

Instruction Manual

WSP-ADS WSP-SBS

Adder (ADS) Subtractor (SBS) MATH UNIT

Thank you for selecting another fine *watanabe* product. Please check the description given on the rating label of this unit to make sure that it meets your specifications and be sure to read this instruction manual before using the product.

This manual outlines the operation, connection and adjustment procedures of this product.

The unit has been manufactured and inspected according to our strict quality control standard. If you should find a defect including damage incurred during transportation, contact us or the dealer where you purchased it immediately.

○PACKAGE INCLUDES:

- Isolation converter.....1
- Base socket.....1

* For details of models and specifications, please download the product catalog from our website.

1. Overview

This is a converter that receives two analog signals and outputs a signal proportional to their sum or difference.

For example, it can be used to calculate flow rate addition, temperature difference, speed difference, etc.

2. Functions and Features

- Output zero span can be adjusted by front DIPSW
- Highly reliable design that is not affected by signal source resistance and receiving resistance
- Realization of 5-year warranty by long-life design
- Compatible with worldwide power supply
- Compliant with CE marking

3. Precautions

- 1) Power supply:
 - Check the rated voltage on the rating label, and use the product within the range of each of the following ratings.
 - ① 100 to 240VAC
100 to 240VAC $\pm 10\%$ (50/60 Hz) approx. 5.5 VA
 - ② 24VDC
24VDC $\pm 10\%$, Approx. 100 mA
 - ③ 100~120VDC
100~120VDC $\pm 10\%$, Approx. 25mA
- 2) Insulation resistance:
 - Mutual between input - output - power supply terminal
 - 100M Ω or more/DC500V
 - Non-isolated between 2 input terminals
- 3) Withstand voltage:
 - Mutual between input - output - power supply terminal
 - AC2000V 1 minute
- 4) Handling
 - When removing or installing the main unit from the socket, be sure to shut off the power supply and input

signal for safety.

- When touching the screws on the main unit or operating the output adjustment switch, touch a metal object to remove static electricity before doing so.

5) Installation

- Please use indoors.
- When installing in a place with a lot of dust, metal powder, etc., store it in a dust-proof housing and take heat dissipation measures.
- Avoid vibrations and impacts as much as possible, as they may cause failure.
- Install in a place where the ambient temperature does not exceed the range of -5 to 55°C.
- Install in a place where the ambient humidity is 90% RH or less (non-freezing, non-condensing).
- Do not block the ventilation openings of the main unit.

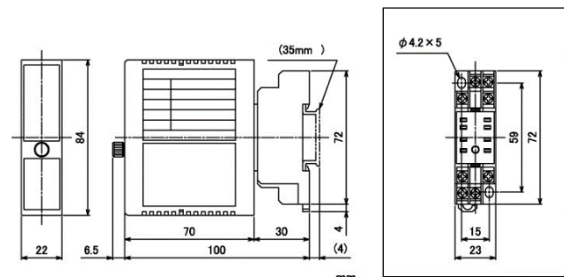
5) Wiring

- Do not wire the power supply line, input line, or output line near noise sources, relay drive lines, or high-frequency lines.
- Avoid bundling together lines on which noise is superimposed or storing them in the same duct.

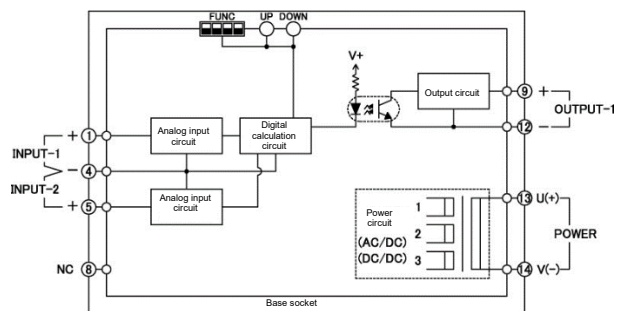
6) Others

- The unit can be operated immediately after turning on the power, but 30 minutes of energization is required to satisfy all performance requirements.

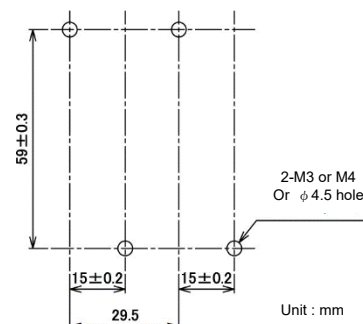
4. Outline Dimensions



5. Circuit Diagram



6. Mounting

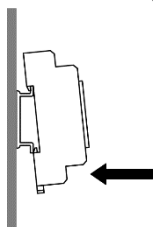


Close mounting is possible, but please leave a space of 6.5mm to 7mm or more for heat dissipation.
As shown in the figure above, a 6.5mm interval can be created with a 29.5mm pitch.

