

Station Service Voltage Transformer

Instruction Manual

I. Safety Instructions

1.1 General Safety Instructions



WARNING

This electrical equipment contains hazardous voltages until it is properly earthed and short-circuited.
Failure to follow the safety instructions may result in serious injury or significant property damage.
Only qualified personnel are authorized to work on, with, or near electrical installations.
These personnel must be trained on safety requirements, safety rules, company procedures, and the applicable national legislation.
The work location, especially areas where installation, commissioning, repair, and maintenance are carried out, must be clearly defined and marked.
Appropriate tools, equipment, and devices (e.g., protective helmets, safety boots, protective clothing, insulated tools, signage) must be used for all the above-mentioned tasks.
Adequate precautions must also be taken to prevent injury from other potential hazards, such as mechanical systems, pressure systems, or falls.

1.2 Definitions

1.2.1 Qualified Person

As used in these instructions and in the warnings on the products themselves, a "Qualified Person" is someone with the relevant education and experience to install, assemble, commission, maintain, repair, and operate the equipment, and to prevent dangers that these tasks may create. The individual must possess the following competencies:

- Knowledge of electricity, understanding of electrical terminology
- Understanding of the installation to be operated, along with practical experience in performing the work.
- Awareness of the hazards that may arise during the work, and the necessary precautions to be taken.
- Training in emergency treatment.

1.2.2 Danger

The "Warning" used in this Instruction Manual indicates that failure to take appropriate preventive measures may result in serious injury, death, or major property damage.

1.2.3 Warning/Caution
The warning of "Danger" and "Caution" in this Instruction Manual and on the product indicate that failure to take appropriate preventive measures may result in serious injury, death, or major property damage.

1.2.4 Note
The "Note" in this Instruction Manual highlights key information related to the manual and the product that requires special attention.

1.3 Specific safety instructions

Refer to the content in this Instruction manual.

Instructions of SF_6 Station Service Voltage Transformers

1 Service Conditions

1.1 Ambient Air Temperature: Maximum: 60°C, Minimum: -40°C. The average ambient air temperature over a 24-hour period must not exceed 30°C.
1.2 Altitude: The altitude must not exceed 1000m. If different requirements are needed, products can be provided for altitudes of 2000m, 3000m, 4000m, or 5000m based on the client's specifications.
1.3 Relative Humidity: The average relative humidity must not exceed 95% at 25°C, measured over a period of one month.
1.4 Wind Speed: The maximum wind speed must not exceed 34m/s.
1.5 Earthquake Intensity: The earthquake intensity must not exceed 8 on the Richter scale.
1.6 Environmental Conditions: There must be no gases that could seriously affect the insulation or conductive capacity of electrical equipment. This includes steam, ash, salt, chemical deposits, pollutants, corrosive substances, or explosive materials.

2 Packing, Transportation, Installation, Use, Maintenance and Storage

2.1 Packing and transportation

2.1.1 The Station Service Voltage Transformers are packed in wooden crates and must always be kept upright according to the directional markings on the packaging (except for products that are packaged and transported lying down).
2.1.2 When opening the package, remove the wooden panels from the top and front. Then, dismantle the 4 M16 bolts that secure the transformer in the frame of the crate. Carefully and slowly lift the transformer vertically out of the package.
2.1.3 The client must inspect the package upon receiving the Station Service Voltage Transformers. If the package is damaged, they should open the package and inspect the product in the presence of the forwarder. The inspection process should be documented, and the details should be sent to the manufacturer.

2.2 Check before installation

2.2.1 The type and specifications of the Station Service Voltage Transformers comply with your order.
2.2.2 The Station Service Voltage Transformers are accompanied by all necessary documentation.
2.3.3 The grounding of the Station Service Voltage Transformer must be secure. The secondary terminals must not be short-circuited. The markings on the leads of the secondary windings must be correct and clearly visible.

2.3 Installation and use

2.3.1 The pressure of the SF6 gas must be maintained at 0.05 MPa (this is the transportation pressure) when installing the Station Service Voltage Transformer. After installation, the SF6 gas should be filled to the rated pressure of 0.65 MPa. The transformer must then be allowed to rest for no less than 24 hours. After this period, check the moisture content in the SF6 gas; the moisture level should be less than 150 μl/l. If all parameters are within specifications, the Station Service Voltage Transformer can be put into service.

