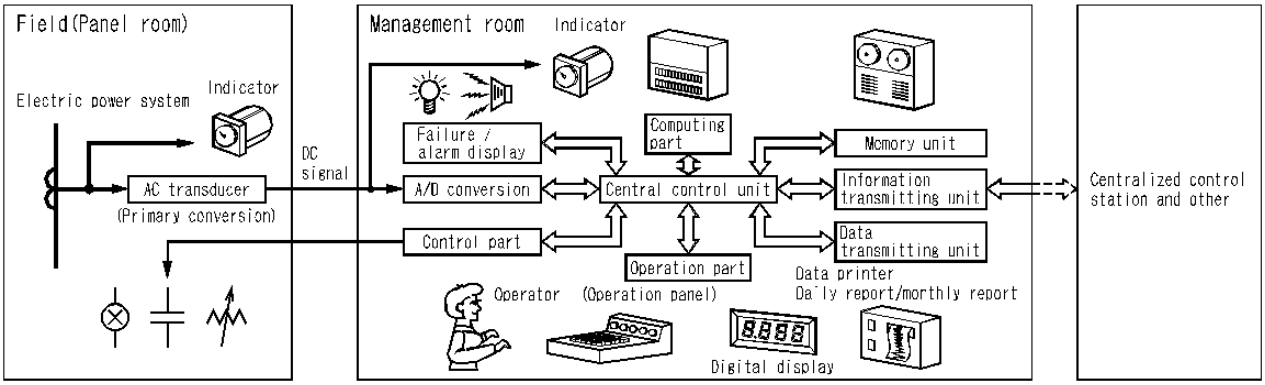
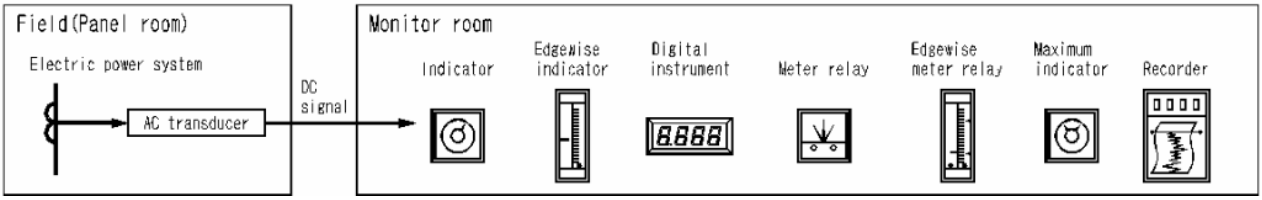
■ EXAMPLE of USE

● EXAMPLE OF CENTRALIZED MONITOR SYSTEM



● EXAMPLE OF DIRECT TRANSMISSION TELEMETER



■ OPERATIONAL METHOD SELECTION (VOLTAGE/CURRENT TRANSDUCER)

(Select an operational method in accordance with the conditions of waveform applied)

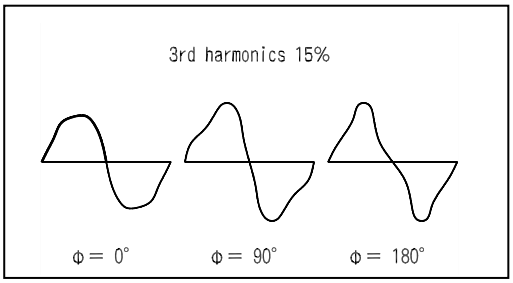
Conditions of waveform applied	Operational method	Error in distorted wave (raw power)	Type name (example)
Sine wave	Rectification method	Mixed 3rd harmonics in by 15%: variation of 6% * SCR : variation of 26%	A: AT2-60 V: VT2-60
3rd harmonics 5%	Rectification method with waveform compensation	Mixed 3rd harmonics in by 15%: variation of 1.5% * SCR : variation of 7%	A: ATT2-82A, 91A V: VTT2-82A, 91A
3rd harmonics 15%	RMS value rectification method	Mixed 3rd harmonics in by 15%: variation of 0.4% * SCR : variation of 1%	A: AT2-82E V: VT2-82E
3rd harmonics 30% SCR waveform	RMS value method	Mixed 3rd harmonics in by 15%: variation of 0.1% * SCR : variation of 0.2%	A: AETT2-82A, 91A V: VETT2-82A, 91A

