

INSTRUCTION MANUAL

AC Current Transducer

WS4A2

Fuji Electric FA Components & Systems Co., Ltd.

Introduction

Thank you for your purchase of our product.

Read this instruction manual carefully before installation, wiring, and using this product.

Keep this instruction manual handy for reference at any time.

Have a contact with us or sales agent in case that this instruction manual is lost or damaged.

<Caution>

Have a contact with us when you have any questions or are aware of missing article.

Safety precaution

In the operation manual, the harm to a user or other persons and damage of property were prevented, and the important matter for using correctly safely is written in it.

Please read a text well after understanding the following contents (a display and a graphic symbol), and protect the mentioned item.



DANGER

Improper use may lead to death or severe injury.



WARNING

Improper use may possibly lead to death or severe injury.



ATTENTION

Improper use may lead to medium injury.

- We are not responsible for the damage caused by following condition (earthquake / fire which is not caused by us, action by third party, other accident, damage caused by our customer, misuse, product usage under abnormal condition).
- We are not responsible for secondary damage caused by product use / product malfunction(loss of profit, halt of business operation). We are also not responsible for damage caused by false operation in combination with connecting equipment which is beyond our control.



DANGER

- Do not disassemble, remodel and repair this product.
If judged as trouble, please contact our company or a distributing agent.
- Do not get this product wet to prevent generation of heat and ignition, product failure.
When this product gets wet, stop using it.
- Metal (wire etc.) other than wiring is not connected to the terminal (metallic portion) of this product.
- Do not work, if combustibles, and an inflammable medicine and inflammable gas are in the circumference.



WARNING

- Connect specified power supply.
Connecting power supply beyond specification causes fire and product failure.
- When dust has adhered to the terminal, remove dust after turning off the power.
- Follow the below-mentioned procedure when abnormality (fuming / bad odor) happens.
 - (1) Stop a power supply and input, and stop using.
 - (2) Contact our company or a distributing agent.



ATTENTION

- Do not use this product in a environment of high temperature / high humidity to prevent any damage.
- Do not touch the terminal during operation to prevent electric shock.
- Do not pull and bend connecting cable with force. Cable damage causes heat generation / burn and contact failure leads to equipment damage.
- Connection or inspection of apparatus are not performed by the wet hand.

Other precaution

- Don't mount or store this unit in the following environment.
 - Locations with excessive corrosive gas (SO₂ / H₂S / etc.)⁽¹⁾.
 - Locations with excessive dust.
 - Locations with excessive vibration or shocks.
 - Locations with excessive influence of external magnetic field ⁽²⁾.
 - Note⁽¹⁾ Corrosive gas : Sulfur dioxide SO₂, Hydrogen sulfide H₂S, etc.
 - Note⁽²⁾ Large current bus, saturable reactor, etc.
- Please wipe off lightly with the dry soft cloth.
 - When it wipes with the damp cloth or the dry cloth strongly, a surface is damaged. And, the character of a name plate may disappear.
 - Please do not use the organic solvent, chemicals, cleaners, etc., such as an alcohol, for cleaning.
- Mercury parts and a nickel-cadmium battery are not used for this product.
- Please dispose of this product as industrial waste (noncombustible).
- The precautions at the case of using by outdoor board.
 - ① These products are not a dustproof construction, waterproof construction, and splashproof construction. Please avoid the place with much dust. Moreover, please install in the place which requires neither rain nor waterdrop.
 - ② Please do not install in the place where sunlight hits directly. Discoloration and degradation of a name plate, and deformation of the box by the surface temperature rise may take place.

The warranty period and warranty scope.

Warranty period.

The warranty period of this product is for one year after supplying the appointed place.

Warranty scope

In the state of the normal use of product-specification within the range according to this instruction manual, the trouble within the warranty period performs exchange or repair gratuitously. However, the shipping expenses and the packing cost in the case of shipping obtain as payment on a customer. And, if it corresponds to the next, it does not warrant.

- (1) If it breaks down when converted or repaired except our company.
- (2) If it breaks down by use out of specification range.
- (3) If the cause of trouble is based on cause other than this product.
- (4) Transportation, movement, damage by falling, and trouble.
- (5) A natural disaster, disaster, etc., if it is the trouble which is irresponsible for a payment side (our company or distributing agent).

