

# RF Exposure and Maximum ERP/EIRP Assessment

For

VEGAPULS  
C 11, C 21, C 22, C 23

FCC ID: O6QBRA200  
IC: 3892A-BRA200

Assessment Reference: MDE\_VEGA\_1902\_MPE\_04

Test Laboratory:  
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Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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## 0 Summary

### 0.1 Technical Report Summary

#### Type of Report

RF Exposure and Maximum ERP/EIRP Assessment for Radar sensors with Radar and Bluetooth Low Energy.

#### Applicable FCC and ISED Rules

For RF Exposure:

OET Bulletin 65 Edition 97-01 August 1997

FCC 47 CFR §1.1307

FCC 47 CFR §1.1310

RSS-102 Issue 5 – March 2015

For Maximum ERP/EIRP:

FCC 47 CFR §15.247

FCC 47 CFR §15.256

IC RSS-247, Issue 2

IC RSS-211, Issue 1

| Report version control |              |  |                  |
|------------------------|--------------|--|------------------|
| Rev Version            | Release date | Changes                                  | Version validity |
| -                      | 02.04.2020   | Initial version                          | Invalid          |
| 1                      | 22.04.2020   | Deleted Maximum EIRP part                | Invalid          |
| 2                      | 29.04.2020   | Corrected EIRP value for Radar           | Invalid          |
| 3                      | 06.05.2020   | Maximum radiated value for Radar changed | Valid            |

## 1 Administrative Data

### 1.1 Laboratory

Company Name: 7layers GmbH

Address Borsigstr. 11  
40880 Ratingen  
Germany

FCC accreditation Designation Number: DE0015  
Test Firm Registration #: 929146

Industry Canada Test Site Acceptance CAB identifier: DE0007  
Test Firm Registration #: 3699A

The test facility is also accredited by the following accreditation organisation:  
Laboratory accreditation no.: DAkKS D-PL-12140-01-01  
DAkKS D-PL-12140-01-02  
DAkKS D-PL-12140-01-03

Responsible for Accreditation Scope: Dipl.-Ing. Bernhard Retka  
Dipl.-Ing. Robert Machulec  
Dipl.-Ing. Andreas Petz  
Dipl.-Ing. Marco Kullik

Report Template Version: 2020-02-19

### 1.2 Project Data

Responsible for assessment and report: Mrs. Melanie Anastassiou

Date of Report: 2020-05-06

### 1.3 Applicant Data

Company Name: VEGA Grieshaber KG

Address: Am Hohenstein 113  
77761 Schiltach  
Germany

Contact Person: Mr. Patrick Friedmann

### 1.4 Manufacturer Data

Company Name: please see applicant data

Address:

Contact Person:

## 2 Test object Data

### 2.1 General EUE Description

Equipment under Evaluation      VEGAPULS C 11, C 21, C 22, C 23  
 Type Designation:                VEGAPULS  
 Kind of Device:                    Radar sensors

General product description:

Radar sensors for continues level measurement of liquids with Bluetooth Low Energy.

### 2.2 EUT Main components

Type, S/N, Short Descriptions etc. used in this Test Report

| Short Description     | Equipment under Evaluation | Type Designation | Serial No.                       | HW Status | SW Status |
|-----------------------|----------------------------|------------------|----------------------------------|-----------|-----------|
| EUE A (BLE radiated)  | VEGAPULS C 21              | VEGAPULS         | PULS C21 Bluetooth Testmode-rad  | 1.2.0     | 1.1.0     |
| EUE B (BLE radiated)  | VEGAPULS C 22              | VEGAPULS         | PULS C22 Bluetooth Testmode-rad  | 1.2.0     | 1.1.0     |
| EUE C (BLE radiated)  | VEGAPULS C 23              | VEGAPULS         | PULS C23 Bluetooth Testmode-rad  | 1.2.0     | 1.1.0     |
| EUE D (BLE conducted) | VEGAPULS C 23              | VEGAPULS         | PULS C23 Bluetooth Testmode-cond | 1.2.0     | 1.1.0     |
| EUE E (Radar)         | VEGAPULS C 21              | VEGAPULS         | 13202003                         | 1.1.0     | 1.1.0     |
| EUE F (Radar)         | VEGAPULS C 21              | VEGAPULS         | PULS C21 Radar-Test-Sample       | 1.1.0     | 1.1.0     |
| EUE G (Radar)         | VEGAPULS C 22              | VEGAPULS         | 13302222                         | 1.1.0     | 1.1.0     |
| EUE H (Radar)         | VEGAPULS C 23              | VEGAPULS         | 132023                           | 1.1.0     | 1.1.0     |

NOTE: The short description is used to simplify the identification of the EUE in this test report.

