Industrial automation and control systems
Józef Gaul

WATER LEVEL DETECTOR

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Table of contents

I. Detector’s construction

The detector is build from following objects:

- Control panel
- Emergency power accumulator
- buzzer
- programmable controller ZELIO
- Water level sensor MB S33M
- Casing
- 220/24V DC Power supply

II. Detector’s work

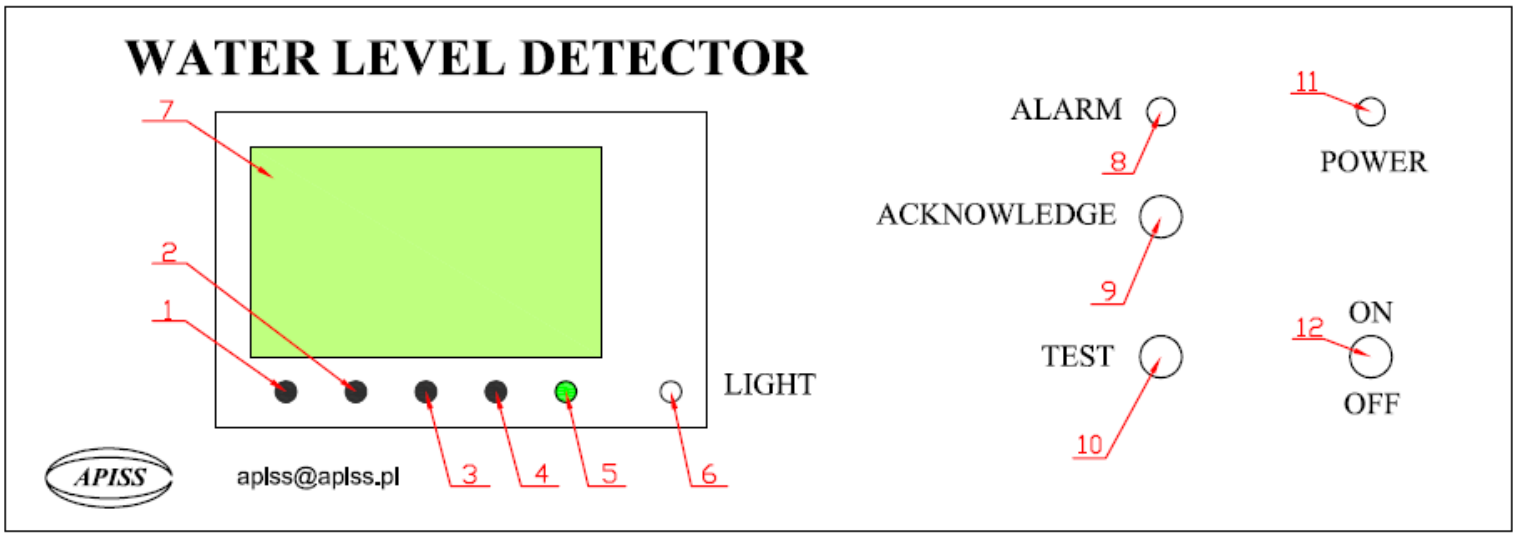
Water level detector detects the level of water in the cargo room. After the water level reaches 30cm first tone and light alarm turns on. The tone alarm may be turned off by the ACKNOWLEDGE button. The light alarm will be working until the water in the cargo room will be 30cm or more. If the water level is still rising the tone alarm will turn on again when the water level reaches 15% of cargo’s room height. Tone alarm may be turned of by the ACKNOWLEDGE button, but the light alarm will stay until the water level will be 30cm or more.

The device is powered by 220V voltage from the ship’s source or the 24V voltage from the emergency gel accumulators. In case of the 220V power supply failure the NO POWER 220V alarm will turn on after 15 minutes. The tone alarm may by turned off by the ACKNOWLEDGE button.

The detector is supplied with a water level sensor in the cargo room which sends a signal to the controller. If the signal is missing because of some kind of failure, the NO SIGNAL alarm, tone and light alarm will turn on. The tone alarm may be turned off by the ACKNOWLEDGE button.

The TEST button lets You check the work of the alarm.