A: current transducer; **V**: voltage transducer

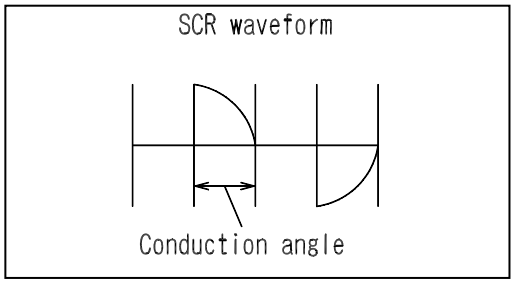
* **Influence** of SCR waveform: the case of changing conduction angle by 90 degree at the time of maximum input.

● EXAMPLE OF INPUT WAVEFORM

► (3rd harmonics content ratio) =
(RMS value of 3rd harmonics)/
(RMS value of fundamental harmonics)

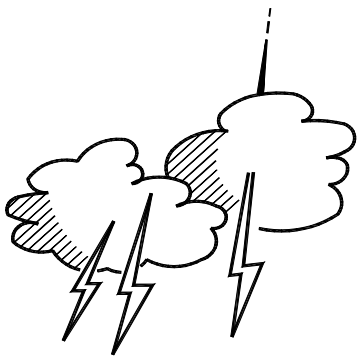


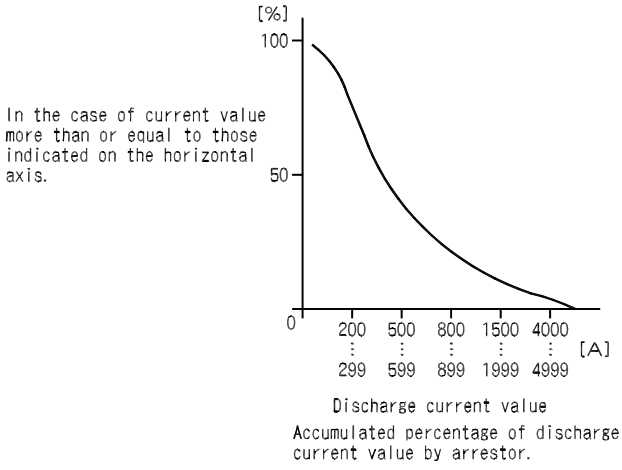
► In the case of SCR waveform, standard conduction angle at maximum rating is 90 degree or more. Specify the conduction angle if it is less than 90 degree.



■ CAUTIONS

● LIGHTNING SURGE





The statistical result of thunder accident which happened to low voltage circuit in national main power stations according to a report on thunder accident of low voltage controlling circuit] released by Investigation Committee for thunder accident, IEEJ;

[Period covered (1955 – 1964): 10 years
Number of power station: 1707
Record of discharge current by arrester: 7085]

As for the strength of lightning surge current in low voltage circuit, approx. 80% were equal to or less than 800A, as for the voltage strength, 99.9% were equal to or less than 4.5kV (Max. 5.75kV).

► Our standard about induced lightning surge voltage/current

Voltage: impulse voltage 5kV±1.2/50μs (identical to JEC-212 waveform) is the standard voltage between electric circuit and earth.

Current: waveform±8/20μs, standard impulse current 2,000A as described in JIS C1111-1989.

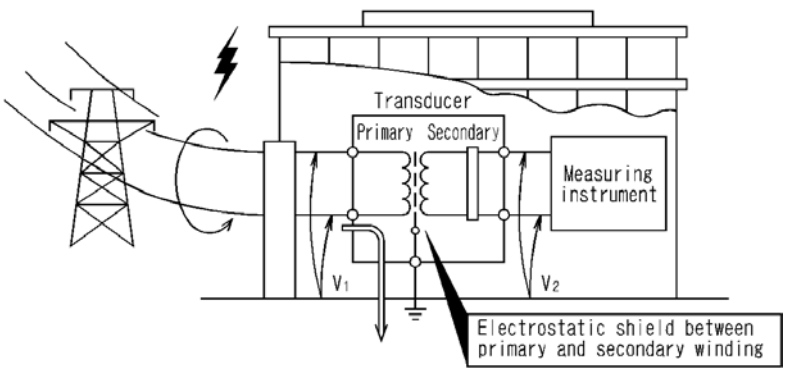
● PROTECTION AGAINST INDUCED LIGHTNING SURGE (LOW VOLTAGE CIRCUIT)

