

POWER STEERING GEAR TECHNICAL & APPLICATION GUIDE

Applicable for All Makes by Bendix
and Genuine Sheppard™ Reman

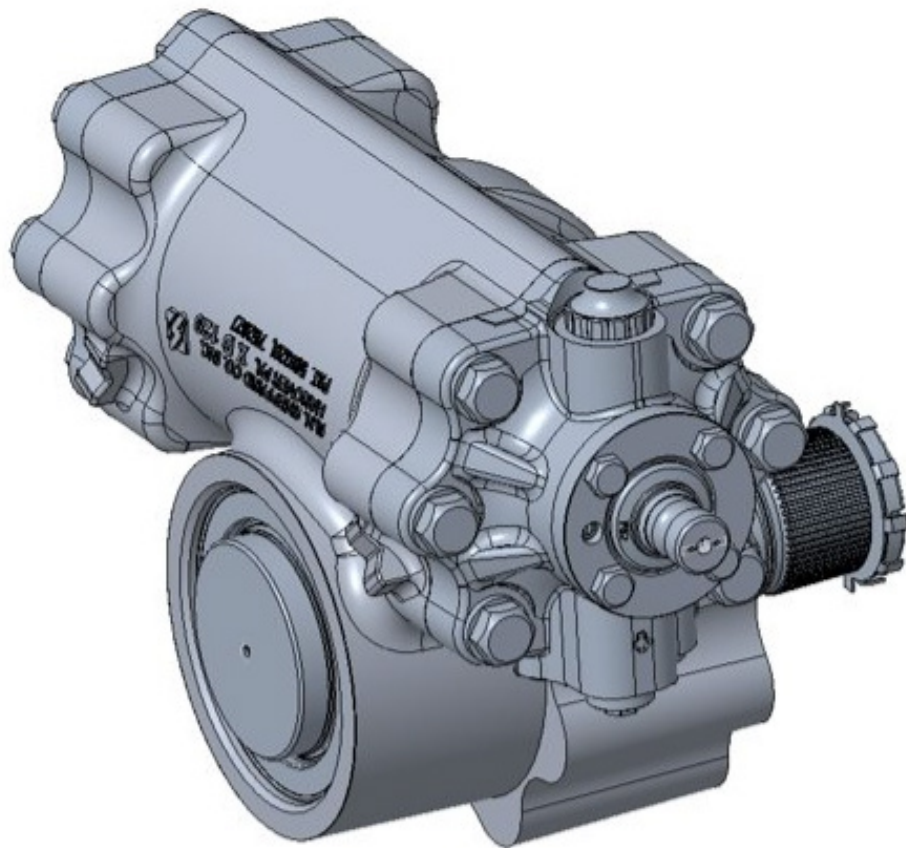


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Bendix is a supplier of remanufactured power steering gears for the commercial vehicle aftermarket. This product and technical guide offers an overview of our product line and product offerings.

The guide includes a step-by-step process to correctly determine the gear part number for all gears offered in our product portfolio. Properly identifying the gear part number for you is an important part of our quality plan, customer satisfaction objectives, and overall business.

The power steering gear on commercial vehicles is located in an area of the truck exposed to the environment; therefore, simply reading a part or serial number on the gear can be rather difficult in many cases. Following the step-by-step process described in this guide – along with the vehicle application information – helps ensure we provide the correct gear for your vehicle.

The troubleshooting tips at the end of this document offer frequently asked questions to help identify, diagnose, and solve typical installation or performance issues with commercial vehicle power steering gears.

Bendix offers a complete line of power steering gears for the commercial vehicle aftermarket industry. Our gears are utilized on all major brands of on- and off-highway commercial vehicles, including the brands below.



Two (2) tier one suppliers -- TRW and R.H. Sheppard Co. Inc., -- deliver original equipment power steering gears in this industry. Bendix produces a full range of reman gear part numbers originally produced by these manufacturers.



There are hundreds – perhaps thousands – of unique part numbers used in this industry. Despite that volume, we find that 16 or 20 of the most popular gear part numbers comprise 95 percent of the overall market demand. To ensure we have “best-in-class” coverage and inventory availability, we maintain 100-150 unique gear part numbers in stock and offer a one- to two-day turnaround on Repair and Return (R&R) service to support you with gear part numbers not currently stocked.

SHEPPARD™-TYPE GEAR PRODUCT FAMILY INFORMATION

The following tables illustrate various features and operating parameters for the Sheppard™-type steering gear product families.

	M80™	M90™	M100™	M110™
Front axle weight (lbs)	9000	12000	14000	20000
Pressure rating (psi)	2350	2350	2350	2175
Gear travel (°)	100	95	95	100
Maximum operating temperature (°F)	250	250	250	250
Minimum pump flow (gpm)	2.1	2.5	3.0	3.5
Recommended pump flow range (gpm)	2.1-3.5	2.5-4.0	3.0-4.5	3.5-5.0
Approximate weight - dry (lbs)	50	65	75	110

	MD83™	HD94™	SD110™	XD120™
Front axle weight (lbs)	10000	14600	18000	23000
Pressure rating (psi)	2683	2683	2756	2175
Gear travel (°)	95	95	95	96
Maximum operating temperature (°F)	250	250	250	250
Minimum pump flow (gpm)	2.4	2.9	3.7	4.8-5.8
Recommended pump flow range (gpm)	2.4-3.4	2.9-4.4	3.7-5.2	4.8-5.8
Approximate weight - dry (lbs)	60	70	85	150

