DL21 Installation Manual
Dual axis Doppler Speed Log System (SOG+STW) for vessels >50.000GT.
INSTALLATION MANUAL
COMMUNICATING WITH US

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YOUR FEEDBACK IS APPRECIATED
If you find errors, misspellings or poorly explained sections in this document, please do not hesitate to contact us at:

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INTRODUCTION

The DL21 is a DL1 (single axis STW) + DL2 (Dual axis STW + SOG), built into 1 sensor housing, 1 electronic unit and 2 Display units.

For installation of DL1 please see “Installation manual DL1” DM-M004.

For installation of DL2 please see “Installation manual DL2” DM-M002.

This manual covers the DL21 specific items not included in the DL1 and DL2 Installation manuals.
CHAPTER 1: GETTING STARTED

OVERVIEW DL21
The DL21 is 2 separate speed logs, DL1 (Single axis STW) + DL2 (Dual axis STW + SOG), built into 1 sensor housing, 1 electronic unit and 2 Operator units.

The system fulfills all class and type regulations based on MED B (wheelmark) and is manufactured in Norway under stringent production controls.

The new DL21 Speed Log is designed for ships over 50.000 GT with simultaneous and independent measurement of speed through water and speed over ground. The system requires no external inputs, however adding inputs from other navigational systems enhances the functionality and allows comprehensive quality control of the data.

The system consist of:

2 x Operator units.
- CU-M001-SA for DL2
- CD402CU-SC for DL1

1 x Dual Electronic Unit
JB70D21-SA Electronic unit

1 x Junction box
JB21-SA
(Optional for extension of 40 m sensor cable)

1 x Sensor DL21SG-SA
- 1 x (STW) Single axis + 1 x (STW + SOG) Dual axis sensor in one housing.
- Fits into SB-100-XX/DB-100-XX sea valves
- Same size as the DL2 and DL850 270 kHz sensors.
**OPTIONAL ITEMS DL21**
The following items are optional SKIPPER supplied items.
- Speed Repeater
- External dimmer
- LAN switch

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**BRIDGE**

**FORE PEAK**

Sensor extension cable.
Yard supply.
6 x twisted shielded pairs
Dimension: see DL2 manual Chapter 3.
**REQUIRED ITEMS NOT SUPPLIED BY SKIPPER**

The following items are not SKIPPER supplied items.
- LAN cable (minimum CAT7) from Operator units to Electronic unit.
- The sensor is manufactured with a 40m cable. The cable may be cut or extended. Extension cable is 6 pairs with individual screens. See DL2 Installation manual Chapter 3 for cable dimension.

**POWER SUPPLY REQUIREMENTS**

The JB70D21-SA power supply includes separate power for DL1 and DL2

**DL2:**
- CU-M001-SA. Operator Unit. 24V DC. Max 10 W, Typical 6 W.
- JB70D21-SA. Electronic unit (DL2 Power): 24V DC and/or 115/230V AC. Max 60 W typical 15 W.

**DL1:**
- CD402CU-SA. Operator Unit. 24V DC. Max 10 W, Typical 6 W.
- JB70D21-SA. Electronic unit (DL1 Power): 24V DC. Max 20 W.

There are no power switches on the CD402CU-SA, CU-M001 or JB70D21-SA. The separate power inputs should be including a manual circuit breaker.

There are no input fuse on the CD402CU-SA, CU-M001-SA or JB70D2-SA. The power input should be including a fuse rated for 100% - 200% of max power installed components.

Example:
Two separate 24V supplies for DL1 and DL2.
Each 24V supply should have a 3A slow blow fuse.

Optional items power supply requirement:
- CD401MR-SB repeater. 24V DC. Max 10 W, Typical 6 W.
- IR31DIM-SA. External dimmer: 24V DC
- LAN switch: 24VDC
CHAPTER 2: HARDWARE MOUNTING

The DL21 is a DL1 (single axis STW) + DL2 (Dual axis STW + SOG), built into 1 sensor housing, 1 electronic unit and 2 operator units.

For mounting of DL1 Operator unit (CD402CU-SC)
Please see “Installation manual DL1” DM-M004.

