SILVA 5000

The SILVA 5000 electronic compass is a precision instrument.

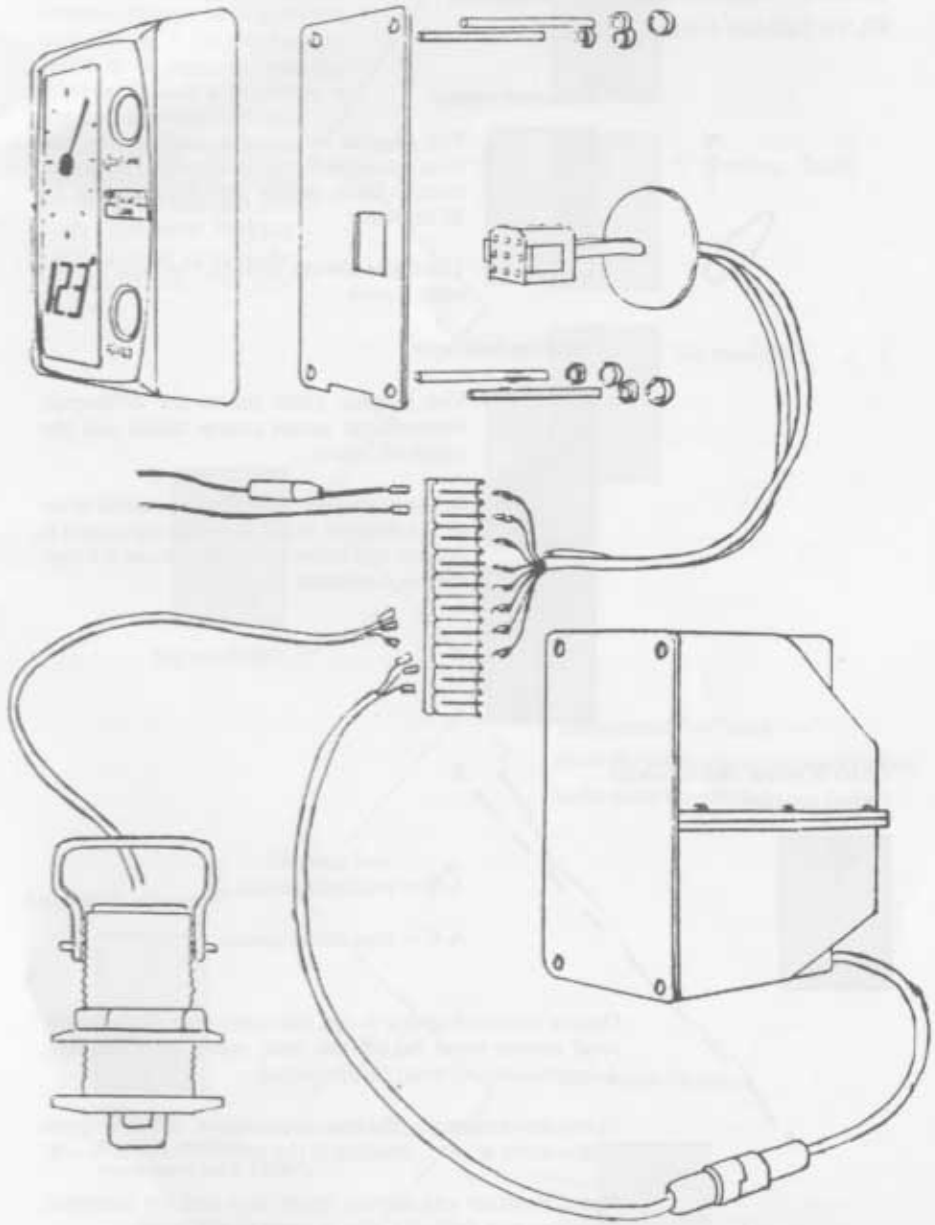
In order to obtain accurate service under all conditions, it is important that installation and calibration is done correctly as described in sections 3 and 5 of this handbok.

CONTENTS:

1. Items supplied

SILVA 5000 is supplied complete with instrument, compass transducer, cable and installation parts/gaskets. Optional extras are log transducer and remote control.

An individual calibration certificate is supplied with each compass.



Description.

The transducer operates according to the flux gate principle. In short, the earth's magnetic field is sensed in two coils located at right angles to each other. The measuring circuit is controlled by a microcomputer to achieve maximum stability and reliability. The transfer of data to the instrument is made in digital form. The instrument's microcomputer carries out calculations for deviation, compassdeviations CMG and tactics. Choice of function is made by pushbuttons.

SILVA 5000 has 4 main functions

Compass course

The angular or graphic scale shows the boat's magnetic course relative to magnetic North. Each yellow line corresponds to 30 degrees.

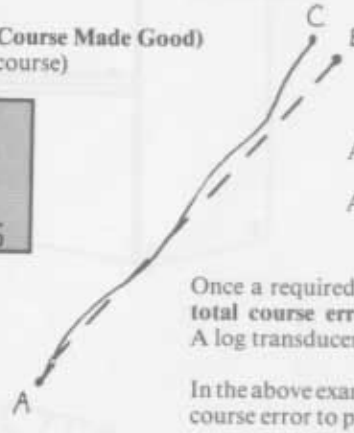
The digits **always** indicate the boat's magnetic course.

Steering indicator

The graphic scale shows the difference between the actual course sailed and the required course.

