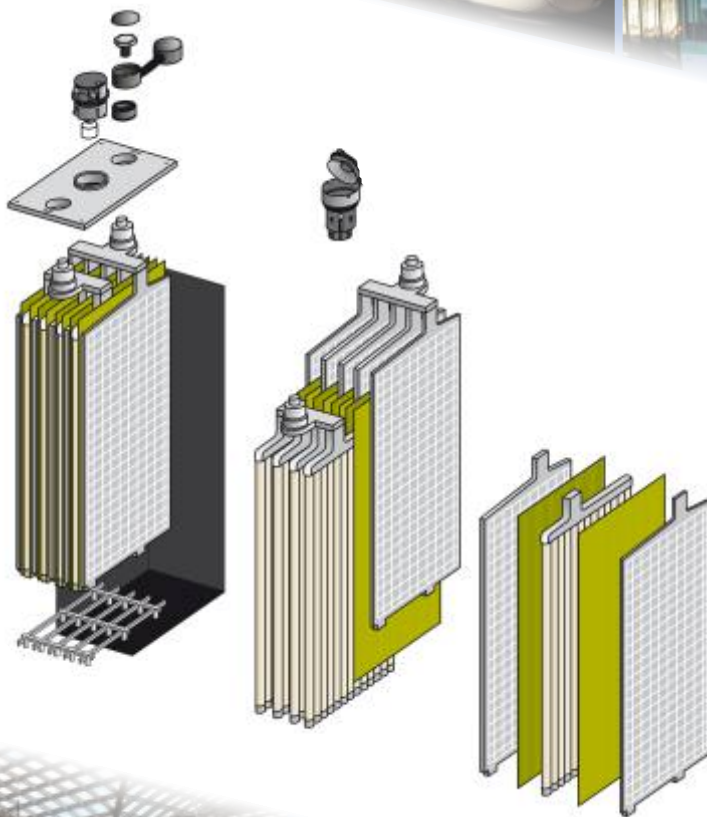


PerfectRail™ 4PzS220



*Lead-Acid Battery Technology
for Rolling Stock Applications*



Robust cell construction

Low maintenance

Shock and vibration resistant

Very high cycle performance

V-0 Flame retardant



Keeping you on track

Hawker® PerfectRail™ 4PzS220

Technical specifications

Part number: 3563014

Electrical Data

Nominal voltage	2 V
Number of cells	1 (Lead-Acid tubular Technology)
Specific gravity of acid	1.24 kg/l (at 30°C) on request 1.27 and 1.29 available
Rated capacity C ₁₀ to 1.80 Vpc at 20 °C	228 Ah
Rated capacity C ₅ to 1.70 Vpc at 30 °C	220 Ah
Current/Power for 0.25 h back-up time 1.60 Vpc 20 °C	291.2 A / 478 W
Current/Power for 0.5 h back-up time 1.60 Vpc 20 °C	211.6 A / 360 W
Current/Power for 1.0 h back-up time 1.60 Vpc 20 °C	135.2 A / 242 W
Current/Power for 3.0 h back-up time 1.70 Vpc 20 °C	60.1 A / 113 W
Current/Power for 5.0 h back-up time 1.75 Vpc 20 °C	40.3 A / 77 W
Current/Power for 8.0 h back-up time 1.75 Vpc 20 °C	28.0 A / 54 W
Current/Power for 10.0 h back-up time 1.80 Vpc 20 °C	22.8 A / 44 W
Current/Power for 24.0 h back-up time 1.80 Vpc 20 °C	10.9 A / 21 W
Conversion to capacity at 25 °C	103 % of Current/Power at 20°C
Internal resistance	0.93 mΩ
Short circuit current	2.16 kA
Self discharge at 20 °C	max. 6% / Month
Heat loss during float service at 20°C	≈ 0.30 W

Mechanical Data

Weight	15.4 kg ±2%
Height of cell / over terminal cover	340 mm / 370 mm
Width	198 mm
Depth	83 mm
Number of terminals	1 + / 1 -
Dimension of terminal screw hole	M10 x 22 deep, female thread
Torque terminal screw	25 Nm ±2
Terminal insulation class according to IEC/EN 60529	IP 20
Diameter of diagnostic hole for voltage probe	2 mm
Maximum cable cross-section	95 mm ²
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 61373:2011)

Environmental Data

Installation	vertically
Cell assembly distance	not required; for higher loads 5-10 mm recommended for cooling
Material of case/cover; Flame retardancy rating (according to)	PP - FR or PP (on request) V-0 (UL94); I2 / F1 (NF F 16-101) or HB (UL94)
Rail service life expected at 15 °C	6 Years (max 30% DoD / day)
Cycle Endurance (DB Test : 30% DOD/8h)	> 80% C _{nom} after 1'300 cycles
Design life	12+ Long Life, according Eurobat Classification
Shipping name	Batteries, wet, filled with acid

