GERMAREL GmbH

NiCd Sales Department
E-mail: sales@germarel.de
Website: www.germarel-nicd.de
Call : 00491747902498

Nickel-Cadmium Industrial cells and batteries

(NiCd Batteries from Germany – Europe)

KGL, KPL, KPM, KPH types (High Quality, 20Years Life Design)

NiCd Battery Cabinet for the industrial application

Paralleled NiCd Batteries in Case

Quality in everything we do!

«Germarel» is a leading manufacturer of autonomous power supply, inverter, industrial ups systems,nicd cells and batteries for different industrial applications.

Our products:

- ✓ autonomous power supply systems for backup power supply to consumers in case of the centralized power cut;
- ✓ NiCd cells of NK, KL (KPL), KM (KPM) types, non-maintenance cells of KGL type for passenger and special railway carriages; electric locomotives and electric trains; underground and urban electric transport; river and sea ships; back-up power for cellular base stations, wire ATS and other telecommunications; signaling system; emergency lighting and electrical power supply; solar and wind power systems; oil & gas and electric power industries; UPS;
- ✓ cells of KH (KPH) type for diesel engine starting of mainline and shunting locomotives, maintenance of way vehicles; diesel generator and internal combustion engine starting; UPS with short discharge rate.

Quality Management System of «Germarel» conforms to the requirements of international standard ISO 9001.

All our products conform to specified requirements of international standards IEC 60623 and IEC 62259.

«Germarel» collects and recycles all types of waste alkaline batteries from your country to Germany with the an economical cost as an European rule.

THE NiCD CELL TYPE SELECTION IS DETERMINED BY THE REQUIRED DISCHARGE RATES:

- ✓ cells of all types **(KPL, KGL, KPM, KPH)** provide the full delivery of the nominal capacity at 0,2 Cn Discharge current, A during 5 hours to the cell voltage 1,0 V, if the Discharge current, A is increasing, the output capacity will be decreasing;
- ✓ the cells of **KPL** and **KGL** types are designed for the long discharge rate at the current to 0,5 Cn;
- ✓ the cells of **KPM** types are designed for the medium discharge rates at the current to 1,0 Cn;
- ✓ the cells of **KPH** types are designed for the high discharge rates at the current to 5,0 Cn, in the pulsed mode – at the current to15 Cn, , under the drop in voltage to 0,65 V on cell.

Nickel-cadmium cells are irreplaceable in situations where the high reliability and long life are required, and also at the operation under severe climatic conditions, operation on the remote objects when the regular monitoring of the batteries is difficult or impossible.

AVERAGE CELL LIFETIME:

- ✓ operation as a back-up power source at the stationary objects - 20 years;
- ✓ operation in transport vehicles – 10 years.

ADVANTAGES OF ALKALINE NICKEL-CADMIUM NiCD CELLS:

- ✓ lack of necessity of electrolyte replacement during the whole lifecycle;
- ✓ high reliability – possibility of instantaneous failure is excepted;
- ✓ maintainability after deep discharge, short circuits and long-term storage;
- ✓ resistance to mechanical loadings and vibration under group M25;
- ✓ wide range of working environment temperature (-40…+45°C);
- ✓ ensure operation after a long being at temperature till -50°C;
- ✓ translucent plastic cell box allows to conduct visual control of electrolyte level;
- ✓ for maintenance-free cells of KGL type - lack of necessity of electrolyte level alignment upon observance of operating conditions.

EXAMPLES OF CELL DESIGNATION:

KPL300P, KPM300P, KPH300P, KGL300P

K – designation of nickel-cadmium electrochemical system;

L, M, H – cell designation according to the discharge rate;

L – cell of long discharge rate;

M – cell of medium discharge rate;

H – cell of high discharge rate;

G – maintenance-free cell with gas recombination;

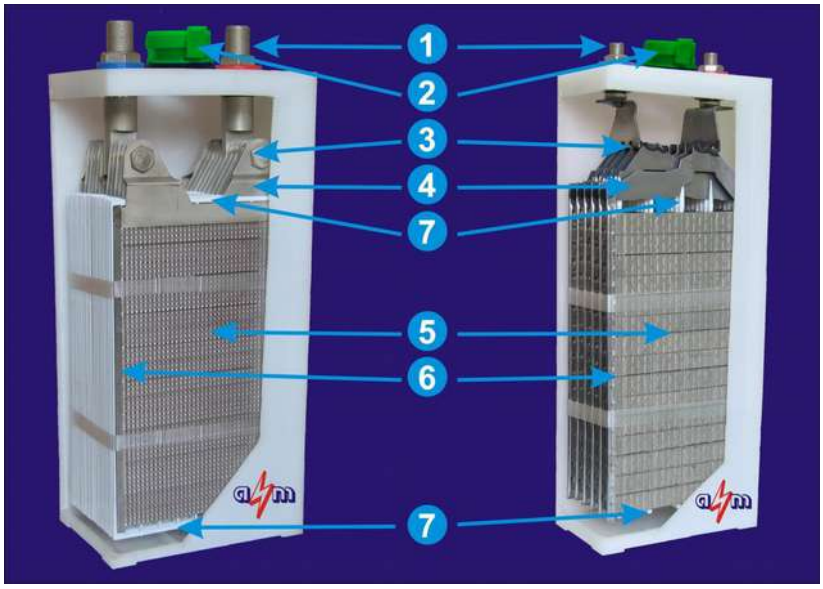
300 – nominal capacity in Ah;

P – plastic box of cell (without “P” – a steel box of cell)

The figure in the front of cell designation means the number of cells in the battery, for example 4KPL300P.

CONSTRUCTION:

Alkaline nickel-cadmium cell consists of pocket plate positive oxide-nickel and negative cadmium electrodes, divided by plastic separators, which provide stable spark gap and free circulation of electrolyte.



1. Terminal - provides the current takeoff and cell connection.

2. Plug - provides convenient electrolyte filling, free gas outlet during charging, and excludes electrolyte plashing and its aerosol steams.

3. Electrode connection - connects the electrodes and provides the current transfer from electrodes to terminal.

4. Contact banks - are welded to electrode and provide the current takeoff from the electrodes.

5. Electrode - consists of horizontally located pocket plates, contains active material enclosed in steel perforated strip.

6. Rib - provide electrode rigidity and current transfer to the contact banks.

7. Frame separator - divides positive and negative electrodes, provides free circulation of electrolyte between the electrodes.

Electrolyte requirements:

Electrolyte is a water solution of potassium hydroxide GOST 9285-78 of superior grade with density (1200±10) kg/m^3 , (1,19 – 1,21 g/cm with addition of lithium hydroxide GOST 8595-83 in amounts of (20±1) g/l. At the electrolyte temperature less than - 30 °C use electrolyte with density 1,26 -1,28 g/cm^3 without addition of lithium hydroxide.

General characteristics:

- ✓ batteries are supplied in the form of separate cells or battery blocks with compounds;
- ✓ nominal voltage of cell is 1,2V, the block voltage depends on the number of the cells in the block (2,4 V; 3,6 V; 4,8 V; 6,0 V; 7,2 V; 8,4 V; 9,6 V; 10,8 V; 12,0 V);
- ✓ cells and batteries provide full operation after storage during three months within the whole working temperature range without charge when putting into operation, under condition, that battery was charged and powered off before placing in storage;
- ✓ cells and batteries ensure operation after six months storage, under condition, that battery was charged and powered off before placing in storage, battery should be charged before starting operation;
- ✓ criterion of cells limiting state is a lowering of available capacity to less than 60 % of nominal capacity;
- ✓ after completion of operation «Germarel» accept cells for recycling together with electrolyte.

