Alcad stationary batteries, solutions you can count on!

1xSYS_00001 92xLCE55P+SGL3

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Stand proposal

project name	New Project 1
project reference	P_21Jun22_Ayhan_a
System name	SYS_00001 - Layout
System reference	SYS_00001
Customer	
Customer reference	

Battery

Cell type	LCE55P
Cells number	92
Stand number	1
Cell container material	PP
Handle	No
Electrolyte	E22
Wiring principle	Normal

Part number	Description	Quantity
311033451	LCE55P	92
310395010	Stand SGL3 - 2100 mm	1

Proposed stand

Stand N°	Stand details	Page
1	92 cell(s) LCE55P - SGL3 - 2100	3

Options

Terminal Connection End Lug - 310537403 : A=16 (mm²) : M6

Cables Ins-Outs : 310535709 L=300 (mm) A=16 (mm²)

End lugs are used to connect the external cables to the cells.

Summary of the system :

Electrolyte volume	97 L
System volume	0,00 m³
System weight	0 Kg

Stand N° 1 proposal of Battery layout and approx packing information

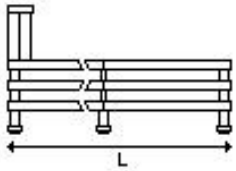
Battery

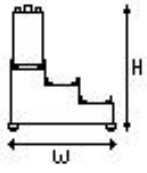
Cell type	LCE55P
Cells included in this stand	92
Cell container material	PP
Handle	No
Electrolyte	E22
Wiring principle	Normal

Part number	Description	Quantity
311033451	LCE55P	92
310395010	Stand SGL3 - 2100 mm	1

Proposed stand

Stand type	SGL3	
Stand dimensions (including cells)	Length (L)	2.100 mm
	Width (W)	645 mm
	Total height (H)	655 mm
	Total weight	350,4 Kg
Packaging (for this stand and only the cells included)	State of charge	Filled and charged
	Cells weight	0,0 Kg
	Stand weight	0,0 Kg
	Total weight	0,0 Kg
	Cells volume	0,00 m³
	Stand volume	0,00 m³
	Total volume	0,00 m³
	Electrolyte volume	96,60 L

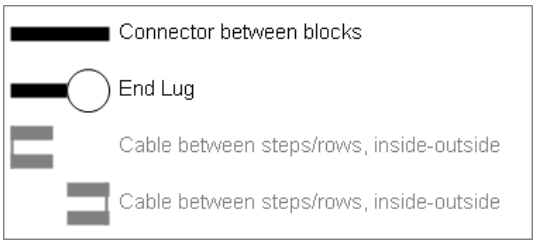


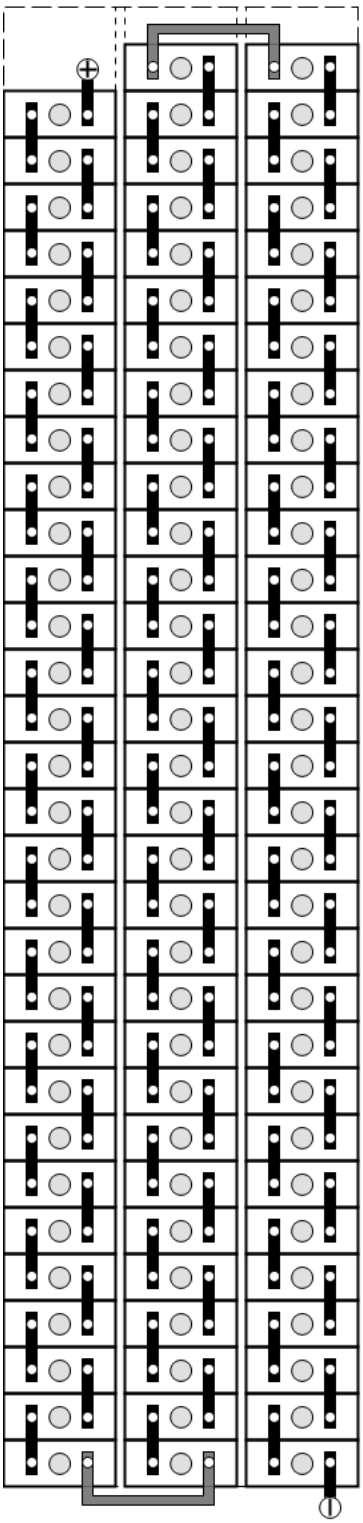


Battery layout

Stand : SGL3 - 2100

Battery : 92 x LCE55P





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IEC 62485-2 / EN 50272-2 ventilation requirement / heat dissipation

