SOLAR ORBITER ENERGETIC PARTICLE DETECTOR

STEP FS Functional Test Report

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Changes Record

Issue	Revision	Date	Modified by	Section modified	Change implemented
1	0	2018-09-12	Panitzsch	All	Initial release
1	1	2019-01-08	Terasa	Annex	Added Scan 2018-12-17

Contents

1 INTRODUCTION

1.1 Scope

The scope of this report is to summarize the results of the Functional Tests (FTs) conducted with STEP FS, most of them being performed during the unit level environmental tests. The functional tests have been carried out following RD-1. The referred procedure is the most up-to-date one. Multiple functional tests have been carried out following older versions of that procedure. This is not considered problematic as the main test objectives did not change significantly and usually more test objectives have been added. The way how to determine certain aspects (how to achive certain information) has improved significantly over time.

2 APPLICABLE AND REFERENCE DOCUMENTS

2.1 Applicable Documents

ID.	Title	Reference	Iss./Rev.	Date
AD-1	Experiment Interface Document part A	SOL-EST-RCD-0050	5	16/03/2015
AD-2	STEP FS EMC Test Procedure	SO-EPD-KIE-TP-0050	1/0	06/12/2016
AD-3	STEP FS Thermal Cycling Test Procedure	SO-EPD-KIE-TP-0049	1/1	06/12/2016
AD-4	STEP FS Vibration Test Procedure	SO-EPD-KIE-TP-0048	1/0	06/12/2016

2.2 Reference Documents

ID.	Title	Reference	Iss./Rev.	Date
RD-1	STEP-FM-Functional-Test-Procedure	SO-EPD-KIE-TP-0051	1/2	14/08/2018

3 Summary of the Test Results

It can be stated that the STEP FS unit has successfully passed all functional tests that have been carried out before, during, and after the environmental test campaigns. The details of the test results will be given in the particular sections below. As all of the conducted functional tests concluded successfully, this report will not discuss all the test results in detail, but give one result per test as an example (as the results differ sufficiently marginally), and provide scans of the tests documentation in the annex. It shall be pointed out that each impedance check as documented in the annex was always accompanied by a successful ad-hoc functional and performance check.

3.1 Unit Impedance Check

The unit impedance check has been performed after each transportation of the unit, and after tests during whose the unit was not operational but a certain risk to damage the unit was present (i.e. the vibration tests, thermal cycling). **The unit passed this test each time this test has been conducted.** The values determined on 2017-05-19 (exemplarily chosen functional test performed in Kiel after return from vibration tests at Airbus DS in Portsmouth) are given below as an example. The unit's impedance checks have always yielded the expected results as will be shown in the annex (scans of the impedance check documentation). This holds for both externally accessible connectors, the MDM25 (connected to EPD-ICU) and the MDM15 (connected to the S/C) connector.

MDM15 connector				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	17.4k
Thermistor 2	2	10	15k to 20k *	17.3k
Thermistor 3	3	11	15k to 20k *	17.3k
Survival Heaters 1	7	14	119	118.3
Survival Heaters 2	8	15	119	119.2

* depending on the unit's temperature at approximately room temperature

MDM25 connector					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement [Ω]
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	<1	0.4
Chassis	Instrument chassis	24	Chassis gnd	<1	0.4
Chassis	Instrument chassis	1	Nom. power	>10M	✓
14	Nom. power return	1	Nom. power	>10M	✓
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	>10M	✓
25	Red. power return	13	Red. power	>10M	✓
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	102.3
6	CLK I2S+	19	CLK I2S-	100	102.4
8	LVDS S2I+	21	LVDS S2I-	50	51.4
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	102.4
7	CLK I2S+	20	CLK I2S-	100	102.5
10	LVDS S2I-	22	LVDS S2I+	50	51.4
not connected and other pins					
2	NC	Chassis	Instrument chassis	>10M	✓
3	DGND	Chassis	Instrument chassis	<1	0.7
4	LVDS I2S-	Chassis	Instrument chassis	>10M	✓
5	LVDS I2S-	Chassis	Instrument chassis	>10M	✓
6	CLK I2S+	Chassis	Instrument chassis	>10M	✓
7	CLK I2S+	Chassis	Instrument chassis	>10M	✓
8	LVDS S2I+	Chassis	Instrument chassis	>10M	✓
9	NC	Chassis	Instrument chassis	>10M	✓
10	LVDS S2I-	Chassis	Instrument chassis	>10M	✓
11	DGND.	Chassis	Instrument chassis	<1	0.7
12	NC	Chassis	Instrument chassis	>10M	✓
14	Nom. power return	Chassis	Instrument chassis	100k	99.9 k
16	LVDS I2S+	Chassis	Instrument chassis	>10M	✓
17	LVDS I2S+	Chassis	Instrument chassis	>10M	✓
18	NC	Chassis	Instrument chassis	>10M	✓
19	CLK I2S-	Chassis	Instrument chassis	>10M	✓
20	CLK I2S-	Chassis	Instrument chassis	>10M	✓
21	LVDS S2I-	Chassis	Instrument chassis	>10M	✓
22	LVDS S2I+	Chassis	Instrument chassis	>10M	✓
23	NC	Chassis	Instrument chassis	>10M	✓
25	Red. power return	Chassis	Instrument chassis	100k	99.9 k

3.2 Power Consumption Check

The power consumption is always checked when the unit is operational. At a supply voltage of 28 V, the expected and determined current consumption is around 100 mA at room temperature. The table below indicates the units power consumption in different operational modes as denoted in the table. The values have been determine on 2018-08-15.

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON and reset)	28.0 V	98 mA	26.0 V	106 mA	29.0 V	95 mA
Unit in HK mode	28.0 V	101 mA	26.0 V	110 mA	29.0 V	98 mA
Unit in SCI mode (low activity)	28.0 V	101 mA	26.0 V	110 mA	29.0 V	98 mA
Unit in SCI mode (high activity, test-pulser)	28.0 V	100 mA	26.0 V	108 mA	29.0 V	97 mA

The measurements yield a units power consumption of about 2.8 W when supplied with 28 V at room temperature in all modes of operation. During the thermal tests, the current consumption for different supply voltages was recorded as summarized in the table below:

Unit configured	28.0 V	Current	26.0 V	Current	29.0 V	Current
Room temperature	28.0 V	98 mA	26.0 V	106 mA	29.0 V	95 mA
+40°C	28.0 V	98 mA	26.0 V	107 mA	29.0 V	95 mA
-46°C	28.0 V	101 mA	26.0 V	109 mA	29.0 V	98 mA

The change in the power consumption of the STEP unit at different (extreme mission) temperatures is negliable.

3.3 Ad-Hoc (Full) Functional Test

The ad-hoc functional test is performed to check whether all sub-assemblies of the unit are working properly (for details, see RD-1). This test is usually (good practice, no requirement) conducted after powering the unit. Also, this test was (or earlier versions of it were) conducted after each transportation of the unit, and after tests with increased risk of damage to the unit. **These tests yielded positive results each time they were conducted and are thus considered successful.** The results as read during one of the full functional test after unit (DIG board) modifications in the scope of NCR-0044 (test run 2018-08-14) are given as an example below:

```
************************************************
************************************************

STEP SFT results

===========>Register readout <===========
UNIT ID 0xd3 STEP FM msg=5 reg=9 sci=9
REG STATUS 0x01 0xd3 0x100 0x0000 0x0002
REG POINTER 0x02000 0x00000 0x00000 0x000
REG CLOCK 1220 3599 0 7 7 1
REG SCRATCH 22505 0 0 6823
REG UART NOM 882 509 0x00 3 0x0100
REG UART RED 6 0 0x14 0 0x0180
REG HEATER 1317 0 0
REG L1L2 0x1e82ff1f1e82ff1f
REG DEADTIME 0 0
REG LIFETIME 0 0

TEST RUN VIA NOMIMAL TERMINAL      OK
FPGA communication                 OK
3 REGISTER read-outs found         OK
Status word 3 = 0xa200 (!= 0)      OK
Status word 4 = 0x0002 (!= 0)      OK

===========>STEP housekeeping <==========
voltages:
+2V5REF = 2.48 V (2.5 V)           OK
AVCC2V5 = 2.47 V (2.5 V)           OK
AVCC3V3 = 3.29 V (3.3 V)           OK
+6VAVCC = 5.92 V (6.0 V)           OK

temperatures: (check for plausibility)
T_ANA =  22.14°C      T_Ti0 =  20.59°C
T_DIG =  23.73°C      T_Ti2 =  20.26°C
T_LVPS = 23.84°C      T_Ti3 =  20.06°C

detector bias: (check for plausibility)
VOLTAGE = 72.97 V
CURRENT = 2.92 nA
```

==========>EEPROM <==========
EEPROM found OK

EEPROM content starts with: (check for plausibility)
STEP FS AF1, 2016-09-29, config version 0, svn 5453, crc 0x7882

==========>SRAM <==========
SRAM found OK

==========>IX <==========
STEP IX 0 THRS 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62
STEP IX 0 REGS I0=2 RSM=0 TESTREG=0x00000000 SELFILTER=2 ICOMP=0
STEP IX 1 THRS 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62 62
STEP IX 1 REGS I0=2 RSM=0 TESTREG=0x00000000 SELFILTER=2 ICOMP=0
STEP IX 0 TEMP VTEMP=1.403 TEMP=25.95 BASE=168
STEP IX 1 TEMP VTEMP=1.401 TEMP=25.44 BASE=35

IX0 rsm = 0 (== 0) OK
IX0 selfilter = 2 (== 2) OK
IX1 rsm = 0 (== 0) OK
IX1 selfilter = 2 (== 2) OK

==========>L0 counter registers <==========
COUNTER[0x440000] 5967 5967 5965 5967 5968 5967 5972 5969 5967 5968 5967 5968 5967 5968 5967 5968
COUNTER[0x440010] 5968 5967 5967 5966 5968 5968 5967 5967 5968 5968 5968 5967 5967 5974 5969 5967
COUNTER[0x440020] 5968 5967 5971 5969 5969 5968 5970 5967 5967 5967 5967 5968 5968 5969 5966 5970
COUNTER[0x440030] 5967 5968 5969 5967 5970 5967 5974 5966 5967 5967 5967 5968 5968 5978 5968 5967
COUNTER[0x440040] 1 0 0 1 0 1 1 0 1 0 0 0 1 1 1 1
COUNTER[0x440050] 0 0 0 1 0 0 1 1 0 1 0 1 2 0 1 0
COUNTER[0x440060] 1 1 0 0 0 0 0 0 0 1 1 0 1 1 1 1
COUNTER[0x440070] 1 0 0 1 1 1 1 1 1 0 0 0 0 0 0 1

testpulses on chn0 = 5967 (>0) OK

==========>Digital counter registers <==========
COUNTER[0x040000] 190944 190976 17 16 190944 190976 0 0 0 0 0 0 191264 191360 33 33
COUNTER[0x040010] 200 0 0 0 0 0 0 0 62280 0 0 0 0 0 0 0
COUNTER[0x040020] 0 0 49 0 68 2 2 0 1249 0 0 512 0 0 0 0
COUNTER[0x040030] 0 1 381952 0 1 763904 190944 190976 0 0 0 0 1 0 1 1
COUNTER[0x040040] 12028 1 1249 4 0 0 0 0 0 0 0 0 0 0 0 0

triggers on chn0= 190944 (>0) OK

SFT result: All checks passed successfully. Check EEPROM content read-out, temperatures, and detector bias parameters for plausibility.

End of STEP SFT

****
****

STEP FFT results:

check testpulser results (focus on sigmas):
->add "plot" to the command line in order to get a plot of each channel <-

ix	pix	mu	sigma	d_sigma	ix	pix	mu	sigma	d_sigma
0	0	226.9	6.6	3.8	1	0	322.8	6.6	3.8
0	1	366.1	6.2	4.2	1	1	395.4	6.4	4.1
0	2	220.3	6.7	3.7	1	2	397.5	5.9	4.8
0	3	170.1	6.4	4.0	1	3	261.1	6.3	4.2
0	4	236.0	6.3	4.2	1	4	235.6	6.5	4.0
0	5	343.1	7.1	3.3	1	5	353.6	6.3	4.2
0	6	373.0	7.1	3.3	1	6	374.3	6.1	4.4
0	7	309.5	6.7	3.7	1	7	386.3	6.1	4.5
0	8	387.7	7.0	3.4	1	8	367.0	6.4	4.1
0	9	113.6	6.3	4.2	1	9	200.6	6.2	4.3
0	10	393.8	5.8	5.0	1	10	352.5	6.2	4.4
0	11	356.7	6.5	3.9	1	11	361.1	6.3	4.1
0	12	359.4	6.7	3.7	1	12	260.6	6.2	4.2
0	13	337.7	6.5	3.9	1	13	312.6	6.5	3.9
0	14	337.6	6.8	3.6	1	14	368.2	6.5	3.9
0	15	295.5	6.4	4.0	1	15	326.5	6.3	4.2
0	16	351.9	4.2	3.8	1	16	322.8	4.3	3.7
0	17	400.1	4.0	4.2	1	17	420.4	3.9	4.6
0	18	384.4	4.3	3.7	1	18	384.1	4.3	3.6
0	19	211.0	4.1	4.0	1	19	339.8	4.2	3.8
0	20	384.6	4.4	3.5	1	20	329.9	3.8	4.6
0	21	397.8	4.1	4.1	1	21	407.2	3.9	4.4
0	22	260.6	4.2	3.9	1	22	347.2	4.1	4.0
0	23	221.8	4.2	3.9	1	23	377.9	3.8	4.6
0	24	413.6	4.1	4.1	1	24	363.6	3.9	4.4
0	25	371.8	4.1	4.1	1	25	365.5	4.2	3.9
0	26	362.1	4.1	4.1	1	26	265.9	4.2	3.9
0	27	323.2	4.1	4.1	1	27	267.3	3.8	4.7
0	28	429.7	4.5	3.4	1	28	313.7	4.1	4.1
0	29	423.0	4.0	4.2	1	29	275.4	4.2	3.9
0	30	285.8	4.4	3.6	1	30	305.5	4.2	3.8
0	31	318.9	4.3	3.7	1	31	153.8	4.0	4.2

mean sigmas:

IX0 large	6.6	IX1 large	6.3
IX0 small	4.2	IX1 small	4.1

3.4 Ad-Hoc Performance Test

The ad-hoc performance test is performed to check whether all channels of both sensors are functional. In this test, the thresholds of all channels of one sensor at a time are reduced step by step. By lowering the thresholds, the sensor gets more sensitive to noise. Using that technique, acceptable threshold levels for each channel can be determined. The results vary, depending on the environmental conditions (temperature, EMI). It is also observed that the values of the determined threshold values increase if the unit's sensors were non-powered and simultaneously not purged for timescales of about a day or more. It needs to be pointed out the threshold values come down again to the expected values with time when the unit incl the sensors is powered. Depending on how long the sensors were off and unpurged it can take up to a few week to re-achive the high sensitivity. Nevertheless, under normal conditions the variations of the determined thresholds for each channel are sufficiently low when repeating this test. This test can be considered successful if no deviations larger than three from the expected threshold values per channel and sensor are detected. For STEP FS, the thresholds shwon below have been determined (2018-08-15, at room temperature) representing the expected threshold values:

Integral channel (IX1):

Resulting thresholds: [5, 7, 5, 5, 5, 7, 5, 6, 5, 6, 6, 5, 6, 6, 5, 5, 7, 6, 6, 7, 4, 5, 5, 6, 6, 6, 7, 5, 6, 4, 7, 6]

Mean of all thresholds: 5.69
Mean of large pixel thresholds: 6.38
Mean of small pixel thresholds: 5.00

Thresholds of large pixels: [7, 7, 6, 6, 6, 7, 6, 6, 7, 6, 6, 7, 6, 7, 6]
Corresponds to IX channel: [1, 5, 7, 9, 10, 12, 16, 17, 18, 19, 23, 24, 26, 28, 30, 31]

Thresholds of small pixels: [5, 5, 5, 5, 5, 5, 6, 5, 5, 4, 5, 5, 6, 5, 4]
Corresponds to IX channel: [0, 2, 3, 4, 6, 8, 11, 13, 14, 15, 20, 21, 22, 25, 27, 29]

Proton channel (IX2):

Resulting thresholds: [4, 6, 5, 5, 5, 6, 5, 6, 5, 5, 7, 5, 5, 5, 5, 6, 6, 6, 6, 7, 5, 5, 5, 6, 6, 5, 6, 5, 6, 5, 5, 6]

Mean of all thresholds: 5.47
Mean of large pixel thresholds: 5.94
Mean of small pixel thresholds: 5.00

Thresholds of large pixels: [6, 6, 6, 5, 7, 5, 6, 6, 6, 7, 6, 6, 6, 6, 5, 6]
Corresponds to IX channel: [1, 5, 7, 9, 10, 12, 16, 17, 18, 19, 23, 24, 26, 28, 30, 31]

Thresholds of small pixels: [4, 5, 5, 5, 5, 5, 5, 5, 5, 6, 5, 5, 5, 5, 5, 5]
Corresponds to IX channel: [0, 2, 3, 4, 6, 8, 11, 13, 14, 15, 20, 21, 22, 25, 27, 29]

With this criterion, the ad-hoc performance tests yielded positive results each time they were conducted, which means the variations were reasonably small. Hence, we consider the performance tests that have been conducted as successful.

3.5 Continuous Functionality and Performance Check

For unit calibration purposes Ba133 spectra have been acquired during calibration campaigns in the Kiel Thermal Vacuum Chamber with the unit at mission-plausible temperatures while also adhering the expected thermal gradients throughout the unit. From the acquired data the energy resolution for each channel (equals pixel) has been determined. The table below lists the mean energy resolution over all applied temperatures. Also, the sensitivity was determined at all temperatures. The value in the table represents the worst sensitivity across the whole temperature range. It can be seen that the energy resolution (FWHM) is usually in the order of 700 eV or better. The sensitivity is better than 3 keV for all pixels and temperatures.

		Integral Channel (IX0)		Magnet Channel (IX1)	
IX chn	SSD pixel	mean FWHM in eV of Ba133 81 keV line	worst detection threshold in keV	mean FWHM in eV of Ba133 81 keV line	worst detection threshold in keV
Large pixels					
1	15	660	2.2	669	2.1
5	10	698	2.3	658	2.4
7	5	708	2.4	681	2.4
9	14	667	2.7	686	2.5
10	9	656	2.1	674	2.4
12	4	672	2.4	687	2.4
16	0	711	2.4	695	2.3
17	3	649	2.4	656	2.6
18	8	728	2.4	666	2.3
19	13	691	2.4	683	2.4
23	2	702	2.6	654	2.4
24	7	676	2.5	680	2.4
26	12	671	2.2	676	2.0
28	1	669	2.5	659	2.3
30	6	736	2.3	669	2.2
31	11	671	2.4	691	2.6
Small pixels					
0	15	645	1.6	640	2.2
2	10	596	1.9	608	2.0
3	5	656	1.9	601	2.1
4	14	545	2.0	606	1.7
6	9	576	1.8	590	1.9
8	4	589	1.9	638	1.8
11	13	615	1.6	580	1.9
13	8	627	1.9	610	1.9
14	3	622	1.8	602	1.9
15	0	658	2.0	620	2.0
20	2	631	1.7	626	1.7
21	7	689	1.8	621	1.9
22	12	612	2.0	586	1.8
25	1	629	1.9	604	1.9
27	6	627	1.7	606	1.8
29	11	581	1.7	611	1.7

The figure below shows calibrated Ba133 spectra only separated for the two sensors (IX1 = Integral channel, IX2 = Magnet channel) but integrated over all 32 channels of the particular sensor and integrated over multiple unit temperatures (ranging from +22°C to -52°C IX temperature. This is to verify the validity of the various channels' thermal calibrations. The FWHM of these two sensor- and temperature-integrated spectra can be determined to be around 700 to 800 eV, respectively, determined at the 53 keV line. This value is only slightly larger than the FWHMs of the single channels determined at a single unit's temperature (around 600 eV as per table above) and proves a good thermal and overall calibration. The additional line in IX2 at roughly 37-39keV stems from the fluorescence of Nd (Neodymium), used in the permanent magnets close to IX2.

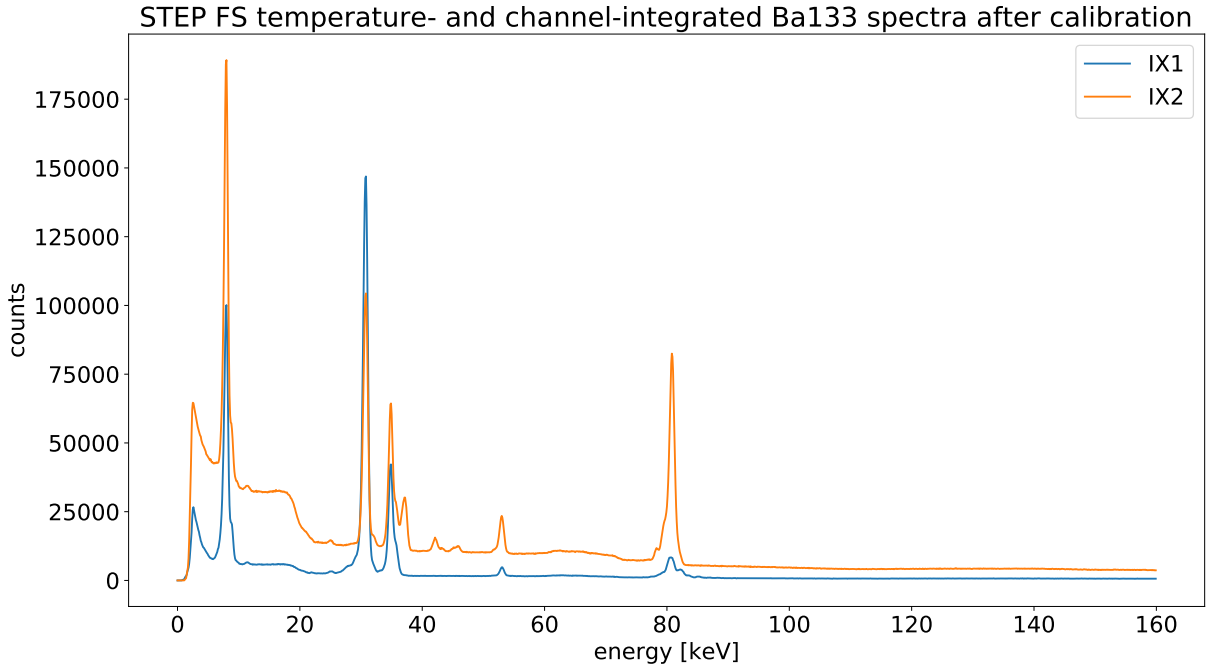


Figure 1: Calibrated Ba133 spectra integrated over all channels of both sensors (IX1 = Integral channel, IX2 = Magnet channel) at multiple temperatures to validate the unit's thermal calibration.

3.6 Operational Heaters Proof of Work

To prove the autonomous functionality of the operational heaters the unit was set to operation (nominal mode) at temperatures cold enough to trigger operational heating. As expected, the operational heaters autonomously started heating up the unit via the unit's heaters located on the LVPS board. This is demonstrated on the figure below. Note that the unit is in parallel being heated via the heating provisions of the TVAC chamber it is installed in but the increased heating rate of the LVPS board can easily be identified. It can also be seen that the operational heaters were switched off at the set temperature autonomously, as well.

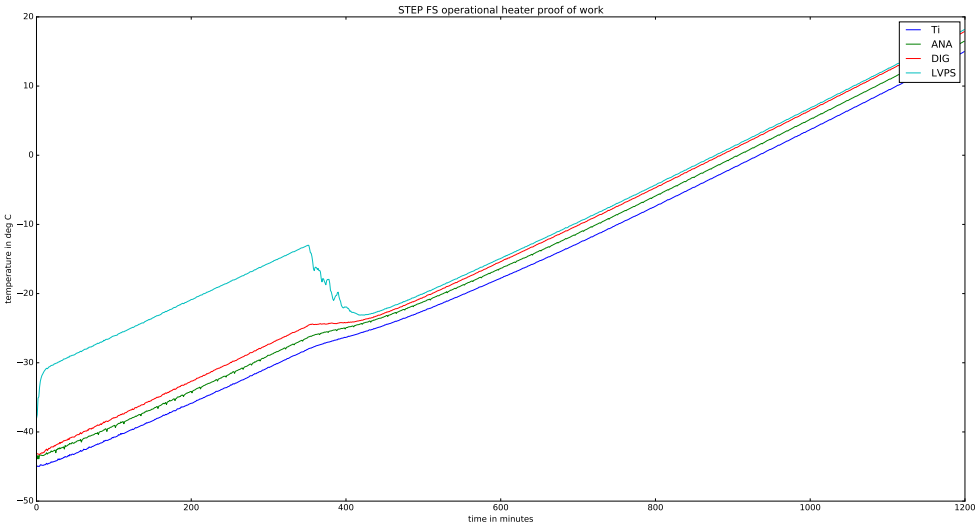


Figure 2: STEP FS operational heaters proof of work.

3.7 NCR-specific Tests (for NCRs with possible impact on the unit's performance or way of operation

3.7.1 NCR-0040: unconnected GND pin of the ripple counter

The root cause for this NCR did not have any impact on the unit's ad-hoc operation or performance. Thus, no NCR-specific tests were conducted. All subsequent SFTs and FFTs yielded positive results.

3.7.2 NCR-0042: x-axis random vibration over-testing at Airbus DS Portsmouth

The overtesting did not introduce any observed damage to the electrical components and neither altered the unit's ad-hoc operation or performance. Thus, no NCR-specific tests were conducted. All subsequent SFTs and FFTs yielded positive results.

3.7.3 NCR-0044: SRAM read errors

In the scope of NCR-0044 SRAM read errors were observed. After successful modification of the STEP FS DIG board the earlier-observed SRAM read errors have not been observed any further. This is true for extended tests on the cleanbench and a slow (and thus extensive) special TVAC cycle focussing on this issue as well. All subsequent SFTs and FFTs yielded positive results.

4 ANNEX: FT document scans

The following pages are scans of the functional tests performed on the STEP FS.

STEP FS 17.12.18
EEPROM UPDATE

4.3 Unit Impedance Check

This test was not performed as the unit from last FT was stored without being moved from clean room

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	
Thermistor 2	2	10	15k to 20k *	
Thermistor 3	3	11	15k to 20k *	
Survival Heaters 1	7	14	119	
Survival Heaters 2	8	15	119	

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms	Temp. °C	Ohms
-60	1,342,000	20	18,410
-55	957,000	22	16,950
-50	690,000	24	15,620
-45	503,700	25	15,000
-40	371,300	26	14,410
-35	276,200	28	13,310
-30	207,500	30	12,300
-25	157,200	32	11,370
-20	120,100	34	10,530
-15	92,600	36	9,756
-10	71,940	38	9,047
-5	56,310	40	8,397
0	44,420	42	7,800
2	40,490	44	7,253
4	36,930	46	6,747
6	33,740	48	6,282
8	30,840	50	5,855
10	28,230	52	5,460
12	25,860	54	5,096
14	23,720	56	4,758
16	21,780	58	4,448
18	20,010	60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	
Chassis	Instrument chassis	24	Chassis gnd	< 1	
Chassis	Instrument chassis	1	Nom. power	> 10M	
14	Nom. power return	1	Nom. power	> 10M	
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	
25	Red. power return	13	Red. power	> 10M	
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	
6	CLK I2S+	19	CLK I2S-	100	
8	LVDS S2I+	21	LVDS S2I-	50	
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	
7	CLK I2S+	20	CLK I2S-	100	
10	LVDS S2I-	22	LVDS S2I+	50	
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	
3	DGND	Chassis	Instrument chassis	< 1	
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	
6	CLK I2S+	Chassis	Instrument chassis	> 10M	
7	CLK I2S+	Chassis	Instrument chassis	> 10M	
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	
9	NC	Chassis	Instrument chassis	> 10M	
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	
11	DGND.	Chassis	Instrument chassis	< 1	
12	NC	Chassis	Instrument chassis	> 10M	
14	Nom. power return	Chassis	Instrument chassis	100k	
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	
18	NC	Chassis	Instrument chassis	> 10M	
19	CLK I2S-	Chassis	Instrument chassis	> 10M	
20	CLK I2S-	Chassis	Instrument chassis	> 10M	
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	
23	NC	Chassis	Instrument chassis	> 10M	
25	Red. power return	Chassis	Instrument chassis	100k	

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	28.03 V ✓
13	Red. power	25	Red. power ret.	28 or 0 *	0 V ✓
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	<3 ✓
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

Not needed for EEPROM Update.