MAINTENANCE-FREE ALKALINE NICKEL-CADMIUM NiCd CELLS OF KGL TYPE AND BLOCKS OF THEM

The cells of **KGL** type are alkaline cells with gas recombination and comply with international standard IEC 62259. These cells don't require periodic correction of electrolyte level when operated at long charge rate by low current or under specified stabilized charge voltage.

APPLICATIONS:

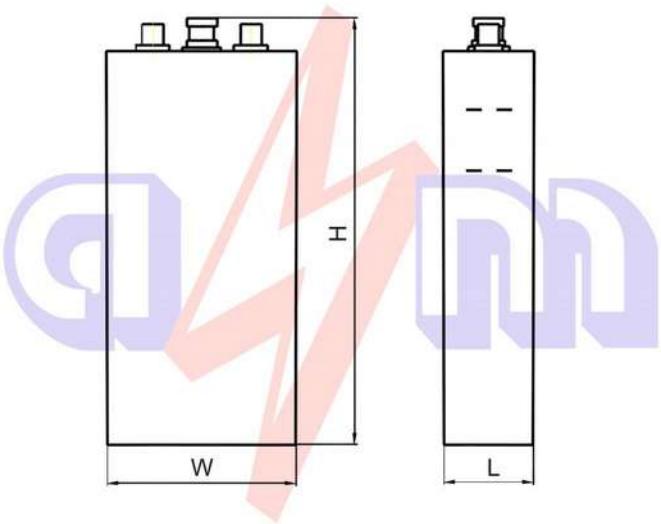
- ✓ back-up power for cellular base stations, wire automatic telephone systems and other telecommunication objects;
- ✓ signaling systems; emergency lighting and electrical power supply;
- ✓ solar and wind power objects;
- ✓ oil and gas complex (recovery, transportation and refining);
- ✓ electric power objects (generation and distribution);
- ✓ power system of navigation marks;
- ✓ UPS;
- ✓ underground;
- ✓ passenger railway carriages;
- ✓ electric locomotives and electric trains;
- ✓ urban electric transport;
- ✓ sea and river ships.

It's possible to develop and supply battery blocks with the different number of cell and individual layout according to customer's technical requirements.

Range and main characteristics of KGL type cells

Cell type	IEC 62259 designation	Nominal capacity, C5	Cell dimensions, mm			Cell weight with electrolyte, kg	Terminals
			W	L	H		
KGL60P	KGL60P	60	113	59	270	2,9	M10
KGL70P	KGL70P	70	127	62,5	282	4,0	M14
KGL100P	KGL100P	100	137	78	360	5,8	M10
KGL125P	KGL125P	125	137	78	360	6,1	M10
KGL140P	KGL140P	140	137	78	362	6,5	M14
KGL160P	KGL160P	160	137	113	327	8,5	M16
KGL200P	KGL200P	200	171	118	356	11,4	M20
KGL200P	KGL200P	200	171	118	370	11,4	M20
KGL250P	KGL250P	250	171	118	356	12,0	M20
KGL250P	KGL250P	250	171	118	370	12,0	M20
KGL300P	KGL300P	300	171	118	356	12,4	M20
KGL300P	KGL300P	300	171	118	370	12,4	M20
KGL300P	KGL300P	300	172	119	405	13,2	M20
KGL350P	KGL350P	350	171	174	370	17,9	M20
KGL400P	KGL400P	400	169	174	411	19,2	2×M16
KGL450P	KGL450P	450	169	174	411	19,9	2×M16
KGL500P	KGL500P	500	169	174	411	20,0	2×M16

Dimensional drawing of a cell in polymeric box



Appearance of KGL type cells

KGL45P
KGL60P

KGL70P

KGL100P
KGL125P
KGL140P

KGL160P

KGL200P
KGL250P
KGL300P

KGL300P

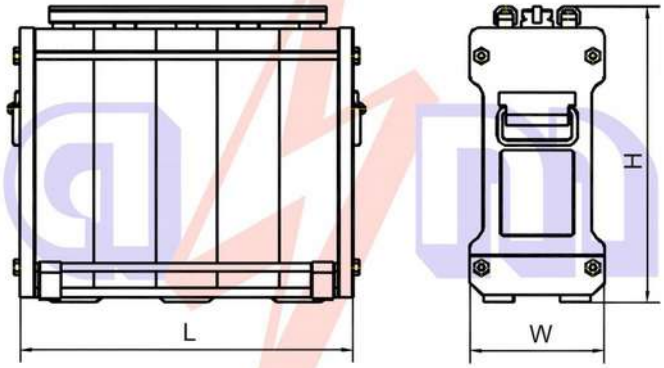
KGL350P

KGL450P
KGL500P

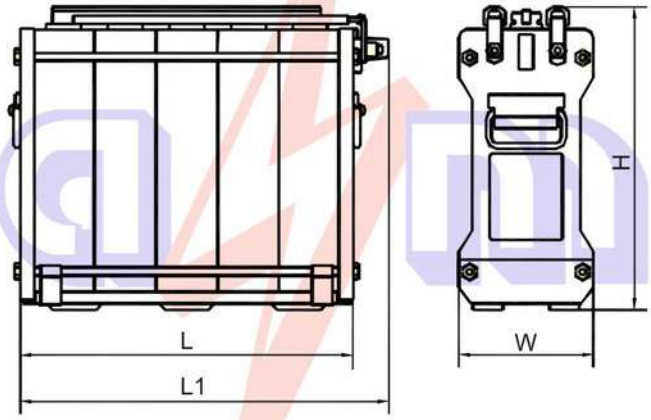
Blocks dimensions

Cell type	Block dimensions, mm									
	W	H	L / L1							
			2	3	4	5	6	7	8	9	10
KGL45P	138	280	148	207	266	325	399	458	517	576	635
KGL60P	138	280	148	207	266	325	399	458	517	576	635
KGL70P	150	295	155	218	280	343	420	483	545	608	670
KGL100P	170	370	192 / 230	270 / 308	348 / 386	426 / 464	522 / 560	600 / 638	678 / 716	756 / 794	834 / 872
KGL125P	170	370	192 / 230	270 / 308	348 / 386	426 / 464	522 / 560	600 / 638	678 / 716	756 / 794	834 / 872
KGL140P	170	370	192 / 230	270 / 308	348 / 386	426 / 464	522 / 560	600 / 638	678 / 716	756 / 794	834 / 872
KGL160P	170	338	262	375	488	601	-	-	-	-	-
KGL200P	205	370	270	388	506	624	-	-	-	-	-
KGL200P	205	384	270	388	506	624	-	-	-	-	-
KGL250P	205	370	270	388	506	624	-	-	-	-	-
KGL250P	205	384	270	388	506	624	-	-	-	-	-
KGL300P	205	370	270	388	506	624	-	-	-	-	-
KGL300P	205	384	270	388	506	624	-	-	-	-	-
KGL300P	205	419	272	391	510	629	-	-	-	-	-
KGL350P	205	380	382 / 437	556 / 611	-	-	-	-	-	-	-