In the examples, the required course is set to 123 degrees. In the first case the course is correct and in the other, the course is 5 degrees to starboard.

CMG (Course Made Good)
(sailed course)



A-B = required course set

A-C = true sailed course

Once a required course is set, the compass calculates the **total course error** taking the boat speed into account. A log transducer must be connected.

In the above example, the boat in position C has a 5 degrees course error to port, relating to the required course A—B.

Note: Position calculation must also include magnetic variation and drift-off, due to current and wind.

Tactical functions:

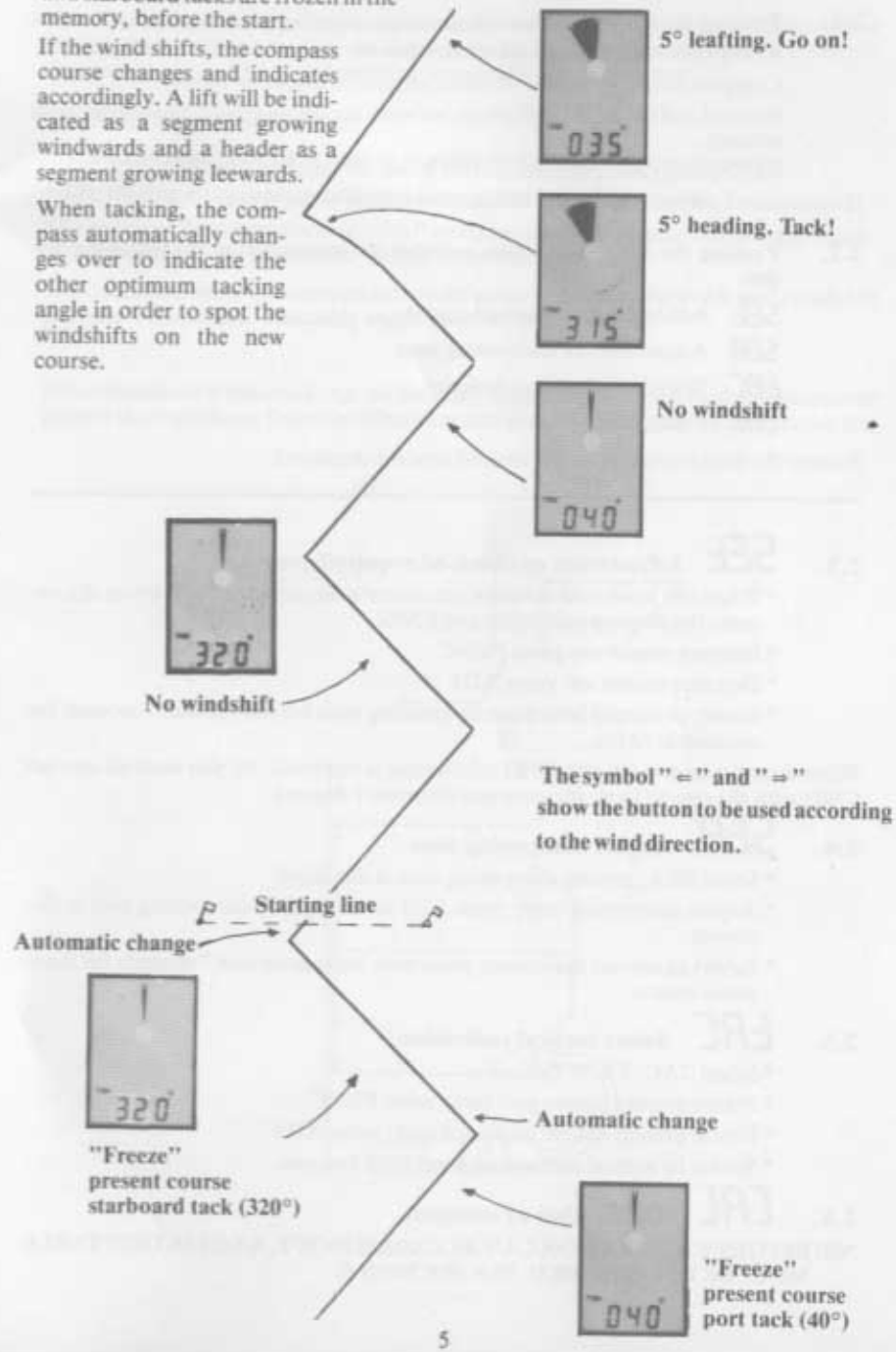
This function is used mainly to check windshifts.

The optimum tacking angles on the port- and starboard tacks are frozen in the memory, before the start.

If the wind shifts, the compass course changes and indicates accordingly. A lift will be indicated as a segment growing windwards and a header as a segment growing leewards.

When tacking, the compass automatically changes over to indicate the other optimum tacking angle in order to spot the windshifts on the new course.

Examples of tactical functions



2. Operation

The instrument's functions are controlled by the pushbuttons.

2.1. Pressing the FUNC pushbutton, causes the function to be displayed. To select a function, release the pushbutton when the desired function is displayed.

Compass course (the boat's course relative to magnetic North)

Steering indicator (the difference between the actual course and the required course).

CMG (total course deviation error from the required course).

If no required course is set, only the compass course is displayed.

2.2. Pushing the ADJ pushbutton, switches the instrument to the following modes:

SEt Adjustment of required course

SEA Adjustment of dampening time

tAC Selection of tactical function

CAL Calibration

Release the pushbutton when the desired mode is displayed.

