RESISTANCE WELDING CONTROLLER

＊W-TC-ND

(PH5-9040-＊W)

INSTRUCTION MANUAL

NADEX

ー ー ー ー ー Important ー ー ー ー ー

Read first this manual before operate this controller. In some case, failure to follow the instructions manual can lead to control or machine damage. In other cases failure to follow instructions can lead to injury, or death of personnel.

This manual explains some instructions depends on the level of danger as follows.

⚠ DANGER It shows readers where people will be hurt if procedures are not followed properly.

⚠ WARNING It shows readers where people may be hurt if procedures are not followed properly.

⚠ CAUTION It shows readers where machinery may be damaged or economic loss can occur, or people may be hurt if procedures are not followed properly.

RISK OF ELECTRIC SHOCK

It shows readers where people will be struck by an electric shock if procedures are not followed properly.

READ FIRST

To use this controller in safety, the operator should follow industry standards and safety senses whenever working on, or near the weld machine.

In some case, failure to follow the warning instructions can lead to control or machine damage. In other cases failure to follow these instructions can lead to injury, or death of personnel.

Some examples of safe practices are listed below. These examples are not to be considered a comprehensive listing of safety practices. Always use safety senses when working with any type of machinery.

⚠ DANGER

1. This controller is charged with hazardous voltage electricity. Turn electrical power OFF before open the door and confirm discharging large capacitors if the door is opened. In the case the door is opened as it is not turn OFF can lead to injury by an electric shock, or death of personnel.
2. In the case of inverter welding controller

   This controller is installed capacitors, and hazardous voltage staying there even if electrical power OFF. Turn electrical power OFF first, and ensure discharge the power supply capacitors before working on any electrical circuit. In some case, failure to follow this instruction can lead to injury, or death of personnel.

   Ensure discharging:

   1. In the case of "DISCHARGE SWITCH" is installed

      Ensure the "Charge" lamp went off completely with keep on pushing "DISCHARGE SWITCH".

   2. In the case of "DISCHARGE SWITCH" is not installed

      It will be started discharging automatically if turn electrical power OFF, so ensure the "Charge" lamp went off completely.

⚠WARNING

In some case failure to follow these instructions as follows can lead to control damage or injury of personnel.

1. Ensure that control/machine is connected to the correct voltage before turning electrical power ON.
2. Whenever power is ON, stand clear of moving parts. This practice should be used even if the machine is not actually in use.
3. Before turning electrical power OFF, ensure that personnel are standing clear of moving parts that are pneumatic or hydraulic powered.
4. Whenever electrical power is turned OFF, install a "lock-out" device at the main disconnect to prevent power from being accidentally turned ON.
5. **The cautions at the time of a breaker trip (only inverter welding controller)**

   When a breaker trip occurs, check the following items.

   (a) Internal leak of the welding transformer

   (b) Ground accident by wear and tear of the primary cable

   (c) Secondary diode break of the welding transformer

   (d) Short circuit of the primary cable

   Welding controller may be damaged when the above-mentioned item corresponds. In this case, both the timer unit and the transistor in contactor will be damaged.

   So, do not use the timer unit and contactor that had the breaker trip and ask to repair those to manufacture.

⚠CAUTION

1. Turn electrical power OFF before changing the tap switch at the weld transformer.

   In the case failure to follow the instruction like a welding at changing the tap switch can lead to injury to personnel.
2. Turn stop cock OFF before some piping work.

   In the case failure to follow the instruction like the electrical circuit is splashed with cooling water can lead to control damage.

⚠CAUTION MEMORY DATA ERROR

This controller preserves the setting data in the flash memory (nonvolatile memory). Time of a few seconds is necessary for writing data in the flash memory because of the characteristic of the device. Therefore, if you drop the power supply in a few seconds after the data is set to the timer, the writing operation in the flash memory is not completed and data will be broken. In this case, it is usually no problem because the not written data is held by SRAM(volatile memory). But if the voltage of a super-capacitor decreases, the data of SRAM will disappear and timer detects MEMORY DATA ERROR.

Data can be held about two weeks even if it is the lowest when a super-capacitor is charged full.

But if there is long time without any power supply, it is necessary to turn on the power supply to the timer for one hour or more for a full charge. Therefore, please notice following items.

1. **Never turn off the power supply FOR 15 SECONDS or more after the data setting to the timer.**
2. **Please turn on the power supply FOR ONE HOUR or more when you begin to use this controller after the long power OFF state.**
3. **If timer detects MEMORY DATA ERROR by any chance,**
   please INITIALIZE the data and set all data again.

⚠CAUTION LEARNED DATA ERROR, MONITOR DATA ERROR

The monitor data such as the stepper count, the learning data (only the CHC model) and the current (etc.) are preserved in SRAM which is backuped by super-capacitor.

Therefore, if timer is left with no power supply for long time(more than 2 weeks), this controller might detect LEARNED DATA ERROR or MONITOR DATA ERROR because the voltage of a super-capacitor has decreased and the data of SRAM will be broken. When timer detected these errors, please execute the following operation because the monitor value of step count and step number is broken.

But, this fault does not affect the setting data because set data is preserved in the flash memory.

When timer detected LEARNED DATA ERROR or MONITOR DATA ERROR,
please CHANGE the ELECTRODE or DRESS it, and RESET the STEPPER.

⚠CAUTION DISPOSAL, RECYCLING

1. Disposal

Please consign the welding controller to the wastes treatment facilities to dispose it.

2. Recycling

The battery might be used in some welding controller. Please recycle the battery. It becomes a valuable resource.

Battery type : Lithium battery, Nickel- Cadmium battery

Contents

1. Outline

This controller controls the welding current in the welding system.

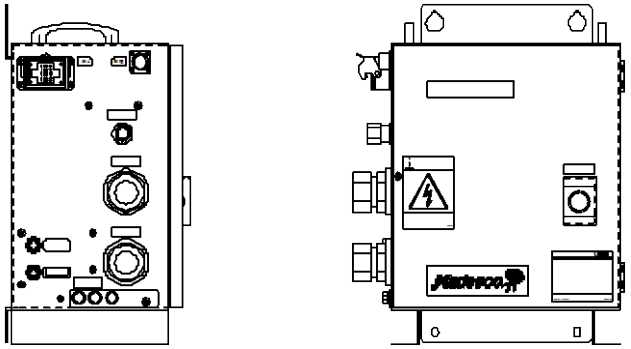
This controller is provided with various functions including constant current function by the direct weld current, voltage compensation function for power voltage fluctuation, stepper function, monitors function and fault detection function.

Welding power source and label language depend of destination.

Component

1-1. Welding controller

Model : PH5-9040-＊W (＊: depend of destination)

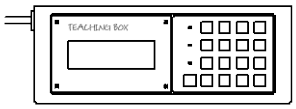


1-2. Teaching Box (optional) : for programming the weld schedule data and other parameters.

Model : TB40-P01x (Japanese type)

TB40-P02x (English type)

Software: since S524V3.00, S541 Ver. no limitation

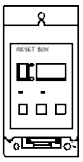


Refer to an instruction manual of teaching box.

1-3. Reset Box (optional): for fault reset and monitor.

Model : RB40-R01x (Japanese type)

RB40-R02x (English type)



Refer to an instruction manual of reset box.

1-4. Reset Cable (optional):

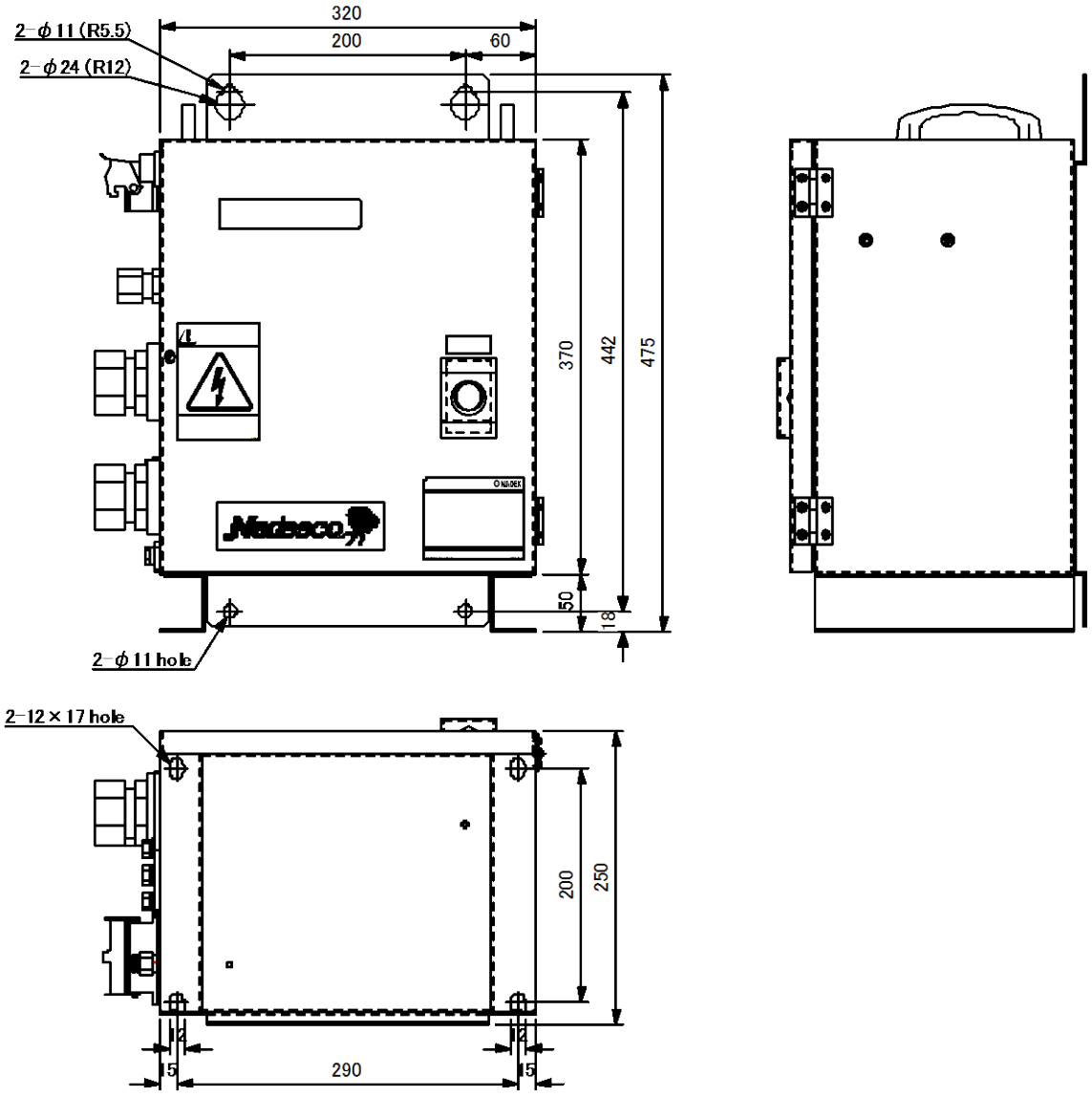
Connect Teaching Box or Reset Box to Welding Controller.

