



FCC ID:W7H-HXPO1000

## EMI -- TEST REPORT

- FCC Part 15B -

**Test Report No. :** T32643-05-04HS

07. April 2009

Date of issue

**Type / Model Name** : VCI (Vehicle communication interface), HX-PO-1000

**Product Description** : Car diagnosis monitor

**Applicant** : samtec automotive software & electronics gmbh

**Address** : Saarstr. 27  
70794 FILDERSTADT, GERMANY

**Manufacturer** : Lüdtke Elektronic GmbH & Co KG

**Address** : Luitpoldstrasse 59  
76863 HERXHEIM, GERMANY

**Licence holder** : samtec automotive software & electronics gmbh

**Address** : Saarstr. 27  
70794 FILDERSTADT, GERMANY

**Test Result** according to the  
standards listed in clause 1 test  
standards:

**POSITIVE**



**DAT-P-207/05-00**

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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## **1 TEST STANDARDS**

The tests were performed according to following standards:

### **FCC Rules and Regulations Part 15 Subpart A - General (October 01, 2007)**

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

### **FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (October 01, 2007)**

Part 15, Subpart B, Section 15.107	AC Line conducted emissions <input type="checkbox"/> Class A device <input checked="" type="checkbox"/> Class B device
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Part 15, Subpart B, Section 15.109	Radiated emissions, general requirements
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ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
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CISPR 16-4-2: 2003	Uncertainty in EMC measurement
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CISPR 22: 2005 EN 55022: 2006	Information technology equipment
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## **2 SUMMARY**

### **GENERAL REMARKS:**

The EUT has a USB-Connection for set up and transmitting data to a PC. The connection is conforming to USB 2.0.

### **FINAL ASSESSMENT:**

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 16 February 2009

Testing concluded on : 25 February 2009

Checked by: \_\_\_\_\_ Tested by: \_\_\_\_\_

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Klaus Gegenfurtner  
Dipl.-Ing.(FH)  
Manager: Radio Group

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Hermann Smetana  
Dipl.-Ing.(FH)  
Radio Expert

### **3 EQUIPMENT UNDER TEST**

#### **3.1 Photo documentation of the EUT – Detailed photos see Attachment A**

#### **3.2 Power supply system utilised**

Power supply voltage : 12 VDC (car application)

#### **3.3 Short description of the equipment under test (EUT)**

Vehicle communication interface (VCI), heavy duty version with USB interface for supporting the maintenance and service of cars.

Number of tested samples: 1  
Serial number: Prototype 1

#### **EUT operation mode:**

The equipment under test was operated during the measurement under the following conditions:

- USB data transmission

#### **EUT configuration:**

(The CDF filled by the applicant can be viewed at the test laboratory.)

#### **The following peripheral devices and interface cables were connected during the measurements:**

- Note book Panasonic Model : tough book CF 30
- USB cable, self manufactured, 2.95 m Model : \_\_\_\_\_
- OBD2 cable, 1 m Model : \_\_\_\_\_
- \_\_\_\_\_ Model : \_\_\_\_\_
- \_\_\_\_\_ Model : \_\_\_\_\_
- \_\_\_\_\_ Model : \_\_\_\_\_

## 4 TEST ENVIRONMENT

### 4.1 Address of the test laboratory

**mikes-testingpartners gmbh**  
Ohmstrasse 2-4  
94342 STRASSKIRCHEN  
GERMANY

### 4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

### 4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners gmbh, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component diversity and modifications in production processes may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests. The manufacturer has the sole responsibility of continued compliance of the EUT.

## 4.4 Measurement Protocol for FCC, VCCI and AUSTEL

### 4.4.1 GENERAL INFORMATION

#### 4.4.1.1 Test Methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

#### 4.4.1.2 Justification

The Equipment under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each in order to obtain maximum disturbances from the unit.

