KINGSINE

KF86 Hardware Instructions

V1.3.1

Dear Customers:

Thank you for your using Kingsine brand protection relay testing system. Hope that the technical data and help information in the manual will be provided to you as detailed as possible about how to use Kingsine products. Meanwhile, we shall be much appreciated to receiving any views about this manual from all the readers and all the experts in the line of relay testing. Should any business advice or technical support service required, then you are welcome to call us or visit our website.

Notes:
Please concern the latest information on our website to get the latest and most helpful information for your work. The function and pictures in this manual should be based on the real published product.

KF86 Hardware Instructions

Printed: Jan, 2018

Publisher

Kingsine Electric Automation Co.,Ltd

Managing Editor

Xiong Zhihuai

Technical Editors

Li Zhi

Zhang RenZhi

Gao Yan

Team Coordinator

Jin Tone

Table of Contents

1 Safety Operation

Only operate (or even turn on) the KF86 set after you have read this reference manual and fully understood the instructions herein.

The KF86 set may only be operated by trained personnel. Any maloperation can result in damage to property or persons.

- **KF86 must only be used from a power outlet that has a protective earth. refer to Power supply & Environment[18] .**
- **Do not connect any of the front panel VOLTAGE/CURRENT OUTPUTS, respectively, to protective earth.**
- **Before connecting and disconnecting test objects, verify that all outputs have been turned off. Never connect or disconnect a test object while the outputs are active.**
- **When disconnecting power supply cables or test leads, always start from the device feeding the power or signal.**
- **All sockets on the front panel are to be considered dangerous with working voltages up to or great 300 Vrms . Only use cables that meet these respective requirements to connect to the equipment.**
- **Do not operate the KF86 kit under wet or moist conditions, or explosive gas or vapors are present.**
- **Please lay flat the KF86 set while using, make sure obligate the fans outlet vacancy area on the back, and bottom of the test set remain unobstructed. Vertical stand use will hinder its heat dissipation and reduce the output cycles.**
- **If the KF86 set is opened by the customer without Kingsine's instruction, all guarantees are invalidated.**

2 Overview

All-in-One design, Integrated IEC61850 SMV (Complied IEC61850-9-1, IEC61850-9-2, IEC61850-9-2LE) & GOOSE, up to 6 currents and 6 Voltages analog channels output, Inbuilt GPS and IRIG-B, and other advance functions.

- eight 100Mbit Optical Fiber ports for SMV and GOOSE simulations (Able change to RJ45 Ethernet adapter)
- 6x35A & 6x310V independent high accuracy and high burden output channels
- 10 channels independent low-level signal outputs
- Transducer calibration (class 0.05)
- Energy meter calibration (Mechanical & Electronic meters)
- Analog and Binary Transient Record
- Transient play back up to 3KHz
- Lightweight, <10Kg
- Fully function KRT software testing modules

2.1 Able to test

Able of what KF86 series can test

Items	ANSI No.
IEC61850 numerical IEDs relay & merge unit	
Distance protection relay	21
Synchronising or synchronism-check relays	25
Under-voltage relays	27
Directional Power relays	32
Undercurrent or under-power relays	37
Negative sequence overcurrent relays	46
Overcurrent/ground fault relays	50
Inverse time overcurrent/ground fault relays	51
Power factor relays	55
Over-voltage relays	59
Voltage or current balance relays	60
Directional overcurrent relays	67
Directional ground fault relays	67N
DC overcurrent relays	76
Phase-angle measuring or out-of-step protection relays	78
Automatic reclosing devices	79
Frequency relays	81
Motor overload protection relays	86
Differential protection relays	87
Directional voltage relays	91
Voltage and power directional relays	92
Tripping relays	94

Voltage regulating relays	
Over-impedance relays, Z>	
Under-impedance relays, Z	
Time-delay relays	

3 Hardware Instruction

3.1 Panel descriptions

3.1.1 Front Panel

1 WIFI port

Wifi sending port, Inbuilt WIFI DHCP service, use for WIFI connection

2 USB port

USB port, which is use for report upload and software upgrade

3 COM port

COM port, use for device firmware debug or system upgrade

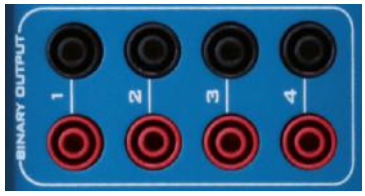
4 RJ45 Ethernet port

10/100M Base-Tx RJ45 Ethernet, for PC control connection

5 GPS port

For GPS antenna connection, SMA female, able to connect, use for End-to-End test. 407160002 GPS antenna or any other compatible type.

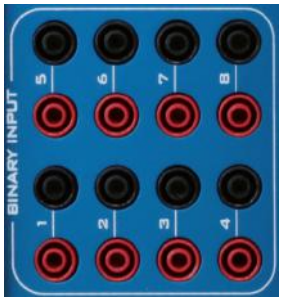
6 4 Pairs Binary Output port



4 pairs Binary outputs (binary 1~4), 4mm banana type terminals, relay type, see Binary output 17

Fast speed,Banana type 4.0mm,Vmax：250V（AC）/ Imax：0.5A,Vmax：250V（DC）/ Imax：0.5A, All pairs isolated.

7 10 Pairs Binary Input Port



8 Pairs binary input, 4mm banana type terminals,5 kΩ...13kΩ（Empty contact）0 V～300Vdc Or dry contact,Binary 1-4 threshold can be set.Binary 5-10 isolate every two pairs binary input, every two pairs binary input share the same one grounding(1+1+1+1+2+2+2)(Binary input turn over potential can be programmable),Sampling Rate:10kHz, Time measurement range:0～105s,Time accuracy:±1ms @ <1s, ±0.1% @ ≥1s

8 10 group FT3 type Fiber port

Tx1~Tx8 is for sending, Rx1,Rx2 is for receiving. output 8 group standard FT3 form sampling value message which comply with IEC60044-7/8,receive 2 group standard FT3 form sampling value message which comply IEC60044-7/8

9 Power supply port(AC&DC)

Nominal voltage:220V/110V (AC),Allowable voltage:90V～264V (AC);127V～350V(DC)
Nominal Frequency:50Hz,Allowable Frequency:45～55Hz
Load Current:10A max
Connection Type:Standard AC socket 60320,Power Consumption:1200VA max

10 Power switch button

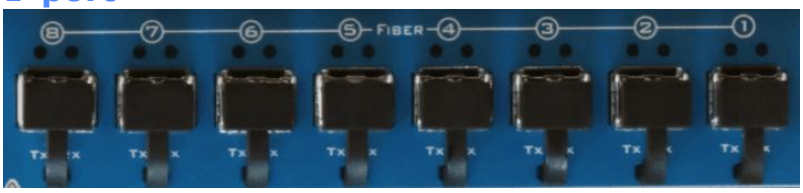
Power switch button,"  " means power on status,"  " means power off status.

