

⚠ Caution for safety

- Before use, please read the safety rules and safety cautions first to use it exactly.
- After reading the instruction manual, keep it at a place where user can always see it.

Cast Resin Transformer Instruction Manual



Before handling LS cast resin transformer, read this instruction manual first.

If you have any questions, or any uncertainties among the contents of this instruction manual, please contact us on the following.

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This instruction manual contains detailed information on the installation, operation and maintenance of LS cast resin transformer. Each transformer has its unique specifications and structural features. These features are specifically described on the outside view and nameplate of the corresponding transformer. The installation of this electrical equipment requires special qualification or education. To fully understand the special requirements, please take a look at the corresponding national and industrial standards.

Safety

Instruction manual

Safety rules

1. The following 'safety precautions' is for prevention of accidents or risks by using the product safety and properly, please keep them all the time.
2. When loading, unloading, transporting or installing a transformer, do not perform work without proper equipment.
3. When loading, unloading, transporting or installing a transformer, maintain the transformer horizontally to prevent mechanical shocks.
4. When storing a transformer for a long time, store it indoors to prevent any kinds of damages from weather.
5. Connection of a transformer must be done according to the direction of the nameplate. Therefore do not change its structure at your discretion.
6. When checking a transformer, observe it with safety equipment and according to safety rules.
7. With the transformer power turned on, do not execute any work such as tap changes or checking accessories.
8. Protection measures are necessary to prevent persons, animals or conductors from touching the vicinity of active transformer.
9. The installation, maintenance and operation of transformers shall be performed only by skilled and qualified staffs

**This instruction manual is based on our standard type.
If you have particular requirements on specification,
Please combine this instruction manual with the final drawings you
submitted. In correct operation can cause system accidents or
malfunction of equipment.**




Safety

Instruction manual

Safety Precautions

The following safety precautions are for prevention of accidents or risks by using the product safely and properly, Please keep them all the time.

The safety precautions are divided into three kinds such as "danger", "warning", "caution" depending on risk degrees, where the meanings of graphical symbols are as follows.

 Danger	A case in which serious injuries or deaths can immediately happen if the mark is violated
 Warning	A case in which serious injuries or deaths can happen if the mark is violated
 Caution	A case in which light injuries or product damage can happen if the mark is violated

The meanings of the graphical symbols mounted on the product and here are as follows.



- This graphical symbol is a symbol to call your attention to matters and operations that can cause risks.
- Read the part where there is this symbol carefully and follows the directions to avoid occurrence of risks.

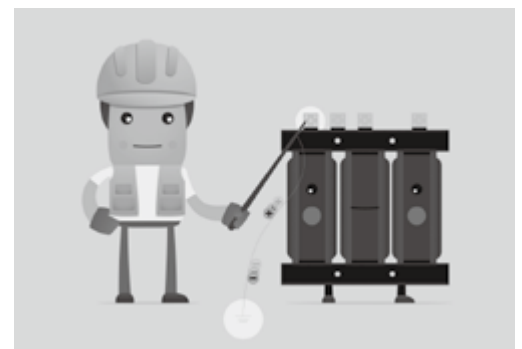


- This graphical symbol is a symbol indicating cautions because there is a possibility of electric shocks under particular conditions.



Danger

- **Before handling the transformer, shut off the supplied power by all means**
Otherwise, serious injuries or deaths can be caused through electric shocks.
- **Before handling or checking the transformer, ground the live part such as coils, etc. with a proper grounding device to discharge all the stored charges.**
Otherwise, serious injuries or deaths can be caused through electric shocks.

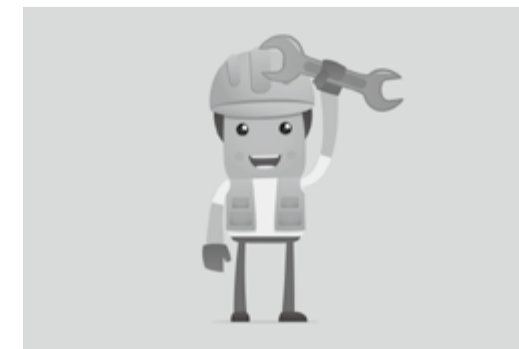


Safety

Instruction manual

Danger

- **To use this device safely, persons with enough knowledge and skill shall handle it.**
Otherwise, injuries, electric shocks or system accidents can be caused.
- **Understand device knowledge, safety information and safe precautions enough by all means before performing installation, operation, checks or maintenance work.**
Otherwise, injuries, electric shocks or system accidents can be caused.
- **When making sure that power is OFF, do not rely on visual marks such as switch positions or fuse removal status. Regard the terminals as live before making sure of it with a proper instrument to guarantee that the terminal power is OFF and grounded.**
Otherwise, injuries, electric shocks or system accidents can be caused.
- **If an abnormality happens, turn off all the power and make sure that the transformer is OFF before checking the transformer. Do not re-input the transformer power before the cause for operation of the 1st side protection device has been solved**
Otherwise, injuries, electric shocks or system accidents can be caused.
- **Never touch the transformer with power turned ON in the high voltage coil or low voltage coil of the transformer.**
Otherwise, injuries, electric shocks or system accidents can be caused.
- **Do not open the protection cover or remove the enclosure with power turned ON in the transformer.**
Otherwise, injuries, electric shocks or system accidents can be caused.
- **When inputting power to the transformer, close the enclosure door and the protection cover.**
Otherwise, injuries, electric shocks or system accidents can be caused.
- **Never change the tap voltage of the transformer with power turned ON.**
Otherwise, injuries, electric shocks or system accidents can be caused.
- **When working around the transformer, use insulated tools and wear the designated protection equipment and garments.**
Otherwise, injuries, electric shocks or system accidents can be caused.
- **Do not disassemble the components of the transformer.**
Otherwise, injuries, electric shocks or system accidents can be caused.



Safety

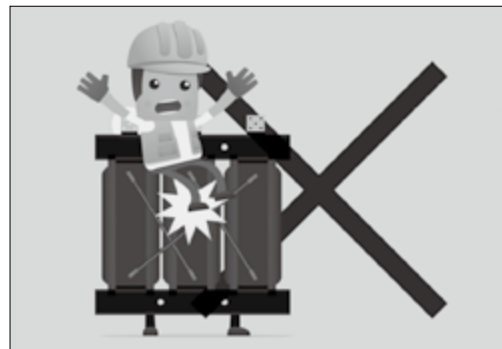
Instruction manual



Warning

- **Do not step on the inter-phase leads, busbars or cooling fans of the transformer.**

Otherwise, serious injuries or deaths can be caused.



- **Do not push the coil part of the transformer with force.**

Otherwise, serious injuries or deaths can be caused.

