ZeMaRail™ Batteries:
Technical Data

ZeMaRail™
BATTERIES

KEEPING YOU ON TRACK

VRLA TPPL+SN BATTERY TECHNOLOGY
FOR ROLLING STOCK APPLICATIONS

Designed specifically for rolling stock railway vehicle applications, the ZeMaRail™ batteries deliver reliable, maintenance-free performance. Featuring advanced Thin Plate Pure Lead (TPPL) technology, the ZeMaRail™ range of Valve-Regulated Lead-Acid (VRLA) TPPL+Sn (tin addition) batteries pack more power into the same space compared to conventional batteries.

- **High Energy Density:** Delivers more power in a compact design, maximizing efficiency without compromising space.
- **Maintenance-Free:** No water topping required, offering you hassle-free, reliable performance.
- **Long Service Life:** Ensures durable, long-lasting energy.
- **Excellent Deep Discharge Recovery:** Advanced TPPL ZeMaRail™ battery technology, with a small addition of tin to the positive plates, ensures superior recovery from accidental deep discharges.

CE UK CA

EnerSys
Power/Full Solutions

ZeMaRail™ 12V BATTERIES

- 12V ELECTRICAL DATA
- 12V ENVIRONMENTAL DATA
- 12V INSTALLATION & OPERATION
- 12V MECHANICAL DATA
- 12V BATTERY DIAGRAMS

