



# 시험 성적서 TEST REPORT

페이지(page) : ( 1 ) / ( 총(Total) 131 )

성적서 번호 Report No.		ICRT-TR-M200006-0A	
신청자 Client	기관명 Name	Electronics and Telecommunications Research Institute	
	주소 Address	218, Gajeong-ro, Yuseong-gu, Daejeon, Republic of Korea	
시험대상품목 Sample description		Tolenoid, Multi-adapter, SMPS	
모델명 Type designation		Tolenoid : TC-46, Multi-adapter : None, SMPS : 12v20w	
정격 Ratings		DC 12 V, 20 W	
시험장소 Place of test		<input type="checkbox"/> 고정시험(Inside test) <input checked="" type="checkbox"/> 현장시험(Field test) Address: 54, Sinilseo-ro 67beon-gil, Daedeok-gu, Daejeon, Republic of Korea	
시험기간 Date of test		2019-11-15 ~ 2019-12-19	
시험방법/항목 Test Method/Item		According to the test method requested by the applicant (Maximum Output measurement, Temperature measurement, Noise measurement, EMC Test, Dielectric strength Test, Cold thermal impact test, Hot thermal impact test)	
시험결과 Test Results		test result reference	
확인 Affirmation	작성자 Tested by	기술책임자 Technical Manager	
	성명 : 양대송 Name : D.S. Yang	(서명) (Signature)	성명 : 여석광 Name : S.K. Yeo (서명) (Signature)
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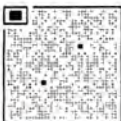
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ICRT-QPA-17-03 Rev.0112, Hwanggeum3-ro 7beon-gil, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea / Tel: 02-6351-9001 ~ 6

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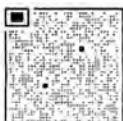




X. Test Report Issuance History: Initial publication (Reception No.: 2019-3060)

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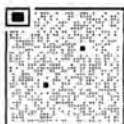




### 1. Sample information and picture

- Sample information

Sample No.	Description	Model	Manufacturer	The use
1-1/4, 1-2/4, 1-3/4, 1-4/4	Tolenoid	TC-46	Ferrarispower	- Maximum output test
2-1/1	Multi-adapter	None	Ferrarispower	- Temperature test noise
3-1/1	SMPS	12v20w	Ferrarispower	- Measurement EMC test
4-1/5, 4-2/5, 4-3/5, 4-4/5, 4-5/5	Tolenoid	TC-46	Ferrarispower	Dielectric strength test
5-1/4, 5-2/4, 5-3/4, 5-4/4	Tolenoid	TC-46	Ferrarispower	Cold thermal impact test
6-1/4, 6-2/4, 6-3/4, 6-4/4	SMPS	12v20w	Ferrarispower	
7-1/4, 7-2/4, 7-3/4, 7-4/4	Tolenoid	TC-46	Ferrarispower	Hot thermal impact test
8-1/4, 8-2/4, 8-3/4, 8-4/4	Multi-adapter	None	Ferrarispower	
9-1/4, 9-2/4, 9-3/4, 9-4/4	SMPS	12v20w	Ferrarispower	



● Sample picture

Tolenoid – External view (Top)



Tolenoid – External view (Bottom)

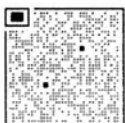


- Sample picture

Tolenoid – External view (Top)

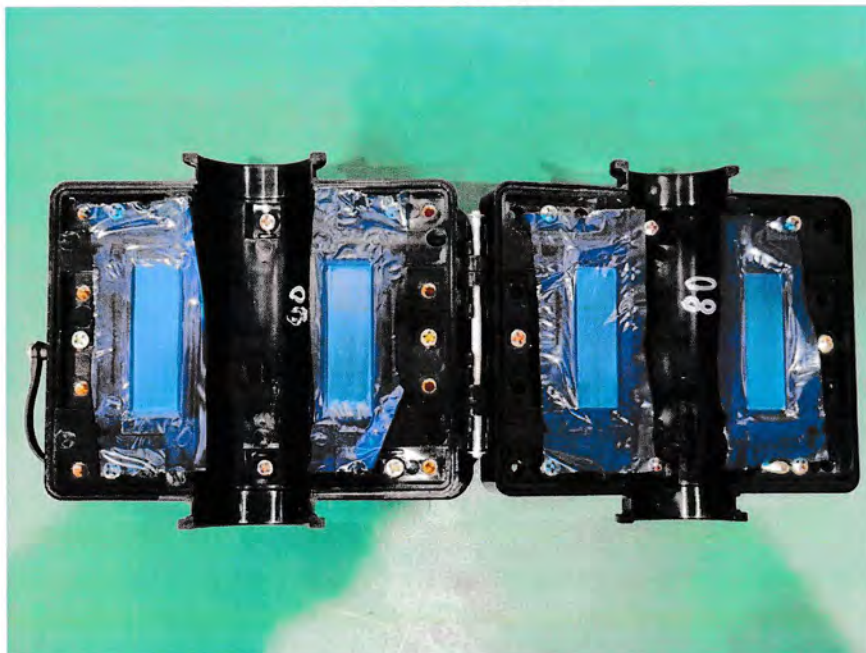


Tolenoid – External view (Bottom)

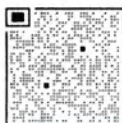
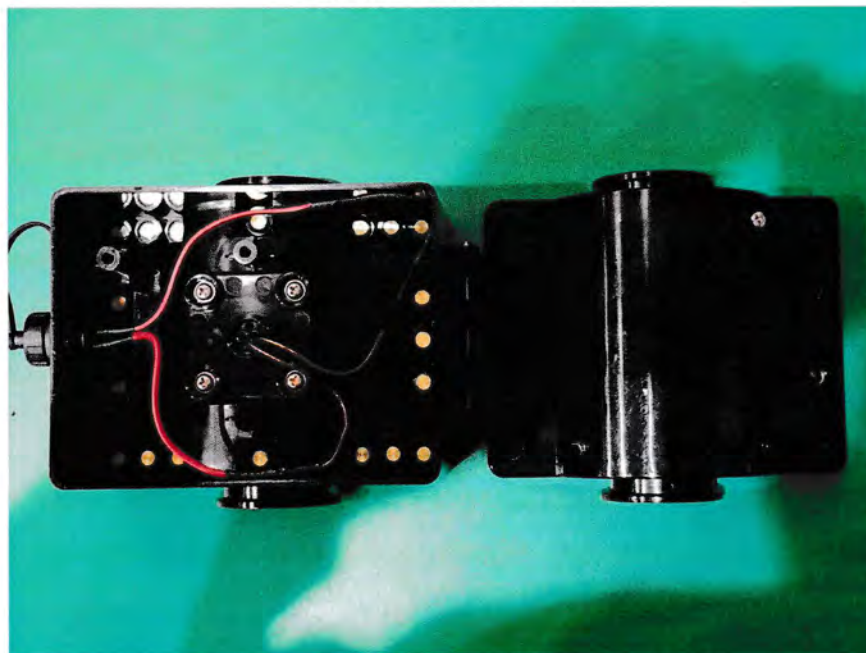


● Sample picture

Tolenoid – Core part



Tolenoid – Internal view

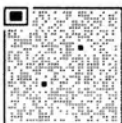
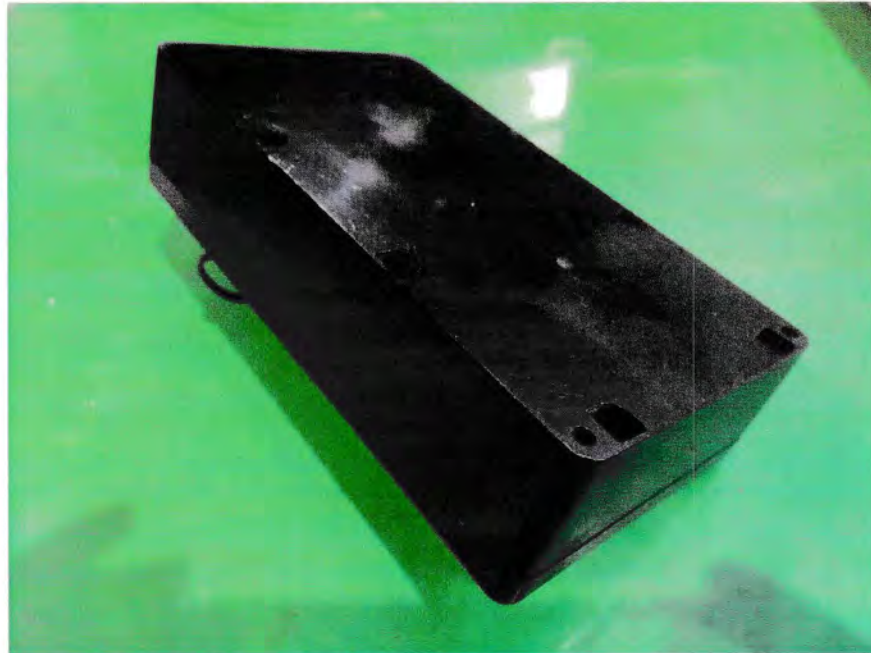


- Sample picture

Multi-adapter – External view (Top)



Multi-adapter – External view (Bottom)

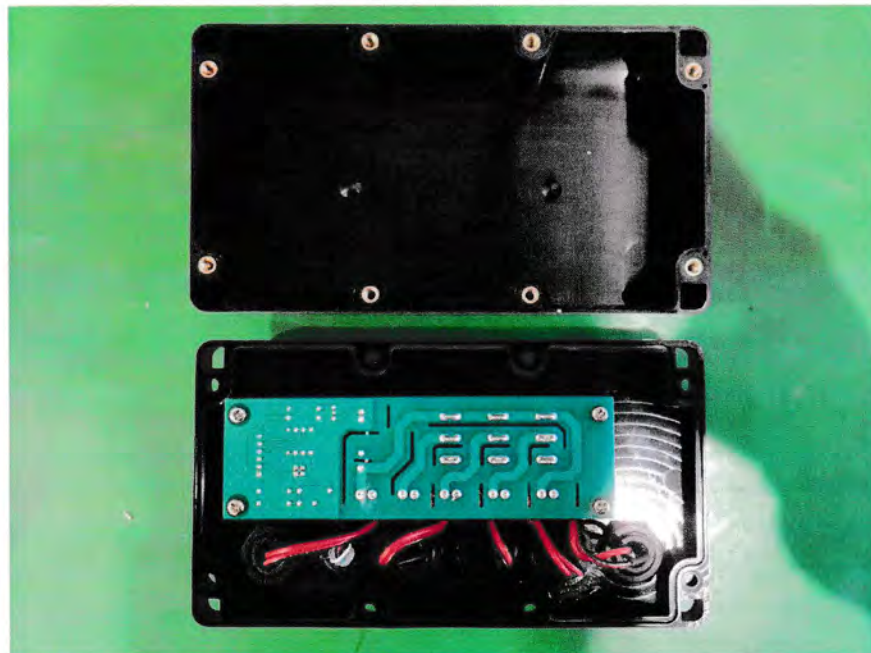


● Sample picture

Multi-adapter – Top connector



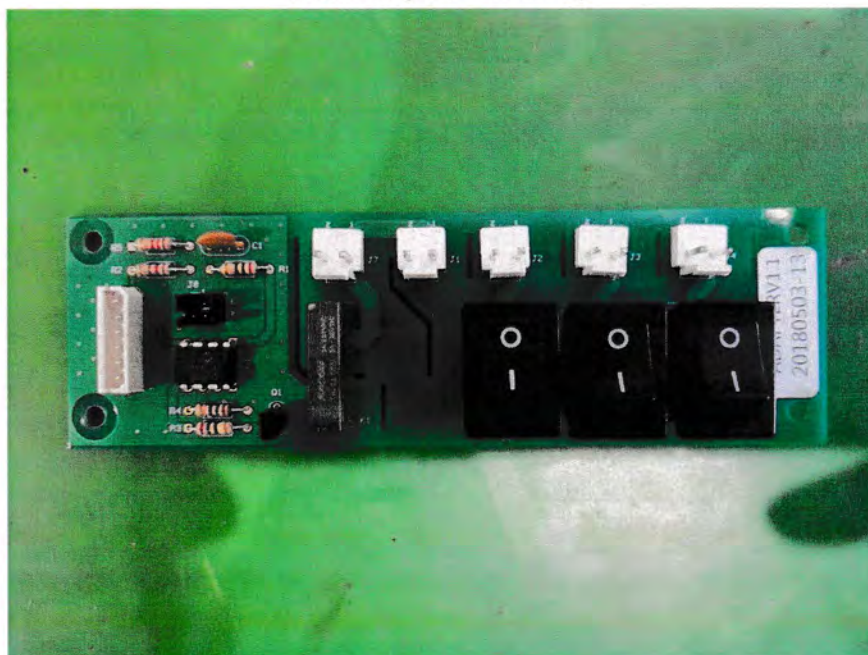
Multi-adapter – Internal



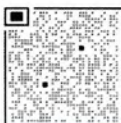
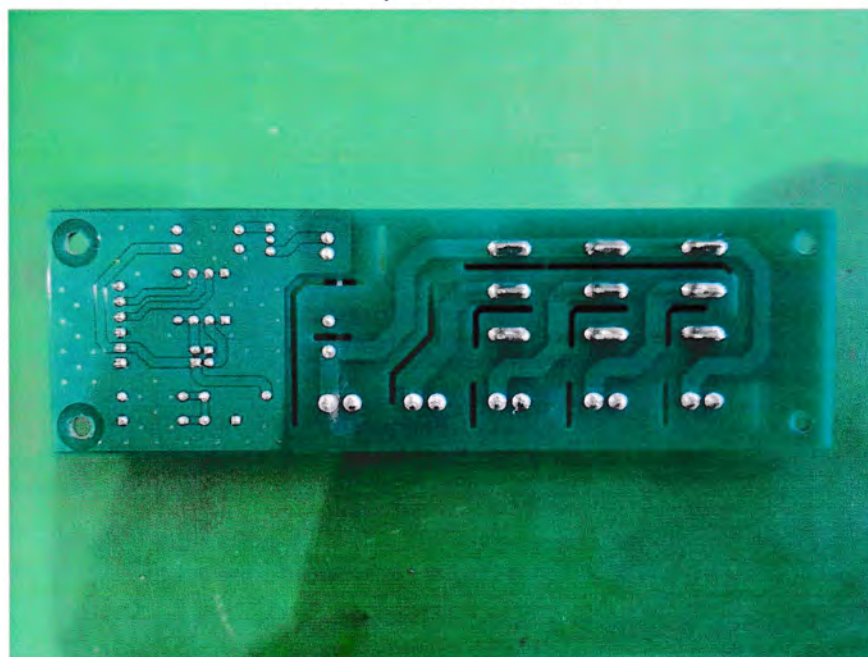


- Sample picture

Multi-adapter – PCB top



Multi-adapter – PCB bottom

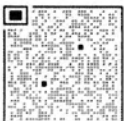
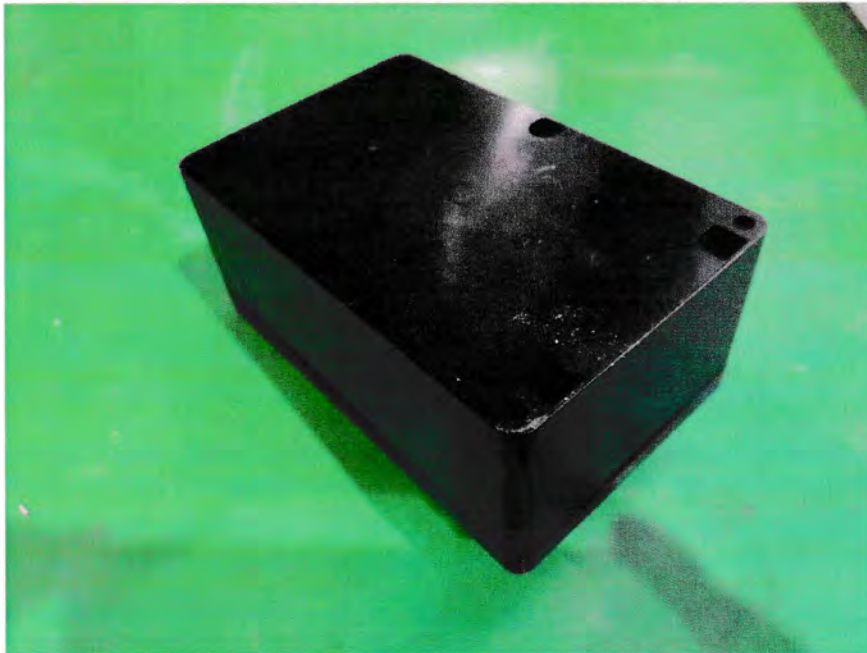


- Sample picture

SMPS – External view (Top)

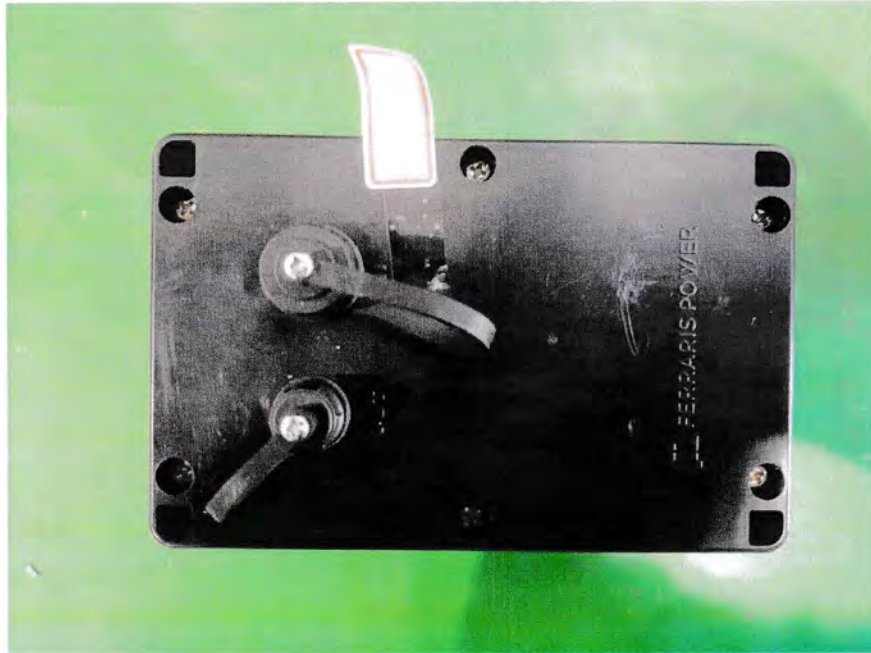


SMPS – External view (Bottom)

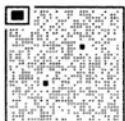
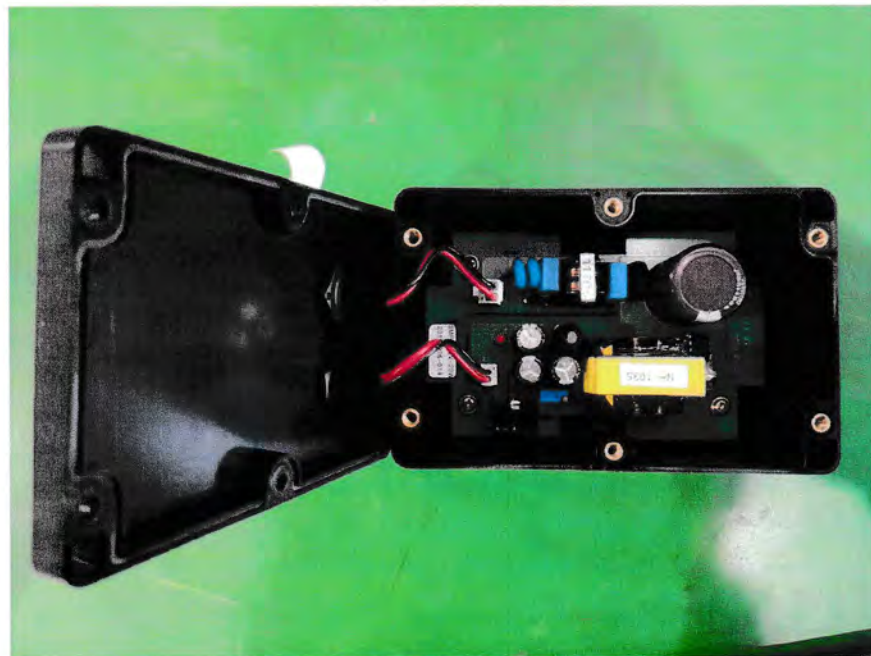


- Sample picture

SMPS – Top connector

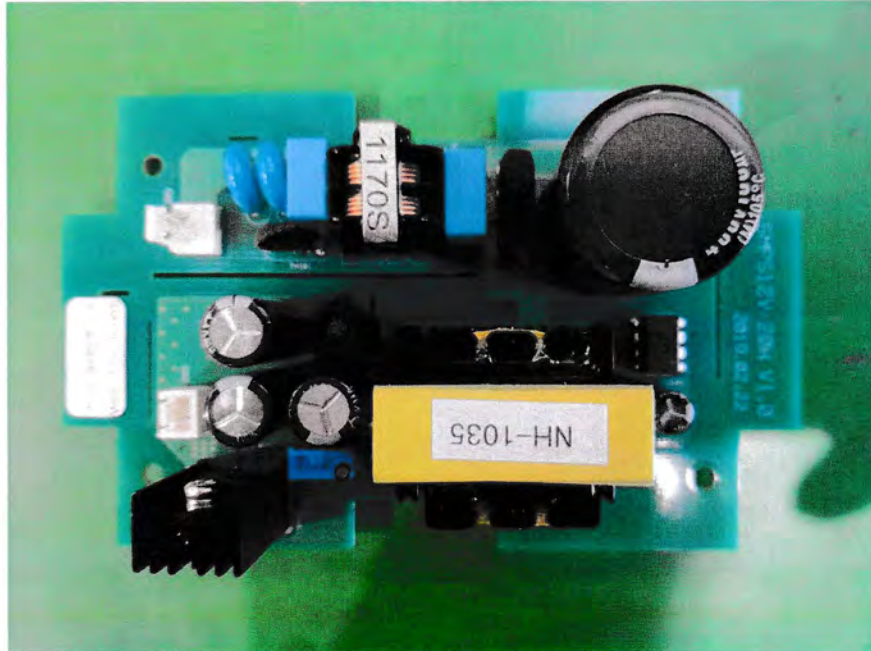


SMPS – Internal

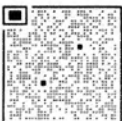
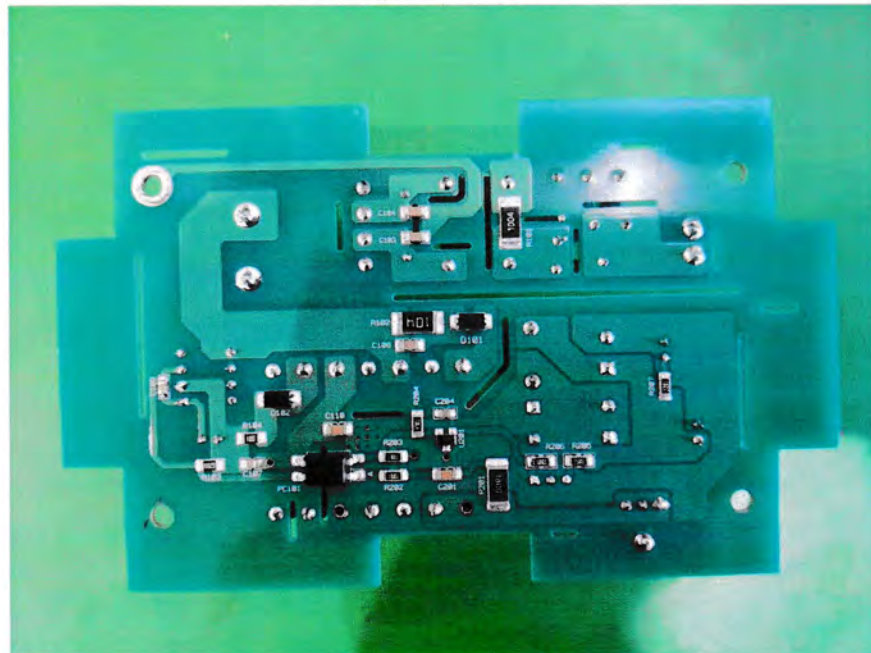


- Sample picture

SMPS – PCB top



SMPS – PCB bottom





## 2. Maximum output measurement

### A. Test standard

Measure and record the maximum outputs of Tolenoid, Multi-adapter, and SMPS according to the Test Method requested by the applicant.

### B. Test method

- ① Install 4 EA Tolenoids on the test track. Installation distance is according to the manufacturer's specifications.
- ② Install Multi-adapter 1 EA, SMPS 1 EA according to the manufacturer's specifications.
- ③ Install Digital Power Meter and a variable resistive load on the output of the SMPS.
- ④ Increase the track current from at least 15 A to 150 A in 15 A increments and measure and record the line voltage and track current.
- ⑤ Measure and record the maximum output of the SMPS under the conditions of each track current.
- ⑥ Under all of conditions when Tolenoids operate 1EA, 2EA, 3EA, and 4EA, measures and records the maximum output of the SMPS.

### C. Measurement equipment

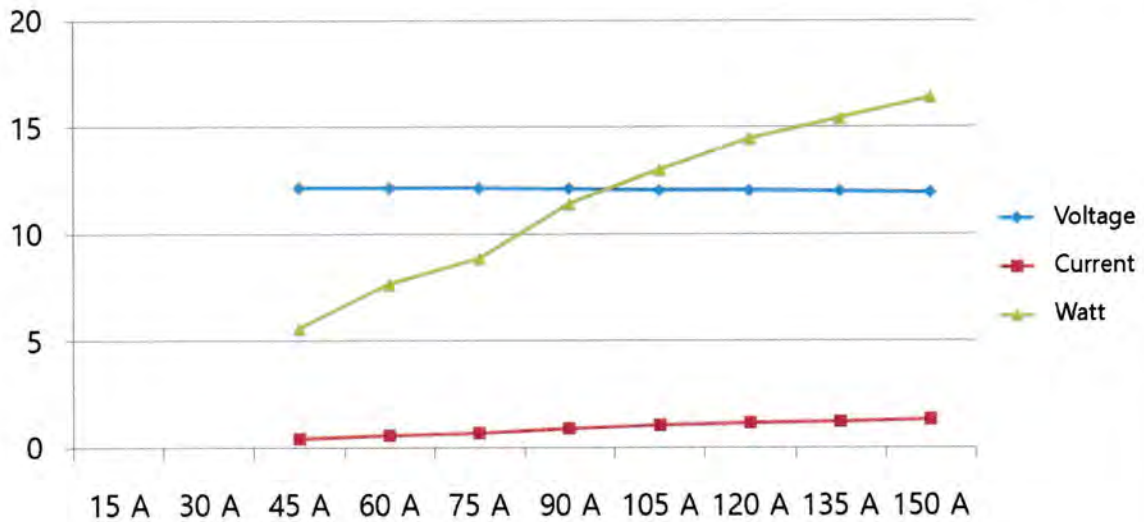
Description	Manufacturer	Model	Calibration date	Next calibration date
CLAMP ON POWER HI TESTER	HIOKI	3169-20	2019-03-06	2020-03-06
Digital Power Meter	YOKOGAWA	WT210	2019-03-05	2020-03-05
Variable Resistor (55 Ω)	ELEX POLYTECH	EP-DL55	N/A	N/A
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 (Temperature/Humidity)	2020-03-05 (Temperature/Humidity)
			2019-03-08 (Atmospheric Pressure)	2020-03-08 (Atmospheric Pressure)
STOP WATCH	CASIO	HS-3	2019-03-26	2021-03-26





**D. Test result**

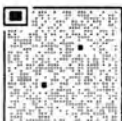
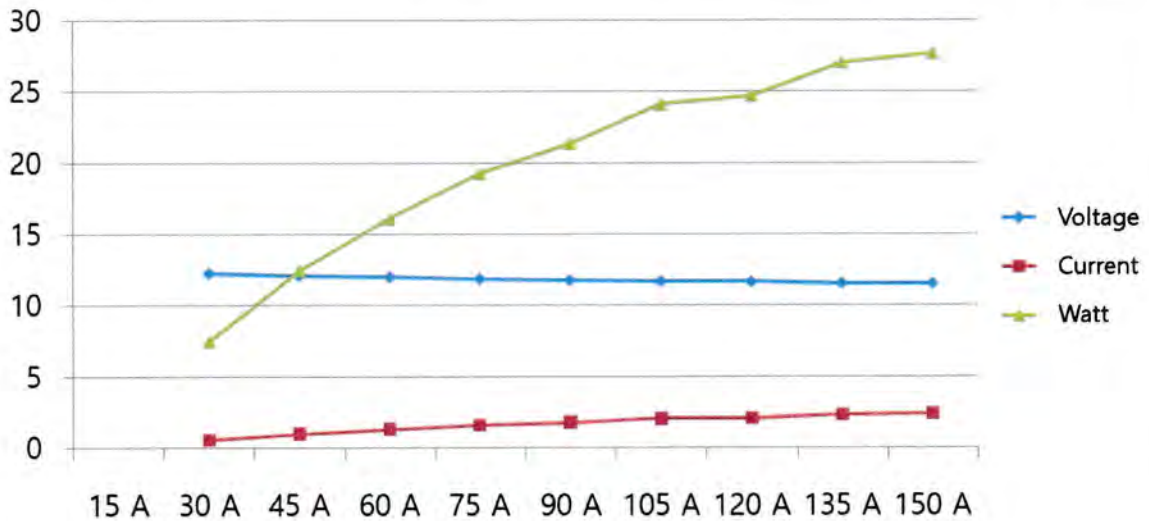
Test date	2019-11-18	Test environment	Temperature:	(15.0 ± 1) °C	
			Humidity:	(31 ± 2) % R.H.	
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1				
Test condition	Tolenoid 1 EA operating				
Test No.	Track		SMPS		
	Voltage (V)	Current (A)	Voltage (V)	Current (A)	Watt (W)
1-1	380.7	45.5	12.18	0.46	5.60
1-2	378.4	59.6	12.17	0.63	7.67
1-3	376.4	74.4	12.17	0.73	8.88
1-4	376.0	89.1	12.15	0.94	11.42
1-5	373.2	101.8	12.06	1.08	13.02
1-6	378.5	118.2	12.06	1.20	14.47
1-7	376.2	132.6	12.05	1.28	15.42
1-8	372.4	145.4	11.98	1.37	16.41





Test result

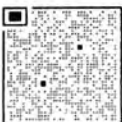
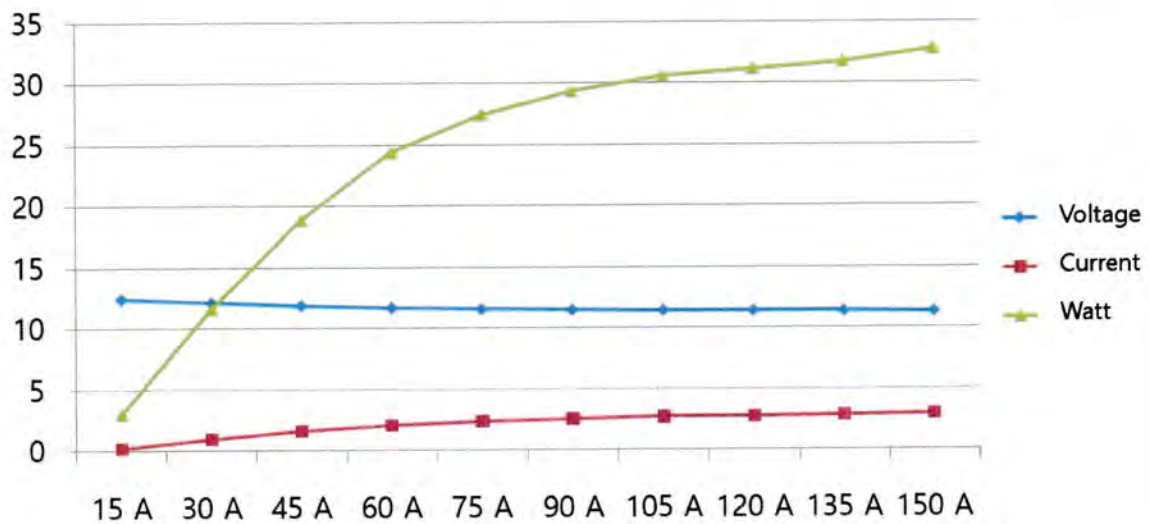
Test date	2019-11-18	Test environment	Temperature:	(15.0 ± 1) °C		
			Humidity:	(31 ± 2) % R.H.		
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1					
Test condition	Tolenoid 1 EA operating					
Test No.	Track		SMPS			
	Voltage (V)	Current (A)	Voltage (V)	Current (A)	Watt (W)	
2-1	375.3	29.9	12.30	0.61	7.50	
2-2	379.3	45.2	12.13	1.03	12.49	
2-3	379.0	59.8	12.03	1.34	16.12	
2-4	375.8	74.2	11.90	1.62	19.28	
2-5	375.7	89.0	11.81	1.81	21.38	
2-6	377.3	104.1	11.72	2.06	24.14	
2-7	376.9	117.2	11.68	2.12	24.76	
2-8	376.2	132.5	11.57	2.34	27.07	
2-9	377.0	147.3	11.54	2.40	27.70	





Test result

Test date	2019-11-18	Test environment	Temperature:	(15.0 ± 1) °C		
			Humidity:	(31 ± 2) % R.H.		
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1					
Test condition	Tolenoid 1 EA operating					
Test No.	Track		SMPS			
	Voltage (V)	Current (A)	Voltage (V)	Current (A)	Watt (W)	
3-1	376.9	14.9	12.46	0.24	3.00	
3-2	381.4	30.3	12.15	0.96	11.66	
3-3	378.2	44.5	11.89	1.59	18.90	
3-4	376.4	59.2	11.69	2.09	24.43	
3-5	375.2	74.0	11.55	2.38	27.49	
3-6	377.4	87.9	11.48	2.56	29.39	
3-7	376.9	102.5	11.42	2.68	30.61	
3-8	377.5	117.9	11.39	2.74	31.21	
3-9	376.8	132.4	11.36	2.80	31.81	
3-10	374.5	146.2	11.31	2.90	32.80	

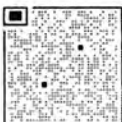
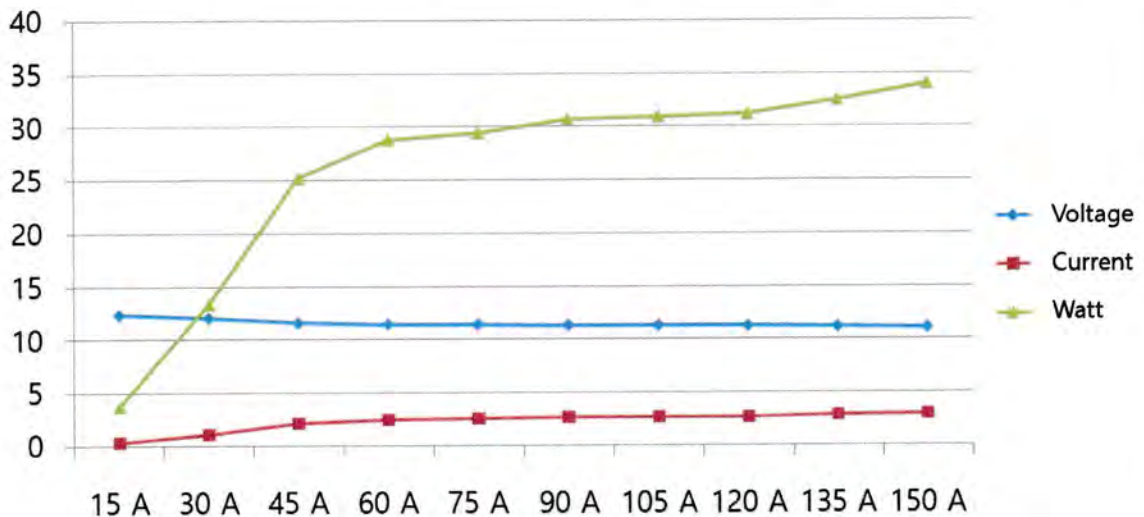






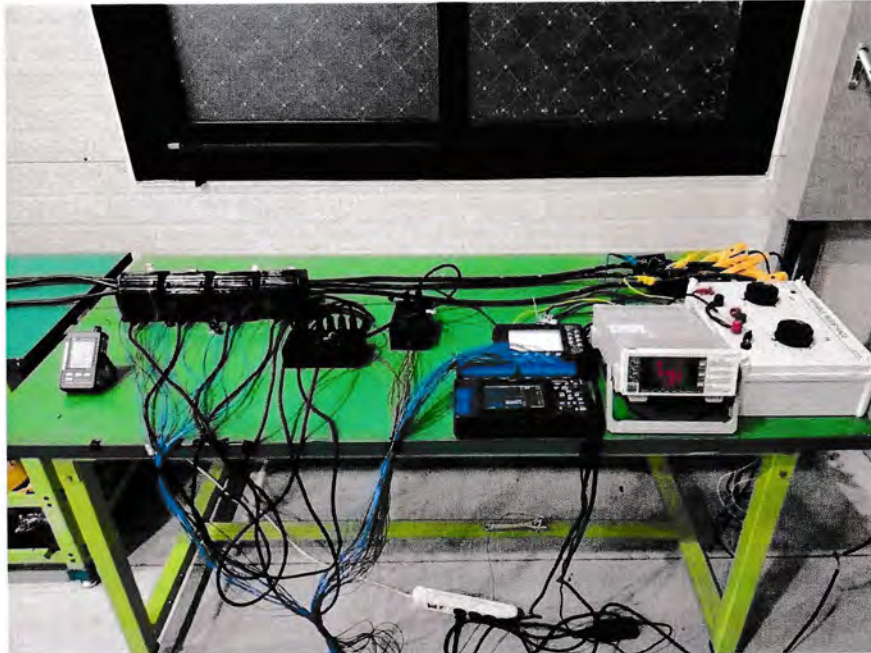
Test result

Test date	2019-11-18	Test environment	Temperature:	(15.0 ± 1) °C	
			Humidity:	(31 ± 2) % R.H.	
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1				
Test condition	Tolenoid 4 EA operating				
Test No.	Track		SMPS		
	Voltage (V)	Current (A)	Voltage (V)	Current (A)	Watt (W)
4-1	379.3	15.0	12.45	0.30	3.74
4-2	381.4	30.4	12.12	1.10	13.33
4-3	377.0	44.4	11.67	2.16	25.21
4-4	380.0	59.4	11.53	2.50	28.83
4-5	376.0	74.1	11.50	2.56	29.44
4-6	377.3	89.3	11.42	2.69	30.72
4-7	374.5	102.9	11.39	2.72	30.98
4-8	377.3	117.8	11.35	2.75	31.21
4-9	374.5	131.7	11.26	2.89	32.54
4-10	376.2	147.0	11.16	3.05	34.04



### E. Test picture

Test set-up

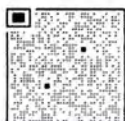
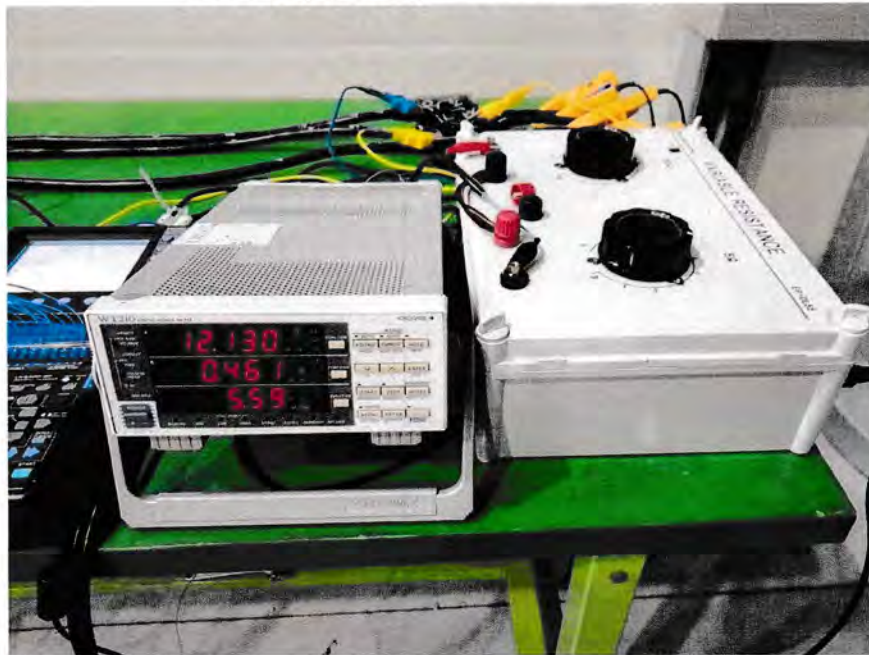


Track voltage/current measurement



Test picture

SMPS output voltage/current measurement





### 3. Temperature measurement

#### A. Test standard

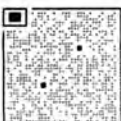
Measure and record the heat generated at maximum output conditions about Tolenoid, Multi-adapter, and SMPS according to the Test Method requested by the applicant.