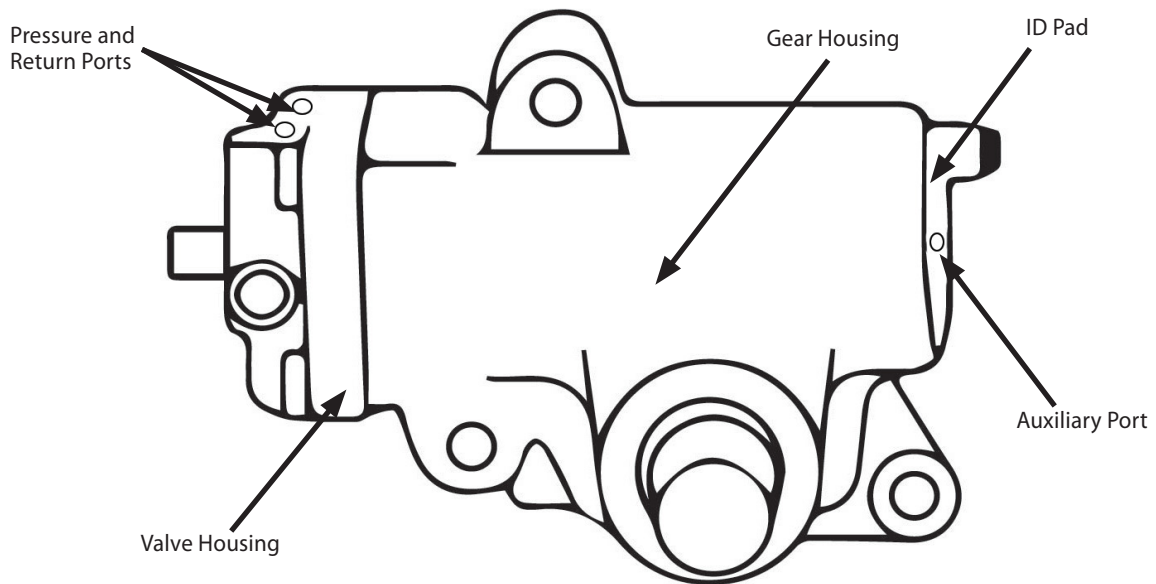
ZF™ TRW™-TYPE GEAR PRODUCT FAMILY INFORMATION

The following tables reference various features and operating parameters for the ZF™ TRW™-type steering gear product families.

	TAS37	TAS40	TAS55	TAS65	TAS66	TAS85
Front axle weight (lbs)	8000	9000	12000	14300	14600	18000
Pressure rating (psi)	1958	2175	2175	2175	2364	2175
Gear travel (°)	100	95	95	95	95	95
Maximum operating temperature (°F)	250	250	250	250	250	250
Minimum pump flow (gpm)	2.5	2.2	2.7	3.0	3.0	3.6
Recommended pump flow range (gpm)	3.6-5.0	3.6-5.0	3.6-5.0	3.6-5.0	3.6-5.0	4.2-8.0
Approximate weight - dry (lbs)	55	60	73	78	78	98

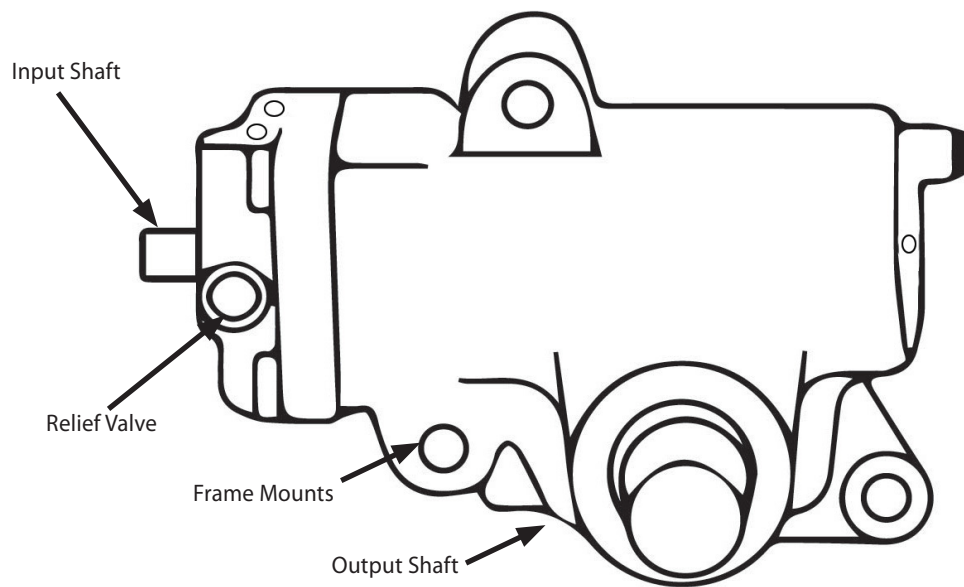
	THP45	THP60	PCF60
Front axle weight (lbs)	9000	14300	14300
Pressure rating (psi)	2683	2683	2683
Gear travel (°)	100	100	100
Maximum operating temperature (°F)	250	250	250
Minimum pump flow (gpm)	2.4	2.9	2.9
Recommended pump flow range (gpm)	3.6-6.3	3.6-6.3	3.6-6.3
Approximate weight - dry (lbs)	58	63	63

IDENTIFYING THE GEAR COMPONENTS



- **Pressure and Return Ports:** These ports are connection points for the hydraulic lines to and from the power steering pump. Typically, one (1) of the ports will have an embossed letter in the casting: "P" for the pressure port or "R" for the return port.
- **Valve Housing:** This casting is bolted onto the cylinder bore of the gear housing and contains the mechanical valve of the steering gear.
- **Gear Housing:** This is the main casting of the steering gear and contains the rack piston and output shaft.
- **ID Pad:** On ZF™ TRW™-type gears, the gear part number is stamped on this machined surface.
- **Auxiliary Port:** Some gears are equipped with four (4) lines to provide hydraulic assist from the master gear to an auxiliary gear mounted on the opposite frame rail. If you have a four-line gear, one (1) of the auxiliary ports is on this end of the gear housing or in the 'bowl' of the gear housing around the output shaft.

