

## II. Checking and Reconditioning

In the below table the most important hypoid rear axle specifications are given. It is understood that the tread is measured with rear axle tubes in horizontal position.

Tread mm (in.)	Teeth	Number of teeth of bevel ring gear	Ratio	Oil capacity liters	Length of rear axle tube mm (in.)	Length and teeth of rear axle shaft mm (in.)
1,435 (41.06)	Gleason hypoid	9 : 40	44.4 : 1	2.6 (0.68 US gal 0.57 Imp. gal)	574 (22.60)	626 (24.65) 26 x 30

### Rear Axle Housing:

In general it will not be necessary to check the bores in the rear axle housing and their angular relation to each other.

If the bronze bushings in which the rear axle tubes are supported are worn, they must be replaced. If, however, the bore for the bronze bushings in the rear axle housing is worn or if a bearing cap has been damaged through unskilled handling, the bores must be reworked with milling attachment 191 589 01 61. As a rule a milling cutter having a diameter of 45 mm (1.77") will suffice after the worn-out bores in the bearing cap have been reworked or the cap has been replaced. For special cases oversize milling cutters with a diameter of 45.25 mm (1.78") and 45.5 mm (1.79"), resp. are available. After the bores have been reworked, ream them to the specified tolerance. Depending on the size of bore, standard or oversize bushings are to be installed. Make sure that the bushings are firmly seated in the housing (overlap approx. 0.02 mm = 0.0008").

### Dimensions and Tolerances of Rear Axle Tube Support in mm (in.)

	Bore in housing	Dia. of bushing
Standard	45.000 (1.77165)	45.037 (1.77311)
	45.016 (1.77228)	45.026 (1.77267)
1st oversize	45.250 (1.78149)	45.287 (1.78294)
	45.266 (1.78212)	45.276 (1.78251)
2nd oversize	45.500 (1.79133)	45.537 (1.79279)
	45.516 (1.79196)	45.526 (1.79235)

### How to Use the Milling Attachment:

15. Insert guide sleeve with 4 mm (0.16") long lugs into the rear axle housing. The key must point towards the outside.

**Note:** If the bore is to be milled without removing the differential gear, place cover plate of attachment 191 589 01 61 on the taper bearing (metal chips!).

16. Install bearing cap and tighten with the four nuts. Check correct seat of cap and make sure that the machining allowance in the bore suffices (0.2 to 0.3 mm = 0.08 to 0.12"). If necessary, rework the mating surface of the bearing cap.

17. Screw clamp so on milling attachment that it arrests the guide piece in the housing. Do not tighten the clamp excessively or the guide sleeve will be distorted. The key guide sleeve must engage the groove in the clamp (Fig. H 3/17).