2.3. SEt Adjustment or check of required course.

* When SEt is selected the latest set course is displayed or "---" which disconnects the steering indication and CMG.
* Increase course set: press FUNC
* Decrease course set: press ADJ
* Revert to normal indication by pressing both buttons or wait 7 seconds for automatic return.

When a new course is set, the CMG calculation is restarted. (If you want to zero set CMG with the course kept, increase and decrease 1 degree).

2.4. SEA Adjust dampening time

* Select SEA; present dampening time is displayed
* Adjust dampening time; press ADJ until required dampening time is displayed.
* Revert to normal indication; press both buttons or wait 7 seconds for automatic return.

2.5. tAC Select tactical indication.

* Select TAC; TRIM flickers
* Freeze present course port tack; press FUNC
* Freeze present course starboard tack; press ADJ
* Revert to normal indication; press both buttons.

2.6. CAL Calibration of compass.

NB! BEFORE CALIBRATION CAN BE CARRIED OUT, A DEVIATION TABLE MUST BE ESTABLISHED. SEE SECTION 5.

3. Installation

3.1 Compass transducer.

The tranducer must be positioned reasonably well away from magnetic disturbance such as objects containing iron, loudspeakers, cables carrying heavy current, transmitting antennas etc. The actual position is normally a compromise.

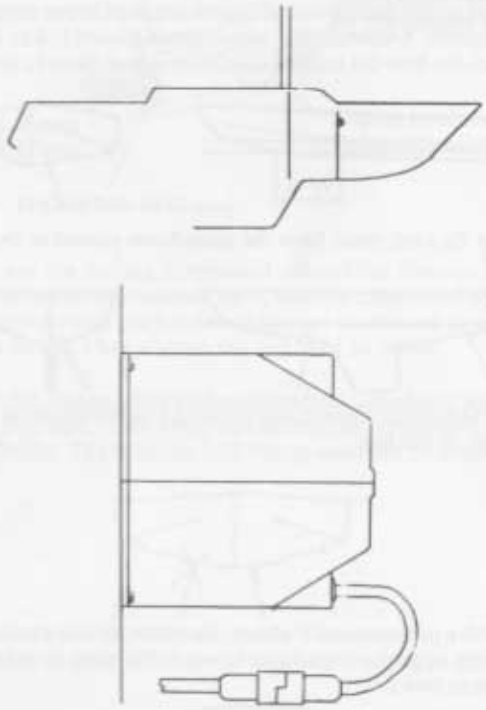
The following guidelines apply:

* The transducer must be as near as possible to the boat's centre of gravity.
* The reading error (before calibration) must not exceed 15 degrees.

The position of the transducer in a GRP boat, can be on a bulkhead below deck, whereas in a steelboat, the transducer should be on the mast.

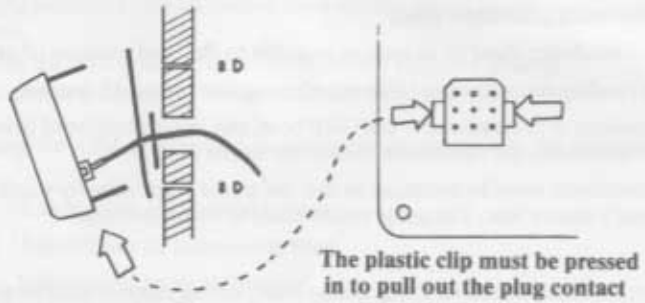
The transducer must be mounted so that the arrow is pointing forwards and parallel to the boat's centre line. The cable outlet must be to the bottom.

If the transducer is mounted, e.g. on the mast, strong support must be given, in order to protect the transducer from the vibrations and shocks of being hit by sails, ropes etc.



3.2. Mounting of instrument housing

The instrument housing is mounted by drilling holes as per the enclosed drill template. Then the instrument is mounted with the bolts and plastic nuts.The gasket is used for sealing between the instrument and the bulkhead. *Make sure that a good seal is obtained between the instrument cable and bulkhead so that no humidity can enter the instrument from the cabin.* This could cause condensation on the instrument glass. If the instrument is mounted on a horizontal surface the gasket's lower part should be sealed with a sealing compound.



The plastic clip must be pressed in to pull out the plug contact

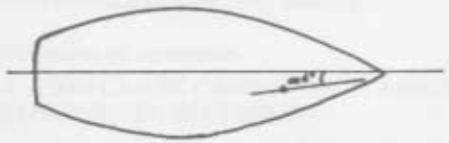
3.3 Mounting of paddlewheel transducer (optional)

The correct position of the paddle-wheel transducer is of prime importance for the accuracy of the instrument. Generally the transducer is placed 1/4 or 1/3 along the water line measured from the bow (in normal conditions) and close to the center line.

Sailingboats with a fin keel, must have the transducer placed in front of the keel.

Avoid placing the transducer close to sharp chines where transverse water-streams can disturb the function of the log.

On sailing boats with a pronounced V-shape, for example full-keeled boats, it could be favourable to slightly align the transducer towards the stern in order to get equal characteristic at different bows.