Battery **92 x LCE55P + SGL3**

During the last stage of high-rate charging (end of charge and during overcharge), the battery is emitting gases (oxygen-hydrogen mixture). The purpose of ventilating a battery location or enclosure is to maintain the hydrogen gas concentration below the 4% hydrogen threshold. Battery accommodation rooms are to be considered as safe from explosions, when by the natural or forced ventilation the concentration of hydrogen gas is kept below this safety limit. Note that specific local regulations for battery installation and ventilation may be valid in your area.

Hydrogen gas (H2) Concentration	4%	**standard**	IEC 62485-2 / EN 50272-2
LEL Value	100%		

Ventilation air flow Q

$$Q = v \times q \times s \times n \times I_{gas} \times C_{rt} \times 10^{-3}\ (m^3/h)$$

Variable	Description	Value
v x q x s	v = dilution factor to avoid a 4% hydrogen concentration ((100 % - 4%) / 4%)	24
	q = maximum generated hydrogen for 1 Ah of overcharge per cell assuming no gas recombination	0.42 x 10^{-3} m^3/Ah
	s = general safety factor	5
n	Number of cells	92
$I_{gas} = I_{float/Boost} \times f_g \times f_s$	Current producing gas during overcharge when charged with constant voltage	
	I_{float} = current for the float charge under fully charged condition at 1.4 V to 1.43 V at + 20 °C	1 mA/Ah
	I_{Boost} = current for the boost charge under fully charged condition at 1.5 V to 1.55 V at + 20 °C	10 mA/Ah
	f_g = gas emission factor, proportion of current at fully charged state producing hydrogen	1
	f_s = safety factor taking into account faulty cells and an ageing	5
$I_{gas} = I_{commissioning}$	Current for commissioning at constant current charge at 0,2 C_5 A	200 mA/Ah
C_{rt}	Rated capacity	55 C_5 Ah

	At float	At boost	Commissioning
Air flow Q (m^3/h)	1.28	12.75	51.00

Note: The charger must be protected against malfunction. If not, the ventilation should be calculated to suit the greatest current available from the charger.

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IEC 62485-2 / EN 50272-2 ventilation requirement / heat dissipation

Battery **92 x LCE55P + SGL3**

Number of air changes per hour

	Length (m)	Width (m)	Height (m)	Volume (m³)
Battery room volume				
Occupied volume				0.46
Free air volume				

	At float	At boost	Commissioning
Number of air changes per hour		N/A	

Natural ventilation

The amount of ventilation air flow shall preferably be ensured by natural ventilation, otherwise by forced ventilation. For natural ventilation, battery rooms or enclosures require an air inlet and an air outlet with a free area of opening calculated by the formula $A > 28 \times Q$ (cm²). The air velocity is assumed to be 0.1 m/sec.

	At float	At boost	Commissioning
Free area of openings - inlet & outlet (cm²)	1.28*28=35.7	12.75*28=357	51.00*28=1428.1

The above calculations are done according to the IEC 62485-2 standard.
Always check local regulations.

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IEC 62485-2 / EN 50272-2 ventilation requirement / heat dissipation

Battery **92 x LCE55P + SGL3**

H2 emissions

The calculated H2 emission value is the amount of H2 that will be released from the cells under normal charging conditions without safety factors.

