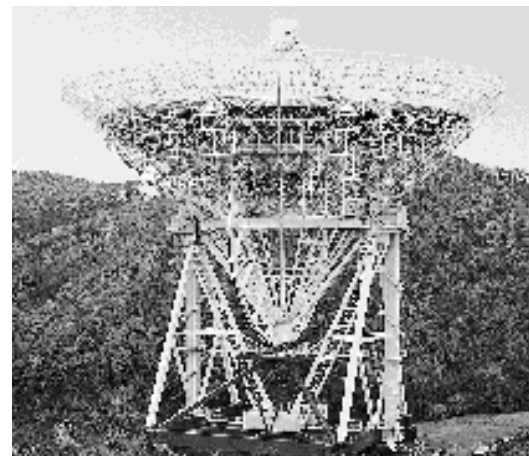
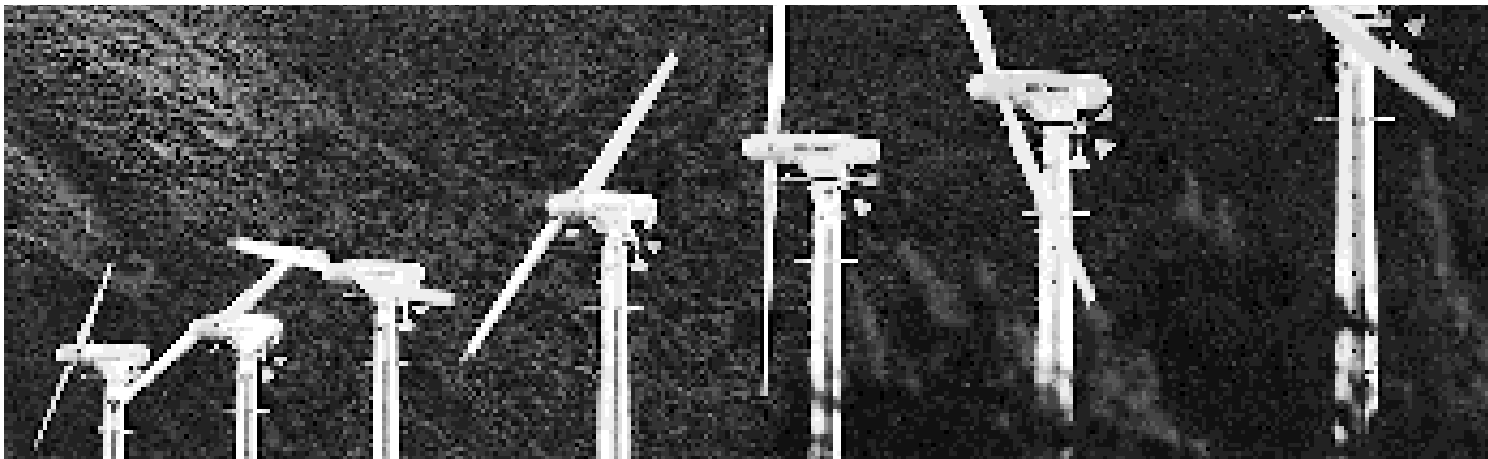


Valve regulated  
sealed industrial battery

HAGEN *OPzV*



# HAGEN OPzV

The OPzV range of valve regulated cells is a subsequent development of the well proven OPzS range and complies with DIN 40742.

The cell containers are made of coloured SAN, classified as UL 94 - HB (upon request also available in ABS, classified as UL 94 VO). Single cells are covering a capacity range from 200 to 3000 Ah in 14 case sizes.

## Scope of application

HAGEN OPzV cells are used mainly for battery support times of more than 1 hour.

HAGEN OPzV cells are designed for  $\geq 15$  years service life (at an ambient temperature of 20° C with 80% residual capacity) and affords high cyclic stability.

Eurobat classification: High integrity.

