

Test report

98747630

based on:
EN 301 025-1 V1.1.2, issue August 2000

Maritime VHF-radiotelephone with integrated
class D DSC-controller and channel 70
watchkeeping receiver
McMurdo / Pains Wessex
F1 DSC



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1 Introduction

This report contains the result of tests performed by:

Telefication bv
Utrechtseweg 310
6812 AR Arnhem
The Netherlands

Telefication complies with the accreditation criteria for laboratories as described in the STERLAB Criteria which contains all of the criteria from EN 45001 and ISO/IEC guide 25 and the relevant criteria from ISO 9001. The accreditation covers the quality system of the laboratory as well as the specified activities described in the accreditation certificate bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie). An extended procedure for performing tests outside their permanent premises has been accepted by the board of STERLAB for accreditation. Telefication is thereby allowed to conduct tests on any suitable site by regular Telefication staff, using suitable equipment that is property of Telefication or of a second party.

Ordering party:

Company name	: McMurdo Ltd.,
Address	: Silver Point, Airport Service Road
Postcode	: PO3 5PB
City/town	: Portsmouth
Country	: United Kingdom
Date of order	: 24 October 2001
References	: --



2 Product

A sample of the following product was submitted for testing:

Maritime VHF-radiotelephone with integrated class D DSC-controller
and channel 70 watchkeeping receiver

Manufacturer	: McMurdo Ltd.,
Trade mark	: McMurdo / Pains Wessex
Type designation	: F1 DSC
Parts of product	: F1 DSC; transceiver unit; s/n: 0001
	: RS 485; handset; s/n.: 0001
Software release	: V 1.0
Particulars	: DSC Class D

3 Test schedule

Tests were carried out in accordance with the specifications detailed in chapter 6 "Summary" of this report.

Tests were carried out at the following location:

- Telefication, Arnhem.
- TNO-CMC, Delft (vibration test).

Tests were carried out between the following dates:

- 12 December 2001 ↔ 21 December 2001.
- 4 March 2002 ↔ 8 March 2002.



4 Product documentation

For production of this report the following product documentation was used:

Description:	Date:	Identification:
Application form	17-12-2001	Application form for testing to EN 301 025
Operator's Manual F1 DSC	07-12-2001	Operator's Manual Draft
Print layout F1 DSC	24-09-2001	Print layout Norbit
Parts List F1 DSC	24-09-2001	Parts List Norbit
Schematic Diagrams F1 DSC	24-09-2001	Schematic diagrams Norbit
Compliance statement chapter 4	13-03-2002	Statement of manufacturer

The above mentioned documentation will be filed at Telefication for a period of 10 years following the issue of this report.

5 Observations and comments

None.



6 Summary

The product is intended for use in the following application area:

MARINE COMMUNICATIONS EQUIPMENT

The sample was tested according to the following specification:

EN 301 025-1 V1.1.2 August 2000

Consequently the equipment complies with:

EN 301 025-2 V1.1.1 August 2000

EN 301 025-3 V1.1.1 May 2001



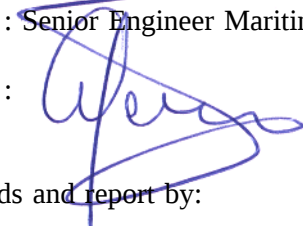
7 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated in chapter 6 "Summary" of this report.

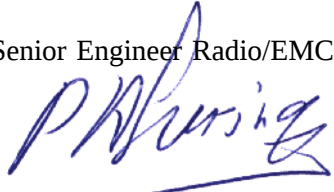
The results of the type tests as stated in this report, are exclusively applicable to the product item as identified in this report. Telefication does not accept any responsibility for the results stated in this report, with respect to the properties of product items not involved in these tests.

This report comprises of a main module and 1 module with test results and other information. All pages have been numbered consecutively and bear the Telefication logo, the report number and sub-numbers. The total number of pages in this report is 98.

All tests are performed by:

name : M.W. Jansen
function : Senior Engineer Maritime
signature : 

Review of test methods and report by:

name : ing. P.A. Suringa
function : Senior Engineer Radio/EMC
signature : 

The above conclusions have been verified by the following signatory:

date : 28 March 2002
name : J.P. van de Poll
function : Co-ordinator Test Group
signature : 

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

LIST OF MEASUREMENTS

The list of measured or checked parameters called for in EN 301 025-1 V1.1.2 is given below.

See page 1c for measurements actually performed.

CLAUSE	GENERAL AND OPERATIONAL REQUIREMENTS	PAGE NUMBER
1	Scope	2/76
2	Normative references	2/76
3	Definitions and abbreviations	2/76
4	General and operational requirements	2/76
4.1	General	2/76
4.2	Construction	2/76
4.3	Construction	2/76
4.4	Controls and indicators	3/76
4.5	Facilities for coding and decoding of DSC	4/76
4.5.1	Call functions	4/76
4.5.2	Manual calls	4/76
4.5.3	Distress calls	4/76
4.5.4	All Ships calls	5/76
4.5.5	Incoming calls	5/76
4.6	DSC display	6/76
4.7	Handset and loudspeaker	6/76
4.8	Safety precautions	7/76
4.9	Labelling	7/76
4.10	Warm up	7/76
TECHNICAL REQUIREMENTS		
5.1	Switching time	8/76
5.2	Class of emission and modulation characteristics	8/76
5.3	Facilities for DSC transmission and reception	8/76
5.3.1	General	8/76
5.3.2	Decoding	8/76
5.3.3	Free channel transmission	9/76
5.3.4	Automatic acknowledgement	9/76
5.3.5	Automatic re-transmission of distress calls	9/76
5.4	Ships identity - MMSI and Group MMSI	9/76
5.5	Entry of position information	9/76
5.6	Alarm circuits	10/76
5.6.1	Distress and urgency	10/76
5.6.2	Other categories	10/76
5.6.3	Acoustic alarms	10/76
5.6.4	Cancellation of alarms	10/76
5.7	Facilities for automatic identification	10/76
5.8	Multiple watch facilities	10/76
5.8.1	General	10/76
5.8.2	Scanning provisions	11/76
5.8.3	Scanning characteristics	12/76

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Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

LIST OF MEASUREMENTS

The list of measured or checked parameters called for in EN 301 025-1 V1.1.2 is given below.

See page 1dc for measurements actually performed.

CLAUSE		PAGE NUMBER
GENERAL CONDITIONS OF MEASUREMENT		
6.1	Arrangement of test signals (receiver)	13/76
6.2	Squelch	13/76
6.3	Normal test modulation	13/76
6.4	Artificial antenna	13/76
6.5	Arrangement of test signals (transmitter)	13/76
6.6	Test channels	13/76
6.7	Generation and examination of DSC signal	13/76
6.8	Standard test signals for DSC	13/76
6.9	Determination of symbol error rate of receiver	13/76
6.10	Measurement uncertainties/interpretation of results	13/76
6.11	Test conditions, power sources and ambient temp.	13/76
6.11.1	Normal and extreme test conditions	13/76
6.11.2	Test power source	13/76
6.12	Normal test conditions	13/76
6.12.1	Normal temperature and humidity	13/76
6.12.2	Normal power sources	13/76
6.13	Extreme test conditions	13/76
6.13.1	Extreme temperatures	13/76
6.13.2	Extreme values of test power sources	13/76
6.14	Procedures for tests at extreme temperatures	13/76
ENVIRONMENTAL TESTS		
7.1	Introduction	13/76
7.2	Procedure	13/76
7.3	Performance check	13/76
7.4	Vibration	14-18/76
7.5	Temperature tests	19/76
7.5.2	Dry heat	19-22/76
7.5.3	Damp heat	23-26/76
7.5.4	Low temperature	27-30/76

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Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

LIST OF MEASUREMENTS

The list of measured or checked parameters called for in EN 301 025-1 V1.1.2 is given below.

See page 1dc for measurements actually performed.

CLAUSE		PAGE NUMBER
TRANSMITTER		
8.1	Frequency error	31/76
8.2	Carrier power	32/76
8.3.	Frequency deviation	33/76
8.3.2	Maximum permissible frequency deviation	33/76
8.3.3	Reduction of frequency deviation at modulation frequencies above 3 kHz	34/76
8.4	Sensitivity of the modulator, including microphone	35/76
8.5	Audio-frequency response	36/76
8.6	Audio-frequency harmonic distortion of the emission	37/76
8.7	Adjacent channel power	38/76
8.8	Conducted spurious emissions conveyed to the antenna	39/76
8.9	Cabinet radiation	40/76
8.10	Transient frequency behaviour of the transmitter	41-42/76
8.11	Residual modulation of the transmitter	43/76
8.12	Frequency error (demodulated DSC signal)	44/76
8.13	Modulation index for DSC	45/76
8.14	Modulation rate for DSC	46/76
8.15	Testing of generated call sequences	47-48/76
RECEIVER		
9.1	Harmonic distortion and rated AF-output power	49-50/76
9.2	Audio frequency response	51/76
9.3	Maximum usable sensitivity	52/76
9.4	Co-channel rejection	53/76
9.5	Adjacent channel selectivity	54/76
9.6	Spurious response rejection	55/76
9.7	Intermodulation response	56/76
9.8	Blocking or desensitisation	57/76
9.9	Spurious emissions	58/76
9.10	Radiated spurious emissions	59/76
9.11	Receiver noise and hum level	60/76
9.12	Squelch operation	61/76
9.13	Squelch hysteresis	62/76
9.14	Multiple watch characteristic	63/76
RECEIVER FOR DSC DECODER		
10.1	Maximum usable sensitivity	64/76
10.2	Co-channel rejection	65/76
10.3	Adjacent channel selectivity	66/76
10.4	Spurious response and blocking immunity	67-68/76
10.5	Intermodulation response	69/76
10.6	Dynamic range	70/76
10.7	Conducted spurious emissions	71/76
10.8	Radiated spurious emissions	72/76
10.9	Verification of correct decoding of DSC calls	73-75/76

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Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

LIST OF MEASUREMENTS

The list of measured parameters called for in EN 301 025-1 V1.1.2 and actually performed is given below.

CLAUSE	GENERAL AND OPERATIONAL REQUIREMENTS	PERFORMED
1	Scope	
2	Normative references	
3	Definitions and abbreviations	
4	General and operational requirements	
4.1	General	yes
4.2	Composition	yes
4.3	Construction	yes
4.4	Controls and indicators	yes
4.5	Facilities for coding and decoding of DSC	yes
4.5.1	Call functions	yes
4.5.2	Manual calls	yes
4.5.3	Distress calls	yes
4.5.4	All Ships calls	yes
4.5.5	Incoming calls	yes
4.6	DSC display	yes
4.7	Handset and loudspeaker	yes
4.8	Safety precautions	yes
4.9	Labelling	yes
4.10	Warm up	yes
TECHNICAL REQUIREMENTS		
5.1	Switching time	yes
5.2	Class of emission and modulation characteristics	yes
5.3	Facilities for DSC transmission and reception	yes
5.3.1	General	yes
5.3.2	Decoding	yes
5.3.3	Free channel transmission	yes
5.3.4	Automatic acknowledgement	yes
5.3.5	Automatic re-transmission of distress calls	yes
5.4	Ships identity - MMSI and Group MMSI	yes
5.5	Entry of position information	yes
5.6	Alarm circuits	yes
5.6.1	Distress and urgency	yes
5.6.2	Other categories	yes
5.6.3	Acoustic alarms	yes
5.6.4	Cancellation of alarms	yes
5.7	Facilities for automatic identification	yes
5.8	Multiple watch facilities	yes
5.8.1	General	yes
5.8.2	Scanning provisions	yes
5.8.3	Scanning characteristics	yes

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LIST OF MEASUREMENTS

The list of measured parameters called for in EN 301 025-1 V1.1.2 and actually performed is given below.

