Safety Inspection and Testing
of Electrical Facilities for Industrial Use in Japan

November 13, 2012 FISUEL in Sno Paulo
Kansai Electricity Safety Inspection Association
Osaka-Kita Office
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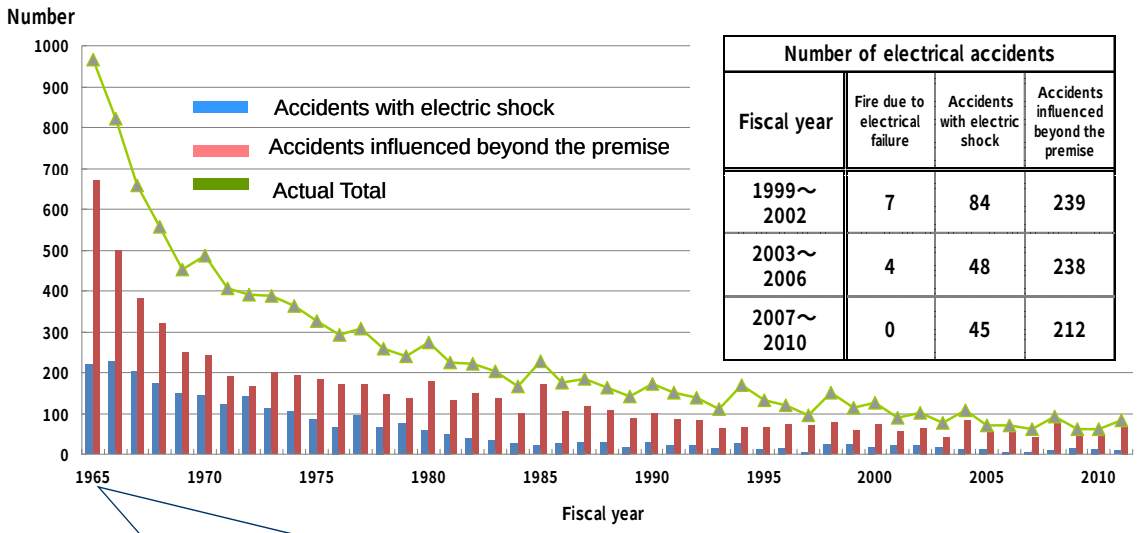
Presentation

1. Changes in Electrical Accidents
2. Electrical Safety Measures by Law
3. Points of Safety Testing/Inspection
   - Live Testing/Inspection
   - Testing/Inspection with suspended power supply
   - State Monitoring
4. Summary

1. Changes in Electrical Accidents

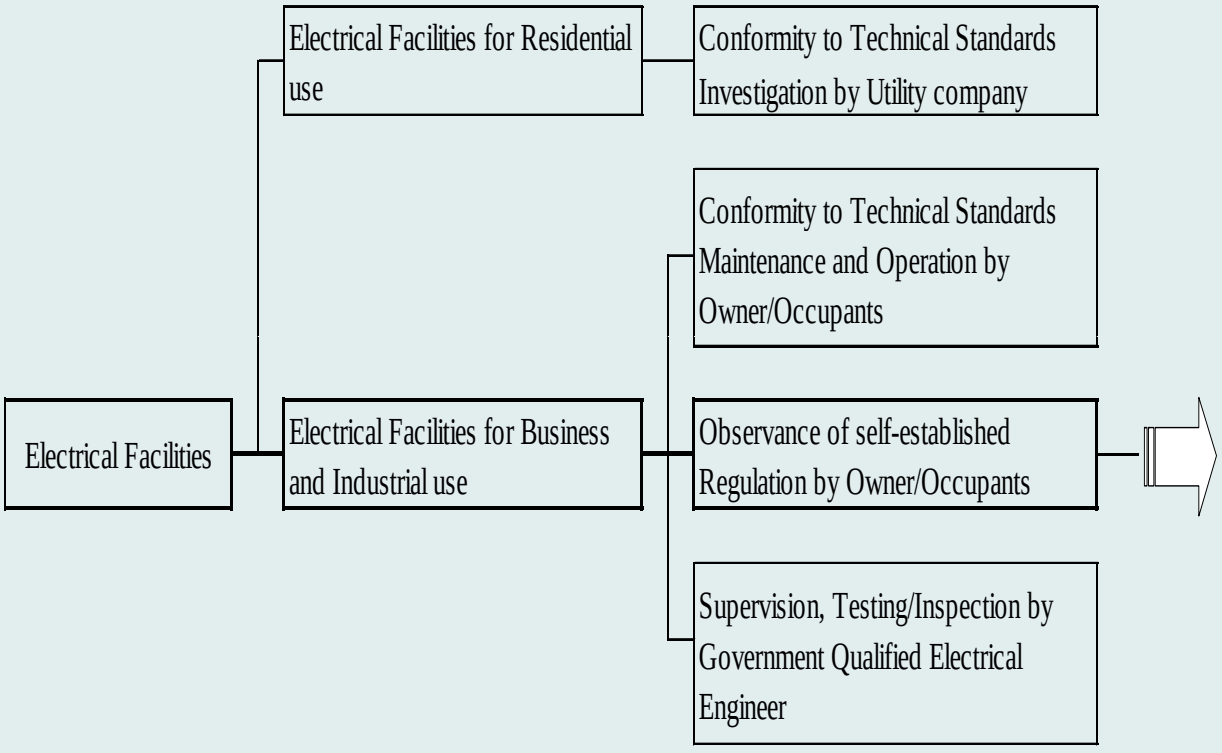
Number of electrical accidents occurred within the jurisdictional district of Kansai-Office of METI