11 Grounding port

Sometimes, power supply without grounding terminal, we need to connect grounding port to earth stable to keep human safety. We have grounding cable[20] in accessories package

3.1.2 Rear & Right Panel

1 WIFI port



8 Pairs fiber port,2 x 100Base-FX Full Duplex, LC type,Configurable to 10/100Mbit, Ethernet RJ45 type
Fiber Type:62.5/125um (Multiple optical fiber, Orange Red)
Wavelength:1310nm
Transmit distance:>1Km
Indicator:SPD Green (light): valid connection,Link/Act Yellow (blinking): Data exchanging
Note: Each pair fiber port have Tx and Rx two port, Tx is for data transmission, Rx is for data receiving.

2 Combination port

IRIG-B electric port and external and internal synchronize port.
T+,T- port: Use device as standard time source, output standard timing to other device.
R+,R- port: Device receive external time source for synchronize.
TR_O: Two or more KINGSINE relay tester synchronize with external time
TR_I: Two or more KINGSINE relay tester synchronize with internal time.(For example, we can use switch signal to trigger)

3 IRIG-B Fiber port

IRIG-B fiber synchronize port, use for IEC61850 testing or End-to-End testing local.
Fin: Fiber port input port.
IN: IRIG-B timing signal input port.
OUT: IRIG-B timing signal output port.

4 Voltage output port

Group1: UA,UB,UC , Group2:UX,UY,UZ, UN: Neutral port. All voltage use neutral port public.
Up to 6 x 310V voltage channels output, From UA-UN, we can inject 0-310VAC and 0-350VDC, Each phase is adjust separately.
From UA-UB,we can inject 0-620VAC(L-L)(Phase difference 180°), 0-700VDC(L-L).

5 Current output port

Group1: IA,IB,IC , Group2:IX,IY,IZ, IN: Neutral port. All current use neutral port public.
Up to 6 x 35A current channels output, From IA-IN, we can inject 0-35AAC and 0-20ADC(Please short-circuit IX&IN when inject DC current), Each phase is adjust separately.
From IA,IX can inject 70AAC max in parallel wire connection.
From IA,IB,IC can inject 100AAC max in parallel wire connection. Please reference to wire connection diagram in software system setting.

3.2 Technical Parameters

3.2.1 Current and Voltage outputs

3.2.1.1 Model Configuration

Model	Current outputs	Voltage outputs
KF86(6U6I)	6*35A / 3*70A	6*310V
KF86(4U6I)	6*35A / 3*70A	4*310V
KF86(4U3I)	3*35A	4*310V

3.2.1.2 Voltage Sources

KF86(6U6I) Voltage Outputs		
Voltage Range 6-Phase AC (L-N) 1-Phase AC (L-N) 1-Phase AC (L-L) 3-DC(L-N)	 6 × 310 Vac 1 × 310 Vac 1 × 620 Vac 3 × 350 Vdc	
Output Power *2 6-Phase AC (L-N)*3 1-Phase AC (L-N) 1-Phase AC (L-L) 3-DC(L-N)	Typical 6 × 125 VA max each 1 × 140 VA max 1 × 200 VA max 3 × 180 W at 350Vdc	Guaranteed 6 × 105 VA max each 1 × 105 VA max 1 × 175 VA max 3 × 150 W at 350Vdc

KF86(4U6I) & KF86(4U3I) Voltage Outputs		
Voltage Range 3-Phase AC (L-N) 4-Phase AC (L-N) *1 1-Phase AC (L-N) 1-Phase AC (L-L) 3-DC(L-N)	 3 × 310 Vac 4 × 310 Vac 1 × 310 Vac 1 × 620 Vac 3 × 350 Vdc	
Output Power *2 3-Phase AC (L-N) *3 4-Phase AC (L-N) *4 1-Phase AC (L-N) 1-Phase AC (L-L) 3-DC(L-N)	Typical 3 × 125 VA max each 3 × 125 VA max each 1 × 140 VA max 1 × 200 VA max 3 × 180 W at 350Vdc	Guaranteed 3 × 105 VA max each 4 × 105 VA max each 1 × 105 VA max 1 × 175 VA max 3 × 150 W at 350Vdc

Accuracy, Resolution & Distortion		
	Typical	Guaranteed
Distortion [5]	<0.05%	<0.015%
DC offset	<10mV	<60mV
Accuracy	<0.015%Rd + 0.005%Rg [7]	<0.04%Rd + 0.01%Rg
Voltage Range [7]	Range I: 31V Range II: 310V Auto Range	
Resolution	1mV	
Frequency		
Frequency Range [6]	Sinusoidal signals: 0~1000Hz Harmonics/Transient signal: DC ~ 3000Hz	
Frequency Error	±0.5ppm	
Frequency Resolution	0.001 Hz	
Phase Angle		
Phase Range	-360° ~ +360°	
Phase Error [5]	0.02 ° Typical	<0.1 ° Guaranteed

Phase Resolution	0.001°
Others	
Short-circuit protection	Automatic unlimited protect for L-N

Footnotes:

1. V4 source automatic simulated +/-3U0, +/-3U0*1.732, etc or configured by customize in frequency, phase and amplitude.
2. Guaranteed data at 220V power supply condition for ohmic load.
3. Data measured for 3-phase systems symmetric conditions. (0 °, -120 °, 120 °)
4. Data measured for 4-phase systems symmetric conditions. (0 °, 90 °, 180 °, -90 °)
5. Valid for sinusoidal signals 50/60Hz and tested at 10V output.
6. Signals above 1KHz not support all the test modules.
7. Rd = reading; Rg = Range value.

