

9. TYPE-APPROVED EQUIPMENT

'Type Approval' is an independent certification service, providing certificates stating that a product is

in conformity with a specific standard or specification and verification of the production quality system.

It is based on design review, initial type testing and verification of the production process.

1 Introduction

Type Approval consists of a review of the design against the classification rules as well as against internationally accepted standards, witnessing of initial type testing and verification of the production process.

An ISO 9000 quality assurance certification of another notified body is also acceptable.

The location onboard where the equipment will be used determines part of the required testing.

Type approved equipment has also been tested and deemed suitable for the marine environment as defined in the classification rules.

European Marine Equipment Directive (MED) is intended to ease free movement of goods within the European market. Equipment certified by a notified body as per MED directive may be used on all European ships, independent of the classification.

All Classification Bureaus accept the MED certificates of other Classification Bureaus as well as MED certificates of other notified bodies.

Using type approved equipment eases class approval but does not away with the normal certification requirements as further detailed in Chapter 27 Testing and Commissioning.

2 Environmental conditions

Before type approval testing can commence the environmental conditions must be defined. The general environmental conditions for air and seawater are:

- Temperature air 45° centigrade (figures can differ for restricted services)
- Temperature seawater 32° centigrade (temperatures can differ for restricted services)
- Maximum humidity 95% not condensing,

The maximum ship movements are defined as:

- Trim: +/- 5°,
- Pitching: +/- 5°
- List: +/- 22.5°
- Roll: +/- 22.5°.

TEST		ENVIRONMENTAL CATEGORY				
		ENV 1	ENV 2	ENV 3	ENV 4	ENV 5
1	Visual inspection	X	X	X	X	X
2	Performance test	X	X	X	X	X
3	Pressure test	X	X	X	X	X
4	Insulation resistance	X	X	X	X	X
5	Power supply variation	X	X	X	X	X
6	Power supply failure	X	X	X	X	X
7	Inclination	X	X	X	X	X
8	Vibration test 1	X	X	X		X
	Vibration test 2				X	
9	Humidity test 1		X	X	X	X
	Humidity test 2	X				
10	Saltmist test					X
11	Dry heat test			X		X
	Solar test			X		X
12	Low temp. test					X
13	High voltage test	X	X	X	X	X
14	Enclosure test					X
15	EMC test	X	X	X	X	X

Basic environmental tests

ENVIRONMENTAL CATEGORIES			
CATEGORY	DESCRIPTION	AMBIENT TEMP. RANGE	
ENV 1	Controlled environment	To producers spec.	
ENV 2	Enclosed spaces subject to temperature, humidity and vibration	Min 5 °C	Max + 55 °C.
ENV 3	Enclosed spaces subject to general heat from other equipment	Min 5 °C	Max + 55 °C.
ENV 4	Mounted on reciprocating machines	Min 5 °C	Max + 55 °C.
ENV 5	Open decks	Min - 25 °C	Max + 70 °C.

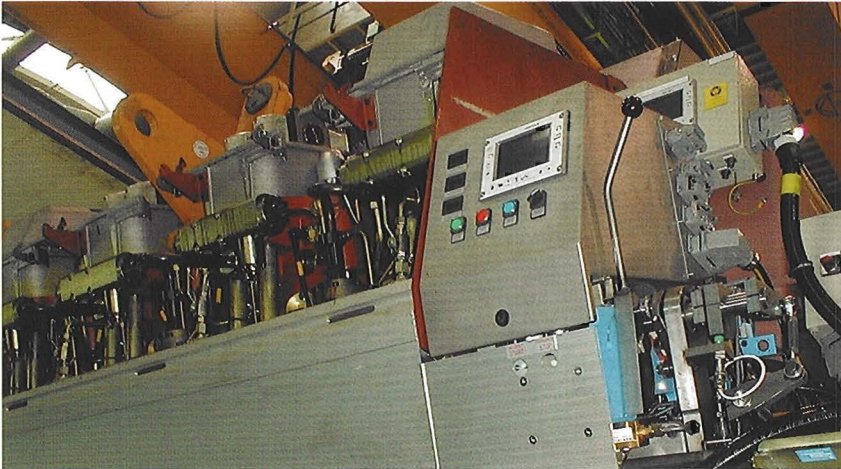


3 Type approval tests

3.1 Vibration

The object to be tested is placed on a support which is fixed to the core of an electromagnet.

The current and frequency in the coil of the electromagnet can be adjusted in order to create any desired vibration. The desired vibration is chosen in relation to the expected environment where the unit has to operate.



A modern diesel engine with standard control and monitoring system fitted on the engine. This unit has also been tested for severe vibration levels as can be expected on a diesel engine. The touch screen control box, mounted in the above control unit is tested separately.



Vibration test



Radiated and conducted interference (EMC Susceptibility) is tested in a special created environment.

VIBRATION TESTS			
ENV 1	Displacement	1.5 mm	2 - 13 Hz
General	Accelleration	10 m/sec ²	13 - 100 Hz
ENV 2	Displacement	1.5 mm	2 - 28 Hz
On engines	Accelleration	10 m/sec ²	28 - 200 Hz

3.2 Salt environment

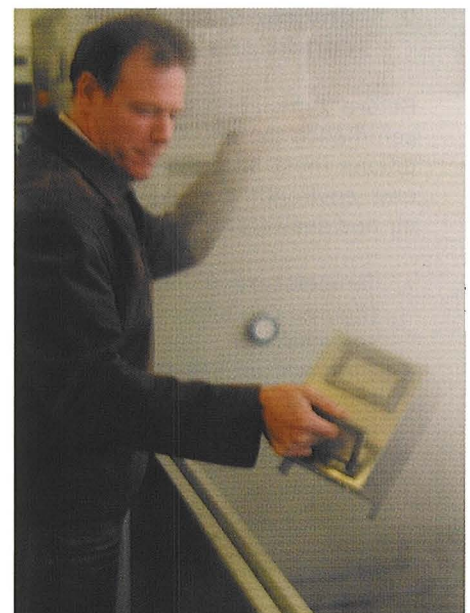
Equipment which has to be installed outside, and is exposed to the salty atmosphere, needs to be subjected

to a salt-mist test.

