Product manual

LVQB 40.5-550
SF6 gas current transformer (top core)

Power and productivity
for a better world™

ABB Jiangsu Jingke Instrument Transformer Co., Ltd.
No.9 Gucheng Road, Su-Su Industrial Park, Suqian, Jiangsu Province, 223800, P.R. China
Tel: +86 527 8288 0810
Fax: +86 527 8288 0868

www.abb.com.cn

Table of contents

Packing, transport and storage

Packing

ABB will prepare, pack and load its materials and instrument transformer according to requirement of customer inspection, guaranteeing that equipment and packing material are qualified for international freight by sea or by air.

Instrument transformer will be packed in horizontal direction in wood crate and plywood, the packing crate will be treated by steam to guarantee that it will be free of insect eggs, plant seeds or animalcule. Instrument transformer packed in vertical direction should be in the plywood package. The crate is strong enough for transport under normal conditions by sea and road freight.

All parts of the plant shall be carefully packed and marked to ensure quick identification and erection on site. All packing will be seaworthy for on-deck/under-deck transport.

Transport

For extreme bad freight condition, purchaser should provide information before award of order and special packing can be applied accordingly with agreement of the customer.

When products are transported by trucks, the speed of trucks shall be steady to avoid mechanical damage.

General traffic speed limit 40km / h, special road speed limit 5km / h, in order to ensure road collision acceleration is less than 3g.

Storage

Upon arrival each unit should be checked according to the shipping documents and the order. If damage is discovered or suspected, the case should be opened and photos should be taken. The package should be opened carefully to avoid the damage on the outer insulation.

If intermediate storage cannot be avoided, please recover the package for safety storage.

Storage site: The ground should be strong enough to stand the pressure of packing case. Please make sure the rain-proof measure is taken if instrument transformer is stored in outdoors.

Ambient condition: The surrounding air must be free from dust and corrosive medium. The temperature is not less than -30℃ . Outdoor storage time should be less than 12 months. For long term storage, products must be packed. Please clean the outer insulation before assembling.
Before using the product again after storage or prolonged period of suspension from service, insulation resistance of the winding, water content of SF6 gas, product leakage rate and insulation must be checked. Appropriate measures must be taken if the result does not conform to requirements.

Stacking of cases: Stacked layers should be confirmed with the packing requirements (please refer to the markings on the packing cases). Cases of different widths shall normally not be stacked. If cases of different widths need to be stacked, a framework must be used between the cases in order to distribute the pressure evenly. Stacking of more than two cases is not allowed. It must be noted that stacking causes instability sidewise and therefore the cases must be secured, i.e., prevented from tumbling down or rolling over.

An approved store is defined as:
Stored in indoor or under the roof to avoid the exposure to sunshine and rain. The equipment can be stored outdoors. If this happens they should be protected by at least a tarpaulin. The tarpaulin shouldn't be so tight so that air circulation to zinc coated surfaces is still prevented.

Marking

There are clear markings to indicate the terminals which should meet the requirements of instrument transformer standards.

Nameplate: All permanent equipment of the works shall be provided with a securely fixed nameplate maker's name, model, serial number, year of manufacturing, main characteristic data of the respective equipment and further relevant information. All main equipment should have the nameplates in English or language upon request.

Packing crate illustration

Product packing and markings:

For example: 245 SF6 gas current transformer

Figure 1 Product packing

Figure 2 Transportation marks

Note: Products are not free of secondary transfer. If necessary, please contact to us!

Product and application

Application

ABB SF6 gas insulated current transformer (top core) applies highest voltage of equipment 72.5, 245, kV and rated frequency of 50 Hz or 60 Hz. The functions are current electric energy metering and measuring, busbar differential protection, overcurrent protection, and distance protection.

Product feature

Stable and reliable insulating performance: the product adopts a uniform coaxial column electric field structure and the insulating medium adopts SF6 gas with the self-restoring performance, rendering the product reliable operation and long service life.