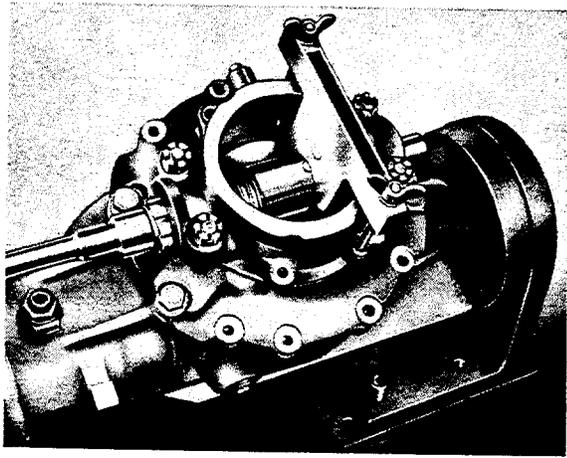


Fig. H 3/17

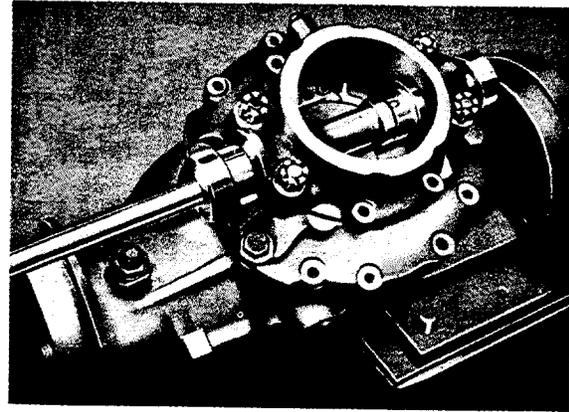


Fig. H 3/19

18. Insert shaft with milling cutter into the bore and run it through under light pressure with the aid of a socket wrench or a drilling machine turning at low speed. Mill the other bore in the same way. Finish the bore with a reamer to finished size and check with an internal gauge or plug. When reconditioning the bore to 1st or 2nd oversize use a bronze bushing whose diameter is larger by 1 mm (0.04") and has to be re-turned to the size specified in the table on page H 3/5.
19. The two inner end faces of the bore must be perfectly flush. If this is not the case, equalize them with attachment 191 589 02 61 (Fig. H 3/29).

20. Select the collar bushings so that practically no end play is present.

In installed condition the rear axle tube should just fall after it has been lifted.

If the collar thickness is not specified, spare bushings will be supplied with 4 mm (0.16") thick collar (standard thickness 3 mm = 0.12"). The collar must then be re-turned to the required size. The collar thickness should be the same at front and rear end.

Coat the bronze bushings with a sealing compound before assembling the cover. This is to ensure that no oil will escape between bushing and cap or housing, resp.

### Ball Bearings:

In general ball or roller bearings may be reused when the running grooves or surfaces as well as the balls or rollers, resp. are free from visible wear or defects. Before examining the bearings, clean them in gasoline or Tri until they are completely free from contaminations. A bearing is perfectly clean if it does not bind at any point when rotated in one's hand.

To check for quiet operation, provide the absolutely clean bearing with a few drops of engine or transmission oil. Note that bearings which have been used for a short period are much noisier than new bearings without, however, being unserviceable.

Under normal operating conditions the side play of anti-friction bearings should increase only slightly in the course of time. How long a bearing can be used depends on its service life. The average life expectancy of a normal anti-friction bearing is approx. 10,000 hours of operation. This means that part of the bearings will reach a substantially longer operating time without becoming defective.

In the case of a repair the bearings should be discarded after 100,000 km (65,000 miles), even if they seem fitted for reuse. The fact whether a bearing can be exchanged readily or only after extensive preliminary work will also be of importance in this respect.

To prevent that serviceable bearings are discarded the antifriction bearings should only be examined by an experienced person.

### Dimensions and Tolerances of Ball and Roller Bearings

in mm (in.)

Application	Designation	Inner dia.	Outer dia.	Side play	End play
Grooved collar bearing for rear axle shaft	183 981 00 25 Special bearing 6208 C 3 DIN 625	40.00 (1.58)	80.00 (3.15)	0.020–0.037 (0.0008– 0.0015)	approx. 0.20–0.37 (0.008–0.015)
Inclined bearing for bevel drive gear	3308 X DIN 628	40.00 (1.58)	90.00 (3.54)	—	approx. 0.005–0.020 (0.0002– 0.0008)
Cylinder bearing for bevel drive gear	000 981 06 01 WL 45 "NA"	45.00 (1.77)	85.00 (3.35)	0.030–0.045 (0.0012– 0.0018)	—
Bevel roller bearing for differential housing	30 210 DIN 720	50.00 (1.97)	90.00 (3.54)	adjustable	adjustable

As stated above, the grooved collar bearing of the rear axle shaft has in new condition an end play of **up to 0.37 mm (0.015")**. Keep this in mind when examining these bearings to avoid that bearings are exchanged which are still serviceable.

Use only bearings (special type 183 981 00 25) that have a distance from edges of  $2 + 0.7$  mm ( $0.08 + 0.028$ "), so that the bearing will fit snugly against the shoulder of the rear axle shaft (Fig. H 3/03).

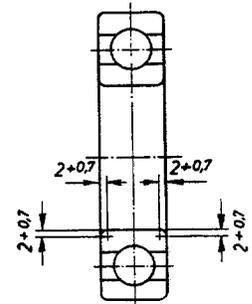


Fig. H 3/03

$2 + 0.7$  mm ( $0.08 + 0.028$ ")

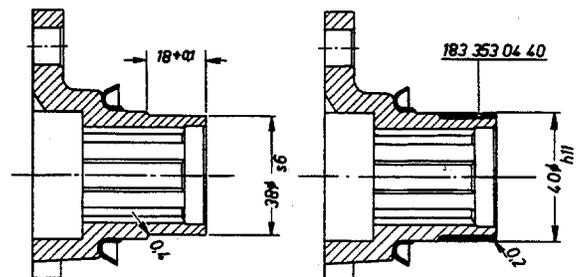
#### Bevel Drive Gear with Three-Arm Flange:

21. If a bevel drive gear is to be exchanged, it must always be replaced together with the ring gear. The out of true at the bearing seats must not be more than 0.005 mm (0.0002").