Dimensional drawing of a battery in metal-plastic carcass



Dimensional drawing of a battery in metal-plastic carcass with front terminals



Appearance of batteries

5KGL45P
5KGL60P

5KGL70P

5KGL125P-III

5KGL160P

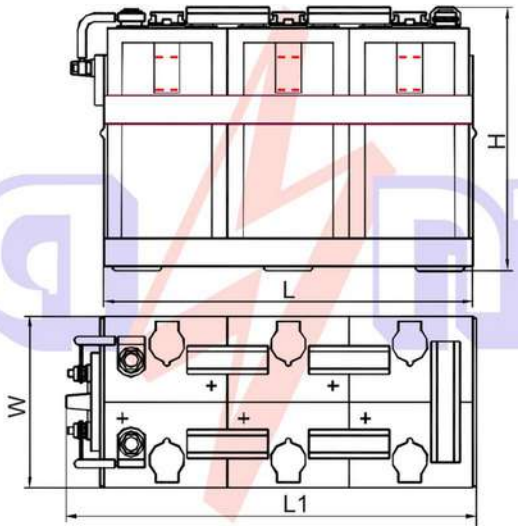
5KGL250P

3KGL350P

Batteries NiCd 4KGL300P and 6KGL300P in metal carcass

Cell type	Nominal capacity, C5	Nominal voltage, V	Block dimensions, mm			Cell weight with electrolyte, kg.	Terminals
			W	L / L1	H		
4KGL300P	300	4,8	175	478 / 537	367	55,0	M10
6KGL350P	300	7,2	240	519 / 578	367	81,0	M10

Dimensional drawing of a battery in metal carcass with front terminals



RECOMMENDED NiCd CHARGING RATES:

1. Two-stage charge mode.

If it is possible to carry out constant charging from the dedicated converter channel (operation of batteries (batteries) as an emergency power source), a charge with a two-stage mode is more preferable.

1st stage - charge by current 0.1 It A until the charging voltage of the batteries is reached depending on the ambient temperature:

- at a temperature of plus 40 ° C - 1.40 V per battery;
- at a temperature of plus 30 °C - 1,43 V per battery;
- at a temperature of plus 20 ° C - 1.46 V per battery;
- at a temperature of plus 10 ° C - 1.51 V per battery;
- at a temperature of 0 ° C and below - 1.58 V per battery.

Deviations of the set charging voltage from the set value should not exceed 2%.

The first stage of charge should last for 24 hours.

Then the charger should go to the 2nd stage - a constant charge with a current of no more than 0.005 It A.

The inclusion of the first stage of charge should occur after each disconnection of the centralized power supply or when the voltage of the batteries decreases under a load less than 1.1 V.

When the voltage drops below 1.0 V, the batteries must be forcibly disconnected from all loads and connected only after charging.

2. Charge at constant voltage.

If it is not possible to organize a two-stage charging mode, in order to ensure the installed battery life without refilling of distilled water (when operating in buffer mode), the electrical equipment must provide the following algorithm for changing the charging voltage, depending on the ambient temperature per battery:

- 1.40 V at a temperature of plus 40 ° C;
- 1.43 V at a temperature of plus 30 ° C;
- 1.46 V at a temperature of plus 20 ° C;
- 1.51 V at a temperature of plus 10 ° C;
- 1.58 V at a temperature of 0 ° C or lower.

At the same time, the maximum charging current of the batteries should be limited to the level of 0.1 It A. Accuracy of maintaining the charging voltage is ± 1%.

KGL cell performance data

Performance for fully charged cells by a constant current charge according to IEC 62259 standard

Discharge current, A at + 20°C ± 5°C Final voltage: 1.15 V/cell

Cell type	Capacity	Hours					Minutes	
	C_5 Ah	10 h	8 h	5 h	3 h	2 h	90 min	60 min
KGL60P	60	5,4	6,4	9,6	12,6	18	19	23
KGL70P	70	6,3	7,5	11,2	14,7	21	22	27
KGL100P	100	9	10,6	16	21	29	32	38
KGL125P	125	11,3	13,3	20	26,6	36	40	47
KGL140P	140	12,6	14,9	22,4	29,4	41	45	53
KGL160P	160	14,4	17	25,6	33,6	47	51	60
KGL200P	200	18	21,3	32	42	59	64	75
KGL250P	250	22,5	26,6	40	52,5	73	80	94
KGL300P	300	27	31,9	48	63	88	96	113
KGL350P	350	31,5	37,2	56	73,5	103	112	132
KGL400P	400	36	42,5	64	84	117	128	150
KGL450P	450	40,5	47,9	72	94,5	132	144	169
KGL500P	500	45	53,1	80	105	146	160	188

Discharge current, A at + 20°C ± 5°C Final voltage: 1.00 V/cell

Cell type	Capacity	Hours					Minutes		
	C_5 Ah	10 h	8 h	5 h	3 h	2 h	90 min	60 min	30 min
KGL60P	60	6	7,5	12	18	27	32	45	54
KGL70P	70	7	8,8	14	21	32	37	53	63
KGL100P	100	10	12,5	20	30	45	53	75	90
KGL125P	125	12,5	15,6	25	38	56	67	94	113
KGL140P	140	14	17,5	28	42	63	75	105	126
KGL160P	160	16	20	32	48	72	85	120	144
KGL200P	200	20	25	40	60	90	107	150	180
KGL250P	250	25	31,3	50	75	113	133	188	225
KGL300P	300	30	37,5	60	90	135	160	225	270
KGL350P	350	35	43,8	70	105	158	187	263	315
KGL400P	400	40	50	80	120	180	213	300	360
KGL450P	450	45	56,3	90	135	203	240	338	405
KGL500P	500	50	62,5	100	150	225	267	375	450

ALKALINE NICKEL-CADMIUM NiCd CELLS OF KPL TYPE AND BLOCKS OF THEM

Cells of **KPL** type are alkaline cells with pocket plate electrodes and comply with international standard IEC 60623.

APPLICATIONS:

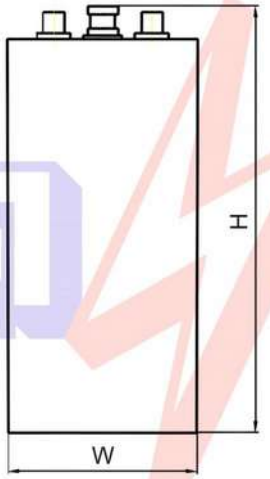
- ✓ back-up power for cellular base stations, wire automatic telephone systems and other telecommunication objects;
- ✓ signaling systems; emergency lighting and electrical power supply;
- ✓ solar and wind power objects;
- ✓ oil and gas complex (recovery, transportation and refining);
- ✓ electric power objects (generation and distribution);
- ✓ power systems of navigation marks;
- ✓ underground;
- ✓ passenger railway carriages;
- ✓ electric locomotives and electric trains;
- ✓ urban electric transport;
- ✓ sea and river ships.

It's possible to develop and supply battery blocks with the different number of cell and individual layout according to customer's technical requirements.