The product has high insulation level, low partial discharge, substantial capacity of transient response, and small and stable dielectric dissipation factor.

Excellent sealing performance: the annual leakage rate of SF6 gas is less than 0.5%, and therefore basically minimum maintenance is needed.

It can stand a voltage of 1.3Um/√ 3 for 5 min at gauge pressure of zero.

In case leakage of SF6 gas due to irresistible natural damage, it can still work under phase voltage to give the user adequate time to take appropriate actions.

Product structure

The product adopts the inverted SF6 gas insulation structure and consists of the shell, secondary winding components, primary conductor, high voltage insulating bush, uniform voltage shielding tube, outlet box, and Density meter. The secondary winding components are placed in the upper section of the shell and the top of the shell is fitted with an anti-explosion piece; the primary conductor passes through the secondary winding components in the center, jointly forming a very uniform coaxial column electric field; between the shell and the base, there is a high voltage insulating bush at the top of which a uniform voltage shielding tube is fitted; there is a secondary terminal board, Density meter, absorbent and inflation valve in the base.

External insulation

The external insulation of the product adopts high strength porcelain bushing or composite hollow insulator and we can meet customer's requirements by providing corresponding configuration. Its flashover distance and creepage distance guarantee to meet the actual application requirements of customers.

Density meter

After filling SF6 gas, the spring tube in the density meter expands under pressure and the pointer is driven mechanically so as to indicate the density value indirectly through the pressure value; during the rising of pressure, the N.C. contract is off-contact. In case of temperature change, the inside temperature compensator will compensate for the change to prevent displacement of the pointer. The pointer of the density meter only lowers when the pressure drops due to SF6 gas leakage; when the pressure drops to the set value for replenishing gas, the contact closes and sends a signal for gas replenishment.

The density meter has a total of 7 contacts. 1-2 are alarm contacts, 3-4 are blocking contacts, 5-6 are alarm contacts, and 7 is ground point.

Main technical parameters

Technical parameters comply with IEC 60044-1:2003 and IEC 61869-1:2007 and IEC61869-2:2012 or upon request. Individual project technical parameters please refer to technical datasheet approved by contract and nameplate.

Operation conditions

Application	Outdoor or indoor	
Ambient temperature	Maximum temperature	+45℃
	Maximum daily average temperature	+35℃
	Minimum temperature	-35℃ *
Altitude	Less than 3500 m *	
Atmospheric conditions	There shall be no dust, corrosive or explosive mediums in the ambient air that may significantly influence the insulation of current transformers	
Maximum daily average relative humidity	95% (25℃)	
Maximum wind velocity	35 m/s *	
System grounding method	Neutral point effectively grounded	

Note: * or upon request.

Electrical schematic diagram

Figure 3 is sample of electrical schematic diagram. Individual projects diagram please refer to nameplate and diagram delivered along with products.

Nameplate

Figure 4 is sample of standard nameplate in English. Other language is available upon request.

SF6 working pressure

Rated working pressure	72.5 kV: 0.4 Mpa
	245 kV: 0.45 Mpa
Minimum working pressure	72.5 kV: 0.35 Mpa
	245 kV: 0.4 Mpa

SF6 gas annual leakage rate <0.5%.