Therefore it is placed for a certain time in a closed box where this environment is simulated.



Salt mist test



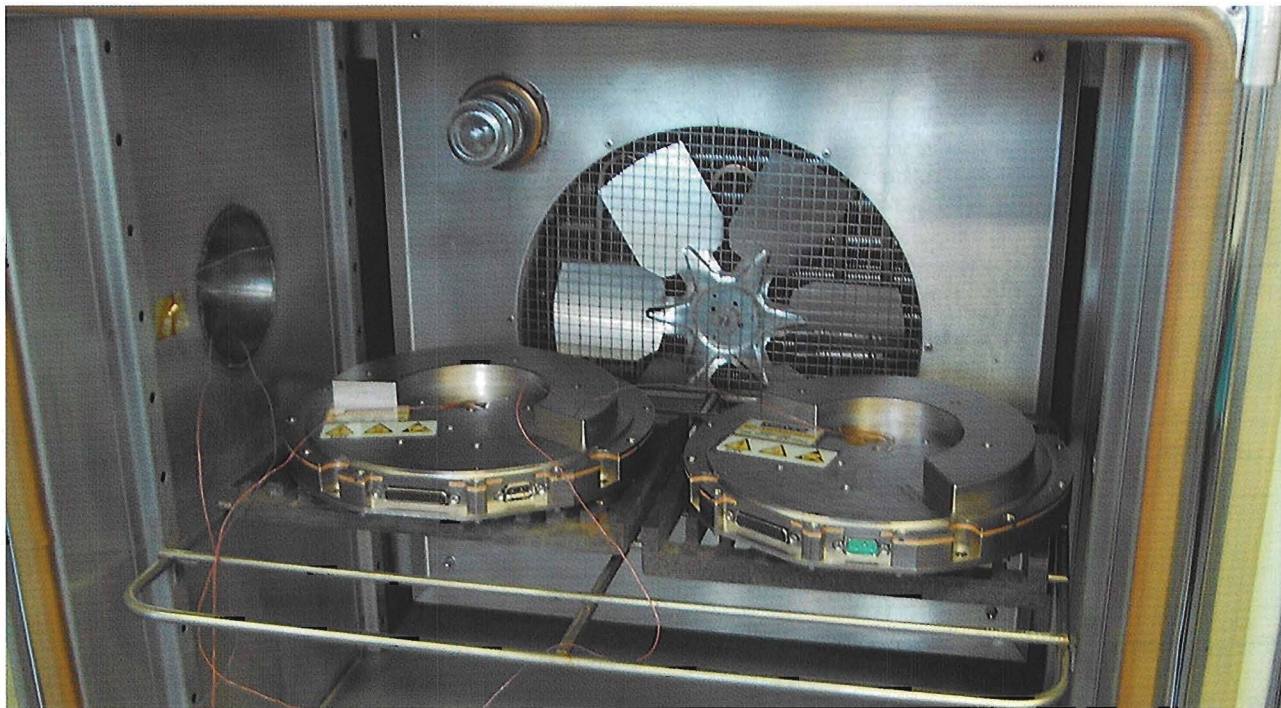
3.3 Dry heat and solar radiation

A dry heat test is required for equipment which has to be installed in spaces subject to generated heat, such as engine rooms and boiler rooms.

