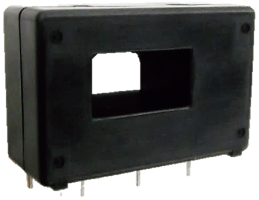
Fluxgate system / Voltage-output type, Through Type

F26PxxxS05A SERIES



F26PxxxS05A series is a model that output voltage waveform distortion improvement of the F26PxxxS05 series.
For details, please refer to supplementary material(P6).

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	+7	
Primary conductor temperature	—	℃	105	
ESD (HBM: Human Body Model)	—	kV	4	C=150 pF, R=330 Ω

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC4300 V, for 1minute (Sensing current 0.5 mA)	Primary ⇔ Secondary
Impulse withstand voltage	Vw	kV	10	Primary ⇔ Secondary Input waveform : ・Front time 1.2 μs ・Time to half value 50 μs ・single
Insulation Resistance	R_{IS}	—	≧ 500M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	d_{Cl}	mm	12.7 (MIN)	Primary ⇔ Secondary
Creepage distance	d_{Cp}	mm	12.7 (MIN)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index : (CTI)	CTI	V	600 (group Ⅰ)	
Application example	—	—	600V, CAT Ⅲ, PD2	Reinforced isolation, non uniform field according to EN62477-1:2012 and EN62477-1:2012/A11:2014.
	—	—	1000V, CAT Ⅲ, PD2	Basic isolation, non uniform field according to EN62477-1:2012 and EN62477-1:2012/A11:2014.

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	T_A	℃	− 40		+ 85	
Ambient storage temperature	T_S	℃	− 40		+ 85	
Mass	m	g		33		

SPECIFICATIONS

Ta=+25℃, R_L=10kΩ, Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Primary nominal current	**F26P050S05A**	I_{PN}	A		50		
	F26P100S05A				100		
	F26P150S05A				150		
Primary current, measuring range (at Vcc= + 5V, Ta= + 85℃)	**F26P050S05A**	I_{PM}	A	− 150		150	
	F26P100S05A			− 270		270	
	F26P150S05A			− 230		230	＊4
Number of secondary turns	**F26P050S05A**	Ns	T		1258		
	F26P100S05A				1258		
	F26P150S05A				1588		
Supply Voltage		Vcc	V	4.75	5.00	5.25	
Consumption current (at IP=0 A)		Icc	mA		20		Icc=20+Ip/Ns+Vout/R_L
Reference voltage (output) (at IP=0 A)		Vref1	V	2.495	2.500	2.505	Ref OUT mode
Reference voltage (input)		Vref2	V	0		4	Ref IN mode
Output voltage (at Ip=0A)		Vout	V		Vref1,Vref2		
Electrical offset voltage ＊1		Voe	mV	− 1.0		+1.0	Voe=Vout (at Ip=0 A)-Vref
Electrical offset current referred to primary	**F26P050S05A**	Ioe	mA	− 80		+80	
	F26P100S05A			− 160		+160	
	F26P150S05A			− 240		− 240	
Temperature coefficient of Vref1		TCVref1	ppm/K			± 50	
Temperature coefficient of Output voltage (at Ip=0 A)		TCVo	ppm/K			± 10	ppm/K of 2.5 V (−40℃～+85℃)
Theoretical sensitivity	**F26P050S05A**	Gth	mV/A		12.50		625 mV (at I_{PN}) Gth=|Vref-Vout|/I_{PN}
	F26P100S05A				6.25		
	F26P150S05A				4.17		
Sensitivity error ＊2		ε_G	%	− 0.7		+0.7	
Temperature coefficient of Sensitivity (at Ta= − 40℃～+ 85℃)		TCG	ppm/K			± 40	
Sensitivity linearity error (at I_{PN}) ＊2		ε_L	%	− 0.1		+0.1	
Peak to peak output ripple at oscillator frequency (f typ=450kHz)		—	mV		16		R_L=1 k Ω , at Ip=0 A
Reaction time (at 10% of I_{PN}) ＊2		t_{ra}	μs		1		R_L=1 k Ω , di/dt=100 A/μs
Response time (at 70% of I_{PN}) ＊2		t_r	μs		1		R_L=1 k Ω , di/dt=100 A/μs
Frequency bandwidth (± 3 dB) ＊2 ＊3		BW	kHz		100		R_L=1 k Ω
Overall accuracy ＊2		X_G	%	− 0.96		+0.96	X_G=(100 × Voe/625)+ ε_G+ ε_L

