Ambient temperature +27.3 °C Relative humidity 72 %

POLLED MODE IEC 61993-2, CLAUSE 14.1.3 (4.2.1 M.1371-1 A2/3.3.2)

TRANSMIT AN INTERROGATION IEC 61993-2, CLAUSE 14.1.3.1

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
Initiate the transmission of an interrogation message (msg 15) by the EUT addressing 1 or 2 destinations according to message table (M.1371-1 table 13) requesting the following responses:
– msg 3, msg 5 from mobile stations
– msg 4, msg 20, msg 22 from base stations
Record transmitted messages.

(2) Required results

Check that the EUT transmits the interrogation message (msg 15) as appropriate.

(3) Test results

Conditions	Results
msg 3	√
msg 5	√
msg 4	√
msg 20	√
msg 22	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 63, 79 to 82, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

INTERROGATION RESPONSE IEC 61993-2, CLAUSE 14.1.3.2

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
Apply an interrogation message (msg 15; EUT as destination) to the VDL according to message table (M.1371-1 table 13) for responses with msg 3, msg 5 and slot offset set to defined value.
Record transmitted messages and frame structure.

(2) Required results

Check that the EUT transmits the appropriate interrogation response message as requested after defined slot offset.
Confirm that the EUT transmits the response on the same channel as where interrogation was received.

(3) Test results

Conditions	Results
msg 3, Slot offset:75	√
msg 3, slot offset:150	√
msg 5, Slot offset:75	√
msg 5, slot offset:150	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58, 75

TEST EQUIPMENT USED:
4, 28, 30 to 52, 63, 66, 67, 79, 88 to 90

.....

Ambient temperature +27.3 °C Relative humidity 72 %

ADDRESSED OPERATION IEC 61993-2, CLAUSE 14.1.4 (6.1 M1371-1 A2/3.3.8)

TRANSMIT AN ADDRESSED MESSAGE IEC 61993-2, CLAUSE 14.1.4.1

(1) Method of measurement

Set up standard test environment and operate the EUT in autonomous mode.
Initiate the transmission of an addressed binary message (msg 6; EUT as source) according to message table (M.1371-1 table 13) by the EUT.
Record the transmitted messages.

(2) Required results

Check that the EUT transmits the msg 6 as appropriate.
Repeat test with the addressed safety related message (msg 12).

(3) Test results

Conditions	Results
msg 6	√
msg 12	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

RECEIVE ADDRESSED MESSAGE IEC 61993-2, CLAUSE 14.1.4.2 (4.2)

(1) Method of measurement

Set up standard test environment and operate the EUT in autonomous mode.
a) Apply an addressed binary message (msg 6; EUT as destination) to the VDL.
b) Apply an addressed binary message (msg 6; other station as destination) to the VDL.
Record transmitted messages and frame structure.

(2) Required results

Check that the EUT transmits the appropriate acknowledgement message.
Confirm that:
a) EUT outputs the received message via the presentation interface.
b) EUT does not output the received message via the presentation interface.

(3) Test results

Conditions	Results
msg 6; EUT as destination	√
msg 6; other station as destination	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

MULTIPLE SLOT MESSAGES IEC 61993-2, CLAUSE 14.2 (4.2 M.1371-1 A2/5.2.1)

5 SLOT MESSAGES IEC 61993-2, CLAUSE 14.2.1 (M.1371-1 A2/5.2.1)

(1) Method of measurement

Apply a BBM sentence to the PI of EUT with a max. of 121 data bytes of binary data in order to initiate transmission of a binary message (msg 8).

(2) Required results

Check that the message is transmitted in up to 5 slots accordingly.

(3) Test results

Conditions	Results
msg 8; BBM with a max. of 121 data bytes	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90

.....

Ambient temperature +27.3 °C Relative humidity 72 %

LONGER MESSAGES IEC 61993-2, CLAUSE 14.2.2 (M.1371-1 A2/5.2.1)

(1) Method of measurement

Apply a BBM sentence to the PI of the EUT with an information content not fitting in 5 slots (i.e. more than 121 data bytes of binary data containing only binary 1's).

(2) Required results

Check that the message is not transmitted.
Check that a negative acknowledgement is given on the presentation interface.

(3) Test results

Conditions	Results
msg 8; BBM with more than 121 data bytes	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90

.....

Ambient temperature +27.3 °C Relative humidity 72 %

INFORMATION CONTENT IEC 61993-2, CLAUSE 14.3 (6.5.1 M.1371-1 A2/3.3.8)

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
Apply all static, dynamic and voyage related data to the EUT.
Record all messages on VDL and check the contents of position report msg 1 and static data report msg 5.

(2) Required results

Confirm that data transmitted by the EUT complies with manual and sensor inputs.

(3) Test results

Conditions	Results
msg 1	√
msg 5	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

SPEED AND COURSE CHANGE IEC 61993-2, CLAUSE 14.4.1 (6.5.2)

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
a) start with own speed of 10 knots; record all messages on VDL for 10 min and evaluate reporting rate for position report of EUT by calculating average slot offset over test period.
b) Increase speed and change course (ROT > 10°/min, derived from heading) in accordance with 6.5.2, Table 1 and ITU-R M.1371-1 A2/4.3.
c) Reduce speed and rotation rate to values below those given in Table 1.
d) Make speed and/or heading sensor unavailable.
For b), c), d) record all messages on VDL and check slot offset between two consecutive transmissions.