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	28.0 V ✓
Current	100 mA ± 5 mA	98 mA ✓

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below. **This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

4.5 Setting up Unit Communication

This short sequence describes how to set up the unit and to establish and check the communication with the EGSE. **This sequence has to be obeyed before performing any of the following tests.**

- Make sure the laptop is switched ON
- Switch ON the laboratory power supply. Make sure that the supply voltage is at 28 V, or at least within the margins given in AD-2. After power-on the STEP unit will drain about 2.8 W, i.e. the current will be roughly 100 mA.
- On the laptop follow these steps:
  - in a terminal browse to **/data/etsolo1/step/svn/solo/eda/gse/**
  - start a session with typing **./sologse.py** and press enter
  - in the prompt you then should read amongst others:
    Connected to UNIT via /dev/ttyUSBx
    Connected to GSE via /dev/ttyUSBx
  - test the communication with the unit (each line followed by an enter):

    reset()
    status()

  If **status()** returns an **SoloGSE timeout** error, close the session (**Ctrl + D**), re-plug the USB cable, restart the session, and repeat the communication test. If **status()** returns a list of parameters, the connection to the unit has been established successfully. Use this session to perform the below listed tests.

* This was successful. (Pre-update SFT)

* The EEPROM Content has been updated from V0 to V3 in STEP FS successfully.

* Post_update SFT was successful.

Data collected for about 2 hours. All data baseline with EEPROM V3.

PA AIT Instrument Scientist

Ali Christos

20.09.2018
post-transportation test Kiel

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	15,76k
Thermistor 2	2	10	15k to 20k *	15,70k
Thermistor 3	3	11	15k to 20k *	15,72k
Survival Heaters 1	7	14	119	118,7
Survival Heaters 2	8	15	119	119,6

OK

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0,7
Chassis	Instrument chassis	24	Chassis gnd	< 1	0,8
Chassis	Instrument chassis	1	Nom. power	> 10M	✓
14	Nom. power return	1	Nom. power	> 10M	✓
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	✓
25	Red. power return	13	Red. power	> 10M	✓
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	102,6
6	CLK I2S+	19	CLK I2S-	100	102,6
8	LVDS S2I+	21	LVDS S2I-	50	51,6
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	103,0
7	CLK I2S+	20	CLK I2S-	100	102,9
10	LVDS S2I-	22	LVDS S2I+	50	51,9
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	✓
3	DGND	Chassis	Instrument chassis	< 1	0,7
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	✓
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	✓
6	CLK I2S+	Chassis	Instrument chassis	> 10M	✓
7	CLK I2S+	Chassis	Instrument chassis	> 10M	✓
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	✓
9	NC	Chassis	Instrument chassis	> 10M	✓
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	✓
11	DGND.	Chassis	Instrument chassis	< 1	0,6
12	NC	Chassis	Instrument chassis	> 10M	✓
14	Nom. power return	Chassis	Instrument chassis	100k	99,9 k
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	✓
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	✓
18	NC	Chassis	Instrument chassis	> 10M	✓
19	CLK I2S-	Chassis	Instrument chassis	> 10M	✓
20	CLK I2S-	Chassis	Instrument chassis	> 10M	✓
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	✓
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	✓
23	NC	Chassis	Instrument chassis	> 10M	✓
25	Red. power return	Chassis	Instrument chassis	100k	99,9k

OK

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	✓
13	Red. power	25	Red. power ret.	28 or 0 *	✓
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	✓
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

Ok

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	27.9 V
Current	100 mA ± 5 mA	98 mA

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below. **This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

FFTs successful on RED & NOM channel

Ok

4.5 Setting up Unit Communication

This short sequence describes how to set up the unit and to establish and check the communication with the EGSE. **This sequence has to be obeyed before performing any of the following tests.**

- Make sure the laptop is switched ON
- Switch ON the laboratory power supply. Make sure that the supply voltage is at 28 V, or at least within the margins given in AD-2. After power-on the STEP unit will drain about 2.8 W, i.e. the current will be roughly 100 mA.
- On the laptop follow these steps:
  - in a terminal browse to **/data/etsolo1/step/svn/solo/eda/gse/**
  - start a session with typing **./sologse.py** and press enter
  - in the prompt you then should read amongst others:
    Connected to UNIT via /dev/ttyUSBx
    Connected to GSE via /dev/ttyUSBx
  - test the communication with the unit (each line followed by an enter):

    reset()
    status()

  If **status()** returns an **SoloGSE timeout** error, close the session (**Ctrl + D**), re-plug the USB cable, restart the session, and repeat the communication test. If **status()** returns a list of parameters, the connection to the unit has been established successfully. Use this session to perform the below listed tests.

ATC - DC test Stevenage 19.09.2018

2018-02-19
ADS Stevenage
DC Magnt

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	17.02
Thermistor 2	2	10	15k to 20k *	16.39
Thermistor 3	3	11	15k to 20k *	16.92
Survival Heaters 1	7	14	119	120.6
Survival Heaters 2	8	15	119	~~120.0~~ 120.1 repeat Mwt

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

2018-09-19

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0,6
Chassis	Instrument chassis	24	Chassis gnd	< 1	0,6
Chassis	Instrument chassis	1	Nom. power	> 10M	open
14	Nom. power return	1	Nom. power	> 10M	open
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	open
25	Red. power return	13	Red. power	> 10M	open
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	102.5
6	CLK I2S+	19	CLK I2S-	100	102.5
8	LVDS S2I+	21	LVDS S2I-	50	51.6
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	102.5
7	CLK I2S+	20	CLK I2S-	100	102.6
10	LVDS S2I-	22	LVDS S2I+	50	51.5
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	open
3	DGND	Chassis	Instrument chassis	< 1	0.5
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	open
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	open
6	CLK I2S+	Chassis	Instrument chassis	> 10M	open
7	CLK I2S+	Chassis	Instrument chassis	> 10M	open
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	open
9	NC	Chassis	Instrument chassis	> 10M	open
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	open
11	DGND.	Chassis	Instrument chassis	< 1	0.5
12	NC	Chassis	Instrument chassis	> 10M	open
14	Nom. power return	Chassis	Instrument chassis	100k	99.9 k
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	open
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	open
18	NC	Chassis	Instrument chassis	> 10M	open
19	CLK I2S-	Chassis	Instrument chassis	> 10M	open
20	CLK I2S-	Chassis	Instrument chassis	> 10M	open
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	open
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	open
23	NC	Chassis	Instrument chassis	> 10M	open
25	Red. power return	Chassis	Instrument chassis	100k	99,9 k

2018-09-19

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					NOM / RED
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	27.93 / 0
13	Red. power	25	Red. power ret.	28 or 0 *	0 / 27.92
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	< 2.6V / < 2.6V
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	27.87
8	Surv Heaters 2	15	Surv Heaters 2	28	NC

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	
Current	100 mA ± 5 mA	

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below. **This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

4.5 Setting up Unit Communication

This short sequence describes how to set up the unit and to establish and check the communication with the EGSE. **This sequence has to be obeyed before performing any of the following tests.**

- Make sure the laptop is switched ON
- Switch ON the laboratory power supply. Make sure that the supply voltage is at 28 V, or at least within the margins given in AD-2. After power-on the STEP unit will drain about 2.8 W, i.e. the current will be roughly 100 mA.
- On the laptop follow these steps:
  - in a terminal browse to **/data/etsolo1/step/svn/solo/eda/gse/**
  - start a session with typing **./sologse.py** and press enter
  - in the prompt you then should read amongst others:
    Connected to UNIT via /dev/ttyUSBx
    Connected to GSE via /dev/ttyUSBx
  - test the communication with the unit (each line followed by an enter):

    reset()
    status()

  If **status()** returns an **SoloGSE timeout** error, close the session (**Ctrl + D**), re-plug the USB cable, restart the session, and repeat the communication test. If **status()** returns a list of parameters, the connection to the unit has been established successfully. Use this session to perform the below listed tests.

pre-EMC tests (Portsmouth) 18.9.18
safe-to-mate only due to EM harness

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	
Thermistor 2	2	10	15k to 20k *	
Thermistor 3	3	11	15k to 20k *	
Survival Heaters 1	7	14	119	
Survival Heaters 2	8	15	119	

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	
Chassis	Instrument chassis	24	Chassis gnd	< 1	
Chassis	Instrument chassis	1	Nom. power	> 10M	
14	Nom. power return	1	Nom. power	> 10M	
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	
25	Red. power return	13	Red. power	> 10M	
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	
6	CLK I2S+	19	CLK I2S-	100	
8	LVDS S2I+	21	LVDS S2I-	50	
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	
7	CLK I2S+	20	CLK I2S-	100	
10	LVDS S2I-	22	LVDS S2I+	50	
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	
3	DGND	Chassis	Instrument chassis	< 1	
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	
6	CLK I2S+	Chassis	Instrument chassis	> 10M	
7	CLK I2S+	Chassis	Instrument chassis	> 10M	
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	
9	NC	Chassis	Instrument chassis	> 10M	
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	
11	DGND.	Chassis	Instrument chassis	< 1	
12	NC	Chassis	Instrument chassis	> 10M	
14	Nom. power return	Chassis	Instrument chassis	100k	
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	
18	NC	Chassis	Instrument chassis	> 10M	
19	CLK I2S-	Chassis	Instrument chassis	> 10M	
20	CLK I2S-	Chassis	Instrument chassis	> 10M	
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	
23	NC	Chassis	Instrument chassis	> 10M	
25	Red. power return	Chassis	Instrument chassis	100k	

WORKMANSHIP EMC TEST
AIRBUS DS EVT Portsmouth TVAC 1.

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

2018-09-18
EM Harness to STEP FS

ok

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	27.91
13	Red. power	25	Red. power ret.	28 or 0 *	0
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	< 2.6
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	
Current	100 mA ± 5 mA	

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below. **This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

4.5 Setting up Unit Communication

This short sequence describes how to set up the unit and to establish and check the communication with the EGSE. **This sequence has to be obeyed before performing any of the following tests.**

- Make sure the laptop is switched ON
- Switch ON the laboratory power supply. Make sure that the supply voltage is at 28 V, or at least within the margins given in AD-2. After power-on the STEP unit will drain about 2.8 W, i.e. the current will be roughly 100 mA.
- On the laptop follow these steps:
  - in a terminal browse to **/data/etsolo1/step/svn/solo/eda/gse/**
  - start a session with typing **./sologse.py** and press enter
  - in the prompt you then should read amongst others:
    Connected to UNIT via /dev/ttyUSBx
    Connected to GSE via /dev/ttyUSBx
  - test the communication with the unit (each line followed by an enter):

    reset()
    status()

  If **status()** returns an **SoloGSE timeout** error, close the session (**Ctrl + D**), re-plug the USB cable, restart the session, and repeat the communication test. If **status()** returns a list of parameters, the connection to the unit has been established successfully. Use this session to perform the below listed tests.

post penalty Z-axis vibration

4.3 Unit Impedance Check

2018-09-17

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

Replace Sauer

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	17.75k
Thermistor 2	2	10	15k to 20k *	17.61k
Thermistor 3	3	11	15k to 20k *	17.64k
Survival Heaters 1	7	14	119	118.5
Survival Heaters 2	8	15	119	118.4

OL

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0.6
Chassis	Instrument chassis	24	Chassis gnd	< 1	0.5
Chassis	Instrument chassis	1	Nom. power	> 10M	open
14	Nom. power return	1	Nom. power	> 10M	open
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	open
25	Red. power return	13	Red. power	> 10M	open
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	102.6
6	CLK I2S+	19	CLK I2S-	100	102.8
8	LVDS S2I+	21	LVDS S2I-	50	51.1
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	102.6
7	CLK I2S+	20	CLK I2S-	100	102.7
10	LVDS S2I-	22	LVDS S2I+	50	51.5
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	open
3	DGND	Chassis	Instrument chassis	< 1	0.8
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	open
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	open
6	CLK I2S+	Chassis	Instrument chassis	> 10M	open
7	CLK I2S+	Chassis	Instrument chassis	> 10M	open
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	open
9	NC	Chassis	Instrument chassis	> 10M	open
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	open
11	DGND.	Chassis	Instrument chassis	< 1	0.7
12	NC	Chassis	Instrument chassis	> 10M	open
14	Nom. power return	Chassis	Instrument chassis	100k	99.9k
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	open
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	open
18	NC	Chassis	Instrument chassis	> 10M	open
19	CLK I2S-	Chassis	Instrument chassis	> 10M	open
20	CLK I2S-	Chassis	Instrument chassis	> 10M	open
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	open
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	open
23	NC	Chassis	Instrument chassis	> 10M	open
25	Red. power return	Chassis	Instrument chassis	100k	99.9k

2018-09-17

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured RED	NOM
Voltage	28.0 V	27.9 V	27.9V
Current	100 mA ± 5 mA	0.10 A	0.10A

fluctuates 0.09 - 0.10 A

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below. **This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

STF, FTTs on RED & NOM successful (ΔCCPON)

4.5 Setting up Unit Communication

This short sequence describes how to set up the unit and to establish and check the communication with the EGSE. **This sequence has to be obeyed before performing any of the following tests.**

- Make sure the laptop is switched ON
- Switch ON the laboratory power supply. Make sure that the supply voltage is at 28 V, or at least within the margins given in AD-2. After power-on the STEP unit will drain about 2.8 W, i.e. the current will be roughly 100 mA.
- On the laptop follow these steps:
  - in a terminal browse to **/data/etsolo1/step/svn/solo/eda/gse/**
  - start a session with typing **./sologse.py** and press enter
  - in the prompt you then should read amongst others:
    Connected to UNIT via /dev/ttyUSBx
    Connected to GSE via /dev/ttyUSBx
  - test the communication with the unit (each line followed by an enter):

    reset()
    status()

  If **status()** returns an **SoloGSE timeout** error, close the session (**Ctrl + D**), re-plug the USB cable, restart the session, and repeat the communication test. If **status()** returns a list of parameters, the connection to the unit has been established successfully. Use this session to perform the below listed tests.

