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ANSCHÜTZ

world-wide

GYRO COMPASS EQUIPMENT
STANDARD 14
BASIC VERSION

Technical Handbook

1. Description
2. Operating Instructions
3. Care and Maintenance
4. Repair
5. Illustrated Spare Parts Catalogue
6. Installation
7. Putting into Operation

Preliminary Remark

The documentation describes the system or the device incl. variations, functional extensions and special types.

An NG... designation behind the type number of a device refers to different variations listed at the beginning of the description.

Possible functional extensions are also stated at the beginning of the description and are designated in the description as a functional extension module (FEM).

If there are customer demands for modifications or complements, you will find them described in the Annex.

The contract for delivery is binding.

The illustrations are numbered in accordance to the chapters, e.g. Fig. 3–1, Fig. 3–2 etc.
With the illustrations named in the text, additional details can be marked.
The used cycles of numerals explain itself by the following example:

Example: (Fig. 4–2.1)

- Detail 1 (from Fig. 2 in the Chapter 4
- Fig. 2 (in the Chapter 4)
- Chapter 4

The first numeral denotes the relevant chapter the illustration belongs to.
The second numeral denotes the number of illustration.
The two numerals are separated from each other by a hyphen.
The third numeral denotes the relevant detail of the resp. illustration and is separated from the previous numerals by a point.

The devices or systems may differ from the illustrations, diagrams and drawings in minor details.
The right of alterations due to further technical development is reserved. The documentation delivered is not subject to the alteration service.

Should an additional expert guidance be required, the ANSCHÜTZ service stations throughout the world are at your disposal.

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1. Description

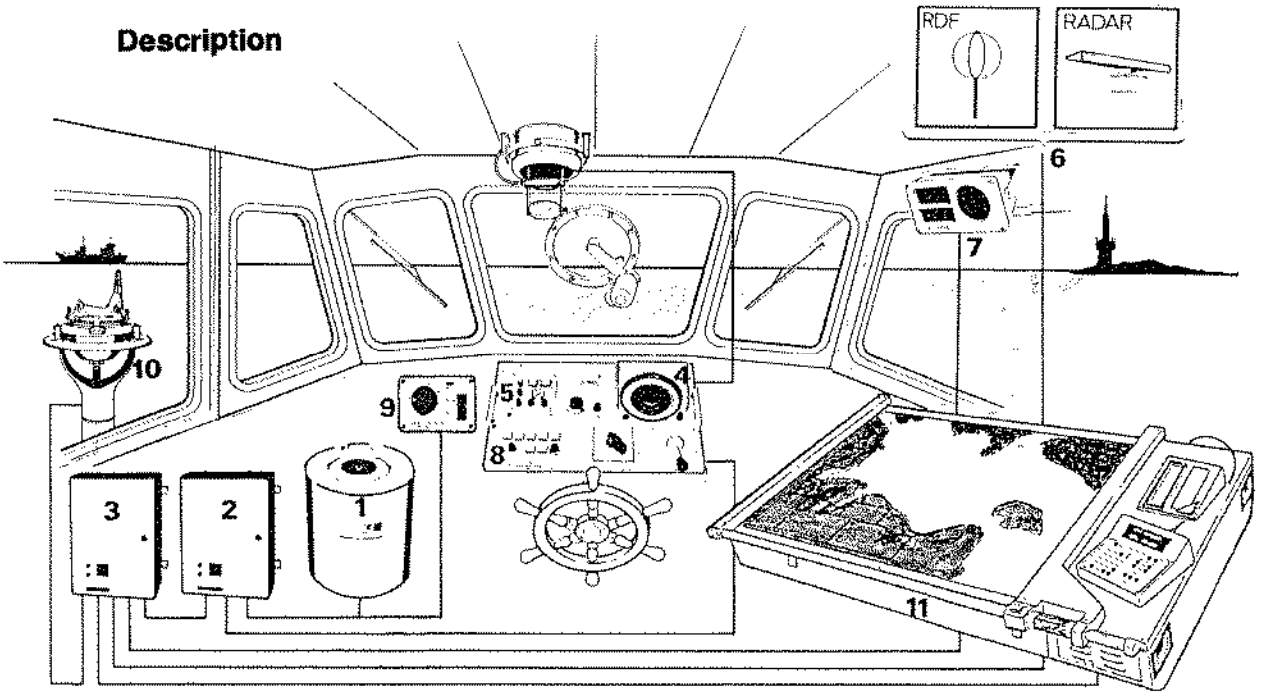


Fig. 1-1: Example of a Gyro Compass Equipment STANDARD 14 BASIC VERSION
– Schematic Representation –
- Basic equipment (see Fig. 1-1.1 to 1-1.2)
- Optional system components (see Fig. 1-1.3 to 1-1.11)

1	Gyro compass STANDARD 14	**7**	Digital repeater compass
2	Inverter	**8**	Signal unit
3	Course trensducer	**9**	Time switch
4	Steering repeeter compass	**10**	Beering repeater compass
5	Autopilot	**11**	Automatic sea chart table "NAUTOPLOT"
6	SATNAV / SATCOM / RDF / RADAR		

1.1 Application

The Gyro Compass Equipment STANDARD 14 BASIC VERSION cen be used on board any sea-going ship.
Due to its minimum dimensions, it is best-suited for smell ship navigation, e.g. on board fishery craft, tugs, patrol, police, customs, coast guerd and cergo boats, motor coasters, off-shore ferries, yachts, dredgers etc.

The Gyro Compass Equipment STANDARD 14 BASIC VERSION provides an analog course indication referred to true north.
Via an electric scanning and transmission system, it permits the compass course reference to be transmitted to analog or digitel repeater compasses, autopilot, satellite navigetion or communication equipment, reder or DF equipment, course recorder es

well as to an automatic sea chart table ANSCHÜTZ "NAUTOPLOT"*).
Due to its modular construction, twin systems can be realized as well for special applications.

1.1.1 Component Psrta of Basic Equipment

The basic equipment consists of:

●	Gyro Compass, STANDARD 14 with gyrosphere Type 111–006	Type 110–106 NG001 (Fig. 1–1.1)
or	Gyro Compass, STANDARD 14 with gyrosphere	Type 110–106 NG002 **) Type 111–006
●	Inverter, with casing and 5m connacting cable	Type 121–043 NG001 (Fig. 1–1.2)
or	Invertar, without casing, without main switch, without fuses,	Type 121–043 NG003 (built–in version) (without illustr.)

Requirament of the "Bundeaanstalt für Seeachiffahrt und Hydrographie" (Federal offica for saa navigation and hydrography; BSH, formarly DHI):
If tha mastar compass is intended to be used as a steering compass, the compass card reading must ba improved by means of a permanently fixed magnifying facility.

*) The automatic sea chart table ANSCHÜTZ "NAUTOPLOT" ensures a continuous, visual indication of the ship's current position on sea charts of any scale. In addition, it permits the electronic storage of waypoints and routes of a ship's course passed through or planned and – in conjunction with an autopilot, e.g. "NAUTOPILOT D" – offers the possibility of reproducing the ship's course in accordance with these stored information, exactly and as often as you want.

**) The version NG002 is additionally equipped with a Transmitter Synchro, Type 11 CX 4, 1 rev. ≙ 360°, e.g. for connecting an autopilot.

1.1.1.1 Extenaion Possibilities of Basic Equipment

The following optionel devices can additionally be connected to the basic equipment:

- 3 Steering– or Bearing Repeater Compasses (with ANSCHÜTZ step system) (Fig. 1–1.4, 1–1.10),

or Digital Repeater Compasses (Fig. 1–1.7).

- 1 Signel Unit, e.g. ANSCHÜTZ "NAUTOALARM", Type 135–089 (Fig. 1–1.8).
- 1 Autopilot, e.g. ANSCHÜTZ "PILOTSTAR" or "NAUTOPILOT" (Fig. 1–1.5).
- 1 Automatic Sea Chart Table, ANSCHÜTZ "NAUTOPLOT" (Fig. 1–1.11).

- 3 Setellite Navigation and/or Communication Systems (Fig. 1–1.6),

or Redar Equipment or Direction Finder (Fig. 1–1.6).

- 1 Additional Group for Magnetic Sonde Course Scanning, Type 148–332 (see Sect. 6.2.5).
- 2 Rete–of–turn Indicators, (ROT) (without illustr.).
- 1 Power supply unit, e.g. ANSCHÜTZ, Type 119–020, for connecting the gyro compass equipment GYROSTAR to en AC ship's mains.
  - Input voltage U_I = 100V AC ... 265V AC (1 phese)
  - Output voltage U_o = 24V DC (max. 5A electric loed).
- 1 DC/DC converter, e.g. Type 121–048 or 121–049 (used with ungrounded ship's meins), for stabilizing the supply voltage (24V DC $\pm$ 0.2%) and for electric isolation of grounded ANSCHÜTZ devices connected. Furthermore – on operating ANSCHÜTZ equipment –, equalizing currents between the different potential levels within the hull are evoided by the device.
- 1 Course Transducer, ANSCHÜTZ, Type 132–603 (Fig. 1–1.3)
- 1 Time Switch, Type NB 03–735 (Fig. 1–1.9).

1.1.1.2 Special Design of Gyro Compass STANDARD 14 with Additional 1/10° Course Indication

On customer request, the gyro compass cen additionally be equipped with a 1/10° course indication. This requires e modified compass hood with a cut–out for the 1/10° card.

Note:

The power consumption of the stepping motor for the 1/10° indicetion approximately corresponds to that of a stepping motor of an ANSCHÜTZ step repeater compass. For reasons of electric load cepecity, it is allowed to connect 2 further ANSCHÜTZ step repeaters to the inverter of the gyro compass equipment.

1.2 Construction and Principle of Operetion

1.2.1 Conatruction of the Gyro Compass STANDARD 14

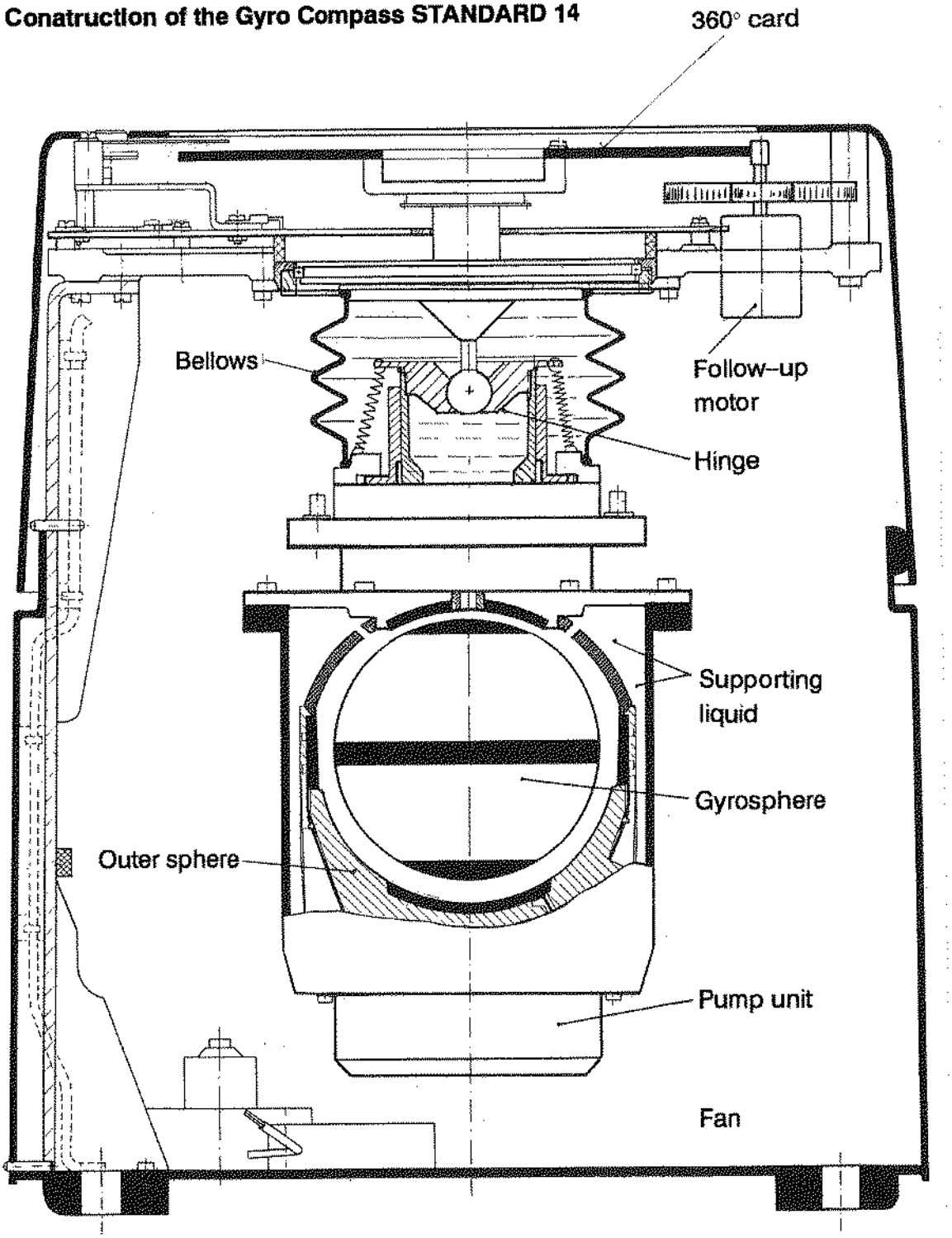


Fig. 1-2: Gyro Compass STANDARD 14
– Schematic Sectional Drawing –

The gyro compass consists of a chassis rigidly connected to the hull. The lower part of the chassis is fitted with e casing. The top side of the chassis is covered by a hood which comprises e window for taking course readings.
The casing end the hood are made of plastics. The supporting plete is mounted on three metal breckets. It accommodetes mechanical and electricel components.
The compass base plate cerries the fan.
The outer sphere is suspended from a pendulum joint.
The outer sphere includes the hydrosteticelly suspended gyrosphere.
The 360° card is connected to the outar sphere via the pendulum joint. Course readings are to be made from the 360° card. A heating and ventilation system permits a constant compass operating temperature to be maintainad at varying ambient temperatures.

1.2.1.1 Supporting Plate

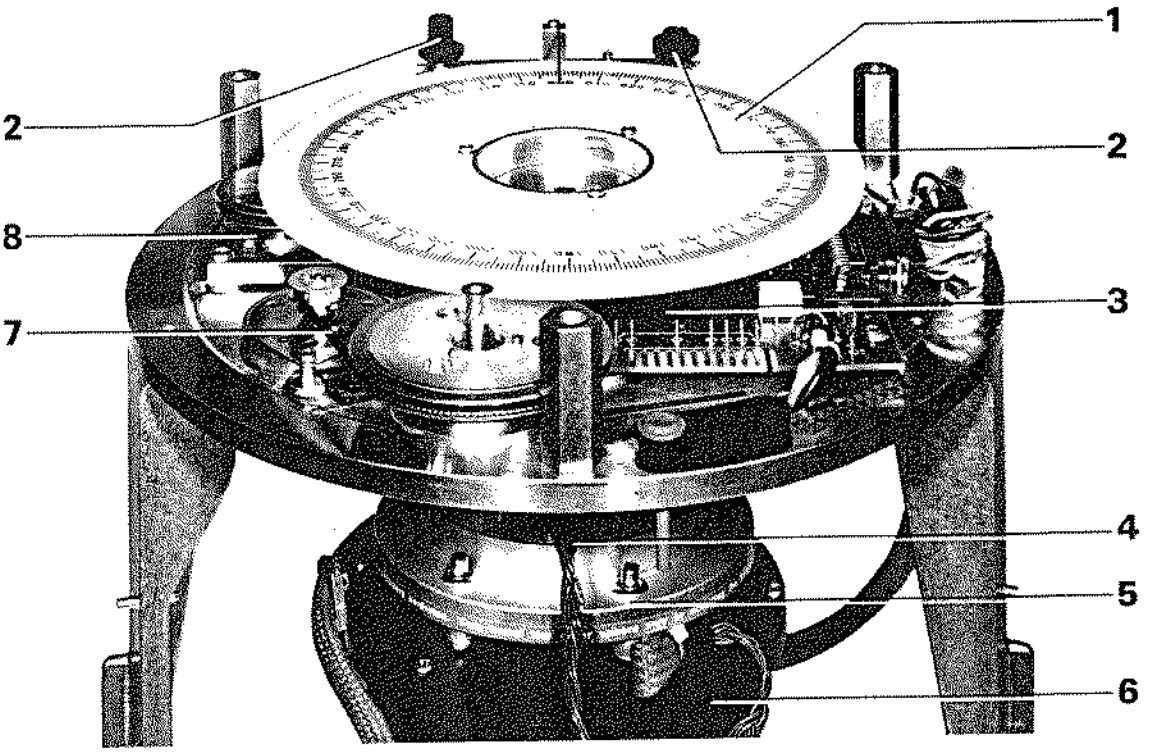


Fig.1– 3:
Supporting Plate with Components

The supporting plate carries the following components:

a) on the top side

- Follow–up gear with 360° card (1–3.1)
- Mounting bracket with control elements (1–3.2)
- Electronics PCB with components and card illumination (1–3.3)
- Stepping motor with toothed belt pulley and toothed belt (1–3.7)

- Synchro (only with version NG002) (1–3.8), or
  sin/cos potentiometer (1–3.8), optional MOD version.

b) on the bottom side:

- Compass connection plug with cable (1–3.4)
- Hinge with connecting flange (1–3.5) and outer sphere (1–3.6) with the gyrosphere included .

1.2.1.2 Follow–up Gesr

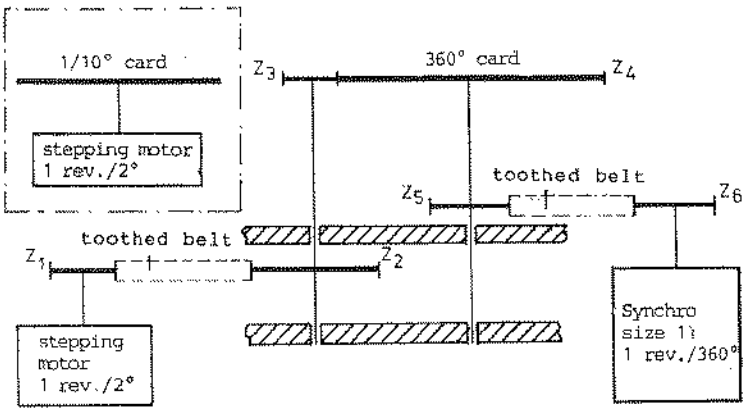


Fig. 1–4:
Principle of the 360° Follow–up Gear in the Gyro Compass STANDARD 14

The ges–filled gyrosphere is freely suspended end centered in the supporting liquid in the outer sphere. The gyrosphere contains the north–seeking gyro system. The outer sphere is caused to take the position of the gyrosphere via the follow–up gear by means of e stepping motor.

The toothed belt pulley z1 is ettached to the shaft end of the stepping motor. The pinion shaft, which carries toothed belt pulley z2, is driven with e ratio of 5:1 vie e toothed belt. The helically toothed pinion z3 is mounted to the upper end of the shaft. It drives the helical 360° card z4 with a ratio of 36:1.

Optional trensmitter synchro or optional ein/cos potentiometer in the Gyro Compese, Type 110–106

Via toothed belt pulley z5, which is rigidly connected to the 360° card, a toothed belt drives the toothed belt pulley z6 which is attached to the shaft of e transmitter element (see Fig. 1–4) with a 1:1 ratio (transmitter element additionally built in and corresponding with the system–specific requirements). An ANSCHÜTZ autopilot can be connected to this transmitter element.

(Size of transmitter element used: 11; 1 rev. ≙ 360°.)

1.2.1.3 Outer Sphere

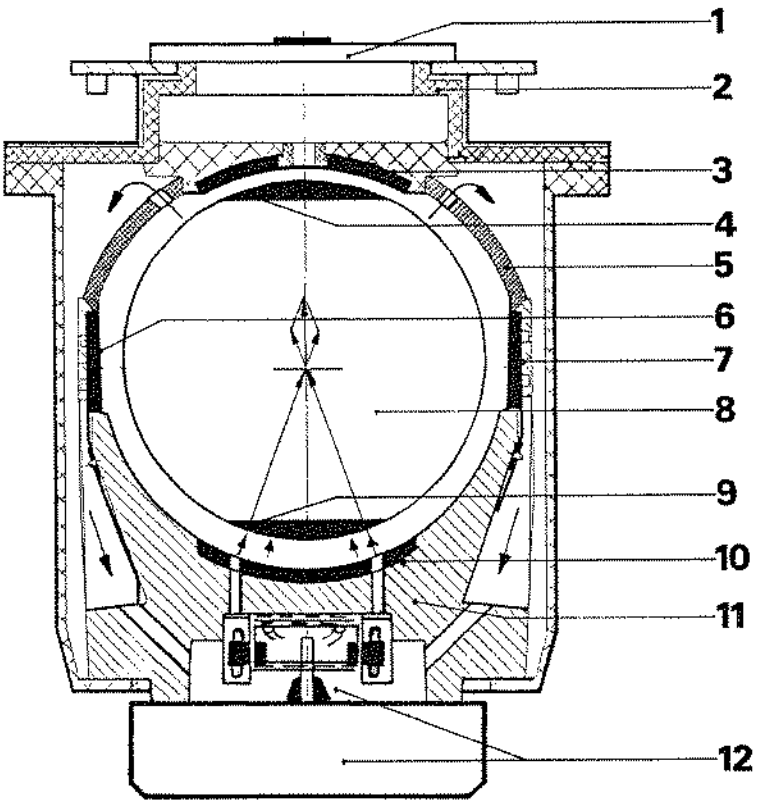


Fig. 1-5: Outer Sphere with Gyrosphere (Sectional Drawing)

The outer sphere includes the gyrosphere (1-5.8) suspended in the supporting liquid. It comprises the cup-shaped lower part (1-5.11) and the inner shell (1-5.5) with the outer sphere cover (1-5.2) above it.

The opening in the outer sphere cover is sealed by means of en insert (1-5.1). The insert houses a transperent measuring cone for reading off the supporting liquid level. In the centre of the measuring cone is a sealing screw with o-ring. All further seals are in the form of quad-rings.

The conductive calottes of the outer sphere (1-5.3, 1-5.10) cerry current to the poles (celottes) (1-5.4, 1-5.9) of the gyrosphere. The lower part comprises the electric reversing contacts (1-5.6 and 1-5.7) thet ensure follow-up. These ere positioned et the height of the equator of the gyrosphere.
The lower part comprises the pump unit U3 (1-5.12).

1.2.1.4 Gyrosphere

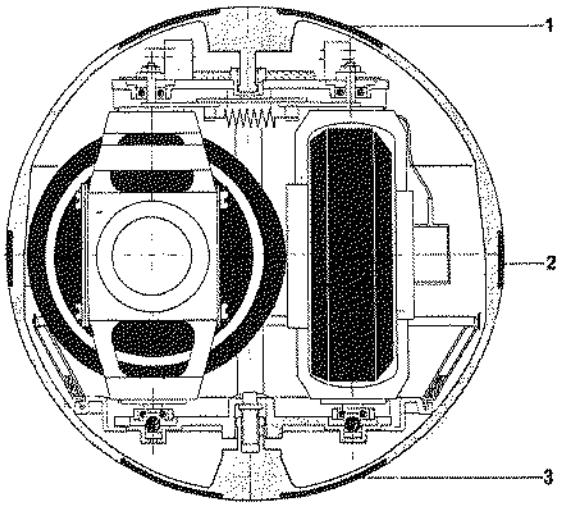


Fig. 1–6:
Gyrosphere
(Sectional Drawing)

The gyrosphere is fitted with a conductive calotte at each pole (1–6.1, 1–6.3). At the equator, there is a semicircular conductive band (1–6.2). It is part of the electric pick–off and follow–up system. The gyrosphere comprises the north–indicating two–gyro system (see Fig. 1–6 and 1–9). The gyrosphere is filled with gas and hermetically sealed.

1.2.1.5 Pump Unit and Heating

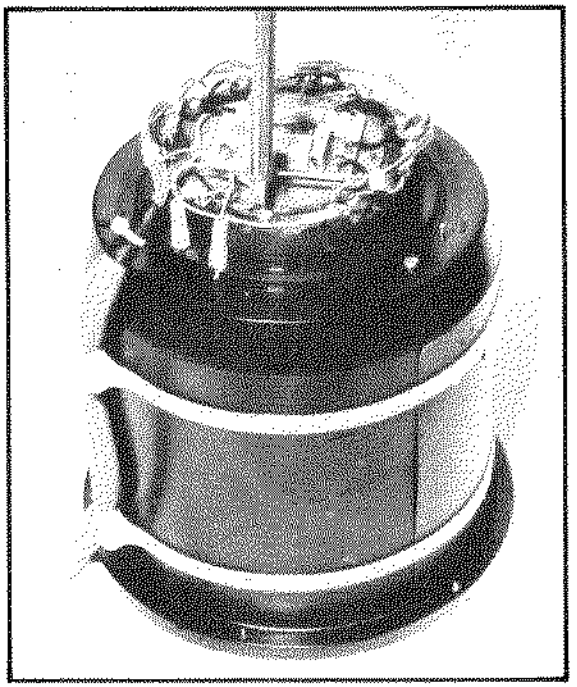


Fig. 1–7:
View from below of
Outer Sphere with Pump
Unit and Heating with
Electronic Equipment

The pump base plate of pump unit U3 is situated on the bottom side of the outer sphere. It comprises the pump with the pump motor, the heating element and the temperature sensor.

1.2.1.6 Supporting Liquid

Ths supporting liquid is an electrically–conductive mixture compossd of distilled water, glycerin and a basic additive. The exact specific gravity of the supporting liquid, in conjunction with a supporting liquid temperature of exactly +52°C, is crucial for the correct functioning of the gyro compass.
The supporting liquid temperature (+52°C) is obtained and kept constant by a:

- **Hsating systsm for hesting ths supporting liquid**
  The heating system consists of an electronically–controlled resistance heating facility connected to the 24V DC circuit and located on the pump base plate.

- **Cooling system for cooling the supporting liquid**
  The cooling system consists of an electronically–controlled fan situated laterally on the compass base plate. If the supporting liquid temperature is too high (higher than +52°C), the fan produces a cooling air stream which enters at the top, below the compass hood, and escapes at the bottom of the casing.

1.2.1.7 Fen

The fan consists of an electric motor without collector and of a flange–connected fan turbine. The electronic equipment required for the operation is located in the motor casing.
The fen is mounted on the compass base plate. The electric motor requires no maintenance.

1.2.1.8 Stepping Motor, Type 110–106.09

The stepping motor drives the follow–up gear in the gyro compass as well as the gears in the step repeater compasses. A 48–pole magnetic rotor turns within a cage which carries the stator windings. The signals from the step adapter SM0, SM1 and the 0V signal zero are led to the connections of the stepping motor.

1.2.1.9 Synchro, Type NB 23–167–4 (optional)

The synchro is incorporated in the supporting plate of the gyro compass as a synchro transmitter element, according to customer order. It generates an electric synchro signal proportional to the course angle, e.g. as a reference signal for an ANSCHÜTZ autopilot, e.g. NAUTOPILOT D. One revolution of the synchro corresponds to 360°.
The synchro is driven by the 360° card shaft in the ratio 1:1 by a toothed belt and via toothed–belt pulleys. The synchro is powered by the connected autopilot.

1.2.2 Operating Principle of the Gyro Compsss STANDARD 14

The gyrosphere, floating freely in the supporting liquid within the outer sphere and comprising the gyro system, constitutes the north–indicating element.
Two gyros installed in the gas–tight gyrosphere and driven by AC produce, in conjunction with the combined effects of the earth's rotation and gravitation, a directive

force which causes the gyrosphere to settle on the geographic north–south line. Two mechanically coupled gyros are used in order to avoid errors caused by the ship's roll and pitch motions.
The outer sphere is suspended as a pendulum and free to turn about its vertical axis. As the ship alters course, an electric follow–up system causes the outer sphere to maintain its azimuth position with regard to the gyrosphere. Therefore, the 360° card – which is mechanically coupled with the outer sphere by means of the pendulum joint – always indicates the course referred to true north.

1.2.2.1 Centring the Gyrosphere in the Outer Sphere

During operation, the following means ensure that the gyrosphere remains suspended and centred:

1. The supporting liquid, which is maintained at a constant operating temperature of +52°C.
2. A supporting liquid stream directed at the gyrosphere and produced by the built–in pump.

The weight of the gyrosphere and the specific gravity of the supporting liquid are adjusted exactly so that, at the gyro compass operating temperature (+52°C), the gyrosphere has a slight residual weight. This residual weight is cancelled by the liquid stream produced by the pump and directed from below towards the gyrosphere with the result that the gyrosphere floats freely in the supporting liquid and is simultaneously centred.

1.2.2.2 Power Supply of the Gyrosphere

The gyrosphere requires an AC supply of 55V/400Hz for its two gyro motors so that the gyros rotate at a constant speed of approx. 12,000 rev./min.

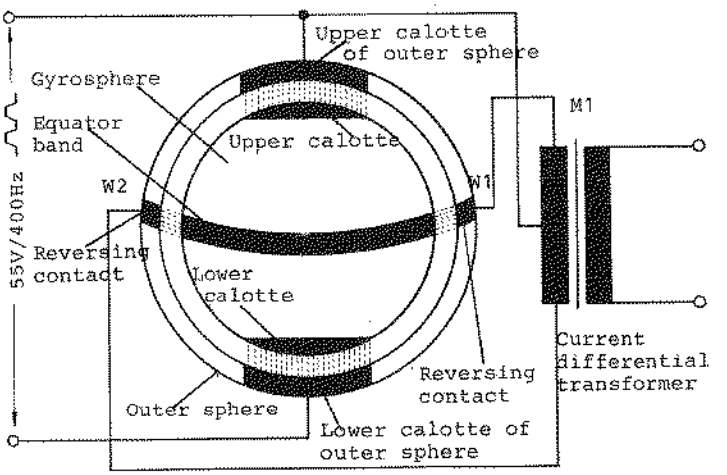


Fig. 1–8: Principle of Current Transmission and Pick–off between Gyrosphere and Outer Sphere

The electric current for supplying the gyro motors passes via the calottes of the outer sphere through the slightly basic, and therefore conductive, supporting liquid to the calottes of the gyrosphere. There, it is picked up and fed to the two gyro motors.

1.2.2.3 Electric Pick-off and Follow-up for Course Transmiaaion

The outer sphere is always caused to automatically follow up the position of the gyrosphere until the electric bridge circuit is in equilibrium again.
Any displacement of the gyrosphere in relation to the reversing contacts (pick-off contacts) W1 and W2 of the outer sphere results in a modification of the electric resistances in the supporting liquid. Due to the resulting asymmetry of the primery winding currents of the current differential trensformer M1 (see Fig. 1-8), an electric voltage is produced in the secondary winding. In the compass electronics and in the step adepter, it is processed into ANSCHÜTZ step signals (192 steps/1°) as well as into SPERRY step signals (6 steps/1°).

1.2.2.4 Gyro System

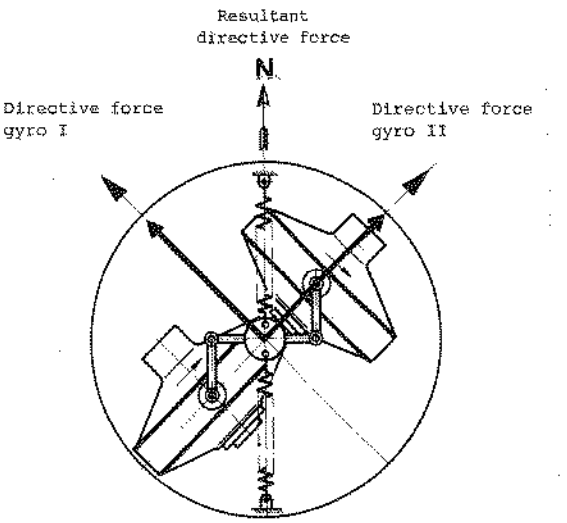


Fig. 1-9:
Gyro System, Arrangement of the Two mechanically Coupled Gyros
(Top View of Gyrosphere, Schematic Representation)

When the compass is switched on, the two gyros start spinning and, under the effects of the earth's rotation, the gyrosphere within the outer sphere oscillates about the north-south direction.

A damping system incorporeted in the gyrosphere damps these oscillations until the gyrosphere comes to rest (approx. 3 ... 5 h) and the resultant vector axis of its gyro system exactly indicates the north-south direction (see Fig. 1-9).

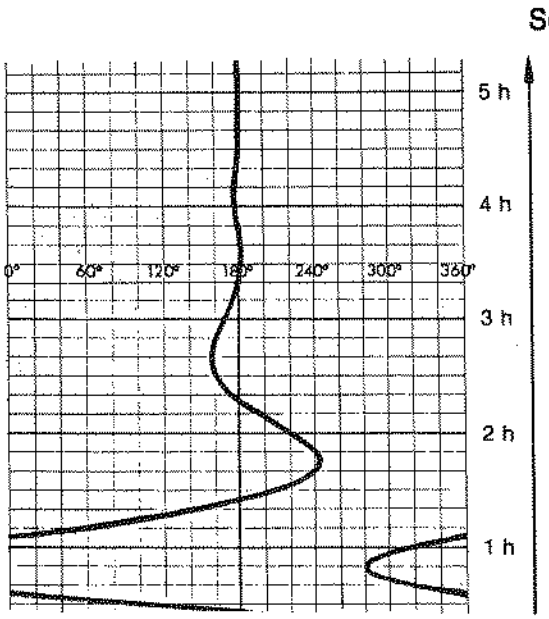


Fig. 1–10:
Settling Curve of the Gyrosphere

1.2.2.5 Directive Moment (Adjusting Capability of the Gyro System)

The magnitude of the directive moment of a gyro is dependent upon its mass, mass distribution, its diameter and upon its speed as well as on the earth's peripheral speed and gravitation.
For a gyro (with constant mass and constant speed), the directive moment is dependent upon the peripheral speed of the earth.
The earth's peripheral speed, and therefore the directive moment, shows highest velues at the equator. It decreases towards the poles and becomes zero directly at the poles.

1.2.3 Inverter, Type 121-043 NG001, NG003

1.2.3.1 Application

The inverter is used in the Gyro Compass Equipment STANDARD 14 BASIC VERSION. It comprises the main part of the electronics for the Gyro Compess Equipment STANDARD 14 BASIC VERSION.

1.2.3.2 Construction of the Inverter, Type 121-043 NG001/NG003

Dependent on the application, the Inverter, Type 121-043, can be supplied in 2 versions:

- Version A, Type 121-043 NG001 (with casing, type of enclosure IP 23),
- Version B, Type 121-043 NG003 (without casing, type of enclosure IP 00).

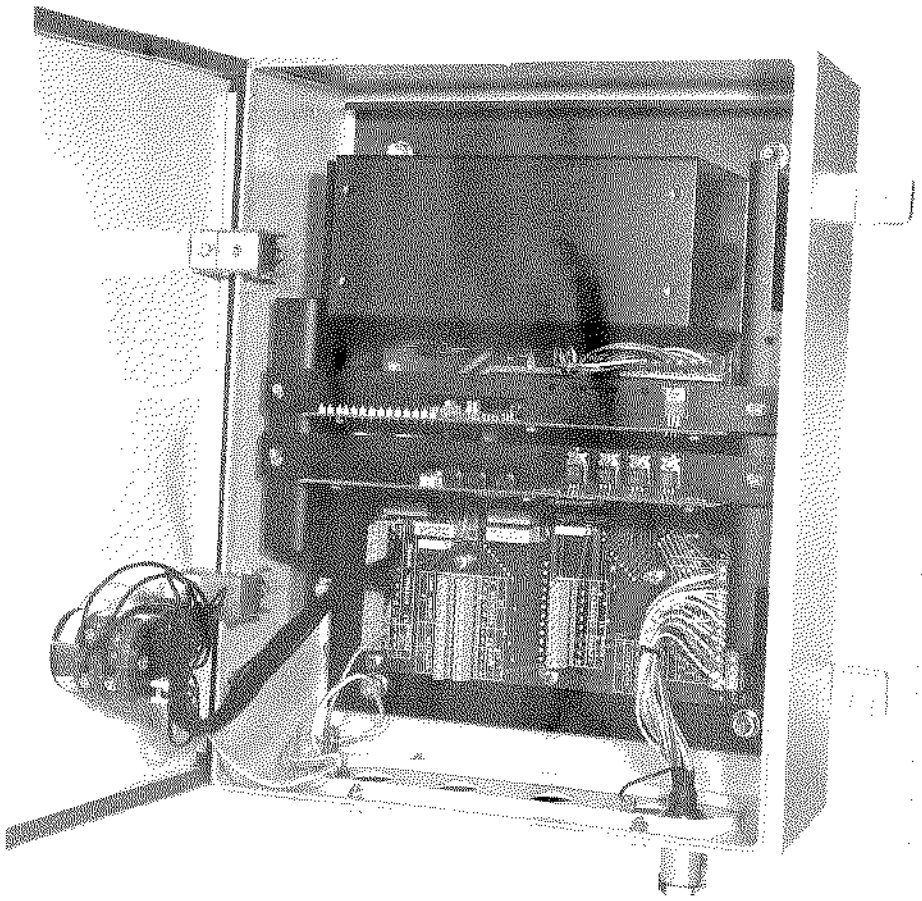


Fig. 1-11:
Inverter, Type 121–043 NG001, Casing opened

Version A, Type 121-043 NG001

The inverter has a metal casing and is intended for vertical bulkhead mounting.
The bottom of the casing is provided with a cable entry plate for 13 possible cable entries and with an earthing bolt (M6) accessible from outside with the appertaining washers and nuts.
The wiring PCB, Type 121–043.05, accommodates two plug–in frames including the following PCBs:

- Step Adapter, Type 121–043.04 as well as
- Compass Electronics, Type 121–043.06.

In addition to this, the wiring PCB carries the inverter, Type 121–043.02, as well as the terminal strips ensuring connection

- to the gyro compass STANDARD 14
- to a 24V DC ship's mains or 24V DC emergency supply or to optional devices such as to an AC power supply with 24V DC output
- up to 3 course reference receivers (with ANSCHÜTZ step system)
- to a signal unit (e.g. ANSCHÜTZ "NAUTOALARM")
- to an autopilot (e.g. ANSCHÜTZ "PILOTSTAR" or "NAUTOPILOT")

- up to 3 SATNAV/SATCOM or RADAR or Direction Finders (with SPERRY input, 6 Steps/1°).
- to max. 2 RoT indicators (ANSCHÜTZ)
- to a course transducer, Type 132–603 NG001 / NG002

A cable, approx. 5 m long, is permanently attached to the inverter and fitted with a 25–pole plug connector for connection with the gyro compass.
The door of the inverter casing carries the main switch B5 as well as the fuses E1 and E2. The door can be locked by means of a special key (included in delivery).

Version B, Type 121–043 NG003
The version B is intended to be incorporated into desks, cabinets or steering stands. The inverter is without casing; and also without cable*) and main switch B5*), fuse-holders*) with the fuses E1*) and E2*).
Further design is according to version A (NG001).

1.2.3.3 Principle of Operation of the Inverter, Type 121–043 NG001 / NG003

The inverter

- produces the supply voltages for the gyro compass equipment from a 24V DC ship's mains or from a 24V DC emergency supply as well as from an AC power supply unit with 24V DC output voltage and
- converts the analog course signals – fed from the master compass into the inverter – by means of the compass electronics and of the step adapter into the following step signals:
  - ANSCHÜTZ fine step signals ≙ 192 steps/1°
  - SPERRY step signals ≙ 6 steps/1°
- amplifies the step signals for connecting step repeaters
- monitors the
  - supply voltage (24V DC) of the equipment
  - follow–up system of the master compass
- provides signalling (via optional signal unit) in case of
  - undervoltage or voltage failure of the power supply
  - follow–up switch is at "OFF" or "TEST" position.
- makes available the connections for the power supply, the gyro compass and the repeaters.

*) These parts are individually to be considered for system planning and installation of the device.

- mekas available a sin/cos or a synchro course signal (dapendent on optionel modification of tha gyro compass) e.g. for connecting an autopilot*).
- produces a rate–of–turn signal (ROT signal) within the compass electronics
  ROT ≙ rate of turn.
- amplifies the RoT signal for tha connection of rate–of–turn indicators.

Note:
The RoT signal is formed as e DC voltage meen value from tha step course signals of the master compass.
This DC voltage mean value is proportional to the rate of turn, as – with increasing course change speed of the vessel – the number of step pulses per unit of time increases.

1.2.3.3.1 Application of the RoT Signal

The rate–of–turn signal (RoT signal) produced by the inverter can be used for measuring the rate of turn of e vessel.
A maximum of 2 rate–of–turn indicators cen be connected to the inverter.
The RoT outputs can be scaled for the intended renge of indication by changing an electric bridge on the compass electronics PCB correspondingly.
Tha scaling can be connected for rates of turn of 30°/min, 100°/min or 300°/min. Special scalings for the RoT indication can be taken into consideration on request and confirmation of order.
For all scalings: ±10V DC ≙ maximum scale deflection.
The polarity of the RoT outputs is defined as follows:

- Port BB ≙ (+)
- Starboard STB ≙ (–)

Important note:
The RoT signal supplied by the inverter is no substitute for a signal coming from a rate–of–turn indicator equipment!
The RoT interfaces may be used only on the market not subject to approval !

*) If the inverter is connected to a gyro compass with optional cos α' synchro or sin/cos potentiometer, the corresponding signal is led via a terminal strip in the inverter to the autopilot.

1.2.3.3.2 Connecting Possibilities of the Inverter (General Survey)

Via its interfaces (see Section 1.2.3.4) the inverter can be connected with the following devices:

1 gyro compass STANDARD 14 (ANSCHÜTZ)
1 autopilot (ANSCHÜTZ), optional
1 course transducer (ANSCHÜTZ), optional
1 signal unit, e.g. ANSCHÜTZ, optional
3 course reference receivers with ANSCHÜTZ step course transmission system (e.g. ANSCHÜTZ analog or digital repeeters), optional
3 course reference receivers with SPERRY step course transmission system (max. load 90mA) e.g. digital repeaters, SATNAV/SATCOM, radar or DF equip–ment, optionel
2 RoT indicators, ANSCHÜTZ (rate–of–turn indicators), optional

1.2.3.4 Interfaces of the Inverter

The following interfaces ere aveileble on the inverter:

- **Interfece for ANSCHÜTZ step course signsls, 192 steps/1°**
  (L20. 1 ... 6)
  To be connected to this interface e.g.:
  1 autopilot, ANSCHÜTZ "NAUTOPILOT" or e.g.
  1 digital navigation data indicator (ANSCHÜTZ)

  Max. load of the interface: ±10mA.

