

## VALVE REGULATED LEAD ACID BATTERIES (VRLA 6V and 12V)

Panasonic's tough Valve Regulated Lead Acid rechargeable batteries are designed to provide outstanding performance in withstanding overcharge, overdischarge, and resisting vibration and shock. Compact, these batteries save installation space, while providing full and reliable power. The use of special sealing epoxies, tongue and groove case and cover construction, and long-sealing paths for posts and connectors, assures that the Valve Regulated Lead Acid battery will offer exceptional leak resistance, and allows them to be used in any position.



### Features:

- High quality and reliability
- Exceptional deep discharge recovery
- No corrosive gas generation
- Long service life
- Quick chargeability
- High power density
- Maintenance-free operation

### Applications:

- UPS (Uninterruptible power supplies)
- Emergency lighting
- Wheelchairs
- Telecom back-up power supplies
- Lawn and garden tools
- Engine starters

### Technical Data

Model No. <sup>1</sup>	Nominal Voltage (V)	Rated Capacity 20 Hours Rate (Ah)	End Use	Outline Dimensions (inch)				Wt. (Approx.) (lbs)	Terminal Types <sup>3</sup>	Battery-Case Resin <sup>2</sup>		
				L	W	H	Total Height			UL94HB	UL94V0	
<a href="#">LC-R061R3P</a>	6	1.3	Main Power & Standby Power	3.82	0.95	1.97	2.17	0.66	B	0	--	
<a href="#">LC-R121R3P</a>	12	1.3	Main Power & Standby Power	3.82	1.87	1.97	2.17	1.30	B	0	--	
<a href="#">LC-R122R2P</a>	12	2.2	Main Power & Standby Power	6.97	1.34	2.36	2.60	1.76	B	0	--	
<a href="#">LC-R123R4P</a>	12	3.4	Main Power & Standby Power	5.28	2.64	2.36	2.56	2.65	B	0	--	
<a href="#">LC-R063R4P</a>	6	3.4	Main Power & Standby Power	5.28	1.34	2.36	2.60	1.37	B	0	--	

<a href="#">LC-R064R5P</a>	6	4.5	Main Power & Standby Power	2.76	1.89	4.02	4.26	1.59	B	O	--	
<a href="#">LC-R067R2P(a)</a>	6	7.2	Main Power & Standby Power	5.95	1.34	3.70	3.94	2.78	B/C	O	--	
<a href="#">LC-R127R2P(a)</a>	12	7.2	Main Power & Standby Power	5.95	2.54	3.70	3.94	5.45	B/C	O	--	
<a href="#">LC-P067R2P(a)</a>	6	7.2	Standby Power	5.95	1.34	3.70	3.94	2.87	B/C	X	--	
<a href="#">LC-P127R2P(a)</a>	12	7.2	Standby Power	5.95	2.54	3.70	3.94	5.51	B/C	--	O	
<a href="#">LC-P0612P(a)</a>	6	12.0	Standby Power	5.95	1.97	3.70	3.94	4.41	B/C	--	O	
<a href="#">LC-R0612P(a)</a>	6	12.0	Main Power & Standby Power	5.95	1.97	3.70	3.94	4.30	B/C	O	--	
<a href="#">LC-RA1212P(a)</a>	12	12.0	Main Power & Standby Power	5.95	3.86	3.70	4.01	8.36	B/C	O	--	
<a href="#">LC-PD1217P</a>	12	17.0	Main Power & Standby Power	7.13	2.99	6.57	6.57	14.34	D/G	X	O	
<a href="#">LC-RD1217P</a>	12	17.0	Main Power & Standby Power	7.13	2.99	6.57	6.57	14.34	D/G	O	--	
<a href="#">LC-X1220P</a> <a href="#">LC-X1220AP</a>	12	20.0	Standby Power	7.13	2.99	6.57	6.57	14.56	D/G	O	X	
<a href="#">LC-X1228P</a> <a href="#">LC-X1228AP</a>	12	28.0	Standby Power	6.50	4.92	6.90	7.07	24.34	D/G	O	--	
<a href="#">LC-XC1228AP</a>	12	28.0	Main Power	6.50	4.90	6.90	7.07	24.34	D/G	O	--	
<a href="#">LC-R1233P</a>	12	33.0	Main Power & Standby Power	7.70	5.12	6.10	7.09	26.50	E	O	O	

1. Numbers followed by an (a): Terminal designator codes and other special codes will appear at the end of the model number.
2. Battery cases marked with an O are the normal product using the standard resin. Those marked with an X indicate specifications as per special order.
- 3.

