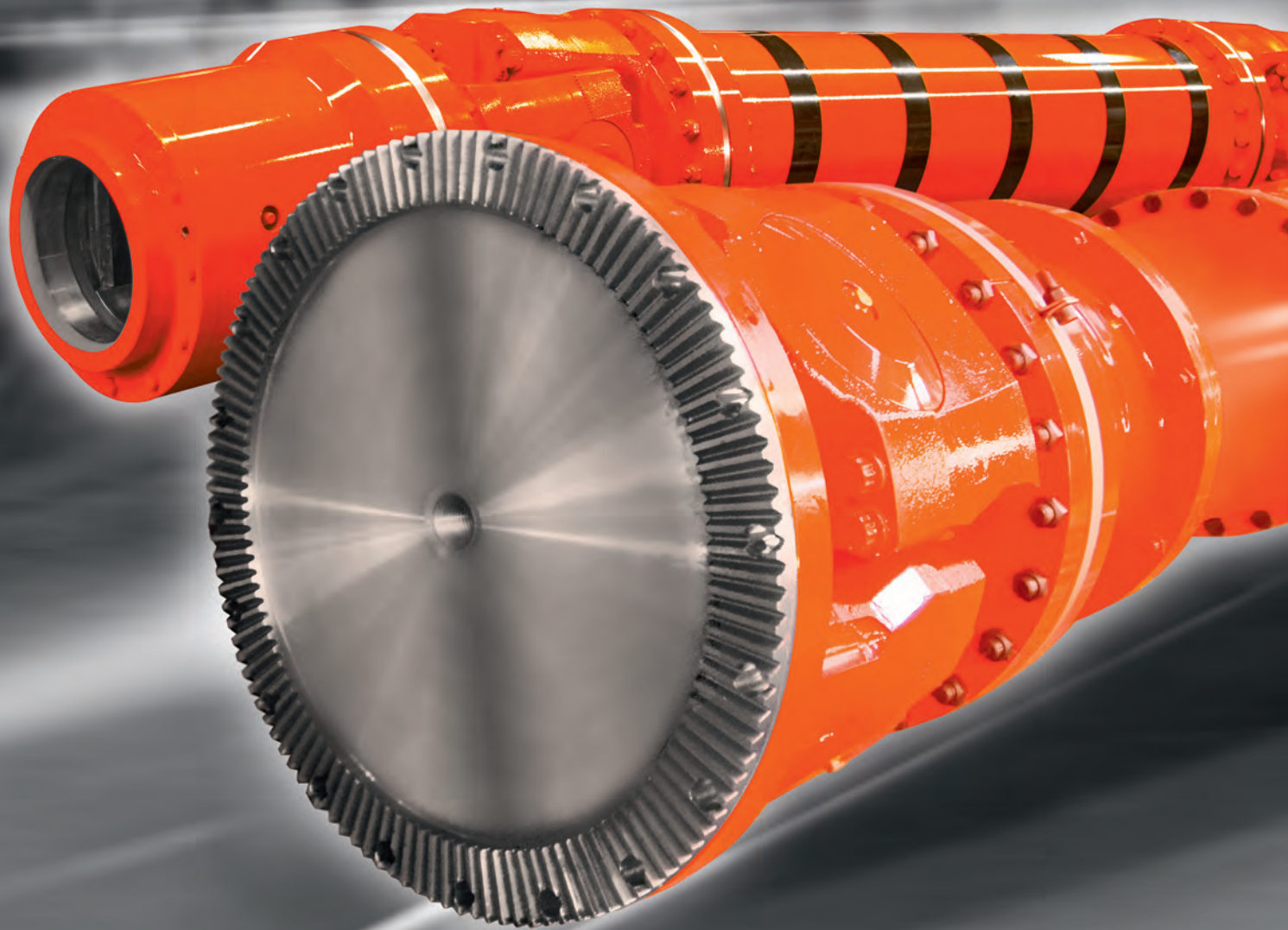




A Dana Brand



Installation and Maintenance
for Driveshafts / Industrial Applications
Important Product Information and
Safety Instructions





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Safety instructions Our products have been developed and tested according to the latest state-of-the-art engineering.



The characteristic features of the products which are described in our information material or which we specified in writing were subjected to proper and careful inspection.

Other features are possible but they are subject to our written confirmation.

Knowledge of the various demands on GWB™ products for a particular application lies with the purchaser. The selection of shaft types and the specification of sizes on our part shall in all cases be considered only as a recommendation. Purchaser is required to verify the drawings and documents submitted by GWB based on the data submitted by purchaser. It is the purchaser's responsibility to determine the fitness of the product for its intended use.

When using, handling, installing, and maintaining driveshafts the following safety instruction must be strictly observed to prevent **injury to persons or damage to**

property. Additional safety information is incorporated throughout this manual.

⚠ WARNING
Rotating Driveshafts

- Rotating driveshafts are dangerous. You can snag clothes, gloves skin, hair hands etc, which can cause serious injury or death.
- Do not work on an exposed drive shaft when it is running and be sure the power source is off.
- Exposed driveshaft must be guarded. Suitable safety devices (e.g. catch bows, solid safety guards) must be provided to prevent possible serious injury or death, or damage to property from thrown parts in the event of a separated shaft
- The operating data of the driveshafts, such as speed, deflection angles, lengths, etc., must never be exceeded.
- Do not alter driveshafts in any way without our written consent. If you do so, you may be creating a safety hazard and you are no longer covered by our warranty.
- The balanced state of a driveshaft must not be altered. An out-of-balance driveshaft may result in uneven running and premature wear of the joints and bearings of the units to which the driveshaft is connected. In extreme cases of imbalance, the driveshaft could break and components could be thrown from the vehicle or machine.

⚠ WARNING
Other Important Safety Information

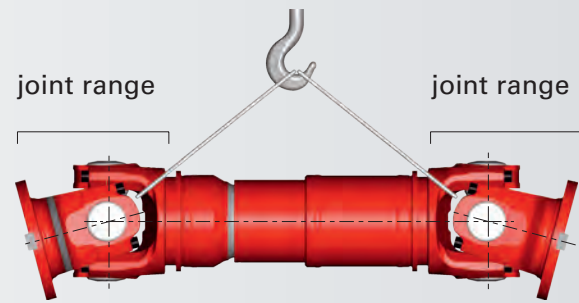
- Installation, assembly and maintenance work should only



Transport and storage

⚠ CAUTION

To prevent injuries of persons and damage to the driveshafts always make sure that the shafts are safely transported and stored.