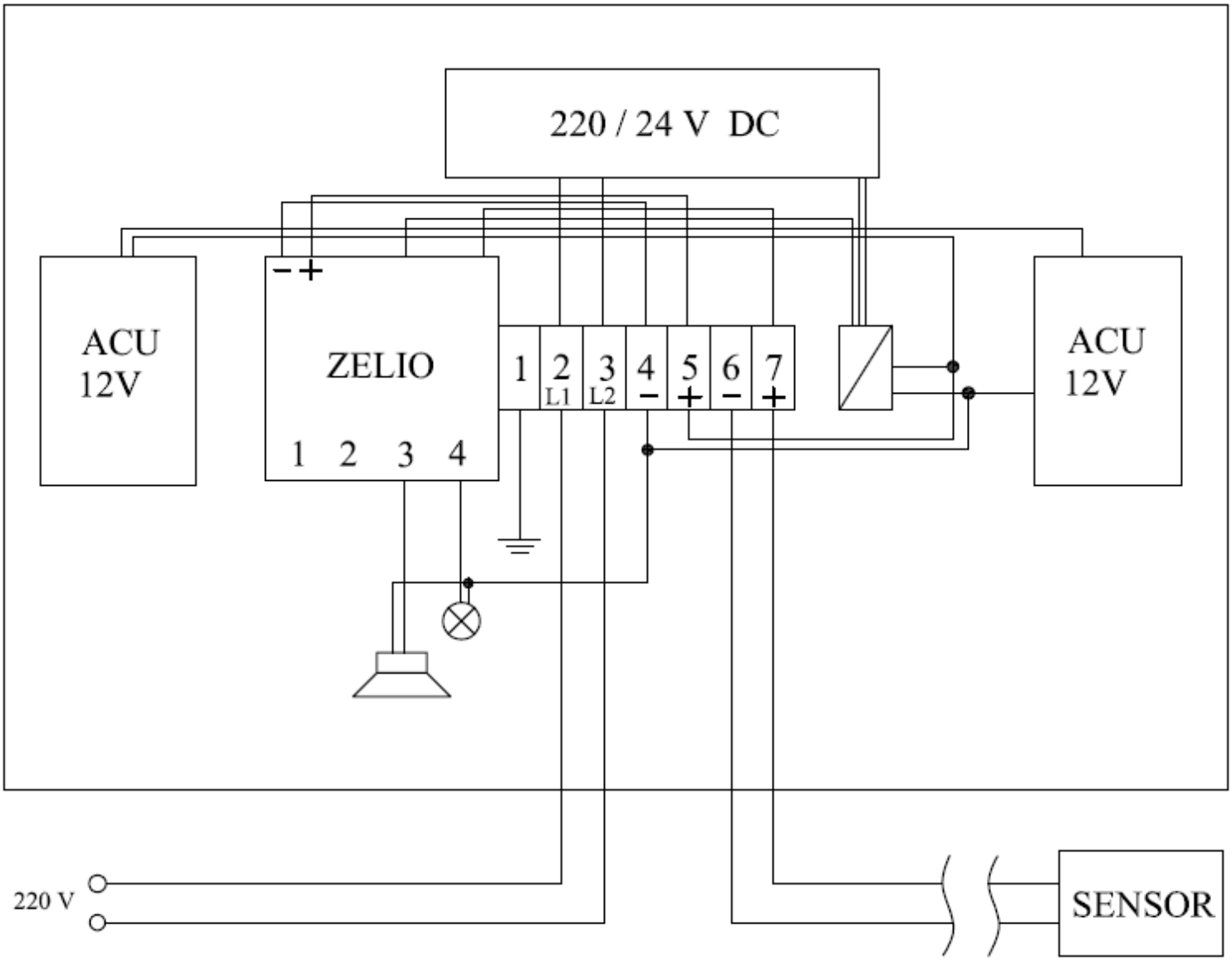
III. Control panel



Control panel elements:

