Table of Contents

CERTIFICATE NUMBER

04-PR424205-PDA

DATE

09 March 2004

ABS TECHNICAL OFFICE

Piraeus Engineering Services

CERTIFICATE OF
Design Assessment

This is to Certify that a representative of this Bureau did, at the request of

Com. A.S. Electronics

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate. It will remain valid for five years from the date of issue or until the Rules or specifications used in the assessment are revised (whichever occurs first).

PRODUCT:	Water Ingress Detection System
MODEL:	SAFEBULKCARRIER
ABS RULE:	2004 Steel Vessel Rules 1-1-4/3.7 and 4-9-7/7
OTHER STANDARD:	IMO SOLAS XII/12, MSC 145(77), IACS UR SC180;

AMERICAN BUREAU OF SHIPPING

I Koumbarelis

Ion G. Koumbarelis

Engineering Type Approval Co-ordinator

AMERICAN BUREAU OF SHIPPING ABS PIRAEUS OFFICE

AB258(07/03)

TX 06/03 3120B

Com. A.S. Electronics
4, Markou Botsari Street
186 48 Drapetsona
Piraeus
Greece
Telephone: +30-210-4610493
Fax: +30-210-4633823

Product: **Water Ingress Detection System**

Model: **SAFEBULKCARRIER**

Intended Service:
Water ingress detection system used on board bulk carriers.

Description:
The water ingress detection system comprises a centralised alarm panel (type SafeBulkCarrier) housing various electrical components and located in the navigation bridge, a main junction box located in accommodation area with safety barriers type SB0028 or SB1250 (manufactured by "CEAG Apparatebau Hundsbach GmbH) connected to maximum 22 water level sensors of electrode type (type A or type B with resistance or zener diode). The panel provides the following audible and visual alarms: pre-alarm at 0.5 m and main alarm at 2.0 m conditions for the cargo holds, and main alarm of ballast tanks located forward of the collision bulkhead and dry or void spaces located forward of the cargo holds.

Ratings:
Power supply input: 220 VAC and 24 V DC. Detector operating temperatures: -30°C to 80°C. Detector enclosure protection: IP68 (pressurised immersion for 20 days at 2.0 bar pressure). Simple apparatus. Safety barrier category: [EEx ia] IIC, TUV certificate No. TUV 99 ATEX 1449 X.

Service Restrictions:
Unit Certification is not required for this product. Maximum height of cargo hold 20.0 meters.

Comments:
Tests and approval are for hardware only. Each vessel configuration and external connection is to be specifically approved.

Notes/Documentation:
The alarm panel and the detectors have been environmentally tested in accordance with the following test Reports: Nos. 2410/002/2004 (dated 30 January 2004), 2410/003/2004 (dated 14 January 2004), 2410/004/04 (dated 2 February 2004) and 2410/005/2004 (dated 2 February 2004) of the HEEQAC S.A., Greece, and ABS Survey Report no. PR494078 (dated 30 January 2004).

Term of Validity:
This product/model is covered under Product Design Assessment (PDA) Certificate # 04-PR424205-PDA, dated 09/Mar/2004. This PDA Certificate expires Mar of 2009. It will remain valid for the 5 years from date of issue or until the Rules or specifications used in the assessment are revised (whichever occurs first).

STANDARDS

ABS Rules:
2004 Steel Vessel Rules 1-1-4/3.7 and 4-9-7/7

International:
IMO SOLAS XII/12, MSC 145(77), IACS UR SC180

DET NORSKE VERITAS
TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. A-9103
This Certificate consists of 3 pages

This is to certify that the
Water Ingress Detection

with type designation
SafeBulkCarrier Alarm Panel, Water Ingress Sensor BC300 1A
as specified on page 2

Manufactured by
COM A.S. Electronics
Piraeus, Greece

is found to comply with
Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Mobile Offshore Units

Application
Protection classes:

Type	Temperature	Humidity	Vibration	EMC	Enclosure
SafeBulkCarrier Alarm Panel	A	B	A	B	A (front panel only)
Water Ingress Sensor BC300 1A	C	B	A	B	D

Place and date
Høvik, 2004-04-20
for DET NORSKE VERITAS AS

Knut-Helge Knutsen
Head of Section

Local Office
DNV Piraeus

This Certificate is valid until
2006-06-30

Geir Bjørn Alnes
Surveyor

Notice: This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Product description

Water ingress alarm system for cargo holds on bulk carriers consisting of:

SafeBulkCarrier Alarm Panel
OSNA Electronics Zener Barriers Type Z111/EK, Type Z318/Ex or
CEAG Zener Barriers Type SB0028 / SB1250
Water Ingress Sensor BC300 1A type A and type B

Approval conditions

The following documentation of the actual application is to be submitted for approval in each case:

- Reference to this Type Approval Certificate
- System block diagram
- Power supply arrangement (may be part of the System block diagram)
- Sensor arrangement and installation (responsibility of installer)

The Type Approval covers hardware listed under Product description.
The sensors are regarded as simple apparatus.

As long as the units are covered by the Type Approval, a product certificate according to Pt.4 Ch.9 Sec.1 A 202 will not be required. Correct configuration and set up for each delivery to be tested during commissioning after installation.

Type Approval documentation

User's Manual, SafeBulkCarrier, Water Ingress Alarm System by COM.A.S
Functional Description, Water Ingress Alarm Panel by COM.A.S

Functional Test Reports No: 2410/004/04 and 2410/005/04, Issued 2004-02-02
Ingress Protection Test Report No: 2410/003/2004, issued 2004-01-14
Enviromental Test Report No: 2410/002/2004, issued 2004-01-30

Ex Certificate, OSNA Zener Barriers Cert No: BAS NO Ex 87B2361/1
Ex Certificate, Zener Barriers Cert No: TUV 99 ATEX 1449 X

Tests carried out

Applicable tests acc. to S.f.C.2.4
Performance testing according to SOLAS Reg.XII/12

Certificate retention survey

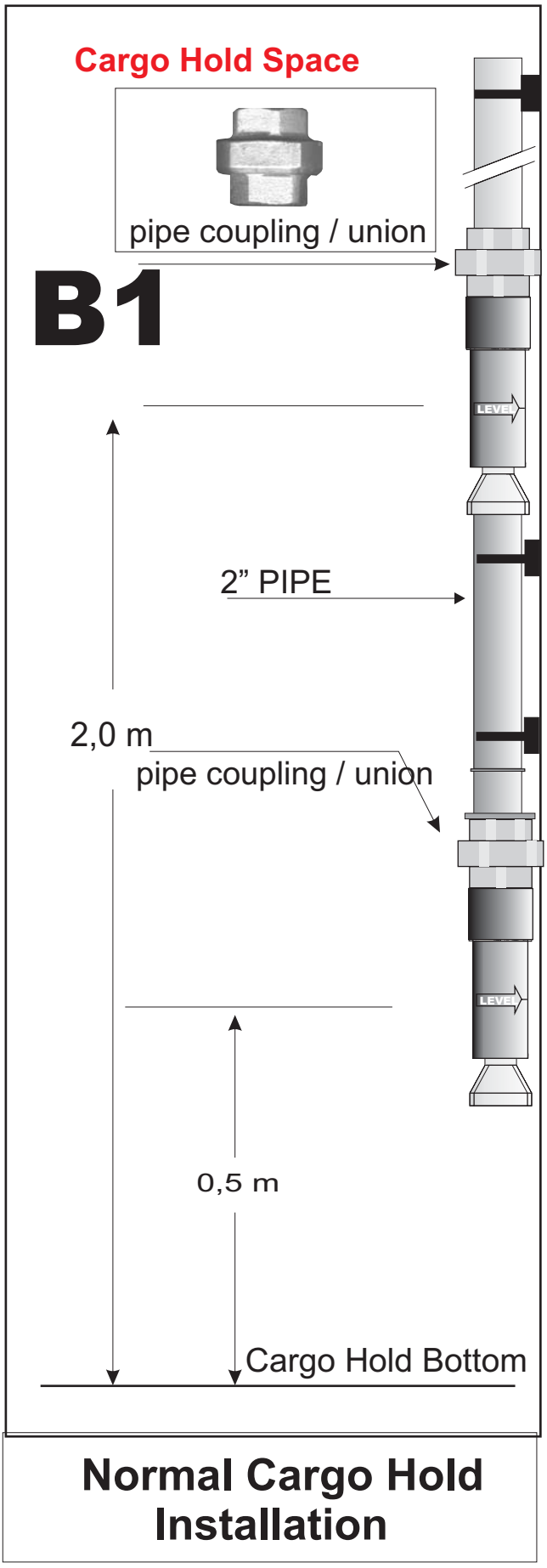
The scope of the retention/renewal survey is to verify that the conditions stipulated for the type are complied with, and that no alterations are made to the product design or choice of systems, software versions, components and/or materials.

The main elements of the survey are:

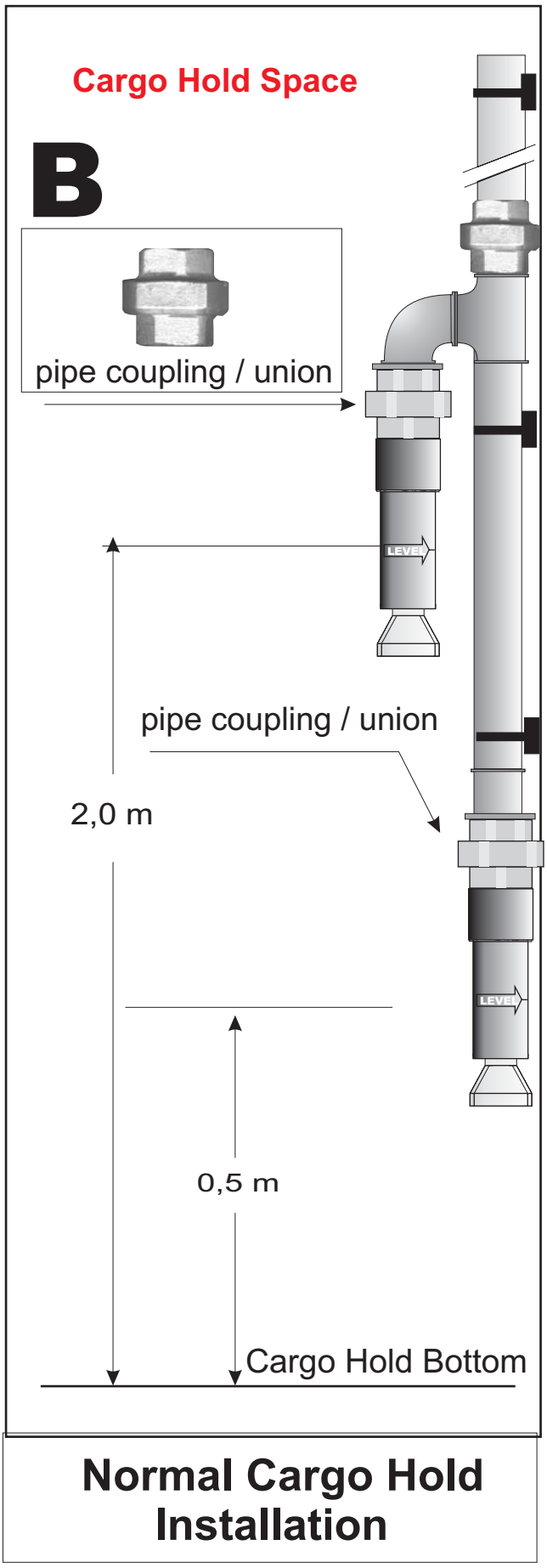
- Ensure that type approved documentation is available.
- Inspection of factory samples, selected at random from the production line (where practicable)
- Review of production and inspection routines, including test records from product sample tests and control routines.
- Ensuring that systems, software versions, components and/or materials used comply with type approved documents and/or referenced system, software, component and material specifications.
- Review of possible changes in design of systems, software versions, components, materials and/or performance, and make sure that such changes do no affect the type approval given.
- Ensuring traceability between manufacturer's product type marking and the type approval certificate.

Survey to be performed at renewal of this certificate.