This warranty is a warranty of a product simplex. It cannot warrant the damage induced by trouble of this product.

Change of instruction manual written contents.

This instruction manual changes written contents without a notice by product improvement etc.

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1. Product outline

This product is the transducer which transforms the AC current in electric power system into the DC signal proportional to this.

Input, output, an aux. power interval is insulated in transformer. Even if a lightning surge to ground etc. occurs in an input and auxiliary supply side, the device by the side of an output is protected. And, even if there is an excessive input by the output limiter circuit, the output is restricted by about 1.5 times the rating.

An output can be outputted to a distant place, because the surge (2000A, 8/20 μ s) protection between wires is attached.

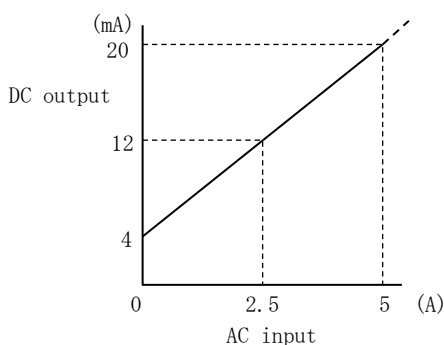
2. Specification and performance

2.1 Specification

Item		Standard specification		Production range
Input	Input current (Consumption VA)	5A AC or 1A AC	0.5VA	0.1 to 10A
	Rated frequency	45 - 65Hz (50/60Hz)		
Output (DC) (Load resistance)		0 - 100mV (Over 200 Ω) 0 - 1V (Over 200 Ω) 0 - 5V (Over 600 Ω) 0 - 10V (Over 2k Ω) 1 - 5V (Over 600 Ω)	0 - 1mA (Below 10k Ω) 0 - 5mA (Below 2k Ω) 0 - 10mA (Below 1k Ω) 4 - 20mA (Below 550 Ω)	100mV to 10V 0.1 to 20mA
Auxiliary supply		100/110V AC +10, -15% 50/60Hz	1.5VA	
		200/220V AC +10, -15% 50/60Hz		
		24V DC \pm 15%	2.5W	
		100/110V DC (88 - 143V)		
Material		Box, Terminal block : Fire-retardant ABS(V-0) Terminal cover : Polycarbonate		
Case color		Munsell N1.5 (Black)		
Mass		Approx. 500g		
Operating temperature and humidity limits		-10 to +55 $^{\circ}$ C, 30 to 85% RH		
Storage temperature limits		-40 to +70 $^{\circ}$ C		
Warranty period		One year		

The example of input-output relation

Input	Output
0 - 5A AC	4 - 20mA DC



2.2 Type number nomenclature

AC Current Transducer (With waveform compensation)

Basic code	Measurement (Method of operation)	Input	Output	Aux. supply	Design number
	① ②	③ ④ ⑤	⑥	⑦	1
WS4	—				
				1 : 100/110V AC 2 : 200/220V AC 3 : 24V DC 4 : 100/110V DC (88 - 143V) Z : Depends on user specification.	
			A : 1 - 5V DC (Over 600Ω) B : 0 - 5V DC (Over 600Ω) C : 0 - 10V DC (Over 2kΩ) D : 0 - 1V DC (Over 200Ω) F : 0 - 100mV DC (Over 200Ω) H : 4 - 20mA DC (Below 550Ω) J : 0 - 1mA DC (Below 10kΩ) K : 0 - 5mA DC (Below 2kΩ) L : 0 - 10mA DC (Below 1kΩ) Z : Depends on user specification.		
		010 : 0 - 1A AC 050 : 0 - 5A AC 060 : 0 - 6A AC 100 : 0 - 10A AC ZZZ : Depends on user specification.			

