ZeMaRail™ Batteries 12ZeMa92:
Technical Data

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.

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ZeMaRail™

12ZeMa92 BATTERIES

KEEPING YOU ON TRACK

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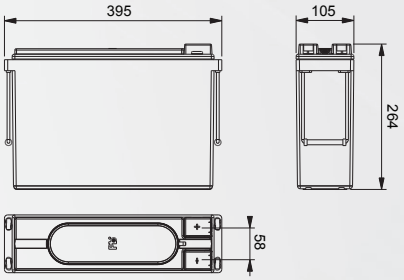
EnerSys RAIL
Power/Full Solutions

Electrical Data	
Nominal voltage	12 V
Number of cells	6 (VRLA (AGM), TPPL+Sn Technology)
Rated capacity C_{10} to 1.80 Vpc at 20 °C	92 Ah
Rated capacity C_5 to 1.70 Vpc at 30 °C	85 Ah
Current/Power for 0.25 h back-up time 1.60 Vpc 20 °C	188.2 A / 2004 W
Current/Power for 0.5 h back-up time 1.60 Vpc 20 °C	114.1 A / 1251 W
Current/Power for 1.0 h back-up time 1.60 Vpc 20 °C	65.5 A / 732 W
Current/Power for 3.0 h back-up time 1.70 Vpc 20 °C	25.6 A / 294 W
Current/Power for 5.0 h back-up time 1.75 Vpc 20 °C	16.5 A / 192 W
Current/Power for 8.0 h back-up time 1.75 Vpc 20 °C	11.1 A / 126 W
Current/Power for 10.0 h back-up time 1.80 Vpc 20 °C	9.2 A / 108 W
Current/Power for 24.0 h back-up time 1.80 Vpc 20 °C	4.5 A / 51.6 W
Conversion to capacity at 25 °C	102% of Current/Power at 20°C
Internal resistance (± 10%) to IEC/EN 60896-21	5.5 mΩ
Short circuit current (± 10%) to IEC/EN 60896-21	2.3 kA
Self discharge at 20 °C to IEC/EN 60896-21	1% / Month
Heat loss during float service at 20°C	70 ... 140 mW per cell

Mechanical Data	
Weight	28 kg
Height of monobloc / over terminal cover	264 mm / 264 mm
Width	105 mm
Depth	395 mm
Number of terminals	1 (+) / 1 (-)
Dimension of terminal screw hole	M8 x 13 deep, female thread
Torque terminal screw	9.0 Nm ± 0.9 Nm
Terminal insulation class according to IEC/EN 60529	IP 20
Diameter of diagnostic hole for voltage probe	2 mm
Maximum cable cross-section	95 mm²
Complete connector and terminal connection	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	
Installation	horizontally or laterally
Distance for cooling and ventilation	10 mm between the blocs
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 15 °C	7 years (max. 30% Depth of Discharge (DoD) / day)
Cycle Endurance (float service with daily discharges)	> 650 cycles (IEC 60869-21; Test 6.13)
Design life (Eurobat classification)	12+ Long Life
Shipping name	Batteries, wet, non spillable



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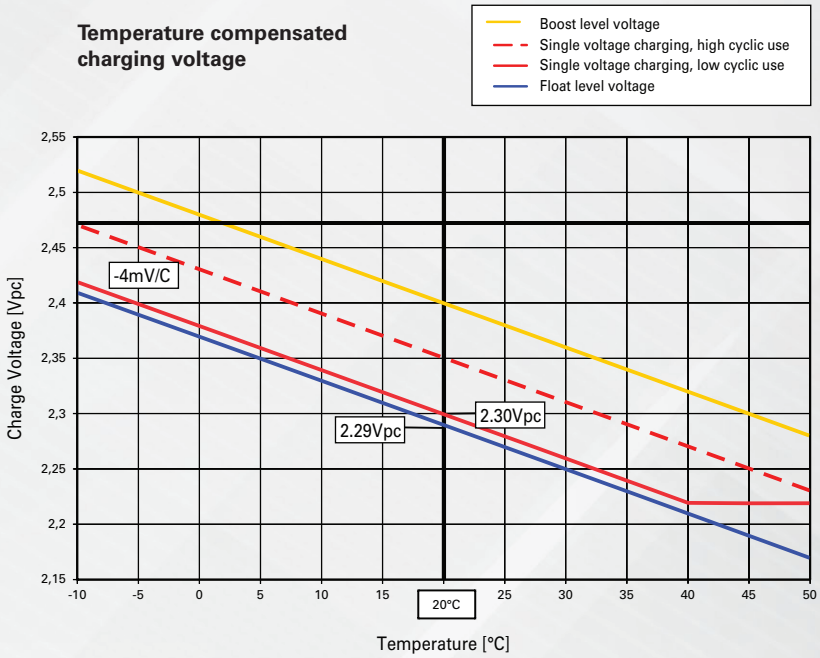
Temperature compensated charging voltage



