

Planning and Layout of the EuroZB.1 Emergency Lighting Supply System

Based on the data given in the tables, planning the ZB-S central battery system can easily and quickly be carried out.

We recommend the following procedure:

• Calculation of required battery capacity

The number of required emergency luminaires is known from the emergency lighting design with the engineering guides included in part 1 of this catalogue.

Example:

The following number of luminaires has been calculated for the emergency lighting of a meeting hall (3 h rated duration and 12 h recharge period).

| Amount | Type | Current consumption | |
|--------|------------|---------------------|----------|
| | | per luminaire | in total |
| 100 | 55021 CG-S | 0.03 A | 3.00 A |
| 250 | 55011 CG-S | 0.03 A | 7.50 A |
| 100 | EVG 13.3 | 0.05 A | 5.00 A |
| | | Total: | 15.5 A |

Based on table 2a and depending on the required rated duration (1 h, 3 h and 8 h), the battery capacity (C10; 1.8V/Z; +20° C) is to be calculated, depending on the maximum discharge current that has been determined on the basis of the total current drawn from the battery by all consumers.

According to EN 50171, batteries with a lifetime of 10 years at +20° C will have to be installed.

In the above example with the required rated duration of 3 h the 59.20 Ah battery (C10; 1.8V/Z; +20° C) is to be selected from the table 2a.

The maximum discharge current for a 3 h discharge according to table 2a is at 15.80 A.

• Calculation of required additional booster.

According to EN 50171, 80% of capacity must be loaded within 12h into the discharged battery. In the calculation of the required booster the ageing factor of 25% must not be considered.

Example:

| | | |
|-----------------------------|---|-------------------------|
| Current consumption battery | = | 15.80 A at 3h discharge |
|-----------------------------|---|-------------------------|

| | | |
|---|---|--------|
| Required number of boosters acc. to table 3 | = | 1 pcs. |
|---|---|--------|

• Calculation of required battery capacity including ageing factor according to table 2a

As a lead-acid battery has a capacity loss of 2.5% each year (25% in 10 years) at intended operation this capacity loss has to be included in the battery appointment acc. to EN 50171. The end of the lifetime is reached when the rated voltage of the battery at full load falls below 90%.

Example:

| | | |
|---|---|--------------------------|
| Current consumption battery | | |
| 15.50 A + 25% ageing factor | = | 19.38 A |
| U_N battery | = | 216 V |
| 90% U_N battery (108 battery) = 194.4 V | = | 1,8 V per battery |

In this example the battery capacity has to be increased from 53.70 Ah to 85.70 Ah.

The maximum discharge current for a 3h discharge is at 23.10 A.

Attention!

In the calculation of the required booster the ageing factor of 25% must not be considered.

• Fuse protection of the mains input

In order to determine the fuse in the main distribution board of the general power supply, you must know the total connected load of the ZB-S system. This is made up of the sum of mains connected loads of the individual luminaires and consumers (see table 1) and of the ratings of the charging unit (charging module 2.5 A and boost charging unit 2.5 A).

Example:

| | | | |
|------------------------------------|---------|---|-----------|
| 100 pcs. 55021 CG-S | à 16 VA | = | 1.60 kVA |
| 250 pcs. 55011 CG-S | à 16 VA | = | 4.00 kVA |
| 100 pcs. EVG 13.3 | | | |
| for 13 W TC-DEL | à 23 VA | = | 2.30 kVA |
| | | = | 7.90 kVA |
| LT2.5 charging unit has 1 kVA | | | |
| Boost charging unit has 1 kVA (2x) | | = | 3.00 kVA |
| Total connected load | | = | 10.90 kVA |