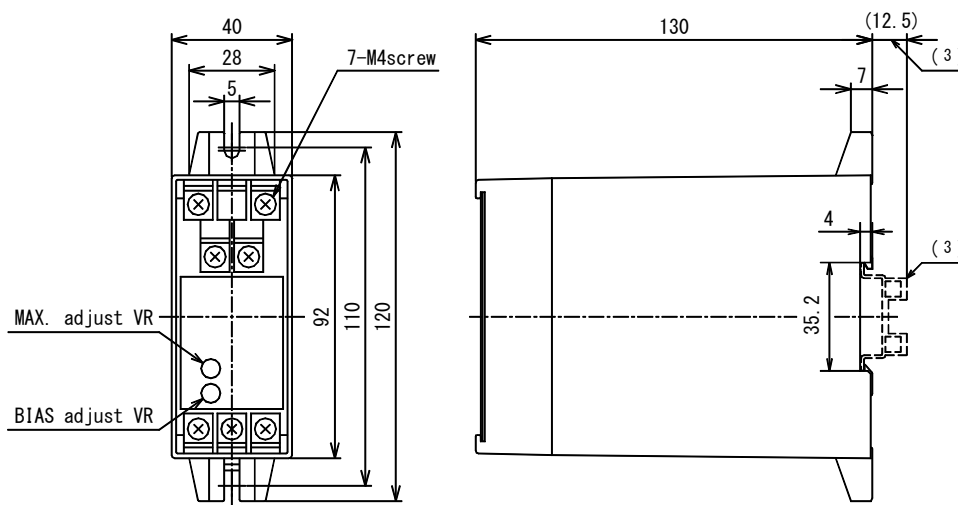
A2 : AC Current (With waveform compensation)

2.3 Performance (Ambient temperature, 23°C)

Item		Condition	Tolerance limit	
Accuracy		Each main point. % for output span.	±0.5%	
Response time		Time within ±1% of final constant value, when step input is charge.	Less than 1 second	
Output ripple		P-P for rated output value.	Less than 1% P-P	
Influence of self-heating		The difference of the output value of immediately after (after 1 to 3 minutes) and after 30 minutes.	0.5%	
Influence of temperature		The difference of the output value when changing ±10°C from 23°C.	0.5%	
Influence of magnetic field		The difference of the output value when adding an external magnetic field (400A/m).	0.5%	
Influence of aux. supply		The difference of the output value when changing the rated voltage variation range.	0.25%	
Influence of frequency		The difference of the output value when changing a 45 to 65Hz.	0.25%	
Influence of waveform		The difference of the output value at the time of a sine wave and the 5% of third harmonics content.	0.5%	
Other characteristics		Complied to JIS C 1111 : 1989	—	
Continuation overload	Input	1.2 times continuation of rated current.	There is no damage.	
	Aux. supply	1.2 times continuation of rated voltage. (Maximum 143V at 110V DC)		
Instantaneous overload	Input	40 times 1 second (20 times 1 second at 10A input) and 20 times 4 seconds and 10 times 16 seconds of rated current.	There is no damage.	
	Aux. supply	1.5 time 10 seconds of rated voltage. (Maximum 143V at 110V DC)		
Insulation resistance		Between electric circuit and case (earth).	In 500V DC	More than 50MΩ
		Between input terminal and output terminal.		
		Between input, output terminals and auxiliary supply terminal.		
Withstand voltage		Between electric circuit and case (earth).	2000V AC (50/60Hz) 1 minute.	There is no damage.
		Between input terminal and output terminal.		
		Between input, output terminals and auxiliary supply terminal.		
Impulse withstand voltage		Between electric circuit and case (earth).	5kV 1.2/50μs (Both positive and negative polarity, for each 3 times)	There is no damage.
		Between input, output terminals and auxiliary supply terminal.		
Output line surge		2000A 8/20μs	There is no damage.	
Shock		Shock of 490m/s ² , add for each 3 times to the direction of X Y Z.	0.5%	
Vibration		Frequency 16.7Hz, double amplitude 4mm (19.6m/s ²), each 1 hour for X Y Z direction.	0.5%	

3. Handling explanation

3.1 Outline dimension



Note⁽³⁾ In case of DIN rail (height 15mm) installation.

Terminal cover is standard attachment.

3.2 Cautions on mounting

The environmental conditions of installation space. Please select indoors without low mechanical vibration, dust, and corrosive gas. And, please select indoors without the influence of the strong electric magnetic field by the large current bus, saturable reactor.

