

Reactor User Manual

(Rev.202107)

Notes: Please read the following information before the operations of our reactors, and the contents stated in the file are subject to change upon necessary.

Acceptance

- Check that no parts are missing and that the shipment has not been subjected to any damage due to improper transit.
- Check that the electrical characteristics indicated on the rating plate correspond to those specified on the order.

In other cases, please attach the packing list with your complaint.

Handling

- Unpack the reactors on the site properly.
- Remove the transportation screws before lifting.
- Lift up the reactors at the top of four loops with the sling if required.

If a fork lift truck is used, ensure that the type of fork is appropriate for the size and weight for the reactor.

Operations

- Make sure that the mounting screws of the reactors are well fixed.
- Install the reactors in the cabinet in vertical directions with adequate clearance to other electrical components.
minimum 40mm distances for low voltage reactors depending on the rated currents to avoid the magnetic field interference
the distances of medium voltage reactors according to IEC 60076-3 standard
- Don't touch the hot reactors during operations.
- Sufficient heat dissipations and cooling system shall be considered under indoor conditions, usually the losses of 1KW requires minimum $3\text{m}^3/\text{min}$ air dissipations.

In case of any doubts, please contact LTEC for technical support.

Storage

- Store the goods in a dry, well-ventilated area free from rain, water spray, chemicals and dust.
- Storage temperature: $0^{\circ}\text{C}+ 40^{\circ}\text{C}$.
- check the conditions of the reactors in stock regularly.

Maintenance

- Monthly check the tightness of the reactor terminals.
- Yearly check the cleanness of the equipment, the ventilation system, the temperature of the area where reactors are installed.

Periodical checks and inspections are required to ensure reliable operation of reactors.

Protection

Temperature switch for low voltage products are provided with a separate screw terminal to cut off the line in the event of over heating, normally 135°C closed contact (250VAC,5A).

If you need other thermal sensors, please contact LTEC.

Safety

Special attentions must be taken to avoid any misuse of the reactors in each application.

No particular fire precautions are required.

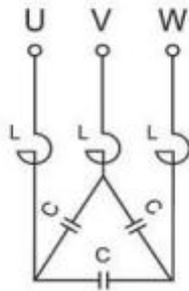
All the operations described in this document shall be performed in accordance with current safety standards and under the responsibility of a competent authority.



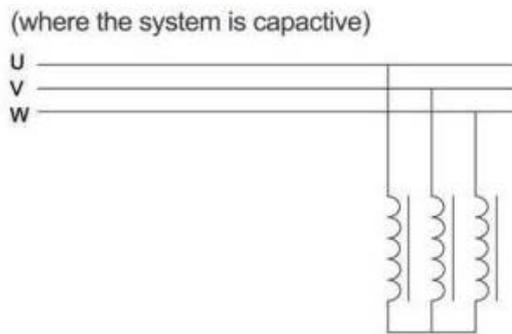
Only the qualified and assigned trained persons are permitted to work with the electrical installations. We are not liable for any damage resulting from inappropriate use.

Electrical Diagram (Low voltage reactors):

A. Series connections in PFC system is recommended as follows:

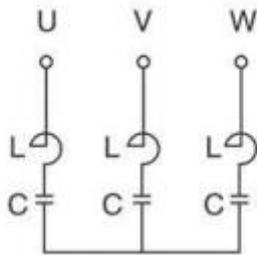


B. Parallel connections in PFC system is recommended as follows:



Electrical Diagram (Medium voltage reactors):

Series connections in PFC system is recommended as follows:



Please check whether the active parts are still under the residual voltage before working on the system.

The grounding connection must be made before any other connections.

Route and properly secure and support all cables prior to power on.

Use proper methods to support the cables to minimize mechanical stress on the cables and connections.

Operating conditions

A. Altitude

The general reactor designs applies for the site elevations above the sea level up to 1000m as per the IEC standard. If you required a different altitude, this information must be defined in the design stage.

B. Ambient temperature

Category	Ambient temperature limits
Maximum	50°C
Average 24 hours	40°C
Average 365 days	30°C

C. Air humidity

Low relative air humidity	5%
High relative air humidity	95%

Ensure that the product specifications are not exceeded by your applications. If beyond the limits, please define it in the design stage too.

