

Battery chargers

PLN-24CH12 / PRS-48CH12



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1 **General**

This supplementary sheet to the manual of the PLN-24CH12 and PRS-48CH12 chargers contains important information for proper installation and operation of the devices.

2 Ri-monitoring

The PLN-24CH12 and PRS-48CH12 battery chargers monitor the resistance of the battery circuit. This monitoring is important and mandatory for compliance to EN 54-4. The chargers monitor:

- The summed resistance of the wiring
- The fuse
- The electrical connections
- The internal resistance (R_i) of the battery.

The chargers warn when you must replace the battery. When the R_i of the battery reaches its maximum allowed value, the backup power system can still power the VACIE.

The resistance of the wiring and the connections is included in the measured total resistance. It is important for these resistances to be very low. Otherwise, even good batteries will generate a fault. A VACIE can take up to 150 A from the battery. Then, every 10 m Ω will cause a voltage drop of 1.5 V, limiting the maximum available output power from the VACIE.

3 Wire gauge selection

Take into consideration all primary contributors to the total resistance:

- The Ri of the battery: typically 3 to 6 mΩ per battery, depending on size and make.
- The cables: very dependent on the length and the gauge.
- The battery fuse: typically 1 to 2 mΩ.
- The connections: typically 1 mΩ.

Check the real values with the battery supplier and the fuse supplier. Make sure to tighten all the screws of the interconnections terminals.

Keep some margin to avoid false positive faults. Stay at least 20 % under the selected resistance threshold, because there is some tolerance on the measurement accuracy.

4 Battery charging

Normal operating mode: the battery charger (re)charges the batteries and maintains them when they are fully charged. The maximum current that can be provided to the main outputs and auxiliary outputs is $I_{max a}$.

Back-up operating mode: the total operating current is provided by the batteries and cannot exceed $I_{max b}$ without mains power.

$I_{max a}$	The maximum available current which can be drawn continuously while charging the battery: – $I_{max a} = 12 A - C/20$ (C = battery capacity in Ah)
$I_{max b}$ (with mains power)	The maximum available output current which can be drawn for a short period of time. During this period, the battery may not be charged if the external load takes the full $I_{max b}$. If the load is less than the $I_{max b}$, the battery will not be discharged and the remaining current is used to charge the battery: – $I_{max b} = 12 A$
$I_{max b}$ (without mains power)	The maximum available current which can be drawn from the batteries when the mains supply is not available: – $I_{max b} = 150 A$, if the jumper is set to 75 – $I_{max b} = 100 A$, if the jumper is set to 50

If $I_{max b}$ (without mains power) is 100 A – 150 A:

1. Use batteries with a capacity of 86 Ah to 225 Ah.
2. Set the jumper on the daughter board to 75.

If $I_{max b}$ (without mains power) is < 100 A:

1. Use batteries with a capacity of 65 Ah to 225 Ah.
2. Set the jumper on the daughter board to 50.

5 Approved batteries and wire gauge

To help you select the right cable gauge, two tables are provided with maximum cable lengths, per wire gauge for several battery types. Use this guideline to determine the needed gauge. The maximum wire length appears in centimeters. The maximum wire length represents the total wire length, from charger to battery, the wires between batteries, and the wire back to the charger. The red and the black wire lengths are represented together. With some smaller batteries, it might happen that the total resistance already exceeds the maximum value, even for zero length cables. This is not allowed and is indicated as n.a. (not allowed).

The first table is for 24 V battery systems. The second table is for 48 V battery systems.