CLAUSE		PERFORMED
	GENERAL CONDITIONS OF MEASUREMENT	
6.1	Arrangement of test signals (receiver)	
6.2	Squelch	
6.3	Normal test modulation	
6.4	Artificial antenna	
6.5	Arrangement of test signals (transmitter)	
6.6	Test channels	
6.7	Generation and examination of DSC signal	
6.8	Standard test signals for DSC	
6.9	Determination of symbol error rate of receiver	
6.10	Measurement uncertainties/interpretation of results	
6.11	Test conditions, power sources and ambient temp.	
6.11.1	Normal and extreme test conditions	
6.11.2	Test power source	
6.12	Normal test conditions	
6.12.1	Normal temperature and humidity	
6.12.2	Normal power sources	
6.13	Extreme test conditions	
6.13.1	Extreme temperatures	
6.13.2	Extreme values of test power sources	
6.14	Procedures for tests at extreme temperatures	
	ENVIRONMENTAL TESTS	
7.1	Introduction	
7.2	Procedure	
7.3	Performance check	yes
7.4	Vibration	yes
7.5	Temperature tests	yes
7.5.2	Dry heat	yes
7.5.3	Damp heat	yes
7.5.4	Low temperature	yes

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LIST OF MEASUREMENTS

The list of measured parameters called for in EN 301 025-1 V1.1.2 and actually performed is given below.

CLAUSE		PERFORMED
	TRANSMITTER	
8.1	Frequency error	yes
8.2	Carrier power	yes
8.3.	Frequency deviation	yes
8.3.2	Maximum permissible frequency deviation	yes
8.3.3	Reduction of frequency deviation at modulation frequencies above 3 kHz	yes
8.4	Sensitivity of the modulator, including microphone	yes
8.5	Audio-frequency response	yes
8.6	Audio-frequency harmonic distortion of the emission	yes
8.7	Adjacent channel power	yes
8.8	Conducted spurious emissions conveyed to the antenna	yes
8.9	Cabinet radiation	yes
8.10	Transient frequency behaviour of the transmitter	yes
8.11	Residual modulation of the transmitter	yes
8.12	Frequency error (demodulated DSC signal)	yes
8.13	Modulation index for DSC	yes
8.14	Modulation rate for DSC	yes
8.15	Testing of generated call sequences	yes
	RECEIVER	
9.1	Harmonic distortion and rated AF-output power	yes
9.2	Audio frequency response	yes
9.3	Maximum usable sensitivity	yes
9.4	Co-channel rejection	yes
9.5	Adjacent channel selectivity	yes
9.6	Spurious response rejection	yes
9.7	Intermodulation response	yes
9.8	Blocking or desensitisation	yes
9.9	Spurious emissions	yes
9.10	Radiated spurious emissions	yes
9.11	Receiver noise and hum level	yes
9.12	Squelch operation	yes
9.13	Squelch hysteresis	yes
9.14	Multiple watch characteristic	yes
	RECEIVER FOR DSC DECODER	
10.1	Maximum usable sensitivity	yes
10.2	Co-channel rejection	yes
10.3	Adjacent channel selectivity	yes
10.4	Spurious response and blocking immunity	yes
10.5	Intermodulation response	yes
10.6	Dynamic range	yes
10.7	Conducted spurious emissions	yes
10.8	Radiated spurious emissions	yes
10.9	Verification of correct decoding of DSC calls	yes

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Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

1. SCOPE
2. NORMATIVE REFERENCES
3. DEFINITIONS AND ABBREVIATIONS
4. GENERAL AND OPERATIONAL REQUIREMENTS
 - 4.1 GENERAL Satisfactory:
 - Manufacturer's declaration of compliance with clause 4 yes
 - Provision of relevant documentation to prove compliance yes
 - 4.2 COMPOSITION

Equipment includes as minimum:

 - VHF radiotelephone; receiver; dedicated ch 70 WKR; DSC-en/decoder yes
 - 4.3 CONSTRUCTION
 - Good engineering practice in respect to mechanical and electrical construction yes
 - Equipment suitable for use on board vessels yes
 - Number of controls suitable for simple and satisfactory operation yes
 - Size of controls enable easy performance *depending on finger-size* yes
 - Detailed operating instructions provided yes
 - Capable of operating on:
 - Single-frequency channels with manual control (Simplex) yes
 - Two-frequency channels with manual control (Simplex) yes
 - Operation on all channels of Appendix 18 of the R.R. yes
 - Blocking of channels 75 and 76 yes
 - Unblocking of blocked channels impossible yes
 - Additional channels (if granted) yes
 - Use of channel 70 only possible for DSC yes
 - Transmission inhibited while any frequency synthesizer is out of lock yes
 - Transmission inhibited during channel switching operations yes

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4.4 CONTROLS AND INDICATORS

Satisfactory:

- Controls impairing technical characteristics not accessible by user yes
- Priority and indication of control units n.a
- Following mandatory controls or functions are provided:
- Distress button yes
- Call yes
- Cancel yes
- Enter (Accept) (OK) yes
- Numeric keypad yes
- Alpha-numeric display yes
- On/off switch for the entire installation with a visual indication that installation is in operation yes
- A manual non-locking push-to-talk switch yes
- A transmit activation indication yes
- A switch for reducing the transmitter output power to no more than 1 Watt with visual indication of low power selection yes
- A volume control to adjust the AF output power yes
- A squelch control yes
- Control for dimming equipment illumination to zero (except distress indicator) yes
- Controls for multiple watch facility (*Dual Watch and Scan*) yes
- Channel designator as in Appendix 18 of the R.R. yes
- Channel designator legible irrespective of the external lighting conditions yes
- Selection of channel 16 by distinctive marked key yes
- Initial selection of channel 16 automatically selects high power yes

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4.5 FACILITIES FOR CODING AND DECODING OF DSC

Satisfactory:

4.5.1 CALL FUNCTIONS

- Quick and precise entering of a call by operator yes
- Call function permits selection of:
 - Individual call; (call to specific MMSI) yes
 - All ships call urgency yes
 - All ships call safety yes
 - Retrieving stored received calls yes
 - Housekeeping functions of equipment yes
- Manual- or directory-individual call can be selected yes
- Directory has facility for 10 entries with programmable MMSI (50) yes

4.5.2 MANUAL CALLS

- Manual call facility permits entry of MMSI yes
- If calling coast station, operator is requested no further information yes
- If calling ship, operator is requested to input channel number yes
- Equipment assists operator by suggesting suitable inter-ship channel yes

4.5.3 DISTRESS CALLS

- Transmission of distress call only by dedicated distress button yes
- Distress button is clearly identified yes
- Distress-button is protected with spring loaded cover yes
- Distress alert initiation requires 2 independent actions yes
- If distress alert is initiated, visual indication and acoustic alarm is activated yes

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4.5.3 DISTRESS CALLS (continued)

Satisfactory:

- Time delay of ≥ 3 s between initiation and activation yes
- Possibility of selecting nature of distress prior to initiation yes
- Default of nature of distress is undesignated distress yes
- Initiation of distress call has priority over any other operation yes
- Equipment selects channel 70 with max. power automatically yes
- Facility provided to discontinue transmission of distress call yes
- Distress call is transmitted 5 times in succession with no interval yes
- Each call of 5 successive calls includes dot pattern yes
- After distress call equipment switches to channel 16 with max. power automatically yes

4.5.4 ALL SHIPS CALLS

- Transmission of all ships urgency/safety calls only by deliberate action yes

4.5.5 INCOMING CALLS

- Facility to convert incoming calls to visual form in plain language (incoming calls with relevant address) yes
- Facility to store at least 10 DSC calls until read manually (20) yes
- Radiotelephone automatically switches to channel identified in incoming call yes
- In case of distress call radiotelephone switches to channel 16 and selects maximum power automatically yes

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4.6 DSC DISPLAY

Satisfactory:

- Display shows functions currently available yes
- Operator is prompted if incorrect operation is attempted yes
- If equipment not in use for normal communication, display shows last entered position yes
- Visual indication of user programmable information of content of call yes
- Manual correction of user programmable information of content of call yes
- Indication of unread incoming messages in memory yes
- Indication that distress alert is in automatic retransmit mode yes

4.7 HANDSET AND LOUDSPEAKER

- Provision of a:
 - telephone handset n.a
 - or
 - microphone yes
 - integral loudspeaker yes
 - and/or
 - socket for an external loudspeaker yes
- Acoustic alarm is also relayed to external loudspeaker(s) yes
- Muting in simplex operation yes

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4.8 SAFETY PRECAUTIONS

Satisfactory:

- Protection against the effects of excessive current and overvoltage (*fuse and zenerdiode*) yes
- Protection against damage due to transient voltage (*filter*) yes
- Protection against damage due to reversal of power supply polarity (*fuse and zenerdiode*) yes
- Earthing (*floating power supply*) yes
- Protection against accidental access of voltages greater than 50 Volts yes
- Protection against damage due to open-circuited antenna terminals yes
- Protection against damage due to short-circuited antenna terminals yes
- DC path from the antenna terminals to the chassis: 0 Ω
limit: $\leq 100 \text{ k}\Omega$ yes
- Memory not erased during power supply interruptions up to 60 seconds yes

4.9 LABELLING

- Controls, instruments, indicators and terminals yes
- Details of power supply yes
- Identification of manufacturer, type designation, serial number yes
- Compass safety distance (*on equipment and in manual*) yes

4.10 WARM UP

- After switched on, equipment is operational within 5 s yes

TEST FORM

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5 TECHNICAL REQUIREMENTS

Satisfactory:

5.1 SWITCHING TIME

- Channel switching time: 2 sec yes
limit: ≤ 5 sec
- Time to change from:
Tx to Rx condition: 0.150 sec yes
Rx to Tx condition: 0.150 sec yes
limit: ≤ 0.3 sec

5.2 CLASS OF EMISSION AND MODULATION CHARACTERISTICS

- Class of emission G3E for speech yes
- Class of emission G2B for DSC yes
- 25 kHz channel separation yes

5.3 FACILITIES FOR DSC TRANSMISSION AND RECEPTION

5.3.1 GENERAL

- Facility to code and transmit DSC on channel 70 yes
- Facility to decode and converse received calls to visual form in plain language yes
- Configuration of equipment:
independent DSC unit for connection to associated radiotelephone n.a
mechanically and electrically integrated with radio equipment yes
- With either configuration automatic channel switching by DSC is possible yes
- Channel 70 watchkeeping receiver of DSC part is continuously in operation yes
- During transmitter usage watchkeeping receiver may be muted yes

5.3.2 DECODING

- Decoding utilizes parity, diversity and error check as Rec. ITU-R M.493 - (9) yes

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5.3.3 FREE CHANNEL TRANSMISSION

Satisfactory:

- Automatic delay of transmission until channel 70 is free yes
- No delay of transmission of distress call if channel 70 is not free yes

5.3.4 AUTOMATIC ACKNOWLEDGEMENT

- No provision of sending automatic acknowledgements yes

5.3.5 AUTOMATIC RETRANSMISSION OF DISTRESS CALLS

- Re-transmission of distress call after random delay 3.5 - 4.5 min yes
- Automatic continuation until acknowledgement received or discontinued manually yes
- Distress call re-attempt by manual intervention at any time yes

