

**Test data:**

Customer: ..... Test Engineer: .....

Date: ..... Serial number: .....

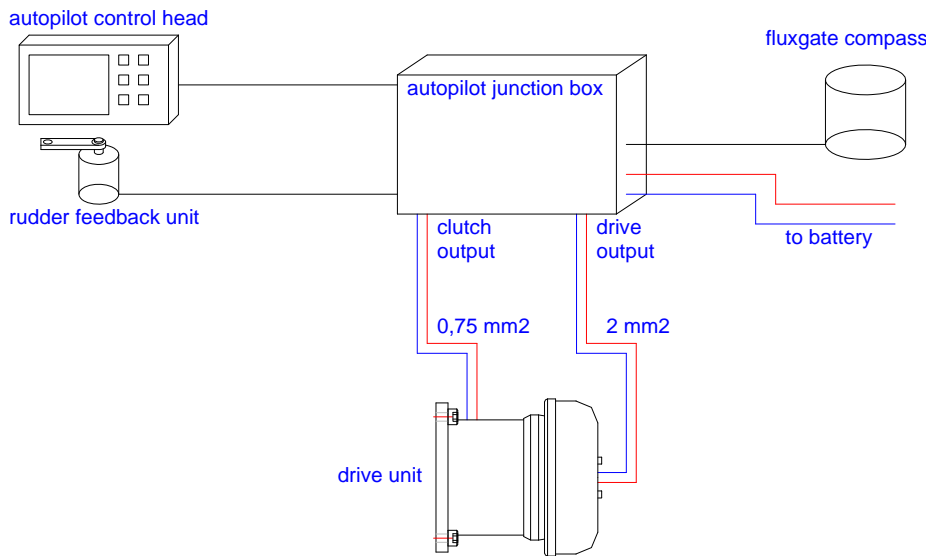
Output torque 200 Nm:  type DU-TS24-12 – 8 revolutions/minute

Motor Voltage: 12 Volts  type DU-TS18-12 – 6 revolutions/minute

Clutch voltage: 12 Volts  type DU-TS10-12 – 3.5 revolutions/minute

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 0.75 mm<sup>2</sup> red and black wires have to 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 mm<sup>2</sup> red and black wires have to be connected to the autopilot drive output connection.

**Performance table:** (in combination with the 1:7 reduction box RG10-70)

rudder torque full rudder (KgM)	rudder torque midships (KgM)	power usage (amps)	rudder rotation per second (degrees/sec.)	time for 72° rudder (sec)
0 (no load)	0	0.2	4.5	16
145	73	5	3.8	19
218	109	7.5	3.4	21
364	182	13	2.5	29
436	218	15	2.3	32
582	291	21	1.3	55

## Compatibility in 12 Volts:

Following table shows the maximum rudder torques at midships and full rudder that can be generated by the Jefa 200 Nm transmission drive in combination with various autopilot junction boxes and reduction gearboxes. As the transmission drive drives the steering system, the maximum rudder torque depends on the type of reduction box used in the system. The hard over time (HO-time) states the time it takes the drive to travel the full 72 degrees of rudder travel when the speed control of the pilot is set to maximum speed.

Autopilot junction box 12 Volt version.	Max. output (Amp.)	BRG10-50 & RG10-50 midships (KgM)	BRG10-50 & RG10-50 full rudder (KgM)	RG10-70 midships (KgM)	RG10-70 full rudder (KgM)	BRG10-67 midships (KgM)	BRG10-67 full rudder (KgM)
DU-TS24-12	8 revs/min	11 sec.		16 sec.		15 sec.	
DU-TS18-12	6 revs/min	14 sec.		21 sec.		20 sec.	
DU-TS10-12	3.5 r./min	24 sec.		36 sec.		34 sec.	
Simrad AC12	12	123	233	172	327	165	313
Simrad AC20	20	169	321	237	449	226	430
Simrad AC40	40	fully functional, but smaller autopilot is advisable (money can be saved by choosing smaller autopilot)					
B&G h1000 (*1)	25	169	321	237	449	226	430
B&G h2000 ACP-1	25	169	321	237	449	226	430
B&G h2000 ACP-2	40	fully functional, but smaller autopilot is advisable (money can be saved by choosing smaller autopilot)					
Nexus-Silva A-1510 (*2)	15	158	299	220	419	211	401
NKE gyropilot 2 RVP (*3)	25	169	321	237	449	226	430
Navman G-Pilot (*4)	20	169	321	237	449	226	430
Northstar MCU600 (*4)	20	169	321	237	449	226	430
Furuno Navpilot 500/511/520	25	169	321	237	449	226	430
Raymarine X-10 (*5)(*6)	10	123	233	172	327	165	313
Raymarine X-30	30	169	321	237	449	226	430

(\*1) Please use part number h1000-CUW specially made for Jefa drives, equipped with dynamic braking. Don't use the standard h1000.

