

# AX-SV-42

SV-10 OPTION  
ANALOG OUTPUT/RS-232C

## INSTRUCTION MANUAL



A&D Company, Limited

WM:PD4000738

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# 1. INTRODUCTION

This manual describes how the SV-10 option, AX-SV-42 (Analog output/RS-232C) works, and how to get the most out of it in terms of performance.

Read this manual thoroughly before using the option and keep it at hand for future reference.

## 1-1 Description of the Option

This option outputs an analog voltage in relation to the viscosity and the temperature, in addition to the standard RS-232C serial interface.

The viscosity is output in the range of 0 to 1V, depending on the set viscosity range. Four ranges to output the viscosity are available for selection in the function setting.

The temperature of 0 to 100°C is output in the range of 0 to 1V (sensitivity: 0.1°C/1mV).

Using the RS-232C serial interface, analog output and RS-232C output are available at the same time.

### Note

**This option is installed in place of the standard RS-232C serial interface board.**

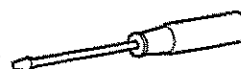
**For details on RS-232C serial interface, refer to the SV-10 instruction manual.**

## 1-2 Accessories

This option is provided with the following accessories.

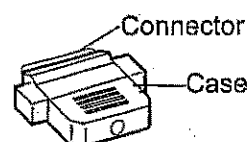
Screwdriver

1 pc.



I/O plug

1 set



### Note

**The I/O plug consists of a connector and a case.**

Instruction manual (this document)

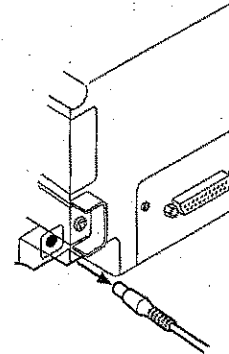
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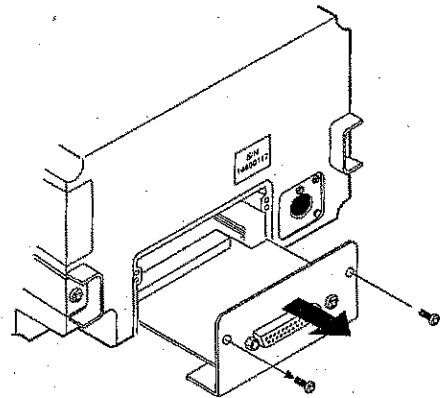
## 2. INSTALLATION

Install the AX-SV-42 as follows:

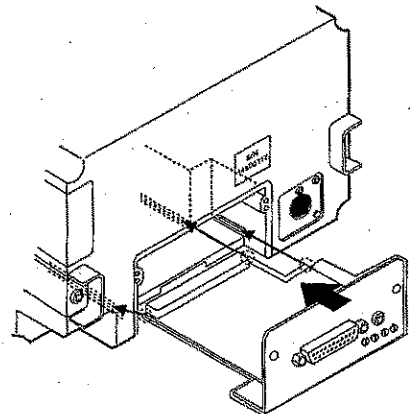
- 1 Disconnect the AC adapter from the display unit.



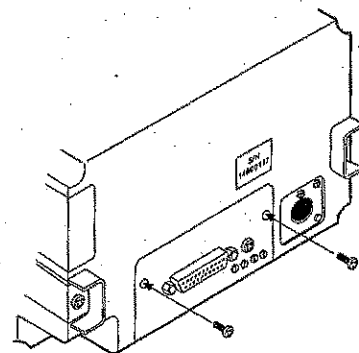
- 2 Remove the two screws on the RS-232C board provided as standard. Pull out the RS-232C board as shown in the illustration.



- 3 Insert the analog output option board, along the guides on the left and right sides.



- 4 Using the two screws removed in step 2, fasten the analog output option board.



## 3. FUNCTION SETTING

The viscometer SV-10, by selecting functions to be used in the function setting, can specify the performance appropriate to the usage.

Each function is assigned parameters. The performance of a function is specified by changing the parameter.