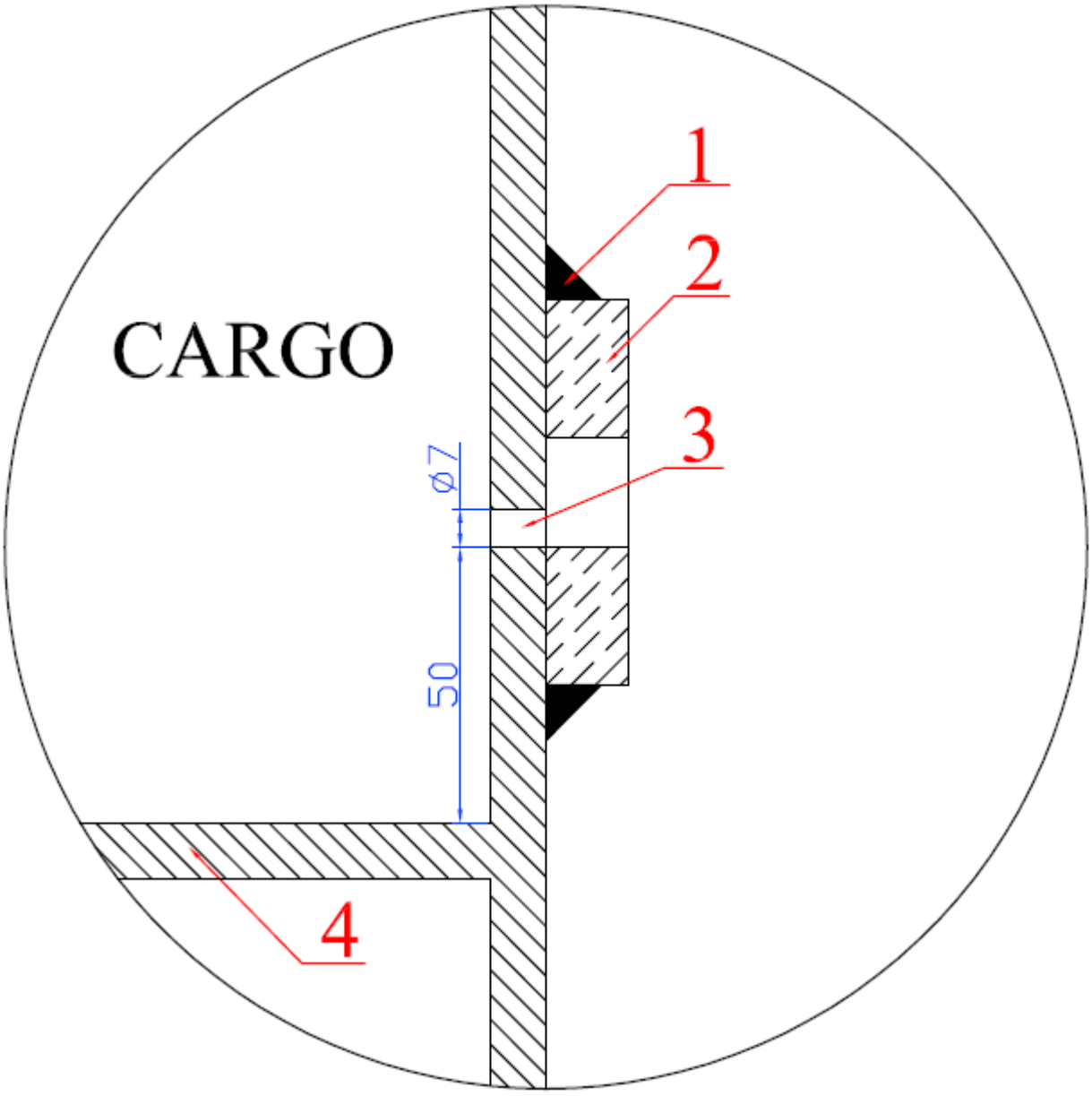
1. TEST – controller's alarm check button.
2. ▼ (-) – controller's button which reduces the cargo room's height value.
3. ▲ (+) – controller's button which increases the cargo room's height value.
4. OK. – controller's confirmation button.
5. MENU/OK. controller's function button.
6. LIGHT – display's light button.
7. DISPLAY – shows the alarms and the present water level.
8. ALARM – alarm indicator.
9. ACKNOWLEDGE – alarm confirmation button.
10. TEST – Test function button.
11. POWER – power indicator.
12. ON – OF – power selector.

IV. Flow chart



V. Montage of detector’s sensor

Drill a hole in the cargo room’s wall, as seen in the picture bellow. Weld the montage collar to the wall outside the cargo room.