ZeMaRail™ 2V BATTERIES

- 2V ELECTRICAL DATA
- 2V ENVIRONMENTAL DATA
- 2V INSTALLATION & OPERATION
- 2V MECHANICAL DATA
- 2V BATTERY DIAGRAMS

EnerSys Power/Full Solutions

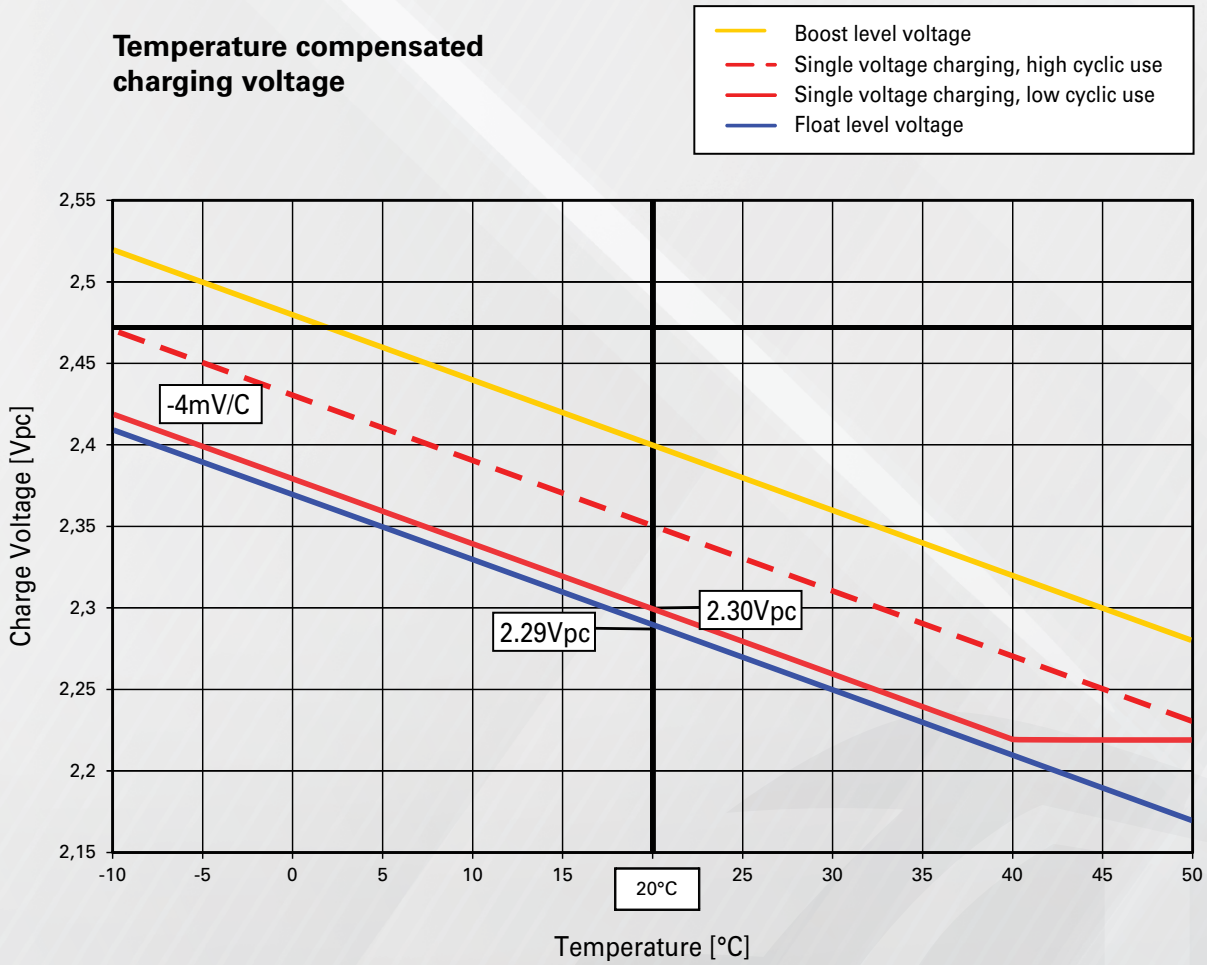
Electrical Data					
	12ZeMa92	12ZeMa122	12ZeMa167	12ZeMa170	12ZeMa190
Product type	12 V Monobloc				
Material number	1538-5066	1568-5093	0740-780000K6	1538-5067	1538-5068
Nominal voltage	12 V				
Number of cells	6 (VRLA (AGM), TPPL+Sn Technology)				
Rated capacity C_{10} to 1.80 Vpc at 68°F (20°C)	92 Ah	122 Ah	167 Ah	170 Ah	190 Ah
Current/Power for 1.0 h back-up time 1.60 Vpc 68°F (20°C)	65.5 A / 732 W	88.4 A / 1034.5 W	130.3 A / 253.3 W	125.5 A / 1380 W	140.0 A / 1536 W
Current/Power for 3.0 h back-up time 1.70 Vpc 68°F (20°C)	25.6 A / 294 W	36.3 A / 433.4 W	157.1 A / 104.4 W	50.2 A / 576 W	56.1 A / 642 W
Current/Power for 5.0 h back-up time 1.75 Vpc 68°F (20°C)	16.5 A / 192 W	23.1 A / 277.7 W	167.6 A / 67.2 W	31.8 A / 366 W	35.6 A / 414 W
Current/Power for 8.0 h back-up time 1.75 Vpc 68°F (20°C)	11.1 A / 126 W	15.2 A / 183.3 W	176.3 A / 44.3 W	21.1 A / 246 W	23.6 A / 270 W
Current/Power for 10.0 h back-up time 1.80 Vpc 68°F (20°C)	9.2 A / 108 W	12.2 A / 147.5 W	180.2 A / 36.3 W	16.9 A / 198 W	19.0 A / 222 W
Conversion to capacity at 77°F (25°C)	102% of Current / Power at 68°F (20°C)				
Internal resistance (± 10%) to IEC/EN 60896-21	5.5 mΩ	4 mΩ	4 mΩ	4 mΩ	3.3 mΩ
Short circuit current (± 10%) to IEC/EN 60896-21	2.3 kA	3.1 kA	3.4 kA	3.4 kA	3.8 kA
Self discharge at 68°F (20°C) to IEC/EN 60896-21	1% / Month				
Heat loss during float service at 68°F (20°C	70…140 mW per cell	93 … 187 mW per cell	123 … 246 mW per cell	125 … 250 mW per cell	140 … 280 mW per cell

