

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

laboratory

certification





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Modules with test results and other information

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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	:	



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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 Wess	sex
Type designation	: F1 DSC	
Parts of product	: F1 DSC; transceiver un	nit; 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 \leftrightarrow 21 December 2001.
- 4 March $2002 \leftrightarrow 8$ 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.



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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



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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	· Weigo
Review of test method	ods and report by:
name	: ing. P.A. Suringa
function	: Senior Engineer Radio/EMC
signature	Phyursing
The above conclusion	ns have been verified by the following signatory:
date	: 28 March 2002
name	: J.P. van de Poll
function	: Co-ordinator Test Group

: Co-ordinator Test Group

signature



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TEST FORM

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

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

See page 1c for measurements actually performed.



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

See page 1dc for measurements actually performed.



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

See page 1dc for measurements actually performed.



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



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



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



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<u>TYP</u> 1	E TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue Augus Radio Equipment and Systems (RES); Technical characteristics and methods measurement for VHF radiotelephone equipment for general communications a associated equipment for Class "D" Digital Selective Calling (DSC)	t 2000 of and
1.	SCOPE	
2.	NORMATIVE REFERENCES	
3.	DEFINITIONS AND ABBREVIATIONS	
4.	GENERAL AND OPERATIONAL REQUIREMENTS	
4.1	GENERAL Satisfa	ctory:
-	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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	associated equipment for Class "D" Digital Selective Calling (DSC)	
4.4	CONTROLS AND INDICATORS	
	Satisf	actory:
-	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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<u>TYP</u>	E TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 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)	<u>2000</u> of nd
4.5	FACILITIES FOR CODING AND DECODING OF DSC	ctory:
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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<u>TYP</u>	E TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 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)	2000 1
4.5	.3 DISTRESS CALLS (continued) Satisfact	ory:
-	Time delay of \geq 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
-	Distess 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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	Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications ar associated equipment for Class "D" Digital Selective Calling (DSC)	of 1d
4.6	DSC DISPLAY Satisfac	tory:
-	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 or migrophone	n.a
		yes
	integral loudspeaker and/or	yes
	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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TYPE R M	TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August Radio Equipment and Systems (RES); Technical characteristics and methods on measurement for VHF radiotelephone equipment for general communications an associated equipment for Class "D" Digital Selective Calling (DSC)	<u>2000</u> f d
4.8	SAFETY PRECAUTIONS Satisfac	tory:
-	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: <u>0 Ω</u> limit: \leq 100 k Ω	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



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5	TECHNICAL REQUIREMENTS	Satisfactory:
5.1	SWITCHING TIME	
-	Channel switching time: <u>2</u> sec	yes
	limit: \leq 5 sec	
-	Time to change from:	
	Tx to Rx condition: <u>0.150</u> sec	yes
	Rx to Tx condition: <u>0.150</u> sec	yes
	limit: \leq 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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TYPE F n	TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue AugusRadio Equipment and Systems (RES); Technical characteristics and methodsmeasurement for VHF radiotelephone equipment for general communications a associated equipment for Class "D" Digital Selective Calling (DSC)	et 2000 of and
5.3.3	3 FREE CHANNEL TRANSMISSION Satisfa	ctory:
-	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	4 AUTOMATIC ACKNOWLEDGEMENT	
-	No provision of sending automatic acknowledgements	yes
5.3.5	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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TYPE R m	TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue An Radio Equipment and Systems (RES); Technical characteristics and metho measurement for VHF radiotelephone equipment for general communication associated equipment for Class "D" Digital Selective Calling (DSC	ngust 2000 ods of ns and)
5.6	ALARM CIRCUITS Sat:	lsfactory:
5.6.1	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	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	3 ACOUSTIC ALARMS	
-	Acoustic power of alarm is \geq 80 dB(A) at 1m distance Measured value: <u>84</u> dB(A)	yes
5.6.4	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 5.8.1	MULTIPLE WATCH FACILITIES	
_	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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TYPI	E TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2	Issue August 2000
	Radio Equipment and Systems (RES); Technical characteristic measurement for VHF radiotelephone equipment for general co associated equipment for Class "D" Digital Selective Ca	s and methods of mmunications and alling (DSC)
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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	Radio	Εqu	ipment	and	Syste	ems (I	RES);	Techr	nical	l cha	arac	teris	tics	and me	ethods	of	
	measu	reme	ent for	VHF	radic	telep	phone	equip	pment	t for	r ge	neral	comn	nunicat	tions	and	1
	a	sso	ciated	equi	pment	for	Class	"D"	Digi	tal	Sele	ective	e Cal	ling (DSC)		

5.8.3 SCANNING CHARACTERISTICS

Satisfactory:

-	Sampling period of the priority channel: <u>1.9</u> sec. limit: <u><</u> 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: <u>150</u> msec. limit: \leq 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: <u>1750</u> msec. limit: \geq 850 msec.	yes
-	Indication of the channel on which a signal is being received	yes



