

# **Ultrasonic Cleaner Pulse Jet W-357-1MQG-SKC**

## **- Instruction Manual -**

- Please carefully read this instruction manual before using this product.
- Please use the product correctly.
- Please keep this document where it can be easily accessed.



**HONDA ELECTRONICS CO.,LTD.**

## Foreword

Thank you for purchasing the Ultrasonic Cleaner Pulse Jet.

This ultrasonic cleaner, using quartz vibration unit, cleans fine contamination that cannot be removed by using only pure water. This process is done by ejecting ultrasonic water onto a semiconductor (e.g. silicon wafer).

This document describes how to use the device correctly and also lists important safety instructions to prevent injury, malfunction, damage (e.g. fire), etc. Please read this document carefully before using the device and be sure to follow the safety instructions.

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## Table of Contents

	<u>Page</u>
1. Safety Precautions .....	1
2. Safety Instructions .....	2
3. Components .....	8
4. Functions and Features .....	9
5. Device Installation and Cable Connection .....	10
6. Installing the Device – Cautions .....	15
7. Operation .....	16
8. Effective Ultrasonic Cleaning – Hints .....	21
9. MENU Operation .....	22
10. RS-422A .....	24
11. Generator - Outline View .....	27
12. Nozzle - Outline View .....	28
13. Cable (provided) - Outline View .....	29
14. Generator - Connection Diagram .....	30
15. Product Specifications .....	31
16. Precautions in Using the Device .....	34
Appendix 1: Alarm code list (W-357-1MQG) .....	35

# 1. Safety Precautions








## 1. Safety Precautions

The following signs describe safety hazards and damages according to the safety level.

 <b>Danger</b>	<b>Incorrect use of the device may result in a critical accident and you may be killed or severely injured.</b>
 <b>Warning</b>	<b>Incorrect use of the device may result in being killed or severely injured.</b>
 <b>Caution</b>	<b>Incorrect use of the device may result in injury or damage to the device.</b>

### ■ Signs and Safety symbols

The following signs and symbols describe the cautions, hints, safety instructions and references.

	Don't		Read the instruction manual
	Instruction		
	Hint		Do not disassemble
	Reference page		Danger - Electrocutation



## 2. Safety Instructions

This device has been carefully manufactured to ensure safe use. However, if you don't follow the safety instructions described in this document, you may be injured or the device may be damaged.

Before you start using this device, please read this document carefully and learn how to operate the device safely and correctly.

### 2. Safety Instructions

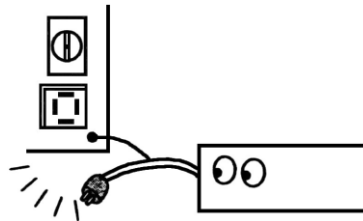
#### 2-1. DANGER - HIGH VOLTAGE

 <b>Danger</b>	<b>HIGH VOLTAGE</b>
 No Disassembly	Do not disassemble, repair or alter the device. Doing so may result in electrocution, injury or cause a fire.

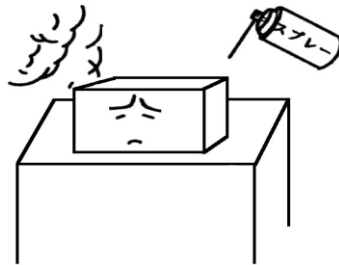
## 2. Safety Instructions

### 2-2. Basic Safety Instructions

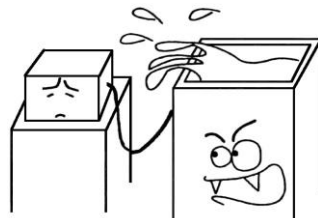
Please carefully read and follow the safety instructions described in this section. If you ignore these safety instructions, an accident may occur that may kill or injure you.



Connect the device to a power source by using a grounded outlet, or connect the ground cable to the ground terminal.



Do not use this device in an environment with inflammable or explosive gas.



Do not subject the device to liquids. Do not place or immerse the nozzle in water.

## 2. Safety Instructions

Please carefully read and follow the safety instructions described in this section. If you ignore these safety instructions, you may be killed or severely injured.



Carefully handle the cleaning and waste solutions.  
Learn first aid procedures well in advance. This will expedite treatment if you are exposed to or accidentally swallow the solution.



Objects heavier than 10kg should be handled by two or more persons or with hoisting equipment.  
Be careful not to fall.  
Be careful about back injuries.

## 2. Safety Instructions

### 2-3. Safety Precautions

#### Precautions when installing the device



- \* Make sure to unplug the power cable when you connect a cable (e.g., power cable, output cable, optional cable).
- \* Do not install the device where you cannot operate the power switch or connect/disconnect the power plug.
- \* Install the device so the generator vent is not blocked.



- \* The nominal power voltage of the generator is 100V-240V AC (single phase). Do not use any other type of power.
- \* Do not use faulty or a damaged power cable or plug. Do not use a power cable or power that cannot be firmly connected to the power outlet.
- \* Do not use a power cable that has a different rating.
- \* Hold the plug firmly while completely inserting the power plug into the power outlet.
- \* Do not pull the power plug out by holding onto the cable. Make sure to hold the plug when disconnecting it from the power outlet.

## 2. Safety Instructions

### Safety precautions when operating the device



- \* Do not touch the power cable or power outlet with wet hands.
- \* Do not connect/disconnect the output connector with wet hands.  
Do not touch the nozzle accidentally.
- \* If an alarm is output, and if you need to touch the device (e.g., cables, nozzle), except the operation panel, turn the power of the generator off first and then disconnect the power cable.



- \* Need the knowledge of cleaning solution and waste solution.  
Safety precautions, first aid methods and / or any required notices for the cleaning solution in use are required to the operator.
- \* Turn the power on/off by following the proper procedure.
- \* Objects heavier than 10kg should be handled by two or more persons or with hoisting equipment.  
Be careful not to fall  
Be careful about back injuries.



- \* Do not use the following materials as a cleaning solution.
  - Inflammable or explosive liquids (e.g., thinner, benzene, etc.)
- \* Make sure to inspect the device before use.
- \* If any of the problems described below occur when turning on the device, turn off the power immediately and contact your dealer.
  - Noise, heat, smoke
  - No LCD display
  - ALARM is displayed again after turning the power off/on.



## 2. Safety Instructions

### Safety in maintenance



- \* Do not open the cover of the device.
- \* Only qualified maintenance personnel should maintain the device.
- \* If the generator gets wet, turn the primary power off immediately and then turn off the power switch. Contact your dealer for further instructions.
- \* If you feel electricity when you touch the generator, turn off the primary power immediately, then turn off the power switch. Next, check if the device has been properly grounded. Contact your dealer for further instructions.
- \* Use the specific nozzle for the device. Make sure the nozzle model and the device model match.
- \* To replace the nozzle, turn off the power switch first and disconnect the output connector.



- \* If any of the problems described below occur when turning on the device, turn off the power immediately and contact your dealer.
  - Noise, heat, smoke
  - No LCD display
  - ALARM is displayed again after turning the power off/on.

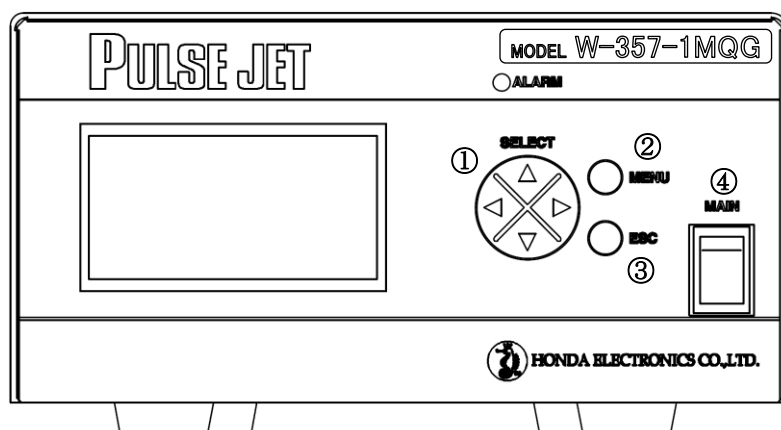
## 3. Components

### 3. Components

- |   |   |
|---|---|
| ① Generator   | 1 |
| ② Nozzle (with output cable (1.5m) and junction cable (3.5m)) | 1 |
| ③ Power cable   | 1 |
| * 100V (2m) or 200V (3m)                                      |   |
| ④ 3P-2P grounding conversion adaptor                          | 1 |
| * Not attached to the power cable (200V (3m))                 |   |
| ⑤ Output connector holding plate                              | 1 |
| ⑥ Control cable (5m)  | 4 |
| * Common cable (SENSOR、REMOTE、ALARM、4-20mA)                   |   |
| ⑦ Instruction Manual (This document)                          | 1 |