Terminal Types:

- (B) Faston type 187 (indicated by model # suffix: P)
- (C) Faston type 250 (indicated by model # suffix: P1)
- (D) M5 bolt and nut type (indicated by model # suffix: P)
- (E) M6 bolt and nut type (indicated by model # suffix: P)
- (G) M5 threaded post type (indicated by model # suffix: AP)

## High Power Series

### Features:

- These high-power trickle use batteries offer a slimmer design and energy density up to 30% higher than conventional sealed lead acid batteries.
- Ideal for use as backup batteries in UPS
- Slim design to reduce UPS volume

### Applications:

- UPS
- PBX
- Back-up Equipment

### High Power Series for Back-Up Power/UPS Applications (All ratings are watts/cell at a 10 minute rate)

Model No.	Nominal Voltage (V)	Rated Capacity 10 Minute Rate (w/cell)	Outline Dimensions (inch)				Wt. (Approx.) (lbs)	Terminal Types <sup>2</sup>	Battery-Case Resin <sup>1</sup>	
			Length	Width	Height	Total Height			UL94HB	UL94V-0
<a href="#">UP-RW1220P1</a>	12	20	5.51	1.52	3.70	4.00	2.98	C	X	O
<a href="#">UP-RW1245P1</a>	12	45	5.95	2.54	3.70	4.00	5.75	C	X	O

1. Battery cases marked with an O are the normal product using the standard resin. Those marked with an X indicate specifications as per special order.

2. Terminal: Faston type 250 (indicated by model # suffix: P1)

# VALVE-REGULATED LEAD ACID BATTERIES: INDIVIDUAL DATA SHEET

## LC-X1228P/LC-X1228AP



Photo/Label for reference only.

(a) The photo and dimensions represent LC-X1228AP.

### Specifications

<b>Nominal Voltage</b>		12V
<b>Rated Capacity (20 hour rate)</b>		28Ah
<b>Dimensions</b>	<b>Length</b>	6.496 inches (165 mm)
	<b>Width</b>	4.921 inches (125 mm)
	<b>Height</b>	7.07 inches (179.5 mm)
	<b>Total Height</b>	LC-X1228AP 6.890 inches (175 mm) LC-X1228P 7.067 inches (179.5 mm)
<b>Approx. mass</b>		24.34 lbs. (11 kg)
<b>Standard Terminals and Resin</b>	UL94HB M5 Bolt and Nut	LC-X1228P
	UL94HB M5 Threaded Post	LC-X1228AP
<b>Optional Terminals and Resin</b>	UL94V-0 M5 Bolt and Nut	◆ LC-P1228P
	UL94V-0 M5 Threaded Post	◆ LC-P1228AP

◆ Please contact Panasonic for availability on optional items. Optional items may be subject to minimum order quantities.

