

TEST REPORT EN IEC 61000-6-2:2019 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments EN IEC 61000-6-3:2021 Electromagnetic Compatibility (EMC) - Part 6 - 3 : Generic Standards – Emission standard for equipment in residential environments	
Report Number.:	21-05191-PS-R01
Compiled by (+ signature)	Hack He 
Approved by (+ signature)	Carrey Wu 
Date of issue	2022.03.22
Tested by	TÜV AUSTRIA (SHANGHAI) CO., LTD. Room 12D, Orient Century Building, No. 345 Xian Xia Road, Shanghai, P/C 200336 P.R. China
Client	
Applicant's name	Shanghai Panelmate Electronics Co., Ltd.
Address.....	Building 18th, No.177 Fulian 2nd Rd. Baoshan District, Shanghai, 201906
Manufacturer.....	Shanghai Panelmate Electronics Co., Ltd.
Address.....	Building 18th, No.177 Fulian 2nd Rd. Baoshan District, Shanghai, 201906
Test specification	
Standard	EN IEC 61000-6-2:2019 EN IEC 61000-6-3:2021
Test procedure	CE-EMC
Non-standard test method	N/A
Test Report Form No.	TTRF_ENIEC61000_6_2&ENIEC61000_6_3
Test Report Form(s) Originator	TÜV AUSTRIA Shanghai
Master TRF	2022-03
Test item description	Industrial Operation Panel PC
Trademark	Panelmate
Model and/or type reference	IPC3619-3K-TRUMPF
Rating(s) (V; Hz).....	DC 24V, 2A

Test case verdicts

Test case does not apply to the test object .. : N/A
 Test item does meet the requirement : P(ass)
 Test item does not meet the requirement : F(ail)

Testing

Date of receipt of test item : January 08, 2022
 Date(s) of performance of test : January 08, 2022 ~ January 24, 2022

General remarks

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 The test results presented in this report relate only to the item(s) tested.

"(see enclosure #)" refers to additional information appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a point is used as the decimal separator.

The test result obtained during witness test or with test specification required other than standard but by the applicant are for reference only. They are not official test reports for product compliance. All official test reports have to be reviewed and signed by the qualified reviewers based on the ISO17025 requirement.

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Determination of the test result includes consideration of measurement uncertainty from the test equipment and methods.

Summary of test results (information/comments):

The tested samples of the product have been tested and complied with the applicable requirements of the relevant test standards.

1. SUMMARY OF TEST RESULT

EMISSION (EN IEC 61000-6-3:2021)			
Description of test item	Standard	Limits	Results
Conducted disturbance at mains terminals	EN 55032:2015+A11:2020	Class A	Pass
Conducted disturbance at telecommunication port	EN 55032:2015+A11:2020	Class A	N/A
Radiated Disturbance	EN 55032:2015+A11:2020	Class A	Pass
Harmonic current emissions	EN 61000-3-2:2019	Class A	N/A
Voltage fluctuation and flicker	EN 61000-3-3:2013 +A1: 2019	--	N/A
Immunity((EN IEC 61000-6-2:2019)			
Description of test item	Basic Standard	Performance Criteria	Results
Electrostatic Discharge (ESD)	EN 61000-4-2: 2009	B	Pass
Radio-frequency, Continuous radiated disturbance	EN 61000-4-3: 2006 +A2:2010	A	Pass
Electrical fast transient (EFT)	EN 61000-4-4: 2012	B	Pass
Surge (Input d.c. power ports)	EN 61000-4-5: 2014+A1:2017	B	Pass
Surge (Telecommunication ports)		B	Pass
Radio-frequency, Continuous conducted disturbance	EN 61000-4-6: 2014+A1:2015	A	Pass
Power frequency magnetic field	EN 61000-4-8: 2010	A	Pass
Voltage dips >95% reduction	BS EN 61000-4-11: 2004+A1:2017	B	N/A
Voltage dips, 30% reduction		C	N/A
Voltage interruptions		C	N/A
Note: N/A is an abbreviation for Not Applicable.			

Measurement Uncertainty

Test Item	Frequency Range	Expanded uncertainty (U _{lab})	Expanded uncertainty (U _{cispr})
Conducted Emission	Level accuracy (9kHz to 150kHz) (150kHz to 30MHz)	± 2.63 dB ± 2.35 dB	± 3.8 dB ± 3.4 dB
Power disturbance	Level accuracy (30MHz to 300MHz)	± 2.90 dB	± 4.5 dB
Electromagnetic Radiated Emission (3-loop)	Level accuracy (9kHz to 30MHz)	± 3.60 dB	± 3.3 dB
Radiated Emission	Level accuracy (9kHz to 30MHz)	± 3.68 dB	N/A
Radiated Emission	Level accuracy (30MHz to 1000MHz)	± 3.48 dB	± 5.3 dB
Radiated Emission	Level accuracy (above 1000MHz)	± 3.90 dB	± 5.2 dB
Mains Harmonic	Voltage	$\pm 0.510\%$	N/A
Voltage Fluctuations & Flicker	Voltage	$\pm 0.510\%$	N/A
EMF		$\pm 21.59\%$	N/A

(1) Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus.

(2) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%

MEASURING DEVICE AND TEST EQUIPMENT

LINE CONDUCTED EMISSION						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	EMI Test Software	EZ	EZ-EMC	/	N/A	N/A
2	EMI Test Receiver	R&S	ESR3	102312	2021-03-16	2022-03-15
3	Artificial Mains	R&S	ENV216	101119	2021-06-21	2022-06-20
4	Pulse Limiter	R&S	ESH3-Z2	102750-NB	2021-08-19	2022-08-18
5	Impedance Stabilization Network	TESEQ	ISN T800	45130	2021-11-16	2022-11-15

RADIATED DISTURBANCE						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	EMI Test Software	E3	E3-EMC	/	N/A	N/A
2	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2021-09-12	2024-09-11
3	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2021-09-05	2024-09-04
4	EMI Test Receiver	R&S	ESR3	102311	2021-08-19	2022-08-18
5	Broadband Preamplifier	/	BP-01M18G	P190501	2021-06-21	2022-06-20

ELECTROSTATIC DISCHARGE						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	ESD Simulator	SCHLODER	SESD 230	604035	2021-07-28	2022-07-27

RF ELECTROMAGNETIC FIELD)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	ESG Vector Signal Generator	Agilent	E4438C	MY42081396	2021-06-11	2022-06-10
2	RF POWER AMPLIFIER	OPHIR	5225R	1052	NCR	NCR
3	RF POWER AMPLIFIER	OPHIR	5273F	1019	NCR	NCR
4	Stacked Broadband Log Periodic Antenna	SCHWARZBEC K	STLP 9128	9128ES-145	NCR	NCR
5	Stacked Mikrowellen Log.-Per Antenna	SCHWARZBEC K	STLP 9149	9149-484	NCR	NCR
6	Electric field probe	Narda S.TS./PMM	EP601	611WX80208	2021-06-29	2022-06-28

Note: NCR means no calibration requirement

ELECTRICAL FAST TRANSIENT IMMUNITY						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Immunity Simulative Generator	EM TEST	UCS500-M4	0101-34	2021-06-21	2022-06-20
2	Capacitive coupling clamp	3CTEST	EC0441098	EFTC	2021.06.21	2022.06.20

SURGES, LINE TO LINE AND LINE TO GROUND						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Immunity Simulative Generator	EM TEST	UCS500-M4	0101-34	2021-06-21	2022-06-20
2	Communication wave lightning generator	HTEC	181701	HTSG 70	2021.11.15	2022.11.14
3	Symmetrical data line coupling network	HTEC	182701	HCN 8	2021.11.15	2022.11.14
4	Data line decoupling network	HTEC	182702	HDEC 8	2021.11.15	2022.11.14