7. How to attach and detach from the DIN rail

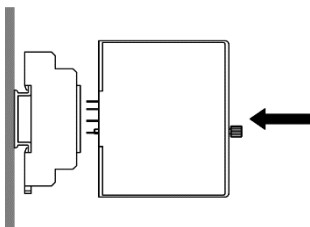
1) Socket fixing method

Place the slider on the bottom of the socket downward, hook the claw on the upper side of the back of the socket to the rail, and then push the bottom of the socket in the direction of the arrow in the figure to fix it.



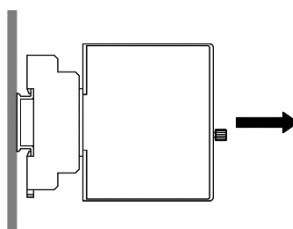
2) How to fix the main body and socket

Orient the main unit so that the characters on the front label can be read correctly, insert it straight, and tighten the screw to fix it.



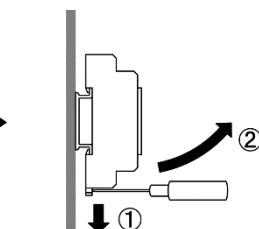
3) How to remove the main body from the socket

Loosen the screws on the main unit and pull the main unit straight out.

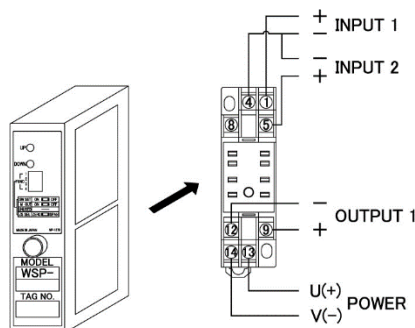


4) How to remove the socket

Insert a flat-blade screwdriver into the groove of the socket slider, and while pulling in the direction of the arrow (1) in the figure, pull the lower part of the socket forward (2) to remove it.



8. Terminal Connections



No	Signal	Description
1	INPUT-1(+)	Input-1
4	Input-1, 2(-)	Input-1, 2
5	INPUT-2(+)	Input-2
8	NC	No connection
9	Output(+)	Output
12	Output(-)	
13	POWER U(+)	Power Supply
14	POWER V(-)	

※ Do not connect to NC terminal

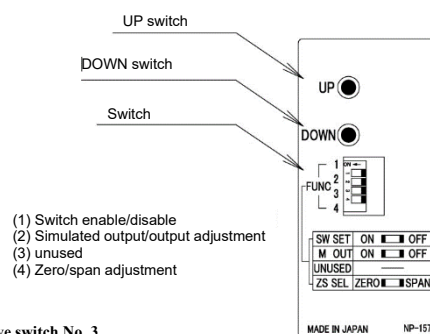
9. Output Adjustment method

The unit has been calibrated at the time of shipment, so no output adjustment is necessary as long as it is used according to the specifications at the time of ordering. If you want to match with the connected equipment, or if periodic calibration is required, adjust as follows.

However, in the case of calibration, use a signal source (standard voltage/current generator, etc.) and a measuring instrument (voltmeter,

ammeter) with an accuracy of 10 times or more than the tolerance of the instrument, and wait at least 30 minutes after turning on the power. Please go after it has passed.

Output adjustment is performed by operating the setting switch on the front of the unit.



※ Do not move switch No. 3, which is set at the time of shipment

○ Adjustment procedure

① Turn on switch 1 (SW SET).

Switch operation is enabled.

② Turn off switch 2 (M OUT).

③ Set switch 4 (ZS SEL) to ZERO.

Input an input signal equivalent to 0%, and press the UP and DOWN switches to adjust so that the output value at that time becomes 0%.

④ Set switch 4 (ZS SEL) to SPAN.

Input an input signal equivalent to 100%, and press the UP and DOWN switches to adjust so that the output value at that time is 100%.

⑤ Input the input signal equivalent to 0% again and confirm that the output is 0%.

If the output is deviated, repeat the adjustment of ③ and ④.