For mounting of DL2 Operator unit (CU-M001-SA)
Please see “Installation manual DL2” DM-M002.
**Placement of the Electronic Unit**

For placement of JB70D21-SA Electronic unit please see “Installation manual DL2” DM-M002. Same as JB70D2-SA

![Diagram of JB70D21-SA Electronic unit placement]

- Use self-tapping screw ST3.5 DIN7985-C or equal (The screw length depends on condition of the wall)
- Recommended cabling space: 50 mm
- Holes in the mounting strip: Ø3.7 mm
- Screw M3.5 x 14 (10x)
- Nut M3.5 (20x)

**Drip Protector**

- ZAA-01330 Drip plate for JB70

**Alternative Assembly**

- E3-0130 Dip plate for JB70

**Dimensions**

- SCALE 1:3
- Recommended cabling space: 50 mm
- 50 60 50
- 114
- 127
- 181.5
- 48

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**Notes**

- ISO 2768
- Gen. tolerance
- Eur. projection
- Material

**Checked by**

- XX-XXX  XX

**Date CN**

- YYYY.MM.DD

**Drawing no.**

- XXX

**Name**

- XXX

**Edition date Sheet**

- 00

**Revision**

- X of X

**Designed by - date**

- 2012.10.31

**Approved by - date**
**Placement of the Sensor in Sea Valve**

For placement of DL21SG-SA sensor please see “Installation manual DL2” DM-M002. Same as DL2SG-SA

The sensor dimensions are the same for DL21 and DL2
There are 6 acoustic channels in DL21
DL1 has 2 channels (Blue)
DL2 has 2 channels (Red).
The acoustic signal is sent in a 30deg angle from vertical

**Placement of JB21 Junction Box**

The junction box JB21 is an option for connecting sensor cable to a yard supplied extension cable (6 x twisted shielded pairs).
It is placed in a dry place within reach of the 40m sensor cable.

**Placement of Repeaters**

Repeaters are typically installed on the overhead console and/or the bridge wings. These can be routed using NMEA signals. These require a local +24 V DC supply.
CHAPTER 3: WIRING

OPERATOR UNITS WIRING

For wiring of DL1 Operator unit (CD402CU-SA) please see “Installation manual DL1” DM-M004. For wiring of DL2 Operator unit (CU-M001-SA) please see “Installation manual DL2” DM-M002.

The Operator units will communicate with JB70D21 over LAN.

Option 1: Direct.
There are 2 LAN ports on JB70D2. A PC or LAN network may be connected to second LAN port.

Option 2: Via LAN network. (as shown in picture)
JB70D21-SA ELECTRONIC UNIT WIRING

The JB70D21-XX does not contain a physical switch (only software) and should be connected to a circuit breaker for removal of power.

The DL2 is powered from nominal 24VDC (Max 32VDC) and/or 115-230V AC. The DL1 is powered from 24V DC Isolated input.

For wiring of DL1 Operator unit (CD402) please see “Installation manual DL1” DM-M004.
For wiring of DL2 Operator unit (CU-M001) please see “Installation manual DL2” DM-M002.
**SENSOR CONNECTION J3 (DL2) AND CN1 (DL1)**

The sensor is connected to JB70D21 Connector J3 and CN1 (See below diagram). The cable screen is connected to screen on sensor side and should not be grounded at JB70 side.
CHAPTER 3: STARTUP PROCEDURE

GENERAL SYSTEM STARTUP
For setup of DL1 Operator unit (CD402) Electronic unit please see “Installation manual DL1” DM-M004.
For setup of DL2 Operator unit (CU-M001) please see “Installation manual DL2” DM-M002.

SPECIAL DL21 FUNCTIONS
DL21 is a combination of 2 systems. The DL1 part provides 1 Axis Speed Through Water (STW). The DL2 part provides 2 Axis Speed Over Ground (SOG), and also 2 axis Speed Through Water. The longitudinal STW value is therefore produced by both system. And at times can be slightly different. This is because the sensors measure at slightly different depths and frequencies.

To prevent confusion it is possible to turn off the STW from the DL2 system. This is done by changing the ‘Output Parameters button in the DL2 setup configuration. This has two settings:

STW + SOG: The DL2 behaves as normal with all IO referring to the DL2.