(2) Required results

a) Reporting rate shall comply with table 1 (10 s ± 10 %).
b) Confirm that the new reporting rate has been established.
c) Confirm that the reporting rate is reduced after 20 s (ROT reduction), or 4 min (speed reduction.
d) Check that with unavailable sensors the reporting rate reverts to default values (10 s if no sensor connected).

(3) Test results

Conditions	Results
Speed of 10 knots	√
Speed of 15 knots and changing course	√
Speed of 15 knots and not changing course	√
Speed and heading sensor unavailable	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

CHANGE OF NAVIGATIONAL STATUS IEC 61993-2, CLAUSE 14.4.2 (6.5.2)

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
Change Navigational status by applying voyage data message to the Presentation Interface of the EUT.
a) set NavStatus to "at anchor" and speed <3 knots
b) set NavStatus to "at anchor" and speed >3 knots
c) set NavStatus to other values
Record all messages on VDL and evaluate reporting rate of position report of EUT.

(2) Required results

a) Reporting rate shall be 3 min.
b) Reporting rate shall be 10 s.
c) Reporting rate shall be adjusted according to speed and course (see 14.4.1).

(3) Test results

Conditions	Results
NavStatus to "at anchor" and speed <3 knots	√
NavStatus to "at anchor" and speed >3 knots	√
NavStatus to other values: NavStatus to "underway using engine" and speed = 15 knots	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

ASSIGNED REPORTING RATES IEC 61993-2, CLAUSE 14.4.3 (6.5.2)

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
Transmit an Assigned mode command msg 16 to the EUT with:
a) initial slot offset and increment;
b) designated reporting rate.
Change course, speed and NavStatus. Record transmitted messages.

(2) Required results

Confirm that the EUT transmits position reports msg 2 according to the parameters defined by msg 16; the reporting rate shall not be affected by course, speed or NavStatus.
The EUT shall revert to msg 1 or 3 in autonomous mode with standard reporting rate after 4 to 8 min.

See IALA clarification

(3) Test results

Conditions	Results
Slot offset: 100, slot increment: 125.	√
Reporting rate: Slot offset 120, increment: 0.	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58, 75

TEST EQUIPMENT USED:
4, 28, 30 to 52, 63, 66, 67, 79, 88 to 90

.....

Ambient temperature +27.3 °C Relative humidity 72 %

STATIC DATA REPORTING RATES IEC 61993-2, CLAUSE 14.4.4 (6.5.2)

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
a) Record the transmitted messages and check for static and voyage related data (msg 5).
b) Change static and/or voyage related station data.
Record the transmitted messages and check for static and voyage related data (msg 5).

(2) Required results

a) Confirm that the EUT transmits msg 5 with a reporting rate of 6 min.
b) Confirm that the EUT transmits msg 5 within 1 min reverting to a reporting rate of 6 min.

(3) Test results

Conditions	Results
Normal (Not changing) static and voyage related data	√
After changing static and/or voyage related data	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90
.....

Ambient temperature +25.5 °C Relative humidity 71 %

SECURITY IEC 61993-2, CLAUSE 14.5 (6.6)

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
Switch the EUT off for more than 15 min and on again at least ten times.
Recover and readout recorded data.

(2) Required results

Confirm that the EUT records and displays times and events correctly.

(3) Test results

Conditions	Results
Switch the EUT off for more than 15 min. and on again. Repeat 9 more times. Recover and readout recorded data.	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

INITIALISATION PERIOD IEC 61993-2, CLAUSE 14.6 (6.7 M.1371-1 A2/3.3.3)

(1) Method of measurement

Set up standard test environment with all sensors available.
a) Switch on EUT with EUT operating in autonomous mode.
b) Switch off EUT for approx. 0.5 s. Record transmitted messages.

(2) Required results

Confirm that the EUT starts transmissions within 2 min after switch on.

(3) Test results

Conditions	Results
Switch on EUT with EUT operating in autonomous mode	√
Switch off EUT for approx. 0.5 s and on again. Record transmitted messages	√(1 min, 16 sec)

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90, 23
.....

Ambient temperature +27.3 °C Relative humidity 72 %

CHANNEL SELECTION IEC 61993-2, CLAUSE 14.7 (6.9)

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
Switch the EUT to different channels randomly selected from the maritime mobile band as specified by ITU-R M.1084-4, Annex 4 using both 25 kHz and 12.5 kHz channel spacing (incl. 12.5 kHz emission on a 25 kHz channel):
a) manually,
b) by transmission of channel management message (msg 22) broadcast and addressed to the EUT,
c) by application of ACA sentence to the presentation interface,
d) by transmission of DSC telecommand to the EUT.
Record the VDL messages.

(2) Required results

Confirm that the EUT switches to channel/bandwidth and duplex/simplex channels accordingly.
Confirm that the EUT delivers a TXT-sentence with ID 036, followed by the ACA-sentences needed to inform of changes in the AIS use of regional operating settings.

Test results

TEST CONDITIONS		Test Results				
		a) Manually	b-1) msg22, broadcast	b-2) msg22, addressed to EUT	c) ACA sentence	d) DSC telecommand
T_{nom}(+25°C)	AC 220 V, 60 Hz	√	√	√	√	√
T_{min} (-15/-25°C)	AC 220 V, 60 Hz	√	√	√	√	√
T_{max}(+55°C)	AC 220 V, 60 Hz	√	√	√	√	√

Remarks:
msg 22 broadcast is same as clause 17.2
msg 22 addressed to EUT is same as clause 17.7.3
ACA sentence is same as clause 17.3
DSC telecommand is same as clause 20.2

The EUT satisfied the requirements of this test.