5.4 SHIPS IDENTITY - MMSI AND GROUP MMSI

- Permanent storage of MMSI-number and automatic insertion in call yes
- Impossible to change MMSI-number with operator controls yes
- Impossible to transmit DSC call until MMSI-number has been stored yes
- Storing of operator programmable group MMSI-numbers yes
- Equipment recognizes call directed to group MMSI-numbers yes
- Programming group MMSI with 8 digits only; leading 0 is inserted automatically yes

5.5 ENTRY OF POSITION INFORMATION

- Provision for manual entry of position with valid time yes
- Provision for automatic entry and encoding of position and time yes
- Above facilities conform with IEC 1162-1 yes
- No connection of, or failure within external circuits disables DSC equipment yes
- Failure of datastream initiates error message on display yes
- If failure, operator is prompted to manually entry position and time every 4 hours yes
- If position not updated for 23.5 hours, position and time is set to default (99.99 999.99 88.88) yes

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5.6 ALARM CIRCUITS

Satisfactory:

5.6.1 DISTRESS AND URGENCY

- Provision of specific acoustic and visual alarm activated by format specifier distress or category distress or urgency yes
- Alarm circuits cannot be disabled yes

5.6.2 OTHER CATEGORIES

- Provision of acoustic and visual alarm activated on receipt of calls of categories other than distress and urgency yes
- Acoustic alarm circuits cannot be disabled yes

5.6.3 ACOUSTIC ALARMS

- Acoustic power of alarm is ≥ 80 dB(A) at 1m distance yes
Measured value: 84 dB(A)

5.6.4 CANCELLATION OF ALARMS

- Provision of manual cancellation of alarms yes
- Automatic cancellation takes place after 2 minutes yes

5.7 FACILITIES FOR AUTOMATIC IDENTIFICATION

- If facility for automatic identification to Rec. ITU-R M.825-1 is provided: *(not provided)*
Operator not permitted to originate this type of call n.a
Equipment capable of responding to request of identification n.a

5.8 MULTIPLE WATCH FACILITIES
5.8.1 GENERAL

- Provision of multiple watch on traffic channels yes
- DSC operation takes precedence yes
- No scanning is possible on channel 70 yes

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5.8.2 SCANNING PROVISIONS

Satisfactory:

- Provision for automatic scanning of a priority channel and one additional channel (*Dual Watch*) yes
- Facilities for automatic sequential change of the additional channel (if provided) (*SCAN*) yes
- Means not accessible to the user to block/unblock the automatic sequential change of the additional channel (if provided) yes
- Priority channel sampled during reception on the additional channel yes
- Additional channel not sampled during reception of the priority channel yes
- Manually operated control to switch the scanning facility on and off yes
- Automatic switch off of the scanning facility during any communication yes
- Selection of the additional channel and selection of the priority channel (if provided) possible at the operating position of the Rx or Tx/Rx yes
- The priority channel is channel 16 if there is no selection of priority provided (unless other decision of the administration) yes
- Indication of both channels during scanning yes
- Transmission in a transceiver inhibited during scanning yes
- Automatic return of Rx and Tx to the selected additional channel when the scanning is switched off yes
- Single manual control to switch the equipment for operation on the priority channel yes
- Indication of the selected additional channel at the operating position of the transceiver as the operational channel yes

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5.8.3 SCANNING CHARACTERISTICS

Satisfactory:

- Sampling period of the priority channel: 1.9 sec.
limit: ≤ 2 sec. yes
- The RX remains on the priority channel if a signal is
detected on this channel for the duration of that signal yes
- The scanning continues if a signal is detected on the
additional channel yes
- Interruption of the reception on the additional channel: 150 msec.
limit: ≤ 150 msec. yes
- Proper functioning of the RX during scanning yes
- Listening period on the additional channel during the
reception of a signal on the additional channel and in the
absence of a signal on the priority channel: 1750 msec.
limit: ≥ 850 msec. yes
- Indication of the channel on which a signal is being received yes

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6 GENERAL CONDITIONS OF MEASUREMENT

- 6.1 Arrangements for test signals applied to the receiver input
 - 6.2 Squelch
 - 6.3 Normal test modulation
 - 6.4 Artificial antenna
 - 6.5 Arrangement for test signals applied to transmitter input
 - 6.6 Test channels
 - 6.7 Generation and examination of the digital selective call signal
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- 7 ENVIRONMENTAL TESTS
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Date of test: 8-3-2002 Ambient temp.: 20 °C R.H.: 55 %

7.4 ENVIRONMENTAL TESTS: VIBRATION

PERFORMANCE CHECK: TX CARRIER POWER

Equipment suspended: yes/no

If YES, state the precise test conditions: -

Rated output power H.P.: 25.0 W
L.P.: 1.0 W

CHANNEL	VIBRATION DIRECTION	HIGH POWER (H.P.)				LOW POWER (L.P.)			
		Min. Power (W)	Vibr. freq. (Hz)	Max. Power (W)	Vibr. freq. (Hz)	Min. Power (W)	Vibr. freq. (Hz)	Max. Power (W)	Vibr. freq. (Hz)
16	X	20.4	*	20.7	*	0.6	*	0.6	*
	Y	20.4	*	20.7	*	0.6	*	0.6	*
	Z	20.4	*	20.7	*	0.6	*	0.6	*
Measurement uncert.		0.61 dB							
Limits		H.P. - between 6 and 25 W - within +2 dB and -3 dB from rated output power L.P. - between 0.1 and 1 W							

H.P. = Output power switch set at its maximum
L.P. = Output power switch set at its minimum

X, Y = Mutual perpendicular directions in the horizontal plane
Z = Vertical direction

* : vibration frequencies 5 - 100 Hz.

Measuring equipment used: 13, 22, 23, 26, 29

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Date of test: 8-3-2002 Ambient temp.: 20 °C R.H.: 55 %

7.4 ENVIRONMENTAL TESTS: VIBRATION
PERFORMANCE CHECK: FREQUENCY ERROR

Equipment suspended: yes/no

If YES, state the precise test conditions: -

CHANNEL	VIBRATION DIRECTION	HIGH POWER (H.P.)		LOW POWER (L.P.)	
		Max. freq. error (Hz)	Vibration freq. (Hz)	Max. freq. error (Hz)	Vibration freq. (Hz)
16	X	- 465	5 - 100	- 467	5 - 100
	Y	- 480	5 - 100	- 485	5 - 100
	Z	- 497	5 - 100	- 502	5 - 100
Measurement uncertainty		9 Hz			
Limit		Max. frequency error ≤ 1500 Hz			

H.P. = Output power switch set at its maximum

L.P. = Output power switch set at its minimum

X, Y = Mutual perpendicular directions in the horizontal plane

Z = Vertical direction

Measuring equipment used: 8, 13, 22, 23, 26, 29

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Date of test: 8-3-2002 Ambient temp.: 20 °C R.H.: 55 %

7.4 ENVIRONMENTAL TESTS: VIBRATION
PERFORMANCE CHECK: RECEIVER MAXIMUM USABLE SENSITIVITY

Equipment suspended: ~~yes~~/no

If YES, state the precise test conditions: -

CHANNEL	MAXIMUM USABLE SENSITIVITY (dBμV)			VIBRATION FREQUENCY (Hz)
	VIBRATION DIRECTION X	VIBRATION DIRECTION Y	VIBRATION DIRECTION Z	
70	- 1.0	- 1.0	- 1.0	5 - 100
Measurement uncertainty	2.8 dB			
Limit	≤ + 6 dBμV for 1% symbol error rate			

X, Y = Mutual perpendicular directions in the horizontal plane
Z = Vertical direction

Measuring equipment used: 2, 9, 22, 26, 28, 29

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Date of test: 8-3-2002 Ambient temp.: 20 °C R.H.: 55 %

7.4 ENVIRONMENTAL TESTS: VIBRATION
RESONANCE FREQUENCIES

Equipment suspended: ~~yes~~/no

If YES, state the precise test conditions: -

Found during performance check : See below.

VIBRATION DIRECTION	RESONANCE FREQUENCY (Hz)				
	Main unit	Handset			
X	73.6	---	---	---	---
Y	46.4	---	---	---	---
Z	98.2	---	---	---	---

X, Y = Mutual perpendicular directions in the horizontal plane
Z = Vertical direction

Measuring equipment used: 29

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Date of test: 8-3-2002 Ambient temp.: 20 °C R.H.: 55 %

7.4 ENVIRONMENTAL TESTS: VIBRATION

PERFORMANCE CHECK: VISUAL INSPECTION

Satisfactory:

Visible damage or deterioration

yes/no/n.a.Observations: No damage or deterioration.

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Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 19-12-2001 Ambient temp.: 23 °C R.H.: 50 %

7.5.2 ENVIRONMENTAL TESTS: DRY HEAT
PERFORMANCE CHECK: TX CARRIER POWER

Rated output power H.P.: 25.0 W
L.P.: 1.0 W

CHANNEL	CARRIER POWER (W)	
	High Power (H.P.)	Low Power (L.P.)
16	15.3	0.4
Measurement uncertainty	0.61dB	
Limits	H.P. - between 6 and 25 W - within + 2 and - 3 dB from rated output power L.P. - between 0.1 and 1 W	

H.P. = Output power switch set at its maximum
L.P. = Output power switch set at its minimum

Measuring equipment used: 13, 22, 23, 26, 30

TEST FORM
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Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 19-12-2001 Ambient temp.: 23 °C R.H.: 50 %

7.5.2 ENVIRONMENTAL TESTS: DRY HEAT
PERFORMANCE CHECK: TX FREQUENCY ERROR

CHANNEL	FREQUENCY ERROR (Hz)	
	High Power (H.P.)	Low Power (L.P.)
16	- 1152	- 1152
Measurement uncertainty	9 Hz	
Limits	Frequency error ≤ 1500 Hz	

H.P. = Output power switch set at its maximum

L.P. = Output power switch set at its minimum

Measuring equipment used: 8, 13, 22, 23, 26, 30

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Date of test: 19-12-2001 Ambient temp.: 23 °C R.H.: 50 %

7.5.2 ENVIRONMENTAL TESTS: DRY HEAT
PERFORMANCE CHECK: RECEIVER MAXIMUM USABLE SENSITIVITY

CHANNEL	MAXIMUM USABLE SENSITIVITY (dBμV)
70	- 1.0
Measurement uncertainty	2.8 dB
Limit	≤ + 6 dBμV for 1% symbol error rate

Measuring equipment used: 2, 9, 22, 26, 28, 30

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Date of test: 19-12-2001 Ambient temp.: 23 °C R.H.: 50 %

7.5.2 ENVIRONMENTAL TESTS: DRY HEAT

PERFORMANCE CHECK: VISUAL INSPECTION

Satisfactory:

Visible damage or deterioration **yes/no/n.a.**

Observations: No visual damage or deterioration.