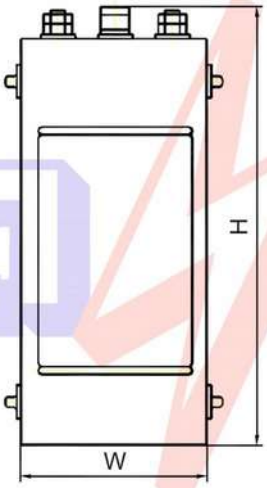
Cells of KPL type

Cell type	IEC 60623 designation	Nominal capacity, C5	Cell dimensions, mm			Cell weight, kg		Terminals
			W	L	H	with electrolyte	without electrolyte	
KPL20P	KL20P	20	113	59	240	2,2	1,3	M5
KPL45P	KL45P	45	113	59	240	2,5	1,8	M5
KPL45	KL45	45	107	55	216	2,8	2,2	M5
KPL60	KL60	60	130	47	352	4,46	3,5	M10
KPL60P	KL60P	60	127	62,5	282	3,8	2,95	M14
KPL65	KL65	65	130	47	352	4,46	3,5	M10
KPL70P	KL70P	70	127	62,5	282	3,8	2,95	M14
KPL100P	KL100P	100	137	78	360	5,7	4,0	M10
KPL110P	KL110P	110	137	78	360	6,1	4,3	M10
KPL125P	KL125P	125	137	78	360	6,1	4,3	M10
KPL140P	KL140P	140	137	113	327	8,3	6,1	M16
KPL160P	KL160P	160	137	113	327	8,5	6,5	M16
KPL180P	KL180P	180	137	113	327	8,5	6,5	M16
KPL200P	KL200P	200	171	118	370	11,4	7,6	M20
KPL220P	KL220P	220	171	118	370	11,6	8,0	M20
KPL250P	KL250P	250	171	118	370	12,0	8,6	M20
KPL275P	KL275P	275	171	118	370	12,0	8,6	M20
KPL300P	KL300P	300	172	119	405	13,6	10,4	M20
KPL320P	KL320P	320	172	119	405	14,0	11,0	M20
KPL340P	KL340P	340	172	119	405	14,0	11,0	M20
KPL375P	KL375P	375	171	174	370	17,9	13,6	M20
KPL400P	KL400P	400	171	174	370	18,3	14,1	M20
KPL420P	KL420P	420	169	174	405	18,3	14,1	2×M16
KPL450P	KL450P	450	169	174	405	19,0	15,5	2×M16
KPL500P	KL500P	500	169	174	405	20,0	15,8	2×M16

Dimensional drawing of a cell in polymeric box



Dimensional drawing of a cell in metal box



Appearance of KPL type cells

KPL20P
KPL45P

KPL60P
KPL70P

KPL100P
KPL110P
KPL125P

KPL140P
KPL160P
KPL180P

KPL200P
KPL220P
KPL250P
KPL275P

KPL300P
KPL320P
KPL340P

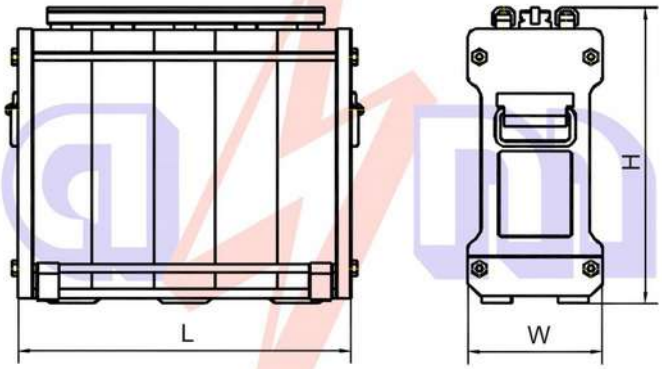
KPL375P
KPL400P

KPL420P
KPL450P
KPL500P

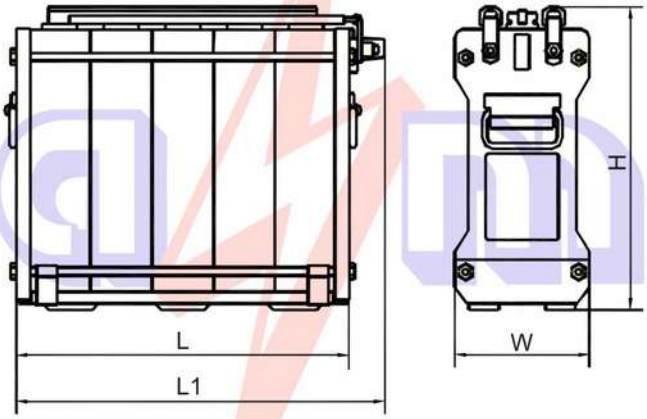
Blocks dimensions

Cell type	Block dimensions, mm										
	W	H	L / L1								
			2	3	4	5	6	7	8	9	10
KPL20P	138	250	148	207	266	325	399	458	517	576	635
KPL45P	138	250	148	207	266	325	399	458	517	576	635
KPL45	145	235	170	235	300	365	445	510	576	640	705
KPL60	176	370	148 / 196	202 / 250	256 / 304	310 / 358	382 / 430	436 / 484	490 / 538	544 / 592	598 / 646
KPL60P	150	295	155	218	280	343	420	483	545	608	670
KPL65	176	370	148 / 196	202 / 250	256 / 304	310 / 358	382 / 430	436 / 484	490 / 538	544 / 592	598 / 646
KPL70P	150	295	155	218	280	343	420	483	545	608	670
KPL100P	170	370	192 / 230	270 / 308	348 / 386	426 / 464	522 / 560	600 / 638	678 / 716	756 / 794	834 / 872
KPL110P	170	370	192 / 230	270 / 308	348 / 386	426 / 464	522 / 560	600 / 638	678 / 716	756 / 794	834 / 872
KPL125P	170	370	192 / 230	270 / 308	348 / 386	426 / 464	522 / 560	600 / 638	678 / 716	756 / 794	834 / 872
KPL140P	170	338	262	375	488	601	-	-	-	-	-
KPL160P	170	338	262	375	488	601	-	-	-	-	-
KPL180P	170	338	262	375	488	601	-	-	-	-	-
KPL200P	205	384	270	388	506	624	-	-	-	-	-
KPL220P	205	384	270	388	506	624	-	-	-	-	-
KPL250P	205	384	270	388	506	624	-	-	-	-	-
KPL275P	205	384	270	388	506	624	-	-	-	-	-
KPL300P	205	419	272	391	510	629	-	-	-	-	-
KPL320P	205	419	272	391	510	629	-	-	-	-	-
KPL340P	205	419	272	391	510	629	-	-	-	-	-
KPL375P	205	380	382 / 437	556 / 611	-	-	-	-	-	-	-
KPL400P	205	380	382 / 437	556 / 611	-	-	-	-	-	-	-

Dimensional drawing of a battery in metal-plastic carcass



Dimensional drawing of a battery in metal-plastic carcass with front terminals



Appearance of batteries

5KPL45P

5KPL70P

5KPL125P-III

5KPL160P

4KPL250P

3KPL375P

RECOMMENDED NiCd CHARGING RATES:

1. **At the operation as emergency power source the combined three-stage source is more preferable.**

Stage 1 – Intensive charge

Charging by constant current 0,2 Cn to the voltage 1,6 V on cell.

Stage 2 – Additional charge

Charging by constant voltage till the charging current declines to 0,02 Cn.

For the best cell charging, the charging voltage of Stage 2 should be corrected in accordance with the environmental temperature – if the temperature increases, the voltage should decrease for preventing electrolyte boiling; if the temperature decreases, the charging voltage should increase for charging level increasing. The dependence between charging voltage and environmental temperature is following:

$U_{charging.} = U_o + 0{,}003 \cdot (25 - t_{env.})$, where

$U_{charging.}$ – charging voltage, V/cell,

U_o – initial voltage (1,53 – 1,58 V in accordance with the cell type and operation conditions)

t_{env} – environmental temperature, °C,

0,003 – temperature coefficient.

Stage 3 – Mode of self-discharge compensation (mode of trickle charge).