> **Note:**
> A 24V DC voltage supply is led vie the interface (L20. 1 ... 6), e.g. for lighting purpose end/or for opereting the device.

- **Interfaces for ANSCHÜTZ fine step signals, 192 steps/1°**
  (L11., L12., L19. 1 ... 6)
  To be connected to eech of these interfeces:
  1 anelog step repeeter compass (e.g. ANSCHÜTZ Types 133–310, 133–311, 133–312, 133–402 NG002) or
  1 digital navigation deta indication (ANSCHÜTZ digital repeater compass, Type 133–809

  Maximum load per interface (SM0, SM1): ± 0.5A.

> **Note:**
> A 24V DC supply is led via each of the interfaces (L11., L12., L19. 1 ... 6), e.g. for lighting purposes and for operating the devices.

- **Interfaces for SPERRY step course signals, 6 steps/1°**
  (L14., L15., L16. 1 ... 6)
  To be connected to each of these interfaces e.g.:
  1 SATNAV or 1 SATCOM or 1 RADAR equipment, or
  1 RDF or
  1 digital repeater compass (e.g. ANSCHÜTZ)

  Maximum load of all 3 interfaces: together 180mA or 60mA each
  (+35V DC ≙ Common positive).

- **Interface for 24V DC main supply or emergency supply** **(L1. 1 ... 3)**

- **Interface for 1 signal unit** **(L3. 1 ... 6)**

- **Interface for 1 course transducer** **(L4. 1 ... 10)** (incl. 28V DC main supply)

- **Interface for 1 autopilot** **(L5. 1 ... 6)**

- **Interface for 1 gyro compass** **(L6. 1 ... 25)**

- **Interfaces for 2 RoT indicators** **(L17., L18. 1 ... 4)**

Note:
One device or equipment only may be connected to each of the interfaces in order that mutual influences might be excluded.
For reasons of electric loadability, a restricted number of repeaters only can be connected to the inverter!

If it is intended to operate more nautical repeaters, they can be connected to an optional Course Transducer, Type 132–603.

1.3 Technical Data

1.3.1 Dimensions and Weights of System Components

– Gyro Compass, Type 110–106

Height:	407 mm
Diameter:	345 mm
Weight:	approx. 12 kg

– Inverter, Type 121–043

Width:	318 mm
Height:	418 mm
Depth:	185 mm
Weight:	approx. 15 kg

1.3.2 Power Supply

1.3.2.1 Power Supply from 24V DC Ship's Mains or 24V DC Emergency Supply

for supplying the inverter Type 121–043

– Input voltage:	24V DC
– tolerance range:	19.2V ... 36V DC

1.3.2.2 Power Supply from the AC Ship's Mains via an optional Power Unit, e.g. Type 119–020

– Input voltage:	100V AC ... 265V AC
– Frequency of input voltage:	50Hz or 60Hz
– Output voltage:	24V DC

Power Supply from AC Ship's Mains via an optional Course Transducer, Type 132–603

– input voltage:	110, 220, 380 or 440V AC
– Frequency of input voltage:	50Hz or 60Hz
– output voltage	28V DC (for supplying the inverter)

Power Consumption with 24V DC Ship's Mains Power Supply:

a) approx. 90W max. (during heating–up)
b) approx. 65W in continuous operation with 3 Repeater Compasses, e.g. alternatively ANSCHÜTZ Types: 133–310, 133–311, 133–312, 133–402 NG002, 133–809.

Power consumption with 110/220/380/440V AC power supply:

approx. 100VA (via optional course transducer)
(including supply of gyro compass, inverter, and 3 Repeater Compasses, alternatively e.g.
ANSCHÜTZ Types: 133–302, 133–303,
133–310, 133–311, 133–312, 133–402 NG001, 133–402 NG002, 133–809.

1.3.3 **Operating Data**

Settling times and course accuracies

- After a settling time of $\leq$3h, the course accuracy is: $< \pm 2°$

- After a settling time of $\leq$5h, the static course accuracy (in port, ship at rest) is: $\pm 0.25°$ (1 σ)
  Peak values, referred to the linear mean value: $\pm 0.7°$

- After a settling time of $\leq$5h, the dynamic course accuracy (at sea, under normal sea conditions and optimum alignment of the compass) is: $\pm 1.5°$ (1 σ)

Rate of follow–up: up to 8.3°/s

Roll and pitch angle freedom: $\pm 30°$

1.3.4 Ambient Conditions

Permissible ambient temperatures

– Operation:	0°C ... +45°C
– Storage	
a) with supporting liquid:	−10°C ... +75°C
b) without supporting liquid:	−25°C ... +75°C

Type of enclosure acc. to DIN 40050

Gyro Compass,	Type 110−106:	IP 23	
Inverter,	Type 121−043 NG001:	IP 23	
Inverter,	Type 121−043 NG003:	IP 00 (without casing)	(optionally)
Course Transducer,	Type 132−603 NG001:	IP 23	(optionally)
Course Transducer,	Type 132−603 NG002:	IP 00 (without casing)	(optionally)
Time Switch,	Type NB 03−735:	IP 23	(optionally)

Degree of interference acc. to VDE 0875: Factor "K"

Resistance to vibration of the gyro compass equipment: According to BSH and GL requirements

1.3.5 Type Test

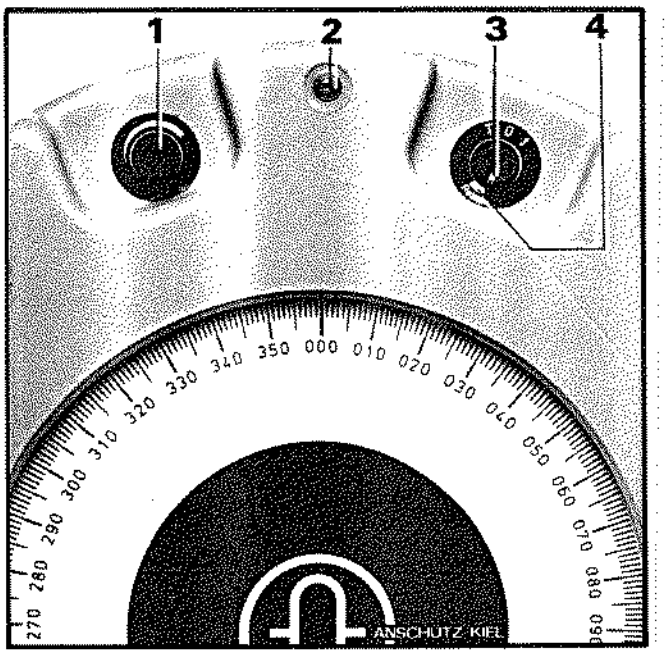
BSH type test specification: acc. to IMO Performance Standard A 242 (XI)

	Degree of interfsrence acc. to VDE 0875:	Factor "K"
	Resistance to vibrstion of the gyro compsss equipmsnt:	According to BSH and GL requirements
1.3.5	**Type Test** BSH type test specification	acc. to IMO Performance Standard A 242 (XI)

2. Operating Instructions

2.1 Switching on the Gyro Compass Equipment

The gyro compass equipment can be switched on either without or – if an optional time switch is used – with time delay. For immediate switching–on, proceed as follows (see Section 2.1.1).



1 Knob for dimming potentiometer
2 LED for signalling
3 Follow–up switch B2
4 RESET range

Fig. 2–1: Control Elements and LED on the Compass Hood (Sectional View of Compass Hood)

2.1.1 Switching–on Procedure

- Set the follow–up switch (2–1.3) to Pos. "0".
- Set the main switch on the inverter (Fig. 1–12) to Pos. "I".
- The red LED (2–1.2) lights up.

The gyros start running up to their rated speed and cause the gyrosphere to settle in the meridian. This settling process is terminated after about 3 ... 5 hours.

After approx. 1 hour from the moment of switching on, the follow–up system can be switched on by means of the follow–up switch (2–1.3). (Set the follow–up switch to Pos. "1", whereupon the red LED (2–1.2) goes out.)

Earlier switching–on (even for a short time) may disturb – and therefore extend – the settling process of the gyrosphere.
The outer sphere now follows up the position of the gyrosphere automatically.

2.2 Adjusting the Repeaters for the Gyro Compass Course

(See also Section 3.2.7, Synchronizing the Course Indications of the Repeaters with the Course Indication of the Gyro Compass.)

Aftar first putting into operation of the gyro compass equipment, all repeater indications must coincide with the gyro compass course indication.
If this is not the case, the repeaters concerned are to be re-adjusted for the coursa of the gyro compass (synchronization).

Hint:
The course adjustment is to be performed only with the compass in settled condition and with the follow-up system switched on. Thus, adjustment errors of other connected repeaters are eliminated.

2.2.1 Adjusting the Card Illumination on the Gyro Compass and on the Rapeater Compassea

By means of the respective illumination potentiometer, the brightness of the card illumination can be adapted to ambient light conditions.

2.3 Signelling during Operation

The LED on the compass hood (2-1.2) indicates the following operating conditions by lighting up red:

- Operating temperature too high (more than +65°C; follow-up system switched on)
- Supply voltage $\leq$18.5V for a period of $\geq$1.5 s
- Follow-up system switched off or in pos. "T" e.g. manually via follow-up switch (2-1.3) or automatically, e.g. due to undervoltage
- Gyro motors without power supply for longer than 1.5 s.

For cancelling a message, set the follow-up switch briefly to Pos. "0" and then back to Pos. "1" (RESET range, 2-1.4). The red LED goes out. Should the LED continue to light, the cause of the fault must be investigated.

2.4 Checks to be made during Operation

The following checks must be made during operation of the equipment:

- Check the signalling LED (see Fig. 2-1.2)
- Check the course indication of the gyro compass
- Check and compare the indicated values between the gyro compass STANDARD 14 and the analog or digital indications of connected repeaters.

Should the indications deviate from the course indication of the gyro compass, the corresponding repeater must be synchronized (refer to Section 3.2.7).
For digital repeater compasses, the enclosed descriptions of device should be observed.

2.5 Voltage Failure of the AC Supply for the optional Course Trsnsducer

(See Section 4.2.4.4).

2.6 Switching off the Gyro Compass Equipment

The following operator actions are required for switching–off:

- Set the follow–up switch (2–1.3) on the compass to Pos. "0".
- Set the main switch on the inverter to Pos. "0".

Hint:
Time switch (if included in the equipment) is not to be actuated !

> **Attention:**
> When the gyro compass has been switched off, the gyros come to a standstill only after a run–down time of approx. 15 min. During this period, access to the gyro compass is not allowed!

Note:
It is recommended not to switch off the gyro compass equipment, when the ship stays in port for no more than one week.

Attention!
On switching off the gyro compass equipment it mey happen that the gyrosphere takes a tilted position within the outer sphere. On re–starting the equipment

with the follow–up system switched on,

the gyrosphere mey oscillete for a period longer than 30 hours. In case the gyrosphere shows a tilted position and the indication is veriable (the gyro current, height of gyrosphere, supporting liquid temperature are correct!), the follow–up system is to be switched off. Switch off the equipment.
Wait until the gyros are at complete standstill (after approx. 15 min.), then switch on the equipment again. After 1 hour, switch on the follow–up system.
At the end of the settling process, check the position of gyrosphere once more. If the gyrosphere remains in a tilted position and the indication shows variable errors, the gyrosphere should be exchanged.

2.7 Time Switch, Type NB 03–735 (optional)

2.7.1 Opereting Instruction

Adjustment of the time when the compass is intended to be available is made by means of the scale of the time switch (see Fig. 1–12).

For this purpose,

- the time till the moment of switching–on
  and
- the settling time (4h) of the gyro compass
  are to be edded together and adjusted on the rotary knob of the time switch.

Note:
The distence of between the short division marks corresponds to 2 hours, the long merks indiceting the deys (from 0 to 6 days).

Applying the 24V DC operating voltage to the input terminals results in that the output relay D1 immediately becomes activated. The opereting voltage is then applied to the output terminels. Simultaneously, the operating voltage is indicated by the green LED Ng "GYRD ON".

Actuating the key "DELAY" causes the relay D1 to drop out and the output to be dead. Simultaneously, the time adjusted by means of the potentiometer R17 runs down. Run–down of the delay time is indicated by the red LED N10 "DELAY".

If during the time run–down the key "DELAY" is actuated once more, the time then adjusted will run down. When the time adjusted has run down, the relay D1 will be re–activeted. Voltage is applied to the output egein.

The output will be ectiveted always 4 hours before the time adjusted has run down. The key "GYRO ON" permits interruption of the time edjusted end switching on the compass immedietely.

3. Care and Maintenance

3.1 Safety Regulations

Attention!
For performing care and maintenance work, due regard to the applicable safety ragulations is indispansable (e.g. VDE regulations on the operation of heavy-current installations, VGB4 safety regulations for electric installations end production facilities or equivalent regulations). Before carrying out any servicing measure on the gyro compass in switched-off condition, wait until the gyros have come to e standstill (run-down time epprox. 15 min).

3.1.1 General Information

Care and routine preventive maintenance of tha gyro compass equipment are restricted to inspections as well as to exchenging the supporting liquid in order to ensure a reliable operation of the gyro compass equipment.

- For new equipment, the first inspection of all system components is recommended to be performed approx. 2 years after first-time commissioning.
- Thereafter, an inspection of all system components incl. ovarhaul should ba made onca a year. The supporting liquid has to be exchanged once a yaar.

Hints:
Due to a certain evaporation, however, the supporting liquid level is to be checked half-yearly, even for new equipment. In case the supporting liquid level is too low, top up **with distilled water only!** (Cf. Section 3.5.1.)
When exchanging the supporting liquid, use "Original ANSCHÜTZ Supporting Liquid" only!

For exchanging the supporting liquid refer to Sections 3.1.2, 3.1.3, 3.3.1.1, 3.3.3. This maintenance work can be carried out by trained ship's personnel or by any ANSCHÜTZ service station.

For inspections, functional checks and repair work of the equipment, please turn to an ANSCHÜTZ service station.
A List of Service Stations is included in the Compass Book.

In the following sections, you will find described the operations that are required for eliminating disturbances.

3.1.2 Opening the Gyro Compass

3.1.2.1 Removing the Compass Hood

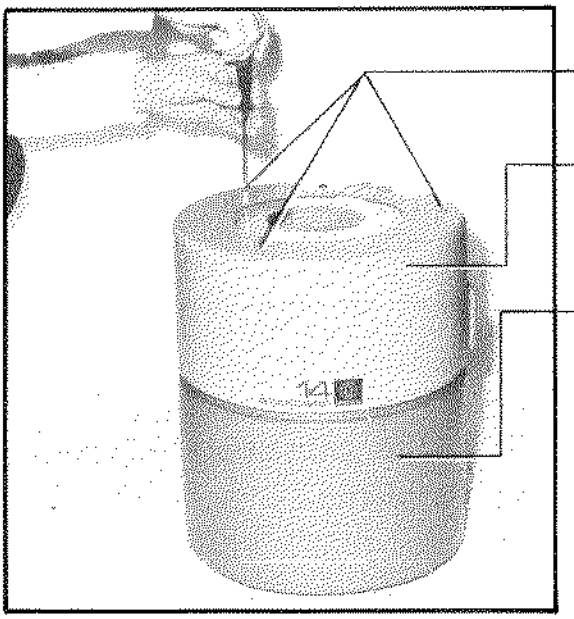


Fig. 3–1:
Unscrewing 3 Cross–slotted Screws on the Compass Hood

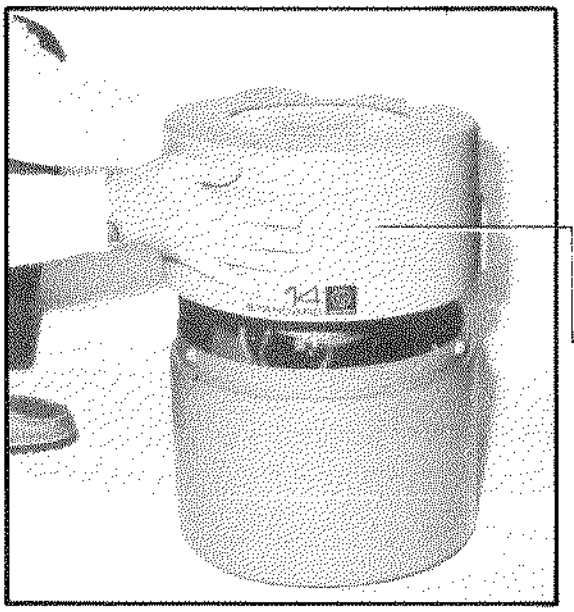


Fig. 3–2:
Removing the Compass Hood to above

3.1.2.2 Removing the Compass Casing

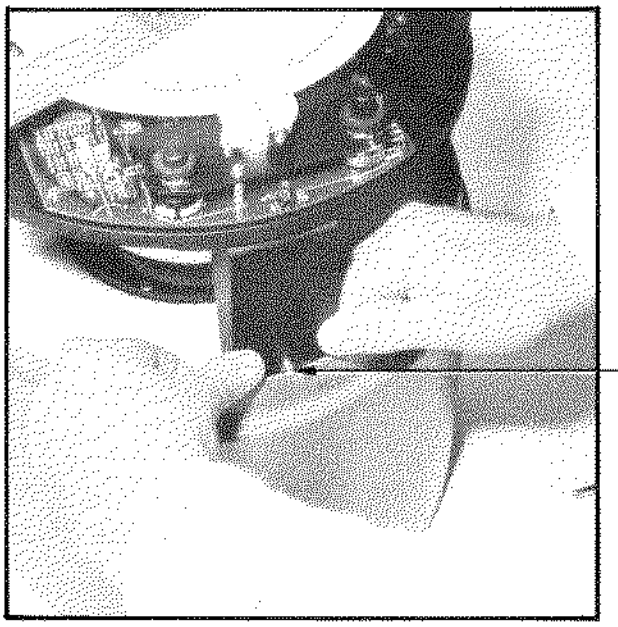


Fig. 3–3:
Pushing the Compass Casing over the 3 Cylindrical Pins (some millimetres). The arrow points to one of the cylindrical pins

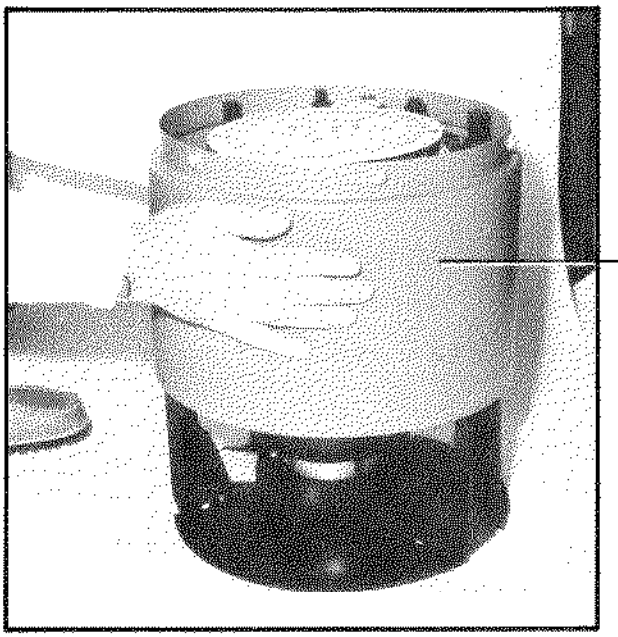


Fig. 3–4:
Pushing the Compass Casing to above and removing it.
Note:
When inserting the compass connection cable laterelly below the compass hood, start loosening and removing the 25–pole plug connection of the compass connection cable (see Fig. 3–21) as well as the cable clamp!

3.1.3 Exchanging the Supporting Liquid

In order to ensure reliable functioning of the gyro compass the supporting liquid should be renewed

- for new equipment after 2 years (from first commissioning), then
- once a year (see Section 3.1.1).

For reasons of expediency, the exchange of the supporting liquid should be mede while the ship is in port or in the course of an annual overhaul; it can be cerried out by the ship's personnel or by an authorized ANSCHÜTZ service station.

Hints:

- Prior to switching off the gyro compass equipment, record the indicated course. Set the follow-up switch to "T" and make the 360° card run into the "000" position.
- Switch off the equipment on the course transducer and on the inverter.
- On exchanging the gyrosphere and /or supporting liquid in extremely cold weather or in cold regions, the supporting liquid is to be pre-heated to room temperature at least, before it is filled into the outer sphere. Extremely cold supporting liquids might extend the settling process of the gyrosphere by several hours. It may happen that the gyrosphere turns in one direction (>360°) for the first one or two hours and only then will start with its normal settling curve.

Preparing the removal of outer sphere end gyrosphere

Attention:

Before performing further work, weit approx. 15 min until the gyros in tha gyrosphere have come to a standstill!

Go on working as described and illustrated under Section 3.3.1:

- Removing the Gyrosphere from the Outer Sphere.
- Draining off the supporting liquid.
- Opening the outer sphere.
- Removing the gyrosphere.
- Cleaning the gyrosphere and outer sphere parts using clear water (if possible, distilled water) only.
- Then dry well the gyrosphere and the outer sphere parts.

Note:

- Reassembly to be made following the dismantling instructions in reverse order.
- Inserting the gyrosphere, for further reassembly proceed as described in Sections 3.3.2 and 3.3.3.
- Checking the cable connections, carrying out functional check.

3.2 Inspecting the Gyro Compass Equipment

3.2.1 Inspecting the Gyro Compass

The work to be carried out on the gyro compass during inspection comprises disassembly and assembly procedures, as decribed in detail in the following sections:

3.1.3 Exchanging the Supporting Liquid
3.3 Replacing the Gyrosphere
3.4 Removing the Pump.

- Set the follow-up switch to Pos. "T" (360° card turns into "000" position).
- Switch off the compass equipment on the course transducer and on the inverter.
- Remove the compass hood and casing.
- Remove the outer sphere and cleen it.
- Clean the compass casing, fan motor end supporting plate from dust and dirt.
- Drain off the supporting liquid and remove the gyrosphere.
- Unscrew the pump unit.
- Clean the pump unit and outer sphere parts with clear water (if possible, distilled water) and dry them well.
- Replace filter ring, teflon washer, seal and gasket.
- Check the cable loom.
- Screw the pump unit onto the outer sphere again.
- Fill the outer sphere with approx. 1/4 l of supporting liquid. (Use only original ANSCHÜTZ supporting liquid!)

Attention:
In extremely cold weather or in cold regions, the supporting liquid is to be pre-heated to room temperature.

- Check the function of the pump by briefly switching the equipment on and off on the course transducer three or four times (with the inverter switched on).
- Then switch off again the inverter and the course transducer.
- Carefully clean the gyrosphere using clear water (if possible, distilled water).
- Re-insert the gyrosphere into the outer sphere.
- Fill supporting liquid into the outer sphere (see Section 3.3.3 and 3.5.1).
- Check the gasket (between outer sphere vessel and cover); renew it, if necessery.
- Close the outer sphere.
- Flange the outer sphere to the pendulum joint again.
- Check the gear wheels, clean and grease them, if necessary.
- Check the toothed belt.
- Check lighting.

3.2.2 Inspecting the Inverter

- Clean the inverter from dust and dirt.
- Open the inverter.
- Measure the supply and operating voltages in the inverter (see Test List for Inverter, compass connection cable removed from the compass, inverter switched on).
- Close the inverter again.

3.2.3 Inspecting the Course Transducer (only if existing)

- Clean the course transducer from dust and dirt.
- Open the course transducer.
- Measure the supply and operating voltages in the course transducer (for this purpose, switch on the course transducer).
- Check the adapter PCBs.
- Close the course transducer again.

3.2.4 Inspecting the Time Switch

- Perform functional check of the time switch (if provided).

3.2.5 Inspecting the Repeater Compass(es)

- Clean the repeater compass from dust and dirt.
- Open the repeeter compess.
- Check the repeater compass installed outside for penetration of weter.
- Renew defective sealings.
- Check the gear wheels or toothed belts; clean, if required.
- Grease gear wheels, e.g. with MOLYKOTE, oil beerings.
- Renew or regenerete the anti-mist cartridge (only with Type 133-310).
- Check the lighting.
- Check stepping motor or
- Check synchro.
- Close the repeater compass again.
- Synchronize repeater compass.

3.2.6 Checking the Operational Function of the Equipment

- Re–establish cable or plug connections, if applicable.
- Switch on the equipment via the course transducer, inverter and, where applicable, time switch.
- Measure the starting and operating current of the gyro motors and of the pump motor.
- After the operating temperature is reached (+52°C, at the earliest after approx. two hours), check the level of the supporting liquid and the height of the gyrosphere.
- After the gyrosphere has settled (max. 5 h), switch on the follow–up system.
- Compare the course indications of the repeaters with the gyro compass course indication and, if necessary, synchronize them (see Section 3.2.7).

Hint:
All peripheral equipment belonging to the system should also be checked for correct functioning.

3.2.7 Synchronizing the Course Indicstion of the Repeaters with the Course Indication of the Gyro Compass

Note:
In order to ensure correct course indication by the repeaters connected, their course indication is to be compared to the NORTH–referred course indication of the gyro compass and, if required, adjusted for the same course velue (synchronization). This edjustment must take place upon commissioning of the gyro compass equipment. Within the scope of the annual inspection of the complete equipment, however, the course indications should also be checked. The same applies when the equipment is again put into operetion, e.g. after checks, repairs, current breakdowns or similar.

3.2.7.1 Preparing the Synchronization Procedure

- Switch on the equipment (acc. to Section 2.1). Follow–up switch (2–1.3) remains in "OFF" position for approx. 1 h.
- Set the follow–up switch (2–1.3) to Pos. "T" (Test). The 360° card now turns into its "000" position.

Hint:
Should the case arise that the gyro compass card with follow-up switch position "T" does not turn into its "000" position (may be the case for initial positions in the range between approx. 350° and 360°), operation of push-button B3 results in that the electrical interlock is interrupted. The gyro compass card now turns into its "000" position. (The push-button B3 and the gyro compass card are accessible after removal of the gyro compass hood, see Section 3.1.2).

3.2.7.2 Synchronizing the Repeater Compasses

- Sat follow-up switch (2-1.3) to Pos. "1".
  Tha gyro compass card and all rapeater compass cards must now run into the same course value. A possibly connected digital repeater compass is to be adjusted for tha corresponding course valua.
  If the indications of the repeatar compasses do not coincide with the master compass indication, the repeater compasses concerned are to be synchronized (adjusted) by means of their adjusting devices for the course valua of the mastar compass.

Procedure of synchronizing the repester compasses:

- Remove protective cap (or locking scraw for Type 133-310).
- Insart tha scraw drivar into the opening and adjust the compass card for the value of the gyro compass indication.
- Put on the protective cap (or screw in the locking screw for Type 133-310).

Hint:
With step-type repeater compasses, the step resolution may result in that the 1/10° indication shows a physically-conditioned deviation of max. ±0.08° which cannot be corrected.

3.3 Replacing the Gyrosphere

3.3.1 Removing the Gyrosphere from the Outer Sphere

Required tools:
1 Injector, 1 Suction cup,
2 Screw drivers for cross–slotted screws, sizes 1 and 2.

- Set the follow–up switch to position "T", thus causing the 360° gyro compass card to run into Pos. "000".
- Switch off the gyro compass equipment on the course transducer and on the inverter.
- Remove the compass hood end casing (see Section 3.1.2).
- Wait approx. 15 min until the gyros in the gyrosphere have come to a complete stendstill.

3.3.1.1 Removing the Outer Sphere from the Pendulum Joint

Teke hold of the outer sphere at the bottom with one hand applying slight pressure to above. In this position, press down the 4 quick–closing pins on the pendulum joint each one time only (see Fig. 3–5).

Attention!
Now the outer sphere is loosened from the pendulum joint.

- Take hold of the outer sphere end carefully take it out of the gyro compass (see Fig. 3–6).
- Put the outer sphere down beside the gyro compass on a plane surface (see Fig. 3–7).

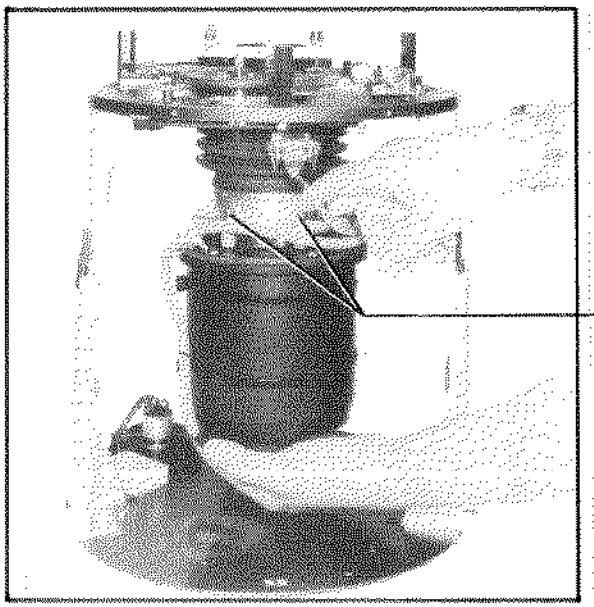


Fig. 3–5:
Loosening the Outer Sphere from the Pendulum Joint:
Press down the 4 quick–closing pins one time each.
Attention! Now the outer sphere is loosened from the pendulum joint.

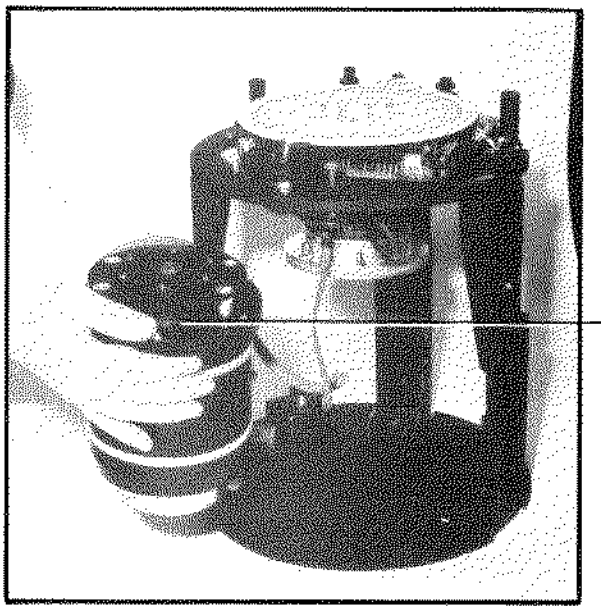


Fig. 3–6:
Taking the Outer Sphere carefully out of the Gyro Compass

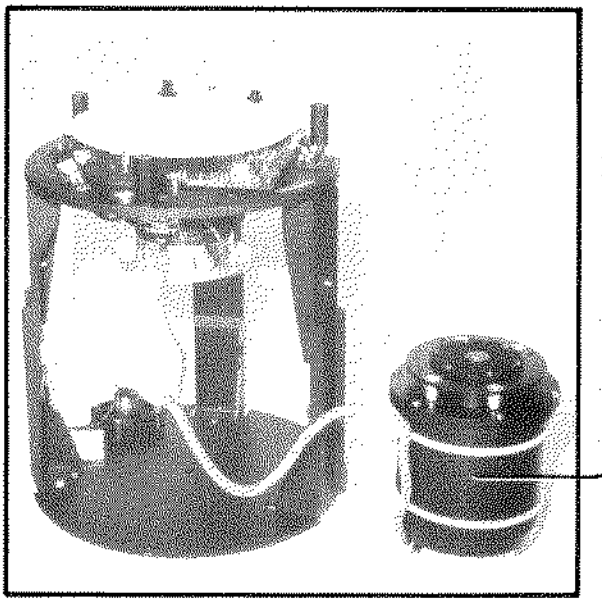


Fig. 3–7:
Putting down the Outer Sphere on a Plane Surface beside the Gyro Compass

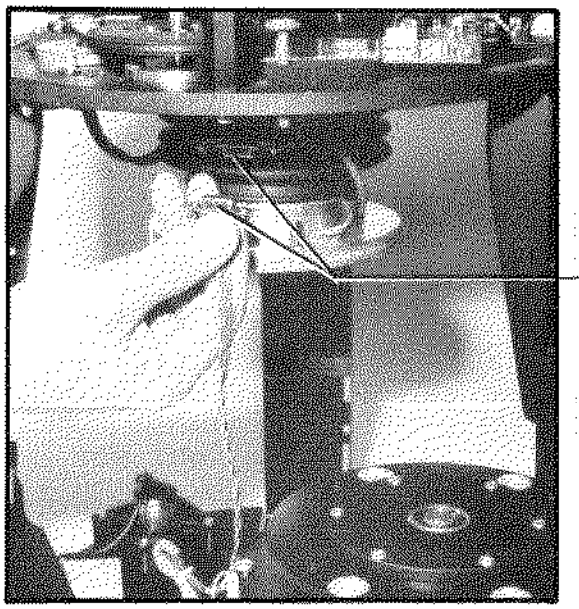


Fig. 3–8:
Loosening the Plug Connection of the Outer Sphere Connecting Cable from the Bottom Side of the Supporting Plate

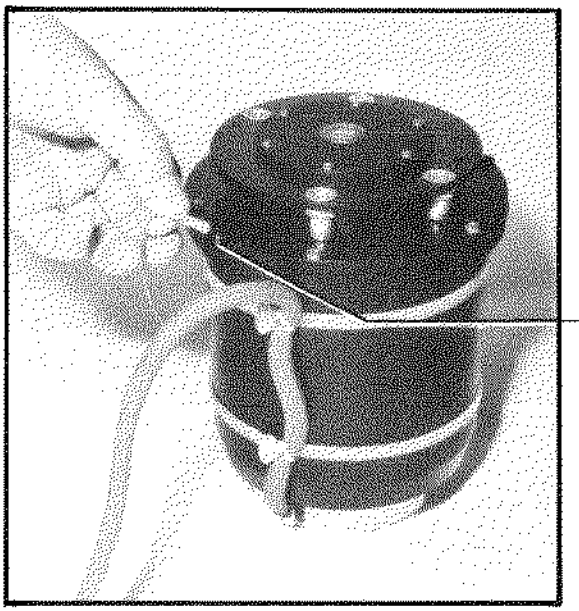


Fig. 3–9:
Loosening the Individual Wire Plug Connection from the Outer Sphere

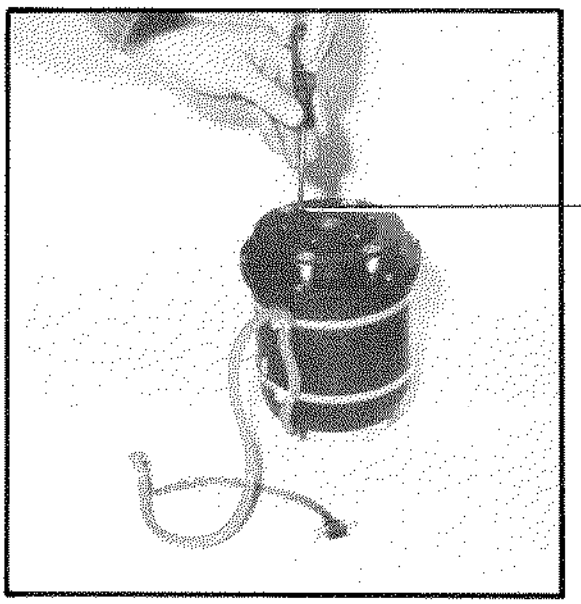


Fig. 3–10:
Unscrewing the Outer Sphere Insert (6 Screws)

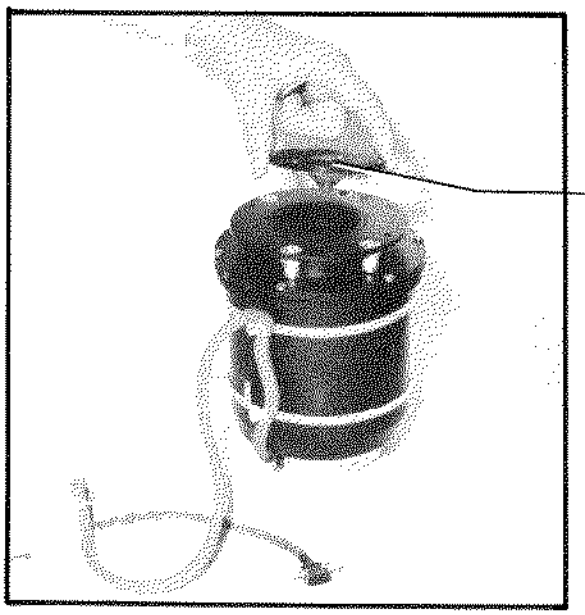


Fig. 3–11:
Removing the Outer Sphere Insert

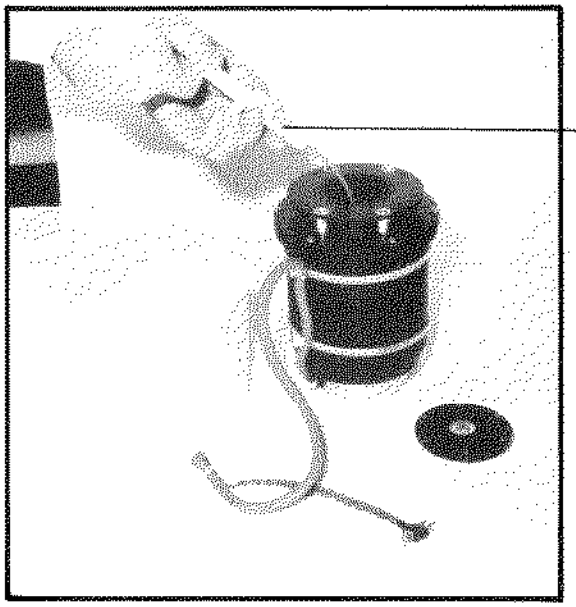


Fig. 3–12:
Removing the Supporting Liquid out of the Outer Sphere by means of the Injector
(Remove approx. 12 to 15 injector fillings)

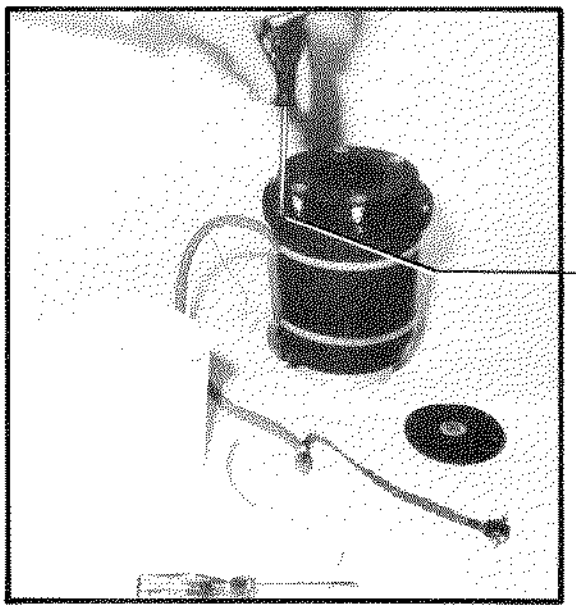


Fig. 3–13:
Screwing off the Outer Sphere Cover
(6 Screws)

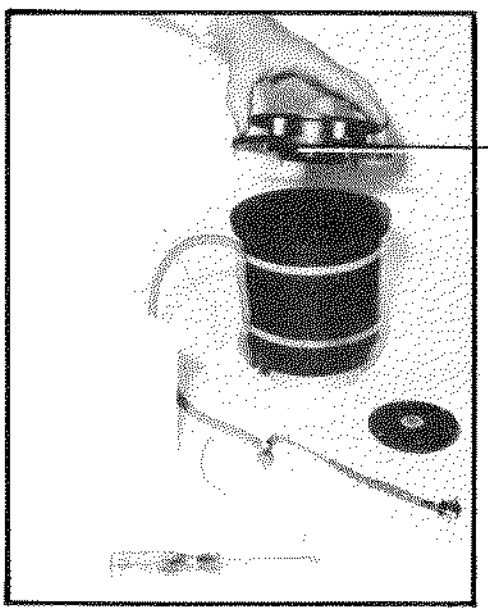


Fig. 3–14:
Removing the Outer Sphere Cover

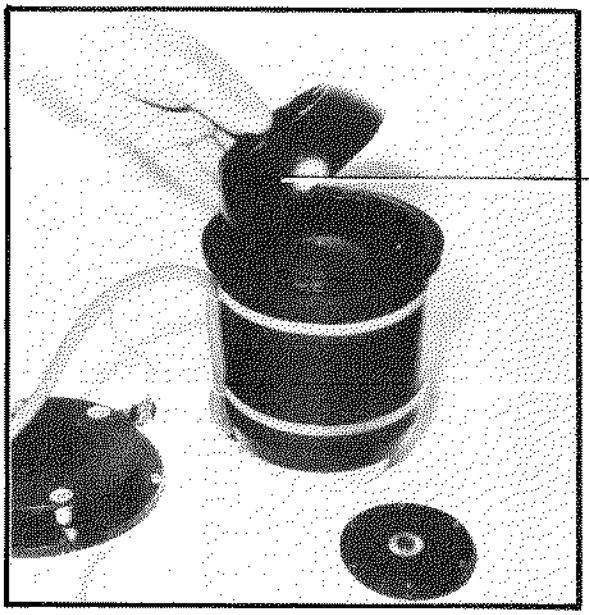


Fig. 3–15:
Removing the Inner Shell

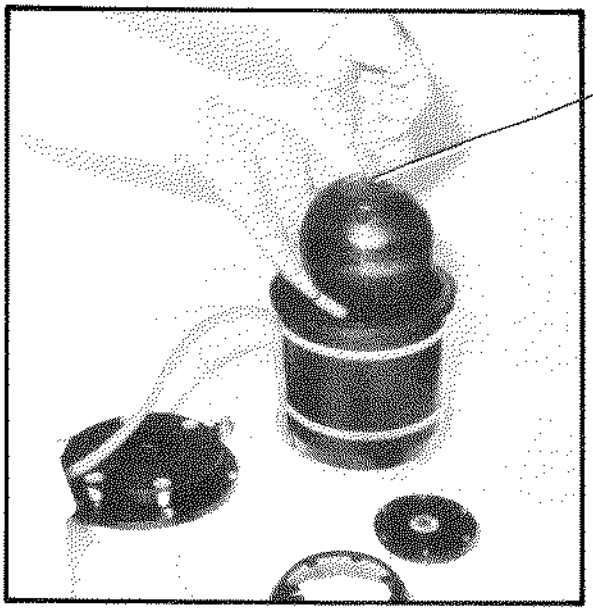


Fig. 3–16:
Lifting out the Gyrosphere by means of the Suction Cup.
For this purpose, moisten the suction cup and press it centered on the calotte of the gyrosphere.
Attention! Take out the gyrosphere carefully. Support the gyrosphere with one hand from below.