Software used: 55 to 58, 75, 79

TEST EQUIPMENT USED:
4, 28, 30 to 52,59, 60, 62, 63, 64, 66, 67, 79, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

TRANSCEIVER PROTECTION IEC 61993-2, CLAUSE 14.8 (6.9; M.1371-1 A2/2.14, 2.15)

(1) Method of measurement

Set up standard test environment and operate the EUT in autonomous mode.
Open circuit and short circuit VHF-antenna terminals of the EUT for at least 60 s each.

(2) Required results

The EUT shall be operative again within 2 min after refitting the antenna without damage to the transceiver.

(3) Test results

Conditions	Results
Open circuit VHF antenna terminal	√
Short circuit VHF antenna terminal	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90

.....

Ambient temperature +27.3 °C Relative humidity 72 %

ALARMS AND INDICATORS, FALL-BACK ARRANGEMENTS — IEC 61993-2, CLAUSE 14.9 (6.10)
LOSS OF POWER SUPPLY — IEC 61993-2, CLAUSE 14.9.1 (6.10.2.3)

(1) Method of measurement
Disconnect power supplies of the EUT.

(2) Required result
Verify that the relay output is "active" when the power is "off".

(3) Test results

Conditions	Results
Disconnect power supply of EUT	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

MONITORING OF FUNCTIONS AND INTEGRITY
Tx MALFUNCTION

IEC 61993-2, CLAUSE 14.9.2 (6.10.2)
IEC 61993-2, CLAUSE 14.9.2.1

(1) Method of measurement
Disable the transmitter by disconnecting the antenna.

(2) Required result
Verify that an alarm sentence ALR with alarm ID 001 is sent and the relay output signals the failure state. Verify that relay deactivates when the EUT receives an ACK and that the status field in the ALR sentence is updated.

(3) Test results

Conditions	Results
Disable the transmitter by disconnecting the antenna	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

ANTENNA VSWR IEC 61993-2, CLAUSE 14.9.2.2

(1) Method of measurement

Prevent the EUT from radiating with full power by mismatching the antenna for a VSWR of 3:1. During the mismatch the output power is not required to be the rated output power

(2) Required result

Verify that the EUT continues operating.
Verify that an alarm sentence ALR with alarm ID 002 is sent and the relay output signals the failure state.
Verify that relay deactivates when the EUT receives an ACK and that the status field in the ALR sentence is updated.

(3) Test results

Conditions	Results
Antenna VSWR = 3:1	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

Rx MALFUNCTION IEC 61993-2, CLAUSE 14.9.2.3

Manufacturers shall provide documentation describing how the AIS detects Rx malfunction and that an ALR sentence with alarm ID as appropriate is sent.

(1) Method of measurement
Disable each frequency synthesizer of receiver.

(2) Required result
Verify that an alarm sentence ALR sent and reaction according to the below table and the relay output signals the failure state.
Verify that relay deactivates when the EUT receives an ACK and that the status field in the ALR sentence is updated.

Quoted from IEC61993-2 Table 2

Alarm's description text	Alarm condition threshold exceeded	Alarm condition not exceeded	Alarm ID or Text Identifier	Reaction of the system to the alarm condition threshold exceeded
AIS: Rx channel 1 malfunction	A	V	003	Stop transmission on affected channel
AIS: Rx channel 2 malfunction	A	V	004	Stop transmission on affected channel
AIS: Rx channel 70 malfunction	A	V	005	Stop transmission on affected channel

(3) Test results

Conditions	Results
Disable Rx channel 1	√
Disable Rx channel 2	√
Disable Rx channel 70	√

Note: All synthesizers were disabled by disconnecting the common 12.8MHz reference oscillator.

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

LOSS OF UTC IEC 61993-2, CLAUSE 14.9.2.4

(1) Method of measurement

Set up standard test environment and operate the EUT in autonomous mode.
Disconnect the GNSS antenna (UTC clock lost).

(2) Required result

Verify that the system continues to operate but changes to indirect synchronisation and that a TXT-sentence with ID 007 is sent and the relay output is not activated.

(3) Test results

Conditions	Results
Disconnect the internal GNSS antenna	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

REMOTE MKD DISCONNECTION, WHEN SO CONFIGURED IEC 61993-2, CLAUSE 14.9.2.5

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
a) Disconnect the connection to the remote MKD.
b) Provide an alarm acknowledgement, ACK sentence with ID 008, to the PI.

(2) Required results

a) Verify that an alarm sentence, alarm ID 008, is sent and the relay output signals the failure.
Verify that the AIS continues operation, with the DTE value "1" in msg 5.
b) Verify that the relay deactivates when the EUT receives an ACK and that the status field in the ALR sentence is updated.

(3) Test results

Conditions	Results
Disconnect the connection line to the remote MKD	N/A
Provide an alarm acknowledgement	N/A

The EUT has no remote MKD so this test is not applicable.

Software used:

TEST EQUIPMENT USED:
N/A
.....