### 4.4.2 DETAILS OF TEST PROCEDURES

#### 4.4.2.1 General Standard Information

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

## 5 TEST CONDITIONS AND RESULTS

### 5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

#### 5.1.1 Description of the test location

Test location: Shielded Room S2

#### 5.1.2 Photo documentation of the test set-up



#### 5.1.3 Applicable standard

According to FCC Part 15B, Section 15.107(a):

Except as shown in paragraphs (b) and (c) of this Section, for an unintentional radiator that is designed to be connected to the public utility AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

#### 5.1.4 Description of Measurement

The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a line impedance stabilization network (LISN) with  $50\Omega/50\ \mu\text{H}$  (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 cm above the floor and is positioned 40 cm from the vertical ground plane (wall) of the screen room. The correction factors for cable loss are stored in the memory of the EMI receiver therefore the final level ( $\text{dB}\mu\text{V}$ ) appears directly in the reading of the EMI receiver. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded. The measurement is performed attending the US AC mains 120V/60 Hz.

To convert between  $\text{dB}\mu\text{V}$  and  $\mu\text{V}$ , the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = 10^{(\text{dB}\mu\text{V}/20)}$$

**5.1.5 Test result**

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 6.6 dB at 4.34 MHz

Limit according to FCC Part 15B, Section 15.107(a):

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency

The requirements are **FULFILLED**.**Remarks:**

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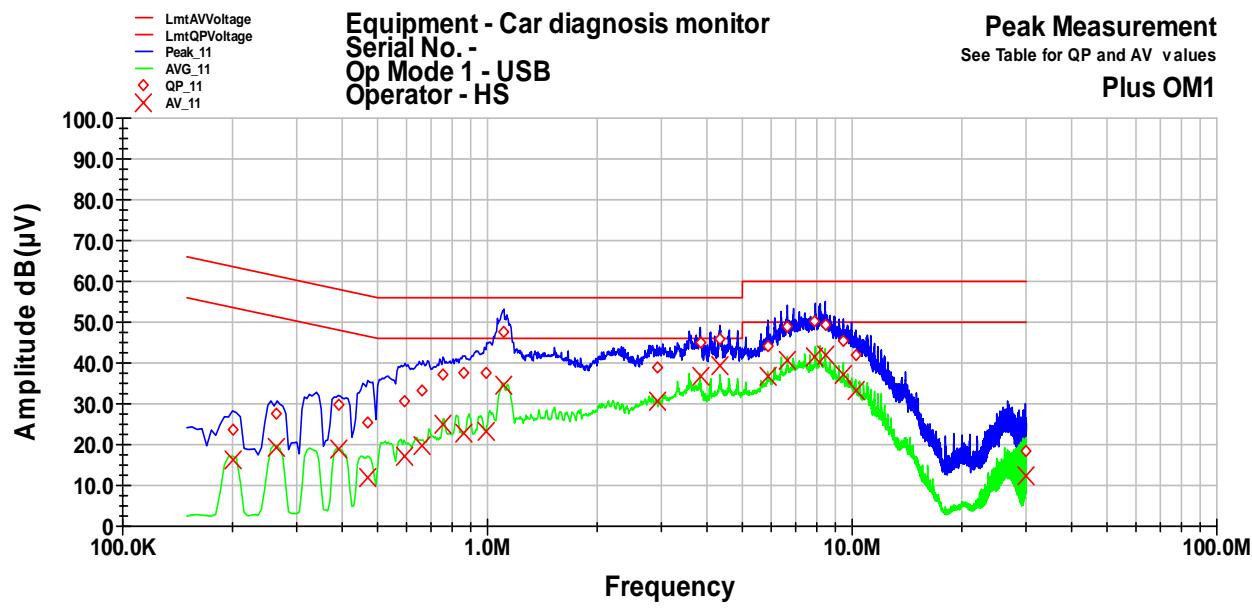
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5.1.6 Test protocol

