EMI – TEST REPORT

- FCC Part 15B -

Test Report No. : **T38836-00-02TK**	17. November 2014 Date of issue

Type / Model Name : One Touch Verio Element

Product Description : Blood glucose meter with Bluetooth 4.0 Low Energy

Applicant : Lifescan Scotland Ltd.

Address : Beechwood Park North

INVERNESS, IV2 3ED, SCOTLAND

Manufacturer : Lifescan, Division of Cilag GmbH International

Address : Gubelstrasse 34

6300 ZUG, SWITZERLAND

Licence holder : Lifescan, Division of Cilag GmbH International

Address : Gubelstrasse 34

6300 ZUG, SWITZERLAND

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

Deutsche Akkreditierungsstelle D-PL-12030-01-00

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart A - General (September, 2013)

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 (September, 2013)

Part 15, Subpart B, Section 15.107	AC Line conducted emission ☐ Class A device ☒ Class B device
Part 15, Subpart B, Section 15.109	Radiated emission, general requirements
Part 15, Subpart B, Section 15.111	Antenna power conduction
ANSI C63.4: 2009	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CISPR 16-4-2: 2011 EN 55016-4-2: 2011	Uncertainty in EMC measurement
CISPR 22: 2008 EN 55022: 2010	Information technology equipment

2 SUMMARY

2.1 General remarks

None

2.2 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 : 29 September 2014

Testing concluded on : 02 October 2014

Checked by:

Thomas Weise
I confirm the correctness and integrity of this document
2014.11.17 14:22:48 +01'00'

Thomas Weise
Laboratory Manager

Tested by:

Tobias Kammerer
I`m the author of this document
2014.11.17 13:48:37 +01'00'

Tobias Kammerer
Radio Team

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT see Attachment A

3.2 Power supply system utilised

Power supply voltage : 3.0 V DC (Battery powered)

3.3 Short description of the equipment under test (EUT)

The EUT is a Bluetooth 4.0 Low Energy system. The EUT is compatible with the standard 802.15.1. It supports the 2.4 GHz frequency band. A single PCB antenna is used within the system. The modulation used by the EUT is GFSK with a data rate of 1000 kbits which means worst case for testing. The EUT has a special firmware that allows enabling a permanent advertising mode with three advertising channels. The output power is set to -4 dBm by firmware and cannot be changed during tests. The EUT has only one integrated antenna, no temporary connector and no external antenna can be connected. The EUT is run with a 3.0V coin cell battery. Further there is a USB connector that allows data transmission to a PC. An active USB connection prohibits wireless transmission.

Number of tested samples: 1
Serial number: Z3GPZ00F

EUT operation mode:

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

- USB data connection to companion device (Laptop computer)

-

-

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:

-	Laptop	Model :	Toshiba TECRA A11-127
-	N/A	Model :	-
-	N/A	Model :	-
-	N/A	Model :	-

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
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. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k = 2. The true value is located in the corresponding interval with a probability of 95 % The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern 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 and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

4.4 Measurement protocol for FCC

4.4.1 General information

4.4.1.1 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 other thus obtaining maximum disturbances from the unit.

4.4.2 Details of test procedures

4.4.2.1 General standard information

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.

4.4.3 Conducted emission

4.4.3.1 Description of measurement

The final level, expressed in dBµV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit or to the CISPR limit.

To convert between dBµV and µV, the following conversions apply:

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

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. 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 Ω / 50 µH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.4.4 Radiated emission (electrical field 30 MHz - 1 GHz)

4.4.4.1 Description of measurement

Spurious emission from the EUT is measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised 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 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. The antenna is positioned in horizontal polarisation and is repeated vertically. To locate maximum emission from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees.
The final level in dBµV/m is calculated by add the antenna correction factor and cable loss factor (dB) on the reading from the EMI receiver (dBµV). The FCC or CISPR limit is subtracted from this result in order to provide the delta to limit listed in the measurement protocol.

Example:

Frequency		Reading level		Correction Factor		Level		CISPR Limit		Delta
(MHz)		(dBµV)		(dB/m)		(dBµV/m)		(dBµV/m)		(dB)
719.0	+	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

4.4.5 Radiated emission (electrical field 1 GHz - 40 GHz)

4.4.5.1 Description of measurement

Radiated emission from the EUT are measured in the frequency range 1 GHz up to the maximum frequency as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak and 10 Hz for average measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emission under better uncertainty and is calculated to the specified test distance.

4.5 Determination of worst case measurement conditions

Measurements have been made in all three orthogonal axes and the settings of the EUT were changed to locate at which position and at what setting of the EUT produce the maximum of the emission.