Number of electrical accidents			
Fiscal year	Fire due to electrical failure	Accidents with electric shock	Accidents influenced beyond the premise
1999～2002	7	84	239
2003～2006	4	48	238
2007～2010	0	45	212

- **Enforcement of the New Electricity Utility Industry Law incl. safety regulation**
- **Establishment of Electrical Safety Inspection Associations**

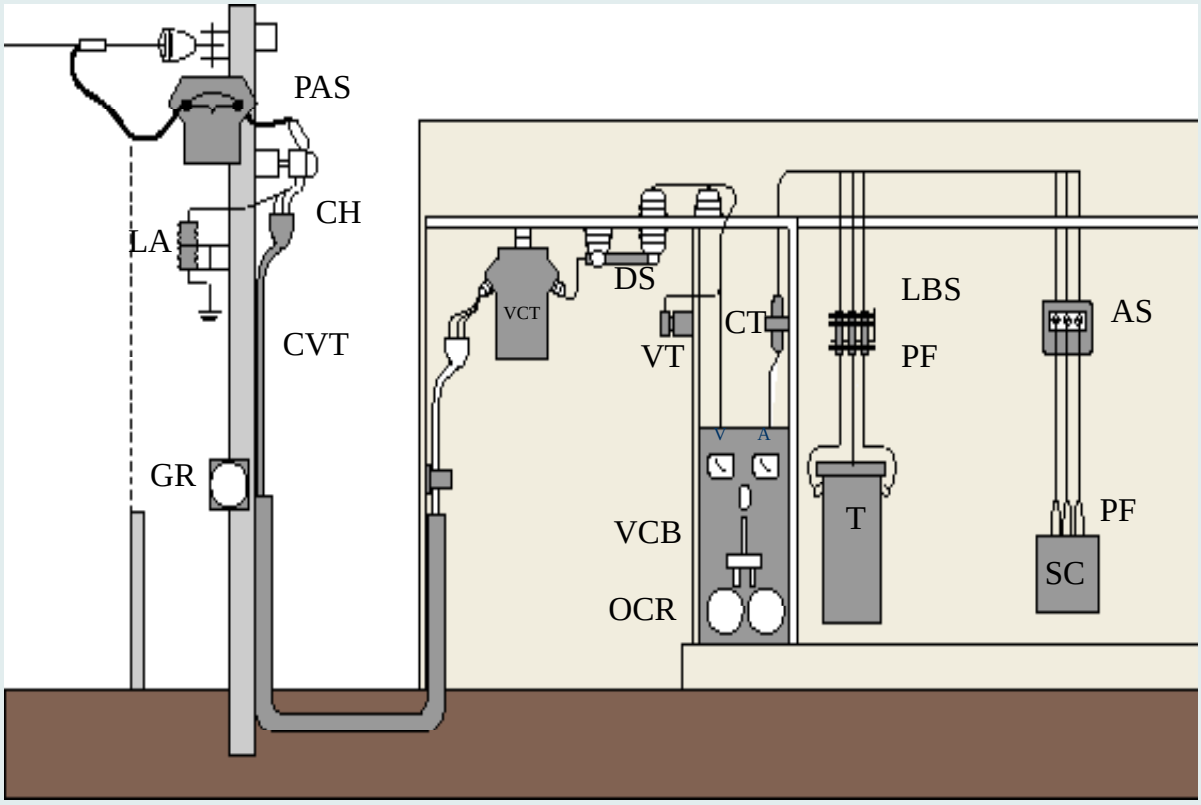
2. Electrical Safety Measures by Law



2. Electrical Safety Measures by Law

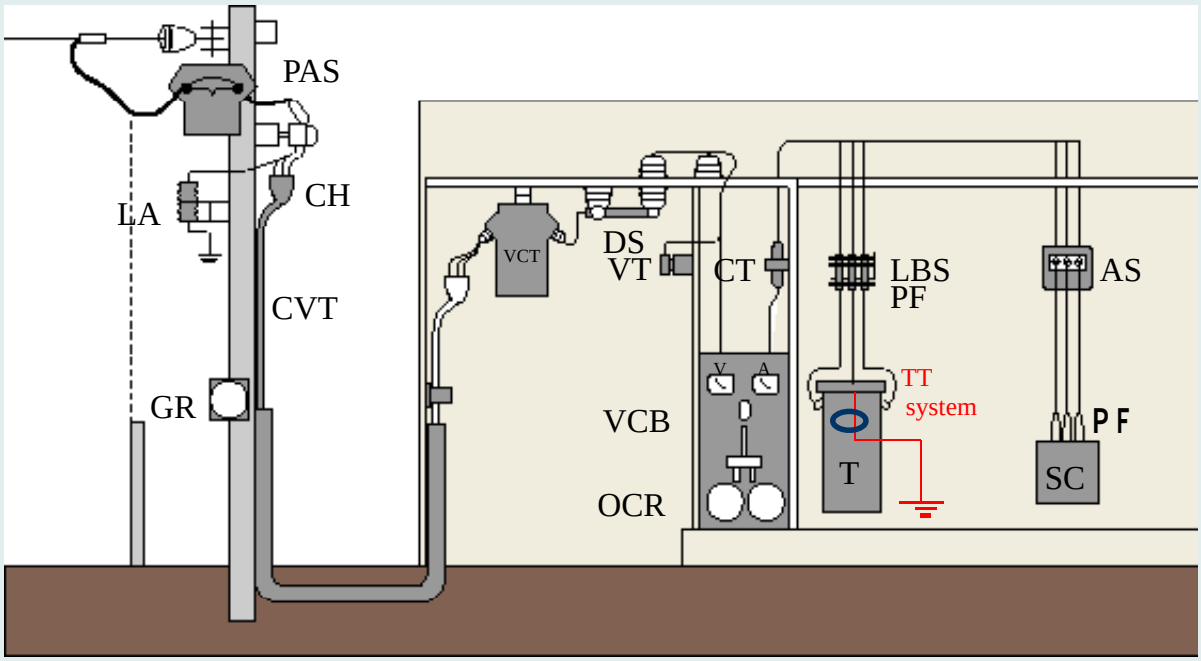
- **Live Testing/Inspection**
  - ① Measuring the leakage current of LV circuits
  - ② Exploring the heating points
  - ③ Exploring the discharging points thru Ultra-phone
- **Testing/Inspection with suspended power supply**
  - ④ Measuring the grounding resistance
  - ⑤ Measuring the Insulation resistance
  - ⑥ Testing protective relays
  - ⑦ Inspecting transformers
- **State Monitoring**
  - ⑧ Regular Insulation monitoring of LV circuits
  - ⑨ Regular Insulation monitoring of HV circuits
- ※ Energy Solution Service