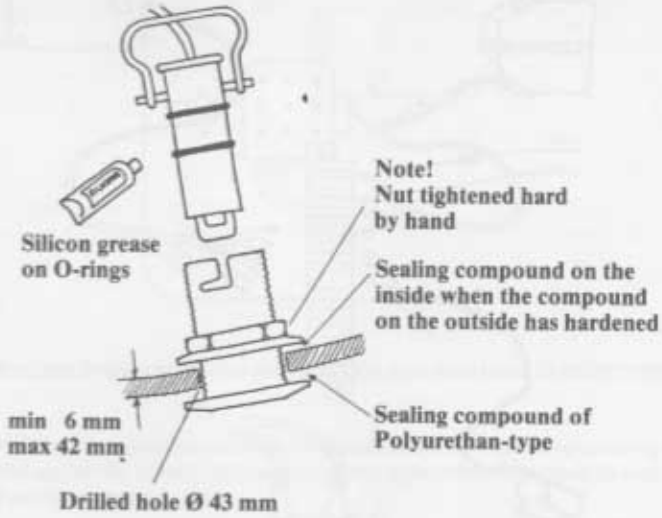


Contact owners with identical boats with a similar log, or SILVA for advice.

Usually the position of the paddlewheel transducer becomes a compromise since one has to consider the access from the inside.

The through-hull fitting should be mounted in a hole with a diameter of 43 mm. Around the hole the hull should have an even thickness.

When mounting the through-hull fitting the dummy plug should be in position. The through-hull fitting should be mounted so that the dummy plug's handle is traverse to the centerline.



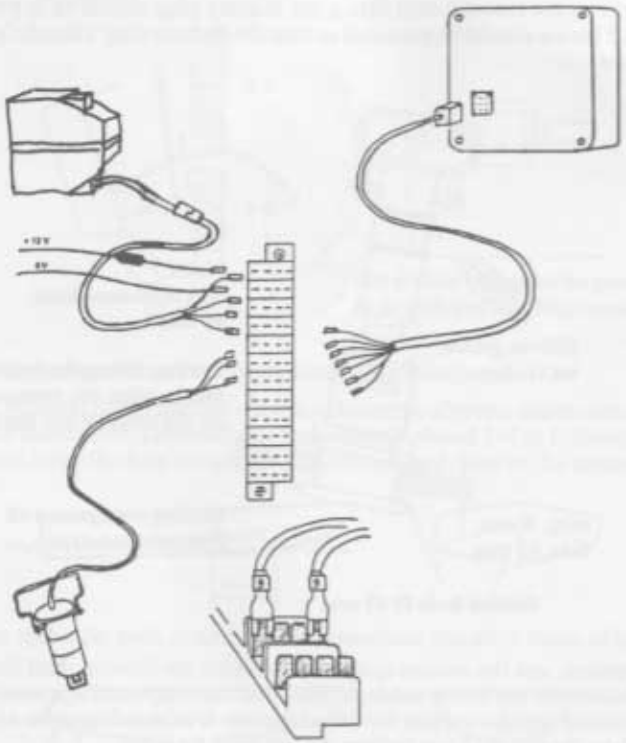
When mounting, put the sealing compound around the through-hull fitting's outer flange and screw the nut on the inside so tight, that the compound is pressed well. When the outer sealing compound has hardened the nut is released in order to put sealing compound on the inside. Then tighten the nut hard ***by hand.***

Fit the O-rings on the dummy plug and paddlewheel transducer and grease them with the enclosed Silicon grease. Take away surplus sealing compound from the outside of the through-hull fitting. The through-hull fitting ***must not*** be countersunk in the hull.

3.4 Installation of wiring

Most faults in electronic equipment originate from incorrect or faulty wiring. Therefore, one must ensure protection of the cables from chaffing, vibration etc.

Connect as per wiring diagram in section 8.Do not to forget to fit the enclosed fuse. (If there is no circuit panel on board your boat).



All cables are supplied with numbered connectors, which must be connected to the terminal strip as shown in the figure and wiring diagrams.

The numbers of the wires to be connected to each other via the connector block, must match!

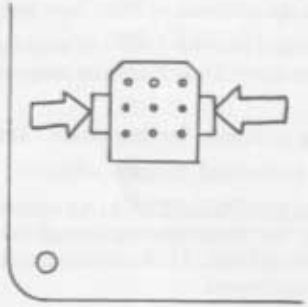
If a number is missing, the colours shown in the wiring diagram, are to be taken as valid. (Applies to system with screw terminals).

4. Maintenance

Cleaning and checking of the paddle-wheel transducer

The transducer can easily be removed for cleaning. Pull out the safety mounting and put in the dummy plug. If this is done quickly, only a little water comes in. The axle of the paddle-wheel can easily be taken out by putting a thin pin or similar through the hole to push out the axle. The axle and paddle-wheel should be cleaned carefully and reassembled. Then blow on the paddle-wheel so that it rotates.

See that no anti-foul paint overlaps the through-hull fitting. The paint-edge may obstruct the paddlewheel's rotation.



The paddlewheel can be painted with a modern, thin anti-foul paint in order to prevent weed growth.

We recommend that the instrument is removed and stored at room temperature, when the boat is layed up for the winter. At the same time, spray the plug contacts and screw terminal with moisture-proof spray.

Do not forget to compress the plug retaining clips as you pull the plug out.

5. Calibration of the compass.

Calibration of the compass is made, in order to correct errors resulting from magnetic disturbance (deviation).

Certain disturbances vary and hence cannot be corrected for . These variations generally come from electrical devices like windshield wiper, motors, moving coil instruments, transmitting antennas etc. so, put the transducer where these cannot affect it i.e. more than 1 metre from them.

Depending on the type of boat and the position of the transducer, alternative methods of calibration can be chosen.