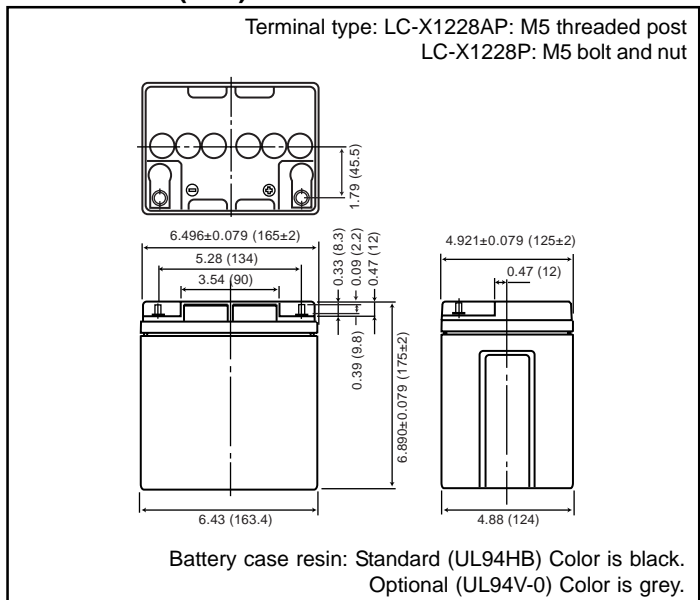
### Characteristics

Capacity (note) 77°F (25°C)	20 hour rate (1.40A)	28.0Ah	
	10 hour rate (2.65A)	26.5Ah	
	5 hour rate (5.00A)	25.0Ah	
	1 hour rate (21.0A)	21.0Ah	
	1.5 hour rate discharge Cut-off voltage 10.5 V	9.80A	
Internal Resistance	Fully charged battery 77°F (25°C)	Approx. 6.0mΩ	
Temperature dependency of capacity (20 hour rate)	104°F (40°C)	102%	
	77°F (25°C)	100%	
	32°F (0°C)	85%	
	5°F (-15°C)	65%	
Self discharge 77°F (25°C)	Residual capacity after standing 3 months	91%	
	Residual capacity after standing 6 months	82%	
	Residual capacity after standing 12 months	64%	
Charge Method (Constant Voltage)	Trickle use	Initial current	4.20 A or smaller
		Control voltage	13.6V to 13.8V (per 12V cell 25°C)

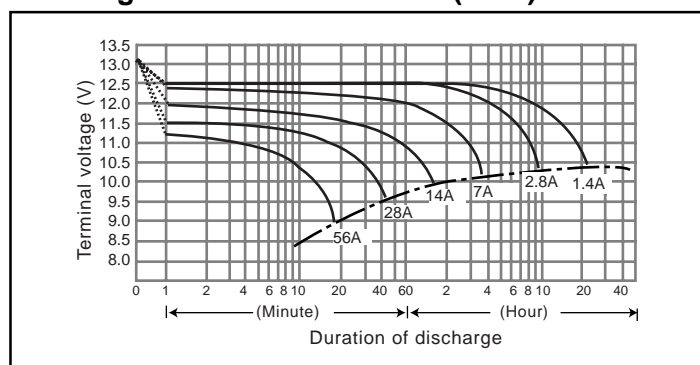
(Note) The above characteristics data are average values obtained within three charge/discharge. Cycles not the minimum values.

For standby power supplies. Expected trickle life: Approx. 6 years at 25°C, Approx. 10 years at 20°C.

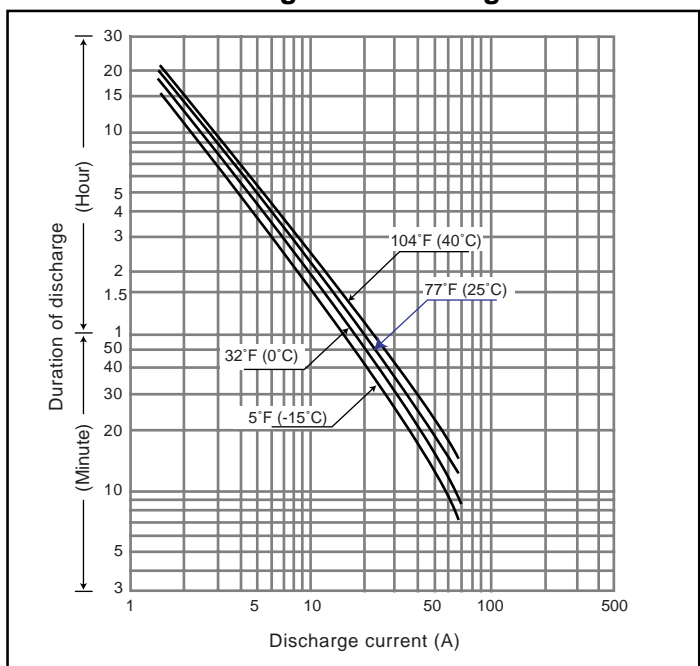
### Dimensions (mm)