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- TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio Equipment and Systems (RES); Technical characteristics and methods of
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associated equipment for Class "D" Digital Selective Calling (DSC)
- 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
- 6.8 Standard test signals for DSC
- 6.9 Determination of the symbol error rate in output of receiving part
- 6.10 Measurement uncertainty and interpretation of measured results
- 6.11 TEST CONDITIONS, POWER SOURCES AND AMBIENT TEMPERATURES
- 6.11.1 Normal and extreme test conditions
- 6.11.2 Test power sources
- 6.12 NORMAL TEST CONDITIONS
- 6.12.1 Normal temperature and humidity
- 6.12.2 Normal power sources
- 6.12.2.1 Battery power source
- 6.12.2.2 Other power source
- 6.13 EXTREME TEST CONDITIONS
- 6.13.1 Extreme temperatures
- 6.13.2 Extreme values of test power sources
- 6.13.2.1 Battery power source
- 6.13.2.2 Other power sources
- 6.14 Procedures for tests at extreme temperatures
- 7 ENVIRONMENTAL TESTS
- 7.1 Introduction
- 7.2 Procedure
- 7.3 Performance check



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measurement for VHF radiotelephone equipment for general communications and
associated equipment for Class "D" Digital Selective Calling (DSC)

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

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.)			
CHANNEL		Min. Power (W)	Vibr. freq. (Hz)	Max. Power (W)	Vibr. freq. (Hz)	Min. Power (W)	Vibr. freq. (Hz)	Max. Power (W)	Vibr. freq. (Hz)
	Х	20.4	*	20.7	*	0.6	*	0.6	*
16	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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TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio 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: <u>8-3-2002</u> Ambient temp.: <u>20</u> °C R.H.: <u>55</u> %

7.4 ENVIRONMENTAL TESTS: VIBRATION

PERFORMANCE CHECK: FREQUENCY ERROR

Equipment suspended: yes/no

If YES, state the precise test conditions: _-

	MEDDARION	HIGH POWI	ER (H.P.)	LOW POWER (L.P.)			
CHANNEL	DIRECTION	Max. freq. error (Hz)	Vibration freq. (Hz)	Max. freq. error (Hz)	Vibration freq. (Hz)		
	X	- 465	5 - 100	- 467	5 - 100		
16	Y	- 480	5 - 100	- 485	5 - 100		
	Z	- 497	5 - 100	- 502	5 - 100		
Measurement uncertainty		9 Hz					
Limit		Max. frequency error <u><</u> 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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measurement for VHF radiotelephone equipment for general communications and
associated equipment for Class "D" Digital Selective Calling (DSC)

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

7.4 ENVIRONMENTAL TESTS: VIBRATION

PERFORMANCE CHECK: RECEIVER MAXIMUM USABLE SENSITIVITY

Equipment suspended: yes/no

If YES, state the precise test conditions: _-

CUANNEL	MAXIN	VIBRATION					
CHANNEL	VIBRATION DIRECTION X	VIBRATION DIRECTION Y	VIBRATION DIRECTION Z	(Hz)			
70	- 1.0	- 1.0	- 1.0	5 - 100			
Measurement uncertainty	2.8 dB						
Limit	\leq + 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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measurement for VHF radiotelephone equipment for general communications and
associated equipment for Class "D" Digital Selective Calling (DSC)

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

7.4 ENVIRONMENTAL TESTS: VIBRATION

RESONANCE FREQUENCIES

Equipment suspended: yes/no

If YES, state the precise test conditions: _-

Found during performance check

: See below.

VIDDATION DIDECTION	RESONANCE FREQUENCY (Hz)						
VIBRATION DIRECTION	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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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)	
Data of toat. 8 2 2002 Ambient temp. 20 80 D.U. EE &	
ale of lest: 8-3-2002 Ambrent lemp.: 20 C R.H.: 55 %	
7.4 ENVIRONMENTAL TESTS: VIBRATION	
PERFORMANCE CHECK: VISUAL INSPECTION	
Satisfactory	:
ligible damage or deterioration	_
$\mathbf{yes} = \mathbf{yes} + \mathbf$	•

Observations: <u>No damage or deterioration.</u>



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TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio 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: <u>19-12-2001</u> Ambient temp.: <u>23</u> °C R.H.: <u>50</u> %

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



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TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio 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: <u>19-12-2001</u> Ambient temp.: <u>23</u> °C R.H.: <u>50</u> %

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 $ \leq 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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measurement for VHF radiotelephone equipment for general communications and
associated equipment for Class "D" Digital Selective Calling (DSC)

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

7.5.2 ENVIRONMENTAL TESTS: DRY HEAT

PERFORMANCE CHECK: RECEIVER MAXIMUM USABLE SENSITIVITY

CHANNEL	MAXIMUM USABLE SENSITIVITY $(dB\mu V)$
70	- 1.0
Measurement uncertainty	2.8 dB
Limit	\leq + 6 dBµV for 1% symbol error rate

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



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Date of test: <u>19-12-2001</u> Ambient temp.: <u>23</u> °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: <u>No visual damage or deterioration.</u>



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TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio 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: <u>21-12-2001</u> Ambient temp.: <u>23</u> °C R.H.: <u>50</u> %