H2 Emission = 0.42 x 0.001 x Crt x Ihydrogen x n dm^3/h (litre/h)

Actual gassing = 0.63 x 0.001 x Crt x Ihydrogen x n dm^3/h (litre/h)

Variable	Description	Value
$I_{hydrogen} = I_{float/Boost} x (1-R_v)$	Current producing gas during overcharge when charged with constant voltage	
	I_{float} = current for the float charge under fully charged condition at 1.4 V to 1.43 V at + 20 °C	1 mA/Ah
	I_{Boost} = current for the boost charge under fully charged condition at 1.5 V to 1.55 V at + 20 °C	10 mA/Ah
	R_v = recombination degree, proportion of hydrogen that is recombined into water	0.3
$I_{hydrogen} = I_{commissioning}$	Current for commissioning at constant current charge at 0,2 C_5 A	200 mA/Ah
n	Number of cells	92
C_{rt}	Rated capacity	55 C_5 Ah

	At float	At boost	Commissioning
H2 Emission (dm^3/h)	1.49	14.9	425
H2+O2 Emission (dm^3/h)	2.23	22.3	638

Heat dissipation

The heat dissipation during float is normally used for dimensioning the cooling system. The cells will also generate heat during discharge and recharge but the generated heat will be absorbed by the plates and the electrolyte and will slowly dissipate to the surrounding air.

	At float 1.43V Per cell	**At boost** 1.47V Per cell	**At discharge** av.current of N/A av.voltage of 1.24V Per cell
Heat dissipation per system (W)	1.4	23.8	N/A

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IEC 62485-2 / EN 50272-2 ventilation requirement / heat dissipation

Battery **92 x LCE55P + SGL3**

Safety distance according to IEC 62485-2 chaper 7.7

$$d = 28,8 \times \sqrt[3]{I_{gas}} \times \sqrt[3]{C_{rt}} \text{ mm}$$

Variable	Description	Value
$I_{gas} = I_{float/Boost} \times f_g \times f_s$	Current producing gas during overcharge when charged with constant voltage	
	I_{float} = current for the float charge under fully charged condition at 1.4 V to 1.43 V at + 20 °C	1 mA/Ah
	I_{Boost} = current for the boost charge under fully charged condition at 1.5 V to 1.55 V at + 20 °C	10 mA/Ah
	f_g = gas emission factor, proportion of current at fully charged state producing hydrogen	1
	f_s = safety factor taking into account faulty cells and an ageing	5
C_{rt}	Rated capacity	55 C_5 Ah

	At float	At boost
Safety distance (mm)	187	403

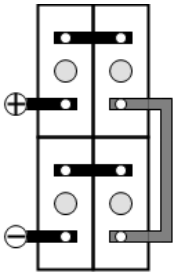
NOTE The required safety distance d can be achieved by the use of a partition wall between battery and sparking device.

LCE55P - Cell data sheet

Classification

Brand	Alcad
Cell type	LCE55P
Cell P/N	311033451
Capacity at 5 hours rate	55 Ah
IEC Designation	KL55P
According to IEC 60623	

Wiring principle Normal



Physical data

Overall height	270 mm		
Cell height	267 mm		
Width	121 mm	Weight per cell	3,3 Kg
Length	66 mm	Block length - 2 cells	-
Block length - 3 cells	-	Block length - 4 cells	-
Block length - 5 cells	-	Block length - 6 cells	-
Block length - 7 cells	-	Block length - 8 cells	-
Block length - 9 cells	-	Block length - 10 cells	-

Construction

Container material	Polypropylene	No. of terminals/polarity	1
Separator type	Grid	Terminal material	Steel
Connection torque	11,0 +/- 1,1 Nm	Vent type	Flame arresting vent (small)
Terminal size	M6 SW 10 mm		
		Handle	No

Plates

Positive		Negative	
Type of plates	Pocket	Type of plates	Pocket

Electrolyte

Electrolyte type: Renewal	E13	Max/Min	35 mm
Electrolyte type: Initial	E22	Vent oil quantity	
Electrolyte per cell: Liquid	1,0 liters		

Connection

Cable area of internal connection cables	16 mm²	End-lug (and external cable)	10 mm²

LCE55P - Cell data sheet

Charging

Float voltage	1,42 V/Cell	High rate voltage (min)	1,47 V/Cell
Single-level voltage	1,43 V/Cell		

Resistance/Short circuit

Internal resistance	2,27 mOhm	Short circuit current	680 A

Performance data

Current discharge

After prolonged float charge of fully charged cells. Available amperes at +20°C +/- 5°C (+68°F +/- 9°F)