Ambient temperature +25.5 °C Relative humidity 71 %

MONITORING OF SENSOR DATA
PRIORITY OF POSITION SENSORS

IEC 61993-2, CLAUSE 14.9.3 (6.10.3)
IEC 61993-2, CLAUSE 14.9.3.1 (6.1.1.3, 6.10.3)

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
Verify the manufacturer's documentation to ascertain the configuration implemented on the EUT for position sensors (see 6.2).
Apply position sensor data in a way that the EUT operates in the states defined below:
a) external DGNSS in use (corrected)
b) internal DGNSS in use (corrected; msg 17) if implemented
c) internal DGNSS in use (corrected; beacon) if implemented
d) external EPFS in use (uncorrected)
e) internal GNSS in use (uncorrected) if implemented
f) no sensor position in use
Check the ALR sentence and the position accuracy flag in the VDL msg 1.

(2) Required result

Verify that the use of position source, position accuracy flag, RAIM flag and position information complies with table 4.
Verify that when the status is changed, an ALR (025, 026, 029, 030), or TXT (021, 022, 023, 024, 025, 027, 028) sentence is sent according to table 2 or table 3 respectively.
Verify that the status is changed after 5 s when switching downwards and 30 s when switching upwards.

(3) Test results

(3.1) Switching downwards

Conditions	Results
External DGNSS in use (corrected)	√
Internal DGNSS in use (corrected; msg 17)	√
Internal DGNSS in use (corrected; beacon)	√
External EPFS in use (uncorrected)	√
Internal GNSS in use (uncorrected)	√
No sensor position in use	√

(3.2) Switching upwards

Conditions	Results
No sensor position in use	√
Internal GNSS in use (uncorrected)	√
External EPFS in use (uncorrected)	√
Internal DGNSS in use (corrected; beacon)	√
Internal DGNSS in use (corrected; msg 17)	√
External DGNSS in use (corrected)	√

(continued on next page)

Ambient temperature +25.5 °C Relative humidity 71 %

PRIORITY OF POSITION SENSORS IEC 61993-2, CLAUSE 14.9.3.1 (6.1.1.3, 6.10.3)

(continued)

Conditions	Result
Check the ALR sentence and the position accuracy flag in the VDL msg 1.	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 63, 79 to 82, 88 to 92

.....

Ambient temperature +27.3 °C Relative humidity 72 %

HEADING SENSOR IEC 61993-2, CLAUSE 14.9.4 (6.10.3.3)

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
a) Disconnect the inputs for HDG and ROT or set their data to invalid (e.g. by wrong checksum, "valid/invalid" flag).
b) Reconnect the inputs for HDG and ROT.
c) Disconnect the input for ROT or set the data to invalid (e.g. by wrong checksum, "valid/invalid" flag).
Establish a rate of heading change that is greater than 5 degrees in 30 s.
d) Reconnect the ROT input.

(2) Required result

a) Check that an alarm sentence ALR with alarm ID 032 for invalid HDG and an alarm sentence ID 035 for invalid ROT are sent to the PI and the "default" data is sent in VDL msg 1, 2, or 3.
b) Check that an alarm sentence ALR with alarm ID 032 for valid HDG and ID 035 for valid ROT is sent to the PI.
Verify that, in the alarm sentences, the alarm condition flag is set to "V" and that the relay output is not activated.
Check that TXT-sentences with ID 031 for valid HDG and ID 033 for ROT indicator in use are sent to the PI.
c) Check that a TXT-sentence with ID 034 for "other ROT source in use" is sent to the PI and that the contents of the message's ROT field is the correct "direction of turn" (table 5 "ROT sensor fall-back conditions," Priority 2).
d) Check that a TXT-sentence with ID 033 for ROT indicator in use is sent to the PI.

(3) Test results

Conditions	Results
Disconnect the inputs for HDG and ROT	√
Reconnect the inputs for HDG and ROT	√
Disconnect the input for ROT	√
Reconnect the ROT input	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 63, 79-82, 88 to 92
.....

Ambient temperature +27.3 °C Relative humidity 72 %

SPEED SENSORS IEC 61993-2, CLAUSE 14.9.5 (6.10.3.5)

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
Verify the manufacturer's documentation to ascertain the configuration implemented on the EUT for position sensors (see 6.10).
a) apply valid external DGNSS position and external speed data.
b) disconnect external DGNSS position, disconnect the inputs for SOG, COG or set their data to invalid (e.g. by wrong checksum, "valid/invalid" flag).
NOTE Test b) is applicable only if the internal GNSS is used as position source.

(2) Required Result

a) Check that an alarm sentence ALR with alarm ID 027 is sent to the PI and the external data for SOG/COG is sent in VDL msg 1, 2 or 3. Verify that the system continues to operate and that the relay output is not activated.
b) Check that two sentences, ALR with alarm ID 025 & TXT ID 028 are sent to the PI and the internal data for SOG/COG is sent in VDL msg 1, 2 or 3. Verify that the system continues to operate and that the relay output is activated.

(3) Test results

Conditions	Results
Valid external DGNSS position and external speed data	√
Disconnect external DGNSS position, disconnect the inputs for SOG, COG	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 63, 79-82, 88 to 92
.....

Ambient temperature +27.3 °C Relative humidity 72 %

DISPLAY AND CONTROL
DATA INPUT/OUTPUT FACILITIES

IEC 61993-2, CLAUSE 14.10 (6.11)
IEC 61993-2, CLAUSE 14.10.1

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
a) Check the MKD indication.
b) Record received messages and check contents of the MKD.
c) Input static and voyage related data via the MKD.

