

## [1] SAFETY PRECAUTIONS

### Before use, read the following safety precautions.

This instruction manual explains how to safely use your new KS3 motor rotation tester & 3phase detector. Before use, please read this manual thoroughly. After reading it, keep it together with the product so you can refer to it when necessary. If this product is not used as specified in this manual, its protection function may be compromised.

To avoid accidental burns or electric shock, always follow any instructions with “⚠WARNING” or “⚠CAUTION” headings.

### 1-1 Explanation of Warning Symbols

The meanings of the symbols used in this manual and on the products are explained below.

⚠ : **Very important instructions for safe use.**

Warning messages are intended to prevent accidents to operating personnel such as burn and electric shock.

Caution messages are intended to prevent damage to the instrument.

⚠ : Symbol requesting warning or reference to the instruction manual.

⚠ : Symbol requesting caution or risk of electric shock.

☐ : Double insulation or reinforced insulation

**CW**: Stands for clockwise (positive phase).

**CCW**: Stands for counterclockwise (negative phase).

### 1-2 Warning Instructions for Safe Use

#### ⚠ WARNING

To avoid physical injury such as burns or electric shock, be sure to observe the following instructions when using this instrument.

1. Pay special attention when measuring voltages of AC 33 Vrms (46.7 V peak) or DC 70 V or more to avoid injury.
2. Never use the instrument on lines that exceed 500 V to avoid the risk of electric shock.
3. Do not use the instrument if the main unit, measurement clip, or measurement cord is damaged or broken.
4. Do not use the instrument with the battery compartment cover removed.
5. Do not attempt to repair or modify the instrument except to replace the battery.
6. Be sure to check the instrument before each use and inspect it at least once a year.
7. To avoid compromising the protection function of this instrument, do not use it in any way other than instructed in this manual.

### Measurement category (overvoltage category)

#### Equipment of CAT I:

Secondary cable runs from a power supply transformer connected to a wall socket.

#### Equipment of CAT II:

Primary cable runs of power-consuming equipments from a wall socket.

#### Equipment of CAT III:

Primary cable runs of equipments directly connected to a distribution board and cable runs from a distribution board to wall sockets.

#### Equipment of CAT IV:

Cable runs from an incoming line to a distribution board.

## [2] APPLICATION AND FEATURES

### 2-1 Application

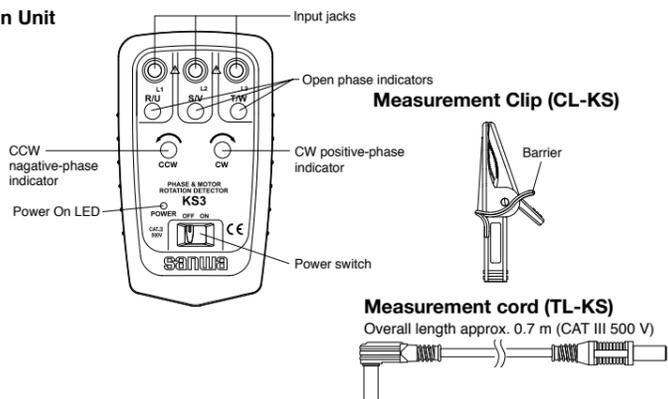
This instrument is a motor rotation tester & 3phase detector that allows you to determine the rotation direction of a three-phase motor by turning the motor shaft manually, as well as to check the phase sequence (positive, negative) and open phase condition of three-phase lines.

### 2-2 Features

- Safety design that complies with IEC61010-1 CAT. III 500 V.
- Motor rotation direction testable before connection of the power supply.
- Phase sequence and open phase checking of three-phase lines.
- Bright LED indicators.
- Magnets on the back of the main unit allow it to be fixed on a distribution board and other metallic objects.

## [3] NAMES OF PARTS

### Main Unit



## [4] DESCRIPTION OF FUNCTIONS

### 4-1 Power switch

Switches the power on and off. After measurement, be sure to set this switch to OFF to prevent wasteful battery consumption.

Note: This instrument does not have the auto power-off

### 4-2 Open phase indicators

In the three-phase power line check, each indicator lights up when the corresponding line is live. An extinguished indicator means that the phase of the line is open.

Note: Each LED indicator lights at an input of about 30 V or more. These indicators do not light during the motor rotation check because the input voltages are less than 30 V.

### 4-3 Input jacks

Insert the measurement cords into the jacks of the same colors.

### 4-4 CW indicator (Clockwise = positive phase)

Lights (in green) when the phase is positive.

### 4-5 CCW indicator (Counterclockwise = negative phase)

Lights (in red) when the phase is negative.

### 4-6 Power ON indicator (Low battery warning)

Lights when the power is on.

It stops lighting when voltage of the built-in battery drops to 6.0 V or less. Replace the battery with a new one as soon as possible if the indicator will not light.