END OF CERTIFICATE

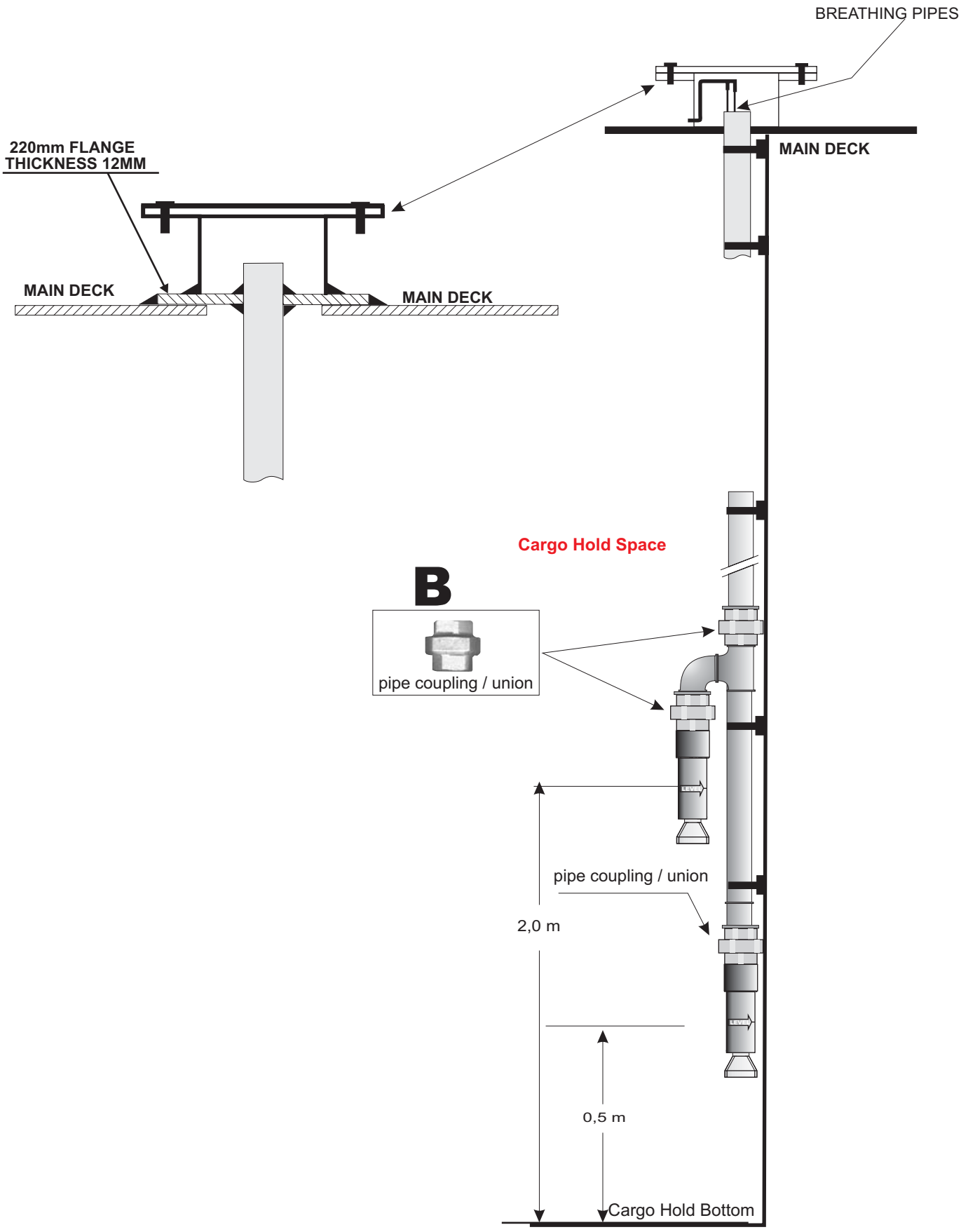


Normal Cargo Hold Installation



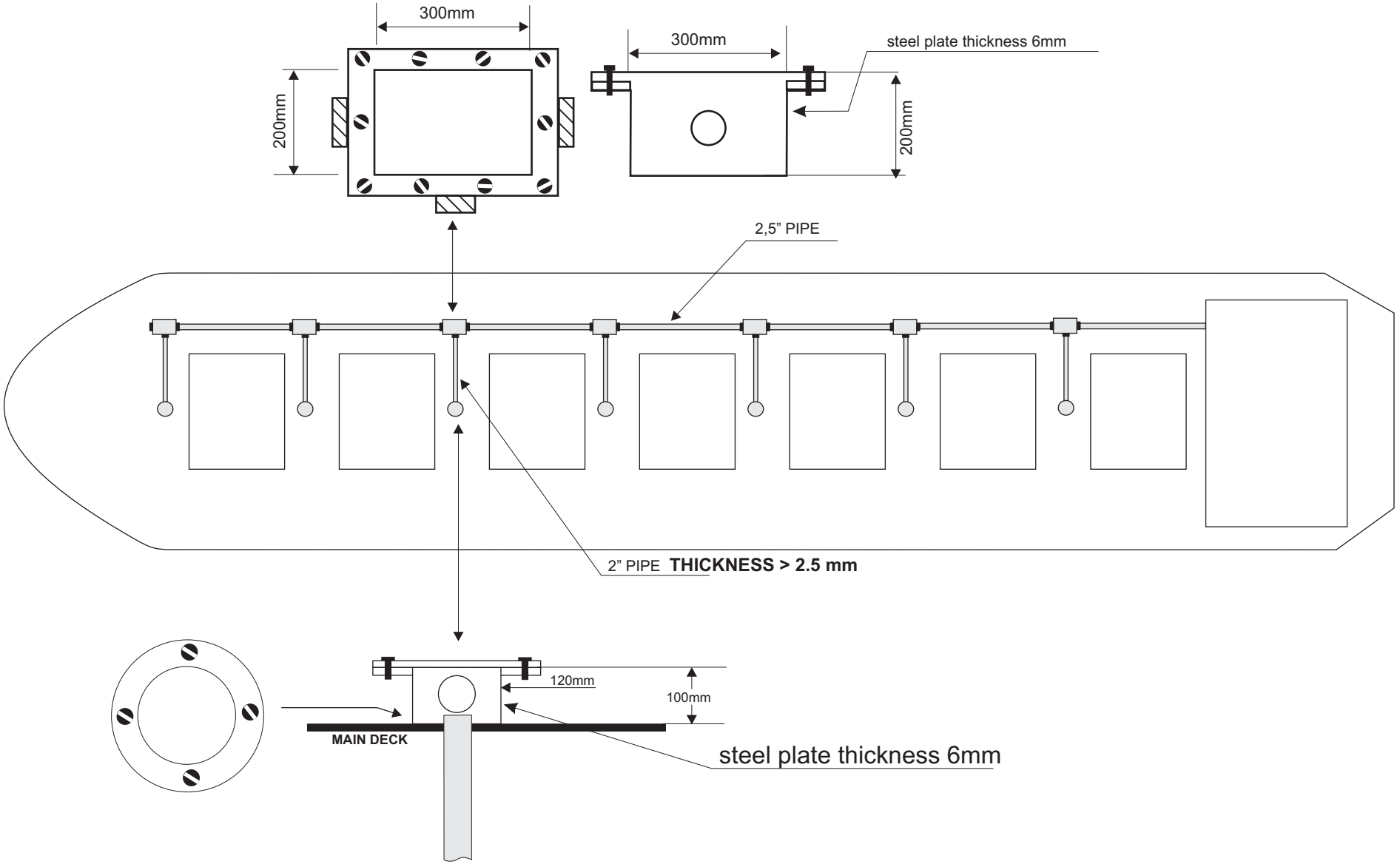
Normal Cargo Hold Installation

ComAS ELECTRONIC	**DRAWING No 9**
Installation Options	**M/V SEA CHARM**



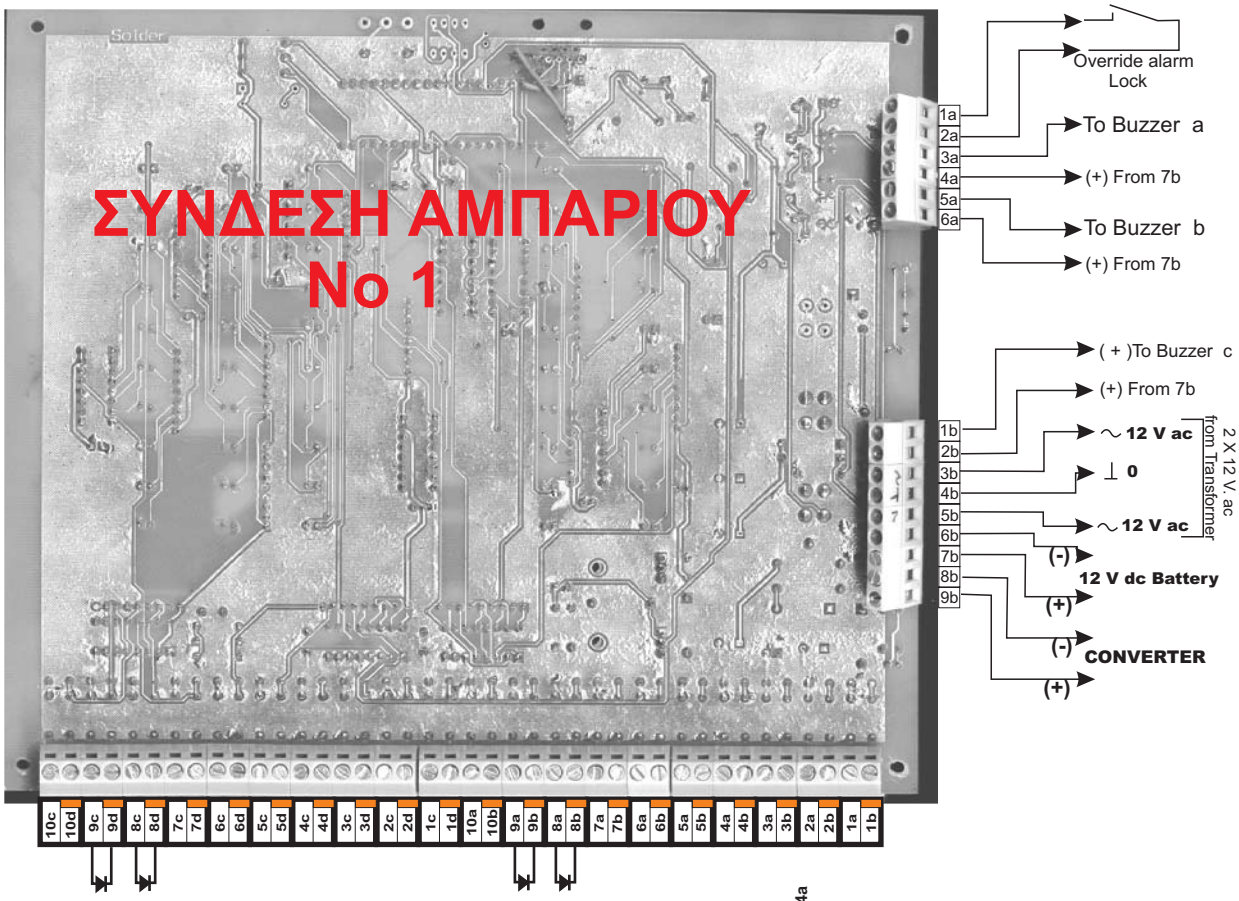
Normal Cargo Hold Installation

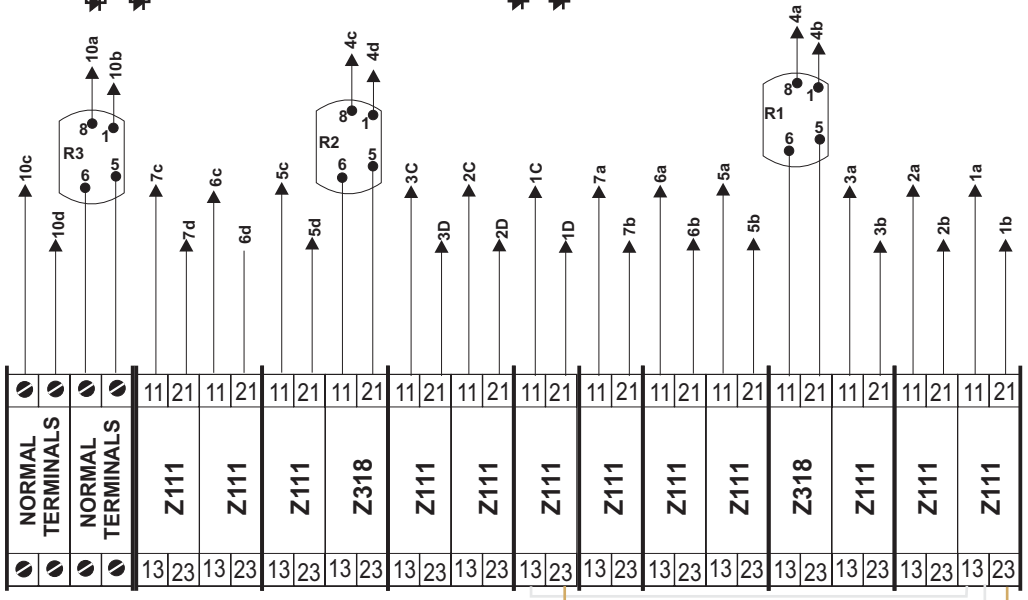
ComAS ELECTRONIC	**DRAWING No 13A**
Installation Options	**M/V SEA CHARM**



ComAS ELECTRONIC

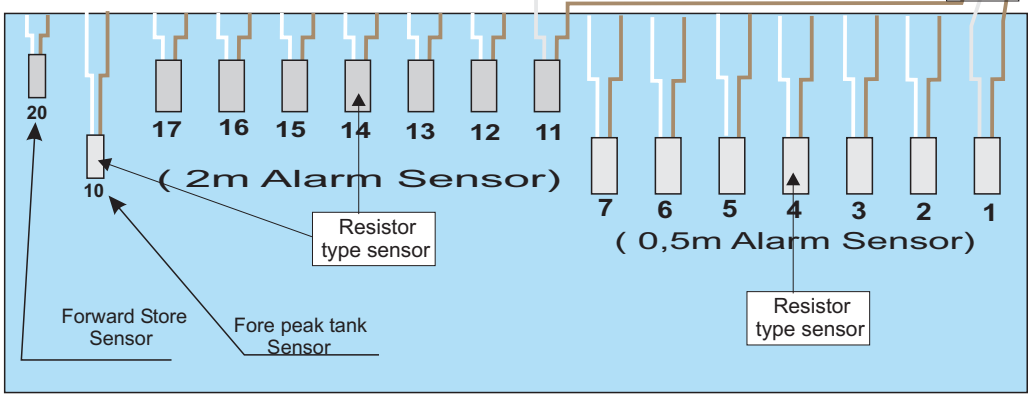
PIPING OF WAT. INGRESS ALARM SYSTEM	**DRAWING No 8A**





THERE ARE TWO DIFFERENT TYPES OF ZENER BARRIERS. THE CORRECT TYPE OF ZENER BARRIERS MUST BE CONNECTED TO THE APPROPRIATE PCB CONNECTIONS IN ACCORDANCE WITH THE DIAGRAM

EXISTING 3 CONDUCTOR CABLE



THERE ARE TWO DIFFERENT TYPES OF SENSORS. THE CORRECT TYPE OF SENSOR MUST BE CONNECTED TO THE APPROPRIATE PCB CONNECTIONS IN ACCORDANCE WITH THE DIAGRAM. SENSORS INTENDED TO BE INSTALLED IN BALLAST TANKS / FOREPEAK ARE MARKED WITH THE WORD "BALLAST".

R — RESISTOR TYPE SENSOR FOR (BALLAST TANKS - CARGO HOLDS)+ FORE PEAK

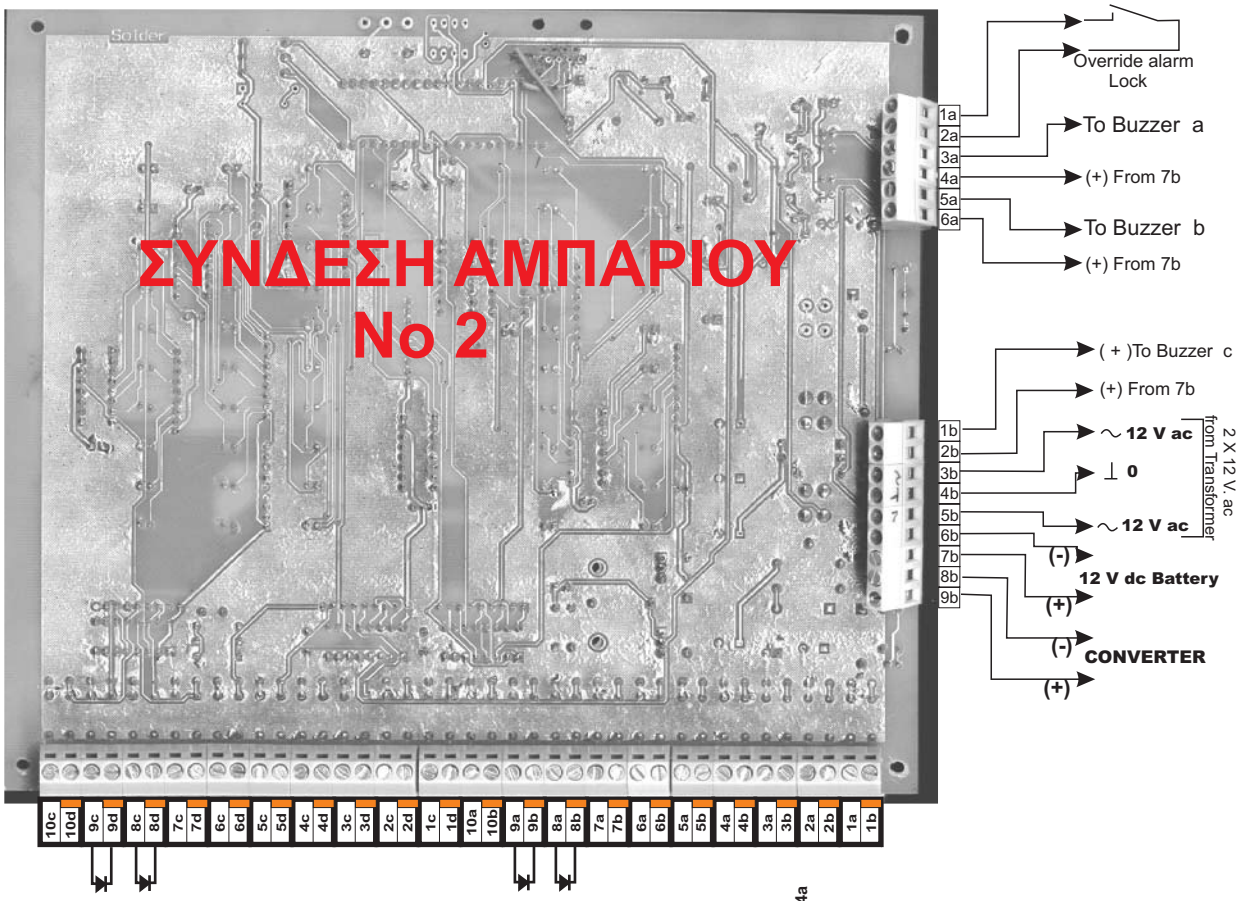
RESISTOR VALUE :
50 KΩ > R > 20 KΩ

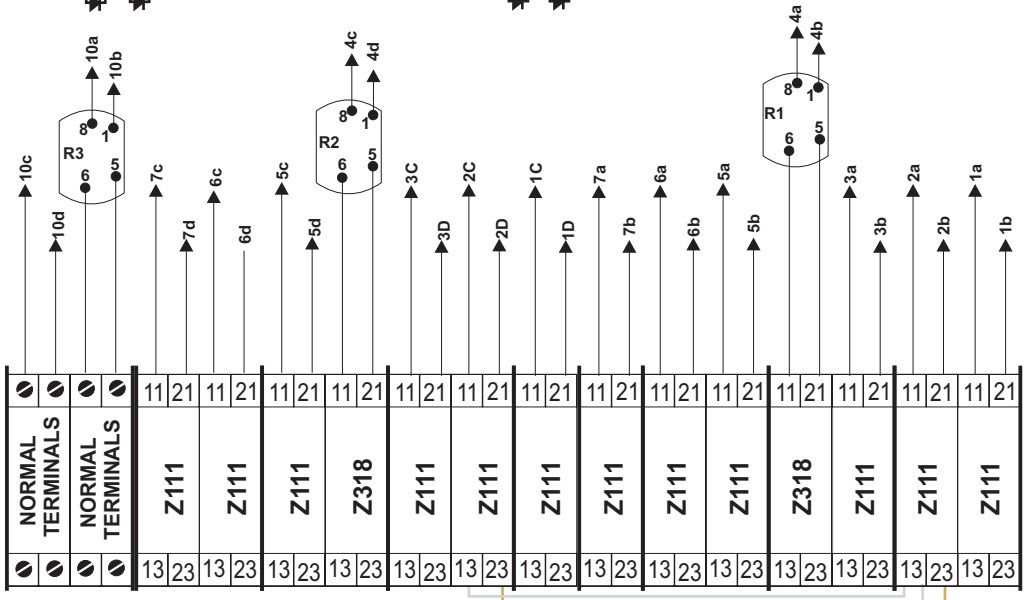
DIODE TYPE SENSOR FOR ALL CARGO HOLDS EXEPT (BALLAST TANKS - CARGO HOLDS)+ FORE PEAK

