

isotherm



- 3000/3500

INSTALLATION AND SERVICE INSTRUCTIONS

ISOTHERM 3000/3500 is a modern cooling system for yachts, motorboats and mobile homes, using a freezer unit for storing the cold together with an electronic system which automatically starts the refrigeration compressor as soon as the engine is running, a large cooling capacity is achieved while at the same time consuming the lowest possible electrical power. The installation is very simple as nothing needs to be connected to the engine nor to the cooling water system

To achieve maximum efficiency and trouble-free operation, the following points are of vital importance.

A well-insulated cold box is the most important factor for refrigeration efficiency. A top-opening box is better than a side-opening fridge. Expanded or cross-linked PVC or polyurethane material should be used as insulation.

Recommended insulation thickness:

Boxes up to 35 litres volume:	30 mm
Boxes 35-75 litres volume:	50 mm
Boxes over 75 litres volume:	75 - 100 mm

The box should be fitted with a partition, preferably adjustable, to create a separate space close to the freezer unit for freezing. This should not be larger than needed. A tight fitting lid and partition together with good insulation minimizes thermal leakage and keeps the cold in the freezer unit longer stored.

It is also important that the electrical system is in good condition, especially when refrigeration is required for several days without the engine running. Try to estimate the total need on board for battery capacity. The engine should always have a separate starting battery. A marine battery of 70 Amp. hours should be suitable for the cooling unit plus additional for other electrical consumption on board.

How the cooling unit is used is also important. Do not put in or take out articles more than necessary and do not have them standing out of the fridge too long after cooking or having your meal. Thermally it is very uneconomical to stow

warm food. A good idea is to use an insulated bag to carry frozen food from home or the shops. This will save battery power. Also, let the engine run a few minutes extra when entering or leaving harbour, as running engine always gives an extra supply of "free" cold.

~MAIN COMPONENTS

~COMPRESSOR UNIT ~ picture A

The Danfoss compressor is specially made for use in boats and vehicles. It will not cause any radio interference,,has a very low noise level and can operate continuously at a 30 heel. The compressor is equipped with two threaded quick-couplings. An electronic control unit is connected to the compressor unit by a short cable. The control unit is equipped with screw connection for plus and minus current, a 2,5 m cable for connecting to the control panel and a 10 amp fuse. The electronic control unit regulates the start and operation programmes and also registers that operating conditions for the compressor are correct. The electronic control unit also contains a start and overload protection device which cuts off the current if the compressor starts to run to slow. The compressor can not be restarted immediately after being stopped as a certain time is required for pressure compensation. If the compressor is first stopped and switched to start again, the compressor will try to start in every 20 sek. It will normally take 3-5 minutes before the compressor starts again and yellow or red lamp is lit.

The electronic control unit is also equipped with a battery drain protection device which cuts off the power supply to the compressor if voltage drops to **10,s** V(21V). However, the unit will automatically make a new startcycle when the voltage has risen over **11,s (22,6)** volt. ISOTHERM can also be operated by shore power if availabel. A transformer or battery charger must then be connected to the batteries. Do not connect this directly to the electronic control unit as this could cause serious damage.

~FREEZER UNIT ~ picture B

The freezer unit is of stainless steel and completely hermetic. It is equipped with a 3 m tinned copper pipe fitted with screw couplings. The unit is pre-filled with Freon R12 gas (which is odourless and non-inflamable) and an alcohol solution with freezes solid in the freezer unit. A temperature sensor is fitted to the back of the unit which is connected by cable to the control panel.

~CONTROL PANEL ~ picture C

The control panel is equipped with a three-way switch and three indicator lights. Two plug connections are fitted inside the control box; one for the cable from the temperature sensor and the other from the electronic control unit connected to the compressor.

~OPERATING

The ISOTHERM refrigeration system is controlled completely from the three-way switch on the control panel. There is no thermostat to adjust as the low and high temperature limits are adjusted during assembly to suit each freezer unit's individual temperature characteristics.

To start, set the switch to position "Normal-Auto". The green light comes on and the cooling system goes automatically into its correct programme:

If the engine is running and the voltage in the electrical system is greater than 13.0 ± 0.2 V, (26.0 ± 0.3 V) both the compressor and cooling fan come into operation until the temperature in the freezer unit drops to -15°C (5°F). The compressor and fan then stop until temperature rises to -8°C (18°F) at which point the cooling cycle starts again. The red "Freeze" lamp lights when the compressor and fan are in this mode.