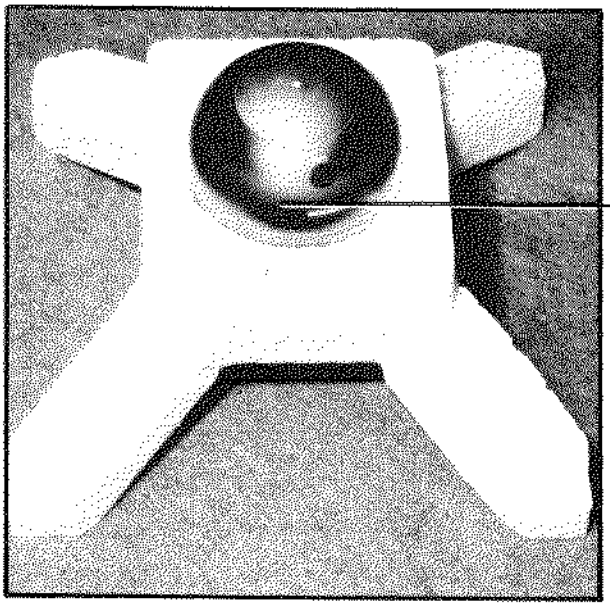


Fig. 3–17:
Keeping the Gyrosphere in a Safe Place (e.g. on a foam part included in the originel packing of the gyrosphere)

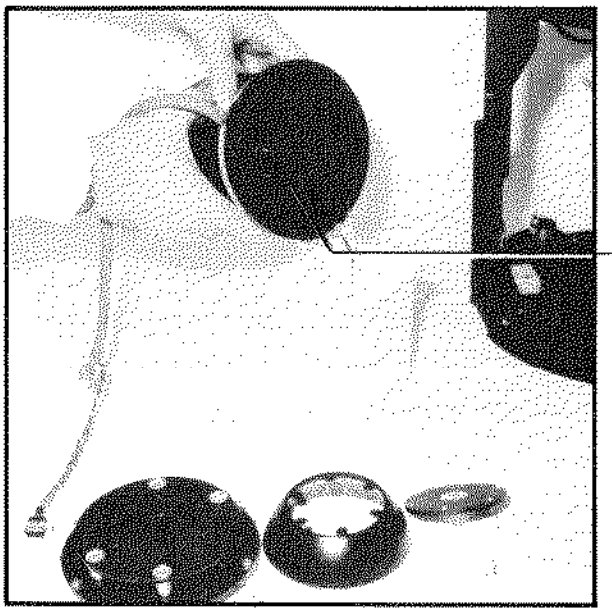


Fig. 3–18:
Pouring out the Remaining Supporting Liquid

Hint:
Before inserting the gyrosphere, check that the outer sphere is not soiled – clean it, if necessary. After long periods of operation, the pump filter should be replaced (at the latest after two years in operation).

3.3.2 Inserting the Gyrosphere into the Outer Sphere

Hint: Compare illustrations showing removal of gyrosphere!

- Fill approx. 1/4 l of original ANSCHÜTZ supporting liquid into the outer sphere.
- Moisten the suction cup and press it onto the centre of the calotte and
- Carefully insert the gyrosphere into the outer sphere (cf. Fig. 3–16).
- Remove suction cup.
- Centrally place the inner shell onto the seat of the lower support bearing of the outer sphere (cf. Fig. 3–15).
- Clean the contact surfaces of the outer sphere, outer sphere cover and insert.
- Check the position of the gasket ring between the outer sphere and outer sphere cover.
- Place the outer sphere cover on the outer sphere (cf. Fig. 3–14) whilst observing the positioning pins!
- Secure the outer sphere cover to the outer sphere (6 screws to be tightened crosswise, cf. Fig. 3–13).
- Check the position of the gasket ring between the outer sphere cover and the
- insert.
- Carefully place the insert on the outer sphere cover (cf. Fig. 3–11).
- Fasten the insert to the outer sphere cover by means of 6 screws (cf. Fig. 3–10).

3.3.3 Filling the Outer Sphere with Supporting Liquid and Measuring the Level of the Supporting Liquid

- Fill in original ANSCHÜTZ supporting liquid via the opening in the outer sphere cover.

Attention:
In extremely cold weather or in cold regions, the supporting liquid is to be pre–heated to room temperature.
Fill in original ANSCHÜTZ supporting liquid in the outer sphere.

Filling height:
approx. 10mm from the upper edge (see Fig. 3–19).
Tilt of the outer sphere for a short time by approx. 20° (removal of air bubbles). The supporting liquid level can be read off the measuring cone (see Section 3.5.1).

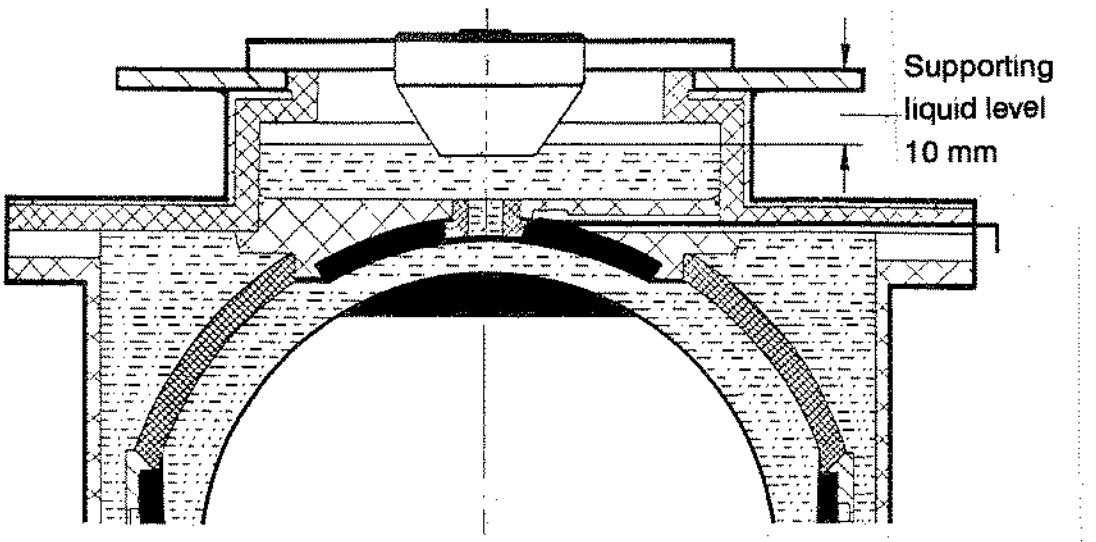


Fig. 3–19: Supporting Liquid Level in the Outer Sphere
(Upper Pert of the Outer Sphere, Schemetic)

- Replace and tighten the top screw.
- Insert the outer sphere into the gyro compass (refer to Section 3.3.4).
- Mount the compass casing end the compass hood.
- Switch on the gyro compass equipment on the course transducer and on the inverter.
- After 3 ... 4 hours, check again the supporting liquid level at operating temperature (+52°C). For this purpose, the follow–up has to be switched off, the compass opened again and the outer sphere is to be removed from the hinge. (Proceed as described in Section 3.3.1.1.)

Hint:
Do not remove the plug from the underside of the supporting plate.

- Check the supporting liquid level and correct if neccessary.
- Check the supporting liquid temperature (+52°C).
- Subsequently re–assemble the removed parts.

3.3.4 Inserting the Outer Sphere into the Gyro Compass

(Cf. Fig. 3–5 and Fig. 3–6)

Re–establish the cable plug connection (Fig. 3–8) between the outer sphere and the supporting plate (if detached).

- Take hold of the outer sphere with one hand from below and carefully couple the outer sphere to the flange of the pendulum joint. Insert the guide pin on the edge of the outer–sphere cover into the guide slot of the flange of the pendulum joint. Apply slight pressure from below to the outer sphere. In this position, press the 4 quick–closing pins on the pendulum joint one time each (see Fig. 3–5).

Note:

Now the outer sphere is fastened to the pendulum joint.

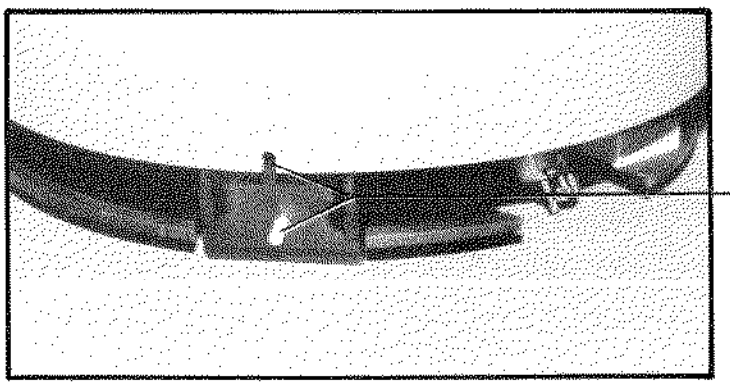


Fig. 3–20:
Mounting the Compass Casing (Pay attention to rear centering, if existing).

Centering:
(pin and groove)

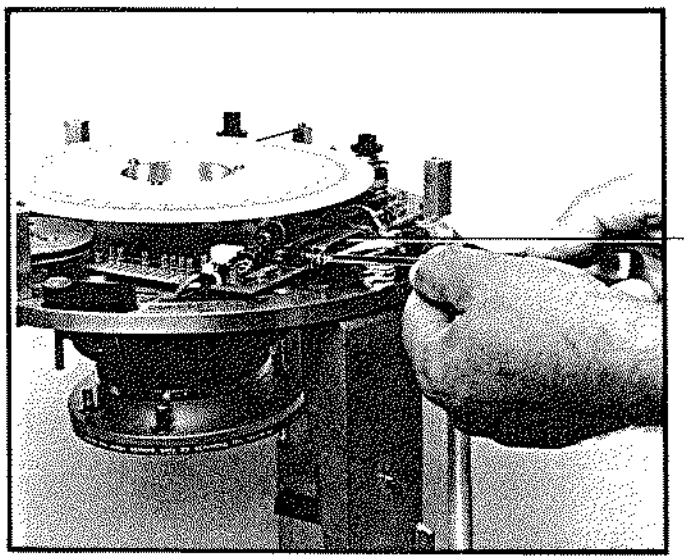


Fig. 3–21:
Establishing the 25–pole Plug Connection of the Compass Connection Cable, if loosened. Secure cable clip.

- Replace and secure the compass hood.

3.4 Removing the Pump

- Set the follow-up switch (2-1.3) to Pos. "T" and let the 360° compass card run into Pos. "000".
- Switch off the equipment on the course transducer and on the inverter.
- Allow the gyros to run down (approx. 15 min!).
- Dismantle the gyro compass (proceed as described in Sections 3.3.1 and 3.3.2).
- Keep the dismantled gyrosphere on an adequate support in a safe place until re-assembly.
- Tilt the outer sphere through 180°.
- Unscrew the 3 festening screws on the cover of the pump unit (Fig. 3-22) and remove the cover (Fig. 3-23).

Attention, danger of confusion!

To be loosened only the 3 screws for fastening the cover.

- Loosen the electrical plug connections of the cable loom from the pump unit and remove them (Fig. 3-24).
- Loosen the 6 fastening screws from the pump unit (Fig. 3-25).
- Carefully remove/install the parts of the pump (see Fig. 3-26, 3-27, 3-28).

The Pump, Type 110-106.06, comprises the following parts:

- Pump casing
- Filter ring
- Teflon washer
- Stator with base plate
- Rotor
- pump cover.

Re-install the new or previously removed parts in reverse order. Pay attention to correct position of the positioning pin (Fig. 3-24)!

- Re-establish the electrical plug connections on the pump.
- Tilt the outer sphare to the normal position again.
- Establish cable connection to the supporting plate (if removed).
- Fill some supporting liquid into the outer sphere (with low ambient temperature, pre-heat the supporting liquid).
- Switch on the coursa transducer briefly on and off 3 or 4 times (check of pump function, bubbling-up of the supporting liquid!)
- Switch off the course transducer again.
- For further re-assembly refer to Sections 3.3.2 and 3.3.3.
- Carry out functional check.

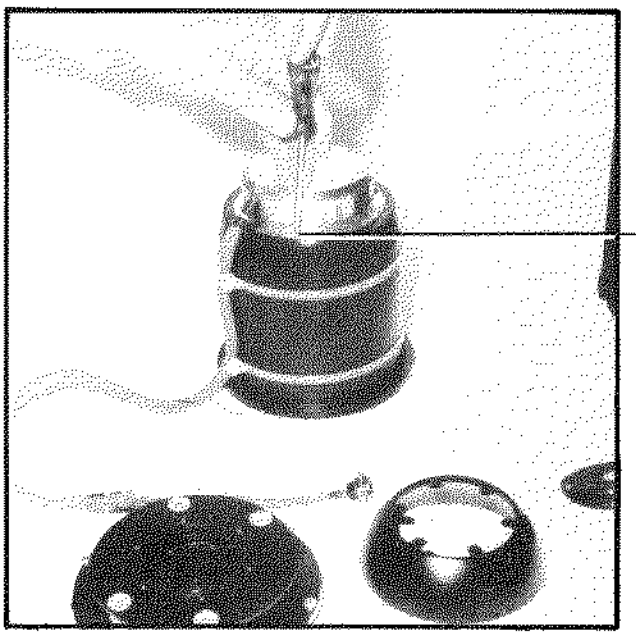


Fig. 3–22:
Screwing off the 3 Fastening Screws on the Cover of the Pump Unit

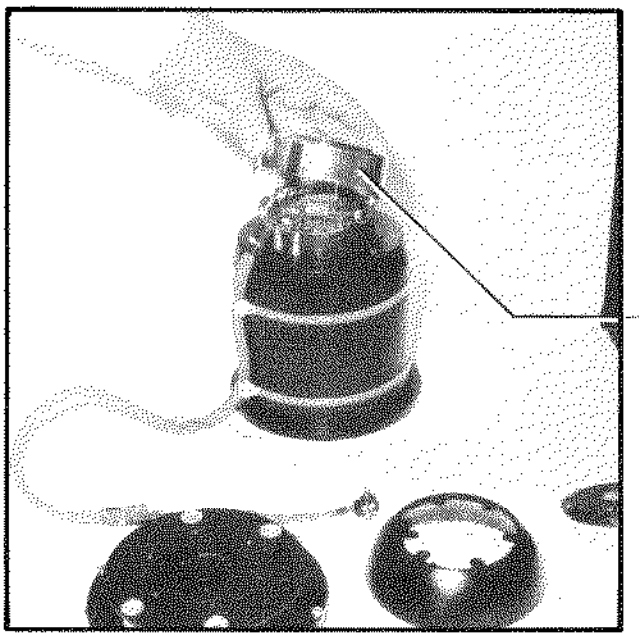


Fig. 3–23:
Removing the Cover of the Pump Unit

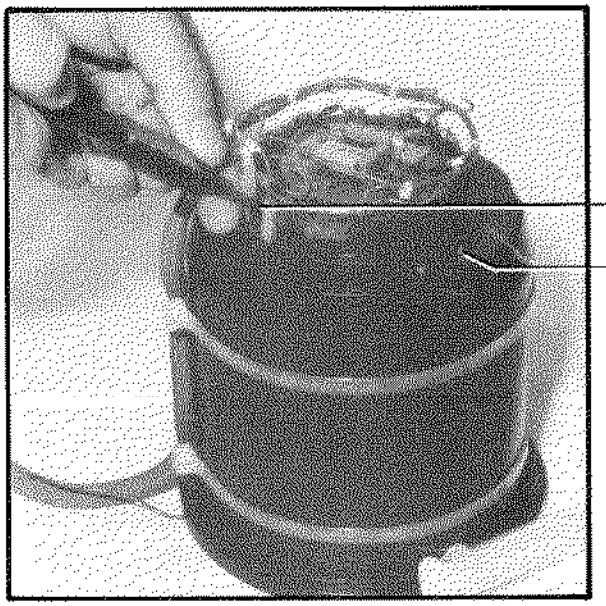


Fig. 3–24:
Loosening and removing the Electric Plug Connections of the Cable Loom on the Pump Unit.
Pay attention to the positioning pin responsible for the correct mounting position of the previously removed cover.

Positioning pin

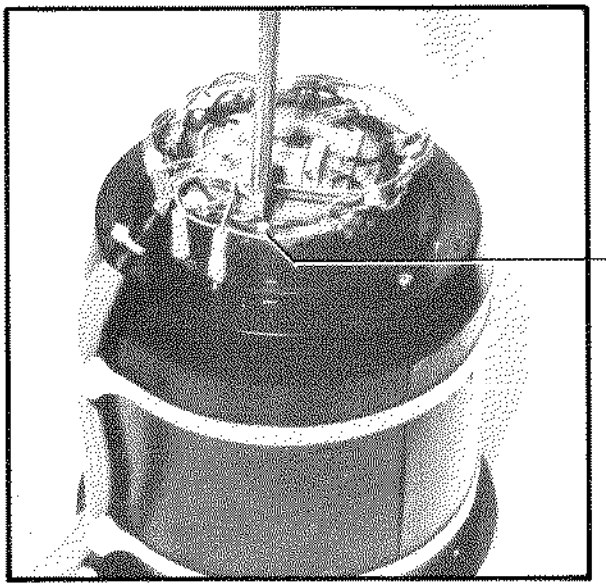


Fig. 3–25:
Unscrewing the 6 Fastening Screws from the Pump Unit

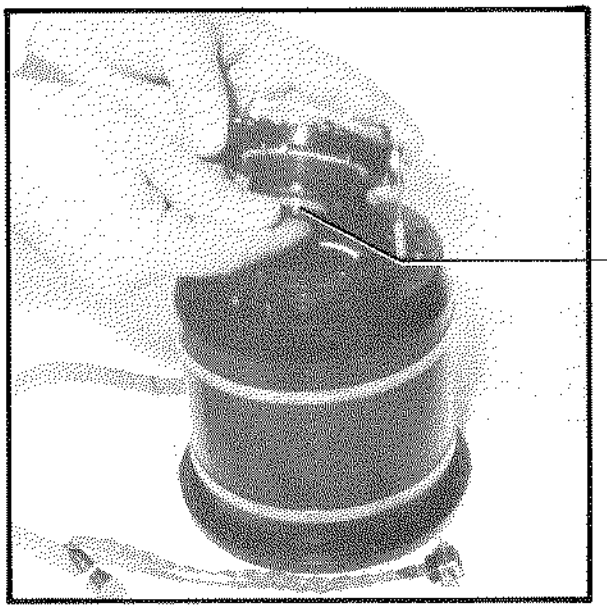


Fig. 3–26:
Removing the Pump Unit with the Rotor included)
Attention!
The rotor might fall out. Hold the rotor tight and take it out carefully.
Pay attention to the positioning pin responsible for the correct mounting position of the previously removed pump unit!

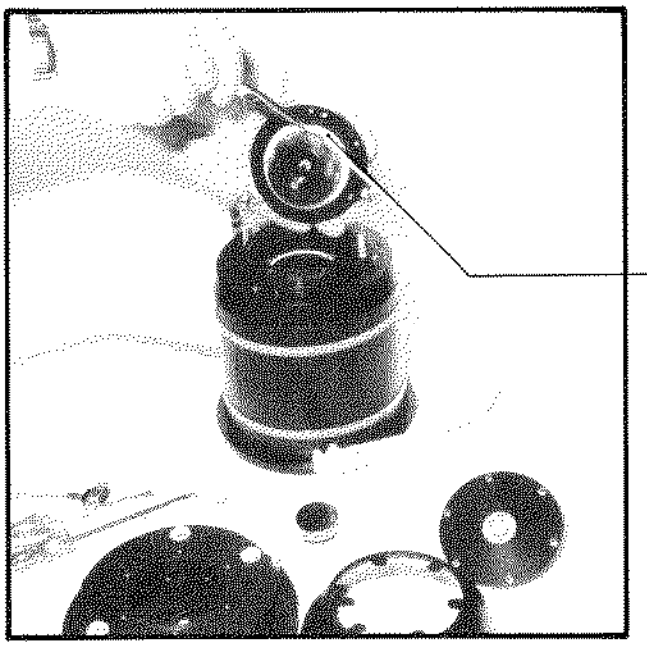


Fig. 3-27:
Replacing the Pump Filter

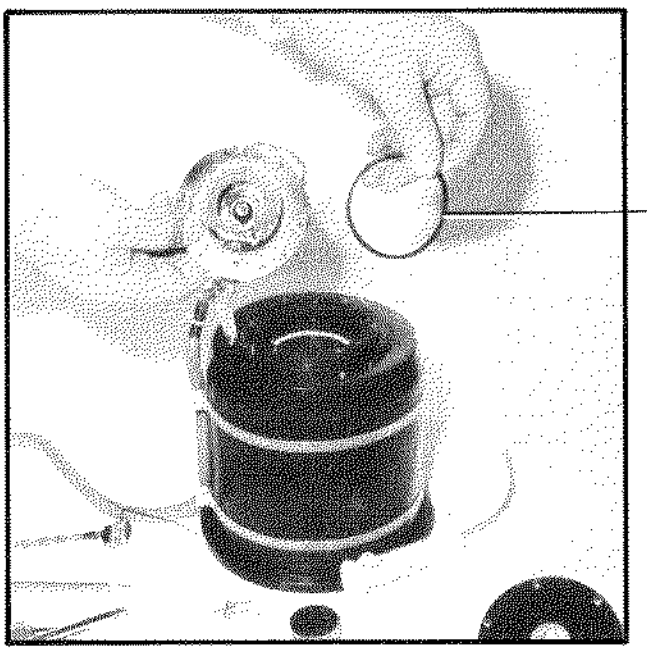


Fig. 3-28:
Replacing the Gasket Ring on the Pump Casing

3.5 General Checks

For the checks to be made, such as:
- Checking the supporting liquid level
- Checking the pump function
- Checking the height of the gyrosphere,

the outer sphere must be removed and placed beside the compass chassis on a plane surface (see Fig. 3–7).
However, removal of the cable plug connection to the outer sphere is not required!
The individual checks are to be made only when the follow-up system is switched off and with an operating temperature of +52°C. This value is reached approx. 1 ... 2 h after switching on, dependent on the ambient temperature.

3.5.1 Checking the Supporting Liquid Level

The supporting liquid level is to be read off the measuring cone (see Fig. 3–19 and 3–29). The part of the measuring cone immersed in the liquid appears dark with regard to the brighter, dry part. If the supporting liquid level is too low (see Fig. 3–29), the supporting liquid is to be topped up with **distilled water only** by means of the syringe (Fig. 3–12) via the filling hole (in the centre of the measuring cone).
Proceed as follows:
- Screw out the top screw from the measuring cone by means of a screw driver (6 mm) and top up with the relevant amount of liquid using the syringa.

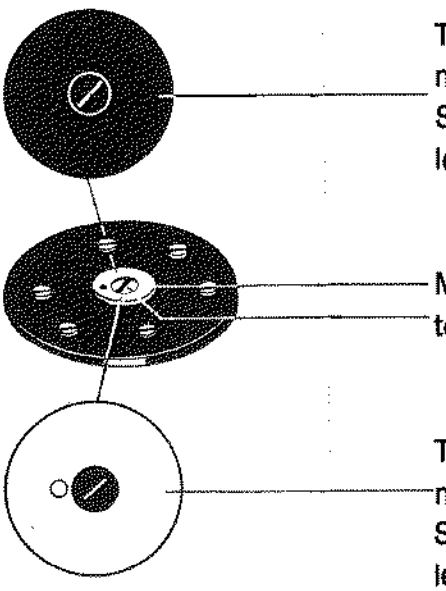


Fig. 3–29: Reading off the Supporting Liquid Level at the Measuring Cone

3.5.2 Checking the Pump Function and the Height of Gyrosphere

- Switch off follow–up.
- Open the gyro compass.
- Take the outer sphere out of the quick–acting closure.
- Screw out the top screw of the measuring cone, insert the gauge stick into the opening of the measuring cone and measure the height of gyrosphere (see Fig. 3–30).

Push down carefully the gauge stick with your finger.
The pump function and, with this, the height of the gyrosphere, are correct when there is a 1.5 mm to 2 mm height difference between the

bottom–contact position ≙ pump "OFF" (Fig. 3–30) and the
operating position ≙ pump "ON" (Fig. 3–31).

- Remove the gauge stick.
- Re–insert the locking screw (with sealing ring) into the measuring cone and tighten it.
- Install the outer sphere and close the gyro compass again.
- Switch on follow–up.

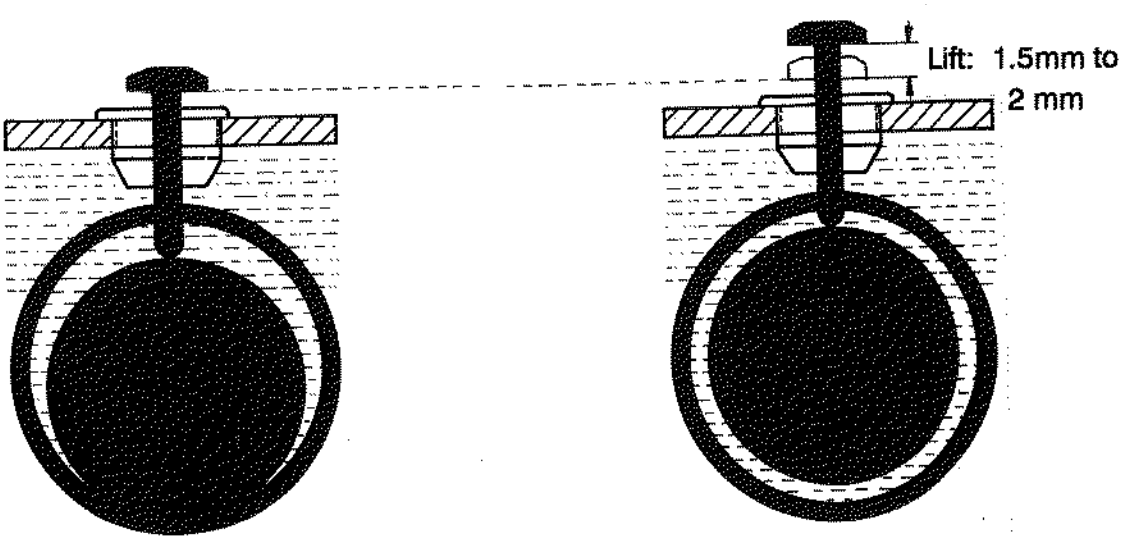


Fig. 3–30:
Gyrosphere in Bottom–contact Position:
Pump "OFF" (Schematic)

Fig. 3–31:
Gyrosphere in Operating Position:
Pump "ON" (Schematic)

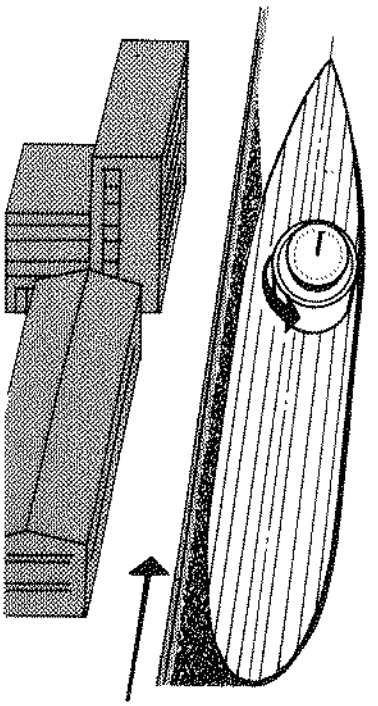
3.6 Ascertaining and Correcting the "A" Error

The "A" error of a gyro compass is brought about by incorrect alignment of the compass casing (lubber line) in ralation to the ship's fore–and–aft lina or a line parallel to this. The result is a constant gyro compass error which must subsequently be corracted by turning the compass casing.

In ordar to correct the "A" error of the gyro compass, the gyro compass must be switched on and the gyrosphere in settled position (approx. 5 h after switching on the equipment, the "A" error correction can be performed). In the interest of the desired accuracy, the ship must be at rest (made fast to a pier) in accordance with BSH (ex DHI) regulations!

Procedure:

- Ascertain the ship's position with regard to the geographical north pole (e.g. determine the direction of the pier by means of a sea chart, refer to example in Fig. 3–32: Direction of pier ≙ 109°).
- Remove the compass hood and casing.
- Loosen the mounting screws of the gyro compass.
- With the follow–up system switched on, carefully turn the compass chassis until the difference between the actual course (direction of pier ≙ 109°) and the course indicated by the compass (e.g. 111°) is cancelled out.
- Re–tighten the mounting screws.
- Compass casing and hood to be mounted and fastened again.



Indicated compass course: e.g. 111°

Example of "A" error correction of the gyro compass: Before correction, the gyro compass indicates e.g. 111°. (Direction of pier is 109°). Thus, the "A" error is 2°. In this case, the "A" error is to be corrected by turning the compass casing anti–clockwise.

Fig. 3–32: Ship lying at the Pier, True Direction ≙ 109°

3.7 Repeater Compasses

The repeater compasses require no special maintenance. They should be checked on the occasion of the annual overhaul recommended for the gyro compass equipment (see Section 3.2.5). See also the individual description appertaining to the repeater compass type in question.

4. Repair

4.1 Circuit Description Gyro Compass STANDARD 14

Circuit Diagram 110 C 106 HP 030, Wiring Diagram 110 D 106 HP 031

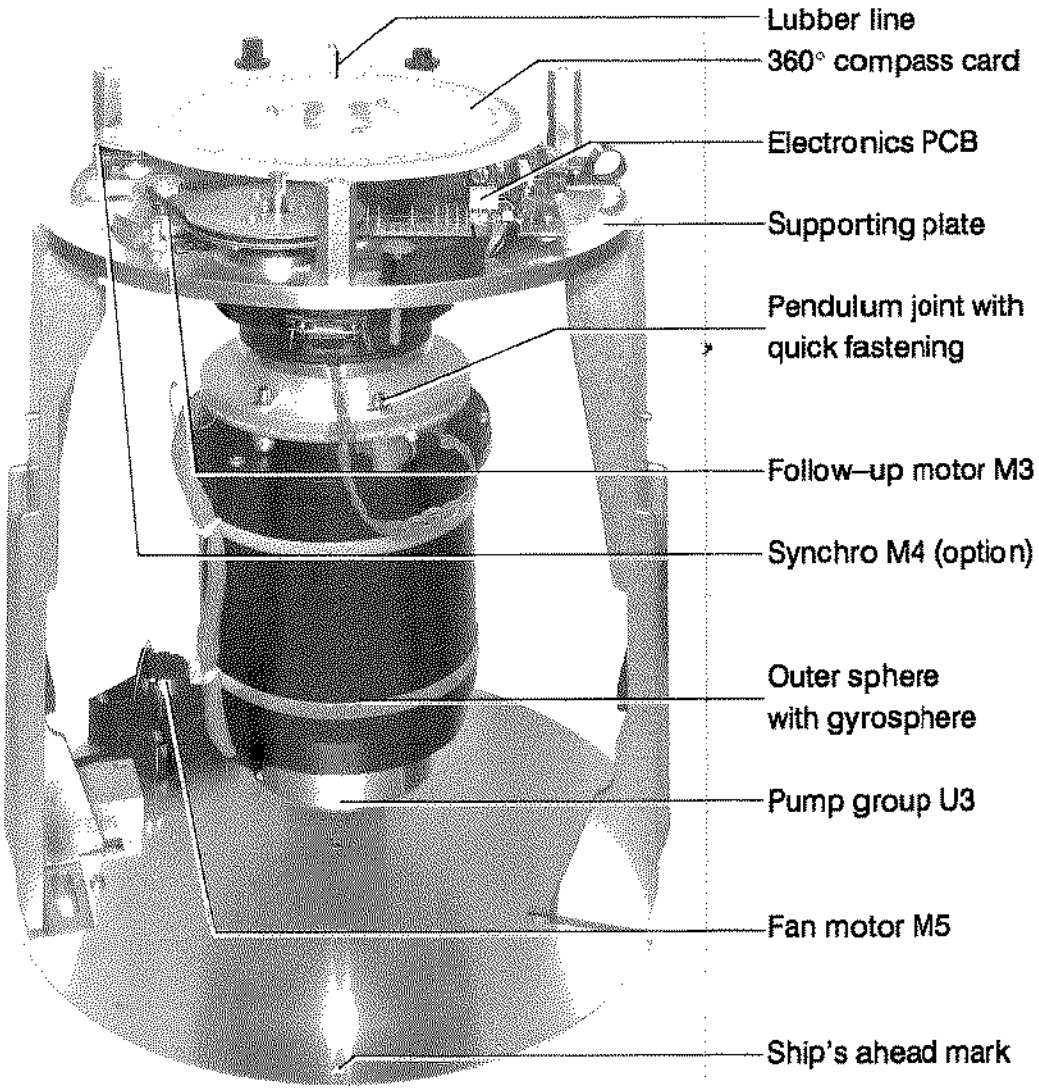


Fig. 4–1: Gyro Compass STANDARD 14 (Hood and Casing removed)

General

The gyro compass comprises the outer sphere U4 with the gyrosphere, the pump unit U3 with the heating resistor R4 and the temperature sensor N1, the supporting plate, the electronics PCB U1 for temperature control, the follow–up motor M3 and the fan motor M5 (on the compass base plate).

A synchro M4 intended for course trensmission to an autopilot can be mounted into the supporting plate as an option (for 110–106 NG 002 already existing).

The electric connection between the outer sphere and the electronics PCB is established by means of nine slip rings and nine sliding spring brushes.
The slip rings form circular copper laminations arranged side by side on the bottom side of the electronics PCB and ere faced with noble metal.

The motors of the two gyros and of the pump ere supplied with a trapezoidel AC voltage 55V/400Hz composed of two component voltages of 27.5V each, the electrical cantre of which approximately corresponds to the potential of the signal zero (TPA1).

The reversing contacts of the follow–up system are located within the outer sphere of the gyro compass. Together with two bridge resistors, R16 and R17, they ere electrically connected to the follow–up emplifier (compass electronics) in the inverter.

The stepping motor signals SM0 and SM1 produced in the compass electronics and in the step adapter from the analog compass signal, and the reference potential 0V are fed into the compass to the stepping motor M3. Via a toothed–belt intermediate drive end via a pinion, the stepping motor M3 drives the externally toothed 360° card which, on its part, turns tha outer sphere by means of the pendulum joint.
The follow–up switch B2 permits the following functions to be adjusted:
In Pos. "1", follow–up is switched on, whilst in Pos. "0", follow–up is switched off. With Pos. "T" (TEST), the compass equipment has a synchronization aid which causes the compass follow–up system to automatically run in to course "000" via the contact points in slip ring "9".
Hint:
Synchronization between the course indication of the gyro compass and the indication of the repeater compass can be performed with any position of indication!

During a voltage failure or voltage dip, the follow–up process will be interrupted as soon as the supply voltage remains under 18.5V DC. After voltage recovery, the follow–up action will be resumed. A voltage failure or voltage dip of >1.5s is signalized by means of the red LED (Fig. 2–1.2). With that, possibly–resulting course errors are indicated. The red LED can be extinguished by setting the follow–up switch momentarily to Pos. "0" and then again to Pos. "1" (RESET range, see Fig. 2–1.4).

4.1.1 Electronics PCB, Type 110–106.03

Circuit Diagram 110 C 106 HP030

Wiring Diagram 110 D 106 HP031

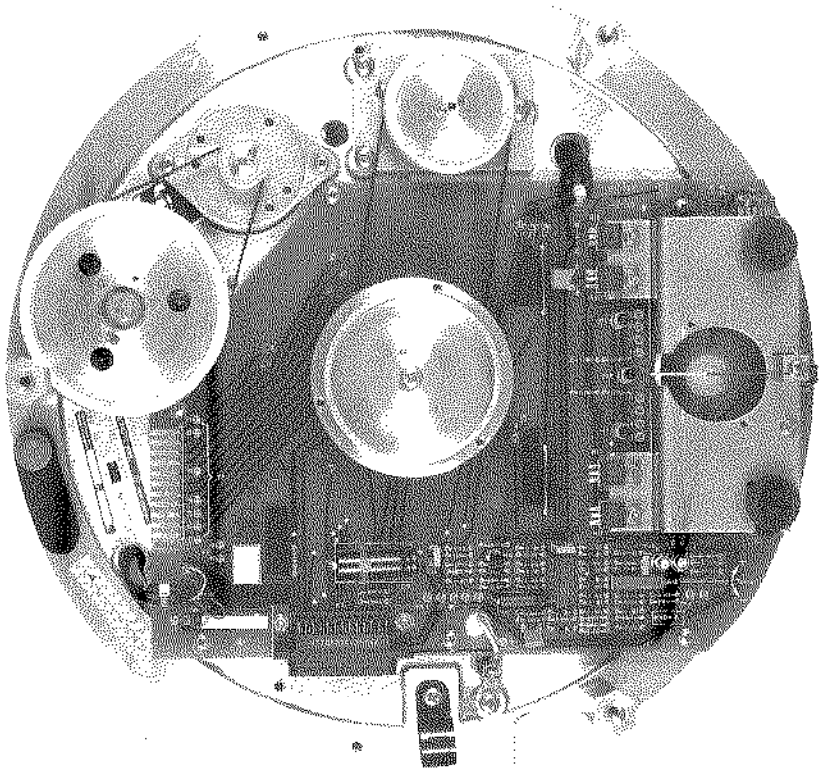


Fig. 4–2: Top View of the Electronics PCB (360° Card removed)

An electronics PCB is located above the supporting plate. It carries the components for the electronic temperature control (heating/ventilation), the compass connection, the slip rings, 3 red lamps for card illumination, the follow–up switch, the lighting potentiometer as well as a red LED for signalling.

Power supply for the electronic temperature control of the gyro compass is 24V DC which is fed via B1.18 (0V) and B1.20 (+24V). The 0V connection is connected to the signal zero in the inverter which is applied to B1.25 and TP1. This potential separation has been performed because of current–dependent voltage drops (heating, fan, lighting).

The signal originating from sensor N1 is proportional to the absolute temperature scale, with e slope of 10mV/K. For example, at 323 K ≙ +50°C, a voltage of 3.23V is measured across TP4 and TP1.

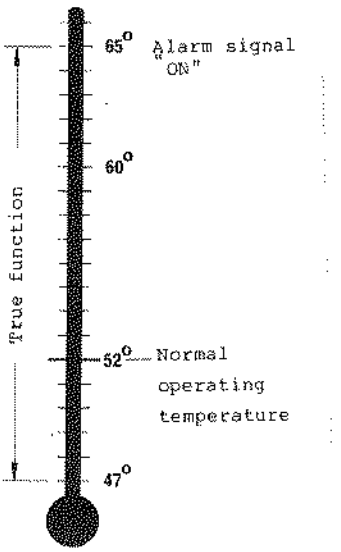
The temperature-dependent voltage value is epplied to the inputs of three emplifiers (N18/8, N18/1, N18/7) where it is compared with voltage velues produced by the precision reference (Zener diode N15) end stepped via the divider resistors R18, R24, R40 and R47.

Via the corresponding amplifiers (quadruple amplifier N18), the three stages actuate the following functions:
At a temperature of >+52.7°C at the sensor, the amplifier N18/7, together with the drive and final transistors N31 and N32, switches off the heating. In this way, the temperature of the supporting liquid is brought to approx. +52°C. If the temperature at the sensor falls to below +51.9°C, the heating is switched on again. R50, R51 and R54 determine the hysteresis of approx. 0.8°C.

At higher ambient temperatures, the heater is only in operation during the heating-up process. After this, the power dissipation of the gyro motors is sufficient for mainteining the temperature. If the temperature at the sensor rises to above +54°C, activation of the fan motor M5 is ensured by amplifier N18/1 together with the input resistors R27/R28 and the subsequent power stage N27/N28.

A temperature-proportional fan voltage is set via feedback R32, R36, R41, nominally being at +54°C and showing such a slope that a difference in temperature of approx. 0.02°C is sufficient for fully activating the fan with 24V DC.

The wiring of diodes N22, N23, resistors R33, R37 and Zener diode N24 limits the fan motor voltage to approx. 27V if the operating voltage exceeds this value with high input tolerances, thus preventing the M5 motor electronics from being damaged.



Switching cycles:

Heating "ON":	<+50°C
Heating "OFF":	>+52°C
Fan "ON":	+54°C
Overtemperature signal "ON"	>+65°C

Hint:
An external signal unit can additionally be connected for indicating, both audibly and visually, when the maximum temperature is exceeded.

Fig. 4–3: Operating Temperature (Schematic)

The fourth amplifier N18/8 responds when a temperature >+85°C is reached. Excessive temperatures are indicated by the red LED (Fig. 2–1.2). This LED also indicates signals (alarms) transferred via B1.11, e.g. follow–up OFF ("0"), follow–up at TEST ("T") or "Voltage failure >1.5s" (cf. Section 4.2.2: Fault Signalling).

The wiring with R13, N13, N14 constitutes a simple voltage stabilizing circuit for approx. 18V DC for supplying N18. Lighting is controlled via R12 and transistor N12. The lamps are protected against overvoltages by means of the Zener diode N11.

4.1.2 Test Points on the Electronice PCB 110–106.03

ATTENTION ! On performing measurements on the electronics PCB, an uncorrect connection of the test lines to the corresponding test points may cause a short–circuit or a damage to the device. E.g. unintended bridging–over the test points 4 and 5 on the electronics PCB 110–106.03 may result in that the temperature sensor N1 is destroyed! In an analogous way, the same applies to measurements carried out at the t est points of the electronics PCBs in the inverter!