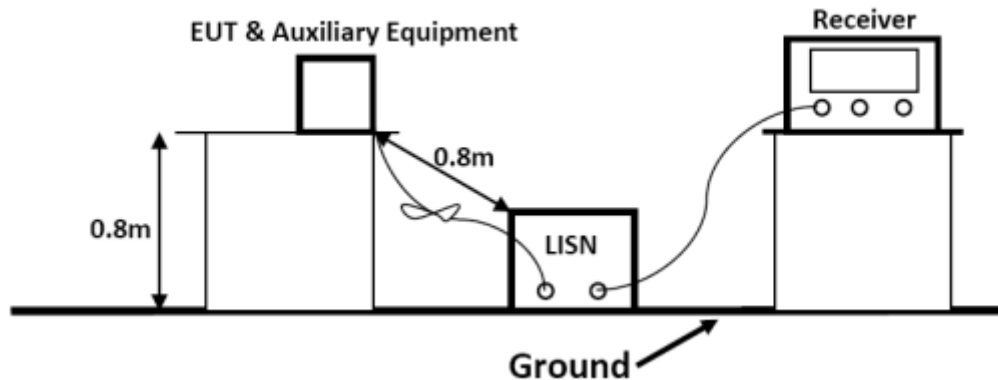
RF COMMON MODE						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Simulator	FRANKONIA	CIT-10/75	A126A1195	2021-08-19	2022-08-18
2	CDN	FRANKONIA	CDN-M2+M3	A2210177	2021-06-21	2022-06-20
3	6dB Attenuator	FRANKONIA	DAM25W	1172040	2021-06-21	2022-06-20
4	Electromagnetic coupling injection clamp	ZHINAN	14017	ZN23203	2021.06.25	2022.06.24

MAGNETIC FIELD SUSCEPTIBILITY TEST						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power frequency mag-field generator System	EVERFINE	EMS61000-8K	906003	2021-06-21	2022-06-20

NCR --- No calibration requirement.

2. POWER LINE CONDUCTED EMISSION MEASUREMENT

2.1. Block Diagram of Test Setup



2.2. Measurement Standard

EN IEC 61000-6-3:2021 Class A

Power Line Conducted Emission Limits (Class A)		
Frequency (MHz)	Limit (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	79	66
0.50 ~ 30.00	73	60

NOTE1-The lower limit shall apply at the transition frequencies.
NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

2.3. EUT Configuration on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the EN 55032 requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

2.4. Operating Condition of EUT

2.4.1. Turn on the power.

2.4.2. Let the EUT work in measuring Mode 1, Mode 2 and measure it

2.5. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and connected to the DC mains through Line Impedance Stability Network (L.I.S.N). This provided 50-ohm coupling impedance for the tested equipments. Both sides of DC line are investigated to find out the maximum conducted emission according to the EN 55032 regulations during conducted emission measurement.

The bandwidth of the field strength meter is set at 9kHz in 150kHz~30MHz.

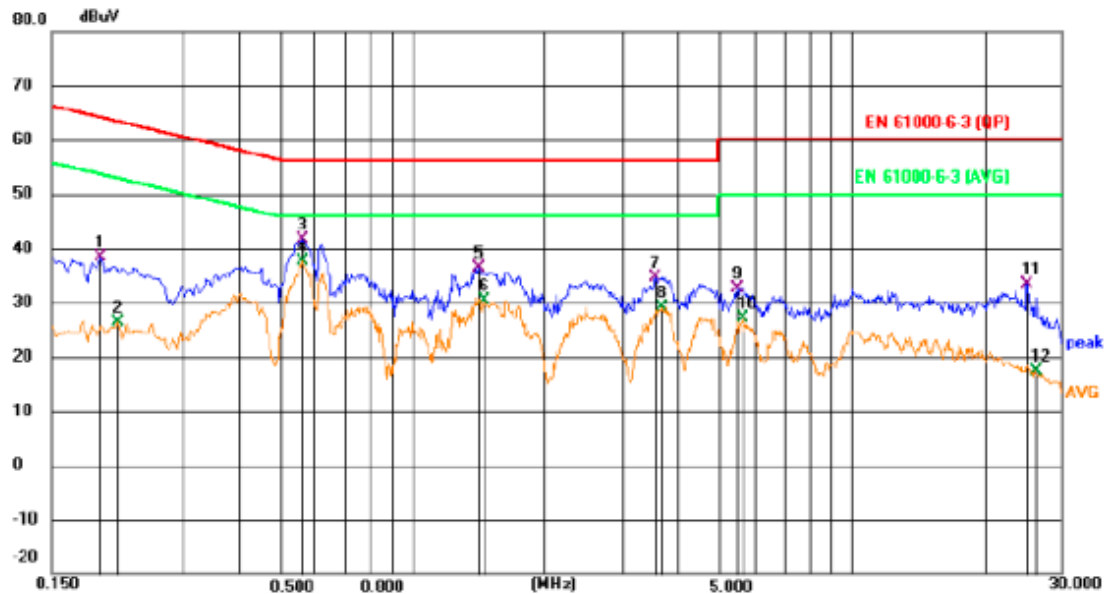
The frequency range from 150kHz to 30MHz is investigated.

2.6. Measurement Results

PASS.

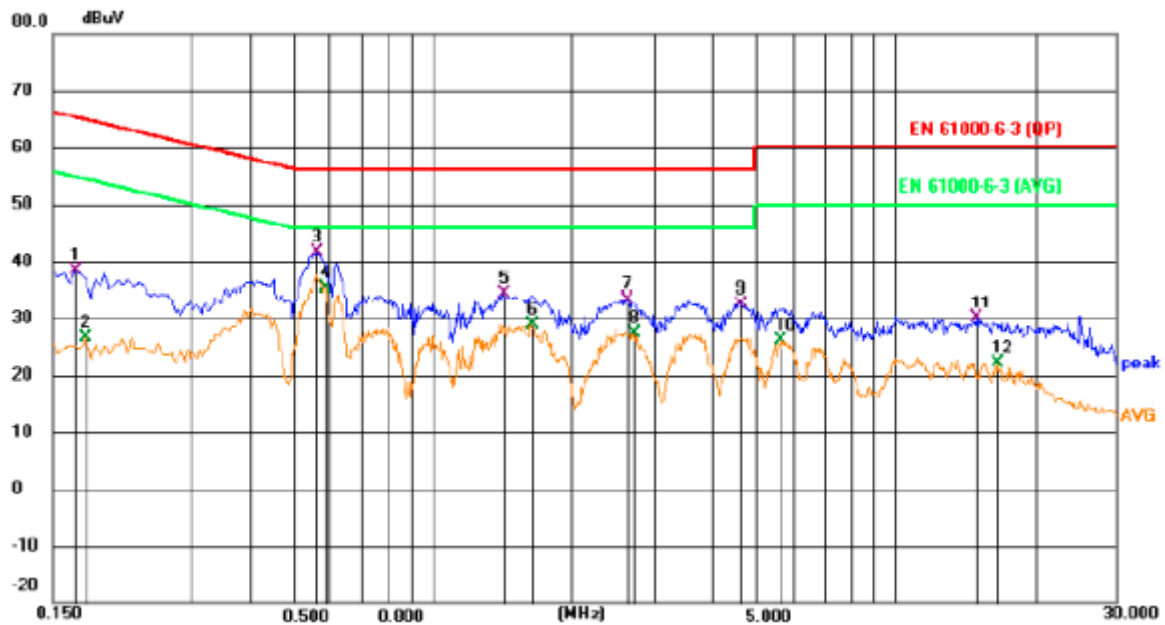
Environmental Conditions:	22.7°C, 53.7% RH
Test Voltage:	DC 24V
Test Model:	IPC3619-3K-TRUMPF
Test Mode:	Mode 1
Pol.	Positive