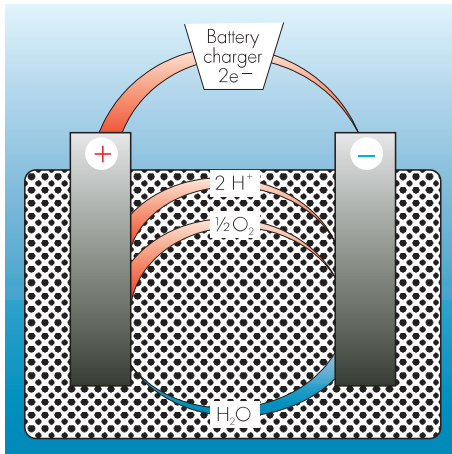
## Main Applications

- Telecommunication systems
- Radio and relay stations
- UPS/special substitute power supply
- Signalling equipment
- Emergency lighting (acc. VDE 0108)
- Solar- and windpower applications

## Useful features

- Use in vertical or horizontal position from 200 Ah up to 1500 Ah cells
- No risk of acid leakage in transport
- Deep discharge protected for more than 30 days
- Expected service life of  $\geq 15$  years (at standby operation)
- Very low self discharge allows for extended storage periods
- Very low service costs
- Not classified as dangerous goods on transports due to gelled electrolyte
- Reduced ventilation requirement

## Recombination and how it works !



Principle of recombination

In lead batteries with liquid electrolyte, water is decomposed into hydrogen and oxygen gas during charging. These gases escape through the battery cell plugs and have to be replaced by adding water.

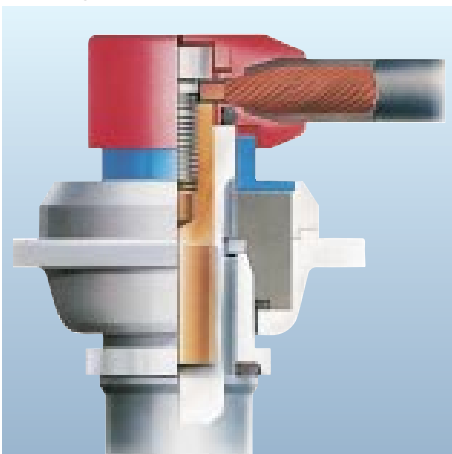
The electrolyte with type OPzV is fixed in form of gel in connection with additives.

During charging, oxygen first evolves at the positive plate. This oxygen can flow through capillaries directly to the negative plates, where it combines with the stream of H<sup>+</sup> ions and electrons to form water again.

During this process the negative electrode is depolarized; as a result, there is practically no production of hydrogen.

The water reaches the positive electrode by means of diffusion. The cycle of decomposition and recombination is closed. As a result, there is no loss of water within the cell.

## Battery construction



HAGEN *patentpol*

The positive tubular plates of HAGEN OPzV batteries are cast from special antimony-free lead alloy and enclosed in extremely strong porous tubular gauntlets. These gauntlets are filled with the active positive material, resulting in an extremely robust and long life assembly.

The negative plates of the OPzV range consist of an antimony free lead alloy grid, pasted with active material.

Separation of the plates is by microporous separators.

## Containers and lids

Cell containers and lids are made from a high grade acid-resistant plastic, either SAN, or, on special request, ABS.

## Terminal and connectors

HAGEN OPzV cells are fitted with the well proven HAGEN *patentpol* terminals, providing a totally airtight seal.

1,2, 3 or 4 terminal pairs/cell are provided, dependant upon the capacity of the cell. Fully insulated flexible cable connectors are used for intercell connection.