SOG Only: The DL2 provides only SOG parameters and internally transfers the information of STW from the DL1. This means the VBW sentence from DL2 will also contain the Longitudinal STW information from the DL1 (but no Transversal information).
In addition the Trip information will be transferred from the DL1, as this comes from STW information and not SOG (SOG can be unavailable for periods when the water depth is too deep). This trip information will also be transmitted from both DL1 and DL2 IO and if external trip reset is used, this will be transferred to the DL1 system.

Synchronisation
The DL21 has internal isolated communication between the DL2 part and DL1 part. This allows the systems to display some information from the other system. It also allows the two systems to synchronise. By doing this the system will minimise the acoustic interference between the systems (The two sensors are within the same sensor housing). Interference effects can only be seen in very poor sensor conditions (Deeper water with few particles in the water to provide reflection), and may be seen as a constant wrong speed on the DL2. This effect is removed by synchronisation. This function can be activated / deactivated on the DL2 setup page.

CHAPTER 4: OPTIONS
For options of DL1 please see “Installation manual DL1” DM-M004.

For options of DL2 please see “Installation manual DL2” DM-M002. Please note that some options available on DL2 will not be available on DL21.
APPENDIX 1: INSTALLATION DRAWINGS

Product Datasheet
JB21-SA JUNCTION BOX

Specifications

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JB21-SA</td>
<td>Junction box, 21 pole for speed logs</td>
</tr>
<tr>
<td>To be used with</td>
<td>SKIPPER speed log sensor cables with digital signals (DL21)</td>
</tr>
<tr>
<td>The junction box contains</td>
<td></td>
</tr>
<tr>
<td>WAGO 264-112</td>
<td>2-conductor terminal strip with fixing flange for screw or similar mounting types 3.2 mm Ø 21 pole</td>
</tr>
<tr>
<td>1 x Cable gland</td>
<td>Pg 13.5 (M20) For green DL21 sensor cable 8 pairs + 2 screens</td>
</tr>
<tr>
<td>3 x Cable gland</td>
<td>Pg 9 (M15) 2 x mounted, 1 x spare</td>
</tr>
<tr>
<td>IP rating</td>
<td>IP 56</td>
</tr>
<tr>
<td>Weight</td>
<td>0.8 kg</td>
</tr>
<tr>
<td>Packaging dimensions / weight</td>
<td>31x22x12 / 0.9 kg</td>
</tr>
</tbody>
</table>

All product specifications are subject to change without notice

Last update: 2014-12-10
# APPENDIX 2: DATA SHEETS

## Data sheet JB70D21-SA

### Specifications

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JB70D21-SA</td>
<td>Electronic unit for DL21</td>
</tr>
</tbody>
</table>

**Control units**

<table>
<thead>
<tr>
<th>Control unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD402CU-XX</td>
<td>Control unit Compact with LAN</td>
</tr>
<tr>
<td>CU-M001-XX</td>
<td>Control unit 9” Touch display</td>
</tr>
</tbody>
</table>

**Sensor**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DL21SX, DL29X +DL1SX</td>
<td>Dual 1 axis STW and 2-axis STW + SOG or 2-axis (STW + SOG) + 1-axis STW</td>
</tr>
</tbody>
</table>

**Package consist of**

<table>
<thead>
<tr>
<th>Package</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JB70D21-SA</td>
<td>Electronic unit for DL21</td>
</tr>
<tr>
<td>M-KIT-JB70XX</td>
<td>Mounting kit for JB70</td>
</tr>
</tbody>
</table>

**PCBs inside electronic unit**

<table>
<thead>
<tr>
<th>PCB</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP-M001</td>
<td>Multi power, PCBM</td>
</tr>
<tr>
<td>PI-M001</td>
<td>I/O Multi extension, PCBM</td>
</tr>
<tr>
<td>PC-M001</td>
<td>Multi main processor, PCBM</td>
</tr>
</tbody>
</table>

**PP-M001 power**

- 115 - 230 V AC/24 V DC max 60 W (For DL2) typ. 15 W 24 V DC max 20 W (for DL1) typ. 10 W
- Dual isolated power supply.