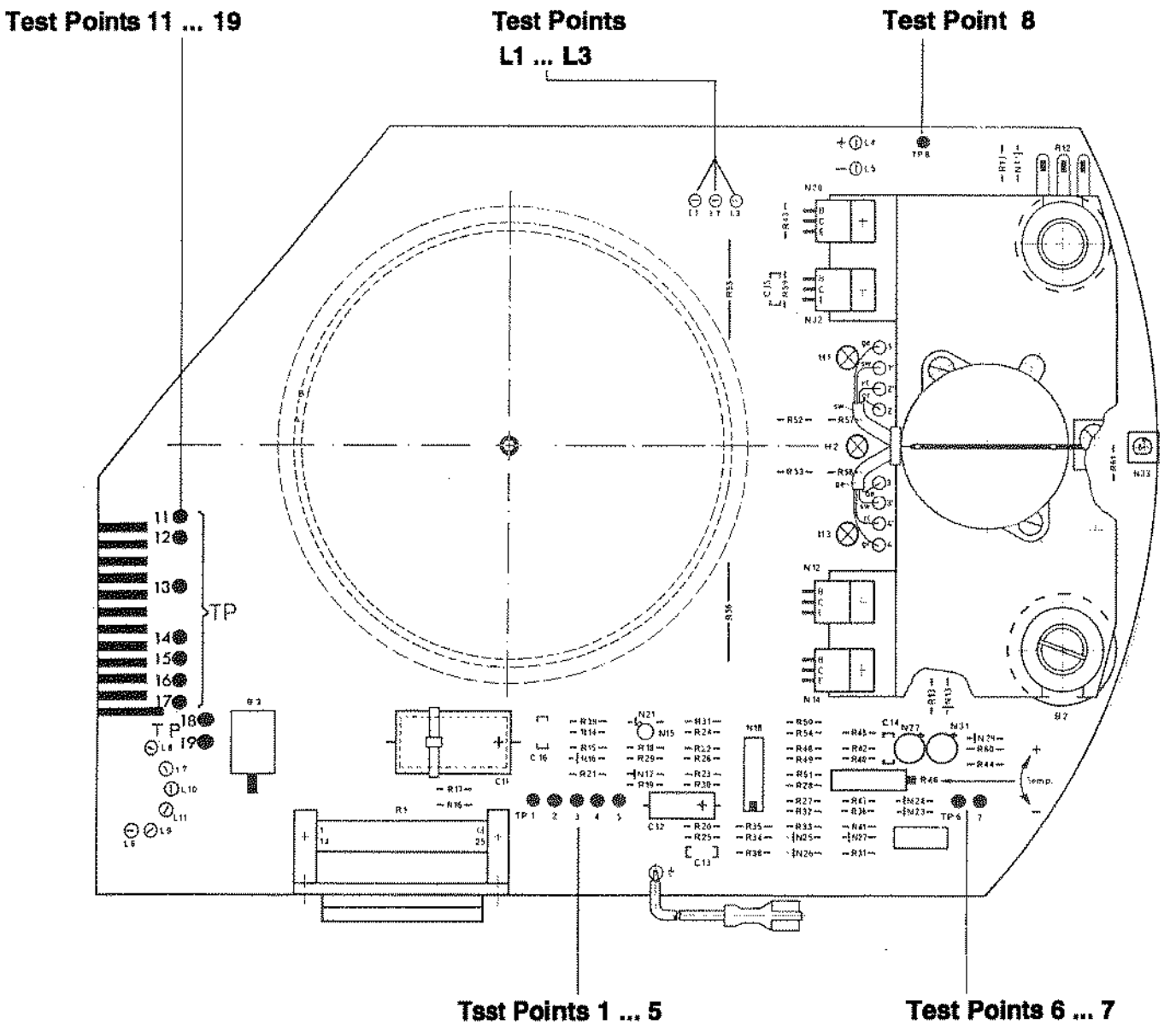


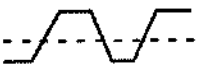
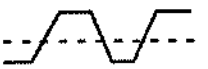
Fig. 4–4: Test Points on the Electronics PCB 110–106.03

4.1.3 **Test List for Gyro Compass STANDARD 14**
(Cf. Circuit Diagram 110 C 106 HP030, Annex)

Meter: Multimeter, internal resistance R_i ≥20kOhm/V
Condition: Gyro compass equipment switched on

Electronics PCB U1, 110–106.03

Test Point: TP +	Test Point: TP − (⊥)	Meaaurement	Maasured Value	Conditiona/ Ramarks
2	1	Supply voltage "Heating, fan, illumination"	+19.2V...+28.8V DC	Dependent on tolerance of main supply
3	1	Supply voltage "Amplifier"	+15.2V...+18.8V DC	
4	1	Sensor voltage dependent on temperature	+2.96V...+3V DC +3.21V...+3.25V DC	With +25°C With +50°C
5	1	Reference voltage	+6.55V...+7.25V DC	
6	1	Fan control signal	+1V...+3.5V DC +3.6V...+4.2V DC	Fan OFF Fan ON
8	1	Heating voltage	0V...+1V DC +18V...+28V DC	Heating OFF Heating ON

Test Point: TP +	Test Point: TP – (⊥)	Measurement	Measured Value	Conditions/ Remarks
11	1	Control signal "NORTH 0"	+10V...+13V DC	Follow-up system to "TEST", compass card is turning
			0V...+1V DC	Follow-up system to "TEST", compass card indication "0°"
12	1	Control signal "NORTH 1"	+10V...+13V DC	Follow-up system to "TEST", compass card is turning quickly
			0V...+1V DC	Follow-up system to "TEST", compass card is turning slowly (from approx. 10°)
14	1	Supply voltage "Gyrosphere"	27V...31V$_{eff}$ 400Hz 	Lower phase
15	1		27V...31V$_{eff}$ 400Hz 	Upper phase
14	15		56V...61V$_{eff}$ 400Hz 	
16	1	Reversing contact voltage	14V...27V AC	W2 Follow-up ——— ON and at W1 rest
17	1			

Test Point: TP +	Test Point: TP – (⊥)	Measurement	Measured Value	Conditions/ Remarks
18	19	Starting current "Gyrosphere + pump"	410mV AC ±50mV AC	Equal pump current with starting and operating (85mV AC ±10mV) $I_{gyro} = I_{tot} - I_{pump}$ (mV ≙ mA)
18	19	Operating current "Gyrosphere + pump"	290mV AC ±50mV AC	
L2	L1	Stepping motor M3 Coil voltage SM1	3V AC ... 7V AC	Follow-up system to "TEST", compass card is turning quickly
L3	L1	Stepping motor M3 Coil voltage SM0		
		Operating temperature	52°C	With thermometer NB 25–21
*)		Height of gyrosphere	Lifting: 1.5mm 2mm	With 52°C operating temperature

4.2 Circuit Description of Inverter, Type121-043 NG001 / NG003

General Diagram, Inverter 121 C 043 HP020
Wiring Diagram 121 D 043 HP026

The wiring PCB of the inverter comprises the following electronic sub-assemblies:

- Inverter, Type 121-043.02 (400Hz inverter)
- Compass Electronics, Type 121-043.06 (PCB)
- Step Adapter, Type 121-043.04 (PCB)

4.2.1 Current Supply to the Inverter

The inverter is supplied with 24V DC
(Tolerance range: 19.2 ... 36V DC)
The power supply is performed either:

- from the 24V DC ship's mains, NAVI or emergency supply or
- from the 110/220V AC ship's mains via an optional power supply or
- from the 110/220/380/440V AC ship's mains via an optional course transducer.

The current supply to the inverter is fed simultaneously only by one or by two different electric current supply sources (as a redundancy):

- with supplying the inverter from the 24V DC ship's mains, NAVI or emergency supply or via an optional power supply
  the feeding is to be performed at terminal L1.1 (+24V)
  and at terminal L1.2 (0V)

- with supplying the inverter
  via an optional course transducer,
  the feeding is to be performed at terminal L4.7 (+28V)
  and at terminal L4.8 (0V).

The inverter operates in the voltage range of 19.2V ... 36V DC without functional restrictions.
The DC voltage fed into the inverter is stepped as $+24V_0$ and $0V_0$ as well as $+24V_1$ and $0V_1$. The DC voltage ($+24V_0$ and $0V_0$) supplies the repeater output 1, 2, 3, the $\pm$10mA course signal output and the signal unit (supply of external devices). The $+24V_1$ and $0V_1$ voltage is picked off behind the anti-interference filter (K1, K2, C1, C2, C3, C4, R3).
The DC voltage ($+24V_1$ and $0V_1$) supplies the 400Hz Inverter, 121-043.02, as well as the gyro compass (supply of internal devices). Monitoring is performed on the Compass Electronics, 121-043.06.
$0V_0$, $0V_1$, $0V_2$ and the reference conductor $\perp$ form the central earthing point in the inverter of inverter and compass.

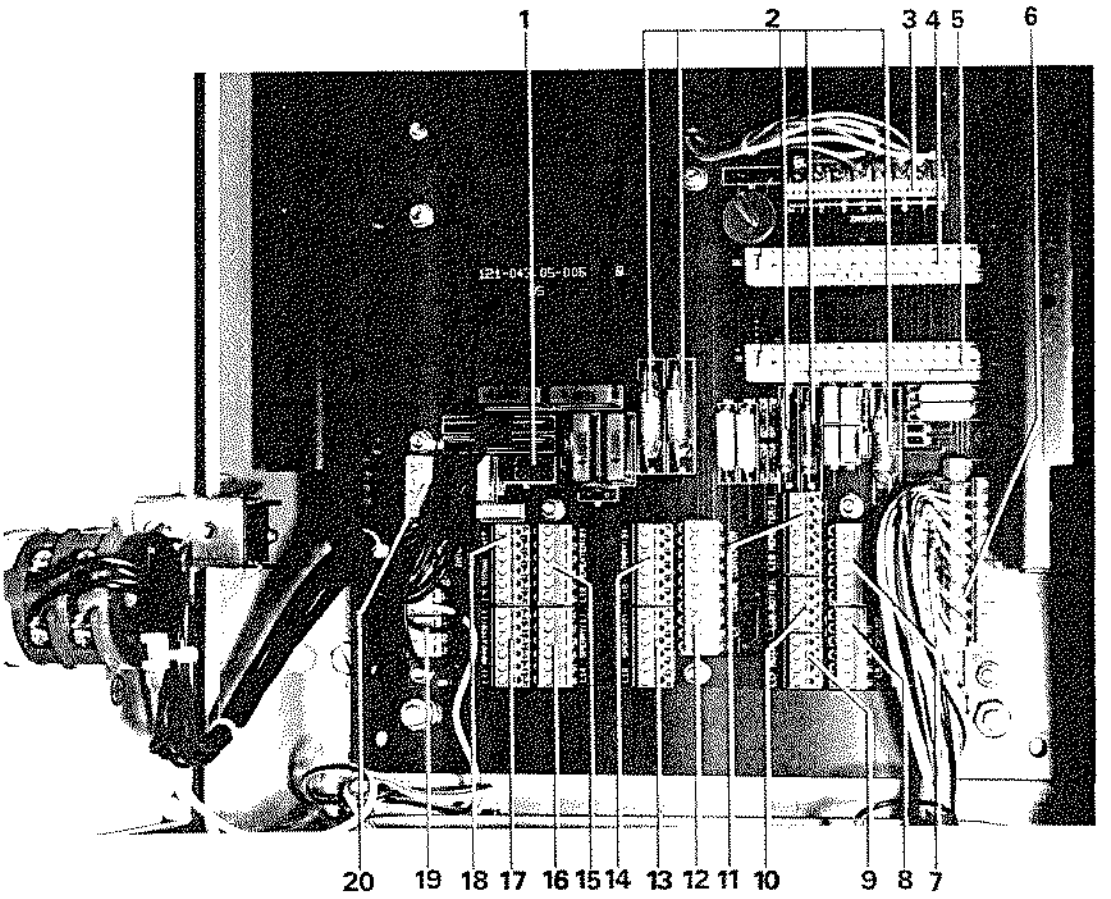


Fig. 4–5: Inverter, Type 121–043, Interior View
Top View of Wiring PCB, PCBs drawn out

1	Relay	D1		
2	Choke	K1, K2, K3, K4, K5		
3	Socket strip for inverter, 8 poles			
4	Socket strip	B2,	32 poles,	eccommodation for compass electronics
5	Socket strip	B1,	32 poles,	accommodation for step adepter
6	Terminal strip	L6,	25 poles,	connection for gyro compass
7	Terminal strip	L20,	6 poles,	connection for ANSCHÜTZ NAUTOPILOT (±10mA max.)
8	Terminal strip	L5,	6 poles,	connection for autopilot, NAUTOCOURSE
9	Terminel strip	L17,	4 poles,	connection for RoT indicator
10	Terminal strip	L18,	4 poles,	connection for RoT indicetor
11	Terminal strip	L19,	6 poles,	connection for repeater, ANSCHÜTZ step
12	Terminal strip	L4,	10 poles,	connection for ANSCHÜTZ course transducer,)
13	Terminal strip	L15,	6 poles,	SPERRY step output signal, 30mA
14	Terminal strip	L16,	6 poles,	SPERRY step output signal, 30mA
15	Terminal strip	L12,	6 poles,	ANSCHÜTZ step output signel
16	Terminal strip	L14,	6 poles,	SPERRY step output signal, 30mA
17	Terminal strip	L11,	6 poles,	ANSCHÜTZ step output signal
18	Terminal strip	L3,	6 poles,	connection for signal unit / signal panel
19	Terminal strip	L1,	3 poles,	connection for 24V DC emergency supply
20	Terminal strip	L2,	12 poles,	internal wiring connection

4.2.2 Fault Signalling

The signal relay D1 (with floating contacts) is located on the wiring PCB and is pulled up in faultless operation. It serves for switching e.g. signal buzzers or signal lamps in case of possible fault conditions within the gyro compass equipment.

Note:
Main switch B5 suppresses the fault message on switching off the gyro compass equipment.

By lighting–up of the red LED (Fig. 2–1.2), the following conditions are indicated:
- Excessive operating temperature (higher than +65°C)
- Supply voltage below 18.5V DC for longer than 1.5s
- Follow–up switched off
- Follow–up in position "TEST"
- Gyros without current supply for longer than 1.5 s.

The fault signal "Gyros without current supply for longer than 1.5 s" is stored in the flip–flop N12 of the Compass Electronics PCB 121–043.06.

4.2.3 Inverter Assembly, Typa 121–043.02 (400Hz Inverter)

(See Circuit Diagram 121 C 043 HP 012)

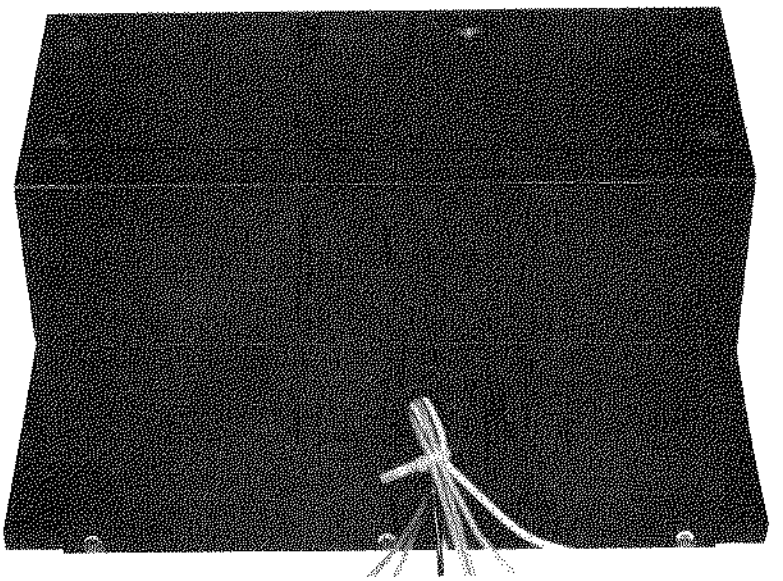


Fig. 4–6:
Inverter Assembly (General View)

The inverter assembly located in the inverter consists of a switching regulator operating with a frequency of 20kHz, and an externally synchronized push–pull transformer with a frequency of 400Hz. Due to rise–time limitation, a trapezoidal voltage with a slope of 20µs is produced in the push–pull transformer.
The inverter is supplied with 24V DC via connections B4.1 and B4.2.

The gyrosphere supply, 55V/400Hz, is applied symmetrically with $0V_2$ to connections

B4.6 ≙ $27.5V_0$ AC and

B4.7 ≙ $27.5V_1$ AC.

The output voltage is levelled against load variations and variations in the input voltage for ±1%.

The supply voltage ±12V DC for the electronics is generated by means of the push–pull transformer (transformer T1) and rectifier G1.

(+12V DC ≙ B4.3)

(–12V DC ≙ B4.5)

The inverter is externally synchronized with an adjustable frequency of 3.2kHz via connections B4.8 and B2.a12 from the compass electronics PCB.

4.2.4 Compass Electronics, Type 121–043.06

Circuit Diagram 121 C 043 HP019

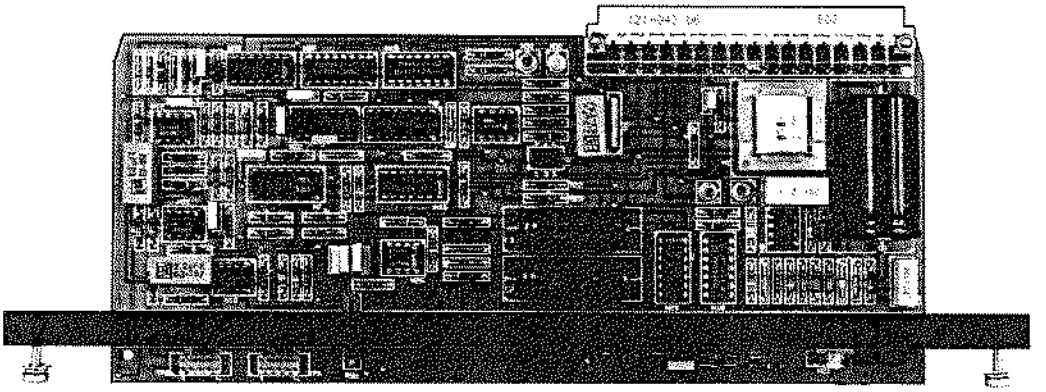


Fig. 4–7: Compass Electronics, Type 121–043.06
(View of Components Side)

The following components are situated on the compass electronics:
- Follow–up amplifier
- Clock generator
- RoT amplifier
- Jumper for coding the RoT slope
- Decoding of the follow–up switch
- Electronic voltage monitoring of supply voltage 24V DC

4.2.4.1 Follow–up Amplifier

The pick–off signal of the reversing contacts is fed to transformer M1 vie compass cable cores B1.22, B1.23, B1.24, terminal strip L6 end plug connectors B1.c16, B1.e16, B1.c12. Transformer M1 produces the current difference which is epplied to TPB4 behind the amplifier N10B as a differential voltage of 4V/1° deviation with a frequency of 400Hz. With the aid of the reference, the differential voltage is rectified via comparetor N15 by the analog switches N7–B, N7–C.

The differential voltage is applied to TPA8 as e DC voltage of 4V/1° devietion. With the follow–up system switched on, the signal is trensferred to the acceleration filter, operational amplifier N11–A, via analog switch N7–D. With a deviation of 1°, a voltage of 8V DC is applied to TPB9.

Together with the clock generator N25, the amplifiers N12–A, N12–B, the AND circuits N26–A, N26–C and the JK flip–flops N27–A, N27–B form a δ modulator.

Depending on the DC voltage at TPB9, positive pulses are generated at TPB8, whilst negative pulses are generated at TPA2. These pulses discharge the integration capacitor C12 via analog switches N8–D or N8–B, with an electric charge determined by the ±12V supply voltage and the clock generator.
A DC charge balance is produced in the capacitor via R45 and a pulse–shaped current balance via R25 or R26. The mean pulse frequency is proportional to the DC voltage at TPB9.

The directional pulses at TPB8 and TPA2 are recoded to direction signal "DIR" and clock signal "STEP" by the gates N19, N26.
These signals are directly fed on the step adapter to 2 electronic UP/DOWN counters N1, N2, counting modulo 192 steps/1 degree.
For each 1/192° step, a pulse towards 0V is applied to TPA4.

4.2.4.2 Clock Generator

The clock generator supplies the δ modulator and also the 400Hz inverter with the required frequency of 3.2kHz. The clock generator comprises timer N25 and the timing element consisting of R81, R60, R58 and C11.
The clock frequency can be set to 3.2kHz via potentiometer R58, whereby the maximum follow–up rate of compass transmission is simultaneously set to 8,3°/s end the gyrosphere supply frequency to 400Hz.

4.2.4.3 Decoding the Follow–up Switch

Lines Mode 0 and Mode 1 transmit the positions of the follow–up switch from the gyro compass:

– Zero position	"000" of the 360° card	"T"
– Follow–up system	"OFF"	"0"
– Follow–up system	"ON"	"1" .

Mode 0 ≙ "LOW" switches on the follow–up system,
Mode 1 ≙ "LOW" switches the system to zero run–in. The run–in to zero heading is controlled via two slip ring contacts in the gyro compass with "NORTH 0" and "NORTH 1":
"NORTH 1" ≙ "LOW" (slow turning speed)
"NORTH 0" ≙ "LOW" ("000" card position).

4.2.4.4 Electronic Equipment for Monitoring the 24V DC Supply

The 24V DC supply is monitored for undervoltage, temporary reduction in the voltage level and for voltage failure. If the ship's mains voltage falls below a value of approx.

18.5V, the demodulator output N10–A is separated from the subsequent filter input and the follow–up system halts at the last value.
R24, R27, R28, Zener diode N6 and comparator N9–B detect supply undervoltages (≤18.5V DC) and apply a "POWER ON" signal to TPB5.
All C–MOS memories, counters, JK flip–flops etc. are isolated from the remeining circuitry via gates at "POWER–ON" ≙ "LOW" and are further powered by the $12V_1$ supply via capacitor C5 in order to retain information during temporary voltage interruptions.
The auxiliary power supply $24V_3$ is produced via N14 from the power supply $24V_1$ and buffered in capacitor C5.

The "POWER–ON" signal determines the power feilure or undervoltage time vie R36, C4 and comparator N9–A. If there is a voltage failure or undervoltage of ≥1.5 s, the signal N–INI is genereted after voltage recovery and all C–MOS memories are erased (initialized).
As e result of feilure or undervoltage of the AC ship's mains for supplying the course transducer and due to the fact thet the 28V DC voltage for the inverter would then not be evailable (the 24V DC emergency being connected to the inverter as a redundancy), the POWER ON signal is led vie the getes N20–B, N18–B and the transistors N23 / N24 to the interfece B1.A8 (elarm 1) end B1.A6 (N–alarm 2).
To these two outputs are connected:
the signal relay D1 as well as e signel unit (optional) and the LED (Fig. 2–1.2) (located above lubber line).

In case of voltage failure of the AC supply for the course trensducer*) (the inverter being supplied further with 24V DC from the emergency supply):
- the LED (Fig. 2–1.2) lights up, an optional elerm unit gives alarm
- the follow–up system stops at the last velue
- the repeaters stop et their last velues
- the gyros in the gyrosphere continue to be supplied with 55V/400Hz
- the course indication is not lost.

After voltage recovery:
- the repeaters connected to the inverter continue opereting
- the repeaters connected to the course transducer continue operating
- the LED (Fig. 2–1.2) goes out, an optional elarm unit gives no longer alerm.

Note:
For safety reasons, however, after eny voltage failure the course indications of the connected repeaters should be compared with the course indication of the master compass, and synchronized, if necessary.

*) If a Course Transducer is optionally existent in the equipment.

4.2.5 Step Adapter, Type 121–043.04

Circuit Diagram 121 C 043 HP022

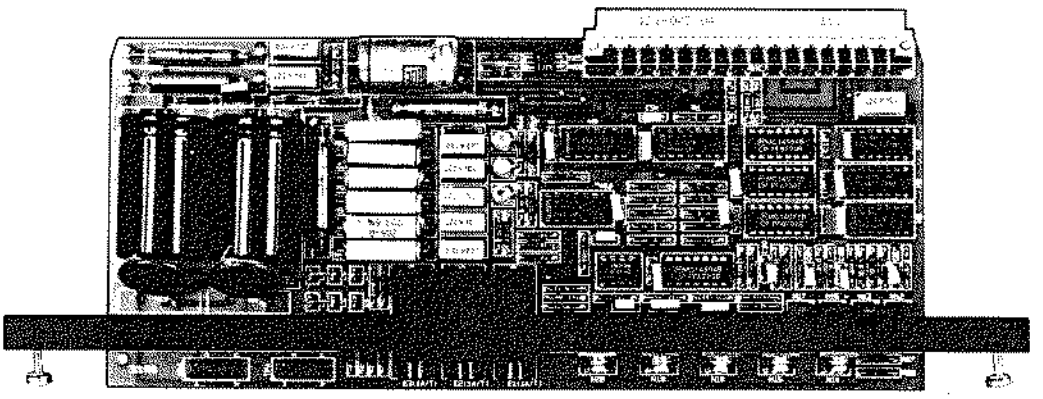


Fig. 4–8: STEP Adapter, Type 121–043.04
View of Components Side

4.2.5.1 Function of the Step Adapter, Type 121–043.04

From the course signals "DIR" and "STEP", the step adapter produces:

1) ANSCHÜTZ step signels, 192 steps/1°
(for operating the stepping motor in the gyro compass and the stepping motors in the connected ANSCHÜTZ step repeeters)
as well as

2) SPERRY step signels, 6 steps/1° (35V DC), 90mA as e maximum
(for operating SPERRY step repeaters such as SATCOM / SATNAV devices, radar equipment, radio direction finder etc.).

4.2.5.2 Principle of Operation of the Step Adepter, Typa 121–043.04

The signals "DIR" and "STEP" are counted in the counters N1, N2, modulo 192. At 192 steps, the 1° course information is retained in counters N1, N2. In case of voltage failure "POWER ON" ≙ "LOW", the getes N3, N4–C, N10–A, N10–B, N10–C, decouple the counter outputs.

Together with the resistors R11 ... R20, gates N4, N5, N6, constitute a double D/A converter which, together with the two amplifiers N11–A, N11–B and the two final stages N14, N15, N18, N19, generate the stepping motor drive signals SM0 and SM1.
When the 360° card is turned, the signals SM0 and SM1 are of trapezoidal shape, SM0 and SM1 being in phase quadrature. The stepping motor signals are transferred to the repeater compasses via EMC filters, K3 ... K4. The resistors, R55 ... R60, determine the damping behaviour of the repeater compasses.

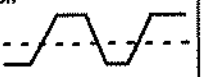
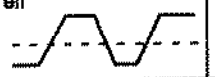
The code conversion of the 1° course information into the SPERRY–compatible interface (6 steps/1°) is performed by gates N4, N8, N9, N10. The SATNAV signal S1, S2, S3 is fed to the output transistors N20, N21, N22 via gates N10–A, –B, –C and resistors, R41 ... R43. The supply current is limited to approx. 180mA via transistor N28.

The step adapter also comprises the following:
- EMC filters K1, K2
- Filter capacitors C20, C21
- Limiter diodes N23, N24
- Fuses E1, E2, E3
- Jumpers L1 ... L5, L3 ... L6
- Varistors R3, R4
- Decoupling capacitors C2, C3 and C15, C16.

4.2.6 **Test List for Inverter, Type 121-043 NG001 / NG003**
(Cf. General Diagram 121 C 043 HP020 Annex)

Meters: Multimeter, internal resistance R_i ≥20kOhm/V
Oscilloscope, probe 10:1 (C ≙ 10 pF)

Inverter, Type 121-043 / Terminal Strips

Terminal +	Terminal − (⏚)	Measurement	Measured Value	Conditions/ Remarks
L1.1	L1.2	Supply voltage	19.2V...32V DC	Switch B5 "ON"
L4.7	L4.8			
L4.9	L4.8			
L6.2	L6.14	Supply voltage for gyro motors of gyrosphere	56V...61V_{eff} 400Hz 	
L6.2	L6.18		27V...31V_{eff} 400Hz 	
L6.14	L6.18			
L6.9	L6.25	Signal mode 0	0V...+1V DC	Follow-up switch in Pos. "1"
			+10V...+13V DC	Follow-up switch in Pos. "T", "0"
L6.10	L6.25	Signal mode 1	0V...+1V DC	Follow-up switch in Pos. "T"
			+10V...+13V DC	Follow-up switch in Pos. "0", "1"
L6.11	L6.25	Alarm signal pilot lamp, compass	0V...+2.5V DC	No error signal
			+7.3V...+13V DC	Error signal (Lamp "ON")

Terminal +	Terminal − (⊥)	Measurement	Measured Valua	Conditions/ Ramarks
L6.12	L6.25	Signal NORTH 0	0V DC...+1V DC	Compass card in Pos. 0°
L6.19	L6.25	Signal NORTH 1		
L6.22	L6.14	Signal "Reversing contact"	max. 1V/400Hz	Follow-up system at rest
L6.23	L6.14		max. 5.5V/400Hz	Follow-up system turning
L6.24	L6.14	Test return line	0V AC ...+0.5V AC	
L6.7	L6.6	Stepping motor signal SM 1	+6V (+12V*) / −6V (−12V*) 3V AV ... 7V AC 8V AC... 14V AC	Follow-up switch to "TEST", compass card is turning quickly (*) Applicable to MOD 015 or MOD 018
L6.8	L6.6	Stepping motor signal SM 0	+6V (+12V*) / −6V (−12V*)	
L11.1	L11.2	Illumination voltage "Repeater compass"	18.5V DC ... 32V DC	
L12.1	L12.2			
L19.1	L19.2			
L20.1	L20.2	Refer. for NAUTOPILOT		To NAUTOPILOT or Digital Repeater Compass
L11.3	L11.4	Stepping motor actuation SM 0	+6V / −6V 3V AC ... 7V AC	Follow-up switch to "TEST", compass card is turning quickly, measured value with load by repeater compass. **With MOD 015/016, L11 and L12 must not be connected!**
L12.3	L12.4			
L19.3	L19.4			
L11.5 L12.5 L19.5	L11.4 L12.4 L19.4	Stepping motor actuation SM 1	+6V / −6V	

Terminal +	Terminal − (⊥)	Measurement	Measured Value	Conditions/ Remarks
L14.1 L14.2 L14.3	L14.5	SPERRY output 1/6° / step	13V...18V AC	Follow-up switch to "TEST" compass card is turning quickly
L15.1 L15.2 L15.3	L14.5			
L18.1 L16.2 L16.3	L16.5			
L17.1 L18.1	L17.2 L18.2	Illumination voltage RoT indication	18.5V...32V DC	
L17.3	L17.4	Signal voltage RoT ±10V DC	0V	Follow-up switch to Pos. "0"
L18.3	L18.4		+10V...+12V DC	Follow-up switch to "TEST", compass card is turning quickly
L20.3	L20.4	Stepping Motor SM 0 actuation	8V...14V AC	Follow-up switch to "TEST", compass card is turning quickly
L20.5	L20.4	Stepping Motor SM 1 actuation	+12V -12V 	
L3.3	L3.5	Alarm signal	Contact D1 closed	No error signal

Terminal +	Terminal − (⊥)	Measurement	Meesured Velue	Conditions/ Remarks
L5.1	L5.2	Supply voltage coarse synchro, 1 rev. / 360° (Autopilot, NAUTOCOURSE)	See Test list Autopilot "NAUTOCOURSE"	If connected
L5.3	L5.4	Output signal synchro, 1 rev./ 360° (Autopilot, NAUTOCOURSE)		
L5.3	L5.5			
L5.4	L5.5			
L4.1	L4.2	Auxiliary power supply "Course transducer"	ca. +12V DC	Approx. 1 s after voltage failure
			+18.5V...+32V DC	Normal
L4.3	L4.4	Clock pulses positive N–STEP–P	+12V DC	Compass card not turning
			LOW pulse +12V 0V 	Compass card turns for increasing course angle
L4.5	L4.4	Clock pulses negative N–STEP–N	+12V DC	Compass card not turning
			LOW pulse +12V 0V 	Compass card turns for decreasing course angle
L4.6	L4.4	POWER ON status signal	+12V DC	"Open" collector signal
				Test: By short–circuiting the terminals L4.6 and L4.4, the total follow–up system (incl. outputs of possible course transducers) is switched off.
L4.7	L4.8	Power supply DC II	+24V...+32V DC	If connected

4.2.7 **Test List for Inverter, Type 121-043 NG001 / NG003**
(Cf. Circuit Diagram 121 C 043 HP019, Annex)

Meters: Multimeter, internal resistance R_i ≥20kOhm/V
Oscilloscope, probe 10:1 (C ≙ 10 pF)

Compasa Electronics PCB, Type 121-043.06

Test Point: TP + TP	Test Point: TP − (⊥) TPA or TPB	Measurement	Measured Value	Conditions/ Remarks
B6	1	Supply voltage	+11.4V...+15V DC -11.4V...-15V DC	
B3	1			
B5	1	Signal "POWER ON"	+11.4V...+15V DC	Main supply >18.5V DC
A6	1	Signal "N-INI"		
B7	1	Offset voltage	approx. 0V DC	Follow-up system at rest
		Offset voltage	approx. +4V...+8V DC	For 1° of card daflection
B9	1	Offsat voltage	approx. 0V DC	1) Follow-up system at rest 2) Follow-up system "OFF" (0) 3) Card in Pos. "000" (T)
			-2V...-12V DC	Daflection of card for increasing course angla
			+2V...+12V DC	Deflection of card for dacreasing course angle

Test Point: TP + TP	Test Point: TP – (⊥) TPA or TPB	Measurement	Maaaured Value	Conditions/ Remerks
B8	1	Clock pulses for positive direction	5V...8V AC (⌐⊔⌐ LOW pulse)	Deflection of card for increasing course angle*)
A2	1	Clock pulses for negative direction	5V...8V AC (⌐⊔⌐ LOW pulse)	Deflection of card for decreasing course angle*)
A3	1	Direction signal	+11.4V...+15V DC	Compass card turns for decreasing course angle
A4	1	Step signal	5V...8V AC (⌐⊔⌐ LOW pulse)	Compass card deflected
A5	1	Clock frequency	3.2kHz	Adjustable by potentiometer R58
A7	1	RoT signal	–10V...+10V DC	Compass card turns for increasing or decreasing velue
A8**)	1	Control voltage, analog switch for follow–up system	0V	Follow–up "ON" (1)
			+8.5V DC	Follow–up "OFF" (0)

*) With test conditions, repeater course values may be out of synchronism. After terminating the measurements, synchronize if required!

**) Dependent on development state of PCB, TP not always connected!

4.2.8 **Test List for Inverter, Type 121–043 NG001 / NG003**
(Cf. Circuit Diagram 121 C 043 HP022, Annex)

Meters: Multimeter, internal resistance $R_i \geq 20$kOhm/V
Oscilloscope, probe 10:1 (C ≙ 10 pF)

Step Adapter, Type 121–043.04

Test Point: TP + TP	Test Point: TP – (⊥) TPA or TPB	Measurement	Measured Value	Conditions/ Remarks
A2	1	Supply voltage $+12V_1$	approx. +12V DC	
A3	1	Supply voltage $+12V_2$	approx. +12V DC	
A4	1	Supply voltage $-12V_2$	approx. –12V DC	
B2 B3	1 1	Step motor excitation SM 1 Step motor excitation SM 0	8V AC ... 14V AC +12V –12V	Follow–up switch to "TEST", compass card is turning quickly
B4 B5 B6	1	SPERRY output 1/6° step	13V AC ... 18V AC	Follow–up switch to "TEST", compass card is turning quickly
B8	1	Counter signal	approx. 3V AC +12V 0V	Follow–up switch to "TEST", compass card is turning quickly
A5	1	SPERRY supply	approx. +32V DC	max. 90mA "Plus Common"

4.3 Tables Trouble Shooting, Tables 1...10

1	2	3	4	5	6	7	8	9
Check operating temperature 52° C ± 2°	Check liquid level Operating temperature must be 52° C	Check operating voltages 55V/400Hz 24V DC	Check height of gyrosphere 1.5 mm with gauging pin and by switching off/on inverter	Check position of gyrosphere White marking point on top of the gyrosphere should be visible through hole of insert. Protecting screw removed and outer sphere exactly vertical. Gyrosphere must have settled	Check gyro operat current + pump current 290mA ± 50mA at terminal 16.14 in inverter for at TP 18/19 in compass, mV)	Check follow-up system Record indicated course. Follow-up switch at position "1", card at "000". allow indication to turn. Follow-up switch at position "1". The card must exactly run in to the course recorded. Gyrosphere must have settled	Check course indication	Check alignment of compass and repeaters
o.k.?	o.k.?	o.k.?	o.k.?	o.k.?	o.k.?	o.k.?	o.k.?	o.k.?
NO → Carry out tests acc. to Table 2	NO → Carry out tests acc. to Table 3	NO → Carry out tests acc. to Table 4 and Test List	NO → Carry out tests acc. to Table 5	NO → Carry out tests acc. to Table 6	NO → Carry out tests acc. to Table 7 and Test List	NO → Carry out tests acc. to Table 8	NO → Carry out tests acc. to Table 9	NO → Carry out tests acc. to Table 10 and Test List

TABLE 2 Check Operating Temperature (52°C)

