



## ZeMaRail™ Batteries 270P12: 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™**  
**270P12 BATTERIES**

**KEEPING YOU ON TRACK**



## Electrical Data

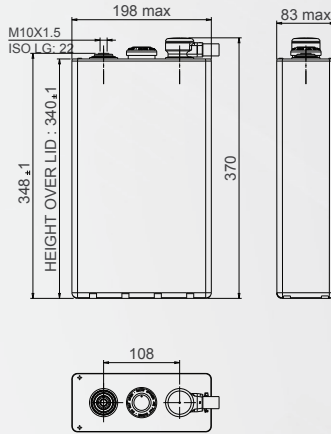
<b>Nominal voltage</b>	2 V
<b>Number of cells</b>	1 (VRLA (AGM), TPPL+Sn Technology)
<b>Rated capacity C<sub>10</sub> to 1.80 Vpc at 20 °C</b>	270 Ah
<b>Current/Power for 0.25 h back-up time 1.60 Vpc 20 °C</b>	430.7 A / 732.6 W
<b>Current/Power for 0.5 h back-up time 1.60 Vpc 20 °C</b>	287.2 A / 507.6 W
<b>Current/Power for 1.0 h back-up time 1.60 Vpc 20 °C</b>	175.2 A / 323.8 W
<b>Current/Power for 3.0 h back-up time 1.70 Vpc 20 °C</b>	74.5 A / 142.8 W
<b>Current/Power for 5.0 h back-up time 1.75 Vpc 20 °C</b>	48.8 A / 94.8 W
<b>Current/Power for 8.0 h back-up time 1.75 Vpc 20 °C</b>	32.8 A / 64.0 W
<b>Current/Power for 10.0 h back-up time 1.80 Vpc 20 °C</b>	27.0 A / 52.9 W
<b>Current/Power for 24.0 h back-up time 1.80 Vpc 20 °C</b>	12.4 A / 24.5 W
<b>Internal resistance (± 10%) to IEC/EN 60896-21</b>	0.48 mΩ
<b>Short circuit current (± 10%) to IEC/EN 60896-21</b>	4.4 kA
<b>Self discharge at 20 °C to IEC/EN 60896-21</b>	max. 1.25% / Month

## Mechanical Data

<b>Weight</b>	16.3 kg +/-3%
<b>Height over terminal</b>	370 mm
<b>Width</b>	198 mm
<b>Depth</b>	83 mm
<b>Number of terminals</b>	1 (+) / 1 (-)
<b>Dimension of terminal screw hole</b>	M10 x 22 deep, female thread
<b>Connection torque</b>	25 Nm
<b>Terminal insulation class according to IEC/EN 60529</b>	IP 20
<b>Diameter of diagnostic hole for voltage probe</b>	2 mm
<b>Complete connector and terminal connection</b>	use flexible EVO or PerfectPlus- connectors
<b>Connector (copper, tin-coated and insulated)</b>	For Rolling Stock flexible connectors are recommended
<b>Shock + Vibration rating (according)</b>	Category 1, Class B (IEC 61373)

## Environmental Data

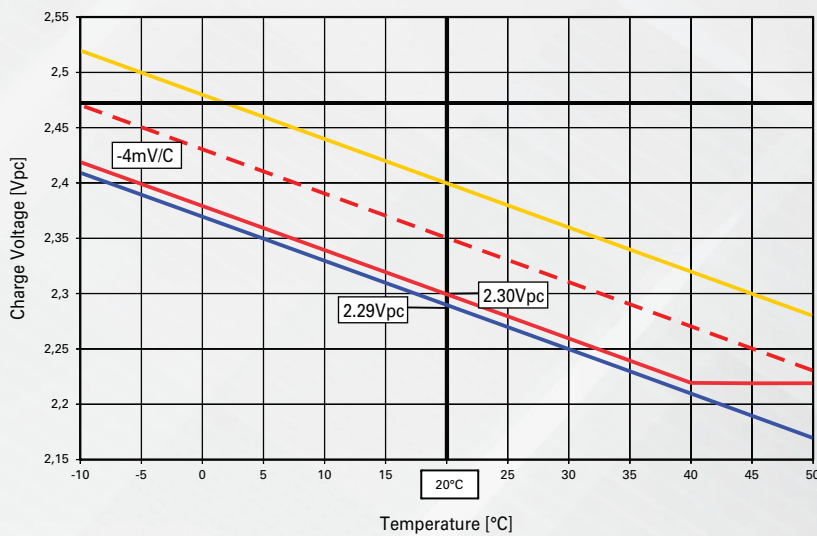
<b>Installation</b>	Vertical
<b>Cell assembly distance</b>	The cells must be installed within a solid battery tray, use spacers to secure required fixation and compression
<b>Material of case/ cover</b>	PP-FR or PP (on special request)
<b>Flame retardancy rating</b>	R7 (EN 45545-2)* *Approval is subject to functional necessity (clause 4.7)
<b>Flame barriers at vents</b>	Yes
<b>Rail service life expected at 15 °C</b>	8-10 years (max. 30% Depth of Discharge (DoD) / day)
<b>Cycle Endurance (60% DoD or 80% DoD)</b>	1'500 / 1000 Cycles
<b>Design life (Eurobat classification)</b>	>12 years - Very Long Life
<b>Shipping name</b>	Batteries, wet, non spillable