24 V	Wire gauge		16 mm ²		25 mm ²		35 mm ²		50 mm ²	
	Jumper setting		50	75	50	75	50	75	50	75
	Maximum load current (A)		100	150	100	150	100	150	100	150
Ah	Brand	Type								
65	SSB	SBL65-12i	129	n.a.	201	n.a.	282	n.a.	403	n.a.
65	Europower	EPS 65-12	289	n.a.	451	n.a.	632	n.a.	903	n.a.
65	Sun	SB12-65SV0	84	n.a.	132	n.a.	185	n.a.	264	n.a.
65	Sun	SB12-65V0	111	n.a.	174	n.a.	243	n.a.	347	n.a.
66	SSB	SBL66-12HR	227	n.a.	354	n.a.	496	n.a.	708	n.a.
68	Leoch	LPL12-65	84	n.a.	132	n.a.	185	n.a.	264	n.a.
68	Effekta	BTL12-65L	84	n.a.	132	n.a.	185	n.a.	264	n.a.
70	Yuasa	NPL78-12IFR	289	n.a.	451	n.a.	632	n.a.	903	n.a.
75	SSB	SBL75-12i(sh)	147	n.a.	229	n.a.	321	n.a.	458	n.a.
75	Sun	SB12-80	147	n.a.	229	n.a.	321	n.a.	458	n.a.
78	Sun	SB12-75	147	n.a.	229	n.a.	321	n.a.	458	n.a.
80	SSB	SBL80-12i	156	n.a.	243	n.a.	340	n.a.	486	n.a.
80	Leoch	LPF12-75	289	n.a.	451	n.a.	632	n.a.	903	n.a.
80	Effekta	BTL12-80	244	n.a.	382	n.a.	535	n.a.	764	n.a.
80	Fiamm	FG28009	431	n.a.	674	n.a.	943	n.a.	1347	n.a.
80	Long	6FM80G/B	200	n.a.	313	n.a.	438	n.a.	625	n.a.
85	SSB	SBL85-12HR	200	n.a.	313	n.a.	438	n.a.	625	n.a.
90	Effekta	BTL12-90	271	n.a.	424	n.a.	593	n.a.	847	n.a.
90	Energysys	12VE90	329	n.a.	514	76	719	107	1028	153
90	Europower	EPS 90-12	289	n.a.	451	n.a.	632	n.a.	903	n.a.
95	SSB	SBLFT90-12i	67	n.a.	104	n.a.	146	n.a.	208	n.a.
95	Effekta	BTL12-90LX	378	98	590	153	826	214	1181	306

100	SSB	SBL100-12HR	289	n.a.	451	n.a.	632	n.a.	903	n.a.
100	SSB	SBL100-12i(sh)	289	n.a.	451	n.a.	632	n.a.	903	n.a.
100	Europower	EPS 100-12	333	53	521	83	729	117	1042	167
100	Effekta	BTL12-100	289	n.a.	451	n.a.	632	n.a.	903	n.a.
100	Fiamm	FG2A007	458	178	715	278	1001	389	1431	556
100	PowerSonic	PS121000GB	298	n.a.	465	n.a.	651	n.a.	931	56
100	Yuasa	NPL100-12	378	98	590	153	826	214	1181	306
105	Sun	SB12-110AFT	244	n.a.	382	n.a.	535	n.a.	764	n.a.
105	Leoch	LPF12-100	333	53	521	83	729	117	1042	167
105	Long	6FM100G/B	289	n.a.	451	n.a.	632	n.a.	903	n.a.
107	Sun	SB12-100	298	n.a.	465	n.a.	651	n.a.	931	56
110	Sun	SB12-100HFT	351	71	549	111	768	156	1097	222
115	Long	6FM115G/B	289	n.a.	451	n.a.	632	n.a.	903	n.a.
116	SSB	SBLFT110-12i	307	n.a.	479	n.a.	671	58	958	83
120	SSB	SBL120-12i(sh)	378	98	590	153	826	214	1181	306
120	Europower	EPS 120-12	378	98	590	153	826	214	1181	306
120	Effekta	BTL12-120	378	98	590	153	826	214	1181	306
120	Fiamm	FG2C007	502	222	785	347	1099	486	1569	694
120	Long	6FM120G/B	378	98	590	153	826	214	1181	306
125	Sun	SB12-120	378	98	590	153	826	214	1181	306
125	SSB	SBL125-12HR	378	98	590	153	826	214	1181	306
125	Sun	SB12-125FT	449	169	701	264	982	369	1403	528
130	Yuasa	NPL130-6IFR	289	n.a.	451	n.a.	632	n.a.	903	n.a.
131	Leoch	LPF12-125	351	71	549	111	768	156	1097	222
132	Leoch	LPF12-120	378	98	590	153	826	214	1181	306
134	SSB	SBL134R-12i	289	n.a.	451	n.a.	632	n.a.	903	n.a.
135	SSB	SBL135-12HR	378	98	590	153	826	214	1181	306
140	Energys	6VE140	476	199	749	311	1048	436	1497	622
140	PBQ	FA140-12	378	98	590	153	826	214	1181	306
150	Effekta	BTL12-150	378	98	590	153	826	214	1181	306
150	Fiamm	FG2F009	547	267	854	417	1196	583	1708	833
150	SSB	SBL150-12i	422	142	660	222	924	311	1319	444
151	SSB	SBL151-12HR	333	53	521	83	729	117	1042	167
155	Cell Power	CPF155-12	467	187	729	292	1021	408	1458	583