#### B. Test method

- ① Install 4 EA Tolenoids on the test track. Installation distance is according to the manufacturer's specifications.
- ② Install Multi-adapter 1 EA, SMPS 1 EA according to the manufacturer's specifications.
- ③ Install Digital Power Meter and a variable resistive load on the output of the SMPS.
- ④ Attach the thermal coupler in the enclosure of Tolenoid, Multi-adapter, SMPS, and the location where the internal heats are expected and connect to the temperature recorder.
- ⑤ Measure and record the temperature generated by the maximum power measurement conditions in this test method paragraph 2.
- ⑥ The temperature measurement shall be considered stabilized and finished if the temperature does not change below 2 K/h.

#### C. Measurement equipment

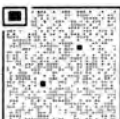
Description	Manufacturer	Model	Calibration date	Next calibration date
CLAMP ON POWER HI TESTER	HIOKI	3169-20	2019-03-06	2020-03-06
Digital Power Meter	YOKOGAWA	WT210	2019-03-05	2020-03-05
Variable Resistor (55 Ω)	ELEX POLYTECH	EP-DL55	N/A	N/A
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 (Temperature/Humidity)	2020-03-05 (Temperature/Humidity)
			2019-03-08 (Atmospheric Pressure)	2020-03-08 (Atmospheric Pressure)
STOP WATCH	CASIO	HS-3	2019-03-26	2021-03-26
MEMORY HI LOGGER	HIOKI	LR8400-20	2019-03-07	2020-03-07

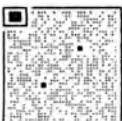
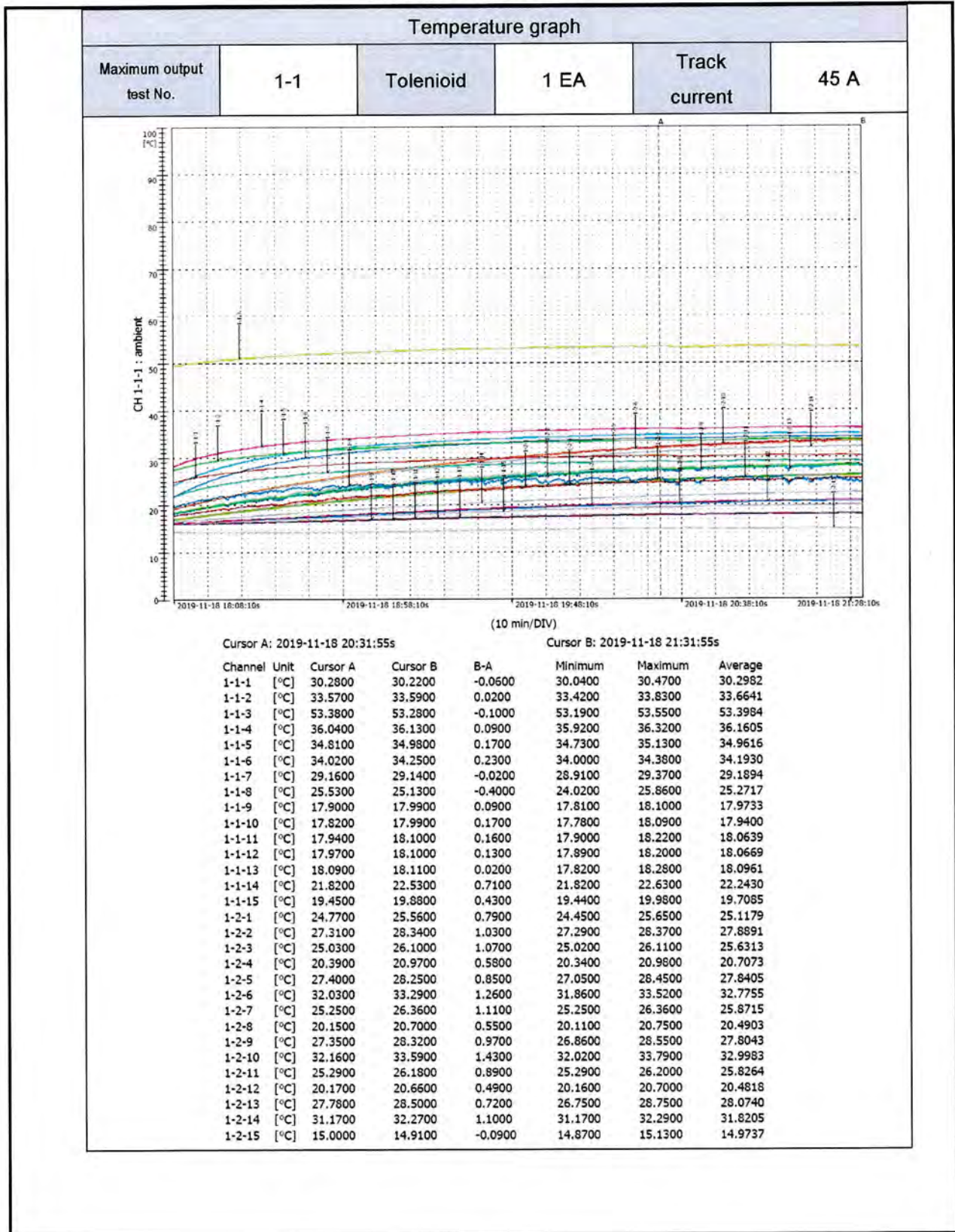




**D. Test result**

Test date	2019-11-18	Test environment	Temperature:	(15.0 ± 1) °C
			Humidity:	(31 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.		1-1 (Tolenoid 1 EA, Track current 45 A)		
Test point		Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.
SMPS	Input Connector	30.2	55.3	1-1-1
	Y-Capacitor	33.6	58.7	1-1-2
	Thermistor	53.3	78.4	1-1-3
	Line filter	36.1	61.2	1-1-4
	EL- Capacitor	35.0	60.1	1-1-5
	Transformer	34.3	59.4	1-1-6
	Output Connector	29.1	54.2	1-1-7
Multi-adapter	Exterior top	25.1	50.2	1-1-8
	Input Connector	18.0	43.1	1-1-9
	Switch	18.0	43.1	1-1-10
	Relay	18.1	43.2	1-1-11
	Output Connector	18.1	43.2	1-1-12
Tolenoid -1	Exterior top	18.1	43.2	1-1-13
	Internal coil	22.5	47.6	1-1-14
	Output Connector	19.9	45.0	1-1-15
	Exterior top	25.6	50.7	1-2-1
Tolenoid -2	Track contact part	28.3	53.4	1-2-2
	Inside coil	26.1	51.2	1-2-3
	Output Connector	21.0	46.1	1-2-4
	Exterior top	28.3	53.4	1-2-5
Tolenoid -3	Track contact part	33.3	58.4	1-2-6
	Inside coil	26.4	51.5	1-2-7
	Output Connector	20.7	45.8	1-2-8
	Exterior top	28.3	53.4	1-2-9
Tolenoid -4	Track contact part	33.6	58.7	1-2-10
	Inside coil	26.2	51.3	1-2-11
	Output Connector	20.7	45.8	1-2-12
	Exterior top	28.5	53.6	1-2-13
Environmental temperature		14.9	40.0	1-2-14
		* Conversion temperature: measurement temperature – Environmental temperature + 40 °C		

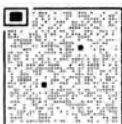


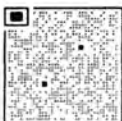
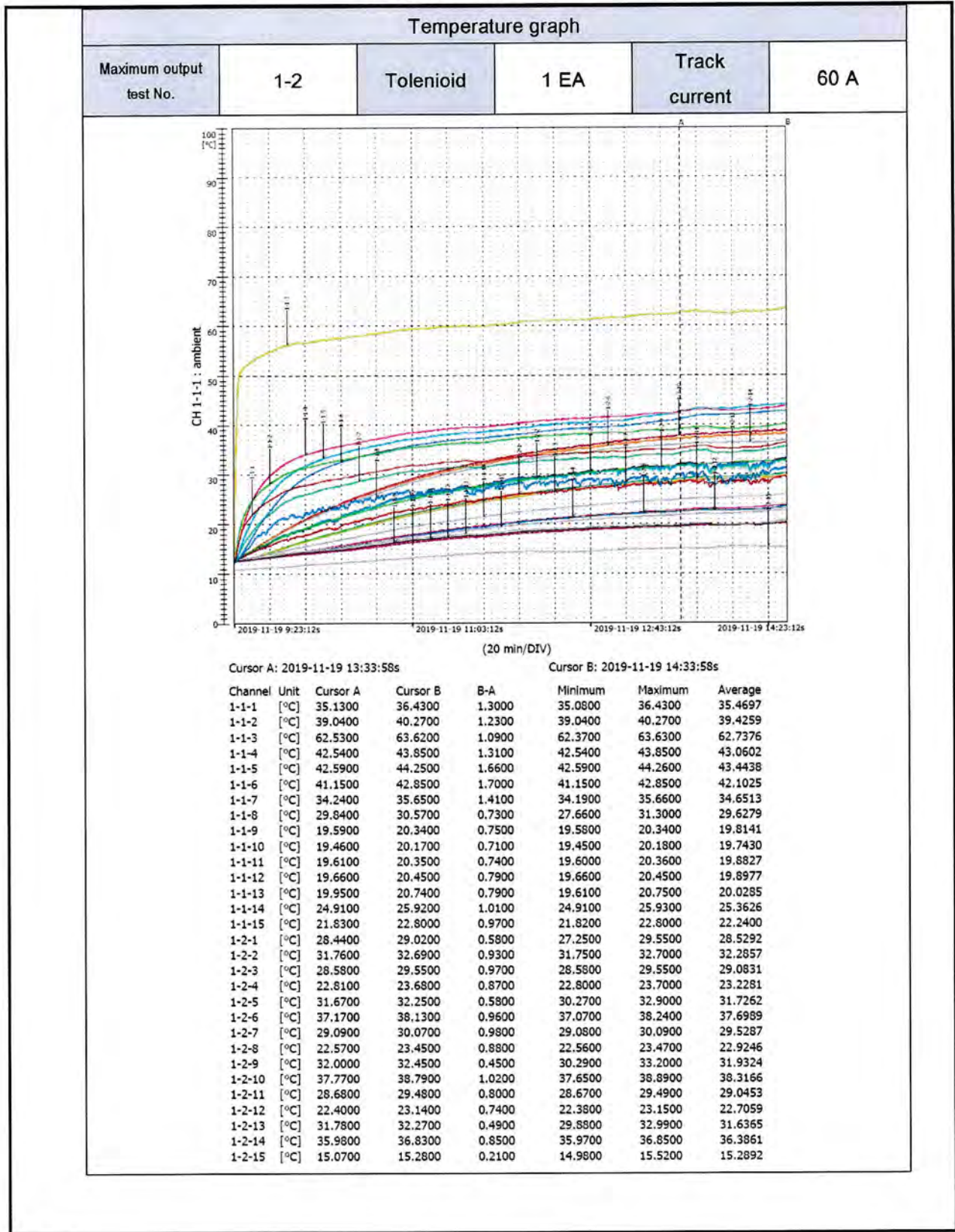




Test result

Test date	2019-11-19	Test environment	Temperature:	(15.3 ± 1) °C
			Humidity:	(31 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	1-2 (Tolenoid 1 EA, Track current 60 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	36.4	61.1	1-1-1
	Y-Capacitor	40.3	65.0	1-1-2
	Thermistor	63.6	88.3	1-1-3
	Line filter	43.9	68.6	1-1-4
	EL- Capacitor	44.3	69.0	1-1-5
	Transformer	42.9	67.6	1-1-6
	Output Connector	35.7	60.4	1-1-7
	Exterior top	30.6	55.3	1-1-8
Multi-adapter	Input Connector	20.3	45.0	1-1-9
	Switch	20.2	44.9	1-1-10
	Relay	20.4	45.1	1-1-11
	Output Connector	20.5	45.2	1-1-12
	Exterior top	20.7	45.4	1-1-13
Tolenoid -1	Internal coil	25.9	50.6	1-1-14
	Output Connector	22.8	47.5	1-1-15
	Exterior top	29.0	53.7	1-2-1
	Track contact part	32.7	57.4	1-2-2
Tolenoid -2	Inside coil	29.6	54.3	1-2-3
	Output Connector	23.7	48.4	1-2-4
	Exterior top	32.3	57.0	1-2-5
	Track contact part	38.1	62.8	1-2-6
Tolenoid -3	Inside coil	30.1	54.8	1-2-7
	Output Connector	23.5	48.2	1-2-8
	Exterior top	32.5	57.2	1-2-9
	Track contact part	38.8	63.5	1-2-10
Tolenoid -4	Inside coil	29.5	54.2	1-2-11
	Output Connector	23.1	47.8	1-2-12
	Exterior top	32.3	57.0	1-2-13
	Track contact part	36.8	61.5	1-2-14
Environmental temperature	15.3	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				





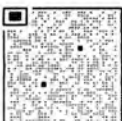


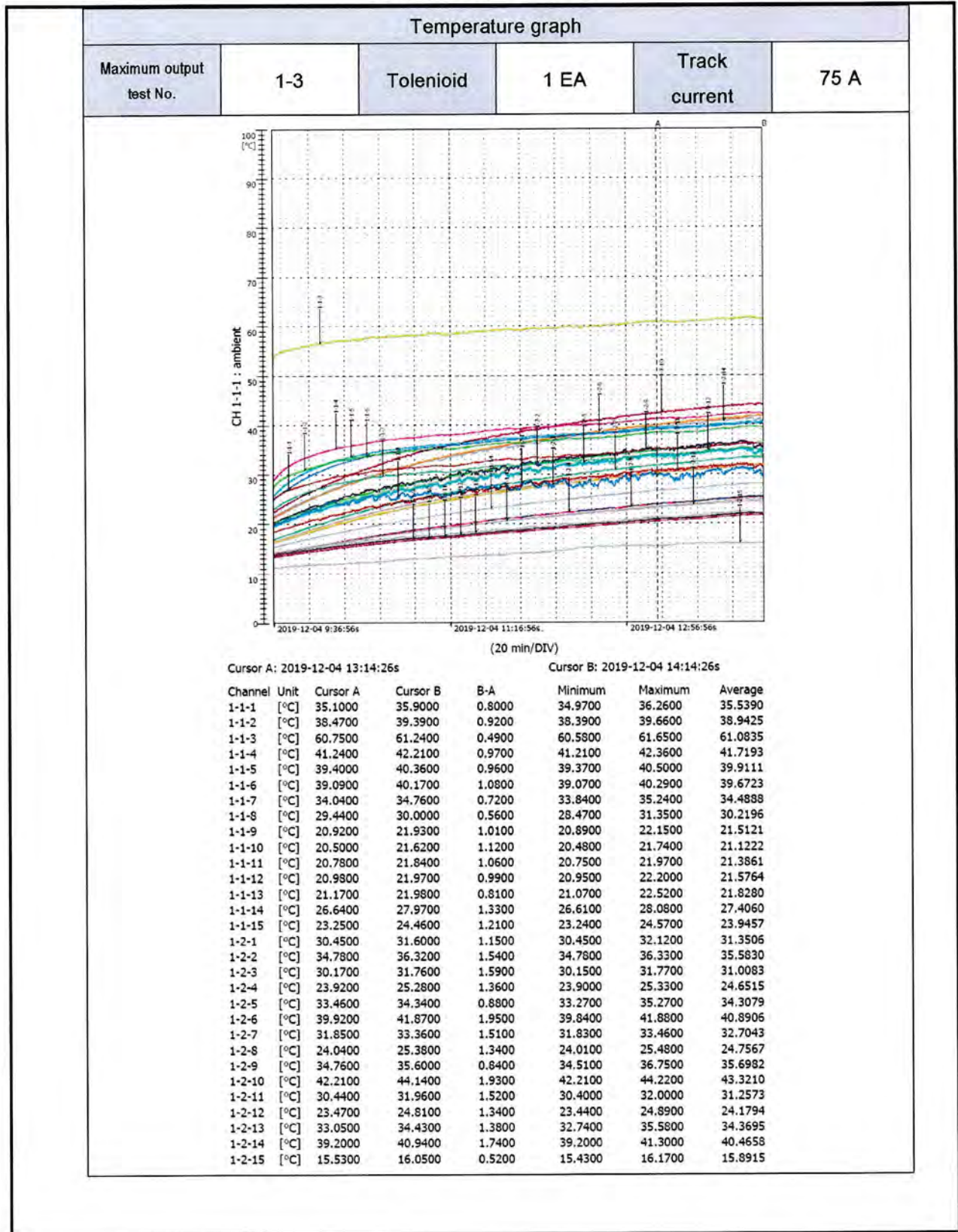


Test result

Test date	2019-12-04	Test environment	Temperature: Humidity:	(15.9 ± 1) °C (25 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	1-3 (Tolenoid 1 EA, Track current 75 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	35.9	59.8	1-1-1
	Y-Capacitor	39.4	63.3	1-1-2
	Thermistor	61.2	85.1	1-1-3
	Line filter	42.2	66.1	1-1-4
	EL- Capacitor	40.4	64.3	1-1-5
	Transformer	40.2	64.1	1-1-6
	Output Connector	34.8	58.7	1-1-7
Multi-adapter	Exterior top	30.0	53.9	1-1-8
	Input Connector	21.9	45.8	1-1-9
	Switch	21.6	45.5	1-1-10
	Relay	21.8	45.7	1-1-11
	Output Connector	22.0	45.9	1-1-12
Tolenoid -1	Exterior top	22.0	45.9	1-1-13
	Internal coil	28.0	51.9	1-1-14
	Output Connector	24.5	48.4	1-1-15
	Exterior top	31.6	55.5	1-2-1
Tolenoid -2	Track contact part	36.3	60.2	1-2-2
	Inside coil	31.8	55.7	1-2-3
	Output Connector	25.3	49.2	1-2-4
	Exterior top	34.3	58.2	1-2-5
Tolenoid -3	Track contact part	41.9	65.8	1-2-6
	Inside coil	33.4	57.3	1-2-7
	Output Connector	25.4	49.3	1-2-8
	Exterior top	35.6	59.5	1-2-9
Tolenoid -4	Track contact part	44.1	68.0	1-2-10
	Inside coil	32.0	55.9	1-2-11
	Output Connector	24.8	48.7	1-2-12
	Exterior top	34.4	58.3	1-2-13
Environmental temperature	Track contact part	40.9	64.8	1-2-14
Environmental temperature		16.1	40.0	1-2-15

\* Conversion temperature: measurement temperature - Environmental temperature + 40 °C

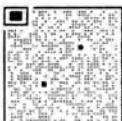


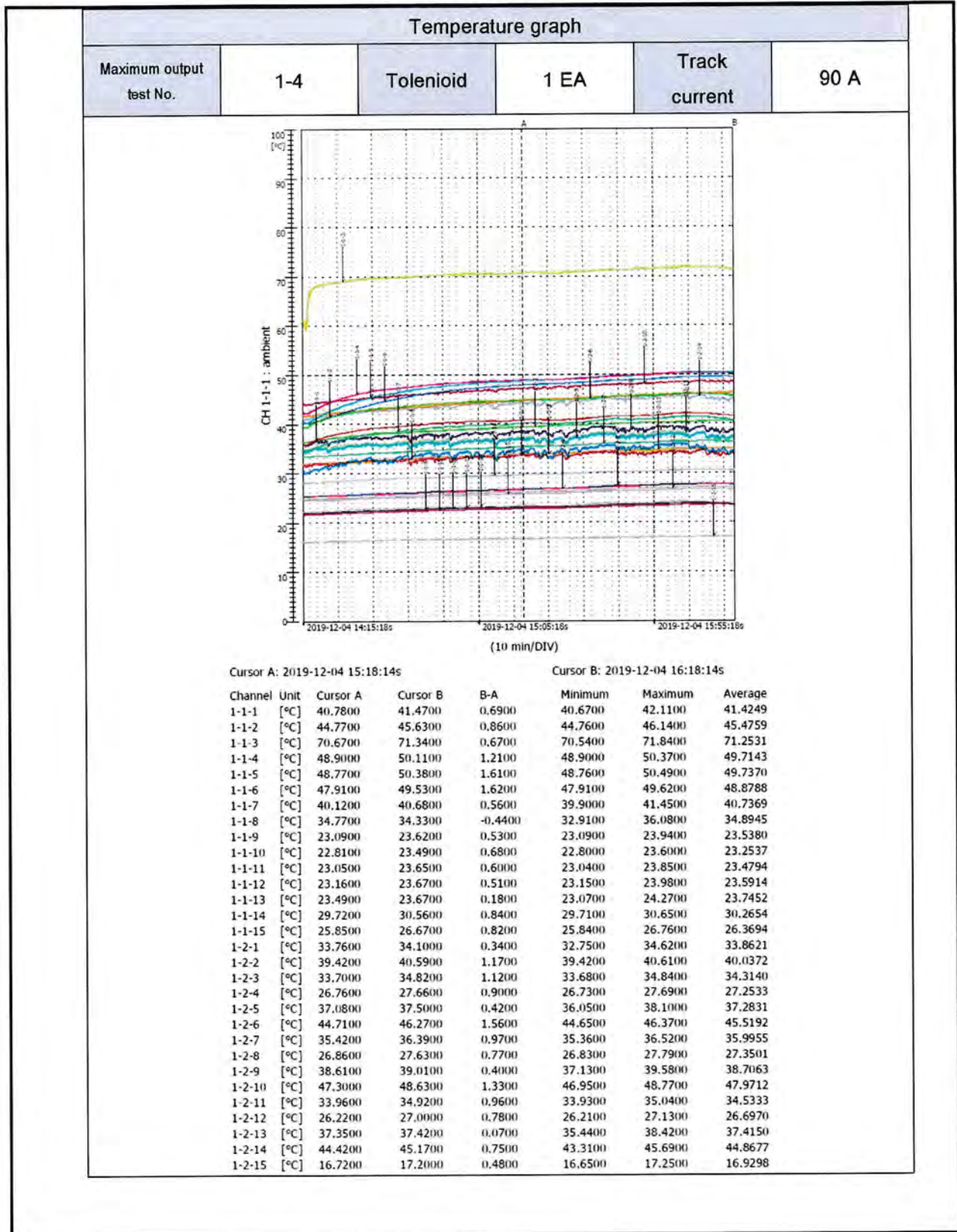




Test result

Test date	2019-12-04	Test environment	Temperature:	(16.9 ± 1) °C
			Humidity:	(25 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	1-4 (Tolenoid 1 EA, Track current 90 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	41.5	64.3	1-1-1
	Y-Capacitor	45.6	68.4	1-1-2
	Thermistor	71.3	94.1	1-1-3
	Line filter	50.1	72.9	1-1-4
	EL- Capacitor	50.4	73.2	1-1-5
	Transformer	49.5	72.3	1-1-6
	Output Connector	40.7	63.5	1-1-7
	Exterior top	34.3	57.1	1-1-8
Multi-adapter	Input Connector	23.6	46.4	1-1-9
	Switch	23.5	46.3	1-1-10
	Relay	23.7	46.5	1-1-11
	Output Connector	23.7	46.5	1-1-12
	Exterior top	23.7	46.5	1-1-13
Tolenoid -1	Internal coil	30.6	53.4	1-1-14
	Output Connector	26.7	49.5	1-1-15
	Exterior top	34.1	56.9	1-2-1
	Track contact part	40.6	63.4	1-2-2
Tolenoid -2	Inside coil	34.8	57.6	1-2-3
	Output Connector	27.7	50.5	1-2-4
	Exterior top	37.5	60.3	1-2-5
	Track contact part	46.3	69.1	1-2-6
Tolenoid -3	Inside coil	36.4	59.2	1-2-7
	Output Connector	27.6	50.4	1-2-8
	Exterior top	39.0	61.8	1-2-9
	Track contact part	48.6	71.4	1-2-10
Tolenoid -4	Inside coil	34.9	57.7	1-2-11
	Output Connector	27.0	49.8	1-2-12
	Exterior top	37.4	60.2	1-2-13
	Track contact part	45.2	68.0	1-2-14
Environmental temperature	17.2	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

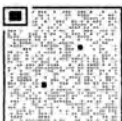


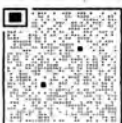
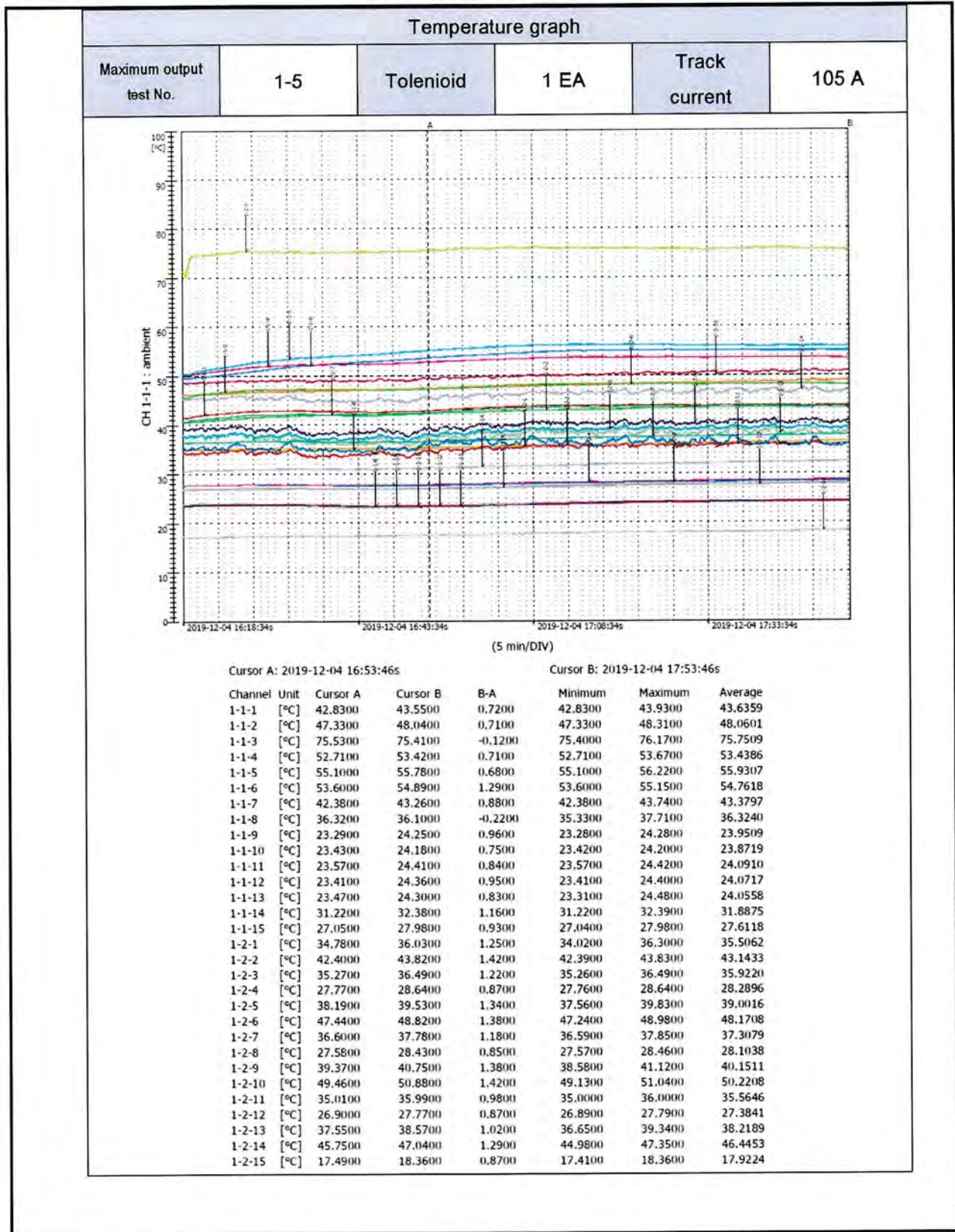




Test result

Test date	2019-12-04	Test environment	Temperature:	(17.9 ± 1) °C
			Humidity:	(25 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	1-5 (Tolenoid 1 EA, Track current 105 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	43.6	65.2	1-1-1
	Y-Capacitor	48.0	69.6	1-1-2
	Thermistor	75.4	97.0	1-1-3
	Line filter	53.4	75.0	1-1-4
	EL- Capacitor	55.8	77.4	1-1-5
	Transformer	54.9	76.5	1-1-6
	Output Connector	43.3	64.9	1-1-7
	Exterior top	36.1	57.7	1-1-8
Multi-adapter	Input Connector	24.3	45.9	1-1-9
	Switch	24.2	45.8	1-1-10
	Relay	24.4	46.0	1-1-11
	Output Connector	24.4	46.0	1-1-12
	Exterior top	24.3	45.9	1-1-13
Tolenoid -1	Internal coil	32.4	54.0	1-1-14
	Output Connector	28.0	49.6	1-1-15
	Exterior top	36.0	57.6	1-2-1
	Track contact part	43.8	65.4	1-2-2
Tolenoid -2	Inside coil	36.5	58.1	1-2-3
	Output Connector	28.6	50.2	1-2-4
	Exterior top	39.5	61.1	1-2-5
	Track contact part	48.8	70.4	1-2-6
Tolenoid -3	Inside coil	37.8	59.4	1-2-7
	Output Connector	28.4	50.0	1-2-8
	Exterior top	40.8	62.4	1-2-9
	Track contact part	50.9	72.5	1-2-10
Tolenoid -4	Inside coil	36.0	57.6	1-2-11
	Output Connector	27.8	49.4	1-2-12
	Exterior top	38.6	60.2	1-2-13
	Track contact part	47.0	68.6	1-2-14
Environmental temperature	18.4	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

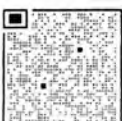


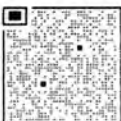
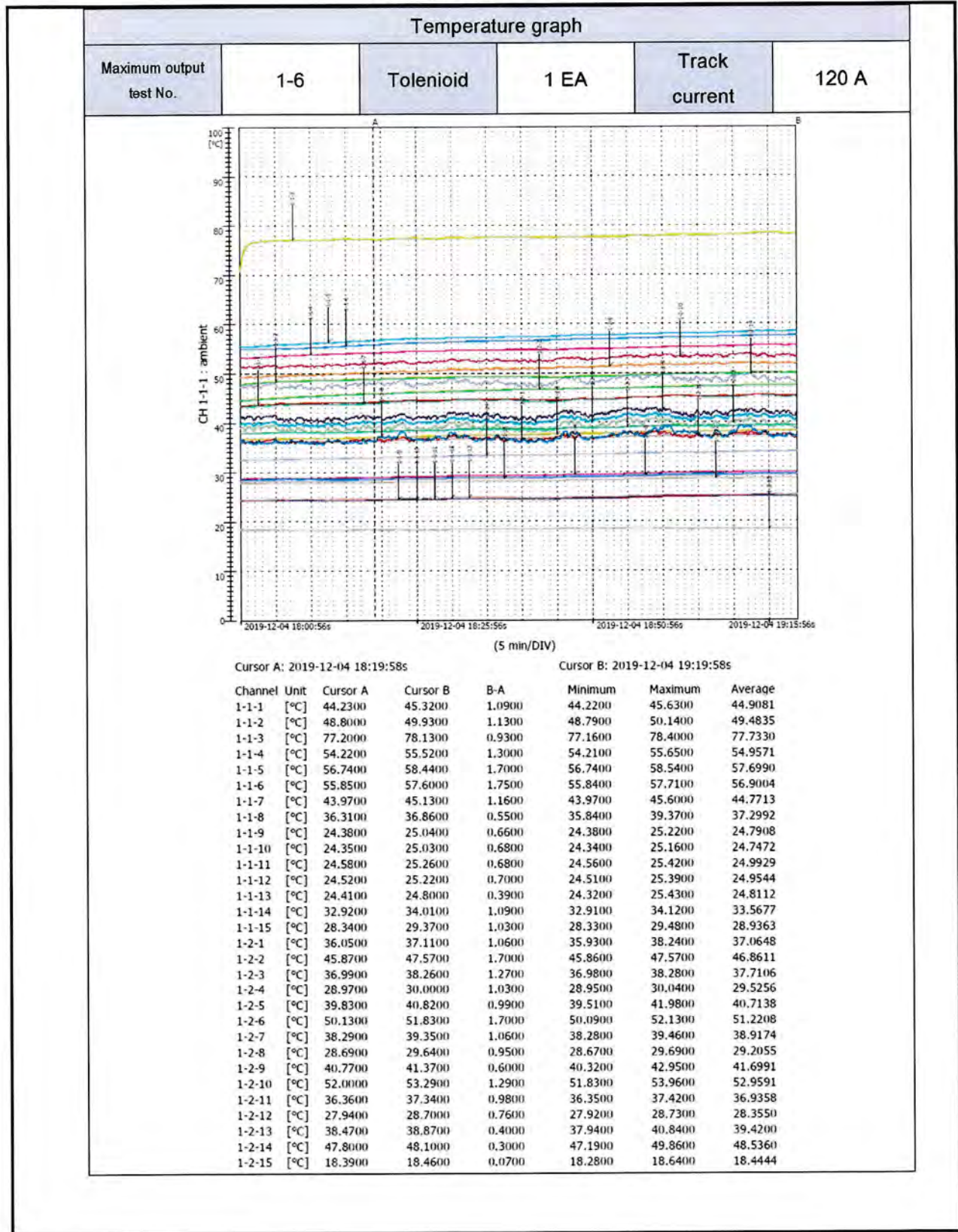




Test result

Test date	2019-12-04	Test environment	Temperature:	(18.4 ± 1) °C
			Humidity:	(25 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	1-6 (Tolenoid 1 EA, Track current 120 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	45.3	66.8	1-1-1
	Y-Capacitor	49.9	71.4	1-1-2
	Thermistor	78.1	99.6	1-1-3
	Line filter	55.5	77.0	1-1-4
	EL- Capacitor	58.4	79.9	1-1-5
	Transformer	57.6	79.1	1-1-6
	Output Connector	45.1	66.6	1-1-7
	Exterior top	36.9	58.4	1-1-8
Multi-adapter	Input Connector	25.0	46.5	1-1-9
	Switch	25.0	46.5	1-1-10
	Relay	25.3	46.8	1-1-11
	Output Connector	25.2	46.7	1-1-12
	Exterior top	24.8	46.3	1-1-13
Tolenoid -1	Internal coil	34.0	55.5	1-1-14
	Output Connector	29.4	50.9	1-1-15
	Exterior top	37.1	58.6	1-2-1
	Track contact part	47.6	69.1	1-2-2
Tolenoid -2	Inside coil	38.3	59.8	1-2-3
	Output Connector	30.0	51.5	1-2-4
	Exterior top	40.8	62.3	1-2-5
	Track contact part	51.8	73.3	1-2-6
Tolenoid -3	Inside coil	39.4	60.9	1-2-7
	Output Connector	29.6	51.1	1-2-8
	Exterior top	41.4	62.9	1-2-9
	Track contact part	53.3	74.8	1-2-10
Tolenoid -4	Inside coil	37.3	58.8	1-2-11
	Output Connector	28.7	50.2	1-2-12
	Exterior top	38.9	60.4	1-2-13
	Track contact part	48.1	69.6	1-2-14
Environmental temperature	18.5	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				



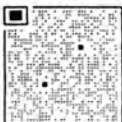


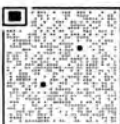
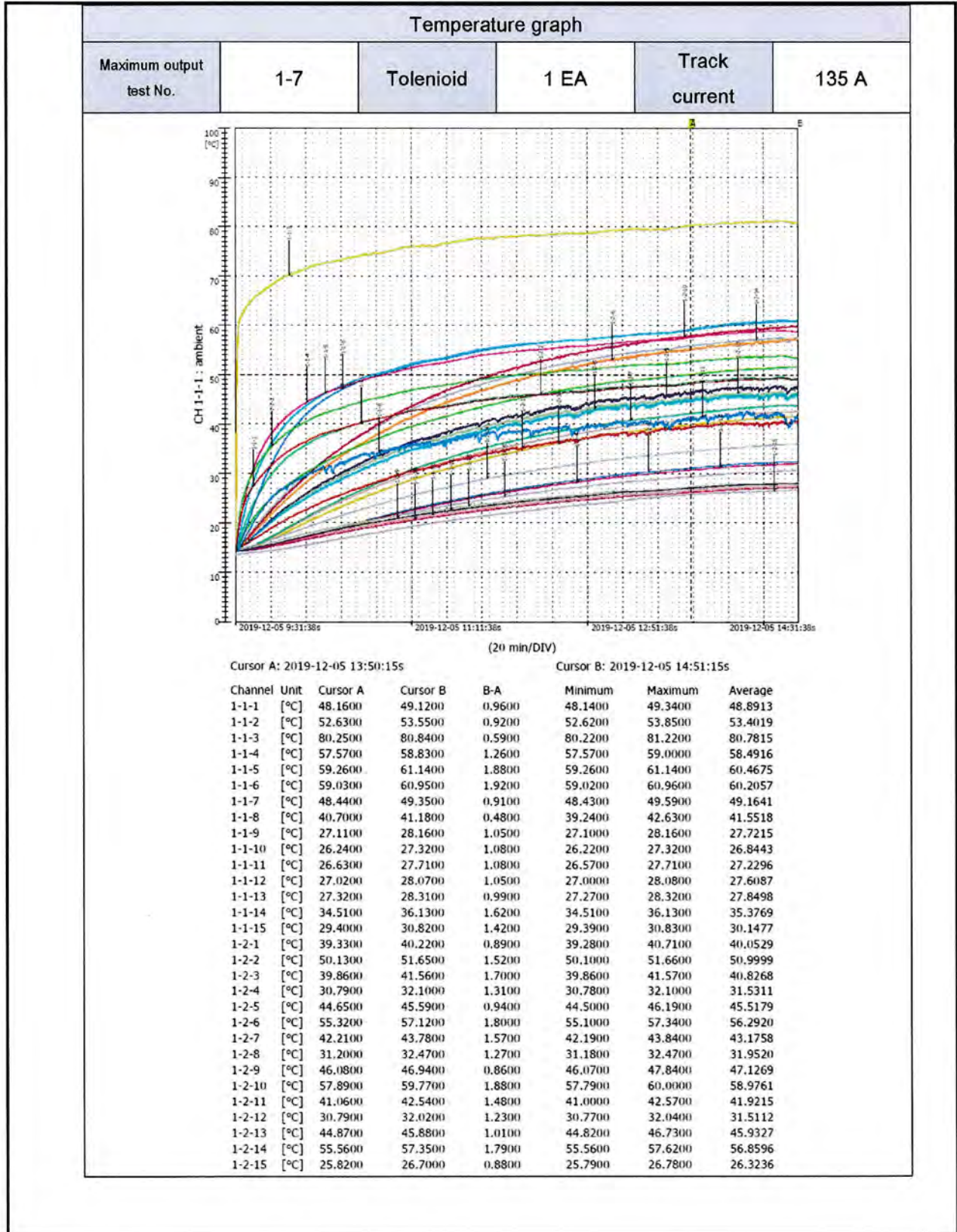