A. Calibration according to the calibration certificate (see page 13)

   This method is recommended only for GRP - or aluminium boats where the transducer is placed at least one metre away from any magnetic disturbance and parallel to the boat's centre line.

B. Calibration with sighting compass. See sections 5.1 and 5.2.

C. Calibration made by an authorised compass adjuster

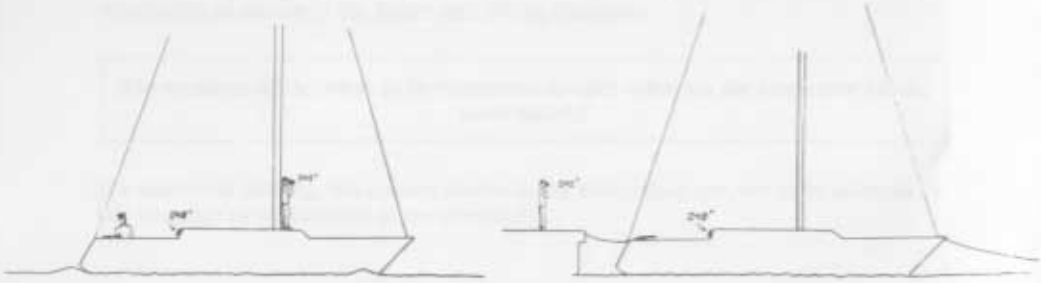
   This is necessary when calibration is difficult. An authorised compass adjuster will be able to assist in finding the correct place to install the compass transducer, especially in steel and ferrocement boats. His knowledge and experience guarantees that the compass is perfectly calibrated.

5.1 Calibration with a sighting compass

This method uses the sighting compass as a reference, which is compared with the reading of the SILVA 5000. The sighting compass must be held, so that no magnetic disturbance affects its reading and must be aligned very accurately with the centerline of the boot. One must choose a position where the distance between the sighting compass and the sighted object is reasonably long and you must stand amidships in order to minimise parallax errors. If the boat is moored, the best way is to get off the boat and sight, on a stay and the mast, for example. These objects have the advantage of having a well defined centreline and hence parallax errors are eliminated.

The boat is steered or moored so that the sighting compass reads the following courses steadily: 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°. The Silva 5000 readings are noted in the deviation table in section 5.2.

NB! When sighting towards objects on land local variation must be considered.



5.2. Deviation table

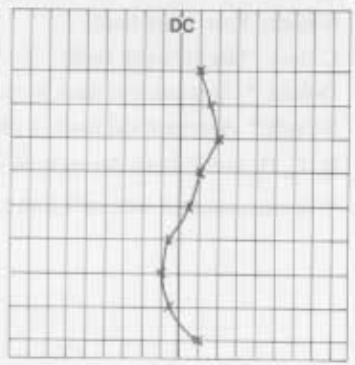
The deviation table can either be the transducer's calibration certificate or a table established by checking the compass in the boat. See example below;:

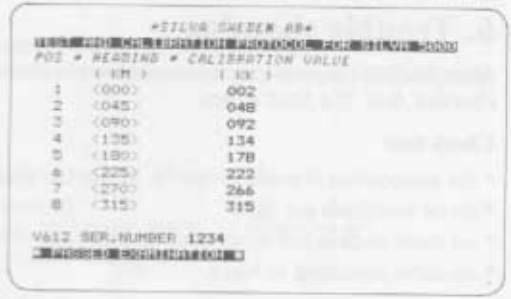
Km = Magnetic course
KK = Compass course
Dev = Deviation
DC = Deviation curve

Deviation table

Date

Km	−/+ Dev	KK
000	+2	002
045	+3	048
090	+4	094
135	+2	137
180	+1	181
225	−1	224
270	−2	268
315	−1	314
360	+2	002





5.3. CAL

Calibration of compass

as per section 2.6.

Press	Comments	The display shows:
ADJ	Select CAL	P00
ADJ	Step to 91	P91
FUNC	First table value (North correction)	000 or deviated value
ADJ*	Adjust according to deviation table	(002) NB! example
FUNC	Next table value (North-East correction)	045 or deviated value
ADJ	Adjust according to deviation table	(048) NB! example

Repeat these steps until all correction values for the courses 000°, 045°, 090°, 135°, 180°, 225°, 270°, 315°, are preserved.

FUNC The compass now displays the **deviated** compass course

When the deviation changes, the table first must be set to zero set: i.e. show 000°, 045°, 090° and so on.

** When adjusting, the values are first increased by single figure step and then jump 40 and then single figures again, i.e. the adjust ment area is ± 20 steps.*

SILVA 5000

Note that the deviation table is made up by checking the compass as described in section 5.1. and includes A, B, C, and D *errors. After calibration the SILVA 5000 indicates correctly.

This is done as per section 5.3.

A-fault: Misalignment of transducer versus the boat's centreline.

B-fault: East-West fault.

C-fault: North-South fault.

D-fault:* Symmetrical fault in the intercardinal directions.

E-fault:* Assymetrical fault in the cardinal directions.

B, C, D, and E-fault depends on magnetic influence from iron objects in the boat.

* Is compensated with soft iron balls in ordinary compasses.

6. Trouble shooting

Most faults in electronic equipment occurs in the outer wiring and this should always be checked first, if a fault arises.

Check that

* the connection is made properly, as per the wiring diagram
* screw terminals are tight
* no loose ends in the wires causing short-circuits .
* no cable squashed or worn.