Model : WP37-WxxxA (based on JIS), WP45-WxxxA (based on UL)

2. Installation

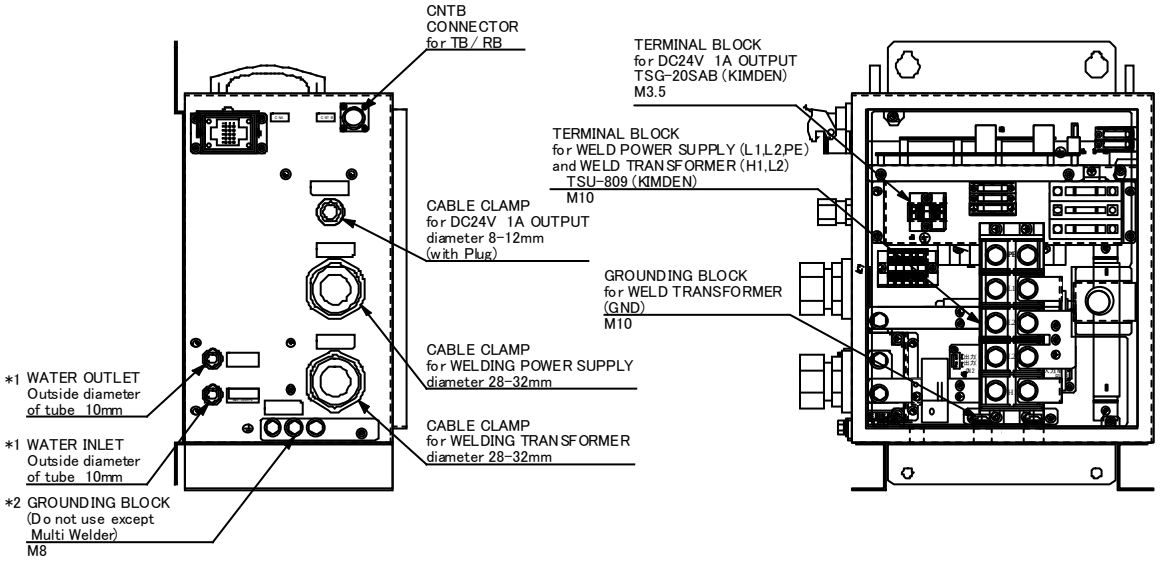
2-1. Fixation

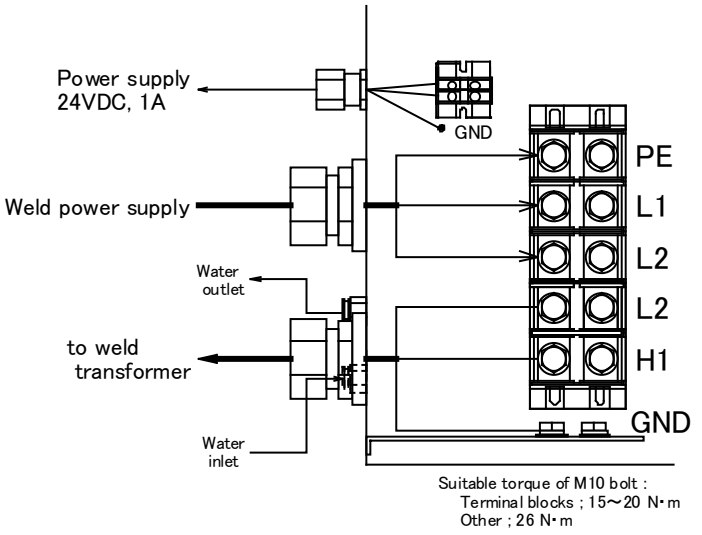
Please fix by using the 12*17 hole of the bottom or Dia.11 hole of rear panel.



2-2. External Connection

Please connect piping of a cooling-water hose, grounding and weld power supply as shown in the figure below.





*1. Please lay cooling water hose at the water inlet and outlet of the cabinet outside.

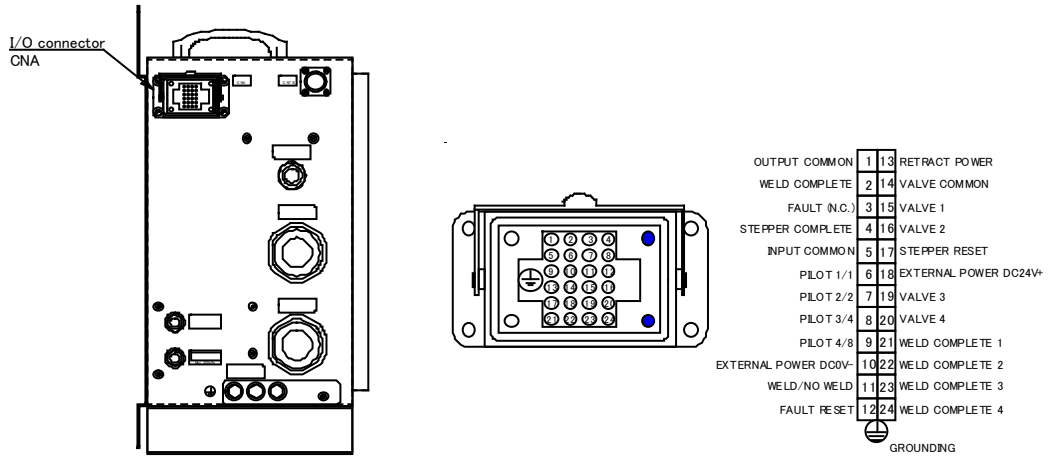
Cooling water Inlet temperature	Less than 30degreeC
Water flow rate	More than 5 litters/min
Pressure rating	Less than 300kPa
Electric resistivity	More than 5000ohm cm

*2. Please do not use Grounding block on the left side of cabinet except Multi Welder.

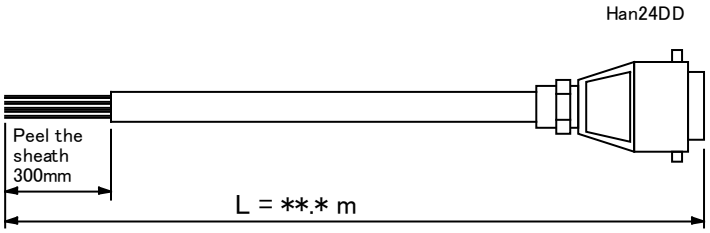
2-3. Wiring of input/output signal.

Please connect input/output signal wiring to I/O connector (CAN) on left side of cabinet.

Please use I/O Cable W-HAN-S-24×**-TC . (Nadex model : WP175-W***A) or WP182-W***A.



・I/O Cable (option) : W-HAN-S-24×**-TC (Nadex model : WP175-W***A)

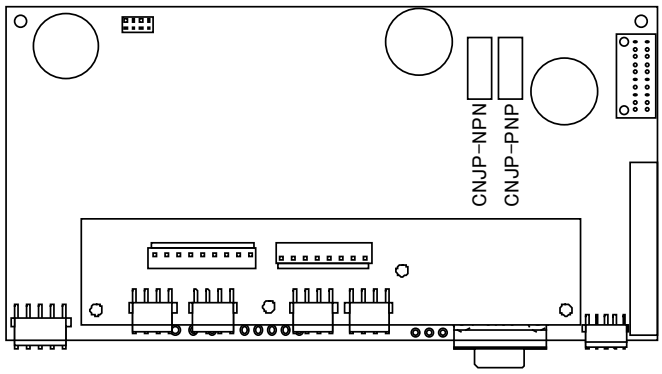


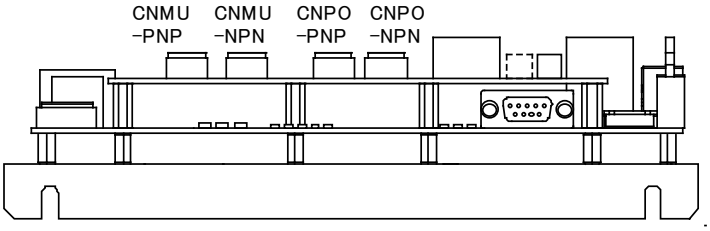
Cable		Han24DD
Wiring No.	Wiring material	Pin No.
1	AWG18 (Blue)	1
2	AWG18 (Blue)	2
3	AWG18 (Blue)	3
4	AWG18 (Blue)	4
5	AWG18 (Blue)	5
6	AWG18 (Blue)	6
7	AWG18 (Blue)	7
8	AWG18 (Blue)	8
9	AWG18 (Blue)	9
10	AWG18 (Blue)	10
11	AWG18 (Blue)	11
12	AWG18 (Blue)	12
13	AWG18 (Blue)	13
14	AWG18 (Blue)	14
15	AWG18 (Blue)	15
16	AWG18 (Blue)	16
17	AWG18 (Blue)	17
18	AWG18 (Blue)	18
19	AWG18 (Blue)	19
20	AWG18 (Blue)	20
21	AWG18 (Blue)	21
22	AWG18 (Blue)	22
23	AWG18 (Blue)	23
24	AWG18 (Blue)	24
GND	AWG14 (Green/Yellow)	Body G

2-4. Switching PNP/NPN

There are two places switching connector of PNP/NPN.

DIO switching board	CNPO-NPN / CNPO-PNP / CNMU-NPN / CNMU-PNP (for Input circuit)
Timer board	CNJP-NPN / CNJP-PNP (for Valve output circuit)





CAUTION

To switch PNP/NPN, you need to change two places jumper connectors.

When an input signal power is set as portable CNPO-xxx (internal power), please be sure to use the same set as the NPN/PNP setup of a valve output.

1) Input signal selection

Please switch the PNP/NPN and Internal power / External power according to the connection circuit.

(1) CNMU-PNP

When using External power to input signal and connection circuit is PNP, set the jumper connector to this connector. However,even if this connector is switched, Valve output does not change.

(2) CNMU-NPN

When using External power to input signal and connection circuit is NPN, set the jumper connector to this connector. However,even if this connector is switched, Valve output does not change.

(3) CNPO-PNP

When using Internal power to input signal and connection circuit is PNP, set the jumper connector to this connector. However,even if this connector is switched, Valve output does not change.

(4) CNPO-NPN

When using Internal power to input signal and connection circuit is NPN, set the jumper connector to this connector. However,even if this connector is switched, Valve output does not change.

2) Valve output selection

Valve output is Internal power only.

Please switch the PNP/NPN according to the connection circuit.

(1) CNJP-PNP

When connection circuit is PNP, set the jumper connector to this connector.

(2) CNJP-NPN

When connection circuit is NPN, set the jumper connector to this connector.

3. Operation and function of input / output signals

The function and the operation of the external I/O signal are shown below.

3-1. DIO Input signals

Pilot input is an individual start-up when X0Y13 binary pilot is set to “0”. Pilot input is a binary start-up when X0Y13 binary pilot is set to “1”.

(1) PILOT 1/1

This signal starts the weld sequence 1 when individual start-up is set.

This signal starts the weld sequence 1(bit0) when binary start-up is set.

Please connect the pilot signal of the welding sequence.

Please open it when you do not use this signal.

(2) PILOT 2/2

This signal starts the weld sequence 2 when individual start-up is set.

This signal starts the weld sequence 2(bit1) when binary start-up is set.

Please connect the pilot signal of the welding sequence.

Please open it when you do not use this signal.

(3) PILOT 3/4

This signal starts the weld sequence 3 when individual start-up is set.

This signal starts the weld sequence 4(bit2) when binary start-up is set.

Please connect the pilot signal of the welding sequence.

Please open it when you do not use this signal.

(4) PILOT 4/8

This signal starts the weld sequence 4 when individual start-up is set.

This signal starts the weld sequence 8(bit3) when binary start-up is set.

Please connect the pilot signal of the welding sequence.

Please open it when you do not use this signal.

(5) FAULT RESET

When this input is turned on, timer reset the fault and waits for the next pilot.

Please connect the signal to reset the fault.

This signal is ignored during the weld sequence.

Please open it when you do not use this signal.

(6)WELD / NO WELD

When this input is off, timer does the sequence with no weld. When this input is on, timer can weld.

Please connect the switch signal of weld/No weld.

If this input is not used, this input needs to be connected to the input common.

(7) STEPPER RESET

The step number and the step counts are reset by turning on this signal. And the stepper completion output is turned off.

Please connect the signal to reset the step-up.

This signal is ignored during the weld sequence.

3-2. DIO Output signals

(1) WELD COMP.

When the weld sequence is finished completely, this output is turned on. And after that, when pilot input goes off, this output goes off. If pilot input has already got off at the end of sequence, this output comes on around 6 cycles like a pulse output.

When timer gets fault, this output never comes on.