IDENTIFYING THE GEAR COMPONENTS



- **Output Shaft:** The output shaft is connected to the pitman arm and steering linkage.
- **Frame Mounts:** These holes are the points where the steering gear mounts to the frame. Typically, there are three (3) or four (4) mounting pads on a steering gear.
- **Relief Valve:** Some gears are equipped with a relief valve to limit the maximum supply pressure from the power steering pump.
- **Input Shaft:** The input shaft is the connection point for the coupling from the steering column.

ORDERING THE CORRECT GEAR PART NUMBER

Most customers calling for a steering gear typically have the make, model, and year of the vehicle, but do not have the specific gear part number. These steps will help you move from the make, model, and year information to the actual gear part number.

With the make, model, and vehicle year in hand (i.e. 1998 International® 3000 series), refer to *BW8100, Bendix Remanufactured Steerings Gear Application Guide*, on *B2Bendix.com* to narrow down the list of gears used on this application. Here's a sample of what you'll find in the application guide.

APPLICATION	MODEL	YEARS	GEAR SPEC	HOUSING CASTING	# OF LINES	RELIEF VALVE	GEAR TYPE	OEM NUMBER	BENDIX
International	3000	1992-2000	TAS40006	TAS402299	2	Yes	ZF™ TRW™	1688882C91	TAS40006
		1998	TAS55001	TAS552299	2	Yes	ZF TRW	1661401C92	TAS55001

This table is copied directly from the Bendix Remanufactured Steering Gears Application Guide

In this example, you most likely need a TAS40006 or TAS55001 steering gear. It's important to verify a few more pieces of information to determine the exact Bendix® remanufactured steering gear part number. Refer to Appendix I of this document for a complete example of the process used to identify a gear part number.

Gear Type

Each OE gear manufacturer places their gear part number in different locations on the steering gear, so the first piece of information needed is the gear type. On the gear housing of each unit, you'll find the OEM's logo embossed or poured into the casting.

Once you've identified the gear type, use the following sections to determine the part number for the various product families produced by each OE gear manufacturer.

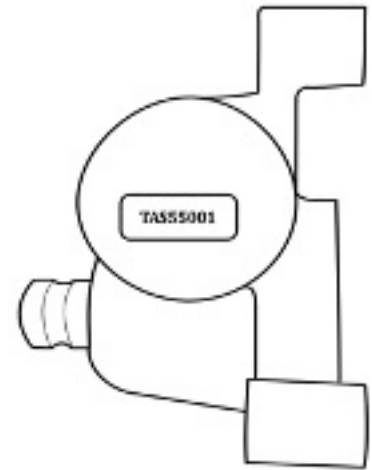
IDENTIFYING ZF™ TRW™ TAS/THP-TYPE GEARS

Gear Part Number

The gear part number, or gear spec, is pin-stamped or stenciled on a machined surface on the opposite end of the input shaft. For ZF™ TRW™-type gears, this is the most accurate method to correctly identify the gear part number. If all characters are legible, refer to *BW8100, Bendix Remanufactured Steerings Gear Application Guide*, on B2Bendix.com to determine the exact Bendix remanufactured steering gear number.

I.E.: TAS55001

PRODUCT FAMILY		GEAR ID
TAS	40	001-050
	55	001-020
	65	001-250
	85	001-175
THP	45	001-010
	60	001-050



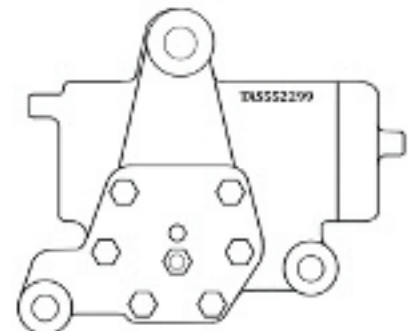
Gear Housing Casting Number

When the stenciled gear part number is unreadable, locate the casting housing number on the cast iron gear housing. This number begins with the product family ID (i.e., TAS55) followed by four (4) digits. The first of these four (4) digits is always a "2."

I.E.: TAS552299

NOTE: U.S. patent numbers are also embossed in the gear housing (i.e., 4942203). These numbers will not help identify the gear part number.

*Once you have the casting number along with the make, model, and vehicle year, refer to *BW8100, Bendix Remanufactured Steerings Gear Application Guide*, on B2Bendix.com to verify the correct Bendix® remanufactured part number. Since we are using the gear housing number to identify the gear – instead of the ID pad – it is important to verify the number of lines and relief valve option discussed in the following sections of this document.*

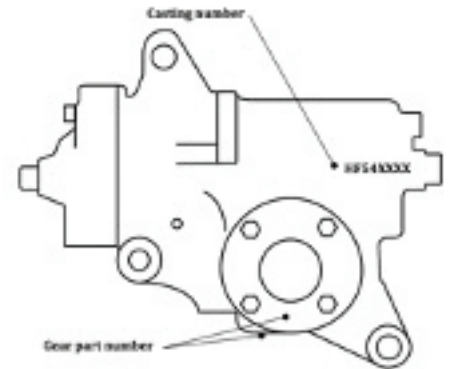


IDENTIFYING ZF™ TRW™ HF-TYPE GEARS

The ZF™ TRW™ HF-type gear part number is hand stamped on the gear housing in the areas shown on the image at the right.