A solar radiation test is required for equipment which

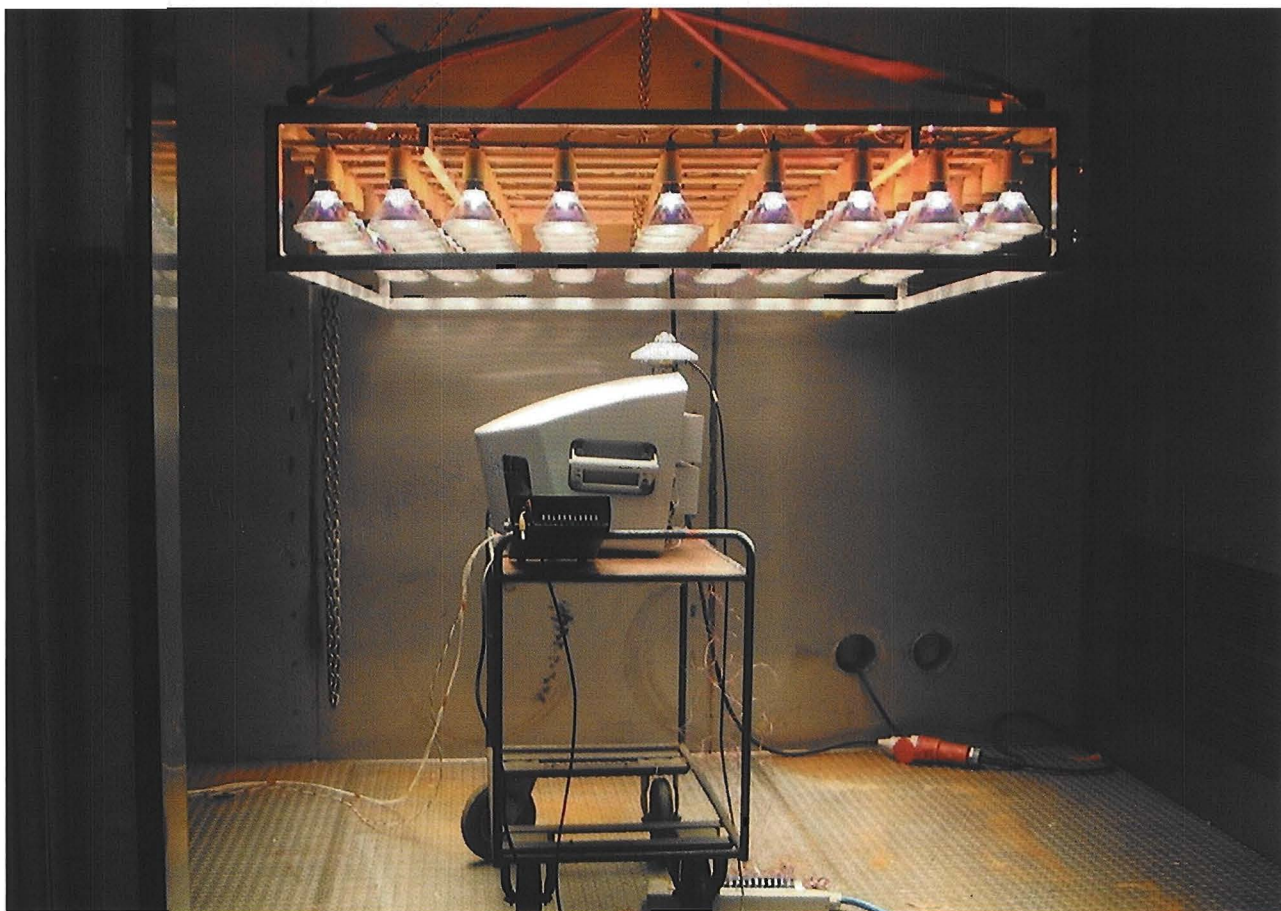
has to be installed on open deck and is directly subjected to the sun.

The dry heat test creates an environment where the complete apparatus is evenly heated up to the required temperature.



Dry heat test

The solar radiation test (below) heats the equipment up from one direction only. This creates also mechanical stresses.



3.4 Low temperature

When a piece of equipment is intended to be installed on an open deck this needs to be subjected to a low temperature test.

3.5 High voltage

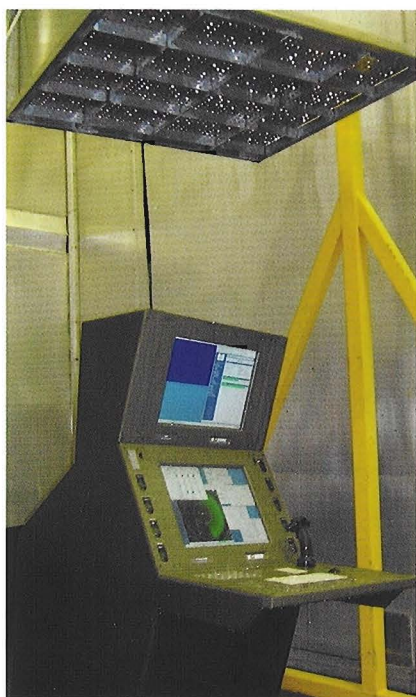
All electrical equipment needs to be subjected to a high voltage test. The relation between nominal voltage and high test voltage to be taken as per following table.

HIGH VOLTAGE TEST	
Rated Voltage U_n	Test Voltage a.c.(r.m.s.), V
$U_n \leq 60$	500
$60 < U_n \leq 1000$	$2 \times U_n + 1000$
$1000 < U_n \leq 2500$	6500
$2500 < U_n \leq 3500$	10000
$3500 < U_n \leq 7200$	20000
$7200 < U_n \leq 12000$	28000
$12000 < U_n \leq 15000$	38000

3.6 Enclosure

Equipment that needs to be used under water or on the forecastle (green water) has to be subjected to a pressure test.

If the equipment is subject to spray or dripping water a drip test is sufficient.