Please open it when you do not use this signal.

(2) WELD COMP. 1

When the weld sequence 1 is finished completely, this output is turned on. And after that, when pilot input goes off, this output goes off. If pilot input has already got off at the end of sequence, this output comes on around 6 cycles like a pulse output.

When timer gets fault, this output never comes on.

Please open it when you do not use this signal.

(3) WELD COMP. 2

When the weld sequence 2 is finished completely, this output is turned on. And after that, when pilot input goes off, this output goes off. If pilot input has already got off at the end of sequence, this output comes on around 6 cycles like a pulse output.

When timer gets fault, this output never comes on.

Please open it when you do not use this signal.

(4) WELD COMP. 3

When the weld sequence 3 is finished completely, this output is turned on. And after that, when pilot input goes off, this output goes off. If pilot input has already got off at the end of sequence, this output comes on around 6 cycles like a pulse output.

When timer gets fault, this output never comes on.

Please open it when you do not use this signal.

(5) WELD COMP. 4

When the weld sequence 4 is finished completely, this output is turned on. And after that, when pilot input goes off, this output goes off. If pilot input has already got off at the end of sequence, this output comes on around 6 cycles like a pulse output.

When timer gets fault, this output never comes on.

Please open it when you do not use this signal.

(6) FAULT (B contact)

This is turned off when some fault is detected. This is turned on when the fault reset input is turned on.

However, keep in mind that there are some which are not reset depending on the kind of fault.

Please open it when you do not use this signal.

(7) STEPPER COMP.

This signal is turned on when stepper No. to select pilot condition of sequence is completed (The ninth step ends). Refer to 6-1. Stepper function for details.

This output is turned off in the stepper reset input on.

(8) VALVE1

This signal is turned on from pre-squeeze time to hold time in the sequence as which 1 is chosen by XNY21 GUN SELECT.

(9) VALVE2

This signal is turned on from pre-squeeze time to hold time in the sequence as which 2 is chosen by XNY21 GUN SELECT.

(10) VALVE3

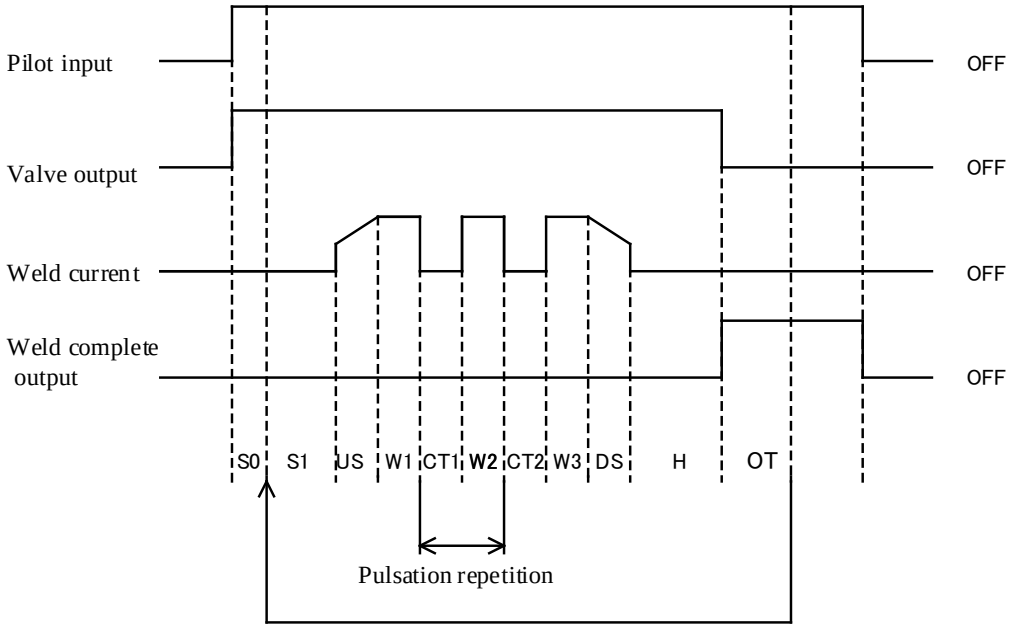
This signal is turned on from pre-squeeze time to hold time in the sequence as which 3 is chosen by XNY21 GUN SELECT.

(11) VALVE4

This signal is turned on from pre-squeeze time to hold time in the sequence as which 4 is chosen by XNY21 GUN SELECT.

4. Operation

4-1. Basic sequence



S0 : Pre-squeeze time S1 : Squeeze time

US : Up slope time W1 : #1 weld time CT1 : #1 Cool time

W2 : #2 weld time CT2 : #2 Cool time W3 : #3 weld time

DS : Down slope time H : Hold time OT : Off time
(Only repeat operation)

CAUTION

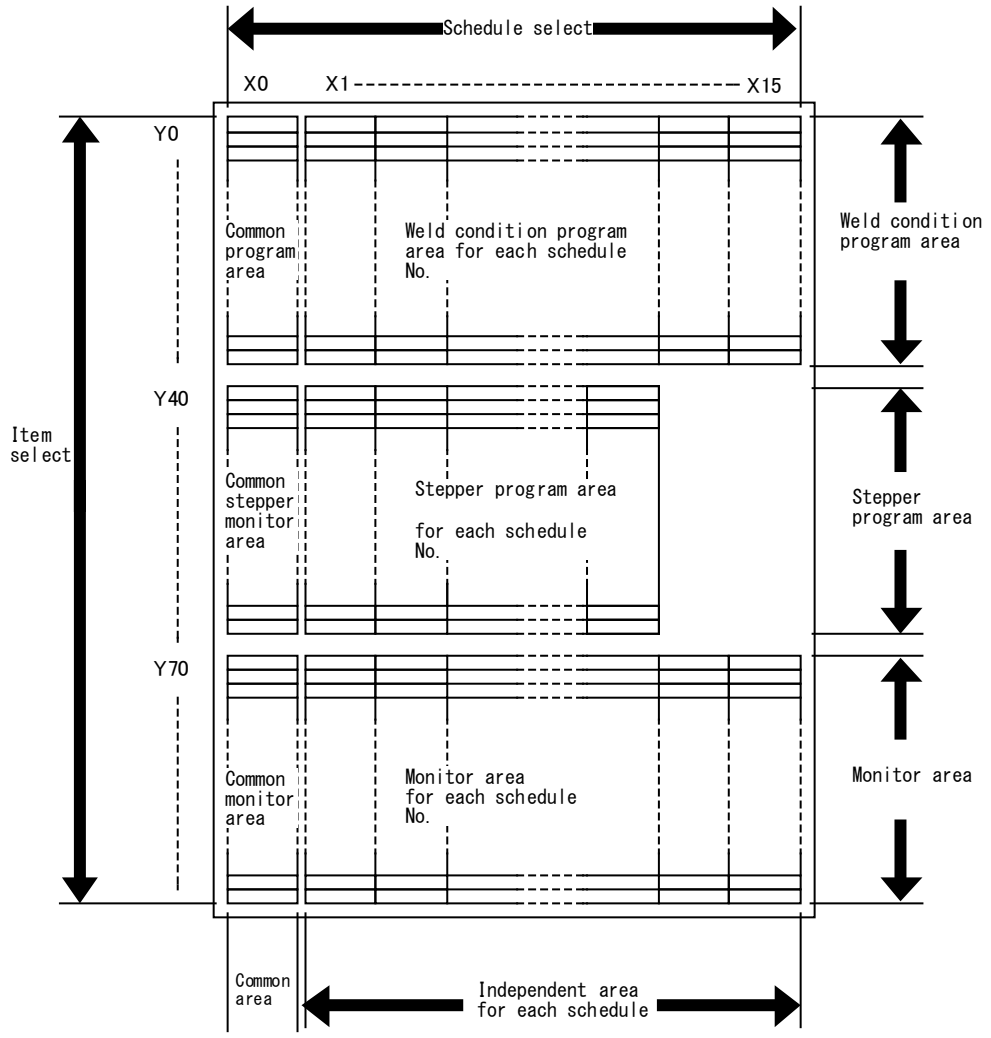
1) CT1 and W 2 are repeated by the number of times of a setup of the pulsation. This figure is the case where the pulsation is 1 time.

2) When off time is completed and pilot continues being on during repeat operation, sequence will be repeatedly performed from squeeze time.

5. Programming

5-1. Outline of program sheet

The address which inputs program data specifies with two values, Series X and Item Y, and shows the outline below.



CAUTION

The data exceed the data range can not be programming.

X addresses of a stepper program are not related to a schedule No.. It follows the value of (Y21 : GUN SELECT) chosen for every schedule.

5-2. Initialized data sheet

The following data sheet shows the initializing welding condition. X5-X15 data is the same value as the data of X1-X4. When shipped from the factory, the data that is specified by your company is set.

==COMMON PROGRAM==			COMMON
ADDR	PROGRAM ITEMS	DATA RANGE	X 0
Y 0	#1 LOW CURRENT LIMIT	50 - 99%	90
Y 1	#1 HIGH CURRENT LIMIT	101 - 150%	120
Y 2	#2 LOW CURR. LIMIT	50 - 99%	90
Y 3	#2 HIGH CURR. LIMIT	101 - 150%	120
Y 4	#3 LOW CURR. LIMIT	50 - 99%	90
Y 5	#3 HIGH CURR. LIMIT	101 - 150%	120
Y 6	SHORT DETECT.CURR.	1 - 99A	15
Y10	CURR.CONTROL METHOD	0 (VC), 1 (CC)	1
Y11	REPEAT	0(OFF), 1(ON)	0
Y12	STEPPER	0(OFF), 1(STAIR), 2(LINEAR)	0
Y13	BINARY PILOT	0(OFF), 1(ON)	0
Y15	PULSE PILOT	0(OFF), 1(ON)	0
Y16	FAULT RES. BY PILOT	0(OFF), 1(ON)	0
Y17	RE-WELD	0(OFF), 1(ON)	0
Y18	SHORT DETECTION PILOT	0(OFF), 1(ON)	0
Y20	ALARM HISTORY	0(OFF), 1(ON)	0
Y28	REF. VOLTAGE	160 - 552V	400
Y33	I-AVAILABLE LOW LEVEL	50 -100 %	100
Y36	I-AVAILABLE LOW DETECTION	0(OFF), 1(FAULT), 2(ALARM)	2

==SEQUENCE PROGRAM==			SCHEDULE No.			
ADDR	PROGRAM ITEMS	DATA RANGE	X 1	X 2	X 3	X 4
Y 0	PRE-SQUEEZE TIME	0 - 99 CYCLE	0	0	0	0
Y 1	SQUEEZE TIME	0 - 99 CYCLE	30	30	30	30
Y 3	UP SLOPE TIME	0 - 30 CYCLE	0	0	0	0
Y 4	#1 WELD TIME	0 - 99 CYCLE	5	5	5	5
Y 5	#1 WELD CURR.(C.C)	2.0 - 25.5kA	5.0	5.0	5.0	5.0
Y 6	#1 WELD CURR.(V.C)	20 - 130%	20	20	20	20
Y 7	#1 WELD C.C. CONTROL	0(OFF), 1(ON)	1	1	1	1
Y 8	#1 COOL TIME	0 - 99 CYCLE	0	0	0	0
Y 9	#2 WELD TIME	0 - 99 CYCLE	0	0	0	0
Y10	#2 WELD CURR.(C.C)	2.0 - 25.5kA	5.0	5.0	5.0	5.0
Y11	#2 WELD CURR.(V.C)	20 - 130%	60	60	60	60
Y12	#2 COOL TIME	0 - 99 CYCLE	0	0	0	0
Y13	#3 WELD TIME	0 - 99 CYCLE	0	0	0	0
Y14	#3 WELD CURR.(C.C)	2.0 - 25.5kA	5.0	5.0	5.0	5.0
Y15	#3 WELD CURR.(V.C)	20 - 130%	60	60	60	60
Y16	DOWN SLOPE TIME	0 - 30 CYCLE	0	0	0	0
Y17	HOLD TIME	0 - 99 CYCLE	0	0	0	0
Y18	OFF TIME	1 - 99 CYCLE	1	1	1	1
Y19	PULSATION	1 - 9 TIMES	1	1	1	1
Y20	TURNS RATIO	4.0～200.0	200.0	200.0	200.0	200.0
Y21	GUN SELECT	1 - 15	1	1	1	1

