
INSTRUCTION MANUAL

Hand-held weld scope

MODEL: WS-100

(Conform to CE/UL)
Original instructions

The instruction manual must be carefully
read for proper machine operation.

No person is allowed to install, conduct test run of, operate, maintain, repair the machine or do similar works, without having well understood what the manual refers to.

The improper operation with inadequate knowledge may cause serious accident. Incidentally, the manual must be kept at a place accessible to any of the person concerned.

Please inquire an uncertain point of our Sales Department/each office.





DENGENSHA MFG.CO.,LTD

1-23-1 Masugata, Tama-ku, Kawasaki-shi, Kanagawa-ken, JAPAN
TEL : +81-44-922-1121 / FAX : +81-44-922-1100

NOTICE

1. Please do not reprint contents of this instruction partially without permission.
2. The content of Instruction manuals might change without notifying beforehand.
3. Please contact us when there are any suggestions like an uncertain by any chance point, mistake, and description leakage, etc.

Revision history

3	Modification of "WARRANTY and REPAIR-AVAILABLE PERIOD" clause.	2014/ 09/24	Nozaki		
2	Appends the offices of Mexico	2014/ 09/04	KAWABE	FUKUTA 2014.9.4	KOMACHI 2014.9.4
1	Incorrect correction	2014/ 08/12	KAWABE	FUKUTA 2014.8.12	KOMACHI 2014.8.12
-	First edition	2014/ 06/30	KAWABE	FUKUTA 2014.7.16	KOMACHI 2014.7.16
Rev. code	Revision item	Date	Drawn	Verification	Approved

Instruction manuals

- Hand held weld scope unit instruction manual (this document)
This manual provides instructions regarding Hand held weld scope, descriptions of the Hand held weld scope functions, installation method, notes of troubleshooting against errors and maintenance.

- Weld Data Manager instruction manual OPI-0002
This manual provides instructions regarding 'Weld data manager', descriptions of the 'Weld data manager' functions, installation method.

Contents

1. SAFETY INSTRUCTIONS AND CONSIDERATIONS	1
1 - 1. Product safety labels and symbols	1
1 - 2. Application of the equipment and safety	2
1 - 3. Safety considerations	2
1 - 4. Safety during operation	2
1 - 5. Electrical safety	3
1 - 6. Safety items on maintenance work	4
1 - 7. Accident prevention	5
2. WARRANTY and REPAIR-AVAILABLE PERIOD	9
2 - 1. Warranty	9
2 - 2. Repair-Available period	10
3. Overview	11
3 - 1. Overview of Hand held weld scope	11
4. Specification	11
4 - 1. Hand held weld scope WS-100 specification	11
4 - 2. Equipment appearance and name of each part	13
5. Connection	14
5 - 1. Current sensor (toroidal coil)	14
6. LCD display	15
6 - 1. Four display items	15
7. Operation	17
7 - 1. Operation tree	17
7 - 2. Numerical screen (main screen)	18
7 - 3. Numeric screen in current measurement mode	18
7 - 4. Numerical screen in pressure measurement mode	22
7 - 5. Graphic screen in current measurement mode	22
7 - 6. History screen	22
7 - 7. System screen	23
8. Cable connection	25
8 - 1. Connection of each cable	25
9. Battery	26
9 - 1. Mounting battery	26
9 - 2. Battery charging instructions	26
9 - 3. Notes	27
9 - 4. Use of other type battery	27
9 - 5. Long term storage	28

10. Maintenance.....	28
10 - 1. Instructions in case of maintenance.....	28
11. Parts List.....	28
11 - 1. Consumable parts.....	28
11 - 2. Other parts and options.....	28

EC DECLARATION OF CONFORMITY

In accordance with BS EN ISO/IEC 17050-1:2010

We **DENGENSHA MFG. CO., LTD.**
1-23-1 Masugata, Tama-ku, Kawasaki-shi
Kanagawa-ken 214-8588 JAPAN



declare that:

Current measuring device
Model: WS-100

In accordance with the following Directives:

2006/95/EC conforms with the essential electrical equipment requirements of the Low Voltage Directive and its amending directives.

2004/108/EC conforms with the essential protection requirements of the Electromagnetic Compatibility Directive and its amending directives.

has been designed and manufactured to the following specifications:

EN 61010-2-032:2012

EN 61000-4-3, EN 61000-4-4, EN 61000-4-5

EN 61000-6-2, EN 55011:2009+A1:2010

I hereby declare that the equipment listed above has been tested and found to comply with the relevant sections of the above referenced specifications. The unit complies with all essential requirements of the Directives.

Oct. 28, 2014

Signature


.....
Hideo Tahara
General Manager
Quality assurance Dept.

Our authorized representative in Europe

Mr. John Mason

DENGENSHA EUROPE LTD
Unit 8, Birchbrook Ind. Park, Birchbrook Lane
Shenstone, Staffordshire, WS14 0DJ, United Kingdom.

DENGENSHA MFG. CO., LTD.

1. SAFETY INSTRUCTIONS AND CONSIDERATIONS


IT IS IMPERATIVE THAT :

Any person involved with the installation, functional testing, operation, maintenance and repair of this machine must start the work with complete understanding of the machine after reading this INSTRUCTION MANUAL carefully, to help prevent personal injury or damage to the equipment. DENGENSHA equipment has been designed and produced with due consideration to safety. Be sure to observe the instructions in this instruction manual. Failure to comply with these instructions may cause personal injury.




1 - 1. Product safety labels and symbols

In this manual and the machine, the following labels or symbols are used.


(1) General warning sign

	This is the general warning sign. It is used to alert the user to potential hazards. All safety messages that follow this sign shall be obeyed to avoid possible harm.
---	--


(2) Hazard severity panels

	DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
	WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

(3) Prohibition sign

	A black graphical symbol inside a red circular band with a red diagonal bar defines a safety sign that indicates that an action shall not be taken or shall be stopped.
---	---

(4) Mandatory action

	A white graphical symbol inside a blue circle defines a safety sign that indicates that an action shall be taken to avoid a hazard.
---	---

1 - 2. Application of the equipment and safety

This equipment is intended for use, exclusively, for the purpose specified in associated documentation (instruction manual, specification sheet). Employment of the equipment for any other purpose is regarded as a deviation from the intended application.

Improper usage other than intended may cause :

- (a) Serious injury or death,
- (b) Damage to this and/or other equipment


DENGENSHA equipment uses the latest state of the art technology and is made to operate safely and reliably. The equipment should be used only for the intended purpose. Dengensha will not accept liability for misuse of the equipment.


1 - 3. Safety considerations

We emphasize that DENGENSHA MFG.CO., LTD. disclaims all liability for damage and malfunctions resulting from non-compliance with the following instructions in particular :

- (a) The instruction manual must be read and strictly understood. If there are any questions, contact our business department and/or each office.
- (b) Unauthorized conversion and/or modification affecting the safety of the equipment are not allowed.
- (c) The equipment may not be equipped or operated with products of other manufacturers whose use is not expressly permitted in the associated manuals.
- (d) For the items(b)and(c), consult with our business department/each office on safety.

1 - 4. Safety during operation

 CAUTION
(1) Injury prevention from electrode or clamping force Resistance welding machine generally uses electrode pressurizing force or clamping force of several thousands Newtons or more. Since this large force is dangerous, do not put hands, fingers, or any part of the body between the electrodes, and between the clamps. Failure to observe this warning can cause serious injury. The same warning applies to the electrodes when opening. A guard is provided to protect against a pinch point when the upper electrode opens. Do not put hands, fingers or any part of the body between the upper electrode and the cylinder body. Operation should not occur unless the guard is in place.

 CAUTION
(2) Wearing safety gear Spark or spatter that is produced during welding operation may cause eye injury. Since it is difficult to eliminate spark or spatter completely, it is necessary to put on protective glasses, helmet, gloves and non-combustible working clothes to safeguard against splash and spatter.



CAUTION

(3) Prevention from burns or fire

Spark or spatter produced during welding operation or hot parts just after being welded cause burns. Observe the following precautions and install fire extinguishers close to the weld working area in case of an emergency.