**PI-M001 interfaces for DL1 Multi**

- NMEA0183, IEC61162-1, 2 output, 1 input
- Auxiliary x 2 output, 1 input
- Alarm relay x 1
- IEC 61162-450 fully implemented
- Web page setup

**PI-M001 switchable interfaces**

- NMEA 0183, IEC 61162-1, 2 output
- Analogue 1 x 0-10 V, 1 x 4-20 mA
- Auxiliary:1 x output , 1 x input
- Programmable outputs for DL2 or DL1 by switch CN1

**PC-M001 interfaces for DL2**

- NMEA 0183, IEC 61162-1, 2 output, 1 input
- Auxiliary x 2 output, 1 input
- Alarm relay x 1
- Analogue output
- IEC 61162-450 fully implemented
- Web page setup

**IP rating**

- IP 22 (when mounted with PCBs vertical)

**Operating temperature**

- -15 to 55°C

**Storage temperature**

- -20 to 70°C

**Humidity**

- 10 to 90 % relative. No condensation

**Weight**

- 1.5 kg

**Packaging dimensions / weight**

- 30.5 x 21.5 x 21 cm / 2 kg

**Manufacturer**

- SKIPPER Electronics AS, Norway

All product specifications are subject to change without notice.

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**Dimensions in mm**

![Dimension Diagram]

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0612 Oslo, Norway
www.skipper.no
Date: 2015-02-20
**Product Datasheet**

**DL21SG-SA Log sensor DL21**

**For 100mm Sea valve SB-100-XX/DB100-XX**

### Specifications

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description/units</th>
</tr>
</thead>
<tbody>
<tr>
<td>DL21SG-SA</td>
<td>Log sensor DL21 SKIPPER for 100mm Sea Valve</td>
</tr>
<tr>
<td></td>
<td>1 Doppler sensor 1-axis STW</td>
</tr>
<tr>
<td></td>
<td>1 Doppler sensor 2-axis STW+SOG</td>
</tr>
<tr>
<td></td>
<td>The 2 sensors mounted in one bottom mounting works independently and are electrically isolated</td>
</tr>
<tr>
<td></td>
<td>Designed for ships over 50,000 GRT with simultaneous and independent measurement of speed through water (STW) and speed over ground (SOG)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To be installed into</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB-100-XX</td>
<td>Sea Valve 100 mm, Single Bottom SST</td>
</tr>
<tr>
<td>DB-100-XX</td>
<td>Sea Valve 100 mm, Double Bottom SST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To be used with</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JB70D21-XX</td>
<td>Electronic unit</td>
</tr>
</tbody>
</table>

- **Acoustic frequency range**: 270-284 kHz (STW+SOG), 710-720kHz (STW)
- **Bottom detection (SOG)**: < 200 m
- **Cable length**: 40 m (may be extended or shortened)
- **Cable diameter**: 11 mm +/- 0.5 mm
- **Cable minimum bending radius**: 56 mm
- **Accuracy**: 0.2 kn or 2 % whichever is greater
- **Speed resolution**: 0.1 kn
- **Max speed**: +45 to -10 kn Longitudinal
  +/- 25 knot Transversal
- **Temperature accuracy**: 1 deg
- **Temperature resolution**: 0.1 deg
- **IP rating**: IP 68
- **Operating temperature**: -15 to 55°C
- **Storage temperature**: -20 to 70°C
- **Depth rating**: 6 bar
- **Outputs**: 2 x NMEA (proprietary formats) RS422
- **Input**: 2 x NMEA (proprietary formats) RS422
- **Power input**: 2 x Nom. 24 V (18 V to 32 V) 16 W
- **Weight**: 10.2 kg
- **Manufacturer**: SKIPPER Electronics AS, Norway

**All product specifications are subject to change without notice**
The multi extension PCB is used in JB70D1 and JB70D21 (+ future option in JB70D2).

APPENDIX 3: I/O MULTI EXTENSION PCB

The PCB is designed with 3 electrical isolated areas.

Area1:
- CN1 and electronics used by DL1

Area2:
- Power for DL2

Area3:
- Electronics with CN2
  - 2 x NMEA Out
  - 1 x AUX In
  - 1 x AUX Out
  - 1 x Analogue out 4-20 mA
  - 1 x Analogue Out 0-10V
  - 1 x 5V AUX power out
  - Configurable to be used and powered by DL1, DL2 or both. (The control from DL2 is not yet implemented)
PI-M002. Multi Extension PCB. DL21 Version

3 power jumpers are installed. CN2 is powered and controlled by DL1.