(\*2) Please read the special installation instructions for the clutch available on our FTP server via [this direct link](#).

(\*3) Please read the special installation instructions for the clutch available on our FTP server via [this direct link](#).

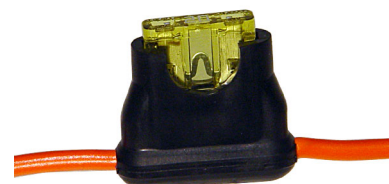
(\*4) Please read the special installation instructions for the clutch available on our FTP server via [this direct link](#).

(\*5) Please read the special installation instructions for the clutch available on our FTP server via [this direct link](#).

(\*6) 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 still 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.

## Fuse Protection:

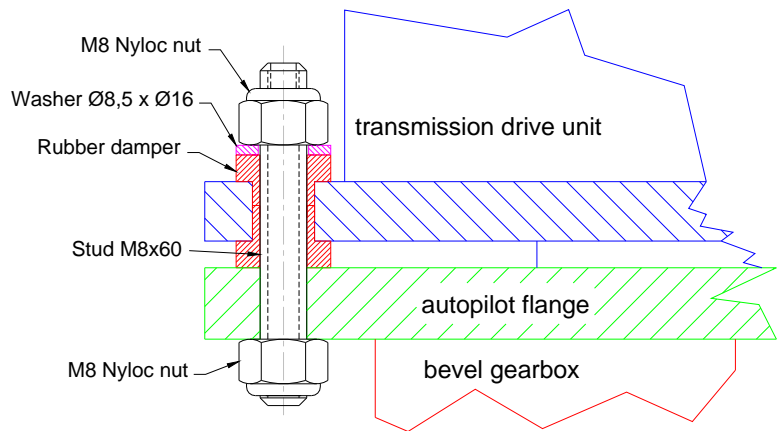
To protect the autopilot drive, the rudder, and the steering system, your Jefa transmission drive is fitted with an inline fuse. Please don't remove this fuse as this will invalid your warranty. The 12 volt transmission drive is fitted with a 20 Amps fuse. A spare fuse is also supplied in the installation manual bag.



The Jefa transmission drives are fitted with rubber dampers to minimise the autopilot noise level on board. Transmission drives can be mounted on a bevel box or on a reduction gearbox.

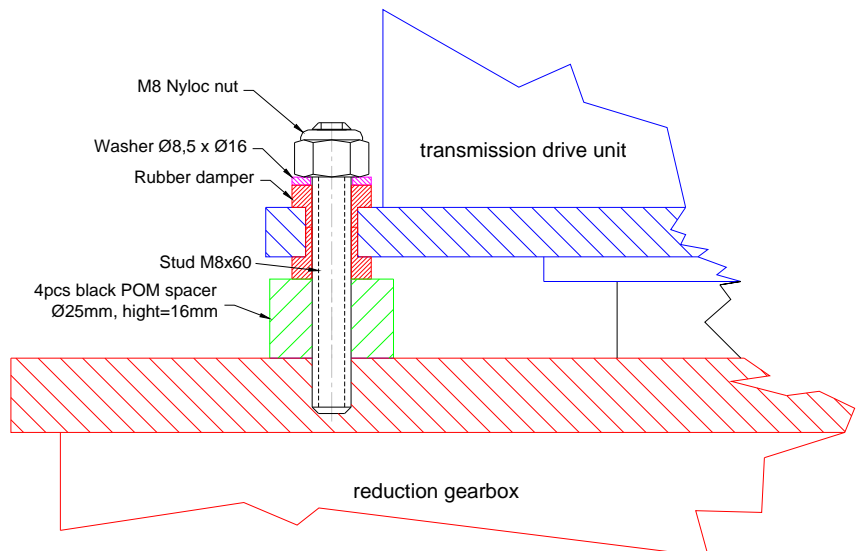
### Mounting instructions for bevel box mounting:

- Screw the 4 M8x60 studs into the autopilot flange.
- Mount the 4 off M8 nyloc nuts. Tighten well with 20Nm torque.
- Mount the drive unit.
- Mount the 4 off washers.
- Mount the 4 off nyloc nuts. Don't tighten too hard to prevent damage of the rubber damper (3 Nm).



### Mounting instructions for reduction gearbox mounting:

- Screw the 4 M8x60 studs into the autopilot flange. Tighten well and use [loctite](#) to lock the thread.
- Mount the 4 off delrin spacers.
- Mount the drive unit.
- Mount the 4 off washers.
- Mount the 4 off nyloc nuts. Don't tighten too hard to prevent damage of the rubber damper (3 Nm).