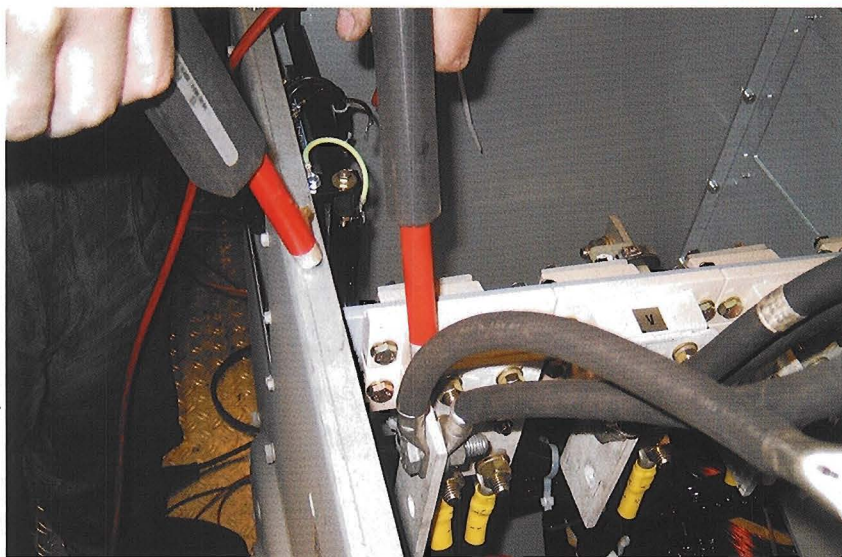
Enclosure dripping test

3.7 EMC

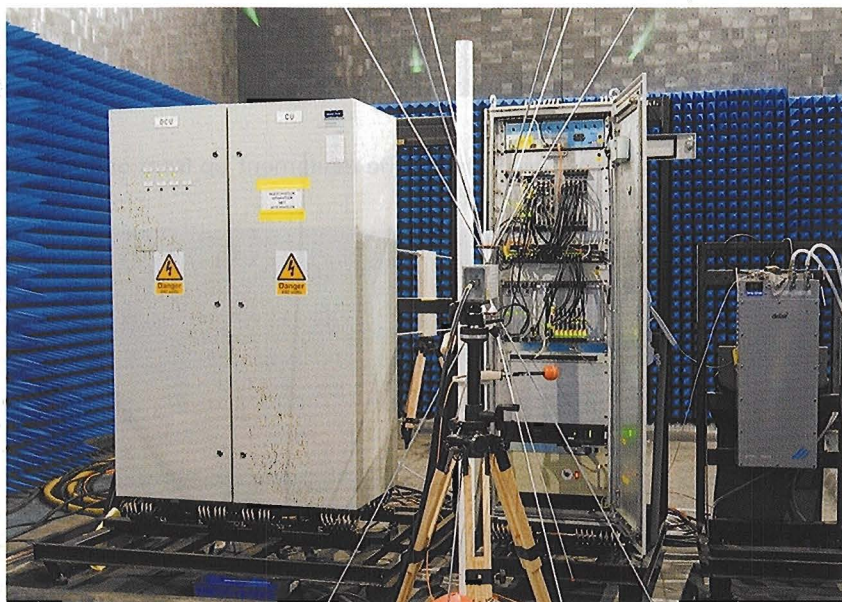
Is required for equipment incorporating active electronic components.

All essential equipment must be selected from the lists of type-tested equipment.

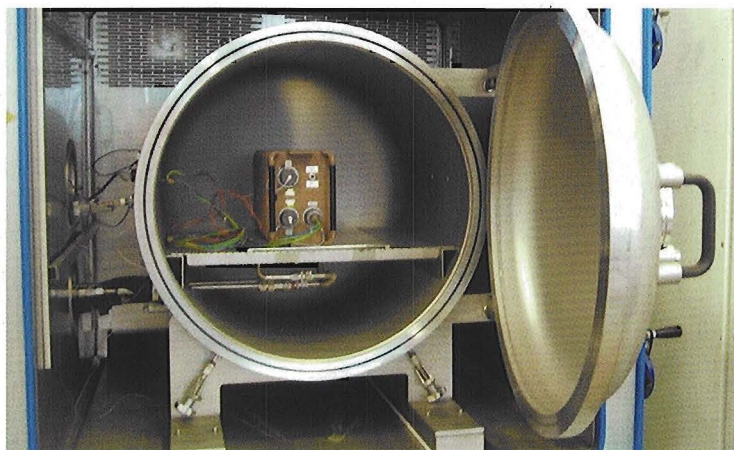
If the chosen equipment is not listed it must fulfill the requirements for type testing at least.



High voltage test



EMC test



Pressure test



Maritime and Coastguard Agency
An Executive Agency of the
Department for Transport

Certificate of Conformity (Module G)

Lloyd's Register Verification (LRV), having been appointed by the UK MCA as a "notified body" under the terms of The Merchant Shipping (Marine Equipment) Regulations S.I. 1999 No. 1957 and Article 9 of Council Directive 96/98/EC as amended by Commission Directives 98/85/EC, 2001/53/EC, 2002/75/EC and 2002/84/EC for Marine Equipment, certifies that:

LRV did undertake the relevant quality assessment procedures for the equipment of the manufacturer identified below which was found to be in compliance with the **Fire protection** requirements of Council Directive 96/98/EC on marine equipment as amended above and in accordance with Annex B, Unit Verification Module G, subject to the conditions below and in the attached Schedule which will also form part of this Certificate.

Manufacturer: Aalborg Industries Inert Gas System B.V.	Place of production: same
Address: St. Hubertsstraat 10 6531 LB Nijmegen The Netherlands	Address: same

Annex A.1 item no **A.1 / 3.42**

Item designation:
INERT GAS SYSTEMS COMPONENTS

Manufacturer's code no: 062.10.1.9530	Product description: Inert Gas system type: Gin 2500-0.15 FU
Product identity number: Serial number 06830	

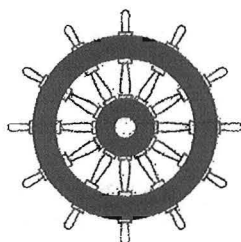
Approval is subject to continued maintenance of the requirements of the above Directives and to all products continuing to comply with the standards and conditions of EC Type Examination Certificates issued by Lloyd's Register Verification.

Date of Issue	16 January 2008	Issued by:	Lloyd's Register Verification
			EC Distinguishing No. 0038

Certificate no. **MED 08G0009 – (Control no: GRO0805012)**

Signed: *[Signature]*
Name: **A.W. van der Velden**
For and on behalf of Lloyd's Register Verification

Note: A technical file shall be maintained to record the above product for a period of at least 10 years from date of issue of this Certificate.



Subject to the Manufacturer's compliance with the foregoing, and those conditions of Articles 10.1(1) and 11 of the Directive, the Manufacturer or his authorised representative is allowed to affix the 'Mark of Conformity' to the products above.

This certificate is issued under the authority of the MCA.

0038 / 08

Lloyd's Register, its affiliates and subsidiaries and their respective officers, employees or agents are, individually and collectively, referred to in this clause as the 'Lloyd's Register Group'. The Lloyd's Register Group assumes no responsibility and shall not be liable to any person for any loss, damage or expense caused by reliance on the information or advice in this document or howsoever provided, unless that person has signed a contract with the relevant Lloyd's Register Group entity for the provision of this information or advice and in that case any responsibility or liability is exclusively on the terms and conditions set out in that contract.
Form 1616V (2005.01)



The above certificate is a Type Approval Certificate with a MED logo for an inert gas system.