Temperature compensated charging voltage	
Temperature in °C	**Percentage of the rated capacity (C_5)**
40	106
35	105
30	104
25	102
20	100
15	97
10	94
5	90
0	86
-5	81
-10	76
-15	70
-20	64
-25	58
-30	52
-35	46
-40	39

Estimated Values
Should be verified with actual load profile

Battery Installation and Operation	
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 20°C	2.40 Vpc
Lower or single level voltage setting at 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)
Voltage compensation in function of temperature	- 4 mV/K per cell
Float level voltage setting at 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 15°C- 25°C
Maximum long term operating temperature	+40°C with ventilation assured (reduced service life)
Maximum short term operating temperature (< 3h)	+50°C with ventilation assured (reduced service life)
Minimum operating and storage temperature	- 40°C (in charged condition)

Constant current performance [Ampere] to the defined end of discharge voltage

Voltage	Temp	Discharge time [h:min]																			
Vpc	°C	0:01	0:05	0:10	0:15	0:20	0:25	0:30	0:40	0:50	1:00	1:30	2:00	3:00	4:00	5:00	6:00	8:00	10:00	12:00	24:00
2.00	20°C	122.7	105.9	78.7	63.2	53.5	46.7	41.5	34.0	29.0	25.3	18.3	14.4	10.3	8.1	6.8	5.8	4.7	4.1	3.6	2.1
	25°C	122.7	107.9	80.7	64.9	55.0	48.0	42.7	35.0	29.8	26.1	18.8	14.8	10.6	8.3	6.9	6.0	4.8	4.1	3.6	2.2
1.95	20°C	215.7	157.2	117.3	94.4	79.2	68.8	61.1	50.1	42.7	37.3	27.2	21.7	15.5	12.2	10.1	8.7	6.8	5.7	4.9	3.0
	25°C	215.7	160.3	120.4	97.2	81.7	70.9	63.0	51.7	44.0	38.5	28.1	22.3	16.0	12.5	10.4	8.9	7.0	5.8	5.0	3.0
1.90	20°C	285.8	204.1	151.7	122.9	103.5	90.1	79.7	65.1	55.6	48.7	35.7	28.4	20.3	16.0	13.3	11.4	9.0	7.5	6.4	3.7
	25°C	285.8	208.5	155.9	126.5	106.9	93.2	82.5	67.4	57.5	50.3	36.9	29.3	21.0	16.5	13.6	11.7	9.2	7.6	6.6	3.8
1.85	20°C	335.3	243.7	181.5	147.0	124.6	108.4	96.4	78.6	67.0	58.4	42.7	34.3	24.8	19.6	16.2	13.9	11.0	9.1	7.8	4.4
	25°C	337.0	250.7	186.7	151.7	128.7	112.5	99.4	81.4	69.3	60.5	44.1	35.5	25.7	20.3	16.7	14.3	11.2	9.3	8.0	4.5
1.80	20°C	379.6	264.5	197.2	157.7	132.5	114.7	101.3	82.6	69.9	60.8	44.6	35.3	25.2	19.8	16.4	14.1	11.1	9.2	7.9	4.5
	25°C	382.3	271.4	203.1	163.0	137.1	118.8	104.9	85.6	72.5	63.0	46.2	36.5	26.0	20.4	16.9	14.4	11.4	9.4	8.1	4.5
1.75	20°C	391.0	288.0	210.6	166.8	139.0	119.8	105.2	85.2	71.9	62.5	45.3	35.8	25.4	19.9	16.5	14.1	11.1	9.3	8.0	4.5
	25°C	391.0	295.2	217.0	172.6	144.0	124.2	109.3	88.5	74.6	64.7	47.0	37.0	26.3	20.5	17.0	14.5	11.4	9.5	8.1	4.6
1.70	20°C	391.0	310.7	223.0	175.1	145.0	124.3	108.9	87.6	73.6	63.7	46.0	36.2	25.6	20.1	16.6	14.2	11.2	9.3	8.0	4.5
	25°C	391.0	318.8	230.3	181.5	150.4	129.1	113.2	91.1	76.5	66.1	47.7	37.5	26.5	20.7	17.1	14.6	11.5	9.5	8.2	4.6
1.65	20°C	391.0	330.0	234.4	182.4	150.0	128.1	111.9	89.6	75.0	64.7	46.5	36.5	25.8	20.2	16.7	14.3	11.2	9.3	8.0	4.5
	25°C	391.0	338.3	242.3	189.3	155.9	133.2	116.4	93.2	78.0	67.2	48.2	37.8	26.6	20.8	17.2	14.7	11.5	9.6	8.2	4.6
1.60	20°C	391.0	345.1	243.7	188.2	153.8	130.8	114.1	91.0	76.0	65.5	46.8	36.7	25.9	20.2	16.7	14.3	11.3	9.4	8.0	4.5
	25°C	391.0	353.8	252.5	195.6	160.0	136.1	118.8	94.8	79.1	68.1	48.6	38.1	26.8	20.9	17.2	14.7	11.6	9.6	8.2	4.6