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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measurement for VHF radiotelephone equipment for general communications and
associated equipment for Class "D" Digital Selective Calling (DSC)

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

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 $ \leq 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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TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio Equipment and Systems (RES); Technical characteristics and methods of
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associated equipment for Class "D" Digital Selective Calling (DSC)

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

7.5.3 ENVIRONMENTAL TESTS: DAMP HEAT

PERFORMANCE CHECK: RECEIVER MAXIMUM USABLE SENSITIVITY

CHANNEL	MAXIMUM USABLE SENSITIVITY $(dB\mu V)$
70	+ 1.0
Measurement uncertainty	2.8 dB
Limit	\leq + 6 dBµV for 1% symbol error rate

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



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TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Is Radio Equipment and Systems (RES); Technical characteristics and measurement for VHF radiotelephone equipment for general commun associated equipment for Class "D" Digital Selective Callin	ssue August 2000 d methods of ications and ng (DSC)
Date of test: <u>21-12-2001</u> Ambient temp.: <u>23</u> °C R.H.	:%
7.5.3 ENVIRONMENTAL TESTS: DAMP HEAT	
PERFORMANCE CHECK: VISUAL INSPECTION	
	Satisfactory:

Visible damage or deterioration

yes/no/n.a.

Observations: <u>No visual damage or deterioration.</u>



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TEST FORM

TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio 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: <u>20-12-2001</u> Ambient temp.: <u>23</u> °C R.H.: <u>50</u> %

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

	CARRIER POWER (W)			
CHANNEL	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 pow			
	L.P between 0.1 and 1 W			

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



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TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio Equipment and Systems (RES); Technical characteristics and methods of
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associated equipment for Class "D" Digital Selective Calling (DSC)

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

7.5.4 ENVIRONMENTAL TESTS: LOW TEMPERATURE

PERFORMANCE CHECK: TX FREQUENCY ERROR

CUANNEL	FREQUENCY ERROR (Hz)		
CHANNEL	High Power (H.P.)	Low Power (L.P.)	
16	- 117	- 117	
Measurement uncertainty	9 Hz		
Limits	Frequency error <u><</u> 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: <u>20-12-2001</u> Ambient temp.: <u>23</u> °C R.H.: <u>50</u> %

7.5.4 ENVIRONMENTAL TESTS: LOW TEMPERATURE

PERFORMANCE CHECK: RECEIVER MAXIMUM USABLE SENSITIVITY

CHANNEL	MAXIMUM USABLE SENSITIVITY $(dB\mu V)$
70	- 2.0
Measurement uncertainty	2.8 dB
Limit	\leq + 6 dBµV for 1% symbol error rate

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



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Date of test: <u>20-12-2001</u> Ambient temp.: <u>23</u> °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: <u>No visual damage or deterioration.</u>



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TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio 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: <u>13-12; 19-12; 20-12-2001</u> Ambient temp.: <u>23</u> °C R.H.: <u>50</u> %

8.1 TRANSMITTER FREQUENCY ERROR.

TEST CONDITIONS		FREQUENCY ERROR (Hz)		
		Channel 16		
Temperature	Voltage	H.P.	L.P.	
Tnom(+20 °C)	Vnom(12.0 V)	- 481	- 481	
	Vmin(10.8 V)	- 117	- 117	
111111(-15 °C)	Vmax(15.6 V)	- 117	- 117	
Vmin(10.8 V)		- 1152	- 1152	
$1 \max(+55 \text{ °C})$	Vmax(15.6 V)	- 1152	- 1152	
Measurement uncertainty		9 Hz		
Limits (8.1.3)		<u><</u> +1500 / -1500 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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measurement for VHF radiotelephone equipment for general communications and
associated equipment for Class "D" Digital Selective Calling (DSC)

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

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.
Tnom(+20 °C)	Vnom(12.0V)	20.0	0.56	20.0	0.56	20.7	0.59
	Vmin(10.8V)	22.0	0.65	22.5	0.68	21.5	0.70
111111(-15 °C)	Vmax(15.6V)	20.4	0.65	21.6	0.68	21.5	0.70
Tmax(+55 °C)	Vmin(10.8V)	14.4	0.40	15.4	0.42	15.4	0.43
	Vmax(15.6V)	12.9	0.41	13.3	0.43	13.6	0.44
Measurement uncertainty		0.61 dB					
Limits (8.2.3)		<pre>Normal test conditions: => H.P.: - between 6 and 25 W - max. of <u>+</u> 1.5 dB from rated outp. power => L.P.: between 0.1 and 1 W Extreme test conditions: => H.P.: - between 6 and 25 W - within +2 & -3 dB from rated outp.power => L.P.: between 0.1 and 1 W</pre>					

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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associated equipment for Class "D" Digital Selective Calling (DSC)

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

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

		FREQUENCY DEVIATION Δf				
CHANNEL	FMOD (Hz)	High Power		Low Power		
		Δf	(kHz)	Δ f (kHz)		
		+	-	+	-	
	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	
1.5	1000	4.3	4.3	4.2	4.1	
16	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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measurement for VHF radiotelephone equipment for general communications and
associated equipment for Class "D" Digital Selective Calling (DSC)