3.2.1.3 Current Sources

KF86(6U6I) & KF86(4U6I) Current Outputs [1]		
Current Range		
6-Phase AC (L-N)	6 × 0~35A (Group1 and Group2 independent)	
3-Phase AC (2L-N)	3 × 0~70A (Group1+Group2 parallel)	
1-Phase AC (6L-N)	1 × 0~100A (6L parallel + Neutral)	
3-DC(L-N + L-N) *2	3 × 0~20A (Group1 + Group2 grounded)	
1-DC(3L-N + L-N) *2	1 × 0~60A (Group1 parallel + Group2 grounded)	
Power *3	Typical	Guaranteed
6-Phase AC (L-N)	6 × 450 VA max each	6 × 425 VA max each
3-Phase AC (2L-N)	3 × 750 VA max each	3 × 670 VA max each
1-Phase AC (6L-N)	1 × 900 VA max	1 × 750 VA max
3-DC(L-N + L-N)	3 × 450W max each	3 × 400W max each
1-DC(3L-N)	1 × 750W max	1 × 600W max

KF86(4U3I) Current Outputs [1]		
Current Range		
3-Phase AC (L-N)	3 × 0~35A (Group1 independent)	
1-Phase AC (3L-N)	1 × 0~100A (3L parallel + Neutral)	
3-DC(L-N + L-N) *2	3 × 0~20A (Group1 + Group2 grounded)	
1-DC(3L-N + L-N) *2	1 × 0~60A (Group1 parallel + Group2 grounded)	
Power *3	Typical	Guaranteed
3-Phase AC (L-N)	3 × 750 VA max each	3 × 670 VA max each
1-Phase AC (3L-N)	1 × 900 VA max	1 × 750 VA max
3-DC(L-N + L-N)	3 × 450W max each	3 × 400W max each
1-DC(3L-N)	1 × 750W max	1 × 600W max

Accuracy, Resolution & Distortion		
	Typical	Guaranteed
Distortion *4	<0.025%	<0.07%
DC offset	<3mA	<10mA
Accuracy *4	<0.02%Rd+0.01%Rg [5]	<0.05%Rd+0.02%Rg [5]

Current Range *5	Range I: 3.5A Range II: 35A Auto Range	
Resolution	1mA / 2mA for 2-phases in parallel	
Frequency		
Frequency Range	0~1000Hz at 0~Imax	
Frequency Error	±0.5ppm	
Frequency Resolution	0.001 Hz	
Phase Angle		
Phase Range	-360° ~ +360°	
Phase Error	0.02 ° Typical	<0.1 ° Guaranteed
Phase Resolution	0.001°	
Others		
Short-circuit protection	Unlimited	
Open-circuit protection	Permitted and Unlimited	

Footnotes:

1. All data measured in 3-phase system for symmetric conditions(0 °, -120 °, 120 °) unless specified otherwise.
2. For DC current outputs, group2 have to wiring connected to the neutral. see dc output connection 8
3. Guaranteed data at 220V power supply condition for ohmic load.Typical data for inductive load.
4. Valid for sinusoidal signal 50/60Hz and Rload ≤0.5Ω.
5. Rd = reading; Rg = upper range value.

Typical duty cycles for operation at ambient temperature of 23 ℃

(3 phase mode, group 1 + group 2 parallel, simultaneous)					
Current output (A)	0-30	40	50	60	70
Power (W)	0-1200	1250	1350	1200	1200
Duty Cycle	100%	75%	62%	62%	62%
T.on (Sec)	>1800	60	8	8	5
T.off (Sec)	0	20	5	5	3
T.continue for Cycle (min)	>30	8	11	8	5

(6 phase mode, group 1 and group 2 independent, simultaneous)					
Current output (A)	0-20	20	25	30	35
Power (W)	0-1200	1250	1350	1200	1200
Duty Cycle	100%	75%	62%	62%	62%
T.on (Sec)	>1800	60	8	8	5
T.off (Sec)	0	20	5	5	3
T.continue for Cycle (min)	>30	8	11	8	5

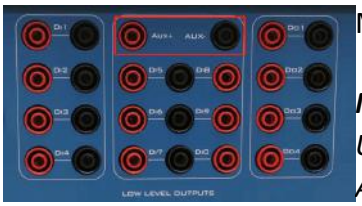
3.2.2 Low-Level outputs

KF86 series have 10 Low-Level outputs represents an interface connector holding two independent generator triples. These 10 high accuracy analog signal sources can serve to either control an external amplifier or to directly provide small signal outputs.

Quantity	10 Channels voltages signal, 16 pin combination socket	
Voltage Outputs Range	AC 0~8V, DC 0~10V	
Load Current	Nominal 2mA, 10mA max transient	
Output Power	>0.5VA	
Accuracy (0.01~0.8 Vrms): (0.8~8 Vrms):	 <0.05% Typical <0.02% Typical	 <0.1% Guaranteed. <0.05% Guaranteed.
Distortion (THD%)	<0.05% Typical	<0.1% Guaranteed.
DC Offset Voltage	< 0.15mV Typical	<1.5mV Guaranteed.
Resolution	<0.25mV	
Frequency Range	0~3000KHz	

See: Low_Level output adapter 26

3.2.3 Auxiliary DC Source (Battery Simulator)



Model: All KF86 series

Note: *Auxiliary DC output from Ub(positive) and Uc(negative) terminals. Auxiliary DC can not simultaneous working with AC mode of Channel Ub & Uc. once Auxiliary DC activated, Channels Ub and Uc AC mode outputs will automatically disable to invalid.*

Range	0~350V @ 150W max
Accuracy	0.5%Rg Guar.