The parameters saved, even if the power is turned off, are maintained in non-volatile memory.

When the analog output option is installed, items related to analog output will be added. For details on the items related to analog output, refer to "3-3 Details of the Function Items" and "3-4 Description of Items".

### 3-1 Operation

The operational procedure of the function setting is as follows:

- 1 In the standby mode ([ - - - - ] is displayed.), press and hold the **MODE** key to enter the function setting mode.
- 2 Press the **MODE** key to select a function item.
- 3 Press the **PRINT** key to confirm the function item. The changeable digit blinks.
- 4 Press the **START** key or **HOLD** key to change the blinking digit.  
**START** key    Increases the value of the blinking digit. When the value reaches the upper limit of the setting range, the minimum value appears again.  
**HOLD** key    Decreases the value of the blinking digit. When the value reaches the lower limit of the setting range, the maximum value appears again.
- 5 To save the new setting, press the **PRINT** key. After "End ", the next item is displayed.  
 To cancel the new setting, press the **STOP** key. The next item is displayed.
- 6 To change other settings, repeat the procedure starting at step 2.
- 7 To exit the function setting mode, press the **STOP** key. The display returns to the standby mode.

#### Analog output function setting

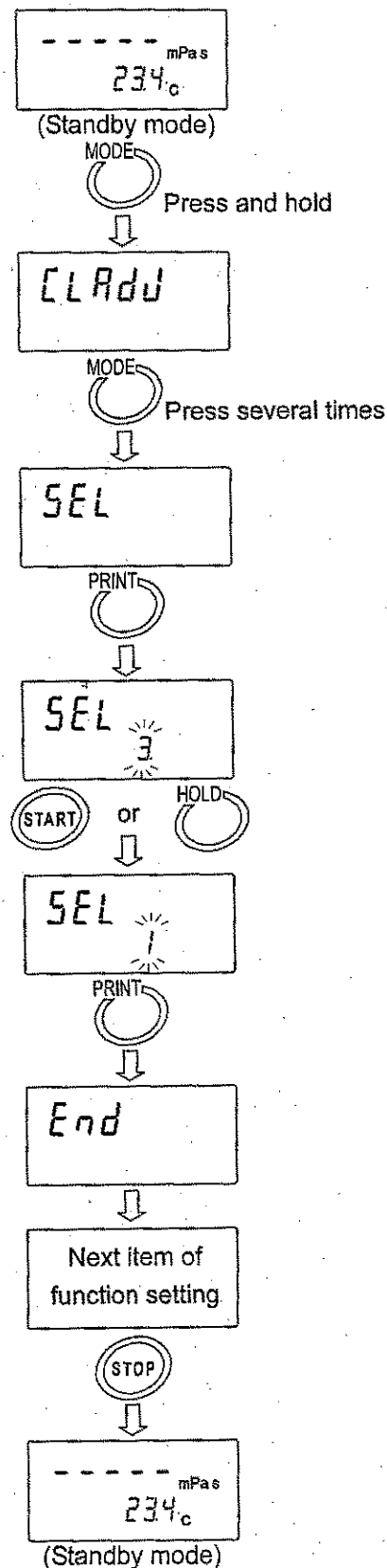
Function	Parameter	Description (Viscosity corresponding to 0-1V )
SEL	0	0 to 10 mPa·s ⇒ 0-1V
	1	0 to 100 mPa·s ⇒ 0-1V
	2	0 to 1000 mPa·s ⇒ 0-1V
	3	0 to 10000 mPa·s ⇒ 0-1V

- Factory setting

## 3-2 Example of the Function Setting Procedure

The following example sets the function to output the viscosity in the range of 0 to 100 mPa·s, using 0 to 1V.

- 1 In the standby mode, press and hold the **MODE** key to enter the function setting mode. "CLAdJ" appears.
- 2 Press the **MODE** key several times to select "SEL".
- 3 Press the **PRINT** key to confirm the item.  
(The decimal point illuminates when the setting currently saved is displayed.)
- 4 Press the **START** key or **HOLD** key to select the viscosity range.  
(In this example, " / " is selected. Viscosity range: 0-100 mPa·s)
- 5 Press the **PRINT** key to save the setting.  
After "End ", the next item is displayed.
- 6 Press the **STOP** key to return to the standby mode.



