

PRODUCT SPECIFICATIONS

Capacitor Temperature Characteristic Evaluation System	No.	4062501004103	
	PREP	2019.01.18	Yoshida
	REV	2019.06.25	Yoshida

1. Product name Capacitor Temperature Characteristic Evaluation System

This system evaluates “impedance: Z,” “dissipation factor: D,” “electrostatic capacity: C,” “Resistance: R” and “inductance: L” of a capacitor or various materials under a given temperature environment.

2. Related document

Model	Drawing No.
AMQ-**-C	4062502002300

3. Model

AMQ— —C



- Number of channels
- 008: 8 channels
 - 016: 16 channels
 - 024: 24 channels
 - 032: 32 channels
 - 040: 40 channels
 - 048: 48 channels
 - 056: 56 channels
 - 064: 64 channels

4. Number of channels

Selected				
	AMQ-008-C (8 channels)	AMQ-016-C (16 channels)	AMQ-024-C (24 channels)	AMQ-032-C (32 channels)

Selected				
	AMQ-040-C (40 channels)	AMQ-048-C (48 channels)	AMQ-056-C (56 channels)	AMQ-064-C (64 channels)

.....
Remarks

5. Options

Selected	
	None

Selected	
	English specification

Selected		
	Power supply voltage 120 V AC \pm 10% Single-phase 12.5A	Power supply voltage 220 V AC \pm 10% Single-phase 6.8A

The standard specification is 100 V AC, single-phase 15A.

A single-phase, single-winding type of step-down transformer is used for the above power voltage specifications.

Selected	
	Insulation resistance measurement feature

Selected	
	Internal chamber temperature monitor feature

6. Performance

6.1 Measurement features

6.1.1 Number of connectable measurement parameter by relay

- ① Impedance: Z
- ② Dissipation factor: D
- ③ Static capacity: Cs, Cp : Selectable from Cs or Cp mode
Cs : Series equivalent circuit mode
Cp : Parallel equivalent circuit mode
- ④ Resistance: Rs, Rp
- ⑤ Inductance: Ls, Lp

6.1.2 Measuring terminal : 4-terminal configuration

6.1.3 Measuring cable length : 4 m (Measurement system from LCR meter to jig (approximate value with scanner board, etc. included))

6.1.4 Integral time : Selectable from SHORT, MEDIUM, and LONG

6.1.5 Averaging : 1 to 256 times

6.1.6 Range : Selectable from AUTO, 10 Ω , 100 Ω , 300 Ω , 1 k Ω , 3 k Ω , 10 k Ω , 30 k Ω , and 100 k Ω

- 6.1.7 Measurement interval : 1 to 1,500 min
 * Measurement interval during constant value operation.
 * Measurement time of approx. 1 min is required for each module, though it may vary depending on the measurement conditions. Therefore, the larger the number of measurement channels, the longer the measurement interval should be set.
- 6.1.8 Measurement time : 1 to 1,000 h
- 6.1.9 Frequency characteristic condition : Set the frequency characteristic testing.
 Frequency characteristic testing can be set under various test operation modes.
 Frequency can be set up to 50 points. Data can be measured and recorded at each frequency.
- 6.1.10 Schedule setting condition : Schedule setting can be enabled only during a constant-value operation.
 Set the measurement recording interval.
 When a block interval is specified, the test time can be divided into three blocks, and recording interval can be set for each block.
- 6.2 Measurement signal
- 6.2.1 Measuring frequency : User-set between 20 Hz and 1 MHz, with 8,610 points (unequal interval).
- 6.2.2. ALC feature : ALC (Auto-level control feature) can be turned ON or OFF.
 * The available range for ALC feature depends on your LCR meter.
- 6.2.3 Measurement signal level : Signal voltage level and signal current level are selectable.
- ① Power voltage : 5 mV to 20 Vrms (Normal mode)
 10 mV to 10 Vrms (Constant mode)
- ② Power current : 50 μ A to 200 mArms (Normal mode)
 100 μ A to 100 mArms (Constant mode)
- * Normal mode : ALC feature is turned OFF
 * Constant mode : ALC feature is turned ON
- 6.3 Display range
- | Measurement parameter | Display range |
|-------------------------|--|
| Impedance: Z | 0.01 m Ω ~99.9 M Ω |
| Dissipation factor: D | -9.9999~+9.9999 |
| Static capacity: Cs, Cp | 0.01 fF to 9.99 F |
| Resistance: Rs, Rp | 0.01 m Ω to 99.9 M Ω (reference value) |
| Inductance: Ls, Lp | 0.01 m Ω to 99.9 kH (reference value) |
- * Resistance: Rs, Rp and Inductance: Ls, Lp are reference values.
 The error may be larger depending on the measurement conditions or specimen types.
- 6.4 Offset feature : Enable or disable OPEN/SHORT offset feature.
 Performed with a cable length of 4 m.
- 6.5 DC bias : \pm 0 to \pm 40 V