When checked at the outer radius, the lateral out of true at the three-arm flange must not exceed 0.03 mm (0.0012"), otherwise the flange must be displaced on the splines. If necessary, regrind or exchange the flange. If the sealing surface for the grease retainer on the three-arm flange has shrunk, the surface may be reworked up to 0.5 mm (0.02").

In the case of excessively shrunk sealing surfaces a sleeve is pressed on with an overlap of 0.02–0.06 mm (0.0008–0.0024"). After the sleeve has been pressed on, its outer diameter must be reworked to the

standard size (Fig. H 3/21). In either case, after reconditioning or after finishing the pressed-on sleeve, the sealing surface must again be provided with lefthand rifling (see Operation No. H 3, cf. 27).



18 + 0.1 mm (0.71 + 0.004")  
Dia. 38 s 6  
0.4 mm (0.016")

Dia. 40 h 11  
0.2 mm (0.008")

Fig. H 3/21

Dia. 38 s = 38.043 – 38.059 mm  
(1.49775 – 1.49838")

Dia. 40 h 11 = 39.840–40.000 mm  
(1.5685 – 1.5748")

## Differential:

22. Check bores for differential bevel gear bolt with a gauge plug (19 H 7 = 19.000–19.021 = 0.7480–0.7489"). See Fig. H 3/22. If the bolt is not seated tightly enough or if the

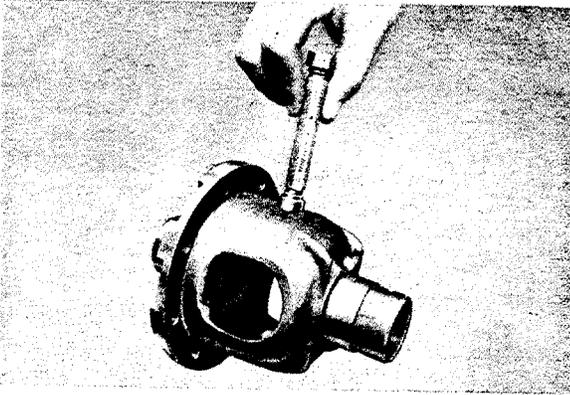


Fig. H 3/22

bores are damaged, the differential housing must be replaced. The same applies if the bevel bearing races have turned on their seats or do not fit tightly. The overlap between race and seat should be 0.02 mm (0.0008").

If the differential bevel gears cannot be easily rotated on the differential bolt or if they have seized, they must be replaced. The same applies to the differential bolt as well as the ball and contact washers.

23. If a new ring gear is to be installed, clean bore in ring gear and seat on housing carefully. Heat the ring gear to 60–80° C (140 to 175° F) and place it on the housing. Should the gear not fall into the bore, drive it in by tapping lightly with a rubber hammer. However, it must by all means be avoided that a chip develops. Use two suitable pilot pins to ensure that the bores in the housing coincide with the threaded holes in the ring gear (Fig. H 3/23).

First tighten the screws evenly with a socket wrench, then tighten them finally to 7–8 mkg (50.5–58 ft.lb.) with a torque wrench (Fig. H 3/23a).