Fault symptom	Check:
If; No indication (black display)	— is there voltage going to the instrument? — fuse
Firm indication all segments lit. If after approximately 7 seconds, "ERR" is shown on the display or, the degree sign "o" does not flash	— The connection of the transducer to the instrument — The voltage to the tranducer
The indication "Lo" is flashing every 4th second	— Battery voltage — Bad contact — Voltage drop
The instrument indicates the wrong course	— The instrument's voltage — The mounting of the transducer — Disturbing magnetic sources

7. Technical data

	Dimensions:
Transducer:	125 × 140 × 120 mm
Instrument:	125 × 125 × 35 mm
Instrument cable:	3 m
Transducer cable:	12 m
Voltage:	10,5-18 VDC
Current consumption:	160 mA
Temperature-range:	Storage —20° to +80°C —5° to +70°C
Dampening:	1, 2, 4, 10, 30, 60 and 120 seconds
Accuracy:	± 1°
Deviation:	± 20° in each 45 step
Output:	NMEA 4800 baud
Option:	Log transducer kit. Silva 4001 Remote control Silva 2002

Self checks:

Indication "Lo" Warning low voltage of battery 10,5V (flashing).
Indication "Err" (steady) caused by iron objects near the transducer or fault in measuring system.

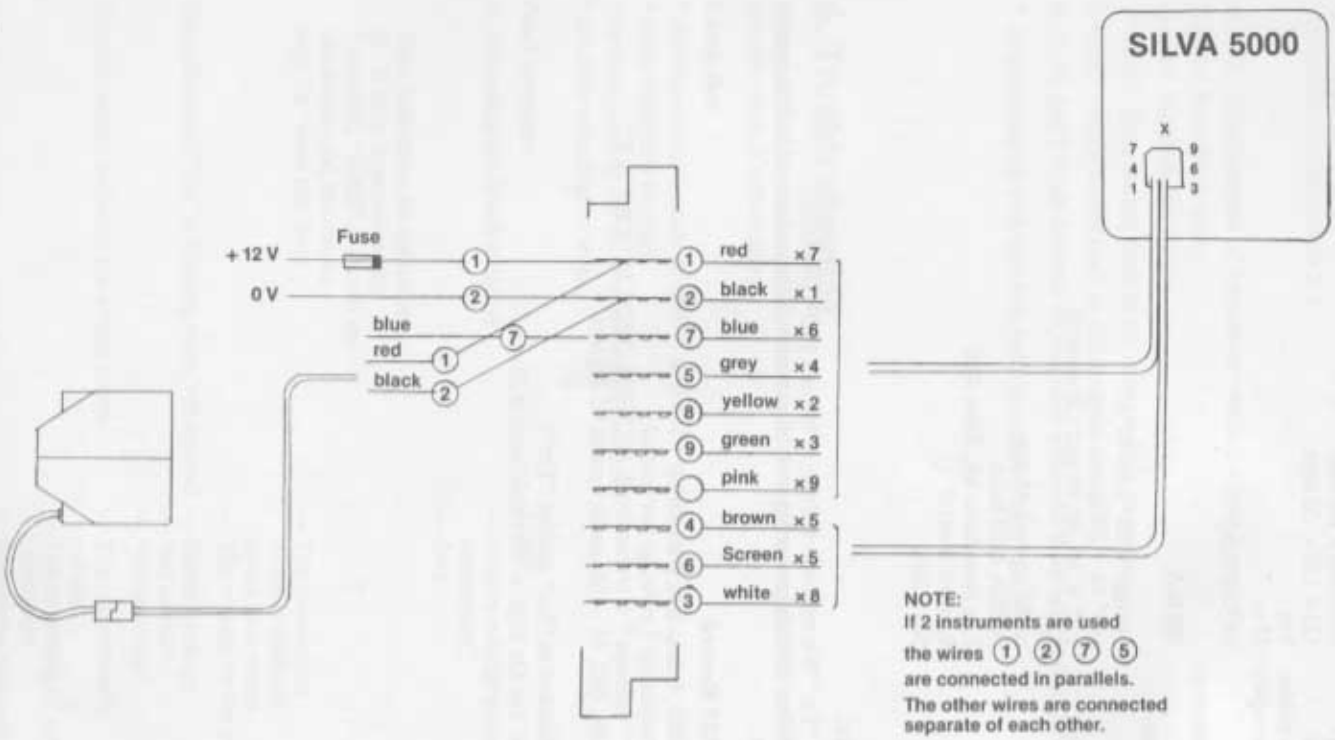
NMEA-0183 Record

Baudrate 4800, 8 data bits, 2 stop bits.
Repeater frequency: 1 message per second
Following "message " is transmitted: HCHDM, XXX, M "CR" "LF"
Ex. HCHDM, 092, M = Magnetic course 92 degrees.

NMEA is blocked at "Lo" and/or "Err".
Outlet level: low Ov high + 10v: sink/source 25 mA.

