Test data and installation instructions 100 KgM linear autopilot drive type LD100.

Test data:

Customer:_____ Test Engineer:_____

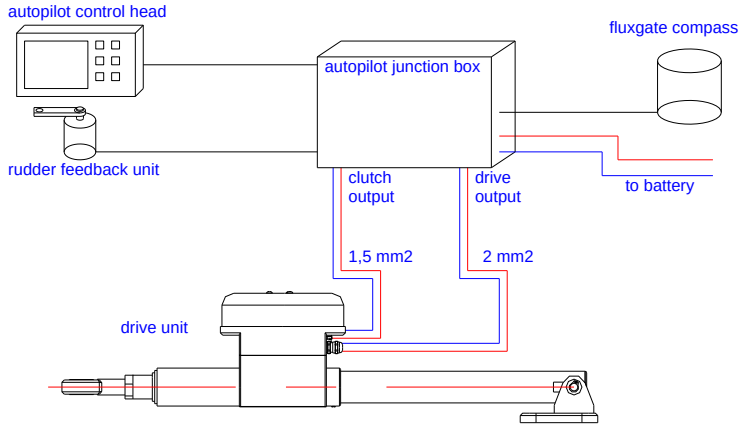
Date:_____ Serial number:_____

Output force 400 Kgs ☐

Motor voltage: 12 Volts ☐ Clutch voltage: 12 Volts ☐

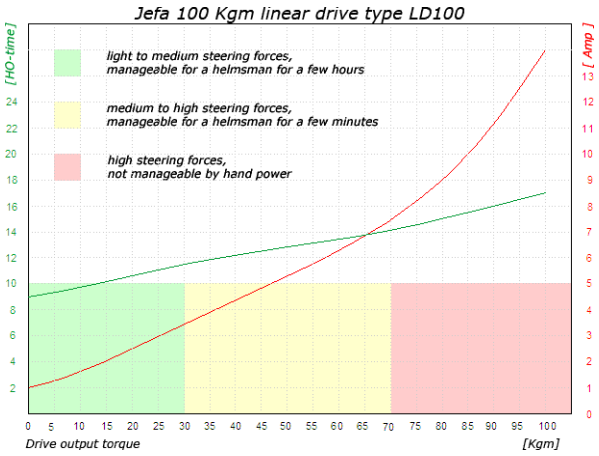
Insulation test: ☐

Electrical Connections:



This illustration shows the minimal components for a working autopilot configuration. Jefa autopilot drives work together with all mayor autopilot electronics. The connection of the Jefa autopilot drive to the autopilot junction box is quite simple. The two 1,5 mm² red and black wires must be connected to the plus and minus of the autopilot clutch line. This will make sure that when the autopilot user engages the autopilot on the control screen, the clutch will engage and allow the autopilot motor to drive the steering system. The two 2 mm² red and black wires must be connected to the autopilot drive output connection.

Performance table:



This performance table shows the relation between the consumed power and the output power and how quick this is done (hard over time). The red line shows the output torque against the needed amperage. The green line shows the hard over time (time to travel 72° of rudder travel) of the drive relative to the output torque. Also visible is the strength of the drive unit related to manpower. The unit is much stronger than a human being and can last much longer but one should note that when the unit is operated in the red zone, something is wrong with the trim of the boats and the sails should be adjusted to achieve lower rudder torques. The above table shows that the Jefa linear drive will steer the yacht even in the worst possible conditions. As the drive will mostly operate in the left green zone and will not continuously rotate, the average power consumption on 12 volts is 1 to 2 amps.

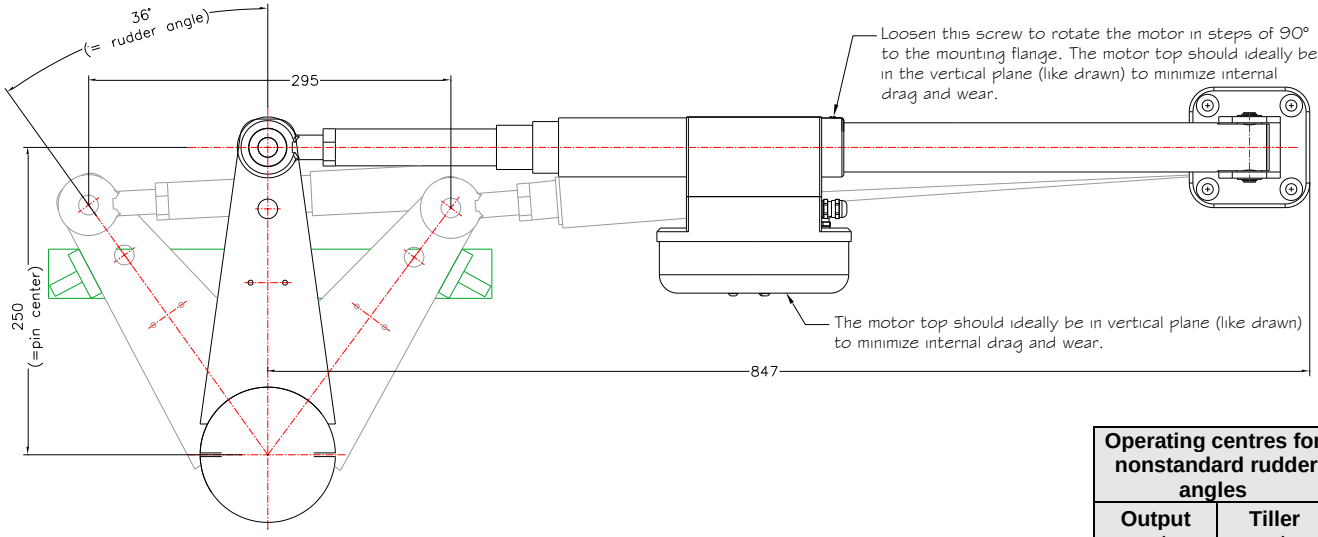
Compatibility in 12 Volts:

The following table shows the maximum rudder torque that can be generated by Jefa 100 Kgm linier drive-in combination with various autopilot junction boxes.