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

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

	Frequency deviation Δf (kHz)			
fmod	Channel 16			
(kHz)	+		-	
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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associated equipment for Class "D" Digital Selective Calling (DSC)

LIMITS FOR TX REDUCTION OF FREQUENCY DEVIATION AT fmod > 3 kHz (Clause 8.3.3.2)

- => <u>3 kHz < fmod < 6 kHz</u> : the frequency deviation shall not exceed the frequency deviation at fmod = 3 kHz
- => fmod = 6 kHz : $|\Delta f| < 1.5$ kHz

=> <u>6 kHz < fmod < 25 kHz</u>:

$$\begin{split} |\Delta f| &\leq 1.5 \boxed{\frac{6}{\text{fmod}}} \overset{2.325}{(\text{kHz})} \quad (\text{fmod in kHz}) \\ \text{or} \\ |\Delta f| &\leq -6-46.5 \, \star \, \log \boxed{\frac{\text{fmod}}{6}} \quad (\text{dB relative to } \Delta f \, = \, 3 \, \, \text{kHz}) \quad (\text{fmod in kHz}) \end{split}$$

or

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



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associated equipment for Class "D" Digital Selective Calling (DSC)

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

8.4 SENSITIVITY OF THE MODULATOR, INCLUDING MICROPHONE.

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

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



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measurement for VHF radiotelephone equipment for general communications and
associated equipment for Class "D" Digital Selective Calling (DSC)

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

8.5 TRANSMITTER AUDIO-FREQUENCY RESPONSE.

	MODULATION INDEX m (dB relative to 1kHz)
FMOD (HZ)	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)

$$m = 20 \log \frac{|\Delta f|}{fmod} dB$$

m = 0 dB at fmod = 1000 Hz

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



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associated equipment for Class "D" Digital Selective Calling (DSC)

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

8.6 AUDIO-FREQUENCY HARMONIC DISTORTION OF THE EMISSION.

			AUDIO FREQUENCY HA	ARMONIC DISTORTION (%)					
		FMOD	Channel 16						
Temp.	Voltage	(HZ)	H.P.	L.P.					
The second	Vnom	300	1.5	1.5					
(+20 °C)	(12.0V)	500	1.4	1.4					
		1000	1.4	1.4					
Tmin	Vmin (10.8V)	1000	0.9	0.9					
(-15 °C)	Vmax (15.6V)	1000	0.8	0.8					
Tmax	Vmin (10.8V)	1000	0.7	0.9					
(+55 °C)	Vmax (15.6V)	1000	0.7	0.9					
Measureme	ent uncerta	ainty	+1.4/-1.3% at 10% dist	ortion					
Limit (8.6.3)			<u><</u> 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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associated equipment for Class "D" Digital Selective Calling (DSC)

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

8.7 TRANSMITTER ADJACENT CHANNEL POWER.

	ADJACENT CHANNEL POWER (µW and dBc)										
		Upper o	channel		Lower channel						
CHANNEL	High	power	Low po	ower	High 1	power	Low power				
	μW dBc μ		μ₩	dBc	μ₩	dBc	μ₩	dBc			
16	-	-75.0	-	-74.8	-	-74.2	_	-74.1			
Measurement uncertainty	2.3 dB										
Limits (8.7.3)	<u><</u> -7() dBc or	<u><</u> 0.2 μ	V							

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



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TYPE	TEST	OF	RADIO	EQUIE	PMENT	ACCO	RDING	TO H	EN	301	025-	-1 '	v1.1.2	2	Issue	Augu	st	2000
	Radio	Εqu	ipment	and	Syste	ems (RES);	Tech	ıni	cal	char	ract	terist	cics	and met	hods	of	
	measur	ceme	ent for	VHF	radic	tele	phone	equi	Ĺpm	ent	for	gei	neral	comm	unicati	ons	and	
	a	sso	ciated	equi	pment	for	Class	"D"	Di	lgita	al Se	ele	ctive	Cal	ling (D	SC)		

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

8.8 TRANSMITTER CONDUCTED SPURIOUS EMISSIONS CONVEYED TO THE ANTENNA.

SPURIOUS EMISSIONS POWER LEVEL									
Channel 16	High power: 20.0 W	Low power: 0.5 W							
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 μ W = - 36 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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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.: _-_ %

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)						
040.4	Hore	ON	0.025	*						
940.4	HOT.	STBY	n.a	n.a						
1007 6	Ver	ON	0.06	*						
1097.6	ver.	STBY	n.a	n.a						
*	Ver	ON	*	*						
	ver.	STBY	n.a	n.a						
Measurement uncertainty	26-1000MHz: 2.5dB; 1-8 GHz: 1.8dB									
Limits (30 MHz - 2 GHz)	Tx ON : \leq 0.25 μ W Tx STAND-BY: \leq 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: _--



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associated equipment for Class "D" Digital Selective Calling (DSC)