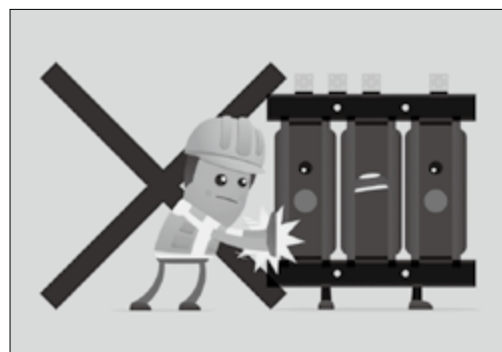
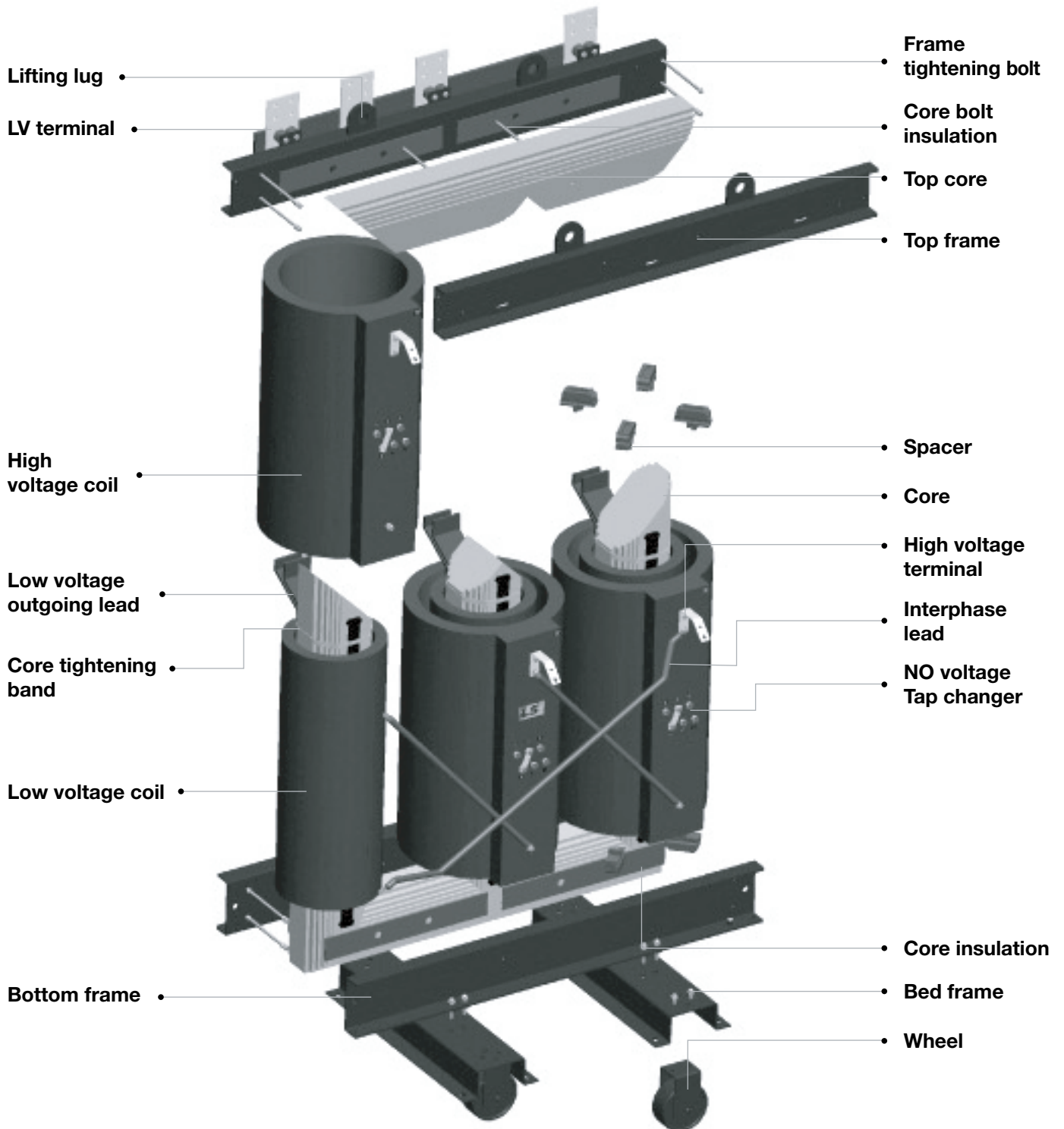


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Structure of Cast Resin Transformer



Acceptance and Transportation of Cast Resin Transformer

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2. Acceptance and transportation of Cast Resin Transformer


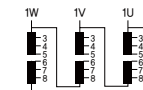
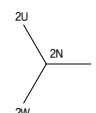
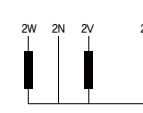
2.1 Product acceptance inspection

Cautions

- Before loading or unloading a transformer, perform the following pre-checks.
 - If any damage or defect is found, then inform the transporter of it immediately and contact us. If there is any abnormality, do not install the product without confirmation of us.
-
- **2.1.1** Remove the protection cover.
 - **2.1.2** Check whether the serial number on the transformer nameplate coincides with the shipping document report. If the serial number doesn't coincide, then contact us.
 - **2.1.3** Check the shipping documents, and review whether the contents are perfect.
 - **2.1.4** Check whether there is no damage to the components, etc. during transportation and whether the quantity coincides.
 - **2.1.5** If any damage or defect is found during product acceptance inspection on site, then inform the transporter immediately, with the transformer damage condition in the receipt, and contact us.
 - **2.1.6** If no damage or defect is found during product acceptance inspection on site, then load or unload the product according to the following handling criterion.

Transformer nameplate (Example)

APPLIED STANDARD				IEC60076-11				VOLT.[V]		CON.		TERM.		VOLT.[V]		TERM.			
PHASE				3				F23100		5-6		1U		400		2U			
FREQUENCY				60 [Hz]				F22550		4-6						2V			
TYPE OF COOLING				AN				R22000		4-7		1V		2W					
RATED CAPACITY				2000 [kVA]				21450		3-7		1W		231		2U-2N			
RATED VOLTAGE				HV				22000 [V]		20900		3-8				2V-2N		2W-2N	
				LV				400 [V]											
RATED CURRENT				HV				52.5 [A]											
				LV				3666 [A]											
LI WITHSTAND VOLT.				(HV/LV)				125/- [kV]											
AC WITHSTAND VOLT.				(HV/LV)				50/3 [kV]											
INSULATION CLASS				(HV/LV)				F/F											
TEMPERATURE RISE				(HV/LV)				95/95 [K]											
IMPEDANCE								6.0 [%]											
ENVIRONMENTAL / CLAMATIC / FIRE								E2/C2/F1											
DEGREE OF PROTECTION								IP00											
TR. WEIGHT (TOTAL)								5050 [kg]											


VECTOR GROUP : Dyn11					
				SERIAL NO.: 200XXXXX MFD.: YYYY.MM.	