### Discharge characteristics 77°F (25°C) (Note)



### Duration of discharge vs. Discharge current (Note)



# TERMINAL DIMENSIONS

## Terminal Data of the medium-capacity (17 to 100Ah) battery

Model No.	Terminal thickness A (1)	Height from battery case top		Terminal width	Hole diameter	Hole Position			Bolt			Type of Terminal
		B1 (1)	B2 (2)			Distance from top: E1 (1)	Distance from top: E2 (2)	Distance from terminal top: E3 (2)	Diameter F1 (3)	Pitch	Length F2 (3)	
LC-RD1217P	5.0 ± 0.3	1.0	---	11 ± 0.4	5.5 ± 0.3	6.5	---	5.5 ± 0.3	M5	P=0.8	15 ± 1.0	M5 bolt and nut
LC-PD1217P	---	1.0	---	11 ± 0.4	5.5 ± 0.3	6.5	---	5.5 ± 0.3	M5	P=0.8	15 ± 1.0	M5 bolt and nut
LC-X1220P	5.0 ± 0.3	1.0	---	11 ± 0.4	5.5 ± 0.3	6.5	---	5.5 ± 0.3	M5	P=0.8	15 ± 1.0	M5 bolt and nut
LC-X1220AP	---	1.7	---	---	---	---	---	---	M5	P=0.8	9.8	M5 threaded post
LC-X1228P	8.0 ± 0.5	4.5	16.5 ± 1.5	16 ± 0.8	6.5 ± 0.4	---	9 ± 1.0	7.5 ± 0.4	M5	P=0.8	15 ± 1.0	M5 bolt and nut
LC-X1228AP	---	2.2 ± 1.0	9.8 ± 1.5	---	---	---	---	---	M5	P=0.8	8.3 ± 1.0	M5 threaded post
LC-R1233P	6.0 ± 0.5	---	26.5 ± 1.5	16 ± 0.8	6.5 ± 0.4	---	19 ± 1.5	7.5 ± 0.4	M6	P=1.0	20 ± 1.0	M6 bolt and nut

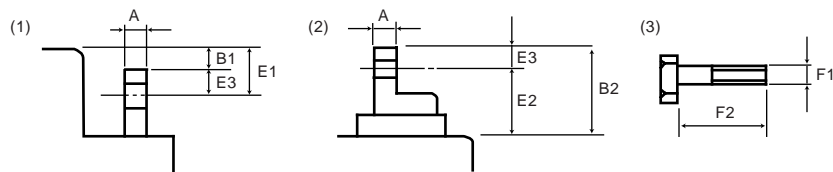
Units: mm

## Cycle Long Life Series

LC-XC1228AP	---	2.2 ± 1.0	9.8 ± 1.5	---	---	---	---	---	M5	P=0.8	18.3 ± 1.0	M5 threaded post
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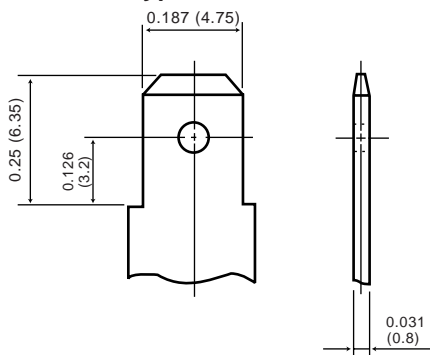
Units: mm

## Bolt and Nut type (M5, M6)

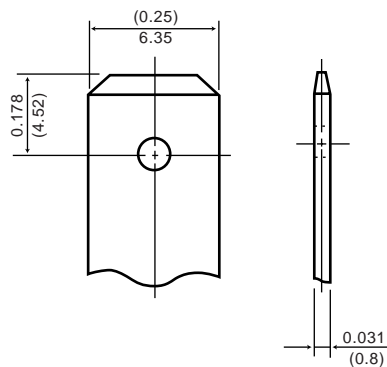


## Terminal Dimensions Inch (mm)

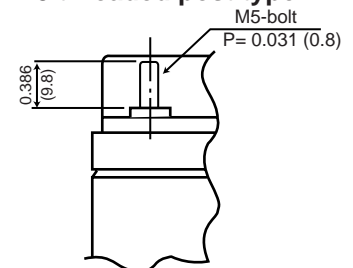
### Faston tab type 187



### Faston tab type 250



### M5 threaded post type



## Terminal Materials

Faston 187: Tin Plated Brass

Faston 250: Tin Plated Brass

Bolt & Nut: Lead Alloy\*

Threaded Post: Tin Plated Brass

### \*Proposition 65 Warning

Battery posts, terminals, and related accessories contain lead and lead compounds, and handling this product may also expose you to sulfuric acid mist, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

# OVERVIEW

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## Overview

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Panasonic valve-regulated lead-acid batteries (VRLA battery) have been on the market for more than 30 years. The VRLA battery is a rechargeable battery which does not require adding water. Based on AGM (Absorbed Glass Mat) technology with calcium grids, the batteries offer excellent high rate performance characteristics and increased life expectancy.