1. Weld
2. Montage collar
3. Ø 7 hole in the cargo room’s wall (must be very close to the floor)
4. Cargo room’s floor

Twirl the sensor in to the montage collar. The sensor's thread must be isolated with the attached tape. Sensor must be twirled in vertically up.

1. Montage collar
2. Sensor MB S33M
3. A plug used to clean the hole

VI. First startup

1. Montage of the water level sensor like in the instructions (point 5)
2. Connect the power cables like in the flow chart (point 4)
3. Connect the sensor like in the flow chart (point 4)
4. Turn the power on (selector nr 12 on the control panel)
5. Set the cargo room's height value (buttons nr 2 and 3 on the control panel)

Detector is ready for work

VII. Set the cargo room's height level

Set the cargo room's height value including the following points:

1. To increase the cargo room's height value use button nr 3 on the controller
2. To reduce the cargo room's height value use button nr 2 on the controller
3. Each use of these buttons changes the height value by 10 cm

Example:

By pressing 50 times the button nr 3 (▲) the cargo room's height value will be 500cm

VIII. Test

Test function is used to check the tone and light alarm

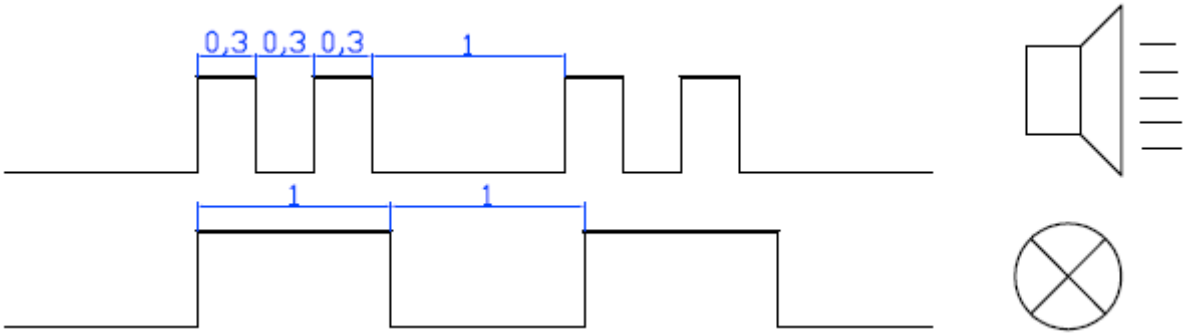
IX. Sensor cleaning

After the upload of any loose cargo the hole must by cleared with a rod max Ø6 and 15cm long. To clear it use a plug at the end of the sensor.

X. Alarms

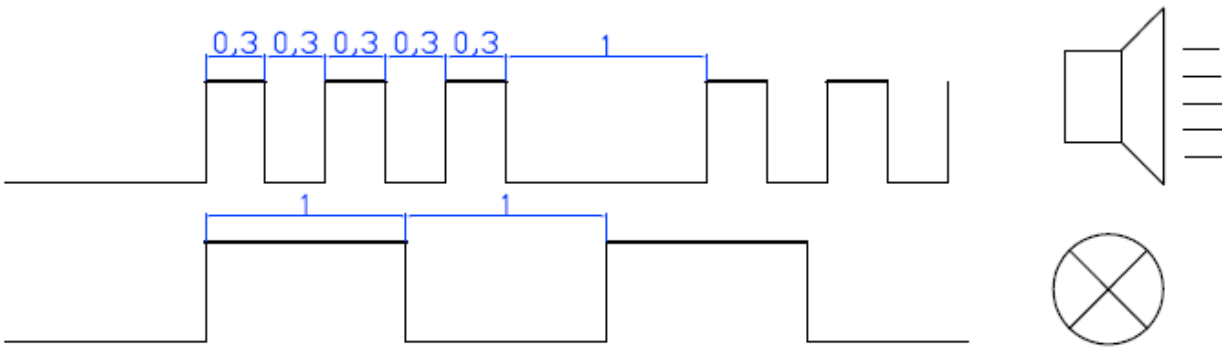
1. 2 tones lasting for 0,3s with a break lasting 0,3s repeated with a 1s break. Light signal lasts for 1s repeated with 1s break

- The alarm will turn on when the water level in the cargo room will reach 30cm
- The alarm turns on with a 20s.delay
- If the water level will decrease below 30 cm. the alarm will turn of after 35s.