Detailed results are shown below:



No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.1949	18.69	19.75	38.44	63.83	-25.39	QP	
2	0.2131	6.63	19.75	26.38	53.08	-26.70	AVG	
3	0.5594	21.79	19.78	41.57	56.00	-14.43	QP	
4 *	0.5594	17.82	19.78	37.60	46.00	-8.40	AVG	
5	1.4144	16.47	19.80	36.27	56.00	-19.73	QP	
6	1.4503	10.49	19.80	30.29	46.00	-15.71	AVG	
7	3.5746	14.86	19.88	34.74	56.00	-21.26	QP	
8	3.7006	0.33	10.88	20.21	46.00	-16.70	AVG	
9	5.4870	12.81	19.93	32.74	60.00	-27.26	QP	
10	5.6356	7.21	19.93	27.14	50.00	-22.86	AVG	
11	25.1701	12.71	20.62	33.33	60.00	-26.67	QP	
12	26.2364	-3.27	20.61	17.34	50.00	-32.66	AVG	

Environmental Conditions: 22.7°C, 53.7% RH
 Test Voltage: DC 24V
 Test Model: IPC3619-3K-TRUMPF
 Test Mode: Mode 1
 Pol. Negative
 Detailed results are shown below:

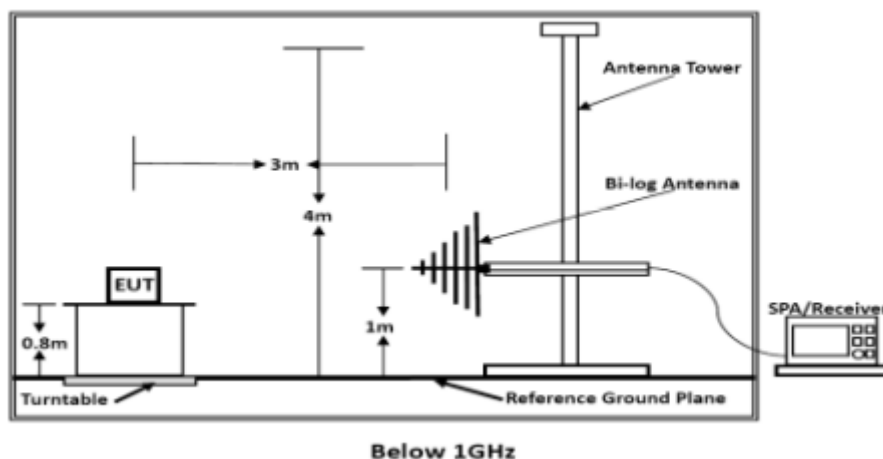


No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1681	18.53	19.76	38.29	65.05	-26.76	QP	
2	0.1771	6.78	19.76	26.54	54.62	-28.08	AVG	
3	0.5596	21.79	19.78	41.57	56.00	-14.43	QP	
4	0.5821	15.47	19.79	35.26	46.00	-10.74	AVG	
5	1.4146	14.47	19.80	34.27	56.00	-21.73	QP	
6	1.6351	9.04	19.82	28.86	46.00	-17.14	AVG	
7	2.6296	13.51	19.84	33.35	56.00	-22.65	QP	
8	2.7106	7.48	19.84	27.32	46.00	-18.68	AVG	
9	4.6276	12.68	19.90	32.58	56.00	-23.42	QP	
10	5.6356	6.21	19.93	26.14	50.00	-23.86	AVG	
11	14.9146	9.52	20.56	30.08	60.00	-29.92	QP	
12	16.6156	1.47	20.65	22.12	50.00	-27.88	AVG	

Note: Pre-Scan all mode, Thus record worse case mode result in this report.

3. RADIATED EMISSION MEASUREMENT

3.1. Block Diagram of Test



3.2. Measuring Standard

EN IEC 61000-6-3:2021 (EN 55032:2015+A11:2020)

3.3. Radiated Emission Limits

All emanations from a device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below:

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dB μ V/m)
30 ~ 230	3	40
230 ~ 300	3	47

Note: (1) The smaller limit shall apply at the combination point between two frequency bands.

(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

3.4. EUT Configuration on Test

The EN55015 regulations test method must be used to find the maximum emission during radiated emission measurement.

3.5. Operating Condition of EUT

3.5.1. Turn on the power.

3.5.2. After that, let the EUT work in test mode 1, mode 2 and measure it.

3.6. Test Procedure

The EUT is placed on a turntable which is 0.8 meter high above the ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna that is mounted on an antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna (calibrated by Dipole Antenna) is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

The bandwidth of the Receiver (ESCI) is set at 120kHz.
The frequency range from 30MHz to 300MHz is investigated.

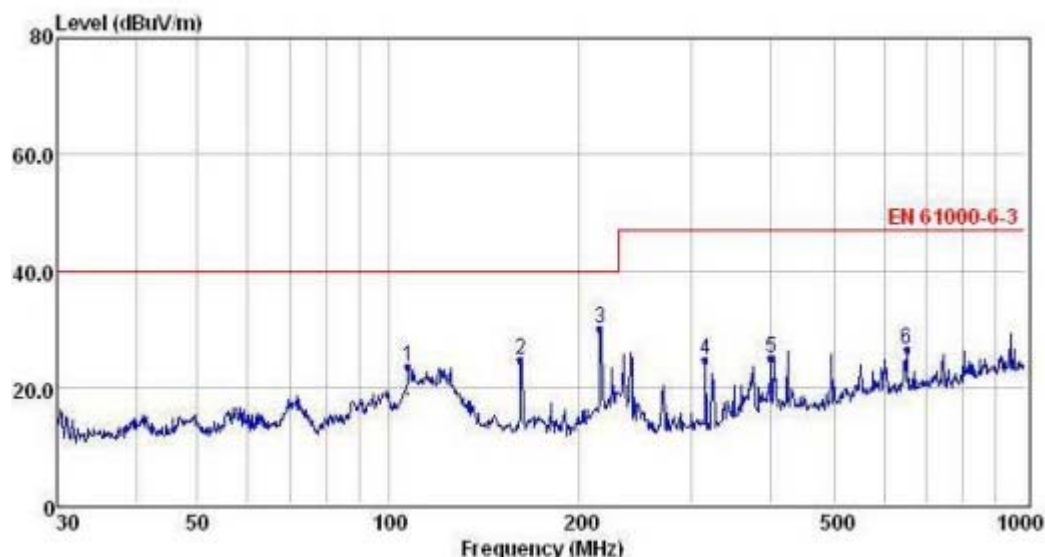
3.7. Measuring Results

PASS.

Please see the attached pages.