＊1 Offset voltage value is after removal of core hysteresis.
＊2 Measurement condition : Primary conductor (bus bar) cross sectional area is as same as through hole, and penetration with 1turn in through hole.
Differences occur depending on the conditions of the primary conductor (busbar).
＊3 High fundamental frequency primary current and/or harmonic current may result in excessive heating in magnetic core.
＊4 The measurement range is less than F26P100S05.

STANDARDS

EN62477-1:2012 and EN62477-1:2012/A11:2014 , UL508 (File No.E243511)

※ Please refer to the another sheet about conditions of UL Recognition.

CHARACTERISTIC CURVE (TYP)

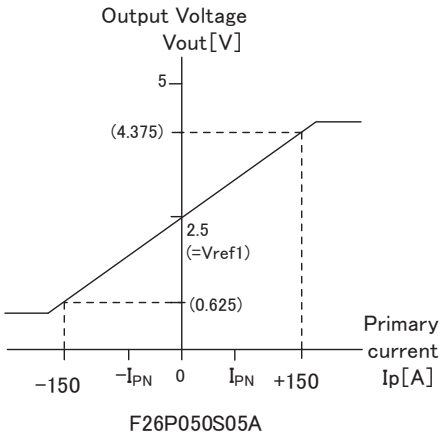


Figure 1 : Linearity curve (Internal reference voltage)

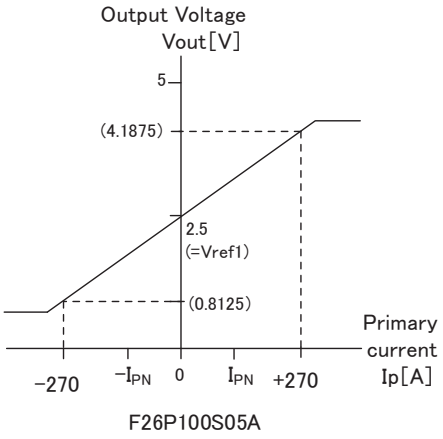


Figure 2 : Linearity curve (Internal reference voltage)

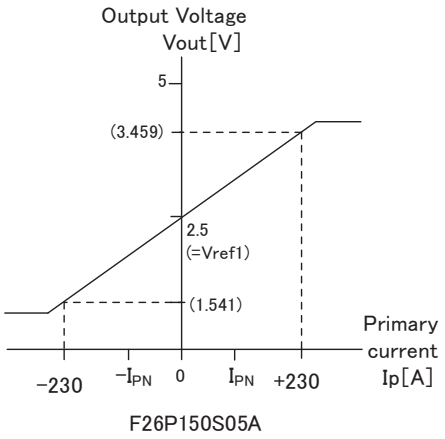


Figure 3 : Linearity curve (Internal reference voltage)