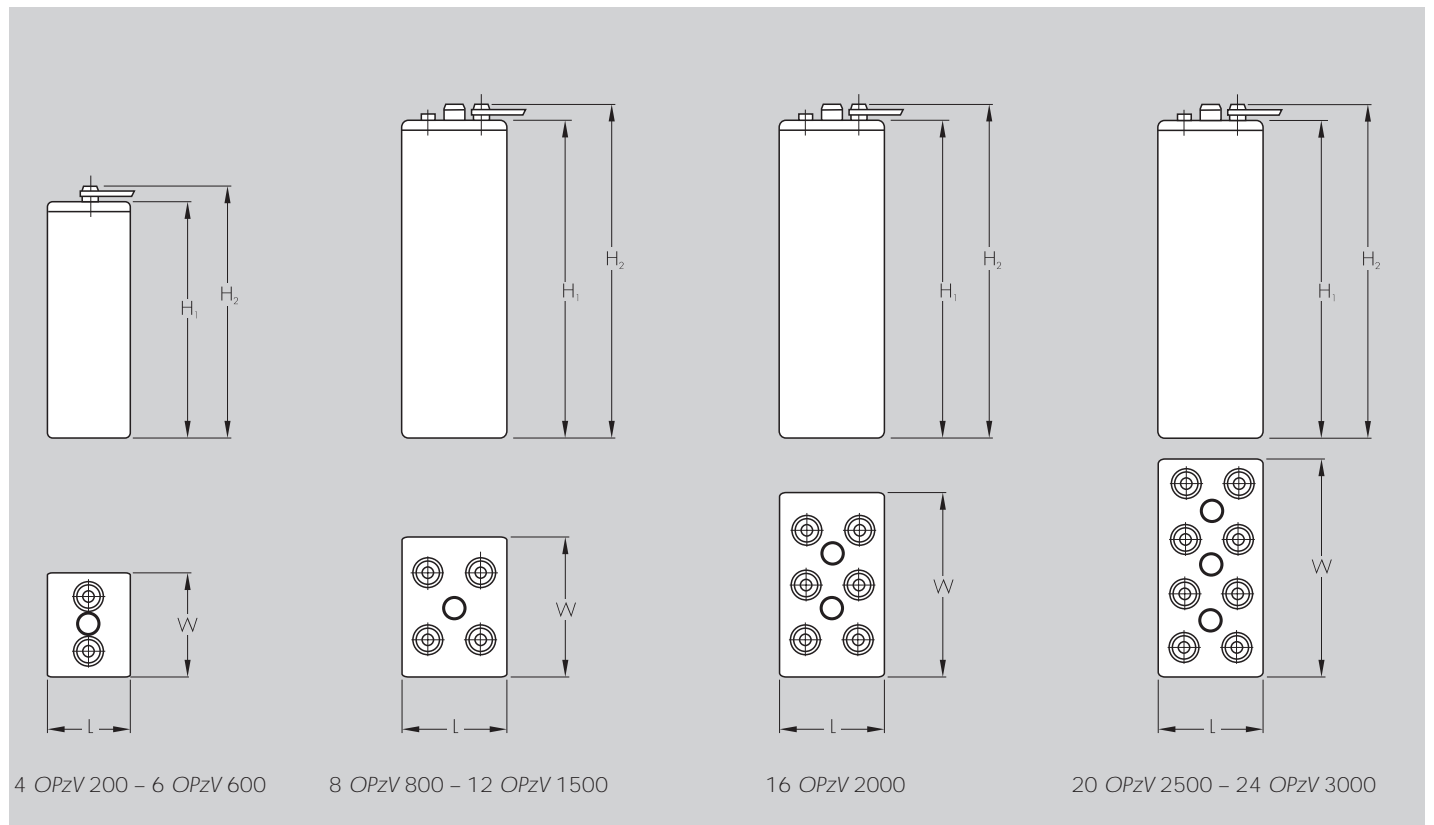
## Storage and installation

HAGEN OPzV cells can be installed (horizontal limited up to 1500 Ah cells) on steel stands or in cabinets.

The general instructions for storage of cells and treatment after storage, shown in our operating instructions, have to be carefully observed.

# Type programme HAGEN OPzV

Cell-Type	Length L mm	Width W mm	Height H <sub>1</sub> mm	Height H <sub>2</sub> mm	Total weight kg
4 OPzV 200	103	206	358	399	20.5
5 OPzV 250	124	206	358	399	24.5
6 OPzV 300	145	206	358	399	29.0
5 OPzV 350	124	206	471	512	31.0
6 OPzV 420	145	206	471	512	36.5
7 OPzV 490	166	206	471	512	42.0
6 OPzV 600	145	206	647	688	50.0
8 OPzV 800	210	191	647	688	68.0
10 OPzV 1000	210	233	647	688	82.0
12 OPzV 1200	210	275	647	688	97.0
12 OPzV 1500	210	275	797	838	120.0
16 OPzV 2000	210	399	772	813	160.0
20 OPzV 2500	210	489	772	813	200.0
24 OPzV 3000	210	579	772	813	240.0



Terminal screws M8 hexagon: 25 Nm ±1

All rights reserved for possible technical alterations due to further development

### Charge voltage

HAGEN OPzV batteries must only be charged with regulated chargers of the type usually used for sealed lead batteries. At 20° C the float charge voltage is 2.25 V/cell ±1%.

