



## ZeMaRail™ Batteries 12ZeMa190: 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.

 HAWKER

**ZeMaRail™**  
12ZeMa190 BATTERIES

KEEPING YOU ON TRACK



### Electrical Data

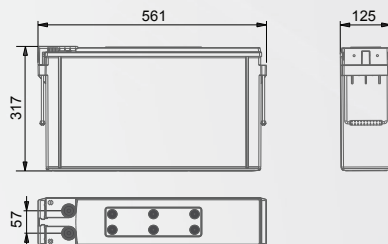
<b>Nominal voltage</b>	12 V
<b>Number of cells</b>	6 (VRLA (AGM), TPPL+Sn Technology)
<b>Rated capacity C<sub>10</sub> to 1.80 Vpc at 20 °C</b>	190 Ah
<b>Rated capacity C<sub>5</sub> to 1.70 Vpc at 30 °C</b>	187 Ah
<b>Current/Power for 0.25 h back-up time 1.60 Vpc 20 °C</b>	375.7 A / 3942 W
<b>Current/Power for 0.5 h back-up time 1.60 Vpc 20 °C</b>	235.1 A / 2528 W
<b>Current/Power for 1.0 h back-up time 1.60 Vpc 20 °C</b>	140.0 A / 1536 W
<b>Current/Power for 3.0 h back-up time 1.70 Vpc 20 °C</b>	56.1 A / 642 W
<b>Current/Power for 5.0 h back-up time 1.75 Vpc 20 °C</b>	35.6 A / 414 W
<b>Current/Power for 8.0 h back-up time 1.75 Vpc 20 °C</b>	23.6 A / 270 W
<b>Current/Power for 10.0 h back-up time 1.80 Vpc 20 °C</b>	19.0 A / 222 W
<b>Current/Power for 24.0 h back-up time 1.80 Vpc 20 °C</b>	8.8 A / 102.6 W
<b>Conversion to capacity at 25 °C</b>	102% of Current/Power at 20°C
<b>Internal resistance (± 10%) to IEC/EN 60896-21</b>	3.3 mΩ
<b>Short circuit current (± 10%) to IEC/EN 60896-21</b>	3.8 kA
<b>Self discharge at 20 °C to IEC/EN 60896-21</b>	1% / Month
<b>Heat loss during float service at 20°C</b>	140 ... 280 mW per cell

### Mechanical Data

<b>Weight</b>	60 kg
<b>Height of monobloc / over terminal cover</b>	317 mm / 331 mm
<b>Width</b>	125 mm
<b>Depth</b>	561 mm
<b>Number of terminals</b>	1 (+) / 1 (-)
<b>Dimension of terminal screw hole</b>	M8 x 13 deep, female thread
<b>Torque terminal screw</b>	9.0 Nm ± 0.9 Nm
<b>Terminal insulation class according to IEC/EN 60529</b>	IP 20
<b>Diameter of diagnostic hole for voltage probe</b>	5 mm
<b>Maximum cable cross-section</b>	95 mm <sup>2</sup>
<b>Complete connector and terminal connection</b>	Accessories Kit (Rear-Take off) available
<b>Connector (copper, tin-coated and insulated)</b>	For Rolling Stock rigid connectors are NOT allowed
<b>Shock + Vibration rating (according)</b>	Category 1, Class B (IEC 61373)

### Environmental Data

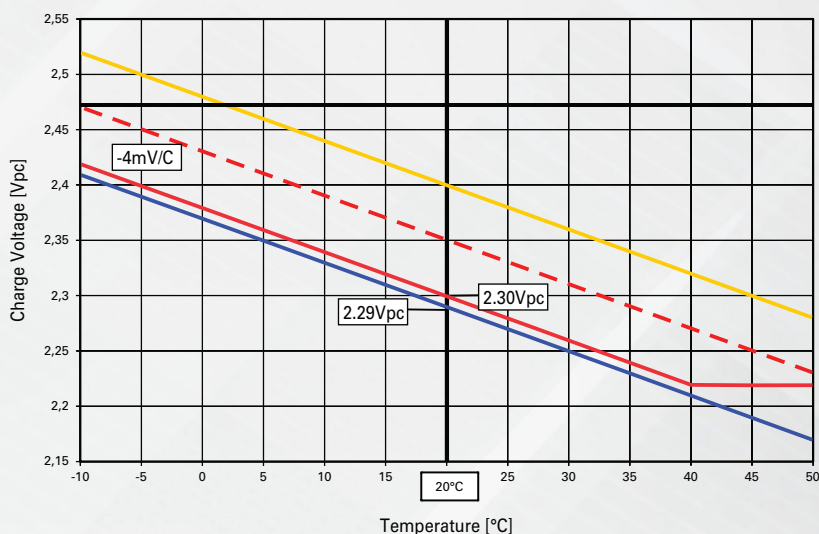
<b>Installation</b>	horizontally or laterally
<b>Distance for cooling and ventilation</b>	10 mm between the blocs
<b>Material of case/cover;</b>	PC+ABS FR
<b>Flame retardancy rating (according to)</b>	R7 (EN 45545-2)* *Approval is subject to functional necessity (clause 4.7)
<b>Flame barriers at vents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



