# 9. Appendix

## 9.1 Appendix a Specifications

### 9.1.1 Oscilloscope

Only if other instructions are provided, are all technical specifications applicable to the probe with the 10X attenuation switch setting and the HDS series digital type oscilloscope. In order to be up to these specifications, the oscilloscope should meet the following requirement.

■ The instrument should operate continuously for more than 30 minutes under the specified operating temperature.

■ If the operating temperature is up to or larger than 5 Celsius degrees, the system function menu must be opened to make the system perform a "Auto- calibration" procedure.

Except those specifications marked with the word **Typical**, all specifications can be up to.

**Sampling**

| Sampling modes | Normal sampling |
| --- | --- |
| | Peak detection |
| | Average value |
| Sampling rate | 100 MS/s |

**Input**

| Input coupling | DC, AC |
| --- | --- |
| Input impedance | 1MΩ±2% connected in parallel　with 20pF±5pF |
| Probe attenuation coefficient | 1X, 10X, 100X, 1000X |
| Max. Input voltage | 400V (peak) |
| Channel delay time（typical） | 150ps |

**Horizontal**

| Sampling rate range | 10S/s～100MS/s |
| --- | --- |
| Waveform interpolation | （sin x）/x |
| Record length | 6K points on each channel |
| Scanning speed range（S/div） | 5ns/div～5s/div, stepping in the "1-2.5-5" mode. |
| Sampling rate and relay time accuracy | ±100ppm(any time interval which is equal to or larger than 1ms) |
| Time interval（△T)measurement accuracy（full bandwidth） | Single: ±（1 sampling interval time+100ppm × reading+0.6ns) |
| | >average 16 : ±(1 sampling interval time +100ppm× reading+0.4ns) |

**Vertical**

| Analog digital converter（A/D） | With the resolution of 8 bits, make sampling on both channels synchronously. |
|---|---|
| Sensitivity range （V/div） | 5mV/div～5V/div（at the input BNC） |
| Displacement range | ±50V(500mV～5V),±1V(5mV～200mV) |
| Analog bandwidth | 20MHz |
| Single bandwidth | Full bandwidth |
| Low frequency response （AD coupling, -3dB） | ≥5Hz（at the BNC ） |
| Rise time（typical one at the BNC） | ≤17.5ns |
| DC gain accuracy | ±5% |
| DC measurement accuracy（average value sampling mode） | The voltage difference (△V) between any two points on the waveform after averaging the captured waveforms more than 16: ±(5% reading + 0.05 divisions). |

**Trigger**

| Trigger sensitivity （Edge triggering） | DC coupling | CH1 and CH2: 1div(DC～full bandwidth) |
|---|---|---|
| | AC coupling | Same as the DC coupling when it is equal to or larger than 50Hz. |
| Triggering level range | | ±6 divisions from the screen center |
| Triggering level accuracy (typical) which is applicable to the signal with rise and fall time equal to or longer than 20ns | ±0.3 divisions | |
| Trigger displacement | 655 divisions for pre-triggering and 4 divisions for post-triggering | |
| Make a 50% level setting (Typical). | Operation with the input signal frequency equal to or larger than 50Hz. | |
| Trigger sensitivity (Video triggering and typical mode) | 2 divisions of peak-to-peak value | |
| Signal system and line/field frequency (Video triggering mode) | Support the NTSC, PAL and SECAM broadcasting systems of any field or line frequency. | |

**Measurement**

| Cursor measurement | Voltage difference (△V) and time difference (△T) between cursors |
|---|---|
| Auto measurement | Peak-to-Peak voltage, mean voltage, root mean square value, frequency and period. |

**Probe**

|                    | 1X position        | 10X position              |
|--------------------|--------------------|---------------------------|
| Bandwidth          | Up to 6 MHz (DC)   | Up to full bandwidth (DC) |
| Attenuation rate   | 1: 1               | 10: 1                     |
| Compensation range | 20pf～40pf          |                           |
| Input resistance   | 1MΩ±2％            | 10MΩ±2％                  |
| Input impendence   | 85pf～115pf         | 14.5pf～17.5pf             |
| Input voltage      | 150 V DC           | 300 V DC                  |

## 9.1.2 Meter

**Voltage (VDC)**

Input Impedance: 10MΩ.