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

8.10 TRANSIENT FREQUENCY BEHAVIOUR OF THE TRANSMITTER.

Channel: 16

PLOTS OF FREQUENCY DIFFERENCE VERSUS TIME

rigger		Status:	Waiti	ng for	Trigo	ger		
Sourco I Chan	1] [, Slopa]	Auto	Scalo	L Dica	LU MIA blad	λ Ι		
Lovol [Adius	1] [+ 310pe] 1] -1 350 V	∩n Ev	ont I	[DISA NNNN1	bieu .			
Probe [1:1]	Coupl	ina i	[dc]	[1 ΜΩ	1		
	1					,		
Graph [1]	1.33 V/dív	0.00 V	10.0 r	m s/div	- 1().00 m	S	
							~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	****
1: [Chan 1 ]								
	φ <del></del> ]							
2: [Chan 2 ]								
	******************************						-	
	TWWW							

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: <u>14-12-2001</u> Ambient temp.: <u>23</u> °C R.H.: <u>50</u> %

8.10 TRANSIENT FREQUENCY BEHAVIOUR OF THE TRANSMITTER.

Channel: 16

## PLOTS OF FREQUENCY DIFFERENCE VERSUS TIME

<u>Switch off condition</u>: limit:  $\Delta f \leq 25$  kHz during t3 (= 5 msec)

imebase	Status: Acquisition Stopped									
Modo [Tria	d 1			Auto	Scalo	L Dica	LU MI	۹ ۱		
Range 100 mg	u j : [Re	al Tin	ne l	Refere	ence	[ Disc	nht	1		
Delay 10.000	10 ms		1	Sampl	ing @	10.0	kHz	1		
Graph [ 1 ]	1.33 V/	div	0.00	V	10.0	m s/div	- 91	0.00 m	is	
: [Chan 1 ]		man Marra		2.940	******	12-11 # 14 - 14 - 14 - 14 - 14 - 14 - 14 -	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	v1m44UP241		
· [Chan ] ]										
, [Chan 2 ]										AAAA
	×									AAAA
										VVVV

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: <u>14-12-2001</u> Ambient temp.: <u>23</u> °C R.H.: <u>50</u> %

8.11 RESIDUAL MODULATION OF THE TRANSMITTER

CHANNEL	LEVEL OF RESIDUAL MODULATION (dB)
16	- 41
Measurement uncertainty	1.6dB
Limit	<u>&lt;</u> - 40 dB

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



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

8.12 FREQUENCY ERROR (DEMODULATED DSC SIGNAL)

					FREQUENCY	ERROR (Hz)
	TEST CON	DITIONS		B-STATE	Y-STATE	
Tnom.	+ 20 °C	Vnom.	12.0	7	+ 3.2	0
Tmin	15.00	Vmin.	10.8 \	7	+ 3.2	+ 0.1
11111.	- 15 °C	Vmax.	15.6 \	7	+ 3.2	+ 0.1
		Vmin.	10.8 \	7	+ 3.1	0
Illiax.	+ 55 °C	Vmax.	15.6 \	7	+ 3.1	0
Measurement uncertainty					0.1	

LIMIT (Clause 8.12.3)

STATE	FREQUENCY (Hz)
В	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: <u>14-12-2001</u> Ambient temp.: <u>23</u> °C R.H.: <u>50</u> %

8.13 MODULATION INDEX FOR DSC

B-state 1300 Hz deviation: ______ 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: <u>05, 10, 11, 13, 22, 23, 26</u>



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

8.14 MODULATION RATE FOR DSC

Bit stream speed : <u>1200</u> Bd

Tolerance: measured value : <u>+ 11</u> 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: <u>4-3 - 7-3-2002</u> Ambient temp.: <u>23</u> °C R.H.: <u>50</u> %

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



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

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

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

## AT THE LOUDSPEAKER

## Rated AF output power: 4.0 W in $4\Omega$ Requirement : $\geq$ 2 W

$\begin{array}{rcl} CHANNEI\\ Fn &= 1 \end{array}$	L 16 56.8 MHz	TEST	EMOD	AF OUTPUT POWER P(W) AND HARMONIC DISTORTION D(%)						
TEST CO	ONDITIONS	LEVEL	(Hz)	F	Fn		.5 kHz	Fn+1	Fn+1.5 kHz	
Temp.	Voltage	(αβμν)		Р	D	Р	D	Р	D	
			300	4.0	10.0	n.a.	n.a.	n.a.	n.a.	
		60	500	4.0	6.1	n.a.	n.a.	n.a.	n.a.	
Tnom Vnom(12.0 (+20 °C)			1000	4.0	2.3	n.a.	n.a.	n.a.	n.a.	
	VIIOM (12.0V)	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				0.34 dB						
- on D				+1.4/-1.3% at 10% distortion						
Limits (9.1.3)			AF output power $\geq$ rated AF output power Distortion $\leq$ 10 %							