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**ZeMaRail™**  
**12ZeMa190 BATTERIES**

**Temperature compensated charging voltage**

- Boost level voltage
- - - Single voltage charging, high cyclic use
- Single voltage charging, low cyclic use
- Float level voltage



Temperature compensated charging voltage	
Temperature in °C	Percentage of the rated capacity (C <sub>5</sub> )
40	106
35	105
30	104
25	102
20	100
15	98
10	96
5	92
0	89
-5	84
-10	71
-15	58
-20	51
-25	44
-30	38
-35	31
-40	25

*Estimated Values  
 Should be verified with actual load profile*

**Battery Installation and Operation**

<b>Recommended charging for rolling stock applications (standby parallel operation)</b>	IU0U- charging : 2 level charging (acc. DIN 41773) with current limitation and temperature compensation
<b>Boost level voltage setting at 20°C</b>	2.40 Vpc
<b>Lower or single level voltage setting at 20°C</b>	2.30 ... 2.35 Vpc (low ... high cyclic use)
<b>Charge current for IU or IU0U-charging (DIN 41773)</b>	80 A (minimum for cyclic use: 50 A)
<b>Voltage compensation in function of temperature</b>	- 4 mV/K per cell
<b>Float level voltage setting at 20°C (± 1%)</b>	2.29 Vpc (also valid for long term trickle charging at workshop and storage)
<b>Air exchange</b>	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)
<b>Preferred operating temperature range</b>	Between 15°C- 25°C
<b>Maximum long term operating temperature</b>	+40°C with ventilation assured (reduced service life)
<b>Maximum short term operating temperature (&lt; 3h)</b>	+50°C with ventilation assured (reduced service life)
<b>Minimum operating and storage temperature</b>	- 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
2.00	20°C	202.1	193.7	146.9	119.4	101.5	88.6	78.7	64.2	54.3	46.9	33.4	26.0	18.1	14.1	11.6	10.1	8.4	7.2	6.3	3.7
	25°C	202.1	196.7	150.4	122.4	104.1	91.0	81.0	66.1	56.1	48.3	34.3	26.7	18.6	14.4	11.8	10.3	8.5	7.3	6.4	3.7
1.95	20°C	343.9	289.4	225.8	185.4	157.8	137.6	122.6	101.1	86.4	75.6	55.4	43.5	30.6	23.9	19.6	16.7	12.9	10.7	9.3	5.5
	25°C	446.3	294.1	231.1	190.3	162.5	141.6	126.3	104.3	89.1	78.0	57.2	44.9	31.4	24.6	20.1	17.1	13.2	10.9	9.5	5.5
1.90	20°C	446.2	361.9	289.1	241.6	207.1	182.1	162.6	134.5	115.3	101.2	74.6	59.3	42.3	32.9	27.1	23.1	17.9	14.7	12.5	7.2
	25°C	446.3	367.1	295.8	247.7	213.3	187.6	167.8	138.8	119.0	104.5	77.1	61.2	43.6	33.9	27.8	23.7	18.4	15.1	12.8	7.3
1.85	20°C	491.3	422.8	341.3	286.9	248.5	219.5	196.3	163.3	140.5	123.1	91.2	73.2	52.6	41.1	33.9	28.9	22.5	18.5	15.7	8.6
	25°C	491.3	428.6	348.2	294.6	255.9	226.9	202.2	169.0	145.1	127.3	94.1	75.7	54.3	42.4	34.9	29.8	23.1	18.9	16.1	8.8
1.80	20°C	491.4	471.7	377.2	313.0	266.7	234.4	208.5	172.6	147.8	129.5	95.6	76.0	54.4	42.5	35.0	29.9	23.2	19.0	16.2	8.8
	25°C	491.5	478.9	385.8	322.1	275.0	242.1	215.7	178.6	152.9	134.0	98.9	78.6	56.2	43.9	36.1	30.7	23.8	19.5	16.6	9.0
1.75	20°C	491.5	491.0	407.9	334.1	282.1	245.8	217.9	179.0	152.7	133.5	97.8	77.6	55.4	43.3	35.6	30.4	23.6	19.3	16.5	9.0
	25°C	491.5	491.1	418.2	344.4	291.7	254.2	225.8	185.3	158.2	138.2	101.3	80.3	57.2	44.6	36.7	31.3	24.2	19.8	16.9	9.2
1.70	20°C	491.5	491.1	432.0	352.2	295.1	255.3	225.7	184.3	156.7	136.6	99.6	78.8	56.1	43.7	36.0	30.7	23.8	19.5	16.6	9.1
	25°C	491.5	491.2	443.0	363.8	305.7	264.3	234.2	191.0	162.5	141.5	103.2	81.6	57.9	45.1	37.1	31.6	24.5	20.1	17.0	9.2
1.65	20°C	491.5	491.2	449.5	366.3	305.1	262.6	231.7	188.1	159.6	138.8	100.8	79.7	56.5	44.1	36.3	30.9	24.0	19.7	16.8	9.1
	25°C	491.5	491.2	460.6	378.7	316.6	272.3	240.5	195.1	165.5	144.0	104.5	82.5	58.4	45.5	37.4	31.9	24.7	20.2	17.2	9.3
1.60	20°C	491.5	491.2	459.8	375.7	311.8	267.3	235.1	190.2	160.9	140.0	101.3	80.0	56.7	44.2	36.4	31.0	24.1	19.7	16.8	9.1
	25°C	491.5	491.2	471.1	388.6	323.6	277.4	244.2	197.6	167.0	145.2	105.1	82.8	58.6	45.6	37.5	31.9	24.8	20.3	17.2	9.3

