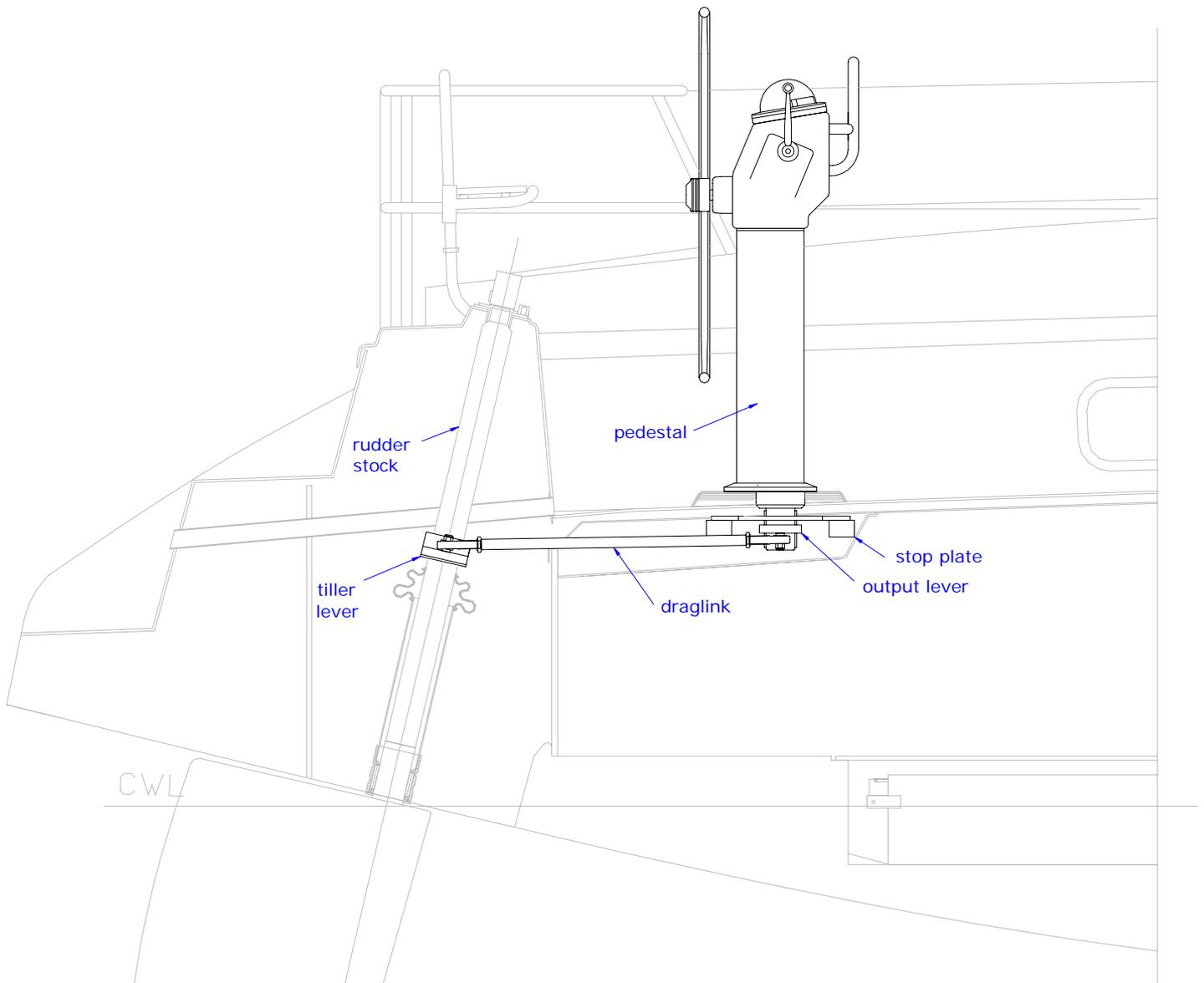




## RP200 & RP300 rack and pinion steering installation and maintenance guide



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CE Jefa RP200 & RP300 rack and pinion steering complies with ISO13929

## **Jefa RP200 & RP300 rack and pinion steering installation guide**

Your Jefa steering RP-system has been designed and manufactured to the highest standards to provide many years of trouble free service. To aid you with the installation we have prepared these simple guidelines, which are vital to follow if the systems full potential and reliability are to be achieved. The notes should be read carefully before installation is commenced. Should you encounter any problems not covered in these instructions or have any queries please contact Jefa Steering or your local Jefa agent who will be pleased to provide technical guidance.