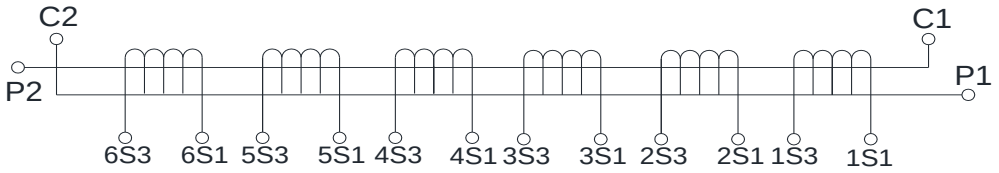


Figure 3 Electrical schematic diagram sample

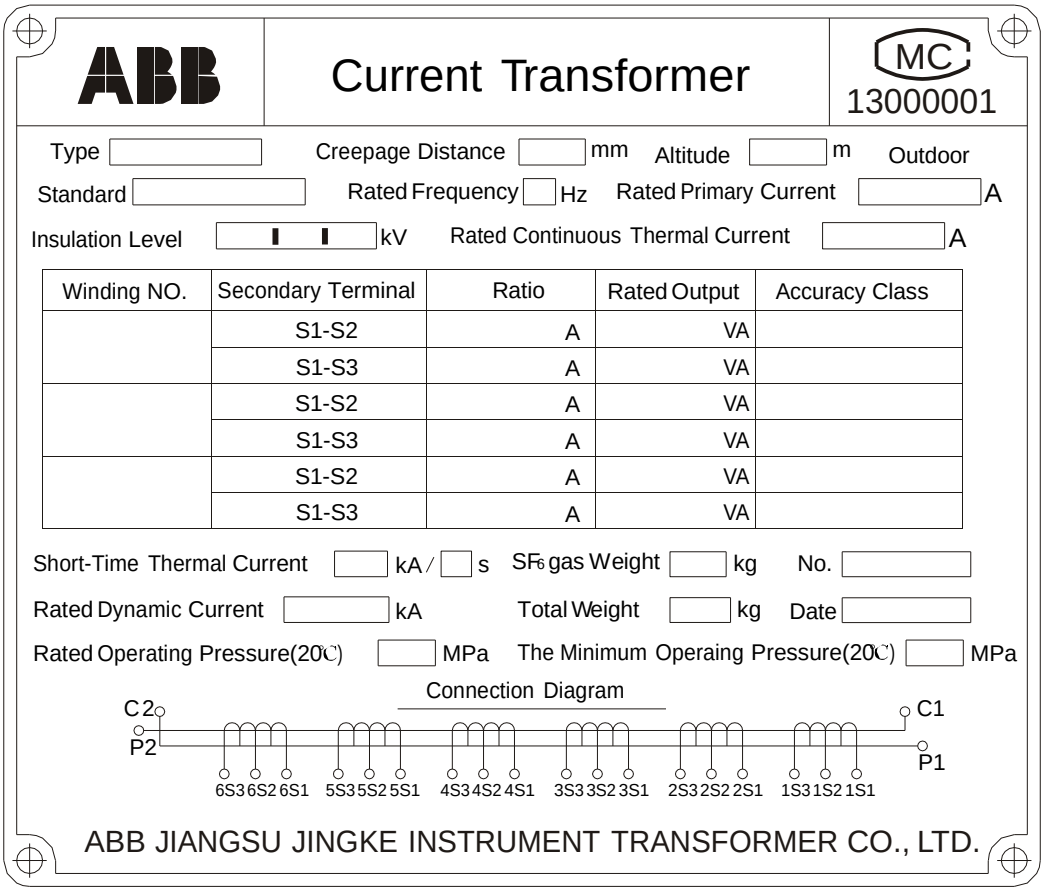


Figure 4 Standard english nameplate sample

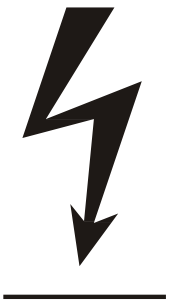
Installation

CAUTION

FOR YOUR SAFETY

DO NOT ATTEMPT TO HANDLE, INSTALL, USE OR SERVICE THIS PRODUCT BEFORE READING THE INSTRUCTION MANUAL.

Failure to read the instruction manual prior to performing these actions can lead to serious injury and/or damage.



Safety notice

This current transformer should be installed within the design limitations as described on its rating plate and in these instructions. Follow your company's safety procedures.

This product is intended to be operated and maintained by qualified persons who are thoroughly trained and who understand the hazards involved. This publication is written only for such qualified persons and is not intended to be a substitute for adequate training and experience in safety procedures for this device.