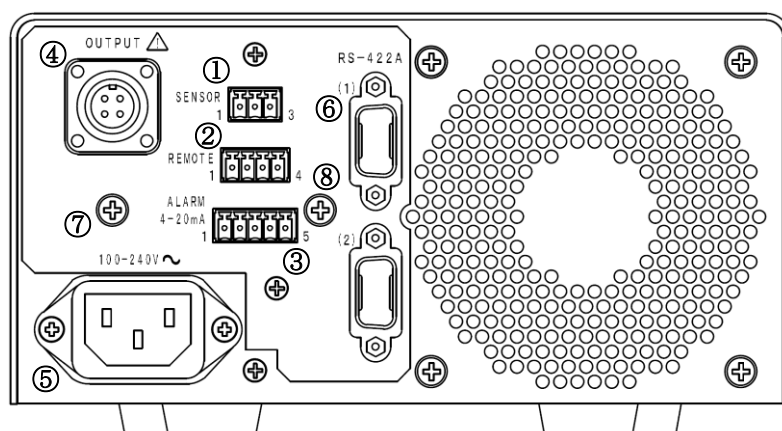
### Generator

Front panel



①	SELECT key
②	MENU key
③	ESC key
④	Power switch (MAIN)

Rear panel



①	SENSOR connector
②	REMOTE connector
③	ALARM/4-20mA connector
④	Output connector
⑤	Power socket
⑥	RS-422A connector
⑦	Screw for fixing output connector holding plate
⑧	Screw for connecting ALARM/4-20mA cable shield

\*"Generator" in this document means a box that includes the LCDs and switches.

"Device" in this document means the whole device (W-357-1MQG) including the generator, the nozzle, and the cables.

## 4. Functions and Features

### 4. Functions and Features

- ① The device (W-357-1MQG-SKC) is a quartz vibration ultrasonic cleaning unit. It uses 1MHz ultrasonic waves; the maximum output is 12W. The device consists of the generator and the nozzle with an internal ultrasonic transducer, which are connected by the cable.
  - ② The output is controlled by constant power to stabilize the energy provided to the transducer.
  - ③ The generator and the nozzle have been optimally calibrated at the factory.
  - ④ The generator calculates and monitors the impedance of the transducer while the generator is emitting the ultrasonic waves. If the relationship between frequency and impedance changes, the mechanical load to the transducer is changing or the transducer is deteriorating. If the impedance changes excessively, the transducer may not output stable ultrasonic waves. If this occurs, the generator outputs an alarm.
  - ⑤ If the device detects an error in the generator and the nozzle, it outputs an alarm. The device can detect the following errors: disconnected cable, short circuit, abnormal power, overcurrent, overvoltage, abnormal transducer impedance and insufficient water flow.
  - ⑥ You can set the power output by key input or RS-422A communication. You can turn ON/OFF by REMOTE connector (Separate line).
- W-357-1MQG - Major functions and Features
    - Constant power control
    - Transducer's impedance monitoring
    - Sophisticated error detection
    - RS-422A, 4-20mA
    - Input power range: 100 - 240V AC

## 5. Device Installation and Cable Connection

### 5. Device Installation and Cable Connection

#### 5-1. Caution

- ① When you connect the nozzle, output cable and optional cables, first disconnect the power plug.
- ② Do not install the device where the generator vent is blocked or where you cannot operate the power switch or connect/disconnect the power plug.
- ③ Place the generator on a horizontal platform that is not subject to vibration. Securely lock the nozzle with a clamp.

#### 5-2. Connecting the Nozzle

- ① Make sure the power switch is turned OFF.
  - ② Connect the plug (nozzle cable) to the output connector (generator (rear side)).
  - ③ Attach the holding plate (output connector) to the connected plug and lock the plug with the screws.
- \* This holding plate (output connector) prevents you from accidentally removing the plug while the device is in operation. However, if you embed the generator in another device, you don't need to install the holding plate (output connector).



See "3. Components" (Page 8)

See "14. Generator - Connection Diagram" (Page 30)

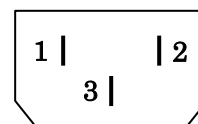
#### 5-3. Connecting the Power Cable

- ① Make sure that the power switch (generator) is turned OFF.
- ② Connect the power cable (provided) to the power socket (generator (Rear side)).
- ③ Connect the power cable to the primary power source.



The power voltage for the generator is "100V - 240V AC (Single-phase) 50/60Hz". Do not use any other power type. If you use a different power, the device may fail or cause an accident (e.g., fire).

Pin 1 ———— Nominal voltage: 100V - 240V AC  
Pin 2 ————  
Pin 3 ———— GND



## 5. Device Installation and Cable Connection

### 5-4. Connecting the SENSOR Connector

- ① Connect the 3-pin connector (provided) to which the control cable is connected to the SENSOR connector (generator (rear-side)). Connect the RED line and WHITE line of the control cable (connected to SENSOR connector) to OUTPUT of the flow switch. (When the water flow exceeds the critical water flow (specified value or more), the flow switch turns "ON" (CLOSE).)

Pin 1	SENSOR signal input (+5V pull-up)	RED line	→ Flow switch
Pin 2	GND	WHITE line	→ Flow switch
Pin 3	GND	SHIELD line	→ Shield

- ② Set the optimum flow rate according to the cleaning effect. Flow switch can stop the oscillation when the flow rate is less than the setting flow rate, "Sensor Open" is displayed on the front panel and ALARM LED lights up. Dry boiling operation for approx. 1 minute only may be allowable, however, the unit cannot be guaranteed at all if the dry boiling operation is done.

\* The flow switch is not provided. The customer should provide it.

## 5. Device Installation and Cable Connection

### 5-5. Connecting the REMOTE connector

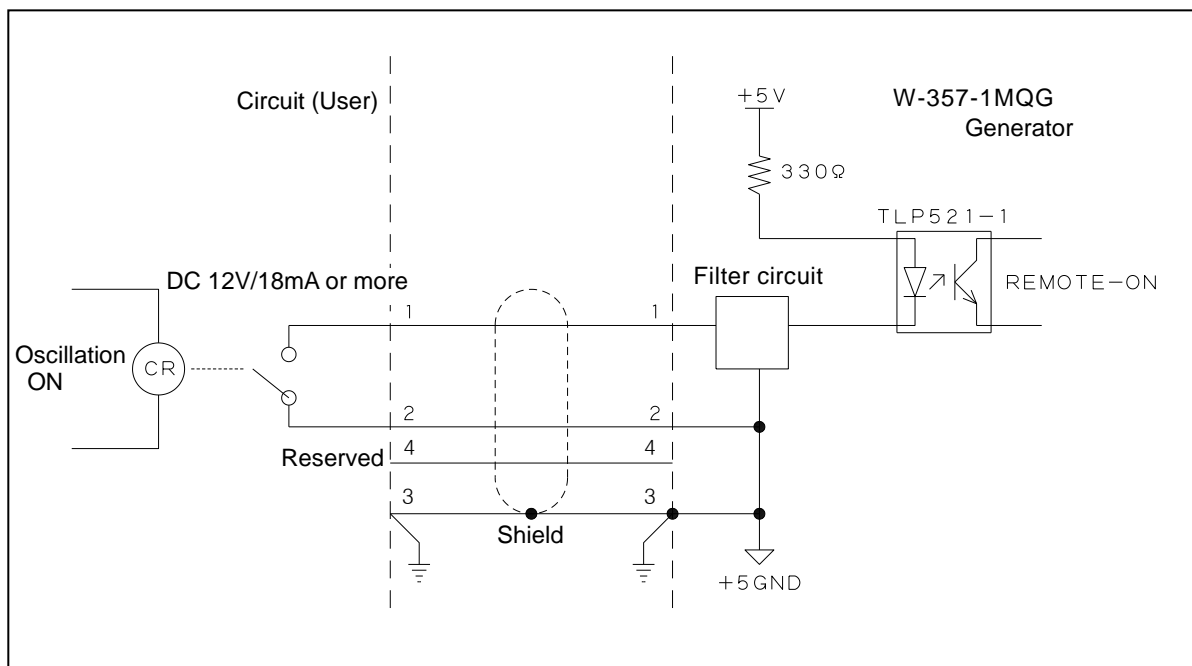
- ① Connect the control cable to the 4-pin connector (provided). Connect the control cable to the REMOTE connector (generator (rear-side)). (The REMOTE connector allows you to turn ON/OFF the emission of the ultrasonic waves.)
- ② You can turn ON/OFF to emit the ultrasonic waves by tuning RED and WHITE lines to "CLOSE/OPEN" of the control cable connected to REMOTE connector.

\* If the REMOTE connector is not connected, the generator remains in the "OPEN" state and "Emitting the ultrasonic waves" is turned "OFF".