Test result

Test date	2019-12-05	Test environment	Temperature:	(26.3 ± 1) °C
			Humidity:	(22 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	1-7 (Tolenoid 1 EA, Track current 135 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	49.1	62.4	1-1-1
	Y-Capacitor	53.6	66.9	1-1-2
	Thermistor	80.8	94.1	1-1-3
	Line filter	58.8	72.1	1-1-4
	EL- Capacitor	61.1	74.4	1-1-5
	Transformer	61.0	74.3	1-1-6
	Output Connector	49.4	62.7	1-1-7
	Exterior top	41.2	54.5	1-1-8
Multi-adapter	Input Connector	28.2	41.5	1-1-9
	Switch	27.3	40.6	1-1-10
	Relay	27.7	41.0	1-1-11
	Output Connector	28.1	41.4	1-1-12
	Exterior top	28.3	41.6	1-1-13
Tolenoid -1	Internal coil	36.1	49.4	1-1-14
	Output Connector	30.8	44.1	1-1-15
	Exterior top	40.2	53.5	1-2-1
	Track contact part	51.7	65.0	1-2-2
Tolenoid -2	Inside coil	41.6	54.9	1-2-3
	Output Connector	32.1	45.4	1-2-4
	Exterior top	45.6	58.9	1-2-5
	Track contact part	57.1	70.4	1-2-6
Tolenoid -3	Inside coil	43.8	57.1	1-2-7
	Output Connector	32.5	45.8	1-2-8
	Exterior top	46.9	60.2	1-2-9
	Track contact part	59.8	73.1	1-2-10
Tolenoid -4	Inside coil	42.5	55.8	1-2-11
	Output Connector	32.0	45.3	1-2-12
	Exterior top	45.9	59.2	1-2-13
	Track contact part	57.4	70.7	1-2-14
Environmental temperature	26.7	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

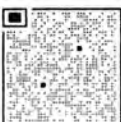


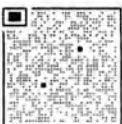
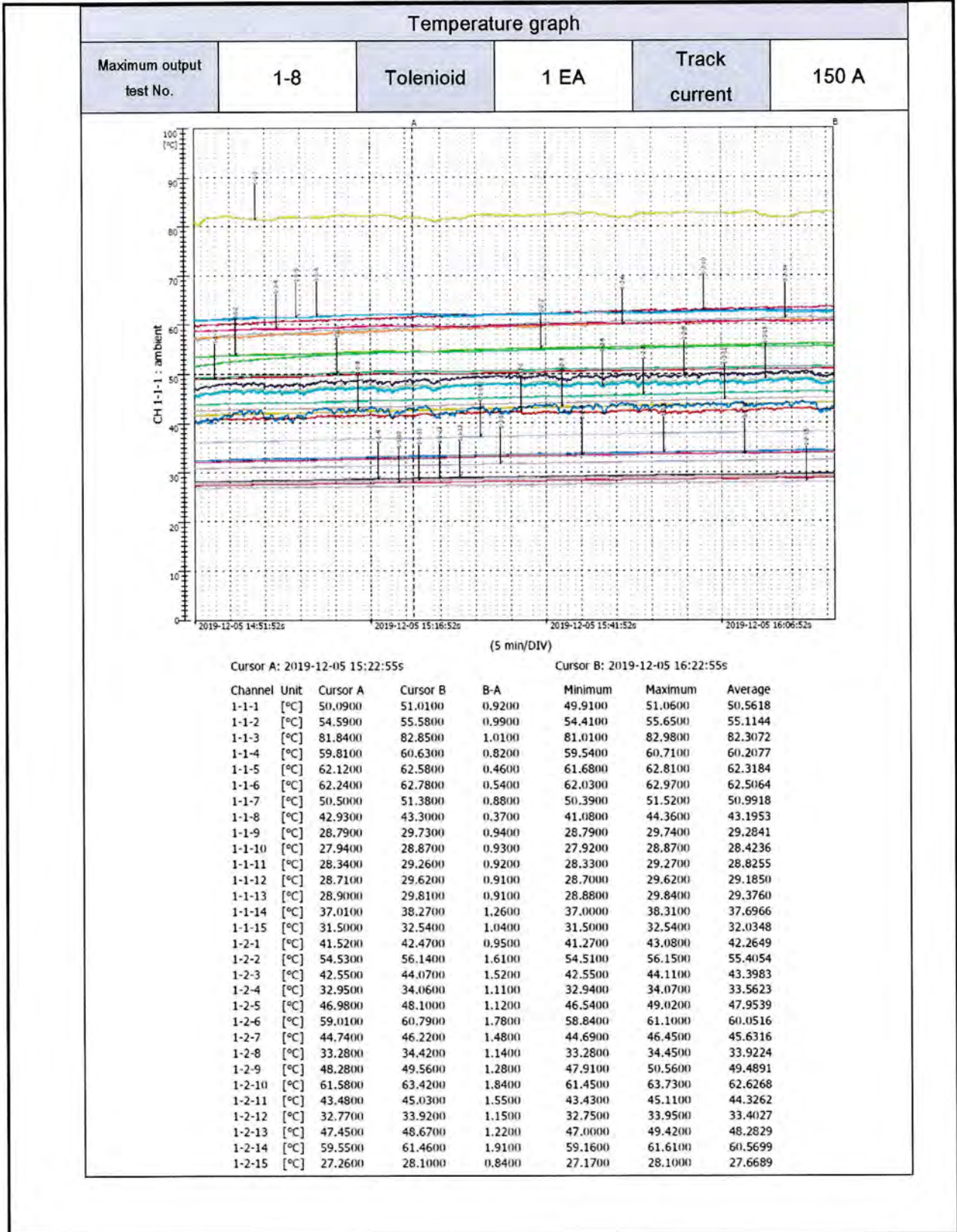




Test result

Test date	2019-12-05	Test environment	Temperature:	(27.7 ± 1) °C
			Humidity:	(22 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	1-8 (Tolenoid 1 EA, Track current 150 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	51.0	62.9	1-1-1
	Y-Capacitor	55.6	67.5	1-1-2
	Thermistor	82.9	94.8	1-1-3
	Line filter	60.6	72.5	1-1-4
	EL- Capacitor	62.6	74.5	1-1-5
	Transformer	62.8	74.7	1-1-6
	Output Connector	51.4	63.3	1-1-7
	Exterior top	43.3	55.2	1-1-8
Multi-adapter	Input Connector	29.7	41.6	1-1-9
	Switch	28.9	40.8	1-1-10
	Relay	29.3	41.2	1-1-11
	Output Connector	29.6	41.5	1-1-12
	Exterior top	29.8	41.7	1-1-13
Tolenoid -1	Internal coil	38.3	50.2	1-1-14
	Output Connector	32.5	44.4	1-1-15
	Exterior top	42.5	54.4	1-2-1
	Track contact part	56.1	68.0	1-2-2
Tolenoid -2	Inside coil	44.1	56.0	1-2-3
	Output Connector	34.1	46.0	1-2-4
	Exterior top	48.1	60.0	1-2-5
	Track contact part	60.8	72.7	1-2-6
Tolenoid -3	Inside coil	46.2	58.1	1-2-7
	Output Connector	34.4	46.3	1-2-8
	Exterior top	49.6	61.5	1-2-9
	Track contact part	63.4	75.3	1-2-10
Tolenoid -4	Inside coil	45.0	56.9	1-2-11
	Output Connector	33.9	45.8	1-2-12
	Exterior top	48.7	60.6	1-2-13
	Track contact part	61.5	73.4	1-2-14
Environmental temperature	28.1	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

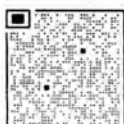


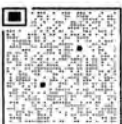
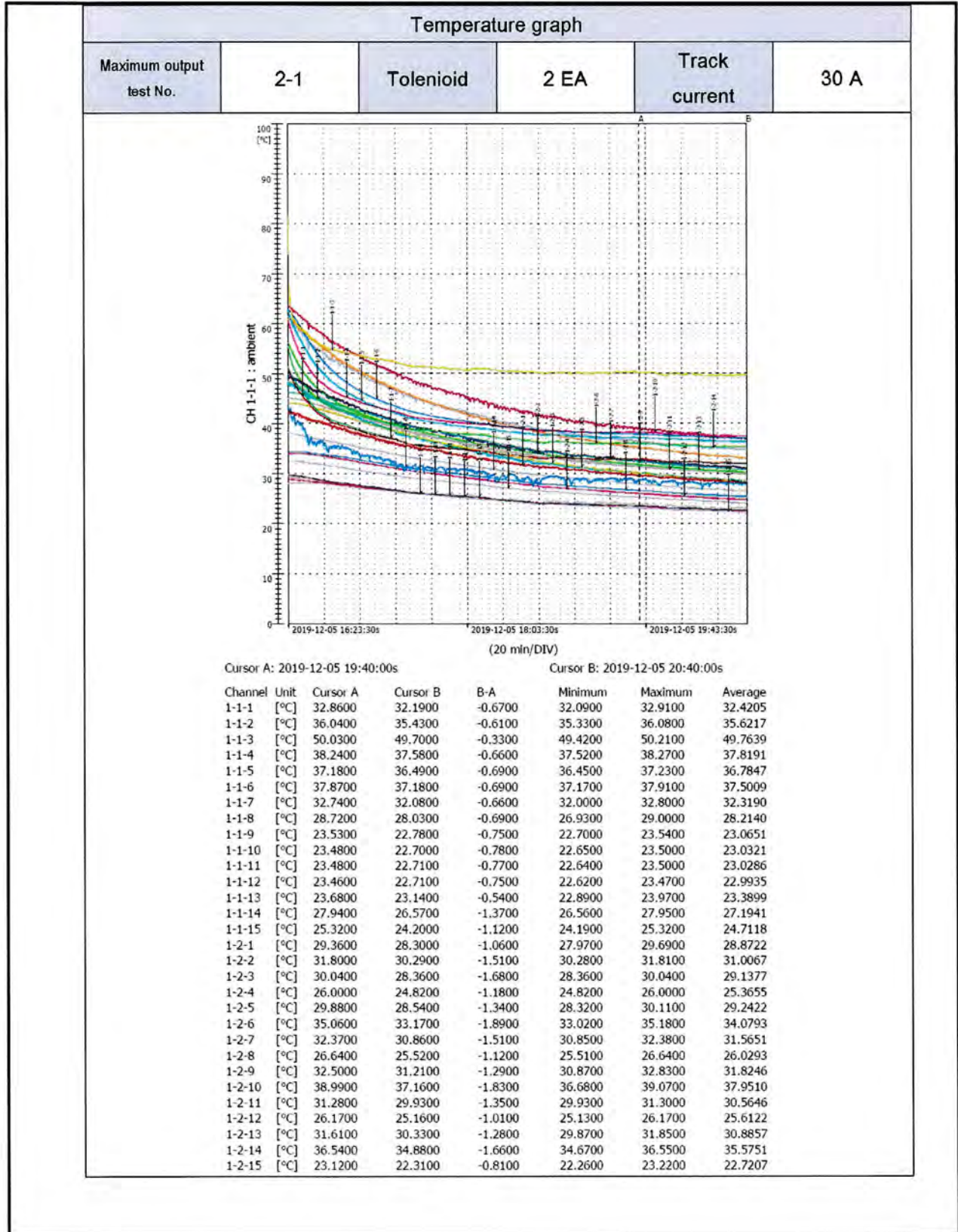




Test result

Test date	2019-12-05	Test environment	Temperature:	(22.7 ± 1) °C
			Humidity:	(22 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	2-1 (Tolenoid 2 EA, Track current 30 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	32.2	49.9	1-1-1
	Y-Capacitor	35.4	53.1	1-1-2
	Thermistor	49.7	67.4	1-1-3
	Line filter	37.6	55.3	1-1-4
	EL- Capacitor	36.5	54.2	1-1-5
	Transformer	37.2	54.9	1-1-6
	Output Connector	32.1	49.8	1-1-7
	Exterior top	28.0	45.7	1-1-8
Multi-adapter	Input Connector	22.8	40.5	1-1-9
	Switch	22.7	40.4	1-1-10
	Relay	22.7	40.4	1-1-11
	Output Connector	22.7	40.4	1-1-12
	Exterior top	23.1	40.8	1-1-13
Tolenoid -1	Internal coil	26.6	44.3	1-1-14
	Output Connector	24.2	41.9	1-1-15
	Exterior top	28.3	46.0	1-2-1
	Track contact part	30.3	48.0	1-2-2
Tolenoid -2	Inside coil	28.4	46.1	1-2-3
	Output Connector	24.8	42.5	1-2-4
	Exterior top	28.5	46.2	1-2-5
	Track contact part	33.2	50.9	1-2-6
Tolenoid -3	Inside coil	30.9	48.6	1-2-7
	Output Connector	25.5	43.2	1-2-8
	Exterior top	31.2	48.9	1-2-9
	Track contact part	37.2	54.9	1-2-10
Tolenoid -4	Inside coil	29.9	47.6	1-2-11
	Output Connector	25.2	42.9	1-2-12
	Exterior top	30.3	48.0	1-2-13
	Track contact part	34.9	52.6	1-2-14
Environmental temperature	22.3	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

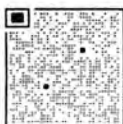


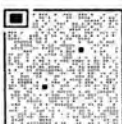
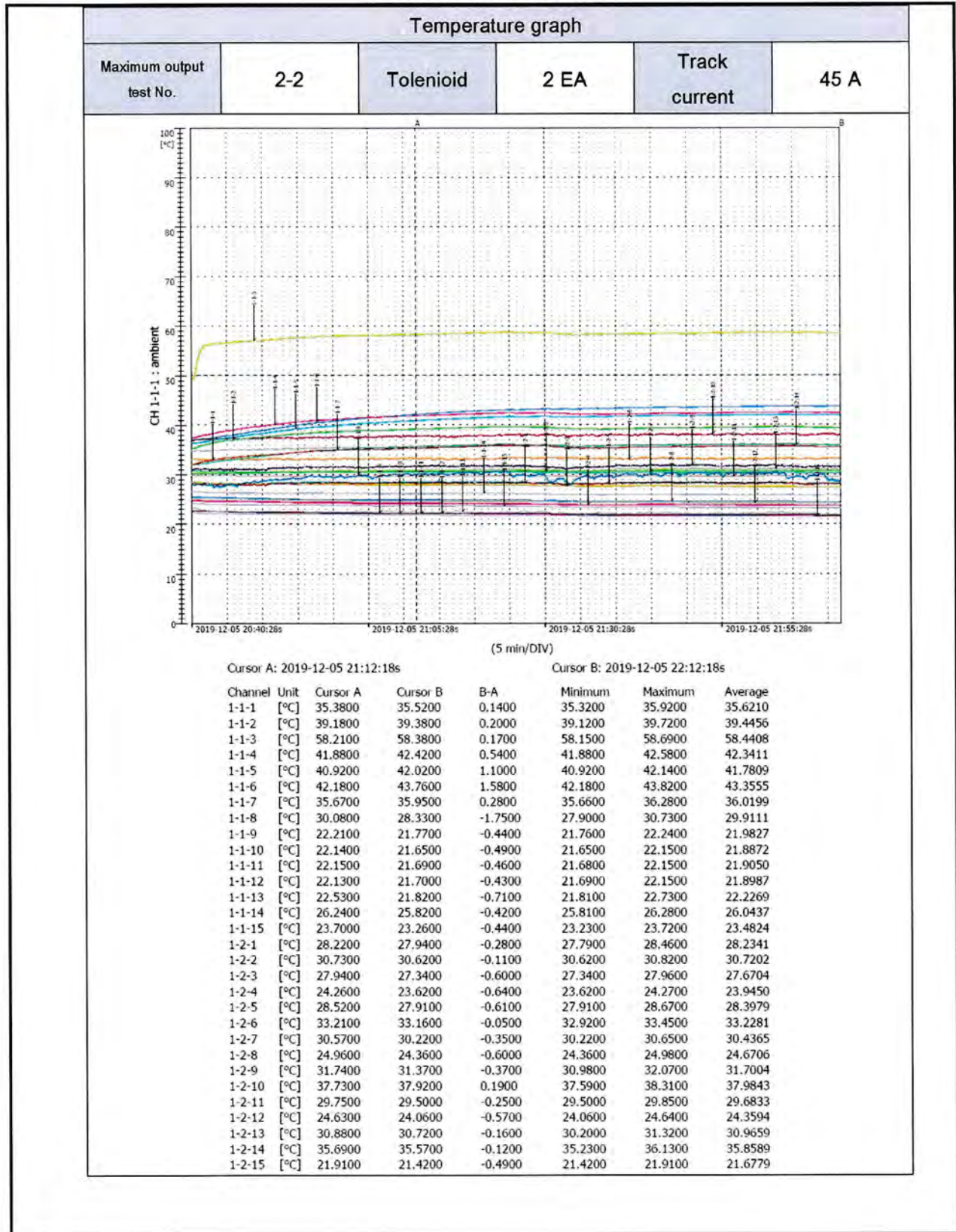




Test result

Test date	2019-12-05	Test environment	Temperature:	(21.7 ± 1) °C
			Humidity:	(22 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	2-2 (Tolenoid 2 EA, Track current 45 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	35.5	54.1	1-1-1
	Y-Capacitor	39.4	58.0	1-1-2
	Thermistor	58.4	77.0	1-1-3
	Line filter	42.4	61.0	1-1-4
	EL- Capacitor	42.0	60.6	1-1-5
	Transformer	43.8	62.4	1-1-6
	Output Connector	36.0	54.6	1-1-7
	Exterior top	28.3	46.9	1-1-8
Multi-adapter	Input Connector	21.8	40.4	1-1-9
	Switch	21.7	40.3	1-1-10
	Relay	21.7	40.3	1-1-11
	Output Connector	21.7	40.3	1-1-12
	Exterior top	21.8	40.4	1-1-13
Tolenoid -1	Internal coil	25.8	44.4	1-1-14
	Output Connector	23.3	41.9	1-1-15
	Exterior top	27.9	46.5	1-2-1
	Track contact part	30.6	49.2	1-2-2
Tolenoid -2	Inside coil	27.3	45.9	1-2-3
	Output Connector	23.6	42.2	1-2-4
	Exterior top	27.9	46.5	1-2-5
	Track contact part	33.2	51.8	1-2-6
Tolenoid -3	Inside coil	30.2	48.8	1-2-7
	Output Connector	24.4	43.0	1-2-8
	Exterior top	31.4	50.0	1-2-9
	Track contact part	37.9	56.5	1-2-10
Tolenoid -4	Inside coil	29.5	48.1	1-2-11
	Output Connector	24.1	42.7	1-2-12
	Exterior top	30.7	49.3	1-2-13
	Track contact part	35.6	54.2	1-2-14
Environmental temperature			40.0	1-2-15
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				



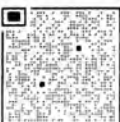


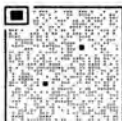
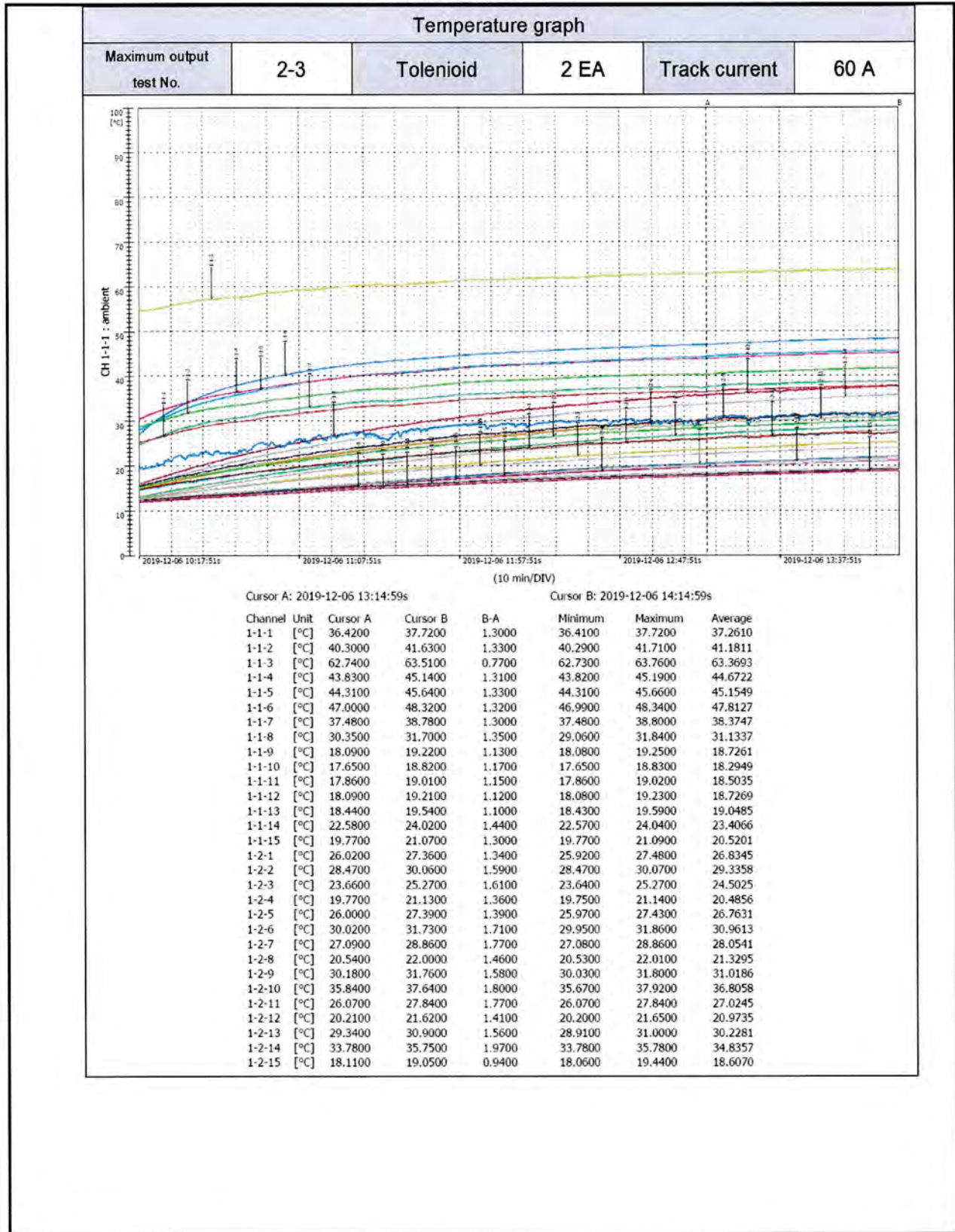




Test result

Test date	2019-12-06	Test environment	Temperature:	(18.6 ± 1) °C
			Humidity:	(24 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	2-3 (Tolenoid 2 EA, Track current 60 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	37.7	58.6	1-1-1
	Y-Capacitor	41.6	62.5	1-1-2
	Thermistor	63.5	84.4	1-1-3
	Line filter	45.1	66.0	1-1-4
	EL- Capacitor	45.6	66.5	1-1-5
	Transformer	48.3	69.2	1-1-6
	Output Connector	38.8	59.7	1-1-7
	Exterior top	31.7	52.6	1-1-8
Multi-adapter	Input Connector	19.2	40.1	1-1-9
	Switch	18.8	39.7	1-1-10
	Relay	19.0	39.9	1-1-11
	Output Connector	19.2	40.1	1-1-12
	Exterior top	19.5	40.4	1-1-13
Tolenoid -1	Internal coil	24.0	44.9	1-1-14
	Output Connector	21.1	42.0	1-1-15
	Exterior top	27.4	48.3	1-2-1
	Track contact part	30.1	51.0	1-2-2
Tolenoid -2	Inside coil	25.3	46.2	1-2-3
	Output Connector	21.1	42.0	1-2-4
	Exterior top	27.4	48.3	1-2-5
	Track contact part	31.7	52.6	1-2-6
Tolenoid -3	Inside coil	28.9	49.8	1-2-7
	Output Connector	22.0	42.9	1-2-8
	Exterior top	31.8	52.7	1-2-9
	Track contact part	37.6	58.5	1-2-10
Tolenoid -4	Inside coil	27.8	48.7	1-2-11
	Output Connector	21.6	42.5	1-2-12
	Exterior top	30.9	51.8	1-2-13
	Track contact part	35.8	56.7	1-2-14
Environmental temperature	19.1	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

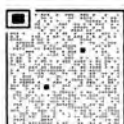


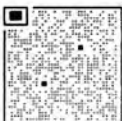
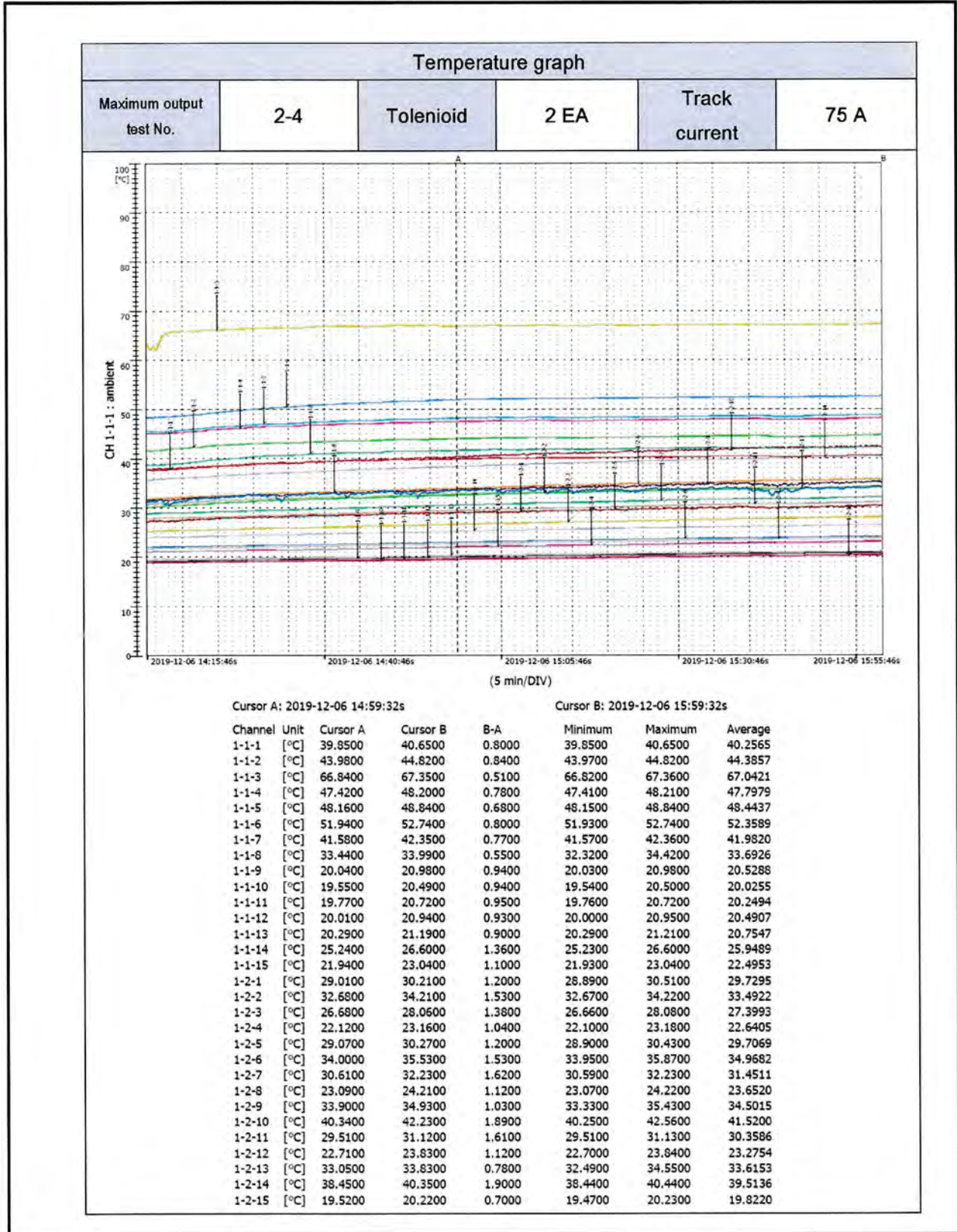




Test result

Test date	2019-12-06	Test environment	Temperature:	(19.8 ± 1) °C
			Humidity:	(24 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	2-4 (Tolenoid 2 EA, Track current 75 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	40.7	60.5	1-1-1
	Y-Capacitor	44.8	64.6	1-1-2
	Thermistor	67.4	87.2	1-1-3
	Line filter	48.2	68.0	1-1-4
	EL- Capacitor	48.8	68.6	1-1-5
	Transformer	52.7	72.5	1-1-6
	Output Connector	42.4	62.2	1-1-7
	Exterior top	34.0	53.8	1-1-8
Multi-adapter	Input Connector	21.0	40.8	1-1-9
	Switch	20.5	40.3	1-1-10
	Relay	20.7	40.5	1-1-11
	Output Connector	20.9	40.7	1-1-12
	Exterior top	21.2	41.0	1-1-13
Tolenoid -1	Internal coil	26.6	46.4	1-1-14
	Output Connector	23.0	42.8	1-1-15
	Exterior top	30.2	50.0	1-2-1
	Track contact part	34.2	54.0	1-2-2
Tolenoid -2	Inside coil	28.1	47.9	1-2-3
	Output Connector	23.2	43.0	1-2-4
	Exterior top	30.3	50.1	1-2-5
	Track contact part	35.5	55.3	1-2-6
Tolenoid -3	Inside coil	32.2	52.0	1-2-7
	Output Connector	24.2	44.0	1-2-8
	Exterior top	34.9	54.7	1-2-9
	Track contact part	42.2	62.0	1-2-10
Tolenoid -4	Inside coil	31.1	50.9	1-2-11
	Output Connector	23.8	43.6	1-2-12
	Exterior top	33.8	53.6	1-2-13
	Track contact part	40.4	60.2	1-2-14
Environmental temperature	20.2	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

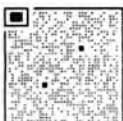


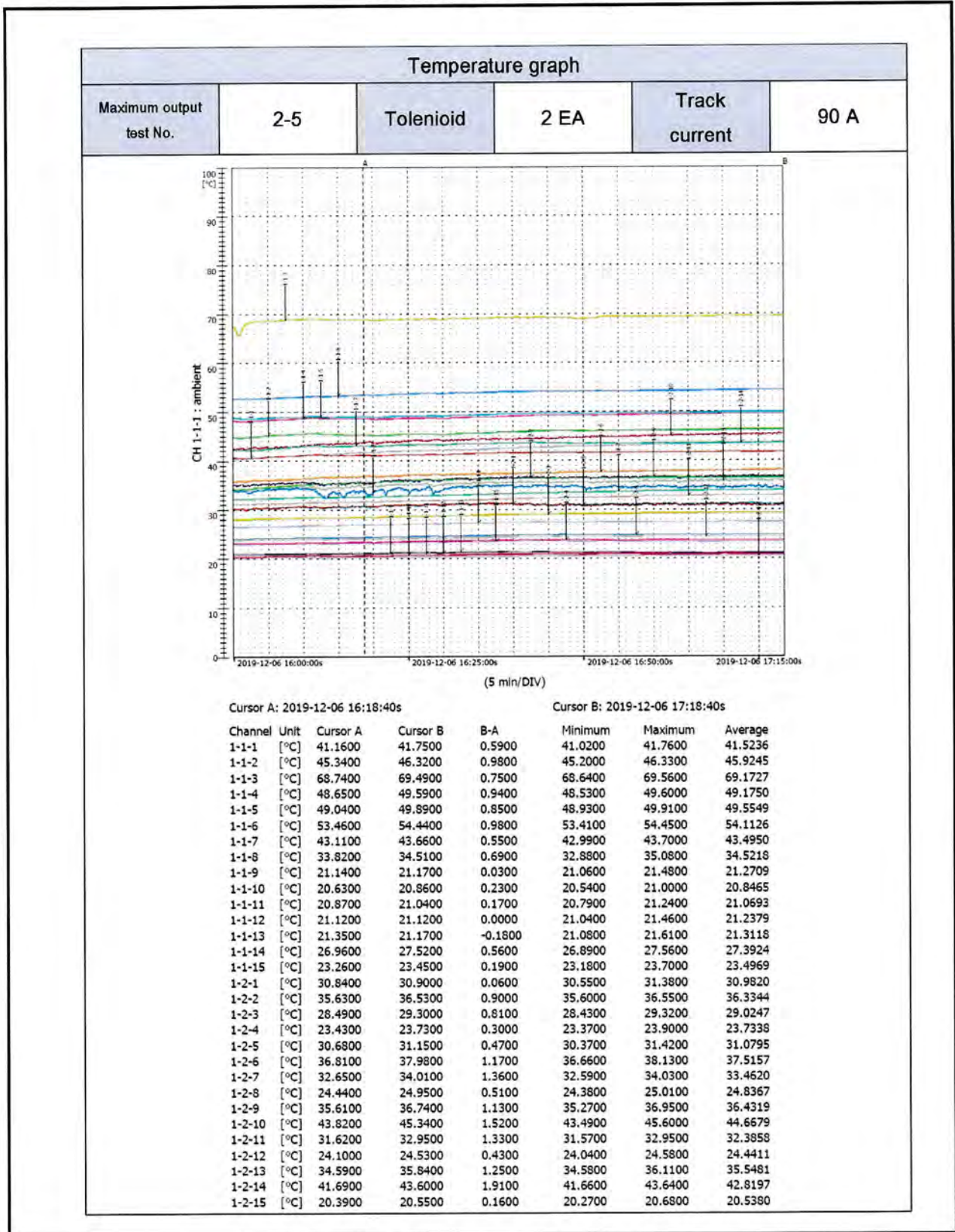




Test result

Test date	2019-12-06	Test environment	Temperature:	(20.5 ± 1) °C
			Humidity:	(24 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	2.5 (Tolenoid 2 EA, Track current 90 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	41.8	61.2	1-1-1
	Y-Capacitor	46.3	65.7	1-1-2
	Thermistor	69.5	88.9	1-1-3
	Line filter	49.6	69.0	1-1-4
	EL- Capacitor	49.9	69.3	1-1-5
	Transformer	54.4	73.8	1-1-6
	Output Connector	43.7	63.1	1-1-7
Multi-adapter	Exterior top	34.5	53.9	1-1-8
	Input Connector	21.2	40.6	1-1-9
	Switch	20.9	40.3	1-1-10
	Relay	21.0	40.4	1-1-11
	Output Connector	21.1	40.5	1-1-12
Tolenoid -1	Exterior top	21.2	40.6	1-1-13
	Internal coil	27.5	46.9	1-1-14
	Output Connector	23.5	42.9	1-1-15
	Exterior top	30.9	50.3	1-2-1
Tolenoid -2	Track contact part	36.5	55.9	1-2-2
	Inside coil	29.3	48.7	1-2-3
	Output Connector	23.7	43.1	1-2-4
	Exterior top	31.2	50.6	1-2-5
Tolenoid -3	Track contact part	38.0	57.4	1-2-6
	Inside coil	34.0	53.4	1-2-7
	Output Connector	25.0	44.4	1-2-8
	Exterior top	36.7	56.1	1-2-9
Tolenoid -4	Track contact part	45.3	64.7	1-2-10
	Inside coil	33.0	52.4	1-2-11
	Output Connector	24.5	43.9	1-2-12
	Exterior top	35.8	55.2	1-2-13
Environmental temperature		20.6	40.0	1-2-14
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

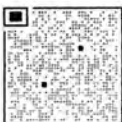


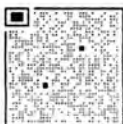
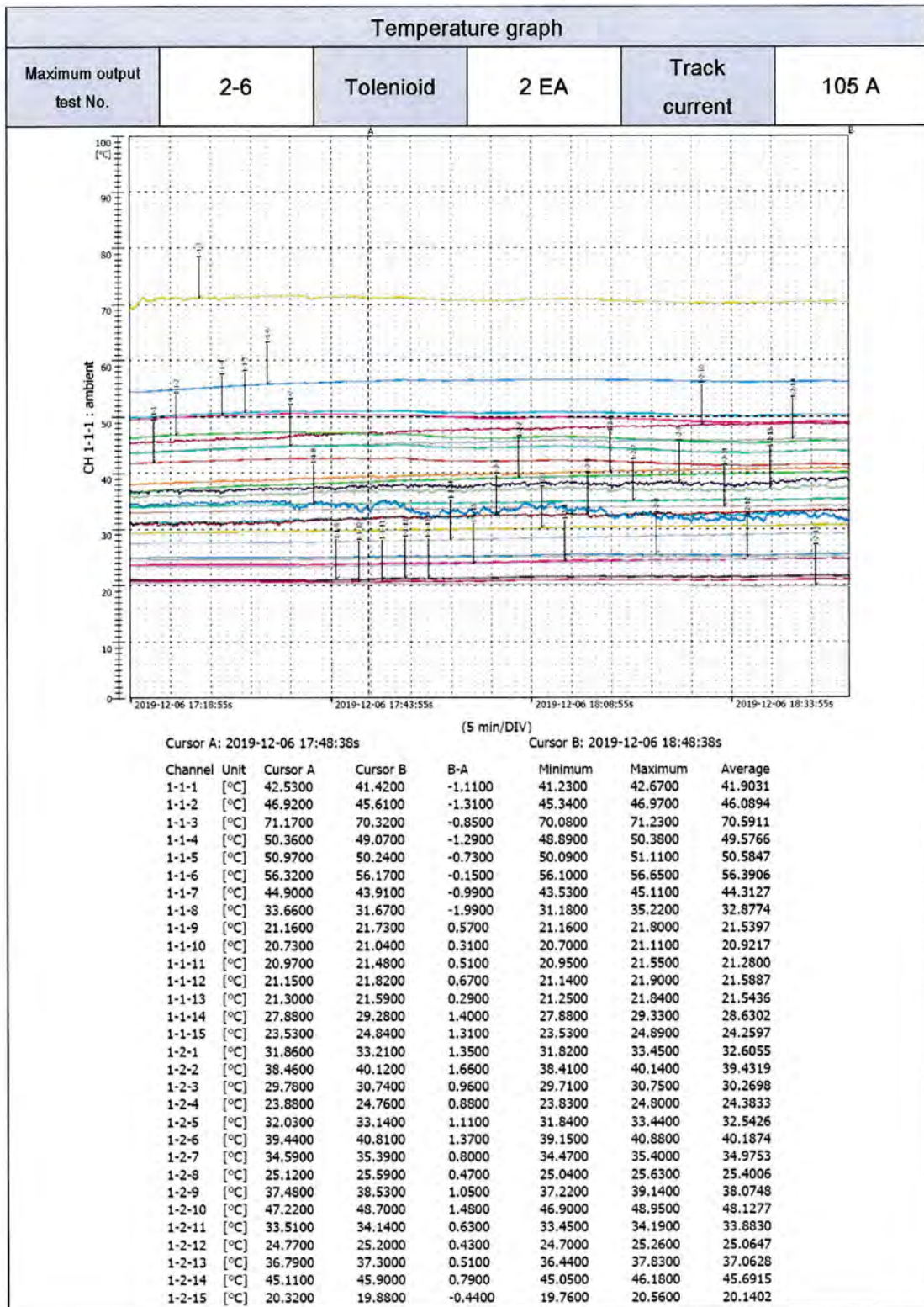