- (a) Remove flammable substances so that Spark or spatter do not fall on them or drape them with a non-combustible cover.
- (b) Do not perform welding work near the flammable gas.
- (c) Do not bring hot parts immediately after being welded, close to the flammable materials.
- (d) Do not touch the parts just after being welded with bare hands. Even if they are not red, the temperature may be very high, causing a burn.
- (e) Keep any personnel other than workers away from a place where spark or spatter is produced.

(4) Noise protection

Measure noise level of this equipment and its surroundings area. If the level is in excess of 85db, use appropriate hearing protection.

1 - 5. Electrical safety



DANGER

(1) In order to avoid electrical shock

In order to avoid electrical shock, be sure to observe the following items :

- (a) Do not touch the parts bearing electrical charges other than secondary conductor.
Failure to observe this may result in a fatal electrical shock or severe burns.
- (b) Do not touch both ends of secondary conductor simultaneously. Failure to observe this may result in a slight electrical shock.

(2) Connection to the power supply

The equipment should be connected properly to the power supply as per the instruction manual. The power supply work should be carried out according to local laws and your in-house standards.

(3) Qualifications for electrical work

Voltage of approx. 440V is supplied to the equipment according to the specification (Higher voltage may be used depending on models. Refer to the specification).

Educated, trained and qualified personnel¹⁾ with regard to the potential hazards arising from these dangerous voltages should be assigned, especially, to electrical work for installation, maintenance and repair works.

Note : 1) For example, personnel who possess qualifications for electrical work or authorized customer employee.

(4) Grounding work

An earth terminal is provided with the equipment for safety.

A person qualified for conducting the electrical work should carry out the grounding work according to the local laws and in house standards.

(5) Provision of properly sized conductors

The customer is responsible to provide properly sized conductors for the incoming power feed to the welder. Do not use wire of insufficient capacity or damaged/exposed wires. Failure to observe this may cause fire due to overheated electrical wire and electrical shock or current leakage.

(6) Electric wire connection

The connection terminal of the electrical wire should firmly be tightened and insulated. In case of loose connection, the connection may become overheated and cause fire, and insufficient insulation may cause electrical shock or current leakage.

1 - 6. Safety items on maintenance work



DANGER

(1) Promotion of safe system start-up and shut-down

There is a possibility of causing extremely dangerous condition when the sources of power supply, pneumatic and water are turned on without warning to a worker during maintenance/repair work. Systems that promote safe system start-up and shutdown should be provided for personnel safety.

(2) Before performing maintenance work



DANGER

Before performing any maintenance and/or repair work, including cleaning, it must be ensured that :

- (a) The equipment has been disconnected, using a lock-out/tag-out procedure, from all power supplies for welding, control and power.
- (b) Perform plant lock-out/tag-out procedures on power sources of the equipment.



CAUTION

- (c) All sources of pneumatic pressure and cooling water have been locked-out/tagged-out.
- (d) Residual pressure of all pneumatic circuits and cooling water circuits have been relieved.

(3) Perform maintenance work

Installation, maintenance/inspection, repair work should be performed by trained qualified personnel²⁾ according to the instruction manual for safety reasons.

Note : 2) Qualified personnel, authorized by the customer, who have received manufacturer's or customer's in-house training and have clear understanding of the equipment in question.

(4) Perform periodic maintenance

It is necessary to perform periodic maintenance and inspection of the equipment as described in the manual.

(5) Water or pneumatic hoses

When the customer prepares to install water, or pneumatic hoses to the welder, make sure they will sufficiently bear the pressure.

Possibilities of danger occur when these hoses have insufficient resistance to pressure or are deteriorated or damaged, periodically perform maintenance and inspection and repair the deteriorated or damaged parts before using the equipment.

(a) When hoses bursts or disconnected, the hose may act violently or the equipment may operate unexpectedly.

(b) When a water hose bursts developing a leak, there is a possibility of deteriorated insulation of the electrical circuit or deterioration of the control equipment and/or current leakage.

1 - 7. Accident prevention

(1) Cooling water used for welding machine

Be sure to observe the following items for safe operation, to prevent accident and maintain proper functioning of the equipment.

(a) Use water of the following quality or equivalent :

i) Rate of electric resistance : More than $5,000\Omega \cdot \text{cm}$ for thyristor cooling water.

ii) Less deposit in water.

iii) Ammonium ion content must be less than 1ppm.

Smaller resistance of water may cause current leakage. The cooling water with large deposits may clog a circuit to degrade the circuit function, lowering the cooling capacity and causing the circuit to malfunction or fail.

Cooling water containing a large amount of ammonium ions may have the possibilities of corroding copper or copper alloy components on the cooling circuit and create water leaks, leading to current leakage and electrical shock or electrical breakdown of welding transformer that can causes a fire on the equipment.

(b) When the cooling water is turned off, be sure to turn off the welding power supply.

Leakage current flowing for a long time may heat and damage thyristors, depending on quality of cooling water.

(c) Amount of cooling water prescribed in the specification of the equipment should be provided in the following manner. It is also important to keep water temperature prescribed in the specification in order to maintain the cooling capacity as well as water quantity :

- i) Maintain a given water pressure prescribed in the specification.
- ii) Check the water flow periodically to prevent clogging & overheating conditions.
- iii) Perform maintenance of cooling water circuit as prescribed in the specification.

When cooling capacity is deteriorated, the equipment may generate faults or a fire may generate due to overheated components such as welding transformers, conductors, electrodes, thyristors.



CAUTION

(2) Upper electrode falls when air supply is stopped

In general, when air supply for welding machine is stopped, the upper electrode falls spontaneously due to deadweight. Though its falling speed is not high, there is a possibility of occurring problems : injury may occur if hands, fingers, a part of body are caught, or work piece be deformed if it is between the electrodes.

(3) Proper pressurizing force must be established

Proper pressurizing force must be established before passing welding current through the electrodes. If current is passed through the electrodes when the pressurizing force is too low, a dangerous explosion of sparks and splatter will occur, causing serious injury or burns.

EXAMPLES:

- (a) When pressure of 0.1Mpa or less has been established causing uncontrolled drifting down of the electrode.
- (b) When the squeeze time is set too short and the electrode completes the weld circuit under load.

(4) Magnetic field effect

The resistance welding machine generates high magnetic field around the secondary circuit when energized. This magnetic field has an influence on operation of certain type of sensors, watch, and magnetic cards. For the same reason, a person who uses a heart pace maker is prohibited from coming up to the resistance welding machine during operation.

(5) Equipment fall down prevention

Equipment may fall down depending on models when an earthquake occurred. Perform installation work of the equipment according to the instruction manual.

(6) Safety information of peripheral devices

Information about possibilities of danger of peripheral devices of this equipment such as conveyors, feeders, robots should also be provided to workers.

(7) To use within maximum input and allowable duty factor

The welding transformer has rated input, maximum input, allowable duty factor, and so forth. This is the heat capacity of welding transformer prescribed under the cooling conditions (temperature and quantity of water). This specification indicates the upper limit of operation of the welding transformer. In excess of this limit, the welding transformer may be overheated or burnt in some cases. Since the heat capacity of welding transformer is based predicated on being cooled, the welding transformer may be overheated under normal operation or burnt in some cases if the cooling condition is insufficient.

The welding machine and welding transformer should be used within prescribed maximum input and allowable duty factor without fail. (For details, refer to the REFERENCE “Maximum Input of Welding Transformer, allowable duty factor”.)

⊙ Reference 1: Maximum input and allowable duty factor of welding transformers

Rated input P_{50} , maximum input P_{max} , allowable duty factor α_{max} , etc. are prescribed for welding transformers.

Rated input P_{50} indicates the input kVA of the welding machine when the duty factor is assumed to be 50%.