MADE IN KOREA **LSIS**

Acceptance and Transportation of Cast Resin Transformer

Instruction manual

Checkpoint before installation

 Caution	
Appearance and component	<ul style="list-style-type: none"> ● Nameplate (phase, voltage, capacity, wiring, etc.) ● Component (Basic and optional) ● Bolt/nut joining condition ● Transformer appearance
Core and coil	<ul style="list-style-type: none"> ● Core appearance ● Coil appearance ● Tap terminal including insulation caps ● Low/high voltage terminal ● Phase connection with busbars

2.2 Loading/unloading/transportation

When handling a cast resin transformer, observe the following safety precautions.

Danger

- The center of gravity of the transformer is located at the top to fall easily when a forklift is used, which requires utmost caution.
- Do not load/unload the transformer using an arbitrary part of the transformer structure, but only its lifting eyes.
- When loading, unloading, transporting or handling a transformer, prohibit access of unnecessary persons around.

● 2.2.1 Loading/unloading with cargo cranes

- a. Select and use proper machines and tools for loading/unloading the transformer according to the work conditions or the weight of transformer. The transformer weight is described on the nameplate.
- b. Because the center of gravity of the transformer is located at the top, when loading/unloading the transformer, be sure to use cranes and use all of the 4 lifting eyes. In addition, when using the lifting eyes, let the angle of the lifting cable be within 60°



Acceptance and Transportation of Cast Resin Transformer

Instruction manual

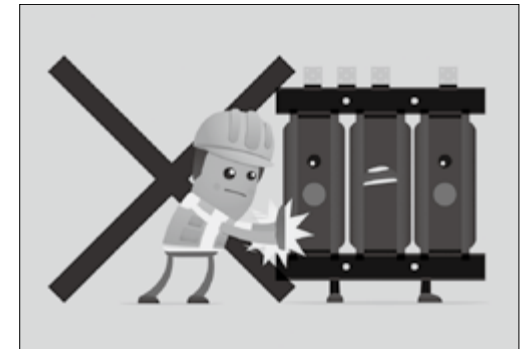
● 2.2.2 Loading/unloading with forklifts

- a. When moving a transformer using a forklift, use the wood packing base or the transportation support installed at the bottom of the transformer.
- b. When loading/unloading/moving a transformer using a forklift, work on a flat and even floor.

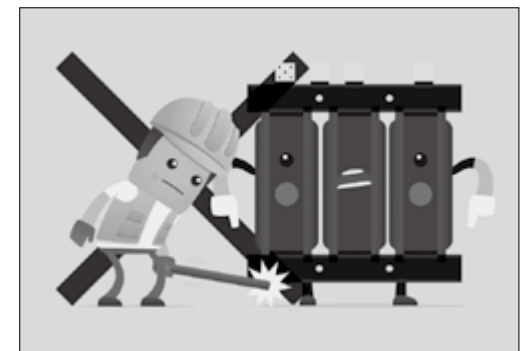
● 2.2.3 Bringing-in and moving work

- a. After the transformer is unloaded, move it inside with a crane. If it is impossible to use a crane, then let a professional installer put the transformer on a transportation roller cart and move it. When pulling the transformer on the transportation roller, use the tow holes at the bottom frame of the transformer. Pulling it through other parts can cause deformation or damage to the transformer.

- b. Applying force to the important parts (coil, terminal connection, etc.) when moving a transformer can cause damage, so be sure to use the designated part (the lifting eyes at the top frame supporting the core) to move it.



- c. When moving and handling a transformer, do not lift the core part directly to move it. Deformation of cores can cause generation of abnormal noises from the transformer.



2.3 Unpacking

- 2.3.1 The transformers are completely packed and then shipped for safety of the product.
- 2.3.2 As soon as the transformer is delivered, check whether there is any damage to it during transportation.
- 2.3.3 Keep the transformer packed as long as possible until installation of the transformer is finished.

3. Storage of Cast Resin Transformer

When storing a transformer, it is better to store it inside a building with a concrete floor. When storing a transformer, observe the following safety precautions.

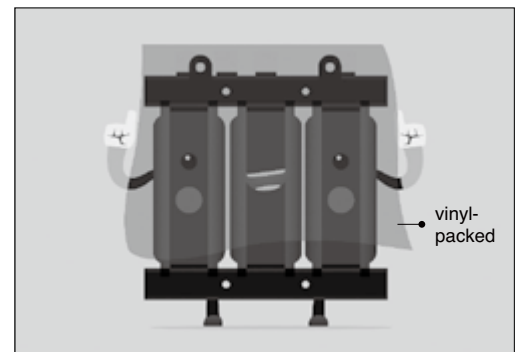


Caution

- Pack the transformer body and wirings using vinyl covers or moisture-proof paper to prevent them from being exposed to the air, and store them in a well-ventilated indoor room without direct sunshine and moisture.
- When using a transformer after long-term storage, dry the transformer completely, measure its insulation resistance, and then use it.

If it is necessary to store a transformer for a long time without use after receiving it, store it in a dry, clean, direct sunlight free and normal-temperature place in the **vinyl-packed** condition.

When storing a transformer for a long time, check whether there is no damage such as rusting, etc. periodically. When reusing a transformer after long-term storage, be sure to measure its insulation resistance before use, and if you have any question, contact us.



3.1 For dry-type transformers, indoor installation is standard. In addition, store them in a place without mechanical shocks, moisture, dust and direct sunlight. If it is impossible to store transformers indoors, seal them to avoid environmental effects and run a heater to prevent dew condensation on the surface of transformer.

3.2 When humidity is high or it's a rainy season, install silica gel, etc. and ventilate the room properly.

3.3 When installing transformers that have been stored in an outdoor warehouse in winter, remove the dust, etc. from the coil surface, dry them enough, and then use them.