17.09.2018 Lauw
STEP FS
ADS Parkmodule

post-transportation & pre-vibration tests

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	16.38k.
Thermistor 2	2	10	15k to 20k *	16.27k
Thermistor 3	3	11	15k to 20k *	16.30k
Survival Heaters 1	7	14	119	118.6
Survival Heaters 2	8	15	119	119.5

ok.

Remove connector Saver

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

21C outside the clean tent

Temp. °C	Ohms	Temp. °C	Ohms
-60	1,342,000	20	18,410
-55	957,000	22	16,950
-50	690,000	24	15,620
-45	503,700	25	15,000
-40	371,300	26	14,410
-35	276,200	28	13,310
-30	207,500	30	12,300
-25	157,200	32	11,370
-20	120,100	34	10,530
-15	92,600	36	9,756
-10	71,940	38	9,047
-5	56,310	40	8,397
0	44,420	42	7,800
2	40,490	44	7,253
4	36,930	46	6,747
6	33,740	48	6,282
8	30,840	50	5,855
10	28,230	52	5,460
12	25,860	54	5,096
14	23,720	56	4,758
16	21,780	58	4,448
18	20,010	60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0.7
Chassis	Instrument chassis	24	Chassis gnd	< 1	0,7
Chassis	Instrument chassis	1	Nom. power	> 10M	open
14	Nom. power return	1	Nom. power	> 10M	open
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	open
25	Red. power return	13	Red. power	> 10M	open
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	102.8
6	CLK I2S+	19	CLK I2S-	100	102.8
8	LVDS S2I+	21	LVDS S2I-	50	51.7
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	102.9
7	CLK I2S+	20	CLK I2S-	100	103.0
10	LVDS S2I-	22	LVDS S2I+	50	52.0
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	open
3	DGND	Chassis	Instrument chassis	< 1	0.8
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	open
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	open
6	CLK I2S+	Chassis	Instrument chassis	> 10M	open
7	CLK I2S+	Chassis	Instrument chassis	> 10M	open
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	open
9	NC	Chassis	Instrument chassis	> 10M	open
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	open
11	DGND.	Chassis	Instrument chassis	< 1	0.7
12	NC	Chassis	Instrument chassis	> 10M	open
14	Nom. power return	Chassis	Instrument chassis	100k	99.9 k
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	open
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	open
18	NC	Chassis	Instrument chassis	> 10M	open
19	CLK I2S-	Chassis	Instrument chassis	> 10M	open
20	CLK I2S-	Chassis	Instrument chassis	> 10M	open
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	open
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	open
23	NC	Chassis	Instrument chassis	> 10M	open
25	Red. power return	Chassis	Instrument chassis	100k	99.9

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	27.95 / 0
13	Red. power	25	Red. power ret.	28 or 0 *	0 / 27,94
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	< 2.8 / < 2.8
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

Nom / Red
ok / ok
ok / ok

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	27.9 V
Current	100 mA ± 5 mA	0.10 A

at Multimeter

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

FFTs on RED & NOM successful (& EEPROM)

4.5 Setting up Unit Communication

This short sequence describes how to set up the unit and to establish and check the communication with the EGSE. **This sequence has to be obeyed before performing any of the following tests.**

- Make sure the laptop is switched ON
- Switch ON the laboratory power supply. Make sure that the supply voltage is at 28 V, or at least within the margins given in AD-2. After power-on the STEP unit will drain about 2.8 W, i.e. the current will be roughly 100 mA.
- On the laptop follow these steps:
  - in a terminal browse to **/data/etsolo1/step/svn/solo/eda/gse/**
  - start a session with typing **./sologse.py** and press enter
  - in the prompt you then should read amongst others:
    Connected to UNIT via /dev/ttyUSBx
    Connected to GSE via /dev/ttyUSBx
  - test the communication with the unit (each line followed by an enter):

    reset()
    status()

  If **status()** returns an **SoloGSE timeout** error, close the session (**Ctrl + D**), re-plug the USB cable, restart the session, and repeat the communication test. If **status()** returns a list of parameters, the connection to the unit has been established successfully. Use this session to perform the below listed tests.

21.08.18
STEP FS TVAC after NCR 44
(semi-scan + 1 cycle)

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	19,4k
Thermistor 2	2	10	15k to 20k *	19,3k
Thermistor 3	3	11	15k to 20k *	19,3k
Survival Heaters 1	7	14	119	116,5
Survival Heaters 2	8	15	119	119,5

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0,8
Chassis	Instrument chassis	24	Chassis gnd	< 1	0,9
Chassis	Instrument chassis	1	Nom. power	> 10M	OL
14	Nom. power return	1	Nom. power	> 10M	OL
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	OL
25	Red. power return	13	Red. power	> 10M	OL
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	103,0
6	CLK I2S+	19	CLK I2S-	100	103,1
8	LVDS S2I+	21	LVDS S2I-	50	52,1
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	103,2
7	CLK I2S+	20	CLK I2S-	100	103,1
10	LVDS S2I-	22	LVDS S2I+	50	52,1
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	OL
3	DGND	Chassis	Instrument chassis	< 1	0,7
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	OL
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	OL
6	CLK I2S+	Chassis	Instrument chassis	> 10M	OL
7	CLK I2S+	Chassis	Instrument chassis	> 10M	OL
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	OL
9	NC	Chassis	Instrument chassis	> 10M	OL
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	OL
11	DGND.	Chassis	Instrument chassis	< 1	0,7
12	NC	Chassis	Instrument chassis	> 10M	OL
14	Nom. power return	Chassis	Instrument chassis	100k	99,9k
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	OL
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	OL
18	NC	Chassis	Instrument chassis	> 10M	OL
19	CLK I2S-	Chassis	Instrument chassis	> 10M	OL
20	CLK I2S-	Chassis	Instrument chassis	> 10M	OL
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	OL
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	OL
23	NC	Chassis	Instrument chassis	> 10M	OL
25	Red. power return	Chassis	Instrument chassis	100k	99,9k

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	0
13	Red. power	25	Red. power ret.	28 or 0 *	28,0V
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	✓
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	28,0
Current	100 mA ± 5 mA	98mA

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below. **This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

4.5 Setting up Unit Communication

This short sequence describes how to set up the unit and to establish and check the communication with the EGSE. **This sequence has to be obeyed before performing any of the following tests.**

- Make sure the laptop is switched ON
- Switch ON the laboratory power supply. Make sure that the supply voltage is at 28 V, or at least within the margins given in AD-2. After power-on the STEP unit will drain about 2.8 W, i.e. the current will be roughly 100 mA.
- On the laptop follow these steps:
  - in a terminal browse to **/data/etsolo1/step/svn/solo/eda/gse/**
  - start a session with typing **./sologse.py** and press enter
  - in the prompt you then should read amongst others:
    Connected to UNIT via /dev/ttyUSBx
    Connected to GSE via /dev/ttyUSBx
  - test the communication with the unit (each line followed by an enter):

    reset()
    status()

  If **status()** returns an **SoloGSE timeout** error, close the session (**Ctrl + D**), re-plug the USB cable, restart the session, and repeat the communication test. If **status()** returns a list of parameters, the connection to the unit has been established successfully. Use this session to perform the below listed tests.

4.6 Performing an Ad-Hoc Functional and Performance Test

The ad-hoc functional and performance test is used to check the ad-hoc functionality and performance of the unit and its sub-assemblies. This test checks the communication with and the functionality of the different sub-assemblies (FPGA, SRAM, EEPROM, IdeF-X, ADCs). The results of the various operations are internally checked for correctness. In the case of the ADCs, the user has to judge whether the determined temperatures are plausible. It shall be noted that the IdeF-X (IX) temperatures always tend to be a few degrees higher than the other temperatures if the system is in a thermally stable condition. Also data is acquired to evaluate the performance of the unit. To perform the above mentioned test, the following procedure needs to be obeyed:

In the prompt of the session type (each line followed by an enter):

reset()

import solo.step.fft as fft

f = fft.fft(msg)

\+ **Start("filename")**

\+ **f.test()**

\+ **Stop()**

To see and evaluate the test results, run the following commands in a second terminal (each line followed by an enter):

step_parser –fft ¡ filename.dat — less

The results of this test are summarized in the output. An **OK** means that the subsystem test was successfully passed. In some cases it is required to check whether the output (temperatures, currents, voltages, or received strings) are plausible. If so, these subsystem tests can be interpreted as passed. Also, check the sigmas of the FFT results. The large pixels are supposed to show a sigma lower than or about 7. The sigmas of the small pixels are expected between 4 and 5. As the result (determined sigma) mainly depends on how long the unit was unpowered while being unpurged, the assessment of the result is laid to the instrument responsible solely and no hard success limits are defined. The values have been observed to increase up to 13 or so (after long rework activities). To repeat the test, the command marked with a preceding "+" needs to be repeated.

4.7 Performing an Ad-Hoc Performance Test

The ad-hoc performance test is used to check the ad-hoc performance of the unit. This test checks the noise levels of the IdeF-X channels. As the noise levels depend on several environmental parameters (temperatures, stray light, and EMI) this test is for information only and the results do not serve as PASS/FAIL criteria. Nevertheless, this check may serve as an indicator for a potential degradation of the unit's performance. To perform the ad-hoc performance test, the following procedure needs to be obeyed:

In the prompt of the session type (each line followed by an enter):

reset()

config_STEP()

optimize_thresholds(ix=1, freq=1., filename="folder and filename**.txt")**

config_STEP()

optimize_thresholds(ix=2, freq=1., filename="folder and filename**.txt")**

The results of this test are printed to the screen and saved in the defined file (use a logging file on asterix for each unit).

for FM: solo/STEP/STEP/models_FM_FS_PQM_PF/FM/FM_acquired_data/thresholds_FM.txt

for FS: solo/STEP/STEP/models_FM_FS_PQM_PF/FS/FS_acquired_data/thresholds_FS.txt

for PQM: solo/STEP/STEP/models_FM_FS_PQM_PF/PQM/PQM_acquired_data/thresholds_PQM.txt

4.8 Configuring the Unit to Operational Modes

The unit can be set to different operational modes following the steps declared below. The **config**-parameter defines the unit (valid options are: **FM**, **FS**, **PQM**, or **PF**) and choses the thresholds to apply accordingly. The **index**-parameter defines the operational mode the unit will be set into. The valid options with explanations are given at the bottom of this page. The resulting data stream on the one hand, and the supply voltage and current as measured by the EGSE on the other hand are sent via the EGSE to the notebook and stored in user-defined files. To set the unit to the desired operational mode, follow the sequence as given below.

In the prompt of the session type (each line followed by an enter):

+ **reset()**
+ **StartIndex("**folder and filename**.dat", index = "calib" , config = "FS")**

It will take up to two minutes until the unit is fully configured. When configured, the prompt in the shell will get available, again. To stop the test, enter **Stop()** followed by **reset()**, and **flush()**. To optionally parse the data, open a second shell, navigate to the same folder and execute the following command:

step_parser -f -A filename.defs < filename.dat

To stop the parser, press **Ctrl + C**.

Excerpt of valid options for the index parameter are:

index	short description	applicablility for functional tests
hk	Housekeeping mode: Provides housekeeping data in Flight configuration but no detector signals will be acquired or processed.	Not relevant for functional tests, can be used to check the configuration of the unit.
nominal	Nominal mode: Provides housekeeping and science data in Flight configuration. Only the large pixels of the detectors are active.	Not relevant for functional tests, can be used to check the configuration of the unit.
small	Same mode as **nominal**, but with small pixels active	Not relevant for functional tests, can be used to check the configuration of the unit.
calib	Calibration mode: All pixels are active and provide streaming data (full information, no I3 processing) and housekeeping data. Not Flight representative	Not relevant for foreseen functional tests, can be used to calibrate the units or check for susceptibility.
pcalib	Calibration mode with test pulsers: Same mode as **calib**, but with testpulser signals cycling through all channels of both detectors at four different energies. Let it run for more than 30 minutes.	Very thorough test of the detectors performace, thus shall be executed at key points (after assembly, before possible delivery, in between some of the environmental tests)

4.9 As Run Functional Test Report

Date and Time	21.08.2018

4.9.1 Functional Test Readiness

Location	Cleanroom CAU Kiel
Personnel	Laura
Instrument ID	STEP FS
Firmware revision	
Reason for FT	test befor TVAC test in scope of NC44
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	ok
Impedance check	ok
Set up communication	ok
Additional constraints	

4.9.3 FT Details

Step #	Activity	Result
1	Data file name if applicable	
2	Test started / stopped	
3	Test result	all tests passed
4	Comments	
Signatures		PdL

post TVAC NCR44
23.03.18

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	16,7k
Thermistor 2	2	10	15k to 20k *	16,6k
Thermistor 3	3	11	15k to 20k *	16,7k
Survival Heaters 1	7	14	119	119,5
Survival Heaters 2	8	15	119	119,5

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	
Chassis	Instrument chassis	24	Chassis gnd	< 1	
Chassis	Instrument chassis	1	Nom. power	> 10M	
14	Nom. power return	1	Nom. power	> 10M	
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	
25	Red. power return	13	Red. power	> 10M	
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	
6	CLK I2S+	19	CLK I2S-	100	
8	LVDS S2I+	21	LVDS S2I-	50	
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	
7	CLK I2S+	20	CLK I2S-	100	
10	LVDS S2I-	22	LVDS S2I+	50	
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	
3	DGND	Chassis	Instrument chassis	< 1	
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	
6	CLK I2S+	Chassis	Instrument chassis	> 10M	
7	CLK I2S+	Chassis	Instrument chassis	> 10M	
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	
9	NC	Chassis	Instrument chassis	> 10M	
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	
11	DGND.	Chassis	Instrument chassis	< 1	
12	NC	Chassis	Instrument chassis	> 10M	
14	Nom. power return	Chassis	Instrument chassis	100k	
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	
18	NC	Chassis	Instrument chassis	> 10M	
19	CLK I2S-	Chassis	Instrument chassis	> 10M	
20	CLK I2S-	Chassis	Instrument chassis	> 10M	
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	
23	NC	Chassis	Instrument chassis	> 10M	
25	Red. power return	Chassis	Instrument chassis	100k	