Following is about the effect of electrostatic shield between primary and secondary winding

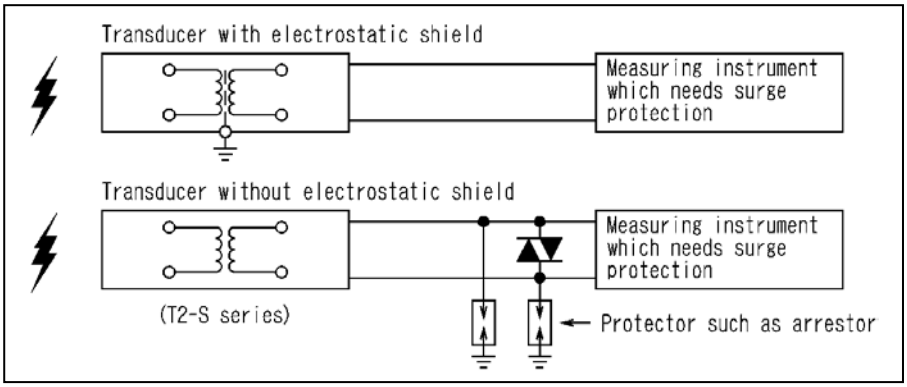
Generally, primary and secondary winding of a small size transformer inside an AC transducer are insulated. If there is a primary and a secondary winding shield between primary and secondary winding, it brings about the following effect.

Effect of electrostatic shield between primary and secondary winding (example)

Condition	Impulse voltage V_1	Voltage between output side and earth V_2	Damping ratio V_2/V_1
W/ electrostatic shield	5kV ± 1.2/50μs	Peak voltage 350V	1/14
W/o electrostatic shield	5kV ± 1.2/50μs	Peak voltage 3800V	1/1.3



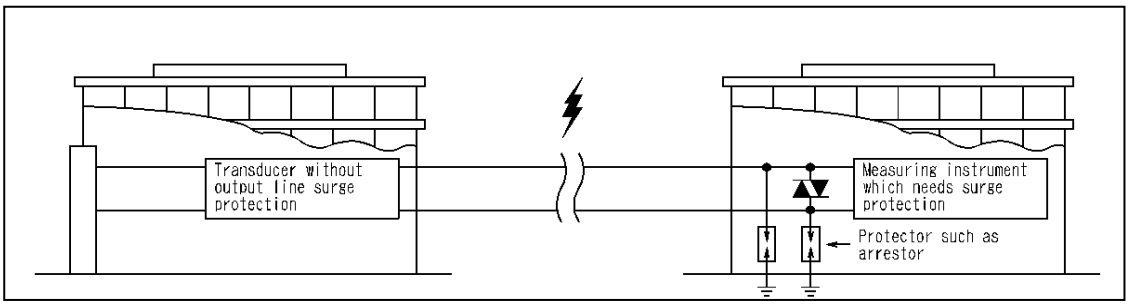
► Protection when an induced lightning surge occurred on input side of an AC transducer.



If there is the possibility for an induced lightning surge occurring on input of an AC transducer, take measures as the figure in the left shows.

Each type of AC transducer has impulse voltage 5kV ± 1.2/50μs against earth.

► Protection when an induced lightning surge occurred on output side of an AC transducer.



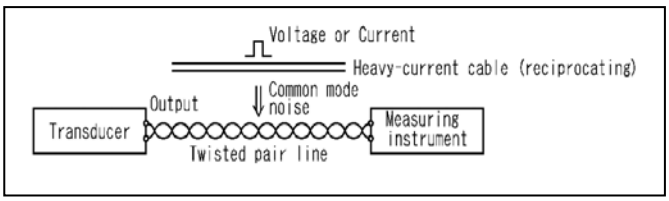
An AC transducer, a sensor transducer or a signal transducer with output line surge protection does not need a protector at transducer output side. Constant current output type which is normal mode noise resistant, such type is the choice in the case of transmitting an output to a distant place.