(2) Required results

a) The minimum display shall contain at least three lines of data, with no horizontal scrolling of the range and bearing data display.
b) Confirm that all messages including binary and safety related and Long Range messages received can be displayed and that means to select messages and data fields to be displayed are available.
c) Confirm that all necessary data can be input.

(3) Test results

Conditions	Results
MKD indication	√
Reception of binary and safety related messages	√
Reception of Long Range messages	√
Input static and voyage related data	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 63, 79-82, 88 to 92
.....

Ambient temperature +27.3 °C Relative humidity 72 %

INITIATE MESSAGE TRANSMISSION IEC 61993-2, CLAUSE 14.10.2

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
Initiate the transmission of non-scheduled messages and interrogations as provided by the EUT.

(2) Required results

Confirm that at least the transmission of safety-related addressed and broadcast messages (msg 12 and msg 14) can be initiated by means of the minimum display.
Confirm that transmission of messages 4, 16, 17, 18, 19, 20, 21, 22 is not possible.
NOTE Use of messages 4, 16, 17, 18,19, 20, 21, 22 is restricted to base stations or class B AIS.

(3) Test results

Conditions	Results
Confirm that the transmission of safety-related addressed (msg 12) can be initiated by means of the minimum display.	√
Confirm that the transmission of broadcast messages (msg 14) can be initiated by means of the minimum display.	√
Transmission of messages 4, 16, 17, 18, 19, 20, 21, 22 is not possible	√

The EUT satisfied the requirements of this test.

Software used: 55 to 58, 75

TEST EQUIPMENT USED:
4, 28, 30 to 52, 63, 66, 67, 79, 88 to 90
.....

Ambient temperature +27.3 °C Relative humidity 72 %

SYSTEM CONTROL IEC 61993-2, CLAUSE 14.10.3

(1) Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
Perform system control/configuration commands as specified.
Check indication of system status/alarms.

(2) Required results

At least initiation of channel switching shall be possible with the minimum display.
Output power may not be switched manually.
Confirm that the configuration level and other functions, not intended for use by the operator, are protected by password or adequate means.

(3) Test results

Conditions	Results
Channel switching operation	√
Protection for the channel switching operation	√

The EUT satisfied the requirements of this test.

Software used:

Software used: 55 to 58

TEST EQUIPMENT USED:
4, 28, 30 to 52, 88 to 90

.....

Ambient temperature +24.5 °C Relative humidity 58 %

FREQUENCY ERROR

IEC 61993-2, CLAUSE 15.1.1
Extreme supply IEC 61993-2, CLAUSE 10.2.2

TEST CONDITIONS		TDMA Transmitter Frequency Error (kHz)			
		156.025 MHz	157.4125 MHz	160.6375 MHz	162.025 MHz
T_{nom}(+25°C)	AC 220 V, 60 Hz	+0.117	+0.115	+0.111	+0.108
T_{min} (-15/-25°C)*	AC 220 V, 60 Hz	+0.082	+0.080	+0.077	+0.076
T_{max}(+55°C)	AC 220 V, 60 Hz	+0.088	+0.088	+0.084	+0.084
Maximum frequency error (kHz)					
Measurement uncertainty (Hz)		±0.01			

* The NTE-182 and NQD-4382 were at –25°C, all other units at -15°C for this test.

Required results:

The frequency error shall not exceed ± 0.5 kHz under normal and ± 1 kHz under extreme test conditions.

Remarks

The EUT satisfied the requirements of this test.

Software used: 71

TEST EQUIPMENT USED:
2, 3, 6, 7, 28, 65

.....

Ambient temperature +24.5 °C Relative humidity 58 %

CARRIER POWER

IEC 61993-2, CLAUSE 15.1.2
Extreme supply IEC 61993-2, CLAUSE 10.2.2

TEST CONDITIONS		TDMA Transmitter Carrier Power (Low/High) (Watts)			
		156.025 MHz	157.4125 MHz	160.6375 MHz	162.025 MHz
T_{nom}(+25°C)	AC 220 V, 60 Hz	Low: 2.2 High: 13	Low: 2 High: 12.1	Low: 2.2 High: 12.5	Low: 2.3 High: 12.5
T_{min} (-15/-25°C)*	AC 220 V, 60 Hz	Low: 2.2 High: 12	Low: 2.2 High: 13	Low: 2.25 High: 12.5	Low: 2.25 High: 12.5
T_{max}(+55°C)	AC 220 V, 60 Hz	Low: 2.25 High: 13	Low: 2.25 High: 12.5	Low: 2.1 High: 12	Low: 2.3 High: 12
Measurement uncertainty (dB)		± 1.5 dB			

* The NTE-182 and NQD-4382 were at –25°C, all other units at -15°C for this test.

Required results:

Normal conditions	The carrier power (conducted) under normal conditions shall be within ±1.5 dB of the rated carrier power (conducted).
Extreme conditions	The carrier power (conducted) under extreme conditions shall be within +2 dB and –3 dB of the rated carrier power (conducted).

Remarks

The EUT satisfied the requirements of this test.

Software used: 71

TEST EQUIPMENT USED:
2, 3, 6, 28, 65

.....

Ambient temperature +24.5 °C Relative humidity 58 %

MODULATION SPECTRUM IEC 61993-2, CLAUSE 15.1.3

25 kHz Channel Mode

See plots on following pages.