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Date of test: 21-12-2001 Ambient temp.: 23 °C R.H.: 50 %

7.5.3 ENVIRONMENTAL TESTS: DAMP HEAT
PERFORMANCE CHECK: TX CARRIER POWER

Rated output power H.P.: 25.0 W
L.P.: 1.0 W

CHANNEL	CARRIER POWER (W)	
	High Power (H.P.)	Low Power (L.P.)
16	17.7	0.5
Measurement uncertainty	0.61dB	
Limits	H.P. - between 6 and 25 W - within + 2 and - 3 dB from rated output power L.P. - between 0.1 and 1 W	

Measuring equipment used: 13, 22, 23, 26, 30

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Date of test: 21-12-2001 Ambient temp.: 23 °C R.H.: 50 %

7.5.3 ENVIRONMENTAL TESTS: DAMP HEAT
PERFORMANCE CHECK: TX FREQUENCY ERROR

CHANNEL	FREQUENCY ERROR (Hz)	
	High Power (H.P.)	Low Power (L.P.)
16	- 1072	- 1072
Measurement uncertainty	9 Hz	
Limits	Frequency error ≤ 1500 Hz	

H.P. = Output power switch set at its maximum

L.P. = Output power switch set at its minimum

Measuring equipment used: 8, 13, 22, 23, 26, 30

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Date of test: 21-12-2001 Ambient temp.: 23 °C R.H.: 50 %

7.5.3 ENVIRONMENTAL TESTS: DAMP HEAT
PERFORMANCE CHECK: RECEIVER MAXIMUM USABLE SENSITIVITY

CHANNEL	MAXIMUM USABLE SENSITIVITY (dBμV)
70	+ 1.0
Measurement uncertainty	2.8 dB
Limit	≤ + 6 dBμV for 1% symbol error rate

Measuring equipment used: 2, 9, 22, 26, 28, 30

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Date of test: 21-12-2001 Ambient temp.: 23 °C R.H.: 50 %

7.5.3 ENVIRONMENTAL TESTS: DAMP HEAT

PERFORMANCE CHECK: VISUAL INSPECTION

Satisfactory:

Visible damage or deterioration **yes/no/n.a.**

Observations: No visual damage or deterioration.

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Date of test: 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

7.5.4 ENVIRONMENTAL TESTS: LOW TEMPERATURE
PERFORMANCE CHECK: TX CARRIER POWER

Rated output power H.P.: 25.0 W
L.P.: 1.0 W

CHANNEL	CARRIER POWER (W)	
	High Power (H.P.)	Low Power (L.P.)
16	22.5	0.6
Measurement uncertainty	0.61dB	
Limits	H.P. - between 6 and 25 W - within + 2 and - 3 dB from rated output power L.P. - between 0.1 and 1 W	

Measuring equipment used: 13, 22, 23, 26, 30

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Date of test: 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

7.5.4 ENVIRONMENTAL TESTS: LOW TEMPERATURE
PERFORMANCE CHECK: TX FREQUENCY ERROR

CHANNEL	FREQUENCY ERROR (Hz)	
	High Power (H.P.)	Low Power (L.P.)
16	- 117	- 117
Measurement uncertainty	9 Hz	
Limits	Frequency error ≤ 1500 Hz	

H.P. = Output power switch set at its maximum

L.P. = Output power switch set at its minimum

Measuring equipment used: 8, 13, 22, 23, 26, 30

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Date of test: 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

7.5.4 ENVIRONMENTAL TESTS: LOW TEMPERATURE

PERFORMANCE CHECK: RECEIVER MAXIMUM USABLE SENSITIVITY

CHANNEL	MAXIMUM USABLE SENSITIVITY (dBμV)
70	- 2.0
Measurement uncertainty	2.8 dB
Limit	≤ + 6 dBμV for 1% symbol error rate

Measuring equipment used: 2, 9, 22, 26, 28, 30

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Date of test: 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

7.5.4 ENVIRONMENTAL TESTS: LOW TEMPERATURE

PERFORMANCE CHECK: VISUAL INSPECTION

Satisfactory:

Visible damage or deterioration **yes/no/n.a.**

Observations: No visual damage or deterioration.

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Date of test: 13-12; 19-12; 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.1 TRANSMITTER FREQUENCY ERROR.

TEST CONDITIONS		FREQUENCY ERROR (Hz)	
		Channel 16	
Temperature	Voltage	H.P.	L.P.
$T_{nom}(+20\text{ }^{\circ}\text{C})$	$V_{nom}(12.0\text{ V})$	- 481	- 481
$T_{min}(-15\text{ }^{\circ}\text{C})$	$V_{min}(10.8\text{ V})$	- 117	- 117
	$V_{max}(15.6\text{ V})$	- 117	- 117
$T_{max}(+55\text{ }^{\circ}\text{C})$	$V_{min}(10.8\text{ V})$	- 1152	- 1152
	$V_{max}(15.6\text{ V})$	- 1152	- 1152
Measurement uncertainty		9 Hz	
Limits (8.1.3)		$\leq +1500 / -1500\text{ Hz}$	

H.P. = Output power switch set at its maximum

L.P. = Output power switch set at its minimum

Measuring equipment used: 08, 13, 22, 23, 26, 30

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Date of test: 13-12; 19-12; 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.2 TRANSMITTER CARRIER POWER.

Rated output H.P.: 25.0 W
L.P.: 1.0 W

TEST CONDITIONS		CARRIER POWER (W)					
		156.050 MHz		Channel 16		157.425 MHz	
Temperature	Voltage	H.P.	L.P.	H.P.	L.P.	H.P.	L.P.
$T_{nom}(+20\text{ }^{\circ}\text{C})$	$V_{nom}(12.0\text{V})$	20.0	0.56	20.0	0.56	20.7	0.59
$T_{min}(-15\text{ }^{\circ}\text{C})$	$V_{min}(10.8\text{V})$	22.0	0.65	22.5	0.68	21.5	0.70
	$V_{max}(15.6\text{V})$	20.4	0.65	21.6	0.68	21.5	0.70
$T_{max}(+55\text{ }^{\circ}\text{C})$	$V_{min}(10.8\text{V})$	14.4	0.40	15.4	0.42	15.4	0.43
	$V_{max}(15.6\text{V})$	12.9	0.41	13.3	0.43	13.6	0.44
Measurement uncertainty		0.61 dB					
Limits (8.2.3)		<u>Normal test conditions:</u> => H.P.: - between 6 and 25 W - max. of ± 1.5 dB from rated outp. power => L.P.: between 0.1 and 1 W <u>Extreme test conditions:</u> => H.P.: - between 6 and 25 W - within +2 & -3 dB from rated outp.power => L.P.: between 0.1 and 1 W					

H.P. = Output power switch set at its maximum

L.P. = Output power switch set at its minimum

Measurement equipment used: 05, 13, 22, 23, 26, 30

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Date of test: 13-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.3 FREQUENCY DEVIATION:
MAXIMUM PERMISSIBLE FREQUENCY DEVIATION (Clause 8.3.2)

CHANNEL	FMOD (Hz)	FREQUENCY DEVIATION Δf			
		High Power		Low Power	
		Δf (kHz)		Δf (kHz)	
		+	-	+	-
16	100	1.4	1.4	1.4	1.4
	300	4.5	4.4	4.4	4.4
	500	4.4	4.3	4.3	4.3
	1000	4.3	4.3	4.2	4.1
	1500	4.2	4.2	4.1	4.1
	2000	4.1	4.1	4.0	4.0
	2500	4.2	4.1	4.0	4.0
	3000	4.1	4.0	4.0	3.9
Measurement uncertainty	100 Hz - 3000 Hz: 0.98dB - 0.37dB.				
Limits	Δf < 5 kHz				

Measuring equipment used: 05, 10, 11, 13, 22, 23, 26

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Date of test: 13-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.3.3 TRANSMITTER FREQUENCY DEVIATION: REDUCTION OF FREQUENCY DEVIATION AT MODULATION FREQUENCIES ABOVE 3 kHz

fmod (kHz)	Frequency deviation Δf (kHz)	
	Channel 16	
	+	-
3	4.0	3.8
3.5	3.9	3.8
4	2.8	2.7
4.5	1.9	1.8
5	1.3	1.3
6	0.7	0.7
7	0.4	0.4
8	0.2	0.2
9	0.15	0.15
10	0.09	0.09
12	0.04	0.04
14	0.03	0.03
16	< 0.03	< 0.03
18	< 0.03	< 0.03
20	< 0.03	< 0.03
22	< 0.03	< 0.03
25	< 0.03	< 0.03
Measurement uncertainty		0.37 dB
Limits		see figure 1 of EN 301 025-1 V1.1.2, page 26

Measuring equipment used: 05, 10, 11, 13, 22, 23, 26

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LIMITS FOR TX REDUCTION OF FREQUENCY DEVIATION AT $f_{\text{mod}} > 3 \text{ kHz}$ (Clause 8.3.3.2)

=> $3 \text{ kHz} < f_{\text{mod}} < 6 \text{ kHz}$: the frequency deviation shall not exceed the frequency deviation at $f_{\text{mod}} = 3 \text{ kHz}$

=> $f_{\text{mod}} = 6 \text{ kHz}$: $|\Delta f| < 1.5 \text{ kHz}$

=> $6 \text{ kHz} < f_{\text{mod}} < 25 \text{ kHz}$:

$$|\Delta f| \leq 1.5 \left[\frac{6}{f_{\text{mod}}} \right]^{2.325} \quad (\text{kHz}) \quad (f_{\text{mod}} \text{ in kHz})$$

or

$$|\Delta f| \leq -6 - 46.5 * \log \left[\frac{f_{\text{mod}}}{6} \right] \quad (\text{dB relative to } \Delta f = 3 \text{ kHz}) \quad (f_{\text{mod}} \text{ in kHz})$$

or

below the 14 dB/octave line on figure 1 of EN 301 025-1 V1.1.2, page 26.

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Date of test: 13-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.4 SENSITIVITY OF THE MODULATOR, INCLUDING MICROPHONE.

CHANNEL	FREQUENCY DEVIATION (kHz)
16	2.8
Measurement uncertainty	1.6dB
Limits	1.5 kHz $\leq$ Δf $\leq$ 3 kHz at 94 dB(A)

Measuring equipment used: 05, 10, 11, 13, 21, 22, 23, 26

TEST FORM

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Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 13-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.5 TRANSMITTER AUDIO-FREQUENCY RESPONSE.

FMOD (Hz)	MODULATION INDEX m (dB relative to 1kHz)
	Channel 16
300	- 1.03
500	- 0.23
600	- 0.08
700	0
800	0
900	0
1000	0
1500	- 0.23
2000	- 0.33
2500	- 0.42
2700	- 0.63
3000	- 1.37
Measurement uncertainty	0.41dB
Limits	-3 ≤ m ≤ 1 dB (see figure 2 of EN 301 025-1 V1.1.2, page 28)

$$m = 20 \log \frac{|\Delta f|}{f_{\text{mod}}} \text{ dB}$$

m = 0 dB at fmod = 1000 Hz

Measuring equipment used: 05, 10, 11, 13, 22, 23, 26

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Date of test: 13-12; 19-12; 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.6 AUDIO-FREQUENCY HARMONIC DISTORTION OF THE EMISSION.

TEST CONDITIONS		F _{MOD} (Hz)	AUDIO FREQUENCY HARMONIC DISTORTION (%)	
			Channel 16	
Temp.	Voltage		H.P.	L.P.
T _{nom} (+20 °C)	V _{nom} (12.0V)	300	1.5	1.5
		500	1.4	1.4
		1000	1.4	1.4
T _{min} (-15 °C)	V _{min} (10.8V)	1000	0.9	0.9
	V _{max} (15.6V)	1000	0.8	0.8
T _{max} (+55 °C)	V _{min} (10.8V)	1000	0.7	0.9
	V _{max} (15.6V)	1000	0.7	0.9
Measurement uncertainty			+1.4/-1.3% at 10% distortion	
Limit (8.6.3)			≤ 10%	

H.P. = Output power switch set at its maximum
L.P. = Output power switch set at its minimum

Measuring equipment used: 05, 10, 11, 13, 22, 23, 26

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Date of test: 13-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.7 TRANSMITTER ADJACENT CHANNEL POWER.