WARNING

DETAILED DESCRIPTIONS OF STANDARD REPAIR PROCEDURES, SAFETY PRINCIPLES AND SERVICE OPERATIONS ARE NOT INCLUDED. IT IS IMPORTANT TO NOTE THAT THIS DOCUMENT CONTAINS CERTAIN WARNINGS AND CAUTIONS REGARDING CERTAIN SPECIFIC SERVICE METHODS THAT COULD CAUSE PERSONAL INJURY TO SERVICE PERSONAL OR COULD DAMAGE EQUIPMENT OR RENDER IT UNSAFE. PLEASE UNDERSTAND THAT THESE WARNINGS CANNOT COVER ALL CONCEIVABLE WAYS IN WHICH SERVICE, WHETHER OR NOT RECOMMENDED BY ABB, MIGHT BE PERFORMED OR POSSIBLE HAZARDOUS CONSEQUENCES OF EACH CONCEIVABLE WAY, NOR COULD ABB INVESTIGATE ALL SUCH WAYS. ANYONE USING SERVICE PROCEDURES OR TOOLS, WHETHER OR NOT RECOMMENDED BY ABB, MUST THOROUGHLY ENSURE ONESELF THAT NEITHER PERSONAL NOR EQUIPMENT SAFETY WILL BE JEOPARDIZED BY THE SERVICE METHOD OR TOOLS SELECTED.

All information contained in this manual is based on the latest product information available at the time of printing. The right is reserved to make changes at any time without notice.

Delivery

Check the current transformer for any transport damages immediately upon delivery. Damage to packaging may be a sign of rough handling. Note any damage (it is advisable to take pictures)

Note!

Check Impact indicator.

10g Impact indicator: Observe the color of milky liquid in the middle of the tube. If color unchanged, it indicates that the condition is normal; If turning red, it indicates that acceleration is beyond10g.

when the current transformers have arrive at spot,and check on Impact indicator on packing firstly. If Impact indicator color has changed red, indicated acceleration is beyond the specified requirements the current transformers need to undertake routine test.If qualified,it can be used, and if unqualified,it can't be used.

when the current transformers are supplied to inland,they can be transported to the location where customer designated by our company and please cheack on Impact indicator on packing,If Impact indicator color has changed red.Please give notice to ABB JIANGSU JINGKE INSTRUMENT TRANSFORMER CO., LTD.timely.

Products are provided with this product manual, quality certificate, packing list. Please check the software and accessories along with the product according to the packing list. Be careful not to damage the product.

Check the products as below after unpacking.

Note!

Check the product appearance for damage.

Note!

Check the software and accessories according to the packing list to ensure they are complete.

Note!

Check if the density meter indicates pressure properly.

Note!

Check if the status leads of the Density meter are complete.

Note!

Check if the product marking are clear and correct.

Note!

The double-ratio product is delivered from factory in parallel; check if the product is correctly connected.

Lifting the instrument transformer

The current transformer shall be hoisted with lifting rope that can stand its weight (Figure 5 Product lifting), then install it vertically on a horizontal base, and rigidly fix it to the base by bolts through mounting holes at the bottom of the product. P1 and P2 terminals are concatenated in AC circuit. The secondary cable should be put into the cartridge at the bottom of the secondary junction box and reliably connected to the secondary terminals to the corresponding measuring and protective instrument; the grounding bolts and system earth screen shall be connected to each other and the status leads of the density controller shall be connected to relevant alarms.

Caution!

Protection shall be established at the contact points between the product and the sling during lifting and it is strictly forbidden to scratch the surface of the product.

Caution!

The inclined angle during lifting shall not exceed 15.°

Caution!

As the center of gravity of the product is relevantly high, anti-toppling measures shall be taken during lifting, storage and installation so as to prevent product damage and hidden quality problems.

Caution!

Product grounding should be reliable and there should be no floating potential.

Caution!

Touch point of External conductor and P1, P2 should be solid and reliable, and contact surfaces should be large enough.

Caution!

Be careful when installing the product and do not damage the sealing.

Caution!