### 3-3 Details of the Function Items

Function	Parameter	Description					
CLPdu Date/Time		Sets the order of the date (YMD,MDY,DMY) and the date/time.					
Cond Condition	0	Follows the viscosity changes quickly. (Prone to vibration)					
	1						
	2	Follows the viscosity changes slowly. (Stable values)					
Unit Unit upon power-on	0	Viscosity	mPa·s	Temperature	°C	MODE key *1	Switches between mPa·s/Pa·s.
	1		Pa·s				Switches between cP/P.
	2		cP				Switches between mPa·s/Pa·s.
	3		P				Switches between cP/P.
	4		mPa·s		°F		Switches between mPa·s/Pa·s.
	5		Pa·s				Switches between cP/P.
	6		cP				Switches between cP/P.
	7		P				Switches between cP/P.
Pnt Decimal point	0	Dot					With "Comma" selected, the separator for CSV format will be ";" (semicolon).
	1	Comma					
Fnc MODE key function during measurement	0	Switches viscosity units.					
	1	Switches between the temperature display and the measurement elapsed time display.					
Prt Data output mode	0	Key mode					Press the [PRINT] key to output data.
	1	Auto print mode					Outputs automatically when the [STOP] key ends the measurement.
	2	Stream mode					Continuous output during measurement. Outputs the viscosity only when D.P. format is selected.
TYPE Data output format	0	A&D standard format					For AD-8121 MODES 1&2
	1	D.P. format					For AD-8121 MODE 3
	2	CSV format					For a personal computer
	3	RsVisco format					For graphing program RsVisco
S-Alt Measurement elapsed time output	0	No output					Available only for D.P. format
	1	Output					
S-Ed Date/time output	0	No output					Available only for D.P. and CSV formats
	1	Output					
S-Ed Other output	0	No output					Available only for D.P. format
	1	Outputs remarks.					
	2	Outputs remarks, Device ID information and signature.					
	3	Outputs ID number.					Available only for CSV format
PUSE Pause at data output	0	No pause					Available only when the analog output option is installed.
	1	Pause (Approx. 2 seconds)					
SEL Viscosity analog output range	0	0-10 mPa·s (0-1V)					
	1	0-100 mPa·s (0-1V)					
	2	0-1000 mPa·s (0-1V)					
	3	0-10000 mPa·s (0-1V)					
ErFnc Reserved	0	Usually use this parameter.					
	1						
	7						
id Device ID number		Set the device ID number.					With "S-Ed", the device ID information is added to the measurement data.
CLr Initialization		Restores to the factory setting.					

• Factory setting

\*1 While the measurement is being performed using the graphing program RsVisco, unit changes using the **MODE** key is not available.  
RsVisco is contained in the accessory Windows communication tools, WinCT-Viscosity.



### 3-4 Description of Items

Here describes the function item, "Viscosity analog output range (SEL)". For the other function items, refer to the SV-10 instruction manual.

#### Viscosity analog output range (SEL)

Parameter	Description	Viscosity at 1V	Sensitivity per 1mV (Calculated)
0	0 to 10 mPa·s	10 mPa·s	0.01 mPa·s/1mV
1	0 to 100 mPa·s	100 mPa·s	0.1 mPa·s/1mV
2	0 to 1000 mPa·s	1000 mPa·s	1 mPa·s/1mV
3 •	0 to 10000 mPa·s	10000 mPa·s	10 mPa·s/1mV

- Factory setting

Example 1: With a viscosity of 50.1 mPa·s, SEL 1 is selected.

$$\text{Analog output voltage} = 1\text{V} \times \frac{50.1 \text{ mPa} \cdot \text{s}}{100 \text{ mPa} \cdot \text{s}} \approx 0.501\text{V}$$