Mechanical Data					
	12ZeMa92	12ZeMa122	12ZeMa167	12ZeMa170	12ZeMa190
Weight	61.73 lb (28 kg)	95.24 lb (43.2 kg)	117 lb (53.1 kg)	115.7 lb (52.5 kg)	132.2 lb (60 kg)
Height of monobloc / over terminal cover	10.39" (264 mm)	10.75" (273 mm)	10.75" (273 mm)	11.14" / 11.69" (283 mm / 297 mm)	12.48" / 13" (317 mm / 331 mm)
Width	4.13" (105 mm)	6.81" (173 mm)	6.79" (172.5 mm)	4.92" (125 mm)	4.92" (125 mm)
Depth	15.55" (395 mm)	13.31" (338 mm)	16.89" (429 mm)	22.09" (561 mm)	22.09" (561 mm)
Number of terminals	1 (+) / 1 (-)				
Dimension of terminal screw hole	M8 x 0.512" deep, female thread (13mm)	M6 x 0.55" deep, female thread (14mm)	M8 x 0.512" deep, female thread (13mm)	M8 x 0.512" deep, female thread (13mm)	M8 x 0.512" deep, female thread (13mm)
Torque terminal screw	9.0 Nm ± 0.9 Nm	6.8 Nm ± 0.7 Nm	9.0 Nm ± 0.9 Nm	9.0 Nm ± 0.9 Nm	9.0 Nm ± 0.9 Nm
Terminal insulation class according to IEC/EN 60529	IP 20				
Maximum cable cross-section	3/0 AWG (95 mm^2)				
Complete connector and terminal connection	Accessories Kit (Rear-Take off) available	Accessories Kit available	Accessories Kit (Rear-Take off) available	Accessories Kit (Rear-Take off) available	Accessories Kit (Rear-Take off) available
Connector (copper, tin-coated and insulated)	For Rolling Stock rigid connectors are NOT allowed				
Shock + Vibration rating (according)	Category 1, Class B (IEC 61373)				

Environmental Data					
	12ZeMa92	12ZeMa122	12ZeMa167	12ZeMa170	12ZeMa190
Installation	Horizontally or Laterally				
Distance for cooling and ventilation	0.3937" around the blocs (10 mm)				
Material of case/cover;	PC+ABS FR				
Flame retardancy rating (according to)	R7 (EN 45545-2)* *Approval is subject to functional necessity (clause 4.7)				
Flame barriers at vents	Yes				
Rail service life expected at 59°F (15°C)	7 years (max. 30% Depth of Discharge (DoD) / day)				
Cycle Endurance (float service with daily discharges)	> 650 cycles (IEC 60896-21; Test 6.13)				
Design life (Eurobat classification)	12+ Long Life				
Shipping name	Batteries, wet, non spillable				

Battery Installation and Operation					
	12ZeMa92	12ZeMa122	12ZeMa167	12ZeMa170	12ZeMa190
Recommended charging for rolling stock applications (standby parallel operation)	IU0U - charging : 2 level charging (acc. DIN 41773) with current limitation and temperature compensation				
Boost level voltage setting at 68°F (20°C)	2.40 Vpc				
Lower or single level voltage setting at 68°F (20°C)	2.30 ... 2.35 Vpc (low ... high cyclic use)				
Charge current for IU or IU0U-charging (DIN 41773)	35 A (minimum for cyclic use: 22 A)	53 A (minimum for cyclic use: 34A)	80 A (minimum for cyclic use: 50A)	75 A (minimum for cyclic use: 47A)	80 A (minimum for cyclic use: 50A)
Voltage compensation in function of temperature	- 4 mV/K per cell				
Float level voltage setting at 68°F (20°C) (± 1%)	2.29 Vpc (also valid for long term trickle charging at workshop and storage)				
Air exchange	As a VRLA battery according to EN IEC 62485-2 $Q = 0.05 * N_{cells} * I_{gas} * C_{AhC10} * 10^{-3}$ [m^3/h] $I_{gas} = 1$ (at 2.29 Vpc) ; $I_{gas} = 8$ (at 2.40 Vpc)				
Preferred operating temperature range	Between 59°F and 77°F				
Maximum long term operating temperature	+104°F (+40°C) with ventilation assured (reduced service life)				
Maximum short term operating temperature (< 3h)	+122°F (+50°C) with ventilation assured (reduced service life)				
Minimum operating and storage temperature	-40°F (-40°C) (in charged condition)				