Open circuit of secondary winding is strictly prohibited while it's running. Standby secondary winding must be grounded by short circuiting.

Caution!

When installing external wire, ensure that mechanical load taken by primary terminal should not exceed the standard value.

Caution!

The Current Transformer must be placed in the vertical position at least 24 hours before energization.

Site test

Carry out site test according to IEC requirements; the results need to be compared with the data in the product quality certificate. Significant differences are not allowed; otherwise further analyses and judgments are required, informed of us when necessary.

Test conditions: temperature 10℃ ~30℃ , relative humidity not larger than 60%.

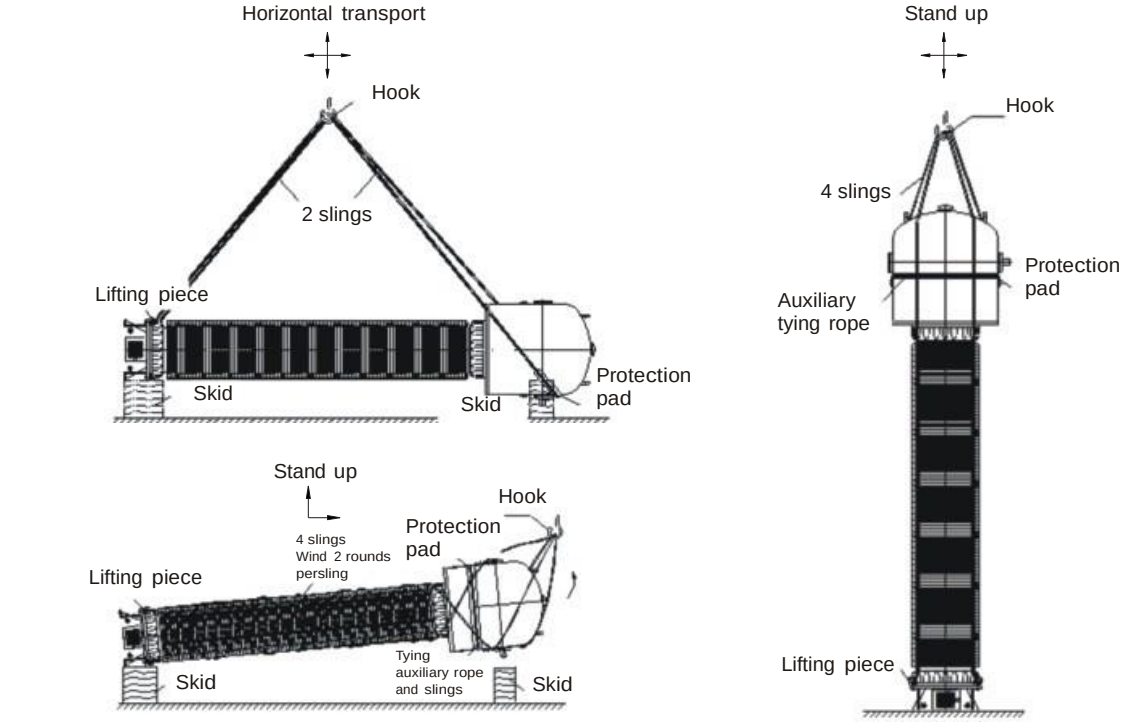


Figure 5 Product lifting

SF6 gas filling

The inside of the product is in a slightly positive pressure state during transportation and therefore it can only be put into operation after fill gas. The product gas filling schematic diagram is shown in Figure 6.

In case of gas filling, connect the gas cylinder with the product using the inflating tube supplied with the equipment. Rinse the filling tube once before connection. Gas filling shall be conducted slowly, preferably at a rate of 0.1MPa/10min; after filling gas, screw on the upper cover piece of the gas valve and then keep the filling tube properly.

Note: The process of gas filling should be conducted slowly and to avoid the moisture rising. Generally it should take several times to complete this filling process; In case the working pressure is up to or above the max pressure 0.8Mpa (Max critical value) during gas filling; Please close the pressure relief valve and wait for 5mins till the pressure goes back to normal; Then repeat the gas filling process till it comes to stable rated working pressure; The whole process may take 4 times and last 60 mins approximately.