- ③ Pin number

Pin 1	REMOTE signal input (+5V pull-up)	RED line → REMOTE driving circuit
Pin 2	GND	WHITE line → REMOTE driving circuit (COM)
Pin 3	GND	SHIELD line → SHIELD
Pin 4	Reserved	BLACK line → Reserved

- ④ Connection - Example



## 5. Device Installation and Cable Connection

### 5-6. Connecting the ALARM cable

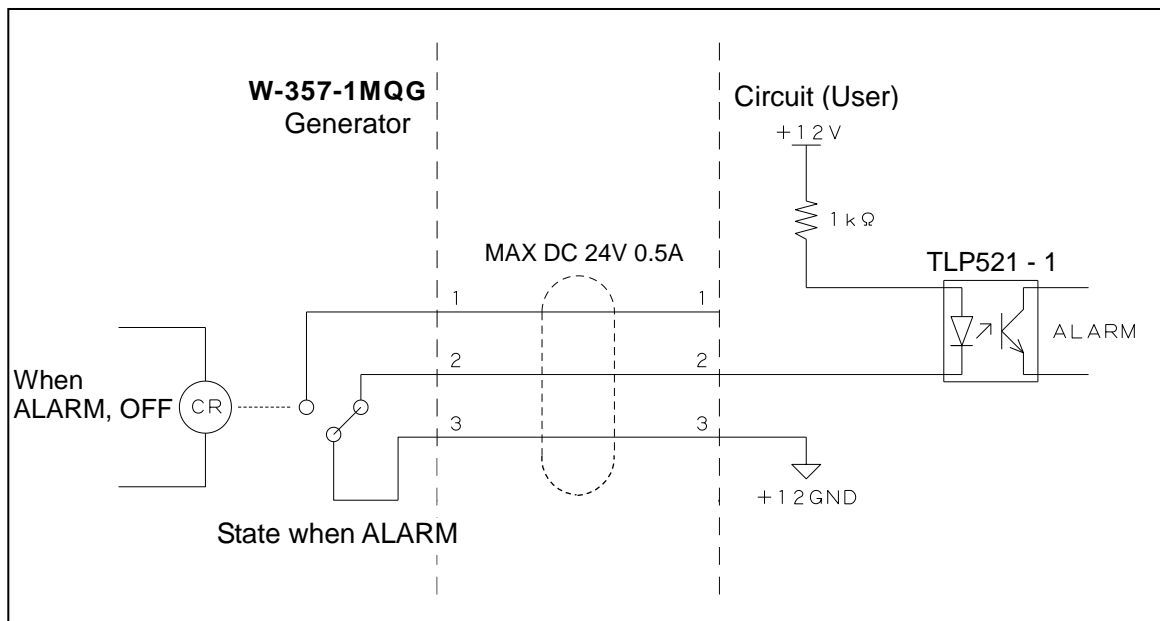
- ① To install a warning buzzer or warning light, connect the control cable to the 5-pin connector (provided) and connect the control cable to ALARM/4-20mA (generator (rear)). (Pins 1 - 3 are used in ALARM.)
- ② To output a warning, "C-contact" of the mechanical relay is used. The rating is DC24V/0.5A (max).

③ Pin number

Pin 1	Alarm OFF	RED line	→ User's circuit (When ALARM , OFF)
Pin 2	Alarm ON	WHITE line	→ User's circuit (When ALARM, ON)
Pin 3	Relay's common terminal	BLACK line	→ User's circuit (Common)

\* Design the control circuit based on the conditions described in ② and ③.

④ Connection - Example



### 5-7. Connecting the 4-20mA cable

- ① To monitor the output power of the generator, connect the control cable to the 5-pin connector (provided) and connect the control cable to the ALARM/4-20mA connector (device (rear)). (Pins 4 -5 are used in 4-20mA.)

② Pin number

Pin 4	4-20mA Output +	RED line	→ User's circuit +
Pin 5	4-20mA Output -	WHITE line	→ User's circuit -

\* Design the control circuit based on the conditions described in ① and ②.

## 5. Device Installation and Cable Connection

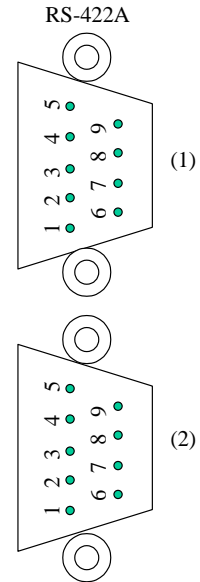
### 5-8. Connection to the RS-422A

To operate the device via Serial communication, connect the RS-422A interface to the external equipment (e.g., PC). The following describes the pin assignment of D-sub9 pin (male) of RS-422A connector.

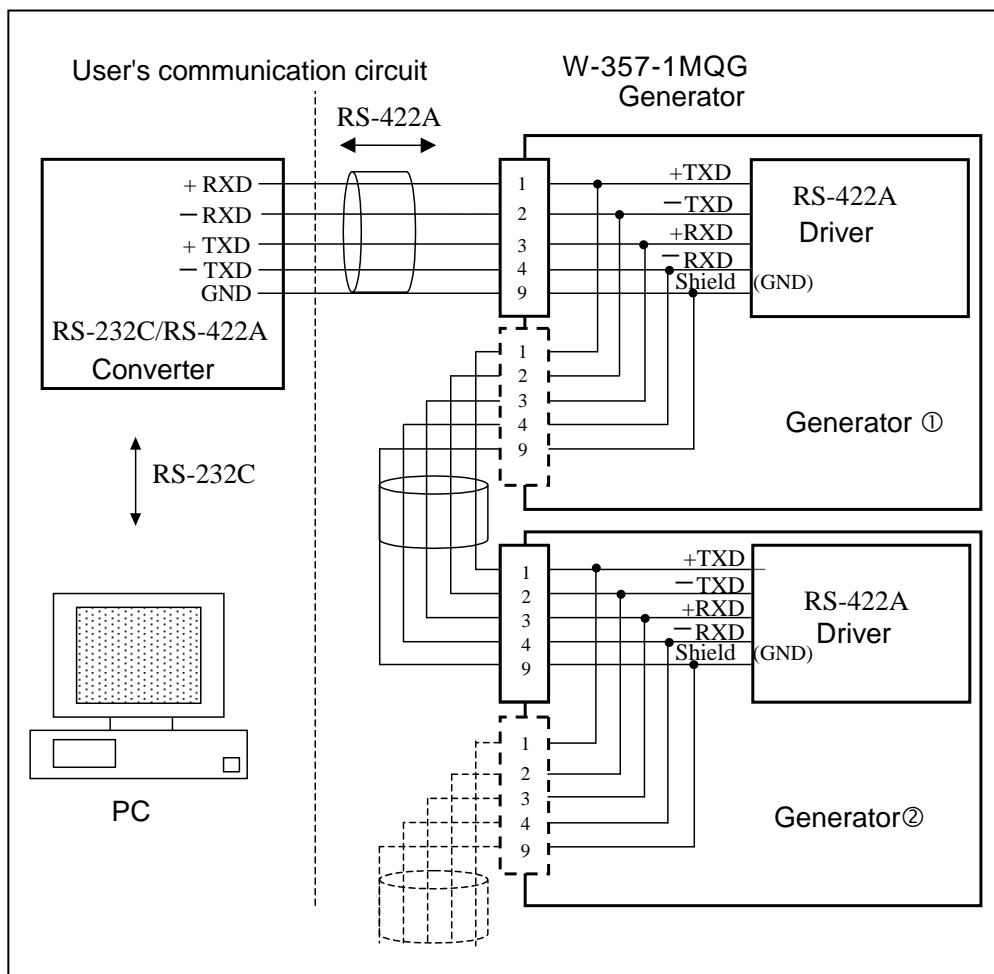
Fig. 1. D-sub9 pin (Male) - Pin assignment

Pin No.	RS-422A (1)	RS-422A(2)
1	TXD	TXD
2	-TXD	-TXD
3	RXD	RXD
4	-RXD	-RXD
5	...	...
6	...	...
7	...	...
8	...	...
9	SHIELD (GND)	SHIELD (GND)

\* Two D-sub9 pins are internally connected in parallel.