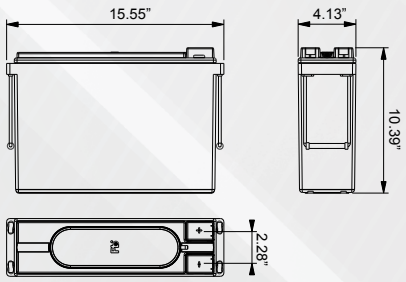
Temperature compensated charging voltage



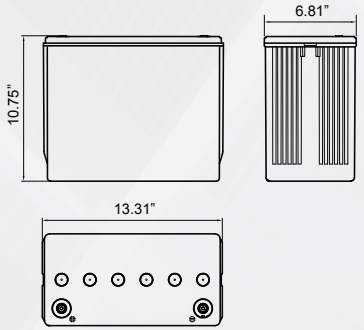
Temperature compensated charging voltage		
Temperature		Percentage of the rated capacity
°F	°C	C_5
104	40	106
95	35	105
86	30	104
77	25	102
68	20	100
59	15	98
50	10	96
41	5	92
32	0	89
23	-5	84
14	-10	71
5	-15	58
-4	-20	51
-13	-25	44
-22	-30	38
-31	-35	31
-40	-40	25

Estimated Values
Should be verified with actual load profile

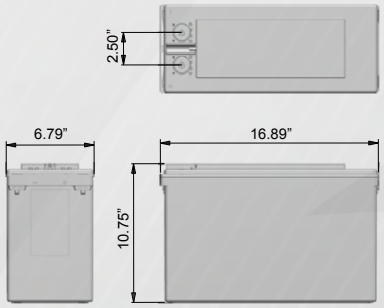
12ZeMa92 BATTERIES



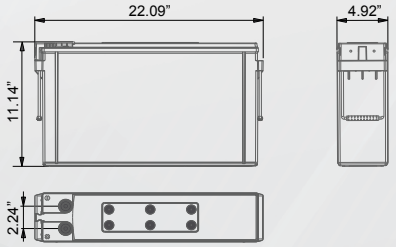
12ZeMa122 BATTERIES



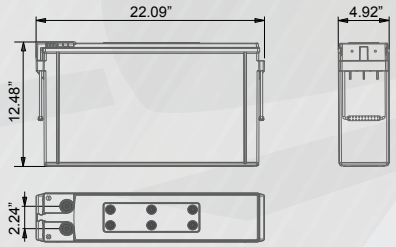
12ZeMa167 BATTERIES



12ZeMa170 BATTERIES



12ZeMa190 BATTERIES



ZeMaRail™ 12V BATTERIES

EnerSys Power/Full Solutions

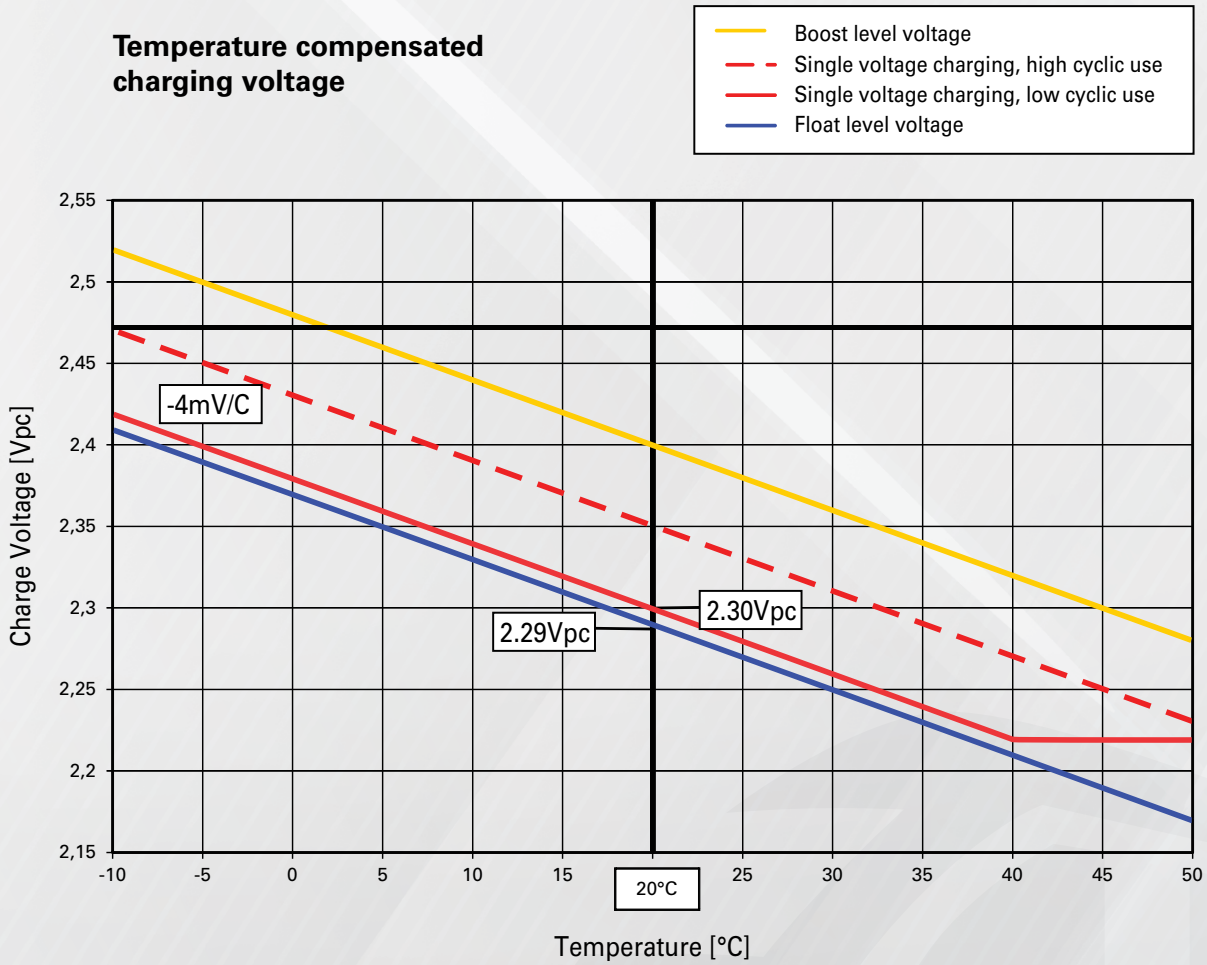
Electrical Data				
	ZeMa200P18	ZeMa270P12	ZeMa340P12	ZeMa450P21
Product type	2 V Cell			
Material number	SR70770206	1896504V0SEC	1898204V0CP	1890507V0CHA
Nominal voltage	2V			
Number of cells	1 (VRLA (AGM), TPPL+Sn Technology)			
Rated capacity C_{10} to 1.80 Vpc at 68°F (20°C)	208 Ah	270 Ah	340 Ah	450 Ah
Current/Power for 0.25 h back-up time 1.60 Vpc 68°F (20°C)	430 A / 754 W	430.7 A / 732.6 W	480.6 A / 818.7 W	819 A / 1356 W