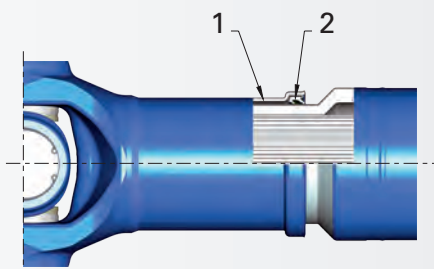
Please consider the following precautions:

- Use strong nylon ropes or lifting belts. When using steel cords, protect the edges.
- Driveshafts should be transported in a horizontal position (see illustration). For non-horizontal transportation additional precautions

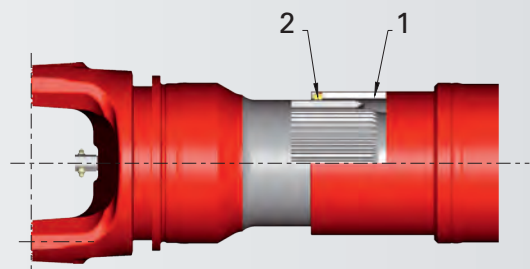
must be taken to prevent the splined parts from separating.
Danger of injury!

- When lifting or putting down the shaft, the moving parts (flange yoke and journal cross) may tilt and lead to injuries.
Keep hands away from the joint!
Danger of crushed hands!

- Avoid bumps and knocks during transport and storage.
- Do not store or handle the shaft with any stress or load on the spline protection (1) or the seal (2).



Series 587, 687, 688, 689



Series 390, 392, 393

- Use appropriate frames or racks for storage, so that the flange yokes are not loaded.
- Use chocks or blocks to prevent driveshaft from rolling.
- Secure shaft against falling over if it is stored in a vertical position.
- Keep driveshafts in a dry place.



Installation/dismantling

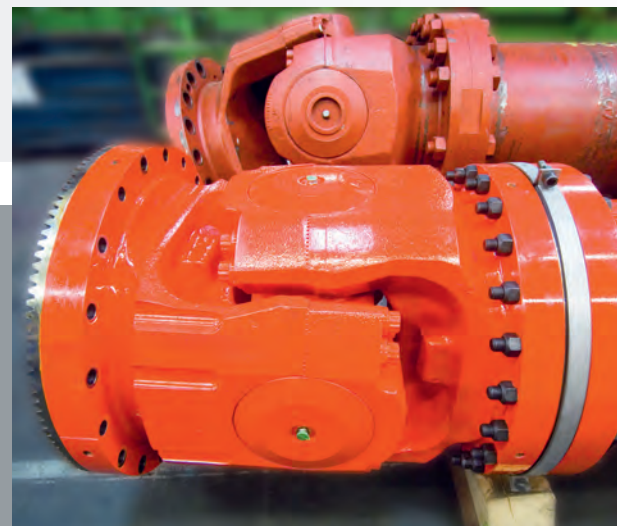
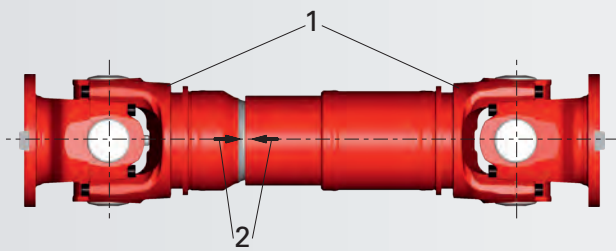
Installation

WARNING

See Rotating Shafts warning on Page 3.

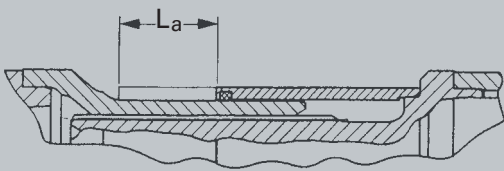
Important Product Installation Information

- In order to maintain the properties of the driveshaft as described in the information brochure, they must not be altered from their as delivered state.
- Driveshafts are elastic and flexural bodies. Their flexural vibration and their critical bending speed must be calculated. The maximum permissible operating speed must be sufficiently below the critical bending speed of the first order.
- For the smooth running and safety of the shaft the $n \times \beta$ value (speed x deflection angle) of the relevant shaft size must not be exceeded. Please contact us.
- The faces and the centering diameter of the shaft flanges and companion flanges must be free of dust, grease or paint to guarantee a safe connection.
- Be careful when handling the driveshaft. Freely moving flange yokes may cause injury.
- Check position of yokes (1) of the shaft. Observe the arrow markings (2). They must be in alignment. The splines are fitted to one another and must not be exchanged or distorted.
- Protection caps should be removed from the regreasing- and ventilation valve before use.
- Before installation remove the transport retainer device, if present. In case of doubt please contact the supplier.
- Check the axial and radial run-out as well as the spigot fit of the mounted flanges and the connected units (see Companion flanges on page 12).
- Do not turn the joints of the driveshafts with assembly levers because this may damage the grease nipples or relief valves.
- Use nuts and bolts of the prescribed quality (strength) (see Flange bolting on page 7).
- Only use nuts and bolts in accordance with the supplier's specification.
- The bolts should be evenly tightened crosswise with a torque wrench (see Flange bolting on page 7).



Installation/dismantling

- When using driveshafts **without length compensation**, one of the connecting units must be **flexible** in order to be fitted over the flange pilot. Variations in length which may be caused by **temperature** changes must be allowed for by a suitable connecting bearing.
- If driveshafts **with length compensation** are used, the companion flanges must be firmly **fitted** on the shafts of the connected units.
- For spray-painting the shaft we recommend our paint standards (Please ask for them).
- Protect rilsan-coated splines (sleeve muff or sleeve yoke) against
 - heat
 - solvents
 - mechanical damage.Visible rilsancoated areas should not be painted after installation in the driveline.
Danger of sealing damage!
- When cleaning driveshafts, do not use aggressive chemical detergents or pressurized water or steam jets because the seals may be damaged and dirt or water may penetrate.
- Driveshafts can be used in a temperature range between -25°C (-13°F) and $+80^{\circ}\text{C}$ ($+176^{\circ}\text{F}$), up to $+120^{\circ}\text{C}$ ($+248^{\circ}\text{F}$) but only for limited periods and not on a frequent basis. Please contact us if the operating temperature deviates from these values.