If the engine is not running and the voltage in the electrical system is lower than 12.0 ± 0.2 V, (25.4 ± 0.3 V), the compressor only starts to lower the temperature of the freezer unit to -6°C (21°F). The compressor then stags and restarts only when the temperature rises to -1°C (30°F). The cooling fan does not operate in this mode. The yellow "Economy" lamp is lit when the compressor is in this mode. When switched to "Freeze", the economy programme is discontinued and the system operates at full effect just as if the engine was running.

Note: There can be a delay of as much as 5 minutes before the compressor starts and the indicator lamps "Economy" or "Freeze" light.

MAINTENANCE

ISOTHERM is a completely hermetic system with soldered joints between pipes and connections. No special maintenance is required. The high-effect, long-life compressor is the same type as those used in high quality household refrigeration units. The complete system can remain in the boat during winter but must not be started if the surrounding temperature is below freezing.

Maintenance of the compressor is limited to checking at least once each season that the condenser radiator and fan are clean. The freezer will need de-frosting occasionally and possible condensation removed from the box. If the refrigerator is used for long periods when the engine is not running, it is important that the batteries are in good condition. Marine-type batteries containing alloys with a low level of antimony are preferable. Compared to standard starter batteries, low antimony type batteries can be discharged down to 90% of their capacity with no deterioration of their charging level. These batteries are somewhat more expensive than normal car batteries but are a good investment.

~TECHNICAL DATA

- ~CAPACITY** ~Suitable for well-insulated cold boxes of top or side-opening type up to **100-125** ltr in volume for 3000 and **150-175** ltr in volume for 3500. Refrigeration effect is appr. **125** watt.
- ~VOLTAGE** ~12 volt **10, 5-15, s** volt or ~24 volt **21, 0-31. 0** volt
- OPERATING CONSUMPTION** 5-6 AMP inc. 0,5 AMP for fan ~2,5-3 AMP)
- ~START CONSUMPTION** ~10 AMP (for a few seconds)
- ~WEIGHT** ~15 kg (35 lbs.) : Isotherm 3500 **17** kg (39 lbs.)
- FUSE** 15 A

Datas in brackets is for the 24-volt version

INSTALLATION INSTRUCTIONS

First decide where the various units are best installed. Choose a suitable space for the compressor that can be reached by the 3 m (10 ft.) copper pipes. This should be positioned so that no sharp bends are required. The space for the compressor unit should preferably cool and large. If this can not be done, the space must be well-ventilated. The space chosen should also be easily reached with electric cable of sufficient area. (see page 7) The electronic control unit must be positioned within 0,6 m (1,6 ft) of the compressor.

The control panel must be placed so it can be reached by two cables: one from the freezer unit and one from the electronic control unit.

The compressor unit and the electronic control unit are designed to withstand a marine environment but should obviously be placed in as dry and protected surroundings as possible.

The freezer unit's position in the cold box should be chosen after considering the route for the copper piping, the partition wall, etc.

Only normal hand tools are required for installation. If possible drill the holes for the copper pipe couplings with a 30 mm ϕ saw drill. A power cable of suitable diameter and length, screws, etc are the only additional components required.

-Freezer unit

If the box to be used is already installed, inspect it to establish the quality of its insulation as this is an important factor concerning thermal efficiency. The best insulation materials are Polyurethane, Divynycell, Bonycell or any other cross-linked expanded polyurethane plastic foam. The thickness of this insulation material should be 30 mm for small fridges, 50 mm for medium ones and 100 mm for larger boxes of 100 - 150 lt. Insulating materials of type Frigolit, Rockwool, etc. are not as effective and the above thicknesses should be doubled.

The freezer unit can be placed in any position. The copper pipe is annealed and can easily be bent over the edge of the freezer so that the exit hole can be positioned behind. The four freezer supports give sufficient space for this to be done. Handle the copper pipe with care and bend carefully to avoid creasing it. Use a cylindrical object if sharp bends are required. Be particularly careful with the thin capillary and its coupling at the other end of the copper pipe. The pipes are filled with Freon, a gas which is completely safe in all respects, and these must not be cut or disconnected after assembly. Start by unrolling the pipe to its full extent. Installation of the freezer unit is easier if someone can assist: One holds the freezer and directs the pipe through the side of the box while the other feeds the pipe and its two connections through bulkheads, etc.