Constant power performance [Watt per cell] to the defined end of discharge voltage

Voltage	Temp	Discharge time [h:min]																			
Vpc	°C	0:01	0:05	0:10	0:15	0:20	0:25	0:30	0:40	0:50	1:00	1:30	2:00	3:00	4:00	5:00	6:00	8:00	10:00	12:00	24:00
2.00	20°C	244.8	212.4	158.6	127.5	108.5	94.6	84.0	69.0	58.8	51.3	37.2	29.3	21.0	16.7	13.9	11.9	9.5	8.1	7.1	4.0
	25°C	244.8	216.3	162.6	130.7	111.4	97.3	86.5	71.0	60.5	52.8	38.3	30.1	21.6	17.0	14.2	12.2	9.7	8.3	7.2	4.1
1.95	20°C	420.3	307.8	231.0	186.5	157.0	136.4	121.4	100.1	85.3	74.4	54.5	43.4	31.1	24.4	20.3	17.5	13.8	11.4	9.8	5.7
	25°C	420.3	313.9	237.1	191.9	161.8	140.7	125.1	103.2	88.0	76.8	56.2	44.7	32.0	25.1	20.8	17.9	14.1	11.7	10.0	5.8
1.90	20°C	540.5	390.8	292.5	237.7	201.1	175.5	155.6	127.4	109.2	95.8	70.3	56.0	40.2	31.6	26.2	22.6	17.8	14.9	12.8	7.2
	25°C	540.5	398.9	300.2	244.6	207.7	181.1	160.8	131.8	112.8	99.0	72.6	57.9	41.4	32.5	26.9	23.2	18.2	15.2	13.1	7.3
1.85	20°C	586.2	456.4	342.7	278.9	237.1	207.1	183.8	151.2	129.4	113.1	82.8	66.8	48.3	38.1	31.7	27.1	21.3	17.7	15.2	8.5
	25°C	586.2	469.1	352.5	288.2	245.2	214.6	190.0	156.6	133.6	117.1	85.7	69.1	49.7	39.2	32.6	27.9	21.9	18.2	15.6	8.7
1.80	20°C	586.3	486.9	365.7	295.1	249.2	216.7	192.0	157.3	133.7	116.5	86.0	68.1	48.8	38.4	31.8	27.2	21.3	17.7	15.2	8.6
	25°C	586.3	499.5	375.9	304.8	257.7	224.2	198.9	163.0	138.5	120.8	89.1	70.5	50.5	39.6	32.8	28.0	21.9	18.2	15.6	8.8
1.75	20°C	586.3	519.7	383.3	307.7	258.3	223.6	197.7	161.1	136.4	118.6	87.1	68.8	49.0	38.5	31.8	27.2	21.3	17.7	15.2	8.6
	25°C	586.3	532.4	394.3	318.0	267.3	231.7	205.0	167.1	141.5	123.1	90.2	71.3	50.7	39.7	32.8	28.0	21.9	18.2	15.6	8.8
1.70	20°C	586.4	553.1	399.2	318.7	266.0	229.7	202.6	164.2	138.7	120.4	87.9	69.3	49.3	38.5	31.8	27.2	21.3	17.7	15.2	8.6
	25°C	586.4	567.5	411.2	329.6	275.7	238.3	210.3	170.6	144.0	125.1	91.1	71.8	50.9	39.8	32.8	28.0	21.9	18.2	15.6	8.8
1.65	20°C	586.4	580.2	412.5	327.6	272.6	234.5	206.3	166.6	140.4	121.7	88.3	69.6	49.4	38.5	31.8	27.2	21.3	17.7	15.2	8.6
	25°C	586.4	586.0	425.6	339.5	283.0	243.5	214.3	173.3	146.0	126.5	91.6	72.2	51.1	39.8	32.8	28.0	21.9	18.2	15.6	8.8
1.60	20°C	586.4	586.0	423.8	334.0	276.8	237.4	208.5	168.1	141.4	122.3	88.5	69.8	49.4	38.5	31.8	27.2	21.3	17.7	15.2	8.6
	25°C	586.4	586.0	438.9	346.4	287.7	246.6	216.8	175.0	147.2	127.2	91.9	72.4	51.1	39.8	32.8	28.0	21.9	18.2	15.6	8.8

Constant discharge values without voltage loss in connectors and cables!
Our technical support offers to calculate the discharge curve for a specific load profile.

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