- Driveshafts that have been stored for more than 6 months must be relubricated before use (see Maintenance).
- In general we recommend to relubricated the driveshaft after setup in the driveline.
- For spray-painting the drive-shaft, make sure that the sliding range of the seal (length compensation L_a) is covered.



Installation/dismantling

Disassembly

- Before disassembly protect the driveshaft from spline separation.

CAUTION

You must secure the driveshaft against falling down before pulling it off the companion flange. The flange yoke may tilt, which could cause injury!

- Observe the directions for transport, storage and installation of driveshafts.

Flange bolting

The flange bolting set can be supplied by GWB™ on request. The bolt lengths given in the tables are only suitable if the dimension $2 \times G$ corresponding to the double the flange thickness G is not exceeded (see data sheets). If longer bolts are used, check whether the bolts can still be inserted from the joint side.

We recommend a bolting set consisting of:

Hexagon bolt with short thread similar to DIN 931/10.9 (shaft length greater than flange thickness)

Self-locking nut, similar to DIN 980/934-10.

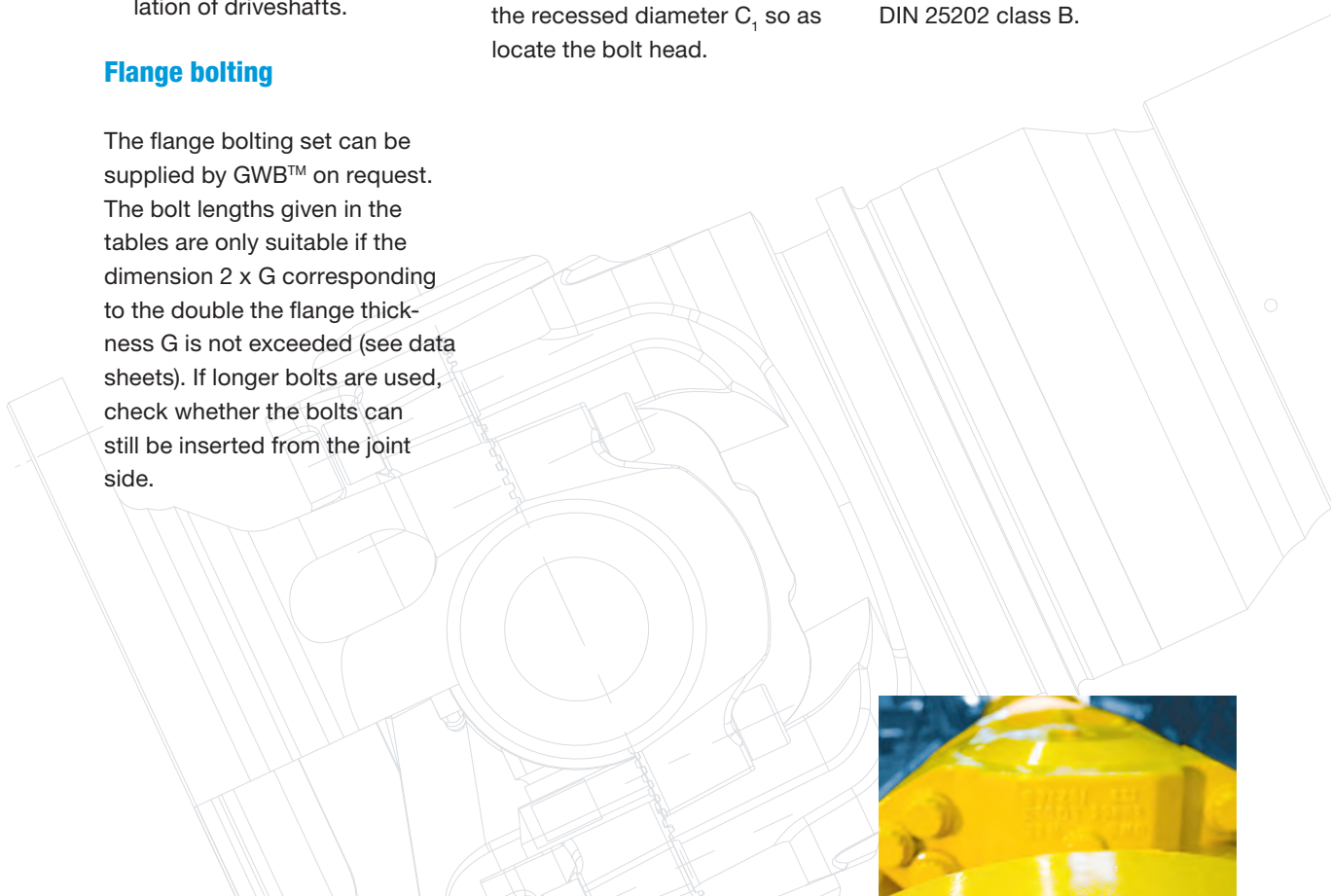
The bolts allow fitting

- a) partially from the joint side, i.e. the recessed diameter c does not prevent the bolt from turning;
- b) from the companion flange side. We recommend designing the recessed diameter C_1 so as to locate the bolt head.

See tables for insertion of bolts. All bolts must be tightened with the specified torque. The tightening torques T_a given in the table are based on a 90% (80% Hirth-serration) utilization of the elastic limit and apply to slightly oiled bolts.

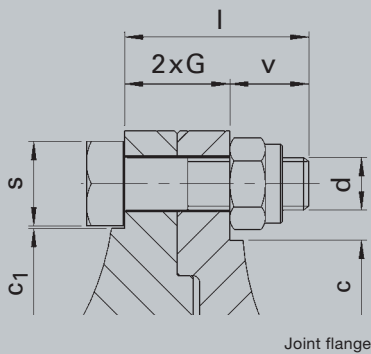
Do not use molycote paste or any other grease on the bolts and nuts. In case of corrosion protected bolts and nuts, please contact us.