When the stenciled gear part number is unreadable, locate the casting housing number on the cast iron gear housing. This number begins with the product family ID (i.e., HF64) followed by four (4) digits. The first of these four (4) digits is always a "2." For example, a stenciled gear part number would appear as HF642989 on the unit.

The HF-type gear completed its production life around 1986; therefore, application, interchange, and cross reference information is limited. To ensure we supply you with the exact gear part number, you need, in addition to the stenciled part number, it's critical that you also have available the input shaft configuration, relief valve option, number of lines, port locations, and the number of frame pad mounts when you contact support.

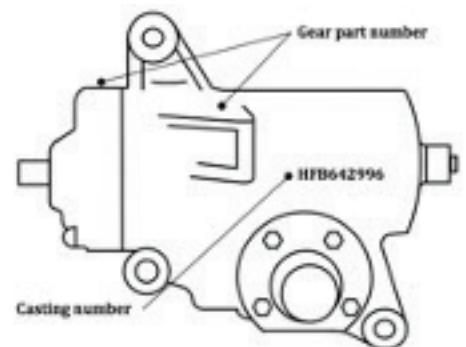


IDENTIFYING ZF TRW HFB-TYPE GEARS

On the ZF TRW HFB-type gear, the gear part number is hand-stamped on either the valve housing or gear housing in the areas shown on the image at the right.

When the stenciled gear part number is unreadable, locate the casting housing number on the cast iron gear housing. This number begins with the product family ID (i.e., HFB64) followed by four (4) digits. The first of these four (4) digits is always a "2." For example, a stenciled gear part number would appear as HFB642299 on the unit.

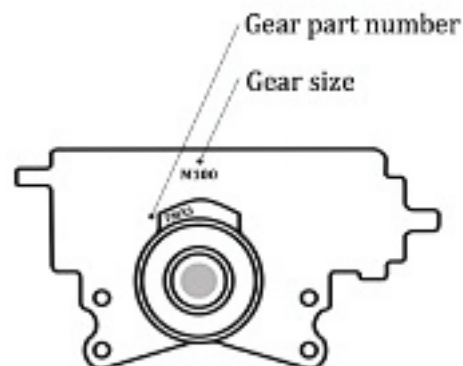
The HFB-type gear completed its production life around 1986; therefore, application, interchange, and cross reference information is limited. To ensure we supply you with the exact gear part number, you need, in addition to the stenciled part number, it's critical that you also have available the input shaft configuration, relief valve option, number of lines, port locations, and the number of frame pad mounts when you contact support.



IDENTIFYING SHEPPARD™ M-SERIES™ GEARS

Identify the gear size

Begin by identifying the gear size. This number is cast or embossed in the main gear housing. **The gear size will appear as M100 or M100 Auto.**



Identify the gear part number

The gear power, model, and series identifiers – for example, M-100 P M X3 – are pin-stamped on a machined surface around the output shaft of the gear. If the gear is still on the vehicle, these numbers may be hidden behind the pitman arm. Turning the wheels all the way to the left will help get the pitman arm out of the way to identify these characters. The chart that follows provides a key to the combination of letters and numbers that make up the gear part number.

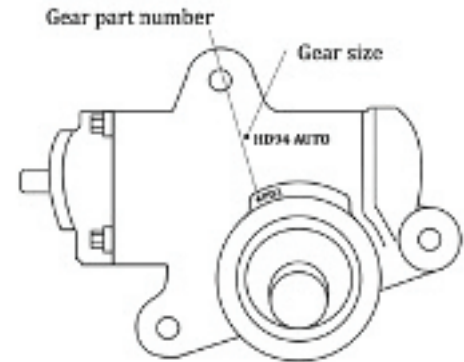
GEAR SIZE	POWER	MODEL	SERIES
M-80	P/S	Alpha	Alpha/Num
M-90	P	Alpha	Alpha/Num
M-100	P	Alpha	Alpha/Num
M-110	P	Alpha	Alpha/Num

If all characters are legible, refer to *BW8100, Bendix Remanufactured Steerings Gear Application Guide*, on B2Bendix.com to determine the exact Bendix remanufactured steering gear number. If the pin-stamped characters around the output shaft are not legible, use the number of frame mounting pads, input shaft type, relief valve option, and number of lines to identify the gear and determine the correct Bendix remanufactured part number.

IDENTIFYING SHEPPARD™ D-SERIES™ GEARS

Identify the gear size

Begin by identifying the gear size. This number is cast or embossed in the main gear housing. **The gear size will appear as HD94 Auto.**



Identify the gear part number

The gear power, model, and series identifiers – for example, HD94 P M 3 – are located on a machined surface around the output shaft of the gear. If the gear is still on the vehicle, these numbers may be hidden behind the pitman arm. Turning the wheels all the way to the left will help get the pitman arm out of the way to identify these characters. The chart that follows provides a key to the combination of letters and numbers that make up the gear part number.