Current/Power for 0.5 h back-up time 1.60 Vpc 68°F (20°C)	258 A / 480 W	287.2 A / 507.6 W	329.5 A / 585.0 W	547 A / 940 W
Current/Power for 1.0 h back-up time 1.60 Vpc 68°F (20°C)	150 A / 280 W	175.2 A / 323.8 W	209.9 A / 386.9 W	325 A / 585 W
Current/Power for 3.0 h back-up time 1.70 Vpc 68°F (20°C)	60 A / 115 W	74.5 A / 142.8 W	92.8 A / 177.8 W	131 A / 245 W
Current/Power for 5.0 h back-up time 1.75 Vpc 68°F (20°C)	37.6 A / 73 W	48.8 A / 94.8 W	61.3 A / 119.3 W	83.7 A / 158.3 W
Current/Power for 8.0 h back-up time 1.75 Vpc 68°F (20°C)	25.8 A / 48.5 W	32.8 A / 64.0 W	41.3 A / 81.1 W	56.8 A / 108.3 W
Current/Power for 10.0 h back-up time 1.80 Vpc 68°F (20°C)	20.8 A / 40.5 W	27.0A / 52.9 W	33.9 A / 66.9 W	45.0 A / 86.5 W
Current/Power for 24.0 h back-up time 1.80 Vpc 68°F (20°C)	9.8 A / 19 W	12.4 A / 24.5 W	15.5 A / 30.9 W	21.2 A / 41.4 W
Conversion to capacity at 77°F (25°C)	102% of Current / Power at 68°F (20°C)			
Internal resistance (± 10%) to IEC/EN 60896-21	0.43 mΩ	0.48 mΩ	0.49 mΩ	0.28 mΩ
Short circuit current (± 10%) to IEC/EN 60896-21	4.9 kA	4.4 kA	4.24 kA	7.5 Ka
Self discharge at 68°F (20°C) to IEC/EN 60896-21	max. 3% / month	max. 1.25% / Month	max. 1.25% / Month	max 3% / month