3.2.4 Binary input

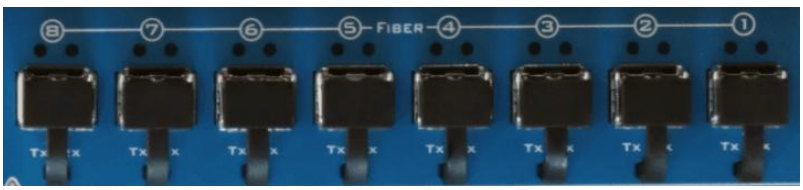
Quantity	10 pairs
Type	wet/dry, measurement
Threshold	0 V～300Vdc Or dry contact,Binary 1-4 threshold can be set.Binary 5-10 isolate every two pairs binary input, every two pairs binary input share the same one grounding(1+1+1+1+2+2+2)(Binary input turn over potential can be programmable)
Threshold error	<0.5Vdc
Time resolution	100us
Deglitch time	0~25ms (Software Controlled)
Time range	Infinite
Time errors	±1ms @ 0.001~1s, ±0.1% @ >1s
Galvanic isolation	BI1 to BI4, each one isolated. BI5 to BI10, 3 isolated with each 2 pairs
Input impedance	5 kΩ…13kΩ（Empty contact）

3.2.5 Binary output

Relay type

Binary Output (Relay Type)	
Quantity	4pairs (1~4)
Type	Potential free relay contacts, software controlled
Break Capacity AC	Vmax：250V（AC）/ Imax：0.5A
Break Capacity DC	VmVmax：250V（DC）/ Imax：0.5A

3.2.6 Fiber optical port



Fiber Ports	2 x 100Base-FX Full Duplex, LC type (Able change to 10/100Mbit, Ethernet RJ45 type adapter)
Fiber Type	62.5/125um (Multiple optical fiber, Orange Red)
Wavelength	1310nm
Transmission	>1Km
Indicator	Spd Green(light): Valid connection Link/Act Yellow(Blinking): Data exchanging
Note:	*All hardware of this module are ready for activated* see IEC61850 SMV & GOOSE[19]

3.2.7 Ethernet Port

PC Connection 	RJ45 Ethernet for PC control connection 10/100M full duplexing Orange: valid connection Green(blinking): data exchanging
	Default IP address : 192.168.1.123

3.2.8 Power supply & Environment

Nominal Input Voltage	220V/110V (AC)
Permissible Input Voltage	90V～264V (AC);127V～350V(DC)
Nominal Frequency	50/60Hz
Permissible Frequency	45Hz ~ 65Hz
Power Consumption	1200 VA max
Connection Type	Standard AC socket 60320
Operating Temperature	-10°C ~ 55°C
Storage Temperature	-20°C ~ 70°C
Humidity	<95%RH, non-condensing
Grounding Terminal	4mm banana socket
Weight	10 Kg
Dimensions(W x D x H)	390mm×256mm×140mm

3.3 Optional Modules

3.3.1 Energy Meter Calibration module

Energy Meter Calibration ***Hardware is ready, to be activated***	
Sensor Usage	Mechanical meters / Electronic meters
Sensor Output	High lever: >4.5V, Low level: <0.2V
Pulse Input	1 pulse input port, 5Vdc high level valid only.
Pulse Range	500KHz pulse input Max.
Pulse Output	1 Transistor output, maximum load 5Vdc/5mA

Details of interface see: Fast Binary output & Energy pulse adapter 23

3.3.2 Transducer Calibration module

DC Measurement Input (Transducer calibrator) ***Hardware is ready, to be activated***		
Voltage Input	Range	0~±10V dc
	Max Input	±11V dc
	Accuracy	<0.05% rg Typ. <0.1% rg Guar.
	Input Impedance	1MΩ
Current Input	Range	0~±1mA / 1~±20mA, auto range
	Max Input	600mA
	Accuracy	<0.05% rg Typ. <0.1% rg Guar.
	Input Impedance	15Ω

3.3.3 IEC61850 SMV & GOOSE

KF86 series products able to test IEC61850 SMV & GOOSE, (SMV complied IEC61850-9-1, IEC61850-9-2, IEC61850-9-2LE).

The communication adapt see Fiber optical port 17.

Each fiber port able to simulate maximum 36 SMV channels and map 128 GOOSE channels. total transceiver rate maximum 100Mbit/s.

All the hardware of IEC61850 SV & GOOSE function are ready to be activated.
Please contact Kingsine for details.

3.4 Accessories

3.4.1 Accessories List

Product Name	Quality
Power supply cable, 1.8m,10A/250V	1 package
Direct net cable, 3 meters	1 pcs
Factory certification	1 pcs
KF86 Hardware User manual+Maintenance manual	1 pcs
8GB flash	1 pcs
PP Plastic waterproof trolley transport case	1 pcs
PP Plastic waterproof internal Liner	1 pcs
Outer packing carton	1 pcs
KRTV3 Software User manual	1 pcs
Phoenix terminal female 3.5mm,4P	1 pcs
KF86 test wire package	1 pcs
Accessories bag	1 pcs
3 Year Warranty Card	1 pcs
plastic carton sticker	1 pcs
Folding Laptop Stand,type LS501	1 pcs

3.4.2 Standard Accessories

PN.	Photo	Descriptions	Qty.
451080002		RJ45 Ethernet Cable Length: 2m Type: Cat5	1pc
451060012		Power Cable for AC socket 60320 (alternative)	1pc
451020001		Testing wire bag	1pc
451040010	**Testing wire pack (detail as below)**		1set
		Jaw 5mm Crocodile clamps for connection of 4mm banana plugs 4x4mm Include: black x 6, red x 2, yellow x 2, green x 2, blue x 2	1pack

		Jaw 10mm Crocodile clamps for connection of 4mm banana plugs 4x4mm Include: black x 6, red x 2, yellow x 2, green x 2, blue x 2	1pack
		4mm schistose for connection of 4mm banana plugs 4x4mm Include: black x 6, red x 2, yellow x 2, green x 2, blue x 2	1pack
		8mm schistose for connection of 4mm banana plugs 4x4mm Include: black x 6, red x 2, yellow x 2, green x 2, blue x 2	1pack
		2mm pin for connection of 4mm banana plugs 4x4mm Include: black x 6, red x 2, yellow x 2, green x 2, blue x 2	1pack
		1mm pin for connection of 4mm banana plugs 4x4mm Include: black x 6, red x 2, yellow x 2, green x 2, blue x 2	1pack
		Grounding cable (Green/Yellow) 1 x 5m, 2.5mm square with banana connection	1pc
		Measurement current cable set 4 x 2.5m (2.5mm square) include: Red x 1; Yellow x 1; Green x 1; Black x 1	2set
		Measurement voltage cable set 5 x 2.5m (1.0mm square) include: Red x 1; Yellow x 1; Green x 1; Blue x 1; Black x 1;	1set
		Measurement binary I/O cable 2 x 2.5m (1.0mm square) include: Blue x 1; Black x 1;	2set
		Short cables 12 x 0.3m (2.5mm square) include: Red x 2; Yellow x 2; Green x 2; Blue x 2; Black x 4;	12pcs
451010029		Carry case, pack the test kit inside for safety storage or transport 640mm x 505mm x 280mm	1pc