The freezer unit should be placed high up in the box, approx. 10 cm below the top so that the cold air can "fall" into the box. Holes for the pipe and couplings should be drilled to 28 - 30 mm ϕ . The hole in the box should be as high up as possible to minimize leakage of cold air. Fill the hole afterwards with insulating material. Any excess pipe should be coiled and fastened to a suitable bulkhead or the like to avoid vibrating.

Partition for adjusting temperature (see picture)

Cold air from the freezer unit sinks down to the bottom of the box. The box therefore needs a separate space to enable it to be used as a freezer compartment. To achieve best results, this compartment should be no larger than absolutely necessary. The dividing partition should rest against the sides of the box and have the same height as the top of the freezer unit. It should have an adjustable gap of some millimeters at the lower edge to allow a suitable amount of cold air to run over into the cool section of the box, where a temperature of +4 to +10°C (40-50°F) can be maintained. The dividing partition need not be insulated, be easy to clean and preferably transparent. Plexiglass is a suitable material.

, FAULT	POSSIBLE CAUSE	, ACTION
<p>1. Nothing happens when switched on. No lamps light.</p>	<p>No power supply,</p>	<p>Is main switch on? Check fuse in electronic control unit. Have power cables been connected incorrectly?</p>
<p>2. Compressor does not start. Green lamp on.</p>	<p>Freezer unit already sufficiently cold. Control unit in blocking state.</p>	<p>Disconnect power for a few seconds.</p>
<p>3. Compressor and fan start and stop when engine is running.</p>	<p>Broken connections to temperature sensor in freezer.</p>	<p>Check cable and connections.</p>
<p>4. Compressor tries to start every 20 seconds. A weak hissing noise will be heard always when it try to star.</p>	<p>Too low voltage in power supply (under 10,5 v)</p>	<p>Check condition of battery.</p>
<p>5. Poor cooling effect. Compressor runs too often.</p>	<p>Voltage drop in electrical system</p>	<p>Area of cables too small. Poor connections. Generator in poor condition or slipping drive belt.</p>
<p>6. No indication of "Freeze" on control panel when engine starts</p>	<p>Fan can not rotate or is faulty,</p>	<p>Check fan blades and that power consumption is max. 1,07AMP (0,8 AMP). Area of cables is too small</p>
<p>7. Compressor and fan continue running after engine is stopped.</p>	<p>Poor transfer of heat from compressor condenser</p>	<p>Clean condenser and fan. Improve ventilation of compressor compartment. Max. ambient temperature 55 C (130 F)</p>
<p>8. Frost on pipe to freezer unit.</p>	<p>Poor insulation of cold box</p>	<p>Improve insulation. Insulate cover.</p>
<p>9. Frost on pipe to freezer unit.</p>	<p>Zooling medium leakage from freezer unit</p>	<p>Check plug gasket. Refill with cooling medium (alcohol solution).</p>
<p>10. No indication of "Freeze" on control panel when engine starts</p>	<p>Generator in poor condition. Incorrectly adjusted charging relay.</p>	<p>Check charging rate. Compensate for battery splitting diodes if fitted.</p>
<p>11. Compressor and fan continue running after engine is stopped.</p>	<p>Generator does not come up to speed.</p>	<p>Adjust or replace drive belt.</p>
<p>12. Frost on pipe to freezer unit.</p>	<p>Battery voltage still high,</p>	<p>Normally a sign that batteries are in good condition. Check that compressor fan stops at 12.6 ± 0,2 V (25.4 ± 0,3 V)</p>
<p>13. Frost on pipe to freezer unit.</p>	<p>System slightly overfilled with Freon.</p>	<p>Gives higher cooling effect. Pipe can be insulated or redirected inside refrigerator.</p>

Compressor unit

The compressor unit can be fitted in a suitable space such as a cupboard, wardrobe, stowage compartment or even high up in the bilges of a large, dryboat. It may be beneficial to fit the unit on two strong 90 angle brackets (available as accessories no. 30012) or on a shelf fitted to a bulkhead so as not to lose valuable stowage space, etc. The unit will operate continuously at angles of up to approx. 30 and should therefore be fitted horizontally across the beam of sailing boats so as not to exceed this at full angle of heel. The unit should be screwed down well to withstand excessive movements.