2.3.2 Instruction for filling or replenishing the SF6 gas: You can loosen the cap of valve A, which is fixed to the base, using a spanner. Then, take valve F from the spare parts case, attach the metal conduit (which should be longer than 2 meters) and its connector. Connect valve F to the Inflation & Reclaim Equipment for SF6 (or to a bottle of SF6). Press the mandrel of valve F with the head of a bolt and exhaust the gas in the conduit for 1 minute. This will help clear valve F, the conduit, and the connector; otherwise, the moisture content may fail to meet the required level. Afterward, connect valve F to valve A and slowly fill or replenish SF6 gas to the rated pressure.
2.3.3 When connecting the secondary terminals, follow the markings on the secondary terminals and the connection diagram in the secondary terminal box.
2.3.4 Never short-circuit any of the secondary terminals of the Station Service Voltage Transformer!

2.4 Maintenance:
These Station Service Voltage Transformers require no special maintenance due to their excellent sealing performance. The insulation of the SF6 gas will not absorb moisture or affect its electrical performance. However, you should regularly check the SF6 pressure to ensure it remains within the green area on the density monitor.

2.5 Storage:
There must be no corrosive gases or materials around the storage area. The Station Service Voltage Transformers should be shielded, and the ambient temperature must not drop below -40°C. If you need to store the products for an extended period, ensure that the packaging remains intact.

2.6 Before reusing the Station Service Voltage Transformer after it has been out of service or stored for a long period, you must check the moisture content in the SF6 gas, the leakage rate, and the insulation of the terminals. If any of these parameters do not meet the required standards, corrective action must be taken before putting the transformer back into service.

3 Attached documents

3.1 Quality certificate
3.2 Routine test report
3.3 Instructions for product
3.4 Instructions for SF_6 density monitor

SSVT- SF_6 Gas Insulation Station Service Voltage Transformers

1 Technical Parameters

1.1 Rated voltages and highest voltages for equipments

Table 1 list of Rated voltages and highest voltages for equipments

No.	Rated voltage	Highest voltage for equipment
1	33	36
2	66(69)	72.5
3	115	123
4	132(138)	145
5	150(161)	170
6	220(230)	245
7	330	362
8	380(400)	420
9	500	550

1.2 Rated frequency is 50Hz or 60Hz

1.3 Rated secondary voltage

Secondary winding is 0.4/ $\sqrt{3}$ kV、0.12kV、0.24kV, 0.38/ $\sqrt{3}$ kV or according to the requirements of the client

1.4 Rated operating pressure of gas SF6 is 0.40-0.65MPa ; Minimum operating pressure of the gas SF6 is 0.55MPa

1.5 Rated power: 25、50、75、100/、125 and 333kVA or according to the requirements of the clients

1.6 System earthing conditions: Non-effectively earthed neutral system and effectively earthed neutral system

1.7 Arcing distance list in table 2 (for standalone installation)

Table 2

No.	Rated voltage (kV)	Arcing distance (mm)
1	33	≥410
2	66(69)	≥720
3	115	≥1010
4	132(138)	≥1160
5	150(161)	≥1350
6	220(230)	≥2010
7	330	≥2360
8	380(400)	≥3323
9	500	≥3980

1.8 Creepage distance of outer insulation please see Table 3 (for standalone installation)

Table 3

Pollution Level		Class Ⅱ (W1)	Class Ⅲ (W2)	Class Ⅳ (W3)
Creepage Distance (mm)	33	≥810	≥1013	≥1256
	66(69)	≥1450	≥1813	≥2248
	115	≥2520	≥3150	≥3906
	132(138)	≥2900	≥3625	≥4495
	150(161)	≥3400	≥4250	≥5270
	220(230)	≥5040	≥6300	≥7812
	330	≥7260	≥9075	≥11253
	380(400)	≥8400	≥10500	≥13020
	500	≥11000	≥13750	≥17050

2 Performance Requirements

2.1 Measurement of No-Load Voltage Ratio

The tolerance of the no-load voltage ratio for the Station Service Voltage Transformer shall not exceed ±5%.

2.2 Limits of Temperature Rise

Using the short-circuit simulated load method, with the primary winding short-circuited and the rated secondary voltage applied to the secondary winding, the temperature rise of the windings for the Station Service Voltage Transformer shall not exceed 75K.