COMMON MONITOR	
ADDR	X 0
Y40-69	STEPPER
Y71	SCHEDULE No.
Y72	FAULT CODE
Y73	SUB FAULT CODE
Y79	#1 SECOND. CURRENT
Y80	#1 LINE VOLTAGE
Y81	#2 SECOND. CURRENT
Y82	#2 LINE VOLTAGE
Y83	#3 SECOND. CURRENT
Y84	#3 LINE VOLTAGE

SCHEDULE MONITOR	
ADDR	X1 ～ X15
Y72	MARGIN

==STEPPER PROGRAM==			STEPPER No.			
ADDR	PROGRAM ITEMS	DATA RANGE	X 1	X 2	X 3	X 4
Y40	STEP 0 CURRENT RATE	50 - 200 %	100	100	100	100
Y41	STEP 0 WELD COUNTS	1 - 9999 TIMES	100	100	100	100
Y42	STEP 1 CURRENT RATE	50 - 200 %	102	102	102	102
Y43	STEP 1 WELD COUNTS	0 - 9999 TIMES	140	140	140	140
Y44	STEP 2 CURRENT RATE	50 - 200 %	104	104	104	104
Y45	STEP 2 WELD COUNTS	0 - 9999 TIMES	180	180	180	180
Y46	STEP 3 CURRENT RATE	50 - 200 %	106	106	106	106
Y47	STEP 3 WELD COUNTS	0 - 9999 TIMES	220	220	220	220
Y48	STEP 4 CURRENT RATE	50 - 200 %	108	108	108	108
Y49	STEP 4 WELD COUNTS	0 - 9999 TIMES	260	260	260	260
Y50	STEP 5 CURRENT RATE	50 - 200 %	110	110	110	110
Y51	STEP 5 WELD COUNTS	0 - 9999 TIMES	300	300	300	300
Y52	STEP 6 CURRENT RATE	50 - 200 %	112	112	112	112
Y53	STEP 6 WELD COUNTS	0 - 9999 TIMES	340	340	340	340
Y54	STEP 7 CURRENT RATE	50 - 200 %	114	114	114	114
Y55	STEP 7 WELD COUNTS	0 - 9999 TIMES	380	380	380	380
Y56	STEP 8 CURRENT RATE	50 - 200 %	116	116	116	116
Y57	STEP 8 WELD COUNTS	0 - 9999 TIMES	420	420	420	420
Y58	STEP 9 CURRENT RATE	50 - 200 %	118	118	118	118
Y59	STEP 9 WELD COUNTS	0 - 9999 TIMES	460	460	460	460

The cautions at the time of data writing

When you perform a condition setup using a teaching box or a personal computer, please do not intercept the power supply of welding controller immediately after data writing. It is required for writing for several seconds on the characteristic of a flash memory. When you intercept the power supply after writing, please intercept, after at least 15 seconds or more pass since write-in operation. If a power supply should be intercepted immediately after writing, E29 MEMORY NOT UPDATE may be detected next time at the time of a power supply is turned on. In this case, since the contents of the flash memory are updated after fault reset, it can be used as it is. However, since data is destroyed when E20 MEMORY DATA ERROR is detected, initialization and a re-setup of welding conditions are needed.

CAUTION

Do not intercept the power supply of welding controller immediately after data writing. Memory data may be destroyed.

5-3. Common program

This is a program common to all schedule and specified with X0.

Please program the data common to all schedule.

5-3-1. Control constant program

Please program the function and constant common to all schedules.

Y0 : #1LOW CURRENT LIMIT (50-99 %)

The level which detects the welding current down of #1 weld can be set up. This is % setup which made the programmed current value 100%.

Y1 : #1HIGH CURRENT LIMIT (101-150 %)

The level which detects the welding current up of #1 weld can be set up. This is % setup which made the programmed current value 100%.

Y2 : #2LOW CURRENT LIMIT (50-99 %)

The level which detects the welding current down of #2 weld can be set up. This is % setup which made the programmed current value 100%.

Y3 : #2HIGH CURRENT LIMIT (101-150 %)

The level which detects the welding current up of #2 weld can be set up. This is % setup which made the programmed current value 100%.

Y4 : #3LOW CURRENT LIMIT (50-99 %)

The level which detects the welding current down of #3 weld can be set up. This is % setup which made the programmed current value 100%.

Y5 : #3HIGH CURRENT LIMIT (101-150 %)

The level which detects the welding current up of #3 weld can be set up. This is % setup which made the programmed current value 100%.

Y6 : SHORT DETECTION CURRENT (1-99 A)

Set the maximum allowable primary current at the weld gun release time to determine the secondary cable short-circuit.

5-3-2. Operation mode program

Please set "0(off)" or "1(on)" as operation modes common to all the schedule.

Y10 : CURRENT CONTROL METHOD

Please set up "1" at the time of constant current control, and set up "0" at the time of voltage compensation control.

#1 WELD TIME separately has the control change function at each schedule.

Y11 : REPEAT

As long as the pilot input is on, the sequence from the squeeze time to the off time is repeated, and the weld complete output turns on during off time.

Y12 : STEPPER

Stepper control can be used if "1" or "2" is set up.

For details, please refer to the "6-1. Stepper function".

Y13 : BINARY PILOT

Pilot input is an individual start-up when it is set to “0”. Pilot input is a binary start-up when it is set to “1”.

Y15 : PULSE PILOT

Pulse signal can be used for the pilot input.

As much pulse width as about 5 cycles is necessary, and weld complete output is put out for about 6 cycles.

Y16 : FAULT RESET BY PILOT

It is the function which carries out fault reset by the pilot input after fault detection, and starts a sequence.

Y17 : RE-WELD

When the E60 EXTREMELY LOW CURRENT or E61 LOW CURRENT are detected, it welds again, and a sequence will be ended if its result is not fault. Fault will be outputted if fault are detected again.

The re-weld restart from the squeeze time.

Y18 : SHORT DETECTION PILOT

In case of using short detection function, set this function "ON(1)", and turn on pilot 15.

Only when starting binary, this is valid.

For details, please refer to the chapter "14.Short detection".

Y20 : ALARM HISTORY

In case that you want to save contents of alarm detection to a fault history monitor, please set up "1".

Y28 : REF. VOLTAGE

Please set to match the hardware.

It should be set to 400 when the tap of the transformer TR1 for the control power is 400V (200V +200 V).

It should be set to 440 when the tap of the transformer TR1 for the control power is 440V (200V +240 V).

It should be set to 480 when the tap of the transformer TR1 for the control power is 480V (240V +240 V).

The initial setting is 400V.

Y33 : I-AVAILABLE LOW LEVEL

Please set up the rate which detects fault to the maximum current.

Y36 : I-AVAILABLE LOW DETECTION

Please set up operation when exceeding I-AVAILABLE LOW DETECT LEVEL.

0 (off) : External information is not performed and control operation is not influenced, either.

1 (fault) : A fault code and a fault output are outputted on and the next weld is forbidden.

2 (alarm) : A fault code and an alarm output are outputted and control operation is not influenced.

5-4. Program for each schedule No.

Please program the conditions for each schedule No..

Please specify a schedule No. by X1-X15.

The schedule No. which is not used does not have the necessity for a program.

5-4-1. Weld sequence program

Please program the weld sequence and the weld condition.

Y0 : PRE-SQUEEZE TIME (0-99 cycle)

This program is used under repeat mode operation.

Please set up time until press is completed from the press start of gun.

Y1 : SQUEEZE TIME (0-99 cycle)

Please set up time until press is completed from the press start of gun.

Y3 : UP SLOPE TIME (0-30 cycle)

Please set the up slope time prior to the #1 weld time.

The initial current value at up slope time reaches the value of 1/2 of the welding current1, and the final current value reaches the value of the welding current1.

Note) When constant current control applies, if you set XNY7 #1 WELD C.C. CONTROL is 0(OFF), the up slope will be operated by voltage compensation control.

Y4 : #1 WELD TIME (0-99 cycle)

Please set the first weld time.

Y5 : #1 WELD CURRENT (CONSTANT CURRENT) (2.0-25.5 kA)

Please set the first weld current for the constant current control mode.

Y6 : #1 WELD CURRENT (VOLTAGE COMPENSATION) (20-130%)

Please set the first weld current for the voltage compensation control mode.

Y7 : WELD1 CONTROL METHOD (0(C.C. OFF), 1(C.C. ON))

0(C.C. OFF), 1(C.C. ON) setting is used when you set X0Y10 current control to 1 (constant current control).

If you set this value to 0(C.C. OFF), voltage compensation control applies only to the first weld current. And this setting can prevent burst caused by cling dust on the work. If you set this value to 1(C.C. ON), normal constant current control will apply. Refer to 7-3. Special control.

Y8 : #1COOL TIME (0-99cycle)

Please set the cooling time between the #1 weld time and the #2 weld time.

Y9 : #2 WELD TIME (0-99cycle)

Please set the second weld time.

Y10 : #2 WELD CURRENT (CONSTANT CURRENT) (2.0-25.5 kA)

Please set the second weld current for the constant current control mode.

Y11 : #2 WELD CURRENT (VOLTAGE COMPENSATION) (20-130%)

Please set the second weld current for the voltage compensation control mode.

Y12 : #2 COOL TIME (0-99cycle)

Please set the cooling time between the #2 weld time and the #3 weld time.

Y13 : #3 WELD TIME (0-99cycle)

Please set the third weld time.

Y14 : #3 WELD CURRENT (CONSTANT CURRENT) (2.0-25.5 kA)

Please set the third weld current for the constant current control mode.

Y15 : #3 WELD CURRENT (VOLTAGE COMPENSATION) (20-130%)

Please set the third weld current for the voltage compensation control mode.

Y16 : DOWN SLOPE TIME (0-30 cycle)

Please set the down slope time after the #3 weld time.

The initial current value at down slope time reaches the value of the welding current3, and the final current value reaches the value of 1/2 of the welding current3.

Note) Even under constant current control, if you set XNY7 #1 WELD C.C. CONTROL to 0(off) and do not schedule the second and third welding current, voltage compensation control will actually apply.

Y17 : HOLD TIME (0-99cycle)

Please set up time for gun to hold press after a welding end.

Y18 : OFF TIME (1-99cycle)

It is used at the time of repeat operation.

Please set up time until it starts the next squeeze time at the time of repeat operation.

Y19 : PULSATION (1-9 times)

Please set up the number of times of pulsation which repeats #1cool time and the #2 weld time.

5-4-2. Control constant program

Please program the constant of the welder and valve No. , etc.

Y20 : TRANSFORMER TURNS RATIO (4.0-200.0)

Please set the ratio of the primary and secondary windings of the weld transformer.

Y21 : GUN SELECT (1-15)

Set the stepper condition select.

If the stepper No.1 is chosen, valve output 1 turns ON.

If the stepper No.2 is chosen, valve output 2 turns ON.

If the stepper No.3 is chosen, valve output 3 turns ON.

If the stepper No.4 is chosen, valve output 4 turns ON.

If the stepper No.5-15 is chosen, valve output don’t turn ON.

5-5. Stepper program

Please program stepper conditions for every stepper No..

The stepper No. which is not used does not have the necessity for a program.

For operation, please refer to the "6-1. Stepper function".

Note) Be sure to reset stepper when you change stepper data.

Y40, 41 : STEP 0

Please set up the STEP 0 CURRENT RATE(Y40) and STEP 0 WELD COUNTS(Y41) of the primary step at the time of stepper operation.

