# KF86 Universal Relay Test Set

**Overview**

Light weight: 10kg, very small size (390mm*256mm*140mm) easy carry on flight journey.

6x20A, 6x310V analog output channels.

Compact 6-phase relay test set with high accuracy & full solution (complying IEC61850 sampled value and GOOSE), fully meet all the requirements for detection and debugging of IEC61850 IEDs, Merge Units, station control systems and traditional protection relays.

**Features:**

1. With analog (6-phase voltage, 6-phase current) and IEC61850 SMV messages simultaneously output.

2. Built-in dual-core CPU industrial computer, built-in large-capacity SSD solid drive;operating system Embedded Windows 7; 9.7-inch true color LCD screen, 1024 × 768 resolution, touch screen (capacitive screen) operation. Can work offline or online;

3. Provide 8 pairs of LC optical ports, can send and receive 36 channels of IEC61850-9-1, IEC61850-9-2 frame format sample values; with optical power test function.

4. Provide 6 ST output optical ports and 2 ST receiving optical ports, which can output 6 sets of sampled value messages conforming to IEC60044-7/8 (FT3) format; can receive 2 sets of FT3 format of IEC60044-7/8 specification Sampled value message;

5. Can subscribe/publish GOOSE information or output, receive switching, and realize closed-loop testing of protection;

6. Simulate 12-channel low level output to test the protection of low level input;

7. Start up to simulate the IED to actively release GOOSE, sampled value signals, to eliminate the reset process of the device under test caused by link interruption after the test is stopped;

8. The optical port output is sampled or GOOSE can be freely defined; multiple different GOOSE control block information can be subscribed/published;

9. Sample value channel function, the number of channels can be set freely, up to 36 channels can be configured;

10. Automatically import SCL (SCD, ICD, CID, NPI) files to realize automatic configuration of sampled values and GOOSE information, and save sample values and GOOSE configuration information as a configuration file for testing.

11. It can automatically detect optical digital signals from MU, protection device and intelligent operation box, and realize automatic configuration function of sampling value and GOOSE information;

12. Can simulate abnormal conditions(loss,misorder, quality abnormality, message retransmission, data anomaly, out of step, etc.);

13. The channel quality of the output SV message can be set, and the simulation unit can be simulated and debug, set to invalid, set to run state, and can simulate double AD inconsistency and other tests.

14. Built-in GPS/Beidou timing module with GPS, IRIG-B code, IEEE1588 synchronization time function;

15. Full-featured software test module, AC, status sequence, recloser test, distance protection, overcurrent protection, inverse time overcurrent, zero sequence protection, ramping test, power direction, differential test, frequency test, synchronize test software modules

16. With the unit test function, you can test the unit's precision, time accuracy, punctuality accuracy, and data transmission and testing functions.

17. Support the graphical display of SCD files, the instrument can graphically display the IED device interconnection relationship and virtual terminal connection.

18. With the B code transmission function, when the external GPS is used, it can be used as a timing device.

**Technical parameters**

| AC current source | |
|---|---|
| Amplitude & Power | 6×20A @ 300VA max each;<br>3×40A @ 520VA max each; |
| Accuracy | ±1mA @ <0.5A<br><0.02%Rd+0.01Rg Typ. @ 0.5A~20A |

| | |
|---|---|
| | <0.05%Rd+0.02Rg Guar. @ 0.5A~20A |
| Range | Range I: 3A<br>Range II: 20A<br>Automatic Range |
| DC Offset | <3mA Typ./ <10mA Guar |
| Resolution | 1mA |
| Distortion | <0.025%Typ. / <0.07% Guar. |
| Ascends/Descent response | <100us |
| DC Current source | |
| Amplitude & Power | 6×10A @ 50W max |
| Accuracy | ±5mA @ <1A<br>±0.2% @ ≥1A |
| Ascends/Descent response | <100us |
| AC voltage source | |
| Amplitude & Power | 6×310V @ 124VA max each |
| Accuracy | ±2mV @ <2V<br><0.015%Rd+0.005Rg Typ. @ 2~310V<br><0.04%Rd+0.01Rg Guar. @ 2~310V |
| Range | Range I: 13V<br>Range II: 310V<br>Automatic Range |
| DC Offset | <10mV Typ./ <60mV Guar |
| Resolution | 1mV |
| Distortion | <0.015%Typ. / <0.05% Guar. |
| Ascends/Descent response | <100us |
| DC Voltage source | |
| Amplitude & Power | 6×150V @ 75W max<br>1×300V @ 150W max |