n.a.: not applicable

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



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

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

## AT THE HANDSET EARPHONE

Rated AF output power: 1 mW in 600  $\Omega$  Requirement :  $\geq$  1 mW

$\begin{array}{rcl} CHANNEI\\ Fn &= 1. \end{array}$	L 16 56.8 MHz	TEST	EST		AF OUTPUT POWER P(mW) AND HARMONIC DISTORTION D(%)					
TEST CO	ONDITIONS	SIGNAL LEVEL	(Hz)	Fi	Fn		.5 kHz	Fn+1	Fn+1.5 kHz	
Temp.	Voltage	(αβμν)		Р	D	Р	D	Р	D	
			300	1.1	7.3	n.a.	n.a.	n.a.	n.a.	
		60	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.	
(+20 °C)		300	1.1	7.3	n.a.	n.a.	n.a.	n.a.		
		100	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.	
Measuremen	Measurement uncertainty: - on P				0.34 dB					
- on D				+1.4/-1.3% at 10% distortion						
Limits (9.1.3)				AF output power $\geq$ rated AF output power Distortion $\leq$ 10 %						

n.a.: not applicable

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



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

9.2 RECEIVER-AUDIO FREQUENCY RESPONSE.

Channel	fmod	AF output power							
Fn	(Hz)	Fi	n	Fn-1.5	5 kHz	Fn+1.	Fn+1.5 kHz		
		Watt	dB (*)	Watt	dB (*)	Watt	dB (*)		
	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		
Fn:	1500	0.1	+0.36	0.11	+0.28	0.1	+0.15		
156.800 MHZ	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	ent ity 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 5				decrea- d point age 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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TEST FORM

TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio Equipment and Systems (RES); Technical characteristics and methods of<br/>measurement for VHF radiotelephone equipment for general communications and<br/>associated equipment for Class "D" Digital Selective Calling (DSC)

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

9.3 RECEIVER MAXIMUM USABLE SENSITIVITY.

Rated AF output power: 4.0 W Requirement :  $\geq$  2 W

		SENSITIVITY LEVEL AND AF OUTPUT POWER						
TEST CC	JULIIONS	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			
mm i m	Vmin (10.8V)			-5.0	2.0			
(-15 °C)	Vmax (15.6V)			-5.0	2.0			
	Vmin (10.8V)			-1.0	2.0			
(+55 °C)	Vmax (15.6V)			-1.0	2.0			
Measure uncerta	ement ainty	2.8 dB	; 0.34 dB					
Limits	(9.3.3)	<ul> <li>NORMAL test conditions         <ul> <li>NORMAL test conditions</li> <li>RF level : </li> <li>+6 dBμV</li> <li>AF output power : 50% of the rated AF output power</li> <li>EXTREME test conditions</li> <li>RF level : </li> <li>+12 dBμV</li> <li>AF output power : between + 3 dB rel. to 50% of th rated AF output power</li> </ul> </li> </ul>				ut power 0% of the		

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



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

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: <u>17-12; 19-12; 20-12-2001</u> Ambient temp.: <u>23</u> °C R.H.: <u>50</u> %

		ADJACENT CHANNEL SELECTIVITY (dB)							
TEST CONDITIONS		Channel Fn: (MHz)		Channel : <i>Fn: 156.</i>	16 800 (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				
Train	Vmin (10.8V)			69.5	70.5				
(-15 °C)	Vmax (15.6V)			69.5	70.5				
Tmox	Vmin (10.8V)			71	69.5				
(+55 °C)	Vmax (15.6V)			71	69.5				
Measurement uncertainty		2.9 dB							
Limits (9.5.3)		NORMAL EXTREME	NORMAL test conditions : $\geq$ 70 dB EXTREME test conditions : $\geq$ 60 dB						

9.5 RECEIVER ADJACENT CHANNEL SELECTIVITY.

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



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

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)	$\geq$ 70 dB at  Funw-Fn  > 25 kHz

Funw = unwanted frequency

* : Rejection on other spurious responses is  $\geq$  80dB.

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



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

9.7 RECEIVER INTERMODULATION RESPONSE.

	INTERMODULATION RESPONSE RATIO (dB)					
FREQUENCY OF UNWANTED SIGNALS B/C	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: <u>17-12-2001</u> Ambient temp.: <u>23</u> °C R.H.: <u>50</u> %

9.8 RECEIVER BLOCKING OR DESENSITISATION.

CHANNEL	Fn - Funw (MHz) -		LEVEL OF UNWANTED SIGNAL (dBµV) FOR A REDUCTION OF:				
FII			3 dB AF outp	in the ut level	the SINA to 1	D ratio 4 dB	
	-1	+1			97	98	
Channel 16 Fn:	-2	+2			> 98	> 98	
	- 3	+3			> 98	> 98	
156.800 MHZ	-5	+5			> 98	> 98	
	-10	+10			> 98	> 98	
Measurement uncertainty	2.9dB						
Limit	<u>&gt;</u> 90 dB are fou	μV except nd (clause	at freque e 9.6)	ncies on whic	ch spurious r	esponses	

Funw = unwanted frequency

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



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

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 n₩			

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

Measuring equipment used: 01, 22, 26



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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 n₩		

 $\mathtt{P1}$  = Testantenna in the position for maximum response  $\mathtt{P2}$  = 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: _--


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

9.11 RECEIVER RESIDUAL NOISE LEVEL.

CHANNEL	NOISE AND HUM LEVEL (dB)
16	- 40.0
Measurement uncertainty	1.6dB
Limit (9.11.3)	<u>&lt;</u> -40