- r Leave the protection caps on until it's time to connect the couplings. Save the protection caps for future use. The brass screw couplings should be connected and tightened quickly and smoothly so that they first reach their sealing position before the membrane inside is opened. The couplings can be unscrewed after this operation without gas will leak out. Use two spanners 24 mm for this operation so that the couplings will be carefully tightened. Be careful that the female coupling on the thin pipe does not rotate.

It can often simplify assembly if the stew couplings are tightened before the compressor unit is installed in its final position.

The electronic control unit should be installed with the cables down wards, vertical and with the fuse holder easily accessible.

If the compressor unit has been fitted in a compartment that is used for other purposes, it may be necessary to protect it from external damage in some way.

Control panel

- p The control panel should be fitted where it is easily visible and within reach of the cables from both the freezer and the compressor units.

To remove the panel from its cover, push the sides outwards so that the lips on each side are released. Carefully lift out the panel and circuit board by holding the switch. Drill 4 small holes in each corner for screws to fasten the box in-position. Drill 15 mm Ø holes in all bulkheads, panels etc. for the cables and their connectors. It is possible to take out the cables downward if you cut a slit in the bottom of the plastic box.

Cables

Carefully plug both cable connectors into the circuit board. Replace the panel. Fasten the cables in such a way that the connectors will not be damaged.

Battery cables should be of a sufficient area in comparison to the length. A good guide to use is 2.5 mm² UD to 2,5 m (5 m), 4 0 mm² UD to 4 m (8 m), 6.0 mm² UP to 6 m (12 m). They should be connected directly to the + and - poles of the battery or better main switch (preferably by self-tapping screws and soldered cable shoes, etc.). A good connection here is vital for efficient operation of the system. Connect the + and - cables to the correct position on the control unit. The fuse will cut if polarity is reversed by incorrect connections.

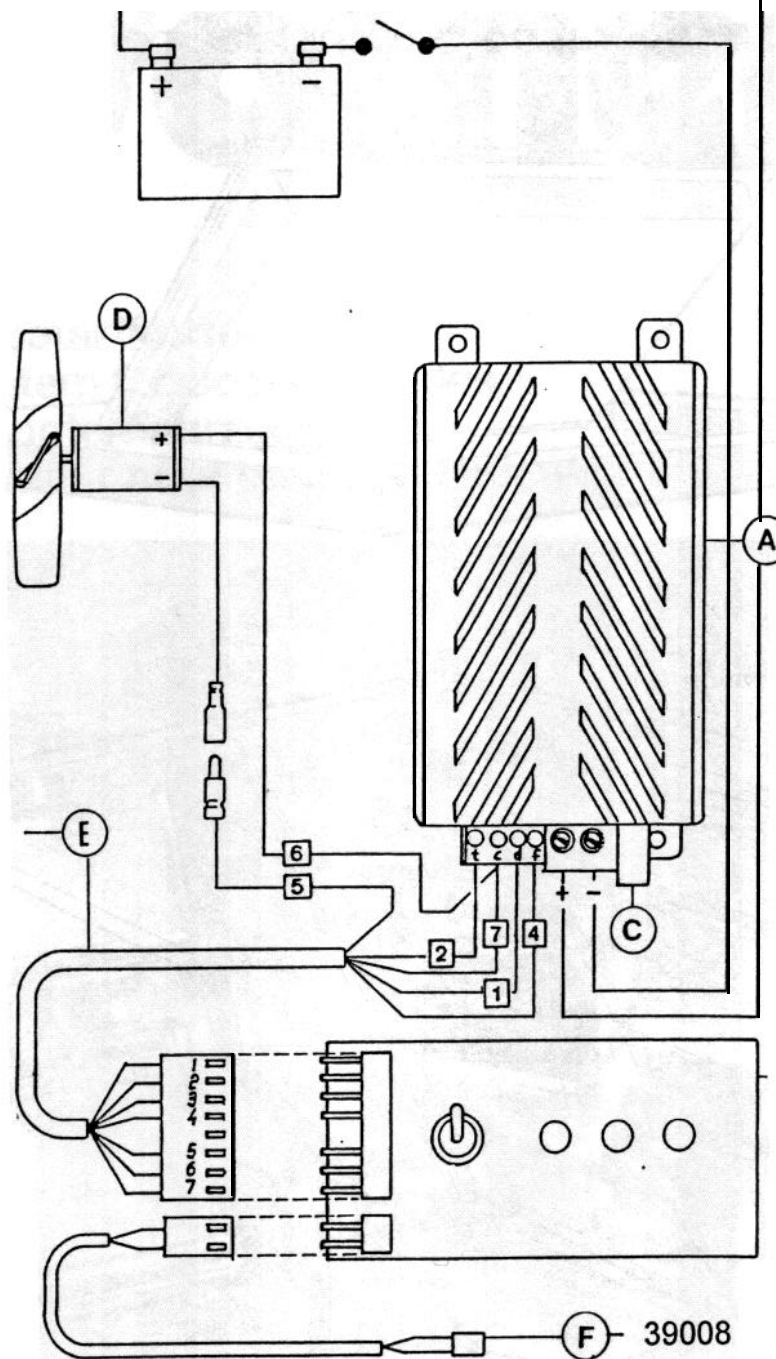
The system must not be connected directly to a battery charger without a battery connected in parallel.