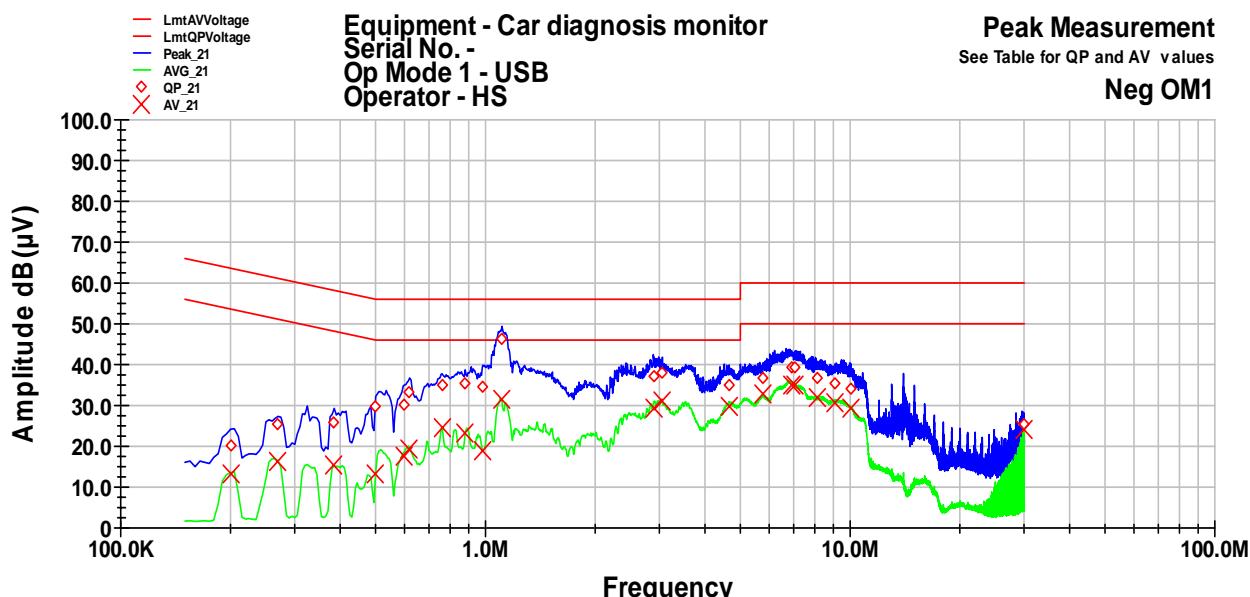
Test point: Plus  
 Operation mode: USB data transmission  
 Remarks:



Frequency MHz	QP Level dB(µV)	QP Delta dB	QP Limit dB	AV Level dB(µV)	AV Delta dB	AV Limit dB
0.2	23.8	-39.9	63.6	16.4	-37.2	53.6
0.265	27.7	-33.6	61.3	19.5	-31.8	51.3
0.39	29.9	-28.1	58.1	19.1	-29.0	48.1
0.47	25.3	-31.2	56.5	12.1	-34.4	46.5
0.595	30.5	-25.5	56.0	17.0	-29.0	46.0
0.665	33.2	-22.8	56.0	19.8	-26.2	46.0
0.755	37.0	-19.0	56.0	24.9	-21.1	46.0
0.865	37.6	-18.4	56.0	22.9	-23.1	46.0
0.995	37.4	-18.6	56.0	23.4	-22.6	46.0
1.11	47.5	-8.5	56.0	34.4	-11.6	46.0
2.915	39.0	-17.0	56.0	30.5	-15.5	46.0
3.83	44.8	-11.2	56.0	36.5	-9.5	46.0
4.34	45.8	-10.3	56.0	39.4	-6.6	46.0
5.87	44.2	-15.8	60.0	36.9	-13.1	50.0
6.64	49.1	-10.9	60.0	40.8	-9.2	50.0
7.92	50.4	-9.6	60.0	41.5	-8.5	50.0
8.43	49.3	-10.7	60.0	41.8	-8.2	50.0
9.455	45.2	-14.8	60.0	37.2	-12.8	50.0
10.23	41.8	-18.3	60.0	33.3	-16.7	50.0
29.98	18.4	-41.6	60.0	12.2	-37.8	50.0