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



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

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)	<u>≤</u> -40

## METHOD OF CLAUSE 9.12.2 b)

CHANNEL	INPUT LEVEL $(dB\mu V)$	SINAD (dB)
16	- 1.0	25
Measurement uncertainty	2.8dB	_
Limits (9.12.3)	<u>&lt;</u> +6 dBµV	_

## METHOD OF CLAUSE 9.12.2 c)

CHANNEL	INPUT LEVEL (dBµV)
16	+ 2.1
Measurement uncertainty	2.8dB
Limit (9.12.3)	<u>&lt;</u> +6 dBµV

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



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

#### 9.13 RECEIVER SQUELCH HYSTERESIS.

CUANNET	INPUT LEVEI	INPUT LEVEL	
CHANNEL	Open the squelch	(dB)	
16	+ 2.2	- 1.2	3.4
Measurement unce:	2.8dB		
Limits (9.13.3)	Between 3 and 6 dB		

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



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Date (	of	test:	17-12-2001	Ambient	temp.:	23	°C	R.H.:	50	_ %
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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 COI	NDITIONS	SCANNING	DWELL TIME (r	ms) ON THE:	SCANNING	
Temp.	Voltage	(ms)	P.C.	A.C.	IF SIGNAL ON P.C.	
Tnom(+20 °C)	Vnom(12.0V)	1900	150 1750		yes	
Tmin (15.9C)	Vmin(10.8V)	1900	150	1750	yes	
1min(-15 °C)	Vmax(15.6V)	1900	150	1750	yes	
$T_{max}(155, 9C)$	Vmin(10.8V)	1900	150	1750	yes	
1111ax (+55 °C)	Vmax(15.6V)	1900	150	1750	yes	
Measurement uncertainty		4.3 ms	1.5 ms	4.3 ms	_	
Limits (9.14.3)		<u>&lt;</u> 2000 ms	<u>&lt;</u> 150 ms	between 850ms and 2s	yes	

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



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

10. RECEIVER FOR DSC DECODER

#### 10.1 MAXIMUM USABLE SENSITIVITY.

TEST CO	ONDITIONS	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	Vmin (10.8 V)	0	0	0				
(-15 °C)	Vmax (15.6 V)	0	0	0				
Tmax	Vmin (10.8 V)	0	0	0				
(+55 °C)	Vmax (15.6 V)	0	0	0				
Measure uncerta	ement ainty	2.8 dB						

#### LIMITS (Clause 10.1.3)

TEST CONDITION	BIT ERROR RATE / MAXIMUM USABLE SENSITIVITY
Normal	$\leq$ 1 % BER at 0 dB $\mu$ V
Extreme	$\leq$ 1 % BER at 6 dB $\mu$ V

BER = Bit Error Rate

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



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

10.2 CO-CHANNEL REJECTION.

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

Funw = unwanted frequency

#### LIMIT (Clause 10.2.3)

	 	_									
	1	ο.	סבות	7 11		O T ONTO T	T T37773T	$\cap \Pi$	_	JDUIT	
BII ERRUR RAIE		6	BER	AT	UNWANTED	SIGNAL		OF	- 5	abuv	

BER = Bit Error Rate

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



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

10.3 ADJACENT CHANNEL SELECTIVITY.

TECT CONDITIONS				BIT ERRO	DR RATE (%)
TEST CONDITIONS				СН	70
				-25 kHz	+ 25 kHz
Tnom.	+ 20 °C	Vnom.	12.0 V	0	0
Tmin	15.00	Vmin.	10.8 V	0	0
111111	- 15 °C	Vmax.	15.6 V	0	0
Tmore		Vmin.	10.8 V	0	0
Illiax.	+ 55 °C	Vmax.	15.6 V	0	0
Меа	asurement (	uncertainty		2.9 dB	

LIMITS (Clause 10.3.3)

TEST CONDITION	BER (%) at LEVEL OF UNWANTED SIGNAL
Normal	$\leq$ 1 % BER at 73 dB $\mu$ V
Extreme	$\leq$ 1 % BER at 63 dB $\mu$ V

BER = Bit Error Rate

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



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

10.4 SPURIOUS RESPONSE AND BLOCKING IMMUNITY.

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

Spurious response rejection: channel 70

* : 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	$\leq$ 1 % BER at 73 dB $\mu$ V

BER = Bit Error Rate

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



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

10.4 SPURIOUS RESPONSE AND BLOCKING IMMUNITY.

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

Blocking immunity: channel 70

Funw = unwanted frequency

LIMITS (Clause 10.4.3)

LIMIT FOR	BIT ERROR RATE AT LEVEL OF UNWANTED SIGNAL
BLOCKING	$\leq$ 1 % at 93 dB $\mu$ V

BER = Bit Error Rate

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



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

10.5 INTERMODULATION RESPONSE.

Channel 70

Level of wanted signal: 3  $dB\mu V$ 

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

#### LIMIT (Clause 10.5.3)

BIT ERROR RATE	≤ 1	00	BER	AT	LEVEL	OF	68	dBµV	OF	UNWANTED	SIGNALS	

BER = Bit Error Rate

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



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

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 dB $\mu$ V: BER = $\leq$ 1 %
----------------	---------------------------------------------------------------