The heat capacity of a welding transformer can be indicated with the following formula, using the input and duty factor.

$$\text{Heat capacity} = P_{50} \times (0.5)^{1/2}$$

The heat capacity is constant, regardless of how the transformer is to be used. Since the heat capacity will be the same even when the transformer is used with maximum input P_{max} , it follows that the duty factor will be restricted by a certain value, and this value will be called the "allowable duty factor" α_{max} . That is, they will have the following relationship.

$$P_{50} \times (0.5)^{1/2} = P_{max} \times (\alpha_{max})^{1/2}$$

In other words, the duty factor will have to be reduced when the welding machine or welding transformer is to be used with a large input kVA, and when using it with the duty factor increased, it will exceed the heat capacity of the welding transformer unless the input kVA is lowered. This can easily be examined, if you apply values to above-mentioned formula.

© Reference 2: Equivalent continuous current (continuous secondary current) of welding machines

Welding current and duty factor are prescribed for welding transformers. Calculating the following formula with these values will give you the equivalent continuous current (continuous secondary current).

$$I_{2p} = \text{Equivalent continuous current} = \text{Welding current} \times \sqrt{\text{duty factor}} \quad (\text{A})$$

This is the maximum continuous current that this transformer can allow to flow.

Example 1 : calculation formula of the equivalent continuous current that uses the specification

When the welding current is 11,000 A, and the duty factor is 10% :

$$\text{Equivalent continuous current} = 11,000 \times \sqrt{0.1} = 3,470 \text{ A}$$

Example 2 : calculation formula of the equivalent continuous current from the welding condition

In the case of applying electrical current three times :

$$I_{2p} = \sqrt{\frac{I_1^2 \times \text{WT}_1 + I_2^2 \times \text{WT}_2 + I_3^2 \times \text{WT}_3}{\text{Production Cycle time (sec.)} \times \text{frequency (Hz)}}} \quad (\text{A})$$

If a transformer is to be used in excess of this equivalent continuous current, generation of heat by this transformer will cause damages and other accidents.

I_1 : First current to be applied (A)

I_2 : Second current to be applied (A)

I_3 : Third current to be applied (A)

WT_1 : Period of time of the first current to be applied (cycle)

WT_2 : Period of time of the second current to be applied (cycle)

WT_3 : Period of time of the third current to be applied (cycle)

2. WARRANTY and REPAIR-AVAILABLE PERIOD

2 - 1. Warranty

(1) Warranty Period

① Product for Japanese market

The warranty period shall be one (1) year from the date of the acceptance inspection of the Product or within 2,000 hours after commencement of operation of the Product, whichever comes first.

② Export Product

In the case where a specification sheet have an agreement on the warranty period, that period shall be applied. In the case where a specification sheet have no agreement on the warranty period, the period shall be one (1) year after the acceptance inspection of the Product, or within 2,000 hours after the commencement of operation, or for a period of fifteen months as from the date of the last shipment of the Product, whichever comes first.

In addition, for a repaired part of the Product, warranty services shall be available for six (6) months since the implementation of such repair, however, the warranty period or the repair-available period for the entire Product shall not be extended.

(2) Warranty Conditions (applied to Product for Japanese market, Export Product)

In the event of any failure that is obviously attributed to the Company during proper operation of the Product as provided in the instruction manual during the warranty period as specified above, the Company shall repair the Product at no cost. Provided that, even within the warranty period, this warranty shall not apply in cases such as the ones specified below:

- ① Any defect or damage due to improper handling, operating, storing, and environment in your premises;
- ② In the cases where the Product has been disassembled, modified, repaired by any company other than the Company or those designated by the Company;
- ③ Any defect due to use of parts other than genuine parts of the Company;
- ④ In the case where the Customer failed to do maintenance as provided in the instruction manual and replace consumable parts;
- ⑤ Any failure or damage caused by dropping, etc. at the time of installation or transfer;
- ⑥ Any failure or damage caused by natural disasters (fire, lightning, earthquake, flood or the like) and abnormal voltage.
- ⑦ Any damage or loss caused by a failure of the Product;
- ⑧ In the case where the person requesting the repair is not the first end-user;
- ⑨ The following consumable parts,

The consumable parts mean those which shall have been worn out and not worked properly by using the Product. Those parts need to be changed periodically.

(For example: Electrode tip, Wheel electrode, guide pin, shunts, Bite cutter, Vinyl tube, Capacitor bank) Including consumable parts listed in Parts list of Instruction manual.

2 - 2. Repair-Available period

- (1) Repair-available period shall mean a period during which the Product can be repaired by using spare parts even after expiration of the warranty period. The period shall be ten (10) years from the acceptance inspection as a standard, but the actual period might vary slightly.
- (2) In the case where the repair period has expired, the request of repair might not be acceptable.
- (3) In the case where a person requesting the repair is not the first end-user and the distribution channel could not be identified, repair service might not be acceptable.
- (4) In the case where the spare parts are out of inventory, the repair period might be longer due to taking time to obtain the repair parts.
- (5) In the case where the spare parts are unavailable, the Product might be repaired by the replacement parts having performance equivalent to the original ones. In such case, the repair period might be longer due to the performance evaluation of the replacement parts and other such procedures. Please note that we would not be able to provide repair services in the case where there are no replacement parts.

3. Overview

3 - 1. Overview of Hand held weld scope

Hand held weld scope 'WS-100' is a device that measures welding current and time of resistance welding machine.

WS-100 displays measurement data on LCD by numeric or waveform, and stores last 10,000 weld points of current and time in its built in memory.

2 types of sensitivity option current sensor helps wide range measurement.

WS-100 able to measure electrode pressure by using optional pressure sensor.

USB interface of WS-100 transfers measurement data to the PC.※

※ note: PC needs to be installed original software (WDM: Weld Data Manager). Please refer to the separate instruction manual "OPI-0002" for WDM.

■ WS-100 Includes following items

- ① toroidal coil(1B4S3UL: 1-fold sensitivity)
- ② battery
- ③ AC adapter
- ④ Instruction manual of WS-100
- ⑤ CD (includes WDM software and its Instruction manual OPI-0002)
- ⑥ USB cable

4. Specification

4 - 1. Hand held weld scope WS-100 specification

No.	Item	Specification
1	Name	Hand held weld scope
2	Model	WS-100
3	Size	W160×D87×H33(mm)
4	Mass	260g (body only) 450g (Including battery, case cover)
5	Language	English
6	Battery type	Four set of Ni-MH battery (AA size) (recommended, Initial accessories) Four set of 1.5V alkaline batteries for only temporary use. (Please do not use AC adapter while alkaline battery in use)
7	Charge unit	AC adapter (USB is not available) Input : AC100~240V 50/60Hz Output : DC9V 1.3A
8	Charging time	Approximately 3.5 hours ※ Charging time may change by charging status and the ambient environment.
9	Continuous operation time	Approximately 8 hours (Ni-MH battery fully charged) ※ when the backlight is OFF

No.	Item	Specification
10	Ambient temperature	0~40[°C] under charging : 5~30[°C]
11	Humidity	90% or less, no dew drop
12	Measuring resistance welder type	Single phase AC, single-phase rectifier, three-phase rectifier, MFDC Note) Maximum no load secondary voltage is 33V rms or less for operator safety.
13	Frequency	50/60Hz *Note Initial setting value is 50Hz, please be sure to set frequency of user region (see 7.7 of this manual)
14	Current sensor type	ISO type :150mV/1000A ※Option 10 times of sensitivity, 1/2 times of sensitivity manual sensor voltage setting is also available
15	Measurement current ranges	AC : 0.60~6.00(kA),2.5~25.0(kA), 5.0~50.0(kA) DC : 1.00~10.00(kA),2.5~25.0(kA),5.0~50.0(kA)
16	Measuring time range	0.5~99[cyc]
17	Measurement accuracy	± 2% F.S.
18	Phase range	30 – 180[°]
19	Maximum storage data	Average RMS current and time : 10,000 weld points RMS current of each cycle : 50 weld points Waveform : 3 weld points
20	PC communication interface	USB Type B (PC connection cable is TypeB-TypeA)
21	Pressure meter range (with option pressure sensor)	0.5 - 10.0[kN]