Max. permissible tolerance of DIN 25202 class B.



Installation/dismantling

Series 587/687/688



Hexagon bolt:
short model similar to
DIN 931/10.9

Hexagon nut:
similar to DIN 980/10
Self-locking

Joint flange

Shaft size		587.50		587.55		587.60
Flange dia.	mm	225	250	250	285	285
Ta	Nm	295	405	405	580	580
c	mm	158	176	168	202	202
c ₁	mm	171	189	189	214	214
d	-	M 16	M 18	M 18	M 20	M 20
l	mm	50	60	60	64	64
v	mm	20	24	24	24	24
s	mm	24	27	27	30	30
i ¹⁾	-	8	8	8	8	8
Bolts inserted from joint side		yes	yes	yes	yes	yes

Shaft size		687/688.15	687/688.20	687/688.25	687/688.30		687/688.35	
Flange dia.	mm	100	120	120	120	150	150	180
Ta	Nm	35	69	69	69	120	120	190
c	mm	64	76	76	76	100	100	119
c ₁	mm	69,5	84	84	84	110,3	110,3	132,5
d	-	M 8	M 10	M 10	M 10	M 12	M 12	M 14
l	mm	23	27	27	27	33	33	40
v	mm	9	11	11	11	13	13	16
s	mm	13	17	17	17	19	19	22
i ¹⁾	-	6	8	8	8	8	8	8
Bolts inserted from joint side	Normal design	yes	yes	yes	yes	yes	yes	yes
Bolts inserted from joint side	Wide angel design	-	-	-	-	-	-	-

Shaft size		687/688.40		687/688.45		687/688.55		687/688.65	
Flange dia.	mm	150	180	180	225	180	225	180	225
Ta	Nm	120	190	190	295	295	295	295	295
c	mm	100	119	119	158	118	158	118	158
c ₁	mm	110,3	132,5	132,5	171	130,5	171	130,5	171
d	-	M 12	M 14	M 14	M 16	M 16	M 16	M 16	M 16
l	mm	33	40	40	50	50	50	50	50
v	mm	13	16	16	20	22	20	20	20
s	mm	19	22	22	24	24	24	24	24
i ¹⁾	-	8	8	8	8	10	8	10	8
Bolts inserted from joint side	Normal design	yes	yes	yes	yes	yes	yes	no	yes
Bolts inserted from joint side	Wide angel design	yes	yes	yes	-	yes	-	-	-

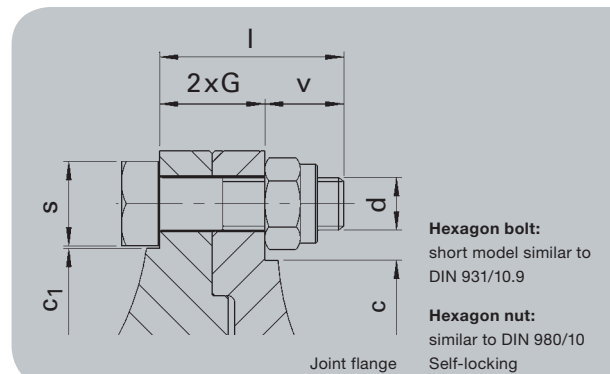
1) = Number of bolt holes

Ta = Tightening torque of bolting Special torque wrenches supplied on request

Installation/dismantling

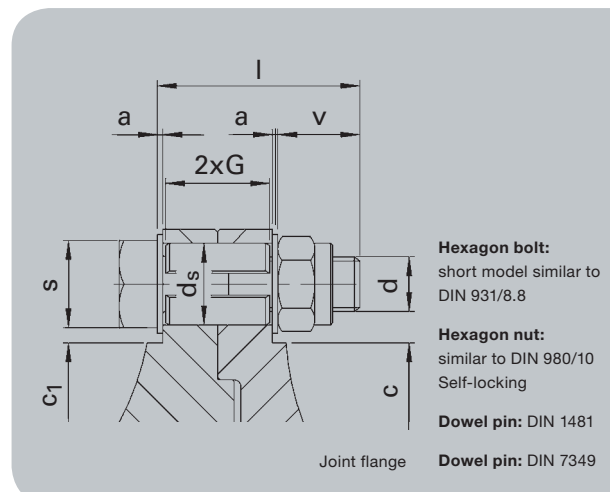
Series 390 Standard bolting

Shaft size		390.60	390.65	390.70	390.75	390.80
Flange dia.	mm	285	315	350	390	435
Ta	Nm	580	780	780	1.000	1.500
c	mm	202	230	256	295	332
c ₁	mm	214	247	277	308	343
d	-	M 20	M 22	M 22	M 24	M 27
l	mm	64	70	75	85	95
v	mm	24	26	25	29	31
s	mm	30	32	32	36	41
i ¹⁾	-	8	8	10	10	10
Bolts inserted from joint side		yes	yes	yes	yes	yes



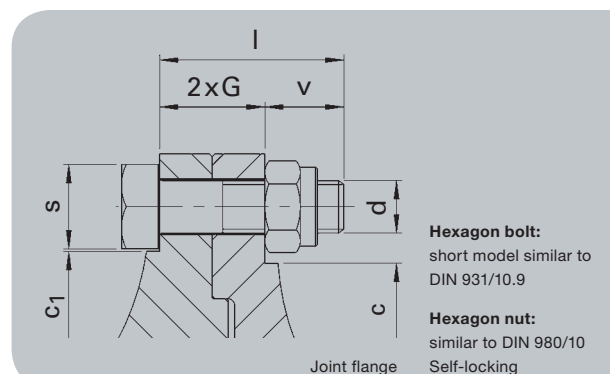
Series 587/390 Dowel pin connection

Shaft size		587.50	587.55	390.60	390.65	390.70	390.75	390.80
Flange dia.	mm	250	250	285	315	350	390	435
Ta	Nm	130	130	200	200	280	280	400
c	mm	176	168	202	230	256	295	332
c ₁ ²⁾	mm	176	176	198	228	254	294	332
d	-	M14	M14	M16	M16	M18	M18	M20
l	mm	65	65	75	75	90	95	110
d _s	mm	25	25	28	30	32	32	35
l _s	mm	32	32	36	40	45	50	60
v	mm	17	17	23	19	24	23	30
a	mm	6	6	6	6	8	8	8
s	mm	22	22	24	24	27	27	30
i ¹⁾	-	4	4	4	4	4	4	4
Bolts inserted from joint side		yes	yes	yes	yes	yes	yes	yes



