### Chapter 1   General Requirements

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**1. The performance shall be stipulated as follows.**

**For equipment with a recorder:**

The following in JIS T 1203 shall be applied.

**6. Performance**

**7.2 Structure**

**7.2.3 Input part**

**7.2.4 Amplification part**

**7.2.5 Stabilizer**

**7.2.6 Recording part**

**7.2.7 Complementary input/output part**

**For equipment without a recorder:**

1) **Input circuit**

Input impedance of each channel shall be "e5 MΩ. DC input circuit current shall be "d10 nA.

1) **Using the measurement circuit shown in Figure 6 of JIS T 1203, Section 8.4.1, close switch S and apply 10 Hz AC voltage from the sine wave voltage generation circuit for test to the input terminal of the electrode connectors, and set the sensitivity so that the amplitude of the indicated waveform is approximately 10 mm. Then, investigate whether the amplitude of the indicated waveform is "e50% for each channel when opening switch S.**

2) **Using the measurement circuit shown in Figure 6 of JIS T 1203, Section 8.4.1, close switch S and apply 10 Hz AC voltage from the sine wave voltage generation circuit for test to the input terminal of the electrode connectors, and set the sensitivity so that the amplitude of the indicated waveform is approximately 10 mm. Then, investigate whether the amplitude of the indicated waveform is "e50% for each channel when opening switch S.**

**2) Clocking device**

The measurement error of the clocking device shall be within ±2%. Apply a signal voltage with intervals of 1 ± 0.002 seconds to any of the channels, indicate the signal voltage with the clocking signal of clocking device for 10 seconds, and compare both results.

3) **Calibration device**

...
The measurement error for the calibration voltage generated by the calibration device shall be within ±5%.

Set the sensitivity to generate an amplitude of the indicated waveform of approximately 10 mm by square pulse voltage of the calibration device and measure the amplitude of the indicated waveform. Without changing the sensitivity, apply the square pulse voltage equivalent to the voltage of the calibration device previously applied via the electrode connector and measure the amplitude of the indicated waveform, and compare both results.

4) Contact resistance measuring device

The measurement error of the contact resistance measuring device shall be within ±10%.

Sequentially connect the reference resistance of 10 ± 0.1, 20 ± 0.2, and 30 ± 0.3 kΩ to the socket of the electrode connector, measure with the built-in contact resistance measuring device, and check the error.

5) Auxiliary input (for equipment with auxiliary input)

The input method shall be unbalanced DC coupling. The input impedance shall be "e100 kΩ"; the sensitivity error shall be within ±10%.

Using the measurement circuit shown in Figure 7 of JIS T 1203, Section 8.4.7, apply 10 Hz, 1 Vp-p voltage between the terminal of the auxiliary input signal and ground terminal using the sine wave voltage generation circuit for test. Under the condition of closure of switch S, measure the amplitude of the indicated waveform when the sensitivity is set so that the amplitude of the indicated waveform is approximately 10 mm against the input voltage of 1 V. Then, check whether the amplitude of the indicated waveform shows "e50% when opening switch S, while maintaining the input voltage.

6) Auxiliary output (for equipment with auxiliary output)

The output method shall be unbalanced DC coupling. The output voltage shall be within 1 Vp-p ± 10% when the sensitivity is set so that the output impedance is "d300 ©" and the amplitude of the indicated waveform is approximately 10 mm.

Frequency characteristic shall have a 3-dB attenuation frequency of "e600 Hz and the linearity stipulated in 7) Waveform linearity when the high-frequency range attenuation filter is set to the maximum value.

Set the sensitivity so that the amplitude of the indicated waveform of the electroencephalograph is approximately 10 mm against the input of 100 µV. Then, check whether the output voltage of the auxiliary output is within 1 Vp-p ± 10% when a test voltage of 10 Hz, 100 µVp-p is applied to the electrode connector using a sine wave voltage generating circuit for test. Under this condition, check whether the voltage between both ends of the resistance is half or more of the output voltage when a resistance of 300 ± 3© is connected between the signal terminal and ground terminal.

Measure the auxiliary output voltage and check its linearity when the test
described in 7) Waveform linearity is performed. Measure the auxiliary output voltage and check the frequency characteristics when the test described in 11) Overall frequency characteristics is performed. Also check the frequency characteristics for a frequency of 600 Hz.

7) Waveform linearity
In a range between 160 and +160 µV, the sensitivity error shall be within ±10%.

Set the sensitivity of the electroencephalograph so that the amplitude of the indicated waveform is approximately 5 mm when the input voltage is 50 µV and check the waveform linearity for each channel. Using the square wave voltage generating circuit, apply the input voltage to each channel by the electrode connector, vary the input voltage to 160 µV with an interval of 20 µV, and measure the amplitude of each indicated waveform. Then, reverse the polarity of the input voltage and measure again in the same manner. Measure the gap between the measured value and input voltage under each voltage.