Autopilot junction box 12 Volt version.	Max. output (Amp.)	Rudder torque (KgM)
Garmin GHP12/GHC10 sailboat APS	40	100
Simrad AC12	12	100
Simrad AC40	40	100
Raymarine X-10 (*1)	10	100
Raymarine X-30	30	100
Nexus-Silva A-1510 (*2)	15	100
NKE gyropilot 2 RVP (*2)	25	100
Navman G-Pilot (*2)	20	100
Northstar MCU600 (*2)	20	100
Furuno Navpilot 500/511/520	25	100

*1: We strongly advise to not use the standard X10 autopilot as it delivered without rudder feedback unit. Without rudder feedback unit the autopilot is not aware of actual rudder angle. In very slow speed conditions or in conditions of a stalling rudder blade, the autopilot doesn't stop with powering the drive unit, running it against the rudder stops and continuing to power the drive. In time the drive fuse will blow, but mechanical damage can occur in the drive unit which will not be covered under our warranty terms as we can identify this specific damage. We strongly advise only to use the X10 unit in combination with the optional rudder feedback unit or use the X30 unit.
*2: Special arrangement needed for clutch operation. See separate manual on our FTP server ftp.jefa.com or visit the linear drive product page on www.jefa.com

Mechanical installation:



Operating centres for nonstandard rudder angles	
Output centre	**Tiller centre**
36°	250
38°	239
40°	229
42°	220
44°	212
46°	204
48°	198
50°	192

The above illustration shows the correct installation geometry of the linear drive. It's very important to check if correct rudder stops are fitted (shown in green) limiting the rudder travel to 2 x 36° (normal for wheel steered systems). The lack of correct rudder stops will cause the direct drive to act as travel limiter, resulting in damage to the internal gears. The linear drive has a maximum travel of 303 mm, so there is 4 mm of spare travel each side assuring a free run. It's advisable to mount the drive with the motor pointing sideways and not up or downwards (like in above illustration) as this position generates less friction and ware over time.
On most cable steered boats, the rudder travel is 2 x 40°, and on some tiller steered boats, the rudder angle is even bigger. Please revert to the table at the right for the correct pin centres in these cases. Please note that the maximum achievable rudder torque will be lower when shorter centres are used. For example: The maximum rudder torque for the 50° setup will be 192/250*100= 77 KgM instead of the 100 KgM with the 36° setup.

Test the system:

Before you can test the system, make sure following things are correct:

- Solid rudder stops should be fitted limiting the rudder travel to an equal travel of 36 degrees from midships to port and starboard. (PS. In the case of a larger rudder angle than 36°, the tiller centres of the linear drive should be adjusted accordingly to prevent the linear drive from acting as rudder stop)
- Make sure all bolted parts (tiller pins, rose joints, mounting plate bolts, tiller arm, etc) are firmly tightened and will not come loose even when exposed to heavy vibrations. Use loctite when necessary.
- No part of the drive unit should contact the vessel, the quadrant, or the tiller arm throughout the full range of movement.
- The drive unit should be mounted with the motor pointing sideways if possible. Mounting the drive unit with the motor pointing up or down may generate more friction, and therefore cause more wear over time.
- Make sure no (drip) water can reach the drive unit as it is NOT waterproof. When the drive is submerged or heavily splashed with water, immediately remove the drive unit, dry it and return it to our factory for overhaul. Continuing using the wet drive will jeopardise the functioning and it will be not repairable anymore. The IP rating code of the LD100 drive unit is 43. Please read more at this web link: http://en.wikipedia.org/wiki/IP_Code

Connect the electronics. Make sure the autopilot is set to “reversible drive” or equivalent. Don’t use settings like “solenoid” or “hydraulic drive” as these settings will disable the speed control of the autopilot leaving the drive running at 100% speed or 0%, but nothing in between. Make sure the clutch voltage is set to 12 volts. Some autopilots pulse the clutch and slowly drop to 6 Volts instead of a steady 12 volts. A contactor (relais) with a capacitor should be used. See the separate manual on our FTP server ftp.jefa.com or visit the linear drive product page on www.jefa.com for info on your specific autopilot electronics.

When the drive doesn’t react to the electronics, test the drive by bypassing the electronics: Connect a plus and minus wire to the battery or fuse box and first connect the clutch, one should hear a click when connecting and disconnecting. With the clutch under power, connect power for a short time to the motor cables. The system should get in motion now. Don’t connect the cables too long as the drive will try to continue, even when the rudder stops are reached, with potential damage to the structure and drive unit. If motion is detected, one can rule out the drive causing the malfunction.

Maintenance:

The linier drive is “greased for life”, so should not be opened. No maintenance is required except for periodic checks of all bolted connections. As the rudder system, the steering system and the autopilot drive is exposed to heavy vibrations (mainly when cruising by motor), all bolted connections should be yearly checked. The only parts that could wear in time are the balls of the drive. These balls are easy exchangeable and available for around 10 € each from any Jefa distributor.

Declaration of conformity:

I, Stig Jensen of Jefa Steering A/S, Agenavej 43, 2670 Greve, Denmark, confirm that the Jefa linier drive, when fitted in accordance with these installation instructions, will meet the requirements of the Electro Magnetic Compatibility Directive Standard contained within Standard No. 60945/A1.

Signed:…… Date: 08-05-2008

Stig Jensen

For more information please visit our website www.jefa.com