Series 587/190 Super short designs

Shaft size		587.50	190.55	190.60	190.65	190.70
Flange dia.	mm	275	305	348	360	405
Ta	Nm	190	295	405	405	580
c	mm	213,5	237,5	274	288	324,5
c ₁	mm	225	250	285	299	338
d	-	M 14	M 16	M 18	M 18	M 20
l	mm	50	50	60	60	65
v	mm	15	20	24	24	21
s	mm	22	24	27	27	30
i ¹⁾	-	10	10	10	10	10
Bolts inserted from joint side		yes	yes	yes	yes	yes



1) = Number of bolt holes

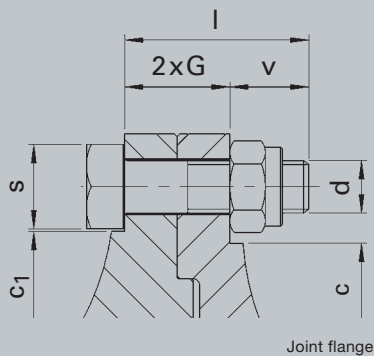
2) = Dowel pin connection without locking

Ta = Tightening torque of bolting Special torque wrenches supplied on request

Installation/dismantling

Series 392/393/689

Flange connection with face key



Hexagon bolt:
short model similar to
DIN 931/10.9

Hexagon nut:
similar to DIN 980/10
Self-locking

Shaft size		392.50 689.50	392.55 689.55	392.60	392.65	392.70	393.75	393.80	393.85	393.90
Flange dia.	mm	225	250	285	315	350	390	435	480	550
Ta	Nm	295	405	580	780	780	1.000	1.500	2.000	2.000
c	mm	152	170	193	224	254	286	315	334	420
c1	mm	171	190	214	247	277	307	342	377	444
d	-	M 16	M 18	M 20	M 22	M 22	M 24	M 27	M 30	M 30
l	mm	60	75	80	90	100	110	120	130	140
v	mm	20	25	26	26	30	30	36	36	40
s	mm	24	27	30	32	32	36	41	46	46
i1)	-	8	8	8	10	10	10	16	16	16
Bolts inserted from joint side		no	no	no	no	no	no	no	no	no

1) = Number of bolt holes

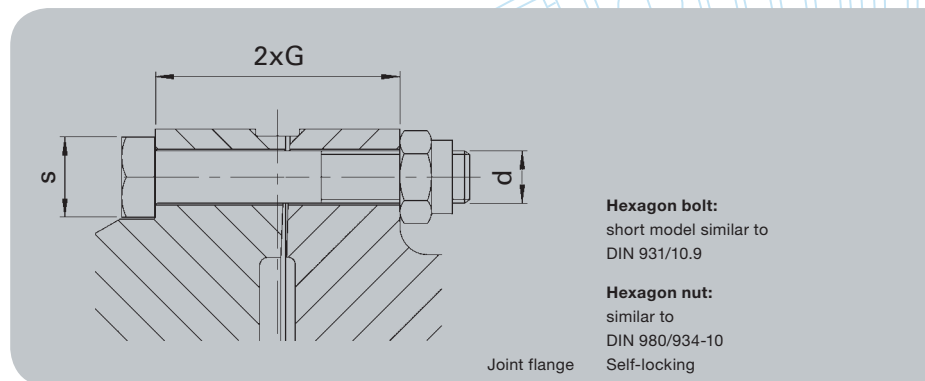
Ta = Tightening torque of bolting Special torque wrenches supplied on request



Installation/dismantling

Series 492/498/598

Flange connection with Hirth-serration



Series 492

Shaft size		492.60	492.65	492.70	492.75	492.80	492.85	492.90
Flange dia.	mm	285	315	350	390	435	480	550
Ta	Nm	175	270	270	375	375	525	720
d	-	M 14	M 16	M 16	M 18	M 18	M 20	M 22
s	mm	21	24	24	27	27	30	32
i ¹⁾	-	10	10	12	12	16	16	16
Bolts inserted from joint side		no	no	no	no	no	no	no

Series 498/598

Shaft size		498.00 598.00	498.05 598.05	498.10 598.10	498.15 598.15	498.20 598.20	498.25 598.25	498.30 598.30	498.35 598.35	498.40 598.40	498.45 598.45	498.50 598.50	498.55 598.55	498.60 598.60
Flange dia.	mm	600	650	700	750	800	850	900	950	1.000	1.050	1.100	1.150	1.200
Ta	Nm	900	900	900	1.800	1.800	3.150	3.150	3.150	5.400	5.400	5.400	8.200	8.200
d	-	M 24	M 24	M 24	M 30	M 30	M 36	M 36	M 36	M 42 x 3	M 42 x 3	M 42 x 3	M 48 x 3	M 48 x 3
s	mm	36	36	36	46	46	55	55	55	65	65	65	75	75
i ¹⁾	-	20	20	24	24	24	24	24	24	20	20	20	20	20
Bolts inserted from joint side		no	no	no	no	no	no	no	no	no	no	no	no	no

1) = Number of bolt holes

Ta = Tightening torque of bolting Special torque wrenches supplied on request



Installation/dismantling

Companion flanges

In general, driveshafts are connected to the driven units by companion flanges.

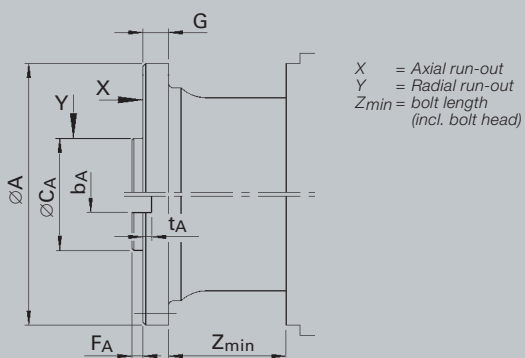
The accurate running of a driveshaft requires certain tolerances for the axial and radial run-out (see tables).