		Protection grade: IP67 Impact resistance: IK08	

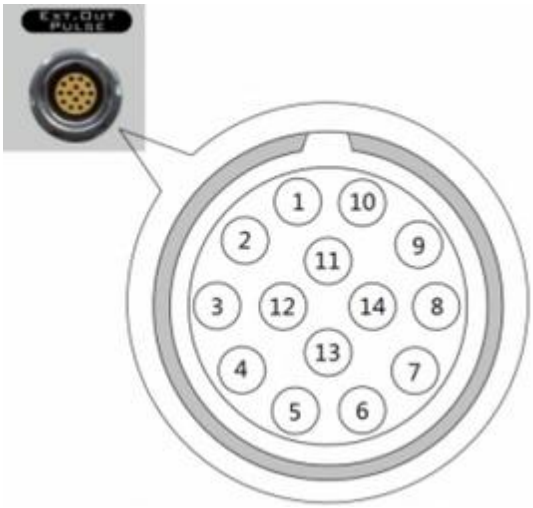
3.4.3 Optional Accessories

PN.	Photo	Descriptions	Qty.
421080068		K31 Low-Level output adapter 16 Pins combination plug to bananas see: Low-Level outputs 16	Independent Optional: 1set
421080066		Fast binary output & energy pulse I/O 14 Pins combination plug to bananas See: Fast Binary output & Energy pulse adapter 23	Optional: 1set With energy optional function
30130009		Clamp for standard meter current measurement Input range: AC 0~5A, class 0.1 Jaw size: 20mm Max.	Independent optional accessory 1set / per channel
30130010		Clamp for standard meter current measurement Input range: AC 0~30A, class 0.1 Jaw size: 20mm Max.	Independent optional accessory 1set / per channel
30120057		C-Shunt Input/Output:4mm banana plugs See: C-Shunt 25 for ordering reference.	Independent optional accessory 1set / per channel

30130008		Photoelectric conversion sampler	Optional: 1set With energy optional function
407160002		GPS antenna SMA male type	Independent optional accessory: 1set
451070001		LC-LC fiber optical cable Length: 3m type:62.5/125um	2pcs (Optional with IEC61850 functions)
451070002		LC-ST fiber optical cable Length: 3m type:62.5/125um	2pcs (Optional with IEC61850 functions)
451070006		ST-ST fiber optical cable Length: 3m type:62.5/125um	2pcs (Optional with IEC61850 functions)

3.4.3.1 Fast Binary output & Energy pulse adapter

Material Order No.: 421080066 (14pin combination plug to bananas)

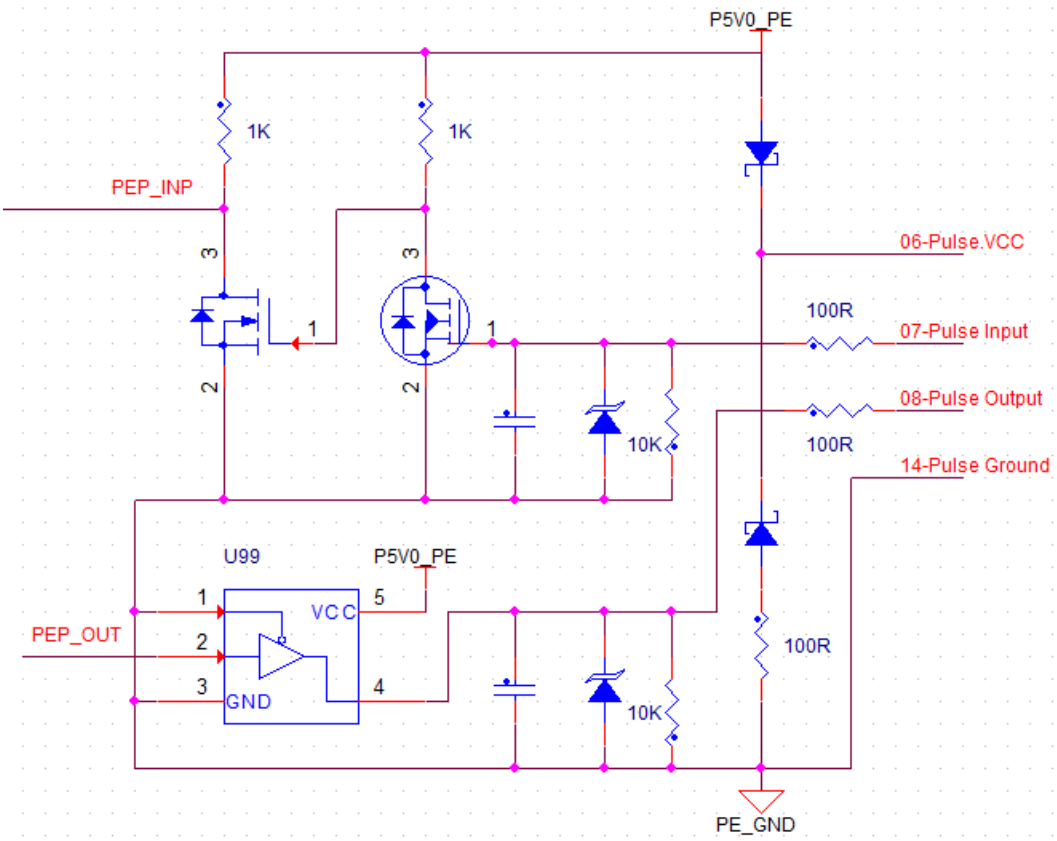


Pin No.	Signals	Bananas color	Tag
1	Binary output 5	Blue	01-BO.5
2	Binary output com	Black	02-BO.COM
3	Binary output com	Black	03-BO.COM
4	Binary output 8	Blue	04-BO.8
5	Binary output 6	Blue	05-BO.6
6	Energy +5V output	Red	06-P.VCC
7	Energy pulse input	Green	07-P.INP
8	Energy pulse output	Yellow	08-P.OUT
9	---		
10	---		
11	---		
12	Binary output 7	Blue	12-BO.7
13	---		
14	Energy Ground	Black	14-P.GND

Note:
Pin number 6/7/8/14 have a common ground pin 14, used for pulse I/O during energy meter testing.