Example 2: With a viscosity of 50.1 mPa·s, SEL 3 is selected.

$$\text{Analog output voltage} = 1\text{V} \times \frac{50.1 \text{ mPa} \cdot \text{s}}{10000 \text{ mPa} \cdot \text{s}} \approx 0.005\text{V}$$

#### Note

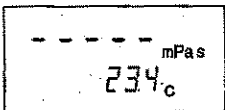

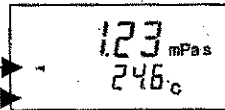
The output voltage may have a maximum linearity error of  $\pm 0.3\%$  ( $\pm 0.003\text{V}$ ).

The correlation of the units are as follows:

1 mPa·s (Millipascal second) = 0.001 Pa·s (Pascal second) = 1 cP (Centipoise) = 0.01 P (Poise)

## 4. VISCOSITY STATUS AND ANALOG OUTPUT

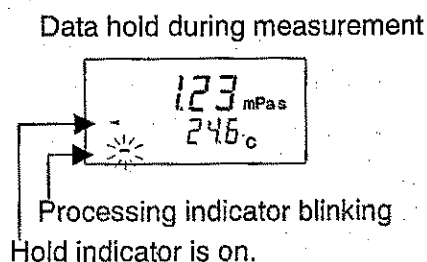
The relation between the viscosity status and analog output (viscosity and temperature) is as follows:

Viscosity status	Viscosity analog output	Temperature analog output
<b>Standby mode</b> 	Outputs 0V.	
<b>During measurement ...*1</b>  Processing indicator blinking	Outputs the viscosity value.	Outputs the temperature value. (e.g.) 23.4°C, 0.234V output ...*2
<b>Data hold after measurement</b>  Processing indicator is off. Hold indicator is on.	Outputs 0V.	

### Note

The output voltage may have a maximum linearity error of  $\pm 0.3\%$  ( $\pm 0.003V$ ).

- \*1 Even when the **HOLD** key is pressed during measurement to temporarily freeze the display of the measurement data, the analog output of viscosity and temperature outputs the current data, not the data that is held.



- \*2 When Fahrenheit (°F) is selected as a temperature unit, 0V is output at 32°F (0°C) and 1V is output at 212°F (100°C).

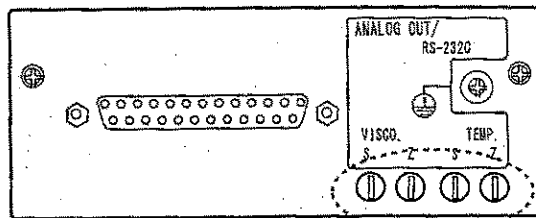
The relation between Fahrenheit and Celsius is as follows:

$$\text{Fahrenheit (°F)} = \frac{9}{5} \times \text{Celsius (°C)} + 32$$

## 5. ANALOG OUTPUT FINE ADJUSTMENT

The output voltage has been adjusted at the factory before shipment.

Using the S and Z fine-adjustment controls located on the option panel, output voltage can be fine adjusted.



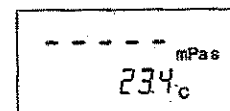
Fine-adjustment controls

### Adjustment procedure

(Before adjustment, attach the accessory I/O plug as necessary.)

In the following procedure, the viscosity analog output is adjusted first, then the temperature analog output is adjusted.

- 1 Make sure that the display is in the standby mode.
- 2 Press and hold the **STOP** key to enter the analog output adjustment mode. The display is in the mode to output 0V for both the viscosity and temperature in the analog output.



(Standby mode)



Press and hold



Continued on the next page

## Fine adjustment of viscosity analog output

- 3 Connect the voltmeter to the viscosity analog output terminals.

	D-sub 25 pin connector
	Pin connection
Viscosity analog output terminal (+ side)	Pin 22
Viscosity analog output terminal (GND side)	Pin 24

- 4 Using the accessory screwdriver, adjust the VISCO. Z control so that the voltmeter indicates 0V.

