

DELTA Test Report



Supplementary type approval testing of Selco modules

Performed for Selco A/S

DANAK-198611

Project no.: A504377-1

Page 1 of 20

including 4 annexes

20 December 2006

DELTA

Danish Electronics,
Light & Acoustics

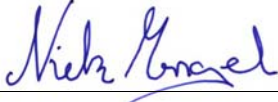
Venlighedsvej 4
2970 Hørsholm
Denmark

Tel. (+45) 72 19 40 00
Fax (+45) 72 19 40 01
www.delta.dk




Title	Supplementary type approval testing of Selco modules
Test objects	M0600, Shutdown Unit M1000, Alarm Annunciator M2000, Engine Controller M2100, Emergency Controller M3000, Analogue Alarm Annunciator M4100, Alarm Annunciator M8100, Synchroscope T4800, Load Sharer Detailed information is given in Section 2.1 to 2.8. The test objects were received on 6 December 2006.
Report no.	DANAK-198611
Project no.	A504377-1
Test period	6 December 2006
Client	Selco A/S Betonvej 10 4000 Roskilde Denmark
Manufacturer	Selco A/S
Specifications	IACS E10: Rev. 4 May 2004. Test Specification for Type Approval. "Test specification applicable, but not confined, to all equipment used for: - Control, protection and safety; - internal communication". IEC 60533: Second edition, 1999. "Electrical and electronic installations in ships - Electromagnetic compatibility". IEC 60945: Fourth edition, 2002 "Maritime navigation and radio communication equipment and systems - General requirements - Methods of testing and required test results".
Results	No malfunctions were detected. The criteria for compliance are listed in Section 3.2.
Test personnel	Claus Momme Thomsen

Date 20 December 2006

Project manager 

Niels Engel, Project manager
DELTA

Responsible 

Kim A. Schmidt, B.Sc.M.E.
DELTA

Table of contents		Page
1.	Summary of test	5
1.1	Introduction	5
1.2	Test requirements	5
1.3	Conclusion	5
2.	Test specimens	6
2.1	Test object: M0600 Shutdown Unit	6
2.2	Test object: M1000 Alarm Annunciator	6
2.3	Test object: M2000 Engine Controller	6
2.4	Test object: M2100 Emergency Controller	6
2.5	Test object: M3000 Analogue Alarm Annunciator	6
2.6	Test object: M4100 Alarm Annunciator	7
2.7	Test object: M8100 Synchroscope	7
2.8	Test object: T4800 Load Sharer	7
3.	General test conditions	8
3.1	Test set-up	8
3.2	Criteria for compliance	8
3.3	Functional test	8
3.4	Standard environment	9
4.	Test and results	10
4.1	Radiated emissions	10
4.2	Radiated radio frequency interference	11
	Annex 1 List of instruments	12
	Annex 2 Photos	14
	Annex 3 Test record sheets - Radiated emissions	16
	Annex 4 Test set-up (from Selco A/S) (This annex is informative and not part of the accredited report)	19

1. Summary of test

1.1 Introduction

The present test report concerns the supplementary type approval testing of selected modules manufactured by Selco A/S as described in Section 2.

The modules have been subjected to previous type approval testing ref. the following test reports:

- DANAK-195254/DELTA-K251196-6
- DANAK-195267/DELTA-K251196-1
- DANAK-195378/DELTA-K251196-3, rev. 2
- DANAK-195381/DELTA-K251196-7
- DANAK-195724/DELTA-K251196-5
- DANAK-197586/DELTA-E501822-1
- DANAK-197639/DELTA-E502468-1

The purpose of the additional type approval testing is to provide documentation for a maintained type approval.

1.2 Test requirements

Consequently the supplementary type approval testing was limited to the following tests:

Test	Test method
Radiated emissions, 1 to 2 GHz	CISPR 16-1:1999, CISPR 16-2:2002, IEC 60945:2002
Radiated radio frequency interference 1 to 2 GHz	EN 61000-4-2:2002

1.3 Conclusion

The test objects mentioned in this report meet the selected requirements of the standards stated below.

- IEC 60945:2002
- IACS E10:2004
- IEC 60533:1999

The test results relate only to the specimens tested.

