



## ZeMaRail™ Batteries 12ZeMa167: Technical Data

### VRLA TPPL+SN BATTERY TECHNOLOGY FOR ROLLING STOCK APPLICATIONS

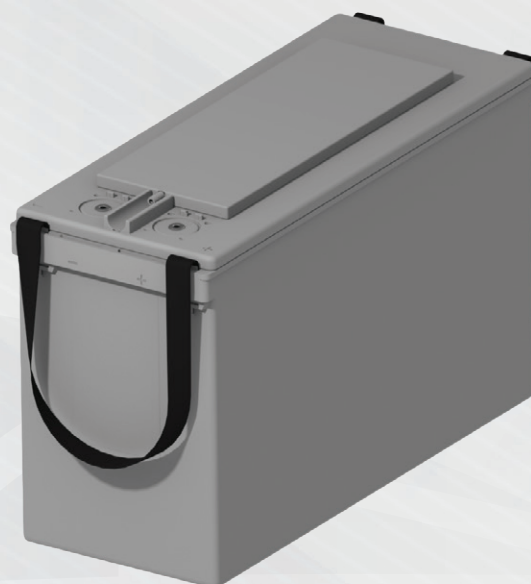
Designed specifically for rolling stock railway vehicle applications, the ZeMaRail™ batteries deliver reliable, maintenance-free performance.

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™**  
**12ZeMa167 BATTERIES**

**KEEPING YOU ON TRACK**



**Electrical Data**

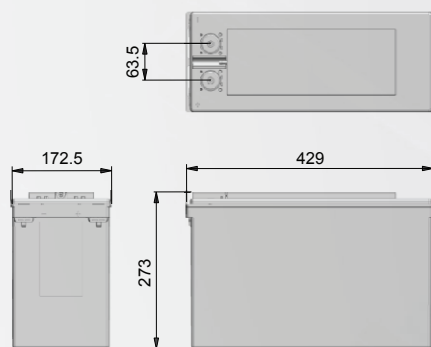
|                                                             |                                   |
|-------------------------------------------------------------|-----------------------------------|
| <b>Nominal voltage</b>                                      | 12 V                              |
| <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>   | 167 Ah                            |
| <b>Current/Power for 1.0 h back-up time 1.60 Vpc 20 °C</b>  | 130.3A / 253.3W                   |
| <b>Current/Power for 3.0 h back-up time 1.60 Vpc 20 °C</b>  | 157.1A / 104.4W                   |
| <b>Current/Power for 5.0 h back-up time 1.60 Vpc 20 °C</b>  | 167.6A / 67.2W                    |
| <b>Current/Power for 8.0 h back-up time 1.60 Vpc 20 °C</b>  | 176.3A / 44.3W                    |
| <b>Current/Power for 10.0 h back-up time 1.60 Vpc 20 °C</b> | 180.2A / 36.3W                    |
| <b>Current/Power for 20.0 h back-up time 1.60 Vpc 20 °C</b> | 191.8A / 192W                     |
| <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>       | 4 mΩ                              |
| <b>Short circuit current (± 10%) to IEC/EN 60896-21</b>     | 3.4 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>               | 123 ... 246 mW per cell           |

**Mechanical Data**

|                                                            |                                                    |
|------------------------------------------------------------|----------------------------------------------------|
| <b>Weight</b>                                              | 53.1 kg                                            |
| <b>Height of monobloc / over terminal cover</b>            | 273 mm                                             |
| <b>Width</b>                                               | 172.5 mm                                           |
| <b>Depth</b>                                               | 429 mm                                             |
| <b>Number of terminals</b>                                 | 1 (+) / 1 (-)                                      |
| <b>Dimension of terminal screw hole</b>                    | M6 x 13, female thread                             |
| <b>Torque terminal screw</b>                               | 9.0Nm ± 0.9Nm                                      |
| <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>                         | 95mm <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)                    |