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	28,0 V
Current	100 mA ± 5 mA	98 mA

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below. **This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

Communication & FFT passed

Lam

4.9 As Run Functional Test Report

Date and Time	23.03.18

4.9.1 Functional Test Readiness

Location	kiel clean room TVAC
Personnel	Robert, Lauri
Instrument ID	STEP FS
Firmware revision	
Reason for FT	end of TVAC test MR0044
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	
Set up communication	
Additional constraints	

4.9.3 FT Details

Step #	Activity	Result
1	Data file name if applicable	
2	Test started / stopped	
3	Test result	
4	Comments	
Signatures		

19.03.2018
TVAC SRAM timing test
pre- test

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	17,3k
Thermistor 2	2	10	15k to 20k *	17,1k
Thermistor 3	3	11	15k to 20k *	17,2k
Survival Heaters 1	7	14	119	118,5
Survival Heaters 2	8	15	119	119,5

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	<1	
Chassis	Instrument chassis	24	Chassis gnd	<1	
Chassis	Instrument chassis	1	Nom. power	$>10M$	
14	Nom. power return	1	Nom. power	$>10M$	
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	$>10M$	
25	Red. power return	13	Red. power	$>10M$	
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	
6	CLK I2S+	19	CLK I2S-	100	
8	LVDS S2I+	21	LVDS S2I-	50	
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	
7	CLK I2S+	20	CLK I2S-	100	
10	LVDS S2I-	22	LVDS S2I+	50	
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	$>10M$	
3	DGND	Chassis	Instrument chassis	<1	
4	LVDS I2S-	Chassis	Instrument chassis	$>10M$	
5	LVDS I2S-	Chassis	Instrument chassis	$>10M$	
6	CLK I2S+	Chassis	Instrument chassis	$>10M$	
7	CLK I2S+	Chassis	Instrument chassis	$>10M$	
8	LVDS S2I+	Chassis	Instrument chassis	$>10M$	
9	NC	Chassis	Instrument chassis	$>10M$	
10	LVDS S2I-	Chassis	Instrument chassis	$>10M$	
11	DGND.	Chassis	Instrument chassis	<1	
12	NC	Chassis	Instrument chassis	$>10M$	
14	Nom. power return	Chassis	Instrument chassis	100k	
16	LVDS I2S+	Chassis	Instrument chassis	$>10M$	
17	LVDS I2S+	Chassis	Instrument chassis	$>10M$	
18	NC	Chassis	Instrument chassis	$>10M$	
19	CLK I2S-	Chassis	Instrument chassis	$>10M$	
20	CLK I2S-	Chassis	Instrument chassis	$>10M$	
21	LVDS S2I-	Chassis	Instrument chassis	$>10M$	
22	LVDS S2I+	Chassis	Instrument chassis	$>10M$	
23	NC	Chassis	Instrument chassis	$>10M$	
25	Red. power return	Chassis	Instrument chassis	100k	

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	5 V
13	Red. power	25	Red. power ret.	28 or 0 *	0 V
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	Pass
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

PdL

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	28.0
Current	100 mA ± 5 mA	97 mA

PdL

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below. **This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

Communication OK

PdL

4.9 As Run Functional Test Report

Date and Time	15.03.2018

4.9.1 Functional Test Readiness

Location	Clean room, TVAC
Personnel	Robert E., Walter B., Lauri P.
Instrument ID	STEP FS
Firmware revision	
Reason for FT	test before TVAC test, to be repeated afterwards
Test to be performed	MDMIS impedance, harness safe-to-mate, communication, SFT

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	
Set up communication	
Additional constraints	

4.9.3 FT Details

Step #	Activity	Result
1	Data file name if applicable	
2	Test started / stopped	
3	Test result	
4	Comments	
Signatures		

06.02.2018
TVAC SCI data test

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	19.06 kΩ
Thermistor 2	2	10	15k to 20k *	17.91 kΩ
Thermistor 3	3	11	15k to 20k *	17.94 kΩ
Survival Heaters 1	7	14	119	118.9 Ω
Survival Heaters 2	8	15	119	119.5 Ω

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	
Chassis	Instrument chassis	24	Chassis gnd	< 1	
Chassis	Instrument chassis	1	Nom. power	> 10M	
14	Nom. power return	1	Nom. power	> 10M	
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	
25	Red. power return	13	Red. power	> 10M	
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	
6	CLK I2S+	19	CLK I2S-	100	
8	LVDS S2I+	21	LVDS S2I-	50	
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	
7	CLK I2S+	20	CLK I2S-	100	
10	LVDS S2I-	22	LVDS S2I+	50	
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	
3	DGND	Chassis	Instrument chassis	< 1	
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	
6	CLK I2S+	Chassis	Instrument chassis	> 10M	
7	CLK I2S+	Chassis	Instrument chassis	> 10M	
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	
9	NC	Chassis	Instrument chassis	> 10M	
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	
11	DGND.	Chassis	Instrument chassis	< 1	
12	NC	Chassis	Instrument chassis	> 10M	
14	Nom. power return	Chassis	Instrument chassis	100k	
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	
18	NC	Chassis	Instrument chassis	> 10M	
19	CLK I2S-	Chassis	Instrument chassis	> 10M	
20	CLK I2S-	Chassis	Instrument chassis	> 10M	
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	
23	NC	Chassis	Instrument chassis	> 10M	
25	Red. power return	Chassis	Instrument chassis	100k	

Test skipped. Unit was operated for 2 weeks just before test.

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	28.0 V
13	Red. power	25	Red. power ret.	28 or 0 *	0 V
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	28V
Current	100 mA ± 5 mA	97 mA

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below. **This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

Communication tested successfully ✓

4.9 As Run Functional Test Report

Date and Time	06.02.2018 1150

4.9.1 Functional Test Readiness

Location	Kiel TVAC
Personnel	Walter B., Robert E., Laura P.
Instrument ID	STEP FS
Firmware revision	
Reason for FT	installation in TVAC
Test to be performed	Safe-to-mate, communicate

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	
Set up communication	
Additional constraints	

4.9.3 FT Details

Step #	Activity	Result
1	Data file name if applicable	
2	Test started / stopped	
3	Test result	Successful
4	Comments	
Signatures	Pal	

12.10.17
After STEP FS TCT Mahesh Lauri

4.9 As Run Functional Test Report

Date and Time	12.11.17

4.9.1 Functional Test Readiness

Location	kiel cleanroom
Personnel	Mahesh, Lauri
Instrument ID	STEP FS
Firmware revision	
Reason for FT	final TCT test
Test to be performed	impedance test, sft, thresholds

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	
Set up communication	
Additional constraints	

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	19,0k
Thermistor 2	2	10	15k to 20k *	18,8k
Thermistor 3	3	11	15k to 20k *	18,9k
Survival Heaters 1	7	14	119	118,5
Survival Heaters 2	8	15	119	119,4

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms	Temp. °C	Ohms
-60	1,342,000	20	18,410
-55	957,000	22	16,950
-50	690,000	24	15,620
-45	503,700	25	15,000
-40	371,300	26	14,410
-35	276,200	28	13,310
-30	207,500	30	12,300
-25	157,200	32	11,370
-20	120,100	34	10,530
-15	92,600	36	9,756
-10	71,940	38	9,047
-5	56,310	40	8,397
0	44,420	42	7,800
2	40,490	44	7,253
4	36,930	46	6,747
6	33,740	48	6,282
8	30,840	50	5,855
10	28,230	52	5,460
12	25,860	54	5,096
14	23,720	56	4,758
16	21,780	58	4,448
18	20,010	60	4,160

19,6°C

√

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0.7
Chassis	Instrument chassis	24	Chassis gnd	< 1	0.7
Chassis	Instrument chassis	1	Nom. power	> 10M	OL
14	Nom. power return	1	Nom. power	> 10M	OL
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	OL
25	Red. power return	13	Red. power	> 10M	OL
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	103
6	CLK I2S+	19	CLK I2S-	100	103
8	LVDS S2I+	21	LVDS S2I-	50	52.3
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	102.8
7	CLK I2S+	20	CLK I2S-	100	102.9
10	LVDS S2I-	22	LVDS S2I+	50	51.8
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	OL
3	DGND	Chassis	Instrument chassis	< 1	0.6
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	OL
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	OL
6	CLK I2S+	Chassis	Instrument chassis	> 10M	OL
7	CLK I2S+	Chassis	Instrument chassis	> 10M	OL
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	OL
9	NC	Chassis	Instrument chassis	> 10M	OL
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	OL
11	DGND.	Chassis	Instrument chassis	< 1	0.5
12	NC	Chassis	Instrument chassis	> 10M	OL
14	Nom. power return	Chassis	Instrument chassis	100k	99.9K
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	OL
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	OL
18	NC	Chassis	Instrument chassis	> 10M	OL
19	CLK I2S-	Chassis	Instrument chassis	> 10M	OL
20	CLK I2S-	Chassis	Instrument chassis	> 10M	OL
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	OL
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	OL
23	NC	Chassis	Instrument chassis	> 10M	OL
25	Red. power return	Chassis	Instrument chassis	100k	99.9K

Pass

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	28V & 98mA
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	28V
Current	100 mA ± 5 mA	98mA

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

Nominal Channel SFT - Lucanful'
Redundant —— " ——

tresholds:	L	S
1X0	6.3	5.0
1X1	5,9	4,8

PdL

STEP FS threshold-check before TCT

26.09.2017
Laura

4.9 As Run Functional Test Report

Date and Time	26.09.2017 15[00]

4.9.1 Functional Test Readiness

Location	CAU kiel cleanroom
Personnel	Laura
Instrument ID	STEP FS
Firmware revision	
Reason for FT	
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	✓
Impedance check	✓
Set up communication	✓
Additional constraints	

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	19,00k
Thermistor 2	2	10	15k to 20k *	19,85k
Thermistor 3	3	11	15k to 20k *	19,88k
Survival Heaters 1	7	14	119	118,5
Survival Heaters 2	8	15	119	119,5

✓

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0,8
Chassis	Instrument chassis	24	Chassis gnd	< 1	0,6
Chassis	Instrument chassis	1	Nom. power	> 10M	✓
14	Nom. power return	1	Nom. power	> 10M	✓
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	✓
25	Red. power return	13	Red. power	> 10M	✓
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	102,7
6	CLK I2S+	19	CLK I2S-	100	102,7
8	LVDS S2I+	21	LVDS S2I-	50	51,6
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	102,7
7	CLK I2S+	20	CLK I2S-	100	102,8
10	LVDS S2I-	22	LVDS S2I+	50	51,6
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	✓
3	DGND	Chassis	Instrument chassis	< 1	0,6
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	✓
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	✓
6	CLK I2S+	Chassis	Instrument chassis	> 10M	✓
7	CLK I2S+	Chassis	Instrument chassis	> 10M	✓
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	✓
9	NC	Chassis	Instrument chassis	> 10M	✓
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	✓
11	DGND.	Chassis	Instrument chassis	< 1	0,6
12	NC	Chassis	Instrument chassis	> 10M	✓
14	Nom. power return	Chassis	Instrument chassis	100k	99,9k
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	✓
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	✓
18	NC	Chassis	Instrument chassis	> 10M	✓
19	CLK I2S-	Chassis	Instrument chassis	> 10M	✓
20	CLK I2S-	Chassis	Instrument chassis	> 10M	✓
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	✓
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	✓
23	NC	Chassis	Instrument chassis	> 10M	✓
25	Red. power return	Chassis	Instrument chassis	100k	99,9k

✓

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

Cleanbench TVac (28.03.17)

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	✓
13	Red. power	25	Red. power ret.	28 or 0 *	✓
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	✓
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

28.04 V *
~~28.08 V~~ *
✓
0 V
0 V
0 V
28,05 V *
28,04 V *
* tested nom & red heater power supply
✓ PaL

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	28 V
Current	100 mA ± 5 mA	100 mA

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

SFT successful on NOM & RED thresholds after direct purge:

1X1: <L>: 6,44 <S>: 5,00

1X2: <L>: 6,12 <S>: 5,12

✓ Lauri

pulser widths nominal (3, 6)

Post-transportation & pre-vibration test at Airbus DS Portsmouth

4.9 As Run Functional Test Report

Date and Time	Pol 17.05.17 11:00 CEST

4.9.1 Functional Test Readiness

Location	Airbus DS vibration test
Personnel	Lauri, Mike
Instrument ID	STEP FS
Firmware revision	
Reason for FT	
Test to be performed	FT

4.9.2 FT Constraints (if applicable)

Safe-to-mate	~~x~~ ✓
Impedance check	~~x~~ ✓
Set up communication	✓
Additional constraints	

Humidity indicator ~ 50-60 %
shock indicator OK

4.3 Unit Impedance Check

J. Mills Fluke 110 Multimeter ± 2 Ω offset

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	17.9 kΩ
Thermistor 2	2	10	15k to 20k *	17.8 kΩ
Thermistor 3	3	11	15k to 20k *	17.8 kΩ
Survival Heaters 1	7	14	119	118.8Ω
Survival Heaters 2	8	15	119	119.8 Ω