● TYPE OF OUTPUT WIRING

When wiring, separate the output line of transducer as much as possible from an electric power line which can be a noise source, or lines with steep and sharp voltage/current fluctuation.

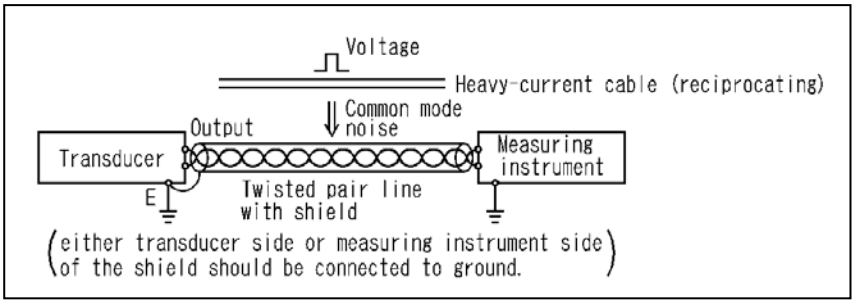
► General output wiring

Twisted pair line is recommended for general output wiring. Twisted pair line sustains a high balancing against electrostatic induced noise by voltage or electromagnetic induced noise by current, this makes it hard for common mode noise to convert into normal mode, and can suppress the occurrence of normal mode noise.



► Effect of using twisted pair line with shield

Twisted pair line with shield is recommended in the case of a particularly big noise.

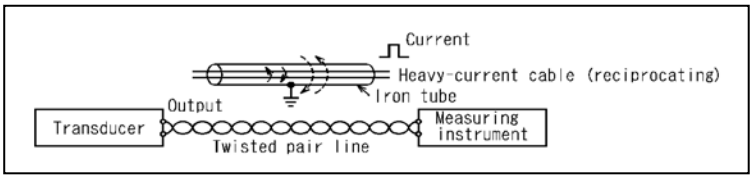


Please ground either one of transducer side and instrument side of the shield.

Electrostatic induced noise (common-mode noise) which is caused by voltage can be reduced by electrostatic shield.

► Reduction of electromagnetic-induced noise

In the case of a particularly big electro-magnetic induced noise, shielding noise source or the output line with an iron tube is recommended. When shielding the heavy-current cable of noise source with ferro-magnetic material, electromagnetic induced noise by current can be reduced. Also, there comes about the effect of electrostatic shield if the shield is connected to ground.

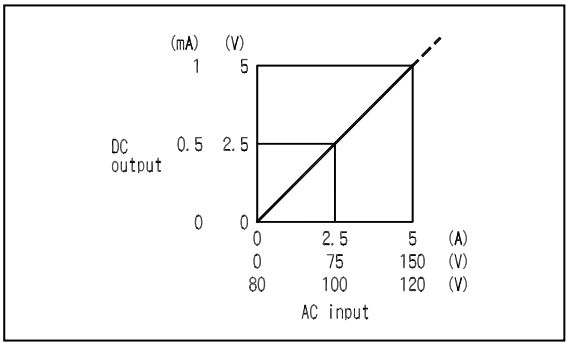


■ INPUT - OUTPUT RELATIONSHIP (AC TRANSDUCER)