There is no limit of a mounting position.

A mounting instruction can select 35mm width DIN rail mounting and screw mounting.

In screw mounting, please install with M4 screw or M5 screw. (However, the screw is not attached.)

The tightening torque of a screw, M4 : 1.0 to 1.3N·m, M5 : 2.0 to 2.5N·m

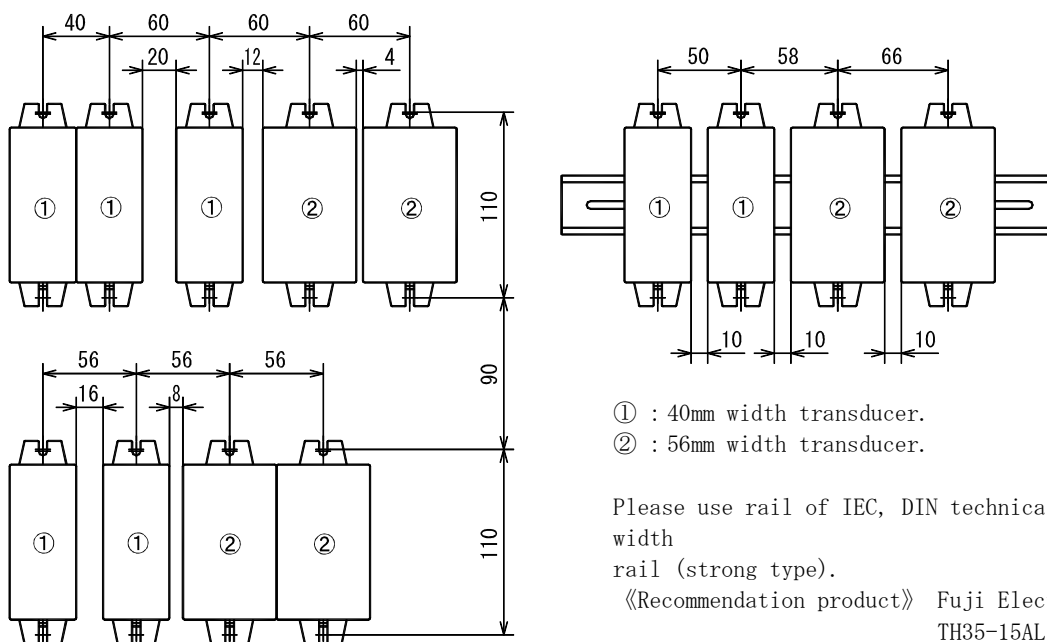
An interval lining up side-by-side does not have regulation.

Please consider radiation and separate more than 10mm of the interval of mounting side-by-side.

Please consider radiation and wiring space and separate more than 90mm of the space above and below.

Please secure the space distance of a terminal and a metal panel 10mm or more.

Combination install dimensions example (Unit mm)



① : 40mm width transducer.
 ② : 56mm width transducer.

Please use rail of IEC, DIN technical standard 35mm width rail (strong type).

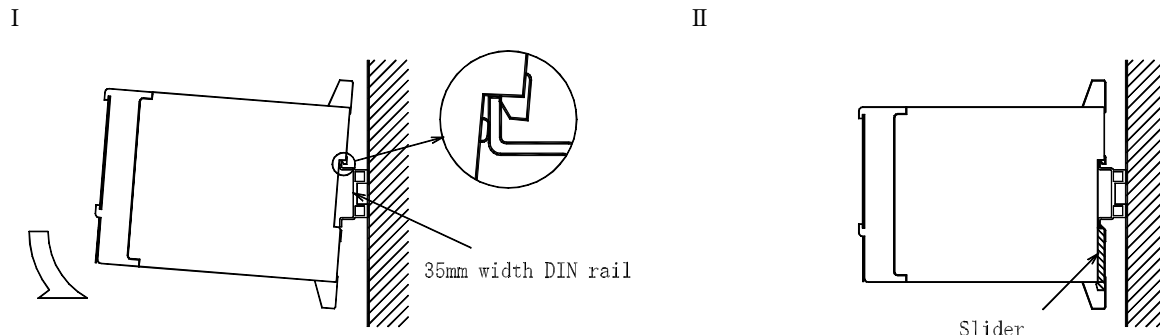
《Recommendation product》 Fuji Electric Co., Ltd.
 TH35-15AL

3.3 The mount to DIN rail, and the method of detachment

Please use the rail (35mm width) in conformity with a DIN standard.