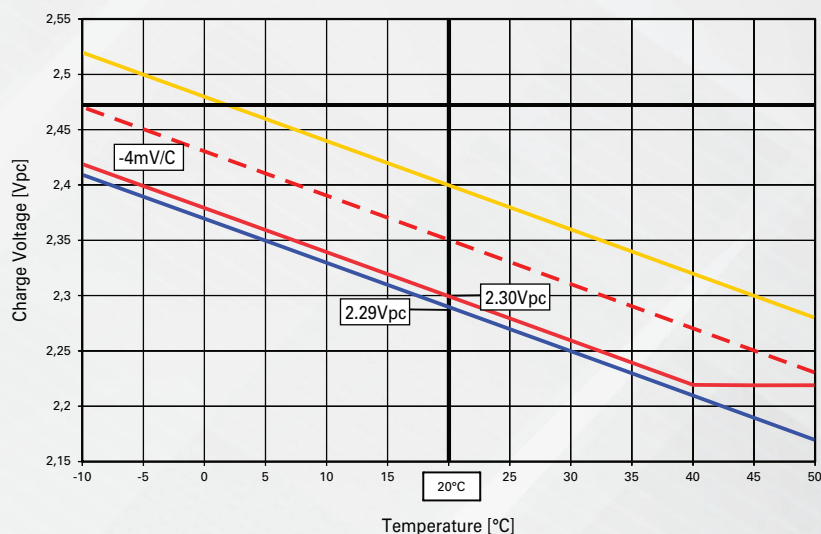
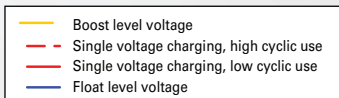
**Environmental Data**

|                                                              |                                                                               |
|--------------------------------------------------------------|-------------------------------------------------------------------------------|
| <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)*<br>*Approval is subject to functional necessity (clause 4.7) |
| <b>Flame barriers at vents</b>                               | Yes, required                                                                 |
| <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                                                 |



**HAWKER**  
**ZeMaRail™**  
**12ZeMa167 BATTERIES**

**Temperature compensated  
charging 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<br>$Q = 0.05 * N_{cells} * I_{gas} * C_{AhC10} * 10^{-3} [m^3/h]$<br>$I_{gas} = 1$ (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   | 0.02                   | 0.05 | 0.10 | 0.15 | 0.20  | 0.30  | 0.45  | 1.00  | 2.00  | 3.00  | 4.00  | 5.00  | 6.00  | 7.00  | 8.00  | 10.00 | 20.00 |
| 1.85                                                                          | 20°C | 175                    | 36.9 | 57.1 | 70.5 | 80.4  | 94.4  | 108.2 | 117.5 | 137.7 | 147.8 | 154.1 | 158.6 | 162.0 | 164.7 | 166.9 | 170.4 | 180.5 |
| 1.80                                                                          | 20°C | 21.4                   | 42.1 | 62.6 | 75.8 | 85.5  | 99.1  | 112.4 | 121.4 | 140.9 | 150.7 | 157.0 | 161.4 | 164.8 | 167.6 | 169.8 | 173.5 | 184.0 |
| 1.75                                                                          | 20°C | 25.4                   | 46.9 | 67.5 | 80.5 | 90.0  | 103.2 | 116.0 | 124.7 | 143.6 | 153.2 | 159.3 | 163.8 | 167.2 | 170.0 | 172.3 | 176.0 | 187.0 |
| 1.70                                                                          | 20°C | 29.2                   | 51.3 | 71.8 | 84.5 | 93.7  | 106.5 | 118.9 | 127.3 | 145.6 | 155.0 | 161.2 | 165.6 | 169.0 | 171.8 | 174.2 | 178.0 | 189.2 |
| 1.67                                                                          | 20°C | 31.3                   | 53.6 | 73.9 | 86.5 | 95.5  | 108.1 | 120.3 | 128.5 | 146.6 | 155.9 | 162.0 | 166.4 | 169.9 | 172.7 | 175.0 | 178.9 | 190.3 |
| 1.65                                                                          | 20°C | 32.6                   | 55.0 | 75.2 | 87.7 | 96.6  | 109.0 | 121.0 | 129.2 | 147.1 | 156.4 | 162.4 | 166.9 | 170.3 | 173.1 | 175.5 | 179.4 | 190.8 |
| 1.63                                                                          | 20°C | 33.7                   | 56.2 | 76.3 | 88.7 | 97.5  | 109.8 | 121.7 | 129.7 | 147.5 | 156.7 | 162.8 | 167.2 | 170.7 | 173.5 | 175.9 | 179.8 | 191.3 |
| 1.60                                                                          | 20°C | 35.3                   | 57.7 | 77.6 | 89.8 | 98.5  | 110.7 | 122.4 | 130.3 | 147.9 | 157.1 | 163.2 | 167.6 | 171.1 | 173.9 | 176.3 | 180.2 | 191.8 |
| 1.55                                                                          | 20°C | 37.0                   | 59.4 | 79.0 | 90.9 | 99.5  | 111.4 | 122.9 | 130.7 | 148.1 | 157.3 | 163.3 | 167.8 | 171.2 | 174.1 | 176.5 | 180.4 | 192.0 |
| 1.50                                                                          | 20°C | 37.7                   | 59.8 | 79.2 | 91.0 | 100.5 | 112.5 | 124.1 | 132.0 | 149.6 | 158.9 | 165.0 | 169.4 | 172.9 | 175.8 | 178.2 | 182.2 | 193.9 |