Test run

Set switch to "Normal-Auto" position. The green light will go on immediately and the yellow after a few minutes. This indicates that the compressor is running. A slight hissing noise will soon be heard from the freezer unit but frost will not appear on the freezer until after 15 - 30 minutes. Start the engine. After a while (the exact time varies depending on the condition of the generator and battery) the indicator lamps change: The yellow goes out and the red comes on. After a short delay the compressor fan will start. When the engine is stopped the reverse will happen - the time it takes before this happens will again depend on the condition of the battery and generator. The greater the charge in the battery, the longer the red light remains on and the fan continues to operate. These conditions will occur as long as the freezer has not become really cold.

When the unit is in "economy" mode but not "ask" for more cold also the yellow lamp will be lighted very weak.

After the test run, check all mechanical and electrical connections and fasten these to bulkheads, etc. so that they are safe and secure.



A Styrssystem - Electronic unit -Steuergerat -
Systeme electronique

B Man&rrpanel-Control panel - Schaltkasten -
Boitier de commande

c SZrkring15A-Fuse15Amp.-Sicherung15A-
Fusible15A

D Flaktmotor- Fan motor-Gebl&semotor- Moteur
de ventilateur

E Manijverpanelkabel- Cable for control panel-
Schaltkasten-kabel-C&ble pour le boitier de
commande