Test Data:

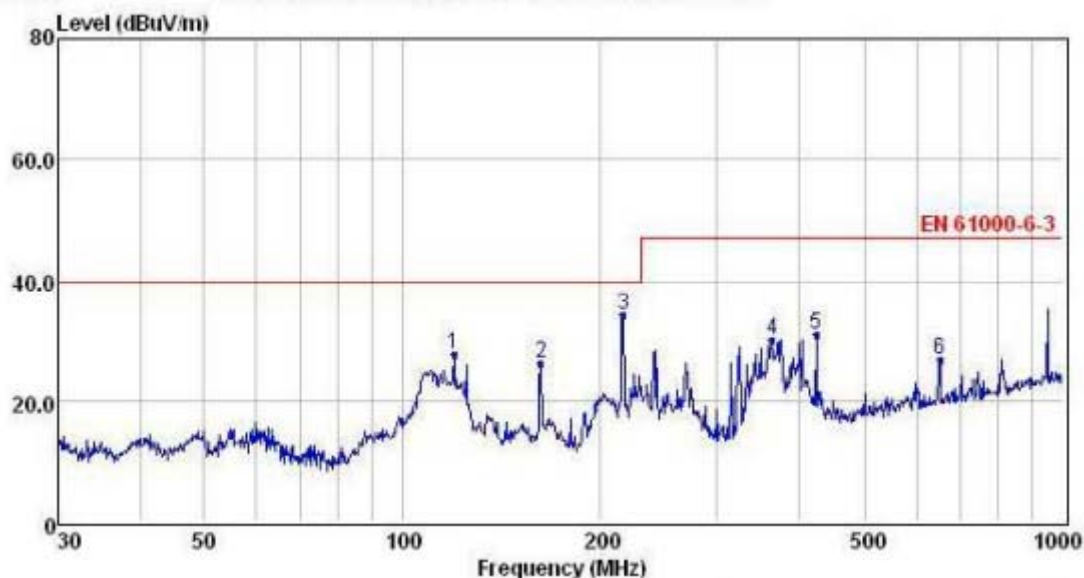
Environmental Conditions: 22.3°C, 53.6% RH
 Test Voltage: DC 24V
 Test Model: IPC3619-3K-TRUMPF
 Test Mode: Mode 1
 Pol: Vertical
 Distance: 3m
 Detailed results are shown below:



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	107.51	10.36	0.68	12.48	23.52	40.00	-16.48	QP
2	161.47	15.25	0.75	8.71	24.71	40.00	-15.29	QP
3	215.27	18.06	0.95	11.05	30.06	40.00	-9.94	QP
4	315.48	10.32	1.09	13.27	24.68	47.00	-22.32	QP
5	400.43	8.59	1.20	15.07	24.86	47.00	-22.14	QP
6	651.94	6.21	1.58	18.64	26.43	47.00	-20.57	QP

Note: 1. All readings are Quasi-peak values.
 2. Measured= Reading + Antenna Factor + Cable Loss
 3. The emission that are 20db below the official limit are not reported

Environmental Conditions: 22.3°C, 53.6% RH
 Test Voltage: DC 24V
 Test Model: IPC3619-3K-TRUMPF
 Test Mode: Mode 1
 Pol: Horizontal
 Distance: 3m
 Detailed results are shown below:

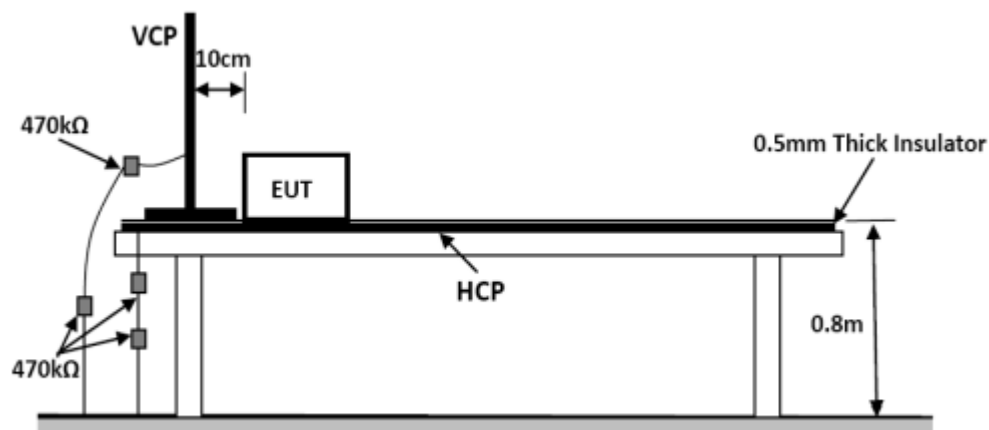


	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	119.86	16.43	0.64	10.51	27.58	40.00	-12.42	QP
2	162.61	16.46	0.86	8.75	26.07	40.00	-13.93	QP
3	216.78	22.33	0.88	11.10	34.31	40.00	-5.69	QP
4	364.26	14.51	1.14	14.46	30.11	47.00	-16.89	QP
5	425.03	14.29	1.16	15.49	30.94	47.00	-16.06	QP
6	651.94	6.41	1.58	18.64	26.63	47.00	-20.37	QP

Note: 1. All readings are Quasi-peak values.
 2. Measured= Reading + Antenna Factor + Cable Loss
 3. The emission that are 20db below the official limit are not reported

4. ELECTROSTATIC DISCHARGE IMMUNITY TEST

4.1. Block Diagram of Test Setup



4.2. Test Standard

EN IEC 61000-6-2:2019 (EN 61000-4-2: 2009,
Severity Level: 3 / Air Discharge: $\pm 8\text{KV}$, Level: 3 / Contact Discharge: $\pm 4\text{KV}$) Severity Levels
and Performance Criterion

4.3. Severity level

Level	Test Voltage Contact Discharge (KV)	Test Voltage Air Discharge (KV)
1	± 2	± 2
2	± 4	± 4
3	± 6	± 8
4	± 8	± 15
X	Special	Special

Performance criterion: B

4.4. EUT Configuration on Test

The configuration of EUT is listed in Section 4.1.

4.5. Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 2.5.
Except the test set up replaced by Section 4.3.1.

4.6. Test Procedure

4.6.1. Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

4.6.2. Contact Discharge:

All the procedure shall be same as Section 4.1. Except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

4.6.3. Indirect discharge for horizontal coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

4.6.4. Indirect discharge for vertical coupling plane

At least 10 singles discharge (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