Our cumulative technological know-how has enabled us to respond to market requirements promptly by developing batteries such as trickle/cycle long life type and improving charging capabilities to allow for quick charging in 1 to 2 hours. The VRLA battery covers a broad range of applications including, electric tools, UPS, emergency lighting and electric wheel chairs.

## Battery Types and model numbers

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For main power applications — Cycle long life type .....LC-XC

For main and standby power applications — Expected trickle life 3-5(approx. 5\*) years..LC-R

For standby power applications — [ Expected trickle life 3-5 (approx.5\*) years...UP-RW  
Expected trickle life approx. 6(10) years\* [ Standard case .....LC-X  
Flame-retardant case ..LC-P

Expected trickle life: Up to 50% of initial capacity under the following conditions:

Temperature: 77°F (25°C)

Discharge current: 0.25CA

Discharge ending voltage: 5.25V for 6V battery, 10.5V for 12V battery

Charge voltage: 6.85V for 6V battery, 13.7V for 12V battery

\*Approximately 6 years at 20°C, 0.1C

## Applications

- **Stand-by/Back-up power applications**
  - Communication equipment: base station, PBX, CATV, WLL, ONU, STB, etc.
  - Back-up for power failure: UPS, ECR, computer system back-up, sequencers, etc.
  - Emergency equipment: lights, fire and burglar alarms, radios, fire shutters, stop-position controls (for machines and elevators), etc.
- **Main power applications**
  - Communication equipment: transceivers
  - Electrically operated vehicles: picking carts, automated transports, electric wheelchairs, cleaning robots, electric automobiles, etc.
  - Tools and engine starters: grass shears, hedge trimmers, cordless drills, screwdrivers, jet-skis, electric saws, etc.
  - Industrial equipment/instruments and non life-critical medical equipment\*: measuring equipment, non life-critical medical equipment (electrocardio-graph), etc.
  - Photography: camera strobes, VTR/VCR, movie lights, etc.
  - Toys and hobby: radio-controllers, motor drives, lights, etc.
  - Miscellaneous uses: integrated VTR/VCR, tape recorders, other portable equipment, etc.

\*(Note) When any medical equipment incorporating a Panasonic VRLA battery is planned, please contact Panasonic.

## Features

### • Leak-resistant structure

A required-minimum quantity of electrolyte is impregnated into, and retained by, the positive and negative plates and the separators; therefore electrolyte does not flow freely. Also, the terminal has a sealed structure secured by long adhesive-embedded paths and by the adoption of strong epoxy adhesives which makes the battery leak-resistant.

(Note) In stand-by/back-up uses, if the battery continues to be used beyond the point where discharge duration has decreased to 50% of the initial (i.e. life judgment criteria), cracking of the battery case may occur, resulting in leakage of the electrolyte.

### • Long service life

Service life of our long-life series (LC-P, LC-X series) is approximately double that of the conventional LC-R series batteries (Temperature 25°C, discharge rate 0.25 CA/ 1.75V/cell, discharge frequency every 6 months, 2.30V/cell charge).

### • Easy maintenance

Unlike the conventional batteries in which electrolyte can flow freely, VRLA batteries do not need specific-gravity checks of the electrolyte nor do they need to have water added; This makes the battery function fully and makes maintenance easy.

### • No sulfuric acid mist or gases

Unlike the conventional batteries in which electrolyte can flow freely, VRLA batteries generate no sulfuric acid mist or gases under the use condition we recommend. In uses under conditions other than recommended, however, gas and sulfuric acid mist generation may occur, therefore do not design the battery housing with a closed structure.