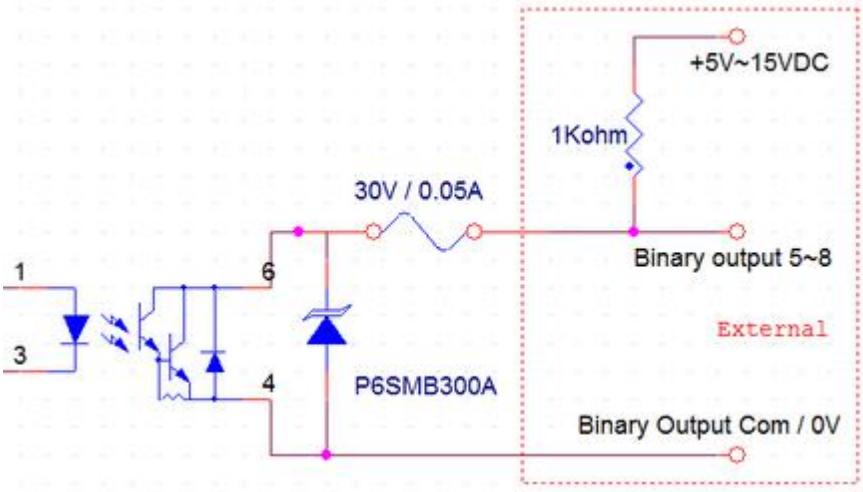
The pin 7 only valid on 5Vdc high level input; If the input pulse is passive signal, user can connect the positive input terminal to Pin6-Vcc, and connect the negative input terminal to Pin7 pulse input; or refer the below open-collector picture connect a external 1Kohm resistor between the Pin6 and Pin7 to convert the input signal from passive to active.

The pin 8 is 5V pulse output for energy meter calibration;



(pulse input / output interface)

The pin 1/4/5/12 are fast binary outputs, they have 2 common ground pin 2 and pin 3; All these fast outputs are open-collector circuit, user have to connect an external active signals(refer the red squareness of below picture).



(Fast binary outputs, open-collector interface)

See: Semiconductor Binary outputs 17

3.4.3.2 C-Shunt

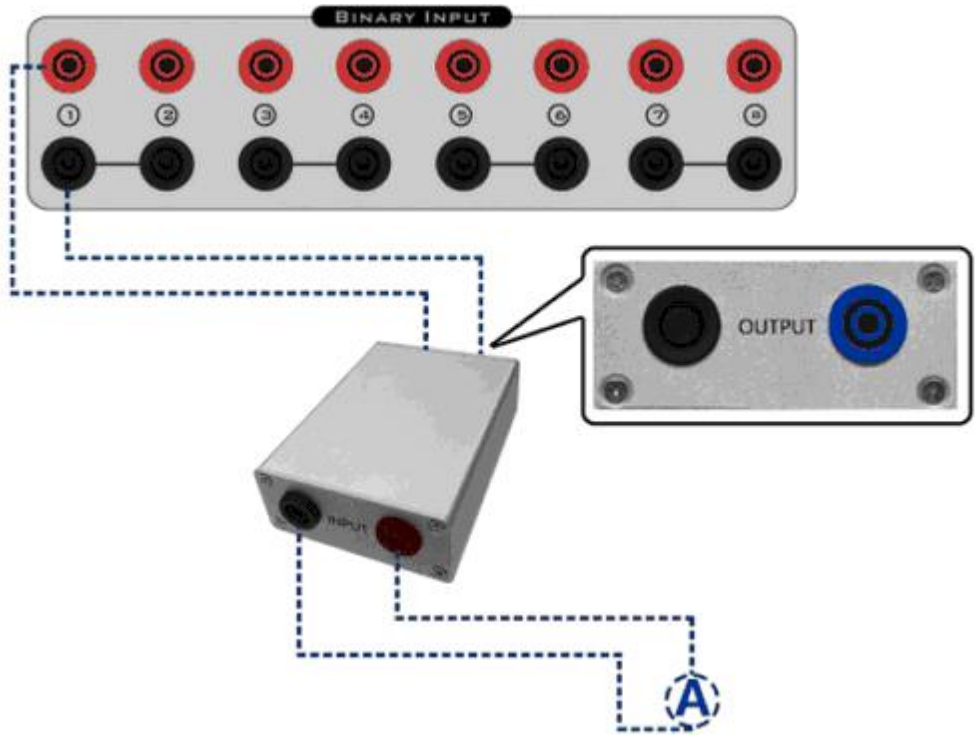
For current measurement, It can be directly inserted into the binary inputs 1~8

Connector type: 4mm banana plugs

1 C-Shunt may measuring 1 channel only.

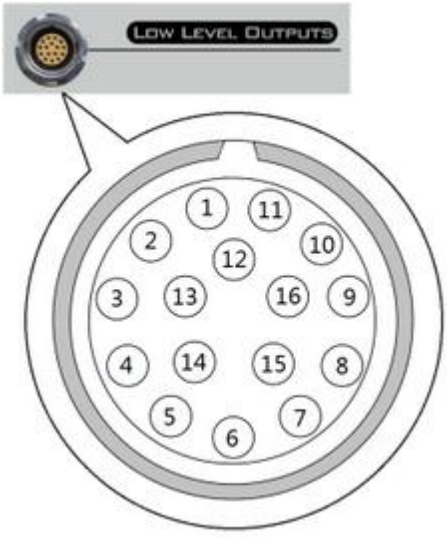
C-Shunt 1	C-Shunt 2
Measure Range: 0-5A Resistance: 100mΩ Resistance tolerance: 0.1% Temperature coefficient: <10ppm/K (0~70°C)	Measure Range: 5-30A Resistance: 10mΩ Resistance tolerance: 0.1% Temperature coefficient: <10ppm/K (0~70°C)
Metarial Order No.: 30120057-1	**Metarial Order No.: 30120057-2**