Y42, 43 : STEP 1

Please set up the STEP 1 CURRENT RATE(Y42) and STEP 1 WELD COUNTS(Y43) of the first step at the time of stepper operation.

Y44-59 : STEP 2-9

Please set up the rate of welding current and the weld counts of the steps 2-9 at the time of stepper operation like the above.

6. Special function

6-1. Stepper Function

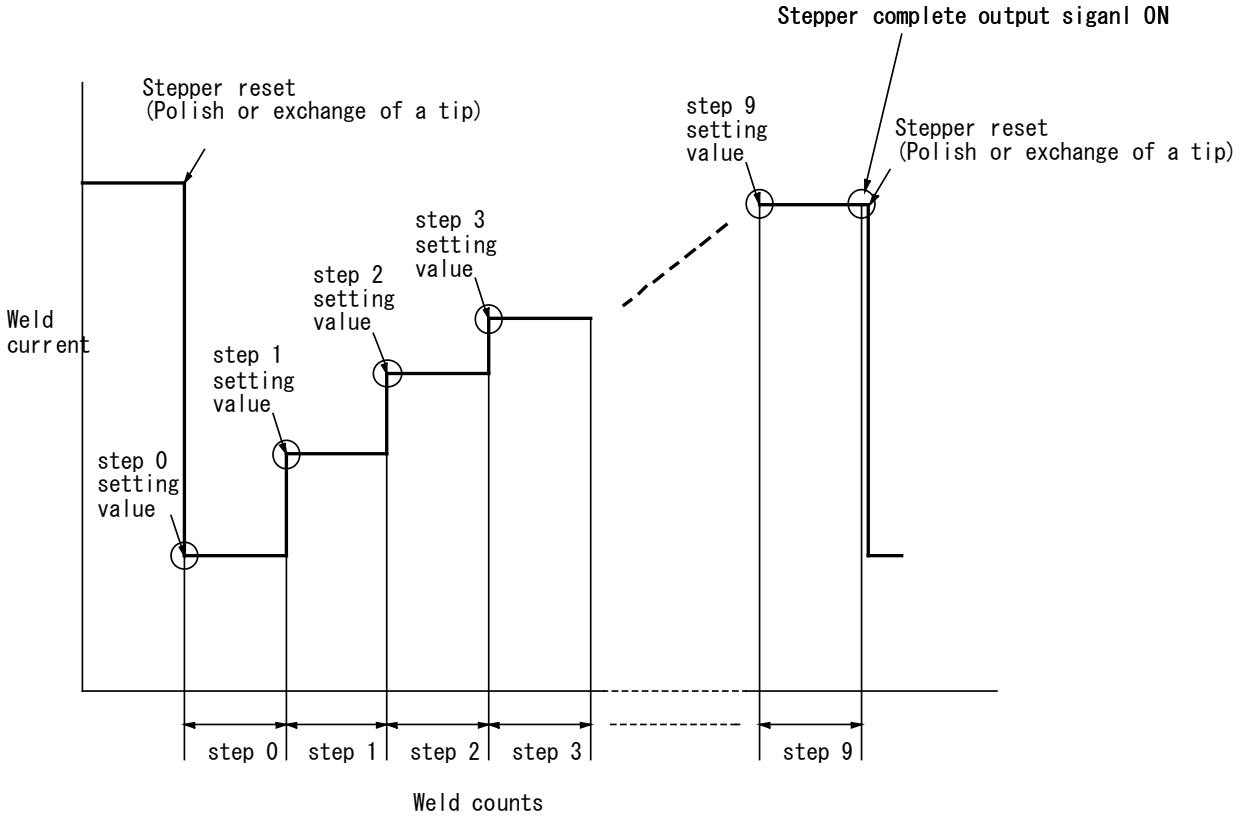
1) Advantage

The number of welding of a electrode is made to increase by making current increase according to wear advance of a electrode.

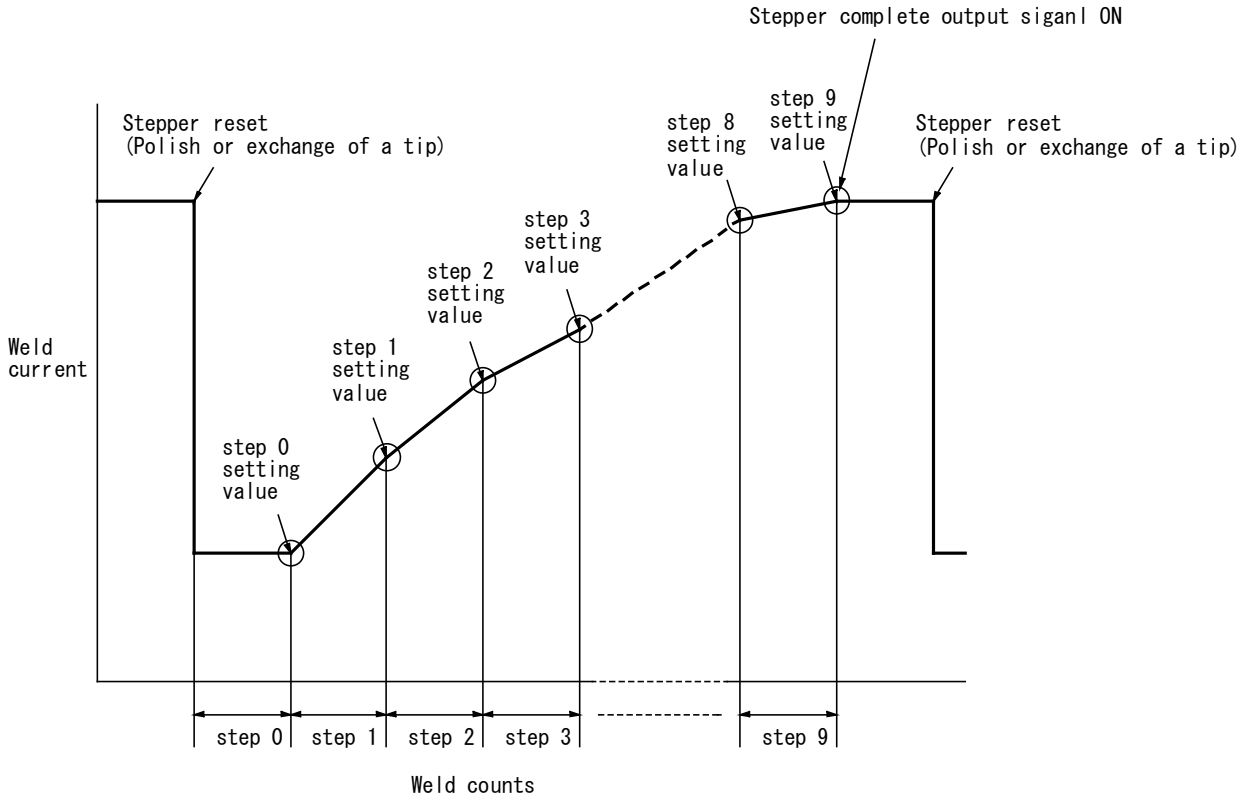
Polish of a electrode and the time of exchange can be known by the stepper complete output.

2) Operation

(1) Stair up



(2) Linear up



3) Setting

- ON / OFF of stepper control

  Please set the data of (X0,Y12) as "1 (stair)" or "2 (linear)".

- Selection of GUN SELECT

  Please choose a stepper No. as the data of (X1-X15, Y21).

- Data of a stepper program.

  Please set each data of (X1-15, Y40-59).

Note: Be sure to reset stepper when you change stepper data.

4) Caution

(1) Stepper reset of a teaching box (TB40) / reset box (RB40) can choose all stepper and each stepper.

(2) After stepper completion, operates according to a rate setup of current of the last step (the 9th step).

(3) When you change the stepper data, please be sure to perform stepper reset.

(4) Do not perform stepper reset and stepper reset operation by a teaching box / reset box at the same time. The reset action at the time of carrying out at the same time is not guaranteed.

(5) Please take more than 6 cycle as a time of stepper reset input.

7. Current control method

A current control system has constant current control, voltage compensation control. Please choose the control system which suited the use situation.

Selecting the current control

1) Constant Current Control (CC)

Please set X0Y10 CURRENT CONTROL METHOD as "1" (common program).

2) Voltage Compensation Control (VC)

Please set X0Y10 CURRENT CONTROL METHOD as "0" (common program).

7-1. Constant Current Control (CC)

Primary current is measured and it controls to flow the current near a programmed current value based on this data. Therefore, it answers at high speed to fluctuation of power supply voltage, or fluctuation of load.

Current setting method	: Value of current can be set directly. Minimum setting unit is 100A.
Available setting range	: 2000-25500A
Transformer Turn Ratio	: Designed turn ratio can be set.
Compensation factors	: Line voltage and fluctuations of load

7-2. Voltage Compensation Control (VC)

When you weld simultaneously from two or more gun, such as multi, please choose voltage compensation control.

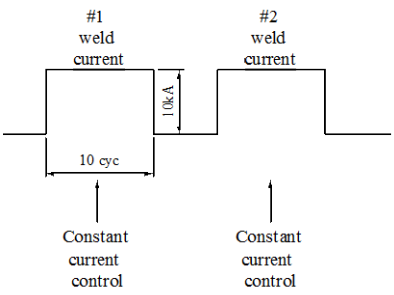
Current setting method	: Set the current taking the weld current at rated voltage as 100%.
Available setting range	: 20-130%
Transformer Turn Ratio	: No need to set.
Compensation factors	: Power voltage compensation only.

7-3. Special control

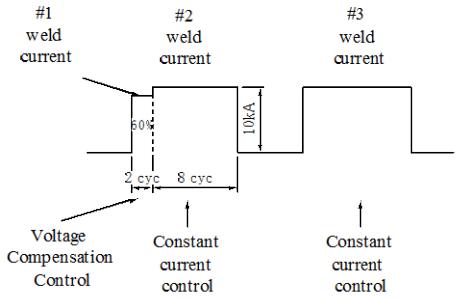
This unit can apply compensated voltage control to the first weld current and constant current control to the following weld currents.
This control is effective to prevent burst when dusts cling on the work.
To enable this control, set XNY7 to 0 (off). Program address XNY7 refers to “Weld No. 1 by Constant Current Control.”
But contrary when compensated voltage control is applied to all welds current (X0Y10 turns to 0), Setting XNY7 to 1 (on) will be rejected so that constant current control will not apply to the first current.
Note) Setting XNY7 to 0 (off), compensated voltage control applies to the up slope.
In case the third and second weld currents are not scheduled, compensated voltage control also applies to down slope.

Ex)When the first welding current is set to 2cyc and prevent burst

Usual constant current control

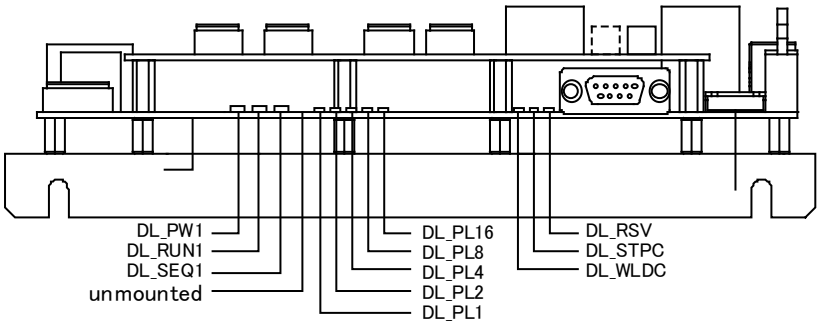


Constant current control
when XNY7 #1WELD C.C. CONTROL is set to 0(OFF)



8. LED display

8-1. Timer unit



Color / LED name	Green lighting	Green flickering	Red lighting	Red flickering	Orange lighting	Orange flickering	Off
DL_PW Power display	Power supply turns on	-	-	-	It writes in a flash memory	-	Power supply turns off
DL_RUN State display	Normal	Emergency stop (at the time of normal) (*1)	System error (*2)	Fault	-	Alarm	-
DL_SEQ Sequence display	During squeeze time	No weld mode and outside of sequence time	During weld	-	During hold time or during cool time	-	Outside of sequence time

' - ' has no functional setup.