1=C.HOLD No.1 (0.5m SENSOR)
2=C.HOLD No.2 (0.5m SENSOR)
3=C.HOLD No 3 (0.5m SENSOR)
4=C.HOLD No.4 (0.5m SENSOR)
5=C.HOLD No.5 (0.5m SENSOR)
6=C.HOLD No.6 (0.5m SENSOR)
7=C.HOLD No.7 (0.5m SENSOR)

11=C.HOLD No.1 (2m SENSOR)
12=C.HOLD No.2 (2m SENSOR)
13=C.HOLD No 3 (2m SENSOR)
14=C.HOLD No.4 (2m SENSOR)
15=C.HOLD No.5 (2m SENSOR)
16=C.HOLD No.6 (2m SENSOR)
17=C.HOLD No.7 (2m SENSOR)

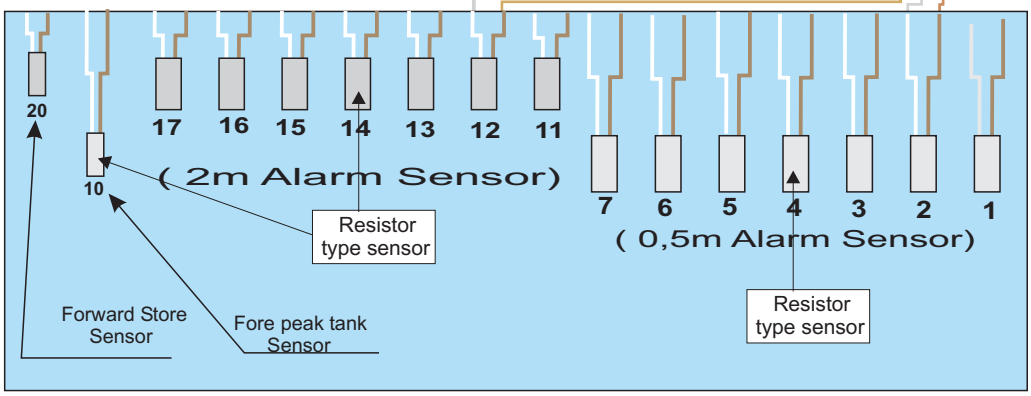
Zener Barrier Connection Diagram
M/V SEA CHARM





THERE ARE TWO DIFFERENT TYPES OF ZENER BARRIERS. THE CORRECT TYPE OF ZENER BARRIERS MUST BE CONNECTED TO THE APPROPRIATE PCB CONNECTIONS IN ACCORDANCE WITH THE DIAGRAM

EXISTING 3 CONDUCTOR CABLE



THERE ARE TWO DIFFERENT TYPES OF SENSORS. THE CORRECT TYPE OF SENSOR MUST BE CONNECTED TO THE APPROPRIATE PCB CONNECTIONS IN ACCORDANCE WITH THE DIAGRAM. SENSORS INTENDED TO BE INSTALLED IN BALLAST TANKS / FOREPEAK ARE MARKED WITH THE WORD "BALLAST".

R — RESISTOR TYPE SENSOR FOR (BALLAST TANKS - CARGO HOLDS)+ FORE PEAK

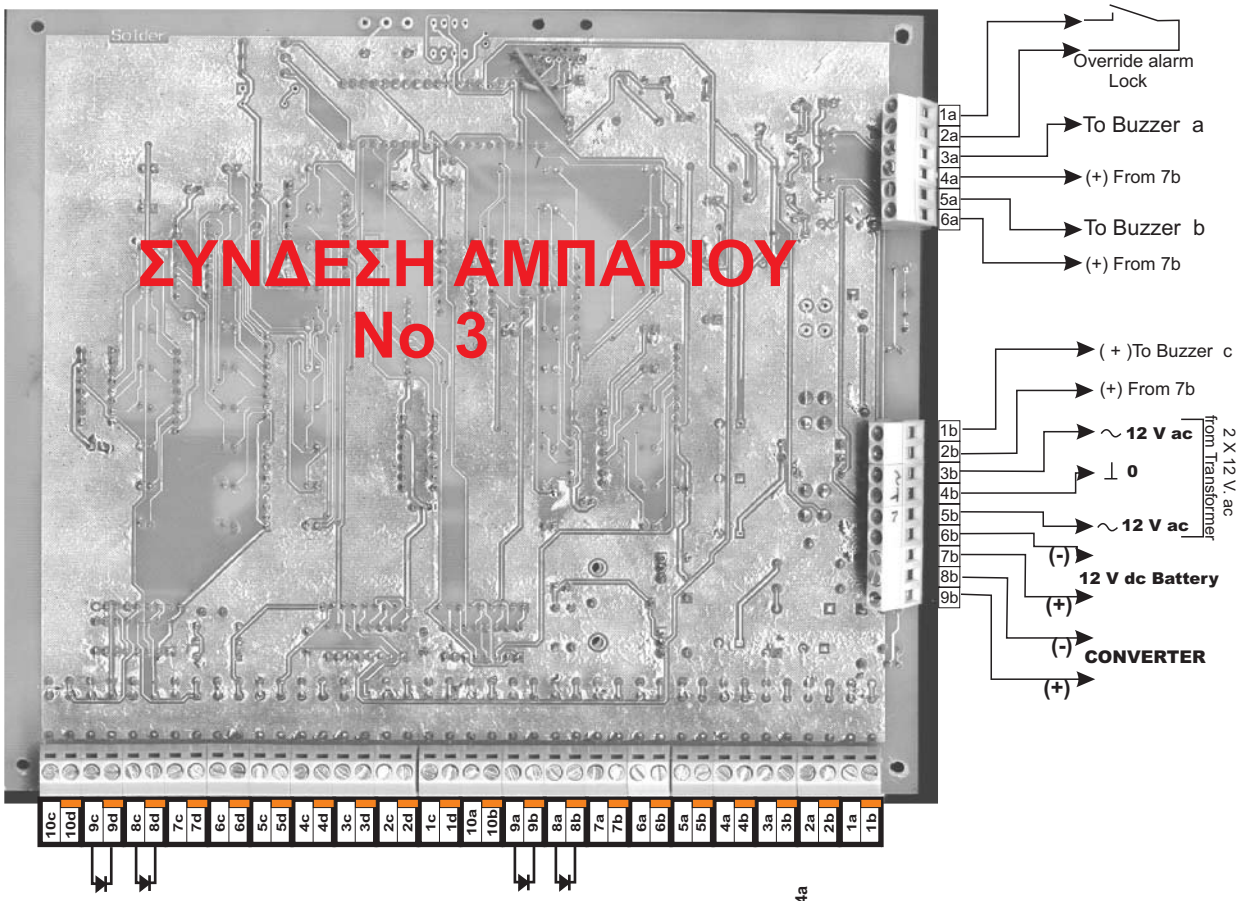
RESISTOR VALUE :
50 KΩ > R > 20 KΩ

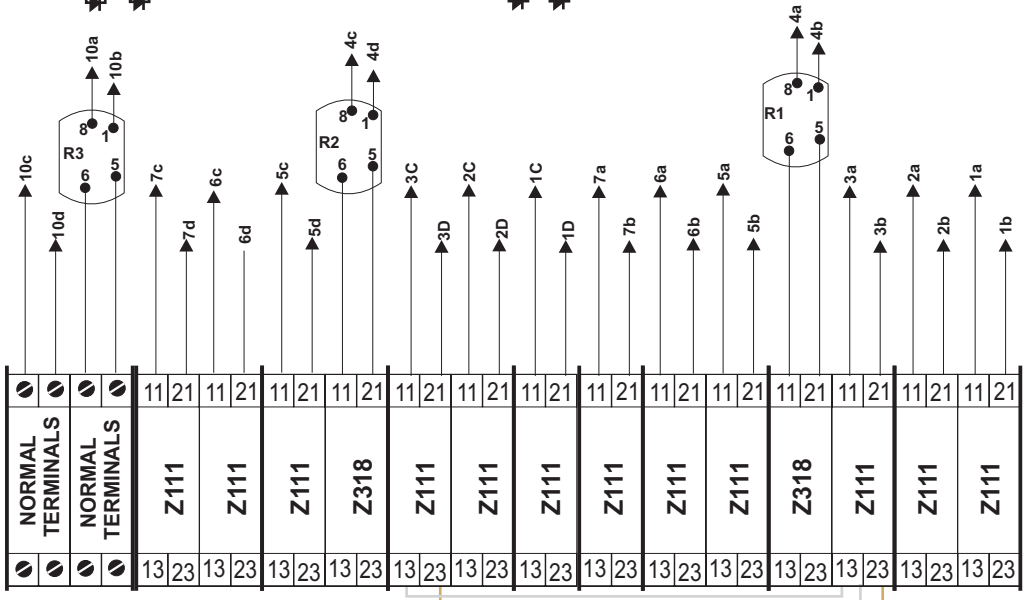
DIODE TYPE SENSOR FOR ALL CARGO HOLDS EXEPT (BALLAST TANKS - CARGO HOLDS)+ FORE PEAK

1=C.HOLD No.1 (0.5m SENSOR)
2=C.HOLD No.2 (0.5m SENSOR)
3=C.HOLD No 3 (0.5m SENSOR)
4=C.HOLD No.4 (0.5m SENSOR)
5=C.HOLD No.5 (0.5m SENSOR)
6=C.HOLD No.6 (0.5m SENSOR)
7=C.HOLD No.7 (0.5m SENSOR)

11=C.HOLD No.1 (2m SENSOR)
12=C.HOLD No.2 (2m SENSOR)
13=C.HOLD No 3 (2m SENSOR)
14=C.HOLD No.4 (2m SENSOR)
15=C.HOLD No.5 (2m SENSOR)
16=C.HOLD No.6 (2m SENSOR)
17=C.HOLD No.7 (2m SENSOR)

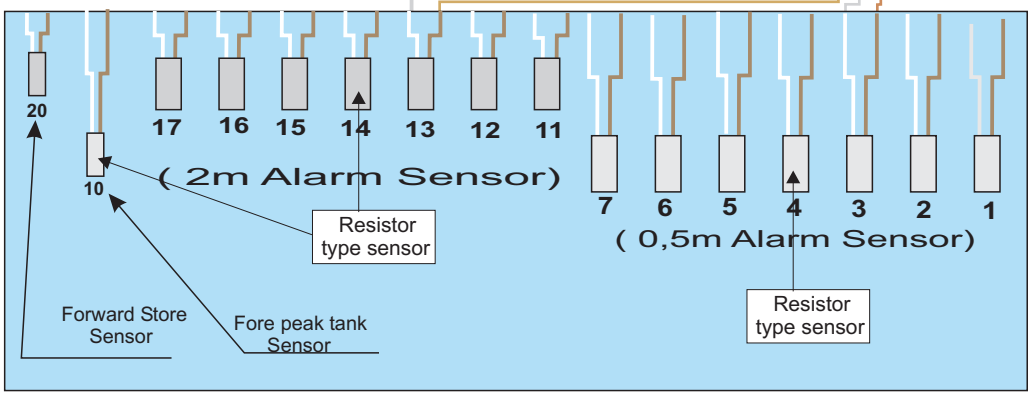
Zener Barrier Connection Diagram
M/V SEA CHARM





THERE ARE TWO DIFFERENT TYPES OF ZENER BARRIERS. THE CORRECT TYPE OF ZENER BARRIERS MUST BE CONNECTED TO THE APPROPRIATE PCB CONNECTIONS IN ACCORDANCE WITH THE DIAGRAM

EXISTING 3 CONDUCTOR CABLE



THERE ARE TWO DIFFERENT TYPES OF SENSORS. THE CORRECT TYPE OF SENSOR MUST BE CONNECTED TO THE APPROPRIATE PCB CONNECTIONS IN ACCORDANCE WITH THE DIAGRAM. SENSORS INTENDED TO BE INSTALLED IN BALLAST TANKS / FOREPEAK ARE MARKED WITH THE WORD "BALLAST".