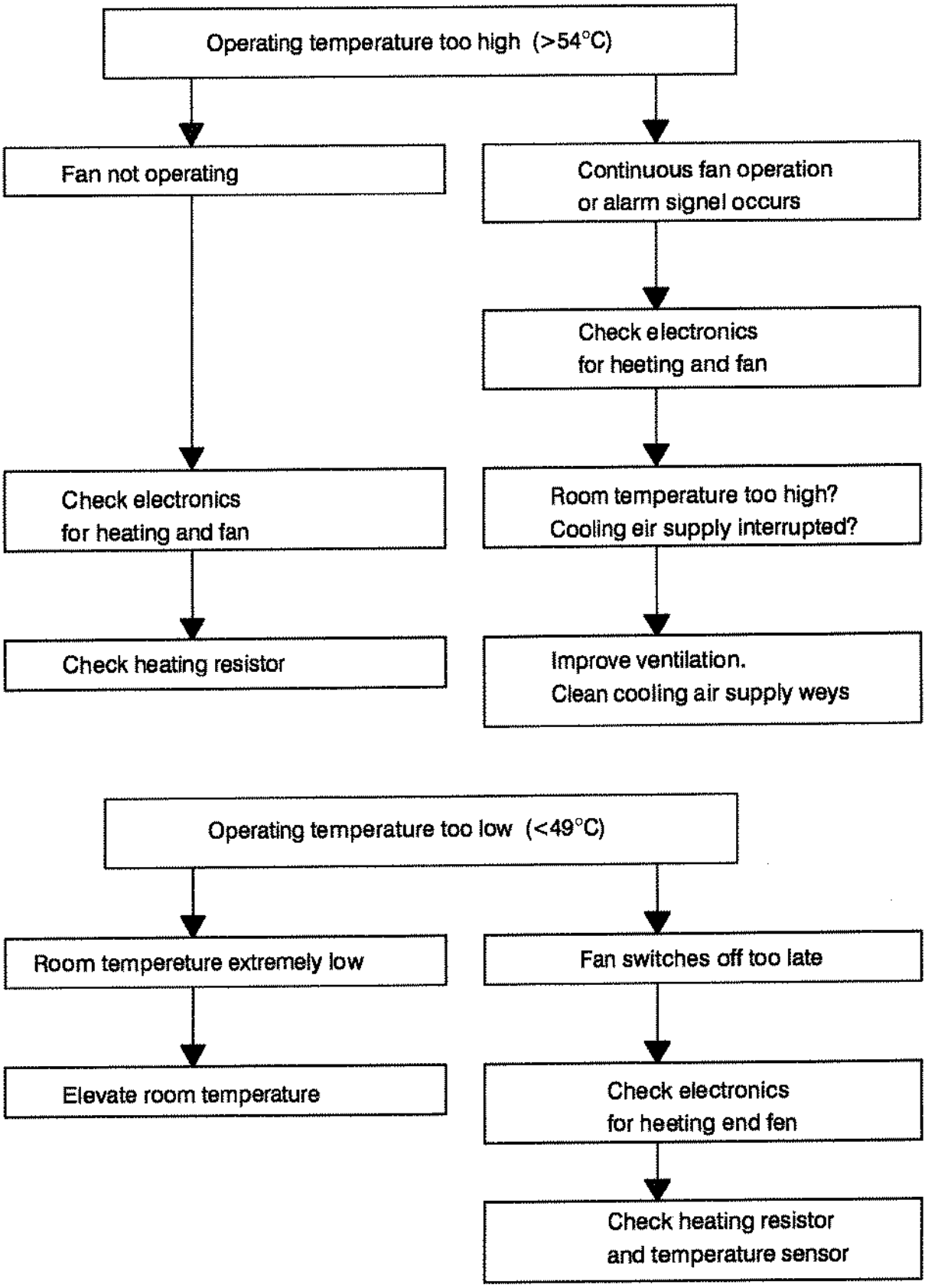


TABLE 3 **Check Supporting Liquid Level**

Operating temperature: 52°C

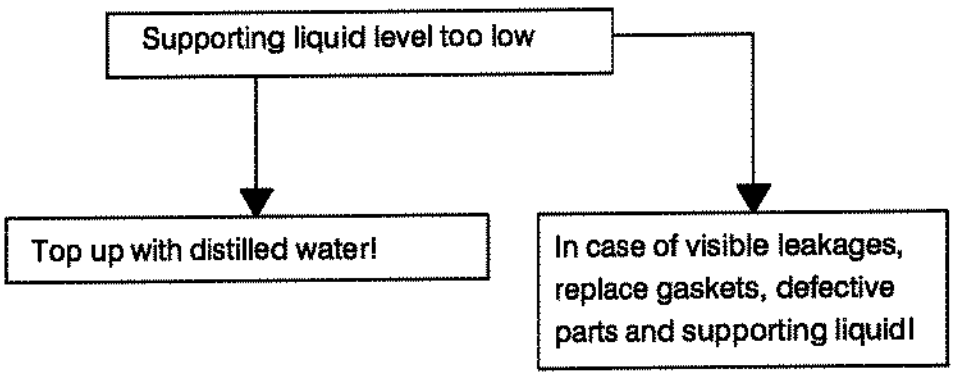


TABLE 4 **Check Operating Voltages**

Input voltage: 24V DC

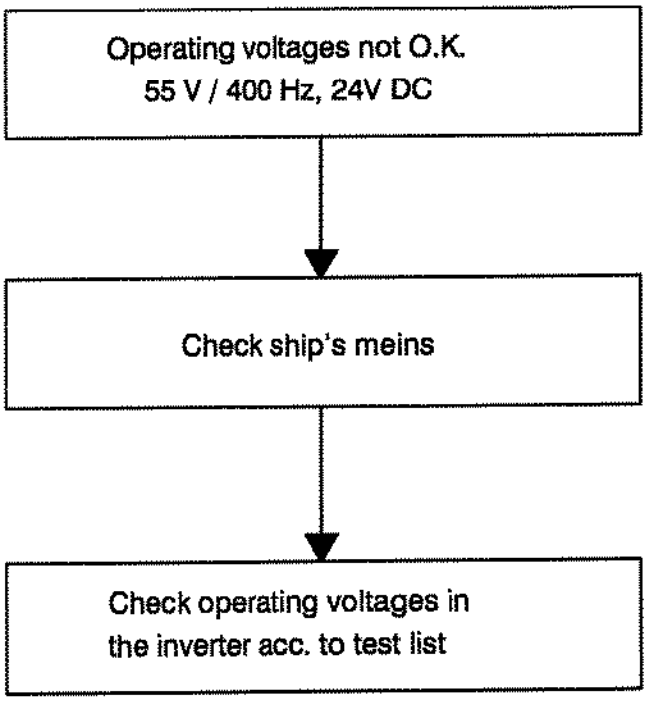


TABLE 5 **Check Height of Gyrosphere**

Height of gyrosphere: 1.5 mm to 2mm
Operating temperature: 52°C

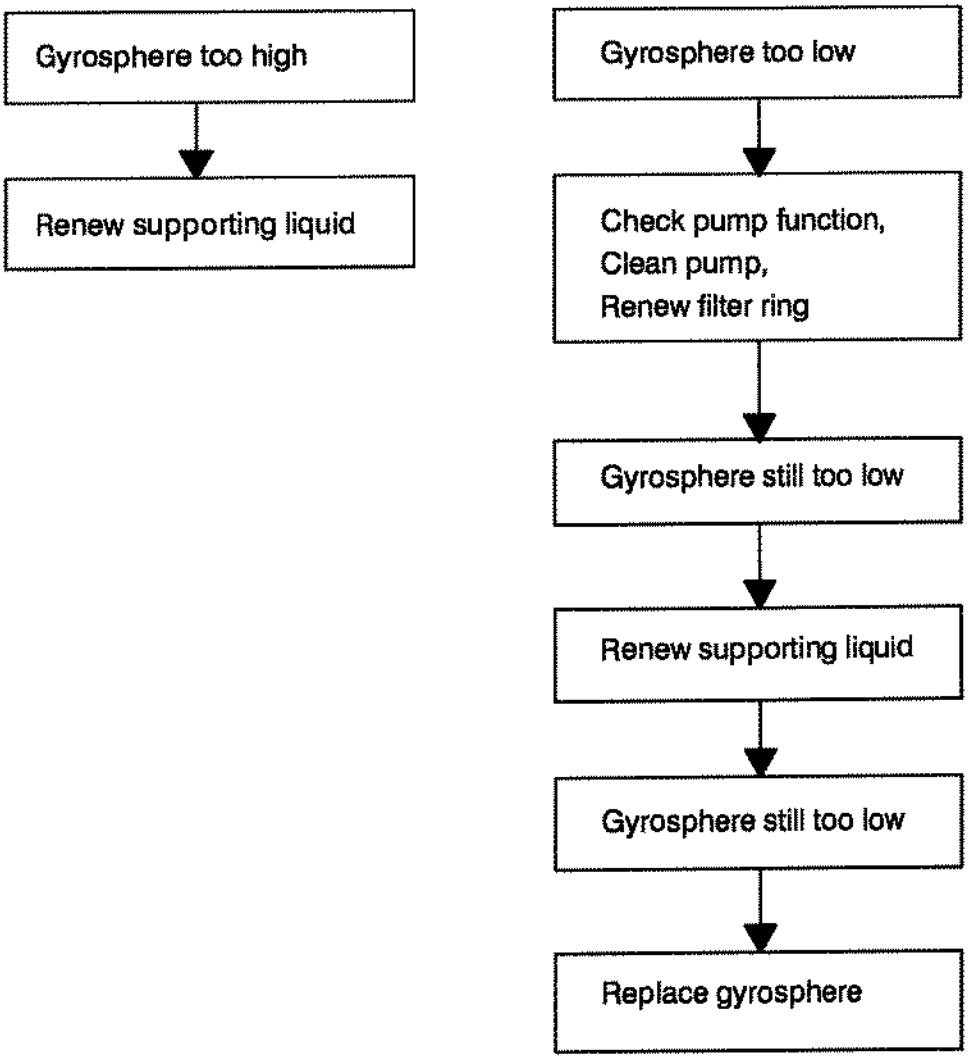


TABLE 6 **Check Poaition of Gyrosphere (Tilt)**

Condition: The gyro compass must be switched on >4 h

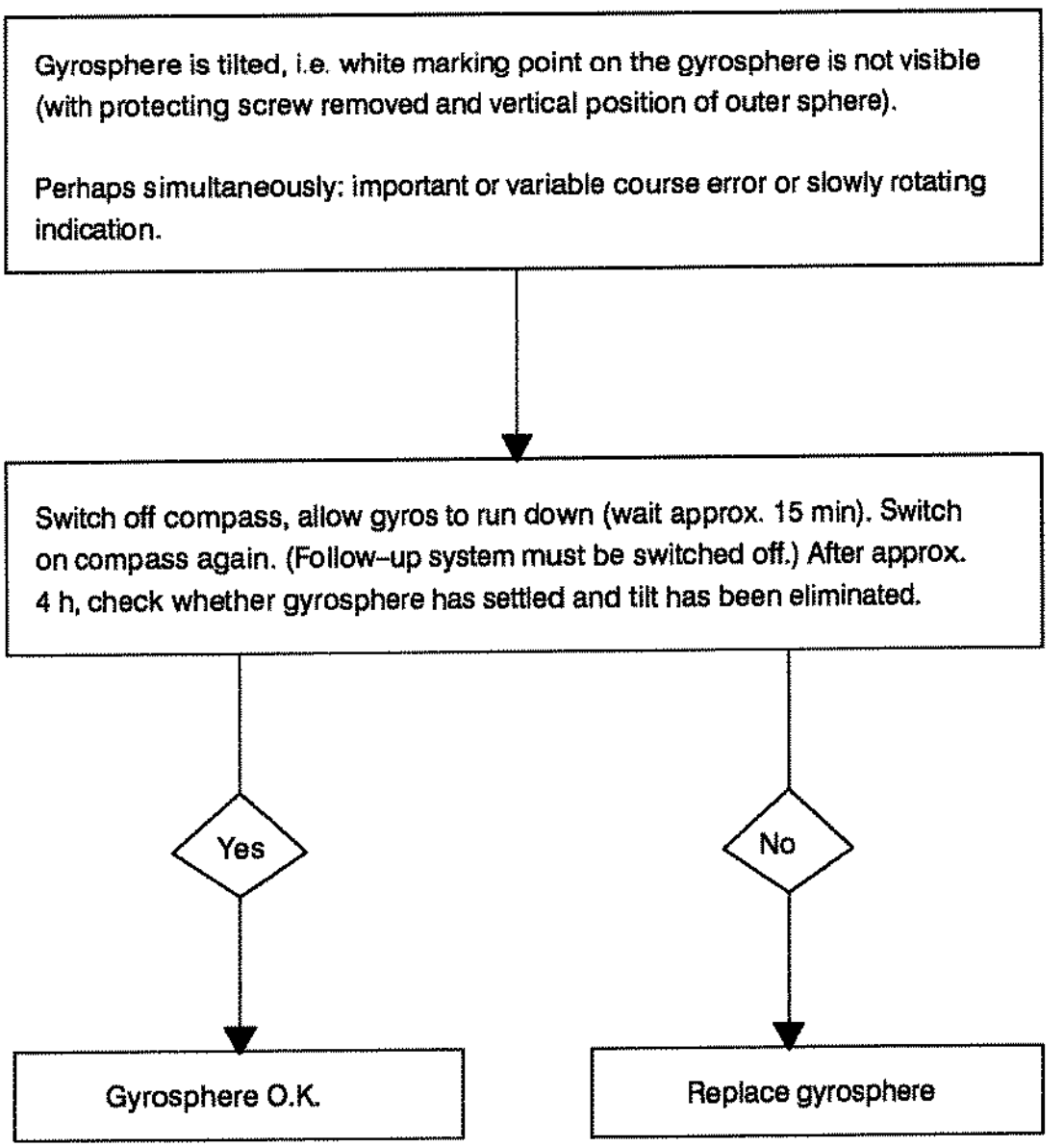
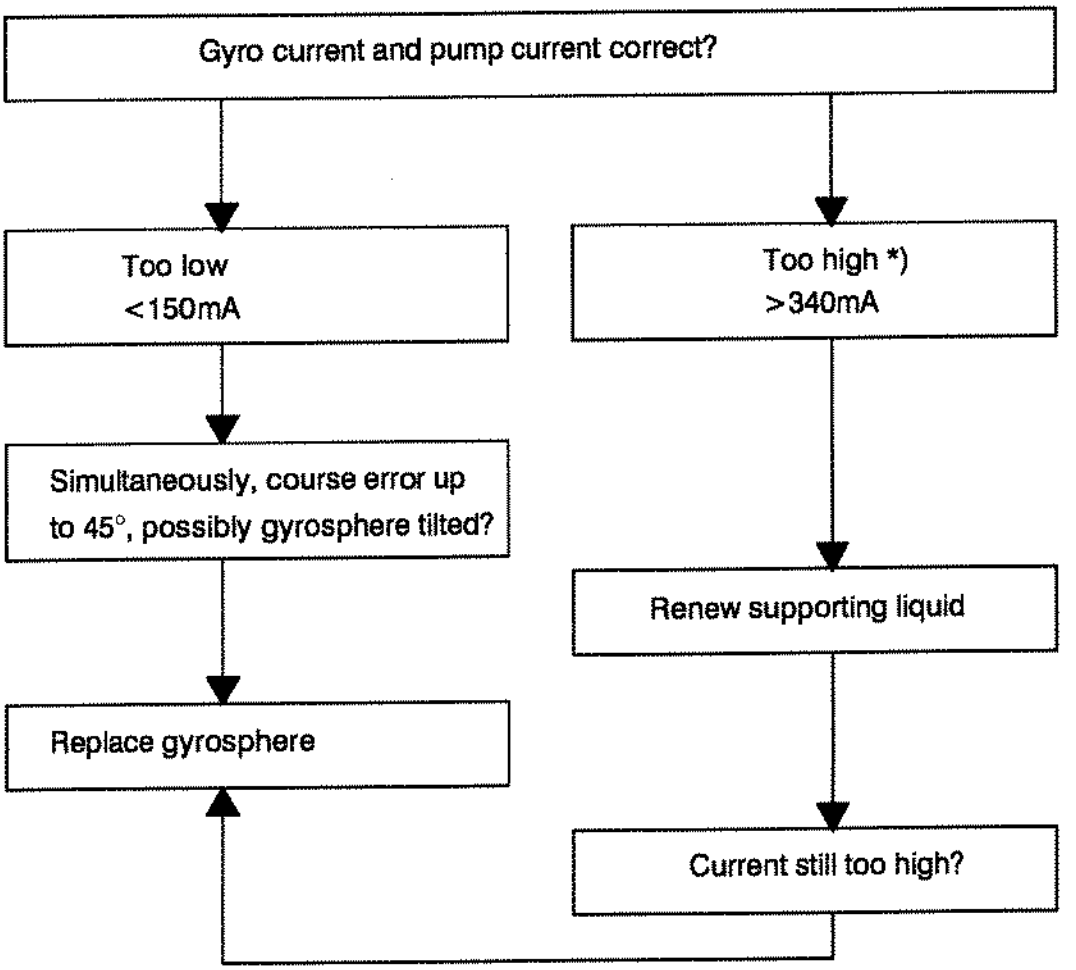


TABLE 7 Check Gyro Current

Operating current: 200mA ±40mA



*) High current consumption may result from increasing conductivity of the supporting liquid!

TABLE 8 Check Follow-up Syatem

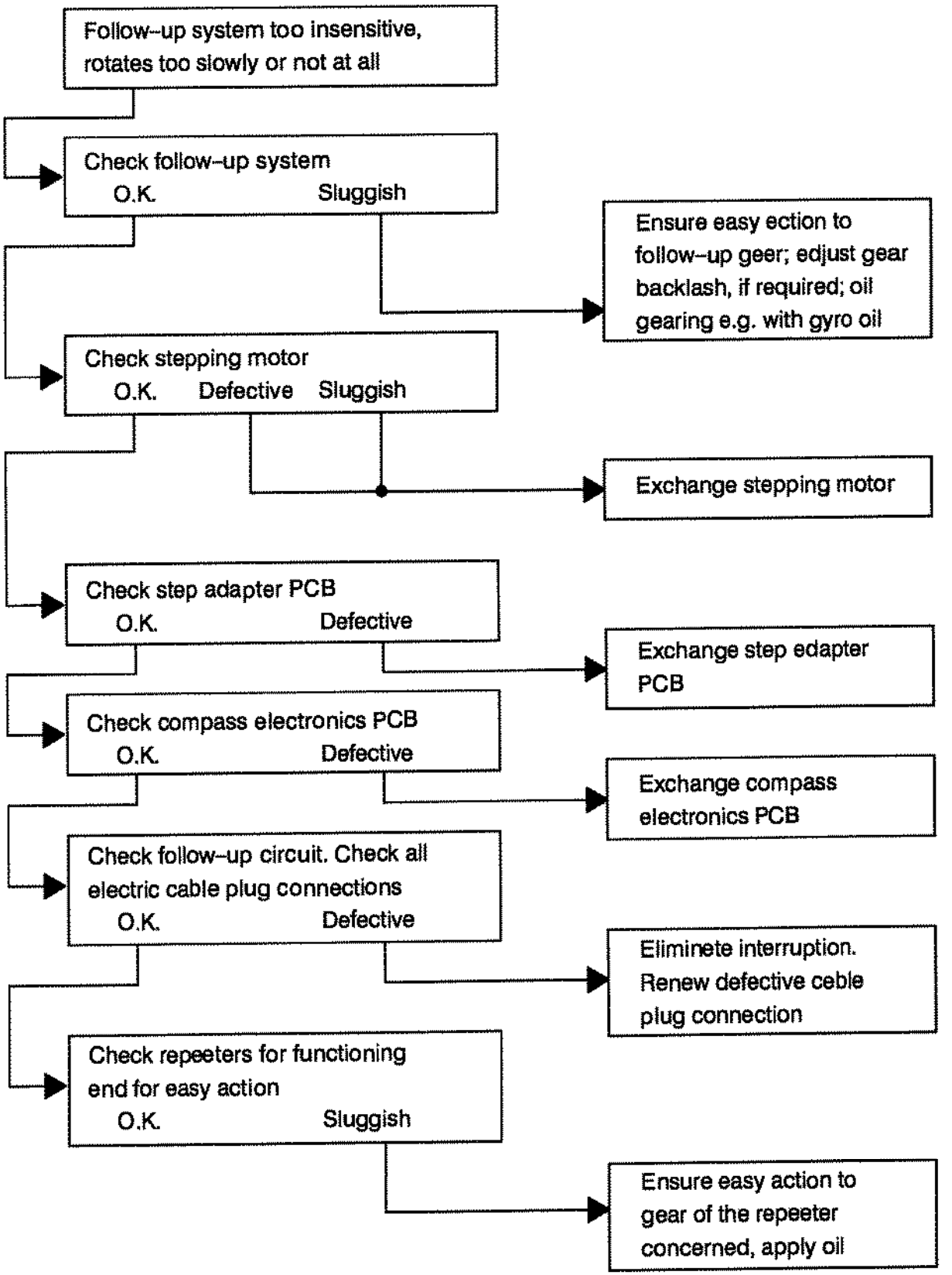


TABLE 9 **Check Course Indication**

Conditions: Gyrosphere must have settled

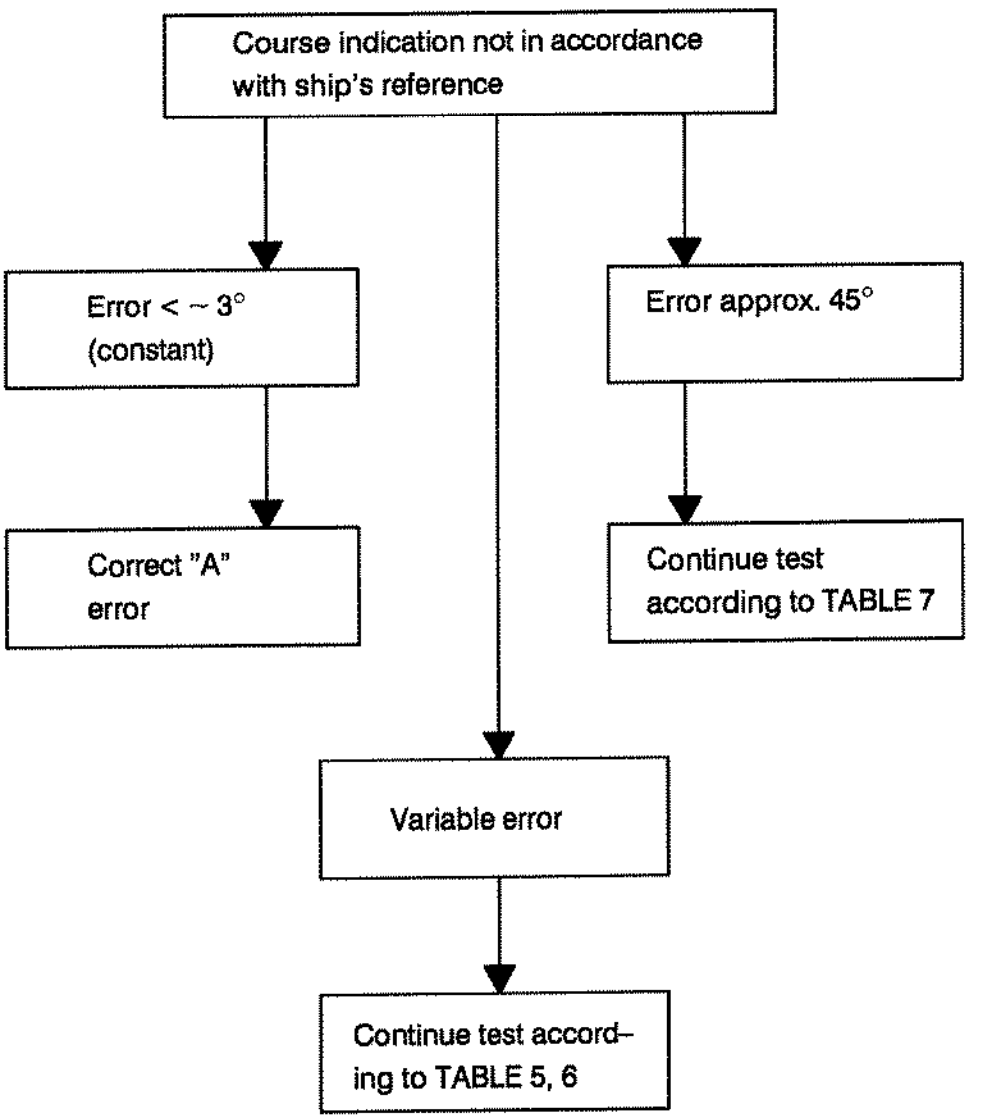
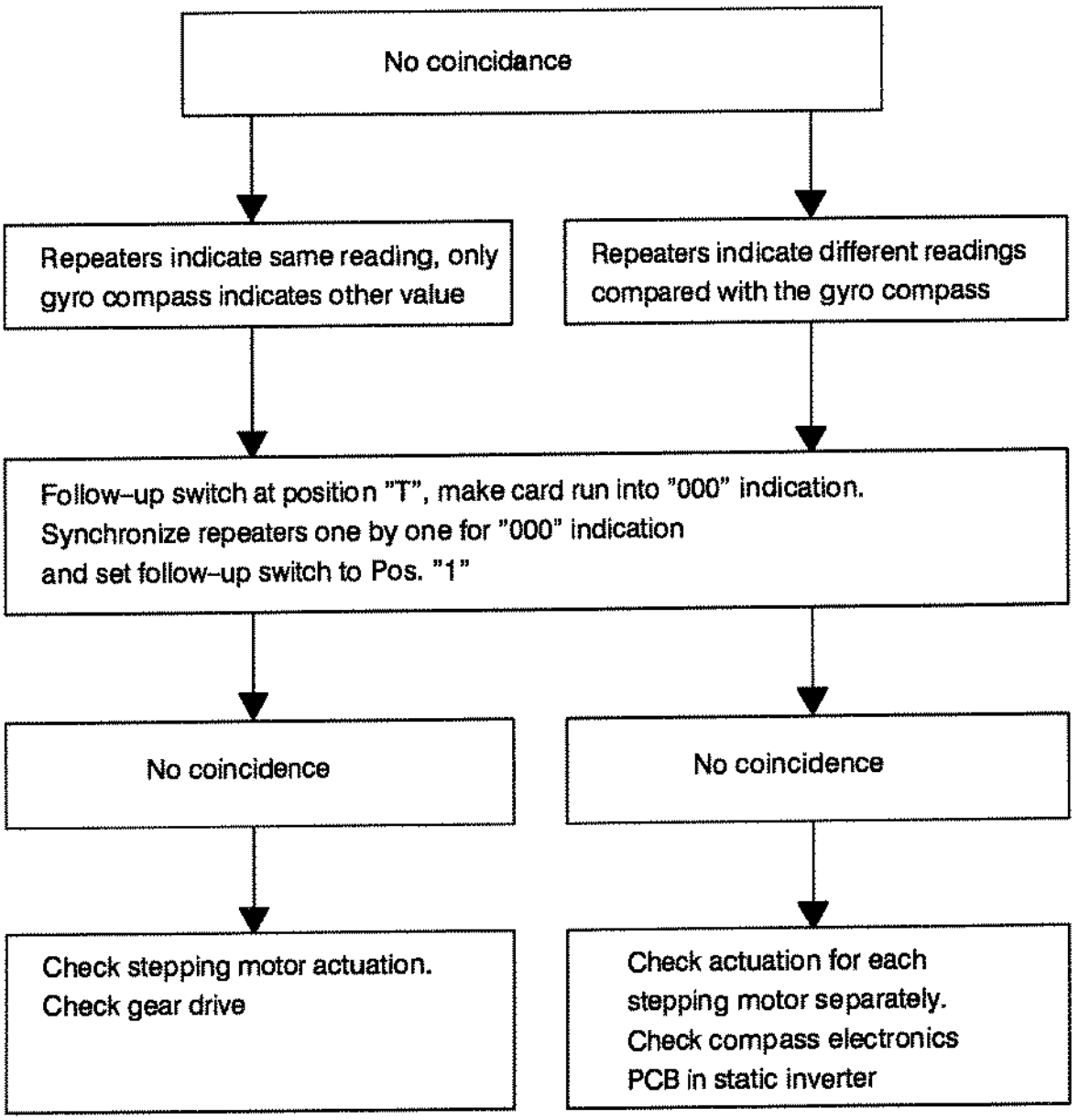


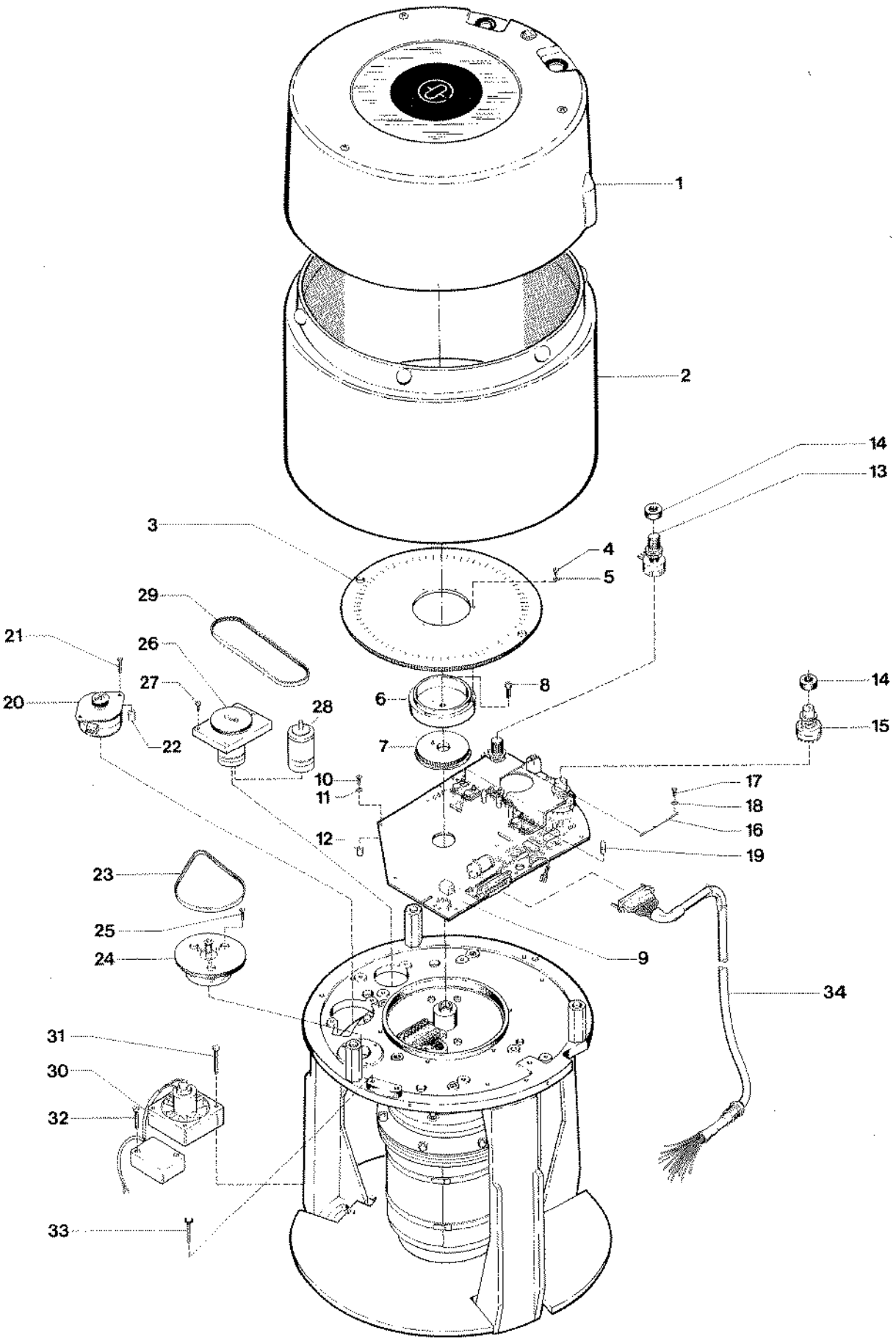
TABLE 10 Check the Gyro Compaaa and Repeater Compass Indications for Coincidance



5. Illustrated Spare Parts Catalogue

comprising:

Gyro Compass,	Type 110–106
Inverter,	Type 121–043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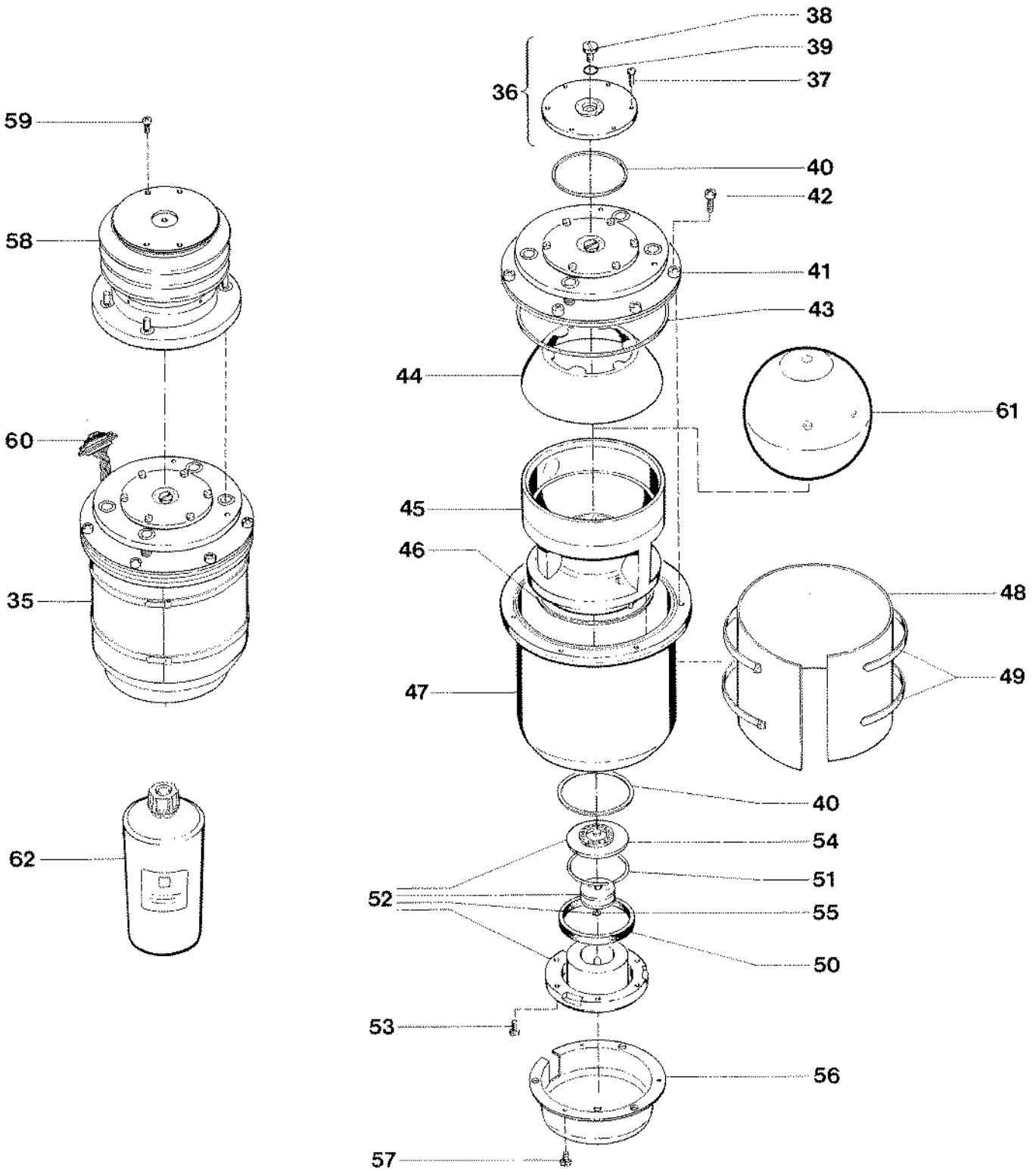
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POS.	Lager-Nr. STOCK-NO.	Benennung	DESIGNATION	Zeichnungs-Nr. PART-NO.	Stck. QTY.	Bemerkungen REMARKS
1*	3.607 850	Haube, kompl.	HOOO, COMPL.	110-106.12 E02	1	
2	3.607 128	Mantel, kompl.	CASING, COMPL.	110-106.04	1	
3	3.512 823	360°-Rose	360°-CARD	110-106.01-028	1	
4	1.607 267	Schraube	SCREW	M 3x6 OIN 7985 A4	3	
5	1.620 706	Scheibe	WASHER	3,2 OIN 125 A4	3	
6	3.512 037	Flansch	FLANGE	110-108.27-005	1	
7	1.503 984	Zahnscheibe z=72	STUDDEO OISK z=72	NB 08-015.00-069	1	
8	1.601 237	Schraube	SCREW	M 4x14 DIN 912 A4	1	
9*	3.607 830	Elektronik	ELECTRONIC PCB	110-106.03 E01	1	
10	1.607 254	Schraube	SCREW	M 3x16 DIN 7985 A4	7	
11	1.620 706	Scheibe	WASHER	3,2 DIN 125 A4	7	
12	1.743 149	Hülse	BUSHING	3x7 PA WN 181	7	
13	3.607 146	Potentiometer, kompl.	POTENTIOMETER, COMPL.	110-106.34 (50 kOhm)	1	
14	1.505 667	Dichtung	GASKET	110-106.01-025	2	
15	3.607 145	Schalter, kompl.	SWITCH, COMPL.	110-106.33	1	
16	3.512 039	Steuerstrich	LUBBER LINE	110-106.30-011	1	
17	1.607 270	Schraube	SCREW	M 3x20 DIN 7985 A4	1	
18	1.620 706	Scheibe	WASHER	3,2 DIN 125 A4	1	
19	1.502 227	Glühlampe (rot)	LAMP (RED)	NB 12-048.00-028 (28V/0,04A Bi-Pin)	3	
20	3.607 133	Schrittmotor, kompl.	STEP MOTOR, COMPL.	110-106.09	1	
21	1.607 254	Schraube	SCREW	M 3x16 DIN 7985 A4	2	
22	1.743 146	Hülse	BUSHING	3x6,5 Al WN 181	2	
23	1.670 082	Zahnriemen z=150	BELT z=150	Nr. 80 150	1	
24	3.607 132	Zwischentrieb	INTERMEDIATE GEAR	110-106.08	1	
25	1.607 172	Schraube	SCREW	M 4x10 DIN 7985 A4	3	
26	3.607 134	Synchro, kompl.	SYNCHRO, COMPL.	110-106.11	1	in NG 002 E02
27	1.607 173	Schraube	SCREW	M 4x12 DIN 7985 A4	3	in NG 002 E02
28	1.508 361	Synchro	SYNCHRO	NB 23-167.00-004	1	in NG 002 E02
29	2.013 036	Zahnriemen z=175	BELT z=175	Nr. 80 175	1	in NG 002 E02
30	3.607 154	Lüfter, kompl.	FAN, COMPL.	110-108.70	1	
31	1.607 271	Schraube	SCREW	M 3x25 DIN 7985 A4	4	
32	1.607 254	Schraube	SCREW	M 3x16 DIN 7985 A4	2	
33	3.511 513	Höhenmeßstab	GAUGING PIN	110-230.31-017	1	
34	3.607 169	Kabel	CABLE	NB 03-732	1	
35	3.607 137	Hüllkugel, kompl.	OUTER SPHERE, COMPL.	110-106.14	1	
36	3.606 815	Ventil, kompl.	INSERT WITH VALVE	110-230.58	1	
37	1.607 252	Schraube	SCREW	M 3x8 DIN 7985 A4	6	
38	3.506 930	Dichtschraube	PROTECTING SCREW	NB 02-268.00-010	1	
39	1.502 375	O-Ring	RUBBER GASKET	NB 08-006.00-020 (R 10x1)	1	
40	1.792 479	Quadring	RUBBER GASKET	Nr. 4145/366y (64,77x2,62)	2	
41	3.607 150	Obere Hüllkugel	COVER, COMPL.	110-106.54	1	
42	1.607 174	Schraube	SCREW	M 4x16 DIN 7985 A4	6	

POS.	Lager–Nr. STOCK–NO.	Benennung	DESIGNATION	Zeichnungs–Nr. PART–NO.	Stck. QTY.	Bemerkungen REMARKS
43	1.792 562	Ouadring	RUBBER GASKET	Nr. 4161/366y (139,37x2,62)	1	
44	3.512 086	Innenschale	UPPER INNER SHELL	110–106.14–014	1	
45	3.607 123	Traglager	LOWER HEMISPHERE	110–106.15	1	
46	1.794 676	Ouadring	RUBBER GASKET	Nr. 4157/366y (113,97x2,62)	1	
47	3.607 173	Topf	LIQUID CONTAINER	110–106.17	1	
48	3.512 030	Abschirmfolie	SCREENING COVER	110–106.14–013	1	
49	1.754 557	Kabelbinder	FIXING TAPE	TY 29 M–O	2	
50	3.512 024	Filter	FILTER	110–106.06–011	1	
51	1.723 246	Schlauch	GASKET	1x0,4 (163 mm)	1	
52	3.607 130	Pumpe	PUMP	110–106.06	1	
53	1.605 226	Schraube	SCREW	M 2,5x14 DIN 84 A4	6	
54	3.511 786	Labyrinthscheibe	EQUALIZING COVER	110–230.52–016	1	
55	3.507 415	Teflon–Scheibe	TEFLON–WASHER	NB 24–015.00–003	1	
56	3.512 872	Deckel	COVER	110–106.14–009	1	
57	1.607 259	Schraube	SCREW	M 2,5x8 DIN 7985 A2	6	
58	3.607 581	Gelenk, kompl.	HINGE, COMPL.	110–222.10	1	
59	1.607 173	Schraube	SCREW	M 4x12 DIN 7985 A4	4	
60	3.607 142	Kabelstamm	CABLE LOOM	110–106.28	1	
61		Kreiselkugel	GYROSPHERE	111–006		
62	3.603 960	Tragflüssigkeit	SUPPORTING LIQUID	148–162		
	3.607 190	Satz Dichtungen	SET OF GASKETS	110–106.00–X01		consisting of Pos. 39, 40, 43, 50, 51, 55

* Diese Ersatzteile sind nur für Kompasse mit o.g. Varianten– und Entwicklungsstand–Nr. einsetzbar.

Siehe Typenschild und Entwicklunsstand–Schild des Gerätes.

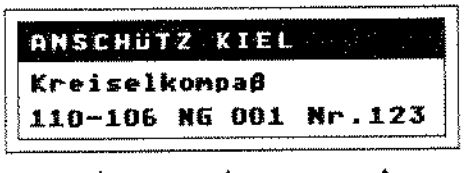
Ersatzteile für andere Varianten und/oder Entwicklungsstände auf Anfrage.

These Spare Parts are only applicable for Compasses with above mentioned No. of Variant and Development Status.

See Type Label and Label of Development Status.

Spare Parts for other Variants and/or Development Status on request.

Typenschild
TYPE LABEL

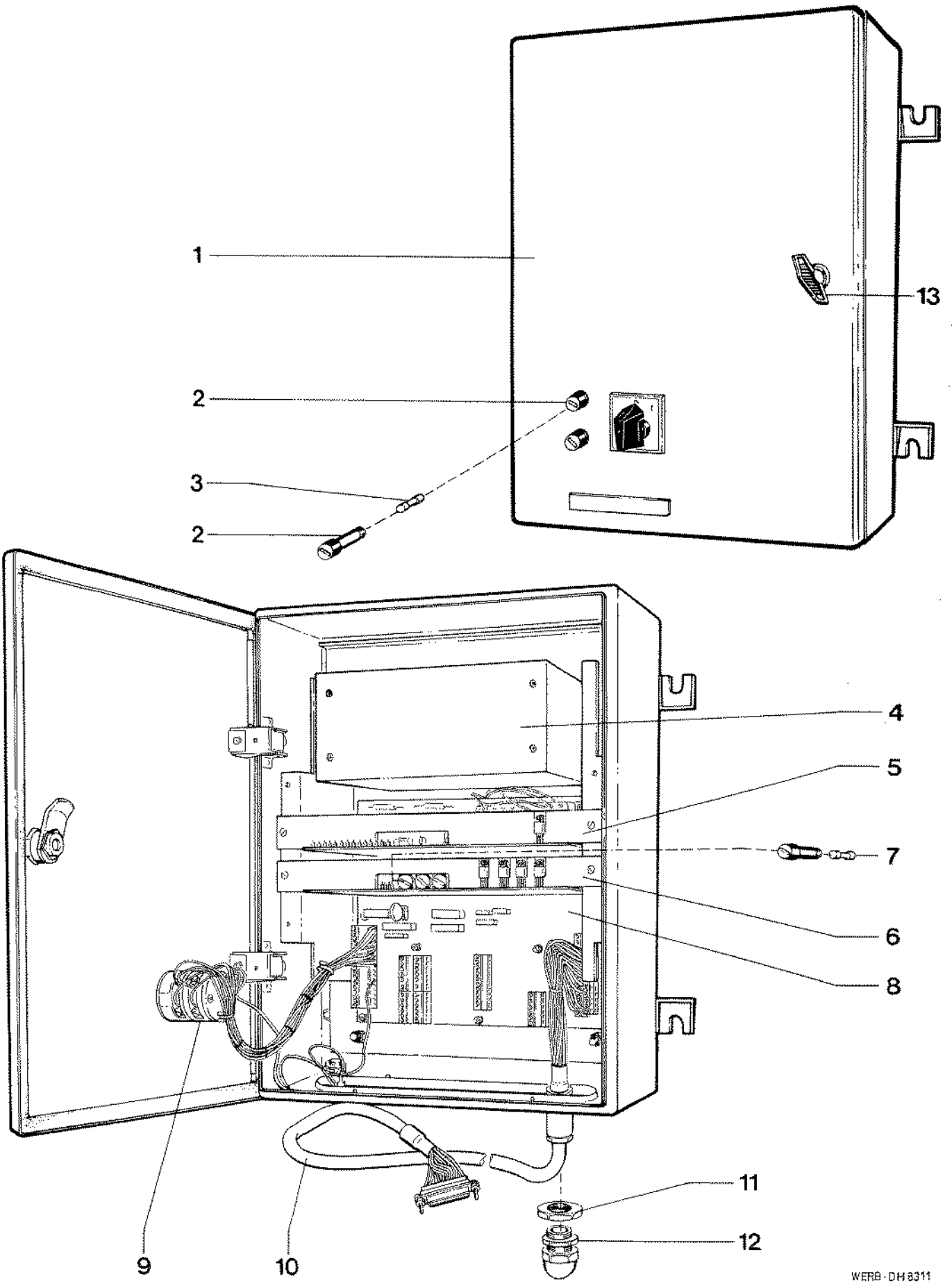


Typen–Nr. TYPE–NO. | Variante VARIANT | Serien–Nr. SERIAL–NO.

Entwicklungsstand–Schild
LABEL OF DEVELOPMENT STATUS

Entwicklungsstand–Nr. (E 02)
NO. OF DEVELOPMENT STATUS (E 02)

Since further development may necessitate making modifications to existing equipment, its conformity with the relevant illustrations and drawings is not always ensured. ANSCHÜTZ will be under no liability whatever that may arise from any such differences.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WERB - DH 8311

Umformer
INVERTER
TYPE 121-043 NG 001 E 02

ANSCHÜTZ

Ersatzteilkatalog
SPARE PARTS
CATALOGUE

POS.	Lager-Nr. STOCK-NO.	Benennung	DESIGNATION	Zeichnungs-Nr. PART-NO.	Stck. QTY.	Bemerkungen REMARKS
1	4.004 781	Umformer	INVERTER	121-043 NG 001 E02		
2	1.762 021	Sicherungshalter	FUSE HOLDER	FEB 031.1402	2	
3	1.762 030	Sicherungseinsatz	FUSE	T 6,3 A DIN 41662	2	
4	1.510 013	Umformer	INVERTER ASSEMBLY	121-043.02	1	
5 *	3.607 770	Kompaßelektronik	COMPASS ELECTRON. PCB	121-043.06 E02	1	
6 *	3.607 827	Step-Adapter	STEP-ADAPTER PCB	121-043.04 E01	1	
7	1.762 017	Sicherungseinsatz	FUSE	T 1 A DIN 41662	3	
8 *	3.607 821	Verdrahtungskarte	WIRING PCB	121-043.06 E02	1	
9	1.504 647	Schalter	SWITCH	NB 14-231.00-060	1	
10	3.607 169	Kabel	CABLE	NB 03-732	1	
11	1.791 785	Gegenmutter	NUT	GMP 16 Nr. 52000105		
12	1.791 784	Kabelverschraubung	CABLE GLAND	ST 16 Nr. 52015030		
13	2.013 897	Doppelbartschlüssel	KEY		1	

* Diese Ersatzteile sind nur für Umformer mit o.g. Varianten- und Entwicklungsstand-Nr. einsetzbar.