⑥ When the adjustment is completed, turn the changeover switch 1 to OFF.

The adjustment value set at that time is written to the internal memory, and the switch operation becomes invalid.

* The adjusted value is written to the internal memory and will not be lost when the power is turned off.

The maximum number of writes to the internal memory is 1000 times.

* If the power is turned off during adjustment, the adjusted value will not be written to the internal memory.

* The adjustment range of zero and span is approximately $\pm 10\%$ fs.

10. Arithmetic expression

○ Adder (WSP-ADS)

The relationship between A input, B input and output is (A = input 1, B = input 2)

$$\text{Output} = \frac{K1}{100} \times \text{Input1} + \frac{K2}{100} \times \text{Input2}$$

(Coefficients K1 and K2 will be adjusted at the time of ordering and shipped.

Setting range: 0.1 to 100.0%, standard: 50%)

Example:

Input specifications are A input: DC1 to 5V, B input: DC1 to 5V, output = DC4 to 20mA, coefficient K1 = 60%, K2 = 40%, A = 3V (50%), B = 4V (75%)

The output with the input signal of is as follows.

$$\text{Ouput} = \frac{60}{100} \times 50\% + \frac{40}{100} \times 75\% = 60\%$$

That is, the 60% output will be 13.6mA.

* If one or both of the input signals are negative, the output signal will be output according to the result of the calculation formula up to -20% of the scaling setting, but

signals below that will not be output.

○In case of subtractor (WSP-SBS)

The relationship between A input, B input and output is
(A = input 1, B = input 2)

$$\text{Output} = \frac{K1}{100} \times \text{Input1} + \frac{K2}{100} \times \text{Input2}$$

(Coefficients K1 and K2 will be adjusted at the time of ordering and shipped.

Setting range: 0.1 to 100.0%, standard: 100%)

Example: Input specifications are A input: 1 to 5 V DC, B input: 1 to 5 V DC, output = 4 to 20 mA DC, coefficient K1 = 100%, K2 = 40%, A = 3 V (50%), B = 4 V (75 %) input signal is as follows.

$$\text{Output} = \frac{100}{100} \times 50\% - \frac{40}{100} \times 75\% = 20\%$$

$$\text{Output} = x50\% - x75\% = 20\%$$

In other words, the 20% output will be 7.2mA.

*1. If the input 1 signal is a negative input, the output signal is output according to the result of the arithmetic expression up to -20% of the scaling setting, but the signal below that is not output.

*2. If the input 2 signal is a negative input, the output signal is output according to the result of the arithmetic expression up to 120% of the scaling setting, but no signal beyond that is output.

11. Simulation Output Function

The instrument has a simulated output function for connection tests, etc.

Simulated output is performed by operating the setting switch on the front of the instrument. (For the switch position, refer to the diagram in section 9.)

○ Simulated output procedure

(1) Turn on switch 1 (SW SET).

Switch operation is enabled.

(2) Turn switch 2 (M OUT) ON.

(3) The simulated output value can be output in 3 stages by pressing the UP and DOWN switches.

(DOWN) 0% ⇄ 50% ⇄ 100% (UP)

(4) When you have finished checking, turn switch 1 OFF.

12. Out-of-range conditions

1) Excessive input

If a signal exceeding the upper limit of the input range is input, it will be calculated as 120%.

The output is according to the calculation formula, but if the calculation result exceeds the output range (-20 to +120%), the output outside the range will not be output and the output will be -20% or +120% constant.

2) Under-input

If a signal below the lower limit of the input range is input, it will be calculated as -20%.

The output is output according to the calculation formula, but if the calculation result exceeds the output range (-20 to +120%), the output outside the range will not be output and the output will be -20% or +120% constant.

3) Out-of-range load

(a) In the case of current output, if the "permissible load resistance range" is exceeded, the output will be approximately proportional to the input until the voltage between the output terminals reaches approximately 15 V, but it will be higher. , the output saturates and the error increases.

(b) In the case of voltage output, if it falls below the "allowable load resistance range", the output will saturate and the error will increase.

13. Warranty

The warranty period for this equipment is five (5) years after delivery. If it should fail under the normal operation conditions within the warranty period, contact us or the dealer where you purchased the equipment as soon as possible.

We will repair the defective equipment free of charge or replace it with a new one if necessary. This warranty does not apply to equipment damaged due to disassembly, modifications or operation under conditions other than those specified.

We will not take any responsibility for any damage incurred due to this product.