8) Maximum sensitivity
The equipment shall have a sensitivity of "e2.5 µV/mm and the error shall be within ±10%.

Set the sensitivity of the electroencephalograph to maximum, and using the square wave voltage generating circuit for test, measure the amplitude of the indicated waveform when a square wave voltage of 25 µV is applied via the electrode connector.

9) Sensitivity change
The sensitivity change shall be "d5 µVp-p.

(1) Set the sensitivity so that the amplitude of the indicated waveform of the electroencephalograph is approximately 10 mm against 100 µV input. For all channels, check whether the change in amplitude of the indicated waveform is "d5 µVp-p when superimposing a test voltage of 10 Hz, 50 µVp-p and a DC voltage (E2) of 500 mV, as shown in Figure 8 of JIS T 1203, Section 8.4.10, to the electrode connector, while switching between each positive and negative terminal (+, -), using a sine wave voltage generating circuit for test.

(2) Set the sensitivity so that the amplitude of the indicated waveform of electroencephalograph is approximately 10 mm against 100 µV input. For all channels, check whether the change in the amplitude of the indicated waveform is "d5 µVp-p when superimposing a test voltage of 10 Hz, 50 µVp-p to the electrode connector and a DC voltage (E2) of 500 mV, as shown in Figure 9 of JIS T 1203, Section 8.4.10, between the positive and negative input terminal (+, -) and the ground terminal (E), while switching between each positive and negative terminal, using a sine wave voltage generating circuit for test.
10) Minimum input identifiable
The input signal of 2.5 µVp-p shall be indicated across a frequency range between 1 and 60 Hz.

Set the sensitivity so that the amplitude of the indicated waveform is approximately 20 mmp-p by applying a voltage of 100 µVp-p at frequencies of 1, 10 and 60 Hz via the electrode connector, using a sine wave generating circuit for test. Then, check whether the amplitude of the indicated waveform can be observed when the input voltage is decreased to 2.5 µVp-p.

11) Overall frequency characteristics
Within a frequency range between 1 and 60 Hz, the amplitude of the indicated waveform shall be within 90% to 110% of the amplitude of the indicated waveform of 10 Hz. The overshoot against the square waveform voltage input under the amplitude of the indicated waveform of 100 µV shall be "d10%.

Set the sensitivity so that the amplitude of the indicated waveform is approximately 15 mmp-p by applying a test voltage of 10 Hz, 150 µVp-p via the electrode connector box, using a sine wave generating circuit for test. Then, measure each voltage when the frequency is 1, 2, 3, 5, 7, 10, 20, 30, 40, 50, and 60 Hz, while maintaining a constant voltage. Measure the amplitude of each indicated waveform when the measured value of the test voltage of 10Hz is regarded as 100%, and measure the gap between the measured value and the test voltage.

Measure the overshoot D, as shown in Figure 11 of JIS T 1203, Section 8.4.3 when performing the test described in 12) Time constant, and check whether the overshoot D is "d10% of the amplitude of the indicated waveform at point A, under the maximum value of the high-frequency attenuation filter.

12) Time constant
At least, the equipment shall have a time constant of 0.1 and 0.3 second, the error of which shall be within 0% to 20%.

When setting the changeover switch of the time constant at 0.3 and 0.1 second, applying a square wave voltage of 100 µV via the electrode connector using a square wave voltage generating circuit for test, and setting the sensitivity so that the amplitude of the indicated waveform gained is approximately 10 mm, measure the time taken to reduce the amplitude to 37%, when the amplitude of the indicated waveform at point A is regarded as 100%, as shown in Figure 11 of JIS T 1203, Section 8.4.13

13) Filter
The high-frequency attenuation filter shall have attenuation characteristic of 3 dB at 60 Hz, the error of which shall be within ±20%. The attenuation characteristic shall be "e6 dB/octave.

Set the high-frequency attenuation filter at the maximum level, apply a
voltage of 60 Hz, 100 µVp-p to each channel via the electrode connector using a sine wave voltage generating circuit for test, set the sensitivity so that the amplitude of an indicated waveform of approximately 10 mm is given, and measure the amplitude of the indicated waveform. Then, when the same sine wave voltage for test is applied following the insertion of a 60-Hz filter, check whether the amplitude of the indicated waveform is (71 ± 20)% when the amplitude of initially indicated waveform is regarded as 100%.

When the frequency of sine wave voltage is set as 120 Hz, check whether the amplitude of the indicated waveform is below 50%.

14) Noise
Noise between 1 and 60 Hz, of more than 3 µVp-p shall not be generated more frequently than once per second.