3. Points of Safety Testing/Inspection



Live Testing /Inspection

【① Inspection of Leakage Current of the secondary circuit of a Transformer】

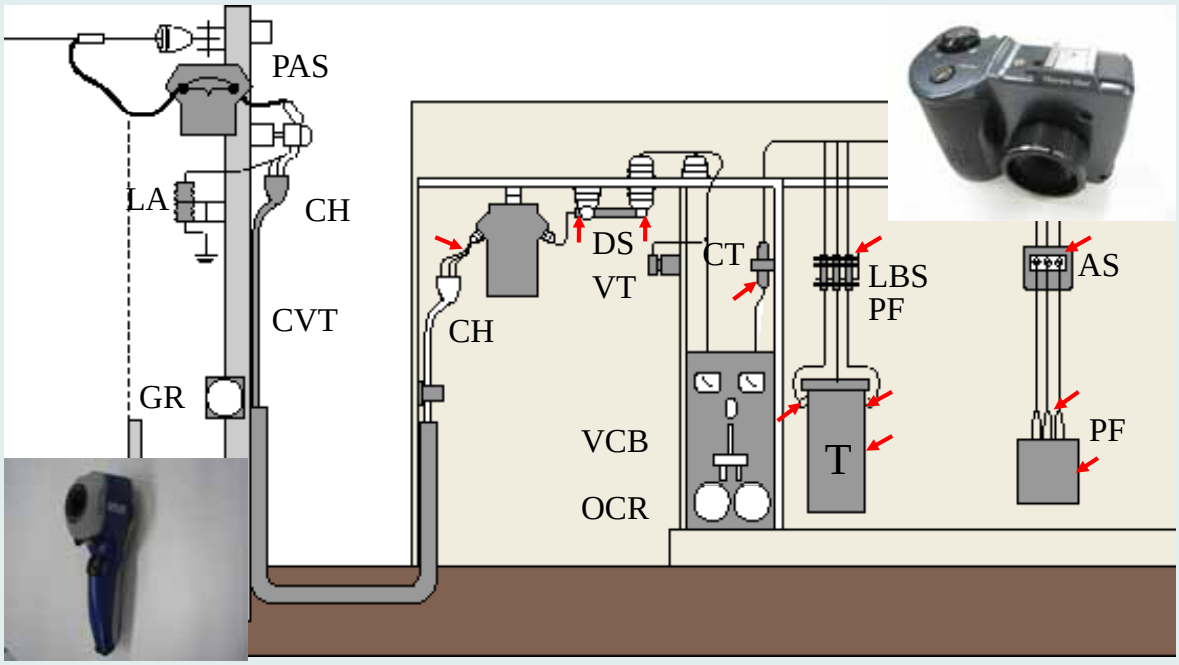


Live Testing/Inspection

【① Leakage Current Inspection of Lower Voltage Circuit】

Live Testing/Inspection

【② Inspection Spots by an Infrared Thermo Graphic Device】



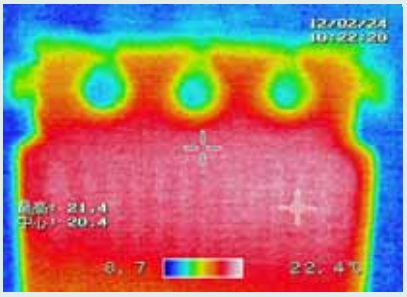
Live Testing/Inspection

【② Measuring Temperature of equipments by an Infrared Thermo Graphic device】

Which can

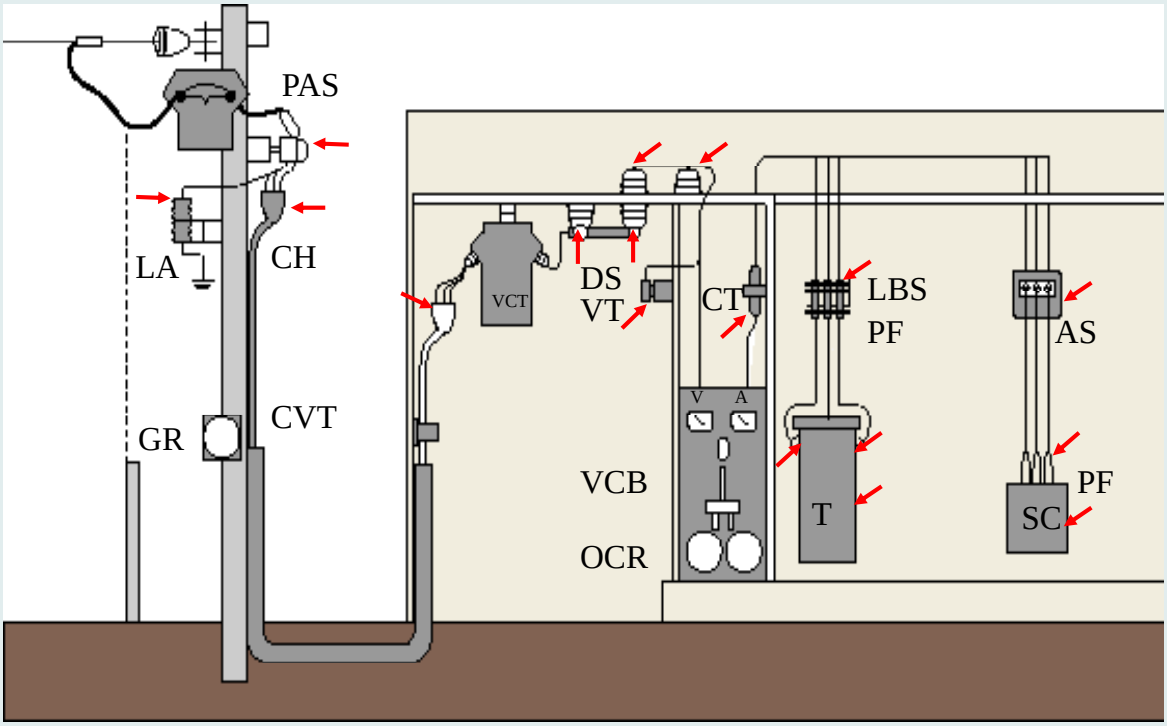
- visualize heating spots of the surface of the equipment
- measure temperature in non-contact manner with the inspection object