F Termistor-Thermistor-Thermistor-Thermistor

FBr&gkod for manoverpanelkabel

Colour coding for control panel cable

Couleurs des fils blectriques du cable pour le boitier de
commande

Farbkennzeichnungen der Schaltkasten-kabel

1. Gul-Yellow-Gelb-Jaune

2. Gr&-Grey-Grau-Gris

3. Griin-Green-Griin-Vert

4. Brun- Brown - Braun - Marron

5, Rosa- Pink- Rosa- Rose

6. Bl5-Blue-Blau-Bleu

7. Vit - White- Weiss- Blanc

OBS! Endas t ISO THERM original elektronikdel passar

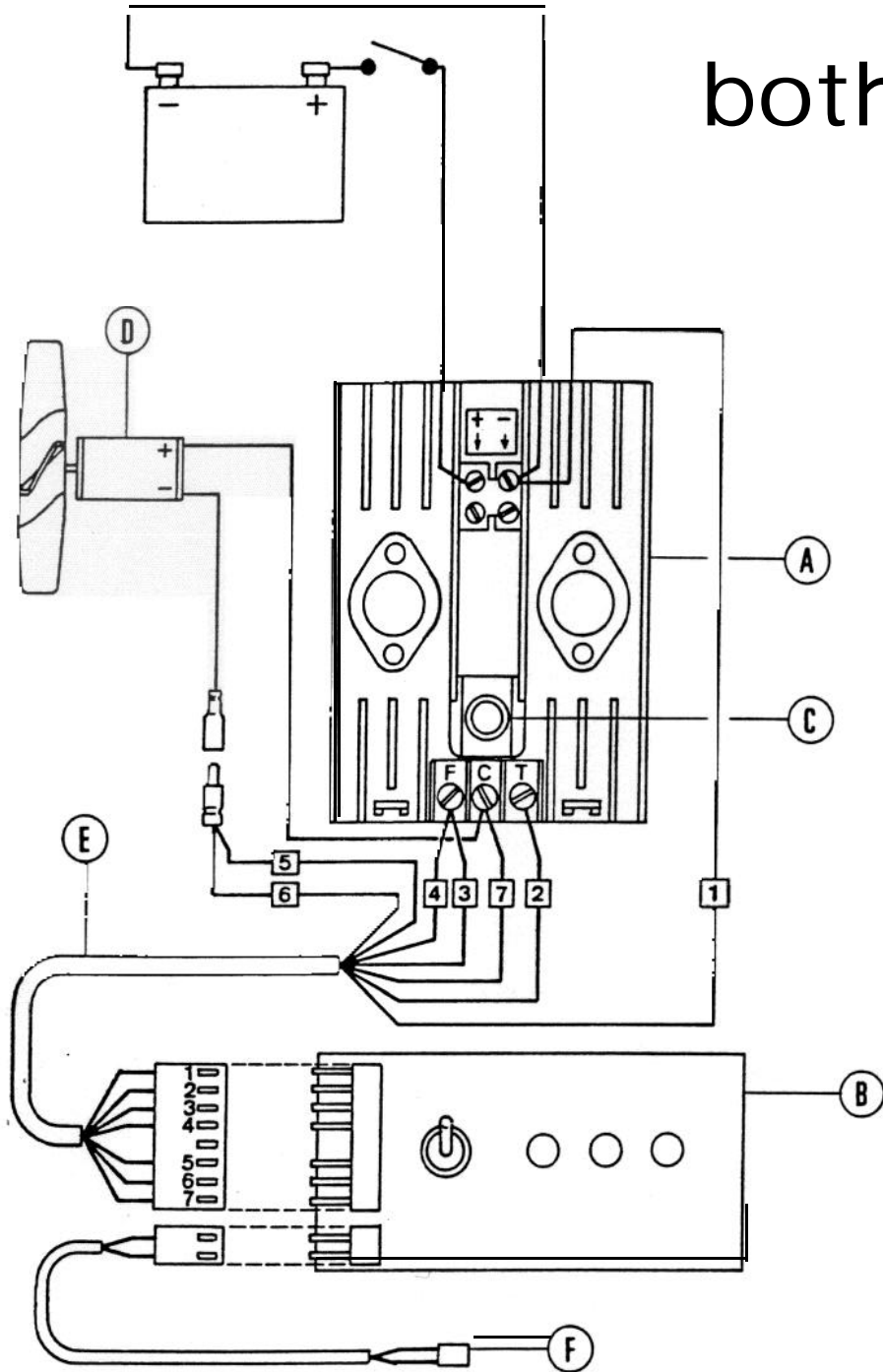
Only the ISOTHERM original electronic unit can be used