Test result

Test date	2019-12-06	Test environment	Temperature:	(20.1 ± 1) °C
			Humidity:	(24 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	2-6 (Tolenoid 2 EA, Track current 105 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	41.4	61.5	1-1-1
	Y-Capacitor	45.6	65.7	1-1-2
	Thermistor	70.3	90.4	1-1-3
	Line filter	49.1	69.2	1-1-4
	EL- Capacitor	50.2	70.3	1-1-5
	Transformer	56.2	76.3	1-1-6
	Output Connector	43.9	64.0	1-1-7
	Exterior top	31.7	51.8	1-1-8
Multi-adapter	Input Connector	21.7	41.8	1-1-9
	Switch	21.0	41.1	1-1-10
	Relay	21.5	41.6	1-1-11
	Output Connector	21.8	41.9	1-1-12
	Exterior top	21.6	41.7	1-1-13
Tolenoid -1	Internal coil	29.3	49.4	1-1-14
	Output Connector	24.8	44.9	1-1-15
	Exterior top	33.2	53.3	1-2-1
	Track contact part	40.1	60.2	1-2-2
Tolenoid -2	Inside coil	30.7	50.8	1-2-3
	Output Connector	24.8	44.9	1-2-4
	Exterior top	33.1	53.2	1-2-5
	Track contact part	40.8	60.9	1-2-6
Tolenoid -3	Inside coil	35.4	55.5	1-2-7
	Output Connector	25.6	45.7	1-2-8
	Exterior top	38.5	58.6	1-2-9
	Track contact part	48.7	68.8	1-2-10
Tolenoid -4	Inside coil	34.1	54.2	1-2-11
	Output Connector	25.2	45.3	1-2-12
	Exterior top	37.3	57.4	1-2-13
	Track contact part	45.9	66.0	1-2-14
Environmental temperature	19.9	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				







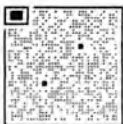
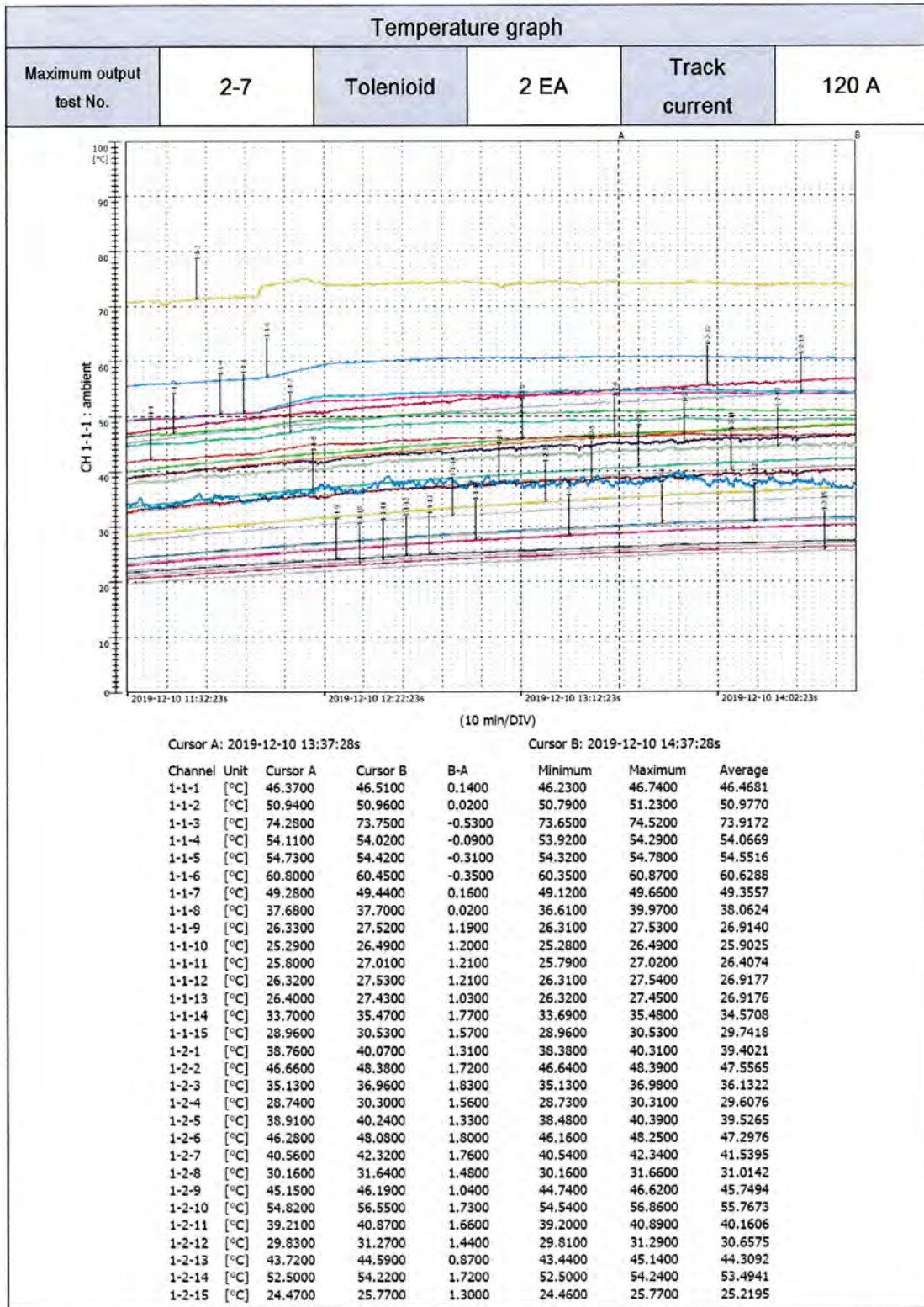


Test result

Test date	2019-12-10	Test environment	Temperature:	(25.2 ± 1) °C
			Humidity:	(21 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	2-7 (Tolenoid 2 EA, Track current 120 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	46.5	60.7	1-1-1
	Y-Capacitor	51.0	65.2	1-1-2
	Thermistor	73.8	88.0	1-1-3
	Line filter	54.0	68.2	1-1-4
	EL- Capacitor	54.4	68.6	1-1-5
	Transformer	60.5	74.7	1-1-6
	Output Connector	49.4	63.6	1-1-7
Multi-adapter	Exterior top	37.7	51.9	1-1-8
	Input Connector	27.5	41.7	1-1-9
	Switch	26.5	40.7	1-1-10
	Relay	27.0	41.2	1-1-11
	Output Connector	27.5	41.7	1-1-12
Tolenoid -1	Exterior top	27.4	41.6	1-1-13
	Internal coil	35.5	49.7	1-1-14
	Output Connector	30.5	44.7	1-1-15
	Exterior top	40.1	54.3	1-2-1
Tolenoid -2	Track contact part	48.4	62.6	1-2-2
	Inside coil	37.0	51.2	1-2-3
	Output Connector	30.3	44.5	1-2-4
	Exterior top	40.2	54.4	1-2-5
Tolenoid -3	Track contact part	48.1	62.3	1-2-6
	Inside coil	42.3	56.5	1-2-7
	Output Connector	31.6	45.8	1-2-8
	Exterior top	46.2	60.4	1-2-9
Tolenoid -4	Track contact part	56.6	70.8	1-2-10
	Inside coil	40.9	55.1	1-2-11
	Output Connector	31.3	45.5	1-2-12
	Exterior top	44.6	58.8	1-2-13
Environmental temperature		25.8	40.0	1-2-14
				1-2-15

\* Conversion temperature: measurement temperature - Environmental temperature + 40 °C

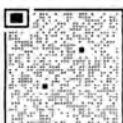


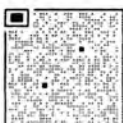
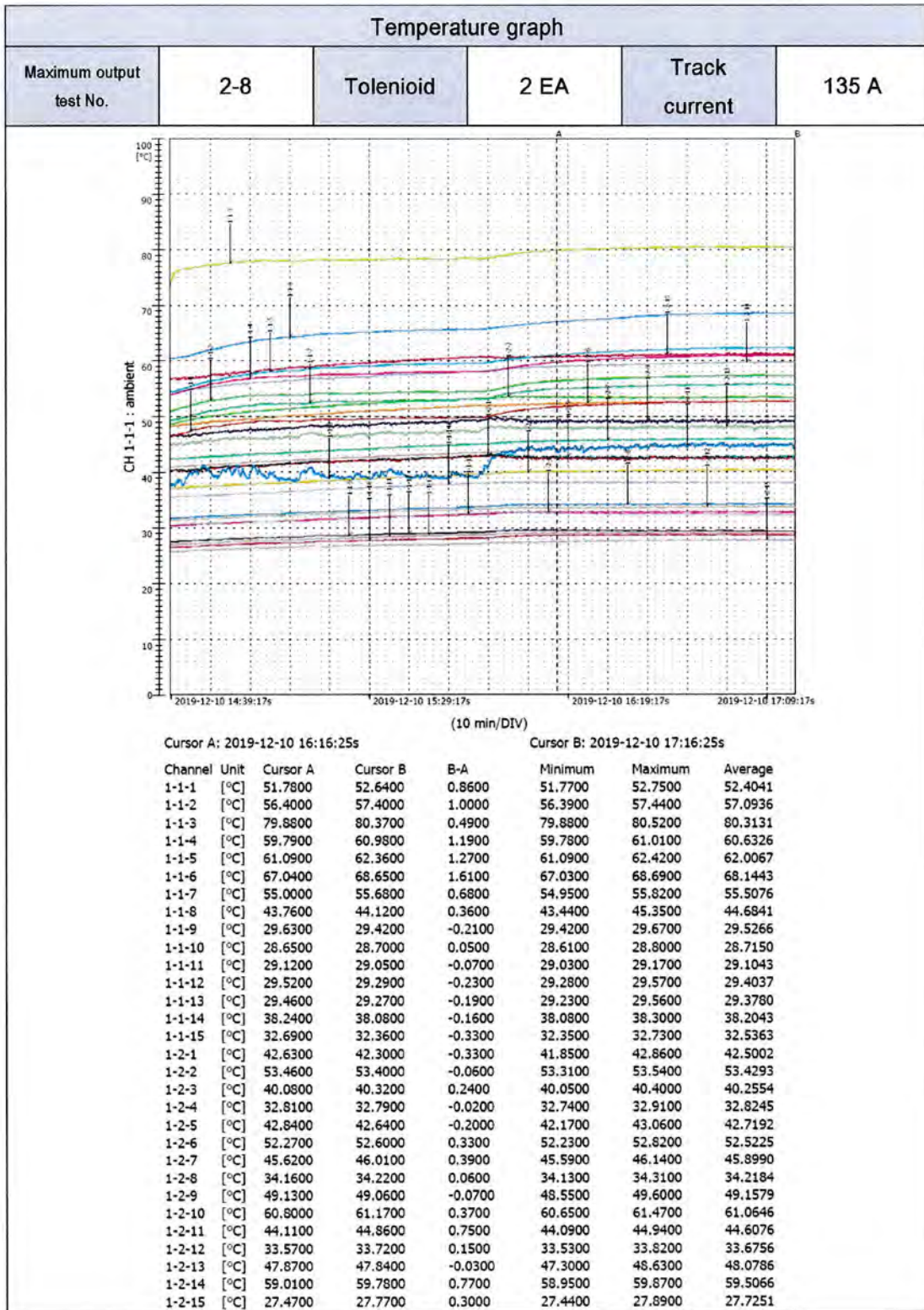




Test result

Test date	2019-12-10	Test environment	Temperature:	(27.7 ± 1) °C
			Humidity:	(21 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	2-8 (Tolenoid 2 EA, Track current 135 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	52.6	64.8	1-1-1
	Y-Capacitor	57.4	69.6	1-1-2
	Thermistor	80.4	92.6	1-1-3
	Line filter	61.0	73.2	1-1-4
	EL- Capacitor	62.4	74.6	1-1-5
	Transformer	68.7	80.9	1-1-6
	Output Connector	55.7	67.9	1-1-7
	Exterior top	44.1	56.3	1-1-8
Multi-adapter	Input Connector	29.4	41.6	1-1-9
	Switch	28.7	40.9	1-1-10
	Relay	29.1	41.3	1-1-11
	Output Connector	29.3	41.5	1-1-12
	Exterior top	29.3	41.5	1-1-13
Tolenoid -1	Internal coil	38.1	50.3	1-1-14
	Output Connector	32.4	44.6	1-1-15
	Exterior top	42.3	54.5	1-2-1
	Track contact part	53.4	65.6	1-2-2
Tolenoid -2	Inside coil	40.3	52.5	1-2-3
	Output Connector	32.8	45.0	1-2-4
	Exterior top	42.6	54.8	1-2-5
	Track contact part	52.6	64.8	1-2-6
Tolenoid -3	Inside coil	46.0	58.2	1-2-7
	Output Connector	34.2	46.4	1-2-8
	Exterior top	49.1	61.3	1-2-9
	Track contact part	61.2	73.4	1-2-10
Tolenoid -4	Inside coil	44.9	57.1	1-2-11
	Output Connector	33.7	45.9	1-2-12
	Exterior top	47.8	60.0	1-2-13
	Track contact part	59.8	72.0	1-2-14
Environmental temperature	27.8	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

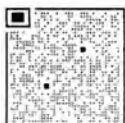


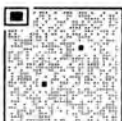
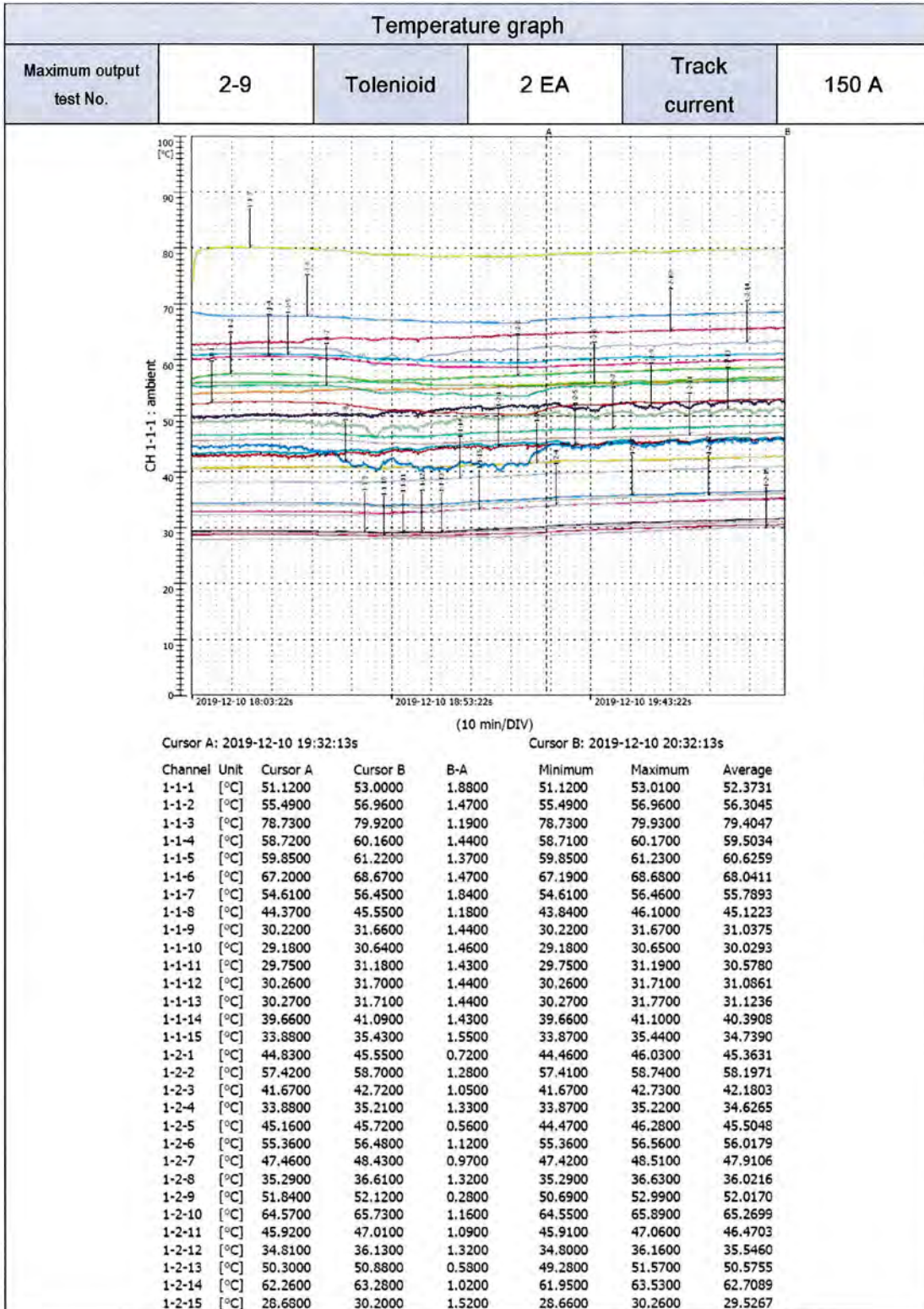




Test result

Test date	2019-12-10	Test environment	Temperature:	(29.5 ± 1) °C
			Humidity:	(21 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	2-9 (Tolenoid 2 EA, Track current 150 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	53.0	62.8	1-1-1
	Y-Capacitor	57.0	66.8	1-1-2
	Thermistor	79.9	89.7	1-1-3
	Line filter	60.2	70.0	1-1-4
	EL- Capacitor	61.2	71.0	1-1-5
	Transformer	68.7	78.5	1-1-6
	Output Connector	56.5	66.3	1-1-7
	Exterior top	45.6	55.4	1-1-8
Multi-adapter	Input Connector	31.7	41.5	1-1-9
	Switch	30.6	40.4	1-1-10
	Relay	31.2	41.0	1-1-11
	Output Connector	31.7	41.5	1-1-12
	Exterior top	31.7	41.5	1-1-13
Tolenoid -1	Internal coil	41.1	50.9	1-1-14
	Output Connector	35.4	45.2	1-1-15
	Exterior top	45.6	55.4	1-2-1
	Track contact part	58.7	68.5	1-2-2
Tolenoid -2	Inside coil	42.7	52.5	1-2-3
	Output Connector	35.2	45.0	1-2-4
	Exterior top	45.7	55.5	1-2-5
	Track contact part	56.5	66.3	1-2-6
Tolenoid -3	Inside coil	48.4	58.2	1-2-7
	Output Connector	36.6	46.4	1-2-8
	Exterior top	52.1	61.9	1-2-9
	Track contact part	65.7	75.5	1-2-10
Tolenoid -4	Inside coil	47.0	56.8	1-2-11
	Output Connector	36.1	45.9	1-2-12
	Exterior top	50.9	60.7	1-2-13
	Track contact part	63.3	73.1	1-2-14
Environmental temperature	30.2	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

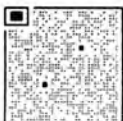


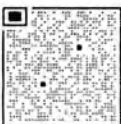
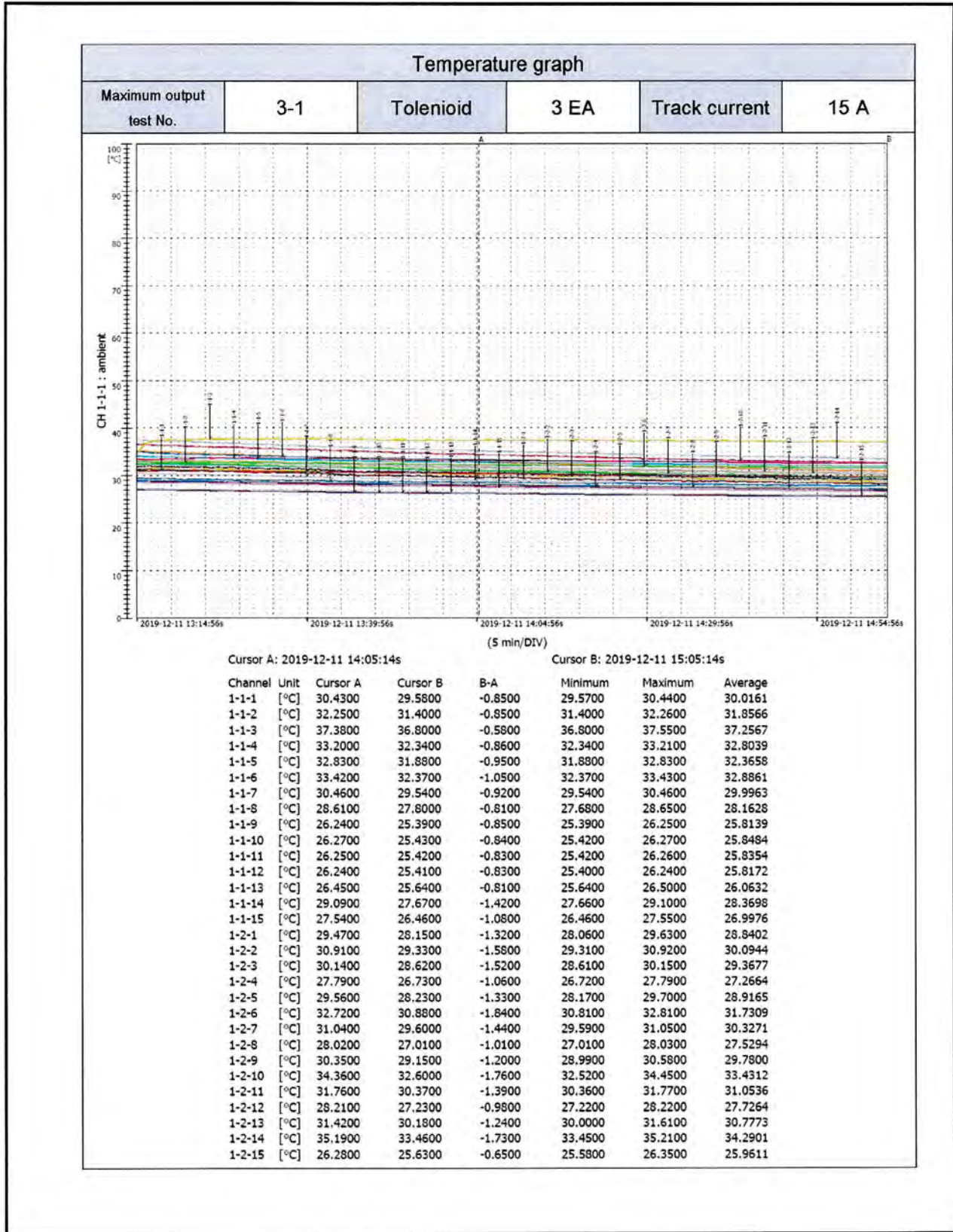




Test result

Test date	2019-12-11	Test environment	Temperature:	(26.0 ± 1) °C
			Humidity:	(20 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	3-1 (Tolenoid 3 EA, Track current 15 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	29.6	44.0	1-1-1
	Y-Capacitor	31.4	45.8	1-1-2
	Thermistor	36.8	51.2	1-1-3
	Line filter	32.3	46.7	1-1-4
	EL- Capacitor	31.9	46.3	1-1-5
	Transformer	32.4	46.8	1-1-6
	Output Connector	29.5	43.9	1-1-7
	Exterior top	27.8	42.2	1-1-8
Multi-adapter	Input Connector	25.4	39.8	1-1-9
	Switch	25.4	39.8	1-1-10
	Relay	25.4	39.8	1-1-11
	Output Connector	25.4	39.8	1-1-12
	Exterior top	25.6	40.0	1-1-13
Tolenoid -1	Internal coil	27.7	42.1	1-1-14
	Output Connector	26.5	40.9	1-1-15
	Exterior top	28.2	42.6	1-2-1
	Track contact part	29.3	43.7	1-2-2
Tolenoid -2	Inside coil	28.6	43.0	1-2-3
	Output Connector	26.7	41.1	1-2-4
	Exterior top	28.2	42.6	1-2-5
	Track contact part	30.9	45.3	1-2-6
Tolenoid -3	Inside coil	29.6	44.0	1-2-7
	Output Connector	27.0	41.4	1-2-8
	Exterior top	29.2	43.6	1-2-9
	Track contact part	32.6	47.0	1-2-10
Tolenoid -4	Inside coil	30.4	44.8	1-2-11
	Output Connector	27.2	41.6	1-2-12
	Exterior top	30.2	44.6	1-2-13
	Track contact part	33.5	47.9	1-2-14
Environmental temperature	25.6	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				





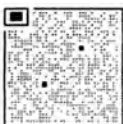
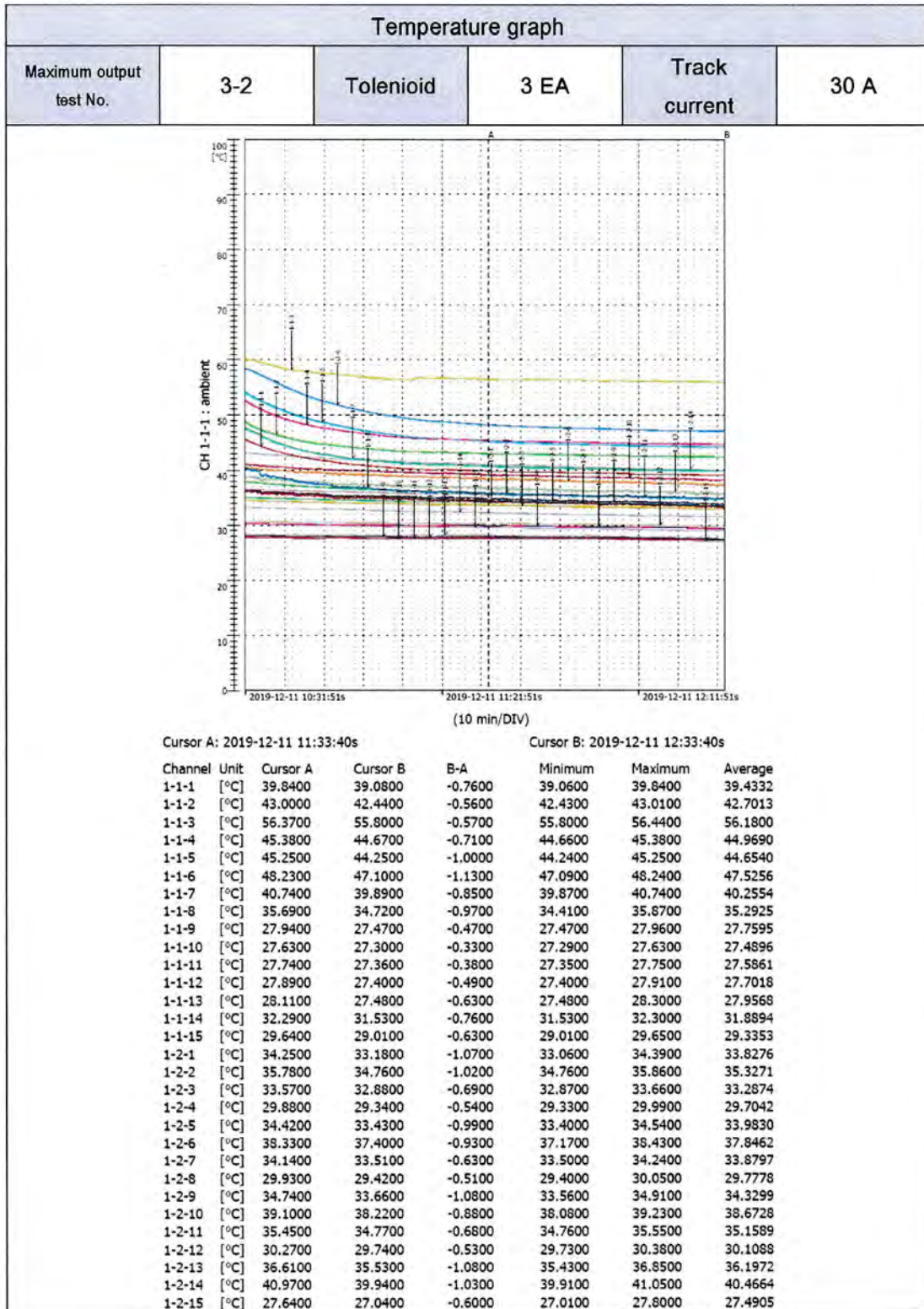




Test result

Test date	2019-12-11	Test environment	Temperature:	(27.5 ± 1) °C
			Humidity:	(20 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.		3-1 (Tolenoid 3 EA, Track current 30 A)		
Test point		Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.
SMPS	Input Connector	39.1	52.1	1-1-1
	Y-Capacitor	42.4	55.4	1-1-2
	Thermistor	55.8	68.8	1-1-3
	Line filter	44.7	57.7	1-1-4
	EL- Capacitor	44.3	57.3	1-1-5
	Transformer	47.1	60.1	1-1-6
	Output Connector	39.9	52.9	1-1-7
	Exterior top	34.7	47.7	1-1-8
Multi-adapter	Input Connector	27.5	40.5	1-1-9
	Switch	27.3	40.3	1-1-10
	Relay	27.4	40.4	1-1-11
	Output Connector	27.4	40.4	1-1-12
	Exterior top	27.5	40.5	1-1-13
Tolenoid -1	Internal coil	31.5	44.5	1-1-14
	Output Connector	29.0	42.0	1-1-15
	Exterior top	33.2	46.2	1-2-1
	Track contact part	34.8	47.8	1-2-2
Tolenoid -2	Inside coil	32.9	45.9	1-2-3
	Output Connector	29.3	42.3	1-2-4
	Exterior top	33.4	46.4	1-2-5
	Track contact part	37.4	50.4	1-2-6
Tolenoid -3	Inside coil	33.5	46.5	1-2-7
	Output Connector	29.4	42.4	1-2-8
	Exterior top	33.7	46.7	1-2-9
	Track contact part	38.2	51.2	1-2-10
Tolenoid -4	Inside coil	34.8	47.8	1-2-11
	Output Connector	29.7	42.7	1-2-12
	Exterior top	35.5	48.5	1-2-13
	Track contact part	39.9	52.9	1-2-14
Environmental temperature		27.0	40.0	1-2-15
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				



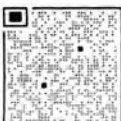


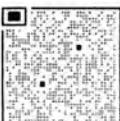
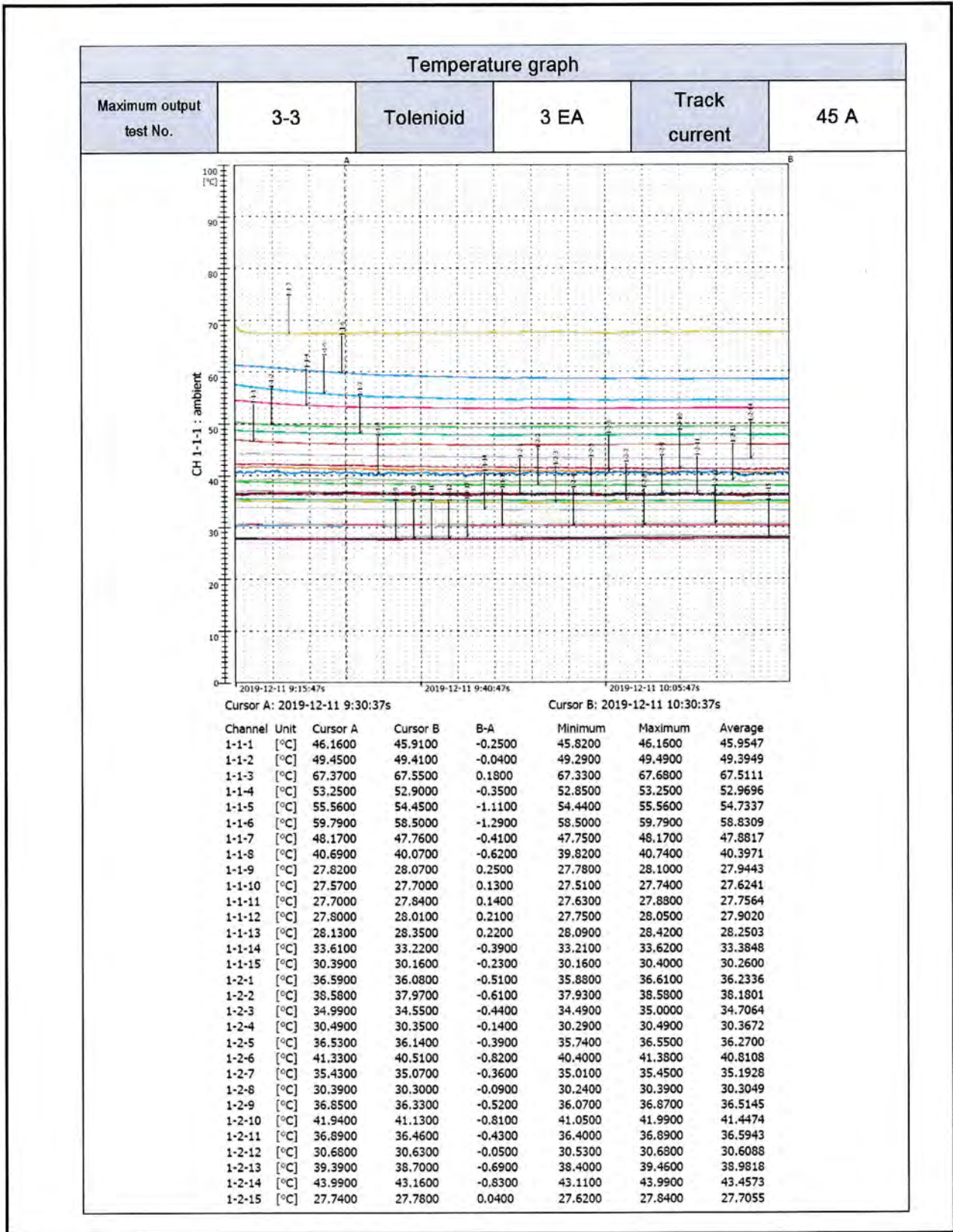


Test result

Test date	2019-12-11	Test environment	Temperature:	(27.7 ± 1) °C
			Humidity:	(20 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	3-3 (Tolenoid 3 EA, Track current 45 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	45.9	58.1	1-1-1
	Y-Capacitor	49.4	61.6	1-1-2
	Thermistor	67.6	79.8	1-1-3
	Line filter	52.9	65.1	1-1-4
	EL- Capacitor	54.5	66.7	1-1-5
	Transformer	58.5	70.7	1-1-6
	Output Connector	47.8	60.0	1-1-7
Multi-adapter	Exterior top	40.1	52.3	1-1-8
	Input Connector	28.1	40.3	1-1-9
	Switch	27.7	39.9	1-1-10
	Relay	27.8	40.0	1-1-11
	Output Connector	28.0	40.2	1-1-12
Tolenoid -1	Exterior top	28.4	40.6	1-1-13
	Internal coil	33.2	45.4	1-1-14
	Output Connector	30.2	42.4	1-1-15
	Exterior top	36.1	48.3	1-2-1
Tolenoid -2	Track contact part	38.0	50.2	1-2-2
	Inside coil	34.6	46.8	1-2-3
	Output Connector	30.4	42.6	1-2-4
	Exterior top	36.1	48.3	1-2-5
Tolenoid -3	Track contact part	40.5	52.7	1-2-6
	Inside coil	35.1	47.3	1-2-7
	Output Connector	30.3	42.5	1-2-8
	Exterior top	36.3	48.5	1-2-9
Tolenoid -4	Track contact part	41.1	53.3	1-2-10
	Inside coil	36.5	48.7	1-2-11
	Output Connector	30.6	42.8	1-2-12
	Exterior top	38.7	50.9	1-2-13
Environmental temperature		27.8	40.0	1-2-14
				1-2-15

\* Conversion temperature: measurement temperature - Environmental temperature + 40 °C