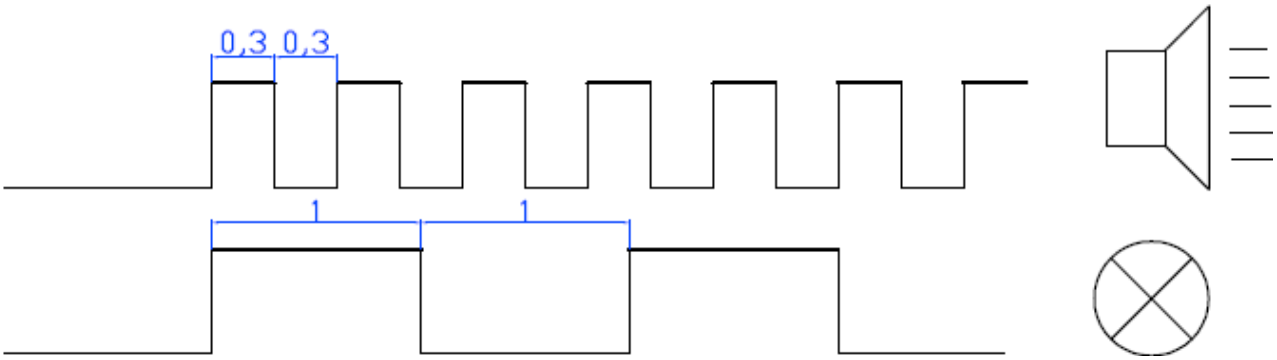
2. 3 tones lasting for 0,3s with a break lasting 0,3s repeated with a 1s break. Light signal lasts for 1s repeated with 1s break

- The alarm will turn on when the water level in the cargo room will reach 15% of cargo room's height.
- The alarm turns on with a 20s. delay
- If the water level will decrease bellow 15% the alarm will turn of after 35s.



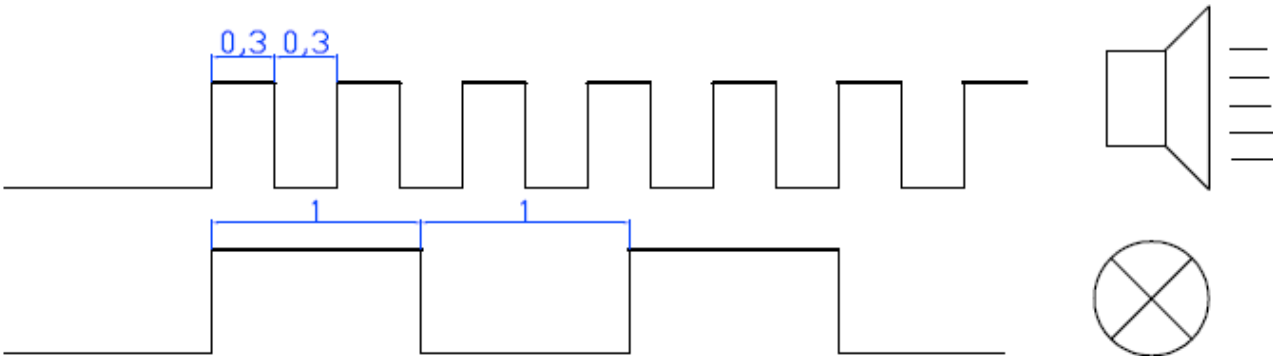
3. 1 tone lasting for 0,3s repeated with a 0,3s break. Light signal lasts for 1s repeated with 1s break with a “NO SIGNAL” sign on the display

- The alarm turns on in case of a sensor failure or cable damage
- The alarm turns on with a 15s. delay
- The alarm turns of without a delay



4. 1 tone lasting for 0,3s repeated with a 0,3s break Light signal lasts for 1s repeated with 1s break with a “NO POWER 220V” sign on the display

- The alarm turns on in case of power demise
- The alarm turns on with a 15min. delay
- The alarm turns of without a delay



