

RF-EXPOSURE REPORT FCC 1.1307, 1.1310, 2.1091 RF-Exposure evaluation for wireless power transfer applications	
Report Reference No	G0M-1904-8188-TFCWPTMP-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	 DAkkS - Registration number : D-PL-12092-01-04 FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	Dräger Safety AG & Co. KGaA
Address	Revalstraße 1 23560 Lübeck GERMANY
Standard	FCC 47 CFR 1.1307(b), 1.1310, 2.1091 KDB 680106 D01 v04
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Bump test station for calibration of X-am 8000
Model(s)	X-dock Module X-am 8000+
Additional Model(s)	None
Brand Name(s)	None
Hardware Version(s)	8321894
Software Version(s)	02.02.19
Test Result	PASSED

Possible test case verdicts:		
required by standard but not tested	N/T	
not required by standard	N/R	
test object does meet the requirement	P(PASS)	
test object does not meet the requirement	F(FAIL)	
Testing:		
Test Lab Temperature	15 - 35 °C	
Test Lab Humidity	30 – 50 %	
Date of receipt of test item	2024-02-16	Test Sample ID 47760 Test Sample ID 47761 Test Sample ID 47762 Test Sample ID 47763 Test Sample ID 47764 Test Sample ID 47765 Test Sample ID 47766
Report:		
Compiled by	Stephan Liebich	
Tested by (+ signature) (Responsible for Test)	Burkhard Pudell	
Approved by (+ signature) (Senior Radio Expert)	Radwan Jaafar	
Date of Issue	2024-05-23	
Total number of pages	32	
General Remarks:		
The test results presented in this report relate only to the object tested. The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.		
Additional Comments:		
None		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2024-05-23	Initial Release	--

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
MPE	Maximum Permissible Exposure
WPT	Wireless Power Transfer

REPORT INDEX

1	Equipment (Test Item) Under Test.....	6
1.1	Reference Documents.....	7
1.2	Field strength radiation source	8
1.3	Test Modes	9
1.4	Test Frequencies.....	10
2	Result Summary.....	11
3	RF-Exposure Classification.....	12
4	RF-Exposure Limits	13
5	RF-Exposure Evaluation	14
6	Evaluation Results.....	15
6.1	Test Conditions and Results – Electric and magnetic field strength	15
ANNEX A	Test Set-up	18
ANNEX B	EUT Photos.....	19

1 Equipment (Test Item) Under Test

Description	Bump test station for calibration of X-am 8000	
Model	X-dock Module X-am 8000+	
Additional Model(s)	None	
Brand Name(s)	None	
Serial Number(s)	ARTA-0086	Test Sample ID 47760
	ARTA-0092	Test Sample ID 47761
	ARTA-0091	Test Sample ID 47762
	ARTA-0090	Test Sample ID 47763
	ARTA-0086	Test Sample ID 47764
	ARTA-0159	Test Sample ID 47765
Hardware Version(s)	8321894	
Software Version(s)	02.02.19	
Equipment type	End Product	
Environment	Uncontrolled / General Public	
Operating frequency range [kHz]	70 - 142	

1.1 Reference Documents

Document Type	Document No.	Issued by	Date
FCC Knowledge Database Publication	KDB 680106 D01 v04	FCC	2023-10-24

1.2 Field strength radiation source

Standalone radiation sources					
Mode	Operating Frequency [kHz]	Maximum electric field strength [V/m]	Maximum magnetic field strength [A/m]	Maximum duty cycle [%]	Measurement distance [cm]
Charging	103.515	0.37	0.015	100	20.0 – 24.0
Comment: --					

1.3 Test Modes

Mode	Description
Charging	Mode = Transmit Modulation = CW Duty cycle = 100 % 5 cascaded chargers with charging loads
Comment: The receiver is permanent co-located with transmitter. The chosen mode represents the worst-case.	

1.4 Test Frequencies

Designator	Mode	Channel	Frequency [kHz]
F1	Tx / Rx	0	103.515
Comment: The chosen frequency represents the worst-case.			

2 Result Summary

FCC 1.1307(b), 1.1310, 2.1091				
Product Standard Reference	Requirement	Reference Method	Frequency	Verdict
FCC 1.1307(b)	Maximum permissible exposure	KDB 680106 D01 v04	103.515 kHz	PASS
Comment: --				

3 RF-Exposure Classification

RF-Exposure Categories	
Fixed	A fixed device is defined as a device physically secured at one fixed location and cannot be easily re-located.
Mobile	A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.
Portable	A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.

RF-Exposure Categories	
Occupational	Limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
General public	Exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

4 RF-Exposure Limits

Limits				
Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f ²)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f ²)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30
f = frequency in MHz. * = Plane-wave equivalent power density.				

5 RF-Exposure Evaluation

MPE Evaluation Procedure
The evaluation is performed according KDB 680106 D01 v04 Section 3.2 The magnetic and electric field strength is measured using magnetic and electric isotropic probes at the given separation distance. If possible all six positions (left, right, front, rear, top and bottom) with respect to the combination of transmitter with client device are measured. If one or multiple locations are not accessible, the positions are marked as N/A (not applicable). The measured field strength are compared to the MPE field strength limits given in FCC 1.1310.