The steering wheel on the certificate, shows that it fulfills the Marine Equipment Directive (MED) requirements for type approval.

The MED certificate can be issued after design appraisal, and testing.

An inert gas system produces an inflammable gas, mostly N₂ mixed with CO₂, used in tankers as a blanket above a dangerous cargo. It serves two purposes: one to avoid an explosive cargo-air mixture above the cargo, and secondly, for certain cargoes, the prevention of mixing of cargo with the oxygen in the air.

The main purpose of Marine Equipment Directive approval is to ease trade within the European community.

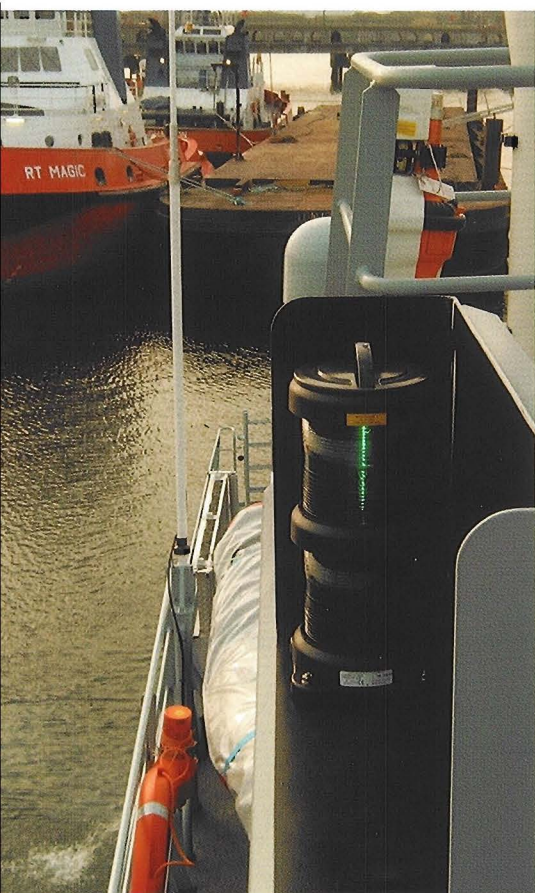
The equipment must be approved as per accepted international standard and the approval system shall be as per EC publication.

Furthermore, the system also consists of a design review and an ini-

tial test witnessed by the authorised body as well as a verification of the production quality system.

Currently, MED certification is limited to safety, fire fighting, navigation, nautical and communication equipment.

The 2007 European Community represents a vast amount of customers.



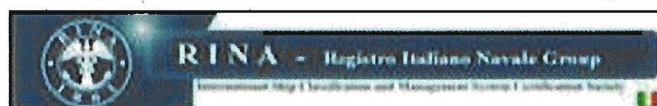
Type approved starboard double sidelight



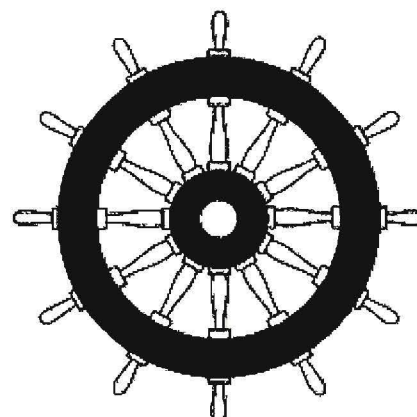
European market



Germanischer Lloyd



Marks of the Regulatory Bodies



MED certified equipment carries the wheel mark.



Bundesrepublik Deutschland

Federal Republic of Germany

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency



BUNDESAMT FÜR
SEESCHIFFFAHRT
UND
HYDROGRAPHIE

EC TYPE EXAMINATION (MODULE B) CERTIFICATE

This is to certify that:

Bundesamt für Seeschifffahrt und Hydrographie, specified as a "notified body" under the terms of „Schiffssicherheitsgesetz“ of 9. September 1998 (BGBl. I, p. 2960) modified last 08. April 2008 (BGBl. I, p. 706), did undertake the relevant type approval procedures for the equipment identified below which was found to be in compliance with the Navigation requirements of Marine Equipment Directive (MED) 96/98/EC last modified by Directive 2008/67/EC.

Manufacturer **aqua signal Aktiengesellschaft**
Address **Von-Thünen-Straße 12, 28307 Bremen, GERMANY**

Applicant **aqua signal Aktiengesellschaft**
Address **Von-Thünen-Straße 12, 28307 Bremen, GERMANY**

Annex A.1 Item **6.1 Navigation lights**
(No & item designation)

Product Name **LED-Serie 65**

Trade Name(s) **LED-Serie 65**

Specified Standard(s)

Regulation COLREG 72, Annex I/14	EN 14744, 2005
IMO Resolution A.694(17)	IEC 60945 Ed.4.0, 2002

This certificate remains valid unless cancelled, expired or revoked.

Date of issue: **2008-09-01**

Issued by: **Bundesamt für Seeschifffahrt und Hydrographie
Bernhard-Nocht-Str. 78, 20359 Hamburg, Germany
Notified body 0735**

Expiry date: **2013-08-31**

Certificate No.: **BSH/4612/6010945/08**

This certificate consists of 2 pages.



by order

Schulz-Reifer



This certificate is issued under the authority of the „Bundesministerium für Verkehr, Bau und Stadtentwicklung“. V2008-07-23



10. HAZARDOUS AREAS - IP RATINGS

Hazardous areas are those areas where, due to continuous or part-time presence of gases, flammable liquids or even explosive dusts, the danger of explosion exists.