Nur2

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

2017-05-

Note offset

MDM25 Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	1.4Ω 0.8Ω mΩ
Chassis	Instrument chassis	24	Chassis gnd	< 1	0.8 Ω mΩ
Chassis	Instrument chassis	1	Nom. power	> 10M	✓
14	Nom. power return	1	Nom. power	> 10M	✓
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	✓
25	Red. power return	13	Red. power	> 10M	✓
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	103.7 Ω
6	CLK I2S+	19	CLK I2S-	100	103.7Ω
8	LVDS S2I+	21	LVDS S2I-	50	53.7Ω
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	103.9 Ω
7	CLK I2S+	20	CLK I2S-	100	104.4 Ω
10	LVDS S2I-	22	LVDS S2I+	50	53.1Ω
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	✓
3	DGND	Chassis	Instrument chassis	< 1	1.8Ω
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	✓
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	✓
6	CLK I2S+	Chassis	Instrument chassis	> 10M	✓
7	CLK I2S+	Chassis	Instrument chassis	> 10M	✓
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	✓
9	NC	Chassis	Instrument chassis	> 10M	✓
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	✓
11	DGND.	Chassis	Instrument chassis	< 1	1.9Ω
12	NC	Chassis	Instrument chassis	> 10M	✓
14	Nom. power return	Chassis	Instrument chassis	100k	100kΩ
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	✓
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	✓
18	NC	Chassis	Instrument chassis	> 10M	✓
19	CLK I2S-	Chassis	Instrument chassis	> 10M	✓
20	CLK I2S-	Chassis	Instrument chassis	> 10M	✓
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	✓
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	✓
23	NC	Chassis	Instrument chassis	> 10M	✓
25	Red. power return	Chassis	Instrument chassis	100k	100kΩ

mΩ

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

Y-harness: NOM ↓ RED ↓

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	28.0
13	Red. power	25	Red. power ret.	28 or 0 *	0
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	✓
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

0 28.0 ✓ MMR

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

NOM | RED

Parameter	Expected	Measured
Voltage	28.0 V	28.0
Current	100 mA ± 5 mA	0,09

0.09A

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

SFT results: RED: all passed
NOM: all passed

Large pixel thresholds: IX0: 6,75
IA1: 6,31

After X-RANDOM

4.9 As Run Functional Test Report

Date and Time	17.05.17 1730 CEST

4.9.1 Functional Test Readiness

Location	as before
Personnel	
Instrument ID	
Firmware revision	
Reason for FT	
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	~~✓~~
Impedance check	✓
Set up communication	✓
Additional constraints	

2017-05-17 Post V-Revision

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	17,3k Ω
Thermistor 2	2	10	15k to 20k *	17,2kΩ
Thermistor 3	3	11	15k to 20k *	17,2kΩ
Survival Heaters 1	7	14	119	119,5Ω
Survival Heaters 2	8	15	119	120,3Ω

mvr

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25 Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0.8Ω
Chassis	Instrument chassis	24	Chassis gnd	< 1	0.8Ω
Chassis	Instrument chassis	1	Nom. power	> 10M	✓
14	Nom. power return	1	Nom. power	> 10M	✓
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	✓
25	Red. power return	13	Red. power	> 10M	✓
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	103.5Ω
6	CLK I2S+	19	CLK I2S-	100	103.6Ω
8	LVDS S2I+	21	LVDS S2I-	50	52.4Ω
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	103.3Ω
7	CLK I2S+	20	CLK I2S-	100	103.4Ω
10	LVDS S2I-	22	LVDS S2I+	50	52.2Ω
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	✓
3	DGND	Chassis	Instrument chassis	< 1	0.9Ω
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	✓
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	✓
6	CLK I2S+	Chassis	Instrument chassis	> 10M	✓
7	CLK I2S+	Chassis	Instrument chassis	> 10M	✓
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	✓
9	NC	Chassis	Instrument chassis	> 10M	✓
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	✓
11	DGND.	Chassis	Instrument chassis	< 1	0.4Ω
12	NC	Chassis	Instrument chassis	> 10M	✓
14	Nom. power return	Chassis	Instrument chassis	100k	100kΩ
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	✓
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	✓
18	NC	Chassis	Instrument chassis	> 10M	✓
19	CLK I2S-	Chassis	Instrument chassis	> 10M	✓
20	CLK I2S-	Chassis	Instrument chassis	> 10M	✓
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	✓
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	✓
23	NC	Chassis	Instrument chassis	> 10M	✓
25	Red. power return	Chassis	Instrument chassis	100k	100.0kΩ

MMG
2017-05-17
post Kuvis Rautio

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured NOM	RED
Voltage	28.0 V	28,0	28,0
Current	100 mA ± 5 mA	0,10 A	0,10 A

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

STI: NOM: all tests passed
RED: " "

thresholds: (mean, large) 1X0: 6,69
1X1: 6,38

thresholds saved in step/data/thresholds-FS.txt

4.9 As Run Functional Test Report

Date and Time	18.05.17 1140

4.9.1 Functional Test Readiness

Location	Airbus DS Portsmouth unit test
Personnel	Laura, Mike
Instrument ID	STEP FS
Firmware revision	
Reason for FT	
Test to be performed	all unit tests

4.9.2 FT Constraints (if applicable)

Safe-to-mate	✓
Impedance check	✓
Set up communication	✓
Additional constraints	

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	17,3 kΩ
Thermistor 2	2	10	15k to 20k *	17,1 kΩ
Thermistor 3	3	11	15k to 20k *	17,2 kΩ
Survival Heaters 1	7	14	119	119,3 Ω
Survival Heaters 2	8	15	119	120,2 Ω

MMP

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0.9Ω
Chassis	Instrument chassis	24	Chassis gnd	< 1	0.7Ω
Chassis	Instrument chassis	1	Nom. power	> 10M	✓
14	Nom. power return	1	Nom. power	> 10M	✓
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	✓
25	Red. power return	13	Red. power	> 10M	✓
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	102.5 Ω
6	CLK I2S+	19	CLK I2S-	100	102.6 Ω
8	LVDS S2I+	21	LVDS S2I-	50	51.8Ω
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	102.6 Ω
7	CLK I2S+	20	CLK I2S-	100	102.8Ω
10	LVDS S2I-	22	LVDS S2I+	50	51.6Ω
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	✓
3	DGND	Chassis	Instrument chassis	< 1	0.8Ω
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	✓
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	✓
6	CLK I2S+	Chassis	Instrument chassis	> 10M	✓
7	CLK I2S+	Chassis	Instrument chassis	> 10M	✓
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	✓
9	NC	Chassis	Instrument chassis	> 10M	✓
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	✓
11	DGND.	Chassis	Instrument chassis	< 1	0.5Ω
12	NC	Chassis	Instrument chassis	> 10M	✓
14	Nom. power return	Chassis	Instrument chassis	100k	100.0kΩ
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	✓
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	✓
18	NC	Chassis	Instrument chassis	> 10M	✓
19	CLK I2S-	Chassis	Instrument chassis	> 10M	✓
20	CLK I2S-	Chassis	Instrument chassis	> 10M	✓
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	✓
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	✓
23	NC	Chassis	Instrument chassis	> 10M	✓
25	Red. power return	Chassis	Instrument chassis	100k	100.0kΩ

✓ 2017-05-18 post B-Rack

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

NOM RED

Parameter	Expected	Measured	
Voltage	28.0 V	28,0V	28,0V
Current	100 mA ± 5 mA	100mA	100mA

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

SFT: NOM: all tests passed
RED: " "

Started testpulse at 12:00
stopped at ~ 13:00

mean Large pixel thresholds:
1x0: 6,81
1x1: 6,38

Post-transportation test after env. tests in Kiel

4.9 As Run Functional Test Report

Date and Time	19.05.17 1400

4.9.1 Functional Test Readiness

Location	Kiel cleanroom
Personnel	Lauri
Instrument ID	STEP FS
Firmware revision	
Reason for FT	
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	✓
Set up communication	✓
Additional constraints	

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	17,4 kΩ
Thermistor 2	2	10	15k to 20k *	17,3kΩ
Thermistor 3	3	11	15k to 20k *	17,3kΩ
Survival Heaters 1	7	14	119	118,3Ω
Survival Heaters 2	8	15	119	119,2Ω

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0,4
Chassis	Instrument chassis	24	Chassis gnd	< 1	0,4
Chassis	Instrument chassis	1	Nom. power	> 10M	✓
14	Nom. power return	1	Nom. power	> 10M	✓
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	✓
25	Red. power return	13	Red. power	> 10M	✓
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	102,3
6	CLK I2S+	19	CLK I2S-	100	102,4
8	LVDS S2I+	21	LVDS S2I-	50	51,4
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	102,4
7	CLK I2S+	20	CLK I2S-	100	102,5
10	LVDS S2I-	22	LVDS S2I+	50	51,4
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	✓
3	DGND	Chassis	Instrument chassis	< 1	0,7
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	✓
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	✓
6	CLK I2S+	Chassis	Instrument chassis	> 10M	✓
7	CLK I2S+	Chassis	Instrument chassis	> 10M	✓
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	✓
9	NC	Chassis	Instrument chassis	> 10M	✓
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	✓
11	DGND.	Chassis	Instrument chassis	< 1	0,7
12	NC	Chassis	Instrument chassis	> 10M	✓
14	Nom. power return	Chassis	Instrument chassis	100k	99,9k
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	✓
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	✓
18	NC	Chassis	Instrument chassis	> 10M	✓
19	CLK I2S-	Chassis	Instrument chassis	> 10M	✓
20	CLK I2S-	Chassis	Instrument chassis	> 10M	✓
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	✓
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	✓
23	NC	Chassis	Instrument chassis	> 10M	✓
25	Red. power return	Chassis	Instrument chassis	100k	99,9k

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 100 mA at 28 V, so about 2.8 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 100 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

RED NOM

Parameter	Expected	Measured	
Voltage	28.0 V	28,0V	28,0V
Current	100 mA ± 5 mA	96mA	94mA

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

STI: RED: all tests passed
NOM: — "—

<1x0L>: 6,81
<1x1L>: 6,49

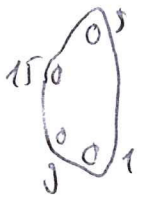
1st functional test after NCR-0040 LVPS rework 2

26.04.17 M. Gerda L. Dannert

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	17,68kΩ
Thermistor 2	2	10	15k to 20k *	17,53kΩ
Thermistor 3	3	11	15k to 20k *	17,56kΩ
Survival Heaters 1	7	14	119	118,3Ω
Survival Heaters 2	8	15	119	119,3Ω



V

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

26-04-2017
Laura P
Hakem Y

After re-assembly of LVPS board

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0.6
Chassis	Instrument chassis	24	Chassis gnd	< 1	0.6
Chassis	Instrument chassis	1	Nom. power	> 10M	OL
14	Nom. power return	1	Nom. power	> 10M	OL
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	OL
25	Red. power return	13	Red. power	> 10M	OL
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	102.5
6	CLK I2S+	19	CLK I2S-	100	102.5
8	LVDS S2I+	21	LVDS S2I-	50	51.5
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	102.4
7	CLK I2S+	20	CLK I2S-	100	102.4
10	LVDS S2I-	22	LVDS S2I+	50	51.4
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	OL
3	DGND	Chassis	Instrument chassis	< 1	0.5
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	OL
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	OL
6	CLK I2S+	Chassis	Instrument chassis	> 10M	OL
7	CLK I2S+	Chassis	Instrument chassis	> 10M	OL
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	OL
9	NC	Chassis	Instrument chassis	> 10M	OL
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	OL
11	DGND.	Chassis	Instrument chassis	< 1	0.4
12	NC	Chassis	Instrument chassis	> 10M	OL
14	Nom. power return	Chassis	Instrument chassis	100k	99.9K
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	OL
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	OL
18	NC	Chassis	Instrument chassis	> 10M	OL
19	CLK I2S-	Chassis	Instrument chassis	> 10M	OL
20	CLK I2S-	Chassis	Instrument chassis	> 10M	OL
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	OL
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	OL
23	NC	Chassis	Instrument chassis	> 10M	OL
25	Red. power return	Chassis	Instrument chassis	100k	99.9K

✓

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	17.68 kΩ
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	17.53 kΩ
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	17.56 kΩ
7	Surv Heaters 1	14	Surv Heaters 1	28	118.3 Ω
8	Surv Heaters 2	15	Surv Heaters 2	28	119.3 Ω

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 110 mA at 28 V, so about 3.1 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 110 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	2.8 V
Current	107 mA ± 5 mA	97 mA

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

4.9 As Run Functional Test Report

Date and Time	26-04-2017 & 12:20

4.9.1 Functional Test Readiness

Location	IEAP Kiel, Cleanroom
Personnel	Lauri J. Mahoney
Instrument ID	STEP FS
Firmware revision	
Reason for FT	After installing the LVPS board
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	✓
Set up communication	
Additional constraints	

SFT - Pass.

Threshold results are documented in the thresholds_FS.txt [on asterix].

STEP FS incoming inspection test in Kiel after EMC test 13.01.17 Lauri

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	17,70k
Thermistor 2	2	10	15k to 20k *	17,51k
Thermistor 3	3	11	15k to 20k *	17,55k
Survival Heaters 1	7	14	119	118,7
Survival Heaters 2	8	15	119	119,7

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	1,0
Chassis	Instrument chassis	24	Chassis gnd	< 1	1,0
Chassis	Instrument chassis	1	Nom. power	> 10M	OL
14	Nom. power return	1	Nom. power	> 10M	OL
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	OL
25	Red. power return	13	Red. power	> 10M	OL
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	102,8
6	CLK I2S+	19	CLK I2S-	100	102,8
8	LVDS S2I+	21	LVDS S2I-	50	51,8
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	102,8
7	CLK I2S+	20	CLK I2S-	100	102,9
10	LVDS S2I-	22	LVDS S2I+	50	51,8
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	OL
3	DGND	Chassis	Instrument chassis	< 1	1,0
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	OL
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	OL
6	CLK I2S+	Chassis	Instrument chassis	> 10M	OL
7	CLK I2S+	Chassis	Instrument chassis	> 10M	OL
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	OL
9	NC	Chassis	Instrument chassis	> 10M	OL
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	OL
11	DGND.	Chassis	Instrument chassis	< 1	1,1
12	NC	Chassis	Instrument chassis	> 10M	OL
14	Nom. power return	Chassis	Instrument chassis	100k	99,8
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	OL
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	OL
18	NC	Chassis	Instrument chassis	> 10M	OL
19	CLK I2S-	Chassis	Instrument chassis	> 10M	OL
20	CLK I2S-	Chassis	Instrument chassis	> 10M	OL
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	OL
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	OL
23	NC	Chassis	Instrument chassis	> 10M	OL
25	Red. power return	Chassis	Instrument chassis	100k	99,8

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 110 mA at 28 V, so about 3.1 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 110 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	28.0
Current	107 mA ± 5 mA	100

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

NOM: SFT OK

RED: SFT OK

Successful !