*1) Display only a product with Run / stop signal.

*2) System error means E01 SYSTEM FAILURE, E11 ILLEGAL POWER FREQUENCY or E31 EXCESSIVE CURRENT (only IWC5).

LED	Red lighting□
DL_PL1	PILOT1/1
DL_PL2	PILOT2/2
DL_PL4	PILOT3/4
DL_PL8	PILOT4/8
DL_PL16	—
DL_WLDC	WELD COMP.
DL_STPC	STEPPER COMP.
DL_RSV	—

DL_PL1, DL_PL2, DL_PL4 and DL_PL8 will light according to the activated schedule.

For example) When activating schedule 3.

Individual start-up : DL_PL4 lights up

Binary start-up : DL_PL1 and DL_PL2 light up

9. Monitor function

This chapter explains monitor function with a teaching box.

9-1. Schedule monitor (X1-X15)

Y72 : MARGIN

This shows the margin of the welding transformer in %.

9-2. Common monitor (X0)

Y71 : SCHEDULE No.

This shows the weld schedule number performed.

Y72 : FAULT CODE

This shows the fault code detected during weld sequence. 0(zero) means no fault.

Y73 : SUB FAULT CODE

This shows the number for distinction of cause in fault code.

The sub codes which are not described in "10. Trouble shooting" are for a maker distinguishing.

Y79 : #1 SECONDARY CURRENT

This shows the average current (kA) of #1 weld time in constant current control.

Y80 : #1 LINE VOLTAGE

This shows the % data of average voltage of welding power supply during #1 weld time.

Y81 : #2 SECONDARY CURRENT

This shows the average current (kA) of #2 weld time in constant current control.

Y82 : #2 LINE VOLTAGE

This shows the % data of average voltage of welding power supply during #2 weld time.

Y83 : #3 SECONDARY CURRENT

This shows the average current (kA) of #3 weld time in constant current control.

Y84 : #3 LINE VOLTAGE

This shows the % data of average voltage of welding power supply during #3 weld time.

9-3. Input / Output monitor

The status of input and output signal can be monitored by function mode of a teaching box.

For detail, refer another manual the instruction manual of a teaching box.

The monitor value is shown in 32 bits binary data. The bit mapping is shown below.

It becomes a display of 16 bits in TB40.

1=ON, 0=OFF

Input monitor display

```
* I N P U T / O U T P U T   M O N I T O R
1 = I N P U T   M O N I T O R
  0 0 0 0 0 0 1 1     0 0 0 1 0 0 0 1
( i j k l m n o p     a b c d e f g h )

  0 0 0 0 0 0 0 0     0 0 0 0 0 0 0 0
( I J K L M N O P     A B C D E F G H )
```

Output monitor display

```
* I N P U T / O U T P U T   M O N I T O R
2 = O U T P U T   M O N I T O R
  0 0 0 0 0 0 1 1     0 0 0 1 0 0 0 1
( i j k l m n o p     a b c d e f g h )

  0 0 0 0 0 0 0 0     0 0 0 0 0 0 0 0
( I J K L M N O P     A B C D E F G H )
```

i: (Reserve)	a: (Trans. Thermo)
j: (Reserve)	b: Weld/No weld
k: (Reserve)	c: Fault reset
l: (Reserve)	d: (Reserve)
m: (Reserve)	e: Pilot 8
n: (Reserve)	f: Pilot 4
o: Stepper reset	g: Pilot 2
p: (Reserve)	h: Pilot 1
I: (Reserve)	A: (Reserve)
J: (Reserve)	B: (Reserve)
K: (Reserve)	C: (Reserve)
L: (Reserve)	D: (Reserve)
M: (Reserve)	E: (Reserve)
N: (Reserve)	F: (Reserve)
O: (Reserve)	G: (Reserve)
P: (Reserve)	H: (Reserve)

i: (Reserve)	a: (Reserve)
j: (Reserve)	b: Fault
k: (Reserve)	c: Weld complete 4
l: (Reserve)	d: Weld complete 3
m: Valve 4	e: Stepper complete
n: Valve 3	f: Weld complete 2
o: Valve 2	g: Weld complete 1
p: Valve 1	h: Weld complete
I: (Reserve)	A: (Reserve)
J: (Reserve)	B: (Reserve)
K: (Reserve)	C: (Reserve)
L: (Reserve)	D: (Reserve)
M: (Reserve)	E: (Reserve)
N: (Reserve)	F: (Reserve)
O: (Reserve)	G: (Reserve)
P: (Reserve)	H: (Reserve)

9-4. Error history

The status of error history can be monitored by function mode of teaching box.

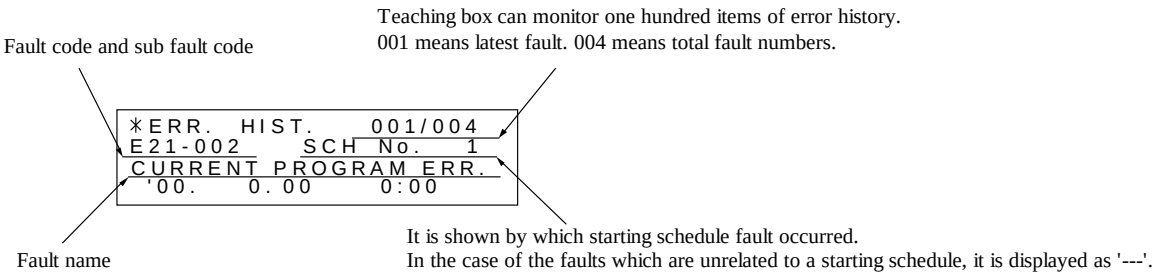
For detail, refer to the instruction manual of teaching box (TB40).

Teaching box can monitor one hundred items of error history. In case that the total fault numbers exceeds 100 items, the data of the oldest fault monitor is erased whenever it detects fault.

It can select whether it leaves an alarm to a history by ALARM HISTORY (X0Y20). At this time, it becomes to 100 in all histories about faults and alarms that it can leave as a history.

Time cannot be set.

This function is available only TB40.



10. Trouble shooting

The followings are the typical detecting timing, contents and countermeasure examples for each fault code.

In case of fault which has a sub fault code, the sub fault code is shown in the following fault contents. The sub codes which are not described are for a maker distinguishing. The sub code is not displayed on fault display of teaching box / reset box. When you want to see the sub code, use error history function.

E01 SYSTEM FAILURE

Fault contents	: With fatal fault like the memory IC fault, fault outputs and/or communication to external units will be impossible.
Detecting timing	: When welding power supply is on.
Reporting timing	: Immediately after fault is detected.
Reporting way	: A fault output is on, and fault is displayed on reset box/teaching box, only in case that they are available.
Reset way	: Reset is impossible.
Countermeasure	: Replace a timer unit.

E03 INT. PARTS FAILURE

Fault contents	: This fault code indicates that the data can not be normally written to the flash memory in case that it is detected at setting condition. (sub fault code : 5) Or in case that this fault is detected when a power supply or weld pilot is turned on, the timer control data of the flash memory may be broken. (sub fault code : 6)
Detecting timing	: When programming, or when a power supply or weld pilot is turned on.
Reporting timing	: Immediately after fault is detected
Reporting way	: A fault output is on, and the fault is displayed on teaching box/reset box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: When this fault is detected at the time of programming, set up data again after fault reset. When this fault is detected frequently, replace timer unit. In case that this fault is detected when a power supply or weld pilot is turned on, replacement of timer unit is required.

E10 LOW LINE VOLTAGE (alarm)

Fault contents	: The fault code indicates for several seconds that welding power voltage became under limit voltage of operation (under about 70% of rated voltage).
Detecting timing	: While welding power supply is on.
Reporting timing	: Immediately after fault is detected.
Reporting way	: A fault is displayed on reset box/teaching box.
Reset way	: A fault is automatically reset by weld pilot input.
Countermeasure	: Check welding power voltage.

E11 ILLEGAL POWER FREQUENCY

Fault contents	: The fault code indicates that the frequency of welding power supply could not be identified when the welding power supply or weld pilot is turned on. (sub fault code : 1) In case that this fault is detected when weld pilot is turned on, there are two kinds : immediately stop depending on shifting situation of power supply frequency(sub fault code : 2), and wait for recovery of shifting width by extending squeeze time (maximum 30 cycles) (sub fault code : 3). When shift width is not able to be converged, it becomes power frequency fault before a welding start.
Detecting timing	: When a power supply injection or weld pilot is turned on.
Reporting timing	: Immediately after fault is detected.
Reporting way	: A fault output is on, and fault is displayed on reset box/teaching box.
Reset way	: Turn on a welding power supply again.
Countermeasure	: Check whether the welding power supply is unstable.

E12 LOW VOLTAGE IN WELD

Fault contents	: This fault code indicates that welding power supply interruption or extreme voltage descent occurred during welding. Or this fault code indicates that welding voltage became about 50% or less of a setting value in voltage compensation control.
Detecting timing	: During welding.
Reporting timing	: Immediately after fault is detected.
Reporting way	: A fault output is on, and fault is displayed on reset box/teaching box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Check the capacity of a welding power supply, and a measure such as avoiding simultaneous welding is required.

E13 HIGH LINE VOLTAGE

Fault contents	: This fault code indicates for several seconds that welding power voltage became over limit voltage of operation (about 150% of rated voltage or more).
Detecting timing	: While welding power supply is on.
Reporting timing	: Immediately after fault is detected.
Reporting way	: A fault output is on, and fault is displayed on reset box/teaching box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Confirm welding power voltage.

E20 MEMORY DATA ERROR

Fault contents	: The fault code indicates that the data in the memory was destroyed or is outside of the specified range.
Detecting timing	: When a power supply or weld pilot is turned on.
Reporting timing	: Immediately after fault is detected.
Reporting way	: A fault output is on, and a fault is displayed on reset box/teaching box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Initialize the data, regardless of the whole area of the program and monitor being used or not, in case of this fault.

E21 CURRENT PROGRAM ERROR

Fault contents	: This fault code indicates that the current exceeded the control range during the constant current control calculation. (More than 2048A) (sub fault code : 1) This fault code indicates that the current was lower than the control range during the constant current control calculation. (Less than 25A) (sub fault code : 2) This fault code indicates that #1～#3 WELD TIME are set to all “0”.
Detecting timing	: During weld current control or when weld pilot is turned on.
Reporting timing	: Immediately after fault is detected
Reporting way	: A fault output is on, and a fault is displayed on teaching box/reset box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Check if the setting current and the turns ratio of the welding transformer is proper value. In case of this fault is detected when weld pilot is turned on, the setting value of welding conditions may remain initialized. Check the setting value, and check whether unused pilot start not set is received.

E27 PARAMETER DATA ERROR

Fault contents	: This fault code indicates that the following various parameter data is destroyed. Timer slave station No. for M-NET.
Detecting timing	: When a power supply is turned on.
Reporting timing	: Immediately after fault is detected
Reporting way	: A fault output is on, and a fault is displayed on reset box/teaching box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Please re-set up. When data is destroyed, it will be recovered, if timer slave station No. is set as "15". When this fault is detected frequently, replace timer unit.

E28 MONITOR DATA ERROR

Fault contents	: This fault code indicates that the monitor data in a memory is destroyed, or that the backup capacitor for memory data storage is discharged and monitor data was replaced by the old data. However, the setting data of welding conditions is not replaced because storage by the flash memory.
Detecting timing	: When a power supply is turned on.
Reporting timing	: Immediately after fault is detected.
Reporting way	: A fault output is on, and a fault is displayed on reset box/teaching box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box. And turn on stepper reset input, or preform reset all schedule stepper of a reset box/teaching box.
Countermeasure	: Replace electrodes and perform stepper reset for restore, because a stepper's present value, etc. are in monitor data.
Caution	: Because the backup capacitor was discharged when this device that has not turned on the power supply for a while is used, this fault is detected.