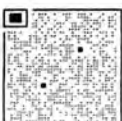


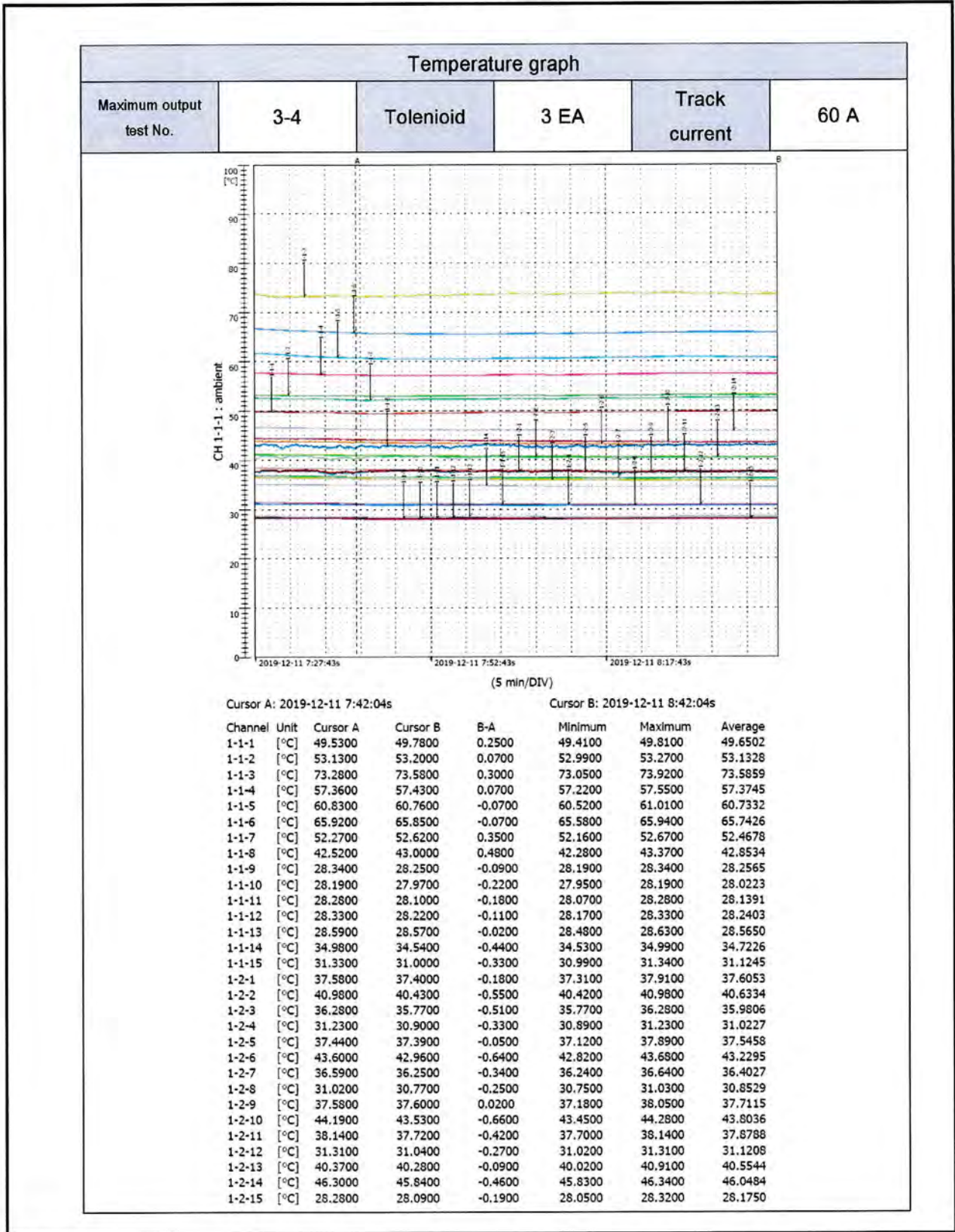




Test result

Test date	2019-12-11	Test environment	Temperature:	(28.2 ± 1) °C
			Humidity:	(20 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	3-4 (Tolenoid 3 EA, Track current 60 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	49.8	61.7	1-1-1
	Y-Capacitor	53.2	65.1	1-1-2
	Thermistor	73.6	85.5	1-1-3
	Line filter	57.4	69.3	1-1-4
	EL- Capacitor	60.8	72.7	1-1-5
	Transformer	65.9	77.8	1-1-6
	Output Connector	52.6	64.5	1-1-7
Multi-adapter	Exterior top	43.0	54.9	1-1-8
	Input Connector	28.3	40.2	1-1-9
	Switch	28.0	39.9	1-1-10
	Relay	28.1	40.0	1-1-11
	Output Connector	28.2	40.1	1-1-12
Tolenoid -1	Exterior top	28.6	40.5	1-1-13
	Internal coil	34.5	46.4	1-1-14
	Output Connector	31.0	42.9	1-1-15
	Exterior top	37.4	49.3	1-2-1
Tolenoid -2	Track contact part	40.4	52.3	1-2-2
	Inside coil	35.8	47.7	1-2-3
	Output Connector	30.9	42.8	1-2-4
	Exterior top	37.4	49.3	1-2-5
Tolenoid -3	Track contact part	43.0	54.9	1-2-6
	Inside coil	36.3	48.2	1-2-7
	Output Connector	30.8	42.7	1-2-8
	Exterior top	37.6	49.5	1-2-9
Tolenoid -4	Track contact part	43.5	55.4	1-2-10
	Inside coil	37.7	49.6	1-2-11
	Output Connector	31.0	42.9	1-2-12
	Exterior top	40.3	52.2	1-2-13
Track contact part	45.8	57.7	1-2-14	
Environmental temperature	28.1	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				



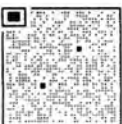
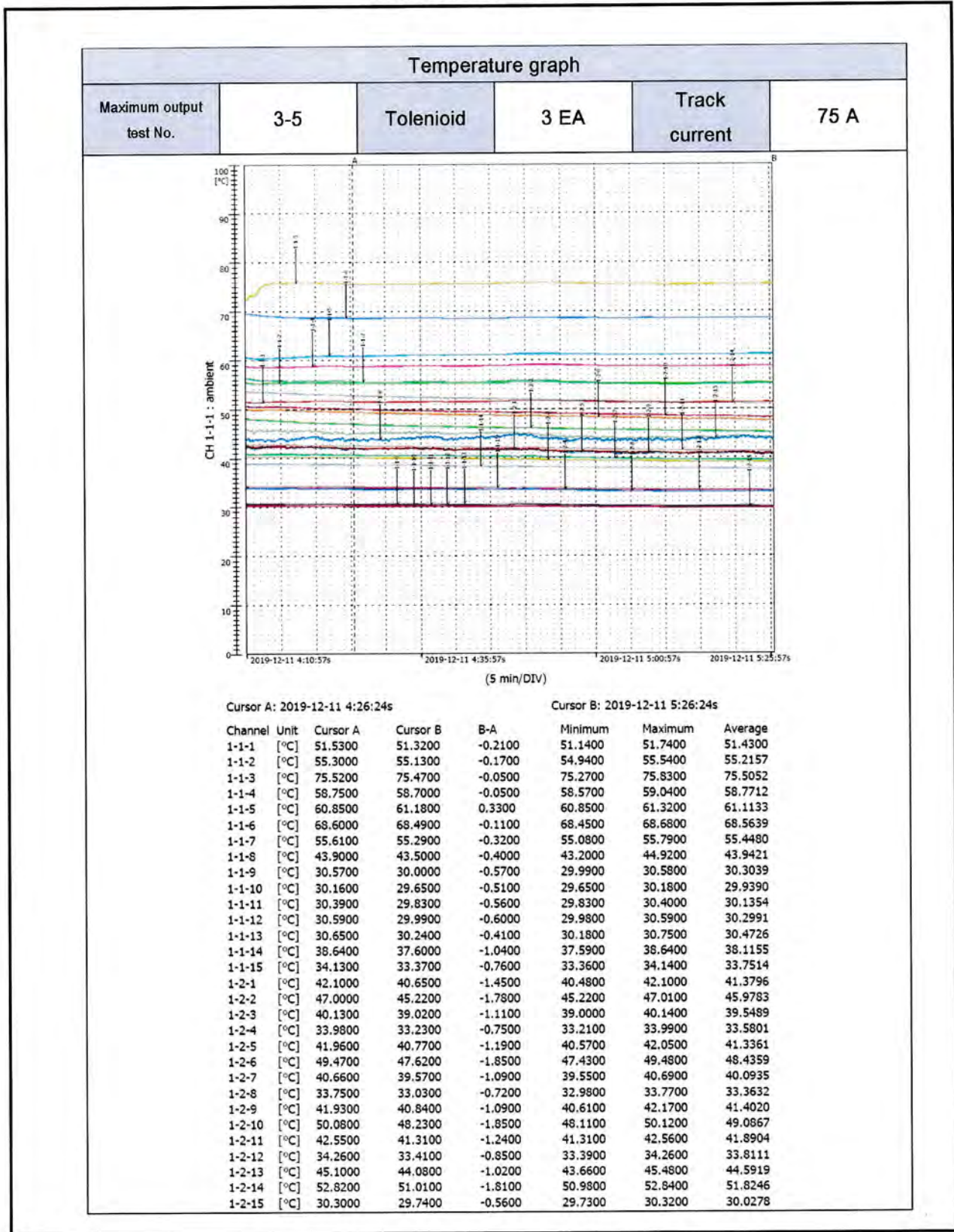




Test result

Test date	2019-12-11	Test environment	Temperature:	(30.0 ± 1) °C
			Humidity:	(20 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	3-5 (Tolenoid 3 EA, Track current 75 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	51.3	61.6	1-1-1
	Y-Capacitor	55.1	65.4	1-1-2
	Thermistor	75.5	85.8	1-1-3
	Line filter	58.7	69.0	1-1-4
	EL- Capacitor	61.2	71.5	1-1-5
	Transformer	68.5	78.8	1-1-6
	Output Connector	55.3	65.6	1-1-7
Multi-adapter	Exterior top	43.5	53.8	1-1-8
	Input Connector	30.0	40.3	1-1-9
	Switch	29.7	40.0	1-1-10
	Relay	29.8	40.1	1-1-11
	Output Connector	30.0	40.3	1-1-12
Tolenoid -1	Exterior top	30.2	40.5	1-1-13
	Internal coil	37.6	47.9	1-1-14
	Output Connector	33.4	43.7	1-1-15
	Exterior top	40.7	51.0	1-2-1
Tolenoid -2	Track contact part	45.2	55.5	1-2-2
	Inside coil	39.0	49.3	1-2-3
	Output Connector	33.2	43.5	1-2-4
	Exterior top	40.8	51.1	1-2-5
Tolenoid -3	Track contact part	47.6	57.9	1-2-6
	Inside coil	39.6	49.9	1-2-7
	Output Connector	33.0	43.3	1-2-8
	Exterior top	40.8	51.1	1-2-9
Tolenoid -4	Track contact part	48.2	58.5	1-2-10
	Inside coil	41.3	51.6	1-2-11
	Output Connector	33.4	43.7	1-2-12
	Exterior top	44.1	54.4	1-2-13
Environmental temperature		29.7	40.0	1-2-14
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				





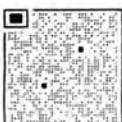


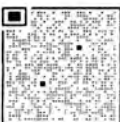
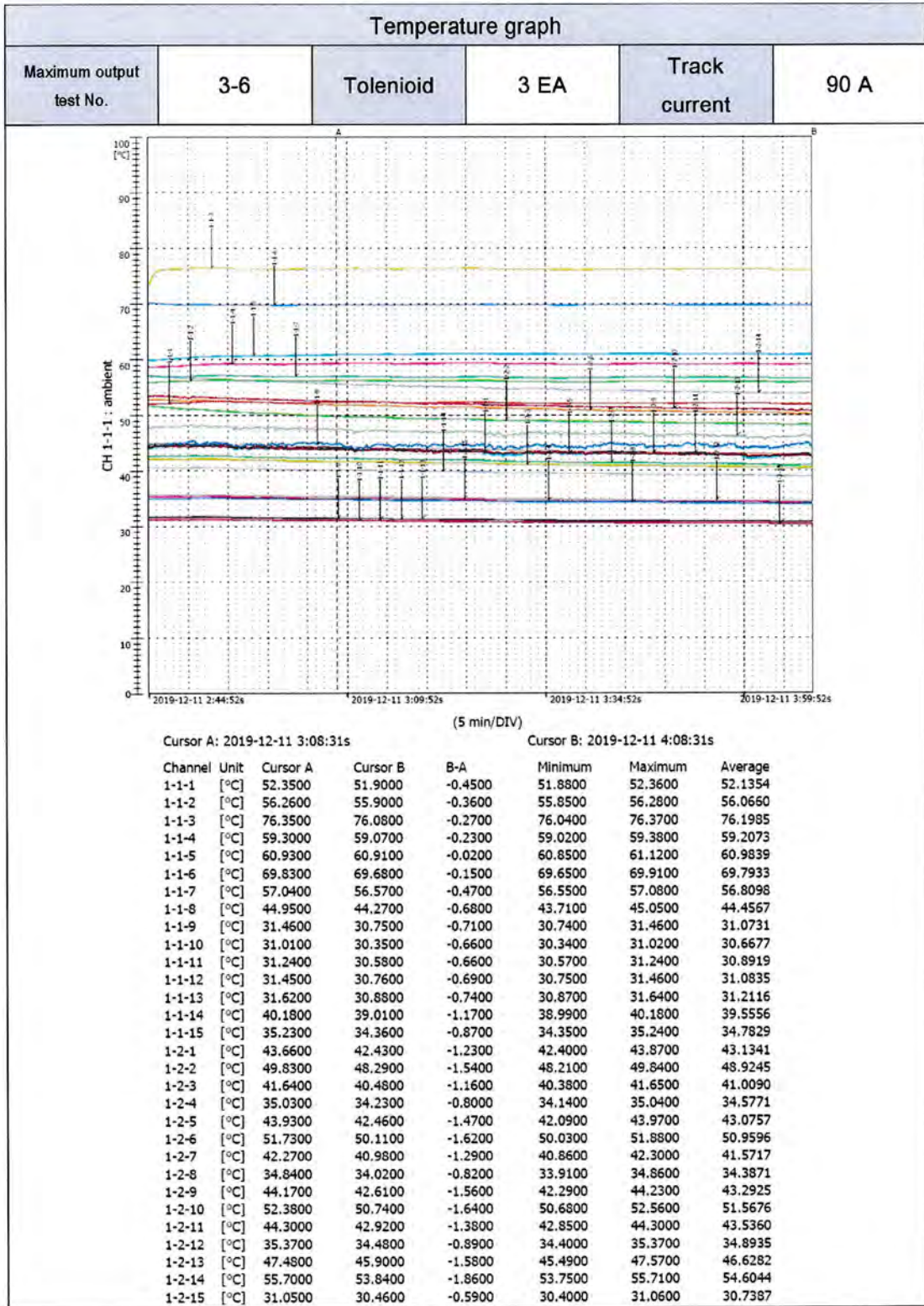


Test result

Test date	2019-12-11	Test environment	Temperature:	(30.7 ± 1) °C
			Humidity:	(20 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	3-6 (Tolenoid 3 EA, Track current 90 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	51.9	61.4	1-1-1
	Y-Capacitor	55.9	65.4	1-1-2
	Thermistor	76.1	85.6	1-1-3
	Line filter	59.1	68.6	1-1-4
	EL- Capacitor	60.9	70.4	1-1-5
	Transformer	69.7	79.2	1-1-6
	Output Connector	56.6	66.1	1-1-7
Multi-adapter	Exterior top	44.3	53.8	1-1-8
	Input Connector	30.8	40.3	1-1-9
	Switch	30.4	39.9	1-1-10
	Relay	30.6	40.1	1-1-11
	Output Connector	30.8	40.3	1-1-12
Tolenoid -1	Exterior top	30.9	40.4	1-1-13
	Internal coil	39.0	48.5	1-1-14
	Output Connector	34.4	43.9	1-1-15
	Exterior top	42.4	51.9	1-2-1
Tolenoid -2	Track contact part	48.3	57.8	1-2-2
	Inside coil	40.5	50.0	1-2-3
	Output Connector	34.2	43.7	1-2-4
	Exterior top	42.5	52.0	1-2-5
Tolenoid -3	Track contact part	50.1	59.6	1-2-6
	Inside coil	41.0	50.5	1-2-7
	Output Connector	34.0	43.5	1-2-8
	Exterior top	42.6	52.1	1-2-9
Tolenoid -4	Track contact part	50.7	60.2	1-2-10
	Inside coil	42.9	52.4	1-2-11
	Output Connector	34.5	44.0	1-2-12
	Exterior top	45.9	55.4	1-2-13
Environmental temperature		30.5	40.0	1-2-14
				1-2-15

\* Conversion temperature: measurement temperature - Environmental temperature + 40 °C



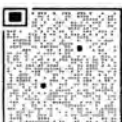


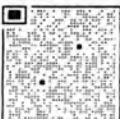
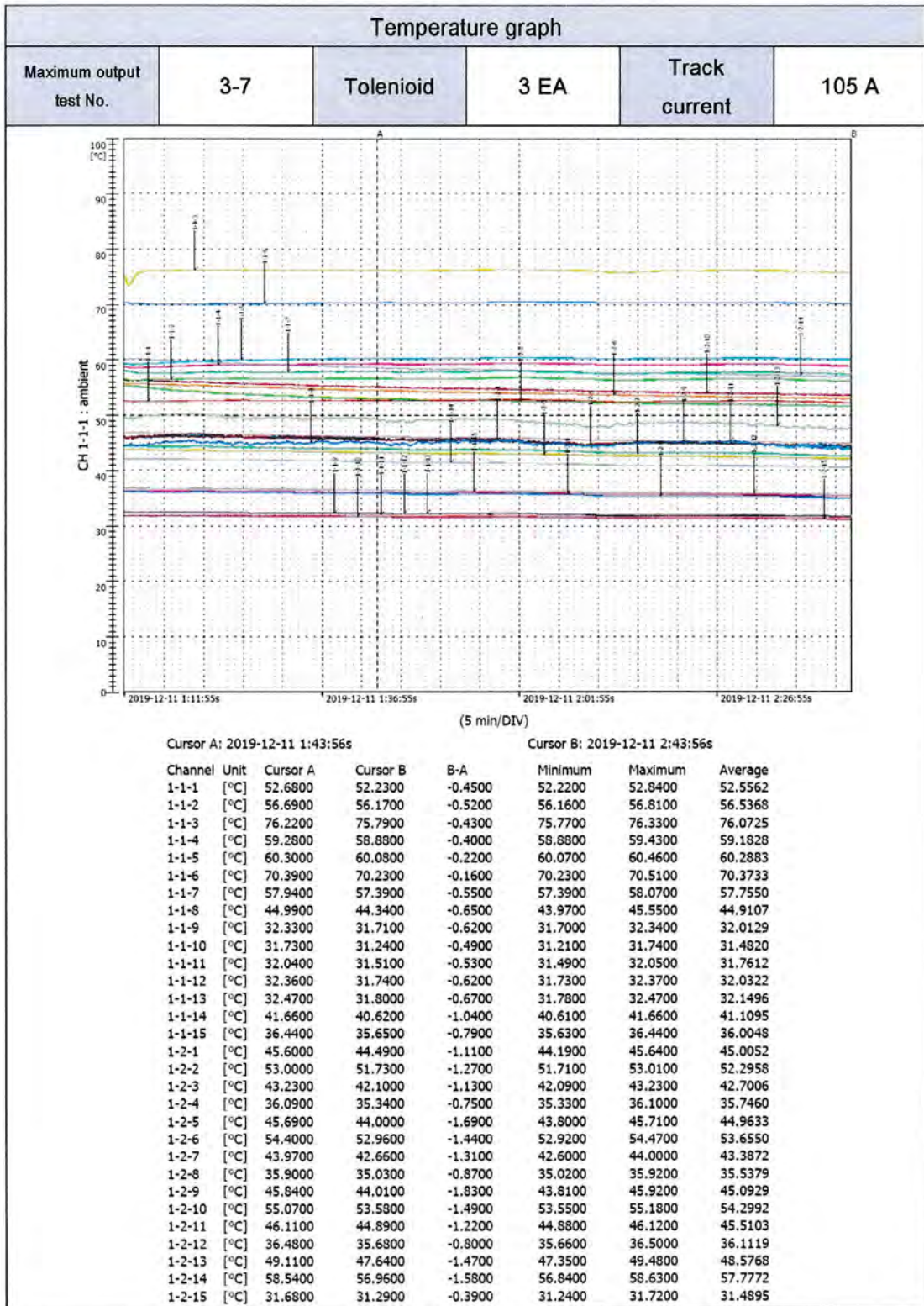


Test result

Test date	2019-12-11	Test environment	Temperature:	(31.5 ± 1) °C
			Humidity:	(20 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	3-7 (Tolenoid 3 EA, Track current 105 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	52.2	60.9	1-1-1
	Y-Capacitor	56.2	64.9	1-1-2
	Thermistor	75.8	84.5	1-1-3
	Line filter	58.9	67.6	1-1-4
	EL- Capacitor	60.1	68.8	1-1-5
	Transformer	70.2	78.9	1-1-6
	Output Connector	57.4	66.1	1-1-7
Multi-adapter	Exterior top	44.3	53.0	1-1-8
	Input Connector	31.7	40.4	1-1-9
	Switch	31.2	39.9	1-1-10
	Relay	31.5	40.2	1-1-11
	Output Connector	31.7	40.4	1-1-12
Tolenoid -1	Exterior top	31.8	40.5	1-1-13
	Internal coil	40.6	49.3	1-1-14
	Output Connector	35.7	44.4	1-1-15
	Exterior top	44.5	53.2	1-2-1
Tolenoid -2	Track contact part	51.7	60.4	1-2-2
	Inside coil	42.1	50.8	1-2-3
	Output Connector	35.3	44.0	1-2-4
	Exterior top	44.0	52.7	1-2-5
Tolenoid -3	Track contact part	53.0	61.7	1-2-6
	Inside coil	42.7	51.4	1-2-7
	Output Connector	35.0	43.7	1-2-8
	Exterior top	44.0	52.7	1-2-9
Tolenoid -4	Track contact part	53.6	62.3	1-2-10
	Inside coil	44.9	53.6	1-2-11
	Output Connector	35.7	44.4	1-2-12
	Exterior top	47.6	56.3	1-2-13
Environmental temperature		31.3	40.0	1-2-14
				1-2-15

\* Conversion temperature: measurement temperature - Environmental temperature + 40 °C



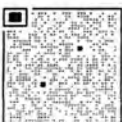
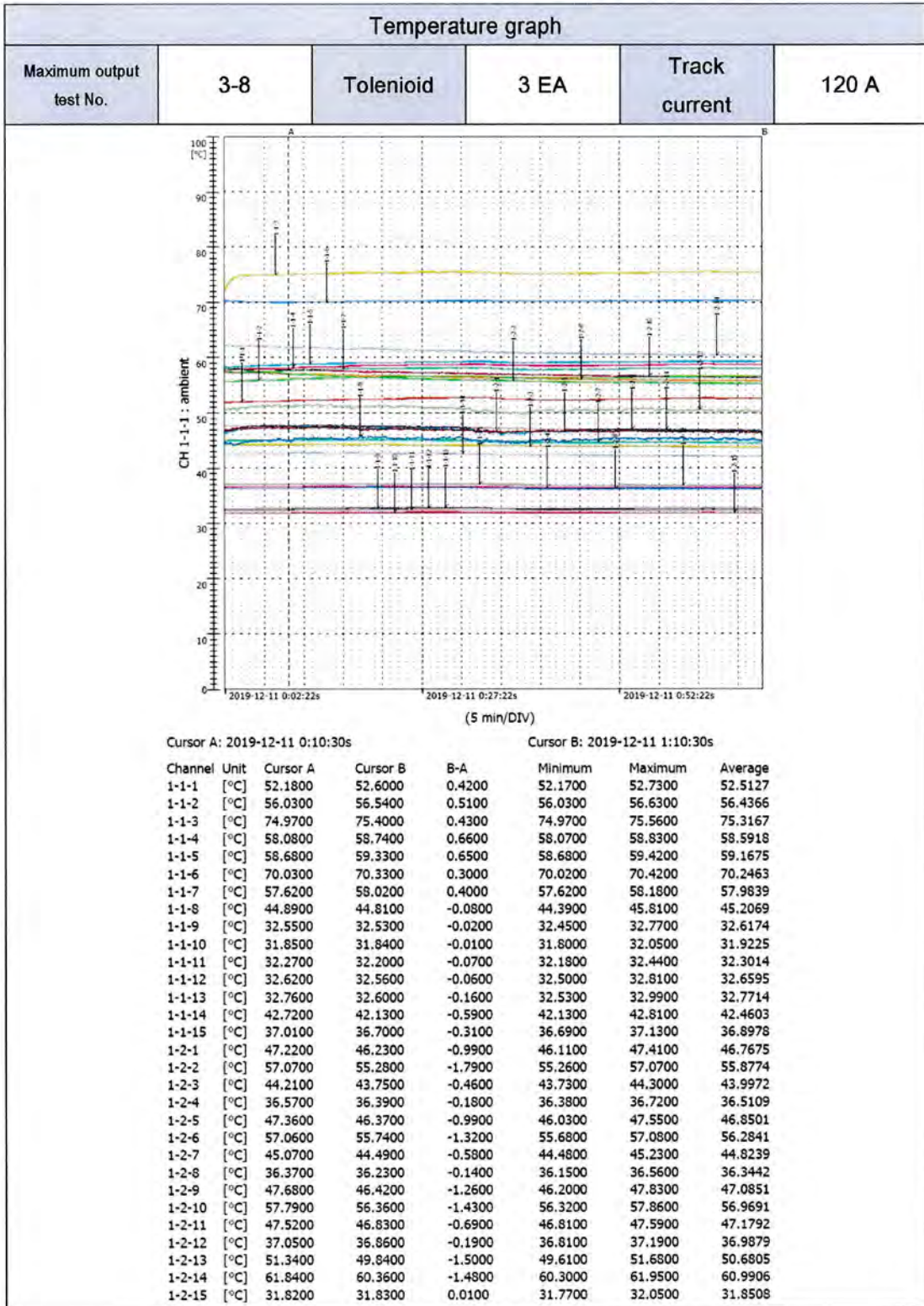




Test result

Test date	2019-12-11	Test environment	Temperature:	(31.9 ± 1) °C
			Humidity:	(20 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	3-8 (Tolenoid 3 EA, Track current 120 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	52.6	60.8	1-1-1
	Y-Capacitor	56.5	64.7	1-1-2
	Thermistor	75.4	83.6	1-1-3
	Line filter	58.7	66.9	1-1-4
	EL- Capacitor	59.3	67.5	1-1-5
	Transformer	70.3	78.5	1-1-6
	Output Connector	58.0	66.2	1-1-7
Multi-adapter	Exterior top	44.8	53.0	1-1-8
	Input Connector	32.5	40.7	1-1-9
	Switch	31.8	40.0	1-1-10
	Relay	32.2	40.4	1-1-11
	Output Connector	32.6	40.8	1-1-12
Tolenoid -1	Exterior top	32.6	40.8	1-1-13
	Internal coil	42.1	50.3	1-1-14
	Output Connector	36.7	44.9	1-1-15
	Exterior top	46.2	54.4	1-2-1
Tolenoid -2	Track contact part	55.3	63.5	1-2-2
	Inside coil	43.8	52.0	1-2-3
	Output Connector	36.4	44.6	1-2-4
	Exterior top	46.4	54.6	1-2-5
Tolenoid -3	Track contact part	55.7	63.9	1-2-6
	Inside coil	44.5	52.7	1-2-7
	Output Connector	36.2	44.4	1-2-8
	Exterior top	46.4	54.6	1-2-9
Tolenoid -4	Track contact part	56.4	64.6	1-2-10
	Inside coil	46.8	55.0	1-2-11
	Output Connector	36.9	45.1	1-2-12
	Exterior top	49.8	58.0	1-2-13
Environmental temperature	31.8	40.0	1-2-14	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

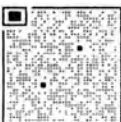


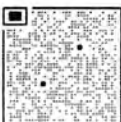
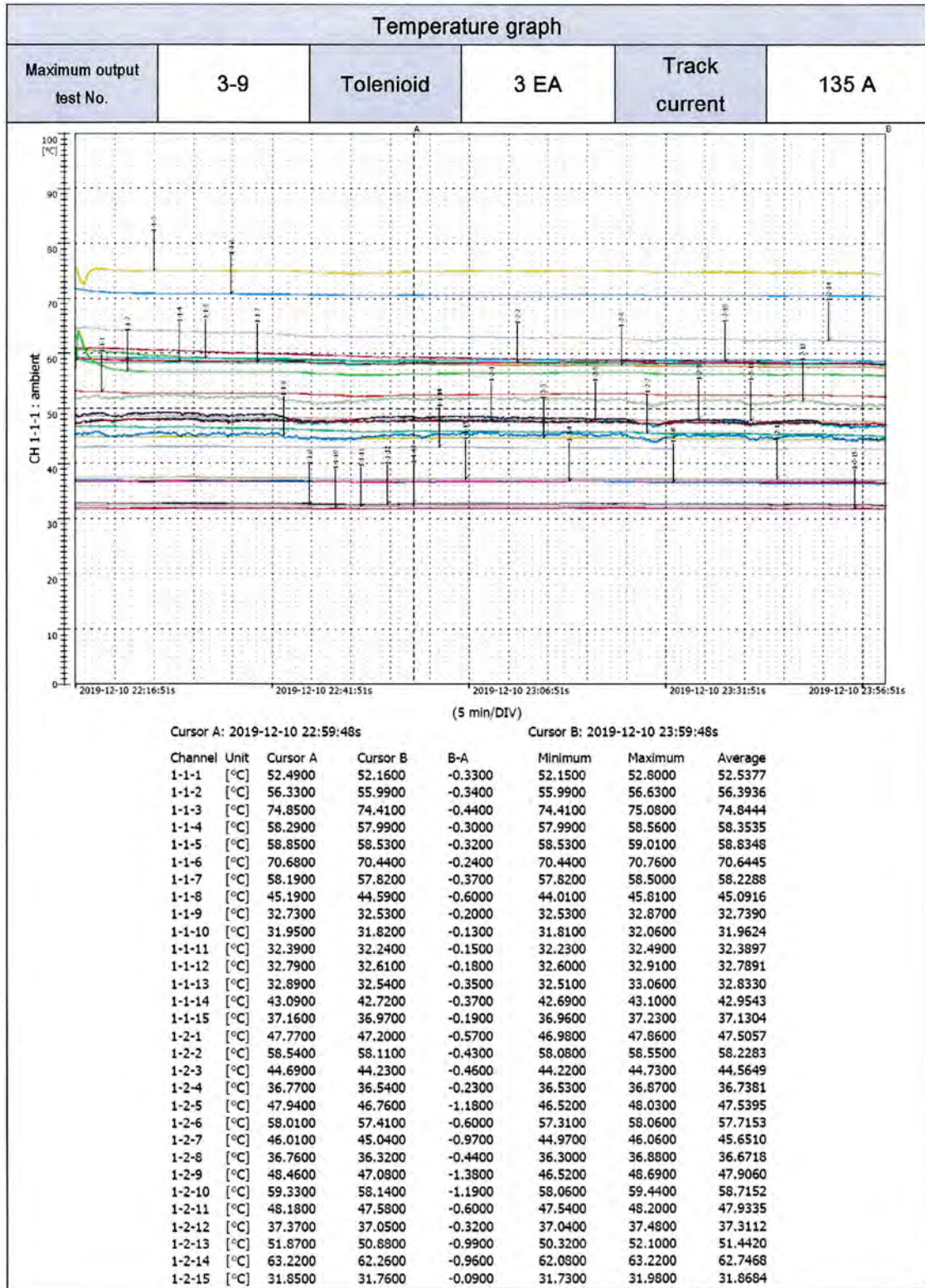




Test result

Test date	2019-12-10	Test environment	Temperature:	(31.9 ± 1) °C
			Humidity:	(21 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	3-9 (Tolenoid 3 EA, Track current 135 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	52.2	60.4	1-1-1
	Y-Capacitor	56.0	64.2	1-1-2
	Thermistor	74.4	82.6	1-1-3
	Line filter	58.0	66.2	1-1-4
	EL- Capacitor	58.5	66.7	1-1-5
	Transformer	70.4	78.6	1-1-6
	Output Connector	57.8	66.0	1-1-7
Multi-adapter	Exterior top	44.6	52.8	1-1-8
	Input Connector	32.5	40.7	1-1-9
	Switch	31.8	40.0	1-1-10
	Relay	32.2	40.4	1-1-11
	Output Connector	32.6	40.8	1-1-12
Tolenoid -1	Exterior top	32.5	40.7	1-1-13
	Internal coil	42.7	50.9	1-1-14
	Output Connector	37.0	45.2	1-1-15
	Exterior top	47.2	55.4	1-2-1
Tolenoid -2	Track contact part	58.1	66.3	1-2-2
	Inside coil	44.2	52.4	1-2-3
	Output Connector	36.5	44.7	1-2-4
	Exterior top	46.8	55.0	1-2-5
Tolenoid -3	Track contact part	57.4	65.6	1-2-6
	Inside coil	45.0	53.2	1-2-7
	Output Connector	36.3	44.5	1-2-8
	Exterior top	47.1	55.3	1-2-9
Tolenoid -4	Track contact part	58.1	66.3	1-2-10
	Inside coil	47.6	55.8	1-2-11
	Output Connector	37.1	45.3	1-2-12
	Exterior top	50.9	59.1	1-2-13
Environmental temperature	31.8	40.0	1-2-14	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				



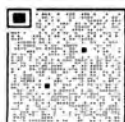


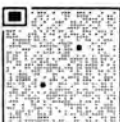
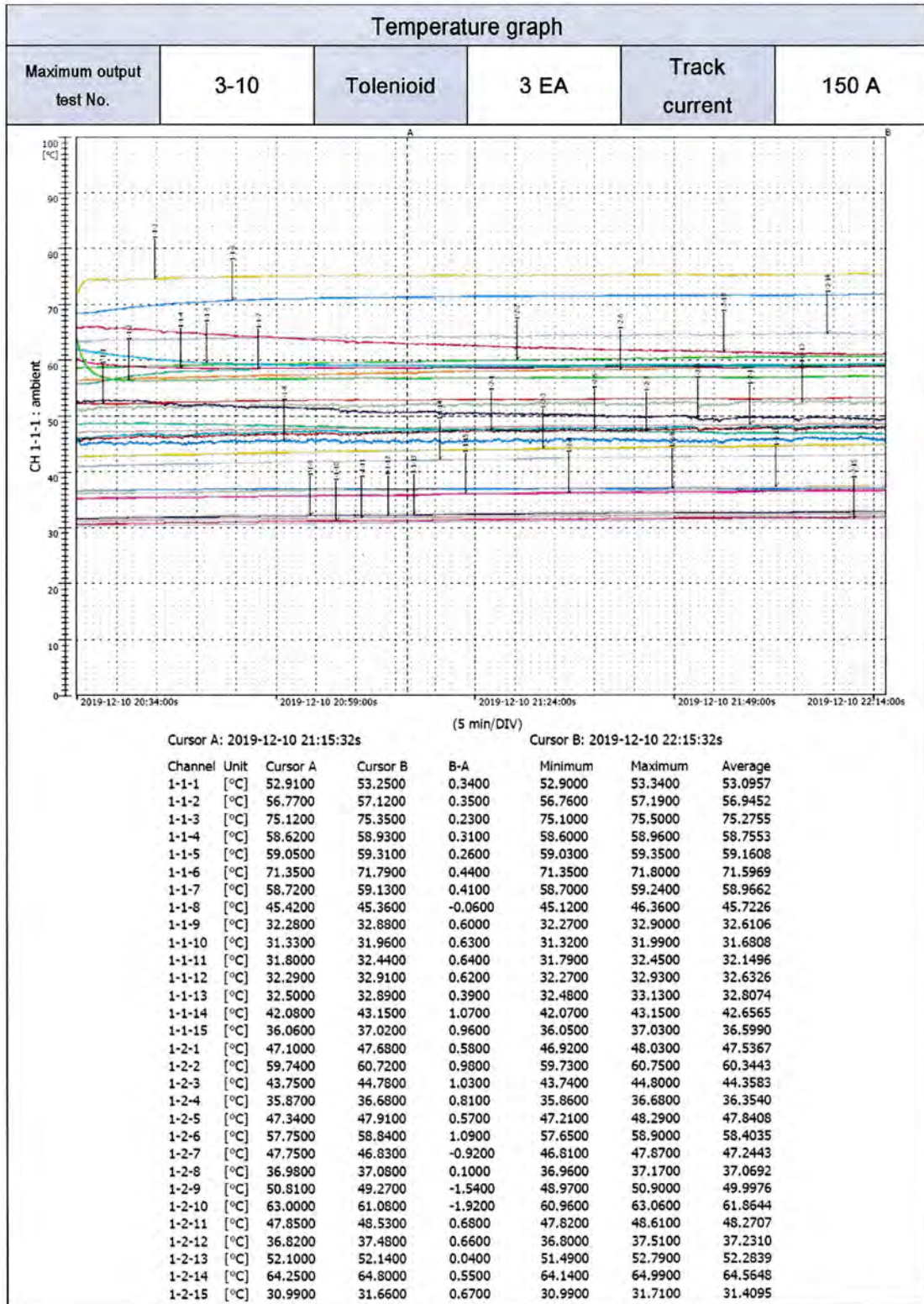




Test result

Test date	2019-12-10	Test environment	Temperature:	(31.4 ± 1) °C
			Humidity:	(21 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	3-10 (Tolenoid 3 EA, Track current 150 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	53.3	61.6	1-1-1
	Y-Capacitor	57.1	65.4	1-1-2
	Thermistor	75.4	83.7	1-1-3
	Line filter	58.9	67.2	1-1-4
	EL- Capacitor	59.3	67.6	1-1-5
	Transformer	71.8	80.1	1-1-6
	Output Connector	59.1	67.4	1-1-7
Multi-adapter	Exterior top	45.4	53.7	1-1-8
	Input Connector	32.9	41.2	1-1-9
	Switch	32.0	40.3	1-1-10
	Relay	32.4	40.7	1-1-11
	Output Connector	32.9	41.2	1-1-12
Tolenoid -1	Exterior top	32.9	41.2	1-1-13
	Internal coil	43.2	51.5	1-1-14
	Output Connector	37.0	45.3	1-1-15
	Exterior top	47.7	56.0	1-2-1
Tolenoid -2	Track contact part	60.7	69.0	1-2-2
	Inside coil	44.8	53.1	1-2-3
	Output Connector	36.7	45.0	1-2-4
	Exterior top	47.9	56.2	1-2-5
Tolenoid -3	Track contact part	58.8	67.1	1-2-6
	Inside coil	46.8	55.1	1-2-7
	Output Connector	37.1	45.4	1-2-8
	Exterior top	49.3	57.6	1-2-9
Tolenoid -4	Track contact part	61.1	69.4	1-2-10
	Inside coil	48.5	56.8	1-2-11
	Output Connector	37.5	45.8	1-2-12
	Exterior top	52.1	60.4	1-2-13
Environmental temperature	31.7	40.0	1-2-14	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