Siehe Typenschild und Entwicklunsstand-Schild des Gerätes.

Ersatzteile für andere Varianten und/oder Entwicklungsstände auf Anfrage.

These Spare Parts are only applicable for Inverters with above mentioned No. of Variant and Development Status.

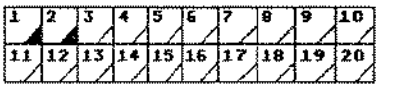
See Type Label and Label of Development Status.

Spare Parts for other Variants and/or Development Status on request.

Typenschild
TYPE LABEL

Typen-Nr. TYPE-NO. | Variante VARIANT | Serien-Nr. SERIAL-NO.

Entwicklungsstand-Schild
LABEL OF DEVELOPMENT STATUS



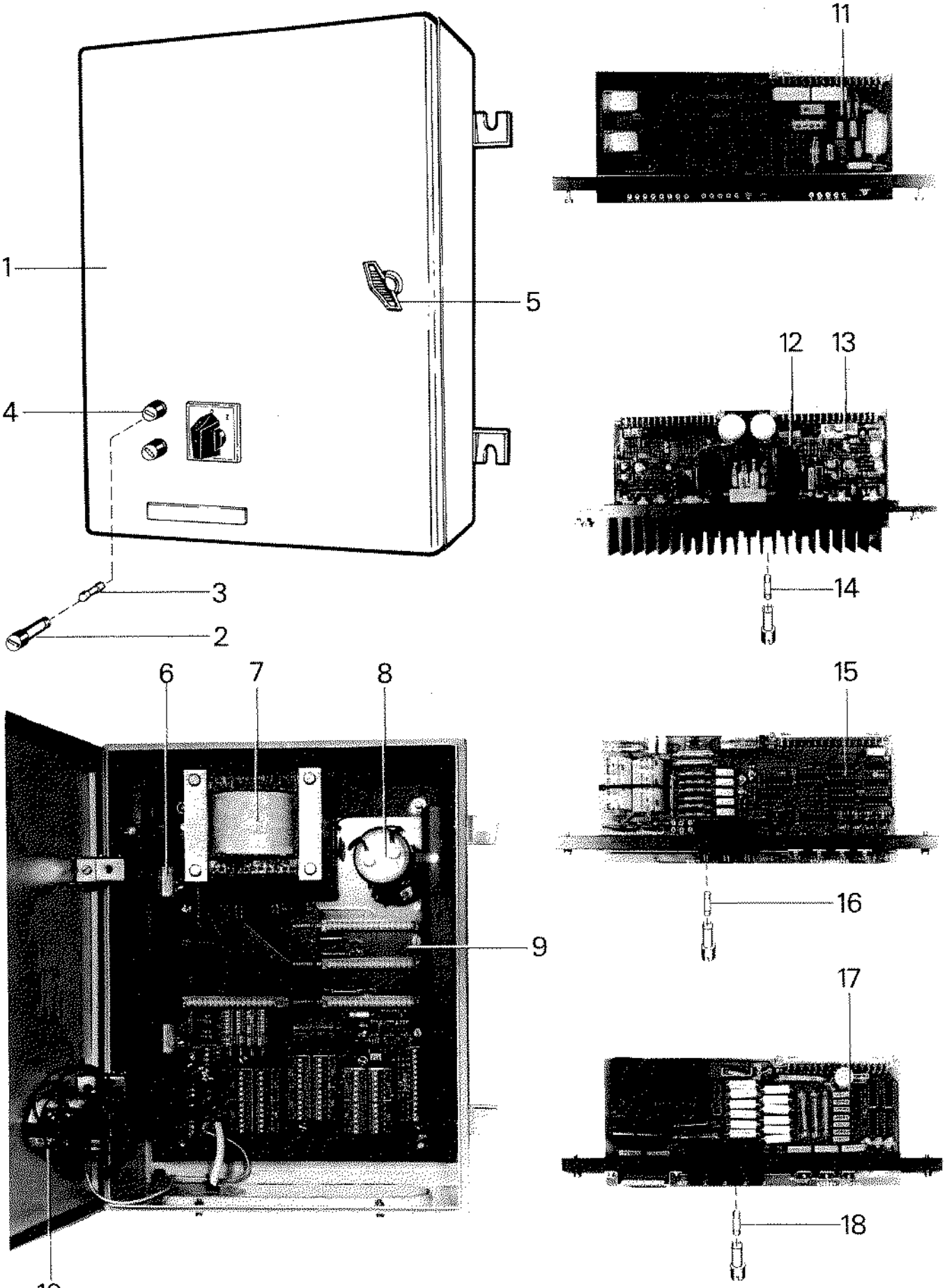
Entwicklungsstand-Nr. (E 02)
NO. OF DEVELOPMENT STATUS (E 02)

Kursumsetzer
COURSE TRANSDUCER

Type 132-603 E 01

ANSCHÜTZ

Ersatzteile
SPARE PARTS



WERB-DH 8412

Kursumsetzer
COURSE TRANSDUCER

Type 132-603 E 01

ANSCHÜTZ

Ersatzteile
SPARE PARTS

POS.	Lager-Nr. STOCK-NO.	Benennung	DESIGNATION	Zeichnungs-Nr. PART-NO.	Stck. QTY.	Bemerkungen REMARKS
1	4.004 663	Kursumsetzer	COURSE TRANSDUCER	132-603 E 01		WITHOUT PCBs
2	1.762 023	Schraubkappe	CAP	Nr. 19786	2	
3	1.762 035	Sicherungseinsatz	FUSE	T 4 A Nr. 19343	2	
4	1.762 025	Sicherungshalter	FUSE HOLDER	Nr. 19780	2	
5	2.013 897	Doppelbartschlüssel	KEY		1	
6	1.794 276	Gleichrichter	RECTIFIER	FPI 4020	2	
				220V/25A	2	
7	3.607 199	Transformator	TRANSFORMER	NB 10-607	1	
8	1.734 303	Kondensator	CAPACITOR	10000 µF +30%-10% 63 V	1	
9	3.607 493	Verdrahtungskarte	MASTER BOARD	102-603.05 E 01	1	INCL. POS. 8
10	1.504 647	Schalter	SWITCH	NB 14-231.00-060	1	
11	4.004 409	Synchro-Adapter	SYNCHRO ADAPTER PCB	132-333		je nach Auftrag DEPENDENT ON ORDER
12	4.004 619	Synchro-Booster	SYNCHRO BOOSTER PCB	132-338		
13	1.762 019	Sicherungseinsatz	FUSE	T 4 A DIN 41662	1	
14	1.762 017	Sicherungseinsatz	FUSE	T 1 A DIN 41662	7	
15		Step-Adapter	STEP ADAPTER PCB	132-334		
16	1.762 017	Sicherungseinsatz	FUSE	T 1 A DIN 41662	3	
17	4.004 410	Sperry-Adapter	SPERRY ADAPTER PCB	132-332		
18	1.762 017	Sicherungseinsatz	FUSE	T 1 A DIN 41662	4	

6. Inatallation

6.1 Removing the Trensportation Supports from the Gyro Compass

6.1.1 General

In order to protect the moving parts of the gyro compass from being damaged during transport, 3 transportation supports are provided in the binnacle (see Fig. 6–1).
The transportation supports consist of:

1) two half–cylindrical foam pieces (6–1.1) enclosing the outer sphere. They are inserted between the casing and the outer sphere, and
2) a circular foam piece (6–1.2) inserted between the outer sphere and the bottom of the gyro compass.
3) a plastic retainer (6–1.3) preventing rotation of the 360° card. It is fastened to the 360° card end to a spacer bolt.

These transportation supports must be removed prior to installation. Observe right order (1, 2, 3)!

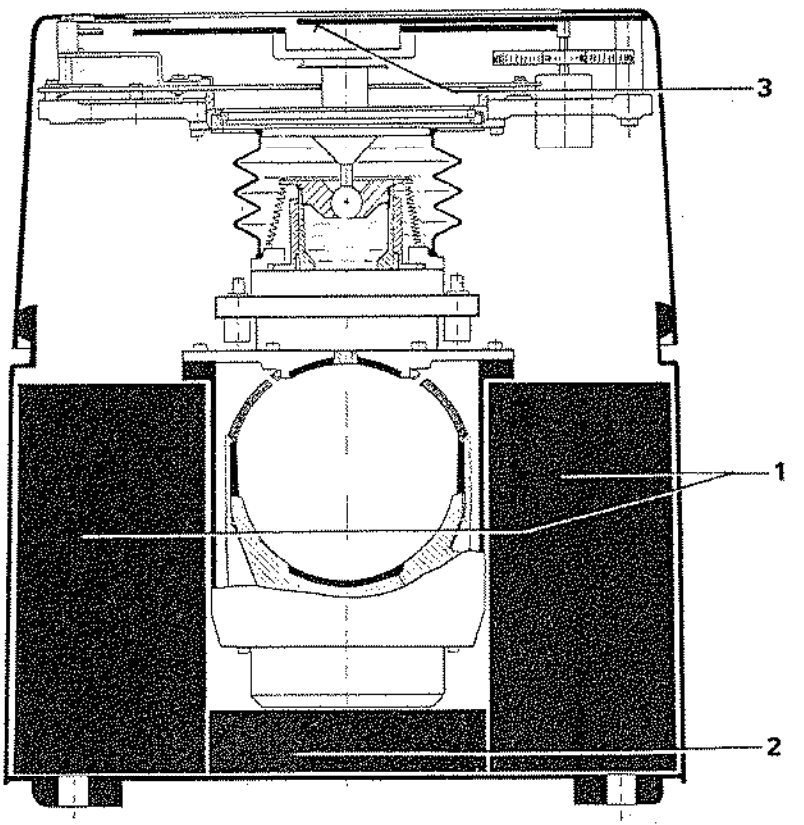


Fig. 6–1: Transportation Supports (Schematic Sectional Drawing)

At first, remove casing and hood of the gyro compass. Then carefully take out the three shaped foam parts. Finally screw off the retainer. (The retainer is screwed on by two screws to be used for fastening the 360° card.) After the retainer has been removed, the screws are to be screwed on again and to be tightened.

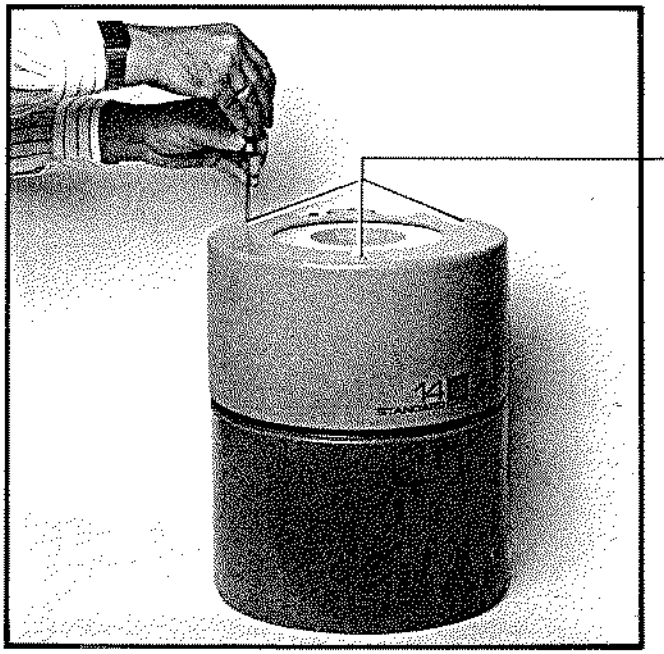


Fig. 6-2:
Screwing out the 3 Cross-slotted Screws on the Compass Hood

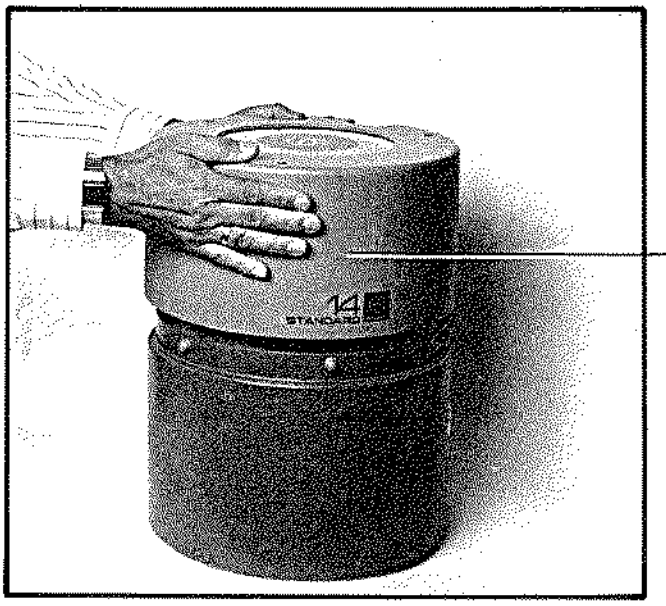


Fig. 6-3:
Removing the Compass Hood

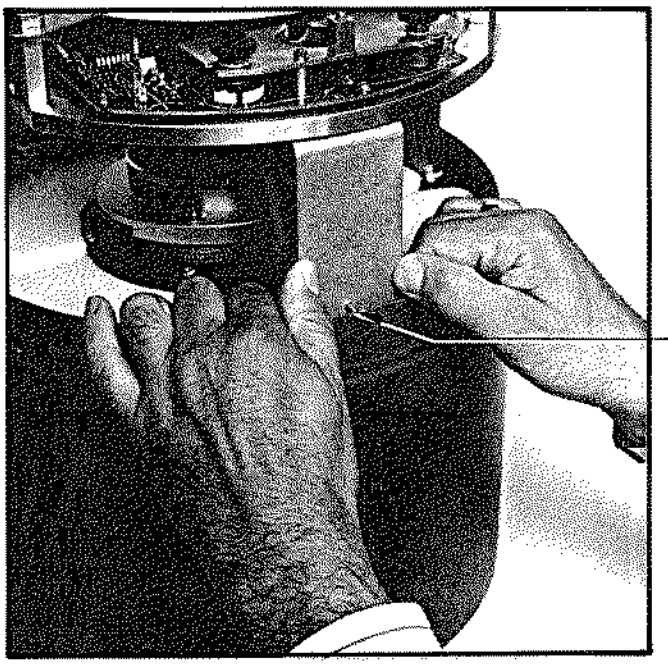


Fig. 6-4:
Pushing the Compass Casing at first over the 3 Cylindrical Pins each by Some Millimeters

The errow points at one of the 3 cylindrical pins

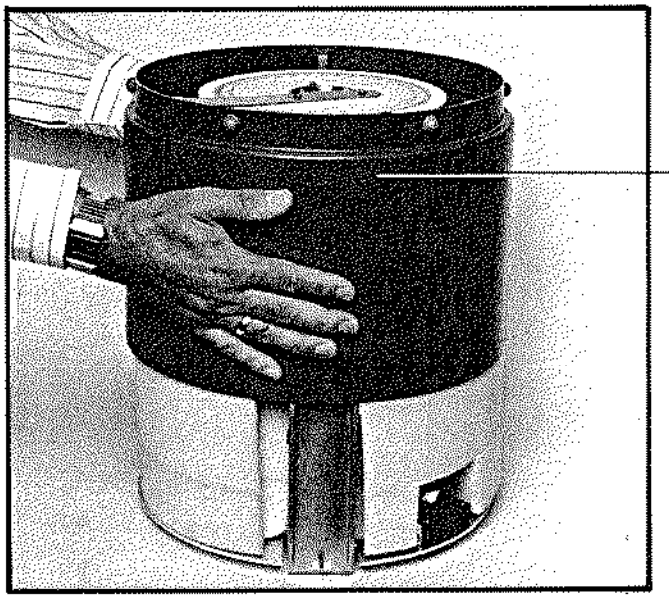


Fig. 6-5:
Pushing the Compass Casing in the Upward Direction and Removing it

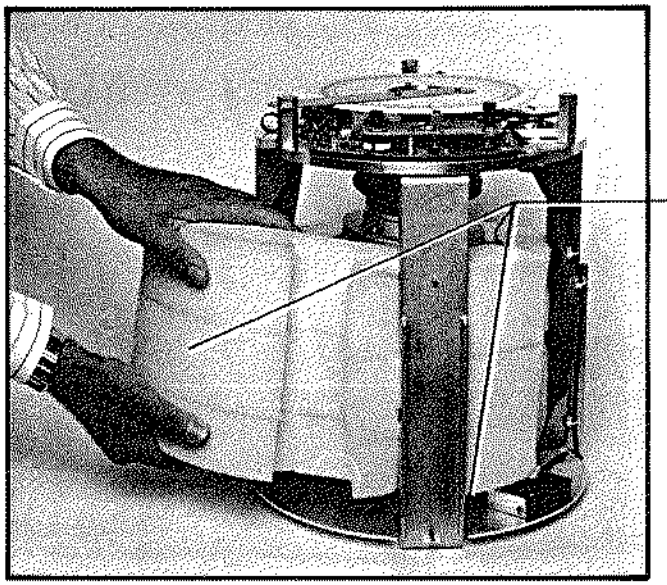


Fig. 6-6:
Removing the 3 Foam Pieces
(2 Half-cylindrical and 1 Circular Foam Part)

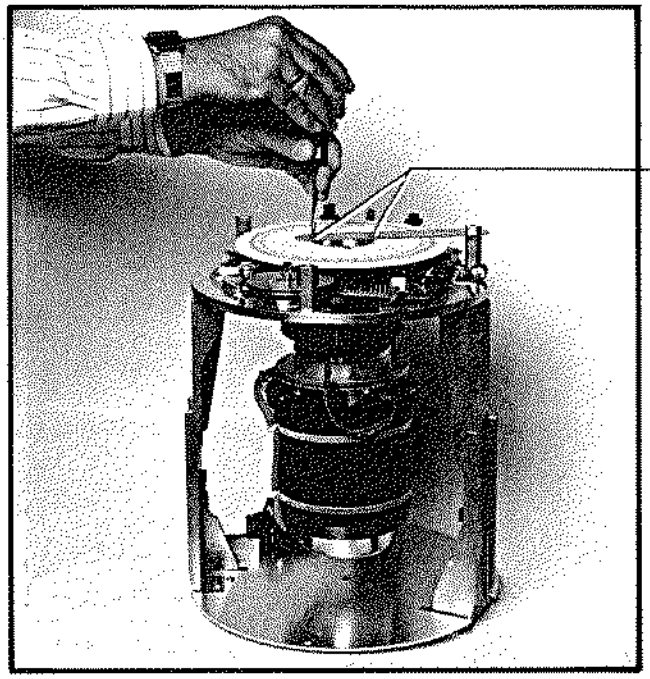


Fig. 6–7:
Removing the Upper Transportation Support

For this purpose, screw out 2 screws on the 360° card and remove the upper transportation support

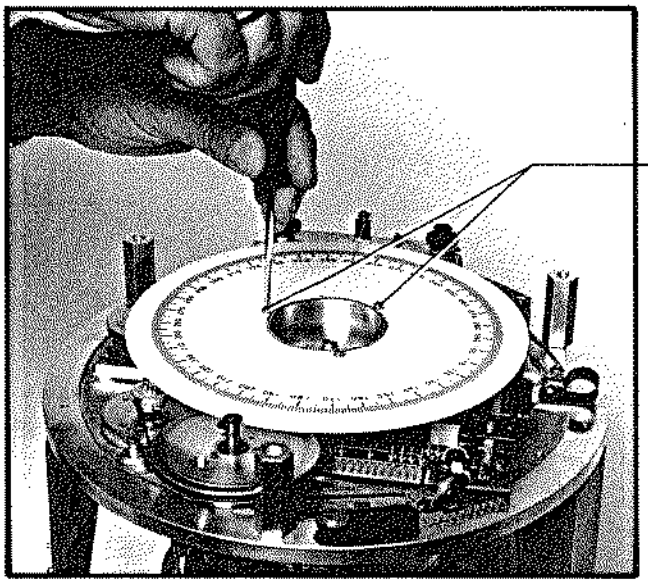


Fig. 6–8:
Removing the Upper Transportation Support and Re–inserting and Tightening the Two Screws that had previously been screwed out

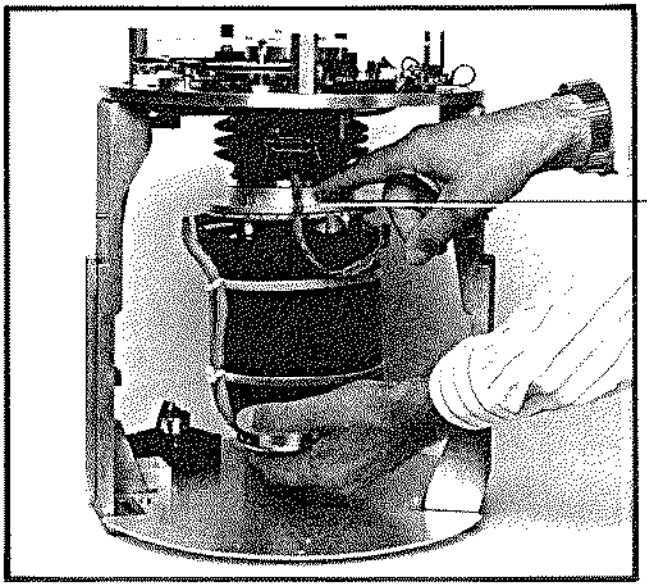


Fig. 6–9:
Loosening the Outer Sphere from the Pendulum Joint:
Press down the 4 quick–closing pins one time each.
Attention! Now the outer sphere is detached from the pendulum joint

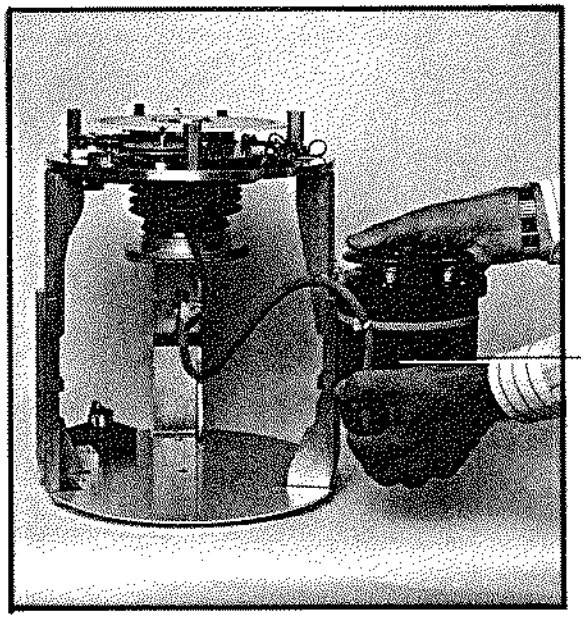


Fig. 6–10:
Taking the Outer Sphere carefully out of the Gyro Compass and Placing it onto a Plane Surface beside the Gyro Compass
(See also Section 3.3.1.1)

6.2 Installing the Gyro Compass Equipment STANDARD 14 BASIC VERSION

The individual components of the gyro compass equipment STANDARD 14 BASIC VERSION are mechanically to be installed in adequate places in accordance with the dimensional drawings and with due regard to the hints given there.

6.2.1 Installing the Gyro Compass STANDARD 14, Type 110–106

(See Dimensional Drawing 110 D 106 HP 005 as well as Drilling Scheme, Fig. 6–12.)

Note:

Take into consideration the cleerence required for ventilation and for care and maintenance work (see Fig. 6–13).

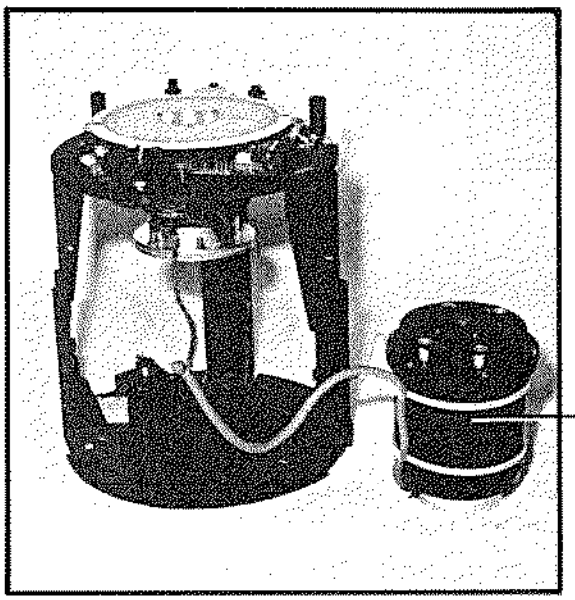


Fig. 6–11:
Placing the Gyro Compass onto the previously marked and prepared Fastening Boreholes (see Fig. 6–12) and Screwing it on.

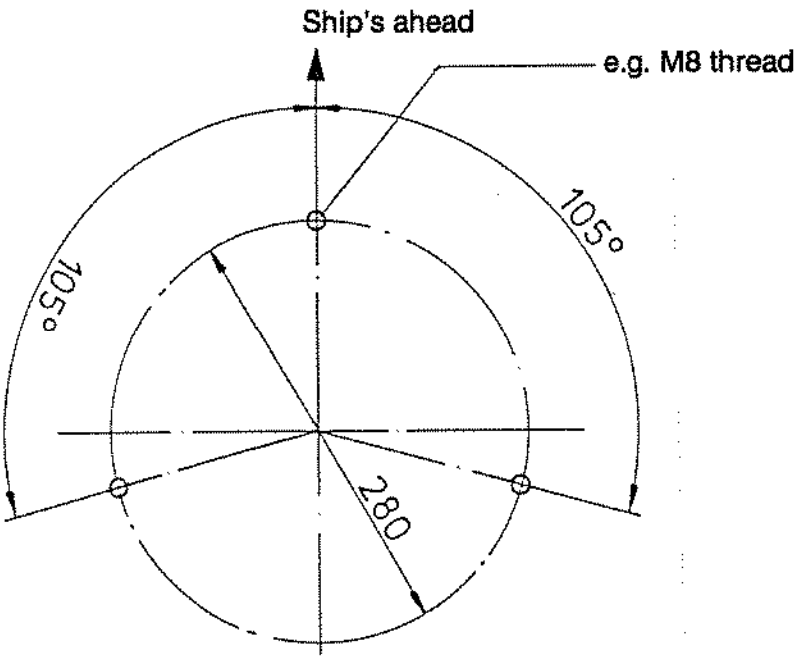


Fig. 6-12: Marking the 3 Points for Fastening the Gyro Compass STANDARD 14 (Drilling Scheme)

- Punch-mark and drill tha 3 fastening holes.
- Tighten tha compass chassis by means of the adequate screws and washers.
- Further work to be performed as shown under Part 7.

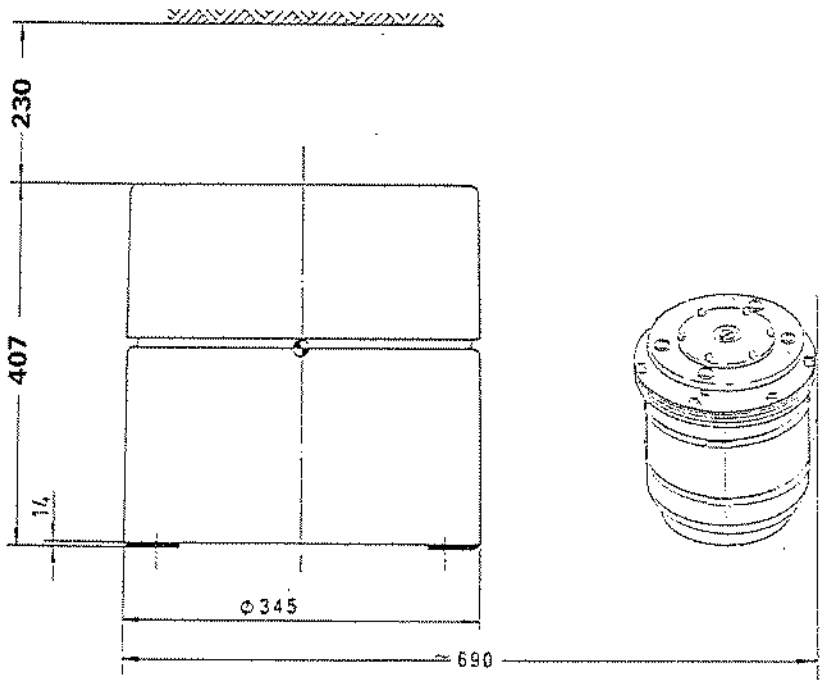


Fig. 6-13: Dimensional Drawing of Clearance required for the Gyro Compass

6.2.2 Installing the Inverter, Type 121-043 NG001 / NG003

The Inverter, Type 121-043, is available in two versions, A and B.
Version A (NG001) has a casing (IP 23) and a permanently mounted compass connection cable of 5 m in length.
Version B (NG003) is without casing (IP 00), without compass connection cable, without ON/OFF switch and without built-in fuseholders and fuses (E1 and E2).

For version A, the mutual distance of between gyro compass and inverter depends upon the length of the compass connection cable (5 m).
The inverter is always to be mounted in vertical position, e.g. bulkhead mounting.
Take into account the clearance required for installation, for opening the door and for meintenance. (See corresponding Fig. 6-14, Course transducer).

Procedure:

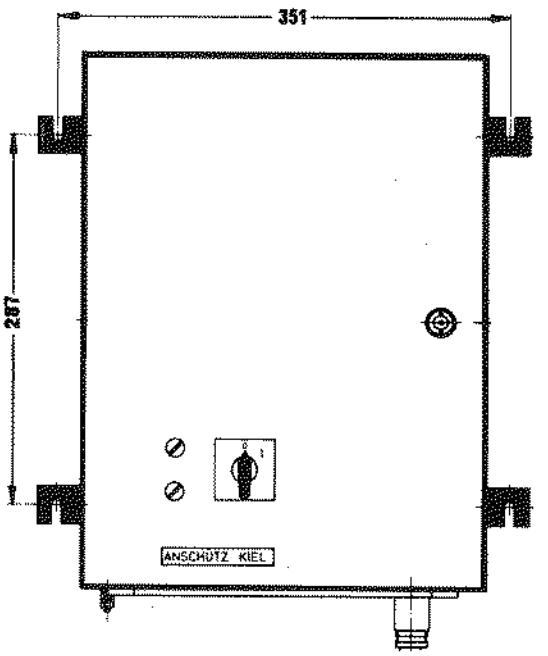
- Punch-mark for drilling the 4 fastening holes
- Drill the 4 fastening holes
- Mount the inverter by meens of the adequete screws end washers.

Version B is intended to be incorporated into desks, cabinets or steering stands (IP 00).
For this purposa, an adequate installation site, e.g. in a control dask, is to be chosen.
The inverter is to be mounted in vertical position, too (as it is applicable for version A).
Adequate ventilation is to be ensured for heat dissipation (powar loss). The ON/OFF switch B5, fuses E1/E2 and the compass connection cable are to be supplied by the shipyard.

6.2.3 Installing a Course Transducer, Type 132-603 NG001 / NG002 (optional)

(See also Section 6.2.2 Installing the Invarter, Type 121-043 NG001 / NG003).
Installing e course transducer is to be performed in equivalence to installing the inverter.
For practical reasons, the mounting site of e course transducer should be close to the inverter.
Take into account the clearances that are required for installing and opening the inverter and the course trensducer.

The dimensions of the inverter and of the course transducer can be taken from Drawings 121 C 043 HP005 and 132 C 603 HP005 given in the Annex.



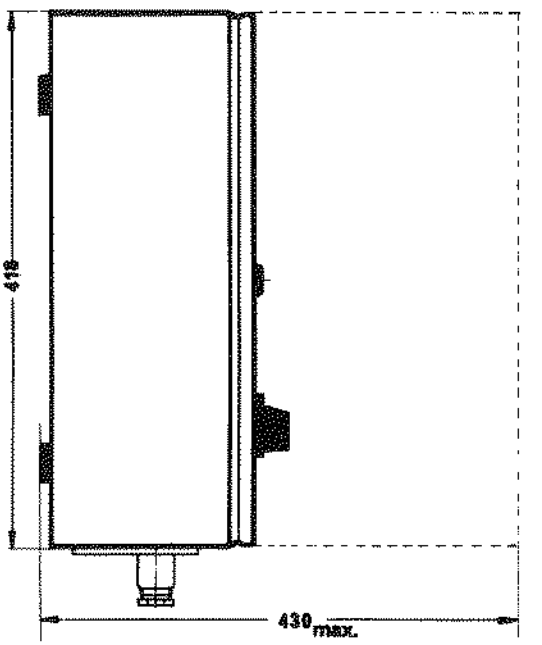


Fig. 6-14: Marking the Fastening Points of the Inverter and/or of the Course Trensducer

Clearance required for inverter and/or course transducer with the door opened

- Punch-mark for drilling the 4 fastening holes.
- Drill the 4 fastening holes.
- Mount the course transducer by means of the adequate screws and washers.

6.2.4 Installing the Time Switch, Type NB 03–735 (optional)

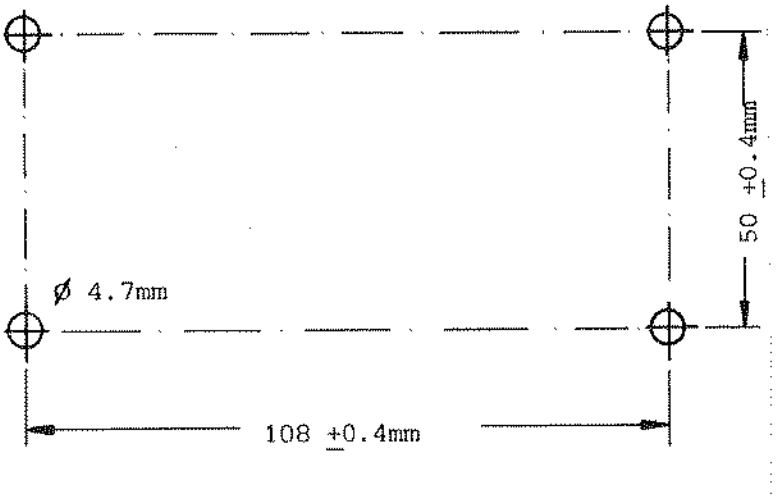


Fig. 6–15:
Drilling Scheme for Fastening Holes of the Time Switch

The time switch can be installed at any point of the ship you like, provided the ambient conditions are adequate. (The time switch is supplied as a spray–proof design, IP 23.)

For performing fastening and cabling, the time switch must be opened. For this, unscrew the four fastening screws on the cover and remove the cover.

- Punch–mark for drilling the fastening holes.
- Drill the fastening holes.
- Mount the time switch.
- Ceble the time switch.

6.2.5 Mounting e Magnetic Sonde for Course Scenning (Optional)

For connecting an autopilot to the gyro compass STANDARD 14, there exists the possibility (if no Transmitter Synchro, Type 11 CX4, is used) of scanning the compass course by means of e suitable magnetic sonde and to convert it into a synchro–signal–like compass course signal (see Assembly Drawing, Fig. 6–16, STANDARD 14 / Megnetic Sonde). For this purpose, a special annuler megnet is to be pested – centred and aligned to true north – into the recess of the 360° card.

The magnetic sonde – centred and aligned to true north – is pasted on tha ecrylic glass disk of the compass hood of STANDARD 14 and permits scanning off the magnetic field of the annular magnet.
In order to reduce the intensity of the magnetic field of the annular magnet, up to 5 matching disks, dependent on the equipment, can be errenged on the annular magnet (see Fig. 6–17.2).
In this wey, optimum adaptation of the magnetic sonde to the autopilot will be possible by carrying out experiments.

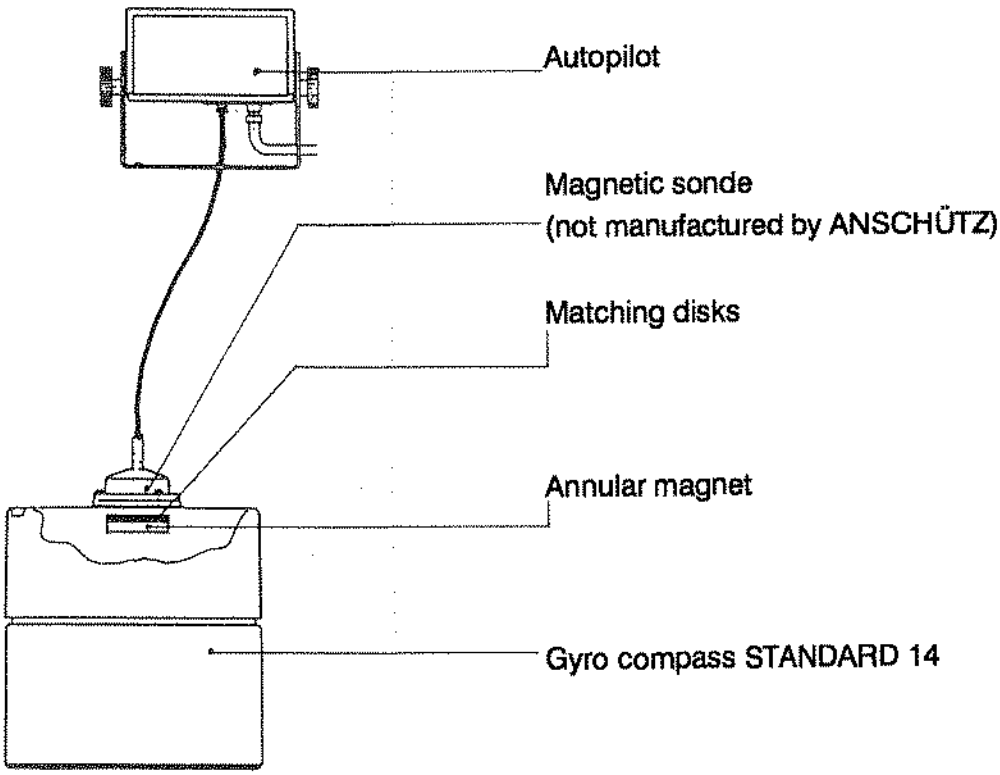


Fig. 6–16: Assembly Drawing: STANDARD 14 / Magnetic Sonde
– Schematic Representation –

Table of Magnetic Field Measurement in Plane "A"
(See Fig. 6–17, Installation Drawing for Additional Group, Type 148–332.)

Annular magnet alone.....	4.35 mT
with 1 sheet.....	2.20 mT
with 2 sheets.....	0.95 mT
with 3 sheets.....	0.53 mT
with 4 sheets.....	0.33 mT

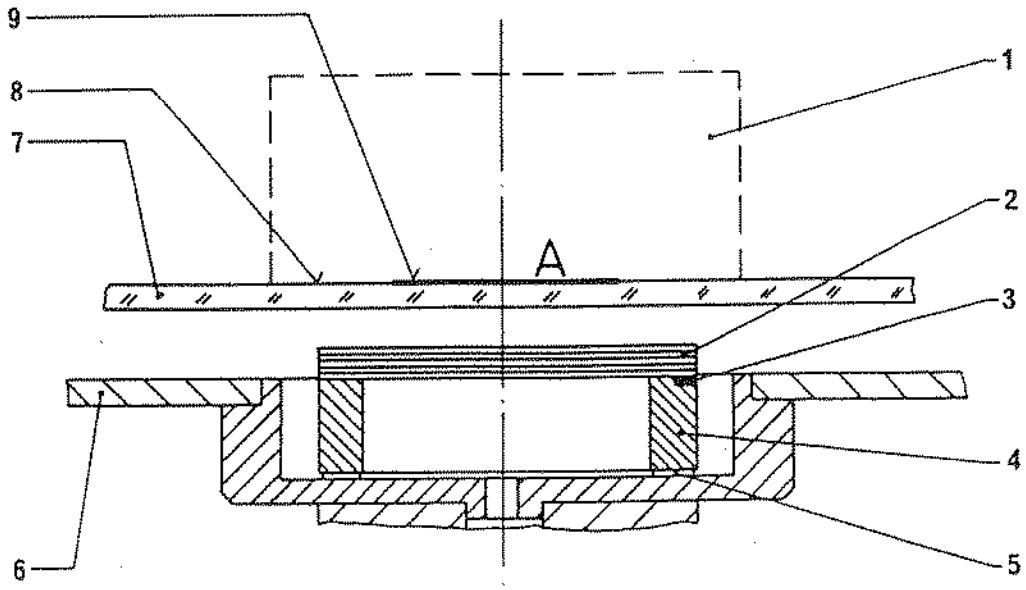


Fig. 6–17: Installation Drawing for Additional Group, Type 148–332

1 Magnetic sonde suitable to the autopilot used
2 Matching Disk for annular magnet, Type 148–332.00–6
3 Mark (notch) on the annular magnet:
top side and north–south direction
4 Annular Magnet, Type NB 15–01–9
5 Adhesion surface of annular magnet for double–faced adhesive tape,
e.g. DUPLOMONT 04 or a suitable adhesive
6 360° gyro–compass card
7 Cover disk of gyro–compass hood
8 Adhesion surface of magnetic sonde for double–faced adhesive tape,
e.g. DUPLOMONT 04 or suitable adhesive
9 Level "A" for magnetic field measurement

6.2.5.1 Mounting Instructions for Additional Group, Type 148–332

1) Set 360° card (Fig. 6–17.6) of the gyro compass exactly to north (to Pos. 000°).

2) Apply double–faced adhesive tape to the bottom side (Fig. 6–17.5) of the annular magnet (Fig. 6–17.4) in 3 points at least.

3) Insert the annular magnet centered into the recess of the 360° compass card and align it to north. The upper notch in the annular magnet should be in alignmant with the 000° mark of the compass card. After alignment, the annular magnet is to be pressed on strongly.

4) Pasta tha magnetic sonde (Fig. 6–17.1) of the autopilot onto the acrylic glass disk of the gyro–compass hood; take into account the mounting instruction supplied by the manufacturer of the magnetic sonda. (Pay attention to that tha magnetic sonde is aligned to true north and fastened in centred position!)

5) Perform trial operation: reduce the intensity of the magnetic field of the annular magnet by arranging of up to 5 matching disks so that optimum adaptation of the magnetic sonde used can be obtained (cf. Table of Magnetic Field Measurement in Plane "A").

6) Parform trial trip. (After successful trial, the matching disks arranged can be fixed by means of a suitable adhesive.)