| | |
|---|---|
| Accuracy | ±10mV @ <5V<br>±0.2% @ ≥5V |
| Ascends/Descent response | <100us |
| Frequency & Phase Angle | |
| Frequency Range | DC ~ 1000Hz, 3000Hz transient |
| Frequency Accuracy | ±0.5ppm |
| Frequency Resolution | 0.001Hz |
| Phase Range | -360° ~360° |
| Phase Accuracy | <0.02° Typ. / <0.1° Guar. 50/60Hz |
| Phase Resolution | 0.001° |
| Binary input | |
| Electrical isolation | 8 pairs of electrical isolated each |
| Input impedance | 5 kΩ…13kΩ（Empty contact） |
| Input feature | 0 V～300Vdc Or dry contact<br>(Binary input turn over potential can be programmable) |
| Sampling Rate | 10kHz |
| Time resolution | 10us |
| Time measurement range | 0～105s |
| Time accuracy | ±1ms @ <1s<br>±0.1% @ ≥1s |
| Debounce time | 0~25ms (Software controlled) |
| Binary Output | |
| Quantity | 4 pairs, Fast speed |
| Type | Banana type 4.0mm |
| AC break capacity | Vmax：250V（AC）/ Imax：0.5A |
| DC break capacity | Vmax：250V（DC）/ Imax：0.5A |
| Electrical isolation | All pairs isolated |
| Synchronize port | |

| | |
|---|---|
| Satellite synchronization | 1 × SMA， Use for GPS antenna interface<br>Support GPS and Beidou Satellite |
| Fiber IRIG-B | 2 × ST， 1 for transmission, 1 for receiving |
| Electric IRIG-B | 1 × 6Pin 5.08mm phoenix terminal<br>1 for transmission, 1 for receiving |
| External trigger synchronization | 1 × 4Pin 5.08mm phoenix terminal<br>external trigger input + external trigger output |
| Communication interface | |
| Ethernet | 1 × RJ45 ， 10/100M |
| WIFI | Inbuilt WIFI DHCP service |
| Serial port | 1 × RS232 |
| USB | 2 × USB2 |
| Weight & Size | |
| Size | 390mm×256mm×140mm |
| Weight | 10kg |
| Display | 9.7inch LCD, touch screen |
| Keypad | Number key + direction key |
| Power supply | |
| Nominal voltage | 220V/110V (AC) |
| Allowable voltage | 85 - 265 VAC ;127V～350V(DC) |
| Nominal Frequency | 50Hz |
| Allowable Frequency | 47-63Hz |
| Current | 10A max |
| Power Consumption | 1200VA max |
| Connection Type | Standard AC socket 60320 |
| Working environment | |
| Operating temperature | -10～+55 ℃ |
| Relative humidity | 5～95%， Non-condensation |

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|---|---|
| Storage temperature | -20℃ ~ +70℃ |
| Atmospheric pressure | 80kPa～110 kPa（altitude 2000m or lower） |

**(Optional modules)**

**IEC61850 functions:**

- Fully complying IEC61850 Sampling value and GOOSE; (IEC61850-9-1, IEC61850-9-2/(LE), IEC60044-7/8)
- Able to simultaneously output sampling value and analog signals, or subscriber and publish GOOSE message and relay contact binary I/O function.
- Up to 36 sampling value channels can be mapped.

| Fiber port (LC type) | |
|---|---|
| Type | 100Base-FX (100Mbit,Fiber, full duplex) |
| Port Number | 8 Pairs |
| Cable model | 62.5/125μm(Multiple-mode fiber, orange) |
| Wave length | 1310nm |
| Transmission distance | > 1Km |
| Status indication | SPD Green (lights): active connection<br>Link\AcT Yellow (blinking): data exchange |
| Fiber serial port (ST type) | |
| Standard | IEC60044-7/8 |
| Port Number | 6 for transmission, 2 for receive |
| Wave length | 850nm |

**Type of relays can be tested:**

| Items | ANSI® No. |
|---|---|
| IEC61850 numerical IEDs relay & merge unit | |
| Distance protection relay | 21 |
| Synchronising or synchronism-check relays | 25 |

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|---|---|
| Undervoltage relays | 27 |
| Directional Power relays | 32 |
| Undercurrent or underpower relays | 37 |
| Negative sequence overcurrent relays | 46 |
| Overcurrent/ground fault relays | 50 |
| Inverse time overcurrent/ground fault relays | 51 |
| Power factor relays | 55 |
| Overvoltage 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 | |
| Overimpedance relays, Z> | |
| Underimpedance relays, Z | |
| Time-delay relays | |