### 5-9. Connection to External Equipment (e.g., PC) - Example





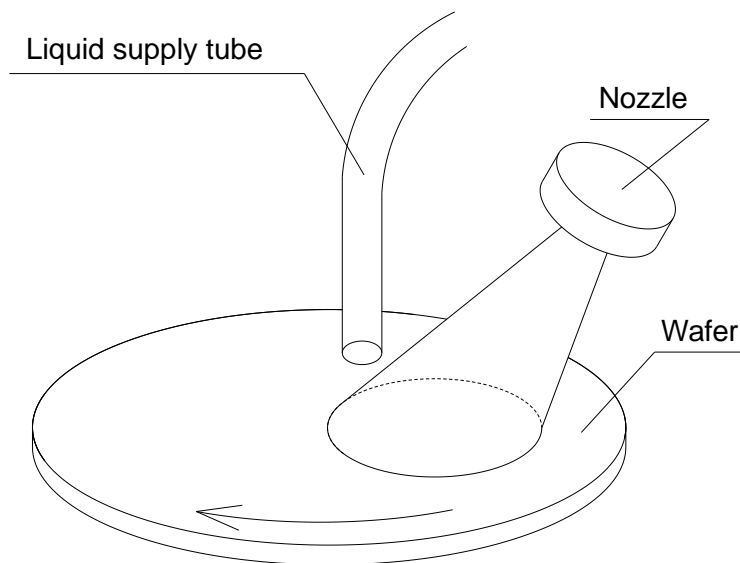
## 6. Installing the Device - Cautions

We propose this cleaning concept by the requirement of “nozzle type megasonic cleaner with less liquid consumption”.

The important things for this cleaning method are the spin speed of the wafer or moving speed of LCD panel, liquid amount and the distance between the nozzle and cleaning object (wafer, LCD panel).

- The irradiation area of the ultrasonic is the flat tip area of the nozzle. Place the irradiation area and wafer in parallel. Set the distance between the nozzle and the cleaning object to approx. 1 - 2mm. If the distance between the nozzle and the cleaning object is closer, it is possible to reduce the cleaning liquid consumption. However, keep the enough gap between the nozzle and the cleaning object in order not to contact with each other and damage them.
- Keep the condition of being filled with the cleaning liquid between the nozzle and the cleaning object in order to avoid the overheating of transducer by the dry boiling operation. If the ultrasonic oscillation without cleaning liquid continues for a long time, the transducer can be broken. Make sure to switch on after the gap between the nozzle and the cleaning object with the the cleaning liquid.
- In the case that the moving speed of the cleaning object is speedy, the consumption of the cleaning liquid is larger. Also, the cleaning effect can be decreased because the ultrasonic irradiation time for each area is shorter.
- Draining of the liquid after cleaning may be important because there is a possibility to reattach the particle to the cleaning object.

### Example for setting



## 7. Operation

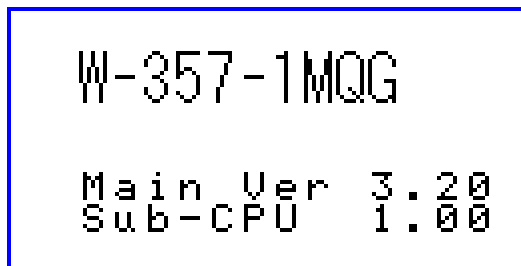
### 7. Operation

#### 7-1. Caution

- ① The customer should provide a water flow switch that turns "ON" (CLOSE) the device when the water flow is specified value or more. (Contact capacity: 12V/18mA or more)
- ② Connect the control cable to the SENSOR connector and connect the RED/WHITE lines of the control cable to the contact of the water flow switch.
- ③ Connect the tubes to the joint for air purging in order to cool the transducer.

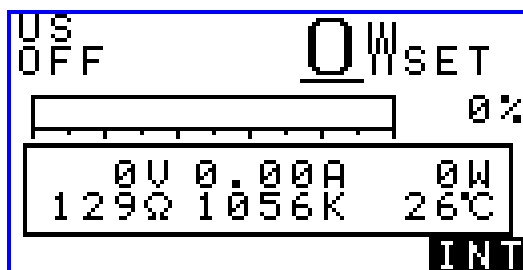
#### 7-2. Power ON

- ① Inject the cleaning solution for the specified water flow.
- ② Turn on the air purging in order to cool the transducer.
- ③ Turn ON the power switch on the front panel.
- ④ After power has been provided to the generator, the LCD turns on and displays the opening message. The model name, software version, sub-CPU version is displayed.



- ⑤ The main screen will appear in two or three seconds.

You can set the output power by INT (key input) or RS-422 (RS-422A). The mode that controls the output power is shown in the right corner of the screen, displaying "INT" or "422".



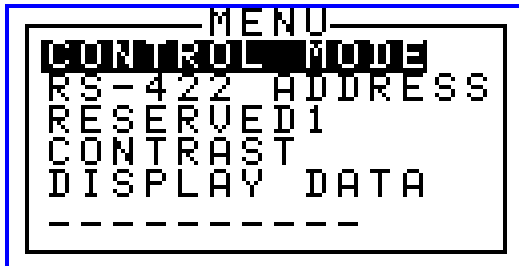
## 7. Operation

### 7-3. Setting

- ① You can change the mode in the MENU screen.

When you press the MENU key, the MENU screen appears. (You cannot change the mode while the generator is running.)

When you press the ESC key in the MENU screen, the previous screen appears.



- ② Keys

△ , ▽ , ◀ , ▶ ..... Select

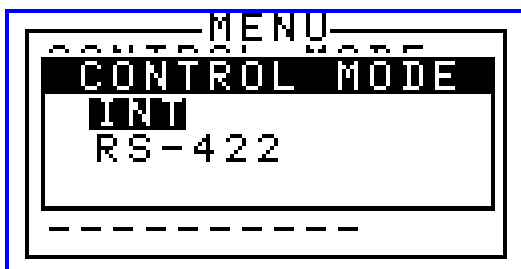
MENU ..... Go to the MENU screen, or Enter

ESC ..... Cancel, or Go to the Previous screen

- ③ When you select "CONTROL MODE" and press the MENU key, the sub screen appears.

When you select the mode and press the MENU key, the mode changes.

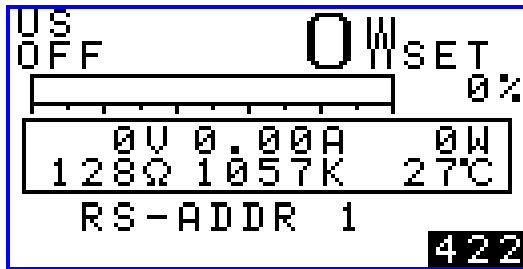
When you press the ESC key, the input is cancelled and the previous screen appears.



## 7. Operation

### ④ Selecting RS-422A

The Machine Address (ID) of RS-422A is displayed at the bottom of the screen.

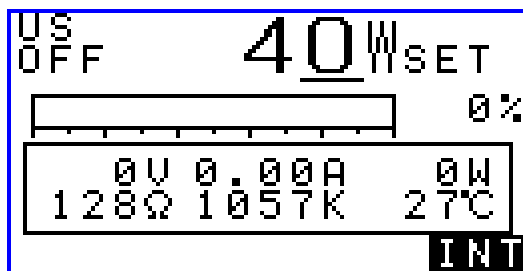


### ⑤ INT mode - Changing the output power

When you press the ◀ or ▶ keys, the digit position ("Wset" number - Underlined) changes.

When you press the ▲ or ▼ keys, the numeral (underlined) is incremented or decremented.

You can change the output power while the generator is running.



## 7. Operation

### 7-4. Oscillation

#### ① Oscillation

REMOTE ON or SENSOR ON starts emitting ultrasonic waves.

REMOTE OFF stops emitting ultrasonic waves.

The box shows the measurement values.

From top left:

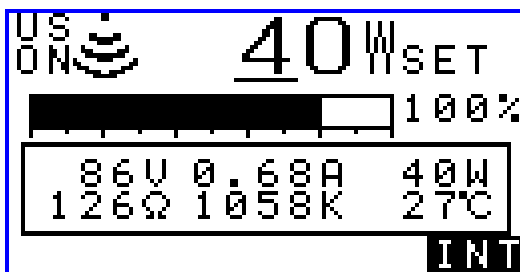
High-frequency voltage, High-frequency current, High-frequency power

Lower line:

Transducer impedance, Frequency, Heat sink temperature

The measured power is shown by the bar graph.

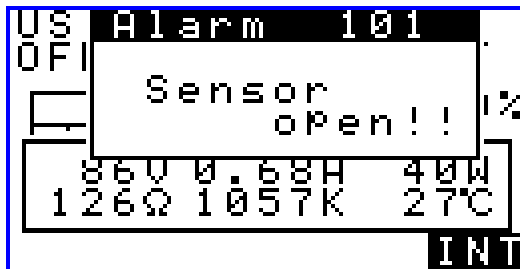
"Measure power / Set power x 100" is shown in %.



#### ② SENSOR alarm

While the state is "REMOTE ON" and "SENSOR OFF", SENSOR alarm is output. The generator stops emitting the ultrasonic waves.

When the SENSOR is ON, the operation is resumed.



#### ③ Other alarms

If an error occurs and the device cannot be operated correctly, an alarm is output.

