COMLAB
Telecommunications– Consultancy,
and Certification

A Division of the Norwegian Post and Telecommunications Authority

Office address: Instituttveien 23, Kjeller
Postal address: P.O.Box 96, N-2007 Kjeller
Telephone: +47 22 82 49 00
Telefax: +47 22 82 49 90
Telex: 79 544 NTRA N
Enterprise no: NO 974 689 162

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Pages : 24
Annexes : 1
Total no. of sheets : 29

Test report : 97 / 7096 / 3

Item tested : Pilot

NON - CONTROLLED

Equipment type : Portable Maritime/Aero VHF

Client : Norbit AS

Tested according to :

DTS/RES-01030 - Maritime VHF distress radio equipment operating on aeronautical frequencies. draft TR (1997-05)

Date of issue : 15.1.98

Authorised by :

Kjell G. Haga
Head of Section

Geir Antonsen
Technical Supervisor

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1. GENERAL INFORMATION

1.1 Test Laboratory

Name :	ComLab
Address :	Instituttveien 23, P.O.Box 96 N-2007 Kjeller, Norway
Telephone :	+47 22 82 49 00
Fax :	+47 22 82 49 90
Test service manager :	Arne Søiland

1.2 Client Information

Name :	Norbit AS
Address :	P.O.Box 141
	N-7501, Stjørdal
Telephone :	74 82 04 30
Fax :	74 82 04 31

Contact:

Name :	Steffen Kirknes

1.3 Manufacturer

Name :	Norbit AS
Address :	P.O.Box 141
	N-7501, Stjørdal
Telephone :	
Fax :	

2. TEST INFORMATION

2.1 Test Item

Name : Pilot

Model/version :

Serial number : 04 (conducted measurements)
06 (radiated measurements)

Software identity and version :

Remarks : Battery type tested: Crompton Eternacell Lithium SDX (XSG-6045) and Saft Li/SO2 cell, LO26SX

2.2 Test Environment

2.2.1 Normal Test Conditions

The values are the limits registered during the test period

Temperature: 20 – 25 °C

Relative humidity: 25 – 45 %

Normal test voltage : 3.0 V DC

2.2.2 Extreme Test Conditions

Temperature

T_{min} : -20°C

T_{max} : +55°C

Voltage

Power Source : Power Supply

V_{min} : 2.6 V

V_{max} : 3.0 V

2.3 Test Period

Test item received date : 23 September 1997

Test period : from 23 September 1997 to 07 January 1998

2.4 Standards and Regulations

DTS/RES-01030 - Maritime VHF distress radio equipment operating on aeronautical frequencies
Draft TR (1997-05)

2.5 Test Engineer

Egil J. Bredholt

2.6 Additional Information

2.6.1 Test Methods

2.6.2 Selection Criteria

2.6.3 Test Equipment

List of used test equipment, see page 22

2.7

3. TEST RESULTS

DTS/RES-01030 Clause 4

3.1 GENERAL PROPOSED LIMITS

3.1.1 Construction

Portable equipment shall comprise at least :	
-an integral transmitter/receiver including antenna , battery and	ok
-includding ptt switch, and microphone and loudspeaker	ok
Antenna gain should be at least -10 dBi	ok
The equipment shall be of small size and light weight	ok
Should have a colour which distinguishes from the portable VHF equipment spesified in ETS 300 225 (4)	ok
The equipment is operable within 5 seconds after power-on.	ok
Any parts of the equipment required to be checked during inspection or maintenance operations shall be readily accessible.	ok
Fixed installations:	
Should have an 50 ohm RF socket	

3.1.2 Controls

It should be possible to operate the equipment using only one hand exception of channel selection.	ok
- an on/off switch for the equipment with a visual indication that the equipment is in operation;	ok
- an audio-frequency power volume control;	ok
- a manual non-locking push to talk switch to operate the transmitter;	ok
-The time necessary to change over from transmission to reception and vise versa, shall not exceed 0.3 seconds	ok

-The channel switching arrangements shall be such that the time necessary to change from one frequency to the other does not exceed 5 seconds.	ok
-Not possible to transmit during channel switching	ok

3.1.3 Operating frequencies.

-Operating on frequencies 121.5 MHz and 123.1 MHz only	ok
-Class of emission: A3E	ok