6.6 Test setting

6.6.1 Measuring frequency operation mode

- ① Constant-value operation mode : In this mode, the temperature is controlled at a fixed value. Data is measured and recorded in accordance with the measurement interval and measurement time specified on the measurement condition setting screen.
- ② Temperature characteristic mode : In this mode, temperature characteristic testing is conducted. Two modes are available: In one mode, any 40 points can be set for data measurement and recording. In the other mode, data measurement and recording are conducted while changing the starting temperature and end temperature by a certain step.
- ③ Frequency characteristic mode : In this mode, frequency characteristic testing is conducted. (Refer to 5.1.9.) The frequency characteristic mode is used together with the above 4 testing.
* For the constant-value operation mode, you can select a mode without a linkage to environmental test chamber. In other operation modes, operation is always linked to environmental test chamber.

- 6.6.2 Temperature stability check mode : Specify the duration of stability check mode that should elapse after the temperature inside the environmental test chamber reaches a certain stability range of the set value. When the temperature exceeds the stability range, the time counter of the stability check is reset, and count-up starts again.
- Temperature stable width : ± 0.0 to 10°C
 - Temperature stability waiting time : 0 to 600 min

- 6.6.3 Ambient temperature setting : Enter the set value for controlling the environmental test chamber after the completion of a test.
- * A value outside the capacity of the environmental test chamber cannot be entered.
 - * The temperature can be set in the range between the lower limit and upper limit of the environmental test chamber you use.

- 6.6.4 Test status monitoring : Monitors the temperature, time elapsed, and operation status. Measured value of each channel, change rate from the initial value, and testing status are monitored.
- * Monitored temperature of environmental test chamber is displayed.

- 6.6.5 Alarm management : The system controller displays a message on the screen and then interrupts measurement in the event of an error in the system. Measured data immediately before the error is stored.

6.7 Data processing feature

6.7.1 Display and saving of measured data

Data is displayed and saved in a unit of 8 channels (1 module).
The following types of data can be saved.

- ① Test conditions
- ② Measured data

6.7.2 Conversion of measured data

Measured data can be converted into text format.

6.7.3 Graph plotting

Data is displayed in a unit of 8 channels (1 module).

Graph plotting feature can perform the following.

- ① Graph a time-dependent change of measured data (in constant-value operation mode)
- ② Graph a temperature characteristic of measured data against temperature (in temperature characteristic mode)
- ③ Graph a frequency characteristic of measured data against frequency (when frequency characteristic mode is selected)
- ④ Display and print temperature coefficient for static capacity between two given points (in temperature characteristic mode)
- ⑤ Display measured data in the vicinity of a point that is selected by a click on the graph using the cursor function
- ⑥ Graph the change rate of measured data, and change the initial value (reference value) for change rate calculation