CHANNEL	ADJACENT CHANNEL POWER (µW and dBc)							
	Upper channel				Lower channel			
	High power		Low power		High power		Low power	
	µW	dBc	µW	dBc	µW	dBc	µW	dBc
16	-	-75.0	-	-74.8	-	-74.2	-	-74.1
Measurement uncertainty	2.3 dB							
Limits (8.7.3)	≤ -70 dBc or ≤ 0.2 µW							

High power = Output power switch set at its maximum
Low power = Output power switch set at its minimum

Measuring equipment used: 2, 10, 11, 15, 22, 23, 26

TEST FORM
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Date of test: 14-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.8 TRANSMITTER CONDUCTED SPURIOUS EMISSIONS CONVEYED TO THE ANTENNA.

SPURIOUS EMISSIONS POWER LEVEL		
<i>Channel 16</i>	<i>High power: 20.0 W</i>	<i>Low power: 0.5 W</i>
Spurious frequency (MHz)	Power level (dBm)	Power level (dBm)
145.3	- 47.5	- 64.3
171.7	- 46.2	--
313.6	- 42.8	- 48.7
470.4	- 45.0	- 51.0
784.0	- 55.0	- 61.0
Measurement uncertainty	0-2 GHz: 1.9dB; 2-12 GHz: 2.7dB	
Limit (30 MHz - 2 GHz)	$\leq 0.25 \mu\text{W} = - 36 \text{ dBm}$	

other spurious emissions are at least 20 dB below the limit.

Measuring equipment used: 01, 13, 22, 23, 24, 26

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Date of test: -- Ambient temp.: -- °C R.H.: -- %

8.9 TRANSMITTER CABINET RADIATION AND CONDUCTED SPURIOUS EMISSIONS OTHER THAN THOSE CONVEYED TO THE ANTENNA

SPURIOUS EMISSIONS POWER LEVEL				
Channel 16			High Power: 20.0W	Low Power: 0.8 W
Spurious frequency (MHz)	Anten. Posit.	TX state	Power level (µW)	Power level (µW)
940.4	Hor.	ON	0.025	*
		STBY	n.a	n.a
1097.6	Ver.	ON	0.06	*
		STBY	n.a	n.a
*	Ver.	ON	*	*
		STBY	n.a	n.a
Measurement uncertainty	26-1000MHz: 2.5dB; 1-8 GHz: 1.8dB			
Limits (30 MHz - 2 GHz)	Tx ON : ≤ 0.25 µW Tx STAND-BY: ≤ 2 nW			

* : other spurious emissions are at least 10 dB below the limit.

TX-standby state is not applicable; see clause 9.9 (RX) for measuring results.

This measurement has been performed by Comlab.
Refer to Comlab testreport number 00/08216/6, issued 21 December 2001 and Comlab testreport number 00/08216/8, issued 6 February 2002; the measured values thereof have been copied into this report.

Measuring equipment used: --

TEST FORM

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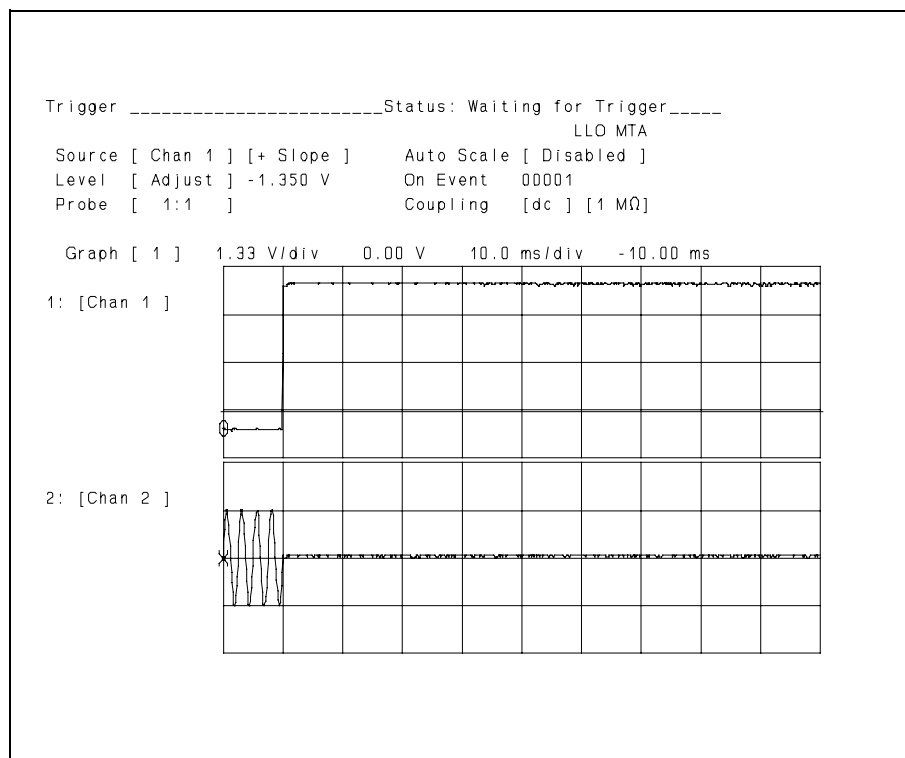
Date of test: 14-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.10 TRANSIENT FREQUENCY BEHAVIOUR OF THE TRANSMITTER.

Channel: 16

PLOTS OF FREQUENCY DIFFERENCE VERSUS TIME

Switch on condition: limits $\Delta f \leq 25$ kHz during t_1 (= 5 msec)
 $\Delta f \leq 12.5$ kHz during t_2 (= 20 msec)



Channel 1: power output level.
Channel 2: TX-freq. displacement 25 kHz/div.

See fig. 4 of subclause 8.10.2 of EN 301 025-1 V1.1.2 for the template

Measuring equipment used: 01, 02, 12, 16, 18, 22, 23, 25, 26

TEST FORM

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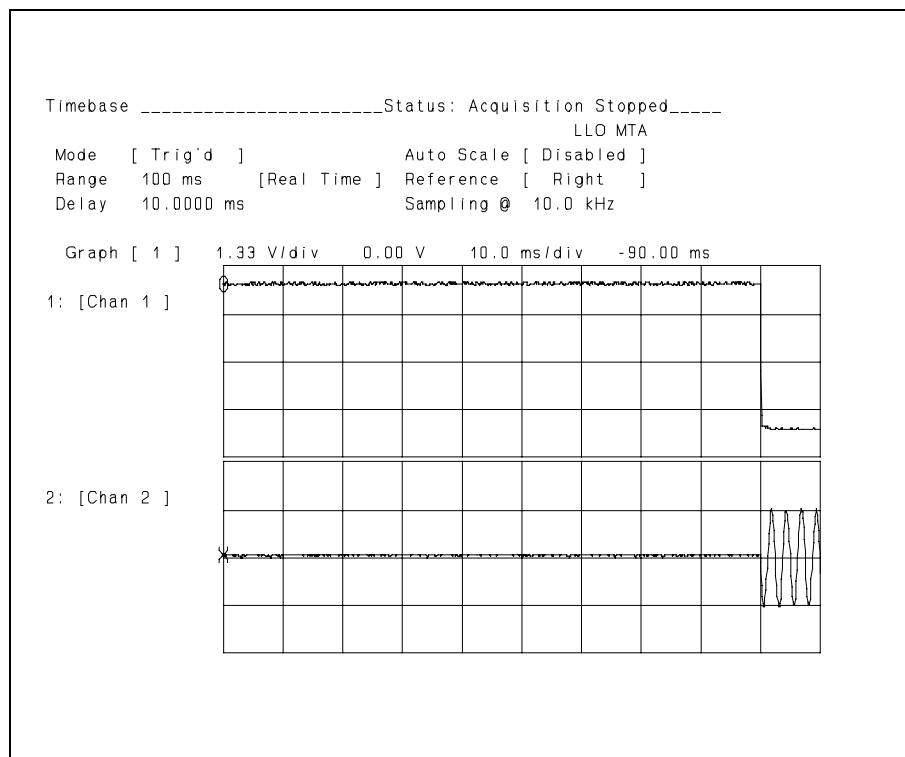
Date of test: 14-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.10 TRANSIENT FREQUENCY BEHAVIOUR OF THE TRANSMITTER.

Channel: 16

PLOTS OF FREQUENCY DIFFERENCE VERSUS TIME

Switch off condition: limit: $\Delta f \leq 25$ kHz during t_3 (= 5 msec)



Channel 1: power output level.
Channel 2: TX-freq. displacement 25 kHz/div.

See fig. 4 of subclause 8.10.2 of EN 301 025-1 V1.1.2 for the template

Measuring equipment used: 01, 02, 12, 16, 18, 22, 23, 25, 26

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Date of test: 14-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.11 RESIDUAL MODULATION OF THE TRANSMITTER

CHANNEL	LEVEL OF RESIDUAL MODULATION (dB)
16	- 41
Measurement uncertainty	1.6dB
Limit	$\leq$ - 40 dB

Measuring equipment used: 05, 10, 11, 13, 22, 23, 26

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Date of test: 13-12; 19-12; 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.12 FREQUENCY ERROR (DEMODULATED DSC SIGNAL)

TEST CONDITIONS				FREQUENCY ERROR (Hz)	
				B-STATE	Y-STATE
Tnom.	+ 20 °C	Vnom.	12.0 V	+ 3.2	0
Tmin.	- 15 °C	Vmin.	10.8 V	+ 3.2	+ 0.1
		Vmax.	15.6 V	+ 3.2	+ 0.1
Tmax.	+ 55 °C	Vmin.	10.8 V	+ 3.1	0
		Vmax.	15.6 V	+ 3.1	0
Measurement uncertainty				0.1	

LIMIT (Clause 8.12.3)

STATE	FREQUENCY (Hz)
B	1300 Hz +/- 10 Hz
Y	2100 Hz +/- 10 Hz

Measurement equipment used: 05, 06, 08, 10, 11, 13, 22, 23, 26

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Date of test: 14-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.13 MODULATION INDEX FOR DSC

B-state 1300 Hz deviation: 2.85 kHz; M.I. = 2.2

Y-state 2100 Hz deviation: 4.3 kHz; M.I. = 2.05

LIMIT (Clause 8.13.3)

The modulation index shall be 2.0 +/- 10%.

Measurement equipment used: 05, 10, 11, 13, 22, 23, 26

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Date of test: 14-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.14 MODULATION RATE FOR DSC

Bit stream speed : 1200 Bd

Tolerance: measured value : + 11 ppm

LIMIT (Clause 8.14.3)

The frequency shall be 600 Hz +/- 30 ppm corresponding to a modulation rate of 1200 Baud.

Measurement equipment used: 05, 07, 08, 10, 11, 13, 22, 23, 26

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Date of test: 4-3 - 7-3-2002 Ambient temp.: 23 °C R.H.: 50 %

8.15 TESTING OF GENERATED CALL SEQUENCES.

Performed DSC calls, used telecommands and introduced errors for verification of the conformity to CCIR 493-(9)

Encoding of the following calls:

- *Distress-call:*

MMSI used:

123456789.

Nature of distress:

undesignated; fire, explosion; flooding; collision; listing; sinking; disabled; abandonning ship; man over board; piracy.

Distress Coordinates:

53.06N 089.12E; 68.34N 018.32W; 23.56S 136.54W; 56.24S 145.47E.

Time of last update:

15:23

Telecommand:

F3E/G3E simplex.

- *Category Urgency call:*

Address:

all ships.

1. Telecommand:

F3E/G3E simplex; no information.

2. Telecommand:

no information.

Freq. channel:

CH 16; 06.

- *Category Safety call:*

Address:

all ships.