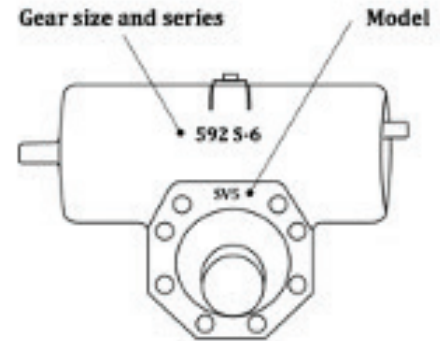
GEAR SIZE	POWER	MODEL	SERIES
HD94	P/S	Alpha	Alpha/Num
SD-110	P	Alpha	Alpha/Num
XD-120	P	Alpha	Alpha/Num

If all characters are legible, refer to *BW8100, Bendix Remanufactured Steerings Gear Application Guide*, on B2Bendix.com to determine the exact Bendix remanufactured steering gear number. If the pin-stamped characters around the output shaft are not legible, I use the number of frame mounting pads, input shaft type, relief valve option, and number of lines to identify the gear and determine the correct part number.

IDENTIFYING SHEPPARD™ 92-SERIES™ GEARS

Identify the gear size

Begin by identifying the gear size. This number is cast or embossed in the main gear housing. It is important to document the gear size and series embossed in the gear housing. The seal kit used to remanufacture the gear is different depending on the series. For example, a 592 S-5 series gear uses a different seal kit than the 592 S-6 series gear.



Identify the gear part number

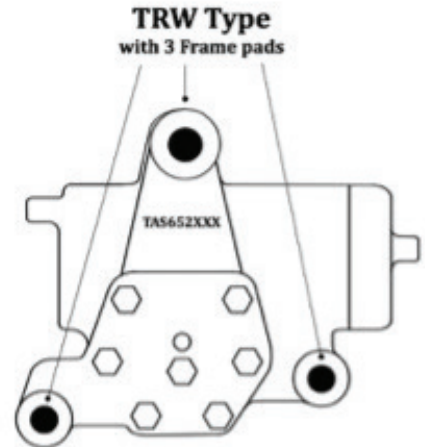
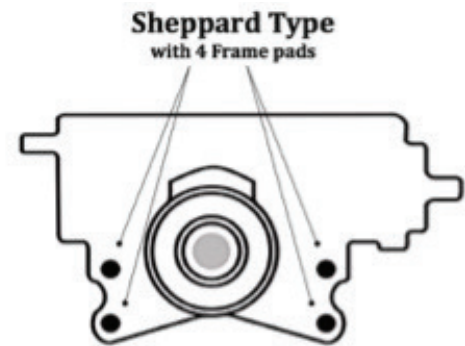
The gear power, model, and series identifiers – for example, 592 S-6 SV5 – are located on a machined surface around the output shaft of the gear. If the gear is still on the vehicle, these numbers may be hidden behind the pitman arm. Turning the wheels all the way to the left will help get the pitman arm out of the way to identify these characters. The chart that follows provides a key to the combination of letters and numbers that make up the gear part number.

GEAR SIZE	SERIES	MODEL
292	3-6	Alpha/Num
392	3-6	Alpha/Num
492	3-6	Alpha/Num
592	3-6	Alpha/Num

FRAME MOUNTING PADS

Examining the gear housing is one of the easiest methods to use when identifying a gear part number. The gear housing is generally what makes a gear unique or different from other gear part numbers. This method is easy and helpful; however, it is not 100% accurate as some gears have RH or LH internal components, different input shaft connection, relief valves, etc. Looking at the frame pads is a simple and helpful guide to identifying the gear part number.

Typically, a steering gear will have three (3) or four (4) mounting pads; on occasion, there are five (5). Looking at the number of frame pads, location of the frame pads, and thickness of the frame pads, then comparing them to the images included in Appendix I of this document will help determine the gear part number. It is especially important to read the casting number on the gear housing for the ZF™ TRW™-type steering gears when trying to identify a gear part number using this method.



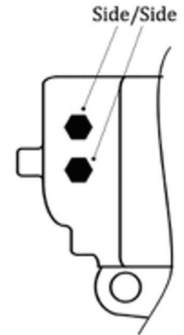
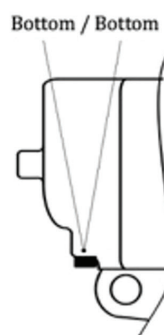
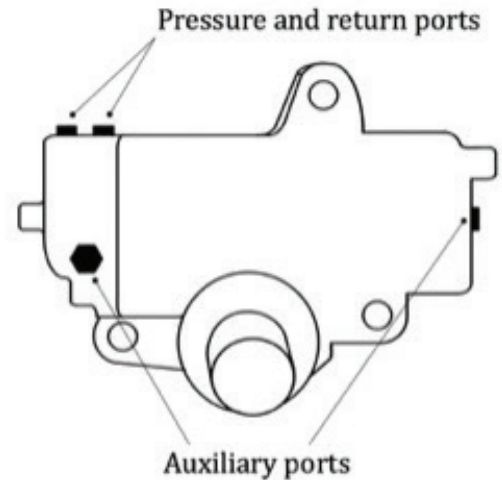
DETERMINE THE NUMBER OF LINES OR HOSES

Knowing the number of lines or hoses is also helpful in identifying the gear part number. Vehicles equipped with an assist gear all have four (4) lines and many vehicles without an assist gear are equipped or ported for four (4) lines.

If the gear on your vehicle has only two (2) ports on the valve housing, this is a two-line gear.

If there is a third port with a steel plug or hydraulic line in the valve housing, you have a four-line gear. Look for the fourth port at the opposite end of the gear. It is located near the ID pad or in the 'bowl' of the gear near the output shaft.

It is also helpful to know the location of the pressure, return, and auxiliary ports when identifying a gear. The images below show the four (4) pressure and return port configuration combinations.