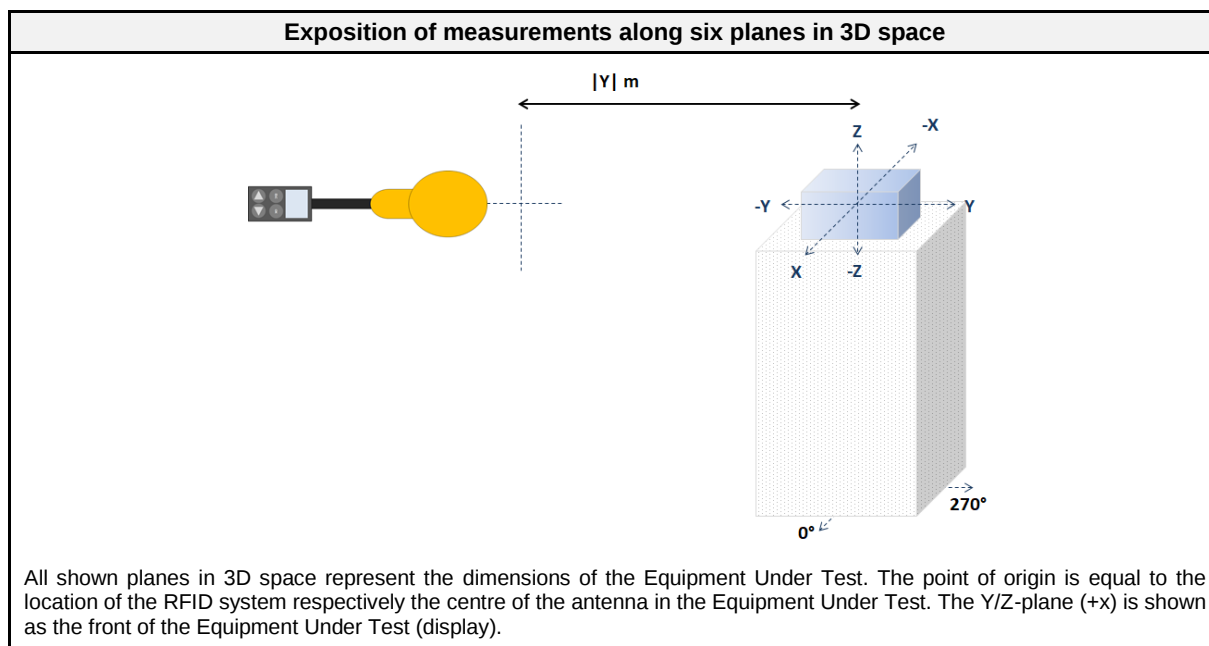
6 Evaluation Results

6.1 Test Conditions and Results – Electric and magnetic field strength

6.1.1 Information

Test Information	
Measurement Method	Radiated only
Operator	Godson Ekezie Offorji
Date	2024-05-22

6.1.2 Setup



6.1.3 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC2	EF00196	–	–
Compact field analyzer	Narda Safety Test Solutions S.r.l.	EHP-50F	EF01830	2023-12	2025-12

6.1.4 Procedure

Test Procedure	
1.	The test was performed in anechoic chamber and the EUT is installed at an 80cm tall table which is constructed of non-metallic material.
2.	Any support equipment used to operate the device shall be placed along the edge with a minimum of 10 cm between each component.
3.	EUT transmitter is activated in test mode under normal conditions.
4.	The perimeter of the EUT is scanned with an electric field probe with a distance of 20, 22 and 24 cm away.
5.	The electric and magnetic field strength is measured.
6.	The maximum field strength values are recorded.

6.1.5 Results

Test Results					
Measurement position	Distance x or y or z [cm]	Max. electric field strength [V/m]	Limit [V/m]	30 % Limit [V/m]	Verdict
Y/Z plane +x	20	0.06	614	184.2	PASS
Y/Z plane -x	20	0.12			
X/Z plane +y	20	0.37			
X/Z plane -y	20	0.07			
X/Y plane +z	20	0.33			
X/Y plane -z	20	0.05			

Test Results					
Measurement position	Distance x or y or z [cm]	Max. magnetic field strength [A/m]	Limit [A/m]	30 % Limit [A/m]	Verdict
Y/Z plane +x	20	0.005	1.63	0.489	PASS
Y/Z plane -x	20	0.005			
X/Z plane +y	20	0.015			
X/Z plane -y	20	0.008			
X/Y plane +z	20	0.008			
X/Y plane -z	20	0.004			

Test Results					
Measurement position	Distance x or y or z [cm]	Max. electric field strength [V/m]	Limit [V/m]	30 % Limit [V/m]	Verdict
Y/Z plane +x	22	0.06	614	184.2	PASS
Y/Z plane -x	22	0.12			
X/Z plane +y	22	0.21			
X/Z plane -y	22	0.08			
X/Y plane +z	22	0.29			
X/Y plane -z	22	0.05			

Test Results					
Measurement position	Distance x or y or z [cm]	Max. magnetic field strength [A/m]	Limit [A/m]	30 % Limit [A/m]	Verdict
Y/Z plane +x	22	0.006	1.63	0.489	PASS
Y/Z plane -x	22	0.005			
X/Z plane +y	22	0.012			
X/Z plane -y	22	0.007			
X/Y plane +z	22	0.007			
X/Y plane -z	22	0.005			

Test Results					
Measurement position	Distance x or y or z [cm]	Max. electric field strength [V/m]	Limit [V/m]	30 % Limit [V/m]	Verdict
Y/Z plane +x	24	0.05	614	184.2	PASS
Y/Z plane -x	24	0.10			
X/Z plane +y	24	0.17			
X/Z plane -y	24	0.07			
X/Y plane +z	24	0.23			
X/Y plane -z	24	0.04			

Test Results					
Measurement position	Distance x or y or z [cm]	Max. magnetic field strength [A/m]	Limit [A/m]	30 % Limit [A/m]	Verdict
Y/Z plane +x	24	0.005	1.63	0.489	PASS
Y/Z plane -x	24	0.005			
X/Z plane +y	24	0.009			
X/Z plane -y	24	0.006			
X/Y plane +z	24	0.006			
X/Y plane -z	24	0.004			