PI-M001. Multi Extension PCB. DL1 Version

All 6 power jumpers are installed. CN2 (and rest of DL1) is powered by any of the power inputs 220 / 115V AC (PWR1), 24V DC (PWR2) or optional 24V DC (PWR3)
## APPENDIX 4: COMMISSIONING CHECKLIST

### DL2

<table>
<thead>
<tr>
<th>Test Nr</th>
<th>Task</th>
<th>Test to be performed</th>
<th>Checklist</th>
</tr>
</thead>
</table>
| DL2 – 1 | Wire and check the system | Wire together the JB70 LAN and CU-M001 Graphic display  
• Display does not show ‘NO COMMUNICATION’  
Set up the config as per instructions  
Wire NMEA IN, NMEA OUT  
• MFD shows VBW,a.a,,V,x,x,y,y,A,,A,z.z,A , MTW, VLW  
Wire Relay output J2 to common alarm  
• Remove power (AC and DC) and check you see alarm | |
| DL2 – 2 | Install and connect sensor for DL2 to the JB70 unit (J3)  
Connect JB70 to CU-M001 display  
Check Sensor | Check Using the service software and the self test in Config – Diagnostic – Self test,  
• Serial Number of sensor (DL2) should be same as on cable  
• Firmware version should be correct (2.14 or greater)  
• Live data should show quality factor (QF) 8 or 9  
Upgrade firmware to the version on the skipper websites | |
| DL2 – 3 | Install setup in the Bridge Conning system | Check on MFD that you see inputs from DL2  
• You can see input VBW, VLW, MTW, occasional VDALR,  
Check on MFD that you can see the Outputs to the Log  
• You can see VTG, DPT, GGA, occasional ACK | |
| DL2 – 4 | Check NMEA 1/2 input  
Check on display – Config – Communication, that the input is showing GYRO and GPS information.  
• Can see HDT/THS, ROT, VTG,GGA/GLL  
• Can see aft speed on page D | |
| DL2 – 5 | | |
| DL2 – 6 | | |
| DL2 – 7 | | |
| DL2 – 8 | | |
| DL2 – 9 | | |
| DL2 – 10 | | |
| DL2 – 11 | | |
| DL2 – 12 | | |
## DL1

<table>
<thead>
<tr>
<th>Test Nr</th>
<th>Task</th>
<th>Test to be performed</th>
<th>Checklist</th>
</tr>
</thead>
</table>
| DL1–1  | Wire and check the system | Wire together the JB70 CN1 and CD402CU compact display  
- Compact shows STW on first line  
- Wire NMEA IN NMEA OUT  
- MFD shows VBW,x,x,,V,,A,,A,,A , MTW, VLW |  |
| DL1–2  | DL1 – 2 | Wire Relay output CN1 to common alarm |  |
| DL1–3  | DL1 – 3 | Install and connect Sensor for DL1 to the JB70 unit (CN1)  
Connect JB70 LAN plug to CD402 LAN plug  
Check sensor. | Check Using the service software and t  
- Check you see STW 0.0 on compact display  
- Using service software, check on the sensor serial number and firmware should be 1.05 or greater.  
- Upgrade firmware if required |  |
| DL1–4  | DL1 – 4 | |  |
| DL1–5  | DL1 – 5 | |  |
| DL2–9  | DL2 – 9 | Install setup in the Bridge Conning system | Check on MFD that you see inputs from DL1  
- You can see input VBW, VLW, MTW, occasional VDALR,  
Check on MFD that you can see the Outputs to the Log  
- You can see VTG, DPT, GGA, occasional ACK |  |
| DL2 – 10 | DL2 – 10 | |  |
| DL2–11 | DL2–11 | Set SPEEDHI alarm to 9 kn.  
Set Menu/set – Diag – DEMO to 1 and wait for alarm.  
- Check alarm sounds  
- Check alarm can be acknowledged | |  |
| DL2–12 | DL2–12 | Check the power failure (Common alarm) | |  |
| | | Remove power from the DL1 part of JB70  
- The common alarm sounds. | |