Nur der ISOTHERM Original Elektronikteil kann verwendet werden

Seulement l' unit4 Blectronique originale de ISOTHERM est utilisable

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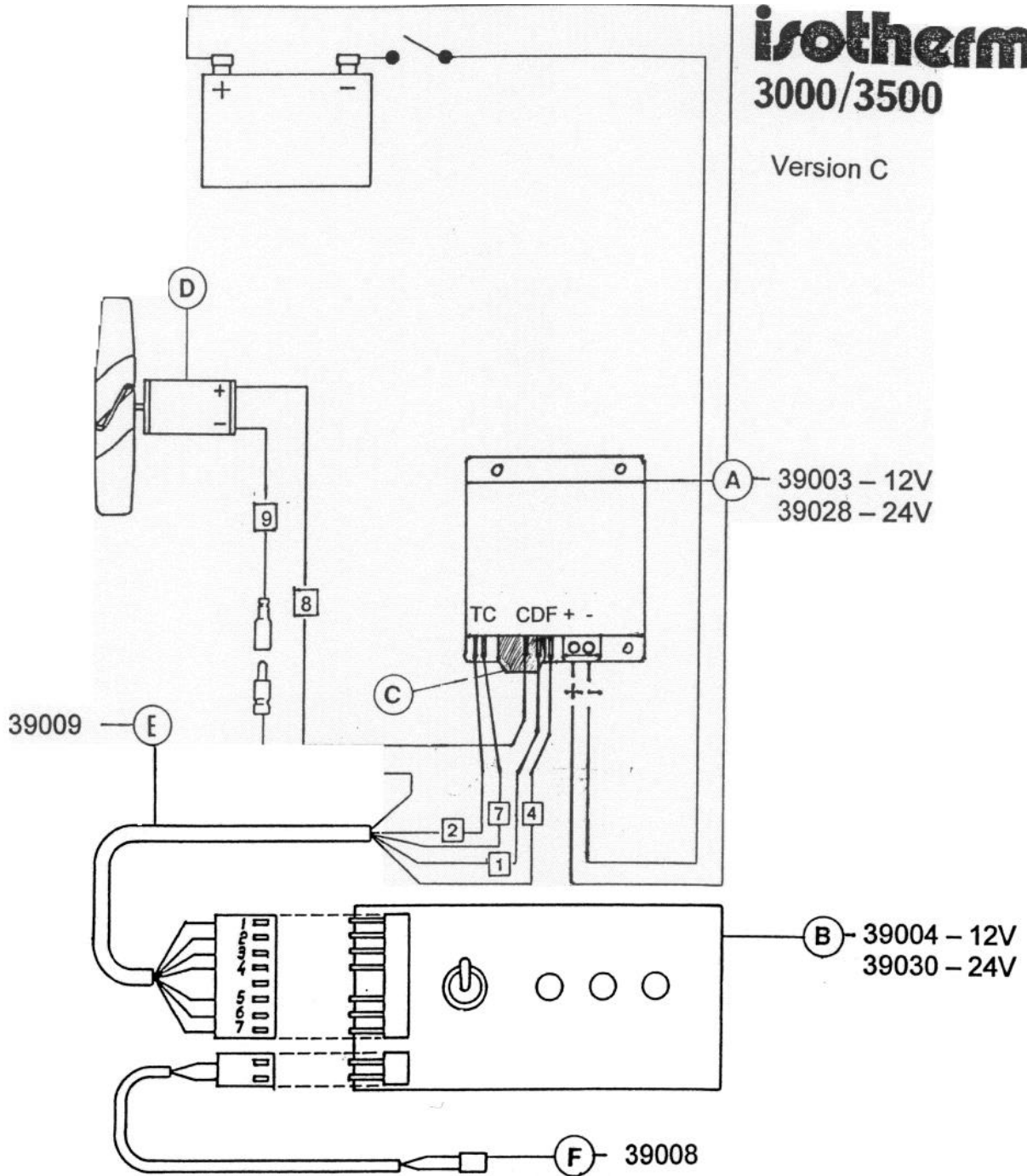
Version A



- A** Styrsystem - Electronic unit -Steuergerat -
Systeme electronique
- B** Mandverpanel -Control panel - Schaltkasten -
Boitier de commande
- c** Sakring IOA-FuselIOAmp.-Sicherung IOA-
Fusible 10 A
- D** Flaktmotor - Fan motor- Geblasemotor ; Moteur
de ventilateur
- E** Manijverpanelkabel - Cable for control panel -
Schaltkasten-kabel-Cable pour le boitier de
commande
- F** Termistor-Thermistor-Thermistor-Thermistor

FBrgekod for manijverpanelkabel
Colour coding for control panel cable
Couleurs des fits blectriques du cable pour le boietiede
commande
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- 6.** BIZi-Blue-Blau-Bleu
7. Vit-White-Weiss-Blanc



- A** Styrsystem - Electronic unit -Steuergerat - Systeme electronique
- B** Manijverpanel-Control panel-Schaltkasten-Boitier de commande
- C** SBkring15A-Fuse15Amp.-Sicherung15A-Fusible 15A
- D** Flaktmotor-Fan motor-GebHsemotor-Moteur de ventilateur
- E** Manijverpanelkabel-Cableforcontrol panel-Schaltkasten-kabel -Ccible pour le boitier de commande
- F** Termistor-Thermistor-Thermistor-Thermistor

Fargkod for manijverpanelkabel
Colour coding for control panel cable
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Farbkennzeichnungen der Schaltkasten-kabel

1. Gul - Yellow - Gelb - Jaune
2. Gra - Grey - Grau - Gris
3. Gron - Green - Griin - Vert
4. Brun - Brown - Braun - Marron
5. Rosa - Pink - Rosa - Rose
6. Blå - Blue - Blau - Bleu
7. Vit - White - Weiss - Blanc
8. Rod - Red - Rot - Rouge
9. Blå - Blue - Blau - Bleu

OBS! Endast ISOTHERM original elektronikdel passar
Only the ISOTHERM original electronic unit can be used
Nur der ISOTHERM Original Elektronikteil kann verwendet werden
Seulement l' unit4 dlectronique originale de ISOTHERM est utilisable