Additional charge by constant voltage 1,42 – 1,43 V on cell.

The described three-stage charging rate provides minimum 90 % of level of charge and minimal electrolyte boiling. In such mode the periodicity of cell filling-up is no more frequently than once 6 months.

2. Two-stage charging rate (**Stage 1 + stage 3**) provides minimum 80 % of level of charge and minimal electrolyte boiling.
3. Two-stage charging rate (**Stage 1 + stage 2**) provides minimum 90% of level of charge, but there will be a bigger electrolyte boiling compared with the use of Stage 3.
4. One-stage charging rate (**Stage 2**) provides up to 90 % of level of charge, but the battery will accumulate capacity after emergency discharge for a longer time. Also there will be a bigger electrolyte boiling.
5. One-stage charging rate(**Stage 1 without cut-off**) provides 90-95 % of level of charge, but there will be a strong electrolyte boiling, for this reason the use of this mode without cut-off is unacceptable.

Before operation it's recommended to prepare the cell in the following way:

Charge with 2 conditioning cycle: charge by 0,2Cn current during 10 hours for the first cycle and 8 hours for the second cycle, discharge by 0,2Cn current during 4 hours for the first cycle and till 1,0 V for the second cycle. Then charge with control cycle: charge by 0,2Cn current during 8 hours, then rest for 1 hour, discharge by 0,2Cn current till 1,0 V.

Then charge by 0,2Cn current during 10 hours. After charging disconnect a battery from a charger.

Charge the battery, using the direct-current or rectified current power supply with the maximum operating voltage of at least $(2 \cdot n)$ V, where n – number of series-connected cells.

Regular operation in floating mode causes the degradation of cell capacity. This process is revertible. For cell recovery it's recommended if necessary to refresh cells by the mode similar to the mode of placing in operation.

KPL NiCd cell performance data

Performance for fully charged cells by a constant current charge according to IEC 60623 standard

Discharge current, A at + 20°C ± 5°C — Final voltage: 1.15 V/cell

Cell type	Capacity	Hours					Minutes		
	C_5 Ah	10 h	8 h	5 h	3 h	2 h	90 min	60 min	30 min
KPL 20 P	20	2	2,5	3,7	5,1	6,4	7	9	11
KPL 45 P	45	4,6	5,5	8,4	11,6	14,5	16	19	24
KPL45	45	4,6	5,5	8,4	11,6	14,5	16	19	24
KPL60	60	6,1	7,4	11,1	15,4	19,3	21	26	33
KPL60P	60	6,1	7,4	11,1	15,4	19,3	21	26	33
KPL65	65	6,6	8	12,1	16,7	20,9	23	28	35
KPL70 P	70	7,1	8,6	13	18	22,5	25	30	38
KPL100P	100	10,1	12,3	18,6	25,7	32,1	36	43	54
KPL110 P	110	11,2	13,5	20,4	28,3	35,4	39	47	60
KPL125 P	125	12,7	15,4	23,2	32,1	40,2	45	54	68
KPL140 P	140	14,2	17,2	26	36	45	50	60	76
KPL160 P	160	16,2	19,7	29,7	41,1	51,4	57	69	87
KPL180 P	180	18,3	22,1	33,4	46,3	57,9	64	77	98
KPL200 P	200	20,3	24,6	37,1	51,4	64,3	71	86	109
KPL220 P	220	22,3	27	40,9	56,6	70,7	79	94	119
KPL250 P	250	25,4	30,7	46,4	64,3	80,4	89	107	136
KPL275 P	275	27,9	33,8	51,1	70,7	88,4	98	118	149
KPL300 P	300	30,4	36,9	55,7	77,1	96,4	107	129	163
KPL320 P	320	32,5	39,3	59,4	82,3	102,9	114	137	174
KPL340 P	340	34,5	41,8	63,1	87,4	109,3	121	146	185
KPL375 P	375	38	46,1	69,6	96,4	120,5	134	161	204
KPL400 P	400	40,6	49,1	74,3	102,9	128,6	143	171	217
KPL420 P	420	42,6	51,6	78	108	135	150	180	228
KPL450 P	450	45,6	55,3	83,6	115,7	144,6	161	193	244
KPL500 P	500	50,7	61,4	92,9	128,6	160,7	179	214	271

Discharge current, A at + 20°C ± 5°C — Final voltage: 1.00 V/cell

Cell type	Capacity	Hours					Minutes		
	C_5 Ah	10 h	8 h	5 h	3 h	2 h	90 min	60 min	30 min
KPL 20 P	20	2,1	2,6	4	6,4	9,1	11	14	18
KPL 45 P	45	4,8	5,9	9	14,5	20,6	25	32	41
KPL45	45	4,8	5,9	9	14,5	20,6	25	32	41
KPL60	60	6,3	7,9	12	19,3	27,4	33	42	55
KPL60P	60	6,3	7,9	12	19,3	27,4	33	42	55
KPL65	65	6,9	8,5	13	20,9	29,7	36	46	59
KPL70 P	70	7,4	9,2	14	22,5	32	39	49	64
KPL100P	100	10,6	13,1	20	32,1	45,7	56	70	91
KPL110 P	110	11,6	14,5	22	35,4	50,3	61	77	101
KPL125 P	125	13,2	16,4	25	40,2	57,1	70	88	114
KPL140 P	140	14,8	18,4	28	45	64	78	98	128
KPL160 P	160	16,9	21	32	51,4	73,1	89	112	146
KPL180 P	180	19	23,7	36	57,9	82,3	100	126	165
KPL200 P	200	21,1	26,3	40	64,3	91,4	111	140	183
KPL220 P	220	23,3	28,9	44	70,7	100,6	123	154	201
KPL250 P	250	26,4	32,9	50	80,4	114,3	139	175	229
KPL275 P	275	29,1	36,1	55	88,4	125,7	153	193	251
KPL300 P	300	31,7	39,4	60	96,4	137,1	167	210	274
KPL320 P	320	33,8	42,1	64	102,9	146,3	178	224	293
KPL340 P	340	35,9	44,7	68	109,3	155,4	189	238	311
KPL375 P	375	39,6	49,3	75	120,5	171,4	209	263	343
KPL400 P	400	42,3	52,6	80	128,6	182,9	223	280	366
KPL420 P	420	44,4	55,2	84	135	192	234	294	384
KPL450 P	450	47,6	59,1	90	144,6	205,7	251	315	411
KPL500 P	500	52,9	65,7	100	160,7	228,6	279	350	457

ALKALINE NICKEL-CADMIUM CELLS NiCd OF KPM TYPE AND BLOCKS OF THEM

Cells of **KPM** type are alkaline cells with pocket plate electrodes and comply with international standard IEC 60623.

APPLICATIONS:

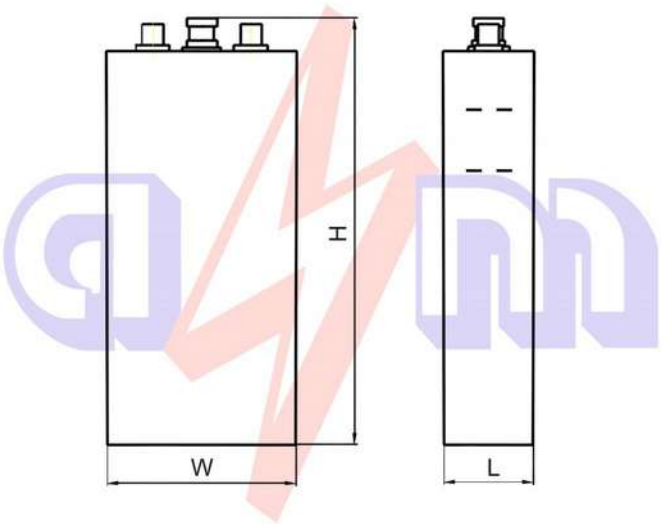
- ✓ back-up power for cellular base stations, wire automatic telephone systems and other telecommunication objects;
- ✓ signaling systems; emergency lighting and electrical power supply;
- ✓ solar and wind power objects;
- ✓ oil and gas complex (recovery, transportation and refining);
- ✓ electric power objects (generation and distribution);
- ✓ underground;
- ✓ passenger railway carriages;
- ✓ electric locomotives and electric trains;
- ✓ urban electric transport;
- ✓ sea and river ships.