2.3 Measurement of Short-Circuit Impedance and Load Loss

Apply a near-sine current at power frequency to one of the windings of the Station Service Voltage Transformer, with the other winding short-circuited. Measure the values and calculate the short-circuit impedance, which shall be within ±10% of the required value.

The load loss of the Station Service Voltage Transformer shall be within ±10% of the required value, with the correction applied at 75°C.

2.4 Insulation requirements

2.4.1 The insulation resistance between the secondary winding(s), the primary N terminal, and earth shall be no less than 1000 MΩ at 20°C.

2.4.2 Power-Frequency Withstand Voltage

a) The power-frequency withstand voltage applied between the primary winding, secondary winding(s), and earth, as listed in Table 5, shall be for 60 seconds. The secondary winding(s), frame, and case shall be connected to earth.

b) The power-frequency withstand voltage of the insulation between the secondary winding(s) and earth shall be 3 kV for 60 seconds.

c) The power-frequency withstand voltage of the insulation between the primary N terminal, secondary winding(s), and earth shall be 5 kV for 60 seconds.

2.4.3 The wet test for the current transformer power-frequency withstand voltage is listed in Table 5.

2.4.4 The rated switching impulse withstand voltage (peak) (Um ≥ 300 kV) for the primary, and the chopped lightning impulse voltage, are listed in Table 5.

2.4.5 The rated lightning impulse withstand voltage (peak) for the primary, and the chopped lightning impulse voltage, are listed in Table 5.

2.5 Partial Discharge Level: The partial discharge test shall be performed after the power-frequency withstand test. First, apply a prestressing voltage raised to 80% of the power-frequency withstand voltage, maintaining this for no less than 60 seconds. Then, gradually reduce the voltage without interruption to the specified partial discharge test voltage, either 1.2 Um or Um. The partial discharge shall not exceed 10 pC at 1.2 Um, and at 1.2 Um/3, the partial discharge shall not exceed 5 pC, as listed in Table 5.

2.6 Test at SF6 Gas Pressure 0 MPa: The current transformer must withstand the power-frequency withstand voltage for 5 minutes at an SF6 gas pressure of 0 MPa, as listed in Table 4.

Table 4 Insulation requirements for the primaries

Rated voltage (kV)		36	69	15	138	161	230	330	400	500
Power-frequency withstand voltage (r.m.s) (kV)		95	160	230	275	325	460	510	630	740
The wet test for the current transformer of power-frequency withstand (r.m.s) (kV)		95	160	230	275	325	460	510	630	740
Rated switching impulse withstand voltage (peak) (kV)		/	/	/	/	/	/	950	1050	1175
Rated lightning impulse withstand voltage (peak) (kV)		200	325	550	650	750	1050	1175	1425	1550
Chopped lighting impulse voltage (peak) (kV)		230	373	635	750	865	1208	1351	1640	1930
Power-frequency withstand voltage at the SF_6 gas pressure 0MPa (kV)		30	54	95	109	128	190	272	315	413
Partial discharge level	Prestressing performed voltage (r.m.s) (kV)	76	112	184	220	260	368	408	504	592
	Test voltage $1.2U_m$ or U_m (kV) PD≤10pC	49	87	126	145	170	252	363	420	550
	Test voltage $1.2U_m/\sqrt{3}$ (kV) PD≤5pC	28	50	87	100.5	118	174	252	291	381

2.7 Short-Circuit Withstand Capability: The Station Service Voltage Transformer must be designed and constructed to withstand, without damage, the mechanical and thermal effects of an external short circuit when energized at the rated voltage for a duration of 1 second.

2.8 Gas Tightness: The relative amount of gas released in one year from the Station Service Voltage Transformer must not exceed 0.1% of the rated SF6 pressure.

2.9 Moisture Content in SF6 Gas: The moisture content in SF6 gas must not exceed 150 μl/l.

2.10 Polarity: All terminals marked A, 1a, …, and da must have the same polarity at the same instant.

2.11 Radio Interference Voltage: The radio interference voltage for Station Service Voltage Transformers with Um ≥ 126 kV must not exceed 500 μV at 1.1 Um/3.

2.12 Transmitted Over-Voltage: The transmitted over-voltage (Us) for Station Service Voltage Transformers with Um ≥ 72.5 kV must not exceed 1.6 kV when a peak voltage of Up (1.6 × 2/3 Um) is applied to the primary winding(s).