Test point: Minus  
Operation mode: USB data transmission  
Remarks:

Result: passed



Frequency MHz	QP Level dB(μV)	QP Delta dB	QP Limit dB	AV Level dB(μV)	AV Delta dB	AV Limit dB
0.2	20.3	-43.3	63.6	13.3	-40.3	53.6
0.27	25.2	-35.9	61.1	16.3	-34.8	51.1
0.385	25.9	-32.3	58.2	15.5	-32.7	48.2
0.5	29.6	-26.4	56.0	13.4	-32.6	46.0
0.6	30.3	-25.8	56.0	17.5	-28.5	46.0
0.62	33.1	-22.9	56.0	19.2	-26.8	46.0
0.76	35.2	-20.8	56.0	24.4	-21.6	46.0
0.88	35.4	-20.6	56.0	23.2	-22.8	46.0
0.985	34.3	-21.7	56.0	19.1	-26.9	46.0
1.11	46.1	-9.9	56.0	31.6	-14.4	46.0
2.885	36.9	-19.1	56.0	29.3	-16.7	46.0
3.055	38.0	-18.0	56.0	30.9	-15.1	46.0
4.66	34.8	-21.2	56.0	29.6	-16.4	46.0
5.775	36.7	-23.3	60.0	32.7	-17.3	50.0
6.885	39.4	-20.6	60.0	34.8	-15.2	50.0
7.02	39.3	-20.7	60.0	34.9	-15.1	50.0
8.14	36.7	-23.3	60.0	31.9	-18.1	50.0
9.045	35.5	-24.5	60.0	30.7	-19.3	50.0
10.02	34.1	-25.9	60.0	29.2	-20.8	50.0
29.935	25.5	-34.5	60.0	24.0	-26.0	50.0

## 5.2 Radiated emissions

For test instruments and accessories used see section 6 Part **SER 1**, **SER 2** and **SER 3**.

### 5.2.1 Description of the test location

Test location: OATS1  
Test location: Anechoic Chamber A2

Test distance: 3 metres

### 5.2.2 Photo documentation of the test set-up





### 5.2.3 Applicable standard

According to FCC Part 15B, Section 15.109 (a):

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 m shall not exceed the given limit.

### 5.2.4 Description of Measurement

Radiated emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 cm above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4. The interface cables that are closer than 40 cm to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 cm from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 m, measurement scans are made with horizontal and vertical antenna polarization and the EUT is rotated 360 degrees. The radiated emissions from the EUT are measured in the frequency range of 1 GHz to maximum frequency as specified in Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 cm above the ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4. The Interface cables that are closer than 40 cm to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 cm above the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. Measurements are made in horizontal and vertical polarization in a fully anechoic chamber. Hand-held or body-worn devices are rotated through three orthogonal axes to determine the attitude of the highest emission shall be used for final testing. During the tests the EUT is rotated 360° and the cables and equipment are placed and moved in position in such a way to find the maximum emission level. For testing above 1 GHz, the emission level of the EUT in peak mode complies to the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported.

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The resolution bandwidth during the measurement is as following:

30 MHz – 1000 MHz: RBW: 120 kHz  
 Above 1000 MHz: RBW: 1 MHz

### 5.2.5 Test result

#### f < 1 GHz

Frequency (MHz)	L: QP (dB $\mu$ V)	L: AV (dB $\mu$ V)	Bandwidth (kHz)	Correct. (dB)	L: QP dB( $\mu$ V/m)	L: AV dB( $\mu$ V/m)	Limit dB( $\mu$ V/m)	Delta (dB)
319,85	15,9		120	17.2	33.1		46.0	12.9
319,75	16,0		120	17.2	33.2		46.0	12.8
320,19	16,6		120	17.2	33.8		46.0	12.2

#### f > 1 GHz

Frequency (MHz)	L: PK (dB $\mu$ V)	L: AV (dB $\mu$ V)	Bandwidth (kHz)	Correct. (dB)	L: PK dB( $\mu$ V/m)	L: AV dB( $\mu$ V/m)	Limit AV dB( $\mu$ V/m)	Delta (dB)

Limit according to FCC part , Section 15.109(a):

Frequency (MHz)	Limit ( $\mu$ V/m)	Limit dB( $\mu$ V/m)
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

The requirements are **FULFILLED**.