The dimensions of the companion flanges correspond with those of the same size of driveshafts, except for the centring depth F_A and the fit C_A , the depth of the keyway t_A and the width b_A . They can be taken from the following tables.

For better bolt locking we recommend designing the relief of the companion flange as a bolt head surface and inserting the bolt

from the companion flange side. In this case the distance Z_{min} must be met between the flange and the adjacent housing.

If it is not possible to insert the bolts from the companion flange side, we recommend the use of stud bolts.



Series 587

Shaft size		587.50		587.55		587.60	
A	mm	225	250	250	285	285	
F_A	mm	4-0,2	5-0,2	5-0,2	6-0,5	6-0,5	
G	mm	15	18	18	20	20	
X and Y	mm	0,05	0,06	0,06	0,06	0,06	
C_A h6	mm	140	140	140	175	175	

Series 687/688

Shaft size		687/688.15		687/688.20		687/688.25		687/688.30		687/688.35	
A	mm	100	120	120	120	150	150	180			
F_A	mm	2,3-0,2	2,3-0,2	2,3-0,2	2,3-0,2	2,3-0,2	2,3-0,2	2,3-0,2	2,3-0,2	2,3-0,2	
G	mm	7	8	8	8	10	10	12			
X and Y	mm	0,05	0,05	0,05	0,05	0,05	0,05	0,05			
C_A h6	mm	57	75	75	75	90	90	110			

Shaft size		687/688.40		687/688.45		687/688.55		687/688.65	
A	mm	150	180	180	225	180	225	180	225
F_A	mm	2,3-0,2	2,3-0,2	2,3-0,2	4-0,2	2,3-0,2	4-0,2	2,3-0,2	4-0,2
G	mm	10	12	12	15	14	15	15	15
X and Y	mm	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
C_A h6	mm	90	110	110	140	110	140	110	140



Installation/dismantling

Series 390

Shaft size		390.60	390.65	390.70	390.75	390.80
A	mm	285	315	350	390	435
F _A	mm	6-0,5	6-0,5	7-0,5	7-0,5	9-0,5
G	mm	20	22	25	28	32
X and Y	mm	0,06	0,06	0,06	0,06	0,06
C _A h6	mm	175	175	220	250	280

Series 587/190 Super short designs

Shaft size		587.50	190.55	190.60	190.65	190.70
A	mm	275	305	348	360	405
F _A	mm	4-0,2	5-0,3	6-0,5	6-0,5	7-0,5
G	mm	15	15	18	18	22
X and Y	mm	0,06	0,06	0,06	0,06	0,06
C _A h6	mm	140	140	175	175	220

Series 392/393

Shaft size		392.50	392.55	392.60	392.65	392.70	393.75	393.80	393.85	393.90
A	mm	225	250	285	315	350	390	435	480	550
F _A	mm	4-0,5	5-0,5	6-0,5	7-0,5	7-0,5	7-0,5	9-0,5	11-0,5	11-0,5
G	mm	20	25	27	32	35	40	42	47	50
X and Y	mm	0,06	0,06	0,06	0,06	0,06	0,06	0,06	0,06	0,06
C _A f8	mm	105	105	125	130	155	170	190	205	250
b _A K8	mm	32	40	40	40	50	70	80	90	100
t _A + 0,2 mm		9	12,5	15	15	16	18	20	22,5	22,5



Maintenance

Maintenance intervals

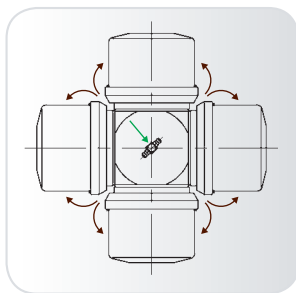
Driveshafts are used in a great variety of industrial plants with very different operating conditions. We recommend inspections at regular intervals and, if possible, to coordinate them with maintenance work on other parts of the equipment. However maintenance work should be carried out once a year at least.

Inspection



Excessive looseness can cause imbalance or vibration in the driveshaft assembly. Imbalance or vibration can cause premature component wear, which can eventually result in separation of the shaft resulting in serious injury to persons or damage to property. It is important that you follow the inspection procedures.

Central lubrication



- Check the flange bolts for tightness and retighten them with the prescribed torque (see Flange bolting on page 7).
- Backlash inspection. By lifting the joints and the length compensation check the visible or tangible backlash.

Check the driveshaft for any unusual noise, vibration or abnormal behaviour and repair the damage, if any.

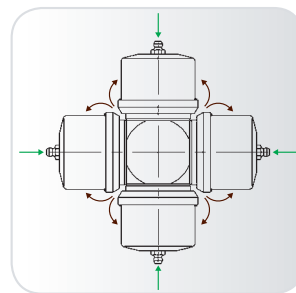
Lubrication



Lubrication Warnings

- In adequate lubrication intervals or improper lubrication can cause journal cross burn up, which can lead to separation of the shaft or connecting components from the vehicle or machine, resulting in serious injury or damage to property.

4 point lubrication



- The use of incompatible lubricants or greases can result in driveshaft failure and possible separation of the driveshaft.

GWB™ driveshafts are lubricated with grease and ready for installation.

- For relubrication of driveshafts, use a standard grease according to STD 4006-005. You may use a lithium complex grease ONLY if it meets the following specification: **KP2N-20/DIN 51502 according to DIN 51818.**

- **Do not use grease with molycolite additives! Original standard GWB grease can be mixed ONLY with lithium complex grease on mineral oil base.**
- Clean the grease nipples before relubricating.
- Use adequate regreasing devices. For joint relubrication maximal pressure of 15 bar is required. For the length compensation it depends on the design. The regreasing must be continued until fresh grease becomes visible from all four seals.
- Driveshafts that have been stored for more than 6 months must be regreased before use.