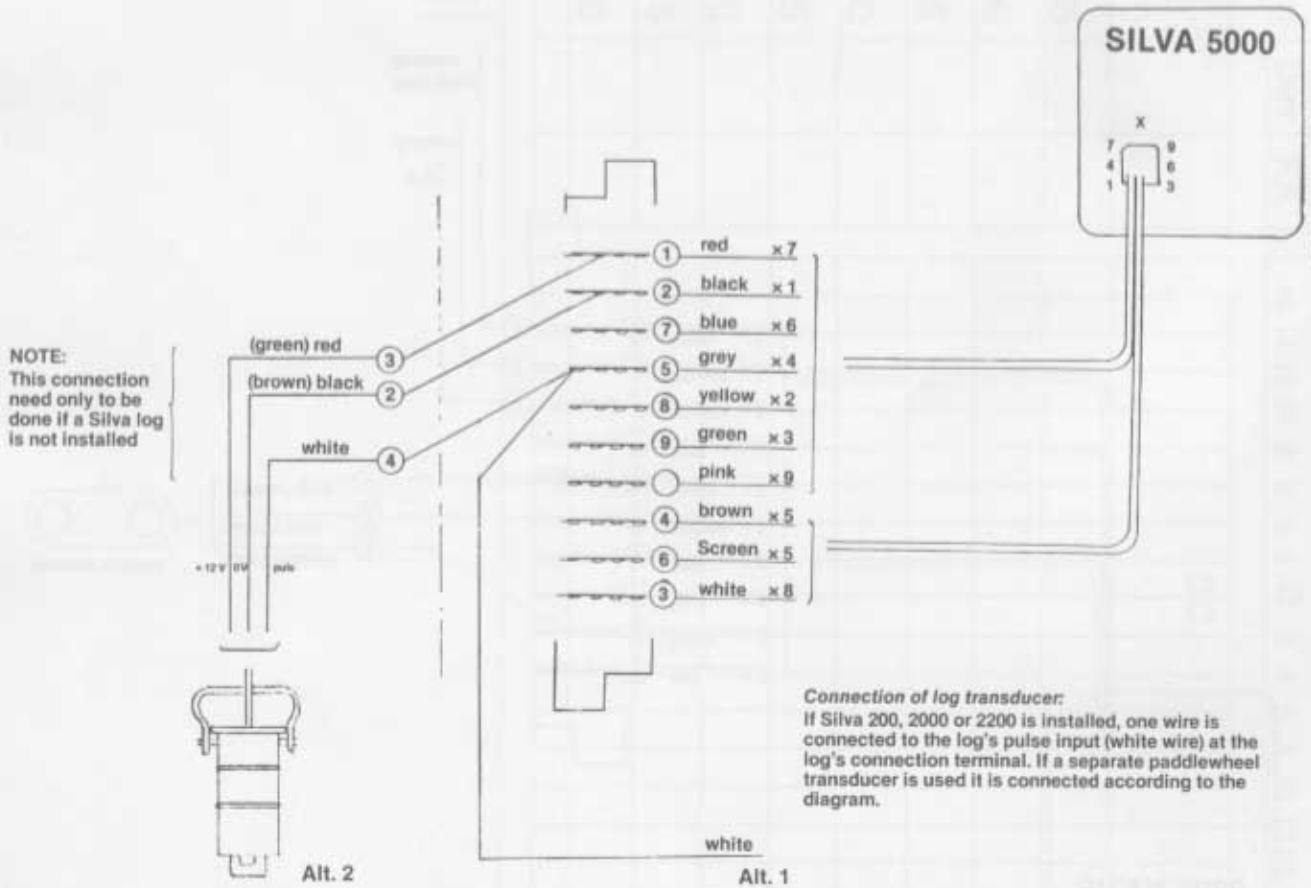
8. Wiring diagram

8.1. Circuit diagram instrument and compass transducer



NOTE:
If 2 instruments are used
the wires ① ② ⑦ ⑤
are connected in parallels.
The other wires are connected
separate of each other.