5 TEST CONDITIONS AND RESULTS

5.1 Conducted emission

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

Note: Photo documentation of the test setup can be viewed in Attachment B

5.1.3 Applicable standard

According to FCC Part 15, Section 15.107(a):
Except for Class A devices, for equipment 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 following the procedures set out in ANSI C63.4. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 13.5 dB at 15.0495 MHz.

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

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

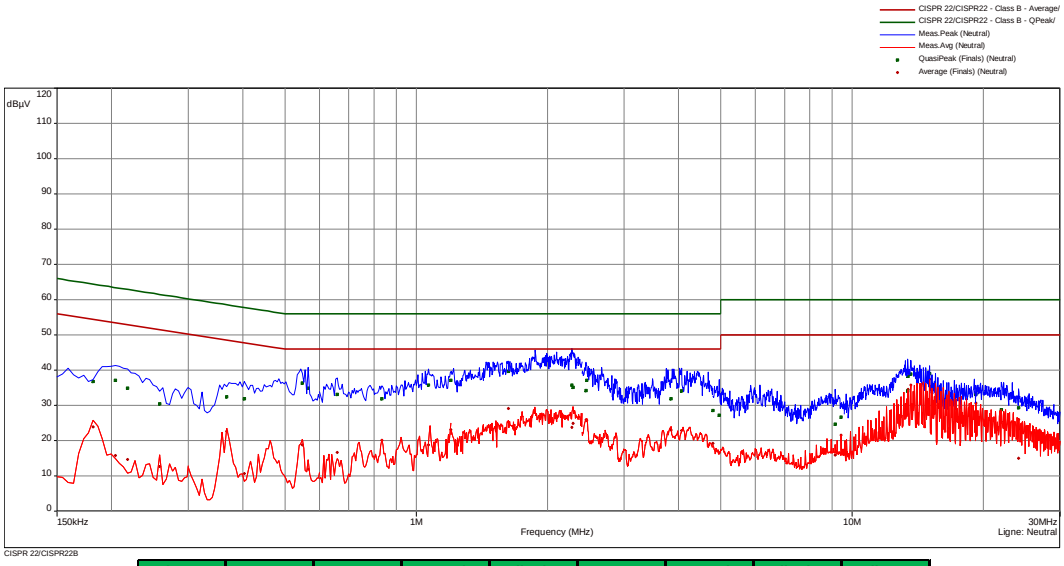
* Decreases with the logarithm of the frequency

The requirements are **FULFILLED.**

Remarks: For detailed test result please refer to following test protocols

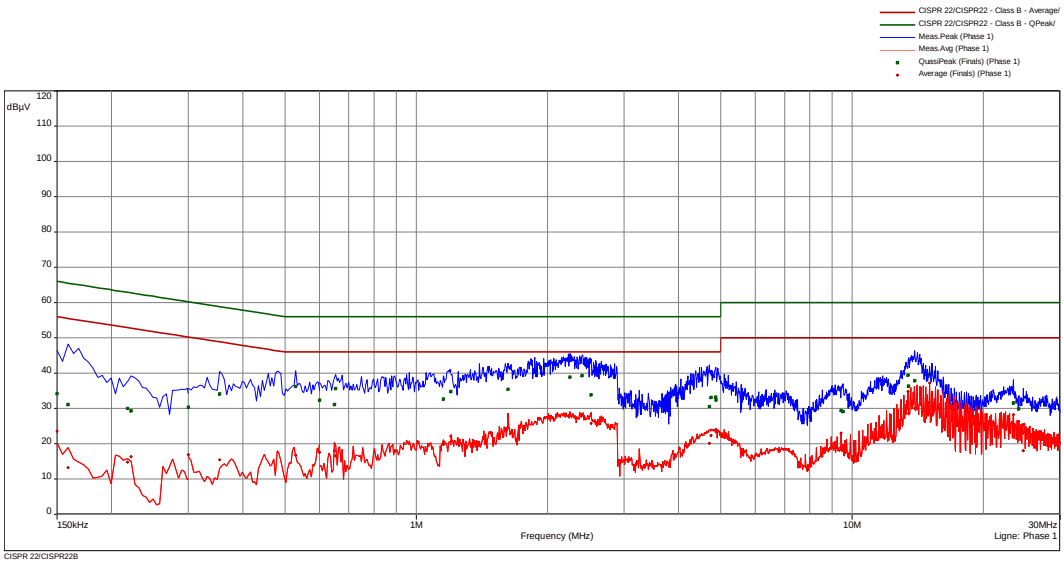
5.1.6 Test protocol

File No.:	T38836-00-02TK	Result	
Operation mode:	USB data connection to PC		
Tested by:	Tobias Kammerer		
Location:	Shielded Room 2	Date:	30.09.2014 16:02:57
Remarks:	Neutral		



freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB	
0.182	9	36.8	-27.6	64.4	23.9	-30.5	54.4	Neutral
0.204	9	37.1	-26.4	63.5	15.8	-37.6	53.5	Neutral
0.218	9	35.0	-28.0	62.9	14.7	-38.3	52.9	Neutral
0.258	9	30.4	-31.1	61.5	12.7	-38.8	51.5	Neutral
0.368	10	32.4	-26.1	58.6	22.7	-25.9	48.6	Neutral
0.404	10	31.9	-25.9	57.8	10.7	-37.1	47.8	Neutral
0.548	10	36.4	-19.7	56.0	18.8	-27.2	46.0	Neutral
0.566	10	34.9	-21.1	56.0	11.9	-34.1	46.0	Neutral
0.659	11	33.2	-22.8	56.0	16.7	-29.4	46.0	Neutral
0.834	11	31.9	-24.1	56.0	20.2	-25.8	46.0	Neutral
1.068	11	35.8	-20.2	56.0	18.8	-27.2	46.0	Neutral
1.200	11	37.2	-18.9	56.0	23.1	-22.9	46.0	Neutral
1.628	12	39.7	-16.3	56.0	29.1	-16.9	46.0	Neutral
2.276	12	35.8	-20.2	56.0	23.8	-22.2	46.0	Neutral
2.289	12	35.1	-20.9	56.0	24.9	-21.1	46.0	Neutral
2.454	13	34.3	-21.7	56.0	25.9	-20.1	46.0	Neutral
2.463	13	37.1	-18.9	56.0	25.8	-20.2	46.0	Neutral
3.845	13	32.0	-24.1	56.0	23.0	-23.0	46.0	Neutral
4.061	13	34.1	-21.9	56.0	23.0	-23.1	46.0	Neutral
4.800	14	28.6	-27.5	56.0	19.3	-26.7	46.0	Neutral
4.958	14	27.3	-28.8	56.0	16.5	-29.5	46.0	Neutral
9.138	14	24.7	-35.4	60.0	15.9	-34.1	50.0	Neutral
9.431	14	26.7	-33.4	60.0	21.6	-28.4	50.0	Neutral
13.403	15	34.2	-25.8	60.0	27.6	-22.4	50.0	Neutral
13.430	15	38.2	-21.8	60.0	34.6	-15.4	50.0	Neutral
13.623	15	38.9	-21.1	60.0	35.8	-14.2	50.0	Neutral
15.050	15	39.0	-21.0	60.0	37.4	-12.6	50.0	Neutral
19.241	16	33.3	-26.7	60.0	30.7	-19.4	50.0	Neutral
21.977	16	28.8	-31.3	60.0	25.3	-24.7	50.0	Neutral
24.092	16	23.5	-36.6	60.0	15.0	-35.0	50.0	Neutral
24.101	16	29.3	-30.7	60.0	26.0	-24.0	50.0	Neutral

File No.:	T38836-00-02TK	Result	
Operation mode:	USB data connection to PC		
Tested by:	Tobias Kammerer		
Location:	Shielded Room 2	Date:	30.09.2014 16:02:57
Remarks:	Phase1		



freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB	
0.150	1	34.3	-31.7	66.0	23.6	-32.4	56.0	Phase 1
0.159	1	31.1	-34.4	65.5	13.3	-42.2	55.5	Phase 1
0.218	1	30.1	-32.9	62.9	14.8	-38.1	52.9	Phase 1
0.222	1	29.3	-33.4	62.7	16.4	-36.4	52.7	Phase 1
0.300	2	30.3	-29.9	60.2	16.9	-33.3	50.2	Phase 1
0.354	2	34.1	-24.7	58.9	15.4	-33.5	48.9	Phase 1
0.530	2	36.3	-19.7	56.0	16.7	-29.3	46.0	Phase 1
0.600	2	32.4	-23.6	56.0	17.5	-28.5	46.0	Phase 1
0.650	3	31.1	-24.9	56.0	18.0	-28.0	46.0	Phase 1
0.654	3	35.6	-20.4	56.0	16.6	-29.4	46.0	Phase 1
1.154	3	32.6	-23.4	56.0	19.8	-26.2	46.0	Phase 1
1.200	3	34.8	-21.2	56.0	22.1	-23.9	46.0	Phase 1
1.623	4	35.5	-20.5	56.0	24.4	-21.6	46.0	Phase 1
2.253	4	38.9	-17.1	56.0	28.1	-17.9	46.0	Phase 1
2.405	5	39.4	-16.6	56.0	28.4	-17.6	46.0	Phase 1
2.522	5	34.0	-22.1	56.0	25.8	-20.2	46.0	Phase 1
4.709	5	30.5	-25.5	56.0	20.2	-25.8	46.0	Phase 1
4.745	5	33.2	-22.8	56.0	22.3	-23.7	46.0	Phase 1
4.868	6	33.2	-22.8	56.0	23.9	-22.1	46.0	Phase 1
4.877	6	32.4	-23.6	56.0	23.3	-22.7	46.0	Phase 1
9.431	6	29.5	-30.5	60.0	23.0	-27.0	50.0	Phase 1
9.534	6	29.2	-30.8	60.0	18.6	-31.4	50.0	Phase 1
13.430	7	39.5	-20.5	60.0	34.8	-15.2	50.0	Phase 1
13.457	7	36.4	-23.7	60.0	28.5	-21.5	50.0	Phase 1
13.925	7	37.9	-22.1	60.0	30.1	-19.9	50.0	Phase 1
15.050	7	39.7	-20.3	60.0	37.2	-12.8	50.0	Phase 1
19.241	8	31.9	-28.1	60.0	30.6	-19.4	50.0	Phase 1
23.435	8	31.6	-28.4	60.0	28.3	-21.7	50.0	Phase 1
24.069	8	29.9	-30.1	60.0	26.4	-23.6	50.0	Phase 1
24.722	8	25.3	-34.7	60.0	18.0	-32.0	50.0	Phase 1