156	Sun	SB12-150	422	142	660	222	924	311	1319	444
157	Leoch	LPF12-150	378	98	590	153	826	214	1181	306
159	Sun	SB12-150AFT	369	89	576	139	807	194	1153	278
159	SSB	SBLFT150-12i	289	n.a.	451	n.a.	632	n.a.	903	n.a.
160	Haze	HZB12-160	555	275	868	430	1215	603	1736	861
160	Effekta	BTL12-150L	378	98	590	153	826	214	1181	306
170	SSB	SBL170-12HR	396	116	618	181	865	253	1236	361
180	Energysys	6VE180	518	238	810	372	1134	521	1619	744
180	Leoch	LPF12-180	422	142	660	222	924	311	1319	444
200	SSB	SBL200-12i	484	204	757	319	1060	447	1514	639
200	Europower	EPS 200-12	511	231	799	361	1118	506	1597	722
200	Effekta	BTL12-200	378	98	590	153	826	214	1181	306
200	Fiamm	FG2M009	591	311	924	486	1293	681	1847	972
200	Yuasa	NPL200-6	502	222	785	347	1099	486	1569	694
210	Leoch	LPF12-200	467	187	729	292	1021	408	1458	583
210	Long	6FM200G/B	467	187	729	292	1021	408	1458	583
214	Sun	SB12-200	493	213	771	333	1079	467	1542	667
225	Energysys	2VE225	525	245	821	383	1149	537	1642	767
225	SSB	SBL225-12HR	413	133	646	208	904	292	1292	417
228	Leoch	PLH210FT	493	213	771	333	1079	467	1542	667
230	Europower	EPS 230-12	511	231	799	361	1118	506	1597	722

48 V	Wire gauge		16 mm ²		25 mm ²		35 mm ²		50 mm ²	
	Jumper setting		50	75	50	75	50	75	50	75
	Maximum load current (A)		100	150	100	150	100	150	100	150
Ah	Brand	Type								
65	ABT	TM12-310W	460	n.a.	718	n.a.	1005	n.a.	1436	n.a.
65	Effekta	BTL12-65	467	n.a.	729	n.a.	1021	n.a.	1458	n.a.
65	Fiamm	FG26505	911	n.a.	1424	n.a.	1993	n.a.	2847	n.a.
65	Fiamm	FG26507	911	n.a.	1424	n.a.	1993	n.a.	2847	n.a.
65	PowerSonic	PS12650GB	236	n.a.	368	n.a.	515	n.a.	736	n.a.
65	Yuasa	NP65-12	556	n.a.	868	n.a.	1215	n.a.	1736	n.a.
65	SSB	SBL65-12i	324	n.a.	507	n.a.	710	n.a.	1014	n.a.
65	Sun	SB12-65SV0	236	n.a.	368	n.a.	515	n.a.	736	n.a.