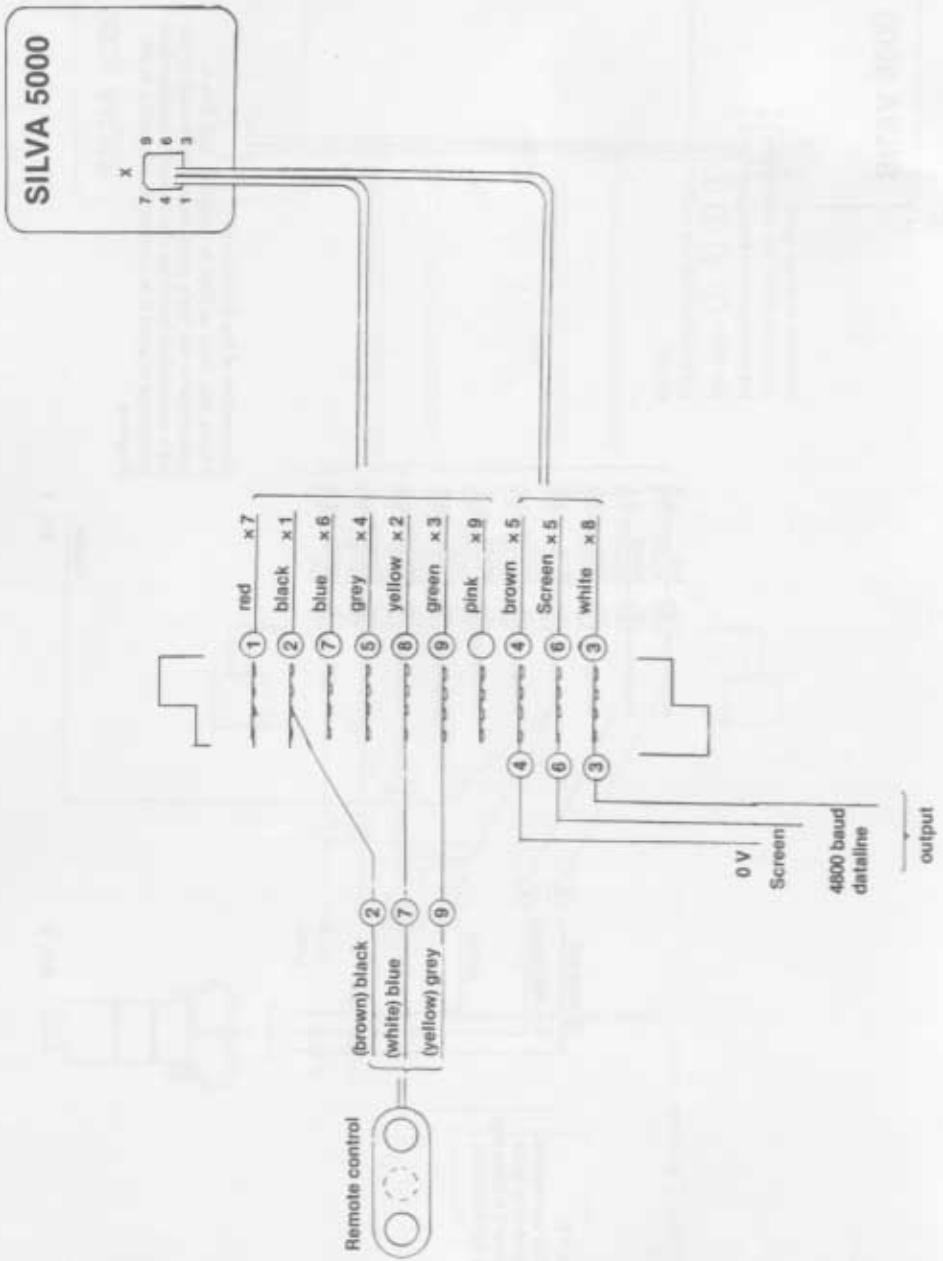
8.2. Circuit diagram connection of log transducer or connection to log instrument



NOTE:
This connection need only to be done if a Silva log is not installed

Connection of log transducer:
If Silva 200, 2000 or 2200 is installed, one wire is connected to the log's pulse input (white wire) at the log's connection terminal. If a separate paddlewheel transducer is used it is connected according to the diagram.

8.3. Circuit diagram connection of remote control and data output NMEA 0183



Deviation table

Date _____

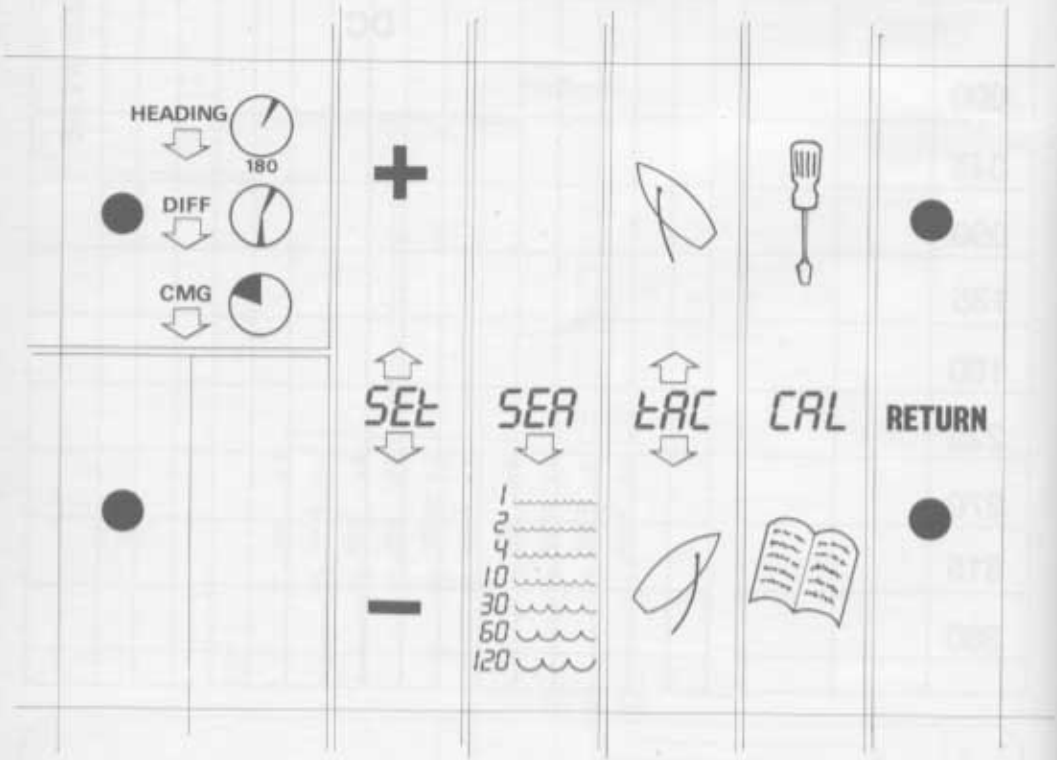
Km	—/+ Dev	KK
000		
045		
090		
135		
180		
225		
270		
315		
360		

West = — East = +

16 14 12 10 8 6 4 2 0 2 4 6 8 10 12 14 16

DC

This is how to use your SILVA 5000



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