Mechanical Data				
	ZeMa200P18	ZeMa270P12	ZeMa340P12	ZeMa450P21
Weight	32 lb ± 2% (14.5 kg)	35.9 lb ± 3% (16.3 kg)	43 lb ± 3% (19.5 kg)	62.5 lb ± 2% (27.9 kg)
Height of monobloc / over terminal cover	10.20" (259 mm)	14.5" (370 mm)	17.13" (435 mm)	14.57" (370 mm)
Width	6.18" (157 mm)	7.80" (198 mm)	7.80" (198 mm)	7.80" (198 mm)
Depth	4.92" (125 mm)	3.27" (83 mm)	3.27" (83 mm)	5.39" (137 mm)
Number of terminals	1 (+) / 1 (-)			
Dimension of terminal screw hole	M10 x 0.78" deep, female thread (20mm)	M10 x 0.78" deep, female thread (20mm)	M10 x 0.78" deep, female thread (20mm)	M10 x 0.78" deep, female thread (20mm)
Torque terminal screw	20 Nm	25 Nm	25 Nm	25 Nm
Terminal insulation class according to IEC/EN 60529	IP 20			
Diameter of diagnostic hole for voltage probe	0.07874" (2 mm)			
Maximum cable cross-section	3/0 AWG / 4/0 AWG (max) (75mm² / 120mm²)			
Complete connector and terminal connection	Use flexible EVO or PerfectPlus - connectors			
Connector (copper, tin-coated and insulated)	For Rolling Stock flexible connectors are recommended			
Shock + Vibration rating (according)	Category 1, Class B (IEC 61373)			

Environmental Data				
	ZeMa200P18	ZeMa270P12	ZeMa340P12	ZeMa450P21
Installation	Vertically			
Distance for cooling and ventilation	None			
Material of case/cover;	Xantar PC+ABS	ESTAPROP PP-FR		
Flame retardancy rating (according to)	R7 (EN 45545-2)* *Approval is subject to functional necessity (clause 4.7)			
Flame barriers at vents	Yes			
Rail service life expected at 59°F (15°C)	8-10 years (max. 30% Depth of Discharge (DoD) / day)			
Cycle Endurance (float service with daily discharges)	1200 / 700 cycles	1500 / 1000 cycles	1500 / 1000 cycles	1200 / 700 cycles
Design life (Eurobat classification)	12+ Long Life			
Shipping name	Batteries, wet, non spillable			