- explore heat spots over comparing with wide area surface-temperatures



Live Testing/Inspection

【③ Possible Inspection points by Ultra-Phone】

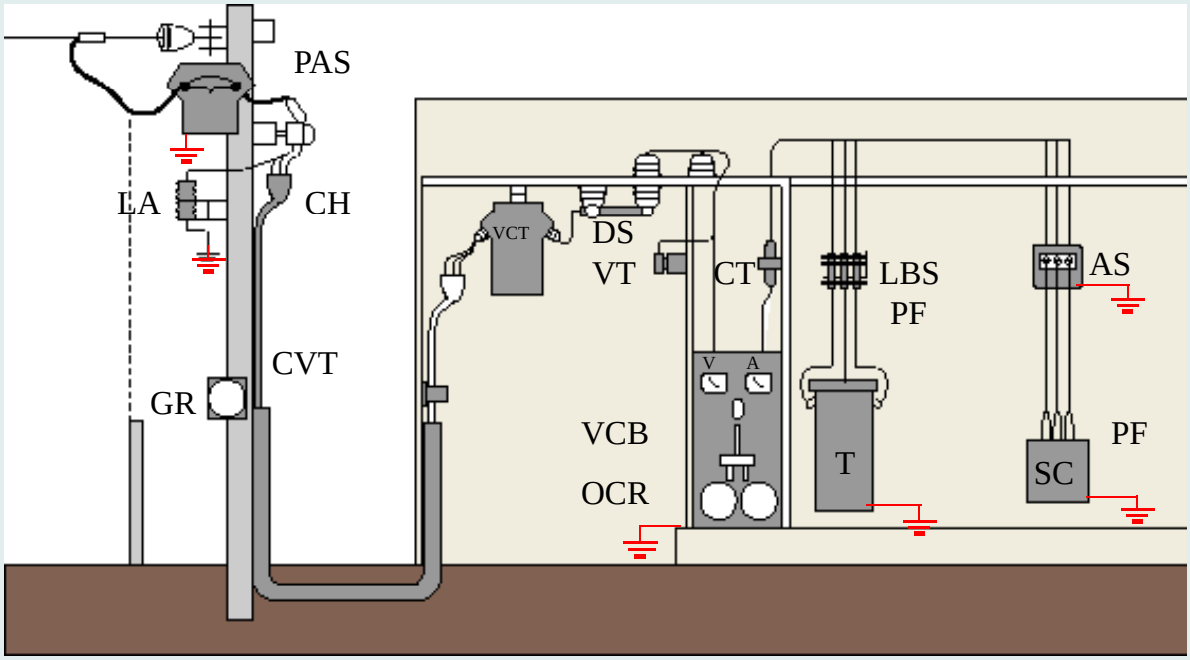


Live Testing/Inspection

【③ Exploring discharging spots by a supersonic-wave device 'Ultra-Phone'】

- which can measure supersonic wave generated due to insulation deterioration
- which can detect fault in non-contact manner with the inspection object

Testing/Inspection with suspended power supply 【④ Inspection Points of Ground Resistance of Equipments over 600V AC】



Testing/Inspection with suspended power supply 【④ Measuring Ground Resistance】

・measured by voltage drop method with 500Hz constant current

・In Japan, Ground Resistance shall be smaller than the following:

① for over 600V quipments 【10Ω】

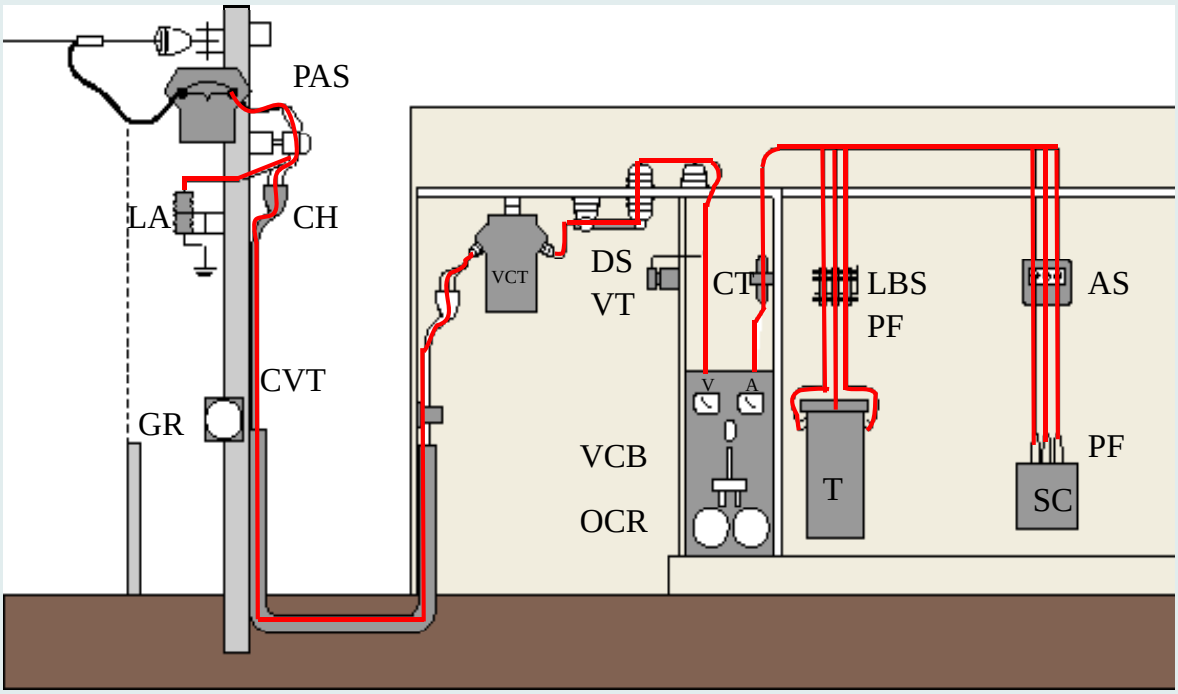
② for secondary circuit of a transformer 【150／*Ig*Ω】

③ for equipments of 300V ～600V 【10Ω】

④ for equipments of less than 300V 【100Ω】

N.B. *Ig* (A) stands for short circuit current at 1LG fault

Testing/Inspection with suspended Power Supply 【⑤ Places for measuring Insulation Resistance】

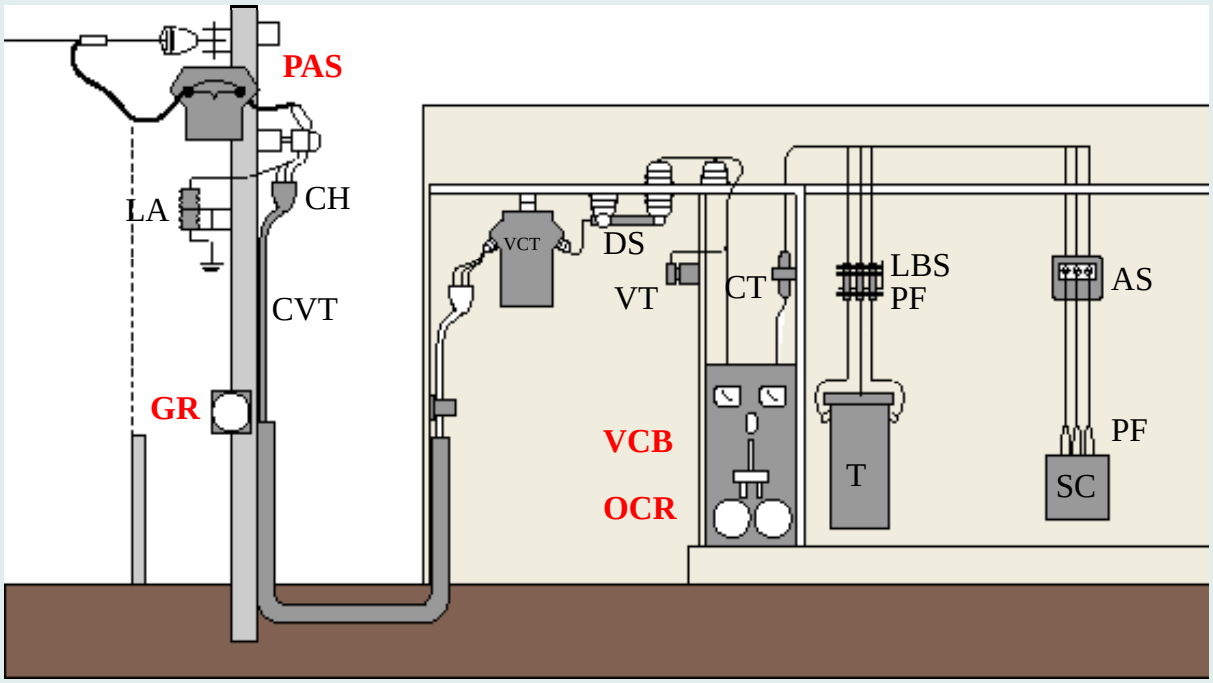


Testing/Inspection with suspended Power Supply 【⑤ Measurement of Insulation Resistance of high Voltage Equipments】