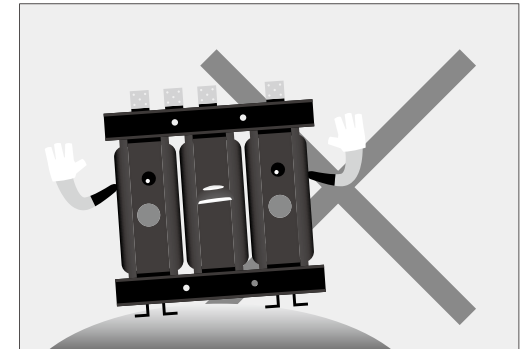
4. Installation of Cast Resin Transformer

4.1 Conditions for installation places

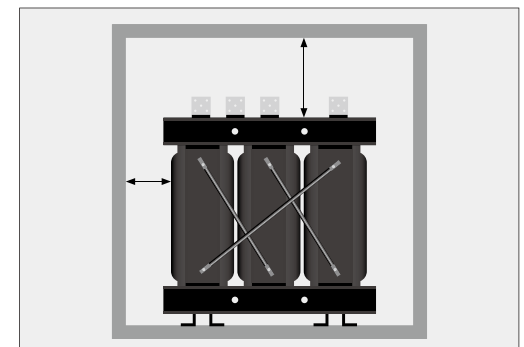
- 4.1.1 Installation place: indoors
- 4.1.2 Ambient temperature: maximum 40°C, minimum -5°C, daily average 30°C or less
- 4.1.3 Relative humidity: 90% or less
- 4.1.4 The installation place shall have a flat floor, have clean surroundings, and have a structure to support the transformer weight and endure earthquakes or vibrations enough.
- 4.1.5 The installation place shall be easy to check, ventilate and access after installation of transformers.

4.2 Transformer installation place

- 4.2.1 When installing transformers, follow the electric safety laws and regulations.
- 4.2.2 Keep the vents located at the top/bottom part of the enclosure of the transformer free of foreign substances, and separate them from other objects at least 600mm to make transformer ventilation smooth.
- 4.2.3 When installing transformers, install them on a reinforced concrete foundation that can endure the weight of the transformers enough. Do not install transformer directly on the ground.



- 4.2.4 The floor must have a drainage system.
- 4.2.5 When installing transformers in an enclosure, keep a minimum insulation distance between the transformer's live parts (live terminal, coil surface) and the structure.



- **4.2.6** The transformer noises can be increased by reflection from the wall, floor or ceiling and by vibrations of the parts connected to the transformers. Therefore, leave an enough separation distance to prevent reflection or vibrations of sounds when installing transformers.
- **4.2.7** In case of installing transformer in an enclosure, the temperature inside the enclosure can exceed 40°C on average due to heating, please be caution. In addition, if the ambient temperature exceeds 40°C, operate the transformer at a reduced rated output, and for details, contact us.

4.3 Transformer handling and access restriction

- **4.3.1** Install transformers at a safe place that can be accessed only by licensed persons.
- **4.3.2** The Transformer is not allowed to be operated by anyone, but only by licensed persons.
- **4.3.3** When installing transformers, observe the following safety precautions.



Danger

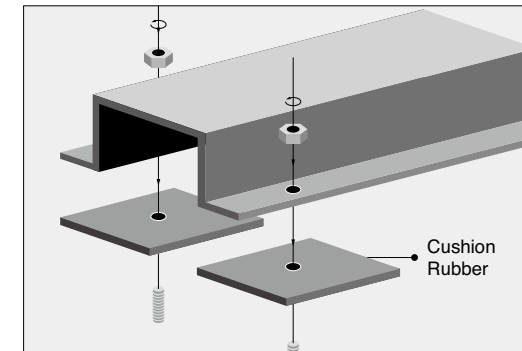
- The transformer is not allowed to be operated by anyone, and is restricted in handling. Only the licensed persons can operate the transformer.

4.4 Horizontal level

The bottom base of the transformer shall be totally adhered to the floor. If the base is not adhered to the floor, noises can be increased by vibrations.

4.5 Foundation bolt fixing work

After the transformer has been positioned, insert cushion rubber beneath the bottom base and fix it into the fixing hole with foundation bolts.



4.6 Transformer protection

● 4.6.1 Installation of lightning or surge arrester

Install a lightning arrester or surge arrester of proper specification at the leading edge of the transformer terminals to protect the transformer, and because the international standard(IEC60071-2 Annex 2) specifies that the lightning arrester or surge arrester should be installed as close as possible from the transformer terminals, select a lightning arrester or surge arrester, considering the dielectric strength against the excessive abnormal voltage, which is essential for absorption of high voltage in the high voltage line of the transformer even in a worst case.

● 4.6.2 Grounding

When grounding a transformer, be sure to use the ground terminals installed at the transformer.



Danger

- When grounding a transformer, perform proper grounding according to the electric safety laws to prevent the voltage in the 2nd terminal from rising to an abnormal voltage.

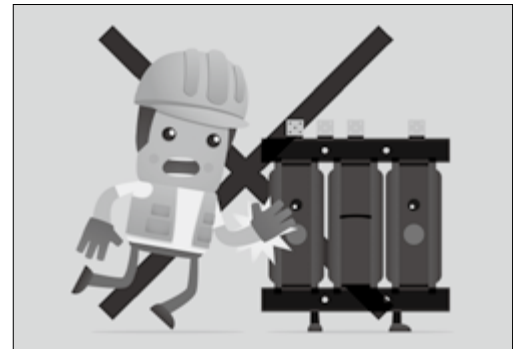
4.7 Wiring

When wiring a transformer, observe the following safety precautions.

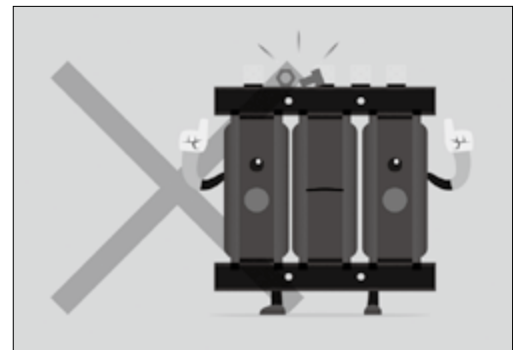


Danger

- Never touch the transformer while operating.
- Never change the tap terminals to adjust the tap voltage while live.



- After the wiring of the terminals and the tap terminals of the transformer has been finished, remove all the tools or metals from the transformer.



- **4.7.1** If the 1st and 2nd side terminals of the transformer are connected to the bus and the bus duct, then install a flexible bus to reduce damage and noises from the connection terminals due to vibrations.
- **4.7.2** When a cable is connected to the 1st and 2nd side terminals of the transformer, then support the cable rigidly and let the cable keep an insulation distance from the terminal and surface of the 1st side coil.
- **4.7.3** When connecting a cable to the 1st side terminal, take care to prevent application of excessive tensile force. Application of excessive force can damage the terminals.
- **4.7.4** If it is necessary to adjust the tap of the transformer, see the "Tap change" (page20) method.
For the wiring of the tap terminals, see the wiring diagram on the nameplate.