Hawker® PerfectRail™ 4PzS220

Operating specifications

Figure 1



Figure 2

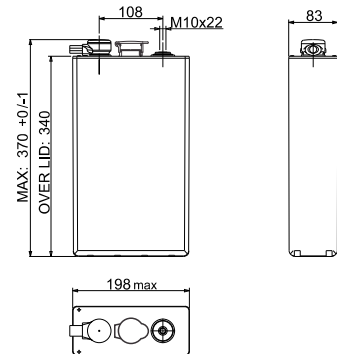
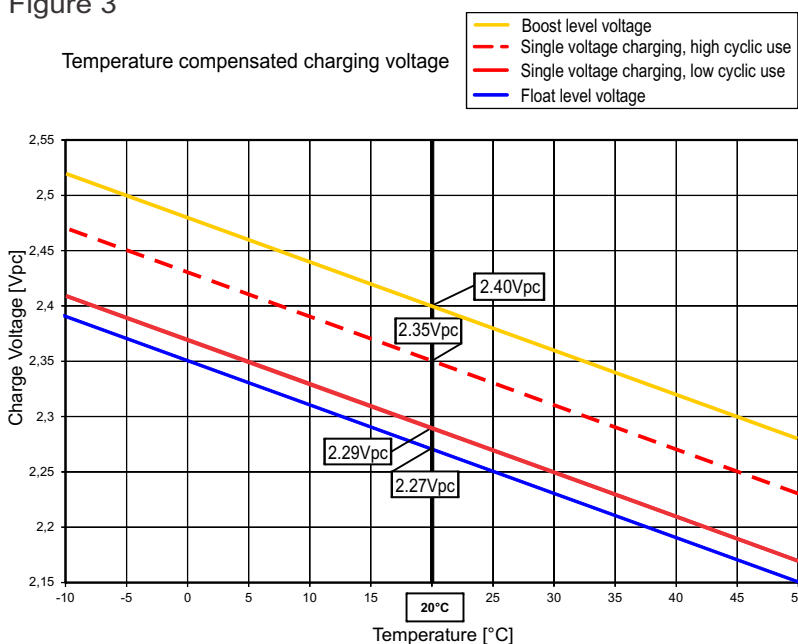


Figure 3



Temperature in °C	Percent of the rated capacity (C ₅)
40	113
35	109
30	106
25	103
20	100
15	97
10	93
5	89
0	84
-5	77
-10	70
-15	62
-20	52
-25	40
-30	29

*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 (Volt per cell)
Lower or single level voltage setting at 20°C	2.29 ... 2.35 Vpc (low ... high cyclic use)
Charge current for IU or IU0U-charging (DIN 41773)	40 ... 60 A (minimum for cyclic use: 50 A)
Voltage compensation in function of temperature	- 4 mV/K per cell
Float level voltage setting at 20°C (± 1%)	2.27 Vpc (valid for long term trickle charging at workshop and storage)
Air exchange	According to EN 50272-2 : 2001 $Q = 0.05 * N_{cells} * I_{gas} * C_{AhC10} * 10^{-3} [m^3/h]$ $I_{gas} = 5$ (at 2.29 Vpc) ; $I_{gas} = 20$ (at 2.40 Vpc)
Water refill	manual / optional 'aquamatic' system
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)