### **Specification:**

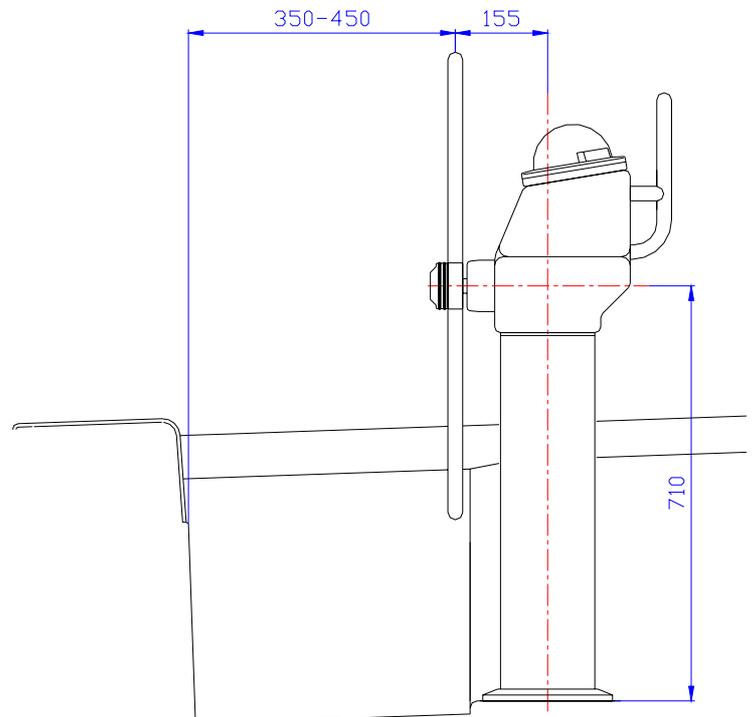
Jefa steering RP200 & RP300 pedestal specifications:  
Maximum turns lock to lock 1.8  
Standard output lever operating centres 130 mm.  
Standard tiller lever operating centres 200 mm.  
Rated output force 12503 N.  
Maximum rudder torque at amidships 255 Kgf.m/2500Nm  
Maximum rudder torque at full lock 464 Kgf.m/4550Nm

### **Installation – basic steps:**

Sight pedestal  
Reinforce cockpit floor if necessary  
Drill cockpit floor and fit pedestal  
Setting up the geometry  
Fit the tiller arm  
Fit rudder stops or stop plate  
Install draglink  
Test system

### **Sighting the pedestal**

The pedestal should be installed in a position where there is adequate space to fully control the craft at all times whilst providing sufficient shelter for the helmsman to brace himself in severe sea conditions. Care should be taken to ensure that it will not obstruct members of the crew from operating bilge pumps, sheet winches and cockpit locker lids, etc. Alternatively these items may require repositioning. Where the pedestal is situated near the mainsheet a guard should always be fitted to help prevent the sheet snagging the pedestal in an inadvertent gybe. The optimum position for mounting the pedestal relative to a helmsman's seat is shown in the right figure. Next check that there is sufficient clearance below the cockpit floor to allow the output lever to move freely and for the draglink to operate. The draglink should operate horizontally  $\pm 5^\circ$  and the rudder stock should next be examined to ensure that the tiller arm can be fitted at the correct height.

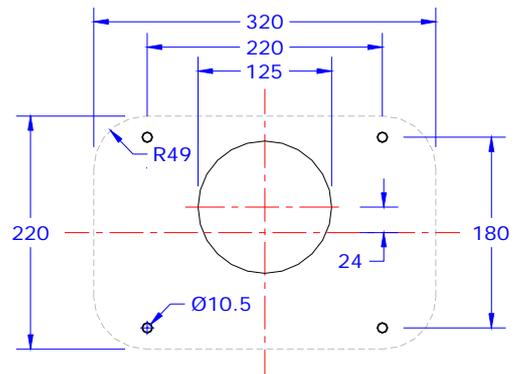


### **Reinforcement of the cockpit floor**

The cockpit sole must be sufficient rigid to withstand the steering loads or the force of the helmsman thrown onto the wheel in severe sea conditions without deflecting significantly. As a guideline for GRP boats, the cockpit floor should have a total thickness of at least 40 mm.