It's possible to develop and supply battery blocks with the different number of cell and individual layout according to customer's technical requirements.

Cells of KPM NiCd type

Cell type	IEC 60623 designation	Nominal capacity, C5	Cell dimensions, mm			Cell weight, kg.		Terminals
			W	L	H	with electrolyte	without electrolyte	
KPM50P	KM50P	50	127	62,5	282	3,8	2,95	M14
KPM100P	KM100P	100	137	78	360	6,1	4,3	M10
KPM140P	KM140P	140	137	113	327	8,5	6,5	M16
KPM160P	KM160P	160	171	118	370	11,4	7,6	M20
KPM180P	KM180P	180	171	118	370	11,6	8,0	M20
KPM210P	KM210P	210	171	118	370	12,0	8,6	M20
KPM250P	KM250P	250	172	119	405	14,0	11,0	M20
KPM300P	KM300P	300	171	174	370	17,9	13,6	M20
KPM320P	KM320P	320	171	174	370	18,3	14,1	M20
KPM350P	KM350P	350	169	174	405	18,3	14,1	2×M16
KPM375P	KM375P	375	169	174	405	19,0	15,5	2×M16
KPM420P	KM420P	420	169	174	405	20,0	15,8	2×M16

Dimensional drawing of a cell in polymeric box



Appearance of KPM type cells

KPM50P

KPM100P

KPM140P

KPM160P
KPM180P
KPM210P

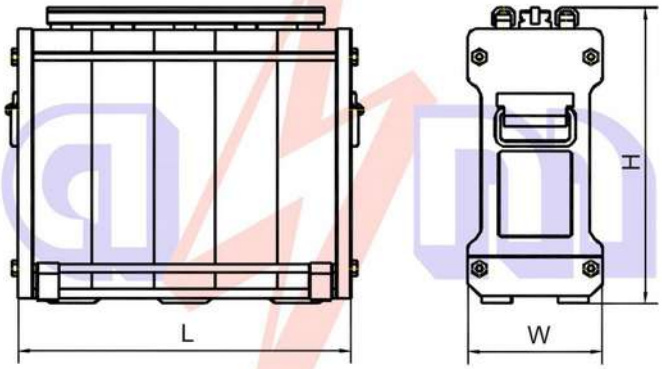
KPM250P

KPM300P
KPM320P

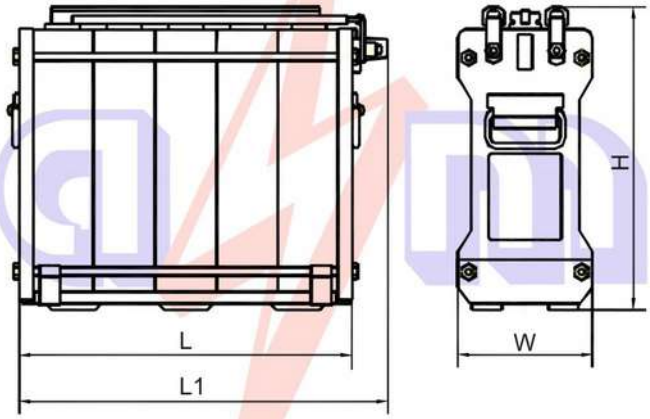
Blocks dimensions

Cell type	Block dimensions, mm										
	W	H	L / L1								
			2	3	4	5	6	7	8	9	10
KPM50P	150	295	155	218	280	343	420	483	545	608	670
KPM100P	170	370	192	270	348	426	522	600	678	756	834
KPM140P	170	338	262	375	488	601	-	-	-	-	-
KPM160P	205	384	270	388	506	624	-	-	-	-	-
KPM180P	205	384	270	388	506	624	-	-	-	-	-
KPM210P	205	384	270	388	506	624	-		-	-	-
KPM250P	205	419	272	391	510	629	-	-	-	-	-
KPM300P	205	380	382 / 437	556 / 611	-	-	-	-	-	-	-
KPM320P	205	380	382 / 437	556 / 611	-	-	-	-	-	-	-

Dimensional drawing of a battery in metal-plastic carcass



Dimensional drawing of a battery in metal-plastic carcass with front terminals



Appearance of batteries

5KPM50P

5KPM100P-III

5KPM140P

4KPM210P

3KPM320P

RECOMMENDED NiCd CHARGING RATES:

1. **At the operation as emergency power source the combined three-stage source is more preferable.**

Stage 1 – Intensive charge

Charging by constant current 0,2 Cn to the voltage 1,6 V on cell.

Stage 2 – Additional charge

Charging by constant voltage till the charging current declines to 0,02 Cn.

For the best cell charging, the charging voltage of Stage 2 should be corrected in accordance with the environmental temperature – if the temperature increases, the voltage should decrease for preventing electrolyte boiling; if the temperature decreases, the charging voltage should increase for charging level increasing. The dependence between charging voltage and environmental temperature is following:

$U_{charging.} = U_o + 0{,}003 \cdot (25 - t_{env.})$, where

$U_{charging.}$ – charging voltage, V/cell,

U_o – initial voltage (1,53 – 1,58 V in accordance with the cell type and operation conditions)

t_{env} – environmental temperature, °C,

0,003 – temperature coefficient.

Stage 3 – Mode of self-discharge compensation (mode of trickle charge).

Additional charge by constant voltage 1,42 – 1,43 V on cell.

The described three-stage charging rate provides minimum 90 % of level of charge and minimal electrolyte boiling. In such mode the periodicity of cell filling-up is no more frequently than once 6 months.

2. Two-stage charging rate (**Stage 1 + stage 3**) provides minimum 80 % of level of charge and minimal electrolyte boiling.
3. Two-stage charging rate (**Stage 1 + stage 2**) provides minimum 90% of level of charge, but there will be a bigger electrolyte boiling compared with the use of Stage 3.
4. One-stage charging rate (**Stage 2**) provides up to 90 % of level of charge, but the battery will accumulate capacity after emergency discharge for a longer time. Also there will be a bigger electrolyte boiling.
5. One-stage charging rate(**Stage 1 without cut-off**) provides 90-95 % of level of charge, but there will be a strong electrolyte boiling, for this reason the use of this mode without cut-off is unacceptable.

Before operation it's recommended to prepare the cells in the following way:

Charge with 2 conditioning cycle: charge by 0,2Cn current during 10 hours for the first cycle and 8 hours for the second cycle, discharge by 0,2Cn current during 4 hours for the first cycle and till 1,0 V for the second cycle. Then charge with control cycle: charge by 0,2Cn current during 8 hours, then rest for 1 hour, discharge by 0,2Cn current till 1,0 V.

Then charge by 0,2Cn current during 10 hours. After charging disconnect a battery from a charger.