1. Telecommand:

F3E/G3E simplex; no information.

2. Telecommand:

no information.

Freq. channel:

CH 16; 06.

Measurement equipment used: 05, 06, 07, 09, 11, 13, 22, 23, 26, 28

TEST FORM

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Date of test: 4-3 - 7-3-2002 Ambient temp.: 23 °C R.H.: 50 %

8.15 TESTING OF GENERATED CALL SEQUENCES (continued).

Performed DSC calls, used telecommands and introduced errors for verification of the conformity to CCIR 493-(9)

Encoding of the following calls:

- *Category Routine call:*

Address:

987654321; 012345678; 009876543.

1. Telecommands:

F3E/G3E simplex; no information

2. Telecommand:

no information.

Freq. channel:

CH 16; 28.

Measurement equipment used: 05, 06, 07, 09, 11, 13, 22, 23, 26, 28

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Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.1 RECEIVER HARMONIC DISTORTION AND RATED AUDIO-FREQUENCY OUTPUT POWER.

AT THE LOUDSPEAKER

Rated AF output power: 4.0 W in 4Ω
Requirement : ≥ 2 W

CHANNEL 16 Fn = 156.8 MHz		TEST SIGNAL LEVEL (dBμV)	FMOD (Hz)	AF OUTPUT POWER P(W) AND HARMONIC DISTORTION D(%)					
TEST CONDITIONS				Fn		Fn-1.5 kHz		Fn+1.5 kHz	
Temp.	Voltage			P	D	P	D	P	D
Tnom (+20 °C)	Vnom(12.0V)	60	300	4.0	10.0	n.a.	n.a.	n.a.	n.a.
			500	4.0	6.1	n.a.	n.a.	n.a.	n.a.
			1000	4.0	2.3	n.a.	n.a.	n.a.	n.a.
		100	300	4.0	10.0	n.a.	n.a.	n.a.	n.a.
			500	4.0	6.1	n.a.	n.a.	n.a.	n.a.
			1000	4.0	3.1	n.a.	n.a.	n.a.	n.a.
Measurement uncertainty: - on P - on D				0.34 dB					
				+1.4/-1.3% at 10% distortion					
Limits (9.1.3)				AF output power ≥ rated AF output power Distortion ≤ 10 %					

n.a.: not applicable

Measuring equipment used: 02, 10, 11, 20, 22, 26

TEST FORM
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Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.1 RECEIVER HARMONIC DISTORTION AND RATED AUDIO-FREQUENCY OUTPUT POWER.

AT THE HANDSET EARPHONE

Rated AF output power: 1 mW in 600Ω
Requirement : ≥ 1 mW

CHANNEL 16 Fn = 156.8 MHz		TEST SIGNAL LEVEL (dBμV)	FMOD (Hz)	AF OUTPUT POWER P(mW) AND HARMONIC DISTORTION D(%)					
TEST CONDITIONS				Fn		Fn-1.5 kHz		Fn+1.5 kHz	
Temp.	Voltage			P	D	P	D	P	D
Tnom (+20 °C)	Vnom(12.0V)	60	300	1.1	7.3	n.a.	n.a.	n.a.	n.a.
			500	1.3	4.7	n.a.	n.a.	n.a.	n.a.
			1000	1.6	2.4	n.a.	n.a.	n.a.	n.a.
		100	300	1.1	7.3	n.a.	n.a.	n.a.	n.a.
			500	1.3	4.7	n.a.	n.a.	n.a.	n.a.
			1000	1.6	3.1	n.a.	n.a.	n.a.	n.a.
Measurement uncertainty: - on P - on D				0.34 dB					
				+1.4/-1.3% at 10% distortion					
Limits (9.1.3)				AF output power ≥ rated AF output power Distortion ≤ 10 %					

n.a.: not applicable

Measuring equipment used: 02, 10, 11, 20, 22, 26

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Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.2 RECEIVER-AUDIO FREQUENCY RESPONSE.

Channel Fn	fmod (Hz)	AF output power					
		Fn		Fn-1.5 kHz		Fn+1.5 kHz	
		Watt	dB (*)	Watt	dB (*)	Watt	dB (*)
Channel 16 Fn: 156.800 MHz	300	2.2	+0.07	2.26	-0.08	2.24	0
	600	0.6	+0.03	0.64	0	0.63	+0.09
	1000	0.22	0	0.23	0	0.22	0
	1500	0.1	+0.36	0.11	+0.28	0.1	+0.15
	2500	0.04	+0.52	0.04	+0.43	0.03	-0.11
	3000	0.02	+0.29	0.02	+0.21	0.02	-0.56
Measurement uncertainty		0.34 dB					
Limits		Between +1 dB and -3 dB rel. to reference curve decreasing by 6 dB/oct and passing through the measured point at 1000 Hz; see fig. 5 of EN 301 025-1 V1.1.2, page 38.					

(*) dB rel. to the 6 dB/oct reference curve.
0 dB = AF output power at 1000 Hz.

Measuring equipment used: 02, 10, 11, 17, 22, 26

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Date of test: 17-12; 19-12; 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.3 RECEIVER MAXIMUM USABLE SENSITIVITY.

Rated AF output power: 4.0 W
Requirement : ≥ 2 W

TEST CONDITIONS		SENSITIVITY LEVEL AND AF OUTPUT POWER					
		Channel -- Fn: -- MHz		Channel 16 Fn: 156.800 MHz		Channel -- Fn: -- MHz	
Temp.	Voltage	RF level (dBμV)	AF output power (W)	RF level (dBμV)	AF output power (W)	RF level (dBμV)	AF output power (W)
Tnom (+20 °C)	Vnom (12.0V)	--	--	-3.5	2.0	--	--
Tmin (-15 °C)	Vmin (10.8V)	--	--	-5.0	2.0	--	--
	Vmax (15.6V)	--	--	-5.0	2.0	--	--
Tmax (+55 °C)	Vmin (10.8V)	--	--	-1.0	2.0	--	--
	Vmax (15.6V)	--	--	-1.0	2.0	--	--
Measurement uncertainty		2.8 dB ; 0.34 dB					
Limits (9.3.3)		- <u>NORMAL test conditions</u> => RF level : ≤ +6 dBμV => AF output power : 50% of the rated AF output power - <u>EXTREME test conditions</u> => RF level : ≤ +12 dBμV => AF output power : between ± 3 dB rel. to 50% of the rated AF output power					

Measuring equipment used: 02, 10, 11, 22, 26, 30

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Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.4 RECEIVER CO-CHANNEL REJECTION.

CHANNEL Fn	Funw - Fn (Hz)	CO-CHANNEL REJECTION (dB)
Channel 16 Fn: 156.800 MHz	+3000	-8.0
	+2000	-8.0
	+1000	-8.5
	0	-8.5
	-1000	-8.5
	-2000	-8.0
	-3000	-8.0
Measurement uncertainty		1.6 dB
Limits		Between -10 and 0 dB

Funw = unwanted frequency

Measuring equipment used: 02, 03, 10, 11, 18, 22, 26

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Date of test: 17-12; 19-12; 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.5 RECEIVER ADJACENT CHANNEL SELECTIVITY.

TEST CONDITIONS		ADJACENT CHANNEL SELECTIVITY (dB)					
		Channel -- Fn: -- (MHz)		Channel 16 Fn: 156.800 (MHz)		Channel -- Fn: -- (MHz)	
Temp.	Voltage	Upper Channel	Lower Channel	Upper Channel	Lower Channel	Upper Channel	Lower Channel
Tnom (+20 °C)	Vnom (12.0V)	--	--	70.5	70	--	--
Tmin (-15 °C)	Vmin (10.8V)	--	--	69.5	70.5	--	--
	Vmax (15.6V)	--	--	69.5	70.5	--	--
Tmax (+55 °C)	Vmin (10.8V)	--	--	71	69.5	--	--
	Vmax (15.6V)	--	--	71	69.5	--	--
Measurement uncertainty		2.9 dB					
Limits (9.5.3)		NORMAL test conditions : ≥ 70 dB EXTREME test conditions : ≥ 60 dB					

Measuring equipment used: 02, 03, 10, 11, 18, 22, 26, 30

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Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.6 RECEIVER SPURIOUS RESPONSE REJECTION.

Channel: 16 Fn: 156.800 MHz

Funw (MHz)	SPURIOUS RESPONSE REJECTION RATIO (dB)
157.7	79.5
167.5	77
*	*
Measurement uncertainty	2.9 dB
Limit (9.6.3)	≥ 70 dB at $ \text{Funw}-\text{Fn} > 25$ kHz

Funw = unwanted frequency

* : Rejection on other spurious responses is ≥ 80 dB.

Measuring equipment used: 02, 03, 10, 11, 18, 22, 26

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Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.7 RECEIVER INTERMODULATION RESPONSE.

FREQUENCY OF UNWANTED SIGNALS B/C	INTERMODULATION RESPONSE RATIO (dB)
	Channel 16 Fn: 156.800 MHz
Fn +50 / +100 kHz	75.0
Fn -50 / -100 kHz	74.5
Measurement uncertainty	3.0dB
Limit (9.7.3)	> 68 dB

Measuring equipment used: 02, 03, 04, 10, 11, 18, 22, 26

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Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.8 RECEIVER BLOCKING OR DESENSITISATION.

CHANNEL Fn	Fn - Funw (MHz)	LEVEL OF UNWANTED SIGNAL (dBμV) FOR A REDUCTION OF:	
		3 dB in the AF output level	the SINAD ratio to 14 dB
Channel 16 Fn: 156.800 MHz	-1 +1	-- --	97 98
	-2 +2	-- --	> 98 > 98
	-3 +3	-- --	> 98 > 98
	-5 +5	-- --	> 98 > 98
	-10 +10	-- --	> 98 > 98
Measurement uncertainty	2.9dB		
Limit	≥ 90 dBμV except at frequencies on which spurious responses are found (clause 9.6)		

Funw = unwanted frequency

Measuring equipment used: 02, 04, 10, 11, 18, 22, 26

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 14-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.9 RECEIVER CONDUCTED SPURIOUS EMISSIONS.

SPURIOUS EMISSIONS POWER LEVEL	
Channel 16	
Spurious frequency (MHz)	Power level (nW)
*	*
--	--
Measurement uncertainty	0-2 GHz: 1.9dB; 2-12 GHz: 2.7dB
Limit (30 MHz - 2 GHz)	≤ 2 nW

* : all spurious emissions are at least 10 dB below the limit.

Measuring equipment used: 01, 22, 26

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: -- Ambient temp.: -- °C R.H.: -- %

9.10 RECEIVER RADIATED SPURIOUS EMISSIONS.

SPURIOUS EMISSIONS POWER LEVEL		
Channel 16	Antenna pos. P1=V	Antenna pos. P2=H
Spurious frequency (MHz)	Power level (nW)	Power level (nW)
*	*	*
--	--	--
--	--	--
Measurement uncertainty	26-1000MHz: 2.5dB; 1-8 GHz: 1.8dB	
Limits (30 MHz - 2 GHz)	≤ 2 nW	

P1 = Testantenna in the position for maximum response P2 = Testantenna in the orthogonal polarisation plane

* : all spurious emissions are at least 10 dB below the limit.

This measurement has been performed by Comlab.

Refer to Comlab testreport number 00/08216/6, issued 21 December 2001 and Comlab testreport number 00/08216/8, issued 6 February 2002; the measured values thereof have been copied into this report.

Measuring equipment used: --

TEST FORM

TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.11 RECEIVER RESIDUAL NOISE LEVEL.