If the mean ambient temperature differs substantially from 20° C for long periods, the set float voltage should be adjusted in accordance with the graph in Figure 1.

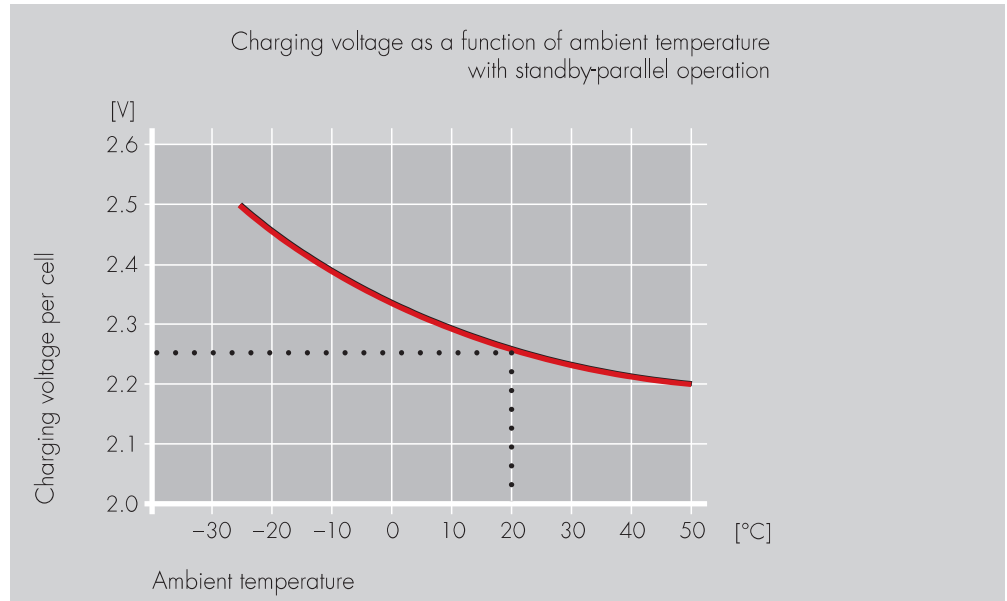


Figure 1

### Charge current

The maximum charge current at 20° C is  $2,5 \times I_{10}$  up to a cell voltage of 2.4 volts. The recharging time of the battery depends upon the previous discharge and the level of current at beginning of "recharge (see Figure 2).