V/Cell	10h	8h	5h	3h	2h	1,5h	1h	30m	20m	15m	10m	5m	1m	30s	5s	1s
1	5,64	7,01	11,0	17,6	23,6	29,3	38,8	52,0	58,8	63,8	68,6	86,7	98,2	109	140	158
1,05	5,61	6,94	10,8	17,0	21,2	25,2	32,9	44,2	51,6	55,6	61,6	62,6	79,2	89,0	116	131
1,1	5,50	6,74	10,4	14,7	18,7	22,3	26,4	35,4	39,4	41,9	46,8	55,2	63,9	73,4	96,0	109
1,14	5,39	6,34	9,10	12,9	16,0	18,0	21,7	27,8	31,3	33,6	35,4	40,5	52,2	60,5	79,3	90,9
1,16	5,06	5,78	7,88	11,1	13,7	15,0	17,8	23,4	27,3	30,6	31,4	36,9	47,7	55,2	72,4	82,9

Power discharge

Available power (W), after prolonged float charged of fully charged cells at +20°C +/- 5°C (+68°F +/- 9°F)

V/Cell	10h	8h	5h	3h	2h	1,5h	1h	30m	20m	15m	10m	5m	1m	30s	5s	1s
1	6,53	8,01	12,3	18,8	24,7	30,3	39,7	52,6	59,2	64,0	68,8	86,7	98,2	109	140	158
1,05	6,53	8,00	12,2	18,8	23,0	27,1	35,1	46,8	54,5	58,6	64,8	65,7	83,2	93,4	122	137
1,1	6,43	7,84	12,0	16,7	21,0	24,9	29,2	39,1	43,4	46,2	51,5	60,8	70,3	80,8	106	120
1,14	6,32	7,42	10,6	15,0	18,5	20,7	24,8	31,7	35,7	38,4	40,4	46,2	59,6	69,0	90,5	104
1,16	5,94	6,80	9,27	13,0	16,0	17,5	20,7	27,1	31,7	35,5	36,4	42,8	55,3	64,0	83,9	96,2

LCE55P - Cell data sheet

Kt Factor

Current discharge

After prolonged float charge of fully charged cells. Kt factor at +20°C +/- 5°C (+68°F +/- 9°F)

V/Cell	10h	8h	5h	3h	2h	1,5h	1h	30m	20m	15m	10m	5m	1m	30s	5s	1s
1	9,8	7,84	5,00	3,12	2,33	1,88	1,42	1,06	0,93	0,86	0,80	0,63	0,56	0,50	0,39	0,35
1,05	9,8	7,92	5,10	3,23	2,59	2,18	1,67	1,24	1,06	0,99	0,89	0,88	0,69	0,62	0,47	0,42
1,1	10,0	8,16	5,31	3,74	2,94	2,46	2,09	1,55	1,40	1,31	1,17	1,00	0,86	0,75	0,57	0,50
1,14	10,2	8,68	6,04	4,26	3,43	3,05	2,54	1,98	1,76	1,63	1,55	1,36	1,05	0,91	0,69	0,61
1,16	10,9	9,5	6,98	4,96	4,02	3,66	3,09	2,35	2,01	1,80	1,75	1,49	1,15	1,00	0,76	0,66

Power discharge

Kt factor power, after prolonged float charged of fully charged cells at +20°C +/- 5°C (+68°F +/- 9°F)

V/Cell	10h	8h	5h	3h	2h	1,5h	1h	30m	20m	15m	10m	5m	1m	30s	5s	1s
1	8,42	6,87	4,47	2,92	2,22	1,81	1,39	1,05	0,93	0,86	0,80	0,63	0,56	0,50	0,39	0,35
1,05	8,42	6,87	4,49	2,93	2,39	2,03	1,57	1,18	1,01	0,94	0,85	0,84	0,66	0,59	0,45	0,40
1,1	8,55	7,02	4,60	3,30	2,62	2,21	1,88	1,41	1,27	1,19	1,07	0,90	0,78	0,68	0,52	0,46
1,14	8,70	7,41	5,17	3,68	2,98	2,66	2,21	1,73	1,54	1,43	1,36	1,19	0,92	0,80	0,61	0,53
1,16	9,25	8,09	5,94	4,24	3,44	3,14	2,66	2,03	1,73	1,55	1,51	1,28	0,99	0,86	0,66	0,57