R — RESISTOR TYPE SENSOR FOR (BALLAST TANKS - CARGO HOLDS)+ FORE PEAK

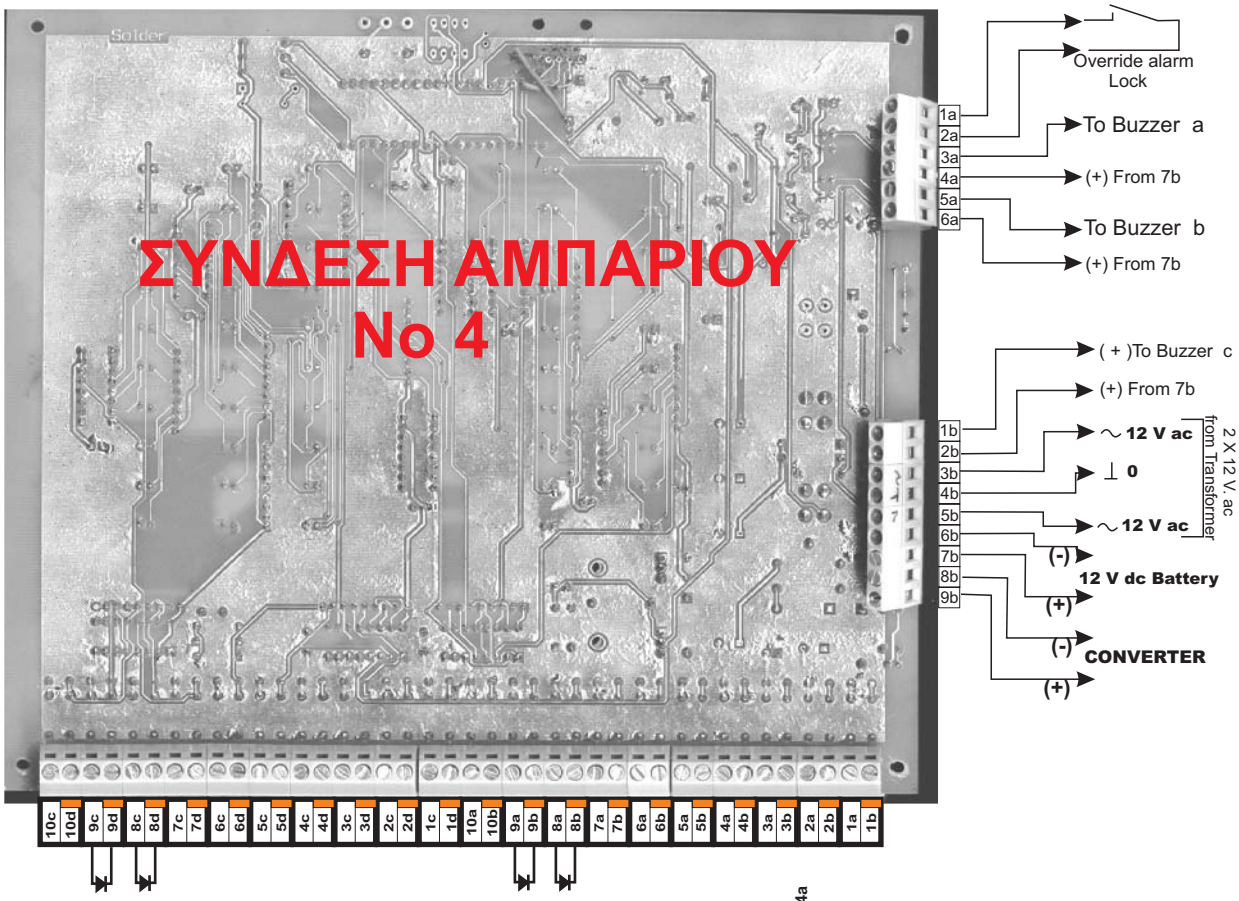
RESISTOR VALUE :
50 KΩ > R > 20 KΩ

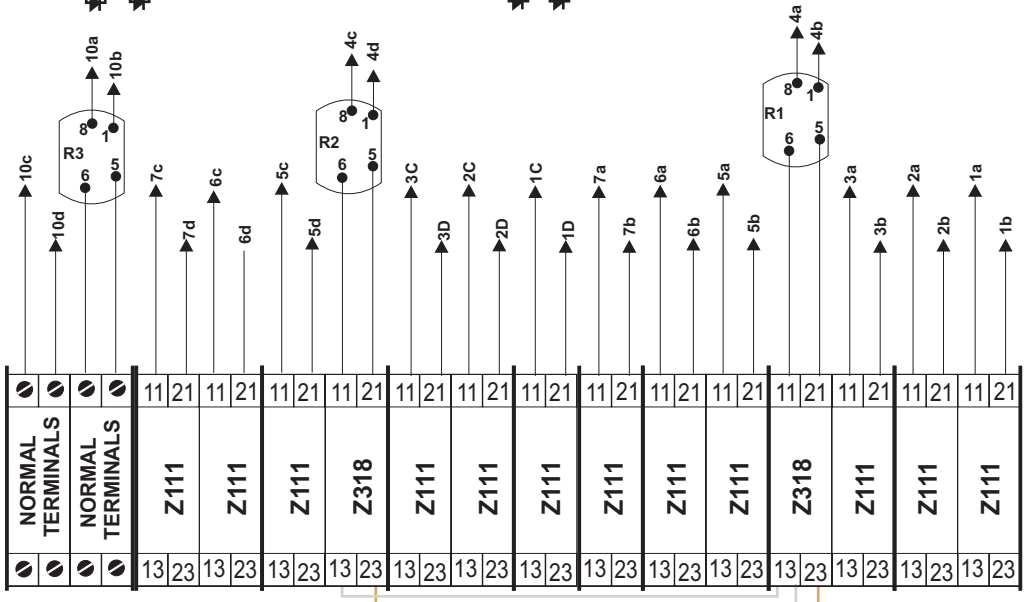
DIODE TYPE SENSOR FOR ALL CARGO HOLDS EXEPT (BALLAST TANKS - CARGO HOLDS)+ FORE PEAK

1=C.HOLD No.1 (0.5m SENSOR)
2=C.HOLD No.2 (0.5m SENSOR)
3=C.HOLD No 3 (0.5m SENSOR)
4=C.HOLD No.4 (0.5m SENSOR)
5=C.HOLD No.5 (0.5m SENSOR)
6=C.HOLD No.6 (0.5m SENSOR)
7=C.HOLD No.7 (0.5m SENSOR)

11=C.HOLD No.1 (2m SENSOR)
12=C.HOLD No.2 (2m SENSOR)
13=C.HOLD No 3 (2m SENSOR)
14=C.HOLD No.4 (2m SENSOR)
15=C.HOLD No.5 (2m SENSOR)
16=C.HOLD No.6 (2m SENSOR)
17=C.HOLD No.7 (2m SENSOR)

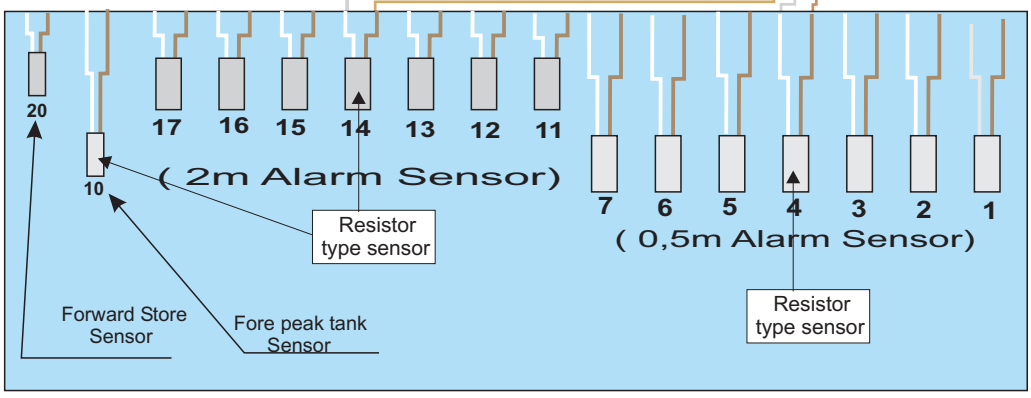
Zener Barrier Connection Diagram
M/V SEA CHARM





THERE ARE TWO DIFFERENT TYPES OF ZENER BARRIERS. THE CORRECT TYPE OF ZENER BARRIERS MUST BE CONNECTED TO THE APPROPRIATE PCB CONNECTIONS IN ACCORDANCE WITH THE DIAGRAM

EXISTING 3 CONDUCTOR CABLE



THERE ARE TWO DIFFERENT TYPES OF SENSORS. THE CORRECT TYPE OF SENSOR MUST BE CONNECTED TO THE APPROPRIATE PCB CONNECTIONS IN ACCORDANCE WITH THE DIAGRAM. SENSORS INTENDED TO BE INSTALLED IN BALLAST TANKS / FOREPEAK ARE MARKED WITH THE WORD "BALLAST".

R — RESISTOR TYPE SENSOR FOR (BALLAST TANKS - CARGO HOLDS)+ FORE PEAK

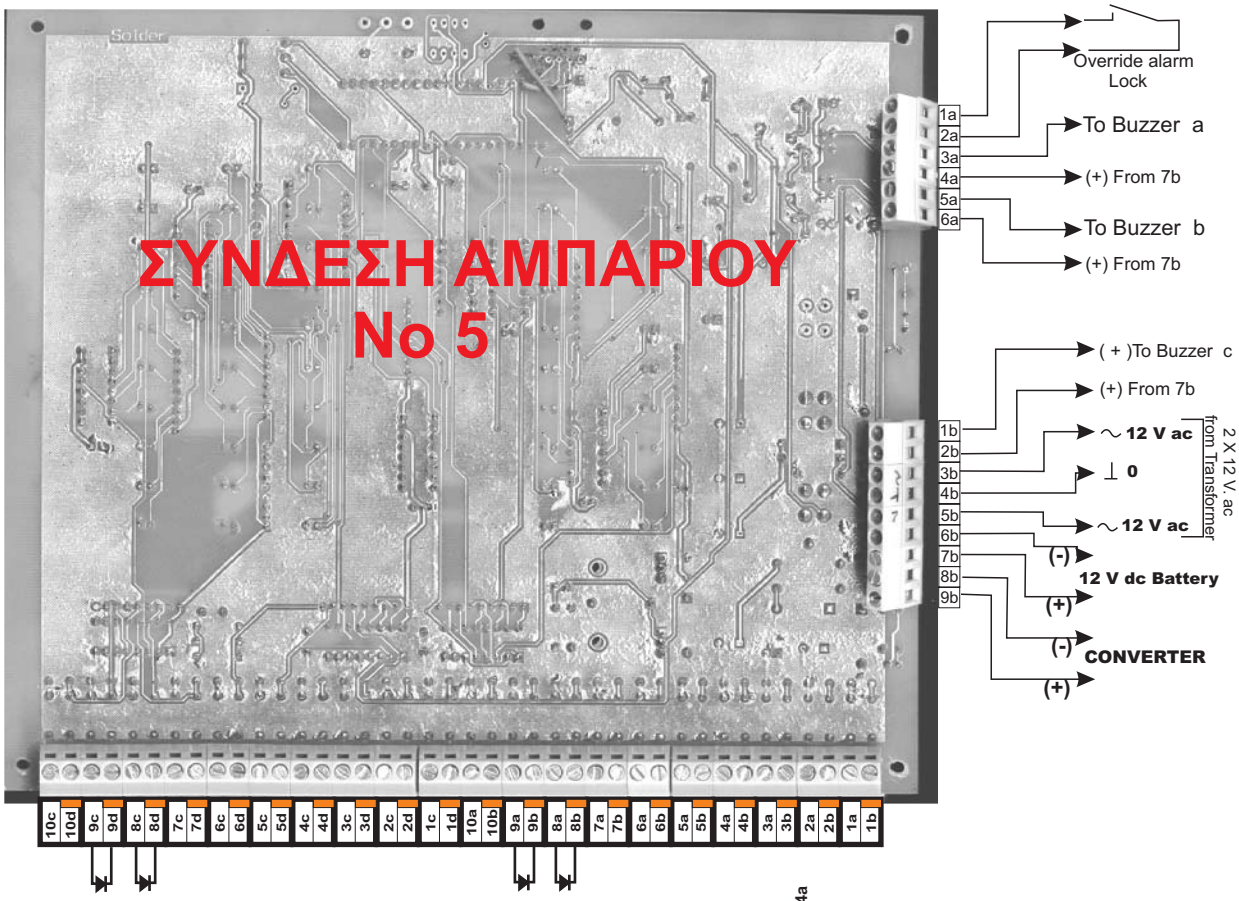
RESISTOR VALUE :
50 KΩ > R > 20 KΩ

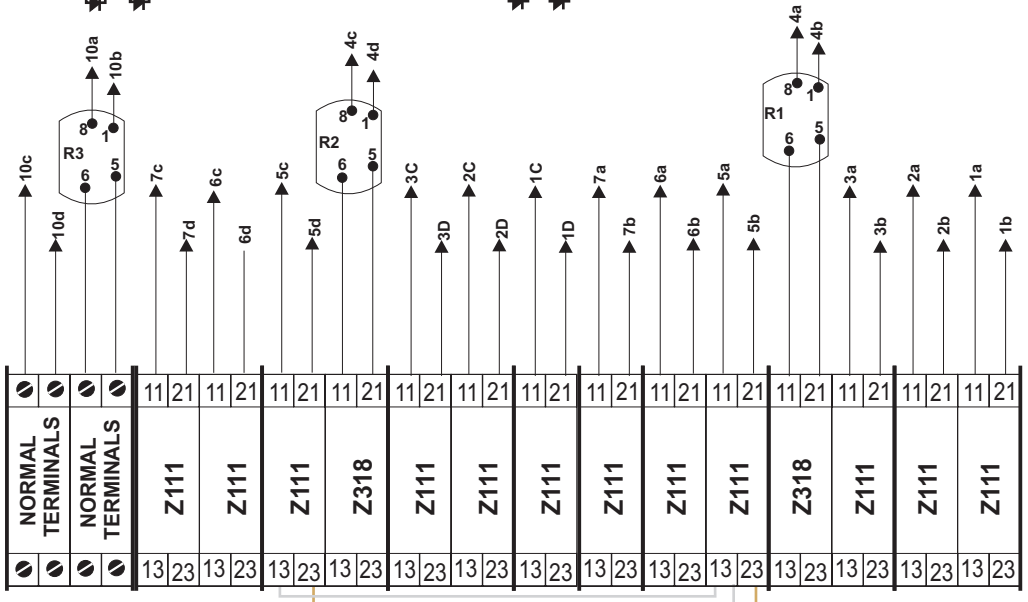
DIODE TYPE SENSOR FOR ALL CARGO HOLDS EXEPT (BALLAST TANKS - CARGO HOLDS)+ FORE PEAK

1=C.HOLD No.1 (0.5m SENSOR)
2=C.HOLD No.2 (0.5m SENSOR)
3=C.HOLD No 3 (0.5m SENSOR)
4=C.HOLD No.4 (0.5m SENSOR)
5=C.HOLD No.5 (0.5m SENSOR)
6=C.HOLD No.6 (0.5m SENSOR)
7=C.HOLD No.7 (0.5m SENSOR)

11=C.HOLD No.1 (2m SENSOR)
12=C.HOLD No.2 (2m SENSOR)
13=C.HOLD No 3 (2m SENSOR)
14=C.HOLD No.4 (2m SENSOR)
15=C.HOLD No.5 (2m SENSOR)
16=C.HOLD No.6 (2m SENSOR)
17=C.HOLD No.7 (2m SENSOR)

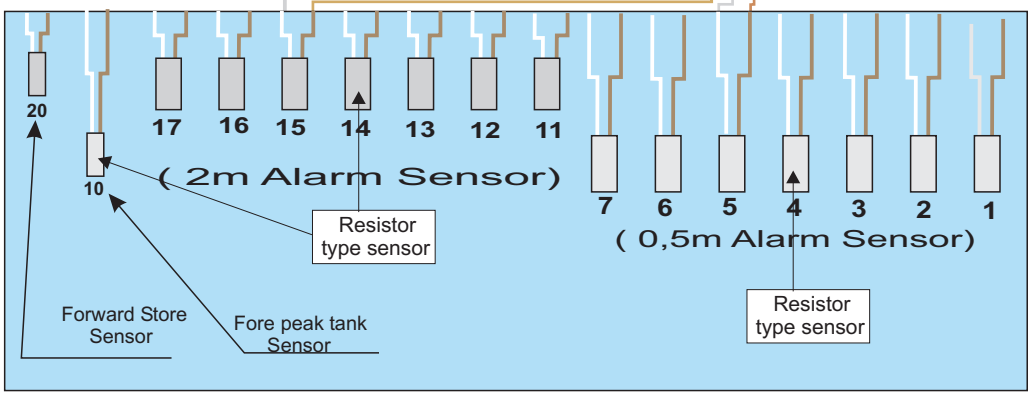
Zener Barrier Connection Diagram
M/V SEA CHARM





THERE ARE TWO DIFFERENT TYPES OF ZENER BARRIERS. THE CORRECT TYPE OF ZENER BARRIERS MUST BE CONNECTED TO THE APPROPRIATE PCB CONNECTIONS IN ACCORDANCE WITH THE DIAGRAM

EXISTING 3 CONDUCTOR CABLE



THERE ARE TWO DIFFERENT TYPES OF SENSORS. THE CORRECT TYPE OF SENSOR MUST BE CONNECTED TO THE APPROPRIATE PCB CONNECTIONS IN ACCORDANCE WITH THE DIAGRAM. SENSORS INTENDED TO BE INSTALLED IN BALLAST TANKS / FOREPEAK ARE MARKED WITH THE WORD "BALLAST".