| Constant power performance [Watt per cell] to the defined end of discharge voltage |      |                        |        |       |       |       |       |       |       |       |       |      |      |      |      |      |       |       |
|------------------------------------------------------------------------------------|------|------------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|-------|-------|
| Voltage                                                                            | Temp | Discharge time [h:min] |        |       |       |       |       |       |       |       |       |      |      |      |      |      |       |       |
| Vpc                                                                                | °C   | 0.02                   | 0.05   | 0.10  | 0.15  | 0.20  | 0.30  | 0.45  | 1.00  | 2.00  | 3.00  | 4.00 | 5.00 | 6.00 | 7.00 | 8.00 | 10.00 | 20.00 |
| 1.85                                                                               | 20°C | 960.9                  | 830.9  | 654.2 | 543.4 | 467.6 | 369.4 | 284.3 | 232.8 | 137.8 | 99.0  | 77.7 | 64.0 | 54.6 | 47.6 | 42.2 | 34.5  | 18.3  |
| 1.80                                                                               | 20°C | 1159.5                 | 933.9  | 707.6 | 577.8 | 492.3 | 384.4 | 293.3 | 239.0 | 140.5 | 100.8 | 79.0 | 65.1 | 55.5 | 48.4 | 42.9 | 35.1  | 18.6  |
| 1.75                                                                               | 20°C | 1354.5                 | 1028.9 | 755.3 | 608.0 | 513.7 | 397.3 | 300.9 | 244.3 | 142.7 | 102.2 | 80.0 | 65.9 | 56.2 | 49.0 | 43.5 | 35.5  | 18.8  |
| 1.70                                                                               | 20°C | 1531.7                 | 1111.0 | 795.4 | 633.1 | 531.3 | 407.8 | 307.1 | 248.5 | 144.4 | 103.3 | 80.8 | 66.6 | 56.7 | 49.5 | 43.9 | 35.9  | 19.0  |
| 1.67                                                                               | 20°C | 1623.4                 | 1152.4 | 815.2 | 645.4 | 539.9 | 412.8 | 310.0 | 250.4 | 145.2 | 103.7 | 81.2 | 66.9 | 57.0 | 49.7 | 44.1 | 36.0  | 19.1  |
| 1.65                                                                               | 20°C | 1676.7                 | 1176.0 | 826.4 | 652.3 | 544.7 | 415.6 | 311.6 | 251.5 | 145.6 | 104.0 | 81.4 | 67.0 | 57.1 | 49.8 | 44.2 | 36.1  | 19.1  |
| 1.63                                                                               | 20°C | 1722.7                 | 1196.4 | 836.1 | 658.2 | 548.8 | 418.0 | 312.9 | 252.4 | 146.0 | 104.2 | 81.5 | 67.1 | 57.2 | 49.9 | 44.3 | 36.2  | 19.2  |
| 1.60                                                                               | 20°C | 1776.8                 | 1220.2 | 847.3 | 665.1 | 553.5 | 420.7 | 314.4 | 253.3 | 146.3 | 104.4 | 81.6 | 67.2 | 57.3 | 49.9 | 44.3 | 36.3  | 19.2  |
| 1.55                                                                               | 20°C | 1822.7                 | 1240.9 | 857.1 | 671.0 | 557.6 | 422.9 | 315.5 | 254.0 | 146.4 | 104.4 | 82.4 | 67.9 | 57.8 | 50.4 | 44.8 | 36.3  | 19.2  |
| 1.50                                                                               | 20°C | 1840.9                 | 1253.3 | 865.7 | 677.7 | 563.1 | 427.1 | 318.7 | 256.5 | 147.9 | 105.4 | 83.3 | 68.6 | 58.4 | 51.0 | 45.2 | 36.6  | 19.4  |

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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