2. Test specimens

2.1 Test object: M0600 Shutdown Unit

Manufacturer	Selco A/S
Model	M0600-00
Serial no.	393952
Supply voltage	24 VDC
Operational mode	Normal operational mode

2.2 Test object: M1000 Alarm Annunciator

Manufacturer	Selco A/S
Model	M1000-24-10C
Serial no.	394625
Supply voltage	24 VDC
Operational mode	Normal operational mode

2.3 Test object: M2000 Engine Controller

Manufacturer	Selco A/S
Model	M2000-20-10C
Serial no.	391903
Supply voltage	24 VDC
Operational mode	Normal operational mode

2.4 Test object: M2100 Emergency Controller

Manufacturer	Selco A/S
Model	M2100-10-10B
Serial no.	338729
Supply voltage	24 VDC
Operational mode	Normal operational mode

2.5 Test object: M3000 Analogue Alarm Annunciator

Manufacturer	Selco A/S
Model	M3000-30-00
Serial no.	394103
Supply voltage	24 VDC
Operational mode	Normal operational mode

2.6 Test object: M4100 Alarm Annunciator

Manufacturer	Selco A/S
Model	M4100-22
Serial no.	394930
Supply voltage	24 VDC
Operational mode	Normal operational mode

2.7 Test object: M8100 Synchroscope

Manufacturer	Selco A/S
Model	M8100-02
Serial no.	391400
Supply voltage	230 VAC
Operational mode	Normal operational mode

2.8 Test object: T4800 Load Sharer

Manufacturer	Selco A/S
Model	T4800-33
Serial no.	372432
Supply voltage	230 VAC
Operational mode	Normal operational mode

3. General test conditions

3.1 Test set-up

A drawing of the test set-up is enclosed in Annex 4.

3.2 Criteria for compliance

No change of the actual operational states of the test specimens is allowed.

The test specimens must comply with the specified limits for radiated emissions.

In addition, the following generic acceptance criteria for compliance were in force during the EMC immunity testing:

- Performance Criterion A: (For continuous phenomena) : The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed as defined in relevant equipment standard and the technical specification published by the manufacturer.
- Performance Criterion B: (For transient phenomena): The EUT shall continue to operate as intended after the tests. No degradation of performance or loss of function is allowed as defined in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self-recoverable is, however, allowed but no change of actual operating state or stored data is allowed.
- Performance Criterion C: Temporary degradation or loss of function or performance is allowed during and after the test, provided the function is self-recoverable, or can be restored by the operation of the controls as defined in the relevant equipment standard and in the technical specification published by the manufacturer.

3.3 Functional test

A functional test was performed before, during (if specified) and after each test. The functional tests were carried out in accordance with the functional test procedures provided by the customer, as described in previous test reports.

3.4 Standard environment

Normal environmental condition:

Temperature	:	15°C to 35°C
Humidity	:	25 %RH to 75 %RH
Air pressure	:	86 kPa to 106 kPa (860 mbar to 1060 mbar)
Power supply voltage	:	$U_{nom.} \pm 3\%$

4. Test and results

4.1 Radiated emissions

Test methods

CISPR 16-1 (1999-10): Specification for radio disturbance and immunity measuring apparatus and methods - Part 1: Radio disturbance and immunity measuring apparatus.

CISPR 16-2:2002 Specification for radio disturbance and immunity measuring apparatus and methods. Part 2: Methods of measurement of disturbances and immunity.

IEC 60945:2002, Section 9.3.2

Severity and procedure

(IACS E10:2004, IEC 60533:1999, IEC 60945:2002 – Bridge and Deck Zone)

Frequency range	:	1000-2000 MHz	
Limits (quasi-peak)	:	30-2000 MHz	: 54 dB μ V/m, except for
		156-165 MHz	: 24 dB μ V/m

(IACS E10:2004 and IEC 60533:1999 - General power distribution zone)

Frequency range	:	1000 - 2000 MHz	
Limits (quasi-peak)	:	100 - 2000 MHz	: 54 dB μ V/m, except for
		156 - 165 MHz	: 24 dB μ V/m

The electric field is measured with antennas at a distance of 3 m.

The measuring bandwidth is 120 kHz in the frequency range 30 MHz to 2000 MHz, except for the frequency range 156 MHz to 165 MHz where the measuring bandwidth is 9 kHz according to IEC 60945.

The test specimens are energised and in normal operational mode during the measurement.

Results

The radiated emissions were within the specified limits. Test record sheets of the radiated emission measurements are enclosed in Annex 4

4.2 Radiated radio frequency interference

Test method

EN 61000-4-3 (2002-03): Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test.

Severity and procedure

Frequency range : 1000 – 2000 MHz
Field strength : 10 V/m
Modulation : 80% AM, 400 Hz sine wave

The test is performed in a semi-anechoic room. The field is generated using linearly polarised broadband antennas.

The test specimens are energised and in normal operational mode during the exposure. The test specimens are observed during the exposure, and a functional test is performed after the exposure.

Results

No malfunction was observed during the exposure, and the function of the test specimens was OK after the exposure.
Performance criterion: A.