Charge the battery, using the direct-current or rectified current power supply with the maximum operating voltage of at least $(2 \cdot n)$ V, where n – number of series-connected cells.

Regular operation in floating mode causes the degradation of cell capacity. This process is revertible. For cell recovery it's recommended if necessary to refresh cells by the mode similar to the mode of placing in operation.

KPM NiCd cell performance data

Performance for fully charged cells by a constant current charge according to IEC 60623 standard

Discharge current, A at + 20°C ± 5°C — Final voltage: 1.15 V/cell

Cell type	Capacity	Hours					Minutes						Seconds			
	C_5 Ah	10 h	8 h	5 h	3 h	2 h	90 min	60 min	30 min	20 min	10 min	5 min	30 s	15 s	5 s	1 s
KPM50P	50	4,8	6,1	9,5	14,3	19,3	23	29	39	45	60	71	120	134	155	175
KPM100P	100	9,6	12,1	18,9	28,6	38,6	46	58	79	89	121	143	239	268	311	350
KPM140P	140	13,5	17	26,5	40	54	64,5	81	110	125	169	200	335	375	435	490
KPM160P	160	15,4	19,4	30,3	45,7	61,7	74	93	126	143	193	229	383	429	497	560
KPM180P	180	17,4	21,9	34,1	51,4	69,4	83	104	141	161	217	257	431	482	559	630
KPM210P	210	20,3	25,5	39,8	60	81	97	122	165	188	254	300	503	563	653	735
KPM250P	250	24,1	30,4	47,3	71,4	96,4	115	145	196	223	302	357	598	670	777	875
KPM300P	300	28,9	36,4	56,8	85,7	115,7	138	174	236	268	362	429	718	804	932	1050
KPM320P	320	30,9	38,9	60,6	91,4	123,4	147	185	251	286	386	457	766	857	994	1120
KPM350P	350	33,8	42,5	66,3	100	135	161	203	275	313	423	500	838	938	1088	1225
KPM375P	375	36,2	45,5	71	107,1	144,6	173	217	295	335	453	536	897	1004	1165	1313
KPM420P	420	40,5	51	79,5	120	162	194	243	330	375	507	600	1005	1125	1305	1470

Discharge current, A at + 20°C ± 5°C — Final voltage: 1.00 V/cell

Cell type	Capacity	Hours					Minutes						Seconds			
	C_5 Ah	10 h	8 h	5 h	3 h	2 h	90 min	60 min	30 min	20 min	10 min	5 min	30 s	15 s	5 s	1 s
KPM50P	50	5,1	6,3	10	16	23	30	42	66	80	103	120	195	211	245	280
KPM100P	100	10,1	12,6	20	32	46,1	60	84	132	160	205	240	390	421	491	561
KPM140P	140	14,2	17,6	28	44,8	64,5	84	118	185	224	287	336	546	590	687	785
KPM160P	160	16,2	20,1	32	51,2	73,7	96	135	211	256	328	384	624	674	785	897
KPM180P	180	18,3	22,6	36	57,6	82,9	108	152	238	288	369	432	702	759	883	1009
KPM210P	210	21,3	26,4	42	67,2	96,8	126	177	278	336	431	504	819	885	1031	1178
KPM250P	250	25,4	31,4	50	80	115,2	150	211	330	400	513	600	975	1054	1227	1402
KPM300P	300	30,4	37,7	60	96	138,2	180	253	396	480	615	720	1170	1264	1472	1682
KPM320P	320	32,5	40,2	64	102,4	147,4	192	270	423	512	656	768	1248	1349	1570	1794
KPM350P	350	35,5	44	70	112	161,3	210	295	463	560	718	840	1365	1475	1718	1963
KPM375P	375	38	47,1	75	120	172,8	225	316	496	600	769	900	1463	1580	1840	2103
KPM420P	420	42,6	52,8	84	134,4	193,5	252	354	555	672	861	1008	1638	1770	2061	2355

ALKALINE NICKEL-CADMIUM NiCd CELLS OF KPH TYPE AND BLOCKS OF THEM

Cells of **KPH** type are alkaline cells with pocket plate electrodes and comply with international standard IEC 60623.

APPLICATIONS:

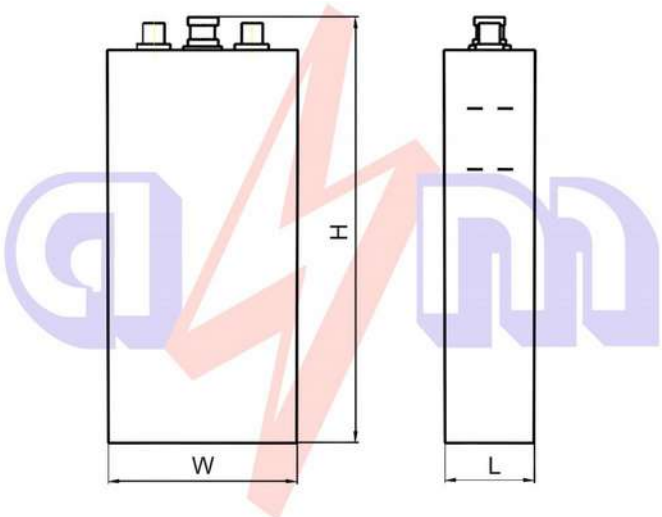
- ✓ diesel engine starting of mainline and shunting locomotives;
- ✓ internal combustion engine starting;
- ✓ UPS with short discharge rate;
- ✓ urban electric transport;
- ✓ sea and river ships.

It's possible to develop and supply battery blocks with the different number of cell and individual layout according to customer's technical requirements.

Cells of KPH type

Cell type	IEC 60623 designation	Nominal capacity, C5	Cell dimensions, mm			Cell weight, kg		Terminals
			W	L	H	with electrolyte	without electrolyte	
KPH70P	KH70P	70	127	62,5	282	4,1	3,5	M14
KPH80P	KH80P	80	137	78	360	5,8	4,2	M14
KPH100P	KH100P	100	137	113	327	6,6	5,0	M16
KPH130P	KH130P	130	137	113	327	8,5	6,5	M16
KPH150P	KH150P	150	171	118	370	11,7	9,5	2×M20
KPH200P	KH200P	200	171	118	370	12,3	10,1	2×M20
KPH210P	KH210P	210	171	118	370	12,3	10,1	2×M20
KPH220P	KH220P	220	171	174	370	16,3	11,6	3×M20
KPH245P	KH245P	245	171	174	370	17,0	12,5	3×M20
KPH270P	KH270P	270	171	174	370	18,0	13,5	3×M20