Battery Installation and Operation				
	ZeMa200P18	ZeMa270P12	ZeMa340P12	ZeMa450P21
Recommended charging for rolling stock applications (standby parallel operation)	IU0U - charging : 2 level charging (acc. DIN 41773) with current limitation and temperature compensation			
Boost level voltage setting at 68°F (20°C)	2.40 Vpc			
Lower or single level voltage setting at 68°F (20°C)	2.30 ... 2.35 Vpc (low ... high cyclic use)			
Charge current for IU or IU0U-charging (DIN 41773)	80 A (minimum for cyclic use: 40A)	108 A (minimum for cyclic use: 54A)	136 A (minimum for cyclic use: 68A)	180 A (minimum for cyclic use: 110A)
Voltage compensation in function of temperature	- 3 mV/K per cell	- 4 mV/K per cell		
Float level voltage setting at 68°F (20°C) (± 1%)	2.29 Vpc (also valid for long term trickle charging at workshop and storage)			
Air exchange	As a VRLA battery according to EN IEC 62485-2 $Q = 0.05 * N_{cells} * I_{gas} * C_{AhC10} * 10^{-3}$ [m³/h] $I_{gas} = 1$ (at 2.29 Vpc) ; $I_{gas} = 8$ (at 2.40 Vpc)			
Preferred operating temperature range	Between 59°F and 77°F			
Maximum long term operating temperature	+104°F (+40°C) with ventilation assured (reduced service life)			
Maximum short term operating temperature (< 3h)	+122°F (+50°C) with ventilation assured (reduced service life)			
Minimum operating and storage temperature	-40°F (-40°C) (in charged condition)			

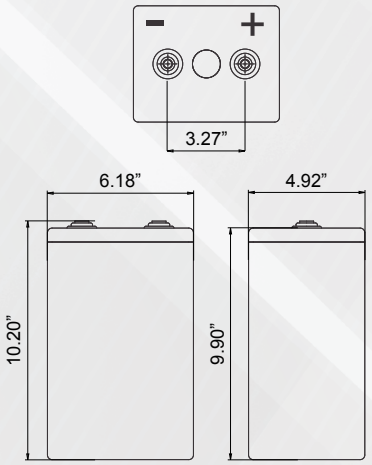
Temperature compensated charging voltage



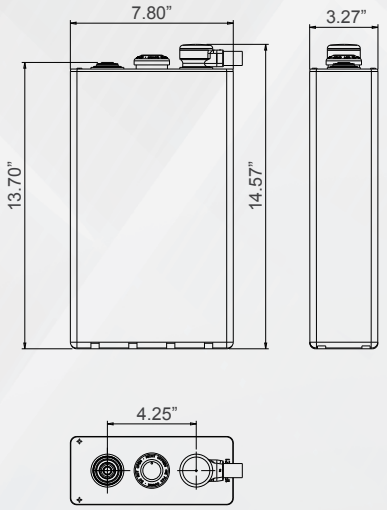
Temperature compensated charging voltage		
Temperature		Percentage of the rated capacity
°F	°C	C_5
104	40	106
95	35	105
86	30	104
77	25	102
68	20	100
59	15	98
50	10	96
41	5	92
32	0	89
23	-5	84
14	-10	71
5	-15	58
-4	-20	51
-13	-25	44
-22	-30	38
-31	-35	31
-40	-40	25

Estimated Values
Should be verified with actual load profile

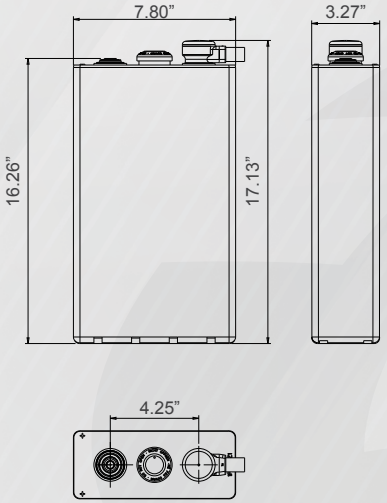
ZeMa200P18 *BATTERIES*



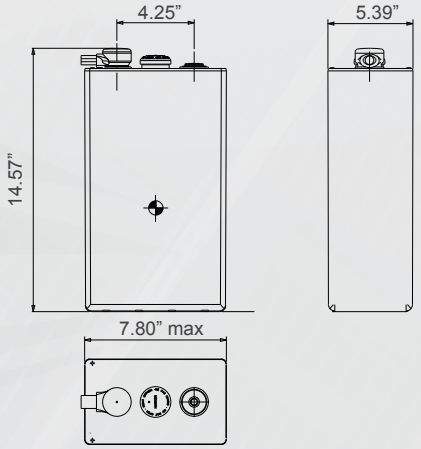
ZeMa270P12 *BATTERIES*



ZeMa340P12 *BATTERIES*



ZeMa450P21 *BATTERIES*



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