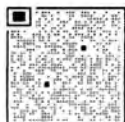


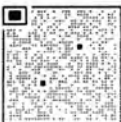
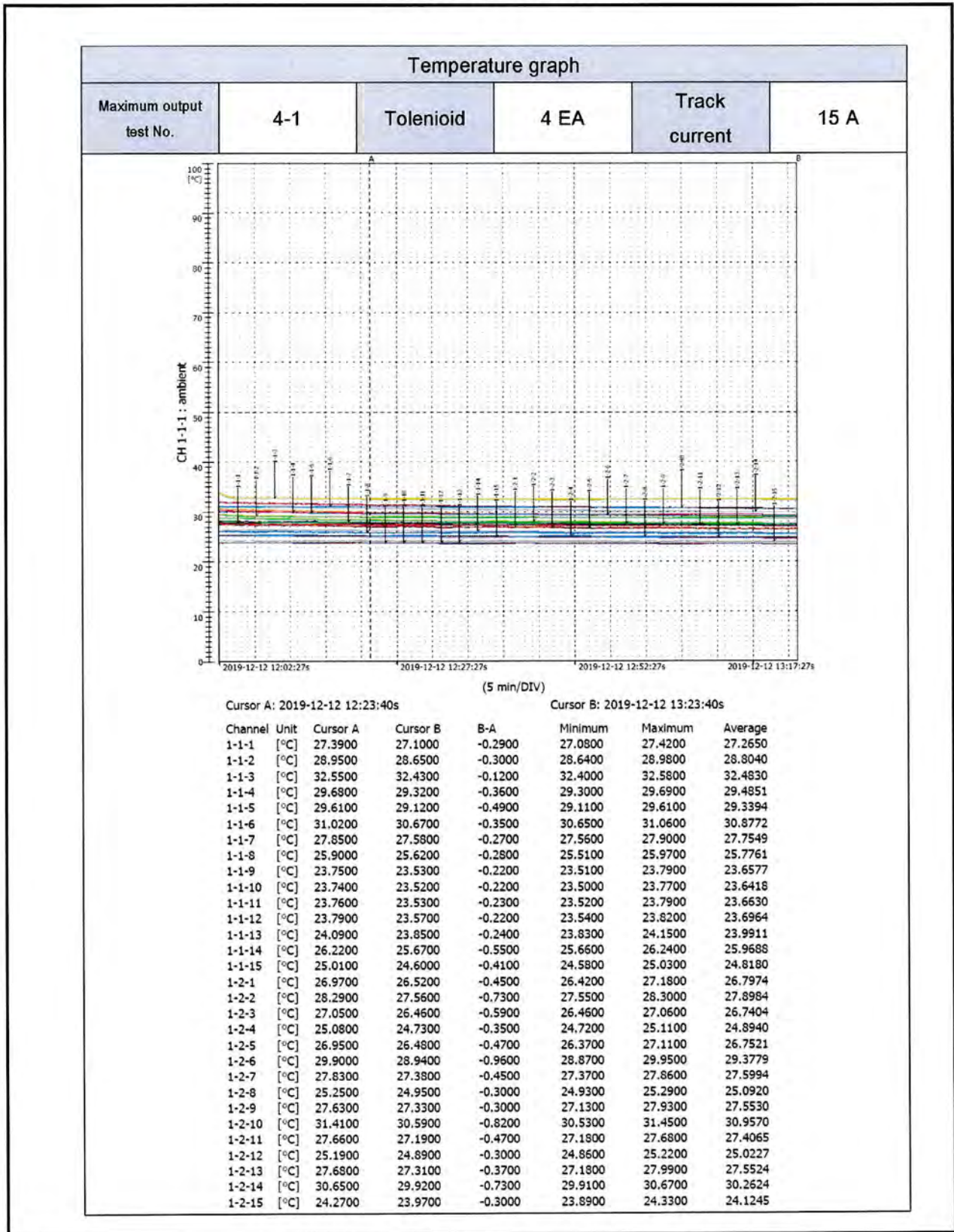




Test result

Test date	2019-12-12	Test environment	Temperature:	(24.1 ± 1) °C
			Humidity:	(23 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	4-1 (Tolenoid 4 EA, Track current 15 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	27.1	43.1	1-1-1
	Y-Capacitor	28.7	44.7	1-1-2
	Thermistor	32.4	48.4	1-1-3
	Line filter	29.3	45.3	1-1-4
	EL- Capacitor	29.1	45.1	1-1-5
	Transformer	30.7	46.7	1-1-6
	Output Connector	27.6	43.6	1-1-7
Multi-adapter	Exterior top	25.6	41.6	1-1-8
	Input Connector	23.5	39.5	1-1-9
	Switch	23.5	39.5	1-1-10
	Relay	23.5	39.5	1-1-11
	Output Connector	23.6	39.6	1-1-12
Tolenoid -1	Exterior top	23.9	39.9	1-1-13
	Internal coil	25.7	41.7	1-1-14
	Output Connector	24.6	40.6	1-1-15
	Exterior top	26.5	42.5	1-2-1
Tolenoid -2	Track contact part	27.6	43.6	1-2-2
	Inside coil	26.5	42.5	1-2-3
	Output Connector	24.7	40.7	1-2-4
	Exterior top	26.5	42.5	1-2-5
Tolenoid -3	Track contact part	28.9	44.9	1-2-6
	Inside coil	27.4	43.4	1-2-7
	Output Connector	25.0	41.0	1-2-8
	Exterior top	27.3	43.3	1-2-9
Tolenoid -4	Track contact part	30.6	46.6	1-2-10
	Inside coil	27.2	43.2	1-2-11
	Output Connector	24.9	40.9	1-2-12
	Exterior top	27.3	43.3	1-2-13
Environmental temperature	24.0	40.0	1-2-14	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				



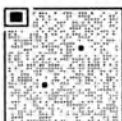


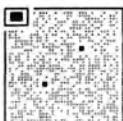
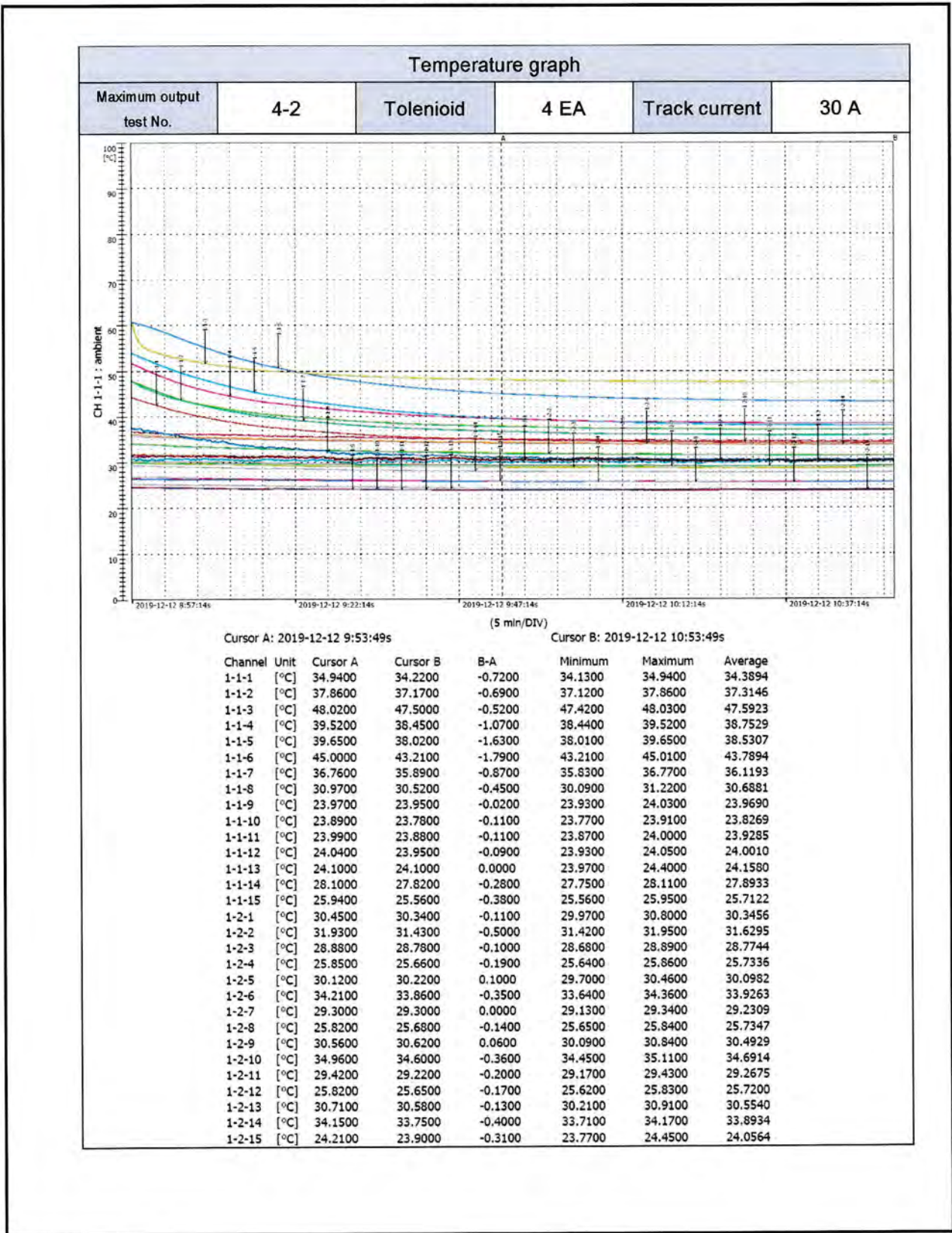


Test result

Test date	2019-12-12	Test environment	Temperature: (24.1 ± 1) °C Humidity: (23 ± 3) % R.H.	
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	4-2 (Tolenoid 4 EA, Track current 30 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	34.2	50.3	1-1-1
	Y-Capacitor	37.2	53.3	1-1-2
	Thermistor	47.5	63.6	1-1-3
	Line filter	38.5	54.6	1-1-4
	EL- Capacitor	38.0	54.1	1-1-5
	Transformer	43.2	59.3	1-1-6
	Output Connector	35.9	52.0	1-1-7
	Exterior top	30.5	46.6	1-1-8
Multi-adapter	Input Connector	24.0	40.1	1-1-9
	Switch	23.8	39.9	1-1-10
	Relay	23.9	40.0	1-1-11
	Output Connector	24.0	40.1	1-1-12
	Exterior top	24.1	40.2	1-1-13
Tolenoid -1	Internal coil	27.8	43.9	1-1-14
	Output Connector	25.6	41.7	1-1-15
	Exterior top	30.3	46.4	1-2-1
	Track contact part	31.4	47.5	1-2-2
Tolenoid -2	Inside coil	28.8	44.9	1-2-3
	Output Connector	25.7	41.8	1-2-4
	Exterior top	30.2	46.3	1-2-5
	Track contact part	33.9	50.0	1-2-6
Tolenoid -3	Inside coil	29.3	45.4	1-2-7
	Output Connector	25.7	41.8	1-2-8
	Exterior top	30.6	46.7	1-2-9
	Track contact part	34.6	50.7	1-2-10
Tolenoid -4	Inside coil	29.2	45.3	1-2-11
	Output Connector	25.7	41.8	1-2-12
	Exterior top	30.6	46.7	1-2-13
	Track contact part	33.8	49.9	1-2-14
Environmental temperature	23.9	40.0	1-2-15	

\* Conversion temperature: measurement temperature - Environmental temperature + 40 °C

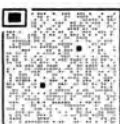
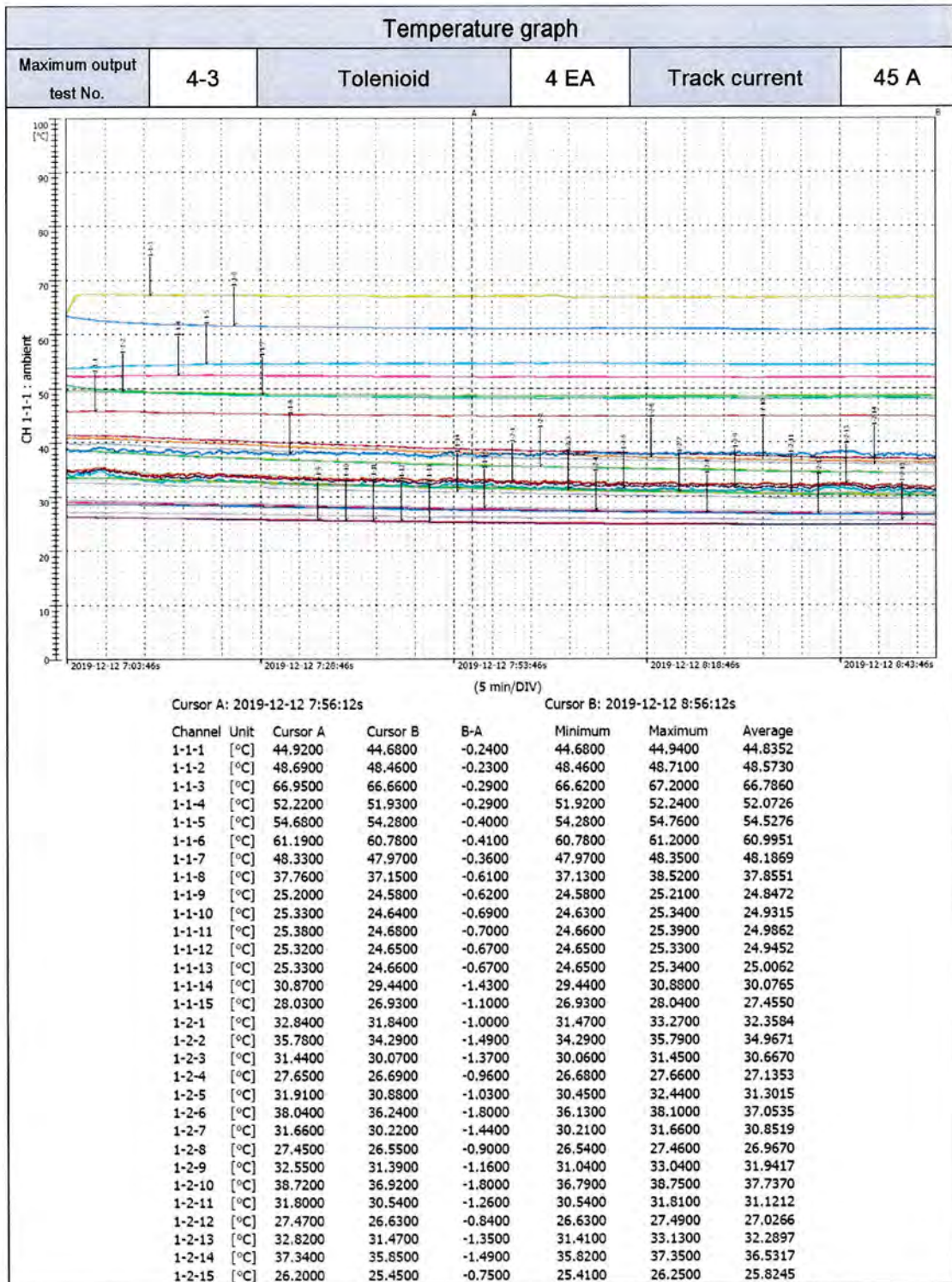






Test result				
Test date	2019-12-12	Test environment	Temperature: (25.8 ± 1) °C Humidity: (23 ± 3) % R.H.	
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	4-3 (Tolenoid 4 EA, Track current 45 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	44.7	59.2	1-1-1
	Y-Capacitor	48.5	63.0	1-1-2
	Thermistor	66.7	81.2	1-1-3
	Line filter	51.9	66.4	1-1-4
	EL- Capacitor	54.3	68.8	1-1-5
	Transformer	60.8	75.3	1-1-6
	Output Connector	48.0	62.5	1-1-7
	Exterior top	37.2	51.7	1-1-8
Multi-adapter	Input Connector	24.6	39.1	1-1-9
	Switch	24.6	39.1	1-1-10
	Relay	24.7	39.2	1-1-11
	Output Connector	24.7	39.2	1-1-12
	Exterior top	24.7	39.2	1-1-13
Tolenoid -1	Internal coil	29.4	43.9	1-1-14
	Output Connector	26.9	41.4	1-1-15
	Exterior top	31.8	46.3	1-2-1
	Track contact part	34.3	48.8	1-2-2
Tolenoid -2	Inside coil	30.1	44.6	1-2-3
	Output Connector	26.7	41.2	1-2-4
	Exterior top	30.9	45.4	1-2-5
	Track contact part	36.2	50.7	1-2-6
Tolenoid -3	Inside coil	30.2	44.7	1-2-7
	Output Connector	26.6	41.1	1-2-8
	Exterior top	31.4	45.9	1-2-9
	Track contact part	36.9	51.4	1-2-10
Tolenoid -4	Inside coil	30.5	45.0	1-2-11
	Output Connector	26.6	41.1	1-2-12
	Exterior top	31.5	46.0	1-2-13
	Track contact part	35.9	50.4	1-2-14
Environmental temperature		25.5	40.0	1-2-15
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				





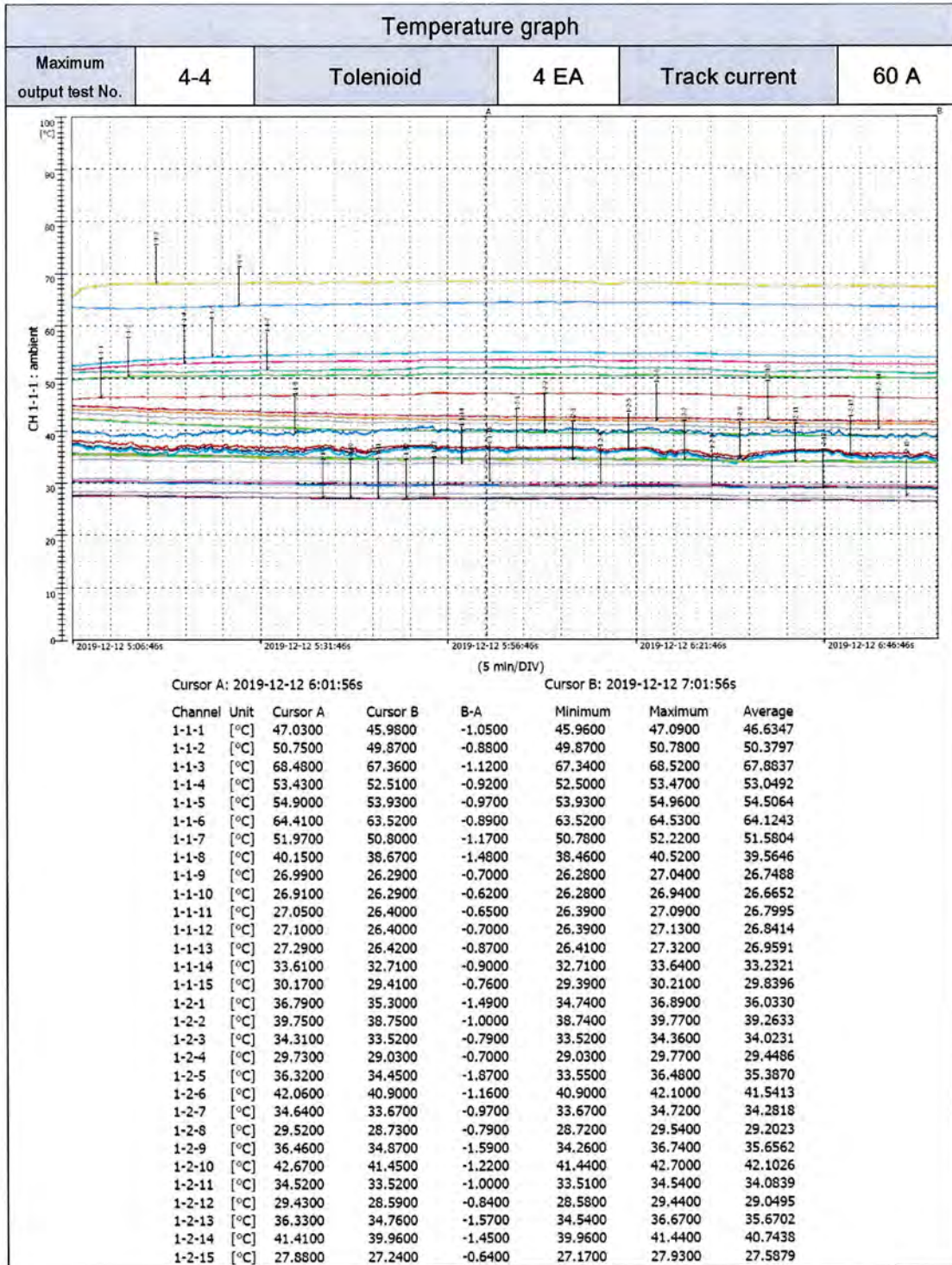




Test result

Test date	2019-12-12	Test environment	Temperature:	(27.6 ± 1) °C
			Humidity:	(23 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	4-4 (Tolenoid 4 EA, Track current 60 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	46.0	58.8	1-1-1
	Y-Capacitor	49.9	62.7	1-1-2
	Thermistor	67.4	80.2	1-1-3
	Line filter	52.5	65.3	1-1-4
	EL- Capacitor	53.9	66.7	1-1-5
	Transformer	63.5	76.3	1-1-6
	Output Connector	50.8	63.6	1-1-7
	Exterior top	38.7	51.5	1-1-8
Multi-adapter	Input Connector	26.3	39.1	1-1-9
	Switch	26.3	39.1	1-1-10
	Relay	26.4	39.2	1-1-11
	Output Connector	26.4	39.2	1-1-12
	Exterior top	26.4	39.2	1-1-13
Tolenoid -1	Internal coil	32.7	45.5	1-1-14
	Output Connector	29.4	42.2	1-1-15
	Exterior top	35.3	48.1	1-2-1
	Track contact part	38.8	51.6	1-2-2
Tolenoid -2	Inside coil	33.5	46.3	1-2-3
	Output Connector	29.0	41.8	1-2-4
	Exterior top	34.5	47.3	1-2-5
	Track contact part	40.9	53.7	1-2-6
Tolenoid -3	Inside coil	33.7	46.5	1-2-7
	Output Connector	28.7	41.5	1-2-8
	Exterior top	34.9	47.7	1-2-9
	Track contact part	41.5	54.3	1-2-10
Tolenoid -4	Inside coil	33.5	46.3	1-2-11
	Output Connector	28.6	41.4	1-2-12
	Exterior top	34.8	47.6	1-2-13
	Track contact part	40.0	52.8	1-2-14
Environmental temperature	27.2	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				

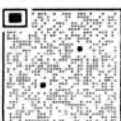
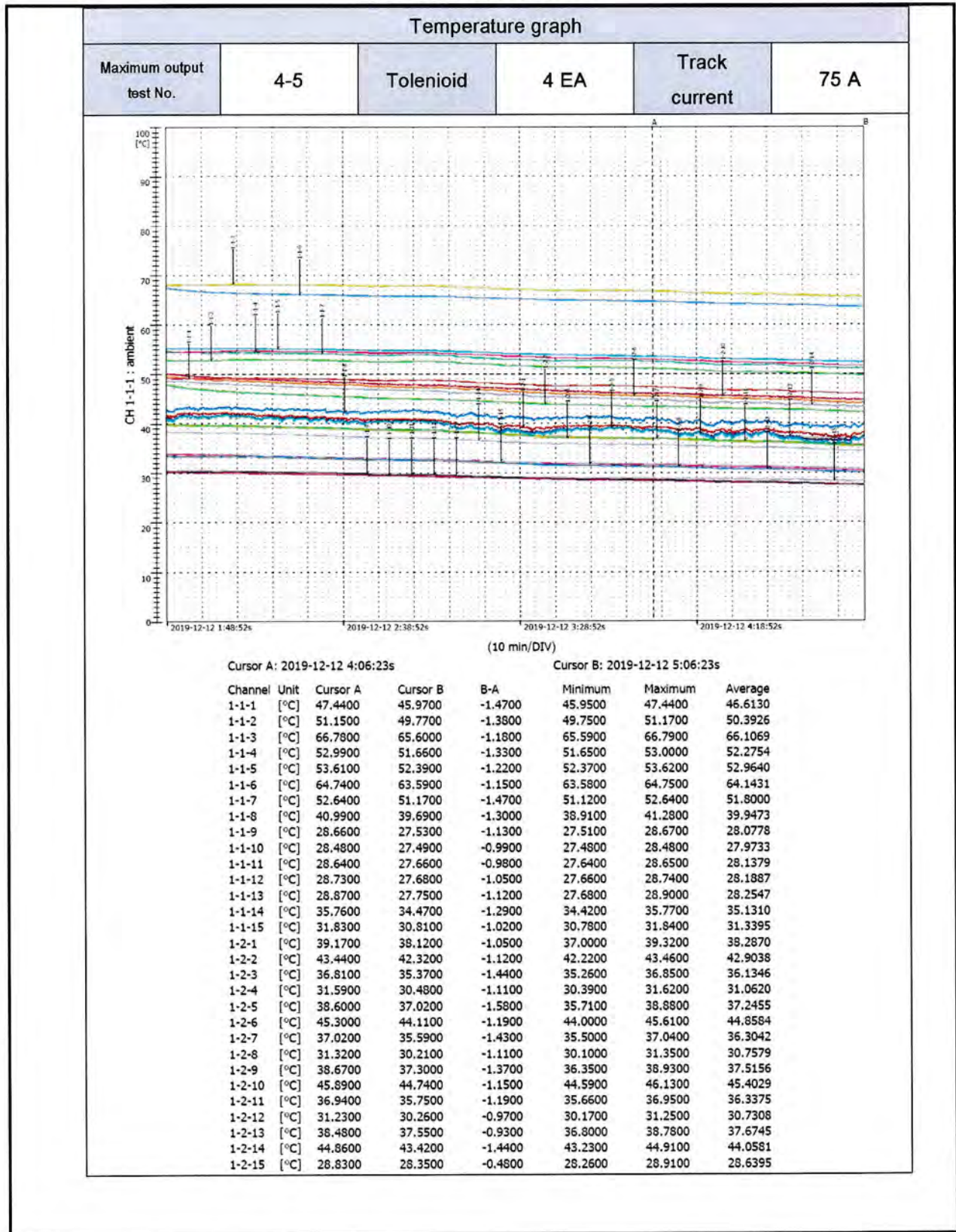






Test result				
Test date	2019-12-12	Test environment	Temperature: (28.6 ± 1) °C Humidity: (23 ± 3) % R.H.	
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	4-5 (Tolenoid 4 EA, Track current 75 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	46.0	57.6	1-1-1
	Y-Capacitor	49.8	61.4	1-1-2
	Thermistor	65.6	77.2	1-1-3
	Line filter	51.7	63.3	1-1-4
	EL- Capacitor	52.4	64.0	1-1-5
	Transformer	63.6	75.2	1-1-6
	Output Connector	51.2	62.8	1-1-7
Multi-adapter	Exterior top	39.7	51.3	1-1-8
	Input Connector	27.5	39.1	1-1-9
	Switch	27.5	39.1	1-1-10
	Relay	27.7	39.3	1-1-11
	Output Connector	27.7	39.3	1-1-12
Tolenoid -1	Exterior top	27.8	39.4	1-1-13
	Internal coil	34.5	46.1	1-1-14
	Output Connector	30.8	42.4	1-1-15
	Exterior top	38.1	49.7	1-2-1
Tolenoid -2	Track contact part	42.3	53.9	1-2-2
	Inside coil	35.4	47.0	1-2-3
	Output Connector	30.5	42.1	1-2-4
	Exterior top	37.0	48.6	1-2-5
Tolenoid -3	Track contact part	44.1	55.7	1-2-6
	Inside coil	35.6	47.2	1-2-7
	Output Connector	30.2	41.8	1-2-8
	Exterior top	37.3	48.9	1-2-9
Tolenoid -4	Track contact part	44.7	56.3	1-2-10
	Inside coil	35.8	47.4	1-2-11
	Output Connector	30.3	41.9	1-2-12
	Exterior top	37.6	49.2	1-2-13
Environmental temperature		28.4	40.0	1-2-14
		* Conversion temperature: measurement temperature - Environmental temperature + 40 °C		

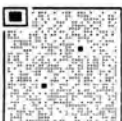


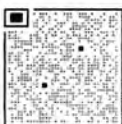
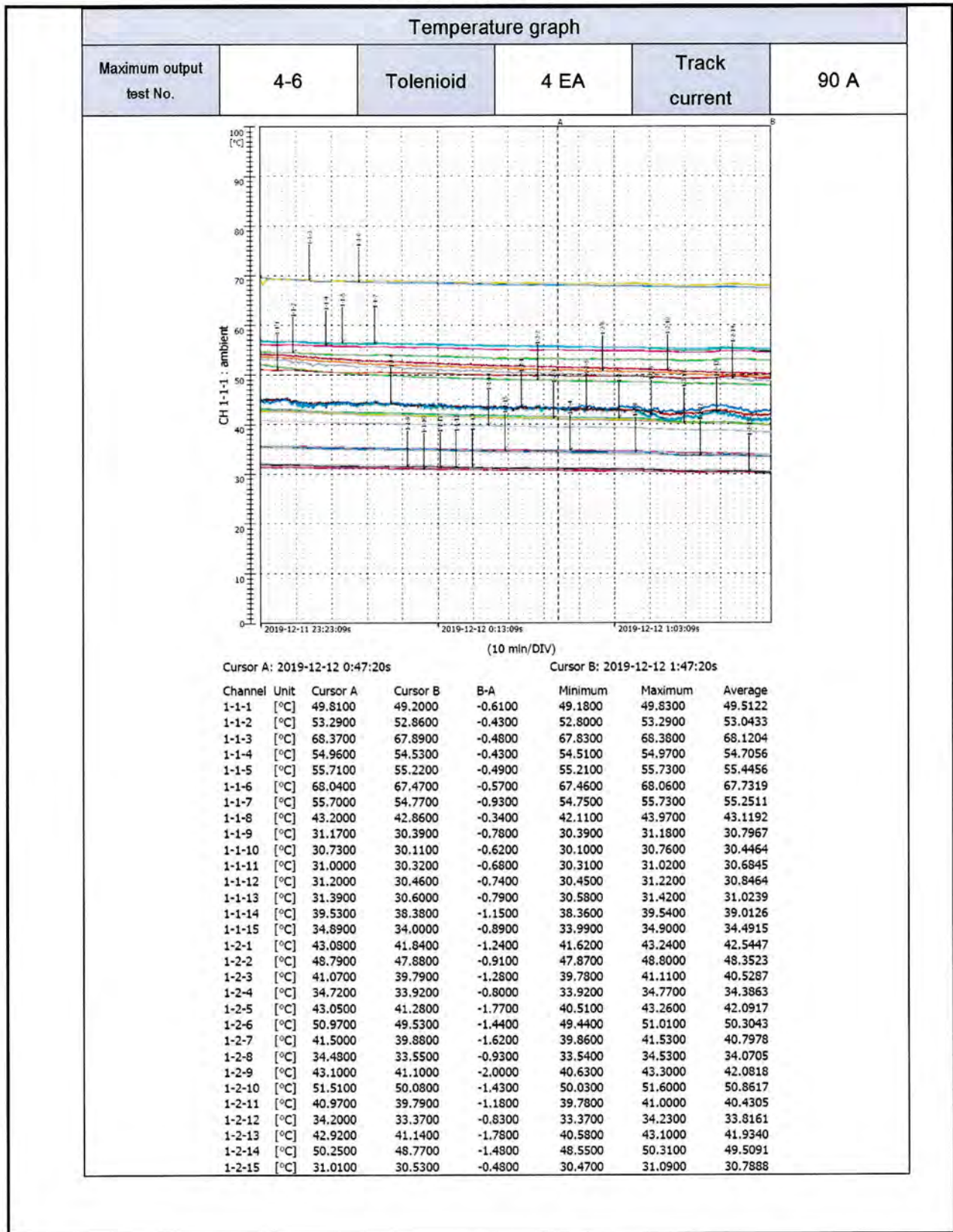




Test result

Test date	2019-12-12	Test environment	Temperature:	(30.8 ± 1) °C
			Humidity:	(23 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	4-6 (Tolenoid 4 EA, Track current 90 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	49.2	58.7	1-1-1
	Y-Capacitor	52.9	62.4	1-1-2
	Thermistor	67.9	77.4	1-1-3
	Line filter	54.5	64.0	1-1-4
	EL- Capacitor	55.2	64.7	1-1-5
	Transformer	67.5	77.0	1-1-6
	Output Connector	54.8	64.3	1-1-7
	Exterior top	42.9	52.4	1-1-8
Multi-adapter	Input Connector	30.4	39.9	1-1-9
	Switch	30.1	39.6	1-1-10
	Relay	30.3	39.8	1-1-11
	Output Connector	30.5	40.0	1-1-12
	Exterior top	30.6	40.1	1-1-13
Tolenoid -1	Internal coil	38.4	47.9	1-1-14
	Output Connector	34.0	43.5	1-1-15
	Exterior top	41.8	51.3	1-2-1
	Track contact part	47.9	57.4	1-2-2
Tolenoid -2	Inside coil	39.8	49.3	1-2-3
	Output Connector	33.9	43.4	1-2-4
	Exterior top	41.3	50.8	1-2-5
	Track contact part	49.5	59.0	1-2-6
Tolenoid -3	Inside coil	39.9	49.4	1-2-7
	Output Connector	33.6	43.1	1-2-8
	Exterior top	41.1	50.6	1-2-9
	Track contact part	50.1	59.6	1-2-10
Tolenoid -4	Inside coil	39.8	49.3	1-2-11
	Output Connector	33.4	42.9	1-2-12
	Exterior top	41.1	50.6	1-2-13
	Track contact part	48.8	58.3	1-2-14
Environmental temperature	30.5	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				





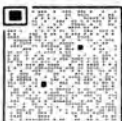
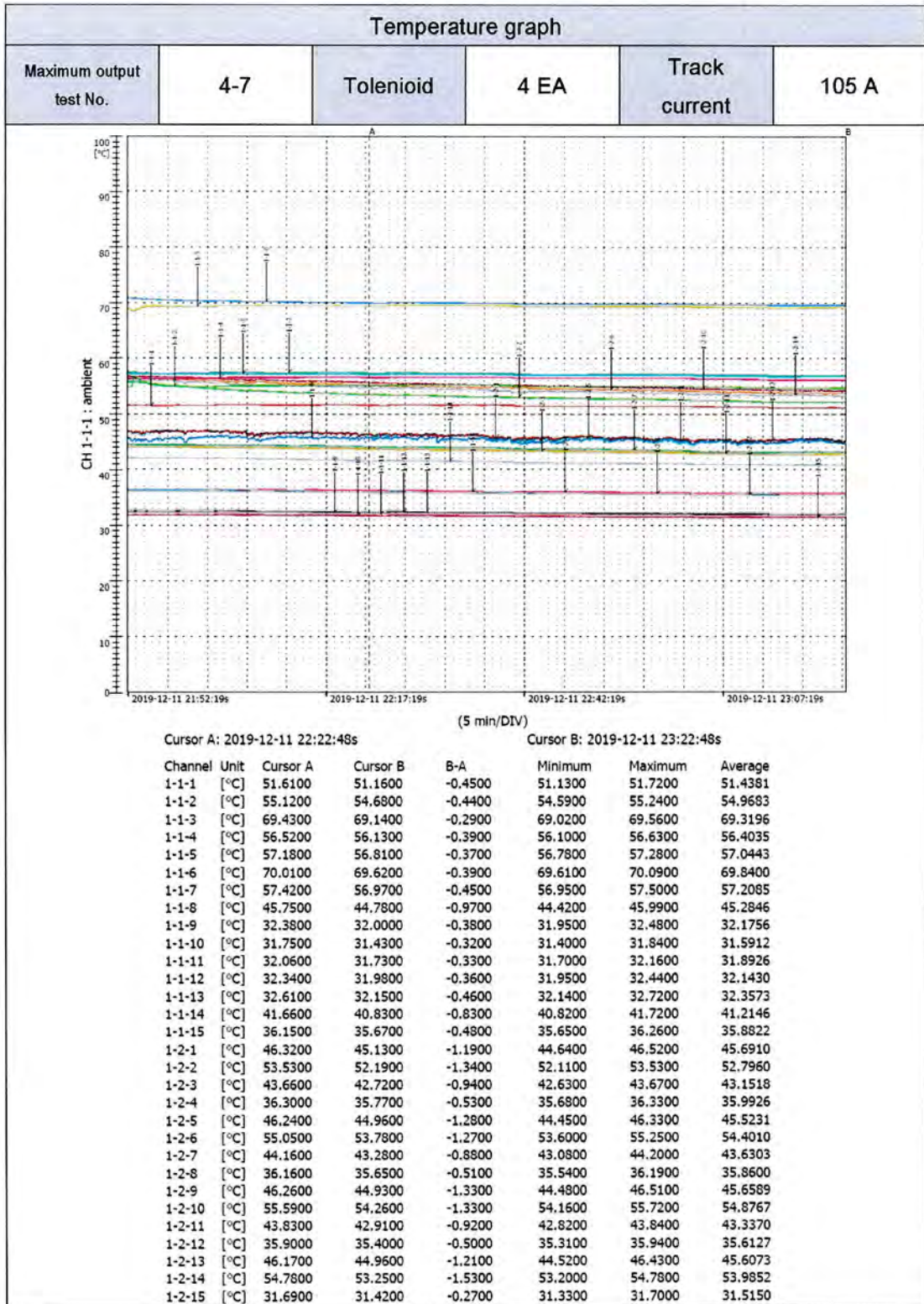


Test result

Test date	2019-12-11	Test environment	Temperature:	(31.5 ± 1) °C
			Humidity:	(20 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	4-7 (Tolenoid 4 EA, Track current 105 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	51.2	59.8	1-1-1
	Y-Capacitor	54.7	63.3	1-1-2
	Thermistor	69.1	77.7	1-1-3
	Line filter	56.1	64.7	1-1-4
	EL- Capacitor	56.8	65.4	1-1-5
	Transformer	69.6	78.2	1-1-6
	Output Connector	57.0	65.6	1-1-7
Multi-adapter	Exterior top	44.8	53.4	1-1-8
	Input Connector	32.0	40.6	1-1-9
	Switch	31.4	40.0	1-1-10
	Relay	31.7	40.3	1-1-11
	Output Connector	32.0	40.6	1-1-12
Tolenoid -1	Exterior top	32.2	40.8	1-1-13
	Internal coil	40.8	49.4	1-1-14
	Output Connector	35.7	44.3	1-1-15
	Exterior top	45.1	53.7	1-2-1
Tolenoid -2	Track contact part	52.2	60.8	1-2-2
	Inside coil	42.7	51.3	1-2-3
	Output Connector	35.8	44.4	1-2-4
	Exterior top	45.0	53.6	1-2-5
Tolenoid -3	Track contact part	53.8	62.4	1-2-6
	Inside coil	43.3	51.9	1-2-7
	Output Connector	35.7	44.3	1-2-8
	Exterior top	44.9	53.5	1-2-9
Tolenoid -4	Track contact part	54.3	62.9	1-2-10
	Inside coil	42.9	51.5	1-2-11
	Output Connector	35.4	44.0	1-2-12
	Exterior top	45.0	53.6	1-2-13
Environmental temperature		31.4	40.0	1-2-14
				1-2-15

\* Conversion temperature: measurement temperature - Environmental temperature + 40 °C