6.8 Measurement errors

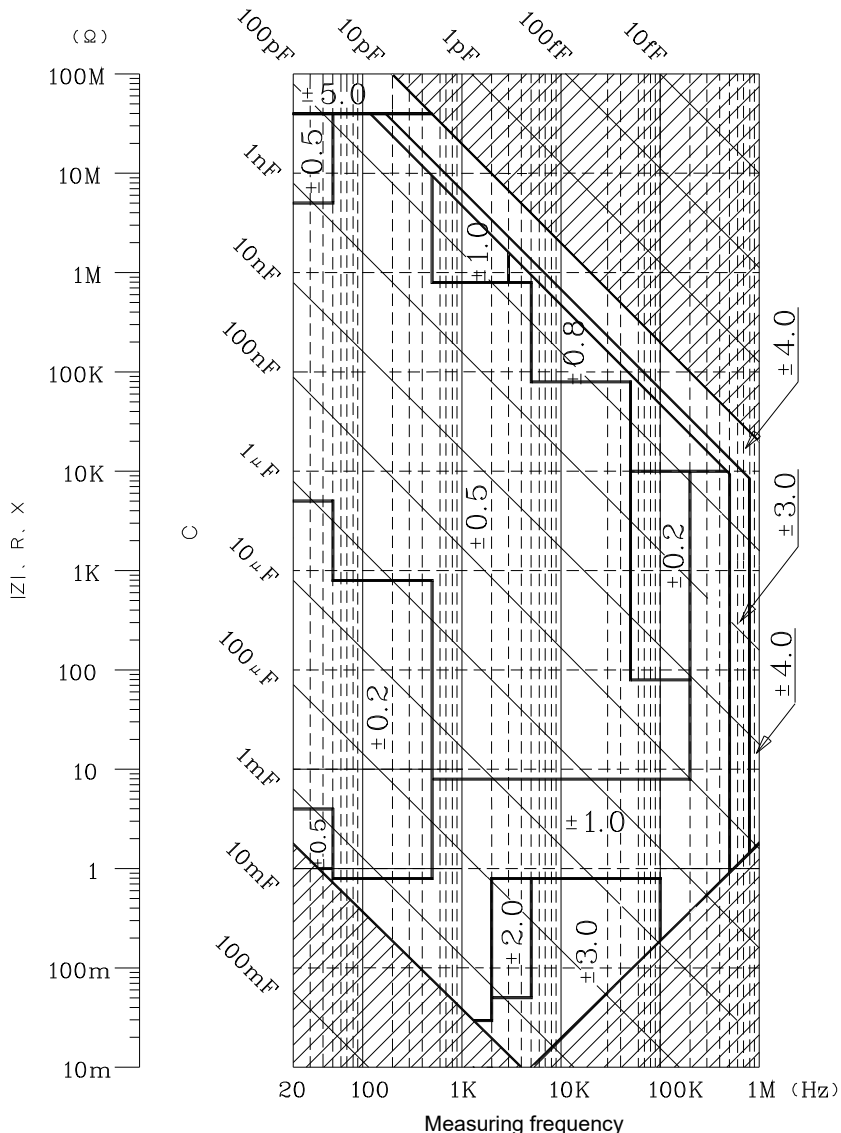
The table below shows errors between the true value and the value obtained by the capacitor temperature characteristic evaluation system. The true value refers to a value measured by DUT prepared by ESPEC by using the LCR meter's standard test fixture (0m).

- * Those errors are guaranteed for impedance, static capacity and phase angle. The scope of the guarantee for the "Table of display errors" covers only up to the end of the 1.5 m cable drawn out from the relay box of the system. (The gig itself is not included.)

The table below shows errors between the true value and the value obtained by the capacitor temperature characteristic evaluation system. The true value refers to a value measured by DUT prepared by ESPEC by using the LCR meter's standard test fixture (0 m). The values in the table are defined when all of the measurement conditions below are satisfied.