Annex 1

List of instruments

List of instruments

NO.	DESCRIPTION	MANUFACTURER	TYPE NO.
29691	0.01 - 20 GHz. SYNTH. SWEEPER	HEWLETT-PACKARD	83620A
29694	1-12 GHz. HORN ANTENNA.	LOGIMETRICS	AN 8200 F
29781	DIGITAL MULTIMETER W. HPIB	HEWLETT-PACKARD	34401A
29846	RF GENERATOR, 9 kHz-2.4 GHz	MARCONI	2024
29975	DIGITAL MULTIMETER w. GPIB	HEWLETT-PACKARD	34401A
29984	RF POWER AMPLIFIER, 0.8-2.2 GHz, 200W	MILMEGA	AS0822-200
49002	SINGLE CHANNEL POWER METER DISPLAY UNIT	ROHDE & SCHWARZ	NRVS
49003	THERMAL POWER SENSOR, DC-18 GHz	ROHDE & SCHWARZ	NRV-Z51
49024	COAX RF DIODE DETECTOR, NEG. OUTPUT, CS TEST	HEWLETT-PACKARD	8471D
49034	"CABLE#42", 3 M, 50 OHM COAX CA- BLE, N-N (STRAIGHT)	CELLFLEX	
29861	EMI-SOFTWARE Ver. 1.60	ROHDE & SCHWARZ	ES-K1, PART: 1026.6790.02
29916	AUTOMATIC TEST RECEIVER, 9 kHz- 2.75 GHz	ROHDE & SCHWARZ	ESCS 30 1102.4500.30
29461	ARTIFICIAL MAINS NETWORK	ROHDE & SCHWARZ	ESH2/Z5
49037	u-WAVE PREAMP, 1-12.8 GHz	MITEQ / DELTA	AMF-5D- 001128-35- 11P
29876	HORN ANTENNA 1-18 GHz	EMCO	3115

Annex 2

Photos



Photo 1. Radiated emissions (1000 - 2000 MHz)



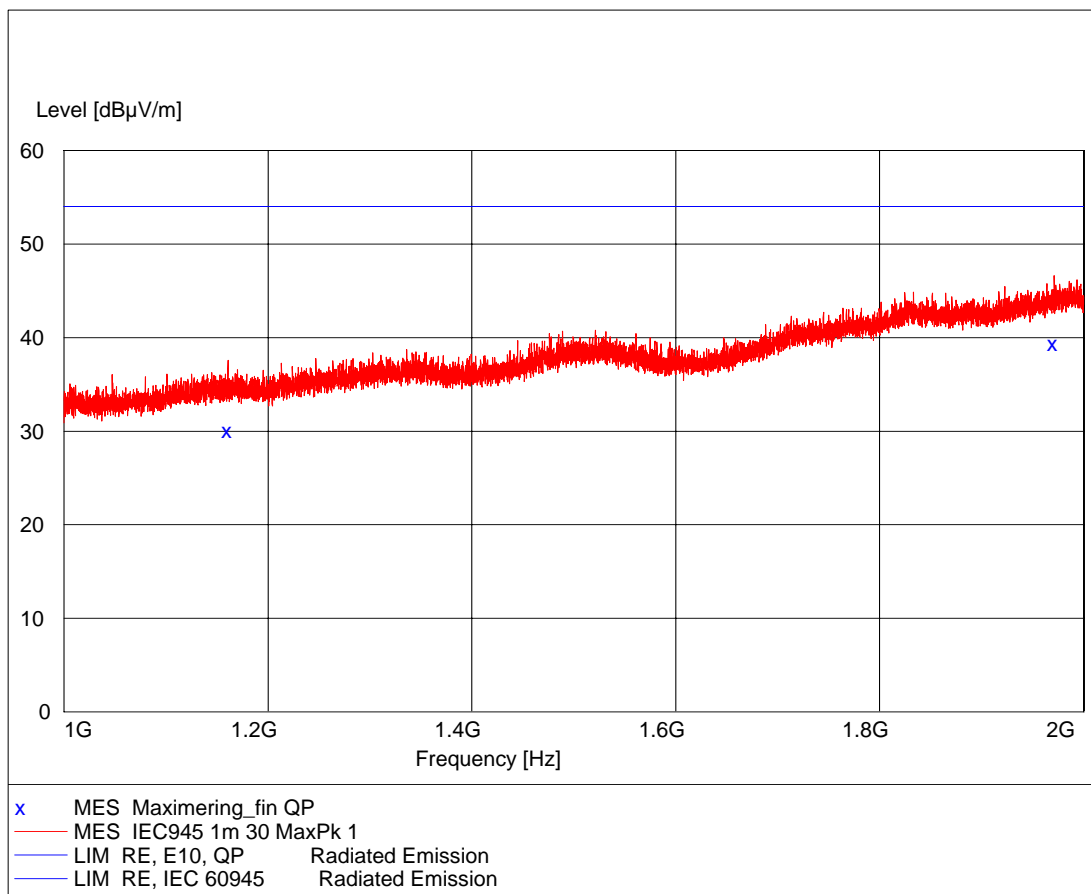
Photo 2. Radiated radio frequency interference (1000-2000 MHz)