Dimensional drawing of a cell in polymeric box



Appearance of KPH type cells

KPH70P

KPH80P

KPH100P
KPH130P

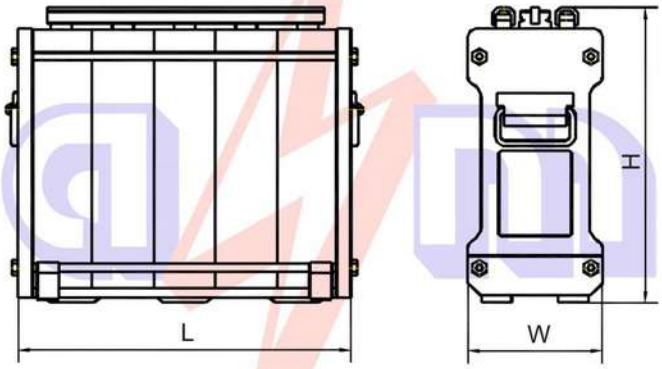
KPH150P
KPH200P
KPH210P

KPH220P
KPH245P
KPH270P

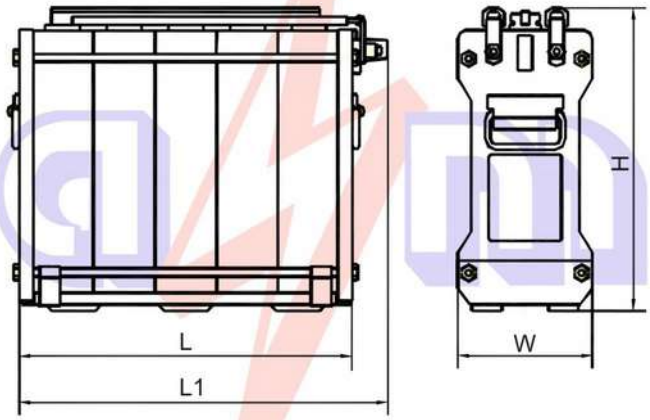
Blocks dimensions

Cell type	Block dimensions, mm									
	W	H	L / L1							
			2	3	4	5	6	7	8	9	10
KPH70P	150	295	155	218	280	343	420	483	545	608	670
KPH80P	170	370	192 / 230	270 / 308	348 / 386	426 / 464	522 / 560	600 / 638	678 / 716	756 / 794	834 / 872
KPH100P	170	339	262 / 300	375 / 413	488 / 526	601 / 639	-	-	-	-	-
KPH130P	170	339	262 / 300	375 / 413	488 / 526	601 / 639	-	-	-	-	-
KPH150P	205	384	270	388	506	624	-	-	-	-	-
KPH200P	205	384	270	388	506	624	-	-	-	-	-
KPH210P	205	384	270	388	506	624	-	-	-	-	-
KPH220P	205	380	382 / 437	556 / 611	-	-	-	-	-	-	-
KPH245P	205	380	382 / 437	556 / 611	-	-	-	-	-	-	-
KPH270P	205	380	382 / 437	556 / 611	-	-	-	-	-	-	-

Dimensional drawing of a battery in metal-plastic carcass



Dimensional drawing of a battery in metal-plastic carcass with front terminals



Appearance of batteries

5KPH70P

5KPH80P-III

5KPH130P

5KPH210P

2KPH270P

RECOMMENDED NiCd CHARGING RATES:

1. **At the operation as emergency power source the combined three-stage source is more preferable.**

Stage 1 – Intensive charge

Charging by constant current 0,2 Cn to the voltage 1,6 V on cell.

Stage 2 – Additional charge

Charging by constant voltage till the charging current declines to 0,02 Cn.

For the best cell charging, the charging voltage of Stage 2 should be corrected in accordance with the environmental temperature – if the temperature increases, the voltage should decrease for preventing electrolyte boiling; if the temperature decreases, the charging voltage should increase for charging level increasing. The dependence between charging voltage and environmental temperature is following:

$U_{charging.} = U_o + 0{,}003 \cdot (25 - t_{env.})$, where

$U_{charging.}$ – charging voltage, V/cell,

U_o – initial voltage (1,53 – 1,58 V in accordance with the cell type and operation conditions)

t_{env} – environmental temperature, °C,

0,003 – temperature coefficient.

Stage 3 – Mode of self-discharge compensation (mode of trickle charge).

Additional charge by constant voltage 1,42 – 1,43 V on cell.

The described three-stage charging rate provides minimum 90 % of level of charge and minimal electrolyte boiling. In such mode the periodicity of cell filling-up is no more frequently than once 6 months.

2. Two-stage charging rate (**Stage 1 + stage 3**) provides minimum 80 % of level of charge and minimal electrolyte boiling.
3. Two-stage charging rate (**Stage 1 + stage 2**) provides minimum 90% of level of charge, but there will be a bigger electrolyte boiling compared with the use of Stage 3.
4. One-stage charging rate (**Stage 2**) provides up to 90 % of level of charge, but the battery will accumulate capacity after emergency discharge for a longer time. Also there will be a bigger electrolyte boiling.
5. One-stage charging rate(**Stage 1 without cut-off**) provides 90-95 % of level of charge, but there will be a strong electrolyte boiling, for this reason the use of this mode without cut-off is unacceptable.

Before operation it's recommended to prepare the cells in the following way:

Charge with 2 conditioning cycle: charge by 0,2Cn current during 10 hours for the first cycle and 8 hours for the second cycle, discharge by 0,2Cn current during 4 hours for the first cycle and till 1,0 V for the second cycle. Then charge with control cycle: charge by 0,2Cn current during 8 hours, then rest for 1 hour, discharge by 0,2Cn current till 1,0 V.

Then charge by 0,2Cn current during 10 hours. After charging disconnect a battery from a charger.

Charge the battery, using the direct-current or rectified current power supply with the maximum operating voltage of at least $(2 \cdot n)$ V, where n – number of series-connected cells.

Regular operation in floating mode causes the degradation of cell capacity. This process is revertible. For cell recovery it's recommended if necessary to refresh cells by the mode similar to the mode of placing in operation.

KPH NiCd cell performance data

Performance for fully charged cells by a constant current charge according to IEC 60623 standard

Discharge current, A at + 20°C ± 5°C — Final voltage: 1.00 V/cell

Cell type	Capacity	Hours			Minutes								Seconds			
	C_5 Ah	5 h	3 h	2 h	90 min	60 min	30 min	20 min	15 min	10 min	5 min	1 min	30 s	15 s	5 s	1 s
KPH70P	70	14	22	33	43	64	120	161	189	224	270	399	441	483	532	595
KPH80P	80	16	26	38	50	73	138	184	216	256	308	456	504	552	608	680
KPH100P	100	20	32	47	62	91	172	230	270	320	385	570	630	690	760	850
KPH130P	130	26	42	62	79	116	209	279	324	383	500	678	742	820	924	1043
KPH150P	150	30	49	71	91	134	241	321	374	441	576	782	856	946	1066	1204
KPH200P	200	40	65	95	122	178	321	429	498	589	769	1043	1141	1262	1422	1605
KPH210P	210	42	68	100	128	187	337	450	523	618	807	1095	1198	1325	1493	1685
KPH220P	220	44	71	105	134	196	353	471	548	647	845	1147	1255	1388	1564	1765
KPH245P	245	49	79	117	149	218	393	525	610	721	942	1278	1398	1546	1742	1966
KPH270P	270	54	87	129	165	240	433	579	672	795	1038	1408	1540	1704	1920	2166

Discharge current, A at + 20°C ± 5°C — Final voltage: 0.65 V/cell

Cell type	Capacity	Seconds					
	C_5 Ah	90 s	60 s	30 s	15 s	5 s	1 s
KPH70P	70	742	788	844	910	1012	1138
KPH80P	80	848	900	964	1040	1156	1300
KPH100P	100	1060	1125	1205	1300	1445	1625
KPH130P	130	1247	1325	1430	1585	1767	1950
KPH150P	150	1439	1529	1650	1829	2039	2250
KPH200P	200	1919	2038	2200	2438	2719	3000
KPH210P	210	2015	2140	2310	2560	2855	3150
KPH220P	220	2111	2242	2420	2682	2991	3300
KPH245P	245	2351	2497	2695	2987	3331	3675
KPH270P	270	2591	2751	2970	3291	3671	4050