SUPPORT DOCUMENTATION

Maximum repetitive primary current

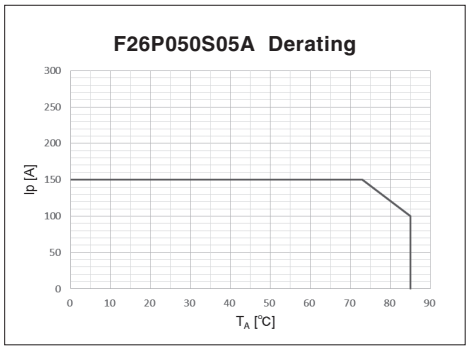


Figure 4 : Ip vs T_A for F26P050S05A

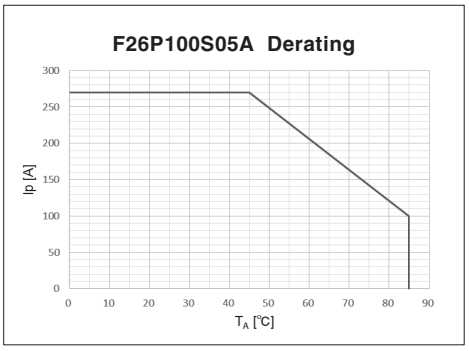


Figure 5 : Ip vs T_A for F26P100S05A

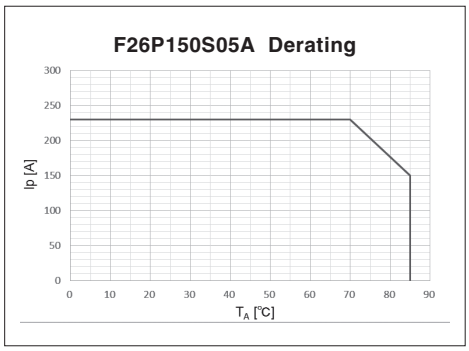


Figure 6 : Ip vs T_A for F26P150S05A

According to which the following conditions are true the maximum repetitive primary current plot shows the boundary of the area.

① Ip < Ipm
② Junction temperature Tj < 125℃
③ Resistor power dissipation < 0.5 x rated power

SUPPORT DOCUMENTATION

Reference voltage

The Ref pin has two modes Ref IN and Ref OUT.

＜Ref OUT mode＞

The 2.5 V internal precision reference is used by the transducer as the reference point for bipolar measurements.

＜Ref IN mode＞

An external reference voltage is connected to the Ref pin. this voltage is specified in the range 0 to 4 V.
its voltage is used as the reference voltage at the time of measurement.

-either to source a typical current of (Vref2-2.5)/680,the maximum value will be 2.2 mA typ.when Vref2 = 4 V.
-or to sink a typical current of (2.5-Vref2)/680,the maximum value will be 3.68 mA typ.when Vref2 = 0 V.

The following graphs show how the measuring range of each transducer version depends on external reference voltage value Vref2.

R_L=1 kΩ , Vcc=+5 V, T_A=-40 ～ +85 ℃

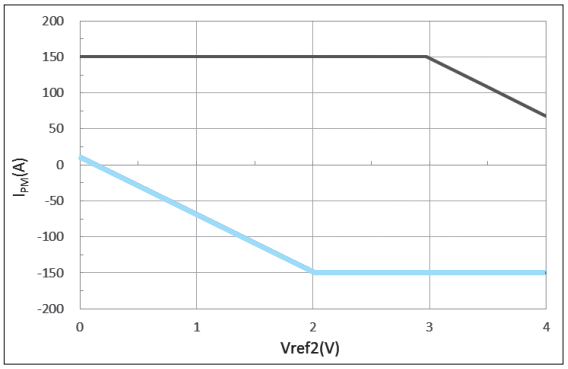


Figure 7 : I_{PM} vs Vref2 for F26P050S05A

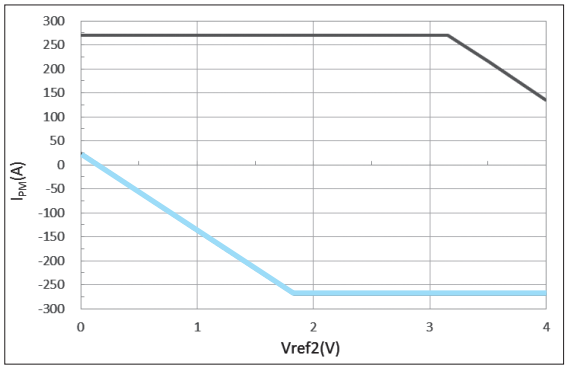


Figure 8 : I_{PM} vs Vref2 for F26P100S05A

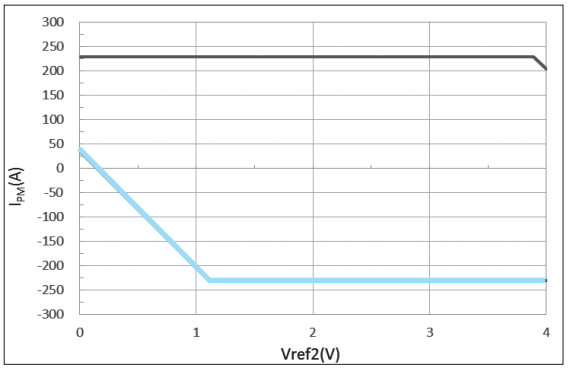


Figure 9 : I_{PM} vs Vref2 for F26P150S05A

e. g. ; In case of F26P100S05A

Upper limit :	Ip = +270 A	(Vref2=0 V ～ 3.16 V)
	Ip = +270-(Vref2-3.16 V)/0.00625	(Vref2=3.16 V ～ 4 V)
Lower limit :	Ip =− 270 A	(Vref2=1.84 V ～ 4 V)
	Ip =− 270-(Vref2-1.84 V)/0.00625	(Vref2=0 V ～ 1.84 V)

If you do not want to use the Ref pin, please unconnected.