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**270P12 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

*Estimated Values (early design status!)  
 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>	108 A (minimum for cyclic use: 54 A)
<b>Voltage compensation in function of temperature</b>	-4mV/K per cell
<b>Float level voltage setting at 20°C (± 1%)</b>	2.29 V/Z (also valid for long term trickle charging at workshop and storage)
<b>Ventilation requirements</b>	As a VRLA battery according to EN 62485-2
<b>Maximum long term operating temperature</b>	+40°C with ventilation assured (reduced service life)
<b>Maximum short term operating temperature (&lt; 3h)</b>	+55°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	122.5	122.5	122.5	122.5	116.3	108.4	101.5	90.8	81.9	74.9	59.8	50.0	38.0	30.8	25.9	22.5	17.8	14.8	12.7	6.9
	25°C	122.5	122.5	122.5	122.5	117.8	109.9	103.0	92.4	83.4	76.4	61.1	51.1	38.9	31.5	26.5	23.0	18.2	15.1	13.0	7.0
1.95	20°C	221.0	220.9	213.1	191.8	174.6	160.4	148.5	129.7	115.7	104.6	81.7	67.7	50.8	41.1	34.5	29.9	23.6	19.6	16.8	9.1
	25°C	221.0	220.9	215.4	194.6	177.7	163.2	151.5	132.6	118.4	107.2	83.8	69.4	52.1	42.1	35.4	30.6	24.2	20.1	17.2	9.3
1.90	20°C	344.7	326.7	282.7	268.3	223.9	204.1	187.7	162.3	143.6	129.0	99.9	81.9	61.1	49.1	41.2	35.6	28.1	23.3	19.9	10.9
	25°C	344.7	329.3	286.4	284.4	228.3	208.4	192.0	166.3	147.3	132.5	102.7	84.22	62.8	50.4	42.3	36.5	28.81	23.86	20.4	11.1
1.85	20°C	465.7	402.8	341.1	319.3	265.6	240.3	219.6	188.6	165.6	148.0	113.1	92.2	68.2	54.6	45.7	39.4	31.0	25.7	22.0	12.0
	25°C	465.7	407.1	346.6	338.4	271.6	246.0	225.2	193.6	170.4	152.3	116.5	95.0	70.23	56.1	46.9	40.5	31.84	26.37	22.5	12.2
1.80	20°C	573.5	471.4	392.7	358.8	299.9	269.4	244.8	207.7	181.3	160.9	121.7	98.7	72.4	57.7	48.2	41.5	32.7	27.0	23.0	12.4
	25°C	575.1	477.1	400.1	380.3	307.1	276.6	251.5	213.8	186.7	166.0	125.5	101.8	74.62	59.4	49.5	42.7	33.52	21.2	23.6	12.7
1.75	20°C	664.1	533.7	436.8	387.9	326.1	290.6	262.2	220.4	191.1	169.0	126.6	102.3	74.5	58.8	48.8	41.9	32.8	27.0	23.0	12.4
	25°C	667.1	540.8	445.9	411.2	335.0	298.9	270.3	227.4	197.2	174.6	130.8	105.5	76.86	60.6	50.2	43.1	33.64	27.7	23.6	12.7
1.70	20°C	749.7	587.5	472.9	409.8	344.8	305.2	274.2	228.8	197.3	174.0	128.8	103.0	74.5	58.8	48.8	41.9	32.8	27.0	23.0	12.4
	25°C	753.7	660.2	483.6	434.3	355.0	314.6	283.2	236.4	203.9	179.8	133.3	106.5	76.83	60.6	50.2	43.1	33.64	27.7	23.6	12.7
1.65	20°C	828.5	633.8	501.4	423.3	358.3	315.5	282.5	234.4	200.2	175.2	128.8	103.0	74.5	58.8	48.8	41.9	32.8	27.0	23.0	12.4
	25°C	833.2	644.5	513.8	448.7	369.5	325.7	292.0	242.4	207.3	181.4	133.3	106.5	76.83	60.6	50.2	43.1	33.64	27.7	23.6	12.7
1.60	20°C	898.0	672.8	523.1	431.6	368.5	323.1	287.2	234.9	200.2	175.2	128.8	103.0	74.5	58.8	48.8	41.9	32.8	27.0	23.0	12.4
	25°C	904.1	685.4	537.2	457.5	380.4	334.0	297.8	243.4	207.3	181.4	133.3	106.5	76.83	60.6	50.2	43.1	33.64	27.7	23.6	12.7