## [5] MEASUREMENT PROCEDURES

#### ⚠ WARNING

1. Do not perform measurement of a voltage exceeding the maximum rated voltage.
2. During measurement, do not hold the measurement clip at any point beyond the barrier.

### 5-1 Pre-operational Check

Perform pre-operational check for safety.

- Check the external appearance. Check that there is no abnormality with the main unit and measurement clips. Check that there is no abnormality with the cord such as disconnection or cracking.
- Check the lighting of the open phase indicators and the functioning of the phase detection by clipping cables with known voltages and phases. If one or more indicator(s) do not light, the measurement cord(s) may be disconnected or the built-in fuse may be blown.

Note: For the fuse replacement, please contact us (see section 7-2).

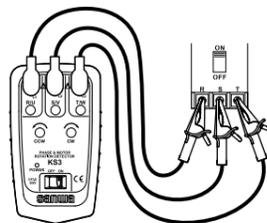
- If the Power ON indicator will not light, replace the battery with a new one.
- Make sure your hands and the measurement clips are not wet.

### 5-2 Checking the three-phase power lines

#### ⚠ CAUTION

1. The open phase indicators do not light if any of the line voltages is less than 30 V.
2. The CW or CCW indicator lights up even when there is an open phase, but the operation is not guaranteed. Be always sure to check the phase sequence while all of the open phase indicators are ON.
3. This instrument cannot be used with three single-phase lines.

- (1) Insert the three measurement cords into the input jacks.
- (2) Set the Power switch to ON.
- (3) Connect the three measurement clips to R-S-T of the three-phase AC power supply as shown below (correct measurement is impossible if only two of them are connected)/ Connect the red measurement clip to R, the white measurement clip to S and the blue measurement clip to T.



Note: Illustrations of ON/OFF status of the indicators in this manual

LED ON indication  LED OFF indication 

- (4) Check the open phase.



In the example above, the indicators of the R- and S-phases are ON and the indicator of the T-phase is OFF, which means that the phase of T is an open phase.

\* The CW or CCW indicator lights up even when there is an open phase, but the operation is not guaranteed. Be always sure to check the phase sequence while all of the open phase indicators are ON.

- (5) Check whether the phase is positive or negative.

When the phase is positive (clockwise), the CW indicator lights green. When the phase is negative (counterclockwise), the CCW indicator lights red.



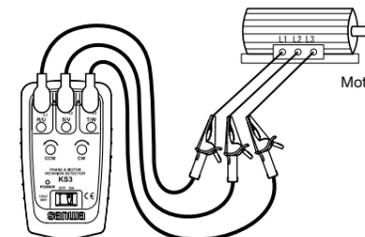
The example above shows the status in which the phase of R, S and T is positive.

### 5-3 Checking the motor rotation direction

#### ⚠ CAUTION

1. Before measurement, make sure that no voltage is applied to the motor.
2. If an open phase is detected in the motor rotation direction check, turning the motor shaft in either direction lights either or none of the CW and CCW indicators. Be sure to check by turning it in both directions.
3. Correct judgment is impossible if the turning speed is low. Be sure to check by turning the motor shaft at a certain speed (the specified rotation speed cannot be reached if it is half stopped or turned at a low speed).

- (1) Insert the three measurement cords into the input jacks.
- (2) Set the Power switch to ON.
- (3) Connect the three measurement clips to L1-L2-L3 of the motor as shown below (correct measurement is impossible if only two of them are connected).



- (4) Turn the motor shaft at a speed higher than the specified rotation speed. When the phase is positive (clockwise), the CW indicator lights green. When the phase is negative (counterclockwise), the CCW indicator lights red.
  - \* The specified rotation speed refers to 2 rotations or more per sec. This figure is variable depending on the number of motor poles.
  - \* If there is an open phase, turning the motor shaft in either direction lights either or none of the CW and CCW indicators. Be sure to check by turning it in both directions.
  - \* Certain motors may rotate in the opposite direction when they are connected in the correct sequence. Please check the specifications document of your motor.

## [6] MAINTENANCE

#### ⚠ WARNING

- The section is very important for safety. Read and understand the following instructions fully and maintain your instrument properly.

### 6-1 Maintenance and Inspection

Before use, check the instrument as specified (see section 5-1) to confirm that there is no abnormality. If anything is abnormal, do not use the instrument and return it to your authorized Sanwa agent or distributor for repair.

### 6-2 Repair

For details, please contact your authorized Sanwa agent or distributor.

### 6-3 Storage

#### ⚠ CAUTION

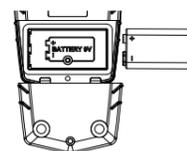
1. The panel and case are not resistant to volatile solvent and must not be cleaned with thinner or alcohol.
2. The panel and case are not resistant to heat. Do not place the instrument near heat-generating devices (such as a soldering iron).
3. Do not store the instrument anywhere it may be subject to vibrations or could fall.
4. When storing the instrument, avoid hot, cold or humid locations, locations exposed to direct sunlight, or locations where condensation is anticipated.
5. When the instrument is not going to be used for an extended time, be sure to remove the batteries.