CHANNEL	NOISE AND HUM LEVEL (dB)
16	- 40.0
Measurement uncertainty	1.6dB
Limit (9.11.3)	≤ -40

Measuring equipment used: 02, 10, 11, 14, 22, 26

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.12 RECEIVER SQUELCH OPERATION.
METHOD OF CLAUSE 9.12.2 a)

CHANNEL	AF OUTPUT POWER (dB RELATIVE TO THE RATED AF OUTPUT POWER)
16	- 76.5
Measurement uncertainty	0.34dB
Limit (9.13.3)	≤ -40

METHOD OF CLAUSE 9.12.2 b)

CHANNEL	INPUT LEVEL (dBμV)	SINAD (dB)
16	- 1.0	25
Measurement uncertainty	2.8dB	-
Limits (9.12.3)	≤ +6 dBμV	—

METHOD OF CLAUSE 9.12.2 c)

CHANNEL	INPUT LEVEL (dBμV)
16	+ 2.1
Measurement uncertainty	2.8dB
Limit (9.12.3)	≤ +6 dBμV

Measuring equipment used: 02, 10, 11, 22, 26

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.13 RECEIVER SQUELCH HYSTERESIS.

CHANNEL	INPUT LEVEL (dBμV) TO:		INPUT LEVEL DIFFERENCE (dB)
	Open the squelch	Close the squelch	
16	+ 2.2	- 1.2	3.4
Measurement uncertainty			2.8dB
Limits (9.13.3)			Between 3 and 6 dB

Measuring equipment used: 02, 10, 11, 22, 26

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

9.14 RECEIVER MULTIPLE WATCH CHARACTERISTIC.

Priority Channel (P.C.): 16 F = 156.800 MHz
Additional Channel (A.C.): 28 F = 162.000 MHz

TEST CONDITIONS		SCANNING PERIOD (ms)	DWELL TIME (ms) ON THE:		SCANNING STOPS ON P.C. IF SIGNAL ON P.C.
Temp.	Voltage		P.C.	A.C.	
$T_{nom}(+20\text{ }^{\circ}\text{C})$	$V_{nom}(12.0\text{V})$	1900	150	1750	yes
$T_{min}(-15\text{ }^{\circ}\text{C})$	$V_{min}(10.8\text{V})$	1900	150	1750	yes
	$V_{max}(15.6\text{V})$	1900	150	1750	yes
$T_{max}(+55\text{ }^{\circ}\text{C})$	$V_{min}(10.8\text{V})$	1900	150	1750	yes
	$V_{max}(15.6\text{V})$	1900	150	1750	yes
Measurement uncertainty		4.3 ms	1.5 ms	4.3 ms	-
Limits (9.14.3)		≤ 2000 ms	≤ 150 ms	between 850ms and 2s	yes

Measuring equipment used: 02, 03, 10, 11, 12, 18, 22, 26

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 17-12; 19-12; 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

10. RECEIVER FOR DSC DECODER
10.1 MAXIMUM USABLE SENSITIVITY.

TEST CONDITIONS		BIT ERROR RATE (%)		
Temp.	Voltage	Channel 70 nominal	Channel 70 Fn - 1.5 kHz	Channel 70 Fn + 1.5 kHz
Tnom (20 °C)	Vnom (12.0 V)	0	0	0
Tmin (-15 °C)	Vmin (10.8 V)	0	0	0
	Vmax (15.6 V)	0	0	0
Tmax (+55 °C)	Vmin (10.8 V)	0	0	0
	Vmax (15.6 V)	0	0	0
Measurement uncertainty		2.8 dB		

LIMITS (Clause 10.1.3)

TEST CONDITION	BIT ERROR RATE / MAXIMUM USABLE SENSITIVITY
Normal	≤ 1 % BER at 0 dBμV
Extreme	≤ 1 % BER at 6 dBμV

BER = Bit Error Rate

Measuring equipment used: 02, 09, 10, 11, 22, 26, 28, 30

TEST FORM

TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

10.2 CO-CHANNEL REJECTION.

CHANNEL Fn	Funw - Fn (Hz)	WANTED SIGNAL: 3 dBμV; UNWANTED SIGNAL: -5 dBμV BIT ERROR RATE (%)
Channel 70 Fn: 156.525 MHz	+3000	0
	+2000	0
	+1000	0
	0	0
	-1000	0
	-2000	0
	-3000	0
Measurement uncertainty		1.60dB

Funw = unwanted frequency

LIMIT (Clause 10.2.3)

BIT ERROR RATE	≤ 1 % BER AT UNWANTED SIGNAL LEVEL OF -5 dBμV
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BER = Bit Error Rate

Measuring equipment used: 02, 03, 09, 10, 11, 18, 22, 26, 28

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 17-12; 19-12; 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

10.3 ADJACENT CHANNEL SELECTIVITY.

TEST CONDITIONS				BIT ERROR RATE (%)	
				CH 70	
				-25 kHz	+ 25 kHz
Tnom.	+ 20 °C	Vnom.	12.0 V	0	0
Tmin.	- 15 °C	Vmin.	10.8 V	0	0
		Vmax.	15.6 V	0	0
Tmax.	+ 55 °C	Vmin.	10.8 V	0	0
		Vmax.	15.6 V	0	0
Measurement uncertainty				2.9 dB	

LIMITS (Clause 10.3.3)

TEST CONDITION	BER (%) at LEVEL OF UNWANTED SIGNAL
Normal	≤ 1 % BER at 73 dBμV
Extreme	≤ 1 % BER at 63 dBμV

BER = Bit Error Rate

Measuring equipment used: 02, 03, 09, 10, 11, 18, 22, 26, 28, 30

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

10.4 SPURIOUS RESPONSE AND BLOCKING IMMUNITY.

Spurious response rejection: channel 70

Funw (MHz)	BIT ERROR RATE (%) AT LEVEL OF UNWANTED SIGNAL
135.125	0
155.625	0
*	*
--	--
--	--
--	--
Measurement uncertainty	2.9 dB

* : other spurious frequencies showed even less response to interference.

Funw = unwanted frequency

LIMITS (Clause 10.4.3)

LIMIT FOR	BIT ERROR RATE AT LEVEL OF UNWANTED SIGNAL
SPURIOUS	≤ 1 % BER at 73 dBμV

BER = Bit Error Rate

Measuring equipment used: 02, 03, 09, 10, 11, 18, 22, 26, 28

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

10.4 SPURIOUS RESPONSE AND BLOCKING IMMUNITY.

Blocking immunity: channel 70

CHANNEL Fn	Fn - Funw (MHz)	BIT ERROR RATE (%)	Fn - Funw (MHz)	BIT ERROR RATE (%)
Channel 70	+ 1	0	- 1	0
	+ 2	0	- 2	0
	+ 4	0	- 4	0
	+ 8	0	- 8	0
	+ 10	0	- 10	0
Measurement uncertainty	2.9 dB			

Funw = unwanted frequency

LIMITS (Clause 10.4.3)

LIMIT FOR	BIT ERROR RATE AT LEVEL OF UNWANTED SIGNAL
BLOCKING	≤ 1 % at 93 dBμV

BER = Bit Error Rate

Measuring equipment used: 02, 03, 09, 10, 11, 18, 22, 26, 28

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 19-12-2001 Ambient temp.: 23 °C R.H.: 50 %

10.5 INTERMODULATION RESPONSE.

Channel 70

Level of wanted signal: 3 dBμV

FREQUENCIES OF UNWANTED SIGNALS	BIT ERROR RATE (%)
$F_n - 25 \text{ kHz}$ $F_n - 50 \text{ kHz}$ (modulated)	0
$F_n + 25 \text{ kHz}$ $F_n + 50 \text{ kHz}$ (modulated)	0

LIMIT (Clause 10.5.3)

BIT ERROR RATE	$\leq 1 \text{ \% BER AT LEVEL OF } 68 \text{ dB}\mu\text{V OF UNWANTED SIGNALS}$
----------------	---

BER = Bit Error Rate

Measuring equipment used: 02, 03, 04, 09, 10, 11, 18, 22, 26, 28

TEST FORM

TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 17-12-2001 Ambient temp.: 23 °C R.H.: 50 %

10.6 DYNAMIC RANGE.

LEVEL OF WANTED SIGNAL (ALTERNATING)	BIT ERROR RATE (%)
0 / 100 dBμV	0

LIMIT (Clause 10.6.3)

BIT ERROR RATE	DURING ALTERNATING LEVEL 0 / 100 dBμV: BER = ≤ 1 %
----------------	--

BER = Bit Error Rate

Measuring equipment used: 02, 09, 10, 11, 22, 26, 28

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 14-12-2001 Ambient temp.: 23 °C R.H.: 50 %

10.7 CONDUCTED SPURIOUS EMISSIONS.

SPURIOUS EMISSIONS POWER LEVEL	
Channel 70	
Spurious frequency (MHz)	Power level (nW)
*	*
--	--
--	--
--	--
--	--
--	--
--	--
--	--
--	--
Measurement uncertainty	1.9 dB

* : all spurious emissions are better than 10 dB below the limit.

LIMIT (Clause 10.7.3)

Limit	9 kHz - 2 GHz: ≤ 2 nW
-------	----------------------------

Measuring equipment used: 01, 22, 26

TEST FORM
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: -- Ambient temp.: -- °C R.H.: -- %

10.8 RADIATED SPURIOUS EMISSIONS.

SPURIOUS EMISSIONS POWER LEVEL		
Channel 16	Antenna pos. P1=V	Antenna pos. P2=H
Spurious frequency (MHz)	Power level (nW)	Power level (nW)
*	*	*
Measurement uncertainty	26-1000MHz: 3.3dB; 1-10GHz: 6.1dB	
Limits (30 MHz - 2 GHz)	≤ 2 nW	

P1 = Testantenna in the position for maximum response P2 = Testantenna in the orthogonal polarisation plane

* : equipment is of integrated type; see for radiated emission clause 9.10.

Measuring equipment used: --

TEST FORM

TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 4-3 - 7-3-2002 Ambient temp.: 23 °C R.H.: 50 %

10.9 VERIFICATION OF CORRECT DECODING OF VARIOUS TYPES OF DSC CALLS.

Performed DSC calls, used telecommands and introduced errors for verification of the conformity to CCIR 493-(9)

Decoding of the following calls:

- *Distress-call (format specifier) and acknowledgement:*

MMSI used:

123456789, 987654321.

Nature of distress:

undesignated; fire, explosion; flooding; collision; listing; sinking; disabled; abandoning ship; man over board; piracy.

Distress Coordinates:

53.06N 089.12E; 68.34N 018.32W; 23.56S 136.54W; 56.24S 145.47E.

Telecommand:

F3E/G3E simplex; acknowledgement.

- *Distress-relay-call and acknowledgement:*

MMSI of ship in distress:

987654321; unknown MMSI.

Address:

all ships.

Nature of distress:

undesignated; fire, explosion; flooding; collision; listing; sinking; disabled; abandoning ship; EPIRB emission; man over board; piracy.

Distress Coordinates:

53.06N 089.12E; 68.34N 018.32W; 23.56S 136.54W; 56.24S 145.47E.

Telecommand:

F3E/G3E simplex; distress relay; acknowledgement.

Measurement equipment used: 02, 07, 09, 11, 22, 23, 26, 28

TEST FORM

TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 4-3 - 7-3-2002 Ambient temp.: 23 °C R.H.: 50 %

10.9 VERIFICATION OF CORRECT DECODING OF VARIOUS TYPES OF DSC CALLS (continued).

- Category Urgency call:

Address:

987654321; all ships.

1. Telecommand:

F3E/G3E simplex; no information.