Annex 3

Test record sheets - Radiated emissions

DELTA Electronics Testing, EMC Section

EUT: M0600, M1000, M2000, M2100, M3000, M4100, M8100, T4800
 Manufacturer: Selco A/S
 Operating Condition: Peakscan 1mv & Final QP measurement
 Test Site: EMC-5
 Operator: CMT - A504377
 Test Specification: IACS E10:2004, IEC 60945:2002, IEC 60533:1999
 Comment: Sheet 1
 Start of Test: 2006-12-06



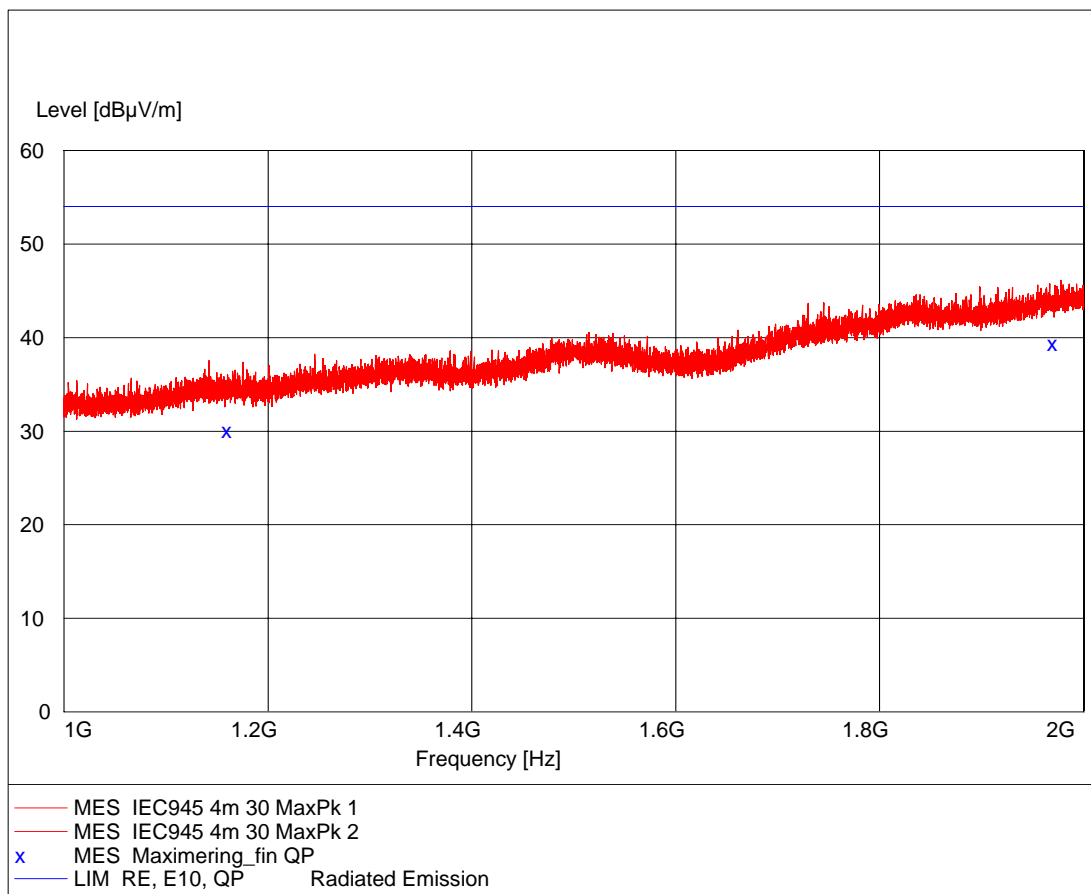
MEASUREMENT RESULT: "Maximering_fin QP"

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Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
1161.200000	30.10	30.6	54.0	23.9	356.0	120.00	VERTICAL
1971.100000	39.40	39.1	54.0	14.6	138.0	105.00	HORIZONTAL

DELTA Electronics Testing, EMC Section

EUT: M0600, M1000, M2000, M2100, M3000, M4100, M8100, T4800
Manufacturer: Selco A/S
Operating Condition: Peakscan 4m Horizontal
Test Site: EMC-5
Operator: CMT - A504377
Test Specification: IACS E10:2004, IEC 60945:2002, IEC 60533:1999
Comment: Sheet 2
Start of Test: 2006-12-06



Annex 4

Test set-up (from Selco A/S)

(This annex is informative and
not part of the accredited report)

Test set-up