N-EVG ... V-CG-S Electronic Ballasts

Table 1.1
Rated value N-EVG ... V-CG-S for mains and battery operation



N-EVG 54 W V-CG-S

| Term | T5 | | | | | |
|--|---------------------|---------------------|---------------------|---------------------|---------|---------|
| | G5 | G5 | G5 | G5 | G5 | G5 |
| Lamp cap | G5 | G5 | G5 | G5 | G5 | G5 |
| Type N-EVG ... V-CG-S | 14 / 21 / 28 / 35 W | 14 / 21 / 28 / 35 W | 14 / 21 / 28 / 35 W | 14 / 21 / 28 / 35 W | 24/39 W | 24/39 W |
| Lamp load [W] | 14 | 21 | 28 | 35 | 24 | 39 |
| Current consumption [A] at 220 V battery operation, setting (Luminous flux Φ_E/Φ_N in %) | | | | | | |
| 100 % | 0.08 | 0.11 | 0.15 | 0.18 | 0.13 | 0.19 |
| 90 % | 0.07 | 0.10 | 0.13 | 0.16 | 0.12 | 0.17 |
| 80 % | 0.064 | 0.09 | 0.12 | 0.14 | 0.10 | 0.15 |
| 70 % | 0.057 | 0.08 | 0.11 | 0.13 | 0.09 | 0.13 |
| 60 % | 0.051 | 0.07 | 0.10 | 0.11 | 0.08 | 0.12 |
| 50 % | 0.045 | 0.062 | 0.09 | 0.10 | 0.07 | 0.11 |
| 40 % | 0.040 | 0.055 | 0.08 | 0.09 | 0.066 | 0.10 |
| 30 % | 0.036 | 0.050 | 0.07 | 0.08 | 0.059 | 0.09 |
| Power consumption [A] at 230 V mains operation | 0.08 | 0.11 | 0.14 | 0.17 | 0.12 | 0.18 |
| Power factor λ | 0.96 | 0.96 | 0.98 | 0.98 | 0.98 | 0.98 |
| Inrush current [A] | 10 | | | | | |
| System power lamp + ECG acc. to EN 50294 [W] | 16 | 23 | 30 | 37 | 25 | 41 |



N-EVG 58 W V-CG-S

| Term | T5 | | | T8 | |
|--|------|------|------|------|------|
| | G5 | G5 | G5 | G13 | G13 |
| Lamp cap | G5 | G5 | G5 | G13 | G13 |
| Type N-EVG ... V-CG-S | 49W | 54W | 80W | 36W | 58W |
| Lamp load [W] | 49 | 54 | 80 | 36 | 58 |
| Current consumption [A] at 220 V battery operation, setting (Luminous flux Φ_E/Φ_N in %) | | | | | |
| 100 % | 0.24 | 0.26 | 0.38 | 0.17 | 0.25 |
| 90 % | 0.21 | 0.23 | 0.34 | 0.15 | 0.22 |
| 80 % | 0.19 | 0.21 | 0.30 | 0.14 | 0.20 |
| 70 % | 0.17 | 0.18 | 0.27 | 0.12 | 0.18 |
| 60 % | 0.15 | 0.16 | 0.24 | 0.11 | 0.16 |
| 50 % | 0.14 | 0.15 | 0.21 | 0.10 | 0.14 |
| 40 % | 0.12 | 0.13 | 0.19 | 0.09 | 0.13 |
| 30 % | 0.11 | 0.12 | 0.17 | 0.08 | 0.11 |
| Power consumption [A] at 230 V mains operation | 0.24 | 0.25 | 0.37 | 0.16 | 0.24 |
| Power factor λ | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Inrush current [A] | 10 | 10 | 12 | 10 | 10 |
| System power lamp + ECG acc. to EN 50294 [W] | 52 | 57 | 84 | 34 | 53 |

Depending on the luminous flux (30% ... 100%) the correspondend battery current has to be projected.

Dim operation permitted by 30% up to 10°C, 60% up to 0°C only.

For outdoor use set 100 % only!

Note: Setting the address switches 1 and 2 on address 0 there is no luminous flux reduction during battery operation.



EVG 13.3



EVG 13.3 V-CG-S




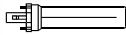
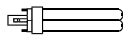

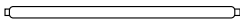

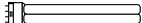
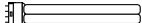
EVG 18 V-CG-S



EVG 18C V-CG-S

Table 1.2

Rated value of EVG 13.3 V-CG-S, EVG 18 V-CG-S and EVG 18C V-CG-S for mains and battery operation