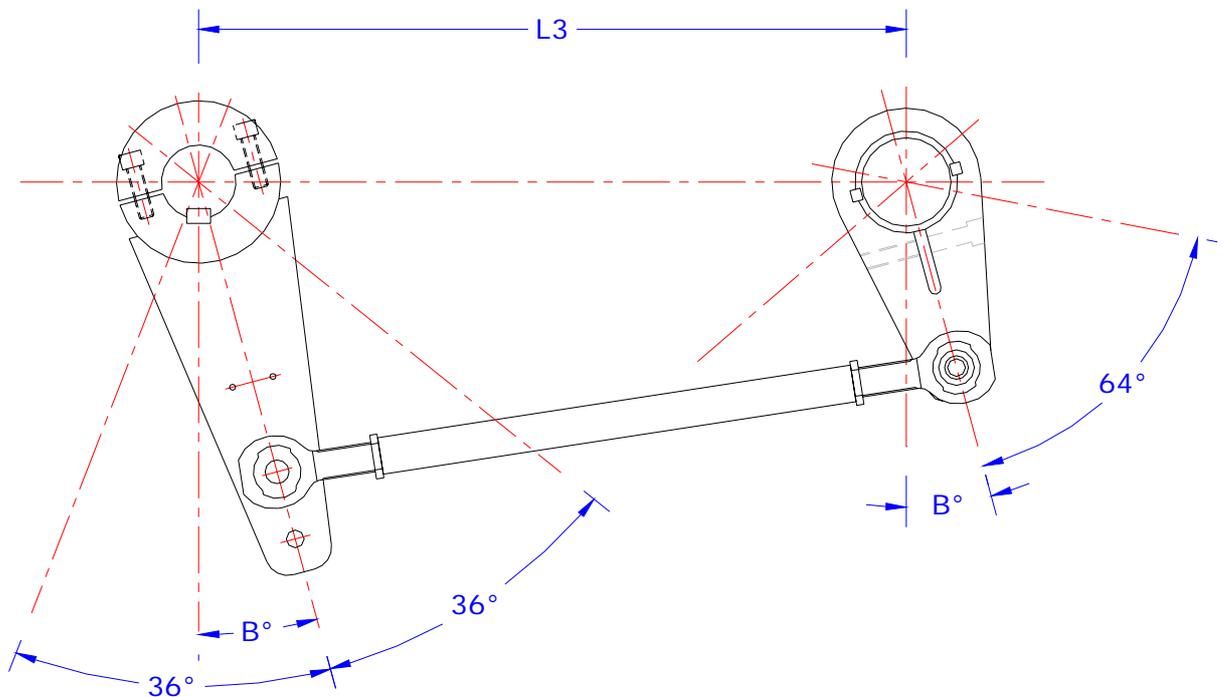
**Drilling of the cockpit floor and the fitting of the pedestal**

After finding the correct pedestal position in the cockpit the cockpit floor can be drilled according to the right figure. The holes for the mounting bolts should be drilled to 10.5 mm. Remove the output lever from the down shaft. Put the pedestal on place and attach the wheel. Carefully measure to both ship centrelines if the pedestal is positioned correctly. Use a sealant to seal off the pedestal.



**Setting up the geometry**

Before commencing to fit the output lever and tiller arm it is important to understand about the offset angles used with the rack and pinion system. The rack and pinion systems uses a principal known as “wide angle geometry” which gives very direct steering near amidships and an increasing mechanical advantage as the rudder approaches full travel. This results in the most direct, positive system available to a helmsman. To accomplish this effect the pedestal output lever is shorter than the tiller lever in a ratio of 1.54:1. At amidships therefore the tiller arm and output lever are not pointing 90 degrees sideways, but instead are angled slightly forward. This offset angle is known as B° and varies dependent on the distance between the pedestal and the rudderstock. The shorter the distance the greater the offset angle B.



In the table below we show the pedestal to rudder stock distance L3 and the corresponding offset angle B°. If you have instructed us to finish bore and key the tiller arm we will have checked the distance L3 and cut the key-way in the tiller arm to the correct offset angle.

L3 mm (distance between pedestal centre and rudder stock)	B° (lever offset angle forward)
less than 200 mm	refer to factory-custom
200-275	25°
276-350	20°
351-450	15°
451-550	12°
551-650	10°
651-1000	8°
1000->	5°

Please note the above assumes the pedestal is mounted forward of the rudder stock. If the pedestal is mounted behind the rudder stock the same offset angles apply but the levers are offset aft. (a good reminder is the fact that the levers, with the rudder amidships, will always point away from the rudder shaft in the pedestal direction)

### Fitting the tiller arm

The tiller arm should always have a perfect fit to the rudder shaft. Between the two till arm parts there should always be a gap to make sure the tiller arm can be clamped. The tiller arm should be slid in vertical direction to achieve the best possible horizontal run of the draglink. The angle of the draglink should not exceed 5° to the horizon.