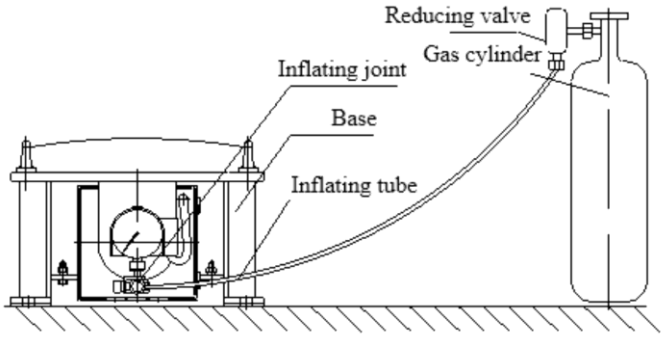


Figure 6 SF6 gas filling

Current ratio switching

If the product has double ratios, users may obtain their desired ratios by changing the series and parallel connection of the product.

For example:
If the rated current ratio is 2×750/5 A
Then the ratio for series connection is 750/5 A
And the ratio for parallel connection is 1500/5 A

Please see Figure 7 for current ratio switching of normal structure.

Inspection before commissioning

It should be comprehensively inspected before commissioning. Special attention should be paid to check the reliability of all electrical connections. Check if the indication of the density meter pointer is proper and if the pressure value meets requirements.

Measure the winding DC resistance, and the difference between the measured value and the factory value should not be greater than 10% (under the same temperature).

At room temperature, measure insulation resistance between each winding and earth by the 2500 V Meg-ohm meter. And there should be no obvious difference between the measured value and the factory value.

Check the fastening of the product's anchor bolts.

Product grounding should be reliable and there should be no floating potential.

Touch point of External conductor and P1, P2 should be solid and reliable, and contact surfaces should be large enough.

Open circuit of secondary winding is strictly prohibited while it's running. Standby secondary winding must be grounded by short circuiting.

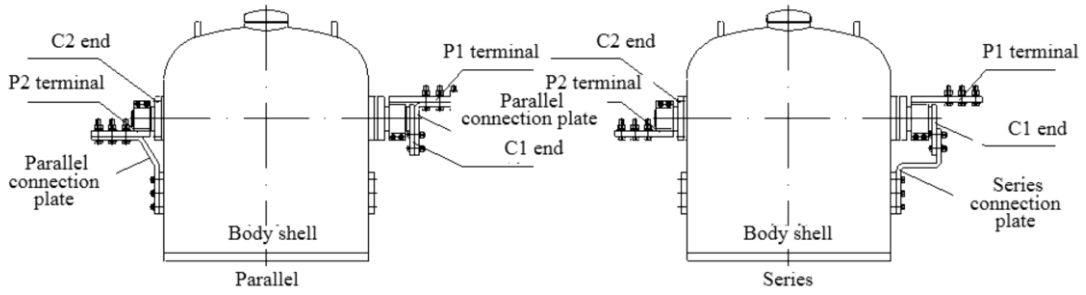


Figure 7 Current ratio switching of normal structure

Mount the connection plate on the primary terminal, see Figure 7, with M12 bolts and torque 70Nm.
Mount the connection plate on the primary terminal, see Figure 7, with M16 bolts and torque 170Nm.

Maintenance

Minimal maintenance is required due to the transformer being hermetically sealed. A visual check is normally sufficient with the recommendation of following the checklist at the back of this manual.

Proposed routine check at the following positions:

- Visual check
- Routine clearance of dusty on surface of current transformer
- Routine check gas pressure signal or density meter

Clearance

Conductive dust on the external insulation surface shall be removed regularly in order to ensure safety operation of the product.

SF6 gas pressure check

The product has good sealing performance with annual leakage rate less than 0.5% and no special maintenance is required. However, regular patrol shall be conducted to see if the SF6 gas pressure of the product (i.e. density meter pressure indication) is normal.