● CURRENT / VOLTAGE

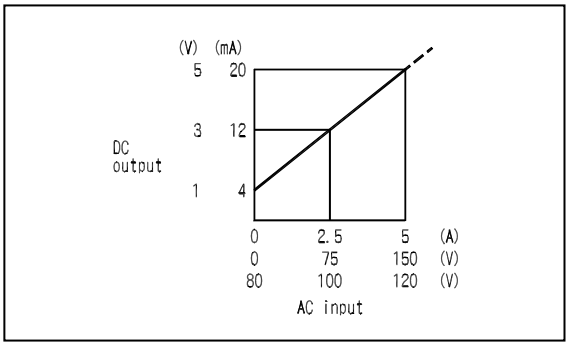
► A-1

Input	Output
5A	5V or 1mA
150V	
80 — 120V	0 — 5V or 0 — 1mA



► A-2

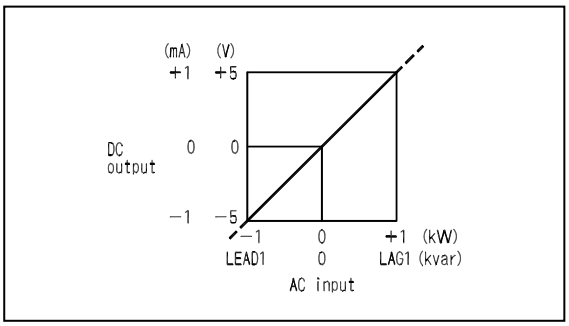
Input	Output
0 — 5A	4 — 20mA or
0 — 150V	1 — 5V
80 — 120V	



● AC POWER / REACTIVE POWER

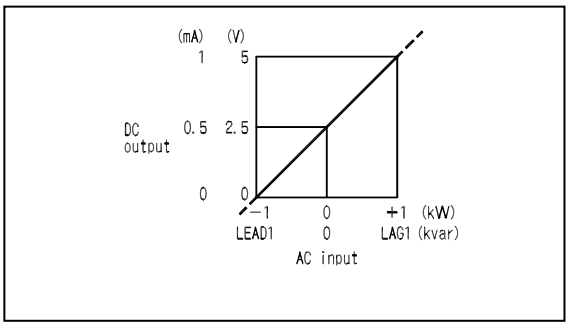
► A-3

Input	Output
±1kW	±5V or ±1mA
LEAD1kvar — LAG1kvar	-5 — +5V or -1 — +1mA



► A-4

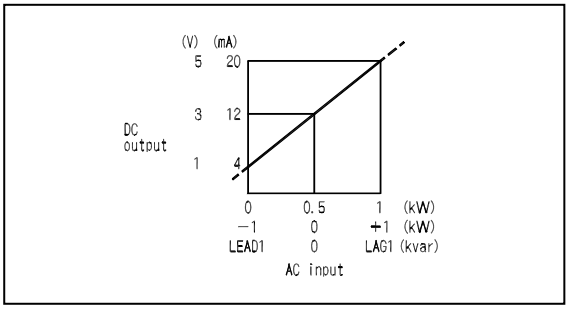
Input	Output
-1kW — +1kW	0 — 5V or
LEAD1kvar — LAG1kvar	0 — 1mA



● AC POWER / REACTIVE POWER

► A-5

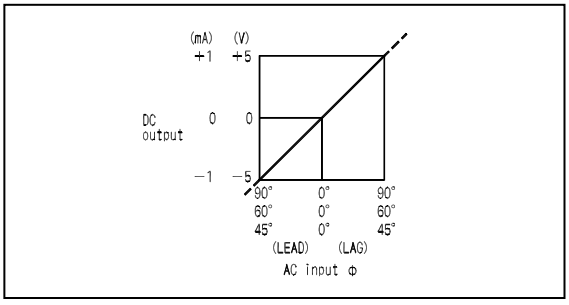
Input	Output
0 — 1kW	4 — 20mA or
-1kW — +1kW	1 — 5V
LEAD1kvar — LAG1kvar	



● V-V / V-I PHASE ANGLE

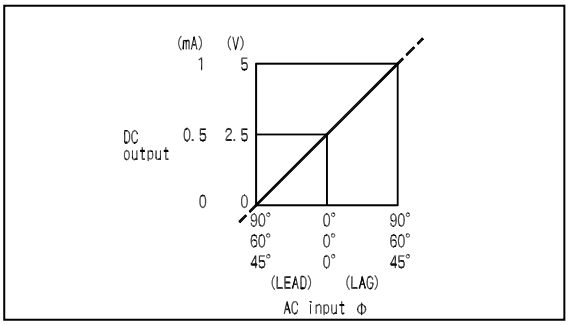
► A-6

Input	Output
LEAD90° — LAG90°	-5 — +5V or
LEAD60° — LAG60°	-1 — +1mA
LEAD45° — LAG45°	