・to diagnose deterioration of the insulation of 6kV equipment through the ratio between the value at imposing DC 5kV and that at 10kV

・ In Japan, Insulation resistance of High Voltage equipments shall be more than the following:
  for HV Cable【5GΩ】
  for HV Cable Sheath【1MΩ】
  for Bus, each equipment【0．1GΩand the Ratio <3】

Testing/Inspection with suspended Power Supply 【⑥ Relays and relevant equipments for testing relay function】

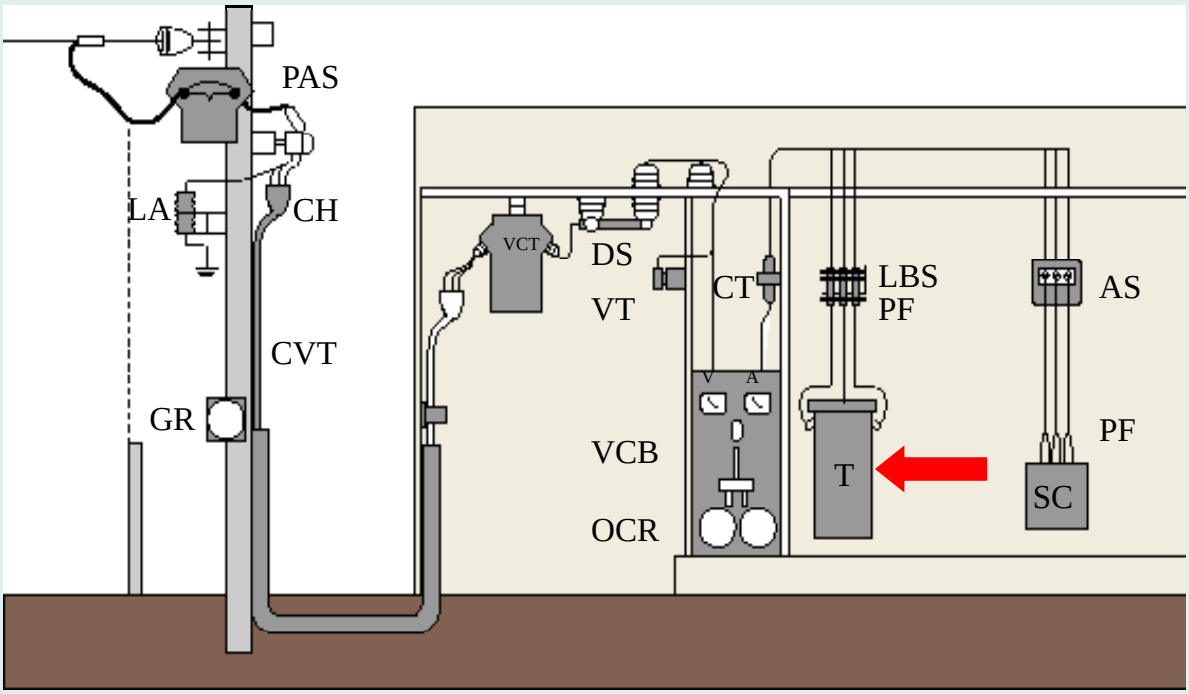


Testing/Inspection with suspended Power Supply 【⑥ Test of Relay】

- A portable Relay-Testing device, using AC 100V, can test all of OCR, GCR, OVR, and UVR

- exam. specs. for HV OCR
  min. operation current 【within±10%】
  over-travel 【at 400%, inactivation in 0.05sec.】
  interlocking movement 【at130%, inactivation in 0.4sec.】