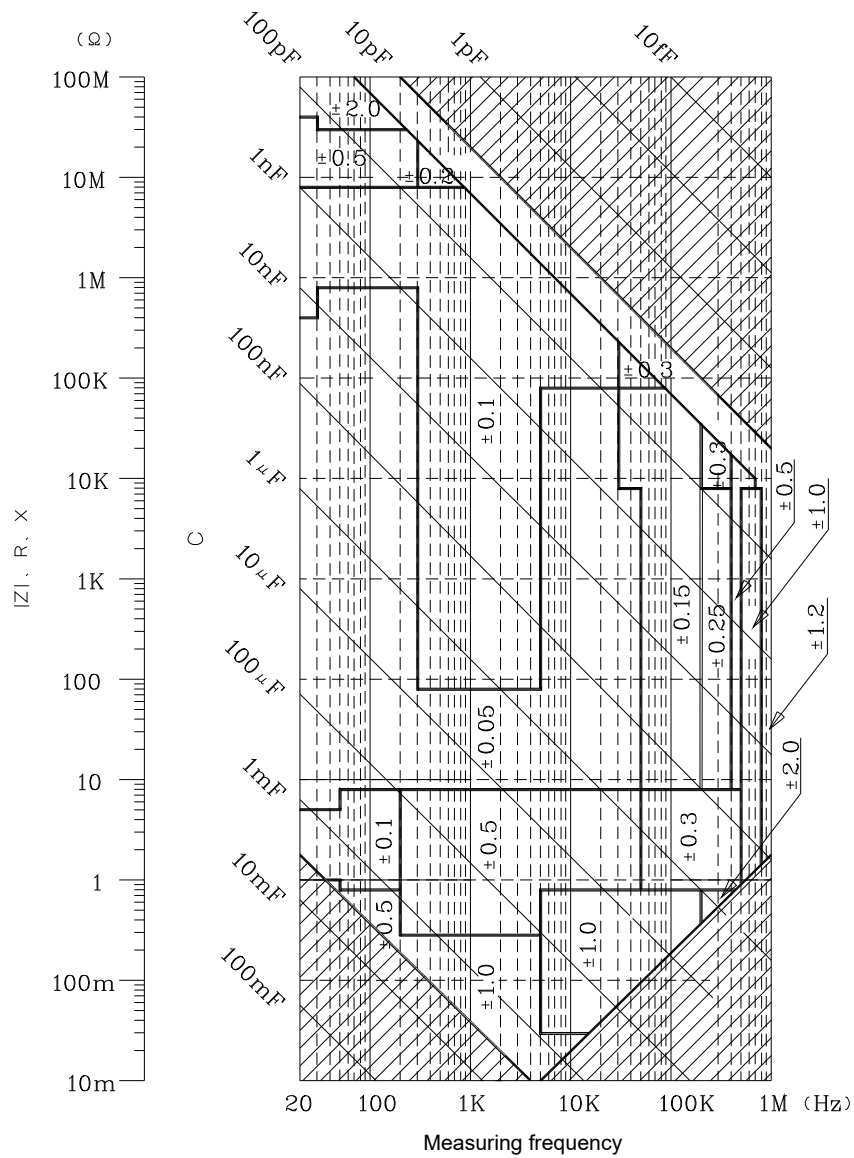
【Measurement conditions】

Ambient temperature: 23°C ± 5°C Signal level: 1 Vrms Integral mode: LONG
 ALC: ON DC bias : 0 V
 Range: AUTO Correction: OPEN/SHORT Corrected



【Table of display errors (Static capacity/Impedance)】

* Display error of static capacity and impedance (in %)
 * When measured value falls on a borderline, the smaller value is used. The shaded area is outside the guaranteed scope.



【Table of display errors (phase angle)】

- * Display error of phase angle (in deg.)
- * When measured value falls on a borderline, the smaller value is used. The shaded area is outside the guaranteed scope.
- * Measurement conditions are the same as those for static capacity/impedance.

7. System composition

7.1 Measurement unit

① Scanner unit	ESPEC	1
Scanner unit consists of the following parts.		
• Buffer board for control signal wire	ESPEC	1
• Scanner board	ESPEC	1 set
• System power supply	COSEL	1
• Scanner unit cable	ESPEC	1 set
② LCR meter	KEYSIGHT TECHNOLOGIES E4980A (With OPT001)	1