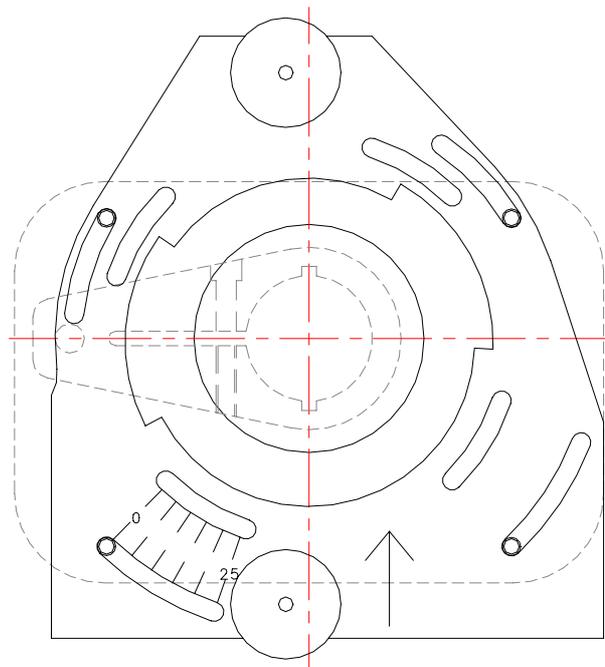
The tiller arm should be firmly locked for rotation around the rudder shaft. **Never** use just clamping to achieve this rotation locking. The best rotational locking is achieved by a keyway in the shaft and lever combined with a stainless steel key. The keyway in the shaft should be machined 90° starboard (or port, depending on the lever positions) The keyway in the tiller lever should be machined in the offset angle B. The torque for the 4 mounting bolts of the tiller lever is 45 Nm. Tubular rudder stocks and carbon rudder stocks should use a through bolt to achieve a proper rotational locking.

### Fitting rudder stops or stop plate

The Jefa rack and pinion system should always be delivered with the stop plate. The stop plate will prevent the output lever from going over the dead point. If this happens, the yacht will not be able to steer any more with all due consequences. The stop plate will prevent the steering pedestal from damage, but when no rudder stops are fitted, all forces will have to go through the draglink and in the prevent of a collision, the draglink could get damaged. Fitting rudder stops in combination with the stop plate will protect both the pedestal and the rudder.

On a starboard run installation, the stop plate should be fitted with the text and arrow pointing downwards (readable). On port run installations, the text has to mark over to the other side with a marker pen and the two stop blocks should be positioned in the opposite side of the tap holes. The arrow on the stop plate should always point away from the rudder shaft. Normally this will be the bow of the yacht. When the rudder stock is in front of the pedestal, the arrow has to point aft. Look in the above table to find the appropriate offset angle for the installation. Rotate the stop plate so the mounting bolt matches the angle of the table. Firmly tighten the mounting bolts so the stop plate will not rotate under load. Put the output lever in the correct offset angle and height. A help is to put a straight bar against the stop blocks and put the output lever 90 degrees to the bar. Now tighten the friction brake in the pedestal so the output lever stays in this position. Slide the output lever upwards as far as possible with 5 mm clearance between the mounting nuts and the top of the output lever. This will make sure the output lever hits the stop blocks properly and will not slide over.

View of RP stop plate from inside the ship looking up to the pedestal with the lever mounted on starboard.



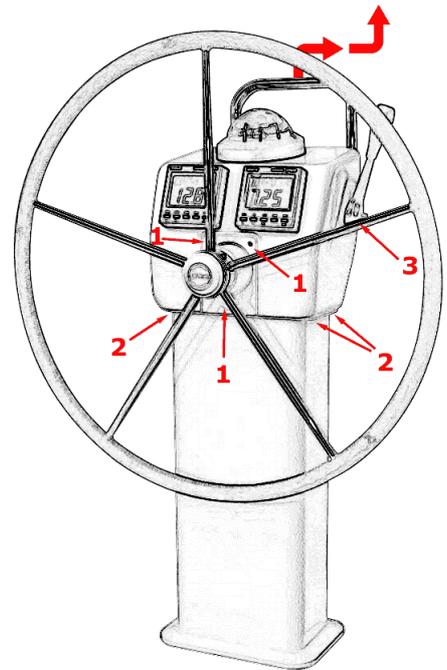
### Fitting the draglink.