65	Sun	SB12-65V0	289	n.a.	451	n.a.	632	n.a.	903	n.a.
65	Europower	EPS 65-12	644	n.a.	1007	n.a.	1410	n.a.	2014	n.a.
66	SSB	SBL66-12HR	520	n.a.	813	n.a.	1138	n.a.	1625	n.a.
68	Long	6FM65G/B	289	n.a.	451	n.a.	632	n.a.	903	n.a.
68	Leoch	LPL12-65	236	n.a.	368	n.a.	515	n.a.	736	n.a.
68	Effekta	BTL-12-65L	236	n.a.	368	n.a.	515	n.a.	736	n.a.
70	ABT	TM12-320W	748	n.a.	1168	n.a.	1635	n.a.	2336	n.a.
70	Fiamm	FG27004	627	n.a.	979	n.a.	1371	n.a.	1958	n.a.
70	Fiamm	FG27007	893	n.a.	1396	n.a.	1954	n.a.	2792	n.a.
73	Long	6FM70G/B	467	n.a.	729	n.a.	1021	n.a.	1458	n.a.
75	ABT	TM12-350W	760	n.a.	1188	n.a.	1663	n.a.	2375	n.a.
75	Effekta	BTL12-75	520	n.a.	813	n.a.	1138	n.a.	1625	n.a.
75	Energys	12VE75	632	n.a.	988	n.a.	1383	n.a.	1975	n.a.
75	SSB	SBL75-12i(sh)	360	n.a.	563	n.a.	788	n.a.	1125	n.a.
75	Sun	SB12-80	360	n.a.	563	n.a.	788	n.a.	1125	n.a.
75	PowerSonic	PS12750GB	360	n.a.	563	n.a.	788	n.a.	1125	n.a.
78	Yuasa	NPL78-12IFR	644	n.a.	1007	n.a.	1410	n.a.	2014	n.a.
78	Sun	SB12-75	360	n.a.	563	n.a.	788	n.a.	1125	n.a.
80	Leoch	LPF12-100/A	644	n.a.	1007	n.a.	1410	n.a.	2014	n.a.
80	Effekta	BTL12-80	556	n.a.	868	n.a.	1215	n.a.	1736	n.a.
80	SSB	SBL80-12i	378	n.a.	590	n.a.	826	n.a.	1181	n.a.
80	Fiamm	FG28009	929	n.a.	1451	n.a.	2032	n.a.	2903	n.a.
84	Long	6FM80G/B	467	n.a.	729	n.a.	1021	n.a.	1458	n.a.
85	SSB	SBL85-12HR	467	n.a.	729	n.a.	1021	n.a.	1458	n.a.
90	Effekta	BTL12-90	609	49	951	76	1332	107	1903	153
90	Energys	12VE90	724	164	1132	257	1585	360	2264	514
90	Europower	EPS 90-12	644	84	1007	132	1410	185	2014	264
95	SSB	SBLFT90-12i	200	n.a.	313	n.a.	438	n.a.	625	n.a.
95	Effekta	BTL12-90LX	822	262	1285	410	1799	574	2569	819
100	SSB	SBL100-12HR	644	84	1007	132	1410	185	2014	264
100	SSB	SBL100-12i(sh)	644	84	1007	132	1410	185	2014	264
100	Effekta	BTL12-100	644	84	1007	132	1410	185	2014	264
100	Fiamm	FG2A007	982	422	1535	660	2149	924	3069	1319
100	PowerSonic	PS121000GB	662	102	1035	160	1449	224	2069	319