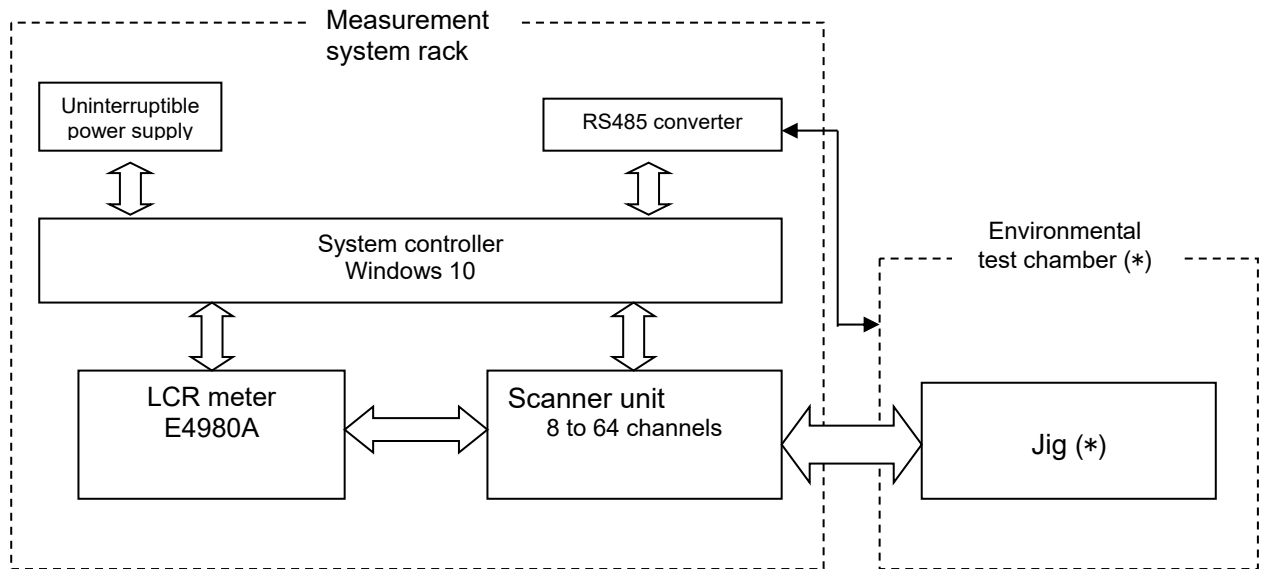
7.2 System controller

① Measurement rack	ESPEC	1
② System controller	DELL OptiPlex Series	1
③ Monitor	DELL 17" LCD	1
④ Auto-measurement support software	ESPEC AMQ_005 (Windows OS)	1 set
⑤ GP-IB board (Built into system controller)	INTERFACE	1 set
⑥ Digital output board (Built into system controller)	INTERFACE	1 set
⑦ Digital output board cable	MISUMI	1
⑧ Uninterruptible power supply unit	OMRON	1
⑨ OS (Preinstalled)	MICROSOFT Windows OS	1 set
⑩ RS232C/RS485 converter	MOXA	1

* The system controller is subject to change without notice.
The latest version available at the time of order or an equivalent controller is provided.

7.3 System block diagram

The system is configured as shown below.



【System block diagram】

* Jig's main unit and environmental test chamber are outside the scope of these specifications.
(Note that the cable provided with the jig is within these specifications.)

8. Safety

8.1 Power outage support

8.1.1. Uninterruptible power supply unit

The uninterruptible power supply unit prevents sampled data from being lost in the event of a power outage by supplying backup power to the system controller. However, this uninterruptible power supply unit does not back up the entire system. Also, the system controller does not shut the system down automatically if a power outage occurs.

8.1.2 Power restoration

This system does not restore operations automatically after recovery from a power outage.

8.2 Power supply leakage breaker

- | | |
|-----------------------|----------------|
| ① Rated voltage | : 100 -230V AC |
| ② Sensitivity current | : 30 mA |
| ③ Trip time | : Max. 0.1 s |
| ④ Rated current | : 15 A |

9. Accessories

- | | |
|---|-------|
| ① User's Manuals | 1 |
| ② System controller accessories | 1 set |
| ③ Monitor accessories | 1 set |
| ④ Uninterruptible power supply unit accessories | 1 set |

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- ⑤ LCR meter accessories 1 set
- ⑥ GP-IB adaptor accessories 1 set
- ⑦ RS-485 cable (with RS232C/RS485 converter) 1 set
- ⑧ AMQ setup CD 1 set

10. General specifications

10.1 Power supply

Voltage	100V	120V	220V
Frequency	50/60Hz	50/60Hz	50/60Hz
MAX. load current	15A	12.5A	6.8A

10.2 Guaranteed working environment

Temperature range : 5 to 35°C (No condensation)

10.3 Outer dimensions

: Approx. W 530 x H 1,832 x D 800 mm
(Excluding projections)

10.4 Weight

: The weight of the standard specification system is as follows.