4.9 As Run Functional Test Report

Date and Time	

4.9.1 Functional Test Readiness

Location	
Personnel	
Instrument ID	
Firmware revision	
Reason for FT	
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	
Set up communication	
Additional constraints	

STEP FS EMC testing at Portsmouth ADS

06.02.17

setup ✓

07.02.17

bonding ✓

inrush 26V: ✓ 28V: ✓ 29V: ✓

/data/ebsolo1/step/data/FS/EMC/...

CE-CM-TD: 2017-02-07_13-25_emc_cecmtd.* (calib)
(calib-mode ✓)

CE-DM-TD: 2017-02-07_13-55_emc_cedmtd.* (calib)
2017-02-07_14-15_emc-cedmtd_nom.* (nominal)

CE-DM-CM-FD: 2017-02-07_emc_cedmcmfd_nom.* ✓
(nominal

RE-30M-16: 2017-02-07_emc:re-30M-16_nom.*

08.02.17

~~RE-Xk~~ RE-Xband-notch1: ~~2017-02-08_09-2~~ ~~2017-02-08_emc_xband1_nom.*~~
2017-02-08_09-45_emc_xband1_nom.*

09.02.17

~~RE~~
RE-Xband-notch2: 2017-02-09_11-00_emc_xband2_nom.*
RE-efield: 2017-02-09_14-45_emc_efield_nom.*

10.02.17

RE-efield: 2017-02-10_08-55_emc_efield2_nom.*

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1): @ 21.5°C

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	19.6K
Thermistor 2	2	10	15k to 20k *	19.4K
Thermistor 3	3	11	15k to 20k *	19.4K
Survival Heaters 1	7	14	119	118.4
Survival Heaters 2	8	15	119	119.5

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0.5
Chassis	Instrument chassis	24	Chassis gnd	< 1	0.5
Chassis	Instrument chassis	1	Nom. power	> 10M	OL
14	Nom. power return	1	Nom. power	> 10M	OL
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	OL
25	Red. power return	13	Red. power	> 10M	OL
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	102.5
6	CLK I2S+	19	CLK I2S-	100	102.5
8	LVDS S2I+	21	LVDS S2I-	50	51.6
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	102.5
7	CLK I2S+	20	CLK I2S-	100	102.5
10	LVDS S2I-	22	LVDS S2I+	50	51.6
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	OL
3	DGND	Chassis	Instrument chassis	< 1	0.5
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	OL
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	OL
6	CLK I2S+	Chassis	Instrument chassis	> 10M	OL
7	CLK I2S+	Chassis	Instrument chassis	> 10M	OL
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	OL
9	NC	Chassis	Instrument chassis	> 10M	OL
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	OL
11	DGND.	Chassis	Instrument chassis	< 1	0.5
12	NC	Chassis	Instrument chassis	> 10M	OL
14	Nom. power return	Chassis	Instrument chassis	100k	99.9K
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	OL
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	OL
18	NC	Chassis	Instrument chassis	> 10M	OL
19	CLK I2S-	Chassis	Instrument chassis	> 10M	OL
20	CLK I2S-	Chassis	Instrument chassis	> 10M	OL
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	OL
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	OL
23	NC	Chassis	Instrument chassis	> 10M	OL
25	Red. power return	Chassis	Instrument chassis	100k	99.9K

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	27.93
13	Red. power	25	Red. power ret.	28 or 0 *	0
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	< 3
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 110 mA at 28 V, so about 3.1 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 110 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	
Current	107 mA ± 5 mA	

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

4.9 As Run Functional Test Report

Date and Time	06.02.17 ~~10~~ 10:40 GMT

4.9.1 Functional Test Readiness

Location	Portsmouth, UK; ADS EMC fac. test chamber
Personnel	Ali, Mike, Christoph
Instrument ID	STEP FS
~~Firmware~~ software revision	5374
Reason for FT	post-transport FT
Test to be performed	imp. check MDM 15+25, safe-to-mate, power cons. op.

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	
Set up communication	
Additional constraints	

communication setup: ✓

SFT: ✓

ad-hoc perf. test: 1X0: ✓ 1X1: ✓

calibration mode: ✓

fn: 2017-02-06_11-35_emc_posttrans.*

14.12.16
STEP FS TVAC calibration

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	
Thermistor 2	2	10	15k to 20k *	
Thermistor 3	3	11	15k to 20k *	
Survival Heaters 1	7	14	118	
Survival Heaters 2	8	15	118	

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	<1	
Chassis	Instrument chassis	24	Chassis gnd	<1	
Chassis	Instrument chassis	1	Nom. power	$>10M$	
14	Nom. power return	1	Nom. power	$>10M$	
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	$>10M$	
25	Red. power return	13	Red. power	$>10M$	
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	
6	CLK I2S+	19	CLK I2S-	100	
8	LVDS S2I+	21	LVDS S2I-	50	
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	
7	CLK I2S+	20	CLK I2S-	100	
10	LVDS S2I-	22	LVDS S2I+	50	
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	$>10M$	
3	DGND	Chassis	Instrument chassis	<1	
4	LVDS I2S-	Chassis	Instrument chassis	$>10M$	
5	LVDS I2S-	Chassis	Instrument chassis	$>10M$	
6	CLK I2S+	Chassis	Instrument chassis	$>10M$	
7	CLK I2S+	Chassis	Instrument chassis	$>10M$	
8	LVDS S2I+	Chassis	Instrument chassis	$>10M$	
9	NC	Chassis	Instrument chassis	$>10M$	
10	LVDS S2I-	Chassis	Instrument chassis	$>10M$	
11	DGND.	Chassis	Instrument chassis	<1	
12	NC	Chassis	Instrument chassis	$>10M$	
14	Nom. power return	Chassis	Instrument chassis	100k	
16	LVDS I2S+	Chassis	Instrument chassis	$>10M$	
17	LVDS I2S+	Chassis	Instrument chassis	$>10M$	
18	NC	Chassis	Instrument chassis	$>10M$	
19	CLK I2S-	Chassis	Instrument chassis	$>10M$	
20	CLK I2S-	Chassis	Instrument chassis	$>10M$	
21	LVDS S2I-	Chassis	Instrument chassis	$>10M$	
22	LVDS S2I+	Chassis	Instrument chassis	$>10M$	
23	NC	Chassis	Instrument chassis	$>10M$	
25	Red. power return	Chassis	Instrument chassis	100k	

13-12-2016

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	28
13	Red. power	25	Red. power ret.	28 or 0 *	0
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	✓
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 110 mA at 28 V, so about 3.1 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 110 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	28V
Current	107 mA ± 5 mA	110mA / 107 after reset V

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below. **This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

4.9 As Run Functional Test Report

Date and Time	14.12.16 1200

4.9.1 Functional Test Readiness

Location	Kiel clean room
Personnel	Mahesh, Robot, Lauri
Instrument ID	STEP FS
Firmware revision	
Reason for FT	
Test to be performed	SFT, Safe to mate

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	
Set up communication	
Additional constraints	

4.9.3 FT Details

Step #	Activity	Result
1	Data file name if applicable	
2	Test started / stopped	
3	Test result	✓
4	Comments	
Signatures		

2017-01-25
pre test for Vibration

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	17.70 kΩ
Thermistor 2	2	10	15k to 20k *	17.55 kΩ
Thermistor 3	3	11	15k to 20k *	17.58 kΩ
Survival Heaters 1	7	14	119	119.2 Ω
Survival Heaters 2	8	15	119	120.2 Ω

2017-01-25
0950
MM

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms	Temp. °C	Ohms
-60	1,342,000	20	18,410
-55	957,000	22	16,950
-50	690,000	24	15,620
-45	503,700	25	15,000
-40	371,300	26	14,410
-35	276,200	28	13,310
-30	207,500	30	12,300
-25	157,200	32	11,370
-20	120,100	34	10,530
-15	92,600	36	9,756
-10	71,940	38	9,047
-5	56,310	40	8,397
0	44,420	42	7,800
2	40,490	44	7,253
4	36,930	46	6,747
6	33,740	48	6,282
8	30,840	50	5,855
10	28,230	52	5,460
12	25,860	54	5,096
14	23,720	56	4,758
16	21,780	58	4,448
18	20,010	60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

2017-01-25

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	1.5 Ω
Chassis	Instrument chassis	24	Chassis gnd	< 1	1.2 Ω
Chassis	Instrument chassis	1	Nom. power	> 10M	Open
14	Nom. power return	1	Nom. power	> 10M	Open
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	Open
25	Red. power return	13	Red. power	> 10M	Open
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	104.1 Ω
6	CLK I2S+	19	CLK I2S-	100	104.2 Ω
8	LVDS S2I+	21	LVDS S2I-	50	53.5 Ω
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	104.1Ω
7	CLK I2S+	20	CLK I2S-	100	104.2Ω
10	LVDS S2I-	22	LVDS S2I+	50	53.1Ω
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	Open
3	DGND	Chassis	Instrument chassis	< 1	0.9Ω
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	Open
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	Open
6	CLK I2S+	Chassis	Instrument chassis	> 10M	Open
7	CLK I2S+	Chassis	Instrument chassis	> 10M	Open
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	Open
9	NC	Chassis	Instrument chassis	> 10M	Open
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	Open
11	DGND.	Chassis	Instrument chassis	< 1	0.8Ω
12	NC	Chassis	Instrument chassis	> 10M	Open
14	Nom. power return	Chassis	Instrument chassis	100k	99.9 kΩ
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	Open
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	Open
18	NC	Chassis	Instrument chassis	> 10M	Open
19	CLK I2S-	Chassis	Instrument chassis	> 10M	Open
20	CLK I2S-	Chassis	Instrument chassis	> 10M	Open
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	Open
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	Open
23	NC	Chassis	Instrument chassis	> 10M	Open
25	Red. power return	Chassis	Instrument chassis	100k	99.9 kΩ

0.8Ω
1.0Ω

Mwo 10:05

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 110 mA at 28 V, so about 3.1 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 110 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Power ON 10:09

Parameter	Expected	Measured
Voltage	28.0 V	27.9 V
Current	107 mA ± 5 mA	0.10 A

MuR

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

SFT Red ok, Nom ok
Threshold test: IdeFix1 very good
IdeFix2 good 10:18 MuR

Data file FS_thresholds.txt

4.9 As Run Functional Test Report

Date and Time	2017-01-25 09:40

4.9.1 Functional Test Readiness

Location	ADS Portsmouth EVT 1
Personnel	L. Ponitsch, L. Seimetz, M. Richter, A. Baranbak
Instrument ID	STEP FS
Firmware revision	
Reason for FT	Pre vibration test
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	NA, Performed 2017-01-23 in STEP PQM Shock test
Impedance check	
Set up communication	
Additional constraints	

After transport
Shock indicator ok
Humidity 40-58 %
No damage bags or container

2017-01-26
Vibration Test
After Y-axis

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	
Thermistor 2	2	10	15k to 20k *	
Thermistor 3	3	11	15k to 20k *	
Survival Heaters 1	7	14	119	
Survival Heaters 2	8	15	119	

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

2017-01-26
Post Y-axis Vibe

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	1.2 Ω
Chassis	Instrument chassis	24	Chassis gnd	< 1	1.5 Ω
Chassis	Instrument chassis	1	Nom. power	> 10M	Open
14	Nom. power return	1	Nom. power	> 10M	Open
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	Open
25	Red. power return	13	Red. power	> 10M	Open
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	103.8 Ω
6	CLK I2S+	19	CLK I2S-	100	103.9 Ω
8	LVDS S2I+	21	LVDS S2I-	50	52.9 Ω
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	103.8 Ω
7	CLK I2S+	20	CLK I2S-	100	104.0 Ω
10	LVDS S2I-	22	LVDS S2I+	50	52.8 Ω
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	Open
3	DGND	Chassis	Instrument chassis	< 1	1.9 Ω
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	Open
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	Open
6	CLK I2S+	Chassis	Instrument chassis	> 10M	Open
7	CLK I2S+	Chassis	Instrument chassis	> 10M	Open
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	Open
9	NC	Chassis	Instrument chassis	> 10M	Open
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	Open
11	DGND.	Chassis	Instrument chassis	< 1	2.1 Ω
12	NC	Chassis	Instrument chassis	> 10M	Open
14	Nom. power return	Chassis	Instrument chassis	100k	99.9 kΩ
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	Open
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	Open
18	NC	Chassis	Instrument chassis	> 10M	Open
19	CLK I2S-	Chassis	Instrument chassis	> 10M	Open
20	CLK I2S-	Chassis	Instrument chassis	> 10M	Open
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	Open
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	Open
23	NC	Chassis	Instrument chassis	> 10M	Open
25	Red. power return	Chassis	Instrument chassis	100k	99.9kΩ

VMR
12:20

2017-01-26
post Y-axis Vibe

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 110 mA at 28 V, so about 3.1 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 110 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

POWER ON

Parameter	Expected	Measured
Voltage	28.0 V	27.9 V
Current	107 mA ± 5 mA	0.10A / 0.10A

1221 / 1225
NOM / RED

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

NOM Communication ok, counter NOM side ok
SFT: NOM ok = pass
RED SFT passs
THRESHOLD: same levels in 20180152 as yesterday (pretest)
Pulser Calibration start 12:30 and 13:38 good

Now
FT passed

4.9 As Run Functional Test Report

Date and Time	2017-01-26 12

4.9.1 Functional Test Readiness

Location	ADS Portsmouth EVT
Personnel	L.P., L.S., A.R., M.R.
Instrument ID	FS
Firmware revision	
Reason for FT	FTest following Y-axis
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	MDM25 connector saver Mated / de Mated
Impedance check	
Set up communication	
Additional constraints	do

2017-01-26
aborted ~~pre~~ - RANDOM in X-axis

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	
Thermistor 2	2	10	15k to 20k *	
Thermistor 3	3	11	15k to 20k *	
Survival Heaters 1	7	14	119	
Survival Heaters 2	8	15	119	