4 - 2. Equipment appearance and name of each part

(1) Equipment appearance

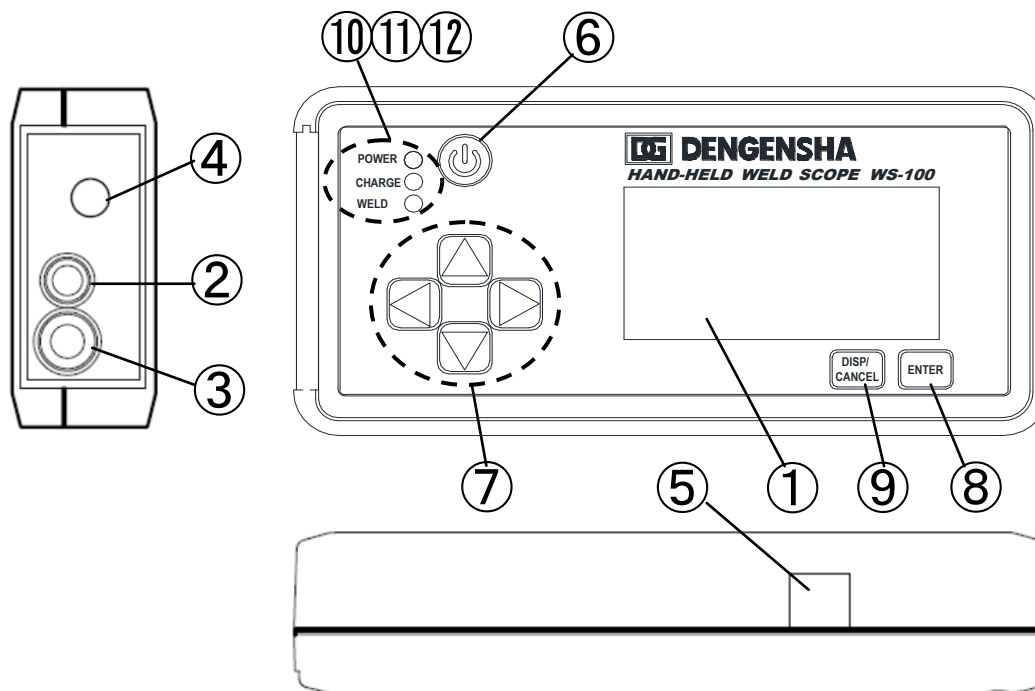


Fig. 1 Equipment appearance

- ① Liquid crystal display (LCD) with LED backlight
- ② Connector for current sensor (toroidal coil)
- ③ Connector for pressure sensor.
- ④ Connector for AC adapter.
- ⑤ USB connector.
- ⑥ POWER button
For power ON and OFF. Please keep pushing for power off (approximately 1.5 second)
- ⑦ Four set of Arrow buttons
For moving cursor, increasing and decreasing setting value on LCD display.
- ⑧ ENTER button
For deciding selected item and changing value on LCD display.
- ⑨ DISP/CANCEL button
For changing display item (total 4 display items).
- ⑩ POWER Lamp (Green)

⚠ Danger

When performing maintenance work inside the body, please turn off power and confirm "POWER" lamp off.

- ⑪ CHARGE lamp (Red)
Under normal charging. : Blinking slowly.
Under abnormal charging. : Blinking fast.
Charge complete or unable to charge: Turn off
- ⑫ WELD lamp (Blue)
For indicating under welding.

5. Connection

5 - 1. Current sensor (toroidal coil)

Please connect current sensor to the connector of WS-100, and wind toroidal coil to welding circuit. Two ends of toroidal coil should be fit and tie up and be positioned outside of weld circuit as depicted in Figure 2 for correct measuring.

The sensitivity of two ends of toroidal coil is lower than the central part, so position between end and welding circuit may cause measurement error.

! Mandatory action
In performing the connection work, please shut off the welding power source.

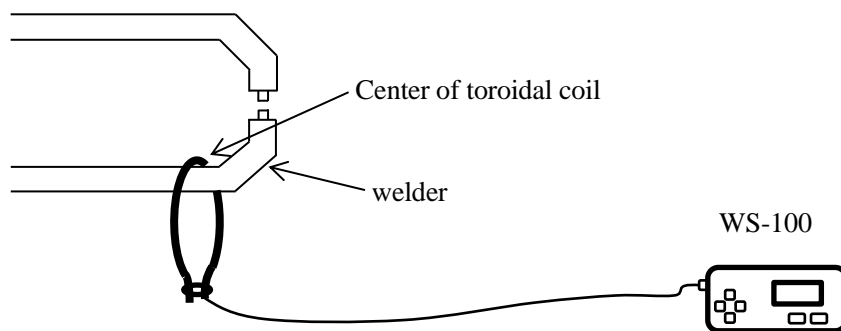


Fig. 2 Mounting of the toroidal coil

! Caution
(1) Read the instruction manual of resistance welding machine to measure, please work with care safely.
(2) When you install the toroidal coil, confirm that the welder's power supply is turn off to prevent accidents such as electric shock or pinching hands between electrode.

! Danger
In order to avoid electrical shock Use only welding circuit that no load voltage is 33V rms or less.

6. LCD display

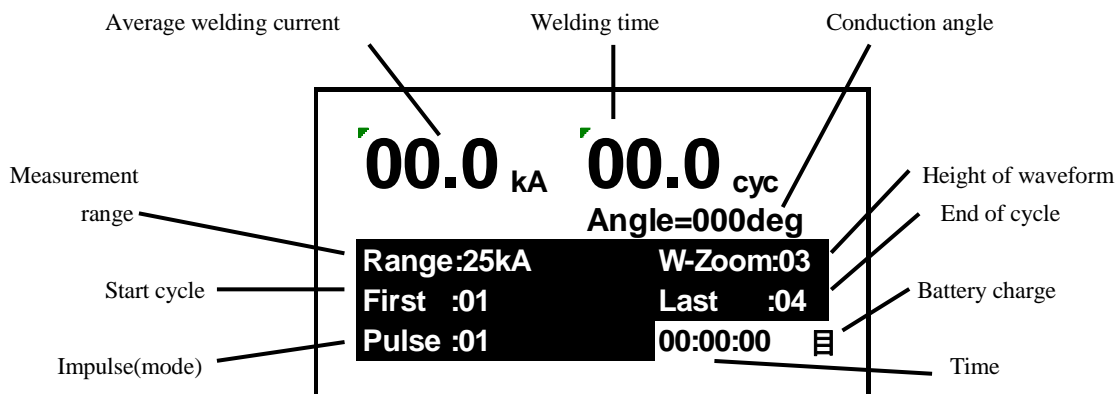
6 - 1. Four display items

By pushing DISP/CANCEL button, display item changes from "numeric screen (main screen)" to "graphic screen" to "History screen" to "system screen" to "numeric screen".

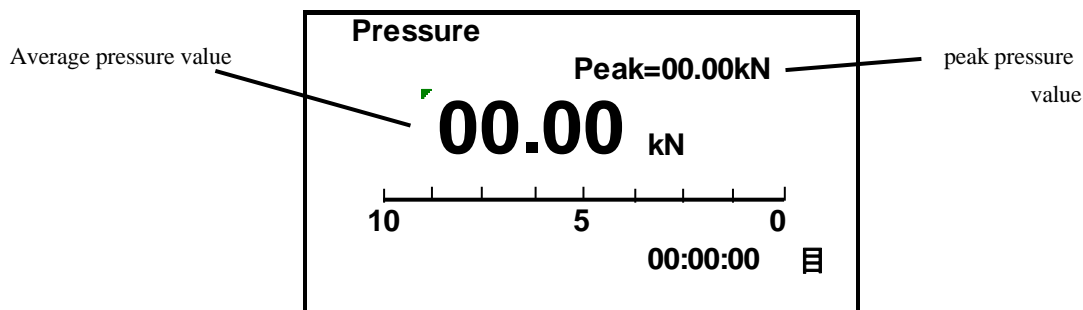
When WS-100 is in pressure measurement mode (setting item [Detect] is [Press]), item of graphic and history does not appear.