**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	243.8	243.8	243.7	243.7	232.8	216.9	203.3	182.6	164.9	150.7	121.0	101.2	77.1	62.5	52.9	45.9	36.5	30.2	26.0	14.2
	25°C	243.7	243.7	243.7	243.7	235.5	220.1	206.3	185.7	168.0	153.5	123.6	103.5	78.8	63.9	54.1	46.9	37.2	30.9	26.5	14.5
1.95	20°C	430.1	430.0	415.9	375.2	341.9	315.3	292.4	256.2	228.7	206.5	162.5	134.8	101.5	82.2	69.3	60.0	47.7	39.7	34.0	18.6
	25°C	430.0	430.0	420.4	380.9	348.0	320.7	298.2	261.7	233.9	211.7	166.5	138.2	104.2	84.3	71.0	61.5	48.8	40.6	34.8	19.0
1.90	20°C	654.6	620.4	539.0	477.9	430.0	392.7	361.9	314.2	279.2	251.4	195.0	160.7	120.6	97.0	81.5	70.6	55.9	46.5	39.9	21.8
	25°C	654.6	625.7	546.6	485.7	438.1	400.8	370.1	321.6	286.2	258.0	200.4	165.2	123.9	99.6	83.7	72.4	57.3	47.6	40.8	22.3
1.85	20°C	860.9	746.8	635.3	557.7	499.6	453.0	415.9	358.2	315.9	283.7	218.4	178.5	132.8	106.7	89.4	77.3	61.1	50.7	43.5	23.8
	25°C	860.9	754.9	645.3	568.4	510.1	463.5	426.1	367.7	324.3	291.6	224.9	183.7	136.6	109.8	91.9	79.4	62.7	52.0	44.6	24.3
1.80	20°C	1032.0	851.5	714.5	620.7	551.4	497.9	455.3	389.4	340.6	303.7	232.4	188.6	139.5	111.9	93.6	80.7	63.7	52.9	45.3	24.5
	25°C	1035.0	861.7	727.3	633.8	564.4	510.3	467.3	400.4	350.9	312.6	239.5	194.6	143.7	115.1	96.3	83.0	65.5	54.2	46.4	25.1
1.75	20°C	1158.0	939.4	776.5	667.6	588.8	527.8	479.9	407.8	355.2	315.1	239.7	194.1	142.8	113.7	94.8	81.4	64.0	52.9	45.3	24.5
	25°C	1163.0	952.0	791.9	683.4	603.8	542.4	493.3	420.0	366.4	325.3	247.3	200.4	147.4	117.1	97.6	83.8	65.7	54.3	46.4	25.1
1.70	20°C	1272.0	1008.0	822.4	700.2	612.5	546.5	494.1	418.2	363.3	321.6	243.0	195.6	142.8	113.7	94.8	81.4	64.0	52.9	45.3	24.5
	25°C	1279.0	1022.0	839.9	717.7	629.5	562.5	509.2	431.1	375.0	332.2	251.0	202.2	147.4	117.1	97.6	83.8	65.7	54.3	46.4	25.1
1.65	20°C	1367.0	1058.0	853.9	720.5	626.8	557.4	502.7	423.8	367.5	323.8	243.0	195.6	142.8	113.7	94.8	81.4	64.0	52.9	45.3	24.5
	25°C	1375.0	1074.0	873.7	740.0	645.1	574.2	518.5	437.2	379.7	335.0	251.0	202.2	147.4	117.1	97.6	83.8	65.7	54.3	46.4	25.1
1.60	20°C	1437.0	1096.0	874.2	732.6	635.1	563.5	507.6	425.2	367.5	323.8	243.0	195.6	142.8	113.7	94.8	81.4	64.0	52.9	45.3	24.5
	25°C	1447.0	1115.0	895.7	753.3	654.3	581.1	524.0	439.1	379.9	335.0	251.0	202.2	147.4	117.1	97.6	83.8	65.7	54.3	46.4	25.1

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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