- How to install this product in a rail.

The claw of the upside of the slot for rail mounting in the bottom of this product is put in a rail. This product is fixable by pushing in the direction of an arrow below.



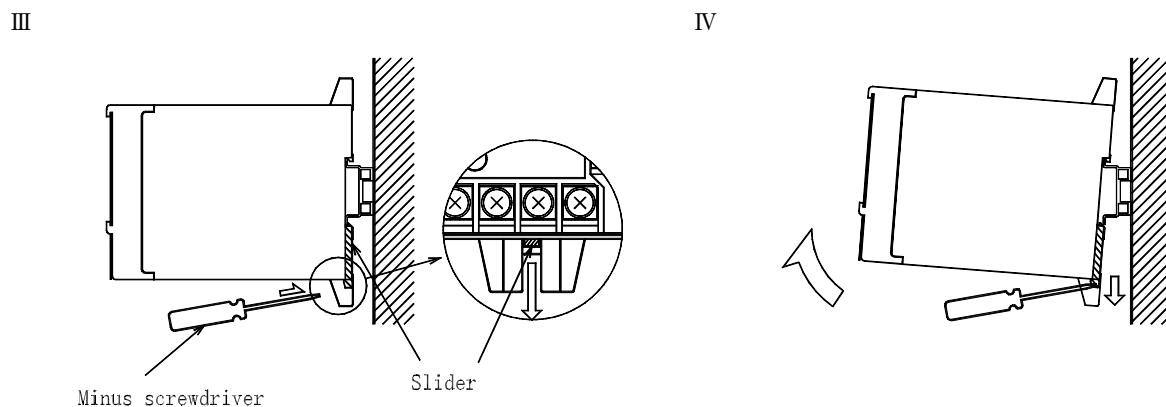
- How to remove this product to the rail.

Please insert a flathead screwdriver in the hole where a slider is square.

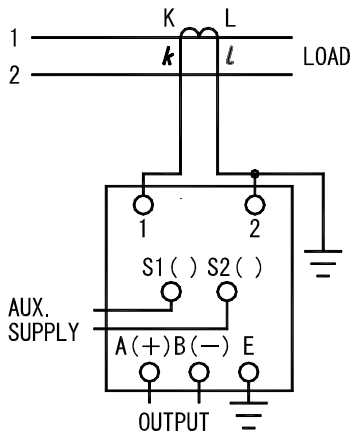
Next, a slider is lowered in the direction of an arrow (Fig. III).

And this product can be removed from a rail by pulling up in the direction of an arrow (Fig. IV).

<Caution> A case may be damaged if this product is pulled up without lowering a slider completely.



3.4 Connection



Please do connection correctly according to a connection diagram. In case of DC power supply is S1(+), S2(-). Please attach a terminal cover after connection work finishing.

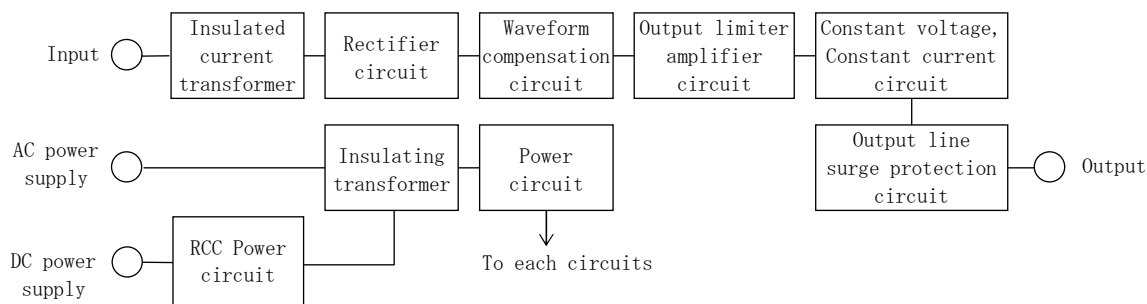
The protection network builds in this product. Even if it has the influence of an indirect stroke surge on a transmission line, protection of this product is unnecessary. In addition, in order to protect the device by the side of a receiver, please install the surge protector between wires, and an arrester (it is an about 500V thing between a transmission line and the ground) to a receiver side.