Hazardous areas are for instance the tanks of a tanker with the deck above, the cargo-handling area, cargo-pump room, the car decks of a ferry where cars are stowed with fuel in their tanks, a paint store or the hold of a dry-cargo ship certified for the carriage of dangerous cargo.

The most cost-effective solution is not to install any electrical equipment in dangerous areas.

The **IP rating** (International Protection rating) as defined in IEC 60529 classifies the degrees of protection provided against the intrusion of solid objects including body parts like hands and fingers, dust, accidental contact and water.

1 Hazardous areas

Hazardous areas not only depend on the type of cargo, but also the location of the area in relation to the location of the cargo.

Inland waterway tankers sometimes sail over sea and seagoing tankers may sail a long distance upriver. At sea or inland each have specific requirements but with the same intention.

Hazardous cargoes are defined and divided into the following groups:

1. Flammable liquefied gases
2. Flammable liquids with a flash point below 60 °C and liquids heated to a temperature within 15 °C of their flash point
3. Flammable liquids with a flash point above 60 °C
4. Hazardous goods and materials, hazardous only when stored in bulk

2 Division of dangerous areas

2.1 Zone 0

Areas where an explosive gas atmosphere is continuously present, such as inside a cargo tank of crude oil, oil products, or a chemical products tanker carrying flam-



Cargo tank zone 0 with level sensors

mable liquids (other than liquefied gases) having a flash point not exceeding 60 °C.

In the case of liquefied gases, the cargo tank itself and the surrounding secondary barrier spaces are classified as zone 0.

2.2 Zone 1

Areas where during normal operation an explosive gas atmosphere can be present periodically. Spaces as adjacent to and below the top of cargo tanks carrying crude oil, oil products or chemicals etc. with a flash point up to 60 degr. C. Also spaces separated by a single deck or bulkhead from zone 0, cargo pumprooms, and spaces where pipes for above cargoes are leading through.



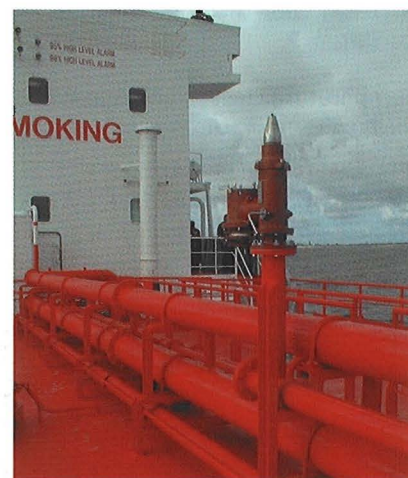
Testing cargo tank alarms

Additionally, the areas on open deck within 3 metres of any cargo tank outlet, cargo valve, cargo pipe flange, cargo pump room outlets, and within a 6 metre radius from a high velocity discharge vent, up to 2.4 metres above deck.

A high velocity vent, often combined with the pressure / vacuum valve, is a device which allows gases to pass through at overpressure or underpressure (vacuum) of the tank with which it is connected, thus preventing damage to the tank structure. At overpressure, during loading of cargo, or as a result of heating up by sun radiation, the gases are blown out at high speed. This is to prevent those gases from forming a hazardous layer at deck level. During loading, gases in cargo tanks which are driven out by pumping in new cargo, are normally collected in the vapour return system and are re-condensed in the refinery in order not to pollute the atmosphere, and to gain back cargo

Zone 1 Areas for IWW tankers range from the outside of the cofferdam fore and aft of the cargo tank area, at less than a 45° angle inwards up to 3 metres above the tank deck. The height is thus, higher than for seagoing tankers. The areas considered dangerous for the outlet of a high pressure discharge valve have a radius of only 2 metres.

The height above deck for high velocity vents outflow only has to be one metre above deck, also much lower than as per IMO, and has to do with keeping the ship as low as possible for under-bridge passage.



Tanker deck, zone 1, with pressure vacuum valve with a high velocity vent.

2.3 Zone 2

Areas where an explosive gas atmosphere is not present during normal operation and if present, for a short period of time only, such as tankers carrying products with a flash point above 60 °C, dry-cargo ships and Ro/Ro spaces of ferries if sufficiently ventilated.

Liquefied natural gases (LNG) and vapours from petrol are heavier than air and any opening to a deck or space below is subject to further study with respect to zoning.

3 Selection of certified equipment

Selection of certified equipment for hazardous areas has to be based upon the cargo.

Gases are divided into the following groups:

- I: Methane, such as in coal mines
- II: General industrial gases and gases from combustible liquids and combustible solid materials
- IIA: Propane
- IIB: Ethylene
- IIC: Hydrogen

Apart from the relevant gas group, certified safe equipment shall also be selected on the basis of the maximum surface temperature during operation. This surface temperature must be below the ignition temperature of the gas from the cargo and is stated in the cargo lists (the certified booklet on board a vessel with the allowed types of cargo).

