

DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3953

Other Probe Parameters

| | |
|---|------------|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | 37.2 |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disable |
| Probe Overall Length | 337mm |
| Probe Body Diameter | 10mm |
| Tip Length | 9mm |
| Tip Diameter | 2.5mm |
| Probe Tip to Sensor X Calibration Point | 1mm |
| Probe Tip to Sensor Y Calibration Point | 1mm |
| Probe Tip to Sensor Z Calibration Point | 1mm |
| Recommended Measurement Distance from Surface | 1.4mm |

DAE CALIBRATION DATA

Calibration Laboratory of
Schmid & Partner
Engineering AG
 Zeughausstrasse 43, 8004 Zurich, Switzerland



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **AGC (Auden)**

Certificate No: **DAE4-1398_Apr20**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BM - SN: 1398**

Calibration procedure(s) **QA CAL-06.v30**
Calibration procedure for the data acquisition electronics (DAE)

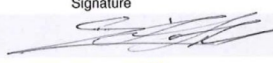

Calibration date: **April 23, 2020**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|-------------------------------|--------------------|----------------------------|------------------------|
| Keithley Multimeter Type 2001 | SN: 0810278 | 03-Sep-19 (No:25949) | Sep-20 |
| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
| Auto DAE Calibration Unit | SE UWS 053 AA 1001 | 09-Jan-20 (in house check) | In house check: Jan-21 |
| Calibrator Box V2.1 | SE UMS 006 AA 1002 | 09-Jan-20 (in house check) | In house check: Jan-21 |

| | | | |
|----------------|------------------------------|--|--|
| Calibrated by: | Name Eric Hainfeld | Function Laboratory Technician | Signature  |
| Approved by: | Name Sven Kühn | Deputy Manager |  |

Issued: April 23, 2020

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: **DAE4-1398_Apr20**

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Glossary

DAE data acquisition electronics
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
 - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
 - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
 - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
 - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - **Input resistance:** Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
 - **Power consumption:** Typical value for information. Supply currents in various operating modes.

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 μ V , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Calibration Factors | X | Y | Z |
|---------------------|---------------------------|---------------------------|---------------------------|
| High Range | 404.182 \pm 0.02% (k=2) | 404.163 \pm 0.02% (k=2) | 403.625 \pm 0.02% (k=2) |
| Low Range | 3.97491 \pm 1.50% (k=2) | 3.99141 \pm 1.50% (k=2) | 3.97045 \pm 1.50% (k=2) |

Connector Angle

| | |
|---|------------------|
| Connector Angle to be used in DASY system | 48.5 ° \pm 1 ° |
|---|------------------|

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

| High Range | Reading (μV) | Difference (μV) | Error (%) |
|-------------------|---------------------------|------------------------------|-----------|
| Channel X + Input | 199993.97 | -0.69 | -0.00 |
| Channel X + Input | 20002.68 | 0.90 | 0.00 |
| Channel X - Input | -19999.43 | 2.09 | -0.01 |
| Channel Y + Input | 199995.37 | 0.92 | 0.00 |
| Channel Y + Input | 20001.91 | 0.19 | 0.00 |
| Channel Y - Input | -20002.51 | -1.02 | 0.01 |
| Channel Z + Input | 199995.81 | 1.22 | 0.00 |
| Channel Z + Input | 19999.53 | -2.15 | -0.01 |
| Channel Z - Input | -20003.31 | -1.71 | 0.01 |

| Low Range | Reading (μV) | Difference (μV) | Error (%) |
|-------------------|---------------------------|------------------------------|-----------|
| Channel X + Input | 2001.04 | -0.06 | -0.00 |
| Channel X + Input | 201.40 | -0.04 | -0.02 |
| Channel X - Input | -198.38 | 0.09 | -0.05 |
| Channel Y + Input | 2000.82 | -0.33 | -0.02 |
| Channel Y + Input | 200.78 | -0.64 | -0.32 |
| Channel Y - Input | -198.93 | -0.50 | 0.25 |
| Channel Z + Input | 2000.88 | -0.29 | -0.01 |
| Channel Z + Input | 200.17 | -1.16 | -0.58 |
| Channel Z - Input | -199.73 | -1.11 | 0.56 |