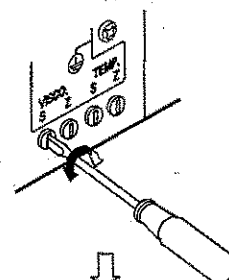
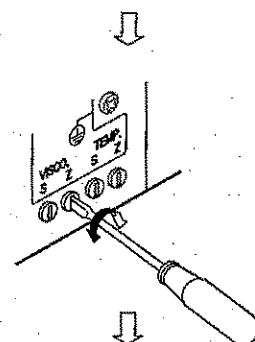
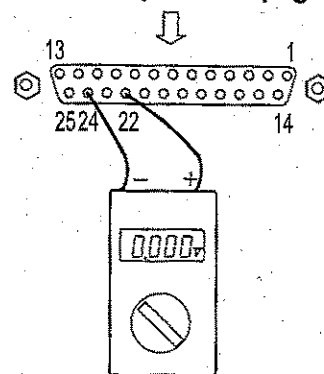
- 5 Press the **START** key. The display is in the mode to output 1V in the viscosity analog output.

- 6 Using the accessory screwdriver, adjust the VISCO. S control so that the voltmeter indicates 1V.

- 7 Press the **START** key. The display is in the mode to output 0V in the viscosity analog output.

- 8 Repeat steps 4 to 7 so that the correct voltage is output in the 0V/1V output mode.

From the previous page



### Fine adjustment of temperature analog output

The procedure is the same as the viscosity analog output fine adjustment.

- 9 Press the **START** key. The display is in the mode to output 0V in the temperature analog output.

- 10 Connect the voltmeter to the temperature analog output terminals.

	D-sub 25 pin connector Pin connection
Temperature analog output terminal (+ side)	Pin 15
Temperature analog output terminal (GND side)	Pin 17

- 11 Using the accessory screwdriver, adjust the TEMP. Z control so that the voltmeter indicates 0V.

- 12 Press the **START** key. The display is in the mode to output 1V in the temperature analog output.

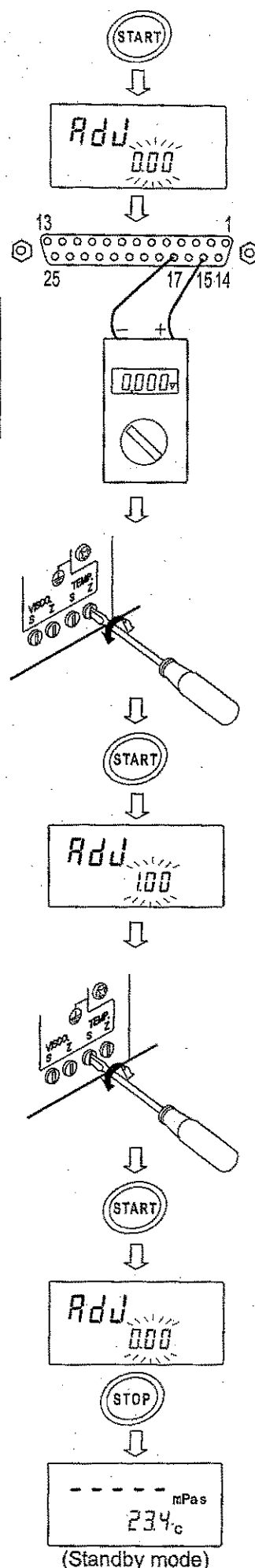
- 13 Using the accessory screwdriver, adjust the TEMP. S control so that the voltmeter indicates 1V.

- 14 Press the **START** key. The display is in the mode to output 0V in the temperature analog output.

- 15 Repeat steps 11 to 14 so that the correct voltage is output in the 0V/1V output mode.

### End of analog output fine adjustment

- 16 Press the **STOP** key to return to the standby mode.