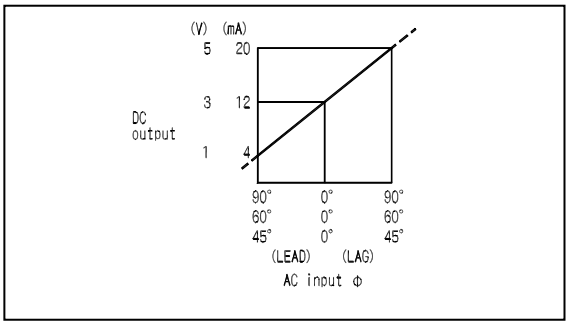
▶ **A-7**

Input	Output
LEAD90° — LAG90°	0 — +5V or
LEAD60° — LAG60°	0 — +1mA
LEAD45° — LAG45°	



▶ **A-8**

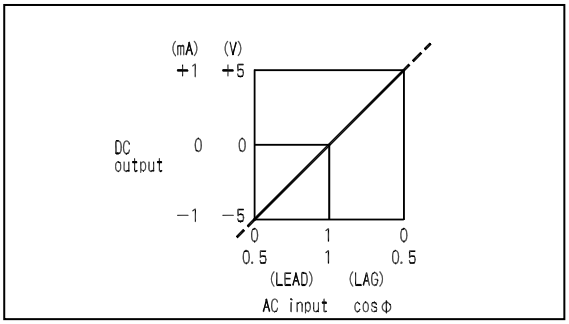
Input	Output
LEAD90° — LAG90°	4 — 20mA or
LEAD60° — LAG60°	1 — 5V
LEAD45° — LAG45°	