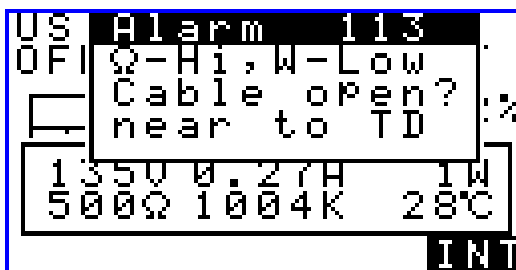
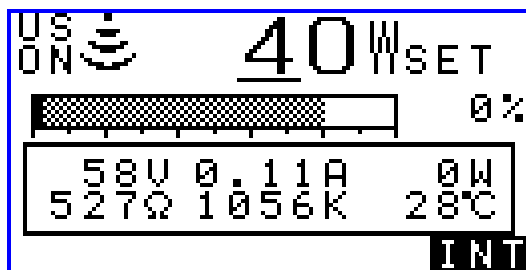
If the output power and the measured power differ, the bar graph shows the difference with "hatching". The following page gives an example where the nozzle is not connected. This example shows that abnormally high impedance of the transducer and a 40W set power cannot be output.

The device will output an alarm and stop the generator.

Alarm 113 indicates the cause of the problem: the cable near the generator changed to "Open". The alarm is continuously displayed while the state is "REMOTE ON". If the cause of the problem is removed, you can turn REMOTE to ON (OFF → ON) to resume the operation.

\* Alarm codes are listed in Appendix 1.

## 7. Operation



The generator, transducer and output cable have high voltage. Do not open the cover of the device. When you touch the device (e.g., connecting the cables), make sure to disconnect the power cable from the power source. If you don't disconnect the power cable, you may be killed or severely injured.

### 7-5. Shutting off the Power

- ① Turn OFF the power switch of the generator.
- ② Next, if you use any external driving devices, shut off the power of those devices.
- ③ Stop injecting the cleaning solution.
- ④ Stop injecting air to cool the transducer.

## 8. Effective Ultrasonic Cleaning - Hints

### 8. Effective Ultrasonic Cleaning - Hints

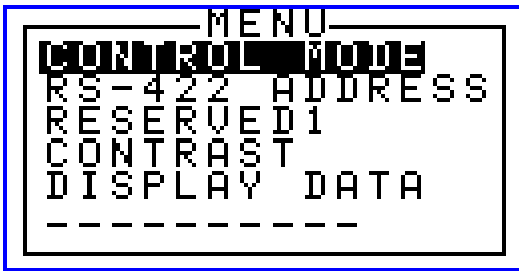
- ① The irradiation area of the ultrasonic is the flat tip area of the nozzle. Place the irradiation area and wafer in parallel. Set the distance between the nozzle and the cleaning object to approx. 1 - 2mm.
- ② When installing the nozzle, ensure the constant gap and angle between the irradiation area of the nozzle and the cleaning object. If the gap or angle changes, the acoustic pressure may vary, resulting in non-uniform cleaning.
- ③ During cleaning, maintain the constant liquid and air temperatures. If the liquid or air temperature changes, the acoustic pressure may vary, resulting in non-uniform cleaning.



Inappropriate cleaning liquid viscosity may reduce the effectiveness of ultrasonic cleaning or lead to cleaner malfunction.

## 9. MENU Operation

### 9. MENU Operation



#### 9-1. Keys

△ , ▽ , ◀ , ▶ ..... Select

MENU ..... Enter

ESC ..... Cancel, or Go to the Previous screen

#### 9-2. CONTROL MODE

You can select the mode to set the output power.

INT (Key entry)

RS-422 (RS-422A)

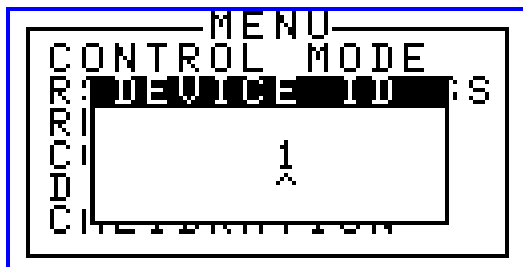


#### 9-3. RS - 422 ADDRESS

You can set the Machine Address (ID) when RS-422A is used.

You can use any of the following letters for the ID:

0-9, A, B, C, D, E





## 9. MENU Operation

### 9-4. RESERVE1

This is a parameter for function extension.

It is set as "0" in the standard specification.

### 9-5. CONTRAST

You can change the contrast level of the LCD display panel.

### 9-6. DISPLAY DATA

- ① **Osc**: Cumulative time (Hour:Minute:Second) that the generator outputs the ultrasonic waves (This cannot be cleared to "0".)
- ② **Td**: Cumulative time that the transducer is used. You can select "0 Clear" when you calibrate the device.
- ③ **Cal**: Cumulative time that the generator outputs the ultrasonic waves after calibration.
- ④ **Times**: Number of times that the generator outputs ultrasonic waves. This is the same as the number of times of "REMOTE ON/OFF".
- ⑤ **Freq**: Driving frequency of the transducer. This is the moving average of the frequency being tracked.
- ⑥ **Impe**: Transducer's impedance. This is the moving average of the transducer being tracked.

These data items are only displayed.

DATA		DISP	
Osc	233	:02	:18
Td	233	:02	:18
Cal	29	:22	:36
Times	7	38	36
Freq[kHz]	1	048	
Impe[Ω]		104	

## 10. RS-422A

### 10. RS-422A

#### 10-1. RS-422A Specification

Electrical characteristics	EIA RS-422 compliant
Communication method	Half-duplex
Synchronization scheme	Asynchronous
Transmission rate	9600 bps
Start bit	1 bit
Data length	7 bit
Parity	Even parity
Stop bit	1 bit
Delimiter	CR
Character code	ASCII code
Machine address (ID)	0 - E
Error check	BCC (Even horizontal parity)



For details on pin assignment, see "5-8 Pin assignment" (Page 14).

## 10. RS-422A

### 10-2. Communication Commands and Responses

Communication command	Send	Response
Output power setting W command	"I[ID],W[Power: 3 digits]W, [BCCH], [BCCL], [CR]" * Power: Set in the range [000~120] Only 422 mode is valid.	"I[ID], W[Power: 3 digits]W, [BCCH], [BCCL], [CR]"
Read status STA command	"I[ID], STA, [BCCH], [BCCL], [CR]" * Any mode is valid.	"I[ID], M[Measured power: 3 digits]W, Rx, Ex, Sx, Wx, [BCCH],[BCCL],[CR]"  Rx-REMOTE state [x=0: Open / =1: Short] Ex-Mode state [x=0:INTorNET / =1:RS-422] Sx-SENSOR state[x=0: Open / =1: Short] Wx-Power Control state x=0: Normal power x=1: Higher than alarm threshold x=2: Alarm threshold or lower
Software version VER command	"I[ID], VER, [BCCH], [BCCL], [CR]"	"I[ID],VERxxxx,[BCCH],[BCCL], [CR]" xxxx: Version (e.g., 1.00)
Output power setting A command (For current models)	"I[ID], A[Current: 4 digits]A, [BCCH], [BCCL], [CR]" * Current: Set in the range [0.00~0.70] Power=40 / 0.49 x Current x Current (Conversion) Only 422 mode is valid.	"I[ID], A[Current]A ,[BCCH], [BCCL],[ CR]"  *Current: Conversion (value) from the power
Read status STATE command (For current models)	"I[ID],STATE,[BCCH],[BCCL],[CR]" * Any mode is valid.	"I[ID], M[Measured power: 3 digits]A, Rx, Ex, Sx, Cx, [BCCH], [BCCL], [CR]"  Rx,Ex,Sx: Same as STA command Cx: Same as Wx (STA command)

[ID] ... Machine address (0 - E)

[BCCH]... 0 - F (Even horizontal parity - Upper 4 bits)

[BCCL] ... 0 - F (Even horizontal parity - Lower 4 bits)

[CR] ... 0D(Hex)

- The response to the SEND command delays for 600ms immediately after a REMOTE short.
- While the generator is running (emitting ultrasonic waves), the response for the output power setting delays for 600ms.

## 10. RS-422A

### 10-3. Error response


If an error occurs after [CR], an error response is returned.