Connection method:



3.4.3.3 Low-Level output adapter

Material Order No.:421080068 (16pin combination plug to bananas)

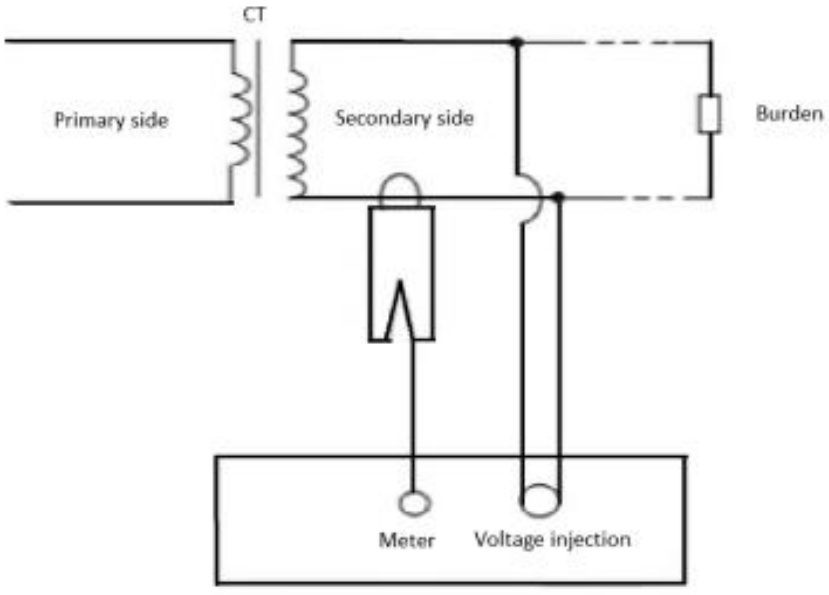


Pin No.	Signals	Bananas color	Tag
1	UA	Yellow	01-UA
2	UB	Green	02-UB
3	UC	Red	03-UC
4	UX	Blue	04-UX
5	Ua	Yellow	05-Ua
6	Ub	Green	06-Ub
7	Uc	Red	07-Uc
8	OUTGND	Black	08-GND1
9	IA	Yellow	09-IA
10	IB	Green	10-IB
11	IC	Red	11-IC
12	Ia	Yellow	12-Ia
13	Ib	Green	13-Ib
14	Ic	Red	14-Ic
15	OUTGND	Black	15-GND2
16	OUTGND	Black	16-GND3

3.5 Hardware Test Tips

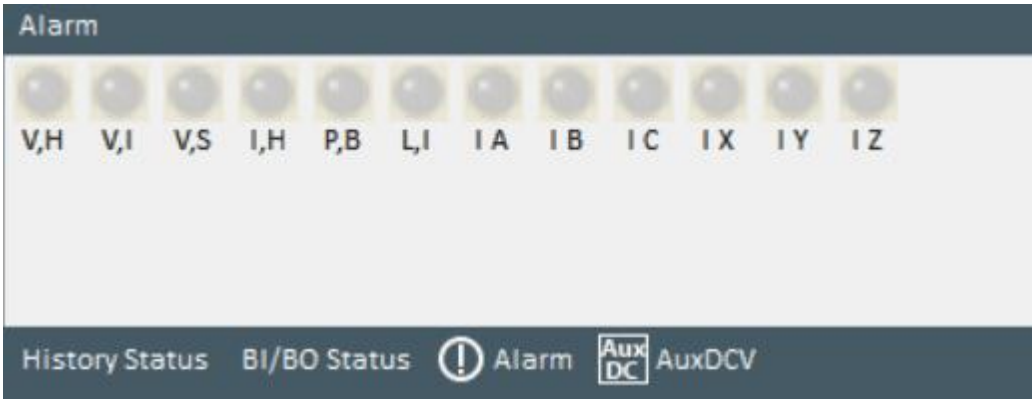
3.5.1 Optional Accessories_2

Burden test



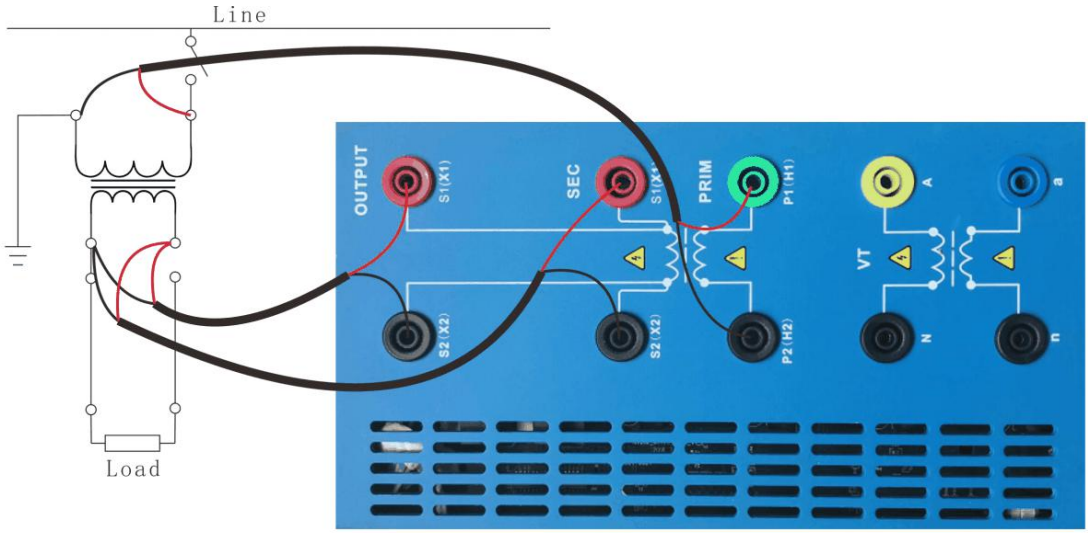
Reference to wire connection, we use Relay test set injection voltage to burden side, and measure current from the circuit, in this case we can get burden specification after calculate the injection value and measure value.

Wiring check



Device have wiring check function which can avoid wrong wiring situation. For example,when we make wrong wiring connection of voltage short-circuit and current open circuit, device hardware will detect from wiring, and give indicate of LED alarm as V,S and IA,IB,IC...etc.
From this we can get which phase of current or voltage have wrong wire connection that can avoid damage of device or test equipment.