Micro-water content

The micro-water content of SF6 gas shall be regularly measured according to the operating procedure requirements; if the water content of the gas exceeds 300× 10^{-6} (V/V), carry out dehydration and gas replacement.

Patrol inspection

It is recommended to have routine patrol inspection.

During high and low temperature, high moisture, abnormal climates, as well as in period of peak load, seasonal high voltage, equipment abnormality, patrol shall be strengthened.

Caution!

Open circuit of secondary winding is strictly prohibited while it's running. Standby secondary winding must be grounded through short circuit.

Caution!

Primary terminals shall be free from deformation and the operating temperature rise shall be lower than the value specified by the standard.

Caution!

Micro-water content of SF6 gas during operation of the product shall not exceed 300×10^{-6} (V/V).

Caution!

When the SF6 gas pressure drops to the minimum working pressure, replenish gas timely.

Caution!

External insulation maintenance should be performed carefully to avoid damage.

Caution!

Product grounding should be reliable, floating potential shouldn't appear.

Caution!

The stud without nuts of the secondary terminal board is not a winding lead terminal. Please do not change the purpose of the stud when installing the leads.

Overhaul

Minor maintenance shall be conducted once every 1-3 years, generally in combination with preventive test. The minor maintenance cycle for products working at high pollution places should be shortened.

Overhaul shall be conducted when necessary based on comprehensive analysis and judgement according to preventive test results of transformer and on-line monitoring results in running (if any). Inform the manufacturer if necessary.

Temporary overhaul shall be performed for serious defects found during operation.

Troubleshooting

Note!

In case of abnormal pressure change during operation, first check if the density controller is working properly and if the density controller joint and the inflation joint are loose and then check the product for leakage.

Note!

If there is abnormal sound during operation, please check whether secondary windings are open-circuited.

Note!

If the external insulation flashover, its external insulating surface should be cleaned.

Note!

In case of transformer overheating, check for overload operation or if terminals are in good contact and secure.

Note!

In case of reduced insulation resistance of the transformer, check whether its surface is wetted or polluted.

Note!

If the transformer is on fire, cut off the power immediately and put out the fire using fire extinguishers.

Transformer secondary circuit open circuit processing:

According to relevant provisions on the relay protection and automatic device, exit from relevant protection.

Find out the fault point and try to make it short circuited at the terminal near the open circuit under the premise of ensuring safety but no fuse. If open circuit couldn't be eliminated, power should be cut for handling.

Product information

Please refer to Figure 8 for product outline and installation drawings.

Note!