Required results:

The modulation spectrum shall be within the mask shown on each of the plots.

Remarks

The EUT satisfied the requirements of this test.

Software used: 71

TEST EQUIPMENT USED:
12, 26, 28, 65, 85
.....

Ambient temperature +24.5 °C Relative humidity 58 %

MODULATION SPECTRUM IEC 61993-2, CLAUSE 15.1.3

25 kHz Channel Mode

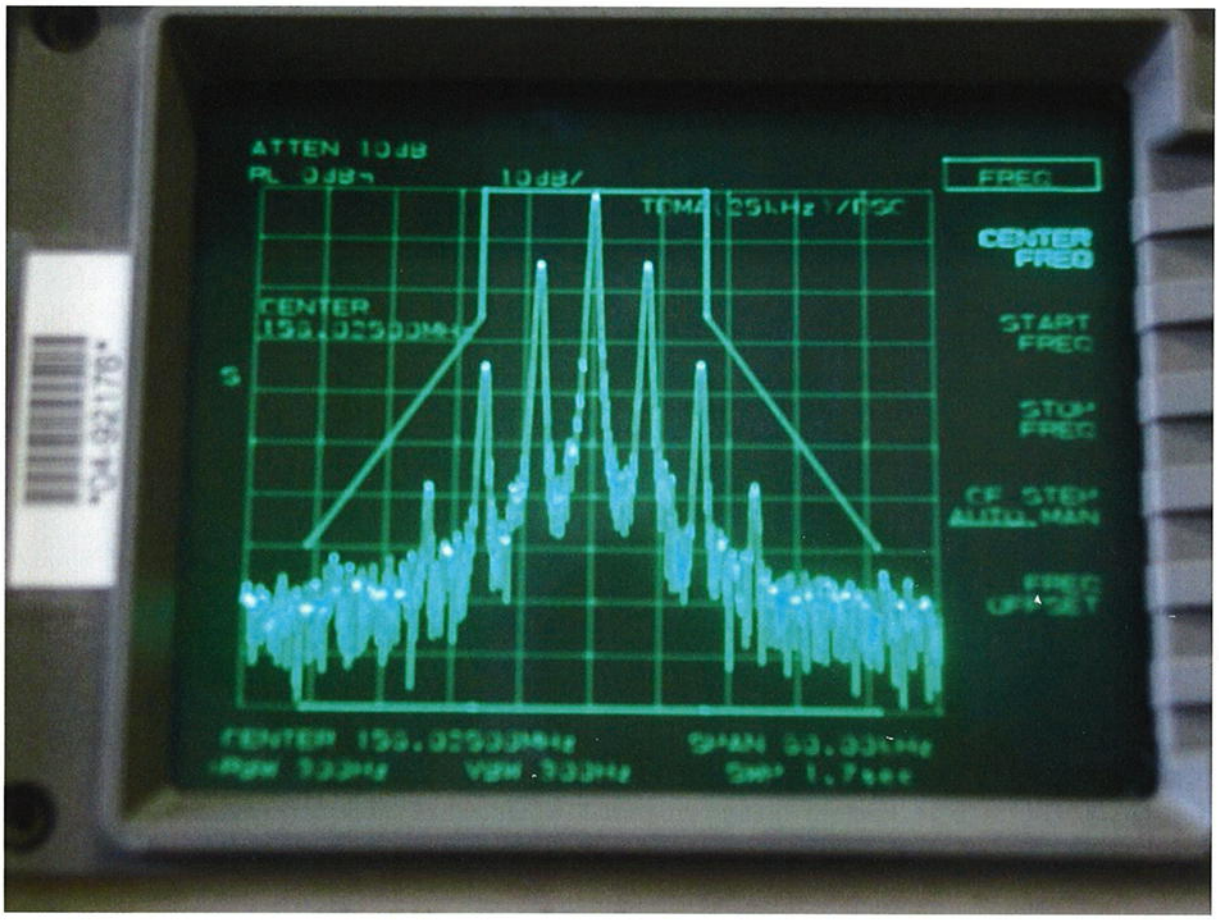

Figure x. Modulation Spectrum, EUT in 25 kHz mode, operating frequency 156.025 MHz, modulation: dot pattern 10101010