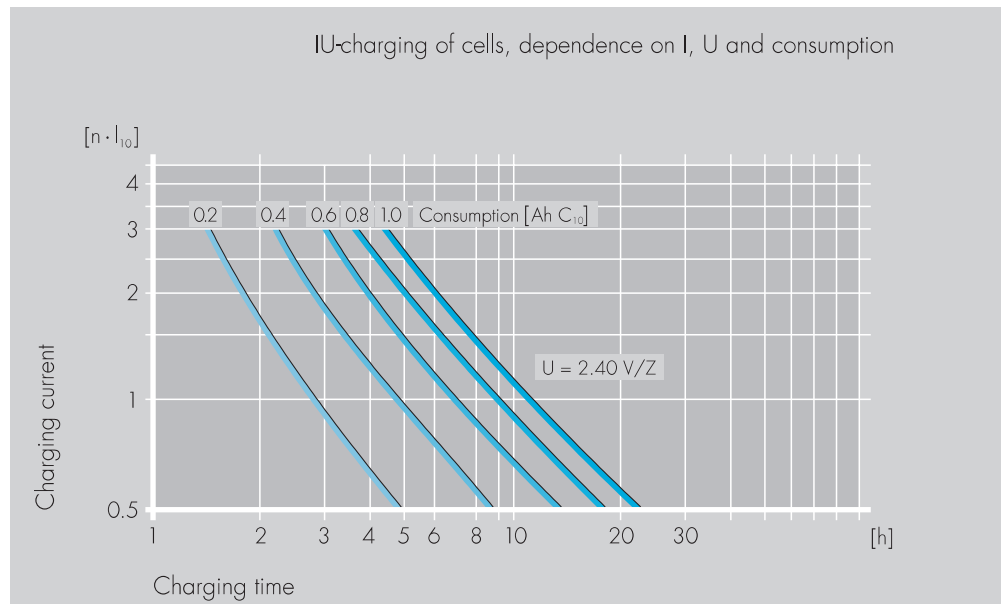


Figure 2

### Deep discharge protection

HAGEN OPzV batteries have excellent deep discharge recovery. The batteries can be recharged to 95% capacity in 12 hours, even following 30 days connected to a load in the discharged state.

### Low self-discharge

The rate of self-discharge by the OPzV batteries is extremely low by comparison to normal lead batteries. Figure 3 indicates the available capacity and storage times at various temperatures.