2.13 Terminal Markings: A and N are the primary terminals; 1a and 1n (or 2a, 2n, etc.) are the secondary terminals.

2.14 Mechanical Requirements (for Standalone Installation): The primary terminals of the Station Service Voltage Transformer (P1 and P2) must support the test mechanical loads listed in Table 5, with horizontal (in two directions) and vertical loads applied to the primary terminals for a duration of 60 seconds. The mechanical loads during normal service of the Station Service Voltage Transformer must not exceed 50% of the test loads.

Table 5 Mechanical requirements for the primary terminals

Rated voltage (kV)	36	69	15	138	161	230	330	400	500
Mechanical requirements (horizontal of two directions and vertical) (N)	1000	1500	2000	2000	2000	3000	3000	3000	3000
Applied to the primary terminals with duration (s)	60	60	60	60	60	60	60	60	60

3 Frame Instruction

3.1 It is a single-phase Station Service Voltage Transformer, with SF6 gas as the insulation material.

3.2 The bushing of the Station Service Voltage Transformer is made of silicone rubber or porcelain (for standalone installation). Inside the transformer, there are aluminum electrodes to improve the electric field distribution.

3.3 A pressure relief device is located at the top of the Station Service Voltage Transformer. If the pressure exceeds 1.3 MPa (and the transformer discharges internally), the relief device will break to release the pressure and trigger an alarm.

3.4 A SF6 density monitor is installed at the base of the transformer. It indicates the SF6 pressure inside the Station Service Voltage Transformer (the indicated value corresponds to the SF6 pressure at 20°C). The monitor will also provide an alert if the SF6 pressure drops below the minimum service pressure, reminding the user to replenish the SF6 gas to the rated pressure.

3.5 The secondary terminal block is cast in epoxy resin, and the frame of the secondary terminal box is a sealed structure, making it suitable for outdoor use.

4 Outline and the Installation Dimensions

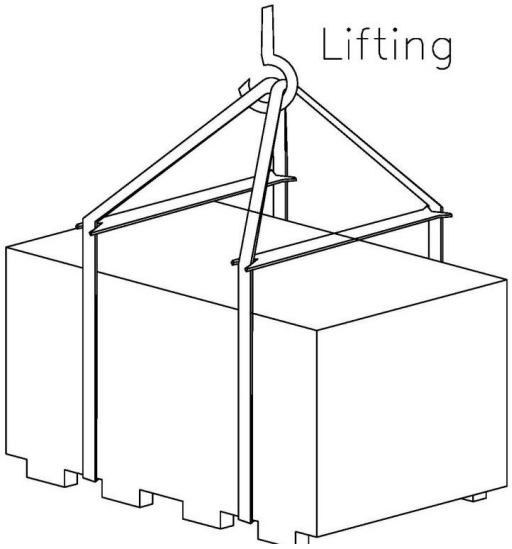
For the outline and installation dimensions, please refer to Drawing 1 (standalone installation). The dimensions of the primary terminals are provided in Table 6.

Table 6

Rated voltage (kV)	Rated power (kVA)	H (mm)	H1 (mm)	W1 (mm)	W2 (mm)	D (MM)
33	25	1350	850	335	335	16
	50	1480	980	335	335	16
	75	1480	980	335	335	16
	100	1620	1120	450	450	16
	125	1620	1120	450	450	16
66(69)	25	1650	930	400	400	20
	50	1650	930	400	400	20
	75	1780	1060	600	600	24
	100	1922	1202	600	600	24
	125	1922	1202	600	600	24
115	25	2005	805	600	600	24
	50	2005	805	600	600	24
	75	2272	1072	600	600	24
	100	2435	1235	600	600	24
	125	2435	1235	600	600	24
132(138)	25	2005	650	600	600	24
	50	2005	650	600	600	24
	75	2272	917	600	600	24
	100	2435	1080	600	600	24
	125	2435	1080	600	600	24
150(161)	25	2125	581	600	600	24
	50	2125	581	600	600	24
	75	2375	831	600	600	24
	100	2568	1024	600	600	24
	125	2568	1024	600	600	24
220(230)	25	3670	1420	600	600	24
	50	3670	1420	600	600	24
	75	3822	1572	600	600	24
	100	3982	1732	600	600	24
	125	3982	1732	600	600	24