Ambient temperature +24.5 °C Relative humidity 58 %

MODULATION SPECTRUM IEC 61993-2, CLAUSE 15.1.3

25 kHz Channel Mode

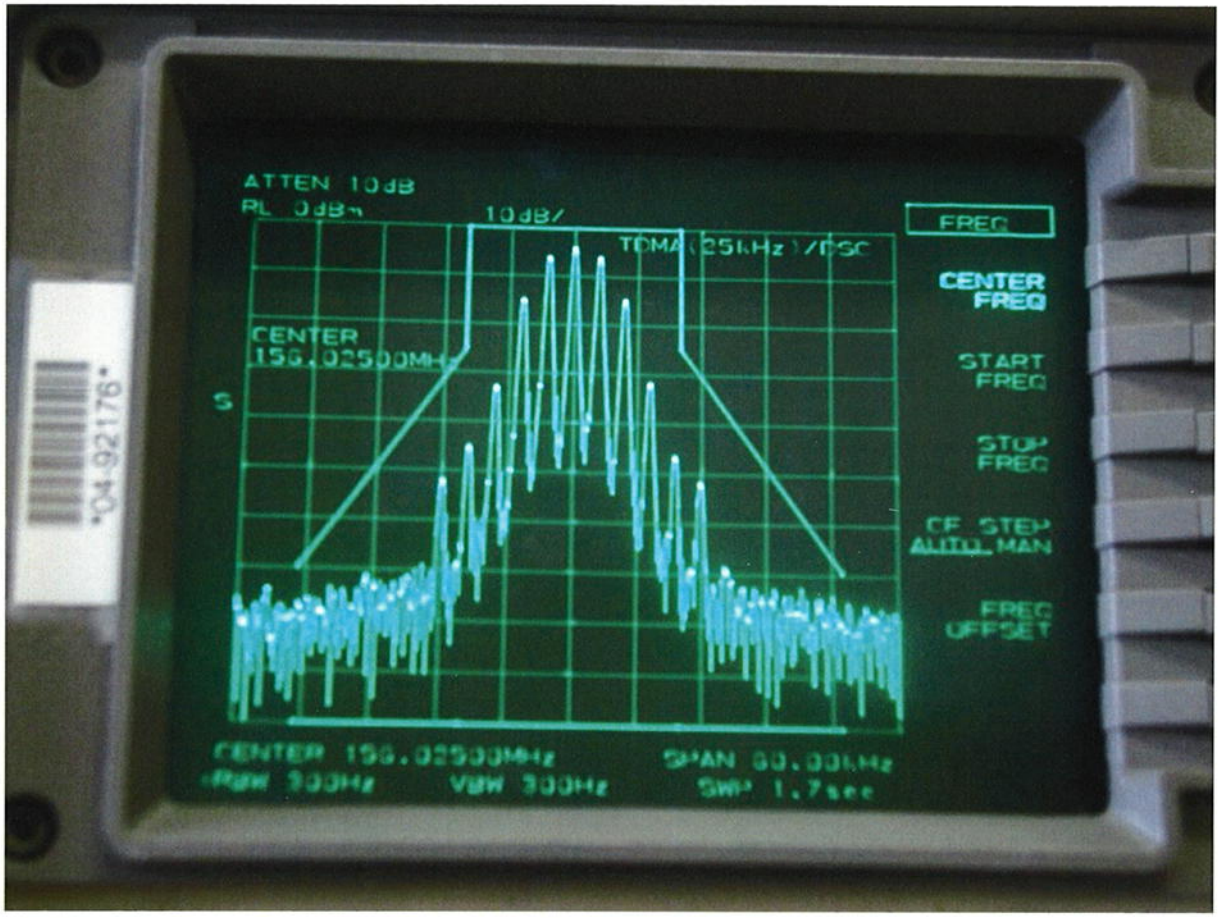

Figure x. Modulation Spectrum, EUT in 25 kHz mode, operating frequency 156.025 MHz, modulation: dot pattern 11001100