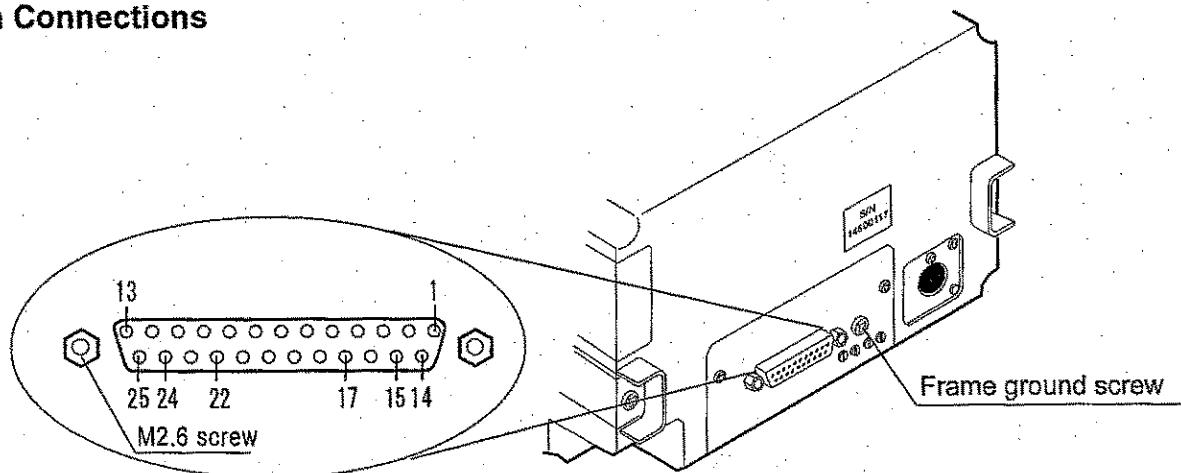
## 6. SPECIFICATIONS

		Viscosity analog output	Temperature analog output
Output impedance		100 $\Omega$ or less	
Linearity error		$\pm 0.3\%$ or less ( $\pm 0.003V$ or less)	
Output connector		D-sub 25 pin connector	
Pin connection	Output (+)	Pin 22	Pin 15
	Output (GND)	Pin 24	Pin 17
Voltage output range		0 to 1V	
Voltage output range and sensitivity per 1mV		Select from below	
		Voltage output range	Sensitivity (Calculated)
		0 to 10mPa·s	0.01mPa·s/1mV
		0 to 100mPa·s	0.1mPa·s/1mV
		0 to 1000mPa·s	1mPa·s/1mV
		0 to 10000mPa·s	10mPa·s/1mV
		Voltage output range	
		0 to 100°C	
		Sensitivity (Calculated)	
		0.1°C /1mV	
Input impedance of the device connected		10 k $\Omega$ or greater	

### Note

For details on RS-232C serial interface, refer to the SV-10 instruction manual.

### Pin Connections



### Analog output

Pin No.	Signal Name	Description
1	FG	Frame ground
22	V-OUT	Viscosity analog output (+ side)
24	V-GND	Viscosity analog output (GND side)
15	T-OUT	Temperature analog output (+ side)
17	T-GND	Temperature analog output (GND side)

### Note

To earth ground the instrument, connect the ground wire to the frame ground screw on the analog output option board panel.

## RS-232C

Pin No.	SV-10 (DCE)		Direction	Computer (DTE)
	Signal Name *1	Description		Signal Name
1	FG	Frame ground	-	FG
2	RXD	Receive data	←	TXD
3	TXD	Transmit data	→	RXD
4	RTS	Ready to send *2	←	RTS
5	CTS	Clear to send *2	→	CTS
6	DSR	Data set ready	→	DSR
7	SG	Signal ground	-	SG

### Note

For details on RS-232C serial interface, refer to the SV-10 instruction manual.

\*1 Signal names of the viscometer side are the same as the DTE side with TXD and RXD reversed.

\*2 RTS and CTS flow control are not used. CTS output is HI always.

### Other terminals

Pin No.	Signal Name
18	Used internally (Not to be connected)
19	
8-14, 16, 20, 21, 23, 25	Not used

## Circuit Diagram