ANNEX A Test Set-up



ANNEX B EUT Photos

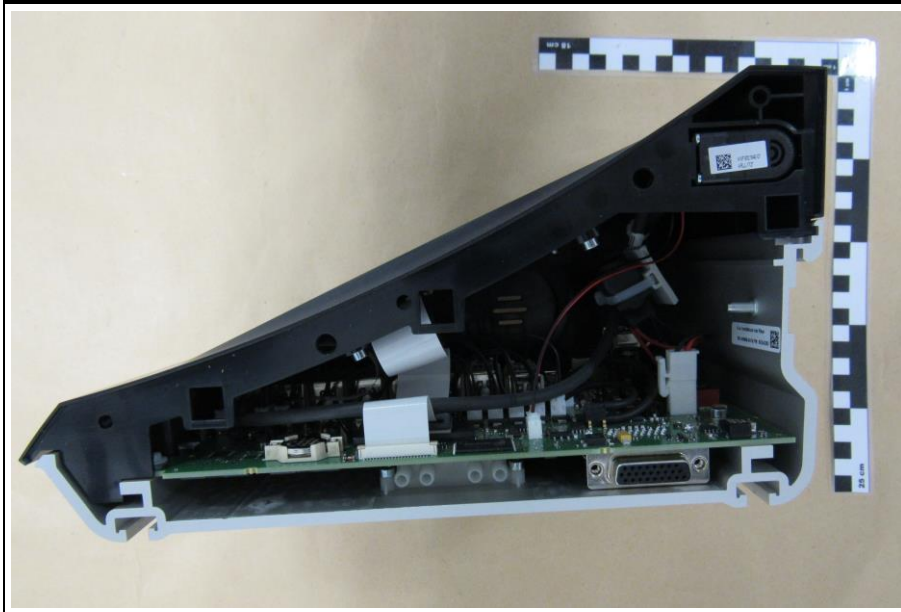
Top View With 1 Stackable Charging Dock



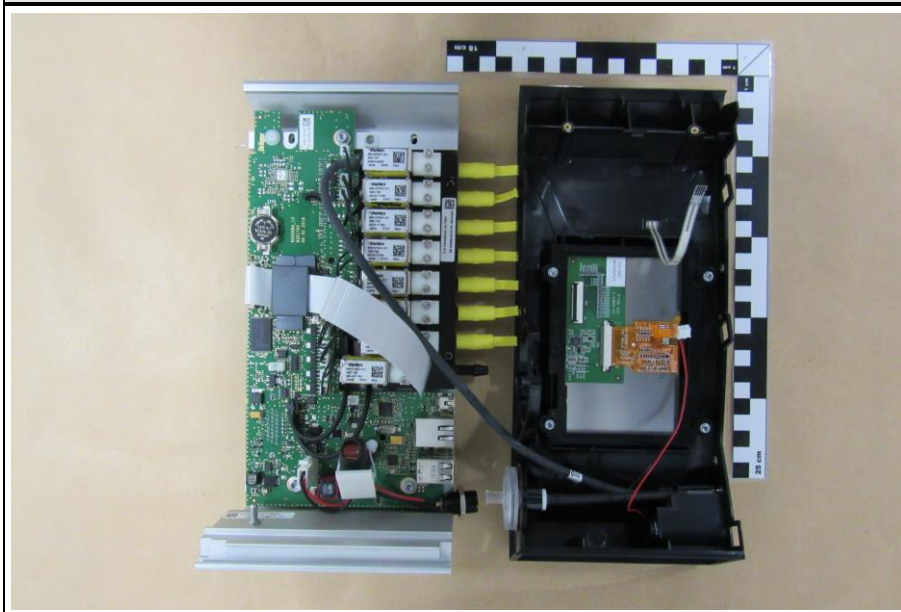
L-Side View



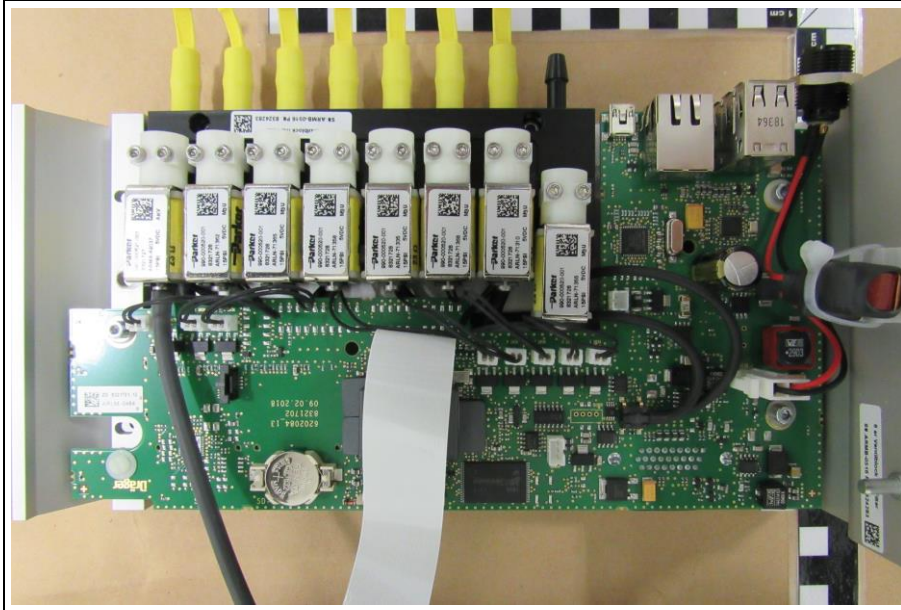
R-Side View