R — RESISTOR TYPE SENSOR FOR (BALLAST TANKS - CARGO HOLDS)+ FORE PEAK

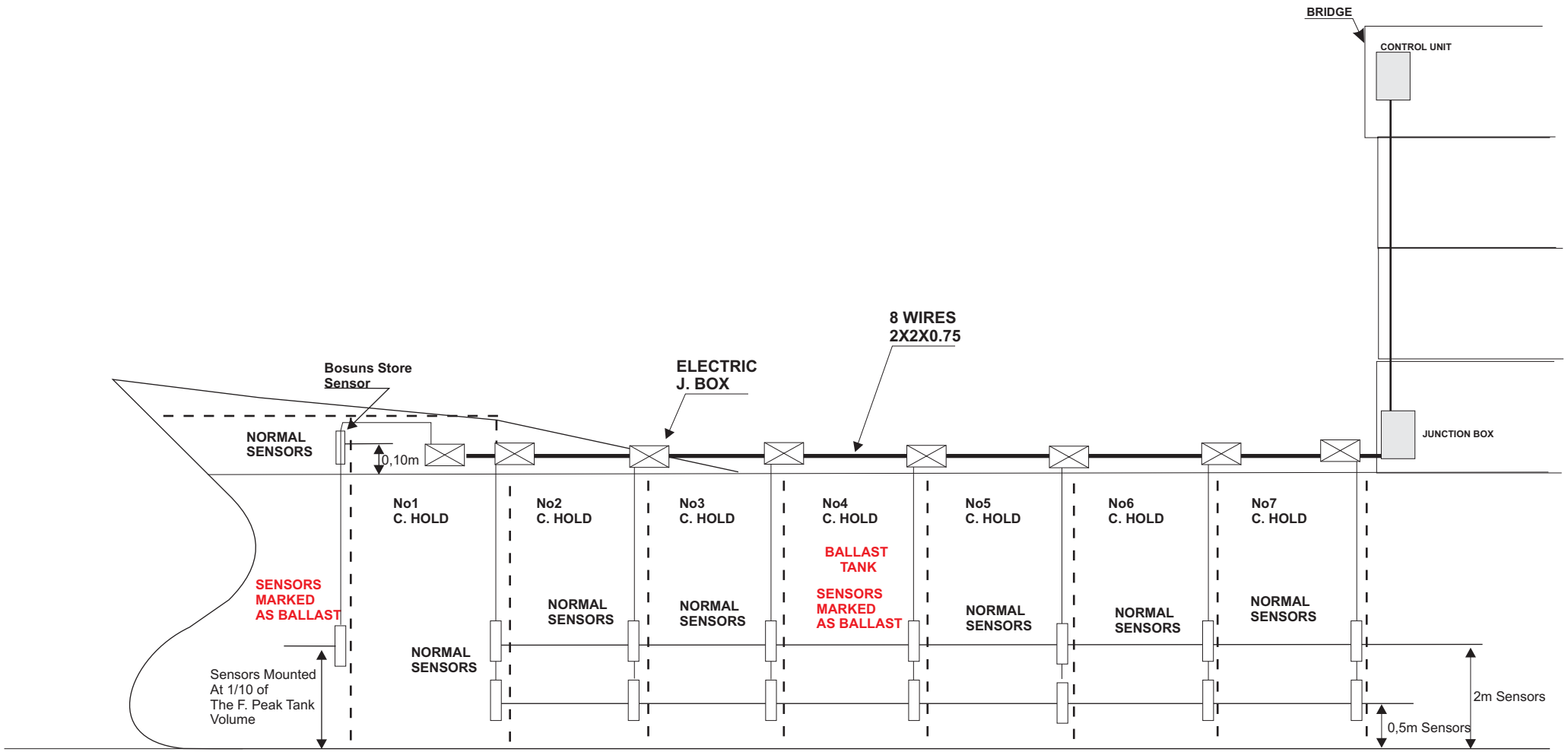
RESISTOR VALUE :
50 KΩ > R > 20 KΩ

DIODE TYPE SENSOR FOR ALL CARGO HOLDS EXEPT (BALLAST TANKS - CARGO HOLDS)+ FORE PEAK

1=C.HOLD No.1 (0.5m SENSOR)
2=C.HOLD No.2 (0.5m SENSOR)
3=C.HOLD No 3 (0.5m SENSOR)
4=C.HOLD No.4 (0.5m SENSOR)
5=C.HOLD No.5 (0.5m SENSOR)
6=C.HOLD No.6 (0.5m SENSOR)
7=C.HOLD No.7 (0.5m SENSOR)

11=C.HOLD No.1 (2m SENSOR)
12=C.HOLD No.2 (2m SENSOR)
13=C.HOLD No 3 (2m SENSOR)
14=C.HOLD No.4 (2m SENSOR)
15=C.HOLD No.5 (2m SENSOR)
16=C.HOLD No.6 (2m SENSOR)
17=C.HOLD No.7 (2m SENSOR)

Zener Barrier Connection Diagram
M/V SEA CHARM



ComAS ELECTRONIC	**DRAWING No 14**
WATER INGRESS AL. SYSTEM	**M/V SEA CHARM**

Tel. No.: +30-210-4610493 – Fax No.: +30-210-4633823 – e-mail: comas@acn.gr

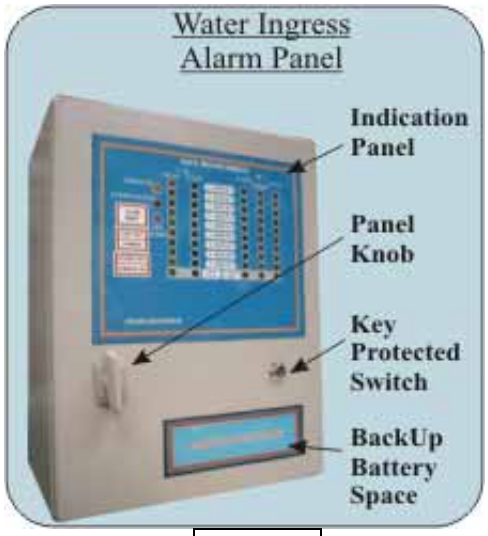
A. *Water Ingress Alarm Panel Function Description.*

i) SYSTEM COMPONENTS

The Water Ingress Alarm complete package includes the following components:

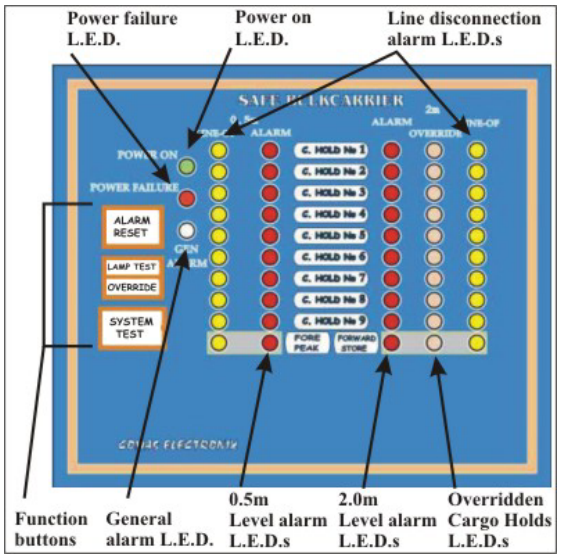
- ✓ **Monitoring Alarm Panel** (mounted on bridge)
  - a) Main Control Card
  - b) Battery Charger
  - c) BACKUP Battery
  - d) Mixture and Clean Water Detection cards (C.W.D.)
- ✓ **Zener Barriers** (mounted in a junction box, which is located in the accommodation area)
  - Manufacturer: CEAG Apparatebau Hundsbach GMBH
    Type: SB0028
    SB1250
  - Manufacturer OSNA electronics
    Type Z111 and Z318
- ✓ **Water Ingress Sensors** (IP68 with 35m cable on each sensor). A maximum number of 22 sensors can be connected on the system.

The Main Alarm Panel is illustrated briefly in picture 1.1.



picture 1.1

ii) MAIN PANEL DESCRIPTION



The SafeBulkCarrier general alarm panel arrangement is illustrated in the picture bellow (picture 2.1).

picture 2.1

When the system is powered on, it automatically starts to test itself for all the bellow listed FAULTS. These fault alarms are in accordance with SC180.

a) Disconnected lines (sensor)
b) Short-circuits (sensor)
c) Ground Fault

Our system is completely isolated from all the vessels power supplies (24VDC, 110VAC and 220VAC) so, in case that the electrodes cables comes in touch with the vessel's ground, the system is not affected.

In case when both cables of the same electrode come in touch with the vessel's ground, then we have a short-circuit, which is indicated by the system.

The sensors which are connected through the C.W.D. function the same way.

If in any case the power supply to the C.W.D. is interrupted, then the system will indicate a line problem to the

relative sensor, because the C.W.D. is used as a sensor for the particular point.

d) CPU failure
In the case when the buzzer relative the SYSTEM FAILURE starts sounding and the GENERAL ALARM L.E.D. does NOT flicker, but remains lit, then the system CPU is damaged and a technician is needed.

e) Power Failure

The Alarm Panel consists of six different visual indication groups (L.E.D.s), three different sounding indications and three function buttons. These items are listed bellow and are described in more detail in the next paragraphs. All alarms relative to Level Sensors have a time delay of 18 seconds in order to avoid false alarms.

Visual Indications:
The following visual alarms and indicators do NOT interfere with the night vision:

- ✓ **Level Alarm**
  There are two different group of red Level Alarms (picture 1.1, 0.5m/2.0m). Last LED in each row indicates Level Alarm in forepeak (left row) and forward store (right row).
- ✓ **Ground Fault**
  Our system is not required to be equipped with Ground Fault Alarm because our sensor's electrodes are totally separated.
- ✓ **Line Short-Circuit**
  There is one Yellow LED for each sensor installed. Yellow LED is lit when problem to the sensor connection occurs.
- ✓ **Line Disconnection**
  There is one Yellow LED for each sensor installed. Yellow LED is lit when problem to the sensor connection occurs.
- ✓ **Overridden Alarms**
  There is one row of ten orange LEDs, 1 LED for each cargo hold / forepeak / forward store
- ✓ **Power On**
- ✓ **Power Failure**
- ✓ **General Alarm**

Sounding Indications:
Three different in pattern buzzer sounding alarms are installed inside the alarm panel.

Our system has one sounding indication for each of the bellow alarms:

- ✓ **0.5m level alarm indication**
- ✓ **2.0m level alarm indication**
  The same sounding pattern is used for ballast tanks / void spaces
- ✓ **System Failure**
  a) Sensor Line Disconnection
  b) Sensor Line Short-Circuit
  c) Power Supply Failure
  d) CPU Failure

Function Buttons:

- ✓ **Alarm reset**
- ✓ **Lamp test**
- ✓ **System Test**
- ✓ **Override alarm**

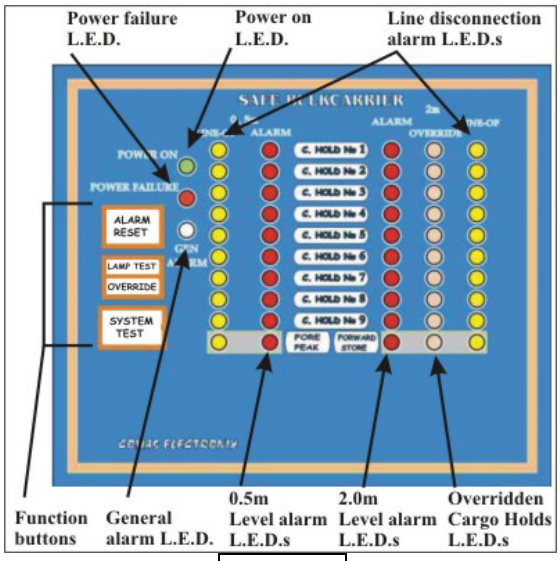
iii) POWER ON

The *SafeBulkCarrier* water ingress alarm panel is powered on immediately when connected to one of the three available power supply inputs (Backup Battery, 24VDC, 220VAC). At this point please note that if a "*POWER FAILURE"* alarm is activated (relative L.E.D. and beeper are activated), one or both the following have occurred:

- ✓ The battery is damaged and needs to be replaced
- ✓ One (or both) of the Primary Power Supply Sources (24VDC/220VAC) does not supply the system

iv) MAIN PANEL FUNCTIONS

The SafeBulkCarrier Water Ingress Alarm Panel is equipped with three operation buttons (picture 4.1). The user can handle a total of five functions, two of which are locked with a key switch (picture 1.1, 4.1).



picture 4.1

The functions are relative to type of user and are listed bellow.

Normal User (Key at LOCK position):

- ✓ **Reset Alarm**
  When an alarm (refer to list in paragraph 1) occurs, then the General Alarm LED and the relative alarm LED start flashing, and the equivalent sounding alarm is initiated. By pressing the Reset Alarm button, the user stops the sounding alarm, the General Alarm and relative alarm LED flashing. The General Alarm will remain permanently lit until all alarm conditions cease to exist. The relative alarm LED will remain lit until the conditions that caused it return to normal.
- ✓ **Lamp Test**
  When this button is pressed, all Alarm Panel LEDs are lit.
- ✓ **System Test**
  The Water Ingress Alarm System (Panel and Sensors) is tested. If all LEDs start flashing and buzzers start sounding, there is no problem with the system. In any other case, there is a fault on the system and technical help is needed.

Master User (Key at UNLOCK position):

- ✓ **Override Alarm**
  The "safe bulk carrier" system has the capability to override the LOW and HIGH alarms **ONLY** in cargo holds used as ballast tanks and ballast tank spaces (forepeak, bosun store, etc.). The procedure is very simple.
  When the ballast tanks are filled with water, and all their alarms are activated, the user turns the key to the OVERRIDE position and press the "OVERRIDE" button. All the ballast tanks alarms are now overridden.
  When the ballast tanks are discharged, the alarms return automatically to their default function and they are ready to detect a new alarm state.

v) LEVEL SENSORS

Our Level Sensor's principle is based on Electrode Level Measurement. They are made of stainless steel (316) metal and come with lifetime guaranty. For further details regarding the construction and installation methods please refer to the attached drawing (drawing 7).

Technical Information:

Sensor Accuracy: ± 1cm

Operating Temperature: -30 – 80^{o}C

vi) MAINTENANCE

Electronic and Electrical Part: Our Water Ingress Alarm System's electronic and electrical part does not require any maintenance.

Sensors:

a) Installation through stool: The sensor's piping entrance for the water/cargo mixture must be cleaned after every cargo discharge.

b) Installation through Cargo Hold: The sensor must be cleaned after every cargo discharge.

vii) TESTING THE SENSORS

a) Installation through stool: The sensor must be removed from the piping by unscrewing the pipe coupling (drawing 4 **A**). In order to test the sensor respond, simply submerge the sensor into a container filled with water. The relative Sounding and Visual alarm must be activated.

b) Installation through Cargo Hold: In order to test the sensor respond, simply submerge the sensor into a container filled with water. The relative Sounding and Visual alarm must be activated.

