased before use.
- The driveshaft must not be cleaned with pressurized water or a steam jet. In case of doubt the shaft must be regreased until the grease escapes from the seals of the bearings.

Recommended regreasing intervals for driveshafts in commercial vehicles

Unless otherwise prescribed by the manufacturer of the vehicle, we recommend the following regreasing intervals. The data in the table refer to European and similar conditions. Operating conditions other than those shown here may require shorter regreasing intervals.

- Regreasing intervals for joints

(applicable only in conjunction with approved greases)

Use of vehicle	Re-greasing intervals	
Commercial vehicles in long-distance traffic or similarly used vehicles	Every or after	50,000 km 1-year max.
Commercial vehicles used on road and off road and in city traffic and similar	Every or after	25,000 km 1/2-year max.
Buses in long-distance traffic	Every or after	50,000 km 1/2-year max.
Buses in city traffic	Every or after	25,000 km 1/4-year max.
Commercial vehicles used on sites, communal vehicles, construction machines, cranes, vehicles used in agriculture and forestry, military vehicles* and similar	Every or after	12,500 km 1/4-year max. <i>(250 h)</i>
	* if driven through water shorter greasing intervals are recommended	

- Greasing intervals for length compensation and centre bearing

As standard the length compensation and the centre bearing are service-free. The lubricating intervals for types designed for periodic re-lubrication are the same as for joints.

Dana Commercial Vehicle Products Group
3939 Technology Drive
Maumee, Ohio, USA 43537

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