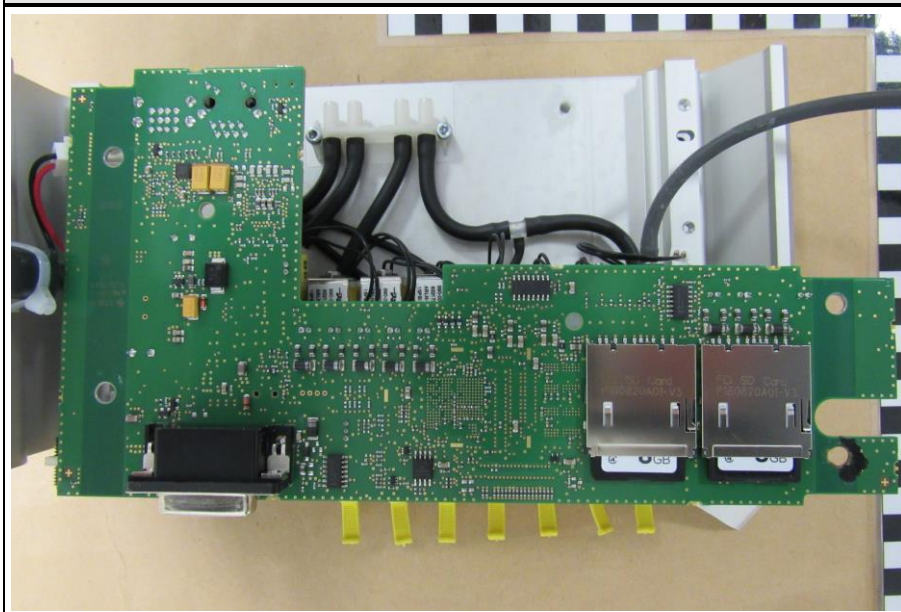
Inside View A

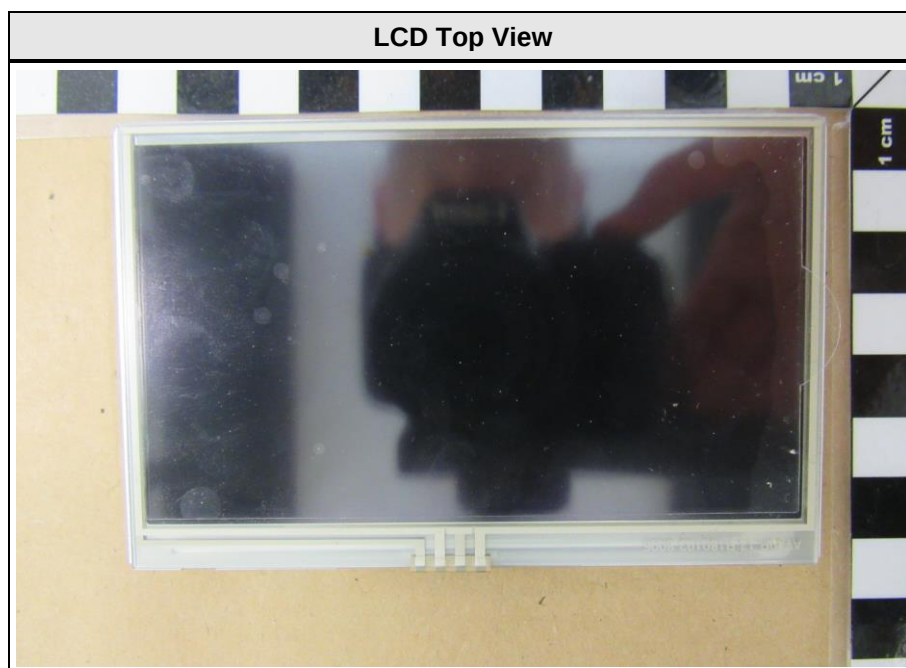
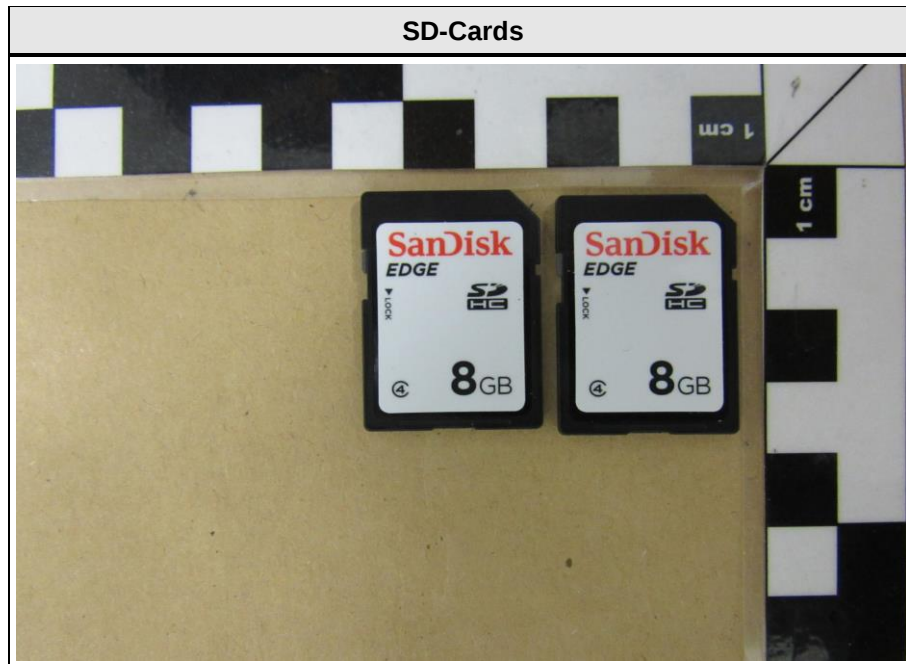


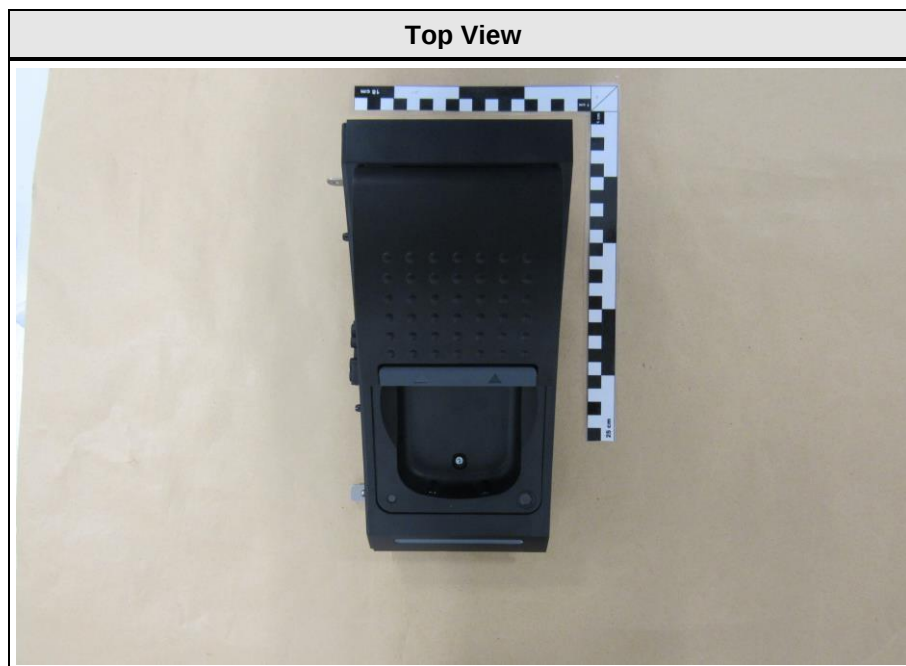
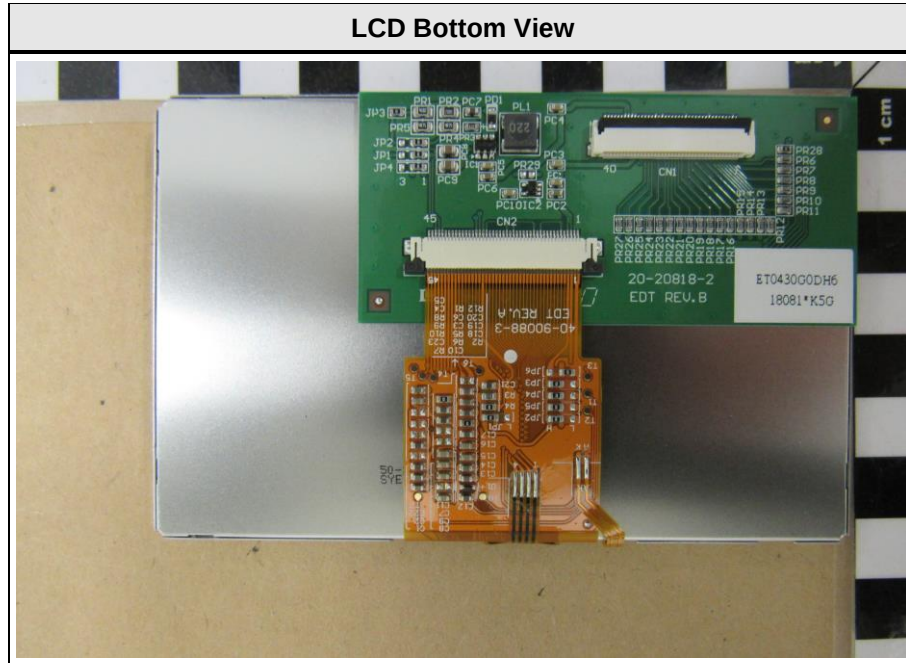
Main PCB Top