Set the sensitivity and the high-frequency attenuation filter at the maximum level, apply and indicate the voltage of 5 µV to the electrode connecting box from a square wave voltage generating circuit for test, compare this with the noise, and check whether noise of more than 3 µVp-p is not generated more frequently than once per second.

15) Common mode rejection ratio
The common mode rejection ratio (CMRR) of the amplifier shall be 1000.

Apply a test voltage of 60 Hz, 50 µVp-p between the positive and negative input terminals (+, −) using a sine wave generating circuit for test, measure the amplitude of the indicated waveform, which is defined as D1. Then, short-circuit the positive and negative input terminals, apply a test voltage of 50 mVp-p between this and the ground terminal, and measure the amplitude of the indicated waveform, which is defined as D2. Calculate the CMRR using the following formula.

\[
\text{CMRR} = \left( \frac{D1}{D2} \right) \times 1000
\]

16) Interchannel interference
The amplitude of the indicated waveform of the non-input channel by interference shall be below 5 µVp-p.

Set the sensitivity of each channel so that the amplitude of the indicated waveform of the electroencephalograph is approximately 10 mm against an input of 100 µV. Apply a square wave voltage of 160 µV to any channel via the electrode connector using a square wave voltage generating circuit for test and check the amplitude of the indicated waveform of a non-input channel by interference. Ground the input terminal of the non-input channel, via the electrode connector across a 10 kΩ resistor.

17) Uniformity of waveform indication
Regarding all indicated amplitudes, time constants, and overall frequency characteristics, the interchannel characteristic difference shall be within ±10% of the mean value.
Adjust the sensitivity of all channels to be the same, and apply a voltage so that the amplitude of the indicated waveform of each channel will be approximately 10 mm, using a square wave voltage generating circuit for test. Then, measure the time constant characteristics for all channels, and check whether the interchannel time constant difference is within ±10% of the mean value.

Apply sine wave voltages of 1 and 60 Hz to each channel using the sine wave voltage generating circuit for test, while maintaining the same sensitivity settings, and check whether the interchannel amplitude difference in each frequency is within ±10% of the mean value.

18) Input part
The input part shall have an electrode connector and electrode selector, in addition to a calibration device and contact resistance measuring device.

(1) Electrode connector
Use the sample shown in Figure 3 of JIS T 1203, section 7.2.3 to display the figure of the device head and the arrangement of electrodes in the electrode connector.

(2) Electrode selector
(a) Structure
The equipment shall have a pattern selector which can sequentially switch the patterns set in advance, and an electrode selector which can freely select at least 23 or more electrodes for each channel.
(b) Polarity indication
The electrode selector shall indicate the polarity with the signs ± and G1 and G2. Regarding the polarity of the electroencephalograph, negative polarity is defined as the polarity showing upper deflections of the waveform of the displaying device when the selector is the negative electric potential against the + selector.

(3) Calibration device
In order to calibrate the input voltage, the equipment shall have, at least, the following circuit to generate square wave voltage for calibration: For a multi-use type device, 10, 20, 50, 100, 200, and 500 µV; for an exclusive-use type device, 50 µV.

(4) Contact resistance measuring device
The equipment shall have a device which can measure the contact resistance between the electrodes and the human body.

19) Amplification part
The amplifier, which is composed of the amplification part, shall have a sensitivity controller, simultaneous sensitivity controller for all channels, high-frequency attenuation filter, and time constant circuit function.

(1) Sensitivity controller
A step controller, which is used to alter the sensitivity in a stepwise manner, with a sensitivity increment for each step of "d100% and an entire alternation range of 8:1 or more, shall be equipped. A step controller can be omitted for an exclusive electroencephalograph.

(2) Simultaneous sensitivity controller for all channels
A simultaneous sensitivity controller for all channels shall have a step controller, with a sensitivity increment for each step of "d100% and an entire alternation range of 8:1 or more.

The equipment shall have, at least, a high-frequency attenuation filter, with 3 dB decrease at 60 Hz.

The device shall have a stabilizer to immediately rectify any fluctuation of the baseline associated with switching the controller.

Regarding the polarity of auxiliary input, the deflections of the waveform of the indication device shall be in the upper direction when a positive signal is added to the auxiliary input. The polarity of the auxiliary output shall be the positive output against the ground when the deflection of the indicated waveform in the indication device is in the upper direction.

2. Visual stimulator
(for equipment with visual stimulator)

This shall be equivalent to that of existing equipment.

Measure any of the following value: illuminance from the light source (lx); integral of the illuminance from light source and illumination time (lx"s); luminance of the stimulation surface (cd/m²); integral of the luminance of stimulation surface and illumination time (cd"s/m²); driving electric power of the light source (W); or driving energy of the light source (J).
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