XI. Enclosures

DET NORSKE VERITAS

TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. A-10164
This Certificate consists of 2 pages

This is to certify that the
Pressure Transmitter

with type designation
MBS 33M

Manufactured by
Danfoss A/S
NORDBORG, Denmark

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

Application
Location classes:

Type	MBS 33M
Temperature	D
Humidity	B
Vibration	B
EMC	A
Enclosure	Plug connection: Class B Integral cable connection: Class C

Place and date
Høvik, 2007-04-10
for DET NORSKE VERITAS AS

Knut Svein Ording
Head of Section

Local Office
DNV Fredericia

This Certificate is valid until
2011-06-30

Ståle Sneen
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.

Cert. No.: A-10164
File No.: 892.10
Job ID: 262.1-002310-1

Product description

Type: MBS 33M
Ranges: 0-1 bar to 0-600 bar
Connections: 1) Plug Hirschmann GDM 3011 and GDME 213
2) Integral cable
3) Integral cable with PG9 cable gland

Type Approval documentation

Data sheet: IC.PD.P20.1D.02/520B2559
Drawings: MBS33M gauge version – design changes: 060G 4-20-288
Approval drawings: 060R3009 ver.01, 060C0335, 060G0215, 060C0331, 060G0249, 060C0450, 060G2252, 060G2288, 060G2768 ver.01, 640B0911 ver.00
Test Reports: MBS33 Ship classification approval 93.06.15, dated 1993-06-15
EMC test on MBS 33M TR 060G055, dated 1999-01-18
Danfoss Sinus vibration 2006-2116-1, dated 2006-03-10
Danfoss IP67 tightness test 2006-2116E-2, dated 2006-03-10

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 not affect the type approval given
- Ensuring traceability between manufacturer's product type marking and the type approval certificate

Retention survey is to be performed at least every second year and at renewal of this certificate.

END OF CERTIFICATE

Type Approval Certificate

Germanischer Lloyd

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the GL Type Approval System.

Certificate No.	**65 326 - 93 HH**
Company	**Danfoss A/S** **Nordborgvej 81** **6430 Nordborg, DENMARK**
Product Description	**Pressure Transmitter**
Type	**MBS 33M**
Environmental Category	**D, H, EMC1**
Technical Data / Range of Application	**Power supply: 24 V DC** **Electrical connection: 2 - wire connection with DIN Plug 43650 or PG9-cable** **Pressure ranges: from 0 to 1 bar up to 0 to 600 bar in 15 standard ranges** **Output signal: 4 mA to 20 mA** **Wetted parts: AISI 316** **Enclosure material: AISI 316 L** **Process connection: thread G 1/2 A or M 18 x 1.5** **Absolute pressure or relative pressure transmitter available** **Code Nr.: 060G3121 to 060G3135 (plug version)** **Degree of protection: IP 65 (plug version)** **Code Nr.: 060G3106 to 060G3150 (PG9-cable version)** **Degree of protection: IP 67 (PG9-cable version)** ***Environmental Category H:** **Cold test: - 40 °C** **Vibration test: 5 Hz to 30 Hz amplitude = 5.6 mm** **30 Hz to 2000 Hz acceleration = 20 g**
Test Standard	**Guidelines for the Performance of Type Approvals, Chapter 2 - Edition 2003**
Documents	**Test Reports: no. appdoc 01-25; no. TR 060G113; no. 2006-2116E-2 of Danfoss** **Test Report no. 2006-2116-1 of Danfoss** **Circuit diagram: 060C0340; Drawings: 060R3009, 060G2398** **Part list 027M0024sheet 1+2; Technical data: IK.20.U2.02**
Remarks	**None**
Valid until	**2011-11-27**

Page **1** of **1**

File No. **I.D.01**

Hamburg, 2006-11-28

Type Approval Symbol GL

Germanischer Lloyd

Jürgen Wittburg

Dariusz Lesniewski

This certificate is issued on the basis of "Guidelines for the Performance of Type Approvals Part 1, Procedure".