Main PCB Bottom



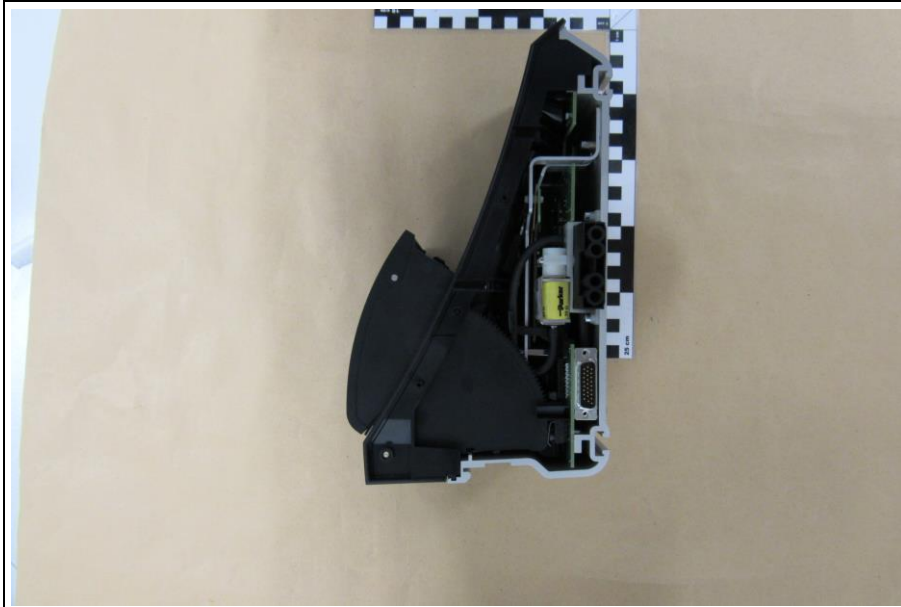




Bottom View



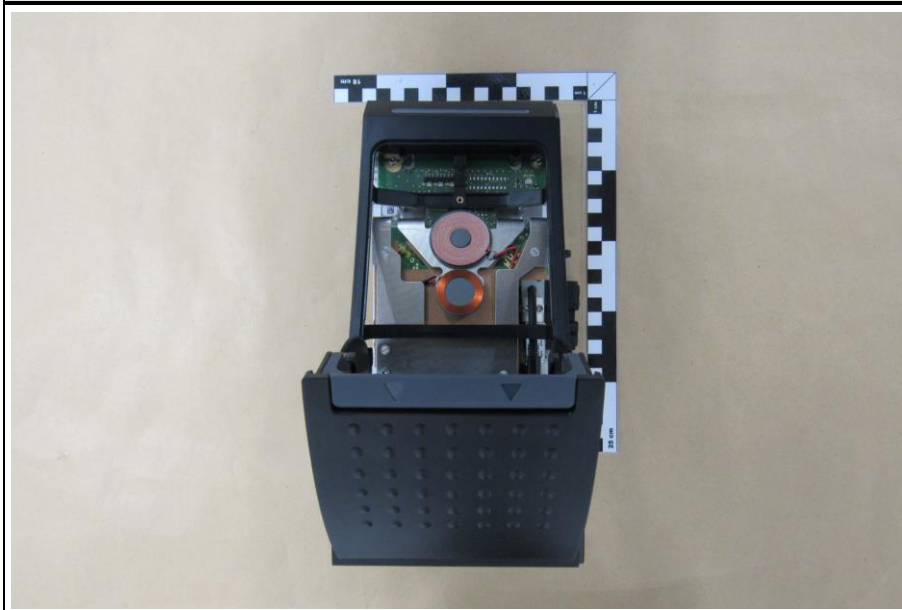
L-Side View



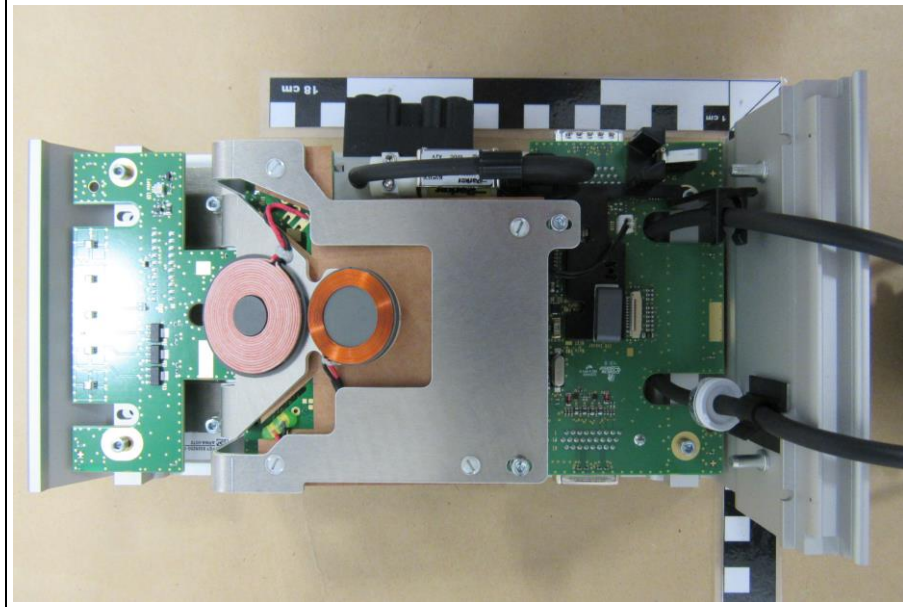
R-Side View



Inside View A