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Discharge data per cell

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

Voltage [Vpc]	Temp	Discharge time [h:min]																		
		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	8:00	10:00	12:00	24:00
1.90	20°C	153.1	153.1	153.1	142.3	131.7	123.2	115.7	103.6	94.3	86.5	70.1	59.4	46.0	38.2	32.9	23.4	19.6	17.0	9.4
	25°C	153.1	153.1	153.1	144.8	134.7	126.2	118.8	106.6	97.2	89.3	72.6	61.5	47.7	39.5	34.0	24.2	20.3	17.6	9.7
1.85	20°C	206.4	206.4	188.6	172.0	158.5	147.2	137.7	122.2	110.3	100.7	80.6	67.7	51.8	42.5	36.4	25.7	21.6	18.6	10.3
	25°C	206.4	206.3	191.7	175.4	162.4	151.2	141.7	126.2	114.1	104.3	83.7	70.3	53.9	44.1	37.7	26.6	22.3	19.3	10.7
1.80	20°C	259.0	249.2	220.5	199.3	182.7	168.8	157.2	138.4	123.9	112.4	88.8	73.9	55.9	45.5	38.7	27.2	22.8	19.6	10.9
	25°C	259.0	252.1	224.5	204.1	187.6	173.8	162.4	143.4	128.8	117.0	92.6	77.1	58.3	47.4	40.3	28.2	23.6	20.3	11.2
1.75	20°C	314.3	285.4	250.7	225.2	204.7	188.2	174.3	152.3	135.2	121.9	94.9	78.3	58.8	47.5	40.3	28.0	23.4	20.1	11.1
	25°C	314.3	289.2	256.0	231.1	210.9	194.5	180.6	158.3	141.0	127.3	99.2	81.9	61.4	49.6	41.9	29.1	24.3	20.9	11.4
1.70	20°C	369.3	319.9	279.1	248.8	225.0	205.4	189.1	163.6	144.2	129.0	99.2	81.3	60.1	48.2	40.6	28.0	23.4	20.1	11.1
	25°C	369.3	324.8	285.3	256.1	232.5	213.0	196.6	170.6	150.9	135.2	104.0	85.2	62.9	50.3	42.3	29.1	24.3	20.9	11.4
1.65	20°C	388.1	351.9	305.7	271.0	243.2	220.3	201.5	172.4	151.0	134.3	100.8	81.6	60.1	48.2	40.6	28.0	23.4	20.1	11.1
	25°C	388.1	357.6	313.3	279.6	252.1	229.4	210.4	180.5	158.4	141.2	106.2	85.7	62.9	50.3	42.3	29.1	24.3	20.9	11.4
1.60	20°C	388.1	381.3	330.5	291.2	259.1	233.0	211.6	179.1	154.1	135.2	100.8	81.6	60.1	48.2	40.6	28.0	23.4	20.1	11.1
	25°C	388.1	387.9	339.1	301.2	269.7	243.5	221.8	188.3	162.8	142.9	106.2	85.7	62.9	50.3	42.3	29.1	24.3	20.9	11.4

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

Voltage [Vpc]	Temp	Discharge time [h:min]																		
		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	8:00	10:00	12:00	24:00
1.90	20°C	290.3	290.3	290.3	271.2	252.2	236.1	222.2	199.6	181.4	166.8	136.0	115.7	90.1	75.1	64.8	46.2	39.0	33.7	18.7
	25°C	290.3	290.3	290.3	275.9	257.3	241.3	227.8	205.3	187.0	172.1	140.7	119.8	93.4	77.6	67.0	47.8	40.2	34.7	19.2
1.85	20°C	379.6	379.6	349.5	319.3	295.6	275.2	258.3	230.6	208.9	191.3	153.7	129.7	100.3	82.1	70.8	50.3	42.3	36.6	20.3
	25°C	379.5	379.5	354.8	325.6	302.2	282.5	265.4	237.6	215.9	197.9	159.5	134.8	104.1	85.4	73.4	52.1	43.8	37.8	20.8
1.80	20°C	465.5	449.2	398.3	361.6	332.7	308.4	288.2	255.4	230.5	210.2	166.6	139.7	106.9	87.3	74.4	52.7	44.2	38.3	21.2
	25°C	465.6	454.4	405.4	369.7	340.8	317.3	297.0	263.9	238.8	218.1	173.7	145.5	111.2	90.9	77.2	54.7	45.8	39.6	21.8
1.75	20°C	549.3	499.7	441.2	398.4	364.4	336.6	313.2	275.2	246.6	224.1	176.3	146.3	110.9	90.4	76.5	54.0	45.2	39.0	21.6
	25°C	549.3	506.5	449.8	408.1	375.0	347.2	323.7	285.7	256.2	233.2	184.2	152.6	115.6	94.2	79.7	56.1	46.9	40.4	22.2
1.70	20°C	627.1	545.7	477.8	429.5	391.2	359.8	333.4	291.0	258.2	233.8	182.5	150.1	112.8	91.5	77.0	54.1	45.2	39.0	21.6
	25°C	627.1	554.1	487.9	441.1	403.5	371.9	345.6	302.9	269.6	243.9	191.0	157.2	118.0	95.5	80.4	56.2	46.9	40.4	22.2
1.65	20°C	652.9	584.5	510.2	455.9	413.1	378.0	348.9	302.7	267.0	239.8	185.4	150.8	112.8	91.5	77.0	54.1	45.2	39.0	21.6
	25°C	652.9	593.6	522.3	469.0	427.0	391.9	362.7	315.9	279.7	250.8	194.8	158.4	118.0	95.5	80.4	56.2	46.9	40.4	22.2
1.60	20°C	652.9	620.0	537.8	478.1	430.6	391.7	360.2	310.6	272.6	241.8	185.4	150.8	112.8	91.5	77.0	54.1	45.2	39.0	21.6
	25°C	652.9	624.6	551.1	493.2	446.2	407.6	375.5	324.9	286.3	254.5	194.8	158.4	118.0	95.5	80.4	56.2	46.9	40.4	22.2

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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