| International term | Lamp cap | EVG-type EVG... | Lamp load in [W] | Power consumption at battery operation [A] ¹⁾ | Power consumption in [VA] | Inrush current [A] | power factor λ |
|---|-----------|---|---|--|---------------------------|--------------------|------------------------|
| T16 / T5 | G 5 | 13.3 V-CG-S | 4 | 0.020 | 8 | 3 | 0.6 |
| | | 13.3 V-CG-S | 6 | 0.025 | 12 | 3 | 0.6 |
| | | 13.3 V-CG-S | 8 | 0.030 | 16 | 3 | 0.6 |
| | |  13.3 V-CG-S | 13 | 0.050 | 23 | 3 | 0.6 |
| TC-SEL | 2 G 7 | 13.3 V-CG-S | 5 | 0.020 | 10 | 3 | 0.6 |
| | | 13.3 V-CG-S | 7 | 0.025 | 13 | 3 | 0.6 |
| | | 13.3 V-CG-S | 9 | 0.030 | 16 | 3 | 0.6 |
| | |  13.3 V-CG-S | 11 | 0.040 | 18 | 3 | 0.6 |
| TC-DEL | G 24 q-1 | 13.3 V-CG-S | 10 | 0.035 | 16 | 3 | 0.6 |
| | | 13.3 V-CG-S | 13 | 0.050 | 23 | 3 | 0.6 |
|  | G 24 q-2 | 18C V-CG-S | 18 | 0.070 | 30 | 8 | 0.6 |
| | | TC-TEL | GX 24 q-1 | 13 | 0.050 | 23 | 3 |
|  | GX 24 q-2 | 18C V-CG-S | 18 | 0.070 | 30 | 8 | 0.6 |
| | | T 26 / T8 | G 13 | 18 V-CG-S | 18 | 0.070 | 30 |
|  | 2 G 10 | 18 V-CG-S | 18 | 0.070 | 30 | 8 | 0.6 |
| | | TC-F |  | 18 | 0.070 | 30 | 8 |
|  | 2 G 11 | 18 V-CG-S | 18 | 0.070 | 30 | 8 | 0.6 |
| | | TC-L |  | 18 | 0.070 | 30 | 8 |

¹⁾ Luminous flux $\Phi_E/\Phi_N = 75\%$

Table 1.3

Current ratings of incandescent and tungsten halogen lamps

| 220 V incandescent lamps (AGL) | | | 12 V tungsten halogen lamps with 220 V electronic transformer | | |
|--------------------------------|--------------|--------------------------------------|---|---------------------------------|----------------------|
| | Φ rated | Current consumption from the battery | Lamp rating | Current rating from the battery | Mains connected load |
| 7 W | 30 lm | 30 mA | 20 W | 115 mA | 33.6 VA |
| 15 W | 90 lm | 70 mA | 35 W | 200 mA | 58.0 VA |
| 25 W | 230 lm | 110 mA | 50 W | 285 mA | 84.0 VA |
| 40 W | 430 lm | 180 mA | 75 W | 420 mA | 72.6 VA |
| 60 W | 730 lm | 270 mA | 100 W | 570 mA | 168.0 VA |
| 75 W | 960 lm | 340 mA | | | |
| 100 W | 1380 lm | 450 mA | | | |

Table 2 a

Calculation of the battery capacity of maintenance free OGIv batteries acc. to EN 50171 (higher capacities on request)

| Battery capacity C10 at 1.8 V/C and +20°C | Ah | 5.5 | 8.5 | 14.0 | 23.3 | 32.0 | 39.8 | 50.4 | 53.7 | 66.2 | 85.7 | 89.4 | 106.0 | 118.0 | 143.1 | 155.6 | 178.8 | 195.4 | 245.0 | 268.2 | 308.0 | 357.6 |
|--|-----|-----|-----|------|------|------|------|------|------|------|------|------|----------------------|-------|----------------------|----------------------|----------|----------------------------------|----------------------|----------|----------------------|----------|
| | | | | | | | | | | | | | 1 x 39.8 1 x 66.2 | | 1 x 89.4 1 x 53.7 | 1 x 89.4 1 x 66.2 | 2 x 89.4 | 1 x 89.4 1 x 66.2 1 x 39.8 | 2 x 89.4 1 x 66.2 | 3 x 89.4 | 3 x 89.4 1 x 66.2 | 4 x 89.4 |
| max. discharge current [A] with operating time [h], 1.8 V per cell and +20°C ambient temperature | 1.0 | 3.2 | 4.5 | 9.3 | 15.4 | 20.2 | 24.1 | 30.7 | 37.9 | 49.2 | 52.6 | 63.8 | 73.3 | 85.1 | 101.7 | 113.0 | 127.6 | 137.1 | 176.8 | 191.4 | 215.5 | 255.2 |
| | 1.5 | 2.5 | 3.4 | 6.9 | 11.9 | 15.0 | 19.0 | 22.7 | 27.6 | 34.5 | 38.3 | 46.1 | 53.5 | 60.0 | 73.7 | 80.6 | 92.2 | 99.6 | 126.7 | 138.3 | 157.3 | 194.7 |
| | 2.0 | 2.1 | 2.9 | 5.7 | 9.2 | 12.3 | 14.6 | 18.5 | 21.5 | 26.3 | 31.0 | 36.0 | 40.9 | 46.9 | 57.5 | 62.3 | 72.0 | 76.9 | 98.3 | 108.0 | 122.6 | 144.0 |
| | 3.0 | 1.5 | 2.1 | 4.1 | 6.9 | 9.1 | 11.0 | 13.6 | 15.8 | 18.2 | 23.1 | 26.5 | 29.2 | 33.3 | 42.3 | 44.7 | 53.0 | 55.7 | 71.2 | 79.5 | 90.5 | 106.0 |
| | 8.0 | 0.7 | 1.0 | 1.7 | 2.8 | 3.7 | 4.8 | 5.9 | 6.6 | 7.9 | 10.3 | 11.0 | 12.7 | 14.2 | 17.6 | 18.9 | 22.0 | 23.7 | 29.9 | 33.0 | 37.8 | 44.0 |