3.5 Handling explanation

- (1) This product is proofread in the sine wave input. When it is distorted wave form input, an error occurs.
- (2) Amplifier is being used for this product. If an auxiliary supply falls in less than 85% of rated voltage, an error will be produced remarkably.
- (3) Please use output load by name-plate display load resistance value range. It becomes an error if the range of a load resistance value is exceeded. And, it becomes the burden of this product. Please avoid the output short circuit in a voltage output.
- (4) Output external adjustment can adjust BIAS ($\pm 5\%$ of output span), and MAX. ($\pm 2\%$ of output span). Only if required, please adjust (matching with a connection device etc.) Please use a 2.3mm phillips-head screwdriver or a flathead screwdriver for adjustment. Please do not turn VR for adjustment strongly. If VR for adjustment is turned by force, it damages and the right measurement becomes impossible.
- (5) The static shield between primary and secondary of transformer and earth terminal (E) are connected inside. In order to advance the static shield effect, please set a earth resistance to less than 100Ω.

4. Principle of operation

4.1 Block-diagram



4.2 Explanation of operation

After being insulated by the current transformer, full wave rectification of the ac input is done by the rectifier circuit.

By the waveform building out circuit, it has mitigated the output error over a harmonic content input. After the output by which waveform compensation was done is smoothed, it does a constant current output or constant voltage output.

5. Calibration and maintenance

5.1 Calibration

Because this product is adjusted, there is not need of calibration especially.

However, if discrepancy arises in an output in long-term use, please adjust in the next way.

- (1) Output load should connect real load (name-plate display load resistance range) or simulation load (resistance equivalent to real load).
- (2) Please apply an auxiliary supply rated voltage and input (equivalent to 50% of rated output value). Do an energization (warm-up) for 15 minutes or more.
- (3) Please apply an input equivalent to the minimum (span) output. Please adjust on the "BIAS ADJ" to become the minimum output value. Next, please apply an input equivalent to a rated output. Please adjust on the "MAX ADJ" so that it may become a rated output value. (The screwdriver for adjustment: Tip width of 1.8 to 2.3mm, Phillips-head screwdriver or flat-blade screwdriver)
- (4) When the minimum (span) output is except 0V (or 0mA), please repeat adjustment of (3) section 2 - 3 times, and adjust until it becomes a normal output.

5.2 Maintenance

- (1) Please do not change wiring of an input and an auxiliary power by the hot line condition.
- (2) In case you check an output unavoidably by the hot line condition, please warn to be unable to touch output wiring and a human body to an input and an auxiliary power terminal.
(Please do not short-circuit a voltage output. If a current output becomes open, the voltage of about 15V will occur.)
- (3) If it checks an input, an output, and an auxiliary power, please carry out after checking schematics.
- (4) Please install a terminal cover, if change and maintenance of wiring finish.
- (5) If a name-plate is wiped with solvents (an alcoholic nature), a display item may disappear.
Please wipe with the dry cloth.

5.3 Storage

- (1) Please avoid storage in the next space. Low temperature, high temperature, high humidity, and sunny place.
- (2) The aluminum electrolytic capacitor is used for a product.
Please do the energization of the power supply within one year after shipment.

5.4 Countermeasures against troubles

As our principle, we recall product in question and repair it.

If judged as product failure, have a contact with us or sales agent for repairing work (Also have a contact with us or sales agent for specification change).

Product failure which we are not responsible for (when responsibility in manufacturing process is not recognized, when product is disassembled/remodeled, in case of false operation by customer, etc.) is beyond our warranty.

Fuji Electric FA Components & Systems Co.,Ltd.

Mitsui Sumitomo Bank Ningyo-cho Bldg., 5-7, Nihonbashi Odemma-cho,
Chuo-ku, Tokyo 103-0011, Japan
URL <http://www.fujielectric.co.jp/fcs/>