E29 MEMORY NOT UPDATE

Fault contents	: This fault code indicates that normal writing was not done in a flash memory when program data such as welding conditions etc. is set up. Writing to a flash memory will be updates after fault detection. If the power supply of a welding controller is interrupted immediately after data writing, the writing to a flash memory will be incomplete, and this fault will be detected next time of a power supply injection.
Detecting timing	: When a power supply is turned on.
Reporting timing	: Immediately after fault is detected.
Reporting way	: A fault output is on, and a fault is displayed on reset box/teaching box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Reset fault and return to normal conditions. Do not interrupt a power supply for at least 15 seconds after data writing.

E30 NO CURRENT FAULT

Fault contents	: This fault code indicates failure in the thyristor firing control, and that welding current is extremely low or unusual. (sub fault code : 1)
Detecting timing	: During welding
Reporting timing	: After the sequence end
Reporting way	: A fault output is on, and a fault is displayed on teaching box/reset box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Check whether the welding transformer is correctly connected. Check dust of sheet metal and dirt of electrode. Check the shortage of the pressure time and the pressure power etc. Please exchange contactor when not restoring it even if the above is done.

E31 SCR SHORT

Fault contents	: This fault code indicates that thyristor is in the short circuit status. (sub fault code : 1)
Detecting timing	: Anytime during no welding
Reporting timing	: Immediately after fault is detected
Reporting way	: A fault output is on, and a fault is displayed on teaching box/reset box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Replace the thyristor and check if welding current and duty exceed the rating, and check the wiring to welding transformer.

E33 NO WELD FAULT

Fault contents	: This fault code indicates that weld/no weld input becomes to OFF (no weld mode) (sub fault code : 1) or teaching box becomes to no weld mode (sub fault code : 2) during weld and weld was interrupted.
Detecting timing	: During welding.
Reporting timing	: Immediately after fault is detected.
Reporting way	: A fault output is on, and a fault is displayed on reset box/teaching box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Review the timing of a change of weld / no weld input.

E41 SECONDARY CABLE SHORT

Fault contents	: This fault indicated that the secondary cable is short-circuit or almost short-circuited.
Detecting timing	: After the leak check.
Reporting timing	: After the leak check sequence end
Reporting way	: A fault output is on, and a fault is displayed on teaching box/reset box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: The short circuit of a secondary cable and breakage of the diode in an inverter transformer can be considered. If expulsion is attached on the welding gun, it may cause short-circuit. Please repair the damaged part after interrupting a welding power supply.

E50 SCR OVERHEAT

Fault contents	: This fault code indicates that the thyristor is overheated. According to an overheating state, it changes from alarm operation to fault operation gradually. More than 55 degrees C (sub fault code : 1), more than 60 degrees C (sub fault code : 2), more than 100 degrees C (sub fault code : 3), thermistor wire break (sub fault code : 4)
Detecting timing	: When weld pilot is turned on.
Reporting timing	: Immediately after fault is detected
Reporting way	: If the thyristor heat sink temperature exceeds about 55 degrees C, it will become alarm operation and will output a fault display to a teaching box / reset box. If it exceeds about 60 degrees C, the fault output will turn ON, and will output a fault display to a teaching box / reset box, and the following starting will be forbidden.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Check the duty, the temperature of cooling water and flowing quantity. The welding controller return from a fault when temperature falls at about 55 degrees C or less and the welding controller return from an alarm when temperature falls at about 50 degrees C or less.

E52 WELD TRANSFORMER OVERHEAT

Fault contents	: This abnormality shows the thing that the welding Trans. thermo signal has been turned off. (It is shown that the welding transformer overheated.)
Detecting timing	: When weld pilot is turned on.
Reporting timing	: Immediately after fault is detected
Reporting way	: A fault output is on, and a fault is displayed on teaching box/reset box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Check the duty.

E60 EXTREMELY LOW CURRENT

Fault contents	: This fault code indicates that the weld current is extremely low (50% or less of a setting current value).
Detecting timing	: After ends of weld current control.
Reporting timing	: After the sequence ends.
Reporting way	: A fault output is on, and a fault is displayed on reset box/teaching box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Check the gun open, the break of welding cable, and check whether there is deposition thing or dirt caught by the electrode tips. When the welding transformer is separated by isolation contactor etc. , this fault is detected.

E61 LOW CURRENT

Fault contents	: This fault code indicates that the weld current1 is lower than LOW CURRENT LIMIT (X0Y0: Initial value is 90%.) . This fault code indicates that the weld current2 is lower than LOW CURRENT LIMIT (X0Y2: Initial value is 90%.) . This fault code indicates that the weld current3 is lower than LOW CURRENT LIMIT (X0Y4: Initial value is 90%.) .
Detecting timing	: After ends of weld current control.
Reporting timing	: After the sequence ends.
Reporting way	: A fault output is on, and a fault is displayed on reset box/teaching box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Check whether setup of LOW CURRENT LIMIT is reasonable. Check the break of welding cable, and check whether there is deposition thing or dirt caught by the electrode tips. And check whether line voltage does not fall by simultaneous welding, or check whether setting current and a turns ratio of transformer are proper, because shortage of the rate of a transformer margin can be considered.

E62 HIGH CURRENT

Fault contents	: This fault code indicates that the weld current1 is higher than HIGH CURRENT LIMIT (X0Y1: Initial value is 120%.) . This fault code indicates that the weld current2 is higher than HIGH CURRENT LIMIT (X0Y3: Initial value is 120%.) . This fault code indicates that the weld current3 is higher than HIGH CURRENT LIMIT (X0Y5: Initial value is 120 %.).
Detecting timing	: After ends of weld current control.
Reporting timing	: After the sequence ends.
Reporting way	: A fault output is on, and a fault is displayed on reset box/teaching box.
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Check whether setup of HIGH CURRENT LIMIT is reasonable.

E65 I-AVAILABLE LOW

Fault contents	: This fault code indicates that the rate of a current value which actually flowed exceeded I-AVAILABLE LOW DETECT LEVEL (X0Y33: Initial value is 100%) set up beforehand in comparison with the maximum current value.
Detecting timing	: After ends of weld current control.
Reporting timing	: After the sequence ends.
Reporting way	: This fault is programmable for the indication of off, fault and alarm in I-AVAILABLE LOW DETECT (X0Y36).
Reset way	: Turn on fault reset input, or perform reset operation of a reset box/teaching box.
Countermeasure	: Check the break of welding cable, and check whether there is deposition thing or dirt caught by the electrode tips.

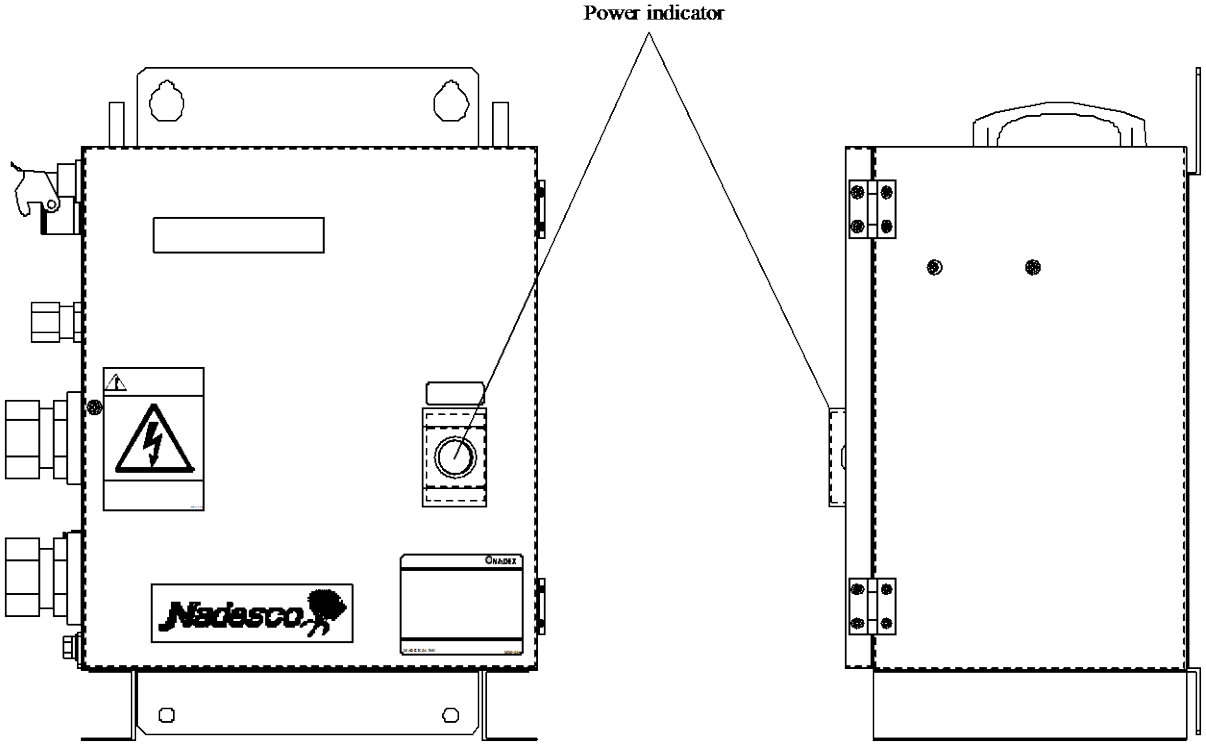
E98 COMMUNICATION FAULT

Fault contents	: This fault code indicates that some trouble occurred to the communication. This fault is always checked and fault display only in reset box/teaching box. Welding controller keeps operation.
Detecting timing	: When a reset box/teaching box is connected to welding controller while welding power supply is on.
Reporting timing	: Immediately after fault is detected
Reporting way	: A fault is displayed on a reset box/teaching box.
Reset way	: It is reset by communicative recovery.
Countermeasure	: Check whether the timer is normal, the communication connector connection, and the communication cable is disconnected.

11. The cautions on a maintenance

11-1. Power indicator

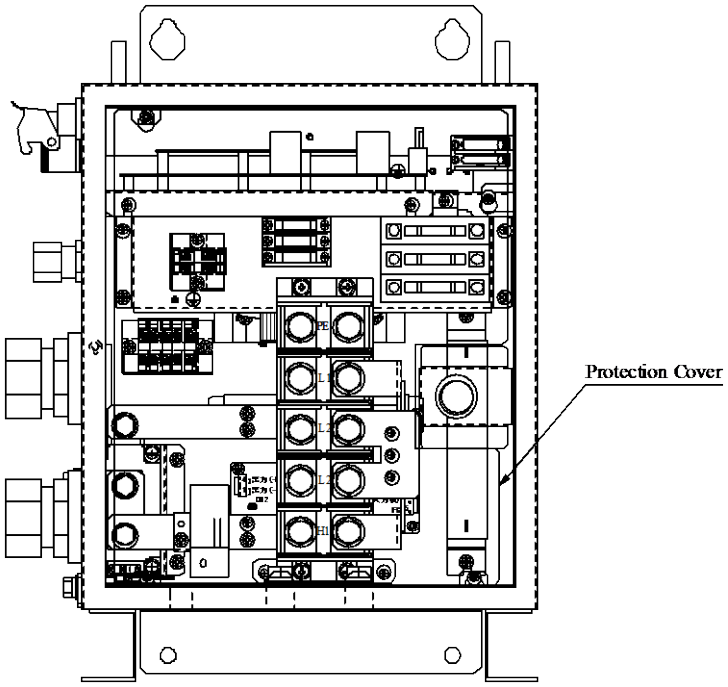
The power indicator is the display of the control power supply of this controller. Since a power indicator may not light up by disconnection of a fuse or power indicator wiring even if the welding power supply is supplied to this controller, when you maintain, please be sure to check that the welding power supply is intercepted.