**Remarks:** Due to USB 2.0 the measurement was performed according to FCC Part 15A, Section 15.33(b),  
 up to the 2500 MHz. Emissions not recorded are more than 20 dB below the limit.

## **6 USED TEST EQUIPMENT AND ACCESSORIES**

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

<b>Test ID</b>	<b>Model / Type</b>	<b>Kind of Equipment</b>	<b>Manufacturer</b>	<b>Equipment No.</b>
A 4	ESHS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-002
	NNB-5 $\mu$ H / 100 A-115 V	LISN	SBF electronic	02-02/20-05-008
	NNBM 8125	LISN	Schwarzbeck Mess-Elektron	02-02/20-07-001
	N-4000-BNC	RF Cable	mikes-testingpartners gmbh	02-02/50-05-138
	N-1500-N	RF Cable	mikes-testingpartners gmbh	02-02/50-05-140
	ESH 3 - Z 2	Pulse Limiter	Rohde & Schwarz München	02-02/50-05-155
	PE1540	Power Supply	Phillips Fluke GmbH	02-02/50-07-033
SER 1	FMZB 1516	Magnetic Field Antenna	Schwarzbeck Mess-Elektron	01-02/24-01-018
	ESCI	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-005
	S10162-B	RF Cable 33 m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20 m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
SER 2	ESVS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-006
	VULB 9168	Trilog Broad Band Anten	Schwarzbeck Mess-Elektron	02-02/24-05-005
	S10162-B	RF Cable 33 m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20 m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
SER 3	FSP 30	Spectrum Analyzer	Rohde & Schwarz München	02-02/11-05-001
	AFS4-01000400-10-10P-4	RF Amplifier 1-4 GHz	PARZICH GMBH	02-02/17-05-003
	AMF-4F-04001200-15-10P	RF Amplifier 4-12 GHz	PARZICH GMBH	02-02/17-05-004
	AFS5-12001800-18-10P-6	RF Amplifier 12-18 GHz	PARZICH GMBH	02-02/17-06-002
	3117	Horn Antenna 1-18 GHz	EMCO Elektronik GmbH	02-02/24-05-009
	Sucoflex N-1600-SMA	RF Cable	novotronik Signalverarbeit	02-02/50-05-073
	Sucoflex N-2000-SMA	RF Cable	novotronik Signalverarbeit	02-02/50-05-075

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<b>Equipment No.</b>	<b>Next Calibration</b>	<b>Last Calibration</b>	<b>Next Verification</b>	<b>Last Verification</b>
02-02/03-05-002	04/30/2009	04/30/2008		
02-02/20-05-008	12/23/2009	12/23/2008		
02-02/20-07-001	02.10.2010	02.10.2009		
02-02/50-05-138				
02-02/50-05-140				
02-02/50-05-155	04.06.2009	10.06.2008		
02-02/50-07-033				
01-02/24-01-018	02/23/2010	02/23/2009		
02-02/03-05-005	01/26/2010	01/26/2009		
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				
02-02/03-05-006	07/30/2009	07/30/2008		
02-02/24-05-005	05.06.2011	05.06.2008	02/28/2009	08/29/2008
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				
02-02/11-05-001	04.08.2009	04.08.2008		
02-02/17-05-003				
02-02/17-05-004				
02-02/17-06-002				
02-02/24-05-009	02.04.2010	02.04.2009		
02-02/50-05-073				
02-02/50-05-075				