Electrical connections

LTEC suggest to fix the screws with the right torques on all the phases, for reliable electrical connections and better conductivities.

Screws	Torques (kgf.cm)	Material kind
M4	13 (11~14)	Copper
M6	40 (34~46)	Copper
M8	100 (85~115)	Copper
M10	200 (170~230)	Copper
M12	380 (323~437)	Copper
M16	950 (807~1092)	Copper

Factory testing

The reactors manufactured by LTEC are 100% tested according to the applicable standards before delivery to ensure the operating safety and reliability.

- Measurement of winding resistance (IEC60076-1)
- Measurement of inductance (IEC60076-6)
- Measurement of loss and quality factor (IEC60076-6)
- Measurement of acoustic sound level (IEC60076-6)
- Separate source a.c. withstand voltage test (IEC60076-6)

When required, the following type tests as well as others are available as a premium.

- Temperature rise test (IEC60076-6)
- Lightning impulse test (IEC60076-6)

All the testing data are maintained by LTEC and kept for tracking upon necessary. Each product is identified by the serial number on the nameplate in case of any problems on site.

Occasionally, due to unusual reactor ratings, there may be some tests which can't be performed according to the specified full load conditions.

If you have any further request on technical specifications or special testing, please contact our sales department.

Make sure that all the electrical insulations of our reactor designs follows the IEC standard given below.

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Table 2 – Winding temperature-rise limits

Insulation system temperature (see Note 1) °C	Average winding-temperature rise limits at rated current (see Note 2) K
105 (A)	60
120 (E)	75
130 (B)	80
155 (F)	100
180 (H)	125
200	135
220	150
NOTE 1 Letters refer to the temperature classifications given in IEC 60085.	
NOTE 2 Temperature rise measured in accordance with Clause 23.	

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Table 4 – Minimum clearances in air (1 of 2)

Highest Voltage for equipment U_m kV	Full Wave Lightning Impulse (LI) kV	Switching impulse (SI) kV	Minimum air clearance	
			Line to earth mm	Phase to phase mm
<1,1	-	-		
3,6	20	-	60	60
	40	-	60	60
7,2	60	-	90	90
	75 ^a	-	120	120
12	75	-	120	120
	95	-	160	160
	110 ^a	-	200 ^a	200 ^a
17,5	95	-	160	160
	125 ^a	-	220	220
24	125	-	220	220
	145	-	270	270
	150 ^a	-	280 ^a	280 ^a
36	170	-	320	320
	200 ^a	-	380	380

Table 3 – Insulation levels based on European practice

Highest voltage for equipment U_m (r.m.s.) kV	Rated short duration separate source AC withstand voltage (r.m.s.) kV	Rated lightning impulse withstand voltage (peak value) kV	
		List 1	List 2
≤ 1,1	3	–	–
3,6	10	20	40
7,2	20	40	60
12,0	28	60	75
17,5	38	75	95
24,0	50	95	125
36,0	70	145	170

The choice between list 1 and list 2 should be made considering the degree of exposure to lightning and switching overvoltages, the type of system neutral earthing and, where applicable, the type of overvoltage protective device, see IEC 60071.

Table 4 – Insulation levels based on North American practice

Dielectric insulation levels for dry type transformers used on system with BILs 200 kV and below												
Max LL system voltage kV	Nominal LL system voltage kV	Low frequency voltage insulation level kV r.m.s.	Basic Lightning Impulse Insulation Levels (BILs) in common use (peak value 1,2 μs)									
			10	20	30	45	60	95	110	125	150	200
0,25	0,25	2,5	None									
0,6	0,6	3	S	1	1							
1,2	1,2	4	S	1	1							
2,75	2,5	10		S	1	1						
5,6	5	12			S	1	1					
9,52	8,7	19				S	1	1				
15,5	15	34					S	1	1			
18,5	18	40						S	1	1		
25,5	25	50						2	S	1	1	
36,5	34,5	70								2	S	1
Impulse chopped wave: minimum time to flash over (μs)			1	1	1	1,3	2	2	1,8	2	2,3	2,7

S = Standard values.
 1 = Optional higher levels where exposure to overvoltage occurs and higher protective margins are required.
 2 = Lower levels where surge arrester protective devices can be applied with lower spark-over levels.