● **4.7.5 For wiring, please follow the please follow the below procedures.**

- a. Remove foreign substances from the terminal connection parts.
- b. The mechanical stresses by expansion and contraction can loosen the wired parts, so use leads of enough length.
- c. Use a torque wrench so that for all the parts tightened with bolts, their tightening force is managed as the value specified in this instruction manual. For standard torques, see the following table.

Bolt size	Torque(Nm)	
	Terminal part	Tap terminal part
M8	13	-
M10	26	20
M12	47	35
M14	-	86
M16	115	-

- d. When installing a transformer in a protection wire mesh or in an enclosure, be sure to keep the following insulation distance criterion.
(Secure more than a minimum insulation distance according to the separate applicable standards and electric safety criterion laws.)

Minimum insulation distance depending on voltages

Voltage (kV)	BIL (kV)	Minimum Clearance (mm)	
		Active – Earthed	Surface of Epoxy Resin– Earthed
≤1.1 kV	-	-	10
3.6 kV	40	60	50
7.2 kV	60	90	50
12 kV	75	120	75
17.5 kV	95	160	100
24 kV	125	250	150
36 kV	170	350	200

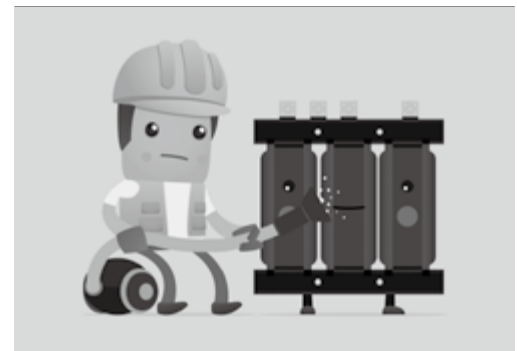
5. Test before use

When testing a transformer before use, observe the following safety precautions.



Danger

- The test shall be performed only by qualified persons.
- Dismantle all the high voltage, low voltage and ground wiring.
- Remove the wiring of accessories such as the lightning arrester cooling fan, thermostat, or low-voltage controller connected to the test-related windings.
- Do not remove the ground wires connected to the transformer frame.
- If foreign substances are attached to or dust is accumulated in the transformer, remove them using a vacuum cleaner or compressed air.



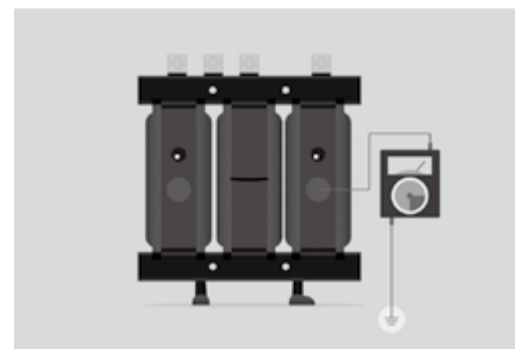
Before a transformer starts to be used after receiving power, perform the following tests at the transformer installation site. The clause 5.1 below is a recommended test, and the clause 5.2 is a test that should be performed if necessary.

5.1 Insulation resistance test

- **5.1.1** Measure the insulation resistance between each coil and between each coil and the ground.
- **5.1.2** When measuring insulation resistance, use a 1000V megger, and for the insulation resistance values, follow the following table.

Insulation resistance value

Measuring point	Measuring point insulation resistance(MΩ)
HV coil - Ground	500
LV coil - Ground	500
HV coil - LV coil	2000



- **5.1.3** For measurement of insulation resistance, please follow the below procedures.
 - a. Use a 1000V megger.
 - b. Undo the core ground wire connected to the bottom frame, and prevent the core ground wire from contacting the transformer ground.
 - c. Connect the ground lead of the megger to the core frame bolt.
 - d. Turn on the power of the megger.
 - e. After the test, be sure to reconnect the core ground wire.

5.2 Insulation test

Before performing a dielectric strength test for high voltage, be sure to measure the insulation resistance, and only if there is no abnormality, perform the test. The reference value for dielectric strength tests shall be within 75% of the factory test (the reference value described on the nameplate).

6. Operation

6.1 Power input

- **6.1.1** When inputting power into the transformer, please follow the below procedures.
 - a. Remove all the packing and packing bolts.
 - b. Check the operation of the cooling fan, thermostat, relay and accessory.
 - c. Check whether the position and wiring of the tap coincides with the transformer nameplate.
 - d. Check the torque of all wires according to the page 17(4.7.5 table), and check whether the insulation distance between the transformer enclosure and the busbar is proper.
 - e. Remove all the tools, devices or other unnecessary objects in the transformer enclosure.



Danger

- The transformer voltage shall be measured with a proper measuring instrument only by qualified persons.
-
- **6.1.2** Check whether the 1st/2nd voltage on the instrument coincides with that on the transformer nameplate.
 - **6.1.3** If the voltage doesn't coincide, adjust the voltage using taps.

6.2 Tap change

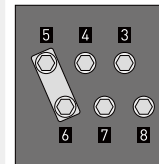
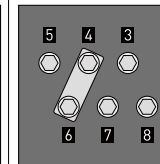
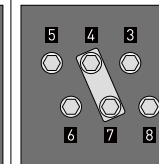
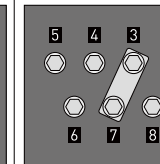
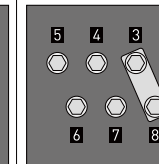


Danger

- Before conducting this procedure, read the safety rules in Section 2.
 - Never change the tap wiring with the transformer power turned on.
 - Shut off all the power, and before checking the transformer, check whether the transformer power is shut off.
 - To check the terminal voltage, use a proper measuring instrument to make sure that the transformer power is shut off.
 - When checking the power shut-off status, do not depend on the external status such as the switch position or the fuse removal status.
-

- **6.2.1** For the tap position change method, follow the following procedures.
 - a. Shut off the transformer power.
 - b. To deal with the high voltage coil of the transformer, open the door of the enclosure.
 - c. Discharge the residual charges in the coil using proper ground tools.
 - d. Move the tap terminals of each phase to the desired position. The tap changer shall be located at the same position for each phase.
(For double voltage or special wiring, see the transformer nameplate.)
 - e. When wiring taps, manage the torque.
 - f. After the tap has been replaced, make sure that all the tools, devices or other unnecessary objects are removed from the enclosure.
 - g. Close the door of the enclosure.
 - h. Turn on the transformer power.