### 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.
- Make sure all bolted parts (tiller pins, rosejoints, draglinks, tillerarm, etc) are firmly tightened and will not come loose even when exposed to heavy vibrations. Use loctite when necessary.
- Move the complete system from port to starboard making sure the rosejoints don't hit the output lever and tiller lever.
- Make sure the drive output lever rotates equally around 65 degrees to both sides and there is no risk for the output lever to go "over dead centre" so it can't return to the initial position any more, blocking the system.

Connect the electronics. Make absolutely 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 brands like B&G have default clutch voltage of 9 volts. This should be adjusted to 12 volts to guarantee a proper working of the clutch. Always fit the delivered fuse into the power feed line. Failing to install this fuse could mechanically overload the drive causing severe damage inside the drive unit.

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. If motion is detected, one can rule out the drive causing the malfunction.

**Maintenance:**

The direct drive is "greased for life", so should no 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 by cruising on motor), all bolted connections should be yearly checked. The only parts that could wear in time are the balls of the draglink. These balls are easy exchangeable and available for around 10 € each from any Jefa distributor.

**Declaration of conformity:**

I, Stig Jensen of Jefa Marine Steering ApS, Nimbusvej 2, 2670 Greve, Denmark, confirm that the Jefa 150Nm transmission 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:.....  
Stig Jensen

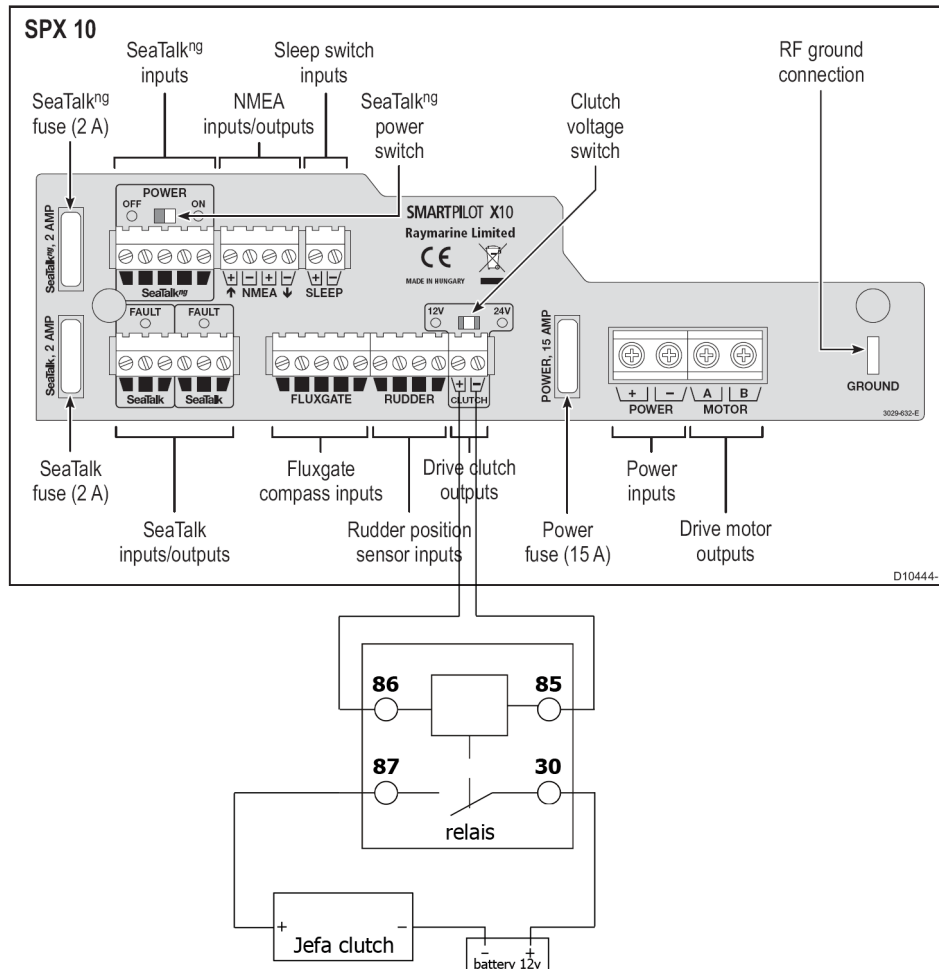
Date: 08-12-2004

For more information please visit our website [www.jefa.com](http://www.jefa.com)



## Special installation instructions for low power clutch lines

The Jefa transmission drive unit can operate with a relatively small course computer. This is due to the high efficiency of the drive unit. The direct drive unit require a current of 1,4 Amps to contract the clutch and to keep it contracted. Many small course computers can't deliver this power. To overcome this, a car contactor (relais) between the clutch ports and the clutch of the drive unit has to be installed. This contactor has to be ordered separately with the code number DU-RE-12 or could be purchased in a local car shop.



Example of the wiring diagram for the contactor.

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[www.jefa.com](http://www.jefa.com)

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