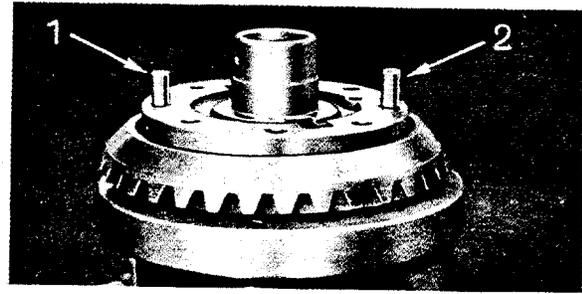


Fig. H 3/23

1 and 2 = Pilot pins

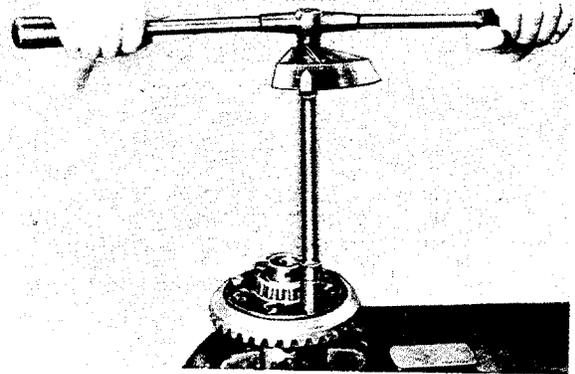


Fig. H 3/23a

## Spiders:

24. Check play of bushings located on fork journals. The journals with the contact surface for the bushing collar may be reground twice (see Fig. H 3/24 with table). However, this should only be done in exceptional cases. It is recommended to exchange the complete spider assemblies.

Very often it will suffice to lap the journals. The spider ring must by no means be reworked.

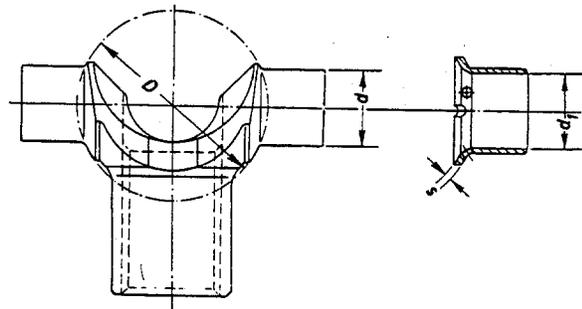


Fig. H 3/24

**Spider Dimensions and Tolerances  
in mm (in.)**

	D	d	d <sub>1</sub>	s
Standard size	57.97	22.993	23.030	2 + 0,02 (0.08 + 0.0008)
	57.94	22.980	23.043	
	(2.2823)	(0.90523)	(0.90669)	
	(2.2811)	(0.90472)	(0.90720)	
1st undersize	57.77	22.793	22.830	2.1 + 0.02 (0.083 + 0.0008)
	57.74	22.780	22.843	
	(2.2744)	(0.89736)	(0.89882)	
	(2.2732)	(0.89685)	(0.89933)	
2nd undersize	57.57	22.593	22.630	2.2 + 0.02 (0.087 + 0.0008)
	57.54	22.580	22.643	
	(2.2665)	(0.88948)	(0.89094)	
	(2.2653)	(0.88897)	(0.89145)	

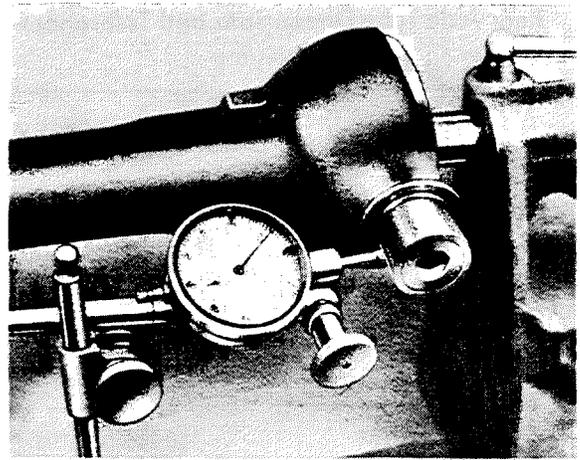


Fig. H 3/25b

Permissible deviation = 0.1 mm (0.004").  
If after straightening the deviation exceeds 0.1 mm (0.004"), the rear axle tube must be replaced.

Check the journals for cracks and replace the pressed-on bushings, if necessary.

For pressing the bushings on the rear axle tube journals see the below specifications.