(1) Numeric screen (main screen)

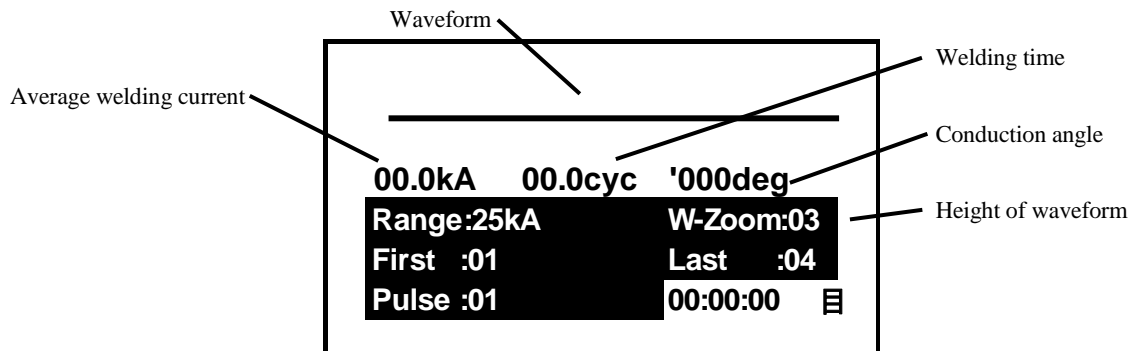
① Current measurement mode



② Pressure measurement mode



(2) Graphic screen (this screen does not appear in pressure measurement mode)



(3) History screen (this screen does not appear in pressure measurement mode)

COUNT	CURNT	CYCL	AGL	
00000	00.00	00.0	000	
00001	00.00	00.0	000	
00002	00.00	00.0	000	

(4) System screen (condition setting)

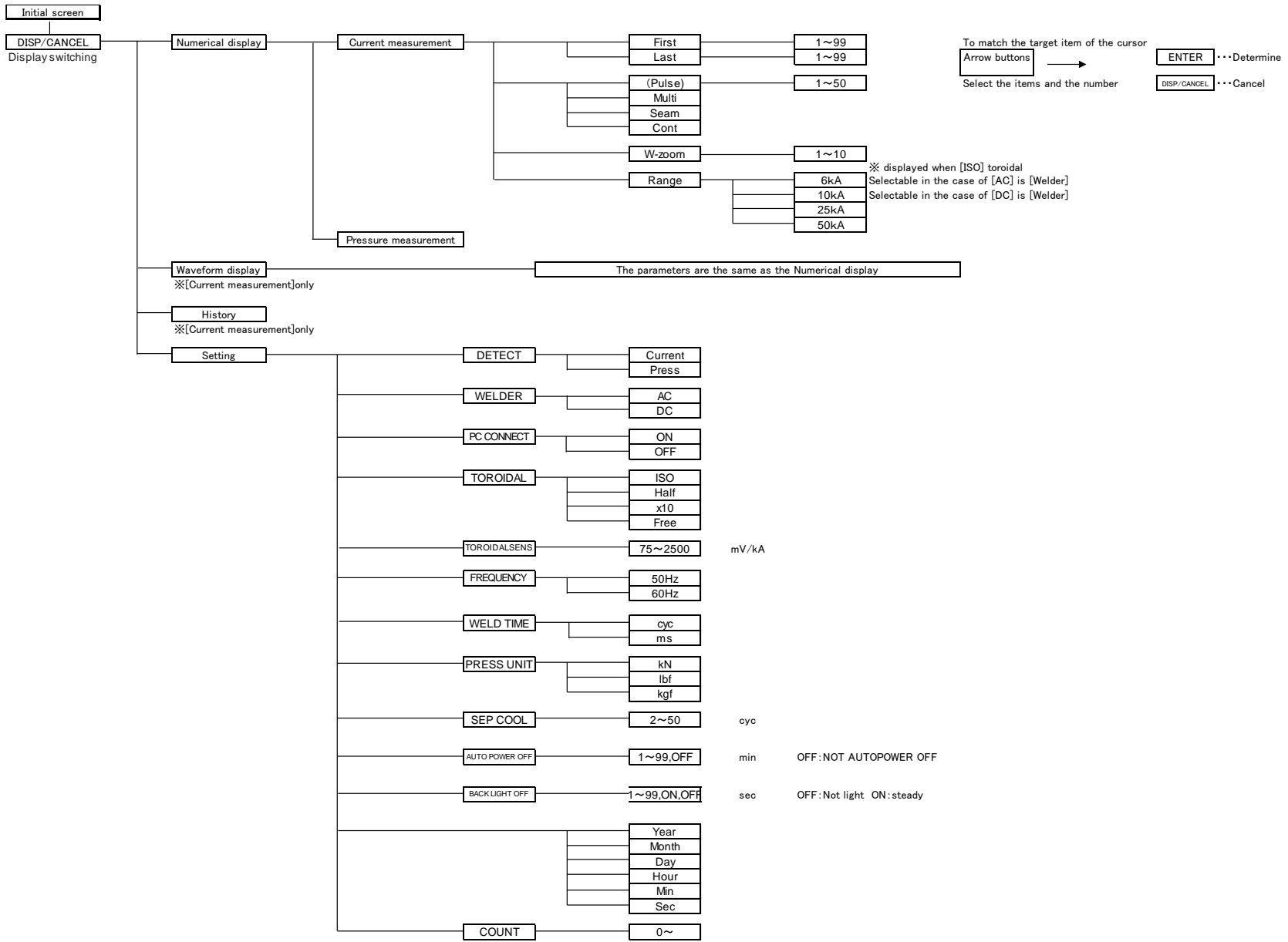
Detect	:Current	
Welder	:AC	
PC Connect	:ON	
Toroidal	:ISO	
ToroidalSens	:0150mV/kA	
Frequency	:50Hz	

↓ scroll by arrow button

Press unit	:kN	
Sep cool	:30cyc	
AutoPowerOff	:10min	
BackLightOff	:10sec	
2000/01/01 00:00:00		

7. Operation





7-1. Operation tree







7 - 2. Numerical screen (main screen)

This main screen appears at power on.

Displayed setting items are able to change by

Pointing cursor to the item by pushing     button and

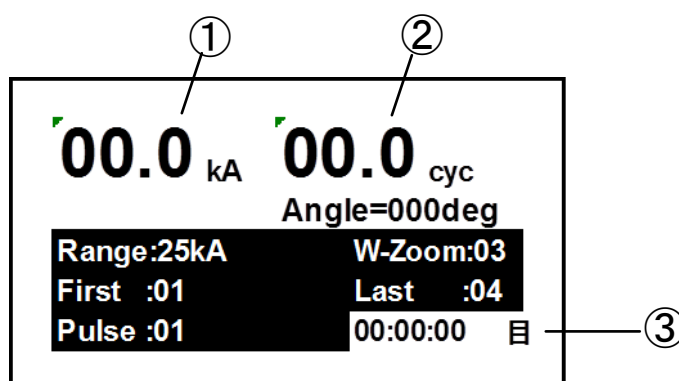
Pushing  button and

Selecting menu or value by pushing     button and

Pushing  button.

7 - 3. Numeric screen in current measurement mode

When WS-100 is current measurement mode (setting item [Detect] is [Current]), LCD displays following items.