Table 2 b

Calculation of the battery capacity of maintenance free OGIv batteries **not acc. to EN 50171** (higher capacities on request)

| | | | | | | | | | | | | | | | | | | | | | | |
|--|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| max. discharge current [A] with operating time [h], 1.7 V per cell and +20°C ambient temperature | 1.0 | 3.4 | 4.7 | 9.7 | 16.7 | 20.8 | 26.2 | 31.7 | 40.9 | 52.6 | 55.3 | 66.8 | 78.8 | 90.0 | 107.7 | 119.4 | 133.6 | 145.6 | 186.2 | 200.4 | 226.6 | 267.2 |
| | 1.5 | 2.6 | 3.5 | 7.3 | 13.2 | 15.5 | 19.9 | 23.5 | 29.5 | 37.4 | 40.5 | 47.9 | 57.3 | 67.4 | 77.4 | 85.3 | 95.8 | 105.2 | 133.2 | 143.7 | 163.6 | 198.6 |
| | 2.0 | 2.2 | 3.0 | 6.1 | 9.8 | 12.7 | 16.0 | 19.2 | 22.8 | 28.6 | 32.9 | 37.2 | 44.6 | 51.7 | 60.0 | 65.8 | 74.4 | 81.8 | 103.0 | 111.6 | 127.6 | 148.8 |
| | 3.0 | 1.6 | 2.2 | 4.4 | 7.2 | 9.3 | 11.8 | 14.1 | 16.6 | 19.5 | 24.5 | 27.2 | 31.3 | 35.4 | 43.8 | 46.7 | 54.4 | 58.5 | 73.9 | 81.6 | 93.4 | 108.8 |
| | 8.0 | 0.7 | 1.0 | 1.8 | 3.0 | 3.9 | 5.1 | 6.1 | 6.8 | 8.2 | 10.8 | 11.2 | 13.3 | 14.9 | 18.0 | 19.4 | 22.4 | 24.5 | 30.6 | 33.6 | 38.7 | 44.8 |

Table 3 a

Additional number of 2.5 A booster acc. to DIN EN 50171 for recharging of:

| Battery capacity C10 at 1.8 V/C and +20°C | Ah | 5.5 | 8.5 | 14.0 | 23.3 | 32.0 | 39.8 | 50.4 | 53.7 | 66.2 | 85.7 | 89.4 | 106.0 | 118.0 | 143.1 | 155.6 | 178.8 | 195.4 | 245.0 | 268.2 | 308.0 | 357.6 |
|---|-----|-----|-----|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 12 hours / 80 % | 1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 6 | 6 | 8 |
| | 1.5 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 6 | 6 | 7 | 8 |
| | 2.0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 6 | 6 | 7 | 9 |
| | 3.0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 4 | 4 | 5 | 5 | 6 | 7 | 8 | 10 |
| | 8.0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 6 | 7 | 8 | 9 |

Table 3 b

Additional number of 2.5 A booster **not acc. to EN 50171** for recharging of 10 h and 20 h:

| Recharging cycle [h] | h | 5.5 | 8.5 | 14 | 23.3 | 32 | 39.8 | 50.4 | 53.7 | 66.2 | 85.7 | 89.4 | 106 | 118 | 143.1 | 155.6 | 178.8 | 195.4 | 252 | 245 | 268.2 | 308 | 357.6 |
|----------------------|-----|-----|-----|----|------|----|------|------|------|------|------|------|-----|-----|-------|-------|-------|-------|-----|-----|-------|-----|-------|
| 10 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 6 | 6 | 6 | 7 | 8 |
| 10 | 1.5 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 9 |
| 10 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 7 | 7 | 7 | 8 | 10 |
| 10 | 3 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 8 | 8 | 8 | 10 | 11 |
| 10 | 8 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 5 | 5 | 6 | 7 | 9 | 9 | 9 | 11 | 13 |
| 20 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 3 | 4 |
| 20 | 1.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 |
| 20 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 5 |
| 20 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 4 | 4 | 4 | 5 | 5 |
| 20 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 5 | 6 |