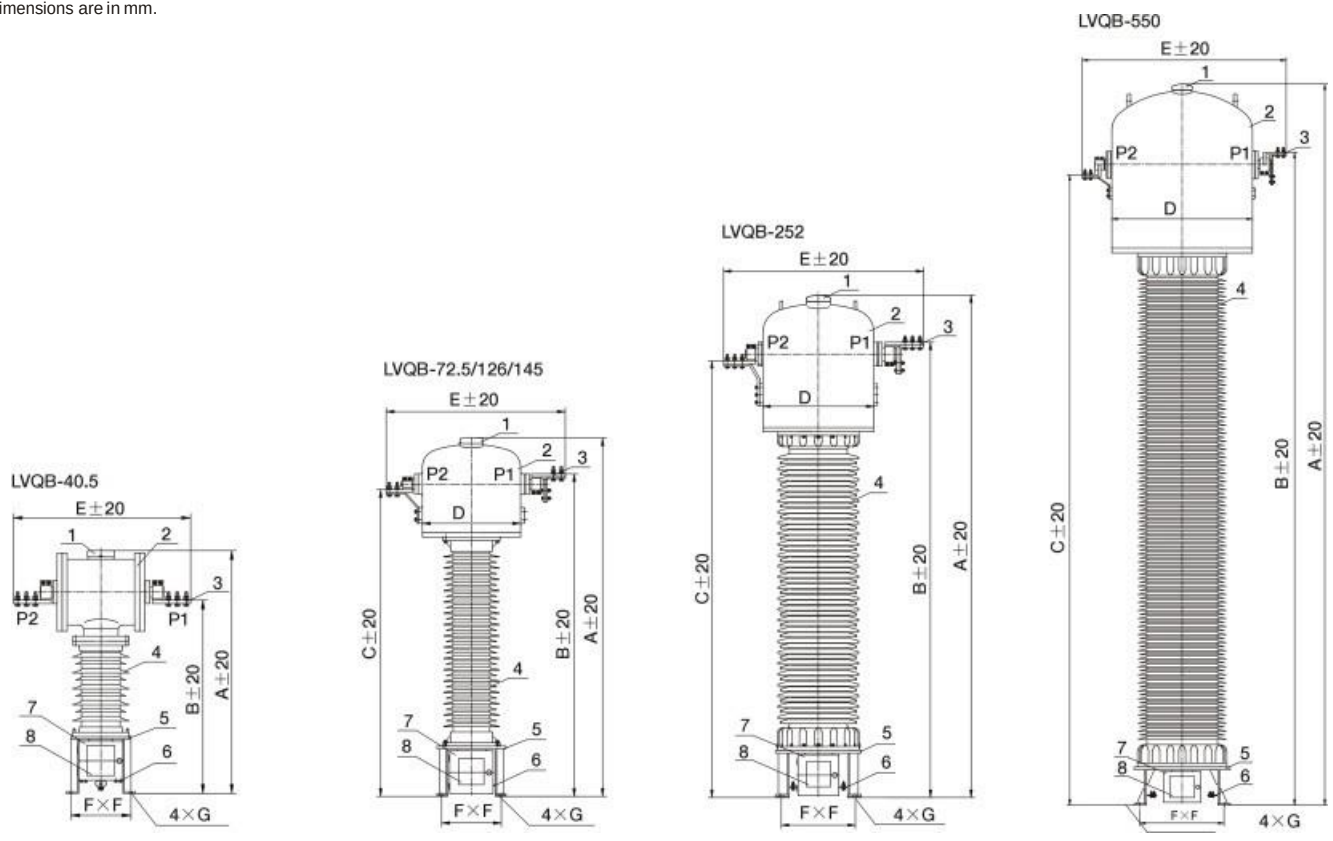
Current transformer is customized product, dimension may adjust upon varies rating and configuration. Detailed drawing please refer to project drawing.

Please refer to the nameplate of the product for weight etc. information.

Dimension

	LVQB-40.5	LVQB-72.5	LVQB-126	LVQB-145	LVQB-252	LVQB-420	LVQB-550	
A	1355	2280	2280	2470	3375	6020	6455	6365
B	1090	2200	2200	2215	3075	5480	5845	5790
C	--	2075	2075	2090	2950	5260	5645	5665
D	--	625	625	670	750	1130	1260	1130
E	1000	1020	1020	1275	1350	1700	1830	1895
F	340	475	475	475	500	760	760	760
G	ϕ16	ϕ22	ϕ22	ϕ22	ϕ26	ϕ30	ϕ30	ϕ30

Note: Above are typical dimension, dimension may adjust upon varies rating and configuration.
All dimensions are in mm.



1	2	3	4	5	6	7	8
Explosion-proof device	Shell	Primary terminal	Bushing	Base	Wiring board	Secondary terminal box	Nameplate

Figure 8 LVQB outline and installation drawing

Customer notes

Customer notes

Contact Us

ABB Jiangsu Jingke Instrument
Transformer Co., Ltd.
Add.: No.9 Gucheng Road, Su-Su
Industrial Park, Suqian, Jiangsu Province,
223800, P.R. China
Tel: +86 527 8288 0810
Fax: +86 527 8288 0868

www.abb.com.cn

TECH-WI-2712 REV.1

Power and productivity
for a better world™