● POWER FACTOR

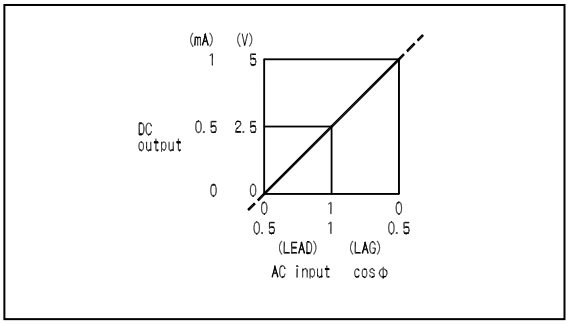
▶ **A-9** Output pattern 1

Input	Output
LEAD0 — 1 — LAG0	-5 — 0 — +5V or
LEAD0.5 — 1 — LAG0.5	-1 — 0 — +1mA



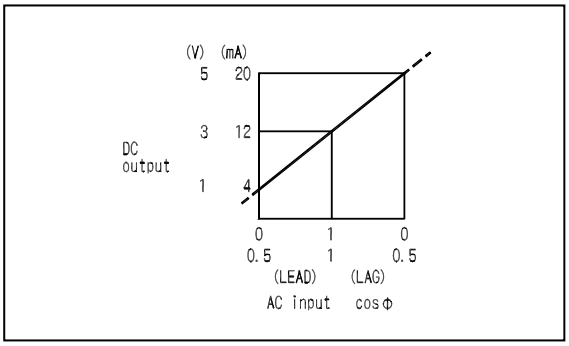
▶ **A-10** Output pattern 1

Input	Output
LEAD0 — 1 — LAG0	0 — 2.5 — 5V or
LEAD0.5 — 1 — LAG0.5	0 — 0.5 — 1mA



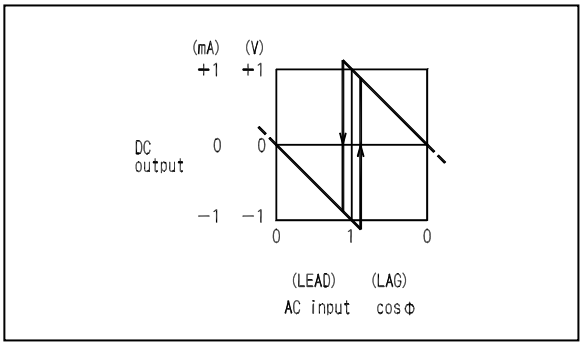
▶ **A-11** Output pattern 1

Input	Output
LEAD0 — 1 — LAG0	4—12—20mA
LEAD0.5 — 1 — LAG0.5	or 1—3—5V



▶ **A-12** Output pattern 3

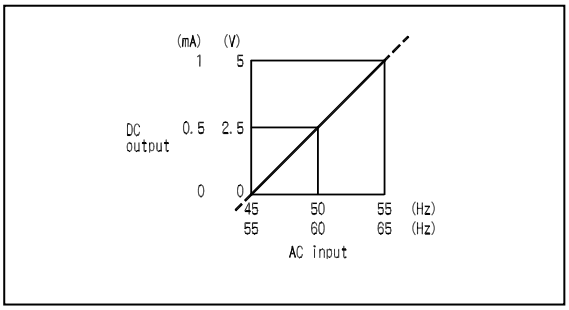
Input	Output
LEAD0 — 1/1 — LAG0	0 — -1/+1 — 0V
	0 — -1/+1 — 0mA



● FREQUENCY

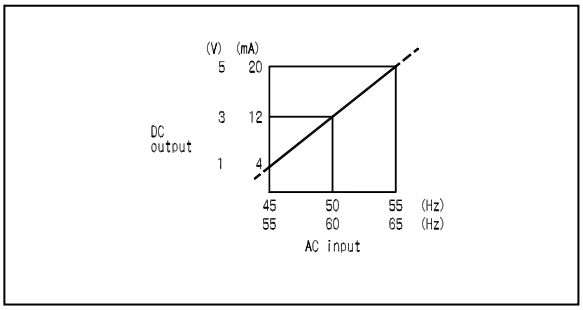
▶ A-13

Input	Output
45 — 55Hz	0 — 5V or
55 — 65Hz	0 — 1mA



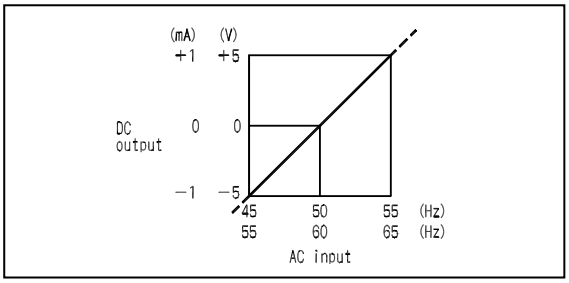
▶ A-14

Input	Output
45 — 55Hz	4 — 20mA or
55 — 65Hz	1 — 5V



▶ A-15

Input	Output
45 — 55Hz	-5 — +5V or
55 — 65Hz	-1 — +1mA

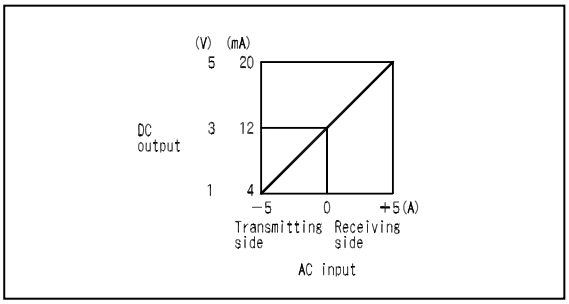


■ INPUT - OUTPUT RELATIONSHIP (AC SPECIAL POWER FLOW TRANSDUCER)