11-2. Protection Cover

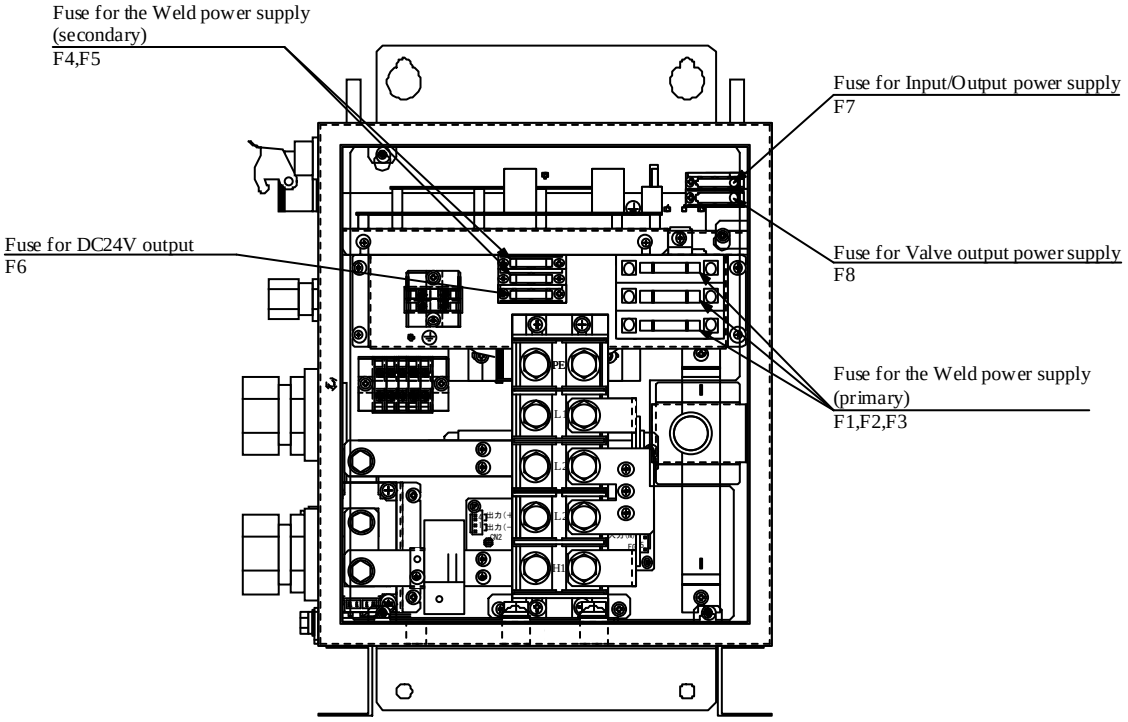
Be sure to install the protection cover in the cabinet before you turn on the welding power supply.

If the protection cover is broken, change new part before use this controller.



12. Maintenance parts

12-1. Fuse



12-1-1. Fuse for the Weld power supply

When fuse for the Weld power supply (F1-5) cuts, Welding controller will not turn on.

In the case of a fuse blown, please replace for the following.

F1,F2 : FNQ-R 600V 2A (BUSSMANN)

F3 : FNQ-R 600V 1A (BUSSMANN)

F4,F5 : F.G.A.O.-2 250V 3A (Fuji Terminal Industry or equivalent)

12-1-2. Fuse for DC24V output

When fuse for the DC24V output (F6) cuts,DC24V output doesn't output it.

In the case of a fuse blown, please replace for the following.

F6 : F.G.A.O.-2 250V 2A (Fuji Terminal Industry or equivalent)

12-1-3. Fuse for Input/Output power supply

When fuse for the Input/Output power supply (F7) cut, input/output doesn't operate.

In the case of a fuse blown, please replace for the following.

F7 : F.G.A.O.-2 250V 1A (Fuji Terminal Industry or equivalent)

12-1-4. Fuse for Valve output power supply

When fuse for the Valve output power supply (F8) cuts, the valve output doesn't output it.

In the case of a fuse blown, please replace for the following.

F8 : F.G.A.O.-2 250V 1A (Fuji Terminal Industry or equivalent)

12-2. Polyswitch

There are polyswitches for protect teaching box / reset box in a timer P.C.B. When a teaching box / reset box display nothing during a power supply injection, this welding controller is turned off and check whether there is any short circuit of a cable and a connector part. Then, turn on a power supply again after setting time for a while.

What is the polyswitch?

When the polyswitch is heated by an over-current and overheating, they are the over-current and overheating protection element which the inside temperature of an element rises, and resistance increases and restricts circuit current minutely. By once turning off a power supply, element temperature falls, and this resistance is reversibility so it is not necessary to replace it like a fuse.

13. Memory data

13-1. The memory data hold method

The program data of welding conditions and parameter data, such as various timer slave station No., are semi permanently held by the flash memory.

Therefore, there is no battery. Memory of monitor data is performed by super capacitor (a kind of a capacitor). When a power supply is intercepted after full charge, it will be held the 15th day or more in the case of a new article state. When memory maintenance time becomes short by degradation, breakage, etc. of super capacitor, please carry out a repair request to our company.

Although E28 MONITOR DATA ERROR will be detected if a power supply injection is carried out when super capacitor is in an electric discharge state, program data and parameter data are kept normal because they are backed up by the flash memory. A flash memory is a non-volatility memory which can be eliminated and written in at once about the data of the fixed range.

13-2. The cautions at the time of data writing

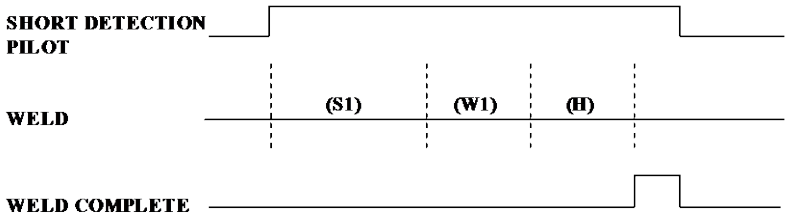
When you perform a condition setup using a teaching box or a personal computer, please do not intercept the power supply of welding controller immediately after data writing. It is required for writing for several seconds on the characteristic of a flash memory. When you intercept the power supply after writing, please intercept, after at least 15 seconds or more pass since write-in operation. If a power supply should be intercepted immediately after writing, E29 MEMORY NOT UPDATE may be detected next time at the time of a power supply is turned on. In this case, since the contents of the flash memory are updated after fault reset, it can be used as it is. However, since data is destroyed when E20 MEMORY DATA ERROR is detected, initialization and a re-setup of welding conditions are needed.

⚠ CAUTION

Do not intercept the power supply of welding controller immediately after data writing. Memory data may be destroyed.

14. Short detection

When a short circuit occurs in insides, such as a secondary cable, welding current shunts on the way. Therefore, invalid electric power increases or welding quality deteriorates. But discernment of it in an external situation is difficult. Such in a state, short detection measures all the invalid current that flows to a secondary side at the time of welding gun release by the primary side, and detects short circuit generating of a secondary cable at an early stage. Therefore, the usual welding operation cannot be performed in this function. When the short detection pilot turns on, the following short circuit detection sequences are performed.



1) Setting procedure

Set the primary current value judged to be short-circuit as X0Y6 SHORT DETECTION CURRENT of the common program. In setting the short detection current, use the reference that it should be 1/10 to 1/30 of the primary current for the normal welding.

2) Operating procedure

To test for short-circuit detection, set the SHORT DETECTION PILOT (X0Y18) to "1(ON)" and set the BINARY PILOT (X0Y13) to "1(ON)", and start sequence at pilot 15.

3) After processing

The short detection is performed by fixed firing angle in a positive side 120-degree and negative side 120-degree. When this effective value exceeds SHORT DETECTION CURRENT, welding controller judges that the secondary cable has short-circuited, and it outputs E41 SECONDARY CABLE SHORT fault signal without outputting the weld complete signal. When normal, welding controller outputs the weld complete signal while leak check pilot is on.

It is not concerned with the state of a soft switch, but operates as stepper off. SCHEDULE No.(X0Y71) of the common monitor become "0", as a result, primary current average value is displayed at the #1 SECONDARY CURRENT[kA]*1) (X0Y79).

*1) A unit should be disregarded when you see this display.

ex. When displayed as 3.1[kA], please read with 31[A].

4) Counter measure

If the short-circuit is not detected, set the short detection to OFF. If it is detected, replace the secondary cable and reset the fault.

CAUTION

A condition setup is not required, because short detection is performed by the fixed sequence shown below.

Squeeze time (S1)---------- 2 cycles

#1 weld time (W1)---------- 1 cycle

Hold time (H) ---------- 1 cycle

When you perform short detection, please be sure to change welding gun into the open state. When having not opened, it detects incorrectly.

15. I-available low detect function

15-1. Purpose

If degradation or disconnection etc. of a secondary cable progress, the maximum current (full heat current) will be low gradually. The low of this maximum current is detected and preventive maintenance such as a cable is urged.

15-2. Detection method

When the rate of a current value which actually flowed exceeded I-AVAILABLE LOW LEVEL set up beforehand in comparison with the maximum current value, E65 I-AVAILABLE LOW is detected.

15-3. Programming item

(1) Set up the rate which detects a fault to the maximum current on I-AVAILABLE LOW LEVEL (X0, Y33).

(2) Set detection operation "0(off)", "1 (fault)" and "2 (alarm)" as I-AVAILABLE LOW DETECT (X0, Y36).

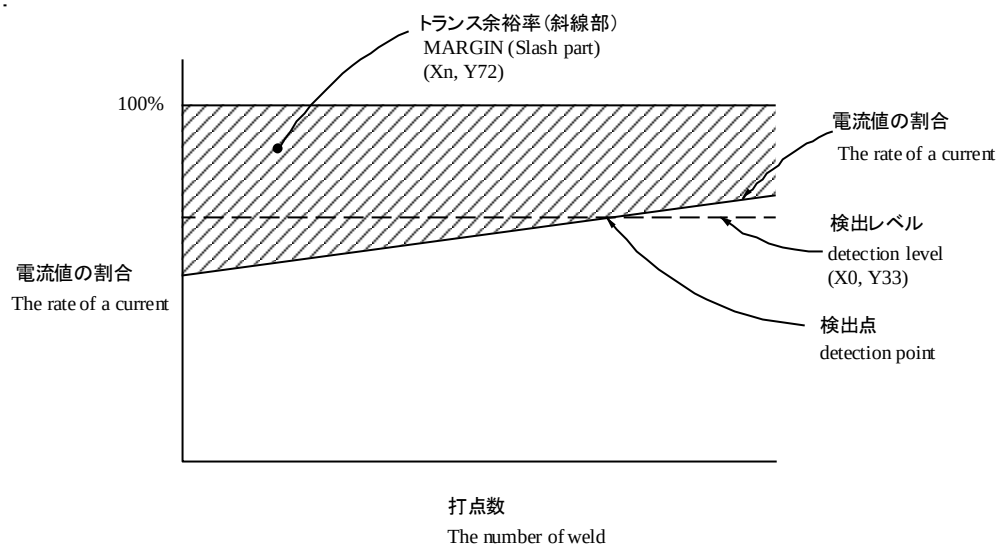
15-4. Others

The rate of a current value which actually flowed is the value which subtracted MARGIN (Xn, Y72) from 100.

It does not detect, when weld time is less than 3 cycles.

When #1-#3 weld time are all used, the rate of the current which flowed makes the largest one applicable to detection.

When you do not use this function, please set I-AVAILABLE LOW DETECT (X0, Y36) as "0 (off)".



MEMO

Date	Jan. 10. 2013
Up Date	Feb. 26. 2014
Drawing No.	**112A01-303-2**

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