Make sure the rudder is in the exact amidships position and lock it. Carefully measure the distance between the two pin centres. Rotate the rose joints of the draglink to achieve the correct length and lock them with the locking nut. Slide both sides over the pin and tighten the lever bolts correctly.

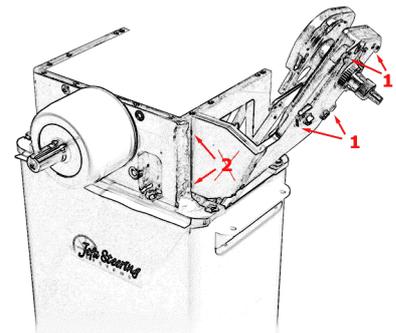
### **Fitting the engine control mechanism (optional)**

The Jefa RP200 & RP300 system can be fitted with an optional TFX engine control mechanism. To access the engine control, the head of the pedestal has to be dismantled. This should be done with care as the GRP of the head could be damaged when dismantled on the wrong way. Remove the head as follows:

- Remove the three bolts holding the front cover (position 1) and pull the front cover forward.
- Remove the four bolts that attach the head to the pedestal (position 2).
- Remove the 2 set screws in the bottom of the mechanism handle (position 3) and pull the mechanism handle off.
- Make sure the steering is in the amidships position as the gear quadrant could block the head from moving upwards.
- Lift up the head a few centimetres and tilt the top towards the mechanism shaft. As soon as the shaft disappears in the head carefully continue to pull upwards.



For the ease of mounting the engine control cables (not included), dismantle the mechanism by unscrewing it from the bracket (position 1). Do not remove the bracket from the pedestal (position 2) as this bracket is carefully positioned relative to the head and it will be difficult to find the correct position again. Follow the instructions in the accompanying TFX installation manual. Reinstall the mechanism with the attached cables back in the mounting bracket and tighten bolts 1 again. Mount the GRP head in reverse order: First make sure the steering is in the amidships position. Then tilt the head a bit and put the mechanism shaft back through the hole in the side of the head. Carefully put the head back on its end position, tighten bolts 2 (upper picture). Put the cover plate back in place and tighten bolts 1 (upper picture). Mount the Jefa stainless steel engine control handle. Make sure the handle reaches the end of the splined shaft. Carefully hit it with a rubber hammer if necessary. Tighten the 2 set screws at the bottom of the handle. Check in the machine room if both the throttle and gearbox levers reach the outer positions and if they are set up correctly in the neutral position. With the red push button one can disengage the gearbox and operate the throttle independently for starting up the engine.



### **Test the system**

Ask a colleague to slowly turn the wheel from lock to lock and check that:

- The tiller arm reaches the rudder stops (if fitted) just before or at the same time as the output lever hits the stop plate blocks.
- The draglink does not foul on the boat structure.
- The rose joints do not exceed their designed working angle and bind.
- The rudder has an equal rudder travel of 36 degrees both ways.

If the above points check out O.K. then ask a colleague to apply moderate load (20 Kg on the rim) with the tiller up against each rudder stop and check that the stops and the cockpit floor do not flex significantly.

The basic installation of the Jefa rack and pinion system is now complete.

We hope you enjoy your Jefa rack and pinion system – the finest system afloat!

## **Maintenance hints**

Your Jefa steering rack and pinion system has been designed and manufactured to the highest standards to provide many years of trouble free service. To get the best from your system there are some simple maintenance hints:

- At least twice a season thoroughly clean the pedestal in fresh water and apply a coat of good quality car wax polish.
- If any paint has accidentally chipped, immediately rub down the area using a fine grade of wet and dry abrasive and touch in with yacht enamel designed for aluminium surfaces. (RAL colour 9010).
- Periodically check that the pedestal bolts, output lever bolts, draglink bolts and the tiller lever bolts are securely fastened.
- Check that the system has proper rudder stops or a stop plate fitted.
- Depending on the time used, the delrin balls in the rose joints could wear. These balls are easy to replace by rotating them 90 degrees and pushing them out. Replacement balls are available with part number DLB16.

*This is version 1.3 of the Jefa steering rack and pinion installation and maintenance manual, updates may be available at our online web catalogue [www.jefa.com](http://www.jefa.com) in the maintenance section.*