5.2 Radiated emission

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

5.2.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 2

Test distance: 3 m

5.2.2 Photo documentation of the test setup

Note: Photo documentation of the test setup can be viewed in Attachment B

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 emission from unintentional radiators at a distance of 3 m shall not exceed the given limit.

5.2.4 Description of Measurement

The 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. The setup of the EUT and the measurement procedure is in accordance to ANSI C63.4, Item 8 and 12. In the frequency range above 1 GHz a spectrum analyser is used. If the emission level in peak mode complies with the average limit, testing is stopped and peak values will be reported, otherwise, the emission is measured in average mode again and both are reported. The EUT is measured in RX continuous mode under normal conditions.

Instrument settings:

30 MHz – 1000 MHz:	RBW:	120 kHz
1000 MHz – 6 GHz	RBW:	1 MHz

5.2.5 Test result

f < 1 GHz

Frequency (MHz)	L: QP (dBµV)	L: AV (dBµV)	Bandwidth (kHz)	Correct. (dB)	L: QP (dBµV)	L: AV (dBµV)	Limit (dBµV)	Delta (dB)
250.00	10.5	-	120	14.0	24.5	-	46.0	-21.5
265.13	12.8	-	120	14.5	27.3	-	46.0	-18.7
324.00	14.4	-	120	16.5	30.9	-	46.0	-15.1
393.79	12.0	-	120	18.8	30.8	-	46.0	-15.2
432.00	13.4	-	120	19.5	32.9	-	46.0	-13.1
597.36	0.1	-	120	23.7	23.8	-	46.0	-22.2

f > 1 GHz

Frequency (MHz)	L: PK (dBµV)	L: AV (dBµV)	Bandwidth (kHz)	Correct. (dB)	L: PK (dBµV)	L: AV (dBµV)	Limit (dBµV)	Delta (dB)
1594.75	69.1	-	1000	-21.2	47.9	-	54.0	-6.1
5377.00	60.5	-	1000	-12.5	48.0	-	54.0	-6.0

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

Frequency (MHz)	Limit (µV/m)	Limit (dBµV/m)
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

The requirements are **FULFILLED.**

Remarks: The measurement is performed according to FCC Part 15A, Section 15.33(b), up to the 5th harmonic.

6 USED TEST EQUIPMENT AND ACCESSORIES

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

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	ESHS 30	02-02/03-05-002	17/07/2015	17/07/2014		
	ESH 2 - Z 5	02-02/20-05-004	18/10/2015	18/10/2013	02/03/2015	02/09/2014
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155			12/03/2015	12/09/2014
A 5	ESVS 30	02-02/03-05-006	03/07/2015	03/07/2014		
	FSP 40	02-02/11-11-001	02/10/2015	02/10/2014		
	VULB 9168	02-02/24-05-005	08/04/2015	08/04/2014	04/03/2015	04/09/2014
	3117	02-02/24-05-009	07/05/2015	07/05/2014		
	VULB 9165	02-02/24-05-017	30/05/2015	30/05/2014		
	S10162-B	02-02/50-05-031				
	NW-2000-NB	02-02/50-05-113				
	N-3000-N	02-02/50-05-192				
	RSM 010-4	02-02/50-05-237				
	Sucofeed 1/2	02-02/50-06-005				
	EF393-21N-20 m	02-02/50-06-007				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				