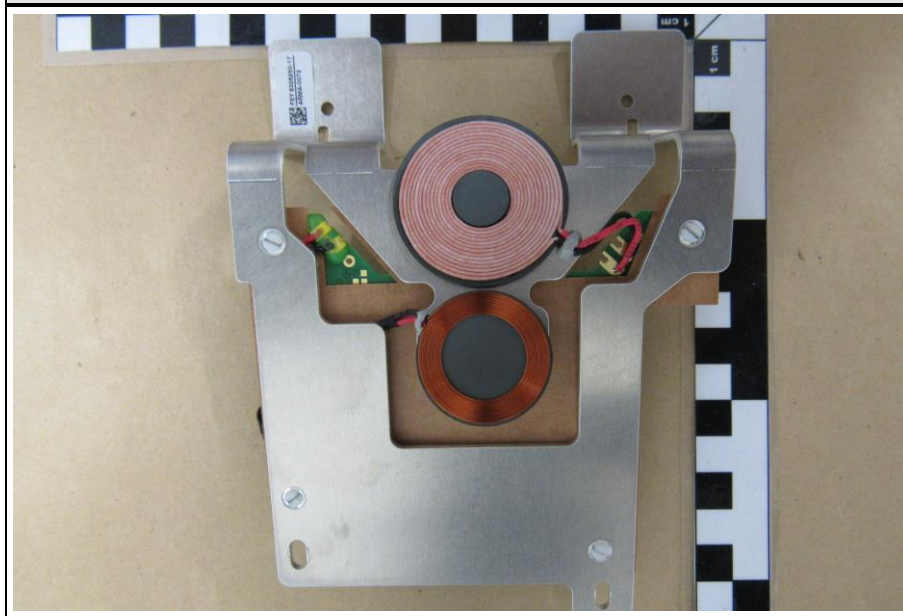
Inside View B



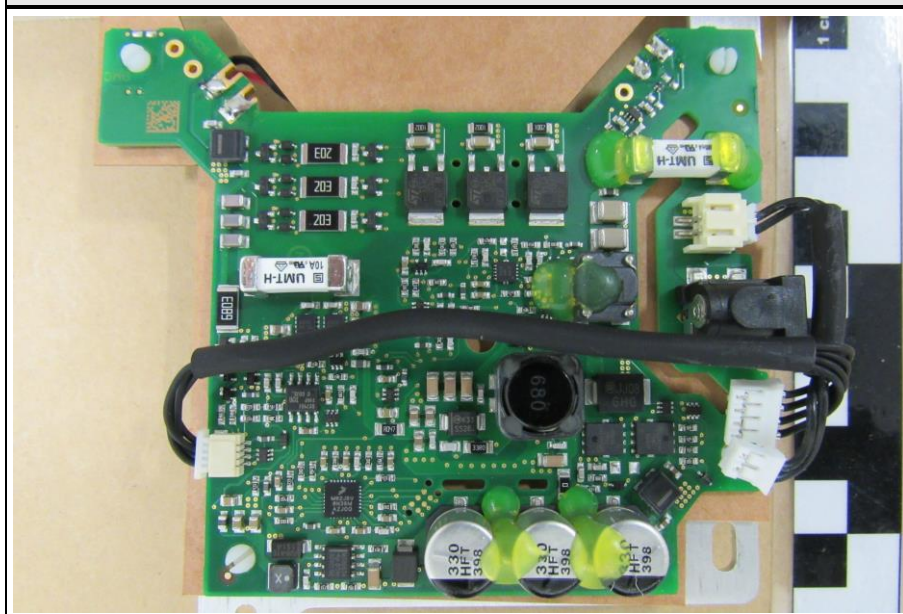
Inside View C



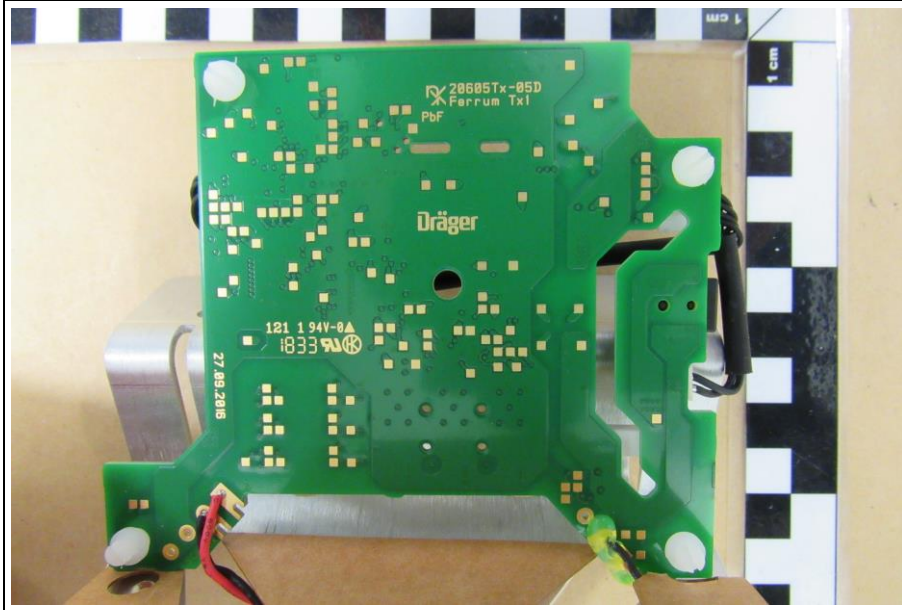
Coils



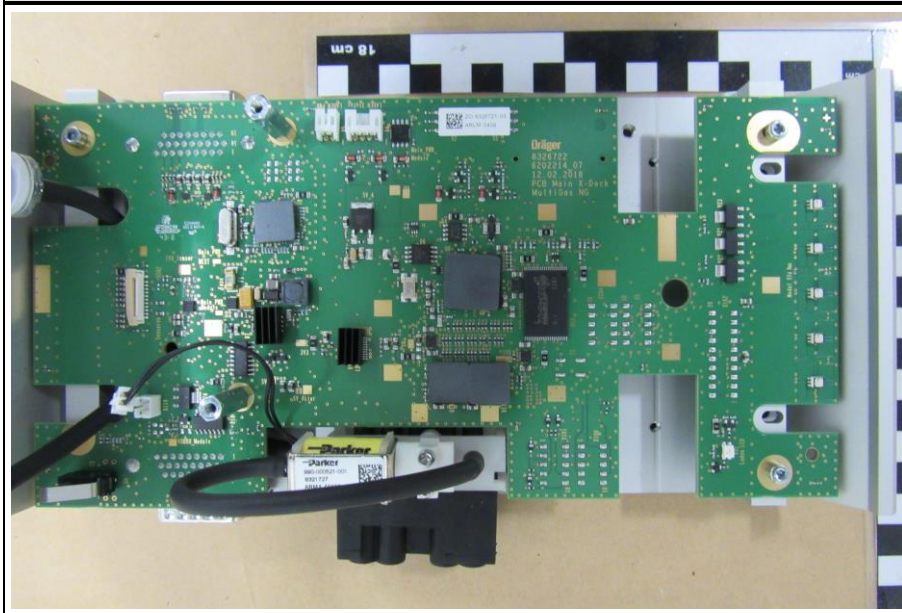
Coil PCB Top