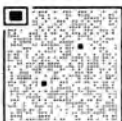


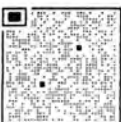
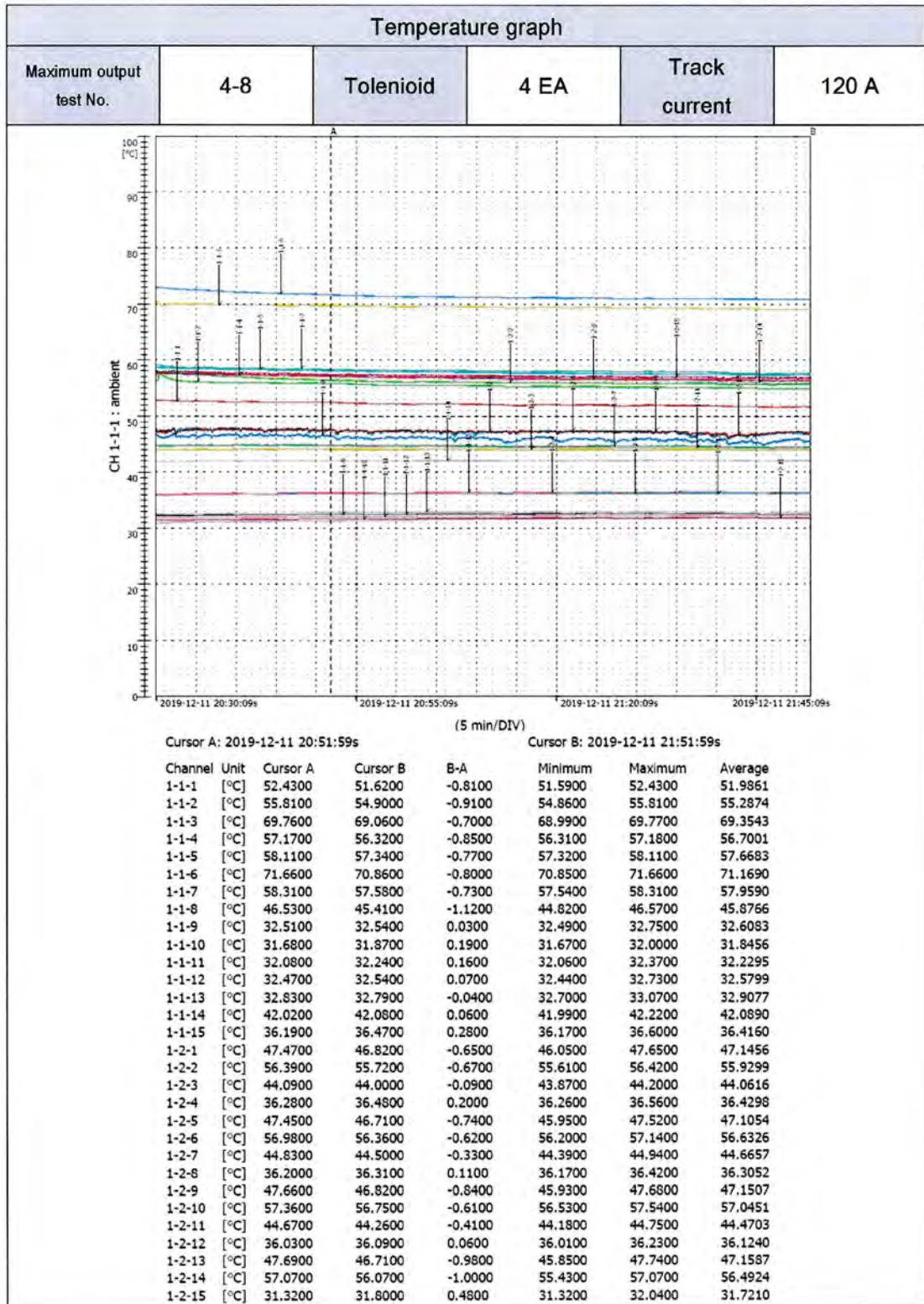




Test result

Test date	2019-12-11	Test environment	Temperature:	(31.7 ± 1) °C
			Humidity:	(20 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	4-8 (Tolenoid 4 EA, Track current 120 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	51.6	59.8	1-1-1
	Y-Capacitor	54.9	63.1	1-1-2
	Thermistor	69.1	77.3	1-1-3
	Line filter	56.3	64.5	1-1-4
	EL- Capacitor	57.3	65.5	1-1-5
	Transformer	70.9	79.1	1-1-6
	Output Connector	57.6	65.8	1-1-7
Multi-adapter	Exterior top	45.4	53.6	1-1-8
	Input Connector	32.5	40.7	1-1-9
	Switch	31.9	40.1	1-1-10
	Relay	32.2	40.4	1-1-11
	Output Connector	32.5	40.7	1-1-12
Tolenoid -1	Exterior top	32.8	41.0	1-1-13
	Internal coil	42.1	50.3	1-1-14
	Output Connector	36.5	44.7	1-1-15
	Exterior top	46.8	55.0	1-2-1
Tolenoid -2	Track contact part	55.7	63.9	1-2-2
	Inside coil	44.0	52.2	1-2-3
	Output Connector	36.5	44.7	1-2-4
	Exterior top	46.7	54.9	1-2-5
Tolenoid -3	Track contact part	56.4	64.6	1-2-6
	Inside coil	44.5	52.7	1-2-7
	Output Connector	36.3	44.5	1-2-8
	Exterior top	46.8	55.0	1-2-9
Tolenoid -4	Track contact part	56.8	65.0	1-2-10
	Inside coil	44.3	52.5	1-2-11
	Output Connector	36.1	44.3	1-2-12
	Exterior top	46.7	54.9	1-2-13
Track contact part	56.1	64.3	1-2-14	
Environmental temperature	31.8	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				



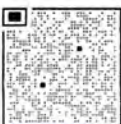
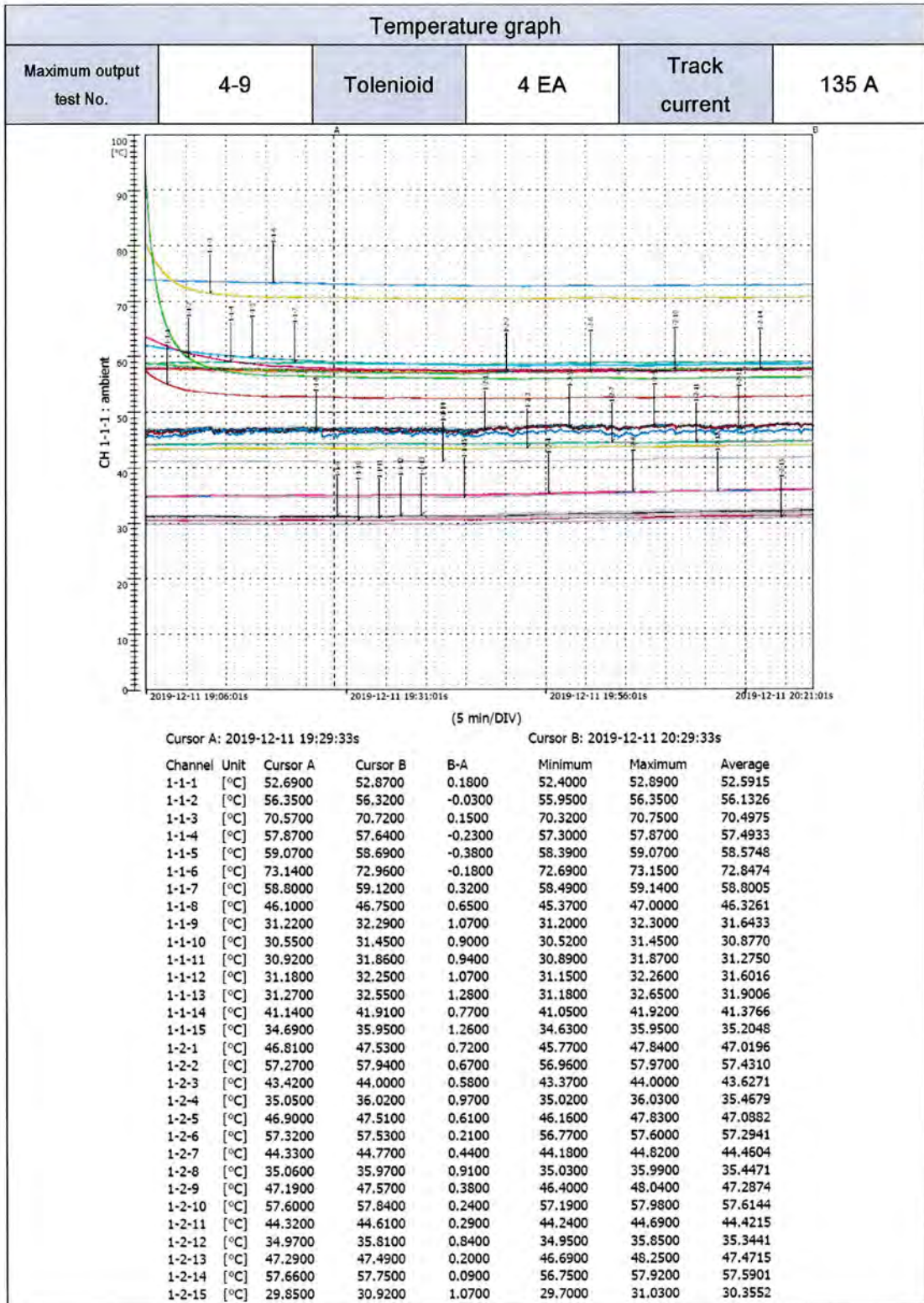




Test result

Test date	2019-12-11	Test environment	Temperature:	(30.3 ± 1) °C
			Humidity:	(20 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	4-9 (Tolenoid 4 EA, Track current 135 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	52.9	62.0	1-1-1
	Y-Capacitor	56.3	65.4	1-1-2
	Thermistor	70.7	79.8	1-1-3
	Line filter	57.6	66.7	1-1-4
	EL- Capacitor	58.7	67.8	1-1-5
	Transformer	73.0	82.1	1-1-6
	Output Connector	59.1	68.2	1-1-7
Multi-adapter	Exterior top	46.8	55.9	1-1-8
	Input Connector	32.3	41.4	1-1-9
	Switch	31.5	40.6	1-1-10
	Relay	31.9	41.0	1-1-11
	Output Connector	32.3	41.4	1-1-12
Tolenoid -1	Exterior top	32.6	41.7	1-1-13
	Internal coil	41.9	51.0	1-1-14
	Output Connector	36.0	45.1	1-1-15
	Exterior top	47.5	56.6	1-2-1
Tolenoid -2	Track contact part	57.9	67.0	1-2-2
	Inside coil	44.0	53.1	1-2-3
	Output Connector	36.0	45.1	1-2-4
	Exterior top	47.5	56.6	1-2-5
Tolenoid -3	Track contact part	57.5	66.6	1-2-6
	Inside coil	44.8	53.9	1-2-7
	Output Connector	36.0	45.1	1-2-8
	Exterior top	47.6	56.7	1-2-9
Tolenoid -4	Track contact part	57.8	66.9	1-2-10
	Inside coil	44.6	53.7	1-2-11
	Output Connector	35.8	44.9	1-2-12
	Exterior top	47.5	56.6	1-2-13
Environmental temperature	30.9	40.0	1-2-15	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				



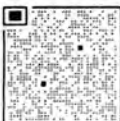
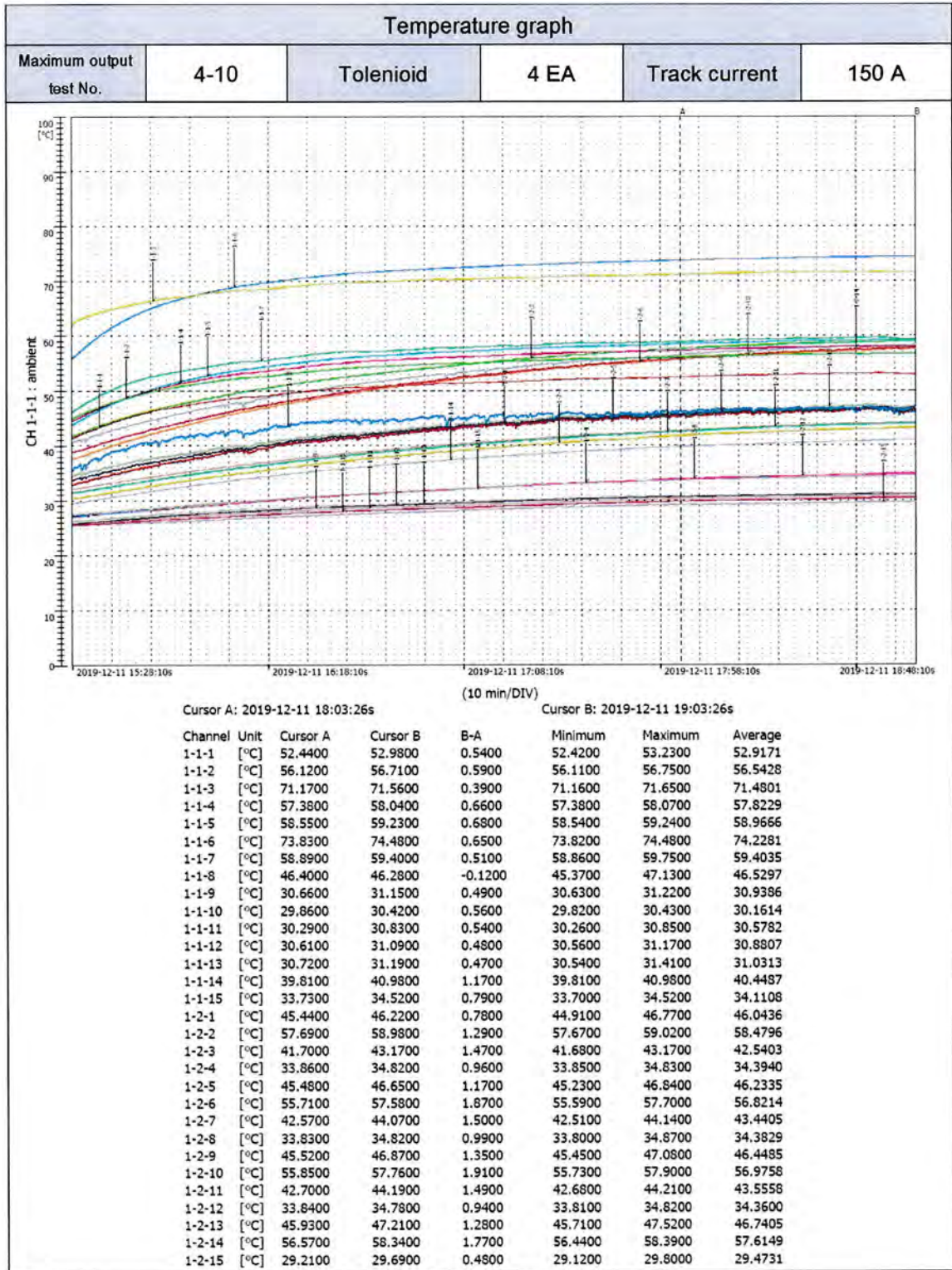




Test result

Test date	2019-12-11	Test environment	Temperature:	(29.5 ± 1) °C
			Humidity:	(20 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Maximum output test No.	4-10 (Tolenoid 4 EA, Track current 150 A)			
Test point	Measurement temperature(°C)	*Conversion temperature(°C)	Sensor No.	
SMPS	Input Connector	53.0	63.3	1-1-1
	Y-Capacitor	56.7	67.0	1-1-2
	Thermistor	71.6	81.9	1-1-3
	Line filter	58.0	68.3	1-1-4
	EL- Capacitor	59.2	69.5	1-1-5
	Transformer	74.5	84.8	1-1-6
	Output Connector	59.4	69.7	1-1-7
Multi-adapter	Exterior top	46.3	56.6	1-1-8
	Input Connector	31.2	41.5	1-1-9
	Switch	30.4	40.7	1-1-10
	Relay	30.8	41.1	1-1-11
	Output Connector	31.1	41.4	1-1-12
Tolenoid -1	Exterior top	31.2	41.5	1-1-13
	Internal coil	41.0	51.3	1-1-14
	Output Connector	34.5	44.8	1-1-15
	Exterior top	46.2	56.5	1-2-1
Tolenoid -2	Track contact part	59.0	69.3	1-2-2
	Inside coil	43.2	53.5	1-2-3
	Output Connector	34.8	45.1	1-2-4
	Exterior top	46.7	57.0	1-2-5
Tolenoid -3	Track contact part	57.6	67.9	1-2-6
	Inside coil	44.1	54.4	1-2-7
	Output Connector	34.8	45.1	1-2-8
	Exterior top	46.9	57.2	1-2-9
Tolenoid -4	Track contact part	57.8	68.1	1-2-10
	Inside coil	44.2	54.5	1-2-11
	Output Connector	34.8	45.1	1-2-12
	Exterior top	47.2	57.5	1-2-13
Environmental temperature	29.7	40.0	1-2-14	
* Conversion temperature: measurement temperature - Environmental temperature + 40 °C				



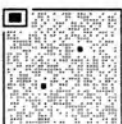
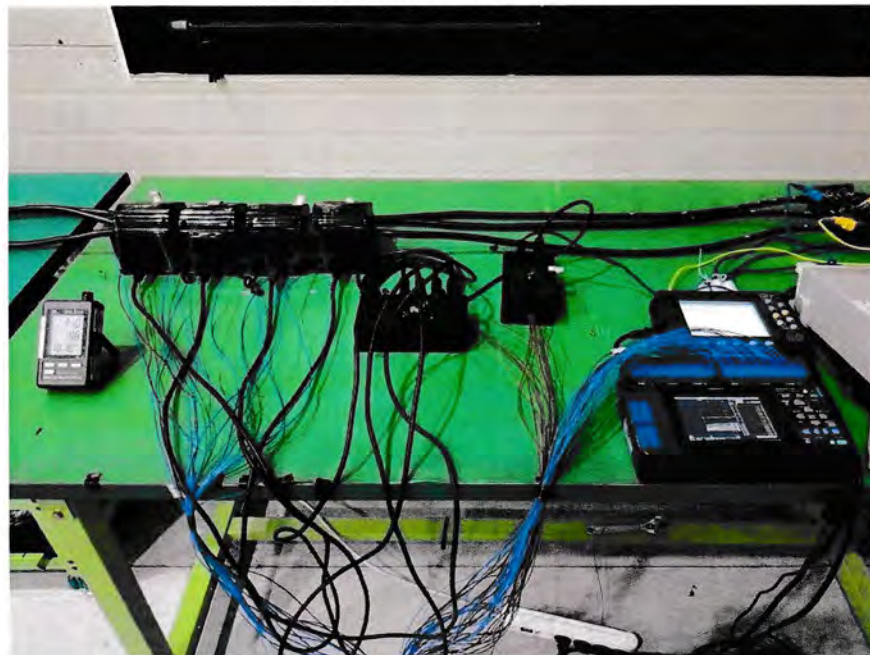


E. Test picture

Test set-up



Measurement temperature





#### 4. Sound pressure level measurement

##### A. Test standard

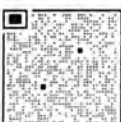
Measure and record the sound pressure level for each output condition of Tolenioid, Multi-adapter, and SMPS according to the test method requested by the applicant.

##### B. Test method

- ① Install 4 EA Tolenoids on the test track. Installation distance is according to the manufacturer's specifications.
- ② Install Multi-adapter 1 EA, SMPS 1 EA according to the manufacturer's specifications.
- ③ Install Digital Power Meter and a variable resistive load on the output of the SMPS.
- ④ Increase the line current from at least 15 A to 150 A in 15 A increments.
- ⑤ Measure and record the sound pressure level at each track's current condition.
- ⑥ Under all of conditions when Tolenoids operate 1EA, 2EA, 3EA, and 4EA, measure and record sound pressure level under all conditions.

##### C. Measurement equipment

Description	Manufacturer	Model	Calibration date	Next calibration date
CLAMP ON POWER HI TESTER	HIOKI	3169-20	2019-03-06	2020-03-06
Digital Power Meter	YOKOGAWA	WT210	2019-03-05	2020-03-05
Variable Resistor (55 Ω)	ELEX POLYTECH	EP-DL55	N/A	N/A
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 (Temperature/Humidity)	2020-03-05 (Temperature/Humidity)
			2019-03-08 (Atmospheric Pressure)	2020-03-08 (Atmospheric Pressure)
Sound Level Meter	Bruel & Kjaer	2236	2019-03-18	2020-03-18
Tape measure	KOMELON	KMC-32D	2019-03-27	2021-03-27

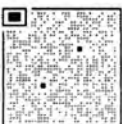
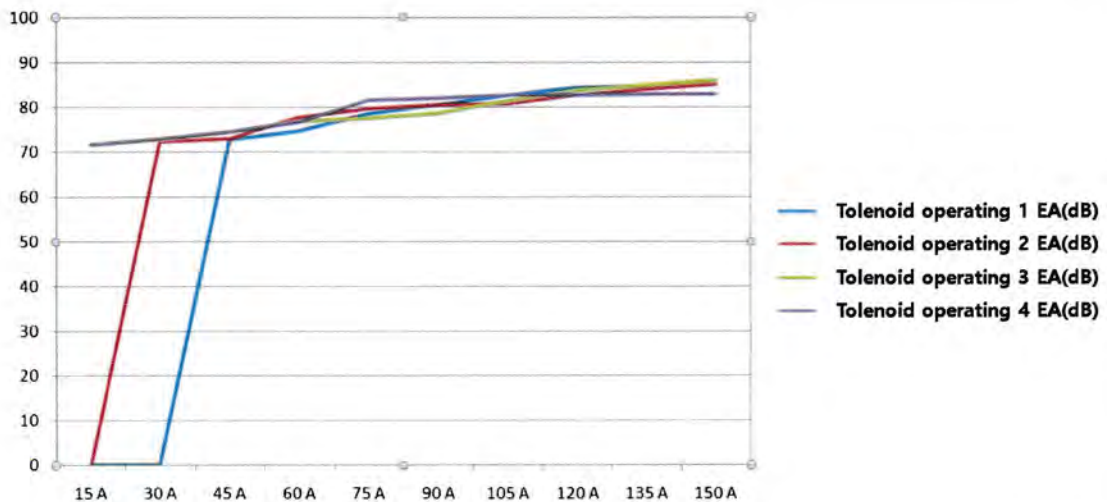






D. Test result

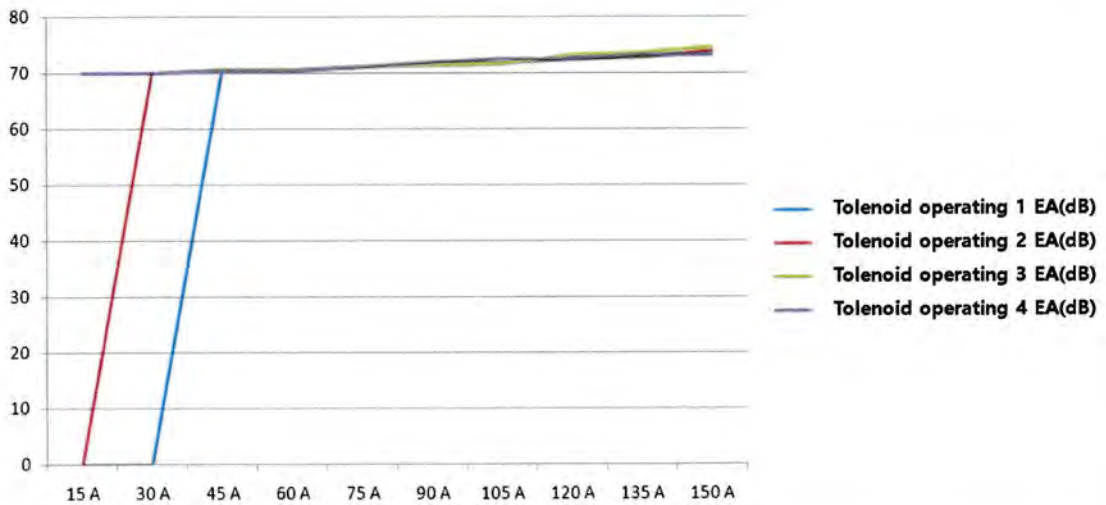
Test date	2019-11-18		Test environment	Temperature:	(15.0 ± 1) °C
				Humidity:	(31 ± 2) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1				
Test condition	Measurement length 30 cm				
Track current	Tolenioid 1 EA operating (dB)	Tolenioid 2 EA operating (dB)	Tolenioid 3 EA operating (dB)	Tolenioid 4 EA operating (dB)	*Environmental sound pressure level(dB)
15 A	-	-	71.6	71.6	71.6
30 A	-	72.3	72.6	73.0	
45 A	72.8	72.9	74.5	74.5	
60 A	74.8	77.7	76.8	76.7	
75 A	78.6	79.7	77.6	81.7	
90 A	80.7	80.5	78.5	82.0	
105 A	82.9	80.7	81.4	82.7	
120 A	84.5	82.8	83.8	82.7	
135 A	84.9	84.1	85.0	82.9	
150 A	86.1	85.1	86.0	82.9	
* Environmental noise is the ambient sound pressure level produced when Tolenioid is not activated.					





Test result

Test date	2019-11-18		Test environment	Temperature:	(15.0 ± 1) °C
				Humidity:	(31 ± 2) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1				
Test condition	Measurement length 100 cm				
Track current	Tolenioid 1 EA operating (dB)	Tolenioid 2 EA operating (dB)	Tolenioid 3 EA operating (dB)	Tolenioid 4 EA operating (dB)	*Environmental sound pressure level (dB)
15 A	-	-	70.0	70.0	70.0
30 A	-	70.0	70.0	70.0	
45 A	70.5	70.5	70.5	70.5	
60 A	70.5	70.5	70.5	70.5	
75 A	70.9	71.2	70.9	71.1	
90 A	71.7	71.6	71.3	72.0	
105 A	71.7	71.7	71.5	72.6	
120 A	72.9	72.4	73.2	72.5	
135 A	72.9	72.7	73.6	73.2	
150 A	73.6	73.9	74.5	73.2	
* Environmental noise is the ambient sound pressure level produced when Tolenioid is not activated.					





### 5. EMC test (Conducted Emission test)

#### A. Test standard

The limit values of EN 61000-6-4 standard are applied, and the noise of power lines from Toleniod to SMPS was measured following the test methods presented by the applicant under the maximum power of Toleniod, Multi-adapter, and SMPS.

#### B. Test method

- ① 4 EA Toleniods are installed on the test lines. Installation distance is according to the manufacturer's specifications.
- ② Multi-adapter 1 EA, SMPS 1 EA is installed according to the manufacturer's specifications.
- ③ Install Digital Power Meter and a resistive variable load on the output of the SMPS.
- ④ Install LISN on the power line between Toleniod and SMPS.
- ⑤ In the track current 150 A state, adjust the variable resistive load to maintain the maximum power of the SMPS.
- ⑥ Measure the conducted noise delivered to the installed LISN through the EMI test Receiver.

#### C. Measurement equipment

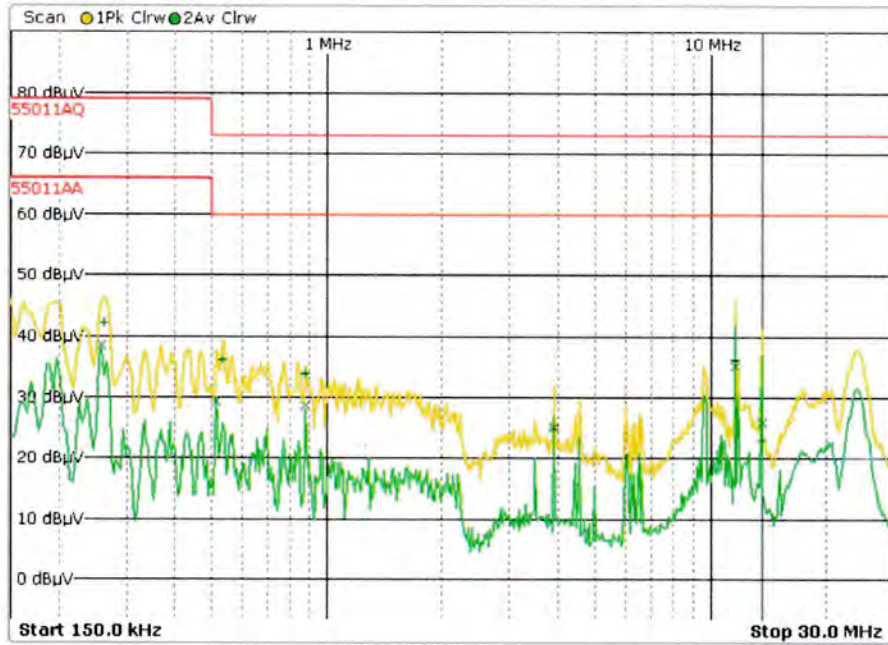
Description	Manufacturer	Model	Calibration date	Next calibration date
EMI Test Receiver	R & S	ESR7	2019-04-17	2020-04-17
LISN	R & S	ENV4200	2019-04-18	2020-04-18
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 <small>(Temperature/Humidity)</small>	2020-03-05 <small>(Temperature/Humidity)</small>
			2019-03-08 <small>(Atmospheric Pressure)</small>	2020-03-08 <small>(Atmospheric Pressure)</small>



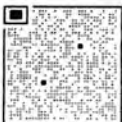


D. Test result

Test date	2019-11-19	Test environment	Temperature:	(15.3 ± 1) °C
			Humidity:	(31 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Test condition	Tolenoid 4 EA operating, Track current 150 A, SMPS maximum output			



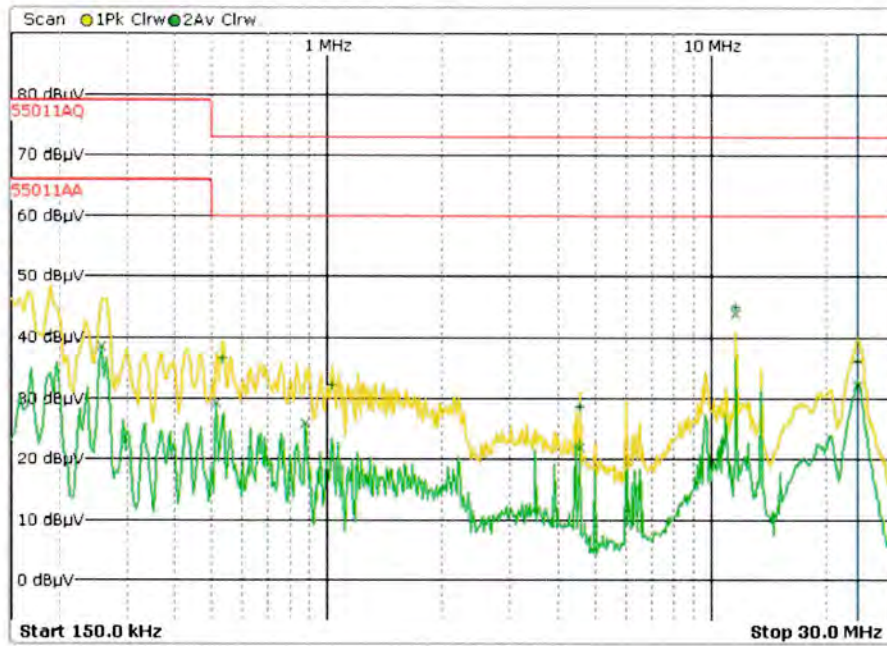
No.	Freq. [MHz]	Phase	Reading		C.Fac [dB]	Result		Limit		Margin	
			<QP> [dB(µV)]	<AV> [dB(µV)]		<QP> [dB(µV)]	<AV> [dB(µV)]	<QP> [dB(µV)]	<AV> [dB(µV)]	<QP> [dB]	<AV> [dB]
			1	0.26		L1	---	28.24	10.30	---	38.54
2	0.26	L1	32.08	---	10.30	42.38	---	79.00	---	36.62	---
3	0.51	L1	---	18.98	10.22	---	29.20	---	60.00	---	30.80
4	0.53	L1	26.08	---	10.22	36.30	---	73.00	---	36.70	---
5	0.88	L1	23.80	18.47	10.21	34.01	28.68	73.00	60.00	38.99	31.32
6	3.91	L1	14.59	14.85	10.29	24.88	25.14	73.00	60.00	48.12	34.86
7	11.37	L1	25.78	---	10.47	36.25	---	73.00	---	36.75	---
8	11.64	L1	---	24.68	10.47	---	35.15	---	60.00	---	24.85
9	13.61	L1	12.56	15.42	10.49	23.05	25.91	73.00	60.00	49.95	34.09





Test result

Test date	2019-11-19	Test environment	Temperature:	(15.3 ± 1) °C
			Humidity:	(31 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Test condition	Tolenioid 4 EA operating, Track current 150 A, SMPS maximum output			

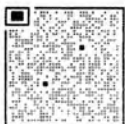
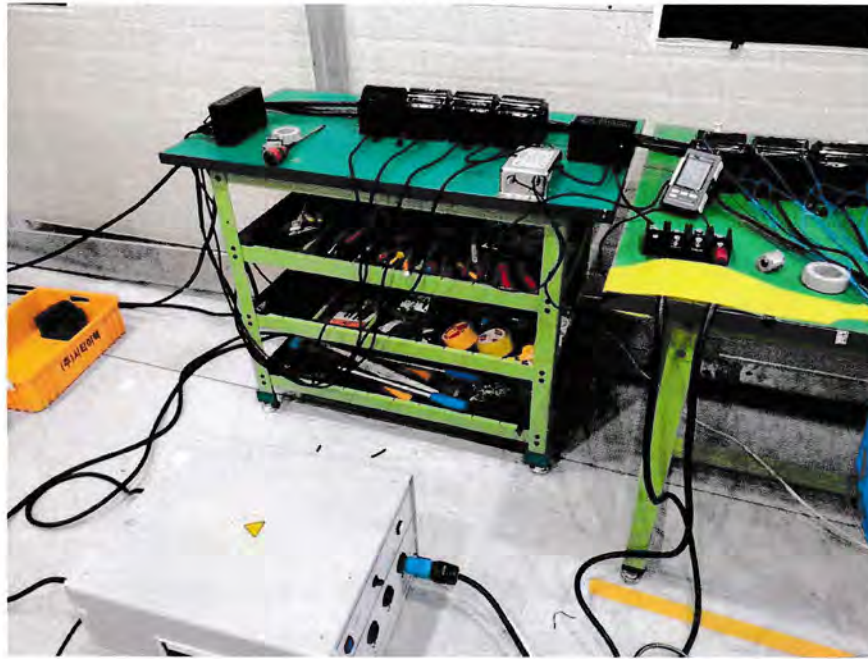


No.	Freq. [MHz]	Phase	Reading		C.Fac [dB]	Result		Limit		Margin	
			<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>
			[dB(µV)]	[dB(µV)]		[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB]	[dB]
1	0.19	N	30.28	—	10.43	40.71	—	79.00	—	38.29	—
2	0.26	N	—	28.11	10.32	—	38.43	—	66.00	—	27.57
3	0.51	N	—	19.05	10.22	—	29.27	—	60.00	—	30.73
4	0.53	N	26.42	—	10.22	36.64	—	73.00	—	36.36	—
5	0.88	N	—	15.71	10.21	—	25.92	—	60.00	—	34.08
6	1.03	N	21.95	—	10.22	32.17	—	73.00	—	40.83	—
7	4.56	N	18.44	11.51	10.32	28.76	21.83	73.00	60.00	44.24	38.17
8	11.64	N	34.56	33.47	10.48	45.04	43.95	73.00	60.00	27.96	16.05
9	24.24	N	25.43	—	10.77	36.20	—	73.00	—	36.80	—
10	24.30	N	—	21.38	10.77	—	32.15	—	60.00	—	27.85



A. Test picture

Test set-up





## 6. EMC test (Radiated emission test)

### A. Test standard

The limit values are applied through EN 61000-6-4 standard, and radiated noise from Tolenioid, Multi-adapter, and SMPS was measured following the test methods presented by the applicant, under the maximum power conditions of Tolenioid, Multi-adapter, and SMPS.

### B. Test method

- ① Install 4 EA Tolenioids on the test track. Installation distance is according to the manufacturer's specifications.
- ② Install Multi-adapter 1 EA, SMPS 1 EA according to the manufacturer's specifications.
- ③ Install Digital Power Meter and a variable resistive load on the output of the SMPS.
- ④ Install the antenna 3 m away from the Tolenioid, the Multi-adapter, and the SMPS.
- ⑤ In the Track current 150 A state, adjust the variable resistive load to maintain the maximum power of the SMPS.
- ⑥ Measure the radiated noise transmitted to the antenna through the EMI Test Receiver.

### C. Measurement equipment

Description	Manufacturer	Model	Calibration date	Next calibration date
EMI Test Receiver	R & S	ESR7	2019.04.17	2020.04.17
Biconical Antenna	A.H. Systems, inc.	SAS-544F	2018.09.05	2020.09.05
Log Periodic Antenna	A.H. Systems, inc.	SAS-510-2	2018.09.05	2020.09.05
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 (Temperature/Humidity)	2020-03-05 (Temperature/Humidity)
			2019-03-08 (Atmospheric Pressure)	2020-03-08 (Atmospheric Pressure)



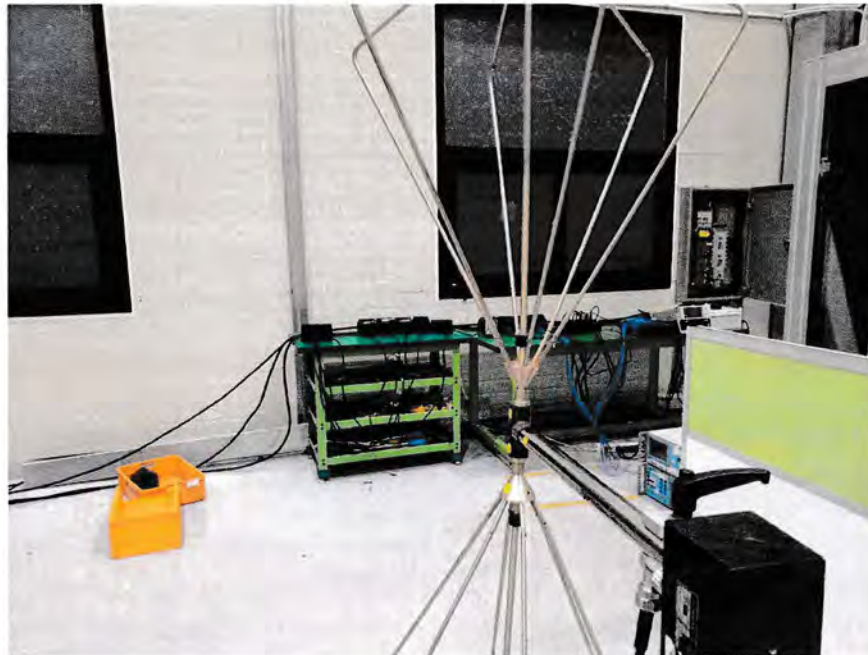


D. Test result

Test date	2019-11-19		Test environment	Temperature:	(15.3 ± 1) °C		
				Humidity:	(31 ± 3) % R.H.		
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1						
Test condition	Tolenioid 4 EA operating, Track current 150 A, SMPS maximum output						
No.	Pol.	Freq. [MHz]	Reading [dB(μV/m)]	C.Fac [dB/m]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
1	Vertical	34.44	10.9	25.6	36.5	50.0	13.5
2	Horizontal	43.92	14.0	23.1	37.1	50.0	12.9
3	Horizontal	59.68	19.4	20.0	39.4	50.0	10.6
4	Vertical	320.96	22.7	14.9	37.6	57.0	19.4
5	Vertical	478.28	22.5	18.0	40.5	57.0	16.5
6	Horizontal	501.08	20.9	18.5	39.4	57.0	17.6

E. Test picture

Test set-up







## 7. EMC test (Electrostatic discharge immunity test)

### A. Test standard

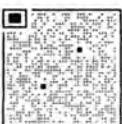
Evaluate the immunity of the equipment when static discharge is applied to the product under maximum power conditions of Tolenioid, Multi-adapter, and SMPS following the test method presented by the applicant.