RELIEF VALVE

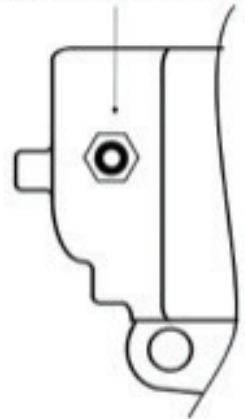
Some gears are equipped with a relief valve to limit the maximum supply pressure from the power steering pump. Knowing whether or not a gear is equipped with a relief valve is useful information when identifying the gear part number.

For all gear types, the relief valve is typically on the outboard surface of the valve housing casting.

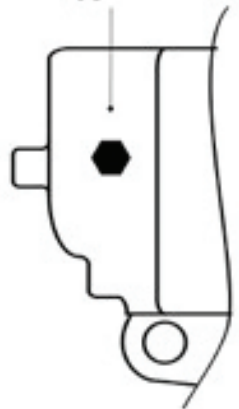
The Sheppard™-type relief valve has a 1½-in. hex with a raised 'hood' in the center of the relief valve.

The ZF™ TRW™-type relief valve has a 7⁄8-in. hex head. The ZF TRW-type relief valve looks similar to the steel plugs used in a four line gear without an auxiliary assist gear. These auxiliary port plugs are a 5⁄8-in. hex head.

Sheppard type relief valve



TRW type relief valve



INPUT SHAFT CONFIGURATIONS

The input shaft configuration is different for many gear part numbers. Determining which input shaft configuration your gear is equipped with is yet another useful method to identify the gear part number.

There are three (3) types of input shaft configurations. Each is available with a 0.812-in. input shaft diameter or a 1.00-in. input shaft diameter.

It is important to have the correct input shaft configuration, ensuring proper and secure connection with the input shaft coupling from the steering column.

Notch

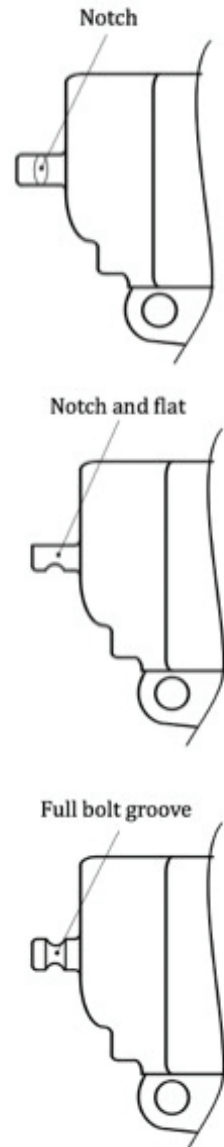
The least common input shaft configuration is the bolt notch. In this design, the splined input shaft has a semi-circular notch broached out of the input shaft for the input coupling bolt.

Notch and flat

The most common input shaft configuration is the notch and flat. In this design, the splined input shaft has a semi-circular notch broached out of the input shaft for the input coupling bolt and the entire length of the input shaft is milled, creating a flat surface.

Full bolt groove

This input shaft configuration (primarily used on Mack® and Volvo® applications) has a bolt groove turned around the entire diameter of the input shaft.



BENDIX TECH TEAM

The Bendix Tech Team – a team of seasoned professionals – is available to assist you with troubleshooting potential issues such as hard steering, loss of assist, or external leaking.

Representatives are available to assist you Monday - Thursday from 8:00 a.m. - 6:00 p.m. ET and Friday from 8:00 a.m. - 5:00 p.m. ET. Call us at 1-800-AIR-BRAKE (1-800-247-2725), option 2. You can also email the Tech Team at techteam@bendix.com.

The troubleshooting section of this document includes information and a step-by-step process to follow when you experience a power steering performance issue.

Before reaching out to the Tech Team, compile the following information:

- Make, model, and vehicle year
- Bendix remanufactured part number purchased



TROUBLESHOOTING GUIDE

BINDING, DARTING, AND OVERSTEER

Problem description:

- A binding condition is when increased steering efforts are required intermittently and/or unexpectedly
- Binding – or darting – is a condition when there is suddenly more steering assist than expected

Checklist:

- Verify there is no binding condition on the input side of the gear (at the i-shaft, u-joint, or firewall boot)
- Verify there is no gear-to-frame interference
- Verify there is no binding at the king pins/steer axle linkage

Do you feel intermittent binding at the steering wheel? If your answer is yes, consider the following:

POTENTIAL CAUSE(S)	VERIFICATION OR ACTION	RESULT	REMEDY
Binding condition exists at a specific point of each wheel revolution	Position the steering wheel at the location where binding is fel. Look for an interference throughout the steering linkage connections	Interference condition is observed	Repair or replace interfering components
		No interference observed	Investigate the next potential cause
Multiple u-joints	Verify the multiple u-joints are properly phased and aligned	Timing marks are not aligned	Realign assembly
		Timing marks for slip mechanisms are aligned	Investigate the next potential cause
	Verify multiple u-joints are properly lubricated	Lubrication is found to be inadequate	Lubricate u-joints to original manufacturer's guidelines
		U-joints are lubricated to the original manufacturer's recommendations	Investigate the next potential cause

BINDING, DARTING, AND OVERSTEER (CONTINUED)

Do you feel intermittent binding at the steering wheel? If your answer is no, consider the following:

POTENTIAL CAUSE(S)	VERIFICATION OR ACTION	RESULT	REMEDY
Vehicle alignment	Check the alignment of the steered axle and rear drive axle	Alignment is correct and condition persists	Investigate the next potential cause
Steer axle wheel bearing adjustment	Verify the adjustment is made to the original manufacturer's specification	Adjustment is correct and condition persists	Investigate the next potential cause
Caster and toe on the front axle	Check caster and toe on the front axle	Adjustment is correct and condition persists	Investigate the next potential cause
Multiple u-joints	Perform the power steering pump test as described in the manufacturer's service manual. Verify the multiple u-joints are properly phased and aligned.	Pass	Investigate the next potential cause
		Fail	Repair or replace the power steering pump
	Perform the power steering pump flow response test as described in the manufacturer's service manual	Pass	Investigate the next potential cause
		Fail	Repair or replace the power steering pump

DIRECTIONAL PULL

Problem description:

- Vehicle tends to pull to the right or left
- To keep the truck going straight, a continual effort or force is required

Do you experience directional pull under braking or accelerating conditions?