### 6-4 Battery Replacement

● The battery loaded at the factory is a monitor battery, so their service life may be shorter than that of a brand-new battery. A monitor battery is a type of battery used to check the functions and performance of a product.

#### ⚠ WARNING

- To avoid electric shock when replacing the batteries, first disconnect the measurement clips from the object to be measured, and turn off the power.



- ① Remove the fixing screw (x 1) from the battery compartment cover.
- ② Slide the battery compartment cover downward to remove it.
- ③ Replace the battery with new ones.
- ④ Place the battery compartment cover and tighten the fixing screw.

## [7] AFTER-SALE SERVICE

### 7-1 Warranty and Provision

Sanwa offers comprehensive warranty services to its end-users and to its product resellers. Under Sanwa's general warranty policy, each instrument is warranted to be free from defects in workmanship or material under normal use for the period of one (1) year from the date of purchase.

This warranty policy is valid within the country of purchase only, and applied only to the product purchased from Sanwa authorized agent or distributor.

Sanwa reserves the right to inspect all warranty claims to determine the extent to which the warranty policy shall apply.

This warranty shall not apply to the battery, measurement cable and measurement clips provided with the product, which have been subject to one of the following causes:

1. A failure due to improper handling or use that deviates from the instruction manual.
2. A failure due to inadequate repair or modification by people other than Sanwa service personnel.
3. A failure due to causes not attributable to this product such as fire, flood and other natural disaster.
4. Non-operation due to a discharged battery.
5. A failure or damage due to transportation, relocation or dropping after the purchase.

### 7-2 Repair

Customers are asked to provide the following information when requesting services:

1. Customer name, address, and contact information
2. Description of problem
3. Description of product configuration
4. Model Number
5. Product Serial Number
6. Proof of Date-of-Purchase
7. Where you purchased the product

Please contact Sanwa authorized agent / distributor / service provider, listed in our website, in your country with above information. An instrument sent to Sanwa / agent / distributor without those information will be returned to the customer.

Note:

- 1) Prior to requesting repair, please check the following:
  - Capacity and installation polarity of the built-in batteries.
  - Continuity of the test leads.
- 2) Repair during the warranty period:
  - The failed instrument will be repaired in accordance with the conditions stipulated in "7-1 Warranty and Provision".
- 3) Repair after the warranty period has expired:
  - In some cases, repair and transportation cost may become higher than the

price of the product. Please contact Sanwa authorized agent / service provider in advance. The minimum retention period of service functional parts is 6 years after the discontinuation of manufacture. This retention period is the repair warranty period. Please note, however, if such functional parts become unavailable for reasons of discontinuation of manufacture, etc., the retention period may become shorter accordingly.

- 4) Precautions when sending the product to be repaired

To ensure the safety of the product during transportation, place the product in a box that is larger than the product 5 times or more in volume and fill cushion materials fully and then clearly mark "Repair Product Enclosed" on the box surface. The cost of sending and returning the product shall be borne by the customer.

### 7-3 SANWA Website

<http://www.sanwa-meter.co.jp>

E-mail: [exp\\_sales@sanwa-meter.co.jp](mailto:exp_sales@sanwa-meter.co.jp)

## [8] SPECIFICATIONS

Operating voltage range	Three-phase, line voltage 75 to 500 V AC (sine wave, continuous).
Overload protection input	600 V
Fuse rating	φ 5 x 20 mm, 0.5 A/500 V Breaking capacity 50 kA
Power frequency range	40 to 400 Hz.
Motor rotation direction	Determined at rotation speeds from 2 Hz (2 rotations/sec.) to 400 Hz.
Operation environment	Altitude 2000 m or less, indoor use, environmental pollution degree II.
Operating temperature/ humidity ranges	0 to 40 °C, 80 % RH or less (without condensation).
Storage temperature/ humidity ranges	-10 to 50 °C, 80 % RH or less (without condensation).
Power supply	Alkaline 9 V battery 6LR61 (6LF22, 1604 A) x1
Power consumption	Approx. 5 mA (standby state), approx. 10 mA (MAX)
Low battery indication	Power ON indicator stops lighting at approx. 6.0 V or less.
Continuous operation duration	Approx. 60 hours
Dimensions and mass	128 (H) x 72 (W) x 38 (D) mm, approx. 210 g (including battery).
Safety standards	IEC61010-1, CAT. III 500 V, IEC61557-1,7, IEC61010-2-030, IEC61010-031.
EMC directive, RoHS directive	IEC61326-1 (EMC), EN50581 (RoHS).
Accessories	Measurement clips (CL-KS), measurement cords (TL-KS), instruction manual, carrying pouch (C-KS2).

Specifications and external appearance of the product described above may be revised or modified without prior notice.