Maintenance

- When cleaning driveshafts, do not use aggressive chemical detergents or pressurized water or steam jets because the seals may be damaged and dirt or water may penetrate. After a cleaning, the driveshaft must be regreased until the grease escapes out from all four seals.

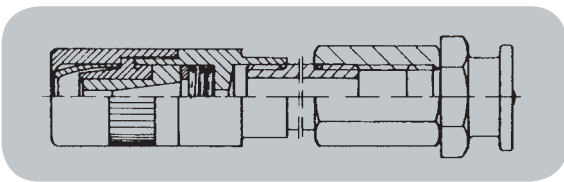
Journal cross assemblies



Excessive looseness across the ends of journal cross bearing assemblies can cause imbalance or vibration in the driveshaft assembly. Imbalance or vibration can cause component wear,

which can result in separation of the driveshaft from the machine or vehicle.

The journal cross assemblies may be relubricated via a conical grease nipple (DIN 71412) located in the middle of the cross or at the bottom of the bush. The journal cross assembly has to be replaced before the calculated bearing lifetime is reached. The bearings of the journal cross must be lubricated until the grease passes through from all four seals of the bearings. Driveshafts of the series 498/598 (in special cases also the series 390, 392, 393, 492, 689) must be lubricated via a flat grease nipple according to DIN 3404. The illustrated adapter pipe can be used as adapter between a conical grease nipple at the driveshaft (acc. to DIN 71412) and a flat grease nipple connection at the grease pump (see illustration).



Order No.: 1 000 00 86 05 006 (90 mm length)
1 000 00 86 05 025 (300 mm length)

Regreasing intervals (standard)

Series	Joints	Length compensation
587	6 months	6 months ¹⁾
687/688	6 months	maintenance-free 12 months ¹⁾
190	6 months	6 months
390/689	6 months	6 months
392/393	6 months	6 months
492/498/598	3 months	3 months

¹⁾ for greasable length compensation

- Grease and air-relief valves must not be removed or replaced by standard grease nipples.
- Protection caps should be removed from the grease nipples before operation.
- Relubricating should be done at the shortest compressed length L_z of the shaft.

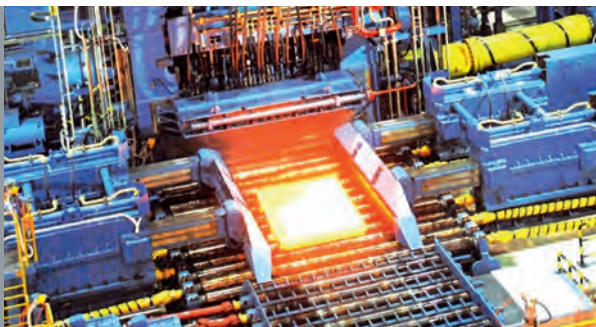
Recommended regreasing intervals

We recommend the following inspection and regreasing intervals (see table below).

- Unfavourable effects like temperature, dirt and water may necessitate shorter lubricating intervals. Principally we recommend adapting the lubricating intervals to the individual operating conditions.
- For driveshafts with plastic-coated splines (on request) the relubricating intervals may be extended, dependent on the application, to 12 months.

Length compensation

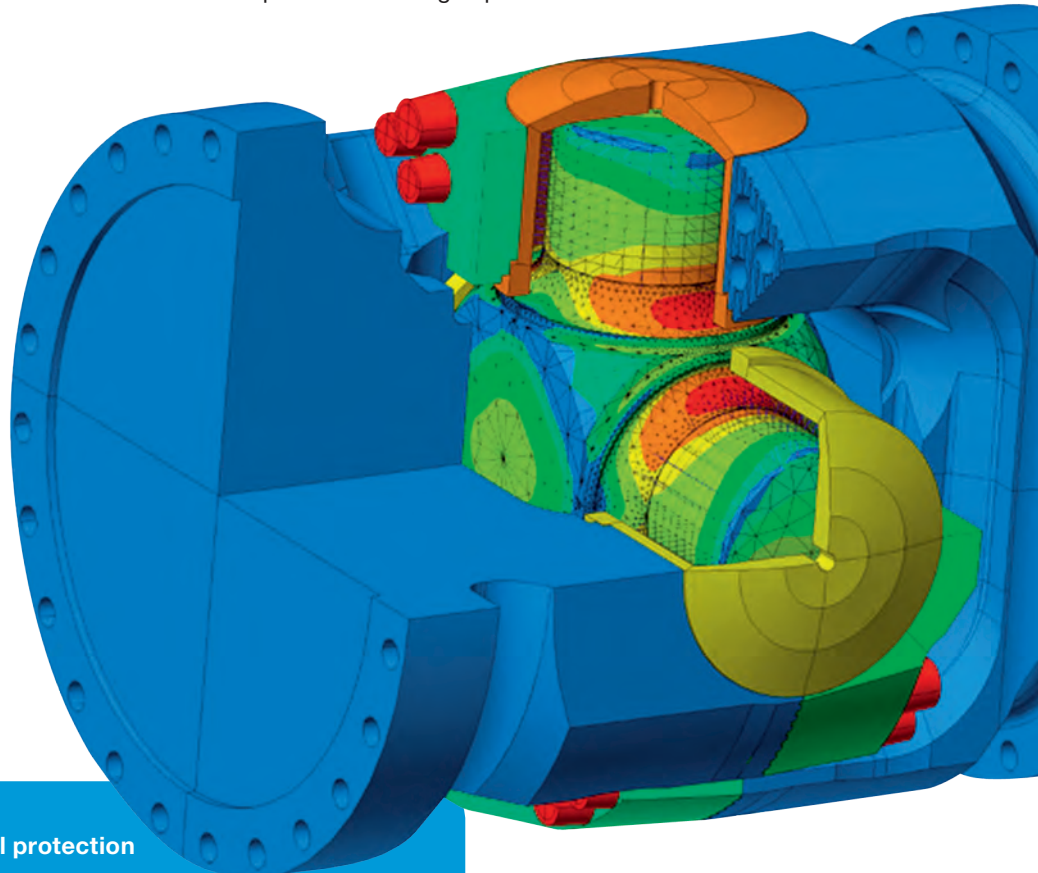
The length compensation of the series 390, 392, 393, 492, 689, 190 and 587 as well as special designs of the series 687/688 is lubricated via a combined grease and air-relief valve with a conical grease nipple according to DIN 71412 (no self-locking grease nipple). The length compensation of the series 498/598 is lubricated via a flat grease nipple according to DIN 3404.