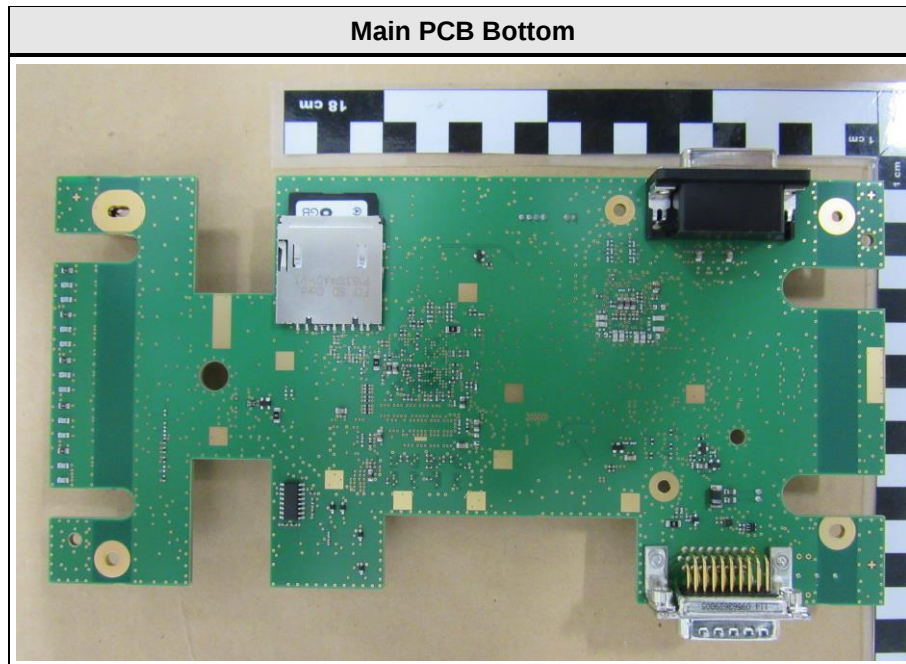


Coil PCB Bottom

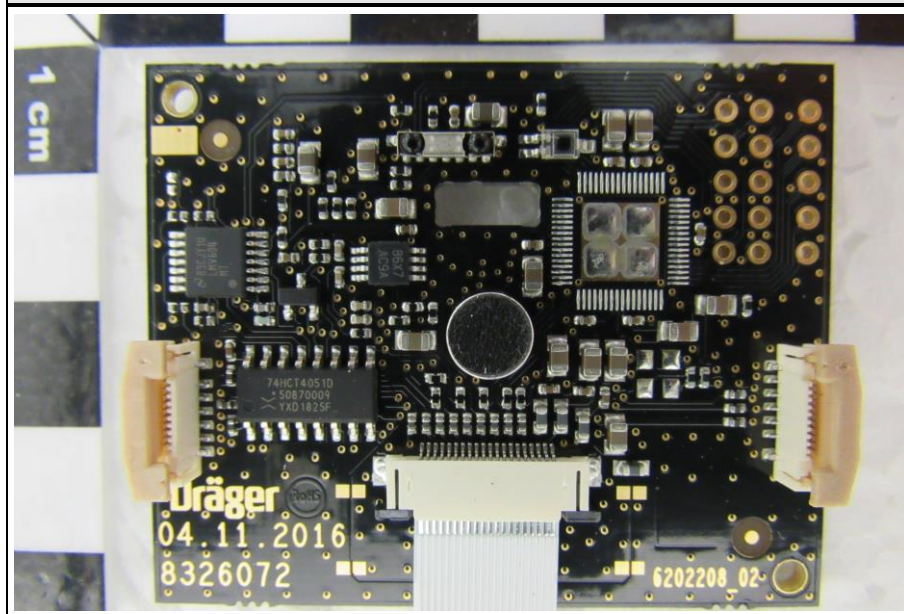


Main PCB Top

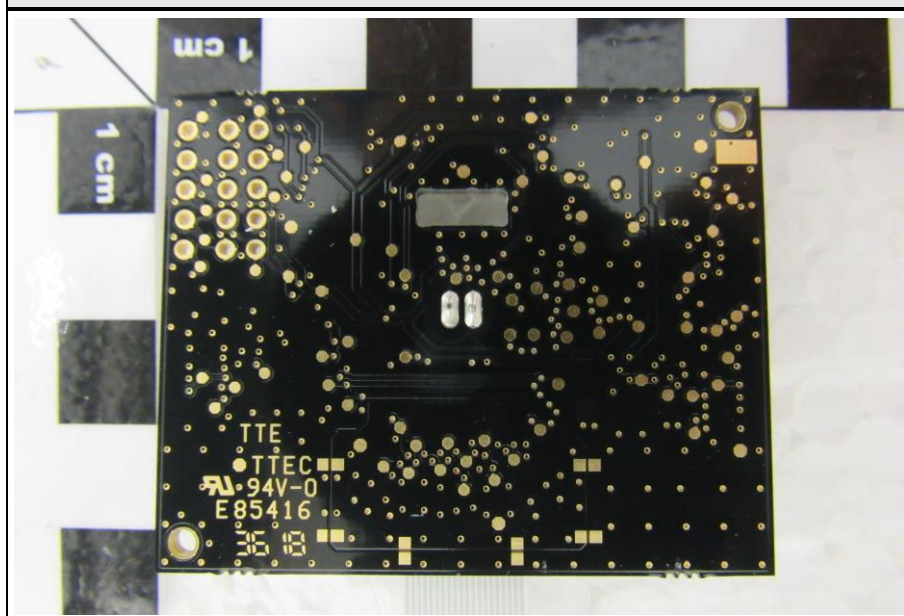




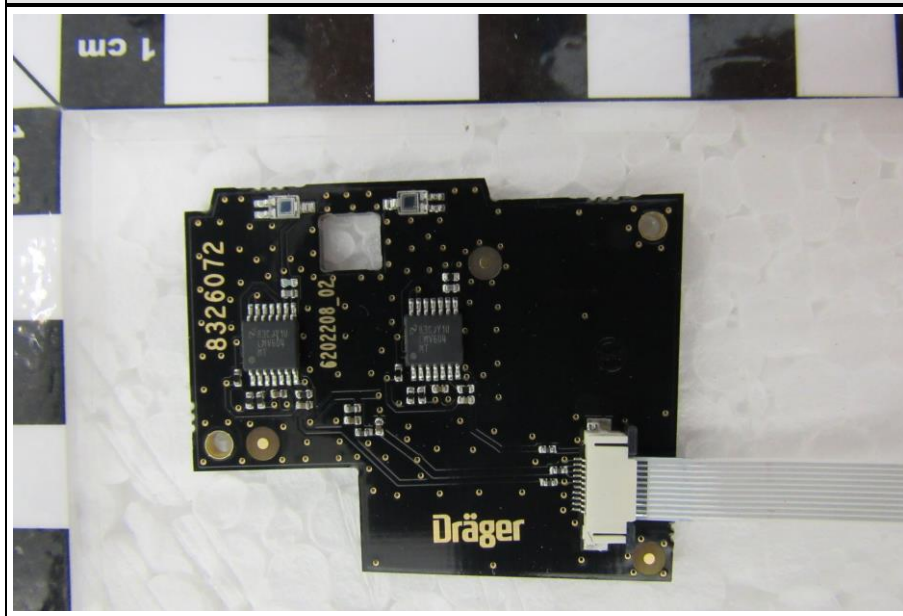
M-Sensor PCB Top