330	25	4450	1500	600	600	24
	50	4522	1572	600	600	24
	75	4630	1680	600	600	24
	100	4730	1780	600	600	24
	125	4730	1780	600	600	24
380(400)	25	4920	1620	600	600	24
	50	4920	1620	600	600	24
	75	4920	1620	680	680	32
	100	4920	1620	680	680	32
	125	4920	1620	680	680	32
500	25	6220	1970	600	600	24
	50	6220	1970	600	600	24
	75	6438	2188	680	680	32
	100	6550	2250	680	680	32
	125	6550	2250	680	680	32

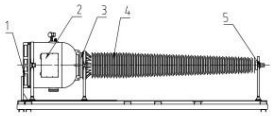
5 Lifting products



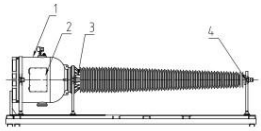
Lifting and Handling Procedures



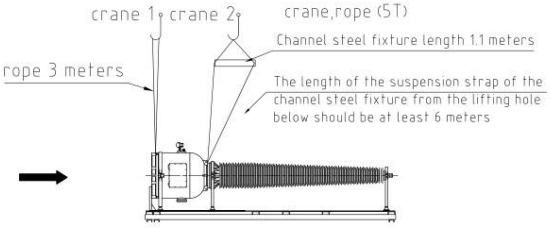
Unpack the side plates and top cover plate



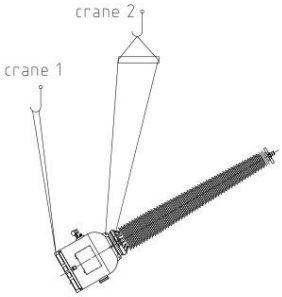
Remove the bolts for the products fix on the packing frame structure, No.1--5.



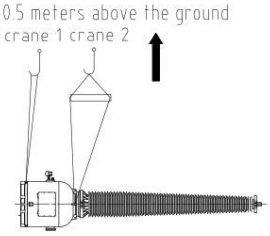
Remove the semi-circular fixing ring 1--4



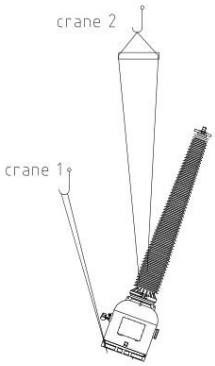
Installation of hooks and straps



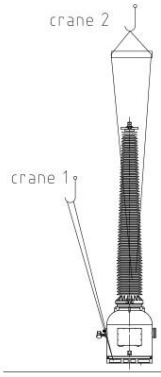
Hook 2 rises slowly,hook 1 descends slowly,and the product gradually tends to stand upright.Note that hook 1 and hook 2 cannot move at the same time.Keep the lowest point about 0.2-0.5 meters above the ground



Hook 1 and Hook 2 rise simultaneously to lift the product away from the packaging rack,then move the product to an open position and lower it to about 0.2-0.5 meters above the ground



When the product is close to vertical,pay attention to observing that the channel steel fixture of hook 2 will not collide with the sleeve



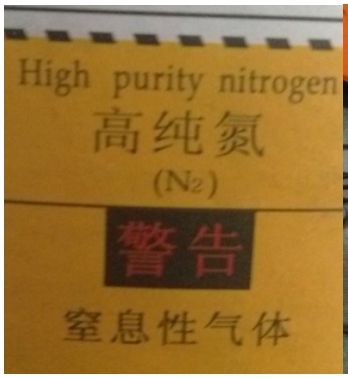
Slowly lower hook 1 until the product is in a vertical position,the lower hook 2 and place the product vertically on the ground or move it to a suitable location.

6 Gas Filling Procedure

1st step: Drying the Gas Filling Pipe

Although all the gas filling pipes are dried before delivery, we recommend drying the pipes again before use to ensure better results.

Necessary items：high purity Nitrogen, gas filling pipe (with sampling valve) , screwdriver






1. Connect the pipe to the high-purity nitrogen gas bottle. Ensure that the gas valve of the nitrogen bottle is in the OFF position.



2. After making the connection, ensure that the sampling valve is in the ON position (turn counterclockwise to open).



3. Open the gas valve of the nitrogen gas bottle and ensure that the pointer on the pressure gauge shows around 2.0 MPa.



4.Then, close the sampling valve by rotating it clockwise (to the OFF position) and ensure that the pointer on the left shows around 0.1–0.2 MPa.



5. Use the screwdriver to press against the joint thimble in the pipeline and flush the pipe with nitrogen for 2–3 minutes.