BER = Bit Error Rate

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



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

#### 10.7 CONDUCTED SPURIOUS EMISSIONS.

SPURIOUS EMISSIONS POWER LEVEL						
Channe	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: $\leq$ 2 nW
-------	----------------------------

Measuring equipment used: 01, 22, 26



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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)	<u>&lt;</u> 2 n₩				

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: _--



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TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio Equipment and Systems (RES);Technical characteristics and methods of<br/>measurement for VHF radiotelephone equipment for general communications and<br/>associated equipment for Class "D" Digital Selective Calling (DSC)

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

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; abandonning 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; abandonning 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



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#### TEST FORM

TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio Equipment and Systems (RES); Technical characteristics and methods of<br/>measurement for VHF radiotelephone equipment for general communications and<br/>associated equipment for Class "D" Digital Selective Calling (DSC)

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

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



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#### 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: <u>22-2; 23-2-2000</u> Ambient temp.: <u>24</u> °C R.H.: <u>52</u> %

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 dx2 rx1 rx2: 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 dx1 and rx1: 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: <u>02, 07, 09, 11, 22, 23, 26, 28</u>



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#### TEST FORM

## TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio Equipment and Systems (RES); Technical characteristics and methods of<br/>measurement for VHF radiotelephone equipment for general communications and<br/>associated equipment for Class "D" Digital Selective Calling (DSC)

ADDITIONAL INFORMATION SUPPLEMENTARY TO THE TEST REPORT

#### <u>Remarks</u>

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.



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#### UTILIZED MEASURING EQUIPMENT

TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio Equipment and Systems (RES); Technical characteristics and methods of<br/>measurement for VHF radiotelephone equipment for general communications and<br/>associated equipment for Class "D" Digital Selective Calling (DSC)

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No.	Instrument/Ancillary	Туре	Manufacturer	ID No.
01	Spectrum analyser	8562E	HP	TE00099
02	Signal generator	2042	Marconi	TE00033
03	Signal generator	2042	Marconi	<i>TE00427</i>
04	Signal generator	8640B	HP	TE00375
05	Modulation meter	TF 2300B	Marconi	TE00360
06	Measuring receiver	ESV	R&S	TE00425
07	FSK-decoder	J0Z-2	НМ	KML 002
08	Frequency counter	PM 6614	Philips	TE00378
09	DSC de/encoder	3817	Debeg	910932
10	Audio analyzer	8903A	HP	TE00373
11	Oscilloscope	442	Tektronix	TE00382
12	Oscilloscope storage	PM 3311	Philips	TE00381
13	RF Wattmeter	Analyst 4381	Bird	TE00377
14	Reference receiver	Ksr-ref	НМ	KSR325
15	Adj. channel power meter	NKS	R&S	TE00339
16	Transient detector	J0Z-1	НМ	KML001
17	X-Y plotter	7015B	HP	KSR526
18	Splitter	ZFSC-2	MCL	KSR500
19	Splitter	ZSC 2-1	MCL	KSR357
20	Attenuator	8494B/8496B	HP	KSR699/700

Calibration of these instruments is performed in accordance with the EN 45001 accreditation. Telefication by is an accredited test laboratory.

The accreditation number is L021.



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#### UTILIZED MEASURING EQUIPMENT

TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2Issue August 2000Radio Equipment and Systems (RES); Technical characteristics and methods of<br/>measurement for VHF radiotelephone equipment for general communications and<br/>associated equipment for Class "D" Digital Selective Calling (DSC)

TEST EQUIPMENT AND ANCILLAIRIES USED FOR TESTS

No.	Instrument/Ancillary	Туре	Manufacturer	ID No.
21	Sound level meter	1983	General Radio	KSR532
22	Dig. Multimeter	8050A	Fluke	TE00428
23	Power attenator	8325	Bird	TE00380
24	Band reject filter	FF 227	KL	KSR624
25	Mixer	10514A	HP	30397
26	Power supply	D050-10	Delta	TE00584
27	Amplifier	5171A	Philips	4980529
28	Soft Bitread	JOZ-soft	HM	BRBS-V1
29	Vibration table	894	LDS	440
30	Climate chamber	EKSC 7.30.70	Enet Weiss	931052

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.



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PHOTOGRAPHS

PHOTOGRAPHS OF THE EQUIPMENT

Number of photographs: 7



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## PHOTOGRAPHS

## PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 1 Description : Assembly of equipment.





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## PHOTOGRAPHS

## PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 2 Description : Front of equipment.





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## PHOTOGRAPHS

## PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 3 Description : Rear of equipment.





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## PHOTOGRAPHS

## PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 4 Description : Interior of equipment.





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## PHOTOGRAPHS

## PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 5 Description : Interior of equipment with front dismantled.





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## PHOTOGRAPHS

## PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 6 Description : Front of equipment during vibration test.





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## PHOTOGRAPHS

## PHOTOGRAPHS OF THE EQUIPMENT

Photograph no.: 7 Description : Rear of equipment during vibration test.





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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.