3.1.4 Labelling

All controls and indicators shall be clearly labelled.	ok
The labelling should at least comprise the following information.	
-Text containg the words: Only for emergency communications with aircraft	Equipment marked: Only for emergency communication with aircraft.
-brief operation instructios	ok
-type designation of the equipment	ok
-serial number	ok
-expiry date for any primary battery	ok
-compass safe distancen (only portable equipment)	2 meters

3.1.5 Battery

Provision shall be made for replacing the battery easily, without degrading the performance of the equipment (particularly watertightness).	ok
Primary batteries shall have a shelf life of at least 2 years	ok
Means shall be incorporated to prevent reversal of polarity of the battery power supply.	ok
The capacity of the battery shall be sufficient to operate the equipment continously for at least 10 hours at any temperature condition (see paras 5.4.1) with following duty cycle : 6 seconds transmit, 6 seconds reception above squelch opening level and 48 seconds reception below squelch opening level.	Voltage when the test starts. Rx: 3.0 V Tx: 2.8 V Voltage after 10 hours: Rx: 2.7 V Tx: 2.6 V

4. MEASUREMENT RESULTS

4.1 ENVIRONMENTAL TESTS ON THE RADIO

DTS/RES-01030 Clause 7.4

4.1.1 Drop Test on Hard Surface

6 drops from 1 metre.

Performance check: Tx Carrier Power and Frequency Error
Receiver Sensitivity

Rated AF output power 0.2 W

	Tx carrier power	Freq.error	RX sensitivity	AF output power
MHz	mW	Hz	dBµV	W
120.5	140	-22	20	0.1
Limits	Between 50 mW and 200 mW	± 2000 Hz	≤ +30 dBµV	At least 0.2 w

Performance check: Visual inspection

Visible damage or deterioration

yes	no
	X

Observations:

Test Equipment used: LR no.: 208, 1066, 1190 and 015

DTS/RES-01030 Clause 7.5

4.1.2 Vibration Test

The equipment has been vibrated vertically :
in the 5 Hz to 13.2 Hz frequency range with an excursion of ± 1 mm ± 10 % and
in the 13.2 Hz to 100 Hz frequency range with constant acceleration of 7 m/s²
The same have been done in two directions on the horizontal plane.

RESONANCE FREQUENCIES

Equipment suspended : ☐ YES

☒ NO

If YES, state the precise test conditions:

Found during performance check:

Vibration direction	Resonance frequencies (Hz)			
X				
Y				
Z				

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

Performance check	ok
Visible damage or deterioration	no

Observations:

Test Equipment used: LR no.: 208, 1066, 1190 and 015

DTS/RES-01030 Clause 7.5

4.1.3 Vibration Test

Performance check: Tx Carrier Power and Frequency Error
Receiver Sensitivity

Rated af output power 0.2 W

	Tx carrier power	Freq.error	RX sensitivity	AF output power
MHz	**mW**	**Hz**	**dBµV**	**W**
120.5	140	-48	20	0.1
Limits	**Between 50 mW and 200 mW**	**± 2000 Hz**	**≤ +30 dBµV**	**At least 0.2 w**

Performance check: **Visual inspection**

	yes	no
Visible damage or deterioration		X

Observations:

Test Equipment used: LR no.: 208, 1066, 1190 and 015

DTS/RES-01030 Clause 7.6.2

4.1.4 Dry Heat Cycle

+65 °C (10 hours) and then +55°C.
Performance check: Tx Carrier Power and Frequency Error
Receiver Sensitivity

Rated AF output power 0.2 W

	Tx carrier power	Freq.error	RX sensitivity	AF output power
MHz	mW	Hz	dBµV	W
120.5	140	-353	21	0.1
Limits	**Between 50 mW and 200 mW**	**± 2000 Hz**	**≤ +30 dBµV**	**At least 0.2 w**

Performance check: **Visual inspection**

Visible damage or deterioration	yes	no
		X

Observations:

Test Equipment used: LR no.: 208, 1066, 1190, 1218 and 015

DTS/RES-01030 Clause 7.6.3

4.1.5 Damp Heat Cycle

+40 °C and 93 % rel. humidity.
Performance check: Tx Carrier Power and Frequency Error
Receiver Sensitivity

Rated AF output power 0.2 W

	Tx carrier power	Freq.error	RX sensitivity	AF output power
MHz	mW	Hz	dBµV	W
120.5	135	-425	21	0.1
Limits	Between 50 mW and 200 mW	± 2000 Hz	≤ +30 dBµV	At least 0.2 w

Performance check: Visual inspection

Visible damage or deterioration	yes	no
		X

Observations:

Test Equipment used: LR no.: 208, 1066, 1190, 1218 and 015

DTS/RES-01030 Clause 7.6.4

4.1.6 Low Temperature Cycle

-25 °C (10 hours) and then -20°C.
Performance check: Tx Carrier Power and Frequency Error
Receiver Sensitivity

Rated AF output power 0.2 W

	Tx carrier power	Freq.error	RX sensitivity	AF output power
MHz	mW	Hz	dBµV	W
123.1	150	-28	19	0.1
Limits	**Between 50 mW and 200 mW**	**± 2000 Hz**	**≤ +30 dBµV**	**At least 0.2 w**

Performance check: **Visual inspection**

	yes	no
Visible damage or deterioration		X

Observations:

Test Equipment used: LR no.: 208, 1066, 1190, 1218 and 015

4.2 TRANSMITTER MEASUREMENTS

DTS/RES-01030 Clause 8.1

4.2.1 Transmitter Effective Isotropic Radiated Power(EIRP)

Tabel 1:

Test Conditions		Transmitter Power (mW)	
		Fn ; 123.100 MHz	
T_{nom}(..23.ºC)	V_{nom}(..3.0.V)	148	
Measurement uncertainty		+3.7 / -4.6 dB	
Limits		Between 50 mW and 200 mW	

Test Equipment used: LR no.: 1260, 1183 , 1025, 1237 and 1119

Carrier power referenced to EIRP

Table 2

Test conditions		Carrier power (mW)	
		121.5 MHz	123.1 MHz
Temperature	Voltage		
T_{nom} 24 C	V_{nom} 3.0 V	144	148 (From table 1)
T_{min}	V_{min} 2.6 V	132	135
55 °C	V_{max} 3.0 V	132	135
T_{max}	V_{min} 2.6 V	152	155
-20 °C	V_{max} 3.0 V	152	155
Measurement uncertainty		± 0.5 dB	
Limits		Between 50 mW and 200 mW corrected by the antenna gain	

Test Equipment used: LR no.: 033, 208, 1066, 1218 and 1006

DTS/RES-01030 Clause 8.2

4.2.2 Frequency Error

Test conditions		Frequency error (Hz)	
		121.5 MHz	123.1 MHz
Temperature	Voltage	Hz	Hz
T_{nom} 24C	V_{nom} 3.0 V	-175	-152
T_{min}	V_{min} 2.6 V	-501	-516
55 V	V_{max} 3.0 V	-501	-516
T_{max}	V_{min} 2.6 V	-38	-38
-20 °C	V_{max} 3.0 V	-38	-38
Measurement uncertainty		± 10Hz	
Limits		Frequency error ≤ 2000 Hz	

Test Equipment used: LR no.: 033, 208, 1066, 1218 and 1006

DTS/RES-01030 Clause 8.3

4.2.3 Sensitivity of the transmitter modulator

Channel	Acoustic level (dBA)	Depht of modulation (%)
123.1 MHz	94	75
Measurement uncertainty		± 3 dB
Limits	70 % with an acoustic level of 94 dBA (± 3 dB)	

Test Equipment used: LR no.: 1066, 015, 263, 264 and 1006

DTS/RES-01030 Clause 8.4

4.2.4 Conducted spurious emissions conveyed to the antenna

Spurious emissions power level		
Fn ; 123.100 MHz		
Spurious freq. MHz	Bandwidth (kHz)	Power level (µW)
369.3		0.025
25-4000		<0.01
Measurement uncertainty	± 2dB	
Limits	≤ 0.25 µW in the range 9 kHz to 2 GHz	

Bandwidth (kHz) refers to the bandwidth of the measuring receiver.

Test Equipment used: LR no.: 208, 1123, 015 and 1006

DTS/RES-01030 Clause 8.4

4.2.5 Radiated spurious emissions

Spurious emissions power level		
Fn ; 123.100 MHz		
Spurious freq. MHz	Bandwidth (kHz)	Power level (µW)
246.2	15	0.08
369.3	15	0.0003
492.4	15	0.001
25-4000		<0.01
Measurement uncertainty	± 2dB	
Limits	≤ 0.25 µW in the range 9 kHz to 2 GHz	

Bandwidth (kHz) refers to the bandwidth of the measuring receiver.