Testing/Inspection with suspended Power Supply 【⑦ Transformer】

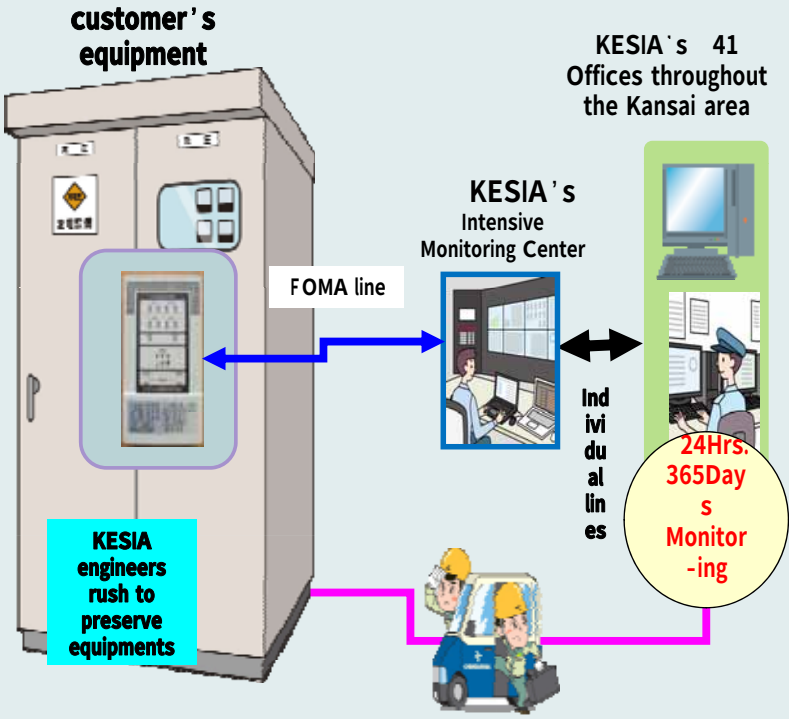


Testing/Inspection with suspended Power Supply 【⑦ Safety Check/Testing of a Transformer】

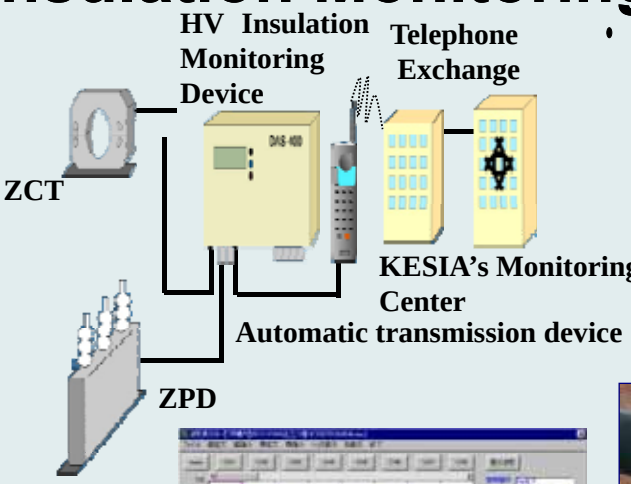
- Photo shows checking the tap voltage of 6kV transformer, oil content, overheating state at distribution terminals
- deterioration diagnosis is done by oxidation degree of oil and electric breakdown voltage

State Monitoring
【⑧ Regular Insulation Monitoring of LV Circuits】

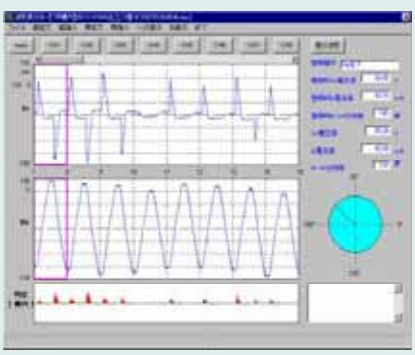
- For 24-hour, 365-day, KESIA monitors insulation status in lieu of customers
- Minute leakage current can be detected through monitoring, which enables early response measures before break
- In case of break, FOMA lines automatically report the incident to the customer and KESIA
- 24-hour technical support service is available by KESIA



State Monitoring 【⑨ Regular Insulation Monitoring of HV Circuits】



- Regular monitoring of zero-phase voltage, zero-phase current, *Io* pulse、wave profile, and grounding resistance enables early detection of precursory effect of slight ground fault before the real earth fault occurs, to prevent a HV grounding fault accident



※ Energy Solution Service activities 【visualizing power consumption through an electricity demand monitoring device】

- Customers can control energy usage through shifting the load peaks and saving electricity, through Diagrams and Charts which can visualize real electricity consumption

4. Summary

(1) Testing /Inspection of Electrical Facilities and Supervision by Qualified Electrical Engineers prevents accidents and enhances safety in Business and Industrial sector

(2) Electrical Safety Measures in Japan work to preserve functions of electrical facilities in Business and Industrial sector