Model	AMQ-008-C	AMQ-016-C	AMQ-024-C	AMQ-032-C
Weight	228 kg	230 kg	232 kg	234 kg

Model	AMQ-040-C	AMQ-048-C	AMQ-056-C	AMQ-064-C
Weight	236 kg	238 kg	240 kg	242 kg

10.5 Configurations

: Refer to dimension drawing (4062502002300).

11. Installation

11.1 Installation conditions

: Install the system in the following environment.

- On a flat, level floor that is sturdy enough to support the system's weight.
- Where not subjected to excessive mechanical vibrations
- Where not exposed to direct sunlight
- Where ambient temperature is between 5 and 35°C (optimal at 23°C)
- Which is free from sharp ambient temperature fluctuations
- Which is not dusty
- Which is not humid
- Away from flammables
- Where not exposed to combustible or corrosive gases
- Away from equipment that generates noise

11.2 Installation space

: Secure a minimum 40 cm of space on the left, right and rear of the system.
Even when the above requirements cannot be secured, always ensure sufficient space behind the system for a person to pass.

11.3 Grounding

: Grounding conditions are as follows.

Ensure 100 Ω or less resistance against ground. (Interpretation of technical standards for electrical equipment, Article 19. Type-D Grounding work)

12. Conditions of acceptance

Upon confirmation by the user that there is no problem during the standard operation check and that the product meets specifications.

(Standard operation check)

To determine a real value, static capacity of ESPEC-specified standard DUT will be measured using a standard test fixture (0 m) for LCR meter.

Upon confirmation that the measured value is within the range stated in the specifications against the true value, standard operation is confirmed.

Static capacity and measurement conditions are as follows.

- ① 100 pF (at 10 kHz) [Measured in parallel equivalent circuit mode]
- ② 10 nF (at 1 kHz) [Measured in parallel equivalent circuit mode]
- ③ 10 uF (at 120 Hz) [Measured in series equivalent circuit mode]

[Other measurement conditions]

- Ambient temperature : 23°C ± 5°C
- Signal level : 1 Vrms
 - DC bias voltage : 0 V
 - Integral mode : LONG
 - Averaging : 4 times
 - Range : AUTO
 - OPEN/SHORT : Corrected
 - ALC : ON