**Rear Axle Tubes:**

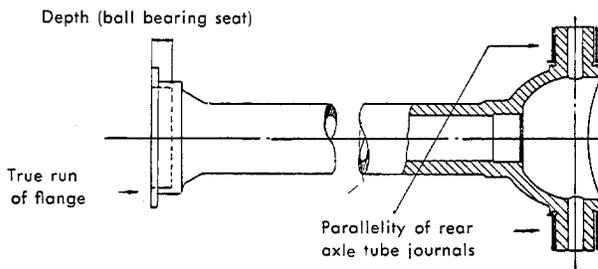


Fig. H 3/25

25. Check true run of flange for fastening the brake anchorage plate (Figs. H 3/25 and 25a).

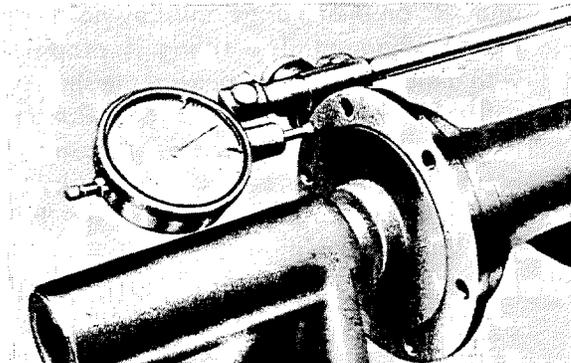


Fig. H 3/25a

If runout at outer rim of flange exceeds 0.1 mm (0.004"), the rear axle tube must be straightened.

Besides check the two rear axle tube journals for angular accuracy (Fig. H 3/25b).

Dimensions in mm (in.)

Selected size	Bore of bushing	Diameter of journal	Overlap
I white	33.000	33.026	0.018-0.034 (0.00071- 0.0013)
	33.008	33.034	
	(1.29921)	(1.30023)	
II blue	33.008	33.034	
	33.016	33.042	
	(1.29952)	(1.30055)	
	(1.29984)	(1.30086)	

Cracked tubes must be discarded.

The depth of the ball bearing seat must be re-turned by the same amount by which the side of the flange has been reworked. (See Fig. H 3/25.)

Check ball bearing seat by inserting a ball bearing. See that the outer race can be pressed in easily.

If the side play between ball bearing and rear axle tube bore is larger than 0.017 mm (0.00067"), the tube must be discarded.

## Rear Axle Tube Dimensions and Tolerances in mm (in.)

Dia. of rear axle tube journal	$\frac{37.95}{37.96}$ (1.4941)
Inner dia. of rear axle tube bushing	$\frac{38.009}{38.034}$ (1.49641)
Dia. of ball bearing bore	$\frac{79.985}{80.004}$ (3.14901)
Dia. of flange	$\frac{110.946}{111.000}$ (4.36794)
Depth of ball bearing seat	$\frac{17.7}{17.8}$ (0.6968)

Then check shaft for runout (Fig. H 3/26b); if necessary, straighten shaft and rework flange. Be careful not to alter the diameter of the brake drum recess ( $67.039$  to  $67.020$  mm =  $2.63933$ – $2.63858$ ").

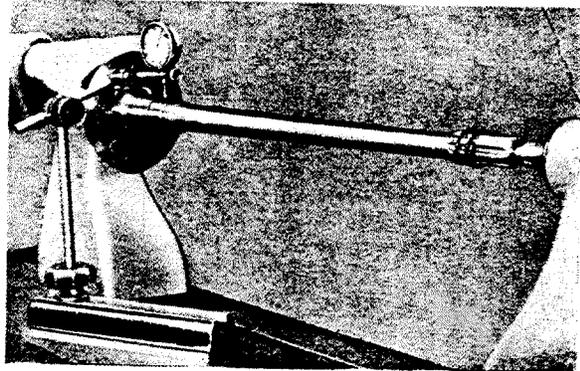


Fig. H 3/26b

### Rear Axle Shafts:

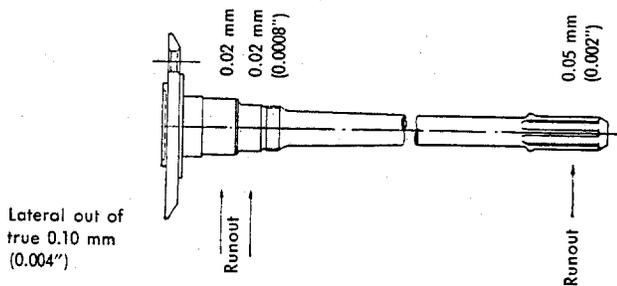


Fig. H 3/26

26. If the rear axle shaft centering hole has been damaged on account of unskilled handling, it must be reground on a center grinding machine (Fig. H 3/26a).