NOTE: The outlet of the pipe should not be directed toward the operator.

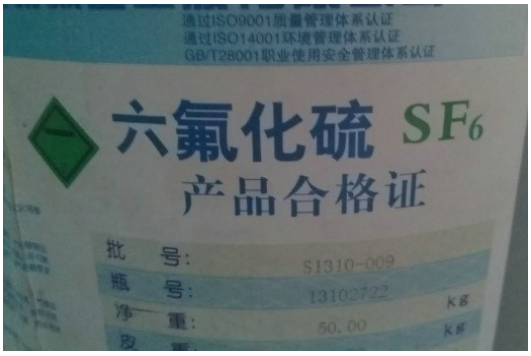


6. Close all the valves after drying, and remove the sampling valve from the Nitrogen gas bottle.



2nd step: Filling the SF6 Gas into the Product

Necessary items：SF6 gas, gas filling pipe (with sampling valve) , unit





1. Connect the pipe to the SF6 gas bottle as shown in the following picture. Ensure that the gas valve of the nitrogen gas bottle is in the OFF position.





2. Ensure that the sampling valve is in the ON position after making the connection (rotate counterclockwise to open).



3. Connect the other end of the pipe to the valve of the unit.





4. Open the gas valve of the SF6 gas bottle and ensure that the pointer on the pressure gauge shows around 2.0 MPa.



5. Then, close the sampling valve by rotating it clockwise (to the OFF position) and ensure that the pointer on the left shows around 0.2 MPa. The SF6 gas filling of the product has now begun. Carefully adjust the sampling valve to maintain a pressure difference of 0.1–0.15 MPa between the sampling valve and the density meter on the product.



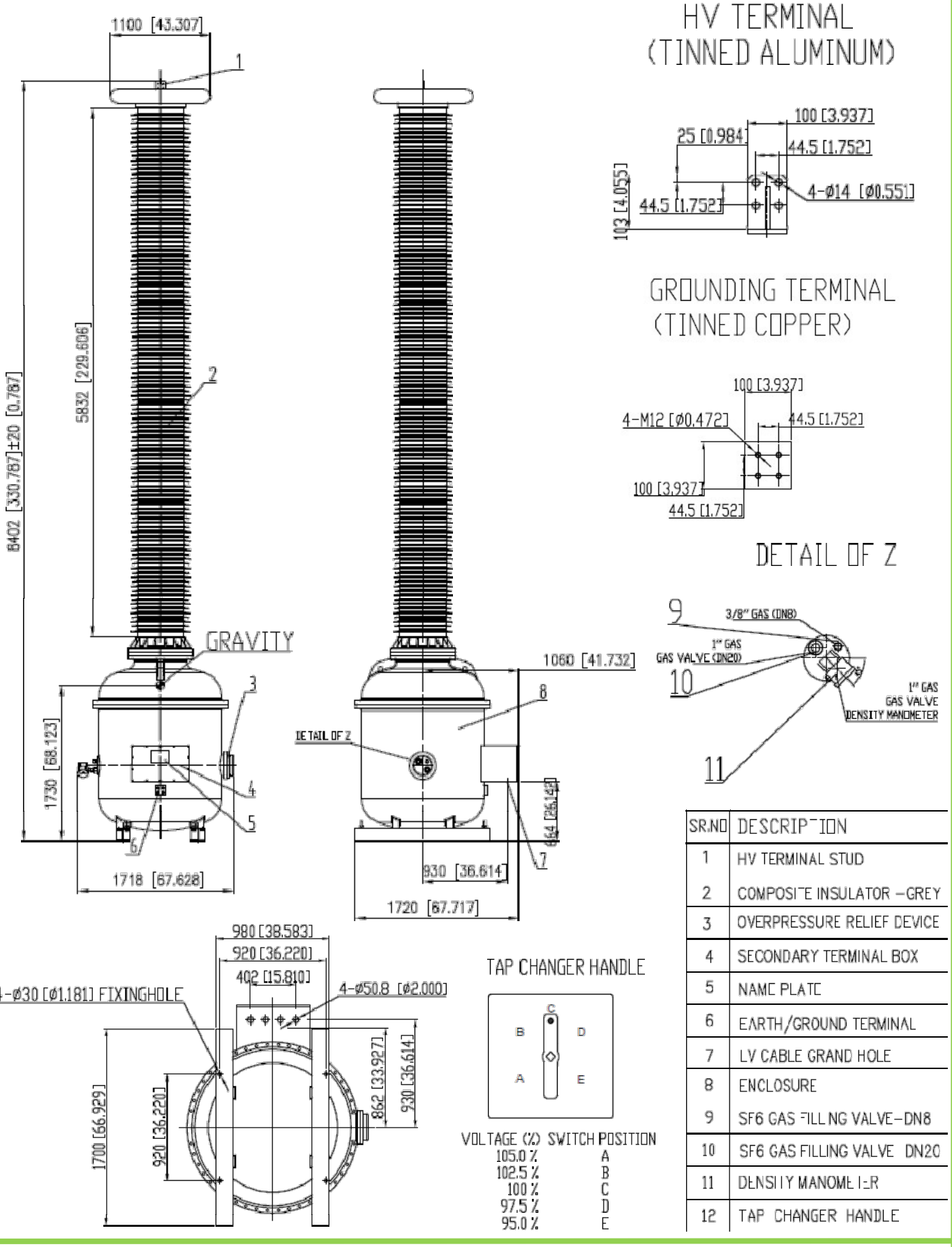
6. When the gas pressure on the density meter of the product reaches 0.65 MPa (a little more SF6 gas can be added, as some will be released during the SF6 gas micro-water content test), stop the gas filling. Then, close the sampling valve by rotating it clockwise (to the ON position), close the valve on the SF6 gas bottle, and remove the sampling valve from the SF6 gas bottle. Finally, disconnect the pipe from the product.