6.2.6 Installing Further Optional Devices

On installing optional devices, e.g. setellite navigation or communication equipment, autopilot, radar equipment, direction–finder, repeater compasses, digital repeater compasses etc., take into account the descriptions, dimensional drawings, system diagrams or cable and connection diagrems enclosed.

6.3 Cabling, General Hints

(See also relevant Cable Connection Diagram in the Annex.)

Installation of the individual devices or systems on board ship is to be performed only in places where the environmental influences upon the devices and systems are adequate.

- After installation of the individual devices, electrical cabling to the mounting sites is to be performed.

- For cable laying, the requirements of electromagnetic compatibility (EMC) are to be taken into consideration. This means that the devices and cables should have the largest possible distance from EMC sources of trouble (continuous, short-time, clicks).

- All cables must be metal-shielded.

- No spare cores are included in the number of cores found in the cable diagrams.

- All devices are to be connected via the earthing bolts with the protective conductor.

- After laying the cables, they are to be cut to such a length that they fit into the devices at their respective mounting locations. The used cores are to be stripped. Cores that are not used are to be tied up.

- The individual cores are to be checked for continuity and – to eech other – for short-circuit.

- Thereafter, the cores are to be connected in accordance with the cable connection diagrams.

Cebling between inverter and gyro compass:

The connecting ceble coming from the inverter can be led into the gyro compass in different weys:

1) either laterally, directly below the compass hood, or
2) laterally, directly below the compass casing, level with the base plate. (This type of installation has the advantage that – when work is to be carried out, e.g. on the outer sphere – the connecting cable need not be removed.)

The compass connection cable – after being introduced into the binnacle – is to be fastened by means of clamps.

7. Putting into Operation

7.1 Mounting the Gyrosphere into the Outer Sphere

Installetion of the gyrosphere is to be performed according to the instructions given in the following sections:

- Opening the Gyro Compass, Section 3.1.2
- Removing the Gyrosphere from the Outer Sphere, Section 3.3.1.
  Proceed with this section to the Point "Screwing off and Removing the Outer Sphere Cover" (see Fig. 3–14).

Note:
For reasons of protection during transportation, the gyrosphere is delivered in a separate transportation box.
For being protected against damage, the inner shell is delivered packed in a plastics bag end placed in the outer sphere. Furthermore, you will find there a mounting instructions sheet, pay attention to it, please!

Procedure:

- Take the inner shell out of the outer sphere end remove plastics bag.
- Rinse out the outer sphere with clear water.
- Take the gyrosphere out of the gyrosphere packing, rinse with clear water and place it on a foam part of its packing.

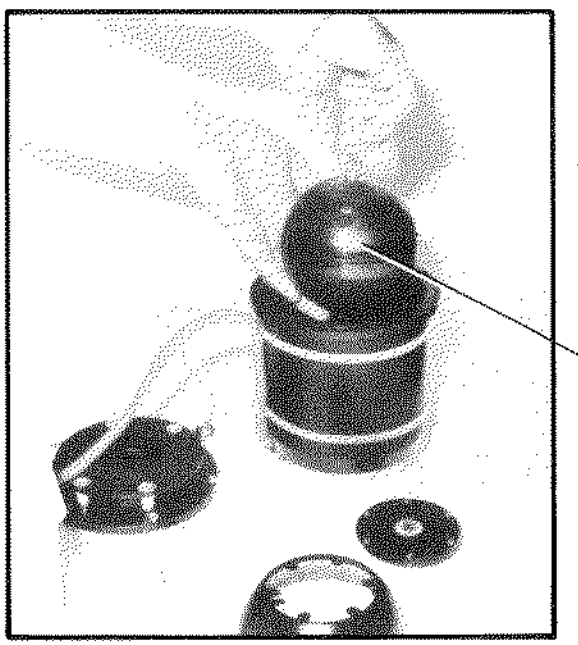


Fig. 7–1:
Inserting the Gyrosphere into the Outer Sphere

- Fill approx. 1/4 l of supporting liquid into the outer sphere.
- Moisten the suction cap and press it centred onto the calotte of the gyrosphere (cf. Fig. 7–2).
- Place the gyrosphere carefully into the supporting bearing of the outer sphere.

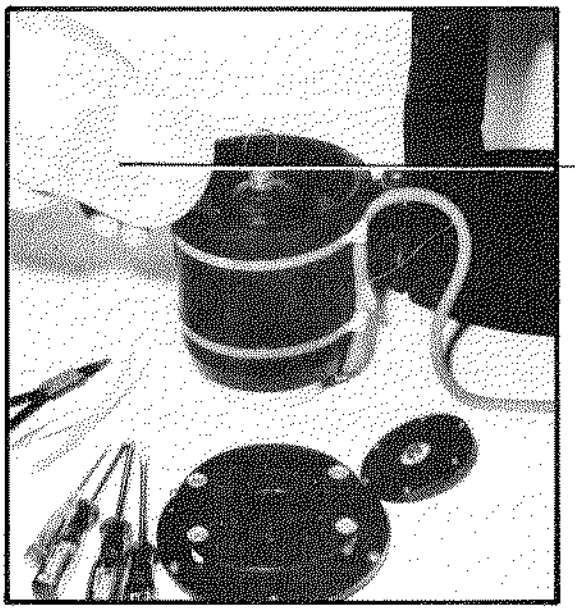


Fig. 7–2:
Filling in Further Original ANSCHÜTZ Supporting Liquid (to approx. 1 cm below the outer sphere edge)

- Take the inner shell out of its packing and place it centred onto the seat of the supporting bearing of the outer sphere (see mounting instructions sheet and Fig. 7–3).

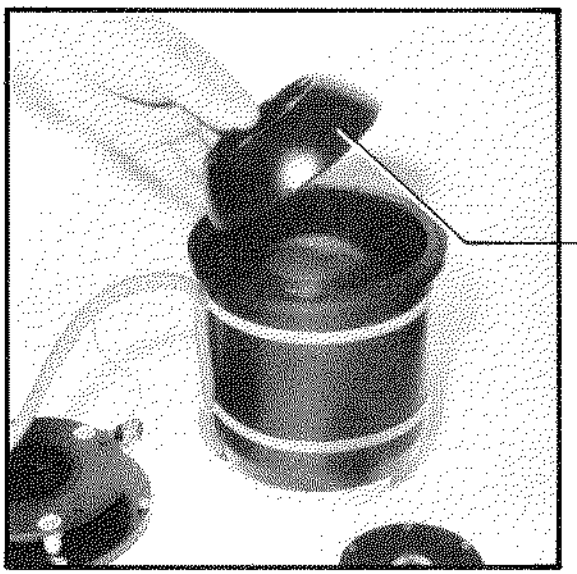


Fig. 7–3:
Placing the Inner Shell onto the Seat of the Supporting Bearing of the Outer Sphere

- Clean the contact surfaces of the outer sphere and outer-sphere cover.
- Check the position of the sealing ring between the outer sphere and outer-sphere cover.
- Carefully place the outer-sphere cover onto the outer sphere, whilst observing the positioning pins!
- Secure the outer-sphere cover to the outer sphere using the six screws.

Hint: Carefully tighten the mounting screws by means of a screw driver (crosswise)!

- Clean the contact surfaces of the outer-sphere cover and insert.
- Fill original ANSCHÜTZ supporting liquid through the opening in the outer-sphere cover.
  (Supporting liquid level see Section 3.3.3.)
- Check the position of the sealing ring between the outer-sphere cover and insert.
- Cerefully set the insert onto the outer-sphere cover.
- Secure the insert to the outer-sphere cover by means of six screws.

Hint:
Carefully tighten the mounting screws (crosswise)!

- Re-establish the plug connection for phase connection of the upper calotte (cf. Fig. 3-9).
- Inserting the Outer Sphere into the Gyro Compass (see Section 3.3.4).

7.2 Switching on the Gyro Compass

The gyro compass equipment is to be switched on in accordance with the Operating Instructions given in Section 2.1.

7.3 Checking Signaliing

Proceed in accordance with Section 2.3.

7.4 Checks to be made on the Gyro Compass

- Measure the starting and operating currents of the gyro motors (incl. pump motor), see Section 4.1.3 Test List of Gyro Compass.
- General checks, see Section 3.2.1
  Then install outer sphere into the gyro compass, see Section 3.3.4.
- Check and, if required, correct the alignment error ("A" error), see Section 3.6.

7.5 Synchronizing the Course Indications of the Repeeter Compesses with ths Course Indicatlon of the Gyro Compaas

(See Section 3.2.7.)

7.6 Chscka to be mads during Operation

(See Section 2.4.)

7.7 Application of the Speed Error Tsble (Speed Error Table in the Compass Book)

The speed error is the difference between the course indicated by the gyro compass and the true course. The underlying causes of this error, which is governed by the ship's speed, course and local latitude, are of the physical type. For amount and sign of speed error, see table supplied with every gyro compass installation.

1. Obtain true course by adding speed error to or subtracting it from compass course according to sign taken from table.

   Rule: FROM "WRONG" COURSE TO "RIGHT" COURSE WITH "RIGHT" SIGN

2. Obtain gyro-compass course by adding speed error to or subtracting it from true course with table sign inverted.

   Rule: FROM "RIGHT" COURSE TO "WRONG" COURSE WITH "WRONG" SIGN

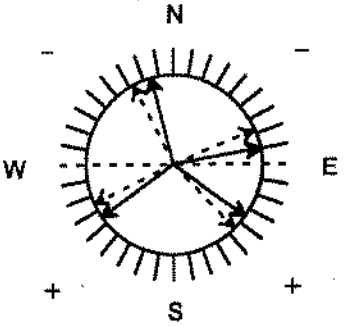
WRONG course . . . compass course – steering course
RIGHT course . . . chart course – true course

RIGHT sign . . . table sign
WRONG sign . . . inverted table sign

Check speed error for correct sign eccording to rule below:

THE TRUE COURSE IS ALWAYS WEST OF THE COMPASS COURSE

- - - - -> true course ⟶ compass course



Examplee for using speed error table:

Example to 1.
compass course . . . . . 345°
latitude. . . . . 55°
ship's speed . . . . . 16 kn

speed error from table – 1.7°

Example to 2.
true course . . . . . 225°
latitude . . . . . 55°
ship's speed . . . . . 16 kn

speed error from table + 1.3°
Attention ! Invert sign !

Example for a bearing
compass course . . . . . 255°
latitude . . . . . 55°
ship's speed . . . . . 18 kn
bearing . . . . . 135°
speed error from table + 0.5°

true course 345° – 1.7° = 343.3° compass course.. 225° – 1.3° = 223.7° true bearing.. . 35° + 0.5° = 135.5°

Latitude	Northerly Course / Southerly Course — Sign of course correction –		+		Speed in Knots 4	8	12	16	20	24	28	32	36	40	44
	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
55°	0	380	180	180	0.4	0.8	1.3	1.8	2.2	2.7	3.1	3.6	4.0	4.4	4.9
	15	345	185	195	0.4	0.9	1.3	1.7	2.1	2.6	3.0	3.4	3.9	4.3	4.7
	30	330	150	210	0.4	0.8	1.1	1.5	1.9	2.3	2.7	3.1	3.5	3.6	4.2
	45	315	135	225	0.3	0.8	0.9	1.3	1.8	1.9	2.2	2.5	2.8	3.1	3.5
	60	300	120	240	0.2	0.4	0.7	0.9	1.1	1.3	1.6	1.8	2.0	2.2	2.4
	75	285	105	255	0.1	0.2	0.3	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.3
	90	270	90	270	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Annex
for the Modified Static Inverter, Type 121-043 MOD 015 or MOD 016

Note:
The Modified Static Inverter, Type 121-043 MOD 015 or MOD 016, can be connected with a maximum of 4 repeater compasses
(with ANSCHÜTZ step system, 192 steps/1°).
The connections are made via the Repeater Compass Distribution Box, Type AWD-138-021-1-OUT.
As to the wiring, the following modifications have been performed.
See drawings:
- 121-C 043 HP020
- AWD-121-025-2-WIR
- AWD-138-021-1-OUT

1. The electrical connections of the compass cable for the follow-up motor of the gyro compass (SM 1, SM 0) have been reconnected in the static inverter from L6.7/L6.8 to L19.5/L19.3.

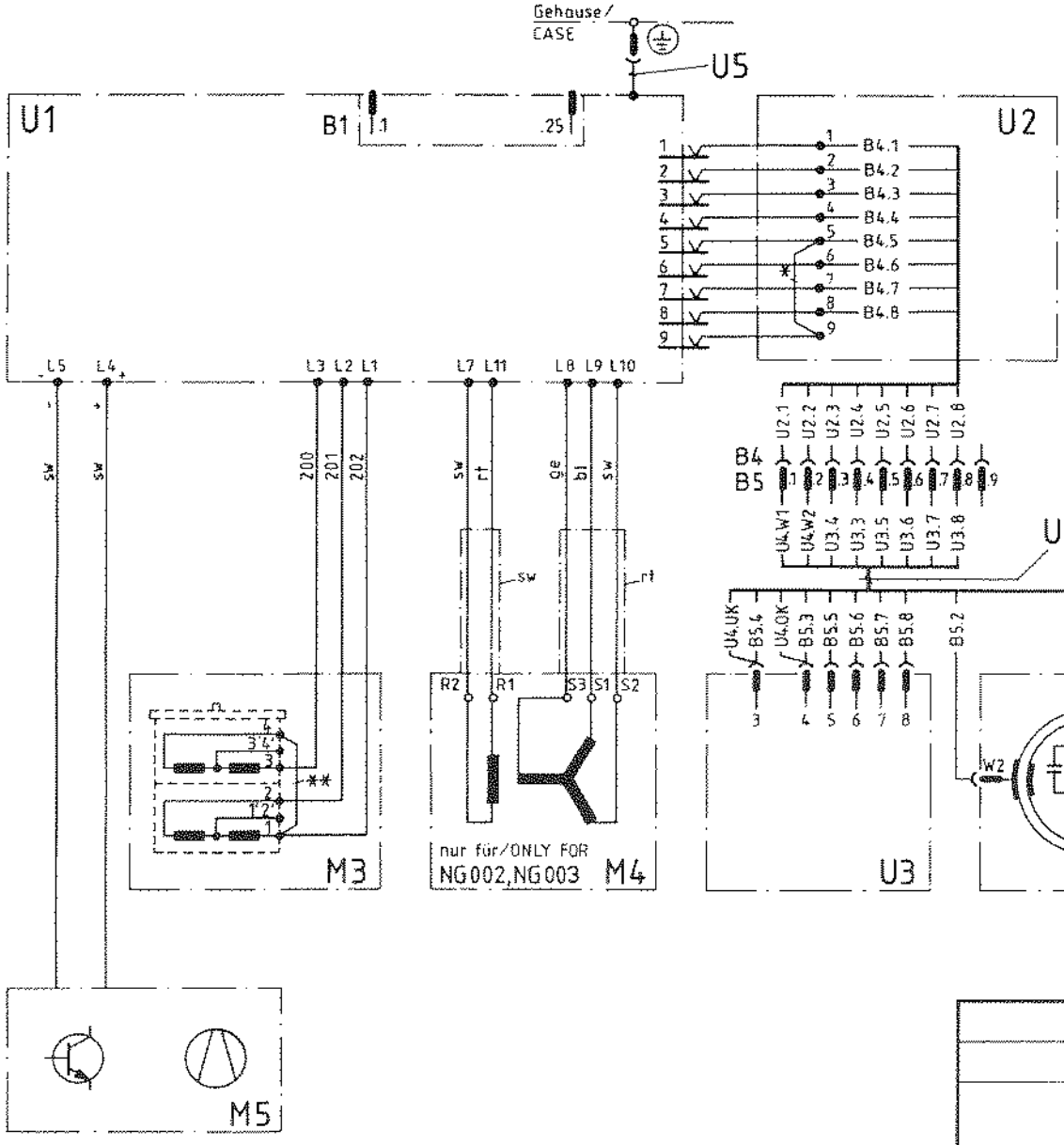
2. The resistors R4 (22 Ω) and R5 (22 Ω) have electrically been bridged over in the static inverter.

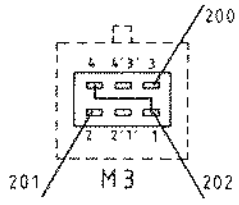
3. The Repeater Compass Distribution Box, Type AWD-138-021-1-OUT, has been connected to the terminals L6.7 (SM 1), L6.8 (SM 0), L19.1 (+24V), L19.2 ($0V_{illumination}$), L19.4 ($0V_{stepping\ motor}$) in the static inverter.

The repeater compass distribution box comprises:
- 1 input terminal strip (L8) with 6 terminals
- 8 current-limiting resistors (R1 ... R8, each 33 Ω/4 Watt), for the stepping motors of the repeater compasses.
- 4 fuses (E1 ... E4, each 2A), for the 24V illumination
- 4 output terminal strips (L10, L12, L14, L16) with 6 terminals each for the connection of 4 repeater compasses as a maximum.

Note
See Static Inverter Measuring List, Page 4-20:
By electrical bridging-over of R4 and R5, the voltages of between L6.6/L6.7 and L6.6/L6.8 increase to +12V or -12V!
The AC voltages rise to 8V ... 14V AC as well!

Attention
For load reasons, no further repeater compasses must be connected to L11 and L12 in the static inverter!





DIN-CODE	Benennung DENOMINATION	Typ od.Zeichnungs-Nr. TYPE OR DRAWING NO.	POS. NO.	aus Stückliste FROM PARTS LIST	gilt für APPLICABLE TO
B4	SOCKET	NB 07 E 03-127	7	110 S 106.23	
B5	PLUG	NB 07 E 03-128	8	110 S 106.28	
M3	STEPPING MOTOR	110 E 106.09	11	110 S 106.01	
M4	SYNCHRO. COMPLETE	110 E 106.11	22	110 S 106	NG002
M5	FAN	110 E 106.70	5	110 S 106.07	
M4	SYNCHRO.COMPLETE	110 E 106.85	22	110 S 106	NG003
U1	ELECTRONICS	110 B 106.03	6	110 S 106.01	
U2	CABLE LOOM	110 C 106.23	15	110 S 106.01	
U3	PUMP, COMPLETE	110 E 106.06	5	110 S 106.05	
U4	GYRO SPHERE	111 - 006	5	110 S 106	
U5	EARTHING CONDUCTOR	110 E 106.35	6	110 S 106.03	
U6	CABLE LOOM	110 C 106.28	8	110 S 106.05	
	WIRING	110 E 106.24	14	110 S 106.01	

Hierzu gehört Stromlaufplan

110 C 106 HP030

TO THIS BELONGS CIRCUIT DIAGRAM

* Schaltdraht YV 0,8 Pos.-Nr 28 aus Stückliste 110 S 106.23

** Schaltdraht Rd 0,8 Pos.-Nr. 94 aus Stückliste 110 S 106.01

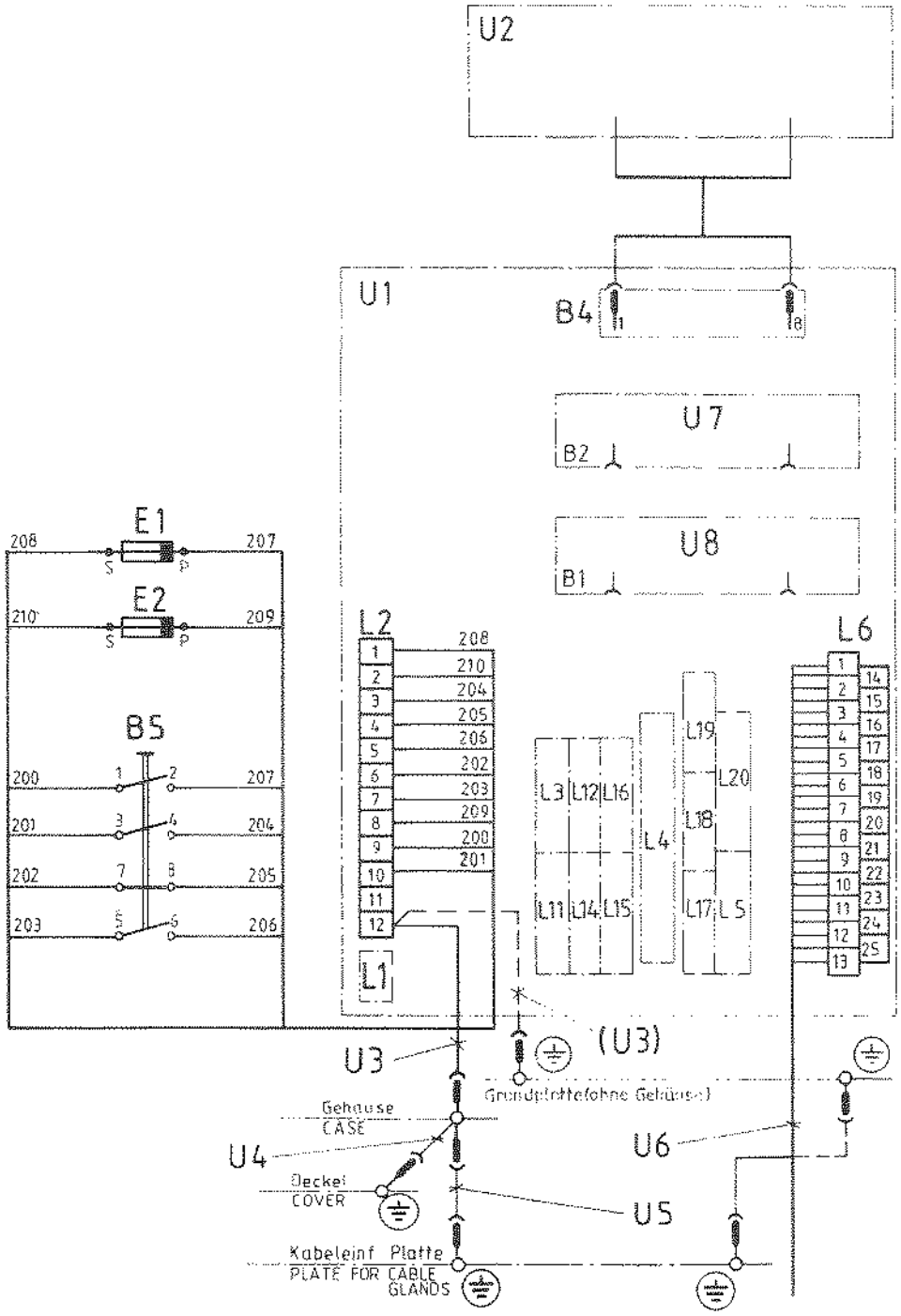
				Maße ohne Toleranzangabe mittel DIN 7168	Arbeitspause	Maßstab —
				1982	Datum	Name
				Bearb.	12.5.	Kempmann
				Gepr.	24.5	Gpi
				Norm	24.5	
				Freigegeben	21.9.82	
k	5773.110	20.4.82	Voss	ANSCHÜTZ & CO. GMBH · KIEL		
a	5683.110	11.12.89	Kg			
Zust.	Änderung	Datum	Name			

Benennung
Bauschaltplan / WIRING DIAGRAM
Kreiselkompaß / GYRO COMPASS
Std. 14

Zeichnungsnummer
110 D 106 HP 031

Blatt 1 / 1 Bl

Ers. f.:



L6	U6 CABLE - 11
1	gnge GREEN YELLOW
2	br BROWN
3	gn GREEN
4	ge YELLOW
5	gr GRAY
6	rs PINK
7	bl BLUE
8	rt RED
9	sw BLACK
10	vio VIOLET
11	grrs GRAY PINK
12	rtbl RED BLUE
13	swtl(13) BLACK(13)
14	brgn BROWN GREEN
15	wsge WHITE YELLOW
16	gebr YELLOW BROWN
17	wsgr WHITE GRAY
18	grbr GRAY BROWN
19	wsrs WHITE PINK
20	rsbr PINK BROWN
21	wsbl WHITE BLUE
22	brbl BROWN BL
23	wsrt WHITE RED
24	brrt BROWN RED
25	wsgn WHITE GREEN

Hierzu gehört Übersichtsplan
TO THIS BELONGS GENERAL DIAGRAM 121 C 043 HP 020
121 C 043 HP 023

DIN-CODE	Benennung DESCRIPTION	Typ od Zeichnungs Nr TYPE OR DRAWING NO	POS NO	aus Stückliste FROM PARTS LIST	gilt für APPLICABLE TO
B4	CONNECTOR	NB 07 E 03 - 190	B4	121 S 043 05	
B5	SWITCH	NB 14 E 231-60	B5	121 S 043 01	
E1	FUSE LINK	T6,3A DIN 41 662	E1	121 S 043 01	
E2	FUSE LINK	T6,3A DIN 41 662	E2	121 S 043 01	
L2	TERMINAL STRIP	NB 07 E 05 - 65 (4x)	L2	121 S 043 05	
L6	TERMINAL STRIP	NB 07 E 05 - 42 (4x) NB 07 E 05 - 37 (1x)	L6	121 S 043 05	
U1	WIRING PCB	121 B 043.05	13 3	121 S 043 121 S 043.01	NG 003/4 NG 001/2
U2	INVERTER	121 D 043.02	1	121 S 043.01	
U3	EARTHING CONDUCTOR	132 - 606 07	8	121 S 043 121 S 043.01	NG 003/4 NG 001/2
U4	EARTHING CONDUCTOR	121 E 039.07	7	121 S 043.01	NG 001/2
U5	EARTHING CONDUCTOR	132 E 192.05	9	121 S 043 01	NG 001/2
U6	CABLE	NB 03 0 732	11	121 S 043	NG 001
U7	COMPASS ELECTRONICS	121 C 043 06	4	121 S 043	NG 001/3
	TMC ELECTRONICS	121 C 043 13	4	121 S 043	NG 002/4
U8	STEP-ADAPTER	121 C 043 04	3	121 S 043	
200 - 210	WIRING	121 E 043 HP 018		121 S 043 01	NG 001/2

Maße ohne Toleranzangabe entnehmen DIN 7168 | Arbeitspause | Maßstab

	Datum	Name
Bearb.	15.10.1992	NIKLAS
Gepr	21.10.92	
Norm	23.10.92	
Freigegeben	23.10.92	

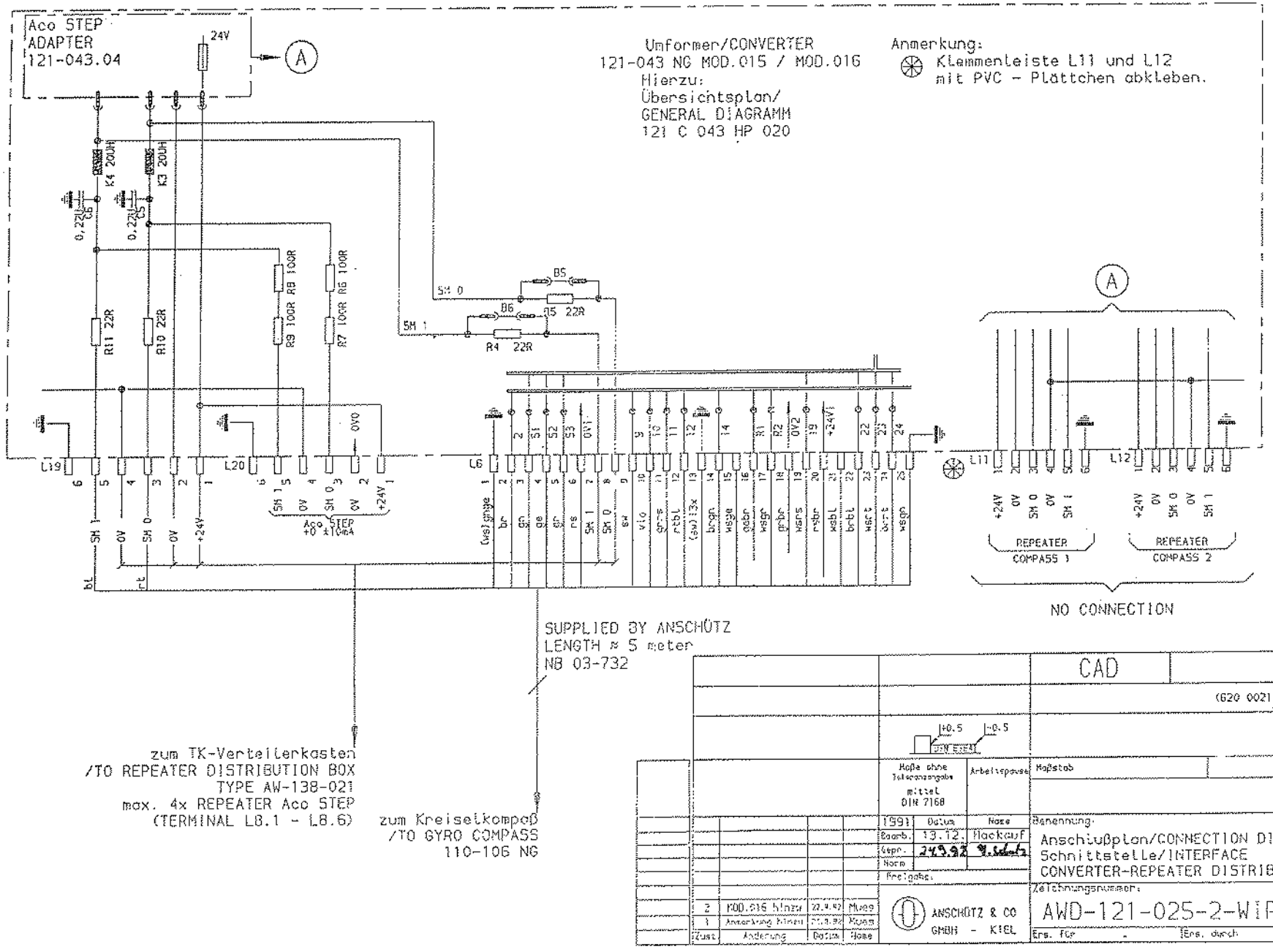
Benennung
Bauschaltplan / WIRING DIAGRAM
Umformer / INVERTER

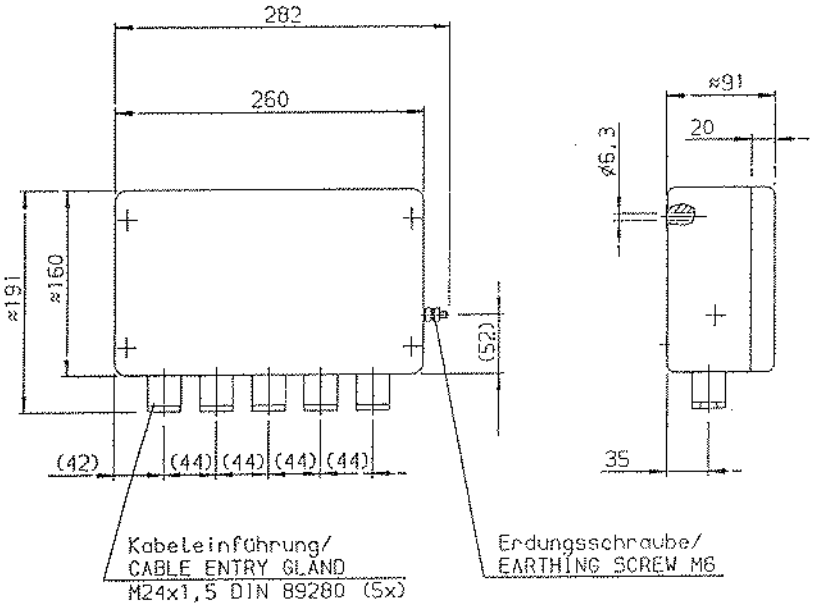
ANSCHÜTZ & CO. GMBH · KIEL

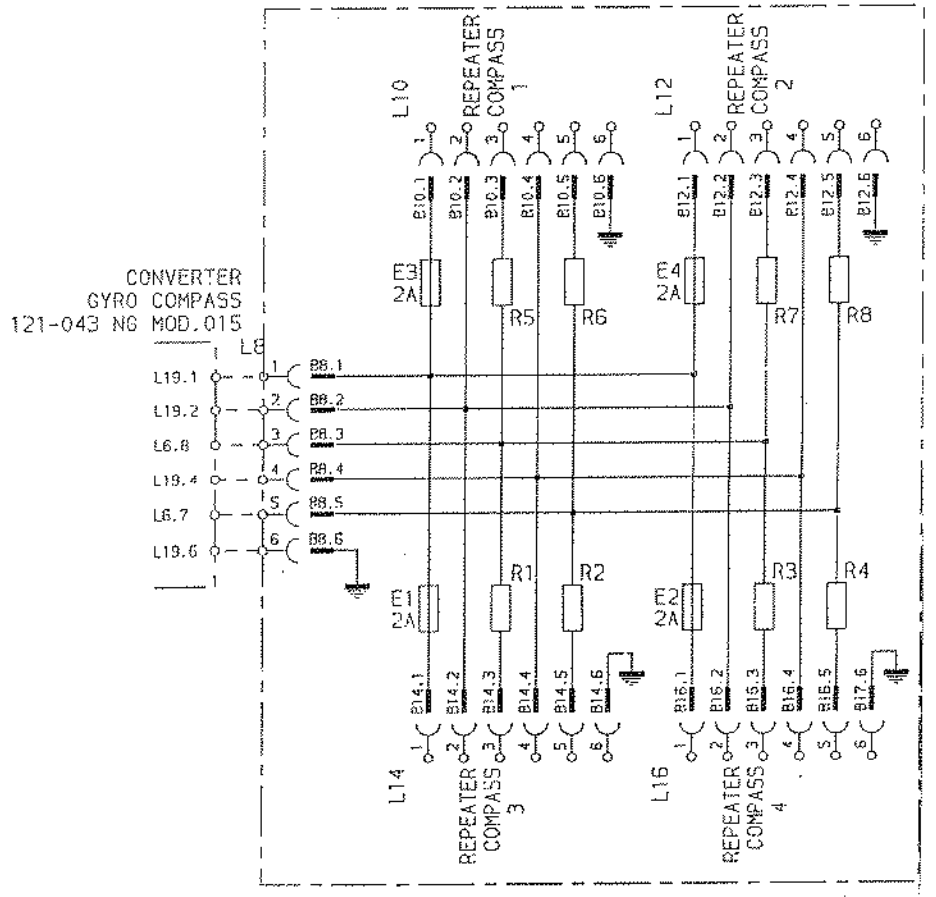
Zeichnungsnummer 121 D 043 HP 026 | Blatt 1 | 1 Bl.

Ers. f.:

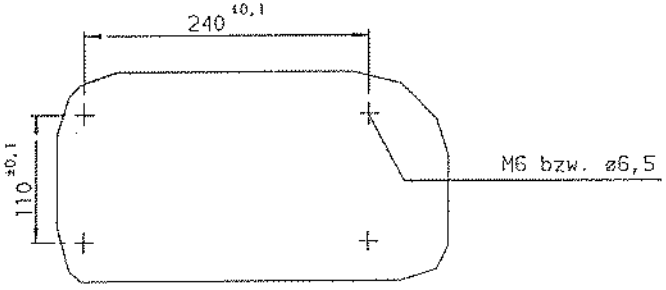
Zust.	Änderung	Datum	Name
A	1064, 121 D 043 Hp 026	15.10.92	NI


Aco STEP
ADAPTER
121-043.04
24V
A
Umformer/CONVERTER
121-043 NG MOD.015 / MOD.016
Hierzu:
Übersichtsplan/
GENERAL DIAGRAMM
121 C 043 HP 020
Anmerkung:
Klemmenleiste L11 und L12
mit PVC - Plättchen abkleben.
K4 20UH
K3 20UH
C6 0.22U
C5 0.22U
R11 22R
R10 22R
R9 100R
R8 100R
R7 100R
R6 100R
B5
B6
Q5 22R
R4 22R
SM 0
SM 1
L19
L20
L6
L11
L12
SM 1
0V
SM 0
0V
+24V
Aco STEP
+0 ±10mA
REPEATER
COMPASS 1
REPEATER
COMPASS 2
NO CONNECTION
SUPPLIED BY ANSCHÜTZ
LENGTH ≈ 5 meter
NB 03-732
zum TK-Verteilerkasten
/TO REPEATER DISTRIBUTION BOX
TYPE AW-138-021
max. 4x REPEATER Aco STEP
(TERMINAL L8.1 - L8.6)
zum Kreiselkompaß
/TO GYRO COMPASS
110-106 NG
CAD
(G20 002161)
Maße ohne Toleranzangabe
mittel
DIN 7168
Arbeitspause
Maßstab
1991
Datum
Name
Bearb.
13.12.
Hackauf
Gepr.
24.3.92
Norm
Freigabe:
Benennung:
Anschlußplan/CONNECTION DIAGRAMM
Schnittstelle/INTERFACE
CONVERTER-REPEATER DISTRIBUTION
Zeichnungsnummer:
AWD-121-025-2-WIR
Bl. 1
von 1
Ers. für
Ers. durch
ANSCHÜTZ & CO
GMBH - KIEL
2 K00.016 hinzu 22.4.92 Maes
1 Anmerkung hinzu 20.8.92 Maes
Zust. Änderung Datum Name



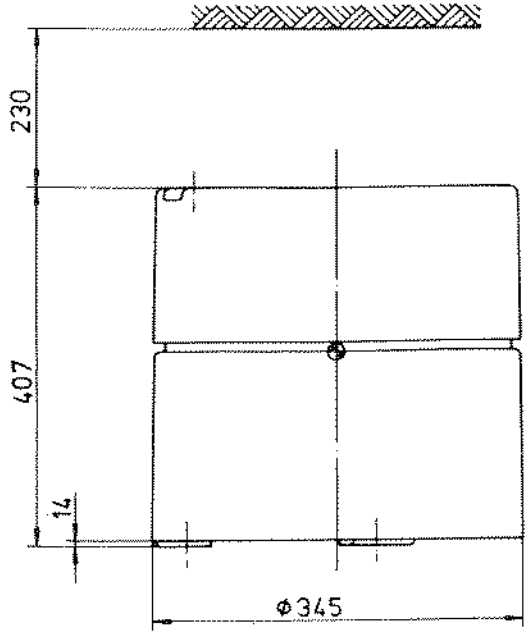


Bohrbild/DRILLING SCHEME

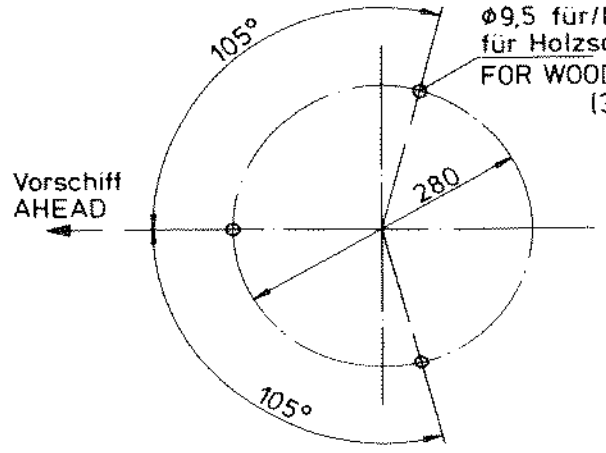


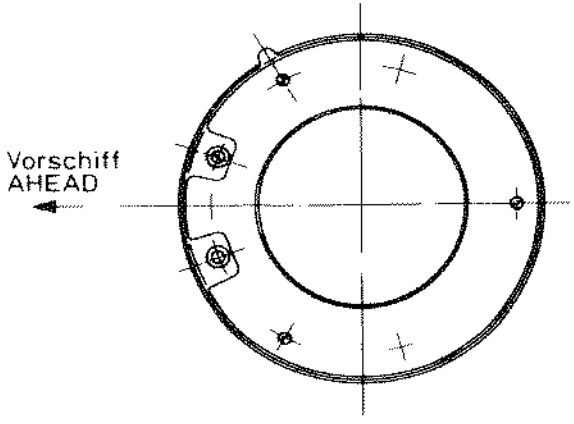
Schutzart/TYPE OF ENCLOSURE IP 44 DIN 40050

				CAD	(G20 002101)
				Gewicht/WEIGHT: ≈3 kg	
			Maße ohne Toleranzangabe mittel DIN 7168	Arbeitsposition	Maßstab
				Name	Datum
				Bearb.	11.11. Hankarf
				Gepr.	11.11. Kruse
				Norm	
				Freigabe	
1	Maße geänd.	24.8.92	Mussa	ANSCHÜTZ & CO GMBH - KIEL	Benennung: Maßzeichnung/DIMENSIONAL DRAWING Verteilerkasten/Tochterkompaß DISTRIBUTION BOX/REPEATER COMP
Zust.	Änderung	Datum	Name		Zeichnungsnummer: AWD-138-021-1-OUT
					Bl. 1 von 1
					Ers. für / Ers. durch



Bohrbild
DRILLING SCHEME





Schwerpunkt
CENTRE OF GRAVITY

Schutzart:
TYPE OF ENCLOSURE: IP 23

Anschluß des Gerätes über Kabel mit Steckverbinder.
CONNECTION OF THE DEVICE VIA CABLE WITH PLUG CONNECTOR

Kabelführung wahlweise innen oder außen (siehe Handbuch)
CABLE RUN SELECTIVE INSIDE OR OUTSIDE (ACCORDING TO MANUAL)

DISTANCE FROM MAGNETIC COMPASS				
STANDARD TYPE: 0,4 m	STEERING TYPE: 0,3 m			
	Maße ohne Toleranzangabe gelten DIN 7168	Arbeitspause	Maßstab —	Gewicht WEIGHT 12 kg
		Datum	Name	Benennung
	Bearb.	3.4.89		Maßzeichnung / DIMENSIONAL DRAWING
	Gepr.			für
	Norm	15.11.89		Kreiselkompaß / GYRO COMPASS
		21.9.82		
Zust. Änderung Datum Name	ANSCHÜTZ & CO. GMBH · KIEL			Zeichnungsnummer 110 D 106 HP 005
				Ers. f.