Table 4

Number of battery cabinets; battery weight

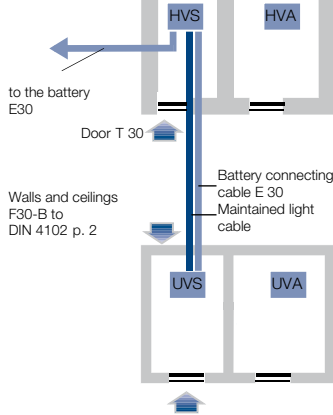
| Battery capacity C10 at 1.8 V/C and +20°C | 5.5 | 8.5 | 14.0 | 23.3 | 32.0 | 39.8 | 50.4 | 53.7 | 66.2 | 85.7 | 89.4 | 106.0 | 118.0 | 143.1 | 155.6 | 178.8 | 195.4 | 245.0 | 268.2 | 308.0 | 357.6 |
|---|-----|-----|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| No. of battery cabinets (weight approx. 150 kg) per cabinet | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 |
| Total weight per battery set approx. kg | 45 | 65 | 100 | 180 | 243 | 252 | 351 | 405 | 499 | 527 | 594 | 612 | 900 | 1000 | 1093 | 1296 | 1354 | 1687 | 1782 | 1782 | 2376 |

EuroZB.1

Accomodation

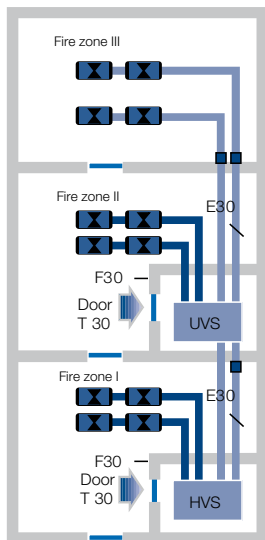
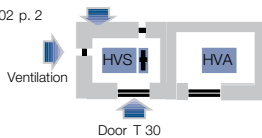
Example 1

Walls and ceilings
F30-B to
DIN 4102 p. 2



Example 2

Walls and ceiling
F30 to
DIN 4102 p. 2



A number of rules and regulations apply to the accommodation of central battery systems, in particular the EltBauVo, DIN EN 50272-2, MLAR and LBO. Depending on the constructional circumstances, the following accommodation possibilities result from these rules and regulations.

Example 1:

Main distribution board of the general lighting power supply (MDB) and main distribution board of the emergency lighting power supply (ZB) in an electrical room.

In case of accommodation acc. to example 1, attention must be paid that the MDB and ZB are isolated from each other so that arcing is safely prevented.

Example 2:

Main distribution board of the emergency lighting power supply (ZB) including the battery, in a separate electrical room.

Ventilation of electrical rooms

Dimensioning of the ventilation acc. to DIN EN 50272-2. The ventilation of rooms, cabinets or containers in the inside of which batteries are operated, is considered sufficient, if a min. air volume flow is ensured that has been calculated according to the following formula:

$$Q = 0.05 \times n \times I_{\text{gas}} \times C_N \times 10^{-3} \text{ [m}^3/\text{h]}$$

Q = needed air volume flow, in m³/h

0.05 = fixed factor

n = no. of accumulator cells

I_{gas} = current in mA per Ah, fits 8 mA per Ah for I_{boost} with VRLA batteries

C_N = capacity C₁₀ for lead acid at 20° C

Example for a ZB cover with 160 Ah lead-acid battery:

$$Q = 0.05 \times n \times I_{\text{gas}} \times C_N \times 10^{-3}$$

$$Q = 0.05 \times 108 \times 8 \times 160 \times 10^{-3} \text{ m}^3/\text{h}$$

$$Q = 6.91 \text{ m}^3/\text{h}$$

In order to ensure the air volume flow of 6.912 m³/h, the air inlets and outlets in the electrical distribution room must have the following minimum cross-sections acc. to DIN EN 50272-2.

Vent cross-section of the air inlets and outlets:

$$A \geq 28 \times Q$$

$$A \geq 28 \times 6.91 \text{ m}^3/\text{h}$$

$$A \geq 193.54 \text{ cm}^2$$

The required vents in the F90 walls must be guarded by fire protection measures, e. g. F90 fire shutters. As the calculation shows, the use of even the largest battery does not require an elaborate technical ventilation (e.g. explosion protected fans). Due to the installed low maintenance of sealed lead acid gas recombination batteries, no further special constructional requirements such as a floor resistant to electrolyte or a floor covering (tiles) etc. have to be met.

VRLA valve regulated lead acid monobloc batteries can operate in any position. Exception on top.