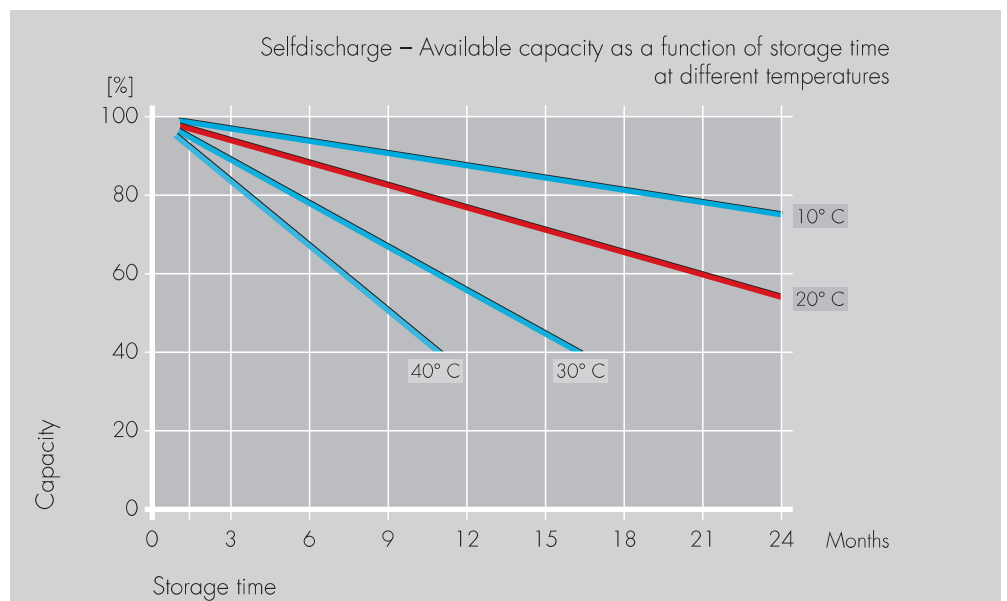


Figure 3

Discharge time	Capacity at 20° C in Ah				Discharge current in A			
	10h	5h	3h	1h	10h	5h	3h	1h
Discharge end voltage per cell	1.80	1.77	1.75	1.67	1.80	1.77	1.75	1.67
Cell size								
4 OPzV 200	200.0	172.0	150.0	106.0	20.0	34.4	50.0	106.0
5 OPzV 250	250.0	215.0	187.5	132.5	25.0	43.0	62.5	132.5
6 OPzV 300	300.0	258.0	225.0	159.0	30.0	51.6	75.0	159.0
5 OPzV 350	350.0	300.0	262.5	185.0	35.0	60.0	87.5	185.0
6 OPzV 420	420.0	360.0	315.0	222.0	42.0	72.0	105.0	222.0
7 OPzV 490	490.0	420.0	367.5	259.0	49.0	84.0	122.5	259.0
6 OPzV 600	600.0	516.0	450.0	312.0	60.0	103.2	150.0	312.0
8 OPzV 800	800.0	688.0	600.0	416.0	80.0	137.6	200.0	416.0
10 OPzV1000	1000.0	860.0	750.0	520.0	100.0	172.0	250.0	520.0
12 OPzV1200	1200.0	1032.0	900.0	624.0	120.0	206.4	300.0	624.0
12 OPzV1500	1500.0	1260.0	1116.0	744.0	150.0	252.0	372.0	744.0
16 OPzV2000	2000.0	1680.0	1488.0	992.0	200.0	336.0	496.0	992.0
20 OPzV2500	2500.0	2100.0	1860.0	1240.0	250.0	420.0	620.0	1240.0
24 OPzV3000	3000.0	2520.0	2232.0	1488.0	300.0	504.0	744.0	1488.0

The a.m. technical data comply with DIN 40742 and international technical standards.

After the first discharge 95% of the stated values will be reached. 100% capacity will be reached after some months in standby parallel operation or after some cycles.

## Setting-up of batteries

The batteries should be set up preferably on floor stands or on multi-tiered stands: these racks should consist mainly of plug-in elements. The installation is easy to perform and thus shortens the setting-up time considerably.

If desired, the batteries can also be set up inside closed steel cabinets (IP 20).

Air requirements can be reduced in accordance with VDE 0510, part 2.7.1, since the plates of the batteries in this series are manufactured without antimony and the cells are sealed.

The air-outlet and air-inlet openings, sufficient for the natural ventilation must have the following minimum cross-section A, depending on the calculated air-volume stream Q. (A = cm<sup>2</sup>, Q = m<sup>3</sup>/h)

### Example:

For IU-charges in standby parallel operation

$$Q = 0.05 \cdot n \cdot I \cdot f_1 \cdot f_2$$

$$Q = \text{air flow rate in m}^3/\text{h}$$

n = no. of cells

I = charging currents

f<sub>1</sub> = 0.5 (for antimony-free cells)

f<sub>2</sub> = 0.5 (for closed cells)

$$A \geq 28 \cdot Q$$

## Steel stands with plug-in elements

### – plastic-laminated –

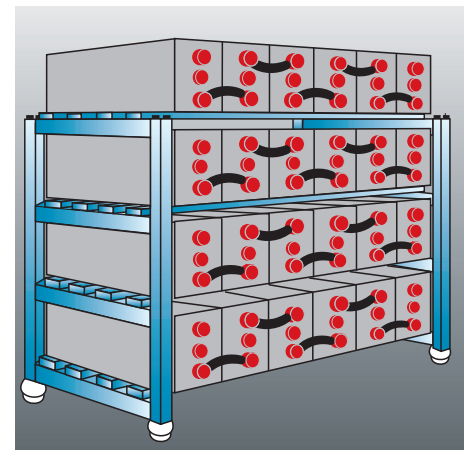
These racks consist of steel parts with plastic lamination (Levasint grey, RAL 7001\*) variable depth (cell width); they can be arranged end-to-end endlessly in module length of 300 mm. A maximum of six rows can be arranged on each level; the maximum number of levels being six. Each stand can be expanded later as necessary to meet requirements.

Assembly time has been reduced to a minimum: with the exception of the diagonal braces, the parts do not require any nuts and bolts etc. Owing to the Levasint lamination and polypropylene insulators, the stands are fully insulated.

Dimensions, assembly possibilities, weights and prices – arranged according to no. of cells – are all given in our computer application lists, which are drawn up specifically with your local conditions in mind. Deflection values of max. 2 mm are accepted resp. incorporated.

Since all steel parts, i.e. the side parts as well, are laminated to a thickness of at least 200 to 300 µ, the electrical disruptive strength is at least 8 kv at all locations.

\* RAL = Subcommittee for Supply Conditions and Quality Control at the German Standards Committee. (Ausschuß für Lieferbedingungen und Gütesicherung beim Deutschen Normenausschuß)



Example: Use in horizontal position