■ Display items

- ① Average welding current (rms)
- ② Welding time (cyc and ms are available)
- ③ Conduction angle

■ Setting items

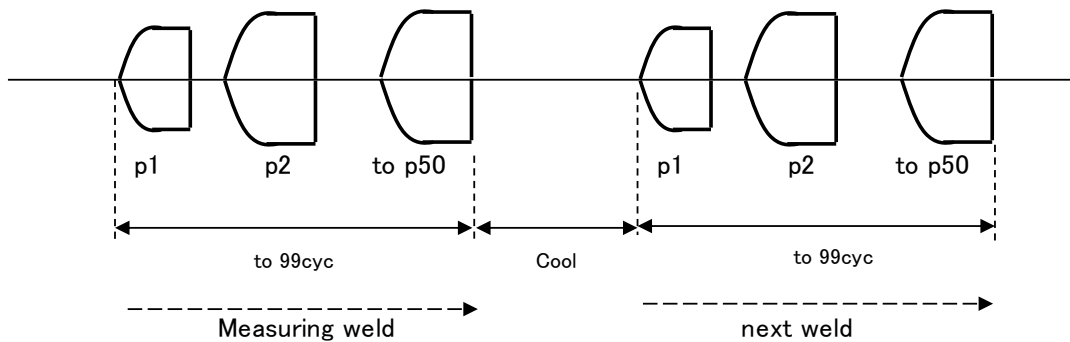
- Range Upper limit of measurement current.
Following four value is selectable when current sensor type is ISO.
(system screen item [Toroidal] is [ISO])
 - 6kA available when welder type is AC (system screen item [Welder] is [AC])
 - 10kA available when welder type is DC (system screen item [Welder] is [DC])
 - 25kA
 - 50kA
 - When sensor type is not ISO, these value changes automatically for fitting sensor.
 - over-range error is displayed when measurement current exceeds this value.
 - Measurement accuracy may degrade when selecting range is too large. Please select requisite minimum value.
- W-Zoom Zoom level of current waveform height in graphic screen.[1~10]
- First WS-100 starts calculating average welding current from this setting cycle. (1~99cyc)
- Last WS-100 completes calculating average welding current at this setting cycle.(1~99cyc:this value should be larger than the value of the First)
- Pulse This area displays measurement mode.

(1) Measurement mode (Detail of mode)

There are four measurement mode.

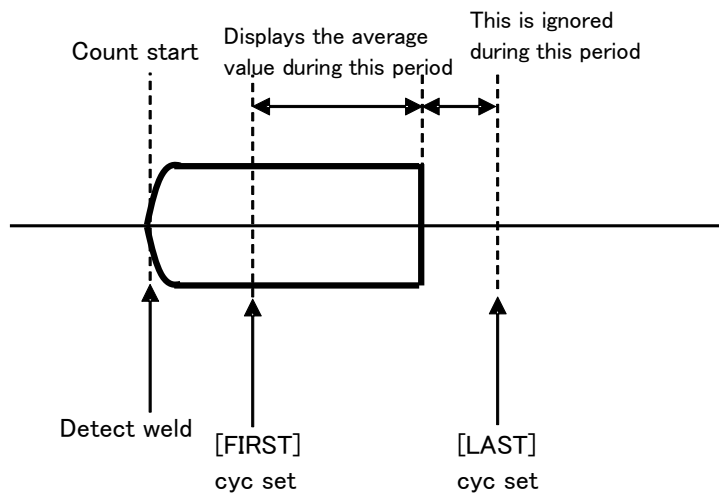
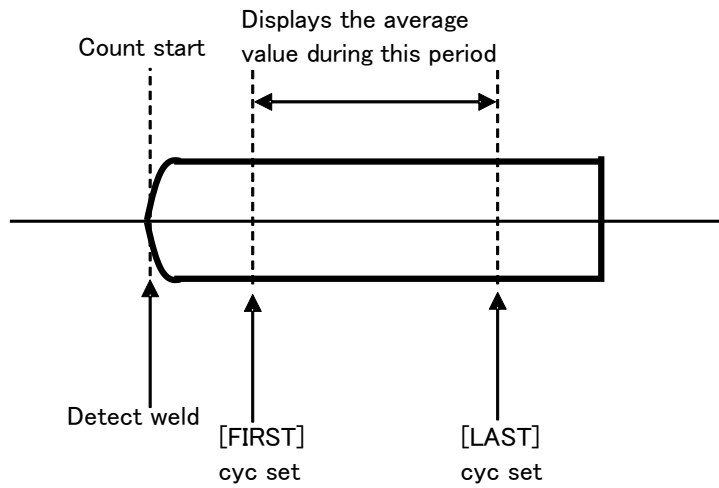
- Pulse mode [Pulse]
- Multi mode : [Multi]
- Seam mode : [Seam]
- Continuous mode : [Cont]

(a) Pulse mode

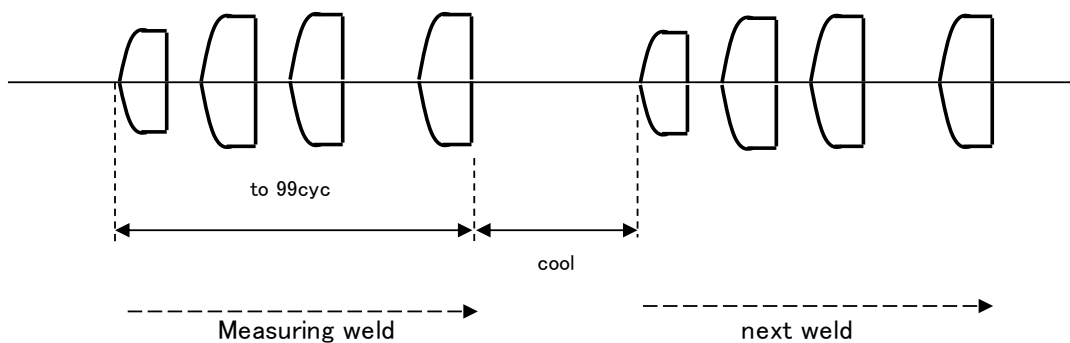


- Maximum measurement time is 99 cycles including pulse and cool time, and up to 50 pulses are available as one weld.
- When measured cool time is longer than [Sep cool]setting, next pulse is considered as next weld.
When measured cool time is shorter than [Sep cool]setting, next pulse is considered as present weld.
- Only welding time of specified pulse [p1 ~ p50] is displayed and storage as welding time. (display item ②)
In case of measuring one pulse weld, please set [p1].
In case of measuring pulsation welding, please specify target pulse number to be displayed and storage.
- Setting of [First] &[Last]
Only average welding current of specified pulse [p1 ~ p50] is displayed as average welding current. (display item ①)
WS-100 also starts calculating average welding current from [First] setting cycle of specified pulse.
And also completes calculating average welding current at [Last] setting cycle of specified pulse.
When pulse finishes before [Last] setting cycle, WS-100 completes calculating average welding current at that time.

After measurement, it is possible to display average weld current and time of another pulse by changing setting of [Pulse],[First] and [Last] while measurement data is stored in memory.



(b) Multi mode



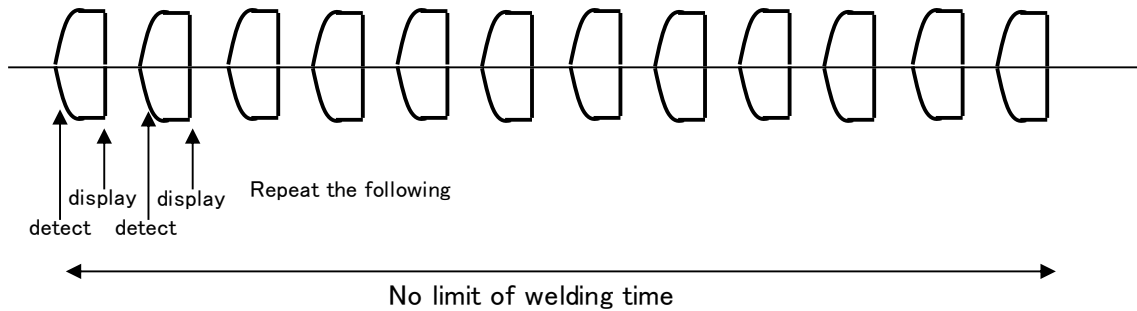
- Maximum measurement time is 99 cycles including pulse and cool time, and any number of pulse is available as one weld.
- When measured cool time is longer than [Sep cool]setting, next pulse is considered as next weld.

- Total time of all pulse and all cool including [Sep cool] setting is displayed and storage as welding time. (display item ②)
- WS-100 also starts calculating average welding current from [First] setting cycle and also completes calculating average welding current at [Last] setting cycle.
- Average welding current data (display item ① and storage data) includes all pulse current between [First] setting and [Last] setting cycle. Average welding current data excludes cool or no current. [Last] setting should include all cycle of pulse and cool.
- After measurement, it is possible to display average weld current of another period by changing setting of [First] and [Last] while measurement data is stored in memory.