If your answer is yes, consider the following:

POTENTIAL CAUSE(S)	VERIFICATION OR ACTION	RESULT	REMEDY
Unequal braking force	Inspect braking surfaces for oil/grease or other contamination and the overall condition of surfaces. Perform brake balance test.	Surfaces appear worn and/or are contaminated	Adjust brakes, replace brakes, or diagnose improper brake balance (refer to BW1555, Air Pressure Balance and Threshold Pressure Tests, on B2Bendix.com)

Checklist:

- Verify proper tire inflation
- Verify alignment of steer axle and rear drive axles
- Verify wheel bearings are adjusted to original manufacturer's guideline
- Air suspension adjustment is consistent with the original manufacturer's guideline
- Swap steer tires and look for mismatched belt tread
- Verify the vehicle is not overloaded

POTENTIAL CAUSE(S)	VERIFICATION OR ACTION	RESULT	REMEDY
Unbalanced gear	Complete the original manufacturer's gear imbalance test procedure	Pass	Investigate the next potential cause
		Fail	Replace the steering gear
Power steering pump	Perform the power steering pump test as described in the manufacturer's service manual	Pass	Call the Bendix Tech Team at 1-800-AIR-BRAKE (1-800-247-2725)
		Fail	Repair or replace the power steering pump

EXTERNAL LEAKAGE

Do you experience external leakage in one direction? If your answer is yes, consider the following:

Correct and verify the problem causing the leak

If your answer is no, consider the following:

Check the following components and conditions:

Fittings	<ul style="list-style-type: none"> • Loose • Defective • Overtightened • Damaged sealing surface • Mismatched fitting/hose connection • O-ring fitting hardened
Hoses	<ul style="list-style-type: none"> • Clamps loose • Heat or age cracked • Twisting, abrasion, or wear • Misassembled end • Loose fitting connection • Wet or signs of weeping
Pump/reservoir/cooler	<ul style="list-style-type: none"> • Broken or cracked brackets, filler tops, dipstick • Plugged vent hole in filler cap • Improper oil level in reservoir • Foaming due to improper filter element installation • Drive shaft seal • Cooler
Steering gear	<ul style="list-style-type: none"> • Poppet screw or sealing nut loose • Input/output shaft seals • Valve housing sealing areas • Side cover seal vent plug, bolts, cover gasket • Porosity in housing cover or valve housing

HARD STEERING

Problem description:

- The truck is difficult to steer
- Excessive effort is required to turn the wheels
- Power assist is lost or limited

Checklist:

- Verify correct level of power steering fluid is in the reservoir
- Verify tire pressure values are correct
- Verify fifth wheel properly greased
- Confirm that vehicle is not overloaded

Does the loss of assist or increased effort occur in one or both directions? If your answer is one direction only, consider the following:

POTENTIAL CAUSE(S)	VERIFICATION OR ACTION	RESULT	REMEDY
Air is trapped in power steering system	Bleed the power steering system following the manufacturer's service procedure	Air was found in the power steering system	Bleeding the power steering system corrected the loss of assist in one direction
		Air is not present in the system and the problem still exists	The gear has an internal leak. Replace the steering gear

HARD STEERING (CONTINUED)

Does the loss of assist or increased effort occur in one or both directions? If your answer is both directions, consider the following:

POTENTIAL CAUSE(S)	VERIFICATION OR ACTION	RESULT	REMEDY
I-shaft binding condition	Follow manufacturer's service procedure on i-shaft binding	Binding condition exists with the slip column and/or i-shaft	Replace i-shaft
		No binding condition exists	Investigate the next potential cause
High operating temperatures (burnt oil)	Complete the manufacturer's service procedure for restricted hydraulic lines	Pass	Investigate the next potential cause
		Fail	Replace restricted lines and inspect remaining lines for damage
Power steering pump	Perform the power steering pump test as described in the manufacturer's service manual	Pass	Investigate the next potential cause
		Fail	Repair or replace the power steering pump
	Perform the power steering pump flow response test as described in the manufacturer's service manual	Pass	Investigate the next potential cause
		Fail	Repair or replace the power steering pump

NON – RECOVERY

Problem description:

- In recovering from a turn, the wheels do not return to straight ahead

Checklist:

- Verify tire pressure values
- Verify the fifth wheel is properly greased
- Verify vehicle alignment
- Verify caster angle

POTENTIAL CAUSE(S)	VERIFICATION OR ACTION	RESULT	REMEDY
Binding in steer axle linkage	Follow the original manufacturer's procedure to inspect for steer axle and linkage binding	Tire does not self return to near straight ahead position	Problem likely exists in the king pin bushings/ bearings or linkage
		Tire self returns to near straight ahead position	Investigate the next potential cause
Gear/column binding	Follow the original manufacturer's procedure to inspect steering column linkage for binding	Binding is NOT isolated to the gear or column	Problem likely exists in the column, driveline, slip joint, u-joint, or firewall boot interference
		Binding is isolated to the steering gear	Investigate the next potential cause
Interference between the steering gear and frame	Follow the original equipment manufacturer's procedure to inspect and/or correct interference between the gear and frame	Interference condition exists	Repair, replace or relocate affected components. Correct surface flatness problem
		No interference condition exists	Investigate the next potential cause