Example) “[ID],COMERR,[BCCH],[BCCL],[CR]”

- If the set value is out of scope, NUMERR is returned. (Only W and A commands (Output setting command))

Error response

Error command (#2)	Description	Priority in error contention
PARERR	Parity error	1
FRMERR	Framing error	2
OVRERR	Overflow error	3
COMERR	Command error	4
NUMERR	Numerical error	5
BCCERR	BCC error	6

	<ul style="list-style-type: none"> <li>• If a command error occurs and the set power (current) value is out of scope, the device maintains the state before the data was entered.</li> <li>• If the ID (Communication) and Generator ID do not match, no response is returned.</li> </ul>
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### 10-4. SEND and Response

① Output power setting - Example: ID = 1 / Set power value = 40W

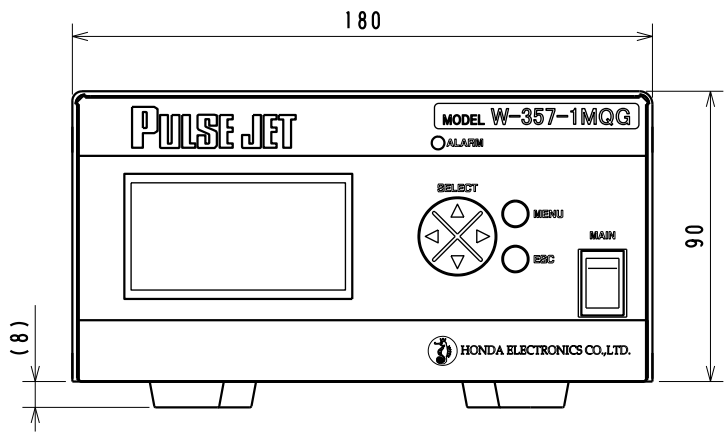
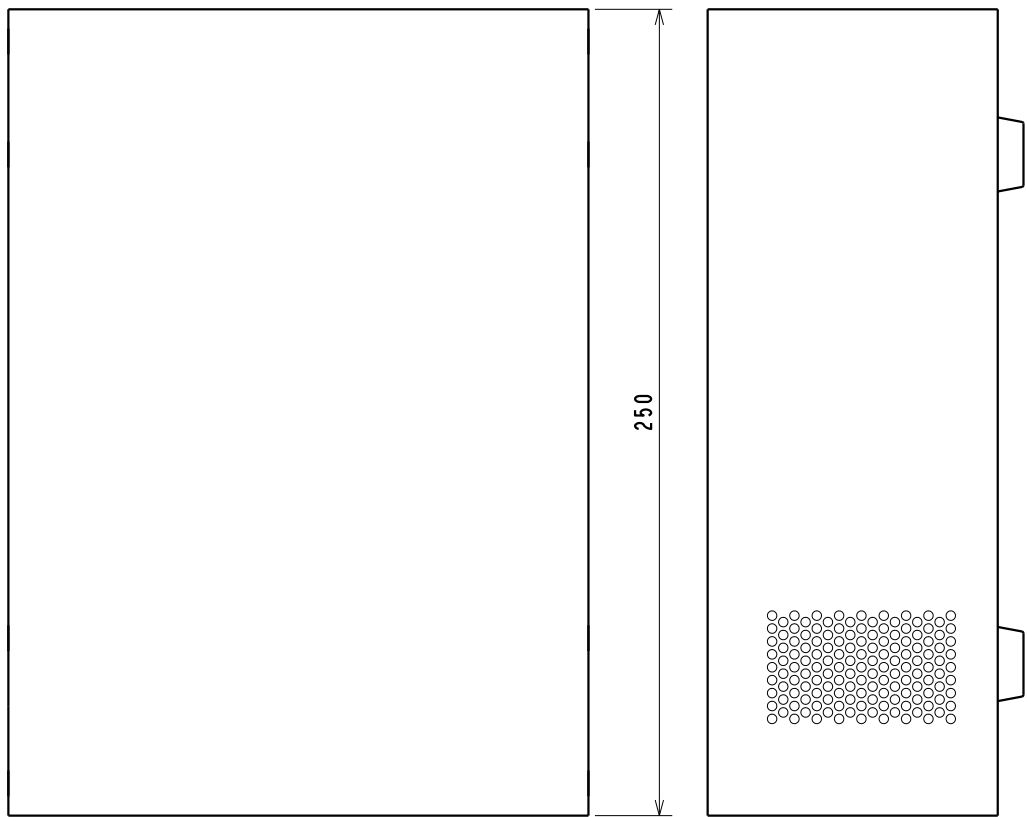
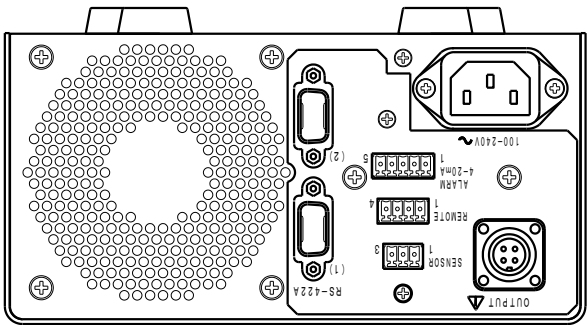
SEND command	Response
“I1,W040W,4,C,[CR]”	⇒ “I1,W040W,4,C,[CR]”

② State read result - Example: ID = 1 / Set power value = 40W

SEND command	Response
“I1,STA,3,E,[CR]”	⇒ “I1,M040W,R1,E1,S1,W0,4,4,[CR]”