DEKLARACJA ZGODNOŚCI

Nr IA/ILEC/ZEL/82/04

Dostawca Adres	**Schneider Electric Polska Sp. z o.o.** **ul. Łubinowa 4a, 03-878 WARSZAWA**
reprezentujący Producenta	**Schneider Electric Industries SA** **89, Boulevard Franklin Roosevelt** **92500 Rueil Malmaison, Francja**
Wyrób	**Przekaźniki programowalne „Zelio Logic" SR2, SR3** **marki Telemecanique**

Deklarujemy na własną odpowiedzialność, że powyższe wyroby są zgodne z :

Dokument nr	Tytuł
PN-EN 61131-2:2003(U)*	Sterowniki programowalne – Część 2: Wymagania i badania dotyczące sprzętu [IDT EN 61131-2:200; IDT IEC 61131-2:2003]
PN- EN 61000-6-2:2003	Kompatybilność elektromagnetyczna (EMC). Część 6-2: Normy ogólne. Odporność w środowiskach przemysłowych [IDT EN 61000-6-2:2001, MOD IEC 61000-6-2:1999]
PN-EN 61000-6-3:2002(U)	Kompatybilność elektromagnetyczna (EMC). Część 6-3: Normy ogólne. Wymagania dotyczące emisyjności w środowisku mieszkalnym, handlowym i lekko uprzemysłowionym [IDT EN 61000-6-3:2001, MOD IEC 61000-6-3:1996]
PN- EN 61000-6-4:2004	Kompatybilność elektromagnetyczna (EMC). Część 6-4: Normy ogólne. Norma emisji w środowiskach przemysłowych [IDT EN 61000-6-4:2001, MOD IEC 61000-6-4:1997]

* Niezgodność z p. Standard operating ranges for digital inputs" (/ Poziom prądu) dla 230 V a.c. (FU) i 12 V d.c. (JD) .

Powyższe wyroby pod warunkiem zainstalowania, utrzymywania i użytkowania zgodnie z ich przeznaczeniem, obowiązującymi przepisami, normami, instrukcją producenta i dobrą praktyką inżynierską spełniają wymagania Dyrektyw Unii Europejskiej:

- **73/23/CEE**	Dyrektywy Niskonapięciowej (LVD) wraz ze zmianą 93/68/CEE
- **89/336/EEC**	Dyrektywy Kompatybilności elektromagnetycznej (EMC) wraz ze zmianami 92/31/EEC i 93/68/EEC0

Informacje dodatkowe:
Niniejszy dokument wystawiono na podstawie „Manufacturer's declaration of conformity" wystawionej przez Schneider Electric Industries SA 07-04-2004 w Dijon (Francja).

Warszawa, 2004-11-29

.....
(Miejsce i data wydania)

Marek Pieńkowski – Dyrektor Marketingu

.....
(Nazwisko, stanowisko)

Marek Pieńkowski
Schneider Electric Polska
Sp. z o.o.
Dyrektor Marketingu
(Podpis i pieczątka)

Merlin Gerin
Modicon
Square D
Telemecanique

Type Approval Certificate

Germanischer Lloyd

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the GL Type Approval System.

Certificate No.	32 540 - 06 HH
Company	Schneider Automation S.A. 245, Route des Lucioles B.P. 147 F-06903 Sophia Antipolis
Product Description	Smart Relays Series Zelio Logic
Type	Telemecanique Zelio Models SR2 & SR3
Environmental Category	C; EMC2
Technical Data / Range of Application	Compact Smart Relays with Display 12 V DC SR2B121JD; SR2B201JD 24 V DC SR2A101BD; SR2B121BD; SR2B122BD; SR2A201BD; SR2B201BD; SR2B202BD 24 V AC SR2B121B; SR2B201B 100 ... 240 V AC SR2A101FU; SR2B121FU; SR2A201FU; SR2B201FU Compact Smart Relays without Display 24 V DC SR2D101BD; SR2E121BD; SR2D201BD; SR2E201BD 24 V AC SR2E121B; SR2E201B 100 ... 240 V AC SR2D101FU; SR2E121FU; SR2D201FU; SR2E201FU
Test Standard	Guidelines for the Performance of Type Approvals Part 2, Edition 2003 Regulations for the Use of Computers and Computer Systems
Documents	Test report : 1505568 dated 09-11-2005; EMC RC-03-40777-A dated 28-01-2004 and RC-03-40134-1-A dated 25-03-03; Test Report No. 030212 dated 20-05-2003; No 030395 and No. 040276 dated 20-02-2006; Qualification Plan dated 20-02-2006; Zelio CD Qualif. GL Zelio 2; Tests and Evidence regarding Requirement Class 3
Remarks	None

Valid until 2011-03-12

Type Approval Symbol GL

File No. I.B.07

Hamburg, 2006-03-13

i.V. Jürgen Wittburg

i.A. Andrea Grün

Germanischer Lloyd

This certificate is issued on the basis of "Guidelines for the Performance of Type Approvals Part 1, Procedure".