● POWER FLOW

▶ **A-16** Two quadrant

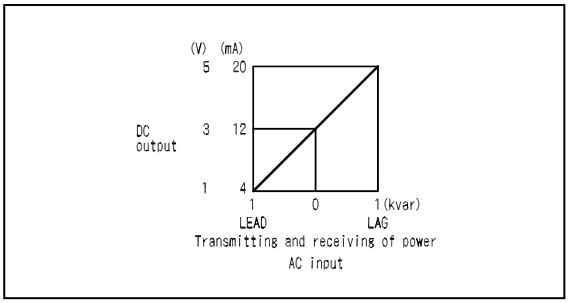
Input	Output
±5A	4—20mA
	1—5V



● POWER FLOW REACTIVE POWER

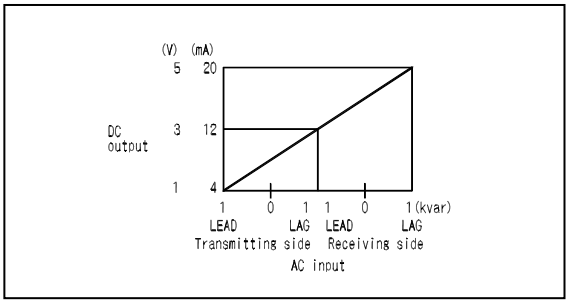
▶ **A-17** Two quadrant

Input	Output
LEAD1kvar—	4—20mA
LAG1kvar	1—5V



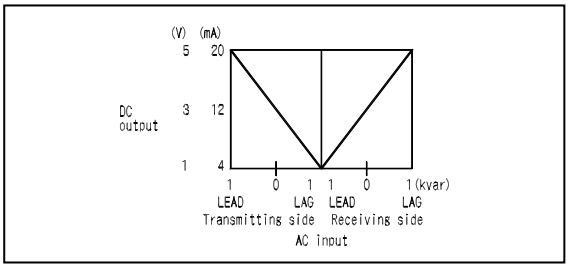
▶ **A-18** Four quadrant

Input	Output
LEAD1kvar—	4—12/12—20mA
LAG1kvar	1—3/3—5V



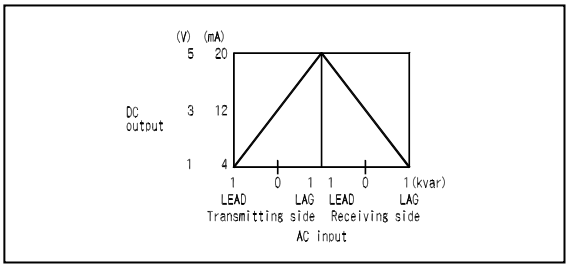
▶ **A-19** Four quadrant

Input	Output
LEAD1kvar—	20—4/4—20mA
LAG1kvar	5—1/1—5V



▶ **A-20** Four quadrant

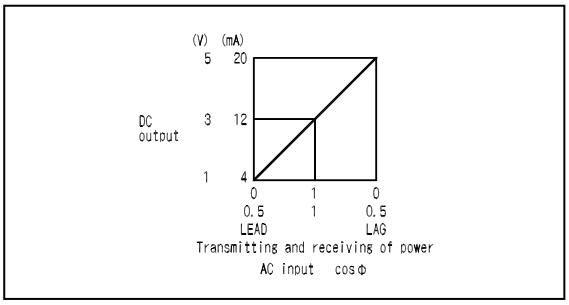
Input	Output
LEAD1kvar—	4—20/20—4mA
LAG1kvar	1—5/5—1V



● POWER FLOW POWER FACTOR

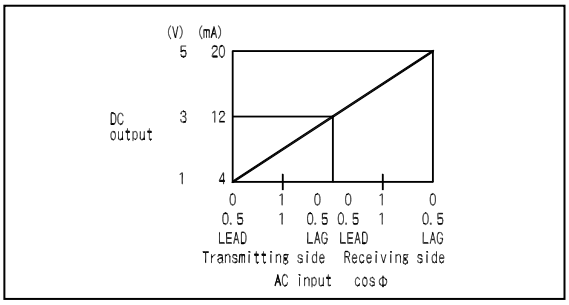
▶ **A-21** Two quadrant

Input	Output
LEAD0—1—LAG0	4—20mA
LEAD0.5—1—LAG0.5	1—5V



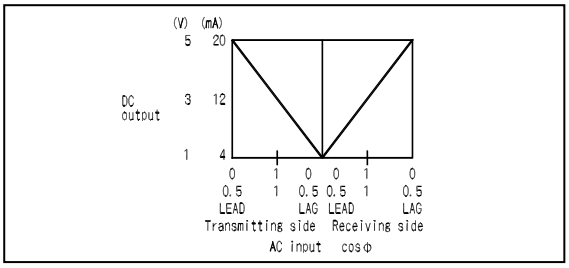
▶ **A-22** Four quadrant

Input	Output
LEAD0—LAG0	4—12/12—20mA
LEAD0.5—LAG0.5	1—3/3—5V



▶ **A-23** Four quadrant

Input	Output
LEAD0—LAG0	20—4/4—20mA
LEAD0.5—LAG0.5	5—1/1—5V



▶ **A-24** Four quadrant

Input	Output
LEAD0—LAG0	4—20/20—4mA
LEAD0.5—LAG0.5	1—5/5—1V