- **6.2.2** Connection number of tap changer

Tap voltage	F34650	F33825	R33000	32175	31350
	F23100	F22550	R22000	21450	20900
	F10500	F10250	R10000	9750	9500
	F6300	F6150	R6000	5850	5700
Tap number	5-6	4-6	4-7	3-7	3-8
Connection diagram					

7. Maintenance

7.1 Check the transformer periodically. The checking period depends on the operation condition. If a transformer is operated in a general use condition defined in the standard, then it is enough to check it for a every 5 years.

7.2 However, in special places with air contaminated with particles such as dust or chemicals, check the transformer once per 3 months or more frequently. Determine an accurate checking period by grasping the situation after performing several checks initially.

7.3 For maintenance and repairs, follow the following procedures.



Danger

- Before conducting this procedure, read the safety rules in Section 2.
 - Before checking the transformer, use a proper ground tool to make sure that all the live charges were discharged.
-
- **7.3.1** Shut off the transformer power according to the following safety procedures.
 - a. Remove the debris or foreign substances cleanly from all vents.
 - b. To deal with the high voltage coil of the transformer, open the door of the enclosure.
 - c. Check the enclosure, and if defects are found, then grasp their causes and take actions if possible.
 - d. Repaint the defective part of the enclosure.
 - e. Replace the corroded part.
 - f. Clean the inner surfaces including the transformer coils according to the "Cleaning"(page23) procedure.
 - g. When turning on the transformer power, see the "Turning on the transformer power"(page20).

7.4 In case of serious defects



Danger

- If the transformer was damaged, do not input power into the transformer again.

- **7.4.1** If the transformer power is turned on, then shut off the transformer power according to the above safety procedures.
 - a. Open the door of the enclosure and check the external damage of the transformer. And if the transformer was damaged, contact us.
 - b. Use a torque wrench to check whether all bolts for transformer were tightened by the tightening torque (page 17).
 - c. Perform the test specified in the "Test before receiving power" (page 18) in Chapter 5. If the test results are unsatisfactory, then never turn on the transformer power, and perform maintenance and repairs according to the "Maintenance, repair" procedure in Chapter 7.

7.5 Cleaning



Danger

- Before conducting this procedure, be sure to read the "Safety rules" in Section 2 for safe use.
 - Before cleaning the transformer, use a proper ground tool to make sure that all the live charges were discharged.
-
- **7.5.1** To clean the transformer, follow the followings.
 - a. Shut off the transformer power according to the above safety rules.
 - b. To deal with the high voltage coil of the transformer, open the door of the enclosure.
 - c. Wipe all the parts of the transformer core. At this time, take care to avoid injuries by sharp parts or protrusions. Use a vacuum cleaner to remove dust or debris if possible.
 - d. Clean the dust or debris attached to the coil, frame, cable, busbar, insulator and other surfaces in the enclosure. Clean the bottom of the enclosure clearly. Wipe it using a vacuum cleaner or cleaning cloth.
 - e. Wipe the coil using an a cleaning cloth moistened with alcohol. Do not soak the cloth in the alcohol too much. After wiping the coils, and then dry it.
 - f. After the cleaning work has finished, remove all the cleaning cloths or other maintenance/repair tools from the coil. Recheck whether there are foreign substances at the top/bottom of and inside of the transformer.

8. Additional accessories

8.1 Temperature monitor

- **8.1.1** It is possible to install a temperature monitor additionally in the LS cast resin transformer. The transformer temperature monitor has functions of automatically turning ON/OFF the cooling fan and functions of alarm display and block signals. For details, see the maker's instruction manual.
- **8.1.2** The temperature monitor installed in LS cast resin transformer is set at the factory as indicated below and then shipped.
(Subjected to changes depending on users' requirements.)

Initial set point for temperature monitors

Division	Initial set temperature (Kind F)
Fan On	100°C
Fan Off	80°C
Alarm 1(Alarm signal)	140°C
Alarm 2(Shut-off signal)	150°C

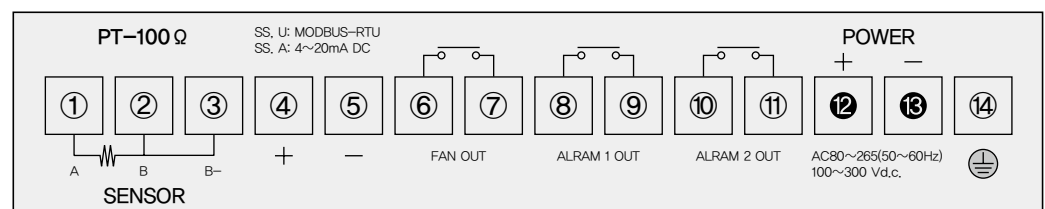
Note) The temperature detection sensor is PT-100Ω and it is inserted into the low-voltage coil (1000V or less).

- **8.1.3** To monitor and control the transformer temperature, the temperature is measured by a temperature sensor(PT-100Ω). This sensor measures the coil temperature to prevent damage due to overheating. In addition, loss is minimized through control of the cooling fan.
- **8.1.4** The kinds of the temperature monitors are P2-100, P2-300M, P2-400, P2-400CH, and for their usage, see the provided manual.

Example of thermometer displays and wiring diagrams (P2-100)



Display part	①	FND	Current temperature display
	④	PEAK FND	Maximum temperature display
	②	Alarm 1 LED	ON in the case of Alarm 1
	③	Alarm 2 LED	ON in the case of Alarm 2
Output part	⑤	FAN / AUTO LED	ON when the fan is automatically turned ON
	⑥	FAN / MANUAL LED	ON when the fan is manually turned ON
	⑦	COMM LED	ON during RS-485 communication
	⑧	FAULT LED	ON when PT-100Ω(sensor) is burnt or wrong wired
	⑨	BZ(BUZZER) ON LED	ON in the case of FAULT and alarm 1 or 2



8.2 Cooling fan

- **8.2.1** The cooling fan for the cast resin transformer is additionally supplied according to customers' request. For connection between the cooling fan and the temperature monitor, see the instruction manual for the temperature monitor.

8.3 Cushion rubber

- **8.3.1** The cushion rubber for the cast resin transformer is included in the product and supplied separately.
- **8.3.2** Insert the cushion rubber between the floor surface and the transformer bottom frame when installing a transformer.
- **8.3.3** For insertion position, insert the cushion rubber into the part tightened with bolts to fix the transformer.

8.4 Other accessories

When other accessories are additionally required and attached, see the instruction manual for additional accessories.

9. Troubleshooting

The followings are the checkpoints and measures for the troubleshooting types that can happen during operation of transformers.