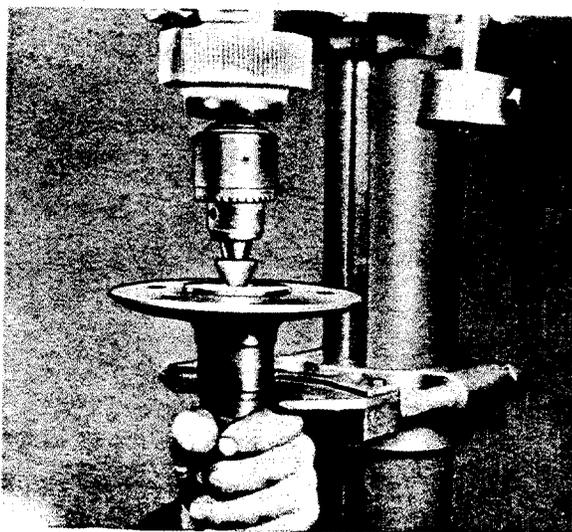


Fig. H 3/26a

27. Shrunk sealing surfaces must be reworked. The diameter must not be reduced by more than  $0.3$ – $0.5$  mm ( $0.012$  to  $0.02$ " ). If the shaft is shrunk more than this, the sealing surface can be brought to standard diameter by means of a shrink-on ring having a wall thickness of  $1$ – $1.5$  mm ( $0.04$ – $0.06$ " ).

After the sealing surface has been reconditioned or a ring has been installed, rifle the sealing surface again. Provide the left rear axle shaft with right-hand rifling and the right rear axle shaft with left-hand rifling. The shafts, which bear the marks "L" and "R" on their flange, must by no means be interchanged. The rifling is produced with a piece of wood which has the shape of a flat file and is lined with No. 80 emery cloth. Hold the tool under  $45^\circ$  approximately and file in the direction indicated by the arrow, that is towards the splined end (Figs. H 3/27 and H 3/27a).

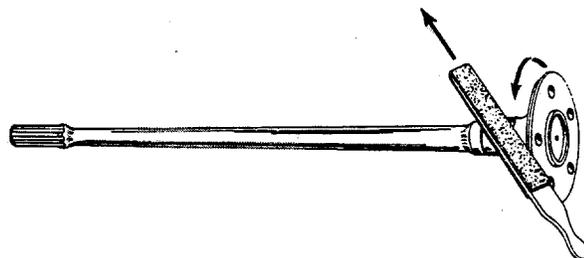


Fig. H 3/27

Left rear axle shaft with right-hand rifling

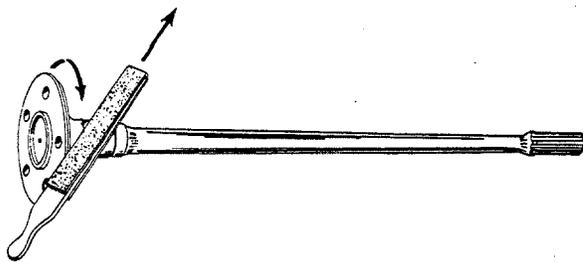


Fig. H 3/27a

Right rear axle shaft with left-hand rifling

In either case the shaft is to be rotated towards the operator. To pronounce the rifling, place a soft rubber pad of about 3 mm (0.12") thickness between the piece of wood and the emery cloth. Run the lathe at a speed of approx. 150 r.p.m.

Before the rifling is produced, clean the shaft thoroughly of oil etc. The rifling must be done vigorously and steadily (about 80 strokes per minute). The surface finish of the rifled section should be 0.003–0.006 mm (0.00012–0.00024"). The grooves must run parallel and must not be interrupted by transverse lines.

28. In the factory the wheel studs are upset at their seating face under great pressure.

After reworking the flange and pressing in the wheel studs, the studs should therefore be peened. Note that the studs must fit absolutely tight.

The ball bearing seat should have an overlap of 0.01–0.015 mm (0.0004–0.0006"). If these specifications are not met, the ball bearing seat may be re-turned and chrome plated.

Check the shaft for twist (give the spline profile your special attention).

It must be possible to move the spiders on the splines of the rear axle shaft easily, but without side play.

#### Rear Axle Dimensions and Tolerances in mm (in.)

Dia. of sliding surface for sealing ring	Ball bearing seat
<u>47.840 (1.88346)</u>	<u>40.002 (1.57488)</u>
48.000 (1.88976)	40.013 (1.57531)