7. Drawings

7.1 Outline Drawing

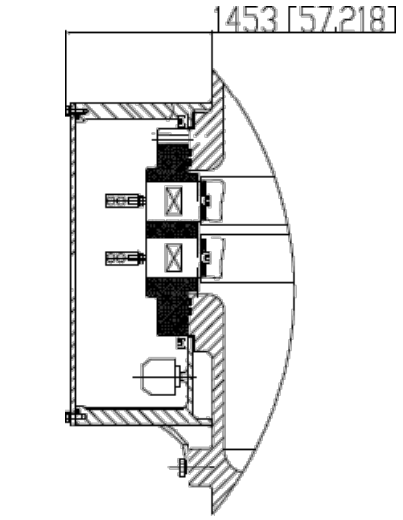


SR.NO	DESCRIPTION
1	HV TERMINAL STUD
2	COMPOSITE INSULATOR –GREY
3	OVERPRESSURE RELIEF DEVICE
4	SECONDARY TERMINAL BOX
5	NAME PLATE
6	EARTH/GROUND TERMINAL
7	LV CABLE GRAND HOLE
8	ENCLOSURE
9	SF6 GAS FILLING VALVE–DN8
10	SF6 GAS FILLING VALVE DN20
11	DENSITY MANOMETER
12	TAP CHANGER HANDLE