Test Equipment used: LR no.: 208, 1123, 015 and 1006

4.3 RECEIVER MEASUREMENTS

DTS/RES-01030 Clause 9.1

4.3.1 Harmonic distortion and audio frequency output power

Requirements:
Rated output power: > 200 mW in a loadspeaker
Fn = 123.100 MHz

Testsignal level	AF output power P and harmonic distortion D	
(dBμV)	P (W)	D (%)
120	0.20	6.0
Measurement uncertainty : -on P -on D	± 0.3 dB ± 1 %	
Limits	AF output power = rated AF output power D ≤ 10 %	

Test Equipment used: LR no.: 033, 208, 1066, 1190 and 015

DTS/RES-01030 Clause 9.2

4.3.2 Maximum Usable Sensitivity

Rated AF output power : 0.2 W

Test Conditions		Sensitivity level and AF output power			
		Fn: 121.500 MHz		Fn: 123.100 MHz	
Temp.	Voltage	RF level (dBµV)	AF output power (W)	RF level (dBµV)	AF output power (W)
T_{nom} 24°C	V_{nom} 3.0 V	21.0	0.1	21.0	0.1
T_{min} 55 °C	V_{min} 2.6 V	21.7	0.1	21.7	0.1
	V_{max} 3.0 V	21.7	0.1	21.7	0.1
T_{max} -20 °C	V_{min} 2.6 V	19.5	0.1	19.5	0.1
	V_{max} 3.0 V	19.5	0.1	19.5	0.1
Measurement uncertainty		± 0.5 dB			
Limits		⇒ RF level : ≤ +30 dBµV ⇒ AF output power : = 50 % of the rated AF output power			

Test Equipment used: LR no.: 033, 208, 1066, 1190, 1218 and 015

DTS/RES-01030 Clause 9.3

4.3.3 Spurious Response Rejection

Fn : 123.100 MHz
Funw = frequency of unwanted signal.

Mod. depth in % : Fn / Funw	30 / 80		
Funw (MHz)	Spurious response rejection ratio (dBA)		
90	70.4		
303.099	72.5		
Measurement uncertainty	± 2 dB		
Limits	≥ 70 dB		

Test Equipment used: LR no.: 019, 036, 208, 1006, 1079, 1087and 1091

DTS/RES-01030 Clause 9.4

4.3.4 Conducted spurious emissions

Spurious emissions power level		
F_n ; 123.100 MHz		
Spurious freq. MHz	**Bandwidth (kHz)**	**Power level (nW)**
213.1		0.001
25-4000		<0.1
Measurement uncertainty	± 2dB	
Limits	≤ 2 nW in the range 9 kHz to 2 GHz	

Bandwidth (kHz) refers to the bandwidth of the measuring receiver.

Test Equipment used: LR no.: 208, 1123, 015 and 1006

DTS/RES-01030 Clause 9.4

4.3.5 Radiated spurious emissions

Spurious emissions power level		
Fn ; 123.100 MHz		
Spurious freq. MHz	Bandwidth (kHz)	Power level (nW)
213.1		<0.1
25-4000		<0.1
Measurement uncertainty	± 2dB	
Limits	≤ 2 nW in the range 9 kHz to 2 GHz	

Bandwidth (kHz) refers to the bandwidth of the measuring receiver.

Test Equipment used: LR no.: 208, 1123, 015 and 1006

5. TEST EQUIPMENT AND ANCILLARIES

To simplify identification of the test equipment and ancillaries used, all item used are identified by the testhouse on each page of the test report. All numbers are referenced to the list given below.

LR No	Instrument/Ancillary	Type	Manufacturer
015	Power Supply	C32-16R	Oltronix
019	Power Supply	C32-16R	Oltronix
033	AF Power Meter	TF893A	MI
036	AF Power Meter	TF893A	MI
208	Multi Meter	Fluke	77
263	Artifical Voice	4219	Bruel & Kjær
264	Precision Sound Level Meter	2203	Bruel & Kjær
1006	Attenuator	765-10	Narda
1025	RF Generator	HP8657B	HP
1066	Radiocom Analyzer	CMTA 54	R&S
1079	RF Generator	SMHU56	HP
1087	Radiocom Analyzer	CMTA 54	R&S
1091	Hybrid	Anza	H9
1119	Substitution Antenna	Model 3121C,DB2	EMCO
1123	RF Spectrum Analyzer	R3271	Advantest
1183	Attenuator	6820.17.A	Suhner
1190	Attenuator	768-10	Narda
1218	Climatic Chamber	HC4057	Vøtsch
1260	Biconical Antenna	HK116	HP
1237	EMI Test Receiver	ESN	R&S