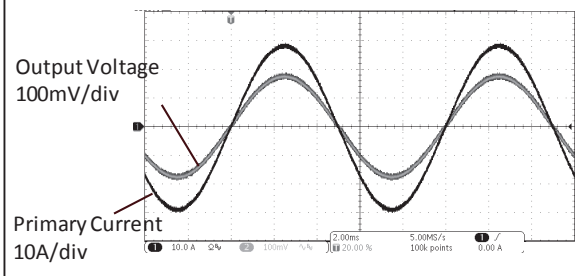
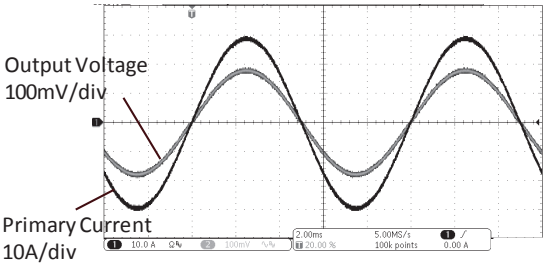
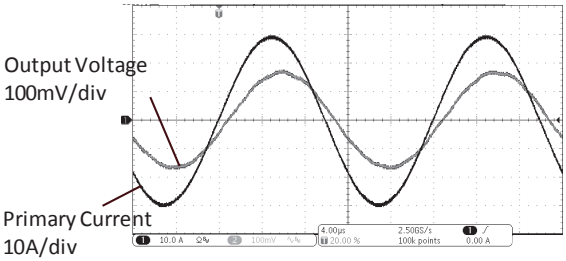
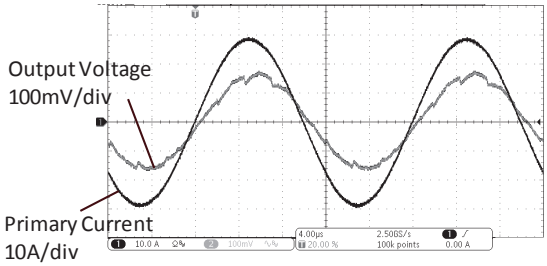
SUPPORT DOCUMENTATION

Information on F26PxxxS05A series.

F26PxxxS05A series is a model that output voltage waveform distortion improvement of the F26PxxxS05 series.
Please select according to the application.

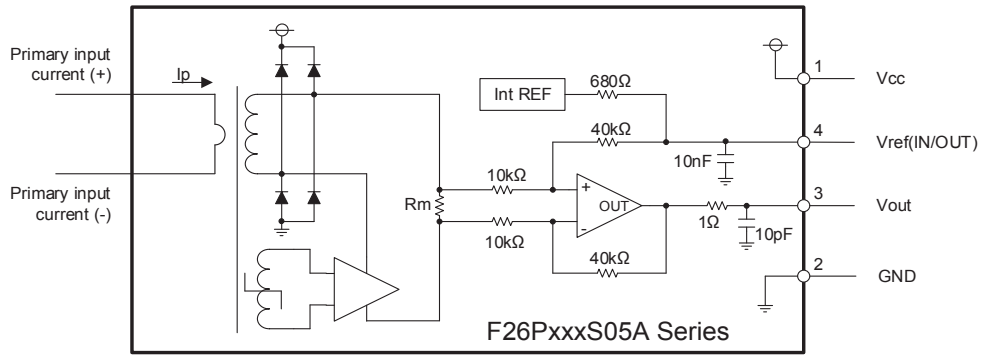
e. g. F26P100S05A

Measurement condition T_A=25 ℃ R_L=1 kΩ Ip=20 A Vcc=+5 V
Primary conductor (bus bar) cross sectional area is as same as through hole, and penetration with 1turn in through hole.