100	Yuasa	NPL100-12	822	262	1285	410	1799	574	2569	819
100	Europower	EPS 100-12	733	173	1146	271	1604	379	2292	542
105	Sun	SB12-110AFT	556	n.a.	868	n.a.	1215	n.a.	1736	n.a.
105	Long	6FM100G/B	644	84	1007	132	1410	185	2014	264
105	Leoch	LPF12-100/A	733	173	1146	271	1604	379	2292	542
107	Sun	SB12-100	662	102	1035	160	1449	224	2069	319
110	Sun	SB12-100HFT	769	209	1201	326	1682	457	2403	653
110	Sun	SB12-100HFT	769	209	1201	326	1682	457	2403	653
116	SSB	SBLFT110-12i	680	120	1063	188	1488	263	2125	375
120	Effekta	BTL12-120	822	262	1285	410	1799	574	2569	819
120	Fiamm	FG2C007	1071	511	1674	799	2343	1118	3347	1597
120	SSB	SBL120-12i(sh)	822	262	1285	410	1799	574	2569	819
120	Europower	EPS 120-12	822	262	1285	410	1799	574	2569	819
121	Long	6FM115G/B	644	84	1007	132	1410	185	2014	264
125	SSB	SBL125-12HR	822	262	1285	410	1799	574	2569	819
125	Sun	SB12-120	822	262	1285	410	1799	574	2569	819
126	Long	6FM120G/B	822	262	1285	410	1799	574	2569	819
130	Yuasa	NPL130-6IFR	644	84	1007	132	1410	185	2014	264
131	Leoch	LPF12-125	769	209	1201	326	1682	457	2403	653
132	Leoch	LPF12-120	822	262	1285	410	1799	574	2569	819
134	SSB	SBL134R-12i	644	84	1007	132	1410	185	2014	264
135	SSB	SBL135-12HR	822	262	1285	410	1799	574	2569	819
140	Energys	6VE140	1025	465	1601	726	2242	1017	3203	1453
150	Effekta	BTL12-150	822	262	1285	410	1799	574	2569	819
150	Fiamm	FG2F009	1160	600	1813	938	2538	1313	3625	1875
150	SSB	SBL150-12i	911	351	1424	549	1993	768	2847	1097
151	SSB	SBL151-12HR	733	173	1146	271	1604	379	2292	542
156	Sun	SB12-150	911	351	1424	549	1993	768	2847	1097
157	Leoch	LPF12-150	822	262	1285	410	1799	574	2569	819
159	SSB	SBLFT150-12i	644	84	1007	132	1410	185	2014	264
159	Sun	SB12-150AFT	804	244	1257	382	1760	535	2514	764
160	Effekta	BTL12-150L	822	262	1285	410	1799	574	2569	819
170	SSB	SBL170-12HR	858	298	1340	465	1876	651	2681	931
180	Energys	6VE180	1103	543	1724	849	2413	1188	3447	1697

180	Leoch	LPF12-180	911	351	1424	549	1993	768	2847	1097
200	Effekta	BTL12-200	822	262	1285	410	1799	574	2569	819
200	SSB	SBL200-12i	1036	476	1618	743	2265	1040	3236	1486
200	Fiamm	FG2M009	1249	689	1951	1076	2732	1507	3903	2153
200	Yuasa	NPL200-6	1071	511	1674	799	2343	1118	3347	1597
200	Europower	EPS 200-12	1089	529	1701	826	2382	1157	3403	1653
210	Leoch	LPF12-200	1000	440	1563	688	2188	963	3125	1375
210	Long	6FM200G/B	1000	440	1563	688	2188	963	3125	1375
214	Sun	SB12-200	1053	493	1646	771	2304	1079	3292	1542
225	SSB	SBL225-12HR	893	333	1396	521	1954	729	2792	1042
225	Enersys	2VE225	1117	557	1746	871	2444	1219	3492	1742
228	Leoch	PLH210FT	1053	493	1646	771	2304	1079	3292	1542
230	Europower	EPS 230-12	1089	529	1701	826	2382	1157	3403	1653

6 New batteries

Capacity

Often, new batteries do not give their rated capacity when received from the manufacturer. This happens due to the methods of making the plates. The plates are made by applying oxides of lead, mixed with a liquid, which is generally diluted sulfuric acid, to the grids. To produce the spongy lead and the lead peroxide, these oxides are subjected to a charging current. After the charge, the oxides are discharged, and then charged again. This cycle is necessary because not all the oxides are changed to active material on one charge. Repeated charges and discharges are required to produce the maximum amount of active materials. Some manufacturers do not charge and discharge a battery enough times before sending it out. These manufacturers expect that, after a battery is put into use, its capacity will eventually increase to the specified value, because more active material is produced during each charge. Backup batteries, however, might never get enough discharge and charge cycles to reach that capacity.

Internal resistance

Due to this reduction of active material, new batteries and batteries that have been stored for longer periods of time show a relatively high internal resistance. This degradation does not recover completely by recharging the battery once. The internal resistance is affected by the number of charging and discharging cycles. Initially, the internal resistance will decrease with every cycle. Eventually, the aging of the battery will increase the internal resistance. Therefore, if you install one of these batteries and it shows a fault on the charger, this fault will not just go away by charging. The charger is not at fault, but the battery.

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