2. Telecommand:

No information.

Freq. channel:

CH 16

- Category Safety call:

Address: 987654321; all ships

1. Telecommand:

F3E/G3E simplex; no information.

2. Telecommand:

No information.

Freq. channel:

CH 16

- Category Routine call:

Address:

987654321; 012345678.

1. Telecommand:

F3E/G3E simplex.

2. Telecommand:

No information.

Freq. channel:

CH 16; 06.

Measurement equipment used: 02, 07, 09, 11, 22, 23, 26, 28

TEST FORM

TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 22-2; 23-2-2000 Ambient temp.: 24 °C R.H.: 52 %

10.9 VERIFICATION OF CORRECT DECODING OF VARIOUS TYPES OF DSC CALLS (continued).

- Verification of correct decoding of DSC-calls with introduced errors:*- Distress-call and all ships-call:*

Parity error in format specifier rx1 and rx2: accepted; ok
Parity error in format specifier dx1 and rx2: accepted; ok
Parity error in format specifier dx2 and rx2: rejected; ok
Parity error in format specifier rx1 and dx2: accepted; ok
Parity error in format specifier dx1 and dx2: accepted; ok
Parity error in format specifier dx1 and rx1: rejected; ok
Parity error in format specifier dx2 rx1 rx2: rejected; ok
Parity error in format specifier dx1 dx2 rx1: rejected; ok

- Individual call:

Parity error in format specifier rx1 and rx2: accepted; ok
Parity error in format specifier dx1 and rx2: accepted; ok
Parity error in format specifier dx2 and rx2: accepted; ok
Parity error in format specifier rx1 and dx2: accepted; ok
Parity error in format specifier dx1 and dx2: accepted; ok
Parity error in format specifier dx1 and rx1: accepted; ok
Number error in format specifier dx1 and rx1: accepted; ok
Number error in format specifier dx2 and rx2: accepted; ok

- Distress-call, All ships-call, Individual-call, Acknowledge-call:

Parity error ECC dx: accepted; ok
Parity error ECC rx: accepted; ok
Parity error ECC dx and rx: accepted; ok
Number error ECC dx: accepted; ok
Number error ECC rx: accepted; ok

- Individual call:

Error in phasing sequence except 1DX and 2RX's: accepted; ok
Error in phasing sequence except 2DX's and 1RX: accepted; ok
Error in phasing sequence except 3RX's: accepted; ok

Measurement equipment used: 02, 07, 09, 11, 22, 23, 26, 28

TEST FORM**TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000**

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

ADDITIONAL INFORMATION SUPPLEMENTARY TO THE TEST REPORT

Remarks

The equipment has been tested regarding output power at extreme bandedges on the frequencies 156.050 MHz and 157.425 MHz.

The channels 87 and 88 have been programmed as simplex channels to align with the new AIS-system.

UTILIZED MEASURING EQUIPMENT
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No.	Instrument/Ancillary	Type	Manufacturer	ID No.
01	<i>Spectrum analyser</i>	<i>8562E</i>	<i>HP</i>	<i>TE00099</i>
02	<i>Signal generator</i>	<i>2042</i>	<i>Marconi</i>	<i>TE00033</i>
03	<i>Signal generator</i>	<i>2042</i>	<i>Marconi</i>	<i>TE00427</i>
04	<i>Signal generator</i>	<i>8640B</i>	<i>HP</i>	<i>TE00375</i>
05	<i>Modulation meter</i>	<i>TF 2300B</i>	<i>Marconi</i>	<i>TE00360</i>
06	<i>Measuring receiver</i>	<i>ESV</i>	<i>R&S</i>	<i>TE00425</i>
07	<i>FSK-decoder</i>	<i>JOZ-2</i>	<i>HM</i>	<i>KML 002</i>
08	<i>Frequency counter</i>	<i>PM 6614</i>	<i>Philips</i>	<i>TE00378</i>
09	<i>DSC de/encoder</i>	<i>3817</i>	<i>Debeg</i>	<i>910932</i>
10	<i>Audio analyzer</i>	<i>8903A</i>	<i>HP</i>	<i>TE00373</i>
11	<i>Oscilloscope</i>	<i>442</i>	<i>Tektronix</i>	<i>TE00382</i>
12	<i>Oscilloscope storage</i>	<i>PM 3311</i>	<i>Philips</i>	<i>TE00381</i>
13	<i>RF Wattmeter</i>	<i>Analyst 4381</i>	<i>Bird</i>	<i>TE00377</i>
14	<i>Reference receiver</i>	<i>Ksr-ref</i>	<i>HM</i>	<i>KSR325</i>
15	<i>Adj. channel power meter</i>	<i>NKS</i>	<i>R&S</i>	<i>TE00339</i>
16	<i>Transient detector</i>	<i>JOZ-1</i>	<i>HM</i>	<i>KML001</i>
17	<i>X-Y plotter</i>	<i>7015B</i>	<i>HP</i>	<i>KSR526</i>
18	<i>Splitter</i>	<i>ZFSC-2</i>	<i>MCL</i>	<i>KSR500</i>
19	<i>Splitter</i>	<i>ZSC 2-1</i>	<i>MCL</i>	<i>KSR357</i>
20	<i>Attenuator</i>	<i>8494B/8496B</i>	<i>HP</i>	<i>KSR699/700</i>

Calibration of these instruments is performed in accordance with the EN 45001 accreditation.

Telefication bv is an accredited test laboratory.

The accreditation number is L021.

UTILIZED MEASURING EQUIPMENT
TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No.	Instrument/Ancillary	Type	Manufacturer	ID No.
21	<i>Sound level meter</i>	<i>1983</i>	<i>General Radio</i>	<i>KSR532</i>
22	<i>Dig. Multimeter</i>	<i>8050A</i>	<i>Fluke</i>	<i>TE00428</i>
23	<i>Power attenuator</i>	<i>8325</i>	<i>Bird</i>	<i>TE00380</i>
24	<i>Band reject filter</i>	<i>FF 227</i>	<i>KL</i>	<i>KSR624</i>
25	<i>Mixer</i>	<i>10514A</i>	<i>HP</i>	<i>30397</i>
26	<i>Power supply</i>	<i>D050-10</i>	<i>Delta</i>	<i>TE00584</i>
27	<i>Amplifier</i>	<i>5171A</i>	<i>Philips</i>	<i>4980S29</i>
28	<i>Soft Bitread</i>	<i>JOZ-soft</i>	<i>HM</i>	<i>BRBS-V1</i>
29	<i>Vibration table</i>	<i>894</i>	<i>LDS</i>	<i>440</i>
30	<i>Climate chamber</i>	<i>EKSC 7.30.70</i>	<i>Enet Weiss</i>	<i>931052</i>

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PHOTOGRAPHS

PHOTOGRAPHS OF THE EQUIPMENT

Number of photographs: 7

PHOTOGRAPHS

PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 1
Description : *Assembly of equipment.*



PHOTOGRAPHS

PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 2
Description : *Front of equipment.*



PHOTOGRAPHS

PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 3
Description : *Rear of equipment.*



PHOTOGRAPHS

PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 4
Description : *Interior of equipment.*

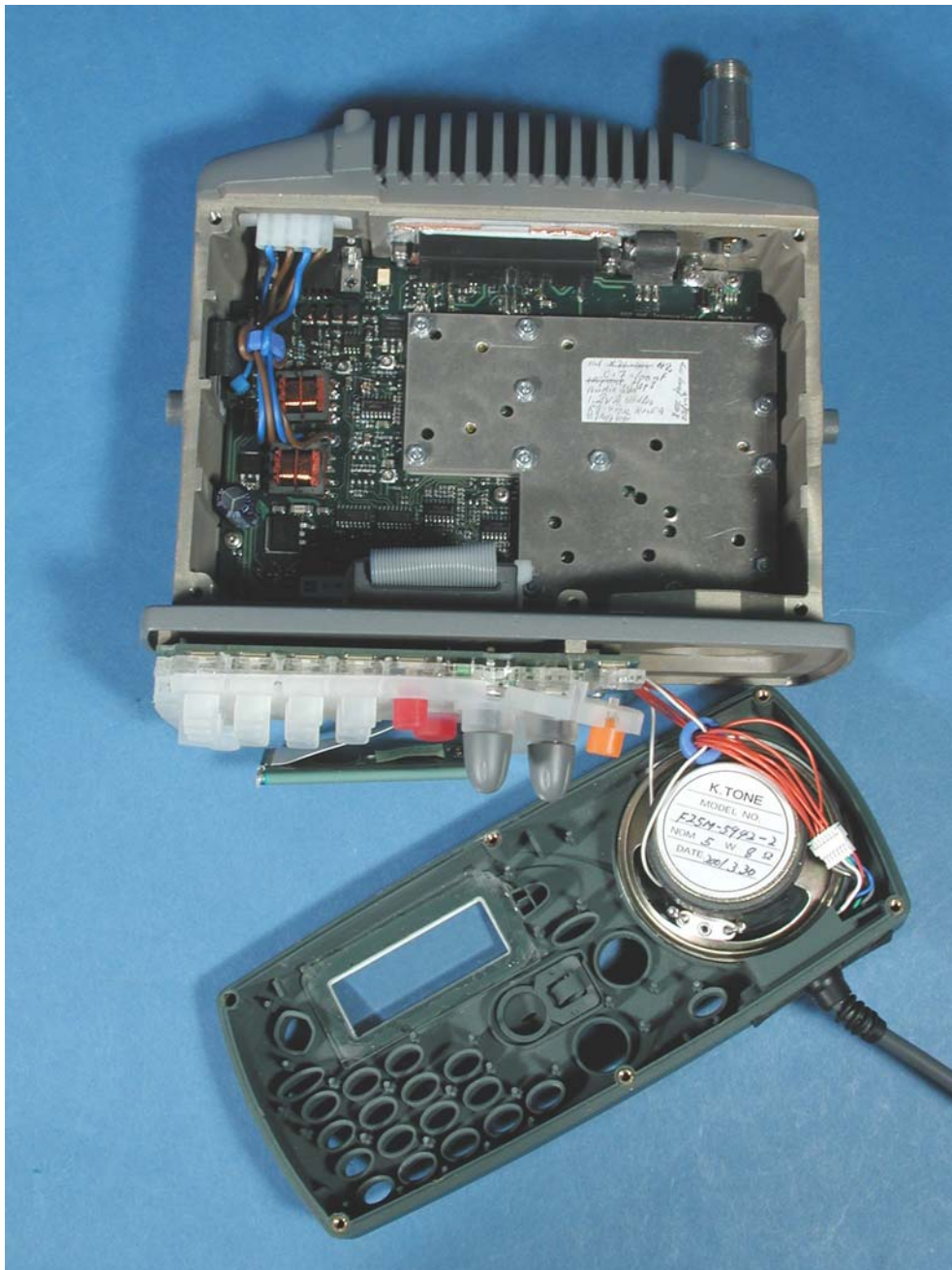


PHOTOGRAPHS

PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 5

Description : *Interior of equipment with front dismantled.*



PHOTOGRAPHS

PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 6

Description : *Front of equipment during vibration test.*



PHOTOGRAPHS

PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 7

Description : *Rear of equipment during vibration test.*



INFORMATION

INFORMATION FROM APPLICANT

This section contains information provided by the applicant.
The information has not been modified by Telefication.

The following information is contained:

- Application form for testing to EN 301 025-1; 16 pages.
- Manufacturer's statement regarding compliance with chapter 4 of EN 301 025-1; 6 pages.

The pages in this section are not included in the total number of pages of this report.