B. ***System Part List***

Water Ingress Alarm System Package includes the following parts:

Part Name	**Description**	**Quantity**
Main Panel PCB Card	Central Alarm Processing Card installed in the Main Alarm Panel	1
C.W.D. Unit	Cargo-mixture and Clean Water Detection Unit installed inside the Main Alarm Panel	(Varies with No. of Ballast Tanks / Void Spaces)
Power Supply Transformer	220VAC – 2x12VDC converter (isolated from vessels ground)	1
0.5m Buzzer	Sounding Alarm for the LOW LEVEL alarm (0.5m)	1
2.0m Buzzer	Sounding Alarm for the HIGH LEVEL alarm (2.0m) and Ballast Tank / Void Space alarm	1
System Failure Buzzer	Sounding Alarm in case of Short-Circuit, Discontinued Circuit, CPU Failure, Primary Power Supply Failure, Damaged Battery.	1
Key-Protected Switch	Protection Switch for overriding Cargo Holds used as Ballast Tanks ONLY	1
Key for Key-Switch	-	2
Zener Barriers	Intrinsic Safety Equipment mounted in the Main Junction Box installed in the Accommodation Area Type: SB0028 OR SB1250 Osna Type :Z111 Z318	(Varies with No. of Cargo Holds /
Level Sensor	IP68 Level Sensors installed in Cargo Holds / Ballast Tanks / Void Spaces). Sensors come with 35m mounted cable (IP68 requirement)	(Varies with No. of Cargo Holds / Ballast Tanks / Void Spaces)

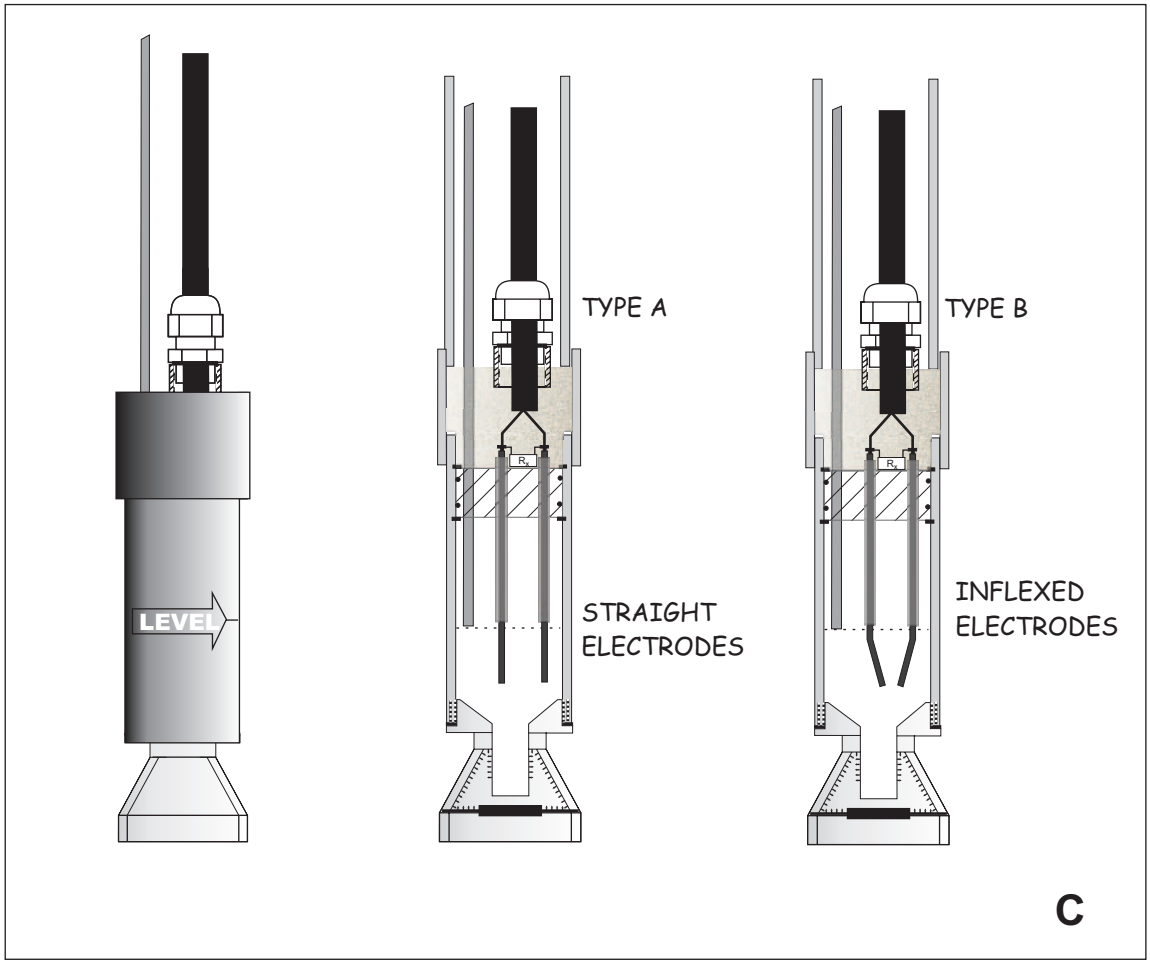
C. *System Installation*

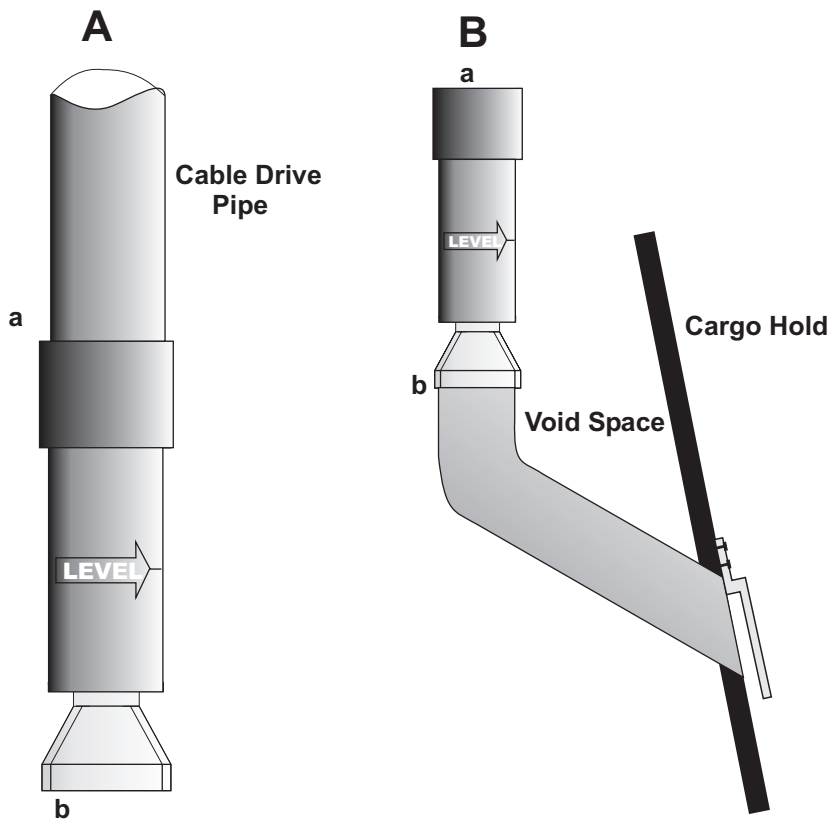
WATER INGRESS ALARM SYSTEM INSTALLATION DESCRIPTION

- The level sensors (drawing No 2) consist of a cylinder made of metal, inside of which a pair of protected electrodes is mounted.

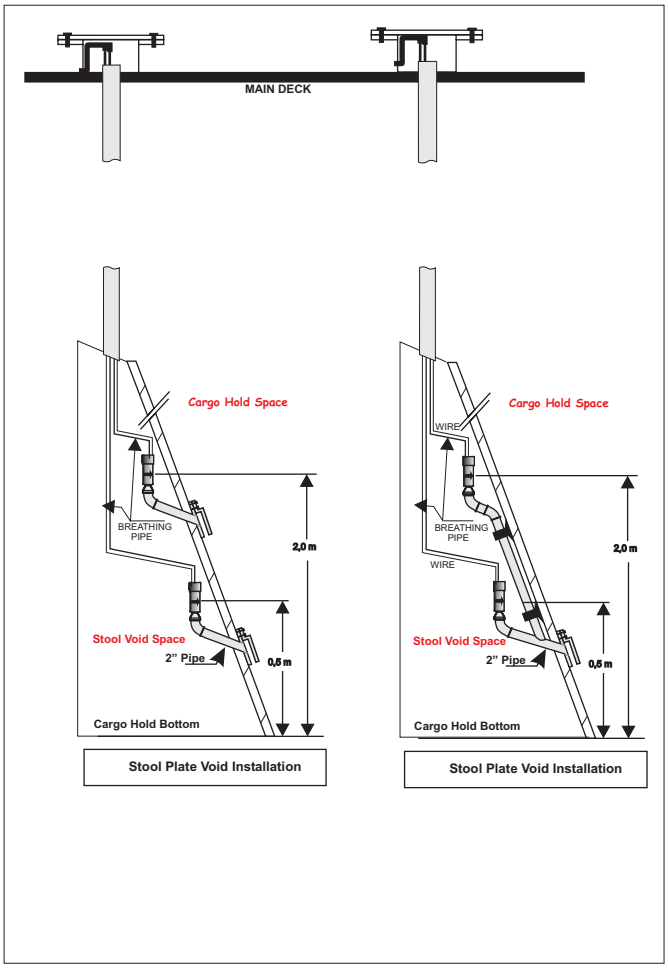
From the one side of the cylinder (a) the sensor cables and breathing pipe exit the sensor body while at the same time, the cylinder's end has a thread in order to be connected to the cable drive pipe as a main pipe (drawing No 2 part A).
On the other side of the fore mentioned metallic cylinder (drawing No 2 part A and B, point β) the Dry Cargo Blocking Valve is installed, which, on its one side bears an internal thread in order to be connected (as a component) on the pipe from where the sea water-cargo mixture will enter the sensor from the cargo hold, in the case where the sensor is installed in the void space area (drawing No 2, part B).

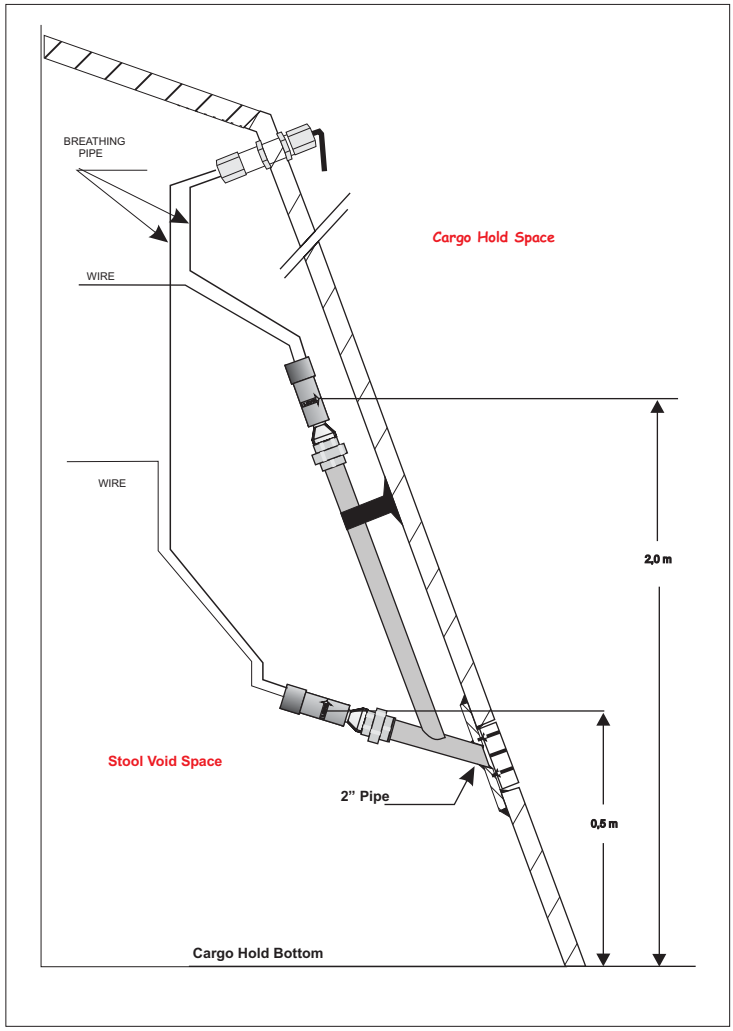
- In case the wiring is done thru main deck, at the point where the Cable Drive Pipe which covers the cables on their way to the Deck, a cylindrical box penetrates the deck.
- In case the wiring is done through the Duct Keel, the breathing pipe will have to be driven on the deck, or back in the c. hold, or install one air vent valve (drawing 3).
- At the last cargo hold, which is beside the Engine Room, the sensors can be installed inside the Duct Keel Access Trunk (drawing 4).

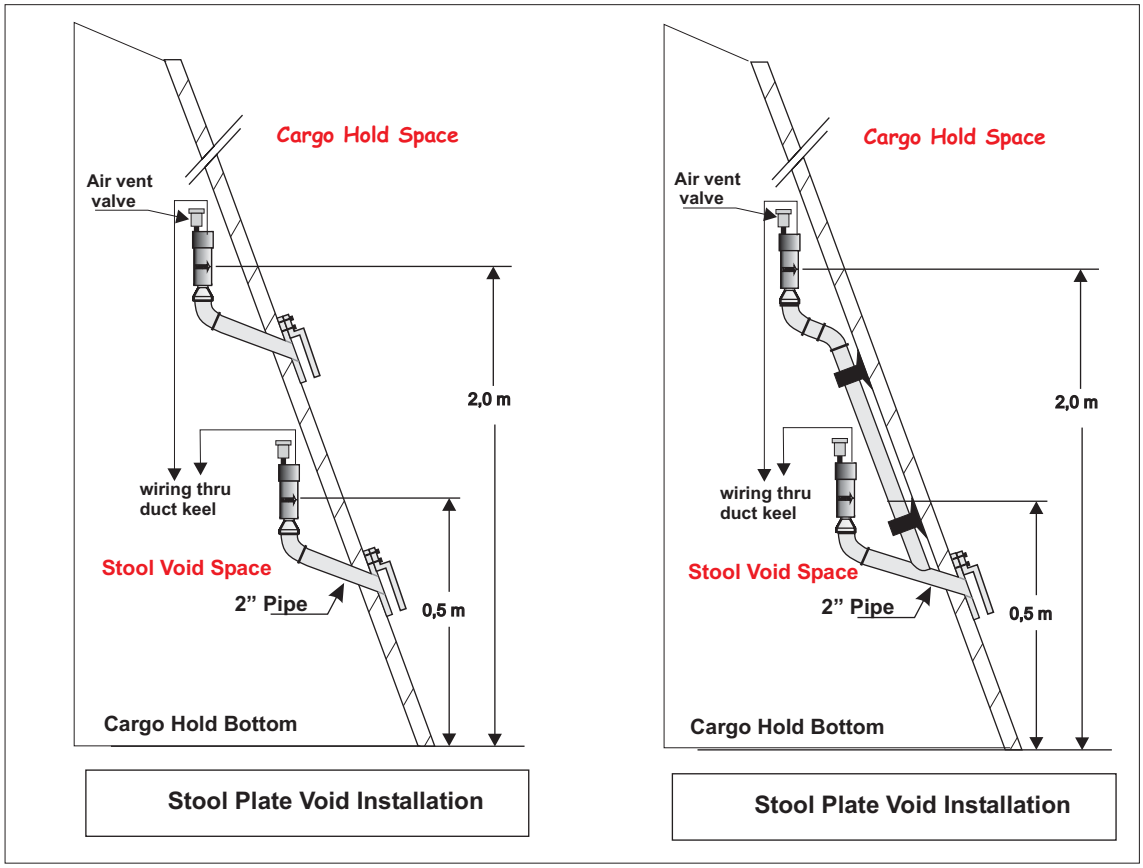




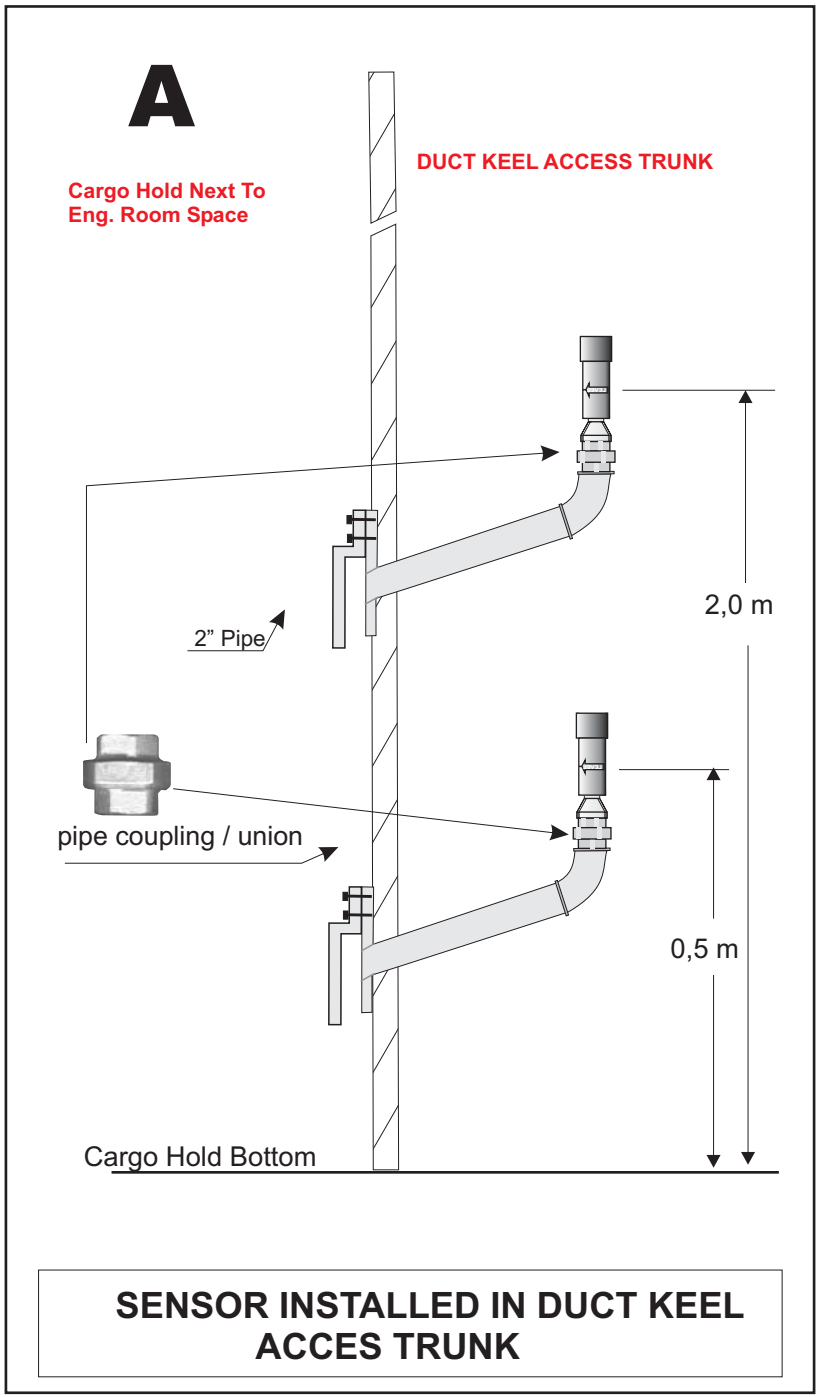
ComAS ELECTRONIC	**DRAWING No 2**
Sensor **BC 300 1A** Installation Procedures	