### B. Test method

- ① Install 4 EA Tolenoids on the test track. Installation distance is according to the manufacturer's specifications.
- ② Install Multi-adapter 1 EA, SMPS 1 EA according to the manufacturer's specifications.
- ③ Install Digital Power Meter and a variable resistive load on the output of the SMPS.
- ④ In the track current 150 A state, adjust the variable resistive load to maintain the maximum power of the SMPS.
- ⑤ Under the maximum power condition of the SMPS, the target points exposed outside are applied static electricity through ESD Generator.
- ⑥ Non-metallic parts are subjected to static electricity of  $\pm 2$  kV,  $\pm 4$  kV, and  $\pm 8$  kV sequentially, and metal parts, apply static electricity of  $\pm 4$  kV.
- ⑦ Check the device is affected by static electricity such as Tolenoid, Multi-adapter, and SMPS.

### C. Measurement equipment

Description	Manufacturer	Model	Calibration date	Next calibration date
ESD Generator	EMCP	ESD3000	2019-04-18	2020-04-18
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 (Temperature/Humidity)	2020-03-05 (Temperature/Humidity)
			2019-03-08 (Atmospheric Pressure)	2020-03-08 (Atmospheric Pressure)

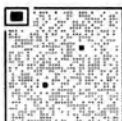


**D. Test result**

Test date Sample No.	2019-11-19	Test environment	Temperature:	(15.3 ± 1) °C
			Humidity:	(31 ± 3) % R.H.
			atmospheric pressure:	102.1 kPa
Test condition	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Test date	Toleniod 4 EA operating, Track current 150 A, SMPS maximum output			
Supply point	Discharge method	Supply voltage[kV]	Result	
Toleniod C module exterior	Air discharge	±(2, 4, 8) kV	A	
Multi-adaptor exterior	Air discharge	±(2, 4, 8) kV	A	
Multi-adaptor power input	Air discharge	±(2, 4, 8) kV	A	
Multi-adaptor power output	Air discharge	±(2, 4, 8) kV	A	
SMPS exterior	Air discharge	±(2, 4, 8) kV	A	
SMPS power input	Air discharge	±(2, 4, 8) kV	A	
SMPS power output	Air discharge	±(2, 4, 8) kV	A	
Combined bolt	Contact discharge	±4 kV	A	
- After the testing and the end of the test, it worked operation.				

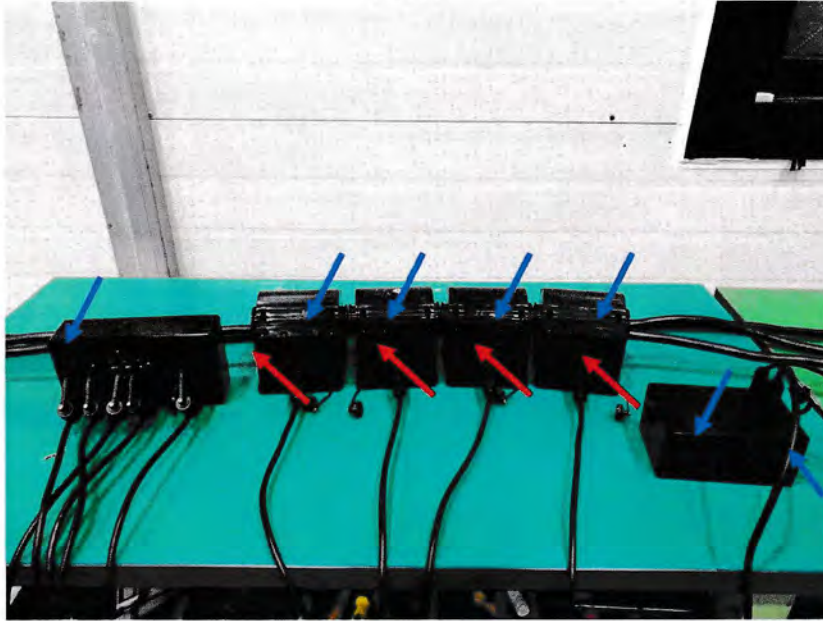
**E. Test picture**

Test set-up

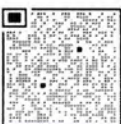
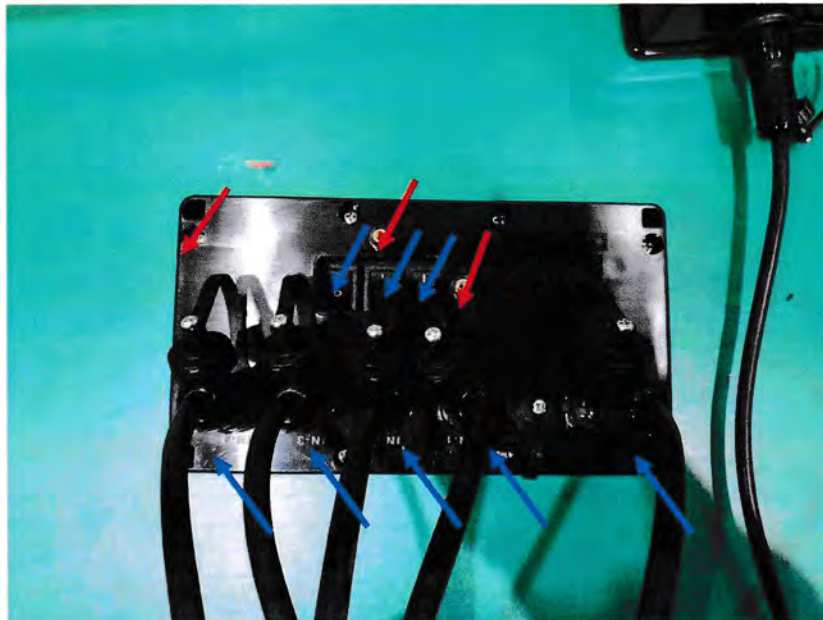


Test picture - point

Point 1



Point 2





### 8. EMC test (Radiated RF immunity test)

#### A. Test standard

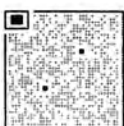
According to the test method requested by the applicant, the product shall be operated as intended in the event of radiofrequency electromagnetic disturbances under the maximum output conditions of Tolenioid, Multi-adaptor, and SMPS.

#### B. Test method

- ① Install 4 EA Tolenoids on the test track. Installation distance is according to the manufacturer's specifications.
- ② Install Multi-adaptor 1 EA, SMPS 1 EA according to the manufacturer's specifications.
- ③ Install Digital Power Meter and a variable resistive load on the output of the SMPS.
- ④ In the track current 150 A state, adjust the variable resistive load to maintain the maximum power of the SMPS.
- ⑤ Apply to 10 V (80% AM, 1 kHz modulation) noise in the 80 MHz to 1 GHz frequency band using BCI probe on power lines used in Tolenioid, Multi-adaptor, and SMPS.
- ⑥ Check if Tolenoid, Multi-adaptor, and SMPS are affected.

#### C. Measurement equipment

Description	Manufacturer	Model	Calibration date	Next calibration date
EMI Signal Generator	NARDA	PMM 3010	2019-04-17	2020-04-17
BCI Probe	FCC	F-140	2019-04-17	2020-04-17
Power Amplifier	PRANA	DT 70	N / A	N / A
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 (Temperature/Humidity)	2020-03-05 (Temperature/Humidity)
			2019-03-08 (Atmospheric Pressure)	2020-03-08 (Atmospheric Pressure)



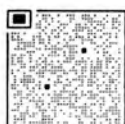
D. Test result

Test date	2019-11-19	Test environment	Temperature:	(15.3 ± 1) °C
			Humidity:	(31 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Test condition	Toleniod 4 EA operating, Track current 150 A, SMPS maximum output			
Frequency range	80 MHz ~ 1 000 MHz	Modulation	80% AM, 1 kHz	
Frequency step	1 %	Stay time	3 s	
Supply point	Supply level	Supply method	Modulation way	Result
Main power	10 V	BCI	80% AM, 1 kHz	A
DC out	10 V	BCI	80% AM, 1 kHz	A

- After the testing and the end of the test, it worked operation.

E. Test picture

Test set-up





### 9. EMC test (Electrical fast transient/burst immunity test)

#### A. Test standard

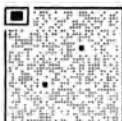
According to the test method requested by the applicant, the electrical transient phenomenon occurs at one of the input/output ports under the maximum output conditions of Tolenioid, Multi-adaptor, and SMPS to evaluate whether the product operates as intended.

#### B. Test method

- ① Install 4 EA Tolenoids on the test track. Installation distance is according to the manufacturer's specifications.
- ② Install Multi-adapter 1 EA, SMPS 1 EA according to the manufacturer's specifications.
- ③ Install Digital Power Meter and a variable resistive load on the output of the SMPS.
- ④ In the Track current 150 A state, adjust the variable resistive load to maintain the maximum power of the SMPS.
- ⑤ Install EMS Test Simulator on the power line between Tolenoid and SMPS.
- ⑥ Check if Tolenoid, Multi-adaptor, and SMPS are affected by generate EFT/Burst

#### C. Measurement equipment

Description	Manufacturer	Model	Calibration date	Next calibration date
EMS Test system	EMCP	IMU4000 F-S	2019-05-15	2020-05-15
Three phase CDN	EMCP	CDN3000A -06-32	2019-05-15	2020-05-15
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 (Temperature/Humidity)	2020-03-05 (Temperature/Humidity)
			2019-03-08 (Atmospheric Pressure)	2020-03-08 (Atmospheric Pressure)



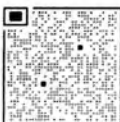
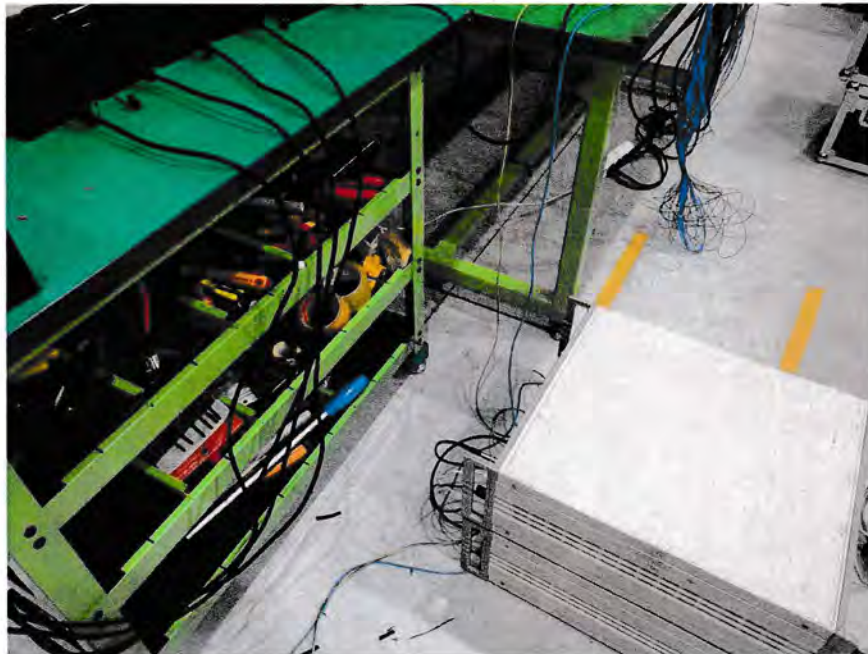
**D. Test result**

Test date	2019-11-19	Test environment	Temperature:	(15.3 ± 1) °C
			Humidity:	(31 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Test condition	Tolenioid 4 EA operating, Track current 150 A, SMPS maximum output			
Repetition rate	5 kHz, Tr/Th = 5 ns, 50 ns	Modulation time	120 s (Each positive/negative polarity 60 s)	
Supply point	Supply level	Supply method	Modulation way	
L1 + L2	±2 kV	CDN	A	

- After the testing and the end of the test, it worked operation.

**E. Test picture**

Test set-up





### 10. EMC test (Surge immunity test)

#### A. Test standard

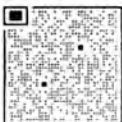
According to the test method requested by the applicant, the ability of the EUT to operate as intended when there is a surge at the mains input port under the maximum output conditions of Tolenoid, Multi-adaptor, and SMPS.

#### B. Test method

- ① Install 4 EA Tolenoids on the test track. Installation distance is according to the manufacturer's specifications.
- ② Install Multi-adaptor 1 EA, SMPS 1 EA according to the manufacturer's specifications.
- ③ Install Digital Power Meter and a variable resistive load on the output of the SMPS.
- ④ In the Track current 150 A state, adjust the variable resistive load to maintain the maximum power of the SMPS.
- ⑤ Install EMS Test Simulator on the power line between Tolenoid and SMPS.
- ⑥ Check if Tolenoid, Multi-adaptor, and SMPS are affected by generating surge.

#### C. Measurement equipment

Description	Manufacturer	Model	Calibration date	Next calibration date
EMS Test system	EMCP	IMU4000 F-S	2019-05-15	2020-05-15
Three phase CDN	EMCP	CDN3000A -06-32	2019-05-15	2020-05-15
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 (Temperature/Humidity)	2020-03-05 (Temperature/Humidity)
			2019-03-08 (Atmospheric Pressure)	2020-03-08 (Atmospheric Pressure)



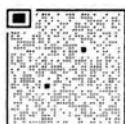


D. Test result

Test date	2019-11-19	Test environment	Temperature:	(15.3 ± 1) °C
			Humidity:	(31 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Test condition	Tolenioid 4 EA operating, Track current 150 A, SMPS maximum output			
Supply voltage	Line to Line: ±0.5 kV, ±1 kV			
Supply waveform	Tr/Th = 1.2 / 50 μs	Phase	0°, 90°, 180°, 270°	
Supply point	Supply level	Supply method	Result	
L1 - L2	±0.5 kV	CDN	A	
L1 - L2	±1 kV	CDN	A	
- After the testing and the end of the test, it worked operation.				

E. Test picture

Test set-up





## 11. EMC test (Conducted RF immunity test)

### A. Test standard

According to the test method requested by the applicant, the product shall be operated and evaluated as intended if there is high-frequency electromagnetic interference at the input/output port under the maximum output conditions of Toleniod, Multi-adaptor, and SMPS.

### B. Test method

- ① Install 4 EA Toleniods on the test track. Installation distance is according to the manufacturer's specifications.
- ② Install Multi-adaptor 1 EA, SMPS 1 EA according to the manufacturer's specifications.
- ③ Install Digital Power Meter and a variable resistive load on the output of the SMPS.
- ④ In the track current 150 A state, adjust the variable resistive load to maintain the maximum power of the SMPS.
- ⑤ Apply to 10 V (80% AM, 1 kHz modulation) noise in the frequency range of 150 kHz to 80 MHz using the BCI Probe to power lines and input/output lines used in Toleniod, Multi-adaptor, and SMPS.
- ⑥ Check if Toleniod, Multi-adaptor, and SMPS are affected.

### C. Measurement equipment

Description	Manufacturer	Model	Calibration date	Next calibration date
EMI Signal Generator	EMCP	PMM 3010	2019-04-17	2020-04-17
BCI Probe	FCC	F-140	2019-04-17	2020-04-17
Power Amplifier	PRANA	DT 70	N / A	N / A
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 (Temperature/Humidity)	2020-03-05 (Temperature/Humidity)
			2019-03-08 (Atmospheric Pressure)	2020-03-08 (Atmospheric Pressure)

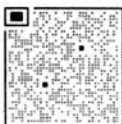
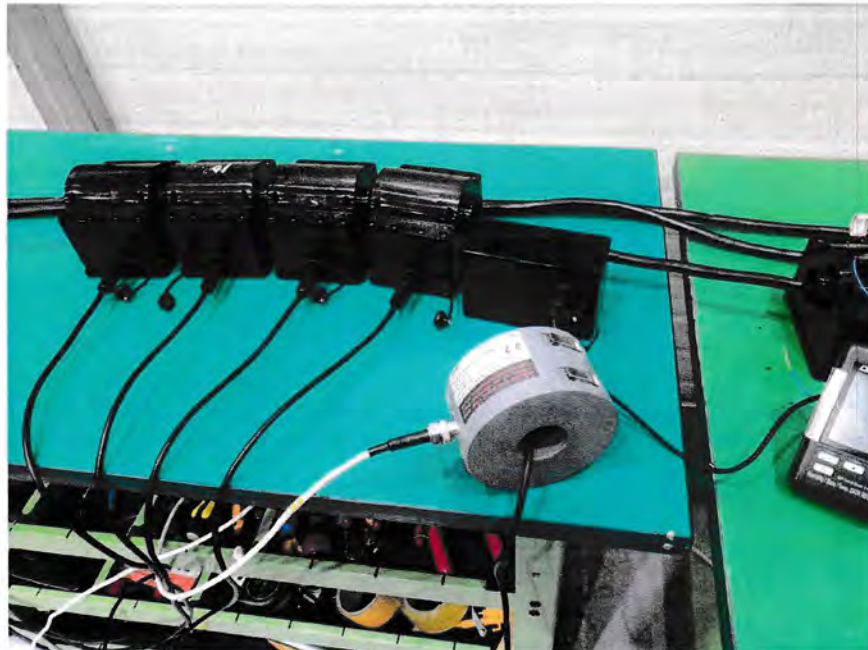


**D. Test result**

Test date	2019-11-19	Test environment	Temperature:	(15.3 ± 1) °C
			Humidity:	(31 ± 3) % R.H.
Sample No.	1-1/4, 1-2/4, 1-3/4, 1-4/4, 2-1/1, 3-1/1			
Test condition	Tolenioid 4 EA operating, Track current 150 A, SMPS maximum output			
frequency range	0.15 MHz ~ 80 MHz	modulated	80 % AM, 1 kHz	
Frequency range	1 %	Stay time	3 s	
Supply point	Supply level	Supply method	modulated method	Result
Main Power Line	10 V	BCI	80 % AM, 1 kHz	A
DC Power	10 V	BCI	80 % AM, 1 kHz	A
- After the testing and the end of the test, it worked operation.				

**E. Test picture**

Test set-up





## 12. Dielectric strength test

### A. Test standard

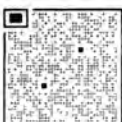
Confirm and record Tolenioid's dielectric strength according to the test method requested by the applicant.

### B. Test method

- ① Install a metal test rod with an outer diameter of 30 mm and a length of 500 mm according to Tolenioid's line fastening method.
- ② Connect the (+) terminal of the high voltage withstand voltage tester to the metal test rod.
- ③ Connect the (-) terminal of the high voltage withstand voltage tester to the Tolenioid output circuit.
- ④ Apply 5 kV, 10 kV, 15 kV, 20 kV, 25 kV, and 30 kV by operating the high voltage withstand voltage tester.
- ⑤ Check and record either breakdown of insulation of the Tolenioid occurs.

### C. Measurement equipment

Description	Manufacturer	Model	Calibration date	Next calibration date
AC DIELECTRIC TEST SET	PHENIX	BK130	2019-08-14	2020-08-14
STOP WATCH	CASIO	HS-3	2019-03-26	2021-03-26
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 (Temperature/Humidity)	2020-03-05 (Temperature/Humidity)
			2019-03-08 (Atmospheric Pressure)	2020-03-08 (Atmospheric Pressure)





**D. Test result**

Test date	2019-11-15		Test environment	Temperature:	(23.8 ± 1) °C		
				Humidity:	(32 ± 2) % R.H.		
Sample No.	4-1/5, 4-2/5, 4-3/5, 4-4/5, 4-5/5						
Test condition	Not operating condition						
Sample No.	Dielectric strength test voltage						
	5 kV	10 kV	15 kV	20 kV	25 kV	30 kV	
4-1/5	No breakdown	No breakdown	No breakdown	No breakdown	No breakdown	No breakdown	
4-2/5	No breakdown	No breakdown	No breakdown	No breakdown	No breakdown	No breakdown	
4-3/5	No breakdown	No breakdown	No breakdown	No breakdown	No breakdown	No breakdown	
4-4/5	No breakdown	No breakdown	No breakdown	No breakdown	No breakdown	No breakdown	
4-5/5	No breakdown	No breakdown	No breakdown	No breakdown	No breakdown	No breakdown	



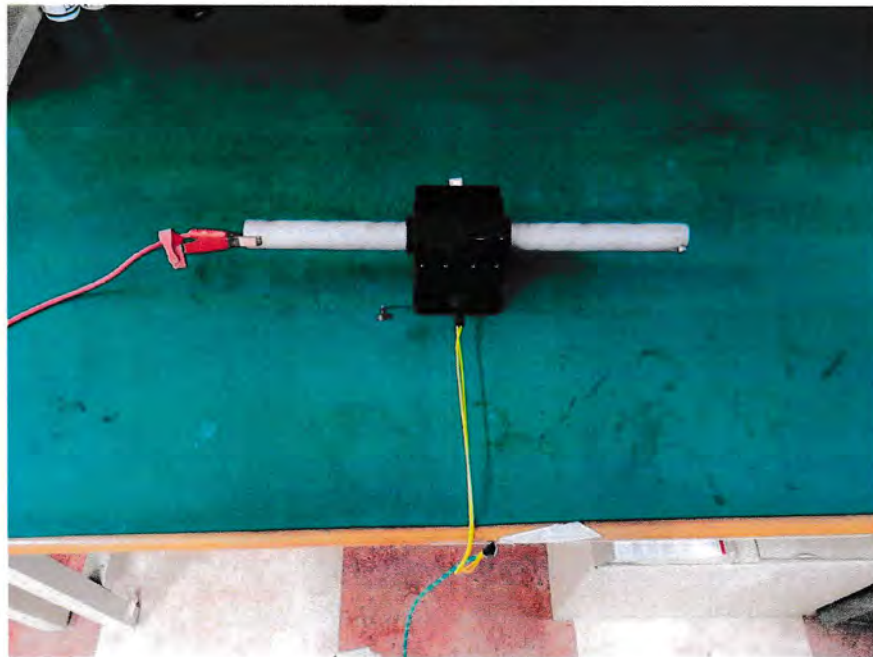


E. Test picture

Test set-up



Tolenoid and test metal rod

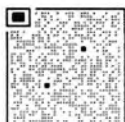
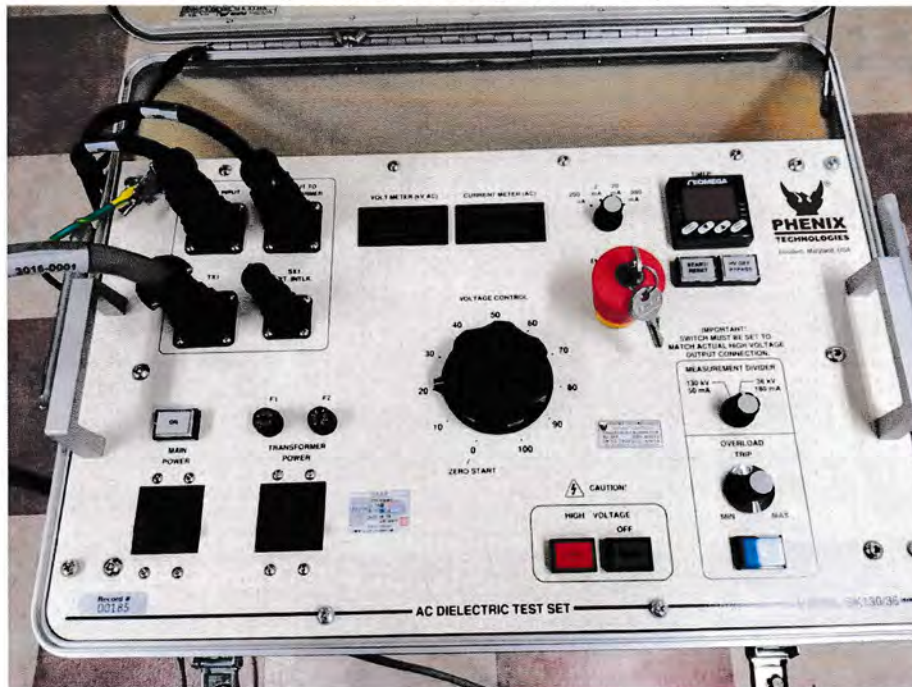


Test picture

High voltage withstand voltage tester – Charging part



High voltage withstand voltage tester – Control part



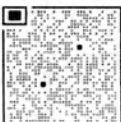


Test picture

Test voltage – 5 kV



Test voltage – 10 kV



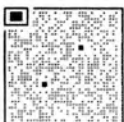


Test picture

Test voltage – 15 kV



Test voltage – 20 kV



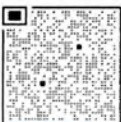


Test picture

Test voltage – 25 kV



Test voltage – 30 kV





### 13. Cold thermal impact test

#### A. Test standard

According to the test method requested by the applicant, each sample of Tolenioid and SMPS shall be checked for deformation during impact test after pretreatment.

#### B. Test method

- ① Tolenioid, SMPS each 1 EA is pretreated for at least 5 hours in a temperature and humidity chamber at -40 ° C.
- ② Impact the pretreated sample by dropping the 500 g steel ball from 1 m high.
- ③ Check the conditions of external crushing, cracking, or damage.
- ④ If visible damage occurs, repeat test at the temperature -30 °C, -20 °C, -10 °C, and 0 °C to check the temperature that does not damage on sample.
- ⑤ Three additional samples are repeated at undamaged temperatures to check for damage.

#### C. Measurement equipment

Description	Manufacturer	Model	Calibration date	Next calibration date
High Speed Chamber	ESPEC	ARSF-0400-15	2019-03-25	2020-03-25
STOP WATCH	CASIO	HS-3	2019-03-26	2020-03-26
Impact Ball	ELEX POLYTECH	IT1320-50	2017-07-14	2020-07-14
STEEL BASE	SEJONG FA	14t-5550 X 5500	2019-03-12	2020-03-12
Tape measure	KOMELON	KMC-32D	2019-03-27	2020-03-27
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 (Temperature/Humidity)	2020-03-05 (Temperature/Humidity)
			2019-03-08 (Atmospheric Pressure)	2020-03-08 (Atmospheric Pressure)

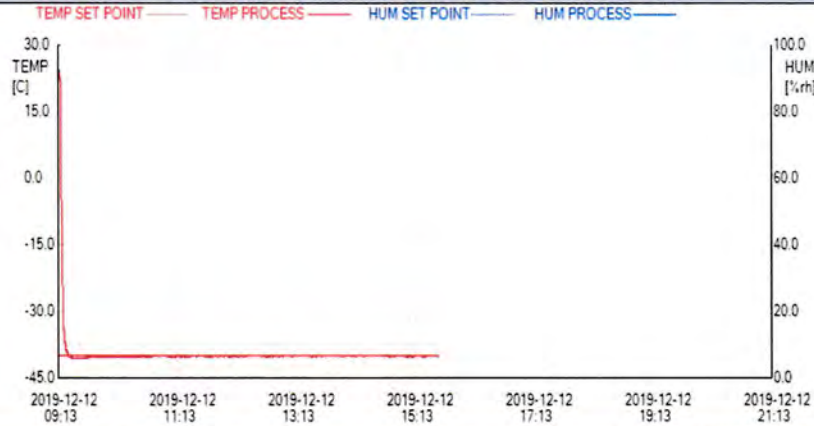




D. Test result

Test date	2019-12-12	Test environment	Temperature:	(19.4 ± 2) °C
			Humidity:	(33 ± 3) %R.H.
Sample No.	5-1/4, 5-2/4, 5-3/4, 5-4/4			

Tolenioid (Pretreatment temperature: -40 °C)



Sample No. 5-1/4



Sample No. 5-2/4



Sample No. 5-3/4



Sample No. 5-4/4

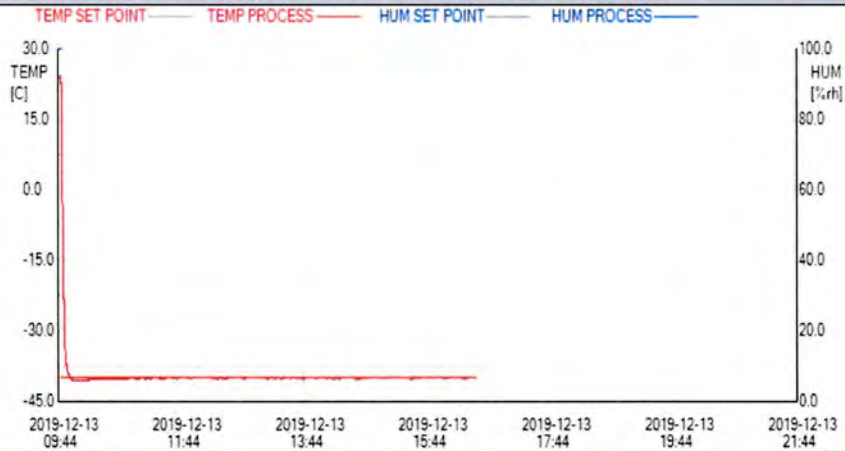




Test result

Test date	2019-12-13	Test environment	Temperature:	(20.3 ± 2) °C
			Humidity:	(31 ± 3) %R.H.
Sample No.	6-1/4, 6-2/4, 6-3/4, 6-4/4			

SMPS (Pretreatment temperature: -40 °C)



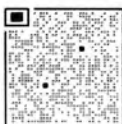
Sample No. 6-1/4

Sample No. 6-2/4



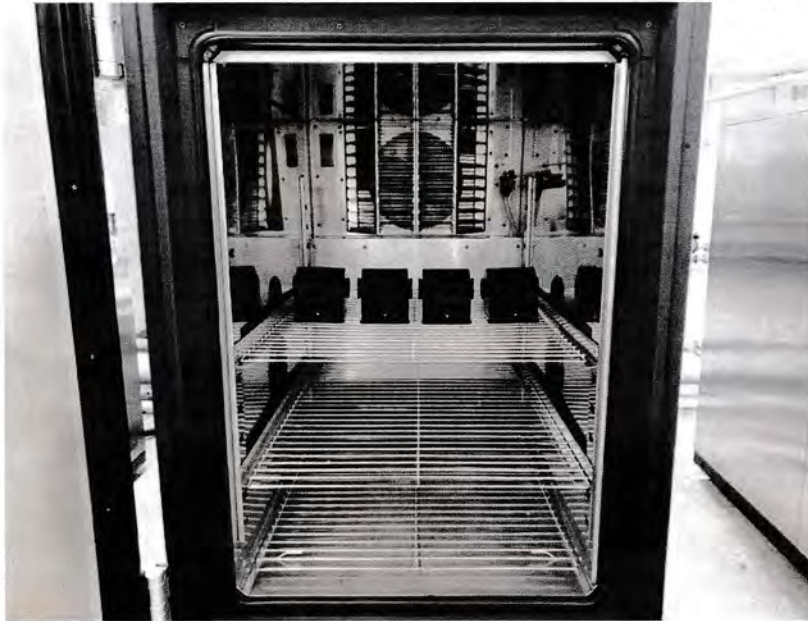
Sample No. 6-3/4

Sample No. 6-4/4

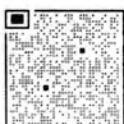


E. Test picture

Temperature and humidity chamber (Pretreatment test device)



Impact ball





### 14. Hot thermal impact test

#### A. Test standard

According to the test method requested by applicant, each sample of Tolenoid and SMPS shall be checked for deformation during impact test after pretreatment.

#### B. Test method

- ① Tolenoid, SMPS each 1 EA is pretreated for at least 5 hours in a temperature and humidity chamber at -40 ° C.
- ② Impact the pretreated sample by dropping the 500 g steel ball from 1 m high.
- ③ Check the conditions of external crushing, cracking, or damage.
- ④ If visible damage occurs, repeat test at the temperature -115 °C, 105 °C, 95 °C, and 85 °C to check the temperature that does not damage on sample.
- ⑤ Three additional samples are repeated at undamaged temperatures to check for damage.

#### C. Measurement equipment

Description	Manufacturer	Model	Calibration date	Next calibration date
High Speed Chamber	ESPEC	ARSF-0400-15	2019-03-25	2020-03-25
STOP WATCH	CASIO	HS-3	2019-03-26	2020-03-26
Impact Ball	ELEX POLYTECH	IT1320-50	2017-07-14	2020-07-14
STEEL BASE	SEJONG FA	14t-5550 X 5500	2019-03-12	2020-03-12
Tape measure	KOMELON	KMC-32D	2019-03-27	2020-03-27
HUMIDITY/BARO/ TEMP.DATA RECORDER	LTR Lutron	MHB-382SD	2019-03-05 (Temperature/Humidity)	2020-03-05 (Temperature/Humidity)
			2019-03-08 (Atmospheric Pressure)	2020-03-08 (Atmospheric Pressure)

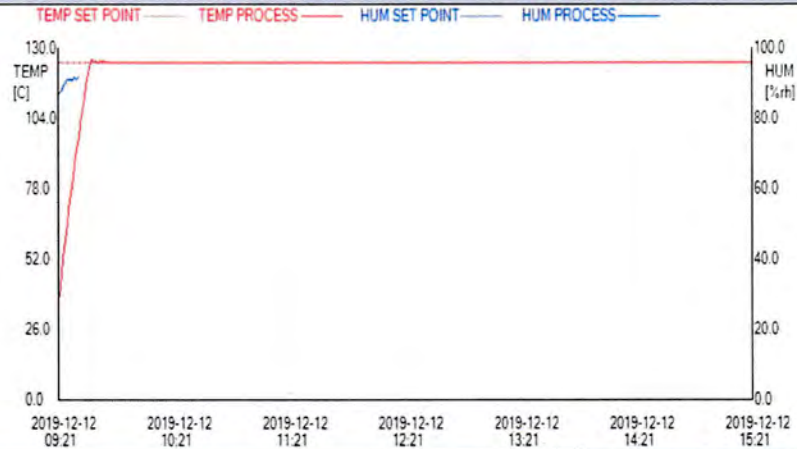




D. Test result

Test date	2019-12-12	Test environment	Temperature:	(19.4 ± 2) °C
			Humidity:	(33 ± 3) %R.H.
Sample No.	7-1/4, 7-2/4, 7-3/4, 7-4/4			

Tolenoid C module(Pretreatment temperature: 125 °C)



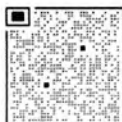
Sample No. 7-1/4

Sample No. 7-2/4



Sample No. 7-3/4

Sample No. 7-4/4



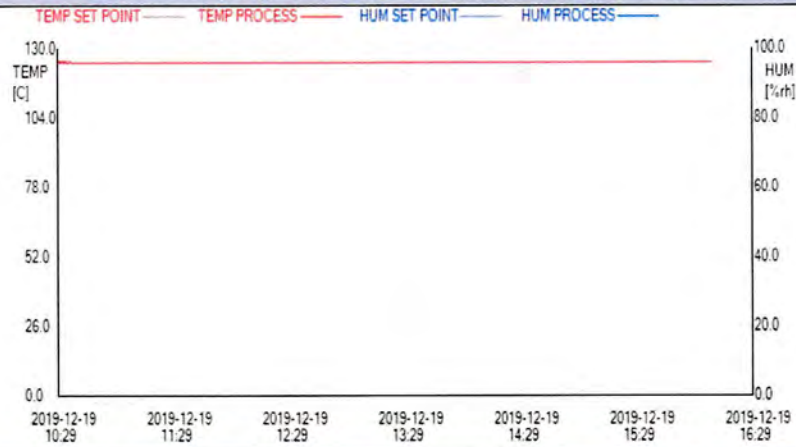




Test result

Test date	2019-12-19	Test environment	Temperature:	(21.3 ± 2) °C
			Humidity:	(33 ± 2) %R.H.
Sample No.	8-1/4, 8-2/4, 8-3/4, 8-4/4			

Multi-adaptor(Pretreatment temperature: 125 °C)



Sample No. 8-1/4



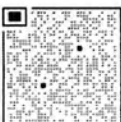
Sample No. 8-2/4



Sample No. 8-3/4



Sample No. 8-4/4

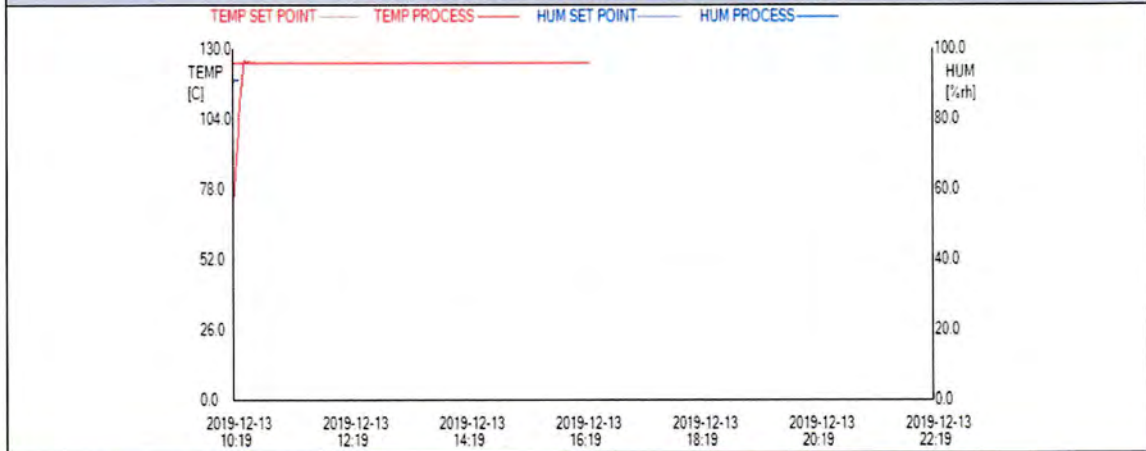




Test result

Test date	2019-12-13	Test environment	Temperature:	(20.1 ± 2) °C
			Humidity:	(31 ± 3) %R.H.
Sample No.	9-1/4, 9-2/4, 9-3/4, 9-4/4			

SMPS(Pretreatment temperature: 125 °C)



Sample No. 9-1/4



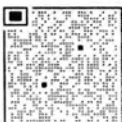
Sample No. 9-2/4



Sample No. 9-3/4



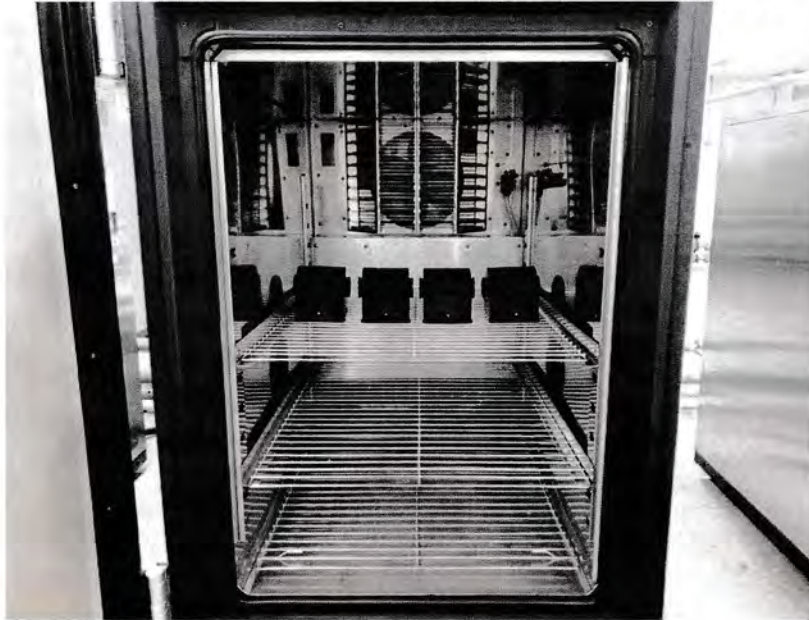
Sample No. 9-4/4





E. Test picture

Temperature and humidity chamber (Pretreatment test device)



Impact ball



- END -