Max. Input Voltage: 1000V (DC or AC peak-to-peak value)

| Range     | Accuracy        | Resolution |
|-----------|-----------------|------------|
| 400.0mv   | ±1.5%±2digit    | 100uV      |
| 4.000V    | ±1%±1 digit     | 1mV        |
| 40.00V    |                 | 10mV       |
| 400.0V    |                 | 100mV      |

**Voltage (VAC)**

Input Impedance: 10MΩ.

Max. Input Voltage: 750V (AC, virtual value)

Frequency range: from 40Hz to 400Hz.

Display: Virtual value of the sine wave

| Range     | Accuracy        | Resolution |
|-----------|-----------------|------------|
| 4.000V    | ±1%±3 digits    | 1mV        |
| 40.00V    |                 | 10mV       |
| 400.0V    |                 | 100mV      |

**Direct Current (DC)**

| Range     | Accuracy        | Resolution |
|-----------|-----------------|------------|
| 40.00mA   | ±1.5%±1 digit   | 10uA       |
| 400.0mA   | ±1.5%±1 digit   | 100uA      |
| 10A       | ±3%±3 digit     | 10mA       |

**Alternating Current (AC)**

| Range | Accuracy | Resolution |
|---|---|---|
| 40.00mA | ±1.5%±3 digit | 10uA |
| 400.0mA | ±2%±1 digit | 100uA |
| 10A | ±5%±3digit | 10mA |

**Resistance**

| Range | Accuracy | Resolution |
|---|---|---|
| 400.0 Ω | ±1%±3 digit | 0.1 Ω |
| 4.000K Ω | ±1%±1 digit | 1 Ω |
| 40.00K Ω | | 10 Ω |
| 400.0K Ω | | 100 Ω |
| 4.000M Ω | | 1K Ω |
| 40.00M Ω | ±1.5%±3 digit | 10K Ω |

**Capacitance**

| Range | Accuracy | Resolution |
|---|---|---|
| 51.20nF | ±3%±3 digit | 10pF |
| 512.0nF | | 100pF |
| 5.120uF | | 1nF |
| 51.20uF | | 10nF |
| 100uF | | 100nF |

**Diode**

Voltage reading: 0 V ～1.5 V.

**On-off Test**

There is a beep sound when the on-resistance is less than 30 Ω.

## 9.1.3 General Specifications

**Basic parameter**

| | |
|---|---|
| Mechanical dimension | 18 cm×11.5cm×4cm |
| Weight | 645 g |
| Power consumption | ＜ 6 W |
| Display type | 3.8" color liquid crystal display |
| Display resolution | 320 (horizontal) ×240 (vertical) pixels |
| Display color | 4096 colors |

**Power Adapter**

| | |
|---|---|
| Power supply | 100-240 V AC 50/60Hz |

| Power output | 8.5 VDC |
|---|---|
| Current output | 1500 mA |

**Working environment**

Temperature

Operation

| | |
|---|---|
| Used battery | 0 to 50 °C (32 to 122 °F) |
| Power adapter | 0 to 40 °C (32 to 104 °F) |
| Storage. | -20 to +60 °C (-4 to 140 °F) |

Temperature

Operation:

| | |
|---|---|
| 0 to 10 °C (32 to 50 °F) | no condensation |
| 10 to 30 °C (50 to 86 °F) | 95 % |
| 30 to 40 °C (86 to 104 °F) | 75 % |
| 40 to 50 °C (104 to 122 °F) | 45 % |

storage

| | |
|---|---|
| -20 to +60 °C (-4 to +140 °F). | no condensation |

## 9.2 Appendix B: Maintenance and Cleaning

### 9.2.1 Maintenance

Do not store or place the instrument in locations where the liquid crystal display (LCD) may be directly exposed to the sunshine for a long time.

**Be careful:** Do not spray liquid into the instrument.

**Cleaning**

Inspect the instrument and the probe frequently in accordance with operating conditions. Clean the outer surface of the instrument according to the following steps:

1. Wipe off the floating dust outside of the instrument and the probe by using soft cloth. When cleaning the LCD, do not scuff the transparent LCD protective screen.
2. Wipe the instrument in power off status by soft cloth that is moist but not dripping. It is allowed to be cleaned by soft detergent or fresh water. Do not use any abrasive chemical detergent to avoid the instrument or the probe being damaged.

⚠️ **Warning:** Before running, please confirm that the instrument has been dried out so as to avoid electrical short circuit and personal injury caused by moisture.

### 9.2.2 Storage of Oscilloscope

If the test tool is to be stored for a long time, it is required to charge the lithium battery before