4.7. Test Results

PASS

Please refer to the following pages

Electrostatic Discharge Test Result

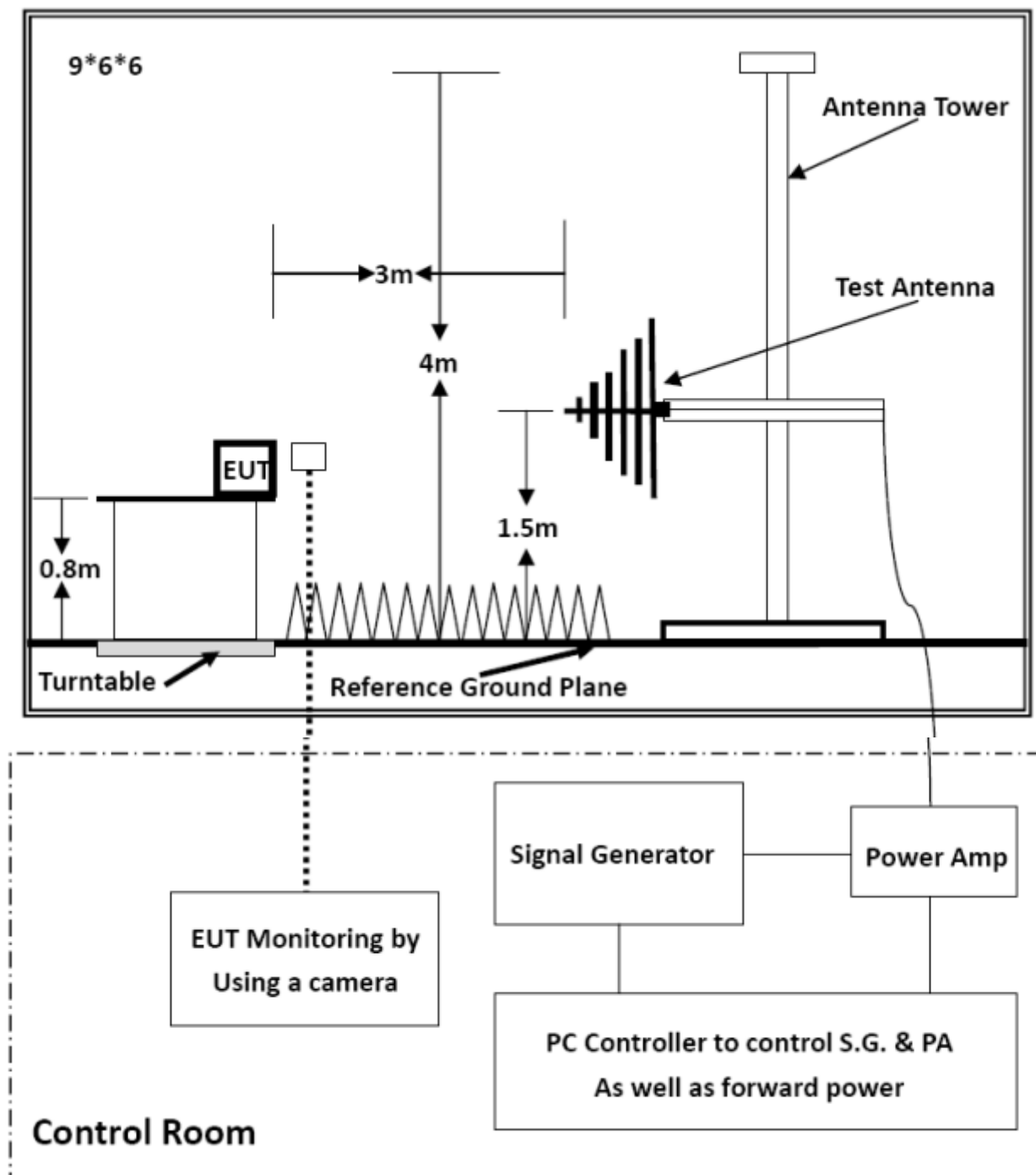
Standard: ☒ IEC 61000-4-2			Result: ☒ PASS / ☐ FAIL		
EUT	: Industrial Operation Panel PC	Test Date	: 2021.12.30		
M/N	: IPC3619-3K-TRUMPF	Temperature	: 23.2°C		
Humidity	: 53.6%	Criterion	: <u>B</u>		
Test Mode	: Mode 1				

Air Discharge						
Test Points	Test Levels			Results		
	± 2KV	± 4KV	± 8KV	Pass	Fail	Performance Criterion
Front	☒	☒	☒	☒	☐	☐ A ☒ B
Back	☒	☒	☒	☒	☐	☐ A ☒ B
Left	☒	☒	☒	☒	☐	☐ A ☒ B
Right	☒	☒	☒	☒	☐	☐ A ☒ B
Top	☒	☒	☒	☒	☐	☐ A ☒ B
Bottom	☒	☒	☒	☒	☐	☐ A ☒ B
Contact Discharge						
Test Points	Test Levels		Results			
	± 2 KV	±4 KV	Pass	Fail	Performance Criterion	
Front	☒	☒	☒	☐	☐ A	☒ B
Back	☒	☒	☒	☐	☐ A	☒ B
Left	☒	☒	☒	☐	☐ A	☒ B
Right	☒	☒	☒	☐	☐ A	☒ B
Top	☒	☒	☒	☐	☐ A	☒ B
Bottom	☒	☒	☒	☐	☐ A	☒ B

Discharge To Horizontal Coupling Plane					
Side of EUT	Test Levels		Results		
	± 2 KV	± 4 KV	Pass	Fail	Performance Criterion
Front	☒	☒	☒	☐	☐ A ☒ B
Back	☒	☒	☒	☐	☐ A ☒ B
Left	☒	☒	☒	☐	☐ A ☒ B
Right	☒	☒	☒	☐	☐ A ☒ B
Discharge To Vertical Coupling Plane					
Side of EUT	Test Levels		Results		
	± 2 KV	± 4 KV	Pass	Fail	Performance Criterion
Front	☒	☒	☒	☐	☐ A ☒ B
Back	☒	☒	☒	☐	☐ A ☒ B
Left	☒	☒	☒	☐	☐ A ☒ B
Right	☒	☒	☒	☐	☐ A ☒ B

5. RF FIELD STRENGTH SUSCEPTIBILITY TEST

5.1. Block Diagram of Test



5.2. Test Standard

EN IEC 61000-6-2:2019 (BS EN 61000-4-3: 2006+A2: 2010, Severity Level: 2, 3V / m)

5.3. Severity Levels and Performance Criterion

5.3.1. Severity Levels

Level	Field Strength V/m
1.	1
2.	3
3.	10
X	Special

5.3.2. Performance Criterion: A

5.4. EUT Configuration on Test

The configuration of the EUT is same as Section 5.1

5.5. Operating Condition of EUT

Same as radiated emission measurement, which is listed in Section 4.4, except the test setup replaced as Section 5.1.

5.6. Test Procedure

The EUT are placed on a table that is 0.8 meter high above the ground. The EUT is set 3 meters away from the transmitting antenna that is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna is set on test. Each of the four sides of the EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a CCD camera is used to monitor it.

All the scanning conditions are as following:

Condition of Test		Remark	
1.	Fielded Strength	10V/m (Severity Level 3)	
2.	Radiated Signal	Unmodulated	
3.	Scanning Frequency	80-1000MHz	
4.	Sweep time of radiated	0.0015 Decade/s	
5.	Dwell Time	3 Sec.	
6.	Fielded Strength	3V/m (Severity Level 2)	
7.	Radiated Signal	Unmodulated	
8.	Scanning Frequency	1.4-6.0GHz	
9.	Sweep time of radiated	0.0015 Decade/s	
10.	Dwell Time	3 Sec	

5.7. Test Results

PASS.

Please refer to the following page.

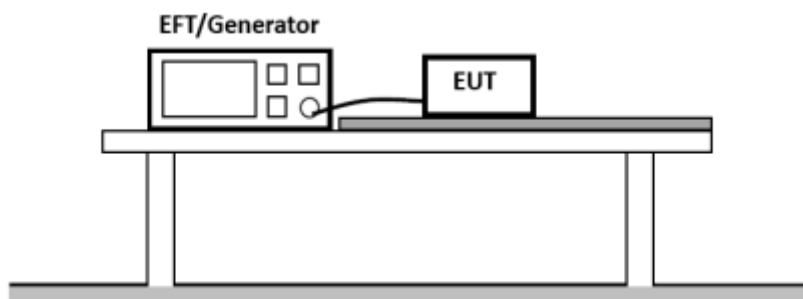
TTRF_ENIEC61000_6_2&ENIEC61000_6_3

RF Field Strength Susceptibility Test Results

Standard: ☒ IEC 61000-4-3		Result: ☒ PASS / ☐ FAIL	
EUT : Industrial Operation Panel PC M/N : IPC3619-3K-TRUMPF Field Strength : 10V/m 3V/m Test Mode : Mode1 Temperature : 23.2°C Humidity : 53.5% Frequency Range : 80MHz to 1000MHz 1.4GHz to 6.0GHz Criterion : A			
Modulation:	☐ None ☐ Pulse ☒ AM 1KHz 80%		
Steps:	1%		
	Horizontal	Vertical	
Front	PASS	PASS	
Right	PASS	PASS	
Rear	PASS	PASS	
Left	PASS	PASS	
Note: None.			