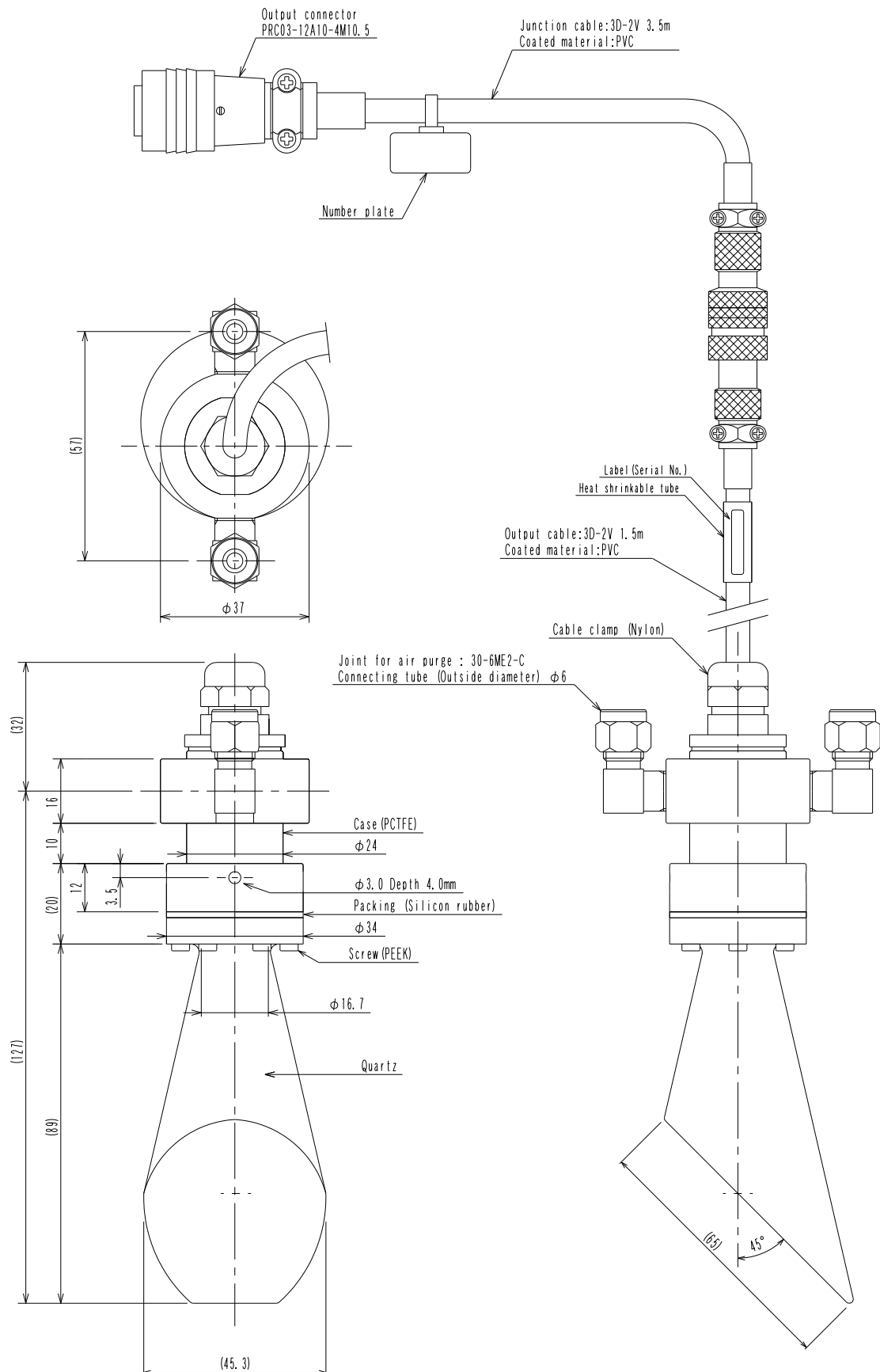
# 11. Generator - Outline View

## 11. Generator - Outline View



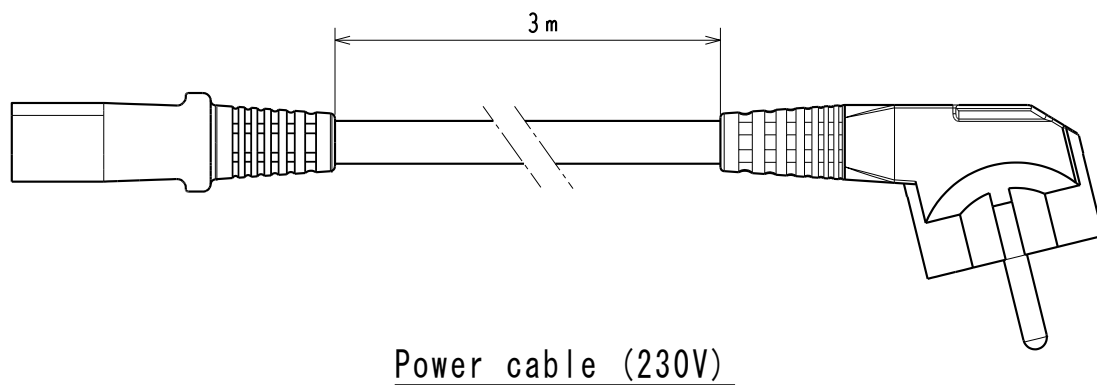
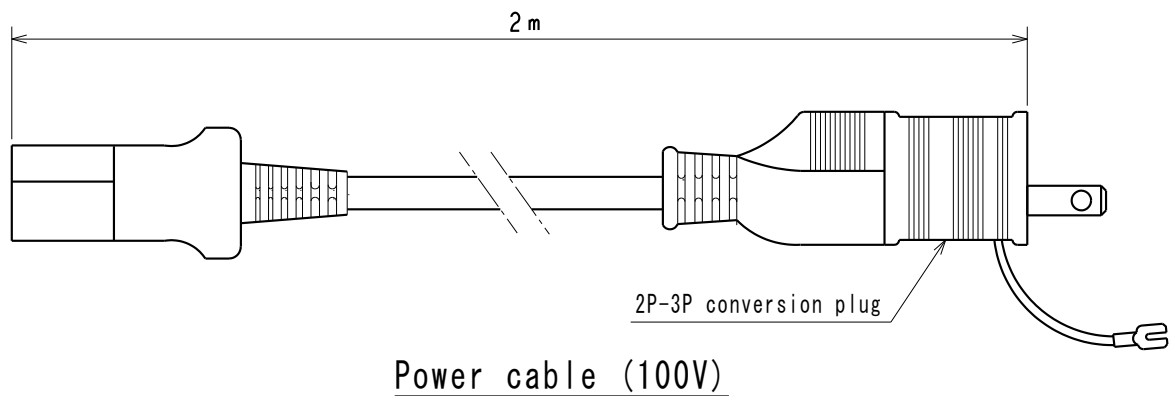
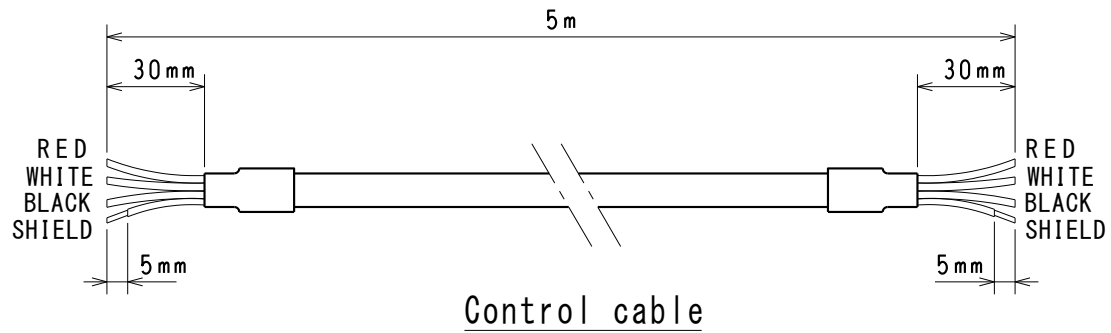
## 12. Nozzle - Outline View