	F26P100S05A	F26P100S05
100Hz (2ms/div)		
50kHz (4us/div)		

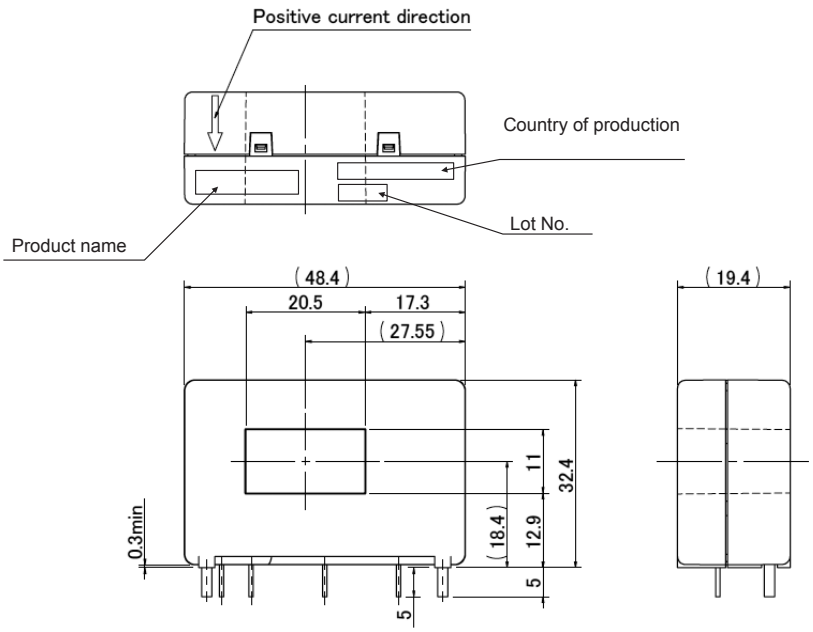
Differences occur depending on the conditions of the primary conductor (busbar).
Please use it after actual machine verification.

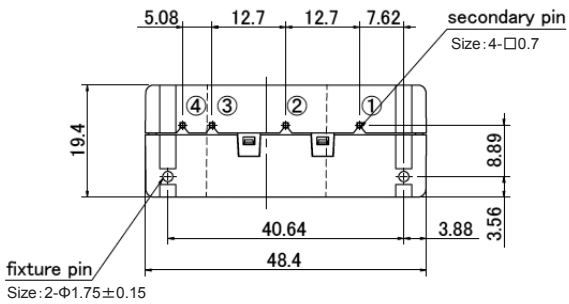
CONNECTION



DIMENSIONS (mm)

※ Tolerance: ± 0.5
Unit: mm

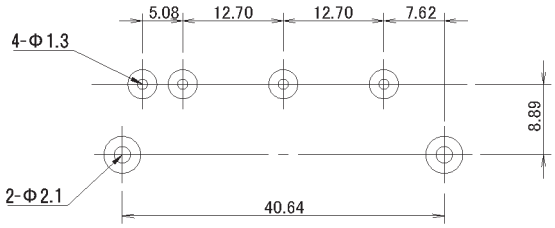




Terminal No.

① Vcc (+5V)
② GND
③ Vout
④ Vref (IN/OUT)

RECOMMENDED HOLE DIAMETER (mm)



TYPE DESIGNATION

F26 P xxx S 05 A
① ② ③ ④ ⑤ ⑥

① Model (3 figures)
F26 : Series
② Mounting configuration (1 figure)
P : PCB Mounting type
③ Measurement current range (3 figures)
050 : 50A
100 : 100A
150 : 150A
④ Control power supply type (1 figure)
S : Single supply
⑤ Power supply voltage (2 digits)
05 : 15V
⑥ Special specification
(none) : Standard type.
A : Output voltage waveform distortion improvement type.

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1. The content of this information is subject to change without prior notice for the purpose of improvements, etc. Ensure that you are in possession of the most up-to-date information when using this product.