NON – RECOVERY (CONTINUED)

POTENTIAL CAUSE(S)	VERIFICATION OR ACTION	RESULT	REMEDY
Steering too tight	Check and adjust according to the appropriate service manual for your steering gear	Non-recovery condition is resolved	
		Non-recovery condition persists	Investigate the next potential cause
Power steering pump	Perform the power steering pump test as described in the manufacturer's service manual	Pass	Call the Bendix Tech Team at 1-800-AIR-BRAKE (1-800-247-2725)
		Fail	Repair or replace the power steering pump
Restricted lines	Complete the manufacturer's service procedure for restricted hydraulic lines	Pass	Call the Bendix Tech Team at 1-800-AIR-BRAKE (1-800-247-2725)
		Fail	Replace restricted lines and inspect remaining lines for damage

REDUCED WHEELCUT

Problem description:

- Turning radius is too big
- Restricted wheelcut
- Wheel does not turn enough times lock to lock

Checklist:

- Axle stops set to manufacturer's specifications

POTENTIAL CAUSE(S)	VERIFICATION OR ACTION	RESULT	REMEDY
Pitman arm/output shaft alignment	Follow the original manufacturer's service procedure to check the pitman arm / output shaft alignment	Timing marks are not aligned	Reinstall pitman arm to output shaft with the timing mark properly aligned
		Timing marks are properly aligned	Investigate the next potential cause
Poppet settings	Complete the original manufacturer's procedure to verify correct poppet or plunger settings	Poppet or plunger settings were incorrect	Completing this procedure has correctly set poppets or plungers
		Poppets or plungers are set correctly and the problem persists	Investigate the next potential cause
Misadjusted drag link	Follow the original manufacturer's service procedure to set the drag link to the correct length	Reduced wheelcut problem persists	Call the Bendix Tech Team at 1-800-AIR-BRAKE (1-800-247-2725)
		Problem resolved	

ROAD WANDER OR LOOSE STEERING

Problem description:

- There is lash or play in the steering wheel
- The steering system continually requires correction at the wheel to keep the vehicle from wandering

Checklist:

- Verify alignment of steer axle and rear drive axles
- Swap steer tires and look for mismatched belt tread
- Verify fifth wheel properly greased
- Verify this condition is not occurring at low vehicle speeds while accelerating due to deflection from high engine torque throughout the steering system and linkage
- Verify soft or loosely supported rear suspensions are not allowing the rear driving axles to become non-square with the centerline of the chassis (rear steer condition)

POTENTIAL CAUSE(S)	VERIFICATION OR ACTION	RESULT	REMEDY
Steer axle wheel bearing adjustment	Verify the adjustment is made to the original manufacturer's specification	Adjustment is correct and condition persists	Investigate the next potential cause
Low torque on steering gear mounting bolts	Torque mounting bolts to original manufacturer's specification	Bolts torqued to specification	Problem resolved
		Bolts torqued, condition continues to exist	Investigate the next potential cause
Looseness in mechanical system	Complete the original manufacturer's service procedure for lash in steering system	Looseness found at a different connection point in the steering system (i.e., lug nuts, steering wheel to column, etc)	Repair or replace loose components
		All connection points within the steering system are tightened to the manufacturer's specification	Call the Bendix Tech Team at 1-800-AIR-BRAKE (1-800-247-2725)

SHIMMY

Problem description:

- A severe shake or shimmy condition is noticeable at the steering wheel

Checklist:

- Verify the rear driving axles are remaining square with the centerline of the chassis during load shift or trailer roll

POTENTIAL CAUSE(S)	VERIFICATION OR ACTION	RESULT	REMEDY
Looseness in mechanical system	Complete the original manufacturer's service procedure for lash in the steering system	Looseness found at a different connection point in the steering system (i.e., lug nuts, steering wheel to column, etc.)	Repair or replace loose components
		All connection points within the steering system are tightened to the manufacturer's specification	Call the Bendix Tech Team at 1-800-AIR-BRAKE (1-800-247-2725)
Air is trapped in the power steering system	Bleed the power steering system following the manufacturer's service procedure	Air was found in the power steering system	Bleeding the power steering system eliminated the steering wheel kick
		Air is not present in the system and the problem still exists	Investigate the next potential cause

STEERING WHEEL KICK

Problem description:

The steering wheel reacts to or is overly sensitive to bumps in the road

POTENTIAL CAUSE(S)	VERIFICATION OR ACTION	RESULT	REMEDY
Air is trapped in the power steering system	Bleed the power steering system following the manufacturer's service procedure	Air was found in the power steering system	Bleeding the power steering system eliminated the steering wheel kick
		Air is not present in the system and the problem still exists	Investigate the next potential cause
Looseness in the mechanical system	Complete the original manufacturer's service procedure for lash in the steering system	Looseness found at a different connection point in the steering system (i.e., lug nuts, steering wheel to column, etc.)	Repair or replace loose components
		All connection points within the steering system are tightened to the manufacturer's specification	Investigate the next potential cause
Shock absorbers	Reference TMC document RP643, Section 1. "Shock Absorbers"		
Power steering pump	Perform the power steering pump test as described in the manufacturer's service manual	Pass	Investigate the next potential cause
		Fail	Repair or replace the power steering pump
	Perform the power steering pump flow response test as described in the manufacturer's service manual	Pass	Investigate the next potential cause
		Fail	Repair or replace the power steering pump

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