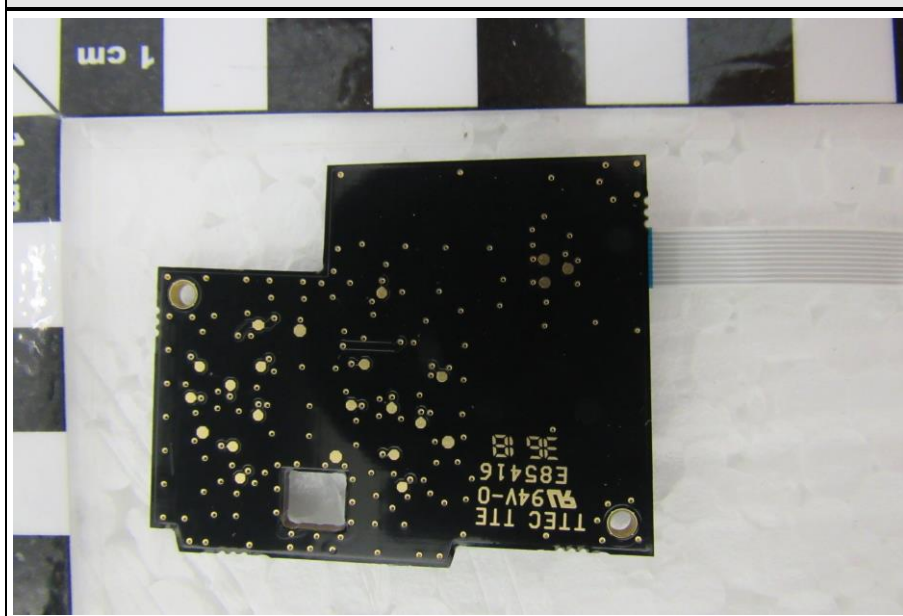
M-Sensor PCB Bottom

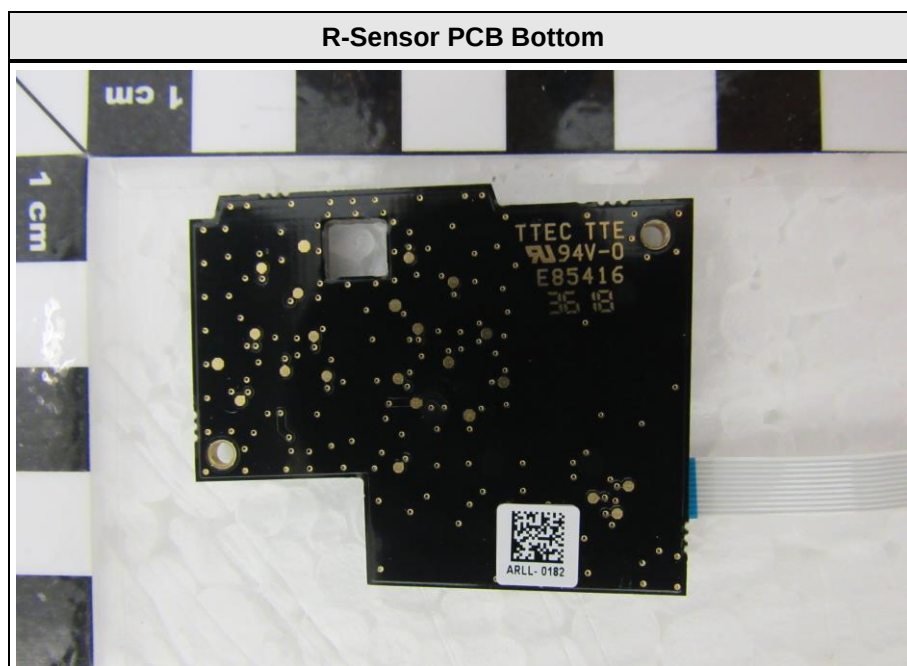
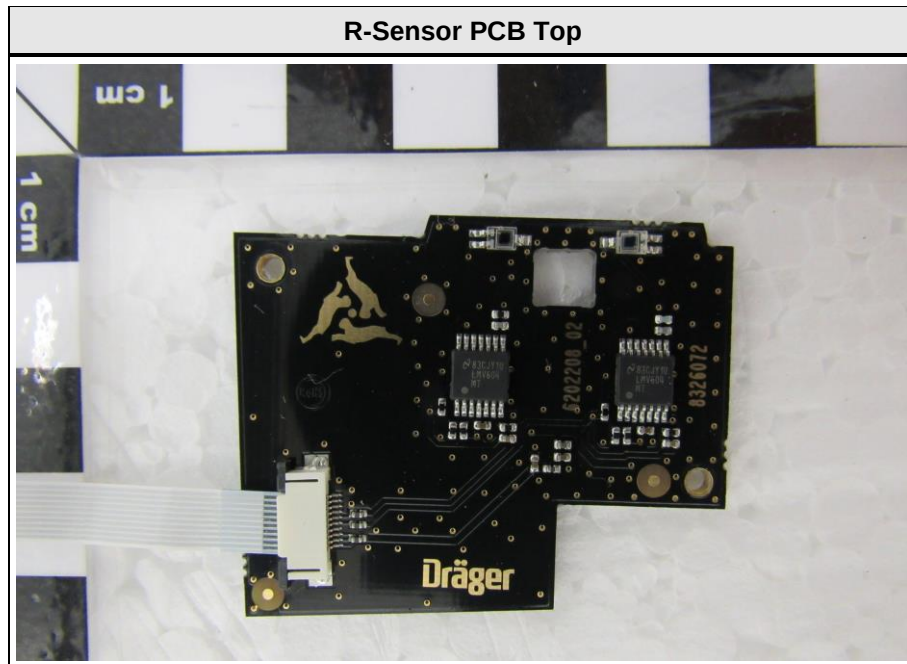


L-Sensor PCB Top



L-Sensor PCB Bottom





== END TEST REPORT ==