Abnormal phenomenon	Cause of faults	Checkpoint and measure
Overheating	<input type="checkbox"/> Overload operation <input type="checkbox"/> Harmonics inflow <input type="checkbox"/> Unbalanced load <input type="checkbox"/> Enclosure ventilation area problem <input type="checkbox"/> Terminal connection part, tap terminal overheating <input type="checkbox"/> Cooling fan not working	<input type="checkbox"/> Reduce the load <input type="checkbox"/> Establish a measure for the harmonics filter <input type="checkbox"/> Check the load <input type="checkbox"/> Establish a measure for the enclosure ventilation <input type="checkbox"/> Check the bolting of the terminal connection part <input type="checkbox"/> Check the cooling fan
Cable overheating	<input type="checkbox"/> Bolt loosening <input type="checkbox"/> Unsuitable cable selection	<input type="checkbox"/> Join the cable bolt <input type="checkbox"/> Check the cable capacity and wiring condition
Voltage drop and zero potential	<input type="checkbox"/> Short circuit between turns <input type="checkbox"/> Tap terminal bolt loosening	<input type="checkbox"/> Contact us <input type="checkbox"/> Join the tap terminal bolt
Decline in the 2nd voltage	<input type="checkbox"/> Low input voltage <input type="checkbox"/> Error in the tap terminal wiring	<input type="checkbox"/> Adjust the tap terminal <input type="checkbox"/> Check the tap terminal position
Unbalanced voltage	<input type="checkbox"/> Unbalanced load <input type="checkbox"/> Incorrect tap terminal positions <input type="checkbox"/> Non-grounding & grounding bad	<input type="checkbox"/> Reduce the load <input type="checkbox"/> Check the tap terminal position <input type="checkbox"/> Check the ground current
Dielectric breakdown	<input type="checkbox"/> Continuous overload operation <input type="checkbox"/> Flashover due to foreign substances <input type="checkbox"/> Mechanical damage due to careless handling <input type="checkbox"/> Lightning & switching surge inflow	<input type="checkbox"/> Contact us
Breaker or fuse operation	<input type="checkbox"/> Load short circuit <input type="checkbox"/> Overload operation	<input type="checkbox"/> Check the power distribution and load <input type="checkbox"/> Reduce the load
Ground potential rise	<input type="checkbox"/> Static charge accumulation <input type="checkbox"/> Problem in the switchboard	<input type="checkbox"/> Check the switchboard
Vibration and noise	<input type="checkbox"/> Low frequency <input type="checkbox"/> Overvoltage input <input type="checkbox"/> Loosened frame bolts <input type="checkbox"/> Unsuitable tap wiring <input type="checkbox"/> Horizontality of the surface of installation place <input type="checkbox"/> Harmonics inflow	<input type="checkbox"/> Adjust the tap terminal position <input type="checkbox"/> Tighten the frame bolts <input type="checkbox"/> Check the tap terminal position <input type="checkbox"/> Insert cushion rubber in the floor <input type="checkbox"/> Attach filters
Smoke	<input type="checkbox"/> Dielectric breakdown	<input type="checkbox"/> Contact us
Insulation burnt	<input type="checkbox"/> Overvoltage due to lightning <input type="checkbox"/> Abnormal voltage in switching and lines <input type="checkbox"/> Foreign substances on the surface	<input type="checkbox"/> Attach a LA <input type="checkbox"/> Attach a SA <input type="checkbox"/> Remove foreign substances

9.1 If an abnormal symptom or problem happens during operation of the transformer, then shut off the transformer power immediately and take proper actions.

9.2 Proper pre-actions and preventive measures can minimize loss by abnormality.

9.3 If the problem is not solved, contact us.

10. Quality assurance

10.1 Free service

We provide free service when an abnormality happens under the normal operating condition without abnormal voltage or lightning invasion from the outside within the guarantee period from the purchase date.

Our product's guarantee period is 24 months from the product shipping date from the factory. If there are additional conditions for the contract, they should follow the contract.

10.2 Charged service

We provide a charged service in the following cases.

- **10.2.1** When the quality assurance period has been expired
- **10.2.2** When the quality assurance period is left

- Natural disaster
(fire, gas damage, earthquake, storm/flood, lightning, abnormal voltage, etc.)
- Fault due to careless handling or use(drop, shock, damage, unreasonable work, etc.)
- Fault due to arbitrary disassembly or repairs by unqualified persons, not our repair engineer from our factory or service center
- When a fault happens due to abnormality in power used or defects in connection devices

※ We don't take responsibility for safety accidents due to customer's mistake.

10.3 Service procedure

If an abnormality happens during operation of the product, then check the instruction manual once again and contact the near service center or the LS Industrial System's Cheongju factory to receive prompt checks and treatments.

- **10.3.1** When requesting a service for the transformer, check the followings and send them to us by telephone or fax.

- Customer name
- Address
- Telephone number
- Staff in charge
- Transformer capacity, voltage, serial number(described on the name plate)
- Problem contents

11. Disuse

- 11.1** Separate the steel materials and non-steel materials according to the ISO 14000 for the whole cast resin transformer, but divide the materials causing environmental contaminations and the materials reusable, and dispose of them to the designated place.
- 11.2** If there are some materials that you want to reuse, then contact us.
- 11.3** The materials generating toxic gases during incineration can cause respiratory diseases, so be sure to dispose of them to the permitted place.