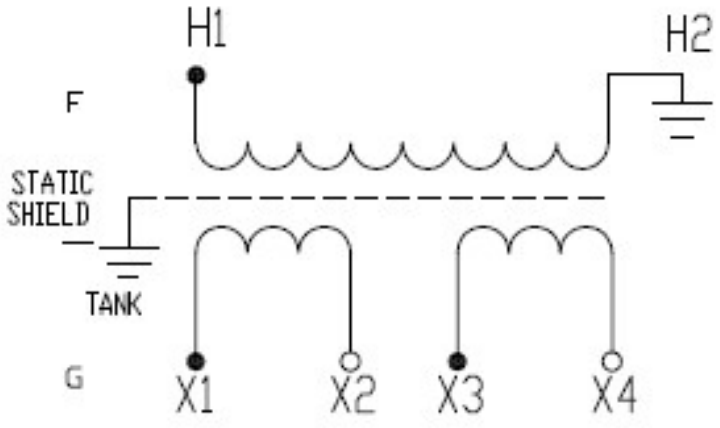
7.2 Nameplate Drawing

To be provided

8.3 Secondary Terminal Box Drawing

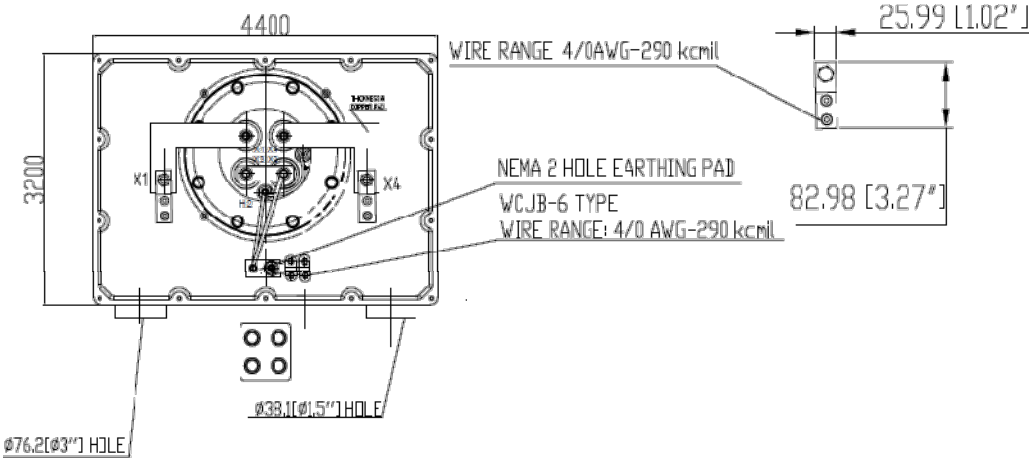


HOLE PAD(COPPER)-ELECTRO TIN

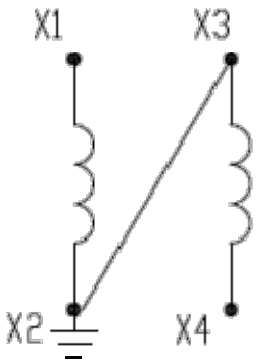


SUBTRACTIVE POLARITY

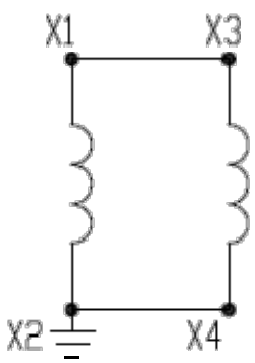
SERIES CONNECTION 240V



SERIES CONNECTION 240 V

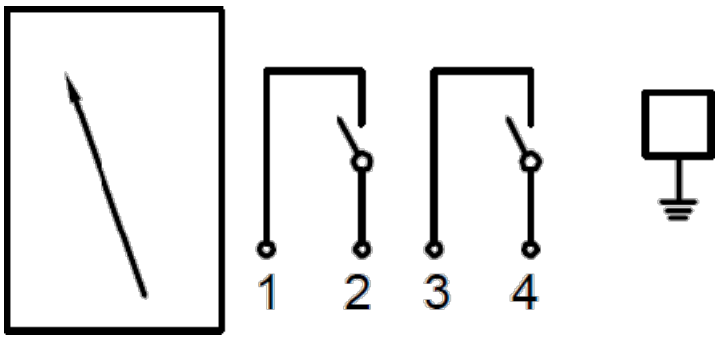


PARALLEL CONNECTION 120 V

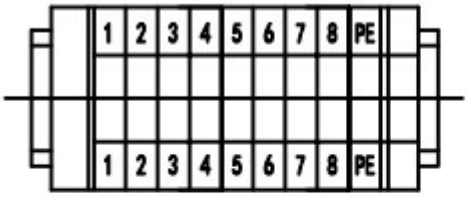


7.4 SF6 Densimeter Low Pressure Warning Diagram Drawing

RATED PRESSURE 0.50 MPa SF6
1-2 ALARM PRESSURE □PERATING PRESSURE 0.48 MPa SF6 (N□ contact)
3-4 MINIMUM □PERATING PRESSURE 0.45 MPa SF6 (N□ contact)



Terminal block



1-2, 3-4 Alarm (Density manometer)
5-6, 7-8 Lock (Density manometer)

Accessory terminal	Phoenix USLKG 6N	1
Accessory terminal	Phoenix UK6N	8
NAME	Type	QUANTITY

8 Checks and Maintenance

If any other issues occur with the equipment, please contact our company promptly and provide the following information:

Nameplate details and specifications of the equipment (Name, Serial Number, Type, and Date of Manufacture)

A detailed description of the issue (including the situation immediately before and after the problem occurred)

If maintenance is required, please contact:

Add：S9419 E US Highway 175 Kemp, TX 75143

Tel： (877) 348-9680

Fax： (903) 498-3364

Web：www.larsonelectronics.com

E-mail: sales@larsonelectronics.com