13. Warranty

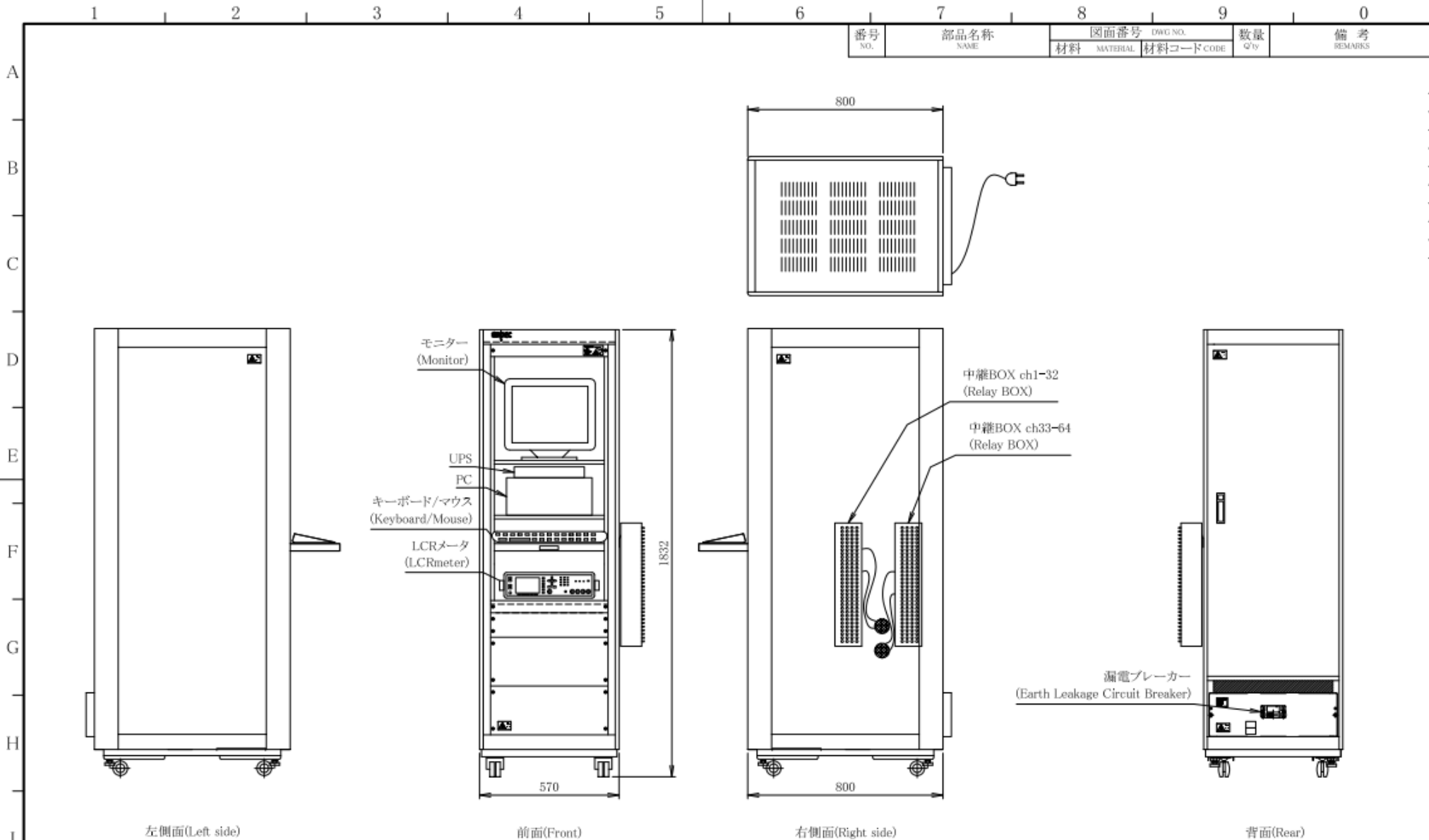
Product failures that occur within one year from the delivery will be repaired free of charge.

Note, however, that there will be a charge for repair service in the following cases.

- ① Product failure or damage is caused by incorrect use or unauthorized repair or modification.
- ② Product failure or damage is caused by handling, storage or use outside the design conditions.
- ③ Product failure or damage is caused due to lack of periodical inspection, daily checks, and cleaning.
- ④ Product failure or damage is caused by fire, pollution, earthquake, storm or other natural disasters.

Notwithstanding this item, warranty of equipment other than those manufactured by ESPEC shall be in accordance with the conditions of the manufacturer of the equipment.

Note, however, that malfunctions in the software developed by ESPEC, detected within 6 months from the start of actual operation, will be promptly repaired free of charge. Malfunctions detected after 6 months from the start of actual operation will be repaired for a charge.



番号 NO.	部品名称 NAME	図面番号 DWG NO.		数量 QTY	備考 REMARKS
		材料 MATERIAL	材料コード CODE		
1					
2					
3					
4					
5					
6					
7					
8					
9					
0					

改訂 REV	作成 DATE		部 署 DEPT.		RED ANGLE PROJ DIM mm		図面名称 TITLE		
	2018/08/27		CEED3				AMQ外觀図(External view)		
	設計 DESIGN	製図 DRAWING	検図 CHECK	承認 APPROV	尺度 SCALE				
	Yoshida	Yoshida	Saito	Saito	1/15				
エスペック株式会社 ESPEC CORP.							DWG SIZE	図面番号 DWG NO.	改訂 REV
							A3	40625020023	00