2. This product is intended to be used in general electronics applications (electric home appliances, business equipment, information equipment, communication terminal equipment, measuring devices, industrial equipment, and so on). This product is neither intended nor warranted for use in following equipment or devices:

   Special application (such as for medical devices, transportation equipment, traffic signal control equipment, fire and crime prevention equipment, aeronautics and space devices, nuclear power control, fuel control, in-vehicle equipment, safety devices, and so on) in which extremely high quality and high reliability is required, or if the malfunction or failures of product could be cause loss of human life, bodily injury.

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   - *Use in liquids such as water, oil, chemical solutions, or organic solvents, and use in locations where the product will be exposed to such liquids.*
   - *Use that involves exposure to direct sunlight, outdoor exposure, or dusty conditions.*
   - *Use in locations where corrosive gases such as sea winds, Cl2, H2S, NH3, SO2, or NO2, are present. (Some product improves durability)*
   - *Use in environments with strong static electricity or electromagnetic radiation.*
   - *Use that involves placing inflammable material next to the product.*
   - *Use of this product either sealed with a resin filling or coated with resin.*
   - *Use of water or a water soluble detergent for flux cleaning.*
   - *Use in locations where condensation is liable to occur.*

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Application notes

<General Considerations>

1. The sensor uses polar electronic components. When the polarity of the power supply is mistaken, the sensor is damaged.
2. Static electricity or excessive voltage can increase an offset voltage in the Hall element, and cause offset voltage to change. Please exercise care in handling and application.
3. In order to prevent the influence of noise, the use of twisted cable or shielded cable for the output line is recommended
4. If using this device within a magnetic field generated by other devices, the specified accuracy may not be obtainable.
5. Our products (several models are excluded) are adjusted with the trimming method by the measurement condition (Load resistance, Power supply voltage) of specification sheets. Therefore, characteristics (Offset, Output, etc.) and its deviation may be changed in different circuit conditions from the measurement condition. All change characteristic items are not indicated on specification sheets.
6. The performance of current sensors with through-hole (aperture) is dependent on the position of the primary conductor. Tamura specifications are based on a primary conductor completely filling the through-hole (aperture) area.
7. The current sensor rated current in DC Amps.
8. Please use mating connector with equivalent terminal plating material to insure proper operation and avoid possibility of 'galvanic corrosion' .
9. Please do not store in high-temperature and high-humidity storage environment. Please use it after confirming soldering when it is kept for six months or more. (product soldered with substrate)
10. We recommend performing a zero offset adjustment by measuring the offset voltage at startup. In continuously operation for a few months, or at change of ambient temperature or humidity is large, we recommend regularly performing a zero offset adjustment at being idling (it is clear that the current is not apply) .
11. The current sensor doesn't have built-in protection circuit (devices and fuses, etc.). As a failure mode of the sensor, there is a short circuit and open state. In the case of a short-circuit state, the abnor-mal temperature rise of the internal parts is assumed, and there is a possibility to smoke and to ignite. If it is used in safety critical circuit blocks, please take appropriate measures by protection devices, protection circuits, etc. For closed loop –type sensors and flux gate (closed loop type) sensors, the consumption current of the secondary power supply varies in proportion to the measurement current.

<Open loop>

1. High frequency primary current may result in excessive heating in iron magnetic core and cause damage to internal circuitry; for high frequency applications select current sensor with ferrite core material.
2. If the measured current exceeds the rated current, magnetic core saturation will occur and the output voltage signal will not be linearly proportional to the measured current.

<Closed Loop>

1. For closed loop current sensors please insure the power supply voltage is balanced, symmetrical, and, applied simultaneously to avoid potential increase in DC offset error.
2. Maximum rated current measurement duration is timedependent. Maximum rated current applied in excess of the time limit can result in damage to internal electronic circuitry; please consult Tamura for assistance.
3. When using a measurement resistor to convert current output to voltage output select a resistor with stable temperature characteristic to insure accuracy of the output voltage.
4. Compensation current supplied to the secondary winding varies in proportion to the measured current based on the conversion ratio. (If/KN; KN = secondary turns) Please insure the PSU has required current capacity to supply compensation current to the secondary winding.

<Flux-Gate>

1. Compensation current supplied to the secondary winding varies in proportion to the measured current. Please insure the PSU has required current capacity to supply compensation current to the secondary winding.
2. There is 450kHz ripple voltage present on the output and reference output voltage signals . An external capacitor maybe added if necessary.