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
2.00	20°C	403.3	387	295.2	240.5	205	179.1	159.2	130	109.9	94.8	67.6	52.7	36.7	28.7	23.5	20.4	16.9	14.4	12.6	7.2
	25°C	403.3	393	302.1	246.3	210.2	183.9	163.7	133.8	113.4	97.8	69.5	54.1	37.8	29.4	24.1	20.7	17.1	14.6	12.8	7.3
1.95	20°C	670.1	566.4	443.8	365.4	312	272.1	243.5	201.4	172	150.5	110.5	86.9	61.1	47.7	39.1	33.5	26	21.3	18.6	10.7
	25°C	670.2	575.4	454.1	374.9	321.0	280.3	250.6	207.6	177.4	155.1	113.9	89.6	62.9	49.1	40.2	34.3	26.6	21.8	18.9	10.9
1.90	20°C	737.3	690.2	555.7	465.7	400.9	353.2	316.2	262.1	225.8	198.5	146.4	116.6	83.3	64.9	53.3	45.5	35.4	29.2	24.8	14.0
	25°C	737.3	700.0	568.4	477.3	412.6	363.7	326.1	270.4	233.0	204.9	151.2	120.4	85.9	66.8	54.9	46.7	36.3	29.9	25.4	14.2
1.85	20°C	737.3	737.1	638.9	541.6	470.7	418.5	373.4	312.9	269.4	237.4	176.0	142.3	102.6	80.2	66.0	56.3	43.8	35.9	30.8	16.7
	25°C	737.3	737.1	651.7	556.0	485.1	431.2	385.1	323.8	278.2	245.5	181.7	147.1	105.7	82.7	68.0	58.0	45.0	36.9	31.5	17.1
1.80	20°C	737.3	737.1	692.4	580.8	498.3	439.7	393.1	326.7	280.6	246.7	183.3	146.0	104.9	82.2	67.7	57.8	44.9	36.8	31.5	17.1
	25°C	737.3	737.2	709.4	596.6	513.9	453.4	406.3	337.5	290.2	255.1	189.6	151.2	108.4	84.8	69.8	59.5	46.1	37.8	32.3	17.4
1.75	20°C	737.3	737.2	737.0	609.2	520.7	455.3	406.2	335.1	287.4	251.9	186.6	148.3	106.2	83.1	68.5	58.4	45.4	37.3	31.8	17.3
	25°C	737.3	737.2	737.0	626.7	537.9	470.2	420.3	347.0	297.4	260.9	193.1	153.5	109.8	85.8	70.7	60.2	46.7	38.3	32.6	17.6
1.70	20°C	737.3	737.2	737.0	632.2	537.5	467.6	416.1	342.0	292.3	256.0	188.7	149.8	107.1	83.7	69.0	58.8	45.7	37.5	32.0	17.4
	25°C	737.3	737.2	737.0	651.5	555.6	484.1	430.9	354.3	302.8	265.3	195.4	155.2	110.7	86.5	71.2	60.6	47.0	38.5	32.8	17.8
1.65	20°C	737.3	737.2	737.0	649.1	549.0	476.4	421.4	344.5	292.6	256.2	189.6	150.5	107.4	84.0	69.2	59.0	45.8	37.6	32.1	17.4
	25°C	737.3	737.2	737.1	670.9	568.2	493.8	437.6	357.8	303.8	265.3	196.4	156.0	111.1	86.8	71.4	60.8	47.1	38.7	32.8	17.8
1.60	20°C	737.3	737.2	737.0	657.3	551.4	477.1	421.4	344.5	292.6	256.2	190.0	150.9	107.6	84.1	69.3	59.1	45.9	37.7	32.1	17.5
	25°C	737.3	737.2	737.1	680.2	571.3	495.1	437.7	357.8	303.8	265.3	196.8	156.3	111.3	86.9	71.5	60.9	47.2	38.7	32.9	17.8

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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