Supplement

Instruction manual

Contact address in case of abnormality

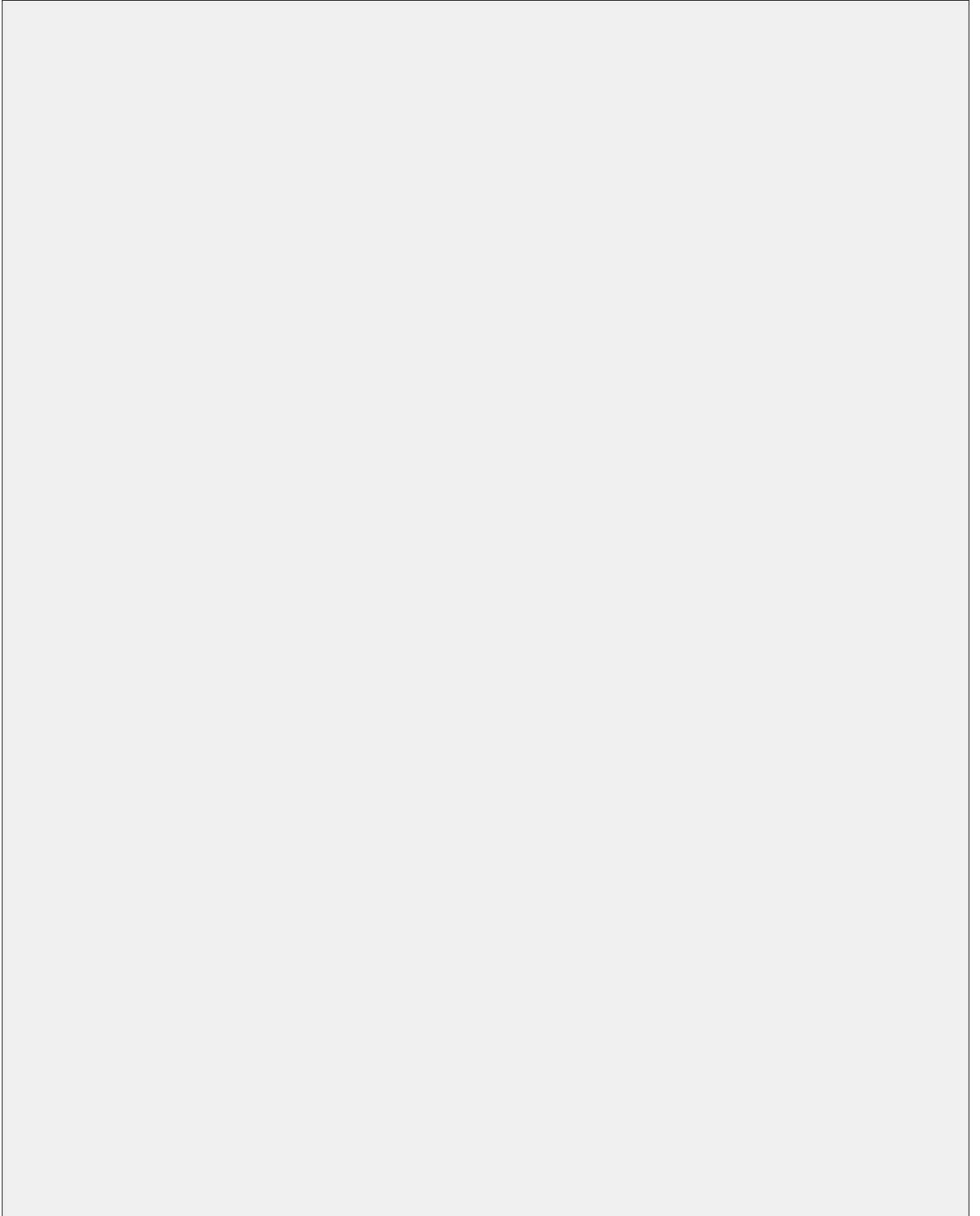
When an abnormality happens, inform us of the followings.

From	Department name		Staff in charge		To	Department name	Sales team	QC team
	TEL					TEL		
	FAX					FAX		
Type ①					Delivery date ③			
Serial number ②					Abnormality occurrence date ④			
Abnormality contents (In detail) ⑤								

Other necessary requirements ⑥

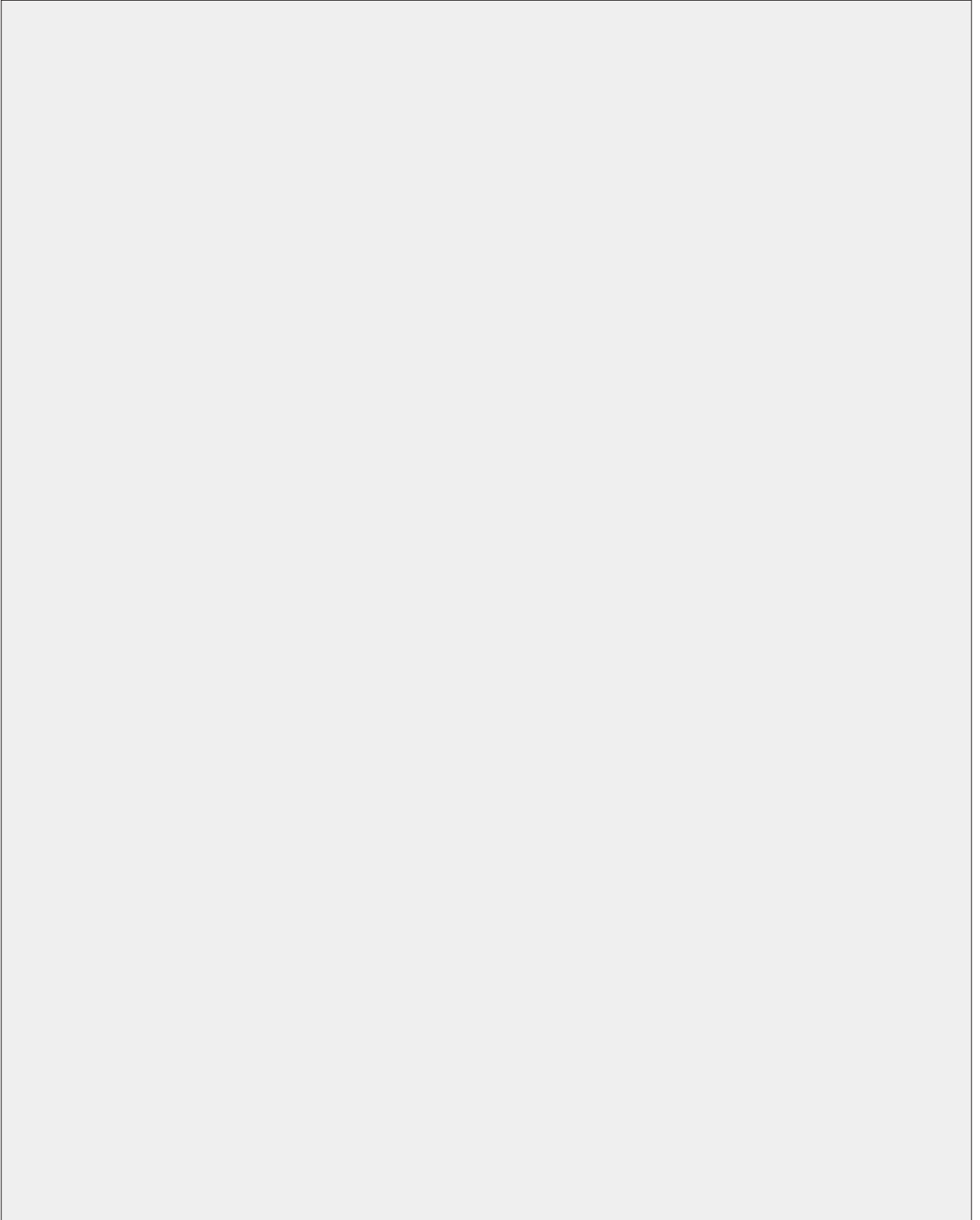
Memo

Instruction manual



Memo

Instruction manual





Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance. Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.



- According to The WEEE Directive, please do not discard the device with your household waste.



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