### 2.3 Ancillary Equipment

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

| Short Description | Equipment under Test | Type Designation | HW Status | SW Status | Serial no. | FCC ID |
|-------------------|----------------------|------------------|-----------|-----------|------------|--------|
| N/A               |                      |                  |           |           |            |        |

### 2.4 Auxiliary Equipment

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Auxiliary Equipment can influence the test results.

| Short Description | Equipment under Test | Type Designation | Serial no. | HW Status | SW Status | FCC ID |
|-------------------|----------------------|------------------|------------|-----------|-----------|--------|
| N/A               |                      |                  |            |           |           |        |

### 3 Evaluation Results

#### 3.1 RF Exposure Evaluation

| Standards                                 |
|---|
| OET Bulletin 65 Edition 97-01 August 1997 |
| RSS-102 Issue 5 – March 2015              |

##### 3.1.1 Test limits

As specified in Table 1B of 47 CFR 1.1310 – Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure.

| Frequency range (MHz) | Power density (mW/cm <sup>2</sup> ) |
|-----------------------|-------------------------------------|
| 300 – 1,500           | f/1500                              |
| 1,500 – 100,000       | 1.0                                 |

Limits specified per RSS-102, Issue 5.

| Frequency range (MHz) | Power density (W/m <sup>2</sup> ) | Power density (mW/cm <sup>2</sup> )         |
|-----------------------|-----------------------------------|---|
| 300 – 6000            | 0.02619 f <sup>0.6834</sup>       | mW/cm <sup>2</sup> = W/m <sup>2</sup> * 0.1 |

Equation OET bulletin 65, page 18, edition 97-01: 
$$S = \frac{PG}{4\pi R^2} = \frac{EIRP}{4\pi R^2}$$

Where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the centre of radiation of the antenna

##### 3.1.2 Test Protocol

Comply with MPE limits for FCC

| Technology  | Duty Cycle (%) | Maximum Conducted/ Radiated output power (dBm) | Maximum Conducted/ Radiated output power (mW) | antenna gain (dBi) | MPE Limit (mW/cm <sup>2</sup> ) | Power Density (mW/cm <sup>2</sup> ) | Separation distance (cm) |
|-------------|----------------|--|---|--------------------|---------------------------------|-------------------------------------|--------------------------|
| BTLE        | 100            | 0  | 1.0000  | 4,0                | 1,0000                          | 0.0005                              | 20                       |
| Radar       | 100            | 34,0   | 2511.8864                                     | -                  | 1,0000                          | 0.4997                              | 20                       |
| Co-Location | 100            | -  | -   | -                  | 1,0000                          | 0.5002                              | 20                       |

Comply with MPE limits for Industry Canada

| Technology  | Duty Cycle (%) | Maximum Conducted/ Radiated output power (dBm) | Maximum Conducted/ Radiated output power (mW) | antenna gain (dBi) | MPE Limit (mW/cm <sup>2</sup> ) | Power Density (mW/cm <sup>2</sup> ) | Separation distance (cm) |
|-------------|----------------|--|---|--------------------|---------------------------------|-------------------------------------|--------------------------|
| BTLE        | 100            | 0  | 1.0000  | 4,0                | 0,5351                          | 0.0005                              | 20                       |
| Radar       | 100            | 34,0   | 2511.8864                                     | -                  | 1,0000                          | 0.4997                              | 20                       |
| Co-Location | 100            | -  | -   | -                  | 1,0000                          | 0.5002                              | 20                       |

##### 3.1.3 Conclusion

The product found compliant for FCC and Industry Canada.