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

2017-01-26
aborted RANDOM ~ X

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	1.2 Ω
Chassis	Instrument chassis	24	Chassis gnd	< 1	1.1 Ω
Chassis	Instrument chassis	1	Nom. power	> 10M	Open
14	Nom. power return	1	Nom. power	> 10M	Open
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	Open
25	Red. power return	13	Red. power	> 10M	Open
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	103.4 Ω
6	CLK I2S+	19	CLK I2S-	100	103.3 Ω
8	LVDS S2I+	21	LVDS S2I-	50	52.4 Ω
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	103.3 Ω
7	CLK I2S+	20	CLK I2S-	100	103.3 Ω
10	LVDS S2I-	22	LVDS S2I+	50	52.2 Ω
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	Open
3	DGND	Chassis	Instrument chassis	< 1	1.9 Ω
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	Open
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	Open
6	CLK I2S+	Chassis	Instrument chassis	> 10M	Open
7	CLK I2S+	Chassis	Instrument chassis	> 10M	Open
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	Open
9	NC	Chassis	Instrument chassis	> 10M	Open
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	Open
11	DGND.	Chassis	Instrument chassis	< 1	0.9 Ω
12	NC	Chassis	Instrument chassis	> 10M	Open
14	Nom. power return	Chassis	Instrument chassis	100k	99.9 kΩ
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	Open
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	Open
18	NC	Chassis	Instrument chassis	> 10M	Open
19	CLK I2S-	Chassis	Instrument chassis	> 10M	Open
20	CLK I2S-	Chassis	Instrument chassis	> 10M	Open
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	Open
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	Open
23	NC	Chassis	Instrument chassis	> 10M	Open
25	Red. power return	Chassis	Instrument chassis	100k	99.9 kΩ

155 K Ohm

2017-01-26
ABORTED - RANDOM ii X

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 110 mA at 28 V, so about 3.1 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 110 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Current limit 360 mA

Parameter	Expected	Measured
Voltage	28.0 V	27.8 V
Current	107 mA ± 5 mA	0.10 A (Red) / 0.110 A (Nom)

1558 ok Mark

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below. **This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

- Red: Communication, SFT ok
- Nom: Comm ok, SFT ok, Thresholds unchanged, ok
- Pulse test ok
- thresholds ok
- SFT ok
- nominal ok

4.9 As Run Functional Test Report

Date and Time	2017-01-26 1600

4.9.1 Functional Test Readiness

Location	ADS PORTSMOUTH EVT
Personnel	
Instrument ID	FS
Firmware revision	
Reason for FT	Abnormal high level status RANDOM, ABORTED
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	
Set up communication	
Additional constraints	

2017-01-26
18 10

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	
Thermistor 2	2	10	15k to 20k *	
Thermistor 3	3	11	15k to 20k *	
Survival Heaters 1	7	14	119	
Survival Heaters 2	8	15	119	

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	1.5 Ω
Chassis	Instrument chassis	24	Chassis gnd	< 1	1.5 Ω
Chassis	Instrument chassis	1	Nom. power	> 10M	Open
14	Nom. power return	1	Nom. power	> 10M	Ope
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	Open
25	Red. power return	13	Red. power	> 10M	Open
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	104.0 Ω
6	CLK I2S+	19	CLK I2S-	100	103.8 Ω
8	LVDS S2I+	21	LVDS S2I-	50	53.0 Ω
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	103.9 Ω
7	CLK I2S+	20	CLK I2S-	100	104.0 Ω
10	LVDS S2I-	22	LVDS S2I+	50	52.9 Ω
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	Open
3	DGND	Chassis	Instrument chassis	< 1	2.1 Ω
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	Open
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	Open
6	CLK I2S+	Chassis	Instrument chassis	> 10M	Open
7	CLK I2S+	Chassis	Instrument chassis	> 10M	Open
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	Open
9	NC	Chassis	Instrument chassis	> 10M	Open
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	Open
11	DGND.	Chassis	Instrument chassis	< 1	2.0 Ω
12	NC	Chassis	Instrument chassis	> 10M	Open
14	Nom. power return	Chassis	Instrument chassis	100k	99.9 kΩ
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	Open
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	Open
18	NC	Chassis	Instrument chassis	> 10M	Open
19	CLK I2S-	Chassis	Instrument chassis	> 10M	Open
20	CLK I2S-	Chassis	Instrument chassis	> 10M	Open
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	Open
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	Open
23	NC	Chassis	Instrument chassis	> 10M	Open
25	Red. power return	Chassis	Instrument chassis	100k	99.9 kΩ

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 110 mA at 28 V, so about 3.1 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 110 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

current limit still set at 350 mA

Parameter	Expected	Measured
Voltage	28.0 V	27.9 V
Current	107 mA ± 5 mA	0.10 A NOM 0.10 A RED

mw2 1821

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

NOM: SFT passed
RED: SFT passed, Thresholds IdxFix1 good, IdxFix2 good, passed.
NOMINAL mode

4.9 As Run Functional Test Report

Date and Time	2017-01-22 1810

4.9.1 Functional Test Readiness

Location	
Personnel	
Instrument ID	
Firmware revision	
Reason for FT	~~Repeated~~ Post LLSS follow RANDOM
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	
Set up communication	
Additional constraints	

2017-01-27 1620
ADS Portsmouth EVT
Final before Transport

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	16.2 kΩ
Thermistor 2	2	10	15k to 20k *	16.07 kΩ
Thermistor 3	3	11	15k to 20k *	16.10 kΩ
Survival Heaters 1	7	14	119	120.5 Ω
Survival Heaters 2	8	15	119	121.5 Ω

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

2017-01-27
post Vide, pre transport

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	1.4 Ω
Chassis	Instrument chassis	24	Chassis gnd	< 1	1.8 Ω
Chassis	Instrument chassis	1	Nom. power	> 10M	open
14	Nom. power return	1	Nom. power	> 10M	open
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	open
25	Red. power return	13	Red. power	> 10M	Open
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	103.4 Ω
6	CLK I2S+	19	CLK I2S-	100	103.5 Ω
8	LVDS S2I+	21	LVDS S2I-	50	52.7 Ω
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	103.7 Ω
7	CLK I2S+	20	CLK I2S-	100	103.7 Ω
10	LVDS S2I-	22	LVDS S2I+	50	52.7 Ω
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	Open
3	DGND	Chassis	Instrument chassis	< 1	1.4 Ω
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	open
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	open
6	CLK I2S+	Chassis	Instrument chassis	> 10M	Open
7	CLK I2S+	Chassis	Instrument chassis	> 10M	Open
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	Open
9	NC	Chassis	Instrument chassis	> 10M	Open
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	Open
11	DGND.	Chassis	Instrument chassis	< 1	1.3 Ω
12	NC	Chassis	Instrument chassis	> 10M	Open
14	Nom. power return	Chassis	Instrument chassis	100k	99.9 kΩ
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	Open
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	Open
18	NC	Chassis	Instrument chassis	> 10M	Open
19	CLK I2S-	Chassis	Instrument chassis	> 10M	Open
20	CLK I2S-	Chassis	Instrument chassis	> 10M	Open
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	Open
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	Open
23	NC	Chassis	Instrument chassis	> 10M	Open
25	Red. power return	Chassis	Instrument chassis	100k	99.9 kΩ

1627 mR

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 110 mA at 28 V, so about 3.1 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 110 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Power ON ca 1630

Parameter	Expected	Measured
Voltage	28.0 V	27.9 V
Current	107 mA ± 5 mA	0.10A (Nom) 0.10A (Red)

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

NOM: SFT ok
RED: SFT ok Timeshifts: Idefix1 very good, Idefix2 very good
leave in nominal mode 1638 -

4.9 As Run Functional Test Report

Date and Time	2017-01-27 1620

4.9.1 Functional Test Readiness

Location	ADS Portsmouth EVT
Personnel	
Instrument ID	
Firmware revision	
Reason for FT	Final before transport
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	
Set up communication	
Additional constraints	Metal saver MDM25 & MDM45

31.01.2017 @ 11:45
Lawi / Mahesh
Clean Room, IEAP
Impedance check after the Vibration test (return from Portsmouth)

4.3 Unit Impedance Check

After transport, before the first connection to the EGSE, and after tests with higher risks to damage the unit the impedances of the unit shall be measured and compared with the expected values as given in the table (based on RD-1):

MDM15				
Name	Pin (+)	Pin (-)	Expected [Ω]	Measurement
Thermistor 1	1	9	15k to 20k *	22.86K
Thermistor 2	2	10	15k to 20k *	21.85K
Thermistor 3	3	11	15k to 20k *	21.78K
Survival Heaters 1	7	14	119	119.9
Survival Heaters 2	8	15	119	120.9

* See figure below, all thermistors are supposed to show similar results depending on the unit's temperature.

Temp. °C	Ohms
-60	1,342,000
-55	957,000
-50	690,000
-45	503,700
-40	371,300
-35	276,200
-30	207,500
-25	157,200
-20	120,100
-15	92,600
-10	71,940
-5	56,310
0	44,420
2	40,490
4	36,930
6	33,740
8	30,840
10	28,230
12	25,860
14	23,720
16	21,780
18	20,010

Temp. °C	Ohms
20	18,410
22	16,950
24	15,620
25	15,000
26	14,410
28	13,310
30	12,300
32	11,370
34	10,530
36	9,756
38	9,047
40	8,397
42	7,800
44	7,253
46	6,747
48	6,282
50	5,855
52	5,460
54	5,096
56	4,758
58	4,448
60	4,160

Figure 3: Thermistor resistivities for various temperatures, taken from the thermistor's datasheet

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [Ω]	Measurement
Nominal power lines and grounding					
Chassis	Instrument chassis	15	Chassis gnd	< 1	0.5
Chassis	Instrument chassis	24	Chassis gnd	< 1	0.5
Chassis	Instrument chassis	1	Nom. power	> 10M	OL
14	Nom. power return	1	Nom. power	> 10M	OL
Redundant power lines					
Chassis	Instrument chassis	13	Red. power	> 10M	OL
25	Red. power return	13	Red. power	> 10M	OL
Nominal communication lines					
4	LVDS I2S-	16	LVDS I2S+	100	102.4
6	CLK I2S+	19	CLK I2S-	100	102.5
8	LVDS S2I+	21	LVDS S2I-	50	51.4
Redundant communication lines					
5	LVDS I2S-	17	LVDS I2S+	100	102.4
7	CLK I2S+	20	CLK I2S-	100	102.5
10	LVDS S2I-	22	LVDS S2I+	50	51.4
not connected (NC) pins					
2	NC	Chassis	Instrument chassis	> 10M	OL
3	DGND	Chassis	Instrument chassis	< 1	0.4
4	LVDS I2S-	Chassis	Instrument chassis	> 10M	OL
5	LVDS I2S-	Chassis	Instrument chassis	> 10M	OL
6	CLK I2S+	Chassis	Instrument chassis	> 10M	OL
7	CLK I2S+	Chassis	Instrument chassis	> 10M	OL
8	LVDS S2I+	Chassis	Instrument chassis	> 10M	OL
9	NC	Chassis	Instrument chassis	> 10M	OL
10	LVDS S2I-	Chassis	Instrument chassis	> 10M	OL
11	DGND.	Chassis	Instrument chassis	< 1	0.4
12	NC	Chassis	Instrument chassis	> 10M	OL
14	Nom. power return	Chassis	Instrument chassis	100k	99.9k
16	LVDS I2S+	Chassis	Instrument chassis	> 10M	OL
17	LVDS I2S+	Chassis	Instrument chassis	> 10M	OL
18	NC	Chassis	Instrument chassis	> 10M	OL
19	CLK I2S-	Chassis	Instrument chassis	> 10M	OL
20	CLK I2S-	Chassis	Instrument chassis	> 10M	OL
21	LVDS S2I-	Chassis	Instrument chassis	> 10M	OL
22	LVDS S2I+	Chassis	Instrument chassis	> 10M	OL
23	NC	Chassis	Instrument chassis	> 10M	OL
25	Red. power return	Chassis	Instrument chassis	100k	99.9k

Paned.

13/01/2017 @ 11:45
Lauri Maher
Clean room, IEAP

4.4 Abbreviated Safe-to-Mate Test and Power Consumption Check

The abbreviated safe-to-mate test shall be performed before the first connection of EGSE to the unit and after transport of the EGSE.

MDM25					
Pin (+)	Signal	Pin (-)	Signal	Expected [V]	Measurement
1	Nom. power	14	Nom. power ret.	28 or 0 *	
13	Red. power	25	Red. power ret.	28 or 0 *	
* 28V expected if connected to the corresponding NOM or RED port, 0V otherwise.					
any other pin		15	Chassis gnd	< 3	
MDM15					
1	Thermistor 1	9	Thermistor 1	tbd by ADS *	
2	Thermistor 2	10	Thermistor 2	tbd by ADS *	
3	Thermistor 3	11	Thermistor 3	tbd by ADS *	
7	Surv Heaters 1	14	Surv Heaters 1	28	
8	Surv Heaters 2	15	Surv Heaters 2	28	

* Voltage and polarity to be defined by ADS, a constant voltage lower than 28 V is expected.

After successful safe-to-mate test, the unit can be powered. The power consumption of the unit is not supposed to change significantly. When powered, the unit shall drain about 110 mA at 28 V, so about 3.1 W. The current limitation of the power supply shall be set to 500 mA. Document the power consumption as part of the standard procedure. This condition resembles the "Unit unconfigured" as per the table below. After configuration of the sensors, the total power consumption is expected to increase to 110 mA ± 5 mA. **For the unconfigured unit (after power ON), or after a "reset"-command after communication has been established:**

Parameter	Expected	Measured
Voltage	28.0 V	28V
Current	~~107 mA~~ ± 5 mA 95 mA	95 mA

To define the units power consumption under the different operational modes and under different supply voltages, document the power consumption under the conditions as given below.**This part of the procedure is required to be conducted only once!**

Condition	28.0 V	Current	26.0 V	Current	29.0 V	Current
Unit unconfigured (after POWER ON)						
Unit in HK mode						
Unit in SCI mode (low activity)						
Unit in SCI mode (high activity, testpulser)						

SFT - Passed

4.9 As Run Functional Test Report

Date and Time	31.01.2017 ; 11:55

4.9.1 Functional Test Readiness

Location	Cleanroom, CAU
Personnel	Lauri / Mahesh
Instrument ID	STEP FS.
Firmware revision	
Reason for FT	
Test to be performed	

4.9.2 FT Constraints (if applicable)

Safe-to-mate	
Impedance check	
Set up communication	
Additional constraints	