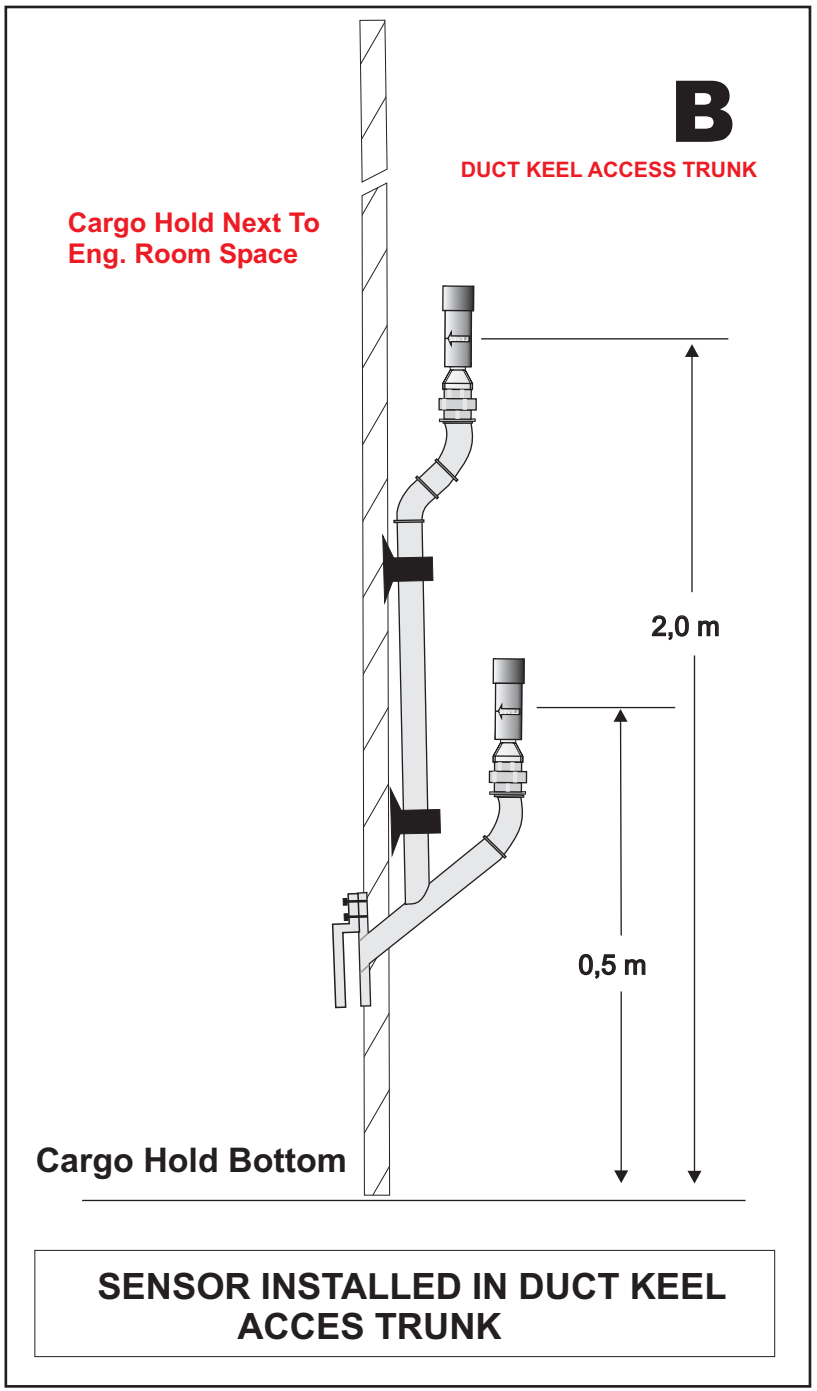




ComAS ELECTRONIC	**DRAWING No 3**
INSTALLATION OPTIONS	



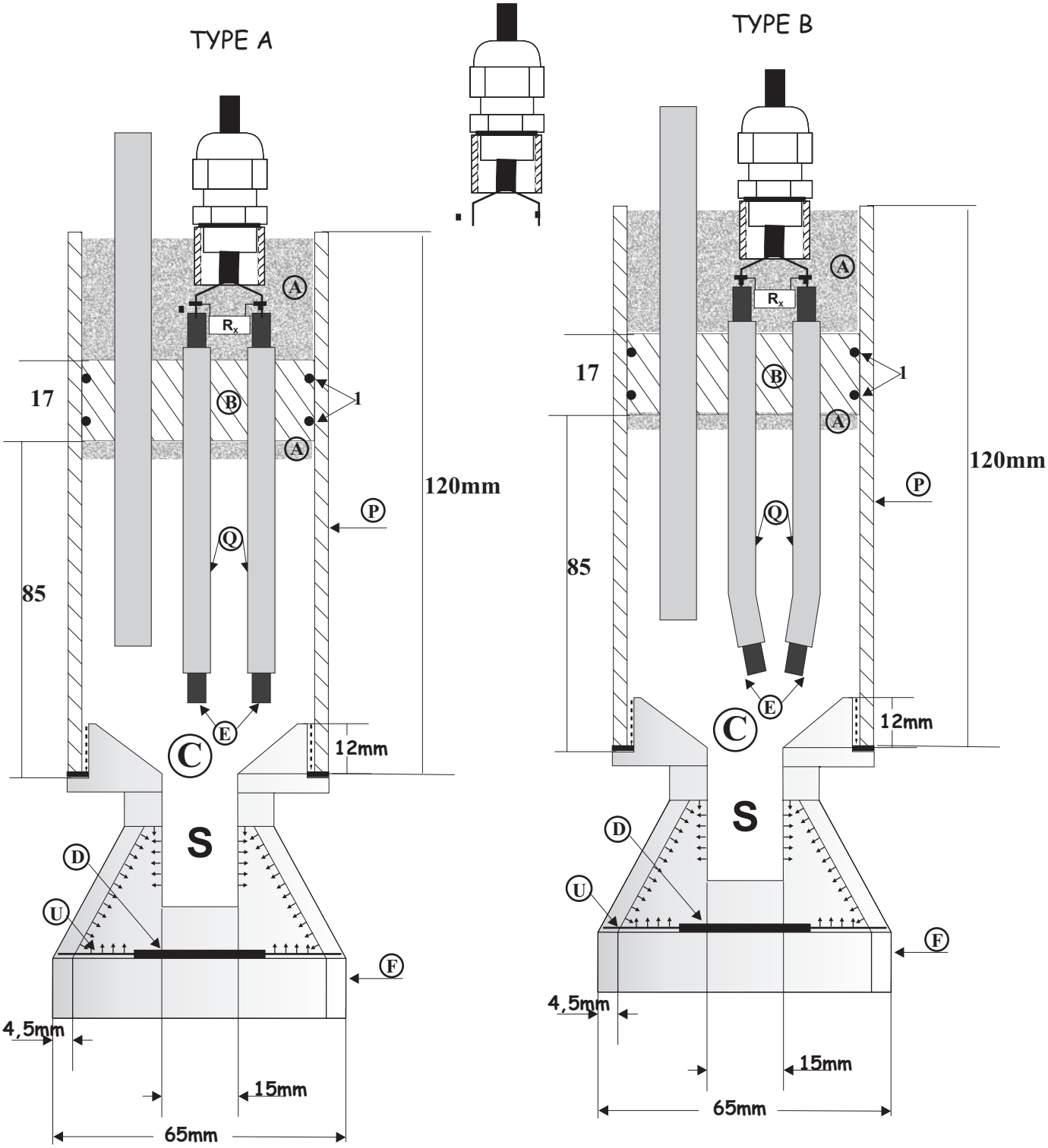
SENSOR INSTALLED IN DUCT KEEL ACCES TRUNK



SENSOR INSTALLED IN DUCT KEEL ACCES TRUNK

ComAS ELECTRONIC	**DRAWING No 4**
Sensor Installation IN Duct Keel Access Trunk	

SENSORS BC-300-1A



ComAS ELECTRONIC	**DRAWING No 7**
Sensor BC - 300 - 1A	

LEVEL SENSOR PARTS LIST

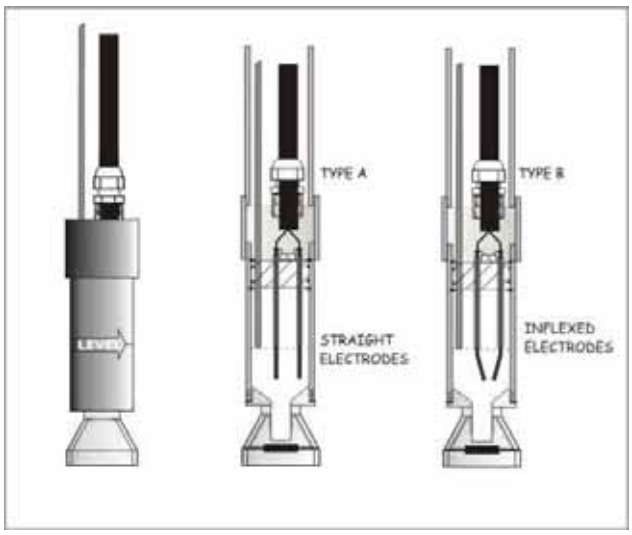
P	Pipe 2''	Stainless steel
F	Dry cargo blocking valve	Stainless steel
E	Electrodes D= 8mm	Stainless steel
K	Exhaust pipe D=12mm	Nylon
1	'o' Ring	Viton
A	Space filed	Epoxy resin
B	Cylindrical insulating (air –tightly) material with items Q, and K impacted	Ertacetal
Q	Electrodes insulation	Nylon
S	Pipe D= 17 mm	Stainless steel
D	Diaphragm	Stainless steel
U	Wire-netting (hole size 2.2x2 mm)	Stainless steel

D. System Wiring

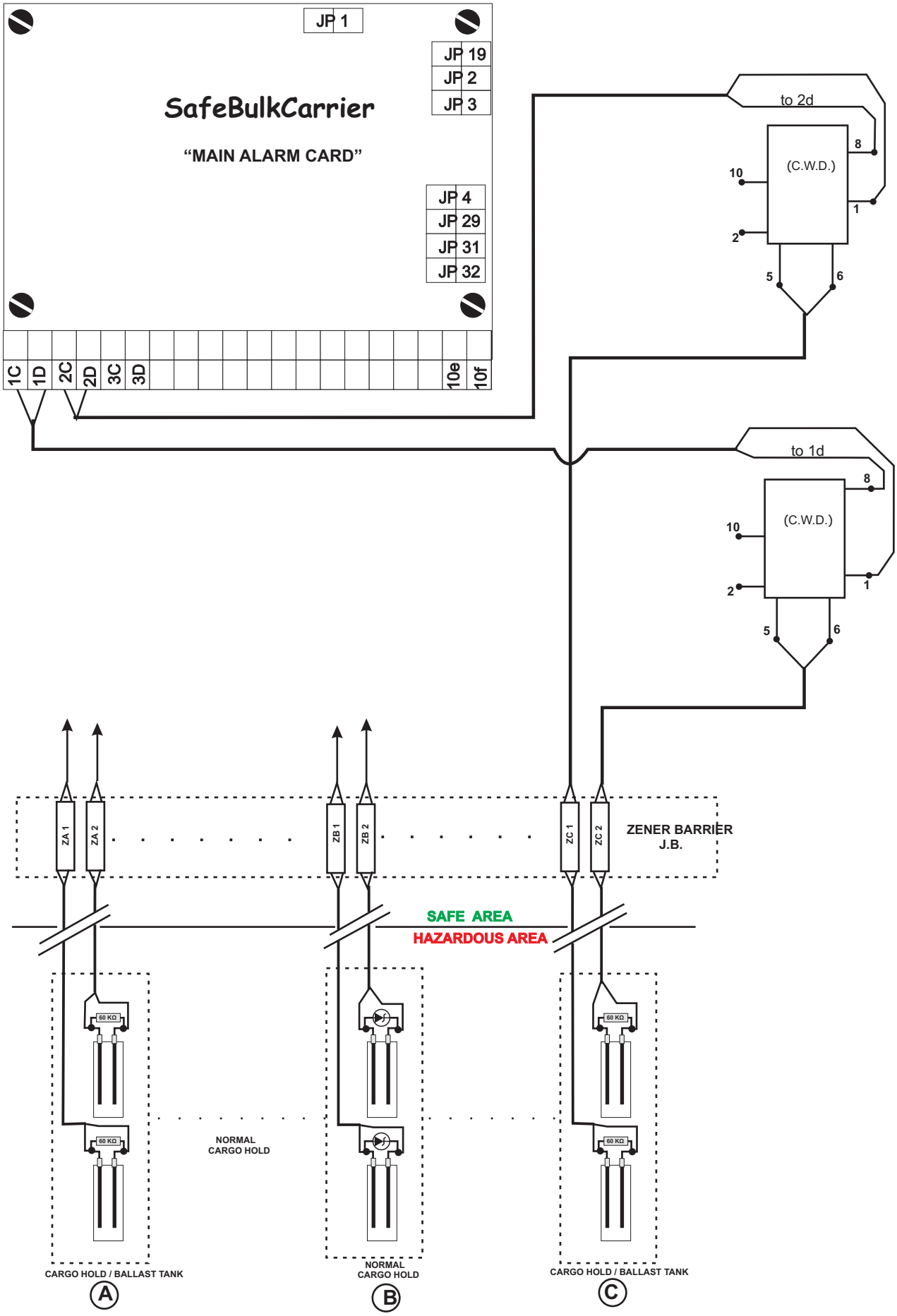
WATER INGRESS ALARM WIRING DESCRIPTION

Our system consists of:

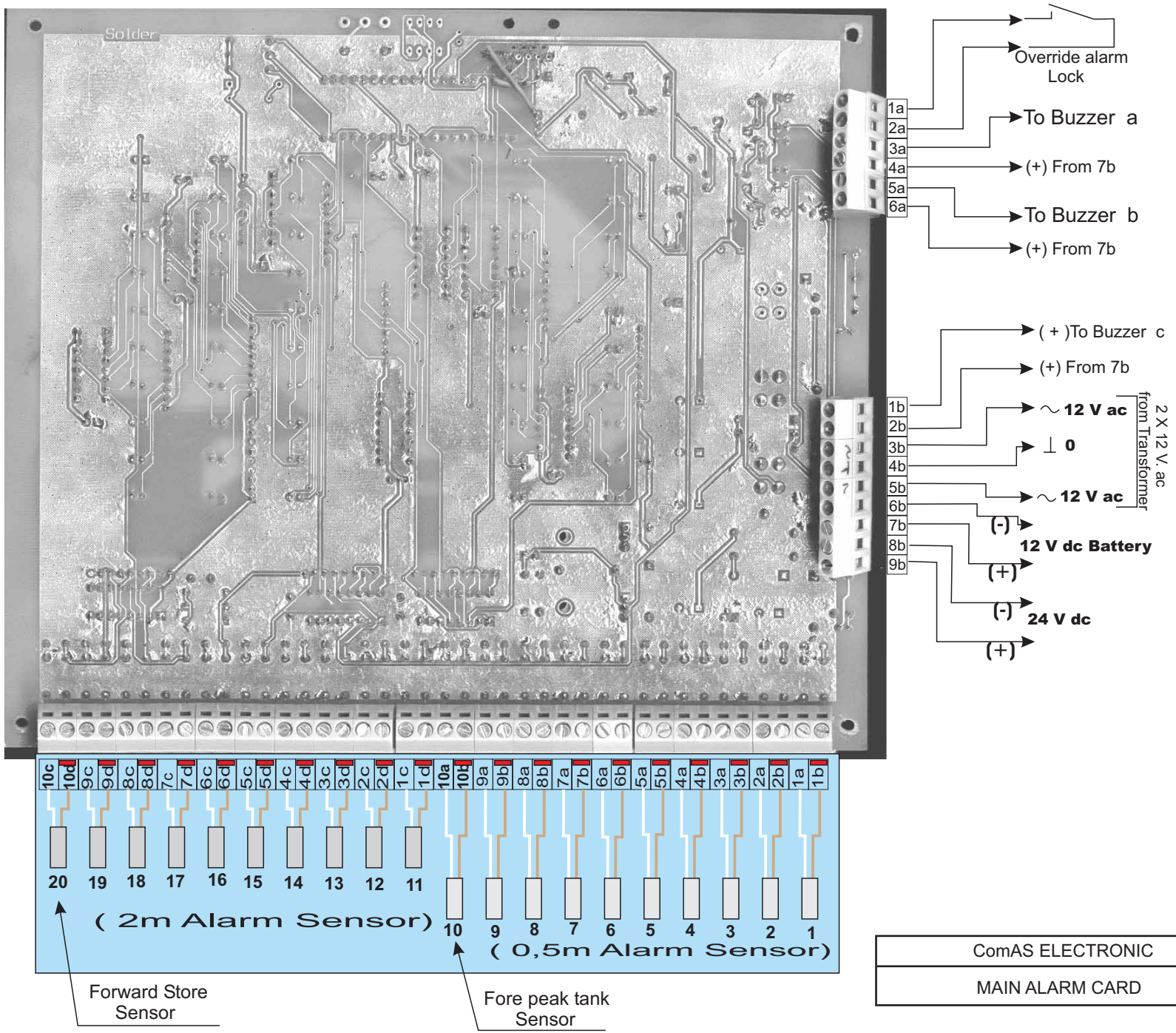
1. Two types of ‘’level sensors’’, which are completely identical. The only difference is that one type of sensor is equipped with Straight electrodes (type A) while the other type of sensor is equipped with inflexed electrodes (type B) drawing 6. Both types of sensors can have connected across their electrodes either a resistor or a diode. The ‘’level sensor’’ equipped with the resistor, is used in cargo holds that are also used as ballast tanks (drawing No 8, cargo hold A and C) while the level sensor which is equipped with a diode το is used in cargo holds that are only loaded with cargo (drawing No 8, cargo hold B)
2. The “C.D.W.’’ is an electronic relay. Its input is connected (terminal 5 and 6 Drawing No 8, cargo hold A, and C), through a zener barrier with a 2 χ 0,75 cable, to a sensor equipped with a resistor, which is designed to detect not only clean sea water but also any sea water mixture. The “C.D.W.’’ output (terminal 1 and 8 drawing No 8, cargo hold A and C) is connected to the (Main Alarm Card) of the water ingress alarm panel.
3. The ‘’level sensor’’ which is equipped with a ‘’diode’’, is installed in cargo holds which are loaded only with cargo. The sensors are connected with a 2 χ 0,75 cable to the ‘’zener barrier’’, and with a 45 core cable it is connected to the main alarm card input (drawing No 8, cargo hold B).
4. The main alarm card is installed in the main alarm panel drawing 1. On its one side of the card the terminals (drawing No.5) that connect to the sensors and CWD outputs (if installed on the vessel) can be seen. Sensors installed at 0,5m position are connected to terminals 1a + 1b up to 10a + 10b, while sensors installed at 2,0m position are connected to terminals 1c+1d up to 10c+10d (Drawing 5).
   On the other side of the Alarm Card, the above are connected:
   The buzzer
   The power supplies
   The override alarm lock
   Drawing No 5



Drawing No 6



ComAS ELECTRONIC	**DRAWING No 8**
WIRING THROUGH (C.W.D.) CLEAN WATER DETECTOR RELAY Cargo Hold	



ComAS ELECTRONIC	**DRAWING No 5**
MAIN ALARM CARD	

PRE - INSTALLATION CAUTION

Before proceeding with the system installation, be sure that the normal sensors are separated from the ones designed to be installed Cargo Holds used also as Ballast Tanks and fore peak.
These two types of sensors are different, and if not installed in the correct position, the system will not work correctly.

Sensors that must be installed in Cargo Holds used as BALLAST TANKS and in the Fore peak are marked with the label "BALLAST" or "FORE PEAK".
In case the marking is damaged. The sensor type can be determined by taking measurements from the sensor's cable. The resulting value of the measurement must be approximately 30 KΩ (no matter the polarity of the measurement).

INSTALLATION PROCEDURE

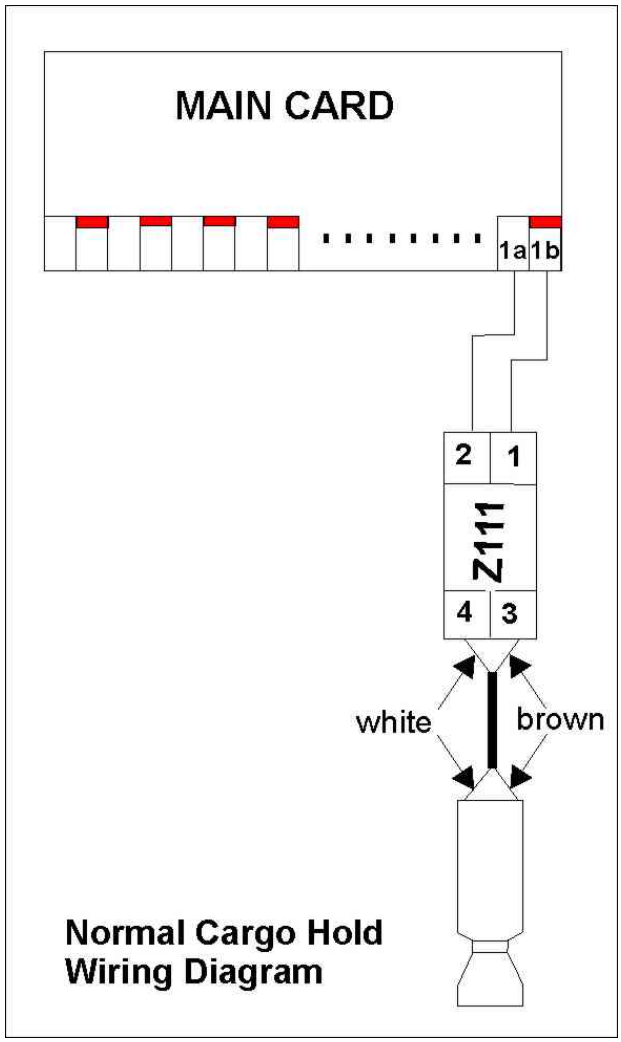
- The Level Sensor's are equipped with one pair (two core) cable (white and brown) BROWN cable must be connected to the Zener Barrier's terminal No**3.** The barrier terminal No**1** must be connected to the main card terminal marked with a red square (STATEMENT VALID FOR ALL SENSORS).

- In the Main Card input terminals (sensor inputs) (1b,1a) – (2b,2a) – (3b,3a) – (4b,4a) – (5b,5a) – (6b,6a) – (7b,7a) – (8b,8a) – (9b,9a) – (10b,10a) – (1d,1c) – (2d,2c) – (3d,3c) – (4d,4c) – (5d,5c) – (6d,6c) – (7d,7c) – (8d,8c) – (9d,9c) – (10d,10c).

- TESTING MEASUREMENTS

We connect the system to the power supply (sensors disconnected from main card). All cargo hold LINE OF alarms must be activated (yellow LEDs), except from the cargo holds that are not used, in which case a diode is connected directly on the corresponding terminals of the main card (e.g. 7b – 7a)
Voltage in each sensor terminal pair (e.g. 1a-1b, etc) should be
4,9Volt < V < 5,1Volt
If voltage measured is between these limits, the main card is working properly.

a) Sensor in NORMAL condition (connected – no water present)
2,8Volt < V < 4Volt
c) System in LEVEL ALARM condition (sensor submerged to water)



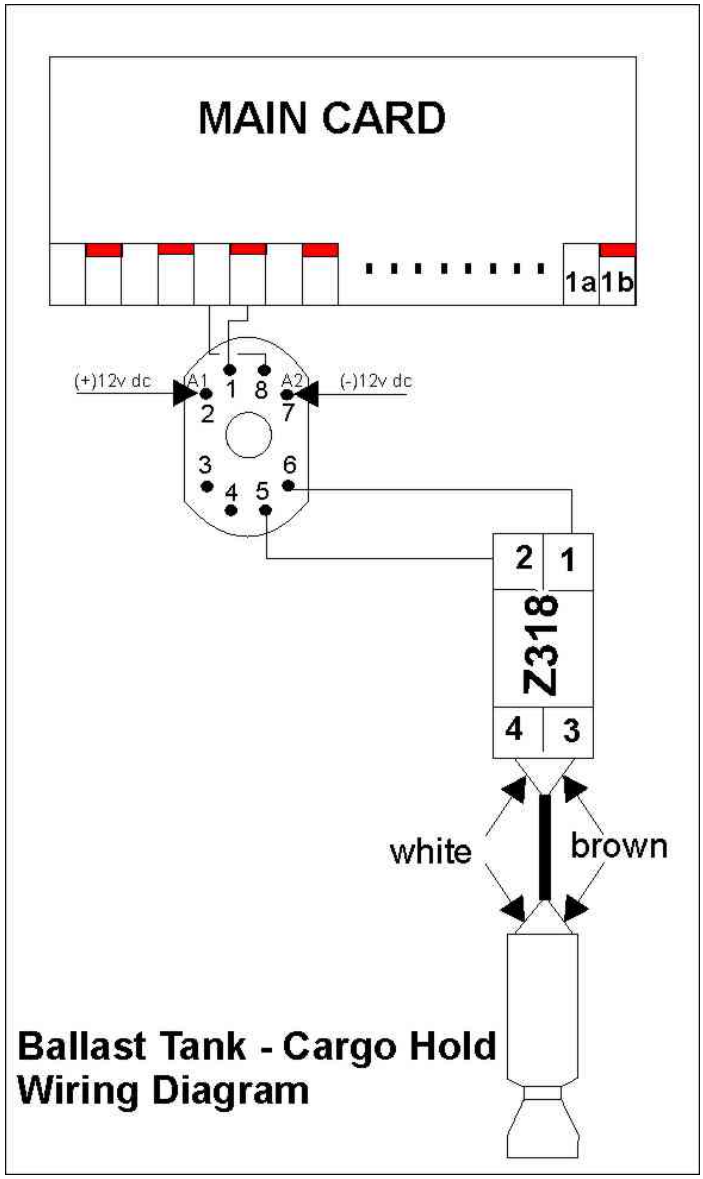
1**,5Volt > V > 0,5Volt**

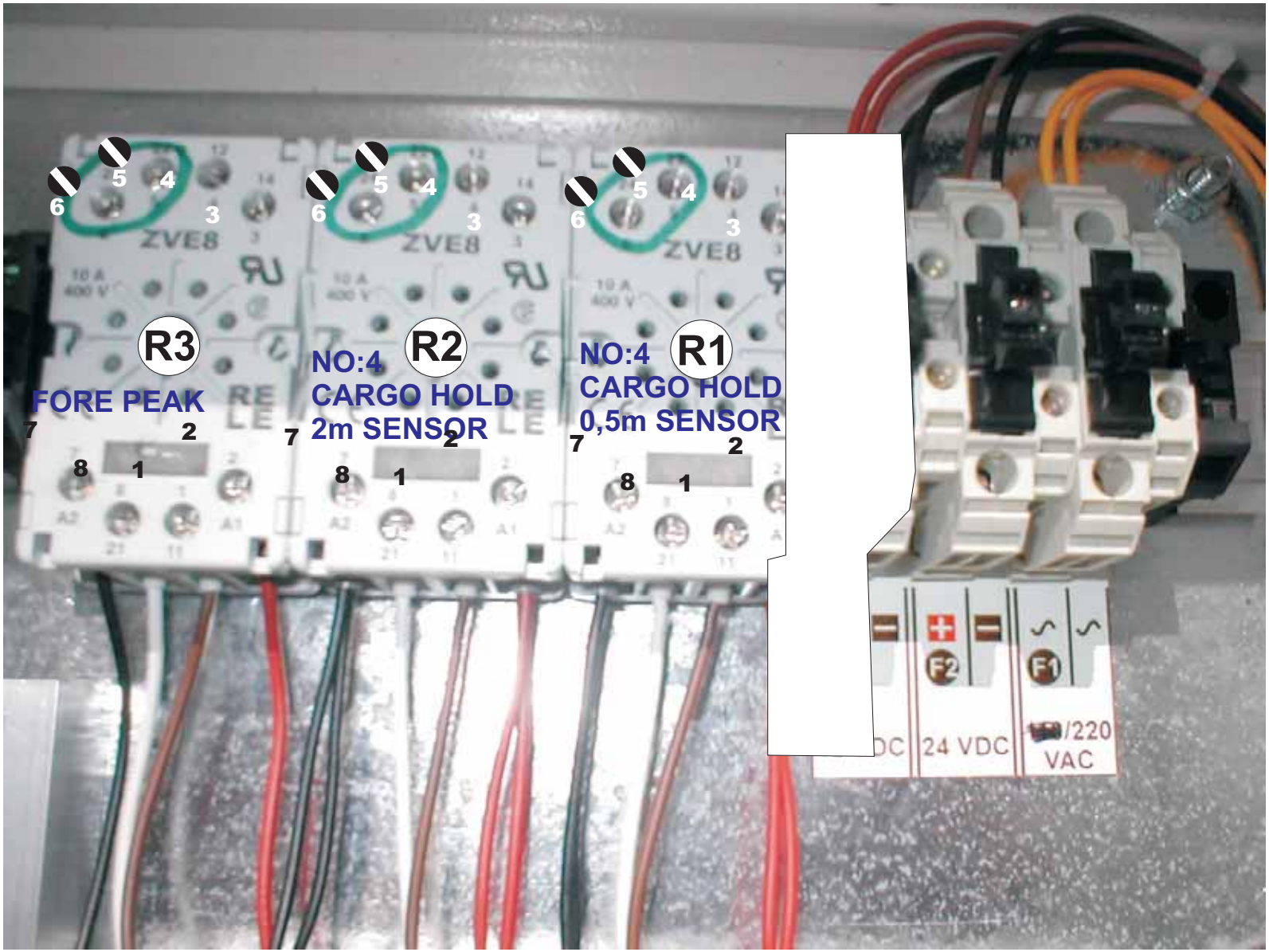
d) System in LINE OF condition (<u>line disconnected</u>)
V > 4Volt

e) System in LINE OF condition (<u>line short-circuit</u>)
V < 0,5Volt

In case one or more of the above measurements are different from the values stated above (a, b, c and d), then there is a wrong sensor connection in the wiring of the system (wrong connection in the part located either between *Level Sensor – Zener Barrier,* or *Zener Barrier – Main System Card*). In that case, please consult the attached page to correct the problem.

In case of ANY problem, please come in touch with us.





ComAS ELECTRONIC	**DRAWING No 5B**
GENERAL WIRING	