※ In general, pulse mode is popular than multi mode.

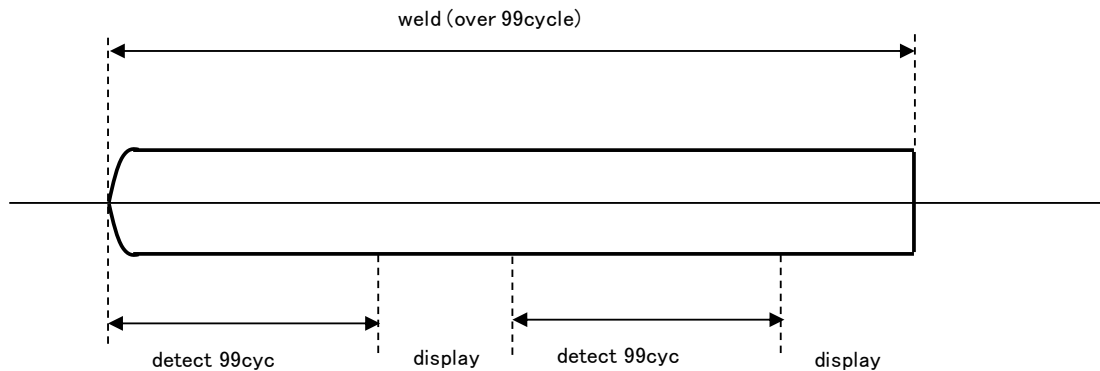
Multi mode is a choice when repeatability of long term average weld current looks more important than the average weld current of specified one pulse.

(c) Seam mode



- Seam mode repeats measurement, display and storage every pulse.
- It is necessary more than 3 cycle of cool time to measure, display and storage every pulse. When cool time is 2 cycles or less, next pulse may be ignored
- WS-100 starts calculating average welding current from detected first cycle and completes calculating average welding current at detected last cycle of each pulse.

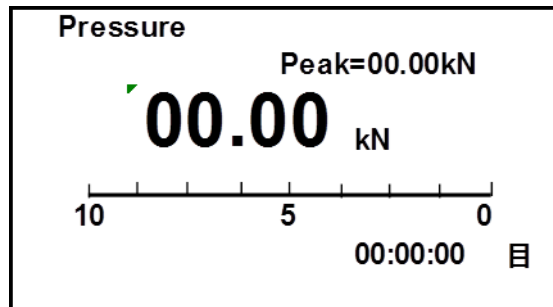
(d) Continuous mode



- Continuous mode repeats measurement, display and storage every 99 cycle. After measuring 99 cycle, 3cycle is ignored and then start next measuring.

7 - 4. Numerical screen in pressure measurement mode

Numerical screen (main screen) changes to pressure measurement screen when system screen setting of [Detect] is [Press].



■ Display items

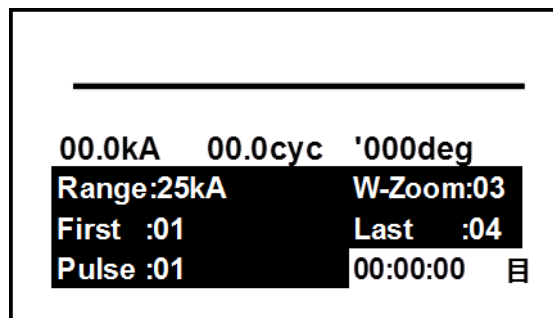
- pressure actual pressure value
- pressure(peak) peak pressure value of last measurement.

Unit of [kgf] , [lbf] and [kN] are available in system screen setting item [Press unit].

7 - 5. Graphic screen in current measurement mode

This screen displays measurement data as waveform.

The settings are same as numerical screen.





7 - 6. History screen

This screen displays list of storage data (current, time, conduction angle).





COUNT	CURNT	CYCL	AGL	
00000	00.00	00.0	000	
00001	00.00	00.0	000	
00002	00.00	00.0	000	

Maximum count means latest data.


This screen able to scroll by using   arrow buttons.


7 - 7. System screen

Displayed setting items are able to change by

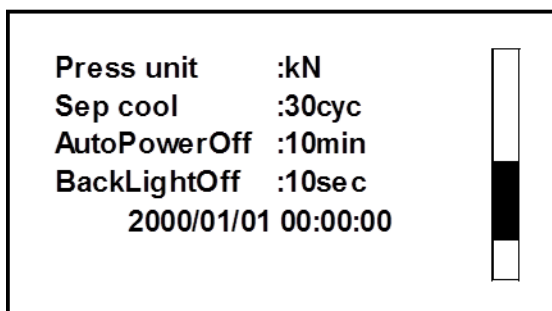
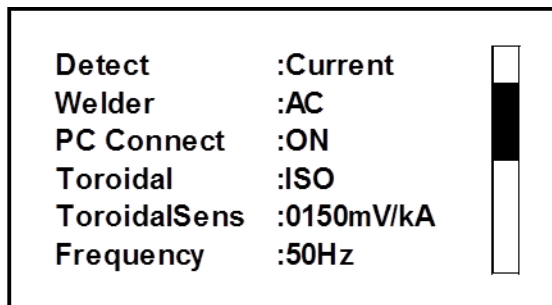
Pointing cursor to the item by pushing     button and

Pushing  button and

Selecting menu or value by pushing     button and

Pushing  button to abort alternation and

Pushing  button to alter.



(1) Setting items

- Detect selection of measurement mode
 - Current : current measurement mode
 - Press : Pressure measurement mode

- Welder selection of weld machine type
 - AC : AC welder, AC-Inverter welder
 - DC : MFDC welder, Three-phase rectifier welder, single-phase rectifier welder

- PC Connect PC communication mode
 - OFF : disconnection mode (do not communicate)
 - ON : connection mode (attempt to communicate)

- Toroidal selection of (Sensitivity) toroidal coil
 - ISO : ISO standard toroidal coil when using (150mV/1kA)
 - Half : The coil when using 1/2 sensitivity (relative to ISO)
 - X10 : The coil when using 10x sensitivity (relative to ISO)
 - Free : Available to set numeric sensitivity value by “ToroidalSens”

-
- ToroidalSens value of toroidal coil sensitivity. This value is available only
 "Troidal" setting is "Free"
 Unit (mV/kA)

 - Frequency selection of power supply frequency.
 50Hz / 60Hz
 *Note Initial setting value is 50Hz, please be sure to set frequency of user region

 - Weld time selection of time unit of welding time
 cyc / ms

 - Press unit selection of pressure unit
 kN / lbf / kgf

 - Sep cool value of cool time to determine one weld end, and next pulse
 considered as next weld 2~50
 Please see 7.3 (a) and (b) of this manual

 - AutoPowerOff auto power off time, in status of without welding current and
 pushing button operation.
 1~99min,
 OFF: manual power off only

 - BackLightOff LCD backlight illumination time from pushing any button
 1~99sec OFF : Not light
 ON : steady
 *Note longer backlight time decreases WS-100 continuous operation time

 - (Time) calendar settings year: month: day: hours: minutes: seconds
 Battery and another sub battery backup calendar.
 Please set calendar data again if lost.

 - Count Number of storage data.