6. Electrical Fast Transient/Burst Immunity Test

6.1. Block Diagram of Test



6.2. Test Standard

EN IEC 61000-6-2:2019 ((EN 61000-4-4: 2012, Severity Level: 3, 1KV)

6.3. Severity Levels and Performance Criterion

6.3.1. Severity Levels

Open Circuit Output Test Voltage $\pm 10\%$		
Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1	0.5 kV	0.25kV
2	1 kV	0.5kV
3	2 kV	1kV
4	4 kV	2kV
X	Special	Special

6.3.2. Performance Criterion: B

6.4. EUT Configuration on Test

The configuration of the EUT is same as Section 6.1

6.5. Operating Condition of EUT

Setup the EUT as shown in Section 4.5.1.
Turn on the power of all equipments.
Let the EUT work in test Mode and measure it.

6.6. Test Procedure

The EUT is put on the table, which is 0.8 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

6.6.1. For input and output DC power ports:

The EUT is connected to the power mains by using a coupling device, which couples the EFT interference signal to DC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 mins.

6.6.2. For signal lines and control lines ports:

The EUT is connected to the power mains by using a coupling device, which couples the EFT interference signal to signal lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 1 mins.

6.7. Test Results

PASS.

Please refer to the following page.

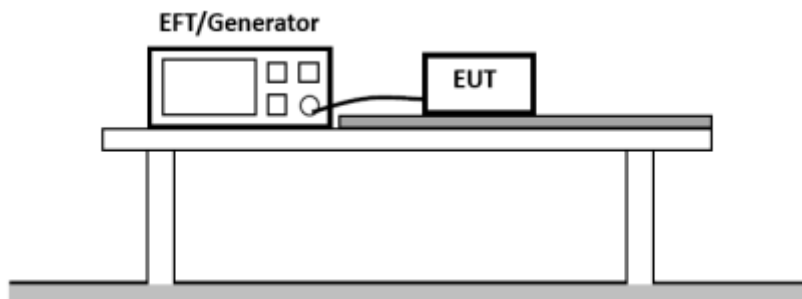
TTRF_ENIEC61000_6_2&ENIEC61000_6_3

Electrical Fast Transient/Burst Test Results

Standard: ☒ EN 61000-4-4		Result: ☒ PASS / ☐ FAIL	
EUT : Industrial Operation Panel PC M/N : IPC3619-3K-TRUMPF Test Mode : Mode1 Temperature : 24.6°C Humidity : 53.5% Criterion : B			
Line	Test Voltage	Result (+)	Result (-)
P	1kV	PASS	PASS
N	1kV	PASS	PASS
PE			
P,N	1kV	PASS	PASS
P,PE			
N,PE			
P,N,PE			
Signal Line			
I/O Cable	0.5KV	PASS	PASS
Note: P indicates the positive polarity of the power port, N indicates the negative polarity of the power port.			

7. Electrical Fast Transient/Burst Immunity Test

7.1. Block Diagram of Test



7.2. Test Standard

EN IEC 61000-6-2:2019 (EN 61000-4-5: 2014+A1: 2017, Severity Level: Line to Line: Level 2, 1.0KV, Line to Earth: Level 3, 2.0KV)

7.3. Severity Levels and Performance Criterion

7.3.1. Severity Levels

Level	On Power Supply Lines
1	0.5 kV
2	1 kV
3	2 kV
4	4 kV
X	Special

7.3.2. Performance Criterion: B

7.4. EUT Configuration on Test

The configuration of the EUT is same as Section 7.1

7.5. Operating Condition of EUT

Setup the EUT as shown in Section 7.1.
Turn on the power of all equipments.
Let the EUT work in test Mode and measure it.

7.6. Test Procedure

Set up the EUT and test generator as shown on Section 7.1

For line to line coupling mode, provide a 1.0 KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points. For I/O port coupling mode, provide a 0.5kv 10/700us voltage surge to EUT selected points.

At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.

Different phase angles are done individually.

Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

7.7. Test Results

PASS.

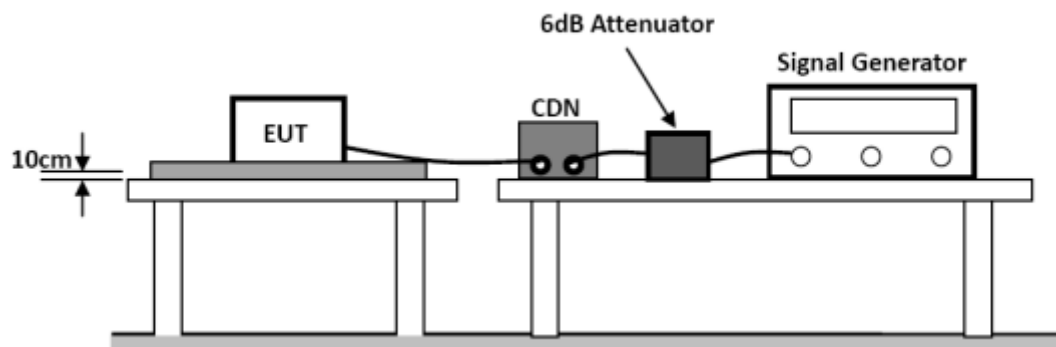
Please refer to the following page.

Surge Immunity Test Result				
Standard: ☒ EN 61000-4-4			Result: ☒ PASS / ☐ FAIL	
EUT	: Industrial Operation Panel PC		Temperature	: 24.4°C
M/N	: IPC3619-3K-TRUMPF		Humidity	: 53.5%
Test Mode	: Mode1		Criterion	: B
Location	Polarity	Number of Pulse	Pulse Voltage (KV)	Result
P-N	+	/	1	PASS
	-	/	1	PASS
P-PE				
N-PE				
Signal Line				
I/O Cable	+	/	0.5	PASS

	-	/	0.5	PASS
Note: P indicates the positive polarity of the power port, N indicates the negative polarity of the power port.				

8. Electrical Fast Transient/Burst Immunity Test

8.1. Block Diagram of Test



8.2. Test Standard

EN 61000-6-2: 2007 (EN 61000-4-6:2014+AC:2015 , Severity Level: Level 3, (0.15MHz ~ 80MHz)

8.3. Severity Levels and Performance Criterion

8.3.1. Severity Levels

Level	Field Strength (V)
1	1
2	3
3	10
X	Special

8.3.2. Performance Criterion: A

8.4. EUT Configuration on Test

The configuration of the EUT is same as Section 8.1

8.5. Operating Condition of EUT

Setup the EUT as shown in Section 8.1.
Turn on the power of all equipments.
Let the EUT work in test Mode and measure it.

8.6. Test Procedure

Set up the EUT and test generator as shown on Section 8.1

Let the EUT work in test mode and measure it

The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).

The disturbance signal described below is injected to EUT through CDN.

The EUT operates within its operational mode(s) under intended climatic conditions after power on.

The frequency range is swept from 150kHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave.

The rate of sweep shall not exceed 1.5×10^{-3} decades/s. where the frequency is swept incrementally; the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.

Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

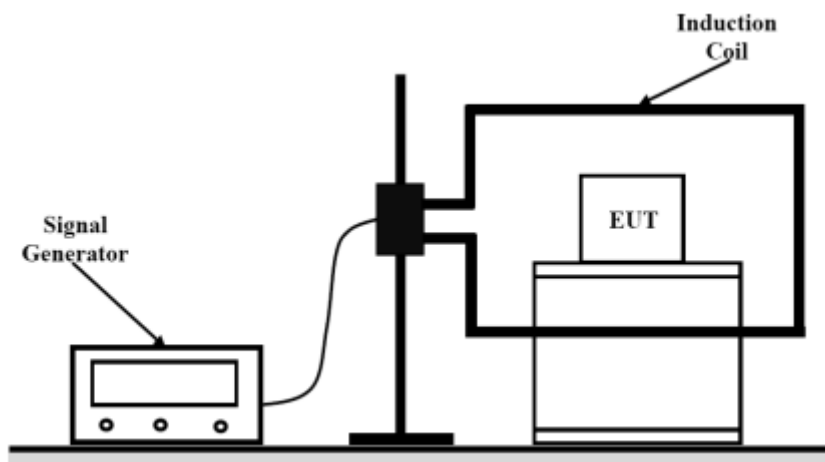
8.7. Test Results

PASS.

Injected Currents Susceptibility Test Results				
Standard: ☒ EN 61000-4-6			Result: ☒ PASS / ☐ FAIL	
EUT	: Industrial Operation Panel PC	Temperature	: 22.4°C	
M/N	: IPC3619-3K-TRUMPF	Humidity	: 52.1%	
Test Mode	: Mode1	Criterion	: B	
Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Criterion	Result
0.15 ~ 80	DC Mains	10V	A	PASS
0.15 ~ 80	I/O Cable	10V	A	PASS
Note: None.				

9. Magnetic Field Susceptibility Test

9.1. Block Diagram of Test



9.2. Test Standard

EN IEC 61000-6-2:2019
(EN 61000-4-8: 2010, Severity Level: Level 4, 30A / m)

9.3. Severity Levels and Performance Criterion

9.3.1. Severity Levels

Level	Field Strength (V)
1	1
2	3
3	10
4	30
5	100
X	Special

9.3.2. Performance Criterion: A

9.4. EUT Configuration on Test

The configuration of the EUT is same as Section 9.1

9.5. Test Procedure

The EUT is placed in the middle of a induction coil (1*1m), under which is a 1*1*0.1m (high) table, this small table is also placed on a larger table, 0.8 m above the ground. Both horizontal and vertical polarization of the induction coil is set on test, so that each side of the EUT is affected by the magnetic field. Also can reach the same aim by change the position of the EUT.

9.6. Test Results

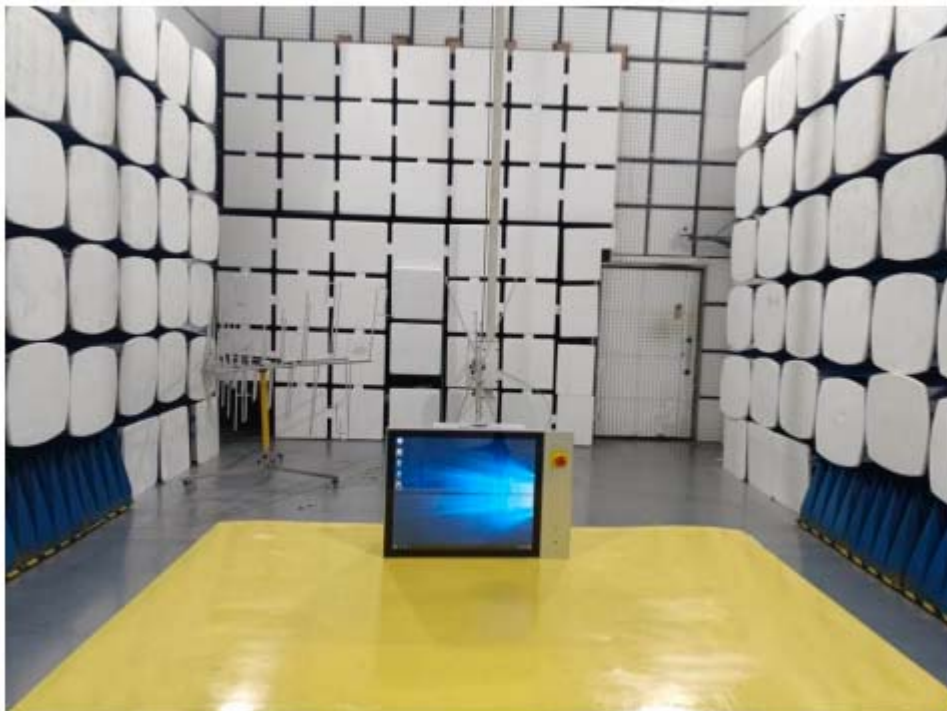
PASS.

Injected Currents Susceptibility Test Results				
Standard: ☒ EN 61000-4-8			Result: ☒ PASS / ☐ FAIL	
EUT	: Industrial Operation Panel PC	Temperature	: 24.7°C	
M/N	: IPC3619-3K-TRUMPF	Humidity	: 53.1%	
Test Mode	: Mode1	Criterion	: A	
Test Level (A/M)	Testing Duration	Coil Orientation	Criterion	Result
30	5 mins	X	A	PASS
30	5 mins	Y	A	PASS
30	5 mins	Z	A	PASS
Note: None.				

10. PHOTOGRAPH OF TEST



Test Setup Photo of Power Line Conducted Measurement



Test Setup Photo of Radiated Measurement (30MHz~1GHz)



Test Setup Photo of Electrostatic Discharge Test



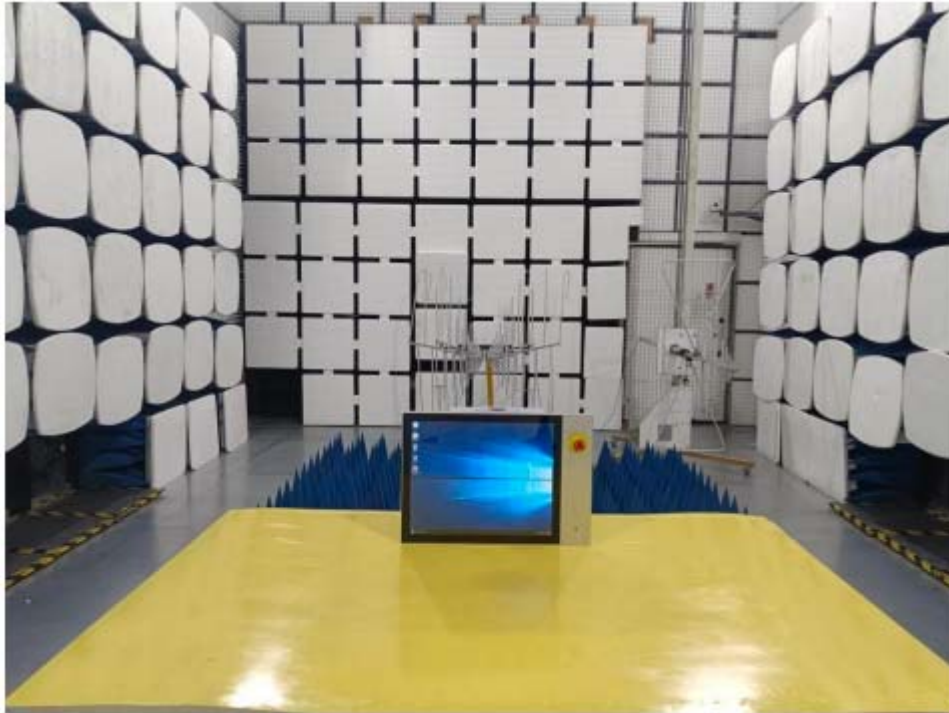
Photo of Power Line Electrical Fast Transient/Burst Test & Surge Immunity Test