Plausibility check for CT/VT with primary injection



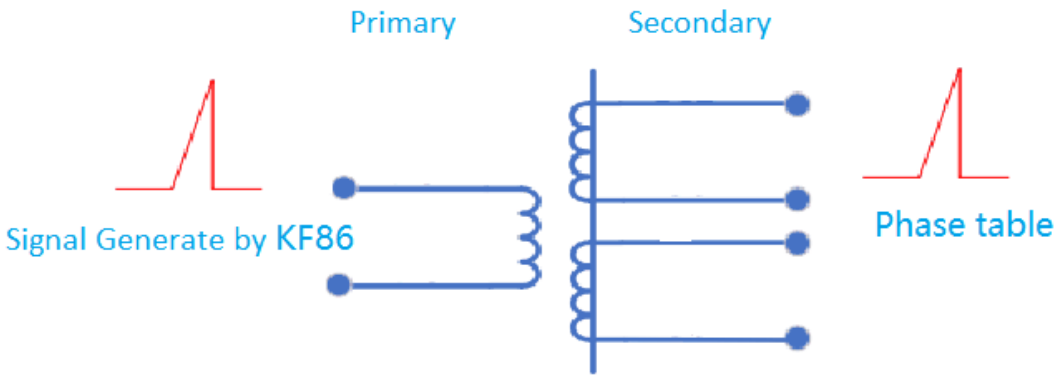
Step1: The second electrification of the current circuit means that the experimental equipment from the secondary terminal at the root of Ta to the circuit to enter a certain stable AC current (1A or 5A) , and measure the AC impedance of the circuit, to check the circuit, in the same set of current circuits, if the difference of three-phase AC impedance is too big, check whether there are some defects such as loose terminal and incomplete metal contact between cable core and terminal. 2. For the TA circuit without differential circuit, the one-time electrification can be carried out directly by the upconverter to check the correctness of the secondary circuit, in order to verify the correctness of TA polarity and differential circuit, the method of one-time power supply is used to check the short circuit on low-voltage side and AC power supply on high-voltage side of transformer, using short-circuit current to simulate load current to check the differential circuit 3.5% .

Step2: The secondary voltage of the voltage loop can be applied either at the TV root or at the secondary open (or fuse) outlet of the local terminal box. The voltage of each group of phase voltages of the TV secondary loop can be applied 57.7 V respectively at

the TV root, each set of voltage amplitudes, phase sequence, phase, and zero sequence open voltages can be measured at each measuring terminal.

Step3: For voltage circuits of voltage levels below 110 kv, the method of TV primary voltage can be used to check the circuit, directly at the primary voltage, at the secondary voltage terminals for measurement, to ensure the TV ratio, polarity, the circuit's exactly right

CT/VT Polarity Check



We use KF86 output pulse current with setting value when we connect device to CT primary.
And a phase table will connect to secondary side to receive the pulse current from secondary side. From the comparison between primary side and secondary side, we can know the current direction different or not. In this case, we can get the polarity of current transformers.

If we have multiple windings of CT, we can use multiple phase of current to test. And get polarity result at same time.

4 FAQ

You may encounter the below malfunctions in operation. We advise you to use the methods below to eliminate them.

Error	Probable cause	Solution
No response while the test set is power on	1.power supply failed.	Check the power supply, make sure the test set is powered;
	2.Fuse burnout	Plug off the power supply, change the fuse (check the specification to find the correct fuse in the tag of power socket in the test set)
	3.power cable loosened,poor contact.	Connect the power cable to test set correctly and stably.
	4. inner part of the test set failed	Please contact tech support of Kingsine
KRT no response while the test set is power on	1.Communication fail	Check PC connecting cable status and make sure it works well
	2.Connecting setting in test software is not setted.	Set the setup in test software.
Short-circuit warning	1.Output overloaded or circuit shorted.	Check the voltage output interphase and the phase-neutral cable , make sure there is no shorted circuit. Advise: plug out all the voltage output cable to retry.
	2. Inner part of the test set failed.	Please contact tech support of Kingsine
Voltage output is not correct while testing	Inappropriate setup.	Check the voltage amplitude per phase and the frequency output, make sure they are right. Check the frequency per channel, make sure the setting is in accordance. Also check the frequency measurement range of the standard power meter, make sure the output frequency doesn't exceed the measurement range
Warning while not in motion after starting-up	The power supply is abnormal.	Check the power supply whether it is too high. Make sue the voltage of power supply is within 15% of the rated power supply
PC can't be connected while it is setted "connecting"	1.The PC connecting cable is broken	1.Check the net cable connection, make sure the direct cable is used when the test set and pc are directly connected. the cross cable is used when them are connected via switchboard.
	2.Confliction in setup.	Check the IP address 1. make sure the IP address in test set and PC are in the same net segment. (The first three segments are the

Error	Probable cause	Solution
		same, the forth segments are different) ; 2. make sure the IP address in application program of the online setting are the same as in the test set; These above can be checked by PING command in PC system.
	3.Programme in dis-accordance	Check the Version of PC program and the test set program, make sure they are in accordance.
The voltage and current output value are not right while testing .	1.the cable connection of the working standard power meter failed.	Make sure the standard power meter work properly and the cable connection are right.
	2.The parameters are not right.	Lead the customized parameter in parament management for testing.
	3.The voltage and current neutral connection are not right.	Check the neutral point connection are properly.
	4.The output are not right.	Calibrate the improper item in system calibration module and save the data. Retest then.
	5.The setup of frequency not right.	Make sure every channel's setup are in accordance.
The reading value in testing protection relay set are irregular or the tested data are not right, when the testing is in process.	1.Wrong setup in frequency.	Set the frequency to 50/60HZ
	2.The output zero is inappropriately big	Contact Kingsine to calibrate the AC zero offset in the system calibration module
It shows "unable to find the updating file" or "mismatching in the updating file and the current version" in software updating progress.	1.The mismatch of the update file	Download the update file that matches the current system.
	2.The update file is unzipped.	Select "unzip to current file folder" in unzipping update file.

Kingsine Electric Automation Co.,Ltd.