Blatt 1 von 1

Verdrahtungskarte
WIRING PCB
121 - 043 05

SIGNALUNIT
ADD-STEP BIS +10MA
REPEATER COMPASS 3
REPEATER COMPASS 2
REPEATER COMPASS 1
SPERRY(1)
SPERRY(2)
SPERRY(3)
COURSE CONVERTER
ROT 1
ROT 2
AUTOPILOT

JUMPER L4.7-L4.9 FOR DC FEEDING I ON

POWER ON

UMFORMER INVERTER 121-043.02

STEP ADAPTER 121-043.04

KOMPASSELEKTRONIK
COMPASS-ELECTRONICS
121-043.06

GYRO COMPASS STD 14

DC I FEEDING

* ONLY FOR NG 007
** ONLY FOR NG 008

					DATUM	NAME
				BEARB	23.5.88	Niklas
				GEPR	23.5.88	Wiese
B	1050 121	19.11.91	NI	NORM	8.6.88	
A	1035 121	26.1.90	NI			
ZUST	AENDERUNG	DATUM	NAME			

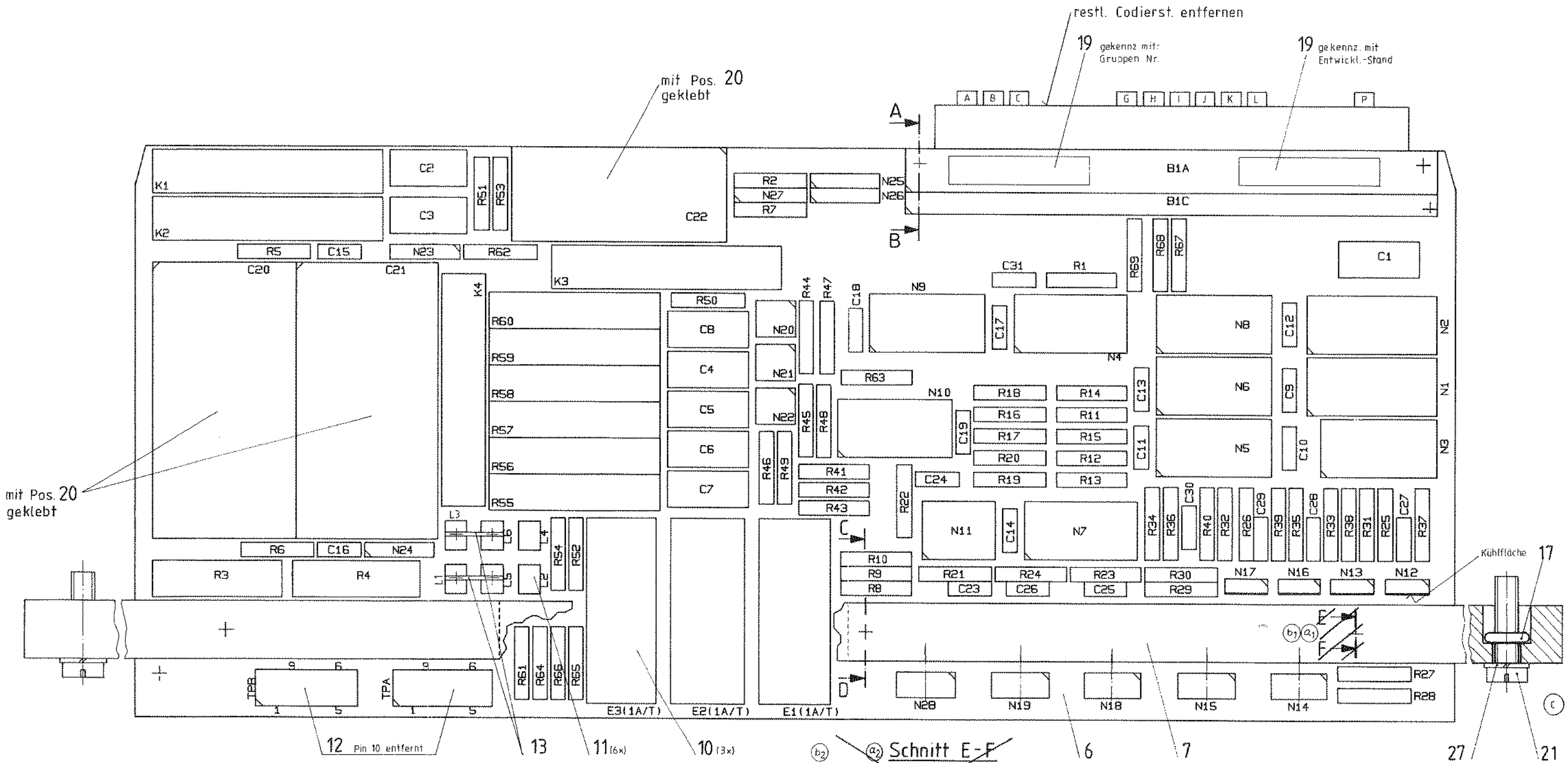
ANSCHUTZ & CO
ANSCHUTZ GMBH KIEL

BENENNUNG
UEBERSICHTSPLAN/GENERAL DIAGRAM
UMFORMER STD 14/INVERTER STD 14

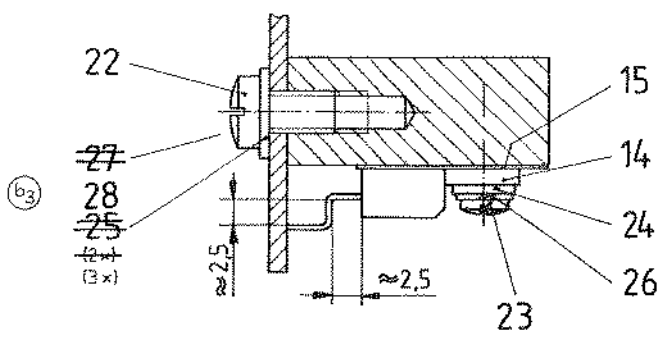
ZEICHNUNGSNUMMER
121 C 043 HP 020

BL 1
V 1

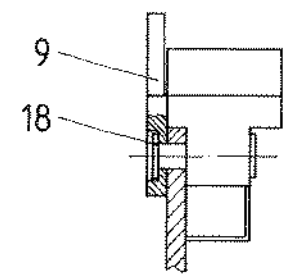
ERS. FUER:
ERS. DURCH:



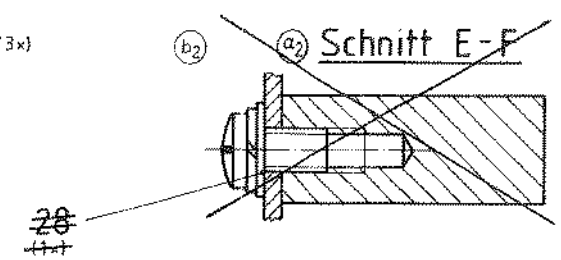
Schnitt C-D



Schnitt A-B



Schnitt E-F



LOETSEITE
LACKIERT NACH AN 0907

ACHTUNG:
BEI C-MOS-BAUTEILEN
BEHANDLUNGSVORSCHRIFT BEACHTEN

KENNZEICHNUNG AUF BESTUECKUNGSPLAN

DIODE (KATHODE)
ELKO (+), GLEICHRICHTER (+)
TRANSISTOR (EMITTER)
FET-TRANSISTOR (GATE)
ICS, NETZWERKE, RELAIS (PIN1)
MESSER- U. BUCHSENLEISTE (PIN1)

C20, C21, C22 nach dem Waschen eingesetzt
R3, R4 gesickt nach WN 161
B1 lackfrei

					DATUM	NAME
				BEARB	26.5.1988	Hilsler
c	1062.121	16.04.92	Th	GEPR	1.9.88	Wiese
b(3x)	1016.121	23.2.89	Ni	NORM	6.9.88	Lemm
a(2x)	1014.121	2.2.89	Ni		24.04.91	
ZUST	AENDERUNG	DATUM	NAME			

ANSCHÜTZ & CO GMBH KIEL

BENENNUNG: STEP - ADAPTER

M 2:1

ZEICHNUNGSNUMMER: 121 C 043.04 E01

BL. 1 / 1

ERS. FUER:

ERS. DURCH:

mit Pos. 23 geklebt

11 (4x)

R1

B4

B4.1 2 3 4 5 6 7 8

INVERTER

8

A → B2

B2C

B2A

2

F G H L M N

plan aufliegend

Ansicht A M: 1:1

10 mit Pos. ~~21~~ geklebt (a2)

A → B1

2

B1C

B1A

D E F M N O

24 (4x) (a1)

mit Pos. 23 geklebt

22

15

14 (4x)

12 (5x)

K1 K2

C2 C1

N1 N2

C3 C4

R2 R3

D1

C9 N3 C10

R11 R10 R8 R6 R9 R7

C5 C7 K6 C6 C8 C11

K3 K4 K5

R5 R4

B6 B5

GR/GE 1
BR/GN 14
BR 2
WS/GE 15
GN 3
GE/BR 16
GE 4
WS/GN 17
GR 5
GR/BR 18
RS 6
WS/RS 19
BL 7
RS/BR 20
RT 8
WS/BL 21
SW 9
BR/BL 22
VIO 10
WS/RT 23
GR/RS 11
BR/RT 24
RT/BL 12
WS/GN 25
13

L6 GYRO COMPASS

L1 FEEDING

L2 INTERNAL WIRING

L3 SIGNAL UNIT

L11 REPEATER(1)

L12 REPEATER(2)

L14 SPERRY(1)

L15 SPERRY(2)

L16 SPERRY(3)

L4 COURSE CONVERTER

L17 ROT(1)

L18 ROT(2)

L19 REPEATER(3)

L5 AUTOPILOT

L20 ACO-STEP

12 (8x)

12 (6x)

13 (6x)

12 (6x)

20 beschriftet mit: Gruppen Nr

20 beschriftet mit: Entw.-Stand

LOETSEITE
LACKIERT NACH AN 0907

ACHTUNG:
BEI C-MOS-BAUTEILEN
BEHANDLUNGSVORSCHRIFT BEACHTEN

KENNZEICHNUNG AUF BESTUECKUNGSPLAN

DIODE (KATHODE)
ELKO (+), GLEICHRICHTER (+)
TRANSISTOR (EMITTER)
FET-TRANSISTOR (GATE)
ICS, NETZWERKE, RELAIS (PIN1)
MESSER- U. BUCHSENLEISTE (PIN1)

					DATUM	NAME
				BEARB	19.5.1988	Niklas
				GEPR	25.5.88	Wurr
				NORM	8.6.88	Hundsmann
a(2x)	1063.121	3.7.92	Ke	freigegeben	1.6.88	Ke

ZUST	AENDERUNG	DATUM	NAME

ANSCHÜTZ & CO GMBH KIEL

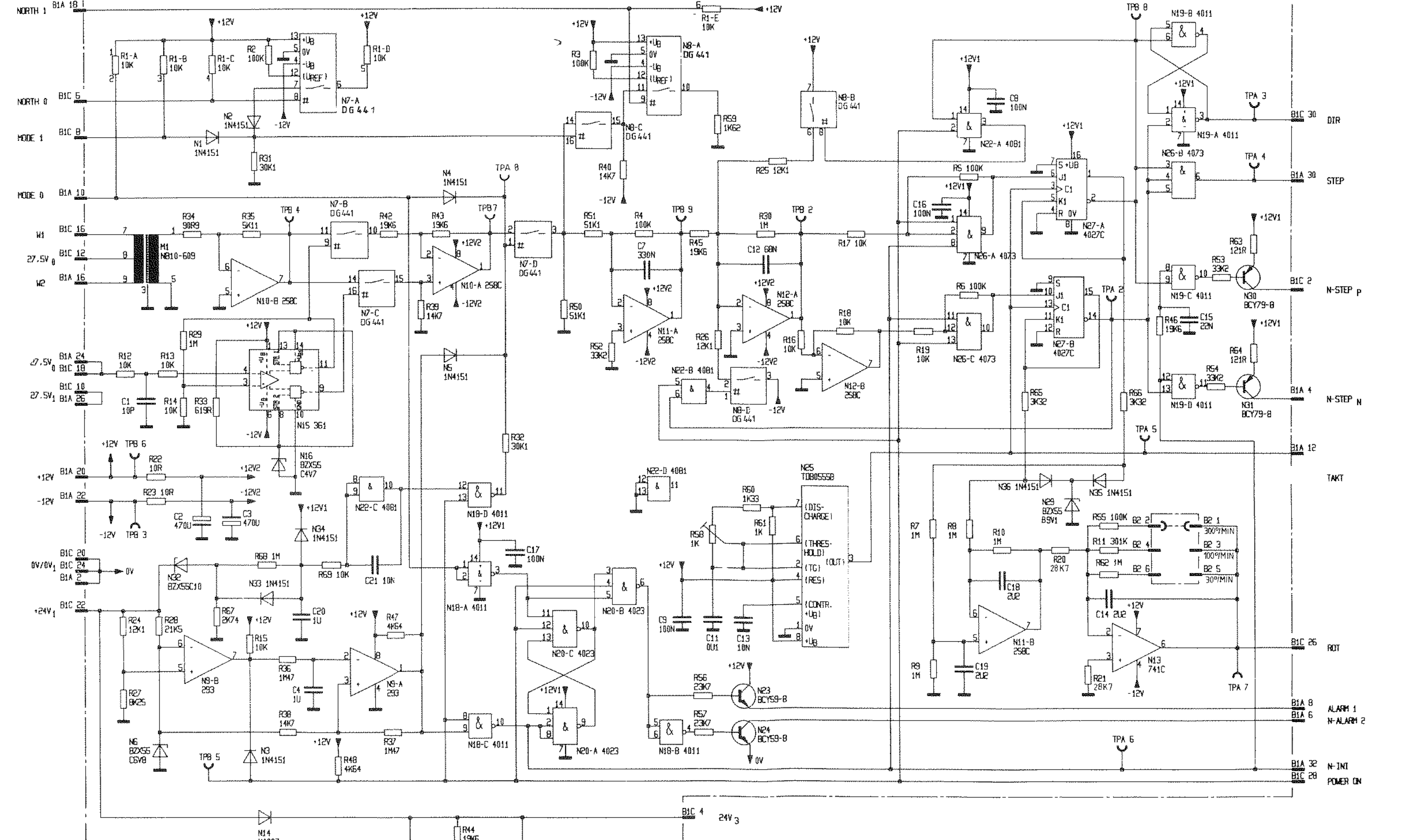
BENENNUNG: VERDRAHTUNGSKARTE

M 1.5:1

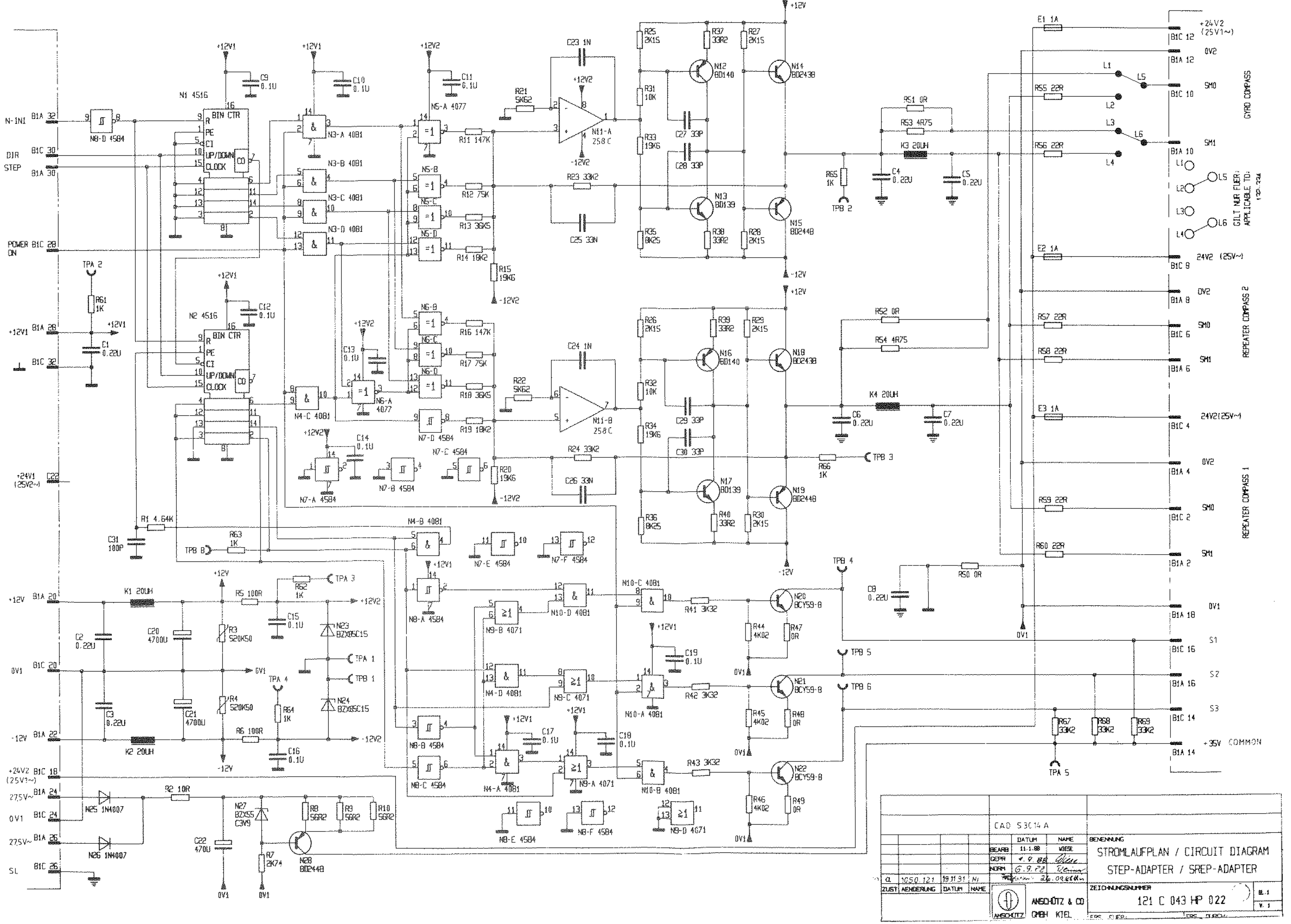
ZEICHNUNGSNUMMER: 121 C 043.05 E02

BL. 1 / 1

ERS. FUER: | ERS. DURCH:



					DATUM	NAME	BENENNUNG
				BEARB	15.12.87		STROMLAUFPLAN/CIRCUIT DIAGRAM
c	1057.121	7.4.91	Ste	GEPR	6.9.88		KOMPASSELEKTRONIK/
b	1022.121	9.5.89	Mi	NORM	6.9.88		COMPASS ELECTRONICS
a	909.121	12.4.89	Mi		26.04.88		ZEICHNUNGSNUMMER
ZUST	AENDERUNG	DATUM	NAME		ANSCHÜTZ & CO		121 C 043 HP 019 — BL. 1 — V. 1


GYRO COMPASS
REPEATER COMPASS 2
REPEATER COMPASS 1
GILT NUR FUER:
APPLICABLE TO:
+35V COMMON
CAD S3014 A
DATUM
NAME
BEARB
11.1.88
WIESE
GEPR
NORM
ZUST
AENDERUNG
DATUM
NAME
a
1050 121
19.11.91
BENENNUNG
STROMLAUFPLAN / CIRCUIT DIAGRAM
STEP-ADAPTER / SREP-ADAPTER
ZEICHNUNGSNUMMER
121 C 043 HP 022
ANSCHÜTZ & CO
GMBH KIEL

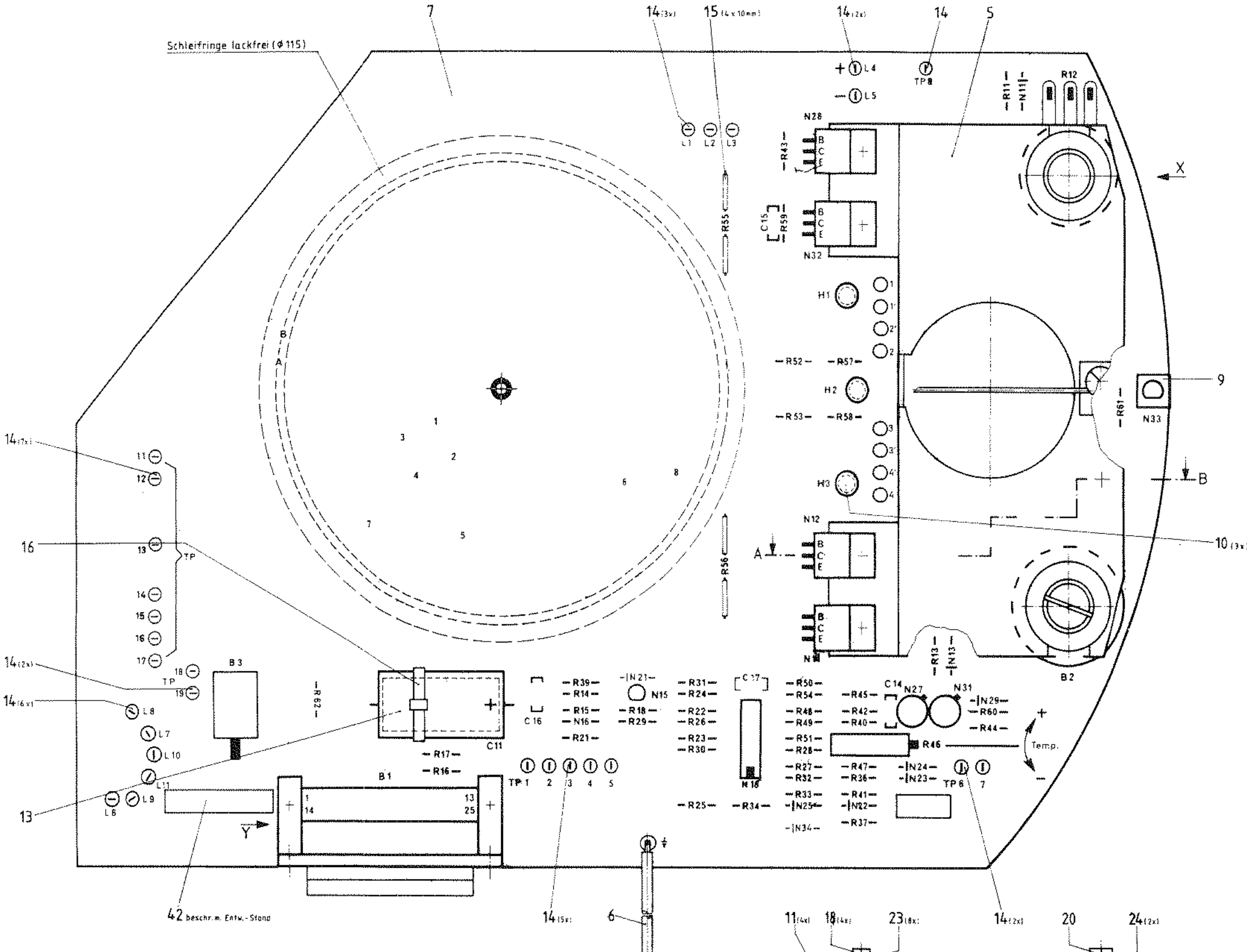
Kommt von
121 - 043 02

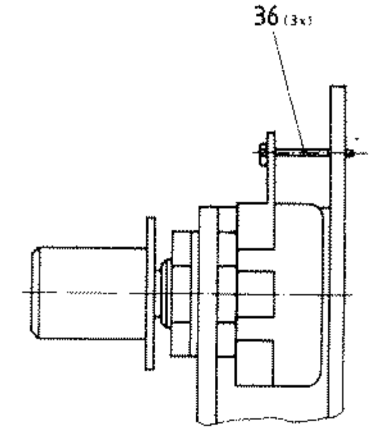
Schaltregler-Modul
SWITCHING REGULATOR MODULE

B4.1 +24 V
0 V
Sync
SRA
Dr 1
Dr 2
D1 SSI 1105
D2 SSI 1105
C1 2200µF 40 V
C21 0,33µF
C3 0,33 µF
C22 47µF
C23 0,1 µF
R1 1,5kΩ
C2 2,2µF
R2 0,1 Ω
R3 22 Ω
C5 33nF
R4 470Ω
R5 2,2 kΩ
R6 150 Ω
R7 27Ω
R8 1Ω
C4 22nF
R9 22 Ω
R10 1kΩ
C7 0,1 µF
D4 18 V
D3 BYW 80
R12 15 Ω
T1 BD 140
T2 BD 140
T3 BDY 56
T4 BD 139
T5 BC 238 C
T6 BC 307
R13 3,3 kΩ
C8 0,33µF
R14 1kΩ
C9 0,22µF
R15 100kΩ
R16 100 kΩ
C6 2,2µF
R17 10 Ω
D IN
D OUT
C8 2200µF 16 V
R 135 22 Ω
T113 BC 237
C105 2,2 µF
JC 1 393
R124 1kΩ
C121 0,1 µF
C122 1 µF
R126 100Ω
D125
T103 BC 238 C
T110 BC 238 C
R136 680 Ω
R137 680 Ω
C133 0,1µF
R154 10 Ω
T1 Prim 1
Prim. 2
R156 10 Ω
C134 0,1µF
R149 680 Ω
R150 680 Ω
T111 BC 237 A
T112 BC 237 A
R155 10 Ω
R157 10 Ω
T104 2N 3055 RCA
T105 2N 3055 RCA
T108 2N 3055 RCA
T109 2N 3055 RCA
R151 680 Ω
R143 47Ω
R145 47Ω
R152 680Ω
R142 2,7 kΩ
R146 2,7kΩ
T106 BC 238 C
T107 BC 238 C
R140 430 Ω
R 141 2,2 kΩ
R144 0,1 Ω
R147 2,2 kΩ
R148 430 Ω
C101 0,1 µF
R101 9,1 kΩ
R102 68 kΩ
C103 1nF
R103 5,6 kΩ
D107
T101 BD 139
R111 2,2 kΩ
C102 100µF 40 V
R114 100 kΩ
R118 4,7 kΩ
R117 100 kΩ
D101 12 V
C104 2,2nF
JC1 393
T102 BC 237A
R112 10 kΩ
R113 22 kΩ
D102
R115 100 kΩ
R116 100 kΩ
JC 2 C 4024
R121 6,8 kΩ
JC 3 C 4013
JC 3
D105 BZX 83 C10
C135 47nF
R135 27 kΩ
C131 0,22µF
JC 4 LM 358
R123 10 kΩ
R131 5,6 kΩ
C132 1µF
D102 4,2 V
R132 22 kΩ
R133 5 kΩ
R134 4,7 kΩ
C149 1µF
D103
D104
Sek. 1
Sek. 2
55 V eff (65 V SS)
G1 B40 C 3300 5000
C141 4700 µF 16 V
C142 4700 µF 16 V
B4.7
+12 V
- 12 V
0 V

alle nicht benannten Dioden
ALL NON - DESIGNATED DIODES
1N 4448

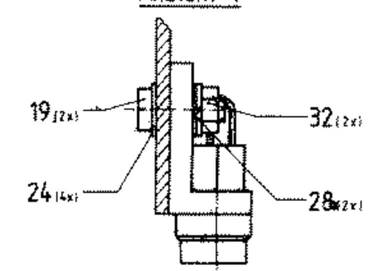
Maße ohne Arbeitspause Toleranzenangabe mittel DIN 7168		Maßstab
1983 Datum Name		Benennung
Bearb 8 8		Stromlaufplan / CIRCUIT DIAGRAM
Gepr		Umformer / INVERTER
Norm 3 4 84		
		Zeichnungsnummer 121 C 043 HP 012
Zust Änderung Datum Name	ANSCHÜTZ & CO GMBH · KIEL	Blatt 1 1 Bl.
		Ers. f.

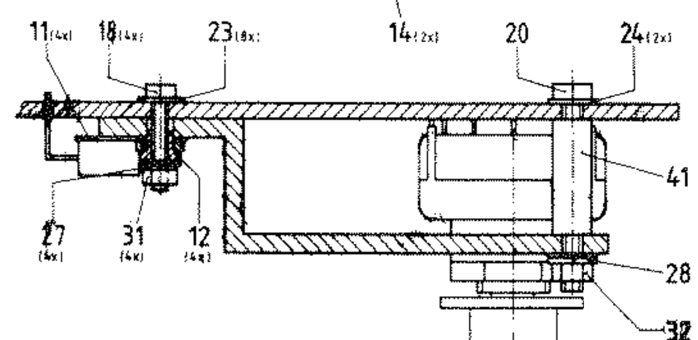




Ansicht X

Ansicht Y





Schnitt A-B

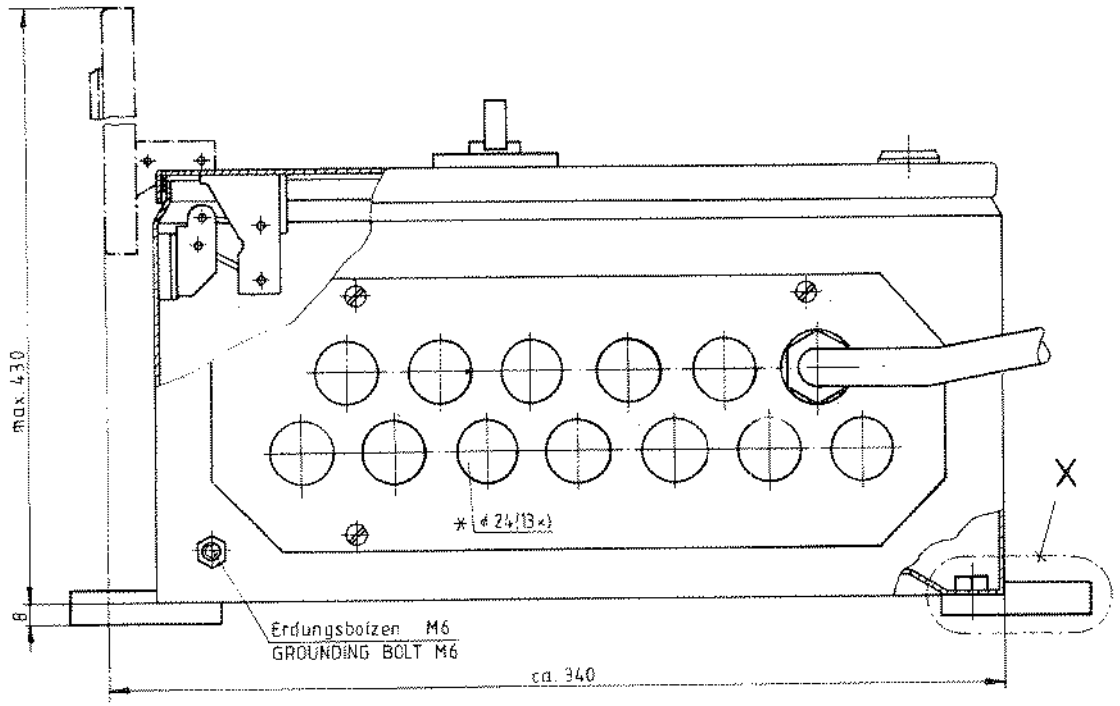
Lötseife lackiert nach AN 0907

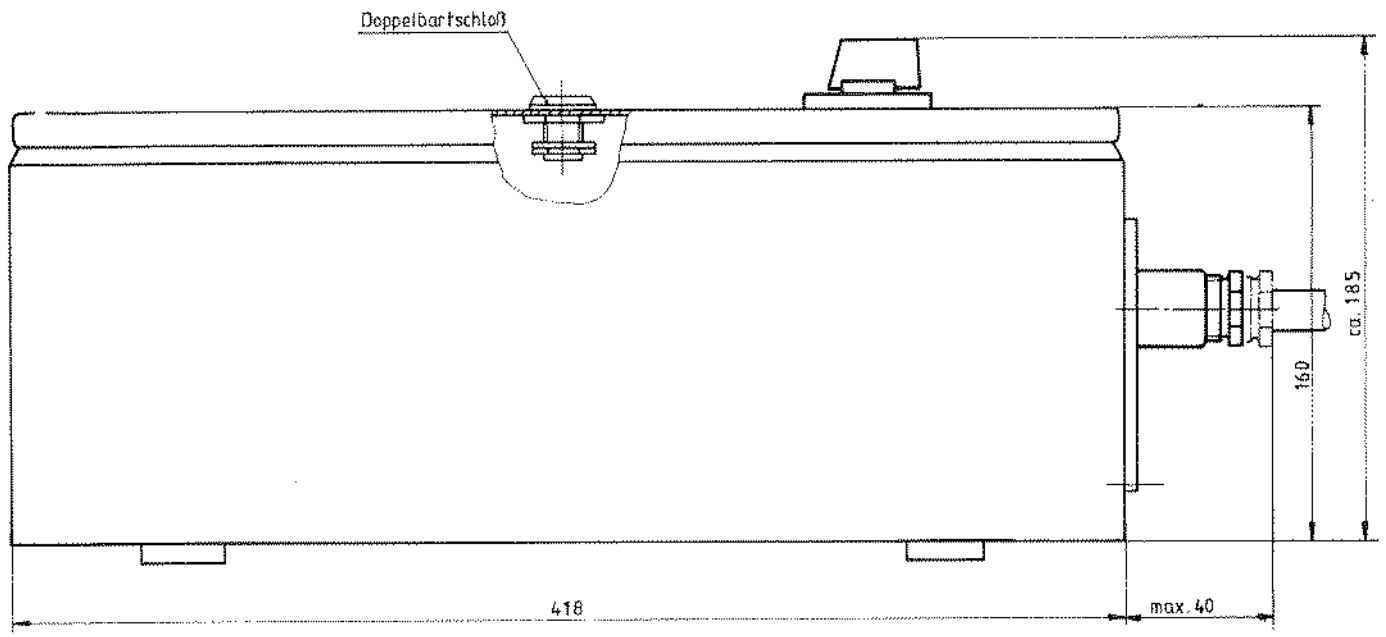
gesickt nach WN 161: C14, C15, N15, N27, N31, C16

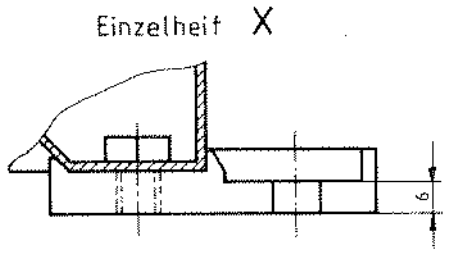
nach dem Waschen eingesetzt: B3, C11, Pos.5 (N12, N14, N28, N32), H1, H2, H3

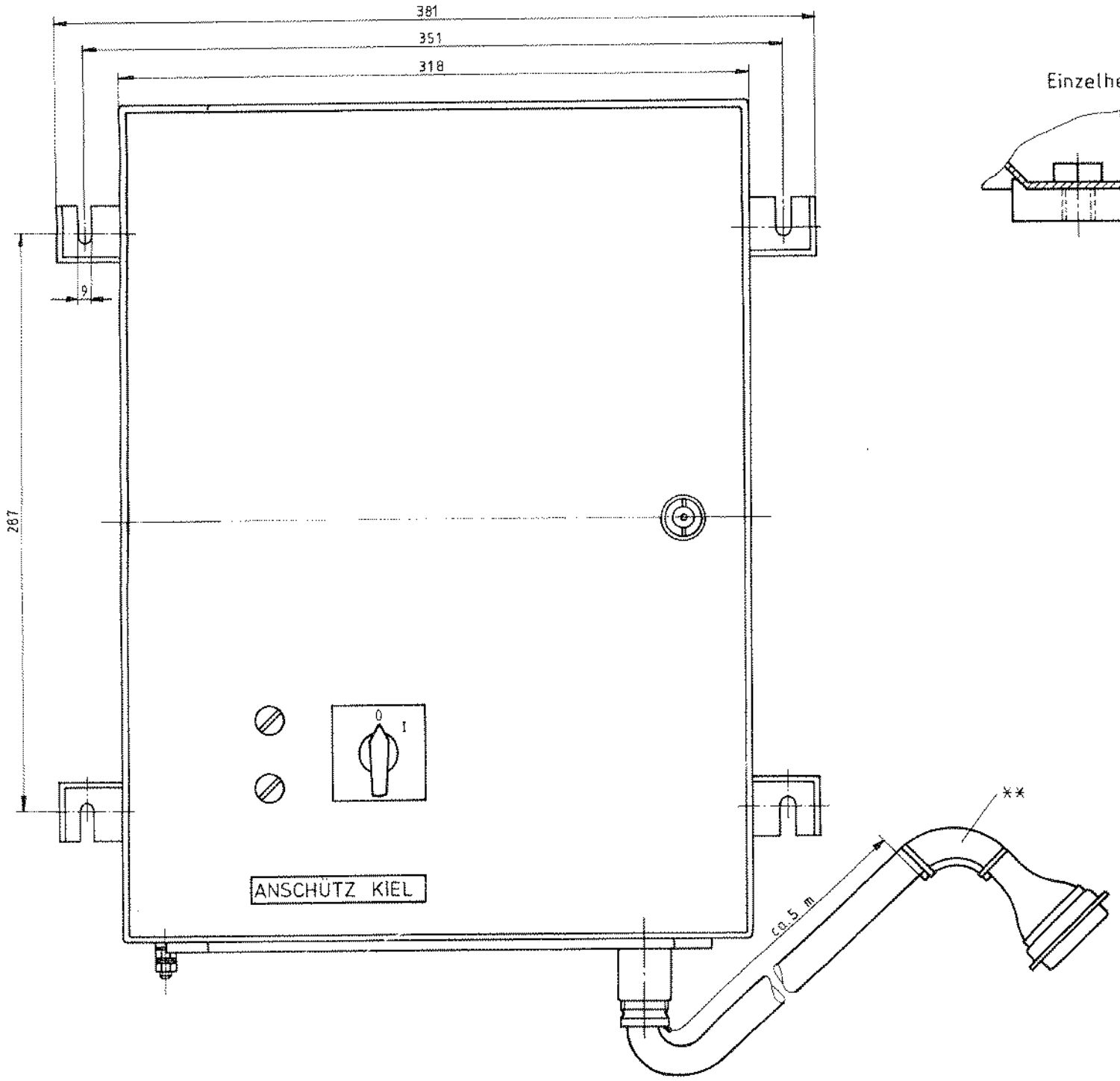
Maße ohne Toleranzangabe mittel DIN 7168	Maßstab
Benennung	Elektronik
ANSCHÜTZ & CO GMBH · KIEL	Zeichnungsnummer 110 B 106.03 E01

FOLLOW-UP MOTOR
55V/400Hz
0V
SM1
SM0
27,5V-0
27,5V-1
B1.6
R62 1Ω
TP14
TP19
TP18
TP15
B4
B5.4
U1
110-106.03 E 01
R55 0Ω L2
R56 0Ω L3
M3 110-106.09
R52 16,2Ω
R57 16,2Ω
R53 16,2Ω
R58 16,2Ω
TP10
C1 0,68µF
110-106.61
M1
R1 511Ω
R2 511Ω
R3 500Ω
N1 LM235AH
U4 111-006
(WEST) W2
W1 (EAST)
B5.1
B4
TP17
R16 332Ω
TP16
R17 332Ω
U3
110-106.06
R4 110 E 106.06-16
TP12
B5.5
B4
C16 0,22µF
TP13
0V
R22 100kΩ
R23 100kΩ
N18 4741-2
R26 1MΩ
R31 1MΩ
N21 1N4151
R39 511Ω
TP11
+18V
R14 4,42kΩ
TP4
TP5
R15 3,65kΩ
R18 7,15kΩ
N15 LM329DZ
R24 261Ω
R29 17,8kΩ
R40 40,2Ω
R46 1kΩ TEMP.
R47 5,9kΩ
R36 100Ω
R37 6,25kΩ
R42 147kΩ
R43 619Ω
N28 BC 548
R45 5,11kΩ
C14 22nF
R44 5,11kΩ
N27 BCY 59 VIII
R32 1MΩ
R41 1MΩ
R33 100kΩ
N22 1N4151
N23 1N4151
N24
N34 BZX55 C22
N29 BZX 55C3V3
R27 100kΩ
R28 100kΩ
N25 1N4151
TP6
N18
+24V
R11 1,33kΩ
R63 1kΩ
N12 BD 647
N11 BZX 55 C27
R12 50kΩ NB07E01-106
0V
H1
H2
H3
NB 12 E 48-26 (3x)
+24V
+18V
R13 3,01kΩ
N14 BD647
N13 BZX 55 C 18
N18
R34 3,01MΩ
R25 133kΩ
R30 82,5kΩ
N16 0Ω
R21 0Ω
0V
TP8
R48 100kΩ
R49 100kΩ
R50 5,62kΩ
N18
C17 0,1µF
R51 1MΩ
R54 1MΩ
+18V
+24V
R59 1kΩ
N32 BD 648
N31 BCY59 VIII
C15 22nF
R60 3,01kΩ
110-106.11
nur für/ONLY FOR NG002, ~~NG003~~
M4
R2 S3 S1 S2 R1
L6 L7 L8 L9 L10 L11
110-106.85
nur für/ONLY FOR NG003
COURSE
L4
L5
TP7
M5
110-106.70
NB07 E 03-189
B1.22 W1
.24 27,5V-0
.23 W2
FOLLOW-UP AMPLIFIER
B2
NB 14 E 231-59
ON
OFF
TEST
MODE 0
MODE 1
NORTH 1
NORTH 0
B3
NB 14 E 230-7
.11
ALARM 1
R61 1kΩ
N33 LS5420P
TP2
TP1
TP3
+24V
0V
TP +18V
C11 220µF
+24V
0V
+18V
Hierzu gehört Bauschaltplan
TO THIS BELONGS WIRING DIAGRAM
110 D 106 HP031
Kommt vor in:
NG 001
NG 002
NG 003
110-106.61
110-106.03 CHEV
110-106.06
Maße ohne Toleranzangabe nach DIN 7168
Maßstab
1991 Datum Name
Bearb 16.9.
Gepr
Norm
Freigegeben 21.3.92 Be.
Benennung
Stromlaufplan / CIRCUIT DIAGRAM
Kreiselkompaß / GYRO COMPASS
Std.14
Zeichnungsnummer
110 C 106 HP 030
Blatt 1 / 1 Bl
a 5862.110 14.492 Ke
n 5842.110, n.Bz. 16.9.91 Ke
ANSCHÜTZ & CO. GMBH · KIEL
Zust. Änderung Datum Name
Ers. f.









Schutzart
TYPE OF ENCLOSURE IP 23

max. Umgebungstemperatur in Betrieb + 55° C
MAX. AMBIENT TEMPERATURE IN OPERATION - 10° C

* verschließbar mit Blindstopfen
CLOSED WITH GLAND SEAL

** nur für
ONLY FOR NG 001

Maße ohne Arbeitspause / Toleranzangabe nach DIN 7168

Maßstab —— Gewicht /WEIGHT : 15 kg

	Datum	Name
1982 Bearb	29.7.	Bollschweiler
Gepr		
Norm	1.8.82	

Benennung
Maßzeichnung /DIMENSIONAL DRAWING
Umformer / INVERTER

Änderung	Datum	Name
c 1073.121	3.11.91	Schl
b 1026.121	19.9.89	Wi
a 805.121	26.1.84	Bz

ANSCHÜTZ & CO GMBH KIEL

Zeichnungsnummer 121 °C 043 · HP 005 Blatt 1 1 Bl

Ers. f.