Temperature classes and maximum surface temperatures are:

T1: < 450° C T4: 135° C
T2: 300° C T5: 100° C
T3: 200° C T6: 85° C

EXPLOSION PROOF TYPES	CODE	ZONE	DIAGRAM	APPLICATION	STANDARD
INCREASED SAFETY	e	1		TERMINAL AND CONTROL BOXES	IEC
				SQUIRREL CAGE MOTORS	60079-7
				LIGHTING FITTINGS	
FLAMEPROOF ENCLOSURE	d	1		OTHER MOTORS	IEC
				SWITCHGEAR AND CONTROLGEAR	60079-1
				INDICATING EQUIPMENT	
PRESSURIZED	p	1		SWITCHGEAR AND CONTROLGEAR	IEC
				ANALISERS	60097-2
				LARGE MOTORS	
INTRINSIC SAFETY	ia	0		INSTRUMENTATION	IEC
				COMMUNICATION	60079-11
				SENSORS	
OIL IMMERSION	o	1		TRANSFORMERS	IEC
				STARTING RESISTORS	60079-6
				TRANSFORMERS	IEC
POWDER FILLING	q	1		CAPACITORS	60079-5
				TERMINALS	
ENCAPSULATION	m	1		SWITCHGEAR AND CONTROLGEAR	IEC
				INDICATION LIGHTS	60079-18
				DISPLAY UNITS	
LIMITED GASTIGHT IP55	n	2		LIGHTING FITTINGS ON CARDECKS	IEC 60529
				SOCKET OUTLETS ON CARDECKS	
				VENTILATED AND ABOVE 45cm	

4 Summary of certified means of protection

- Certified intrinsically safe
- certified intrinsically safe category 1b
- Flame proof equipment type "d"
- Pressurised equipment type "p"
- Non sparking equipment type "N"
- equipment for cable trays and cables
- Cables with metallic shielding and non-metallic impervious outer shielding

Example of extract from cargo list

SUMMARY OF MINIMUM REQUIREMENTS						
PRODUCT NAME	HAZARDS	REQTS VENTILATION	EXAMPLES OF ENV. CONTROL	TEMP CLASS	APP GROUP	FLASH POINT
	SAFETY	CONTROLLED	INERTING	T1 - T6	IIA, IIB or IIC	NON FL.
	POLUTION	OPEN	DRYING			YES >60°
	S/P BOTH		VENTILATION			NO <60°
ACRYLIC ACID	S/P	CONTROLLED	NO REQ.	T2	IIA	NO <60°
CYCLOHEXYLAMINE	S/P	CONTROLLED	NO REQ.	T3	IIA	NO <60°
ISOPROPYL ETHER	S/P	CONTROLLED	INERTING			
MANGO KERNAL OIL	POLUTION	OPEN	NO REQ.			YES >60°
NITRO BENZENE	S/P	CONTROLLED	NO REQ.	T1	IIA	YES >60°

4.1 Intrinsically safe equipment

Intrinsically safe equipment is equipment isolated by a barrier unit; the barrier limits the energy in the hazardous area to the extent that it cannot cause a spark which could start an explosion. The cable from the barrier unit to the intrinsically safe unit in the dangerous area must be routed separately from other, not intrinsically safe cables to prevent the cable picking up additional power through induction that would exceed the IS safe limit.

4.2 Equipment in zone 0

In Zone 0, no other electrical equipment than that which is certified intrinsically safe, category "1a", can be used.

There are lists of dangerous cargoes, in the form of gases, liquids and solid materials, stating the requirements for electrical equipment in zones 1 and 2.

4.3 Separation by gastight boundaries

A space separated by a gas tight bulkhead or deck from another space can be classified as a less hazardous zone, taking into account sources of release and the ventilation conditions.

Sources of release are venting and other openings to cargo tanks, slop tanks, cargo piping, piping systems and equipment containing liquid or gas having flanged joints or glands.

From the table is seen that preventing any potential leak in a space and ventilation system can ease the requirements for a space. Details and more instructions can be found in IEC standards 60092-502 for tankers and IEC 60092-506 for ships carrying hazardous goods. When the area classification depends on ventilation, failure of this ventilation must be monitored and alarmed and all equipment not suitable for the area without ventilation, must be switched off. Doors must not be fitted between a hazardous and non-hazardous area unless required operationally and never in a zone 0 area.

An enclosed space with access to zone 1 may be considered zone 2 and an enclosed space with access to zone 1 may be considered non-hazardous, provided the space is ventilated by overpressure and the door is self-closing.

4.4 Equipment in hazardous zones

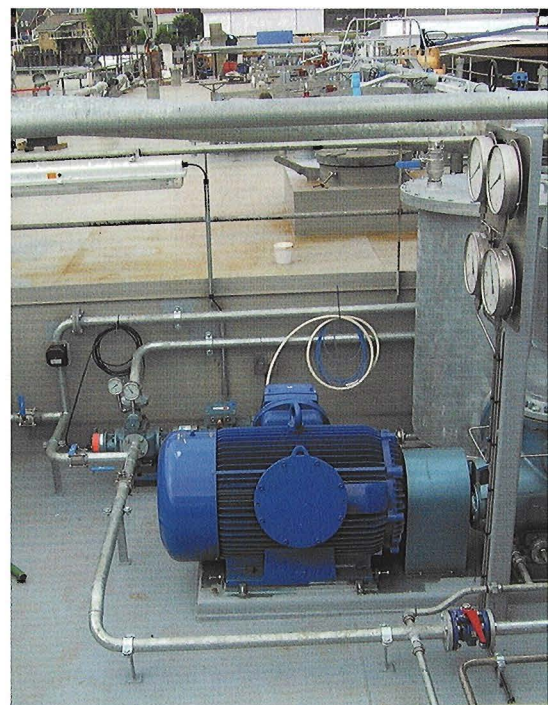
Equipment in zones 1 and 2 also has to be selected and to fulfill requirements according to stringent rules. In zone 1, in general intrinsically safe, flameproof or pressurized. In zone 2 some relaxation. Cables need to be provided with metallic shielding, covered by a non-metallic outer layer. Cable joints are permitted, contrary to zone 0.