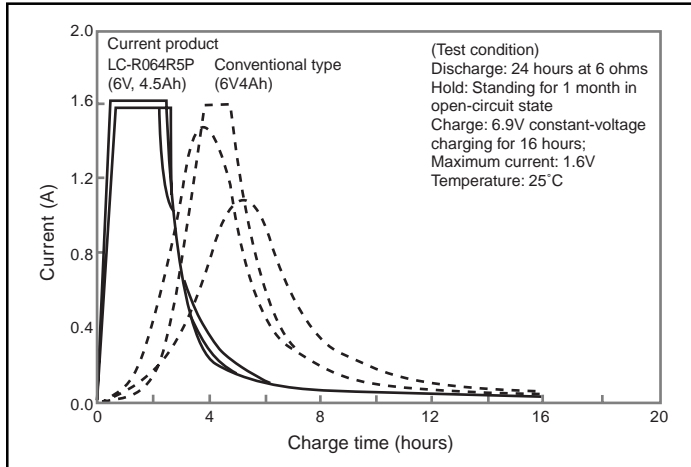
### • Exceptional deep discharge recovery

As seen in the figure on the next page, our VRLA battery shows exceptional rechargeability even after deep discharge, which is often caused by failure to turn off the equipment switch, followed by standing (approx. 1 month at room temperature is assumed).



# GENERAL INFORMATION ON VALVE-REGULATED LEAD-ACID BATTERIES - CONT.

## Example of rechargability after deep discharge and standing



## Transportation

All of our lead acid batteries are unregulated by DOT for transportation by truck, rail, ocean and air transportation because they meet the requirements of 49 CFR 173.159 (d). The only transportation requirements are:

- 1) The battery must be securely packaged in such a way to prevent the possibility of short circuiting.
- 2) The battery and the outer most packaging must be labeled "NONSPILLABLE" or "NONSPILLABLE BATTERY".

All of our lead acid batteries are unregulated for air transportation because they meet the requirements of Special Provision--"A67" as promulgated by the International Air Transportation Association (IATA) and the International Civil Aviation Organization (ICAO). They also meet the Vibration and Pressure Differential

Tests of the International Maritime Dangerous Goods (IMDG) regulations.

### • ISO 9001

The quality systems at our SLMB plant (China) have been recognized and registered by the Quality Assurance Corporate Registration System as conforming with ISO 9001.

### • ISO 14001

The Environmental Management Systems at our SLMB (China) plant has been approved with the ISO 14001.

### • JIS (Japan Industrial Standards)

Our sealed lead-acid batteries comply with JIS C 8702.

### • UL recognition

Our VRLA batteries fall into UL1989 (Standby Batteries). UL1989 requires that the battery is free from the hazard of bursting, that is, when the battery is overcharged the vent valve opens to release internal pressure. UL-recognized types of VRLA batteries to date are listed in the following table. A number of the recognized battery types are in use for such applications as emergency lights.

### • VDE and other recognition

The types of VRLA batteries which have acquired VDE (Germany) recognition are also listed.

**Table of battery types which acquired local/overseas recognition**

Standard/recognition	Contents	Recognition number	Recognized Models (As of: July 28, 2004)		
UL U.S. Safety standard	U.L. 1989 Standby Batteries	MH13723	LC-R061R3(a) LC-R063R4(a) LC-R064R2(a) LC-R064R5P(a) LC-R067R2(a) LC-R0612(a) LC-R121R3(a) LC-R122R2(a) LC-R123R4(a) LC-R127R2(a) LC-RA1212P LC-RD1217(a) LC-LA1233(a) LC-SD122(a)	LC-SA122R3(a) LC-V067R2(a) LC-V0612(a) LC-V121R3(a) LC-V122R2(a) LC-V123R4(a) LC-V127R2(a) LC-V1212 LC-VD1217(a) LC-VA1233(a) LC-V1233(a) LC-T122(a) LC-TA122(a) LC-P067R2(a) LC-P0612(a) LC-P127R2(a)	LC-X1220(a) LC-X1228(a) LC-X1242(a) LC-X1265(a) LC-XA12100(a) UP-RW1245(a) UP-RW1220(a) LC-XC1228(a) LC-XC1238(a) LC-RA064R2(a) LC-R1233(a) LC-PD1217 LC-P1228(a)
VDE German Safety Standard		G196049 G188151 G191053 G198048 G193046 G100001 G198049 B100002 G199090	LC-121R3PG LC-R127P/P1 LC-X1224APG/AP	LC-R122R2PG LC-R127R2PG/PG1 LC-X1238APG/AP LC-X1238PG/P	LC-R123R4PG LC-RA1212PG/PG1 LC-RA1212P/P1 LC-X1265PG/P

Additional configuration codes (alphabetic letters or numbers) may appear for (a) in the code numbers of UL recognized types. (Note) These standards are also valid for old model numbers.