Repair

Safety Information Regarding Repairs

- For safety reasons driveshafts should only be repaired by GWB™ or by GWB -approved repair shops. The repair of driveshafts is performed in a professional manner by our driveshaft service experts. The shafts are overhauled using original spare parts.
- The repair of driveshafts by the user should only be made in emergency cases and only for such equipment where the operating speed of the shaft does not exceed 500 rpm. If the speed exceeds 500 rpm, the driveshaft must be rebalanced.
- If journal cross assemblies are to be replaced, you should also replace the bearing cap screws of shafts of the series with split yokes. Observe our installation and repair instructions.
- Improper repairs can lead to driveshaft failures that can cause serious injury or damage to property. Please contact us if you have questions or need additional information.



Dana's environmental protection management policy

An important feature of Dana's environmental protection management policy is dedication to product responsibility. Because of this commitment, the effect of driveshafts on the environment is given considerable attention. GWB driveshafts are lubricated with lead-free grease, their paint finishes are low in solvents and free of heavy metals, and they are easy to maintain. After use, they can be introduced into the recycling process.

Additional information and ordering instructions

Selection of driveshafts

The selection of a **GWB™** driveshaft is determined not only by the maximum permissible torque of the shaft and the connections but also by a variety of other factors.



For the exact determination and selection of driveshafts, see the Selection of Driveshafts pages in **GWB** catalogue.

Dana engineers can precisely calculate the correct size of the shaft and joint for your application with the use of computer programs created specifically for this purpose.

In order to best match your requirements, you'll be asked to provide the following information:

- Installation length of the driveshaft
- Maximum joint angle requirement
- Required length compensation
- Maximum rotation speed of the shaft
- Shaft end connection details
- Maximum torque to be transmitted
- Nominal torque to be transmitted
- Load occurrences
- Description of the equipment and working conditions

Specific applications

Driveshafts in railway transmissions

The selection of driveshafts in the secondary system of railway vehicles must be based on the maximum torque that can be

transmitted to the track (wheel slip or adhesion torque).

Driveshafts in crane travel drives

The particular operating conditions for travel drives of cranes have been taken into consideration in the DIN-standard 15450. As a result, driveshafts for these applications can be selected by using that standard.

Driveshafts in marine transmissions

These driveshafts are subject to acceptance and must correspond to the standards of the respective classification society.

Driveshafts for other forms of passenger conveyance

Driveshafts used in amusement park equipment, ski lifts or similar lift systems, elevators, and rail vehicles must be in accordance with the standards and specifications of the appropriate licensing and supervisory authorities.

Driveshafts in explosive environments (Atex-outline)

For the use of driveshafts in areas with danger of explosion, an EC-conformity certificate acc. to EC-outline 94/9/EG can be provided.

The possible categories for the product „driveshaft“ are:

- a) in general: $\text{CE} \otimes \text{II 3 GDc T6}$
- b) for driveshafts with adapted features: $\text{CE} \otimes \text{II 2 GDc T6}$

The driveshaft should not be used under the following operating conditions:

- Within the critical bending speed range of the drive
- Within the critical torsional speed range of the drive
- At operating angles which exceed the specified maximum (refer to drawing confirmed with order)
- At dynamic and static operating torques which exceed the specified limit (refer to drawing confirmed with order)
- At speed x deflection angle ($n \times \beta$) conditions which exceed the limit (refer to **GWB** catalogue)
- For usage time which exceeds the calculated bearing lifetime of the joint bearings

If you'd like more information on **GWB** driveshafts, or would like to discuss specific application requirements with an engineer, please call Dana at 00 49 (0) 201-81 24-0 or visit www.gwbdriveshaft.com, www.dana.com.



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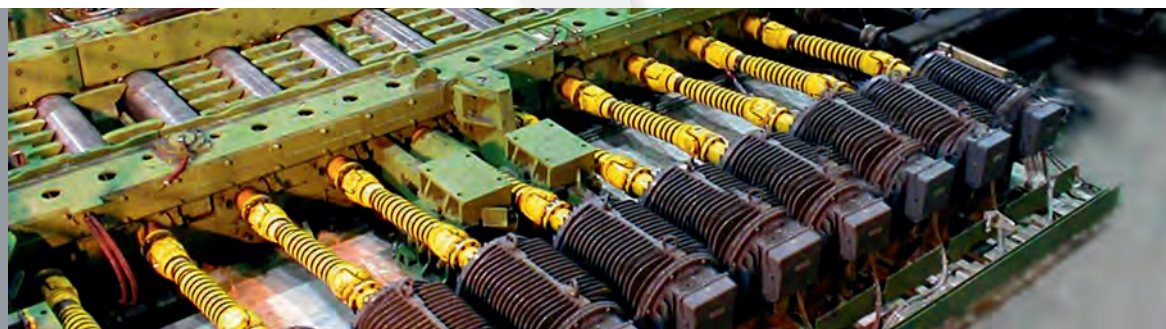
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Dana Holding Corporation

is a world-leading supplier of driveline, sealing, and thermal-management technologies that improve the efficiency and performance of passenger, commercial, and off-highway vehicles with both conventional and alternative-energy powertrains. The company's global network of engineering, manufacturing, and distribution facilities provides original-equipment and aftermarket customers with local product and service support. Based in Maumee, Ohio, Dana employs approximately 23.000 people in 25 countries and reported 2015 sales of \$6,06 billion.

About the Dana GWB™ Products

Dana produces GWB industrial drive-shafts and genuine service parts for the scrap steel, construction, railway, marine, and paper industries. Manufacturing and assembly operations in Germany are supported by Dana's global network of R&D and distribution facilities.

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Trains



Industrial plants



Ships



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Capacity ratings, features, and specifications vary depending upon the model and type of service. Application approvals must be obtained from Dana. We reserve the right to change or modify our product specifications, configurations, or dimensions at any time without notice.