8. Cable connection

8 - 1. Connection of each cable

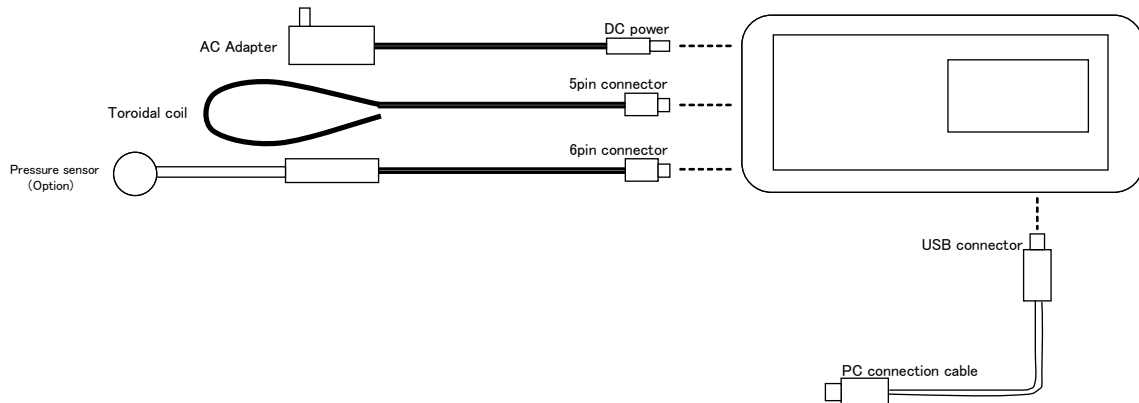


Fig. 3 Connection of each cable

■ Toroidal coil

5-pin connector.

Connection: Align the cut-outs, and insert fully to the end (lock).

Disconnection: Pull the connector (unlock).

※ Please do not pull on the cable section.

Please perform a sensitivity setting (see 7.7 of this manual)

Specification and production code

ISO standard toroidal coil (150mV/1kA) : 1B4S3UL

10x sensitivity (option) : 10B4S3UL

1/2 sensitivity (option) : 1/2B4S3UL

■ Pressure sensor (option)

6-pin connector.

Connection: Align the cut-outs, and insert fully to the end (lock).

Disconnection: Pull the connector (unlock).

※ Please do not pull on the cable section.

Specification and product code

Pressure sensor body + Cable : F10kN-DG**

** is Cable length, standard is 15 (1.5m)

■ AC adapter

DC power connector.

Connection: insert fully to the end. Battery starts charging.

Disconnection: Pull the connector.

Please do not connect the AC adapter other than the supplied with WS-100.

Mandatory action

Use only the AC adapter supplied with WS-100.

■ USB cable

USB interface of WS-100 transfers measurement data to the PC.※

※ note: PC needs to be installed software (WDM).

Please refer to the separate instruction manual "OPI-0002" for WDM.


9. Battery

9 - 1. Mounting battery

AA nickel-metal hydride battery × 4

Open the back cover of the body, and put the battery as shown in Figure the battery box.

Please put it correctly according to the polarity that is displayed in the battery box.

 Mandatory action
Battery polarity direction should be Fig.4.

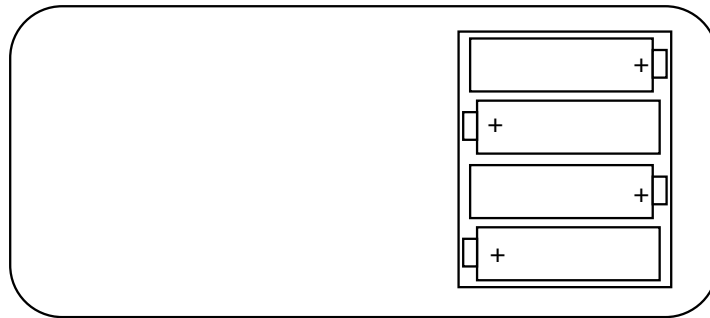


Fig. 4 Built-in battery polarity direction

9 - 2. Battery charging instructions

- ① The built-in battery properly Be sure to note the polarity, and close the back cover, Check ([POWER] lamp is off.
- ② Connect DC power connector to WS-100, and connect AC adapter to AC plug.
Battery charging will start.
Temperature range of under charge : 5 °C ~ 30 °C
Please keep temperature rage when battery charging.
Over range temperature may cause abnormal charging.
- ③ CHARGE lamp (Red)
Under normal charging. : Blinking slowly (once per second).
Under abnormal charging. : Blinking fast.(4 times per second)
Charge complete or unable to charge: Turn off
When abnormal charging or unable to charge happens,
Please stop charging.
Please confirm temperature, and battery polarity direction.

-
- ④ [CHARGE] lamp turns off when charging is complete.
In case of empty battery charging, it takes approximately 3.5 hours.
Charging time may change by charging status and the ambient environment
 - ⑤ Please disconnect AC adapter from plug, and please disconnect DC power connector.

9 - 3. Notes

Please perform the battery of the same charge level.
Different level battery may cause overcharge and heat.

When repeat charging again, temperature protection may work. In that case stop charging and wait a while.


During charging, AC adapter, battery, body becomes warm, but this is not a malfunction.
However, if you notice a smell, such as abnormal heating, disconnect AC plug and DC power connector soon.

Please do not measure under charging.
After charging, please disconnect AC adapter from plug, and please disconnect DC power connector.

Battery rechargeable time is approximately 500 times (it depends on the condition of use)
And continuous operating time will decrease even if normal charging is done,
Please replace all of four battery before continuous operation time become short.
Please do not mix old and new battery.
Recommended battery is the same type of the specification. (see 4.1)

9 - 4. Use of other type battery

Recommended battery is the same type of the specification. (see 4.1)
1.5V alkaline battery is only for a temporary use.
Do not connect AC adaptor while alkaline battery is in use.
Do not use Ni-Cd battery

 Prohibition
Do not use Ni-Cd battery. Do not connect AC adapter while alkaline battery is in use.

9 - 5. Long term storage

WS-100 consumes battery slightly even in the power OFF state.

In case of long term storage, please remove battery to avoid over-discharge.

(1) Calendar data backup period

With battery: approximately half a year

(Data backup period may change shorter due to battery state of charge.)

Without battery (only sub battery): approximately 2 days

※ Please set calendar data again if lost.

10. Maintenance

10 - 1. Instructions in case of maintenance

- Please be sure to check that the power is turned off.
- Please do not use parts other than specified replacement parts.

11. Parts List

11 - 1. Consumable parts

Parts Name	Q'ty	MFG	Remarks
Ni-MH battery	4	(Panasonic)	AA size

11 - 2. Other parts and options

Parts Name	Parts Number	Q'ty	MFG	Remarks
Toroidal coil	1B4S3UL	1	DG	1 -fold sensitivity
	10B4S3UL	1	DG	10× sensitivity
	1/2B4S3UL	1	DG	1/2 × fold sensitivity
Pressure sensor + cable	F10kN-DG**	1	DG	The cable length ** Standard 15 (1.5m)
AC adapter	UN1110-0913	1	DG	
USB Cable	-	1		



Memo





Memo





Memo



Head Office & Plant	1-23-1 Masugata, Tama-ku, Kawasaki-shi, Kanagawa-ken, Japan	Tel: +81(44)922-1121
Toyama Plant	2-27-2 Ariso, Imizu-shi, Toyama-ken, Japan	Tel: +81(766)86-3113
Aichi Office	2-151-3 Onda-cho, Kariya-shi, Aichi-ken, Japan	Tel: +81(566)63-5318
Kita-Kanto Office	216 Iida-cho, Ohta-shi, Gunma-ken, Japan	Tel: +81(276)46-6621
Osaka Office	1-9-16 Yamabiko-Bldg. Oyodo-Minami, Kita-ku, Osaka-shi, Osaka-hu, Japan	Tel: +81(6)6451-0521
Hiroshima Office	15-10 Central-Bldg. Hachobori, Naka-ku, Hiroshima-shi, Hiroshima-ken, Japan	Tel: +81(82)225-2573
Kyusyu Office	1-9-1 Katanoshinmachi, Kokurakita-ku, Kitakyusyu-shi, Fukuoka-ken, Japan	Tel: +81(93)922-4442
Dengensha America	7647 First Place Drive Bedford, Ohio 44146, USA	Tel: +1(440)439-8081
Dengensha Mexico Office	Paseo del Moral #206 Int. 4 Col. Jardine del Moral, Leon G to C.P. 37160 MEXICO	Tel: +52(477)717-8827
Dengensha Europe	Unit 8, Birchbrook Industrial Park Birchbrook Lane, Shenstone, Staffs WS14 0DJ, ENGLAND	Tel: +44-1543-481844