Test Setup Photo of Power Line Injected Currents Susceptibility Test



Test Setup Photo of Magnetic Field Immunity Test



Test Setup Photo of RF Field Strength Susceptibility Test

Annex: Sample photos

View of product



View of product



View of product



View of product



View of product



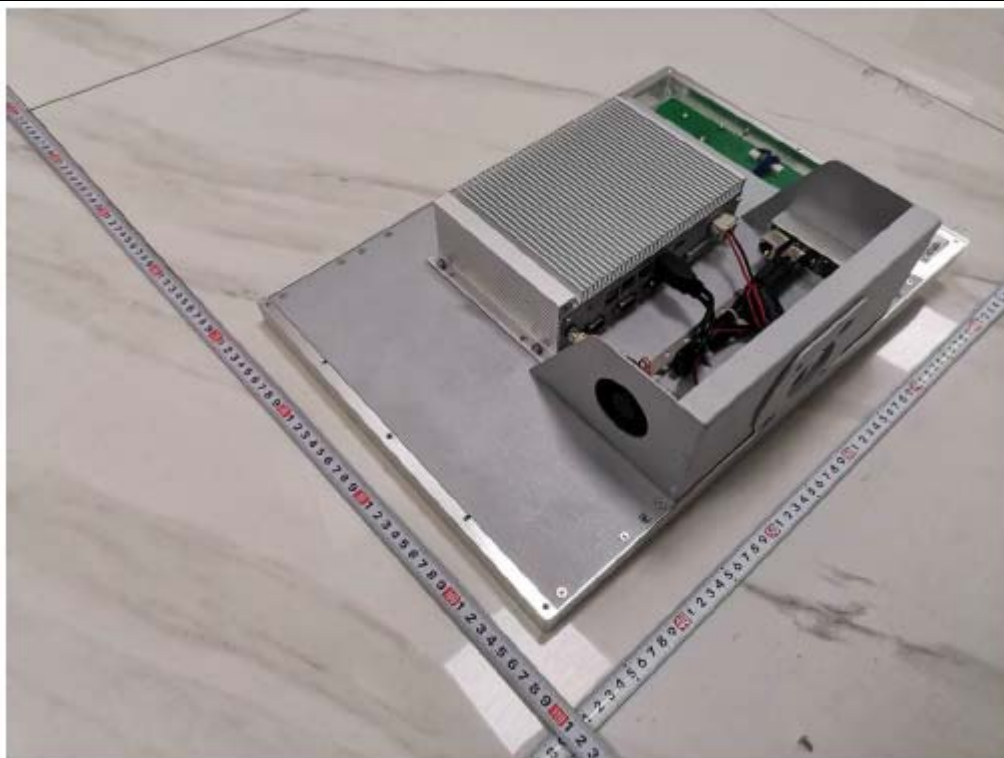
View of product



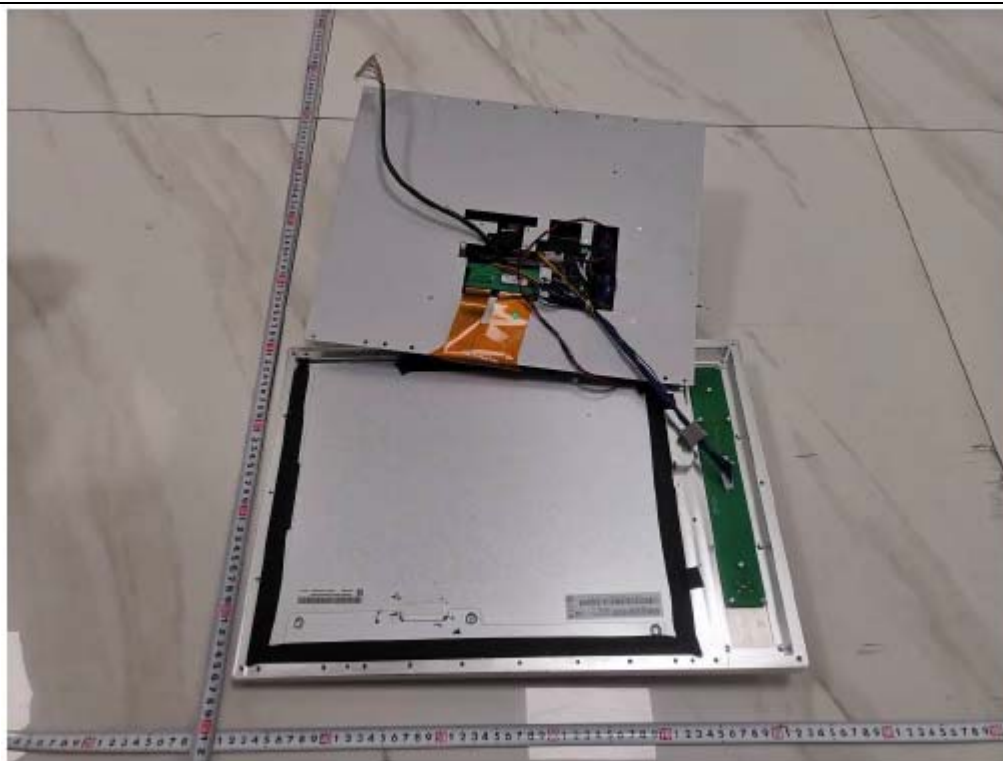
View of product



View of product



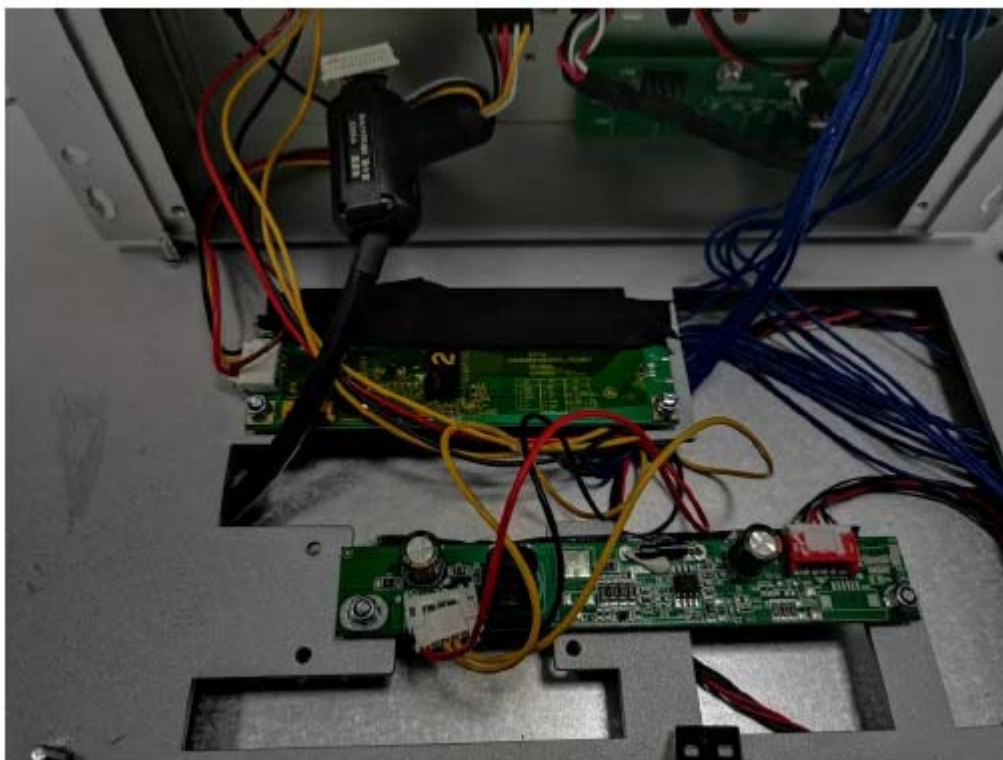
View of product



View of product



View of product



View of product



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