Ambient temperature +24.5 °C Relative humidity 58 %

MODULATION SPECTRUM IEC 61993-2, CLAUSE 15.1.3

25 kHz Channel Mode

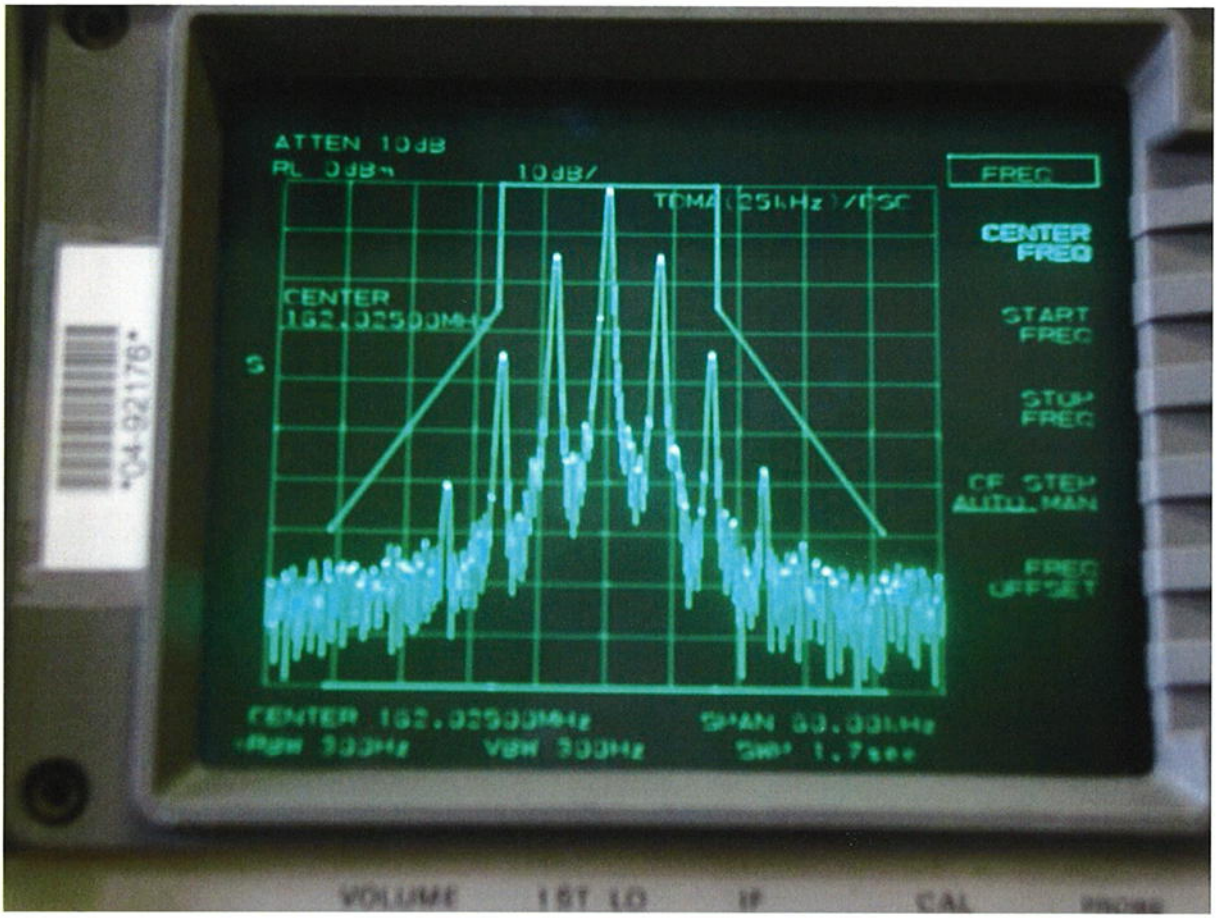

Figure x. Modulation Spectrum, EUT in 25 kHz mode, operating frequency 162.025 MHz, modulation: dot pattern 10101010

Ambient temperature +24.5 °C Relative humidity 58 %

MODULATION SPECTRUM IEC 61993-2, CLAUSE 15.1.3

25 kHz Channel Mode

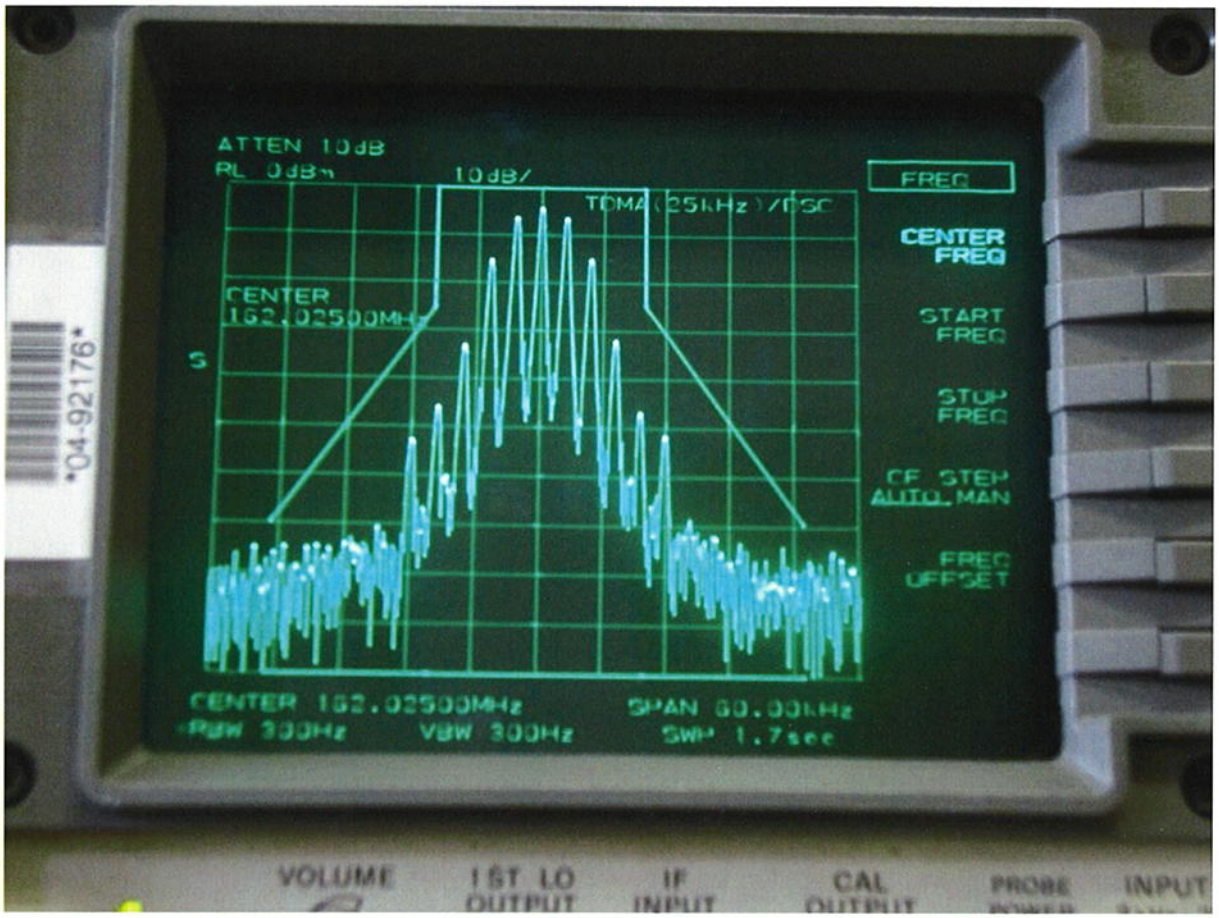

Figure x. Modulation Spectrum, EUT in 25 kHz mode, operating frequency 162.025 MHz, modulation: dot pattern 11001100