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | Common mode Input Voltage (mV) | High Range Average Reading (μV) | Low Range Average Reading (μV) |
|-----------|--------------------------------|--|---|
| Channel X | 200 | -13.38 | -14.99 |
| | -200 | 16.43 | 14.19 |
| Channel Y | 200 | 9.12 | 8.64 |
| | -200 | -10.42 | -10.63 |
| Channel Z | 200 | 7.29 | 7.30 |
| | -200 | -10.50 | -10.14 |

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | Input Voltage (mV) | Channel X (μV) | Channel Y (μV) | Channel Z (μV) |
|-----------|--------------------|-----------------------------|-----------------------------|-----------------------------|
| Channel X | 200 | - | -2.81 | -1.24 |
| Channel Y | 200 | 3.25 | - | -2.30 |
| Channel Z | 200 | 9.51 | 1.74 | - |

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | High Range (LSB) | Low Range (LSB) |
|-----------|------------------|-----------------|
| Channel X | 15956 | 15899 |
| Channel Y | 15963 | 17836 |
| Channel Z | 15841 | 13905 |

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M Ω

| | Average (μ V) | min. Offset (μ V) | max. Offset (μ V) | Std. Deviation (μ V) |
|-----------|--------------------|------------------------|------------------------|---------------------------|
| Channel X | 0.28 | -0.86 | 2.25 | 0.44 |
| Channel Y | -0.69 | -1.65 | 0.47 | 0.36 |
| Channel Z | -0.76 | -1.67 | 0.59 | 0.37 |

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

| | Zeroing (kOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| Channel X | 200 | 200 |
| Channel Y | 200 | 200 |
| Channel Z | 200 | 200 |

8. Low Battery Alarm Voltage (Typical values for information)

| Typical values | Alarm Level (VDC) |
|----------------|-------------------|
| Supply (+ Vcc) | +7.9 |
| Supply (- Vcc) | -7.6 |

9. Power Consumption (Typical values for information)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|----------------|-------------------|---------------|-------------------|
| Supply (+ Vcc) | +0.01 | +6 | +14 |
| Supply (- Vcc) | -0.01 | -8 | -9 |

DIPOLE CALIBRATION DATA



SAR Reference Dipole Calibration Report

Ref : ACR.116.3.19.SATU.A

ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.

1-2/F, BUILDING 19, JUNFENG INDUSTRIAL PARK,
CHONGQING ROAD, HEPING COMMUNITY, FUHAI
STREET
BAO 'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA
MVG COMOSAR REFERENCE DIPOLE
FREQUENCY: 750 MHZ
SERIAL NO.: SN 47/14 DIP 0G750-340

Calibrated at MVG US
2105 Barrett Park Dr. - Kennesaw, GA 30144



Calibration Date: 04/26/2019

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

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


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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.116.3.19.SATU.A

| | Name | Function | Date | Signature |
|---------------|---------------|-----------------|-----------|---|
| Prepared by : | Jérôme LUC | Product Manager | 4/26/2019 |  |
| Checked by : | Jérôme LUC | Product Manager | 4/26/2019 |  |
| Approved by : | Kim RUTKOWSKI | Quality Manager | 4/26/2019 |  |

| | Customer Name |
|----------------|--|
| Distribution : | ATTESTATION OF GLOBAL COMPLIANCE CO. LTD. |

| Issue | Date | Modifications |
|-------|-----------|-----------------|
| A | 4/26/2019 | Initial release |
| | | |
| | | |

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1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, FCC KDBs and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

| Device Under Test | |
|--------------------------------|----------------------------------|
| Device Type | COMOSAR 750 MHz REFERENCE DIPOLE |
| Manufacturer | MVG |
| Model | SID750 |
| Serial Number | SN 47/14 DIP 0G750-340 |
| Product Condition (new / used) | Used |

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

MVG's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, FCC KDBs and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.



Figure 1 – MVG COMOSAR Validation Dipole

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