Type Approval Certificate

Germanischer Lloyd

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Certificate No. **32 540 - 06 HH**

Firmware Version : V3.09

Modular Smart Relays with Display
- 12 V DC
  - SR3B261JD
- 24 V DC
  - SR3B101BD; SR3B102BD; SR3B261BD; SR3B262BD
- 24 V AC
  - SR3B101B; SR3B261B
- 100 ... 240 V AC
  - SR3B101FU; SR3B261FU

Discrete I/O Extension Module SR3XT
- 12 V DC for SR3B261JD
  - SR3XT61JD; SR3XT101JD; SR3XT141JD
- 24 V DC for SR3B...BD
  - SR3XT61BD; SR3XT101BD; SR3XT141BD
- 24 V AC for SR3B...B
  - SR3XT61B; SR3XT101B; SR3XT141B
- 100 ... 240 V AC for SR3B...FU
  - SR3XT61FU; SR3XT101FU; SR3XT141FU

Connecting Cable; Interface
SR2CBL01; SR2USB01; SR2CBL06

Memory Cartridge
SR2MEM01; SR2MEM02

Modbus network slave communication module
SR3MBU01BD

Valid until 2011-03-12

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Certificate No. **32 540 - 06 HH**

Inputs

Discrete DC Input Ratings (I1...IA & ICH...IR)	SR.....JD 12 V DC / 4 mA; SR.....BD 24 V DC / 4 mA
Discrete or Analog DC Input Ratings (IB...IG)	SR.....JD 12 V DC / 4 mA; SR.....BD 24 V DC / 4 mA
Analog DC Input Ratings	SR.....JD 0...10 V or 0...12 V; SR.....BD 0...10 V or 0...24 V
Analog DC Input Ratings (IH, IJ & Pt)	IH, IJ 0...10 V DC, 0...20 mA; Pt -25°C ... +125°C
Discrete AC Input Ratings	SR.....B 24 V AC / 4.4 mA; SR.....FU 100 ... 240 V AC / 0.6 mA

Outputs

Relay Output Ratings	8x Outputs Ith 8A	SR2.../ SR3B101../ SR3XT61.. / SR3XT101..
	8x Outputs Ith 8A +2x Outputs Ith 5A	SR3B261..
	4x Outputs Ith 8A +2x Outputs Ith 5A	SR3XT141..
	DC12 24 V DC / 1.5 A; DC13 24 V DC / 0.6 A	
	AC12 230 V AC / 1.5 A; AC15 230 V AC / 0.9 A	
Transistor Output Ratings	24 V DC / 0.5 A	SR.B..2BD

Supplies

Supply Ratings 12 V DC SR2B121JD 120 mA; SR2B201JD 200 mA; SR3B261JD 250 mA, 400 mA with extension

Supply Ratings 24 V DC SR2.1.1BD 100 mA; SR2B122BD 100 mA; SR2.201BD 100 mA; SR2B202BD 100 mA; SR3B101BD 100 mA, 100 mA with extension; SR3B102BD 50 mA, 160 mA with extension; SR3B261BD 190 mA, 300 mA with extension; SR3B262BD 70 mA, 180 mA with extension

Supply Ratings 24 V AC SR2B121B 145 mA; SR2.201B 233 mA; SR3B101B 160 mA, 280 mA with extension; SR3B261B 280 mA, 415 mA with extension

Supply Ratings 100...240 V AC SR2.101FU, SR2.121FU 80-30 mA; SR2.201FU 100-50 mA; SR3B101FU 80-30 mA, 80-40 mA with extension; SR3B261FU 100-50 mA, 80-60 mA with extension

Valid until 2011-03-12

Type Approval Symbol GL

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