SPACES SEPARATED BY ONE GASTIGHT BULKHEAD OR DECK		
ZONE	WITH SOURCE OF RELEASE OF GAS	
	WITH VENTILATION	WITHOUT VENTILATION
ZONE 0	ZONE 1	ZONE 0
	CARGO PUMPROOM	COFFERDAM + CARGO FLANGES
ZONE 1	ZONE 2	ZONE 1
	SPACES WITH CARGOPIPE FLANGES	SPACES + CARGOPIPE FLANGES
ZONE 2	ZONE 2	ZONE 1
	SPACES WITH CARGOPIPE FLANGES	SPACES + CARGOPIPE FLANGES
ZONE	WITHOUT SOURCE OF RELEASE OF GAS	
	WITH VENTILATION	WITHOUT VENTILATION
ZONE 0	ZONE 2	ZONE 1
	BALLASTPUMPROOMS	COFFERDAM VOID
ZONE 1	NON HAZARDOUS SPACE	NON HAZARDOUS SPACE
ZONE 2	NON HAZARDOUS SPACE	NON HAZARDOUS SPACE

4.5 Codes and standards for hazardous areas.

With the design of electrical installations in hazardous areas typical codes and standards should be used. These may include Rules and Regulations from Class, the American Petroleum Institute (API), European ATEX, IEC and others.

It should be noted that codes and standards for equipment in hazardous areas are changing to more international standards like ATEX and IEC Equipment Protection Levels (EPL) and these should be checked on a regular basis or at least at the start of a project.



Zone 1. Tanker deck with flame-proof motor



Zone 2. Car deck of ferry with IP55 equipment

ENVIRONMENTAL CONDITION	LOCATION	MINIMAL LEVEL PROTECTION	PERMITTED EQUIPMENT			
EXPLOSION DANGER			SWITCH GEAR	MACHINES	OTHER EQUIPMENT	
ZONE 0	TANKS AND HOLDS DANGEROUS GOODS	INTRINSICALLY SAFE TYPE 1A	NO	NOT APPL.	MEASURING EQUIPMENT	
ZONE 1	TANKER DECK	EXPLOSION PROOF	YES	YES		
ZONE 1	PAINT STORE	EXPLOSION PROOF	NO	NO	LIGHT ONLY	
ZONE 1	BATTERY ROOMS	EXPLOSION PROOF	NO	NO	LIGHT ONLY	
ZONE 2	CARDECKS	IP 55	YES	YES	ABOVE 45 CM	1
ZONE 2	BOATSTORES ON YACHTS	IP 55	YES	YES	ABOVE 45 CM	2
DANGER TO PEOPLE	DRY SPACES	IP 20	YES	YES		
NO MECHANICAL DAMAGE	CABINS	IP 20				
	CORRIDORS	IP 20				
	BATHROOMS	IP 34	NO	NO	LIGHT ONLY	
DRIPPING WATER	ENGINE CONTROL ROOM	IP 23		YES		
LIGHT MECH.DAMAGE	NAVIGATION BRIDGE	IP 23				
	ENG RM ABOVE TWEENDECK	IP 23				
	SWITCHBOARD ROOM	IP 23				
SPLASH WATER	Engine roomS	IP 44		YES		
MODERATE MECH. DAMAGE	BATHROOMS	IP 44			SAFE SOCKETS	
	GALLEY	IP 34				
	LAUNDRY	IP 34				
SPRAYWATER OR DUST	ENG RM BELOW FLOORPLATES	IP 55	NO	YES		
SOLID WATER	FORESHIP AND OPEN DECK	IP 67	NO	YES		
SUBMERGED	SUBMERSIBLE	IP 68	NO	YES		3
NOTES	1-10 AIRCHANGES	2- ALSO GAS DETECTION	3- DEPTH TO BE SPECIFIED			

5. IP Ratings

Protection classes are categorized in the IP Rating, indicating the protection against dust and water and in the EX Rating, indicating the protection against flammable gases. Between the two there is a considerable overlap.

The ratings are mainly standardized by IMO, IEC and NEC 500 (USA).

IMO is for worldwide maritime use, IEC is the International Electrical Committee, worldwide in use for land and sea.

NEC, the National Electrical Committee, is the USA Standard, with emphasis on gas, dust and fibres. In the USA is mining an important topic.

The type of protection depends on the environmental conditions as per table on this page.



Engine room with IP 44 and higher motors

IP RATINGS	ELECTRICAL EQUIPMENT
FIRST DIGIT PROTECTION AGAINST DUST	SECOND DIGIT PROTECTION AGAINST WATER
0 NO PROTECTION	0 NO PROTECTION
1 OBJECTS < 50mm	1 Vertical Dripping water
2 OBJECTS < 12mm	2 Angled dripping water 75-90°
3 OBJECTS < 2.5mm	3 Sprayed water 45-90°
4 OBJECTS < 1.0mm	4 Splashed water
5 Dust Protected	5 Water jets
6 Dust tight	6 Heavy seas
	7 Immersion under 1m water column
EXAMPLE: IP 68	8 Infinite immersion under "X"metre water column
	"X"to be stated on certificate/nameplates

IP 67 is dust tight and can be immersed in up to 1 metre of water. It should be noted that equipment with this IP rating is not suitable to be used on open deck where 'green' water could be present. This should be checked with drawings / design.

IP 68 equipment can be used infinitely immersed under a defined water column. The certificate of approval must indicate the maximum allowed water pressure.

The table on this page gives an explanation of the digits in an IP rating.

IP 23 is the rating of the most cost-effective motor available, to be used in dry spaces, without the danger of gases or dust. There is a minimal protection against dripping water.

IP 55 Gives protection against a water jet (firehose) limited gases and dust.

IP 66 suitable for use on open decks with splashed solid water, heavy seas.

IP 44 is the next grade up. It ensures protection against splashed water and dust particles larger than 1 mm.



Galley with IP 34 or higher equipment