### 12. Nozzle - Outline View



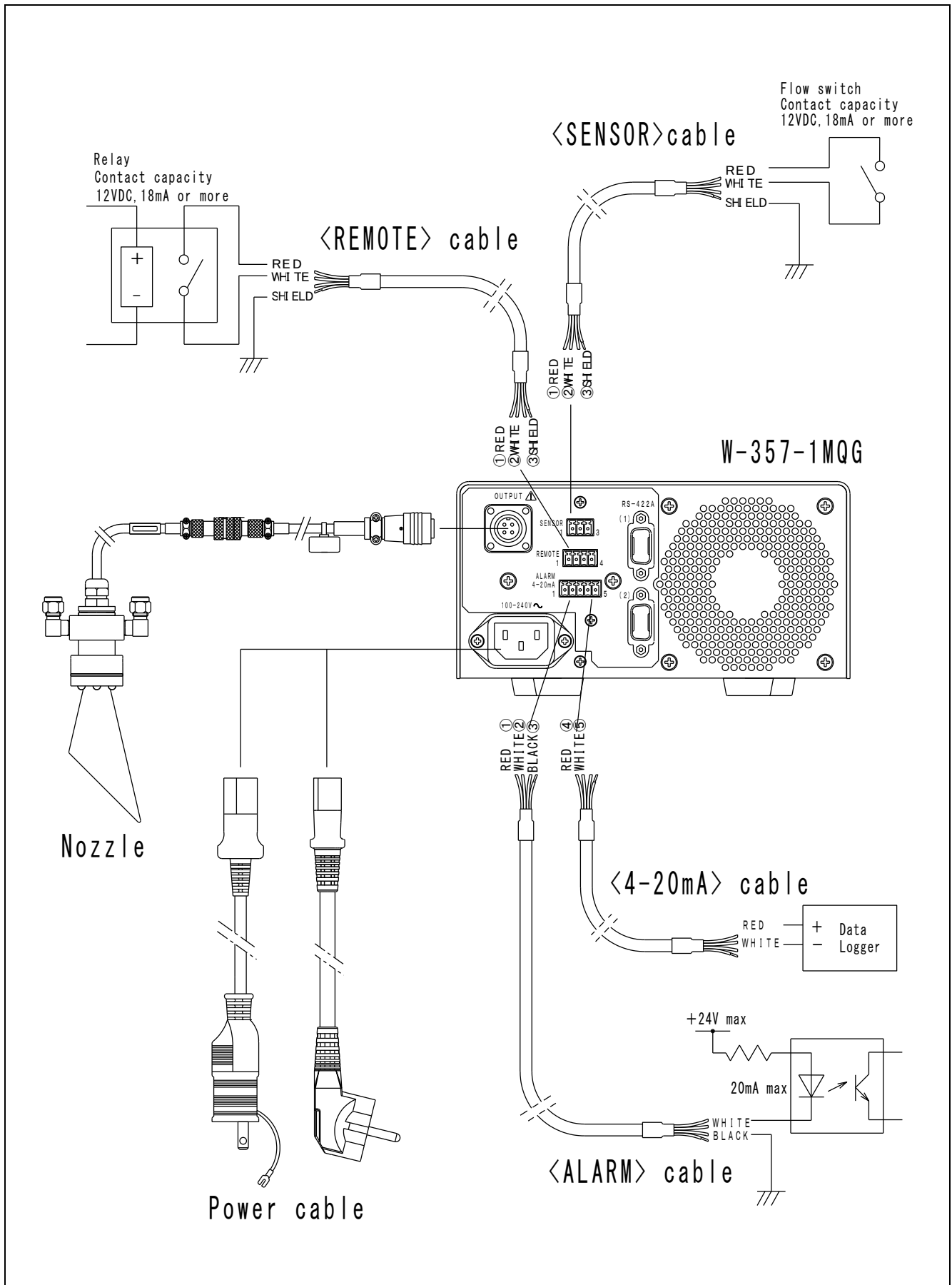
### 13. Cable (provided) - Outline View

#### 13. Cable (provided) - Outline View



## 14. Generator - Connection Diagram

### 14. Generator - Connection Diagram





## 15. Product Specifications

### 15. Product Specifications

#### • Generator

- |    |                                 |   |
|----|---------------------------------|---|
| 1. | Model                           | W-357-1MQG-SKC  |
| 2. | Oscillation method              | Separately excited oscillation by the fixation of oscillated frequency  |
| 3. | Oscillation frequency           | 1MHz (Nominal)  |
| 4. | Output range                    | 0~12W<br>(Allowable input to the nozzle for continuous operation is 10W when the transducer is cooled by the air purging.)  |
| 5. | Output adjustment               | Constant power control<br>Set by key entry or RS-422A.  |
| 6. | Power                           | Nominal voltage - Single phase 100V - 240V AC<br>50/60Hz, 300VA<br>Fuse: 5A (User cannot replace the fuse)  |
| 7. | Error detection                 | Output cable - Short, Open<br>Transducer impedance error<br>Overcurrent, Overvoltage, Abnormal power<br>Flow sensor OFF   |
| 8. | Interface                       |   |
|    | (1) Sensor input                | Connector: MCV1,5/3-G-3,5 (Manufacturer: PHOENIX CONTACT)<br>Dry-boiling sensor - Close = Flow rate OK  |
|    | (2) Remote input                | Connector: MCV1,5/4-G-3,5 (Manufacturer: PHOENIX CONTACT)<br>Close = Oscillation ON   |
|    | (3) Alarm output /4-20mA output | Connector: MCV1,5/5-G-3,5 (Manufacturer: PHOENIX CONTACT)<br><ul style="list-style-type: none"> <li>• Alarm output           <ul style="list-style-type: none"> <li>Relay contact output when alarm is output</li> <li>Both A and B contacts: Output</li> <li>Rated load: DC24V / 0.5A</li> <li>Alarm LED: RED</li> </ul> </li> <li>• 4-20mA output           <ul style="list-style-type: none"> <li>Connector: MCV1,5/5-G-3,5 (Manufacturer: PHOENIX CONTACT)</li> <li>Measured output power is output.</li> </ul> </li> </ul> |

## 15. Product Specifications

- |                         |  |  |
|-------------------------|--|--|
| (4) RS-422A             | Connector: Dsub-9pin(M) - 2 units: Parallel connection<br>9600bps, 7bit, Stop1bit, Even parity, BCC<br>Machine Address (ID): 0 - E (Set in MENU screen)<br>Output power setting, Status read   |  |
| (5) LCD                 | <div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>MENU setting</p> <p>MENU display</p> <p>Oscillation state monitor</p> </div> <div style="width: 65%;"> <p>Control Mode setting<br/>RS-422A - Machine number setting<br/>LCD contrast setting</p> <p>Oscillation cumulative time<br/>Cumulative time after transducer replacement<br/>Cumulative time after calibration<br/>Number of oscillations<br/>Frequency (calibration)<br/>Impedance</p> <p>Output power, High-frequency voltage,<br/>High-frequency current, Transducer impedance,<br/>Oscillation frequency, Heat sink temperature,<br/>Oscillation ON/OFF, Set power.<br/>Alarm number display</p> </div> </div> |  |
| (6) Key entry           | △ , ▽ , ◁ , ▷ , MENU , ESC   |  |
| 9. Usage environment    | Temperature: 5 - 40°C / Humidity: 10 - 85%<br>Indoor usage in industrial environment<br>Altitude: 2000m or lower (Pollution level: 2 / Overvoltage category: II)   |  |
| 10. External dimensions | 180(W) × 250(D) × 100(H)mm (Including rubber feet)   |  |
| 11. Weight              | 2.2kg  |  |

<h2>15. Product Specifications</h2>
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- **Nozzle**

1.	Maximum input	12W
2.	Material	
	Case Cap Nozzle tip Cable clamp Transducer Packing Screw Joint	PCTFE PP Quartz glass Nylon PZT Silicon rubber PEEK PTFE, ECTFE
3.	Liquid temperature	20~50°C
4.	Joint for air purge	Tube size: External diameter 6mm Elbow type joint: 30-6ME2-C (Manufacturer: Flowell) Recommended pressure: 0.01MPa
5.	External dimensions	Reference diagram: Nozzle - Outline View (page 28)
6.	Weight	0.6kg
7.	Output cable	
	3D-2V cable Length Shield material	1.5m PVC
8.	Junction cable	
	3D-2V cable Length Shield material	3.5m PVC

- **Accessories**

1. Control cable 5m : 4 cables

(Connected to SENSOR, REMOTE, ALARM, 4-20mA)

\* The RS-422A cable is not provided.

2. Connector for control cable (3-pin, 4-pin, 5-pin) : 1 pc/ each

## 16. Precautions in Using the Device

### 16. Precautions in Using the Device

The following describes the precautions to use with this product.

(1) Generator

The maximum power output is 12W and it is adjustable every 0.1W.

However, the allowable max. output to the nozzle is 10W for continuous operation with air purging (Pressure of air purge : 0.01MPa) .

※ Cooling of the transducer is necessary .

※ It is recommended not to use the unit at less than 1W because of the appearance of tracking error with ALARM signal.

(2) Combination of the generator and the nozzle

Make sure that the serial numbers of generator and the nozzle are the same.

(The generator is adjusted based on the characteristics of the transducer built into the nozzle.)

(3) Shock

Do not subject the product to shock. When you install, move or store the product, make sure not to hit or drop it. (In particular, handle the nozzle carefully because the nozzle is fragile.)

(4) Output cable and Junction cable

The output cable and junction cable is connected to the nozzle to connect the nozzle to the generator. Do not alter the cable length or the connector. Altering the cable length or connector may cause a malfunction or an accident.

(5) Dry boiling

This product has a "SENSOR" contact to prevent dry boiling. Make sure to connect the water flow switch and SENSOR contact so that the switch turns ON (CLOSE) when water more than the specified amount flows.

(6) Installation

Do not block the generator vent. The vent is used to dissipate heat from the generator. If you use the generator when the vent is blocked or in an environment where environment usage conditions (temperature, humidity) have not been satisfied, the generator may malfunction. Make sure to install the device in the correct environment.

(7) Storage

Store this product in a location:

- Not subject to direct sunlight
- Temperature: -15°C - +60°C
- Humidity: 10 - 85%
- No condensation

(8) Cleaning

Use an appropriate cleaning cloth to clean the generator or nozzle. Wipe the generator or nozzle if needed.

## Appendix 1: Alarm code list (W-357-1MQG)

No	Alarm	Description
10	Backup data error	Abnormal backup data
20	Low frequency	The frequency is lower than the lower limit when the frequency is automatically set.
21	High frequency	The frequency is higher than the upper limit when the frequency is automatically set.
98	Overpower detected	Power 50% higher than the set current is detected.
99	Overcurrent detected	Current exceeding the maximum allowed current of the design is detected.
101	Insufficient cleaning solution flow	The SENSOR cable is not shorted.
105	Temperature raise inside of generator	The temperature inside of generator is more than the specified temperature.
106	Overvoltage detected	The voltage is more than the specified voltage.
110	Power small	The power is more than 1.5W lower than the power set by the device or communication.
111	Power small - Impedance small	The power is more than 1.5W lower than the power set by the device or communication and the impedance is lower more than the specified value than the average value.
112	Power small - Impedance large	The power is more than 1.5W than lower than the power set by the device or communication and the impedance is larger more than the specified value than the average value.
113	Power small - Impedance large	The power is more than 1.5W lower than the power set by the device or communication and the impedance is larger more than the specified value than the average value.
120	Power large	The power is more than 1.5W larger than the power set by the device or communication.
121	Power large - Impedance small	The power is more than 1.5W larger than the power set by the device or communication and the impedance is smaller more than the specified value than the average value.
122	Power large - Impedance large	The power is more than 1.5W larger than the power set by the device or communication and the impedance is larger more than the specified value than the average value.

The alarm codes listed above are used in 1MQG (Standard product).

Some alarms are disabled for a custom made product (special specification).

- Oscillation behavior when an alarm is output

- The main unit (1MQG) turns on the alarm LED and stops the oscillation. The alarm details are output as "Alarm No." in the display and communication. \*1
- You can cancel the alarm state by turning OFF the REMOTE signal of the main unit and then turning ON the signal again. (The REMOTE signal is controlled by the sequencer.) \*2 \*3
- "Alarm No. 99" (Overcurrent detected) completely terminates the oscillation to protect the generator. You cannot cancel this alarm by turning OFF/ON the REMOTE signal. If "Alarm No.99" occurs, turn OFF/ON the generator power to cancel the alarm.
- If the alarm is not cancelled even after cancelling the alarm multiple times, the device may have failed. Contact your dealer for repairs.

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\*1 Only "Alarm No. 20" and "Alarm No. 21". The alarm LED does not turn on.

The oscillation is stopped and the Alarm No. is displayed in the same way as other alarms.

\*2 "Alarm No. 10" indicates a failure in the electrical circuit. Contact your dealer for repairing the device.

\*3 "Alarm No. 106" and "Alarm No. 112", "Alarm No. 113" can be output even if the output cable or relay cable is not connected. Check if the output cable or relay cable is correctly connected.

### ◆ After sales service

When the after service such as the repair is required, please contact the seller of product with the detailed information about the malfunction.

<b>Do Not Duplicate</b>
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## W-357-1MQG-SKC



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- This instruction manual is as of 2017 August.
- The specifications for the product may be changed without prior notice to improve the product.

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