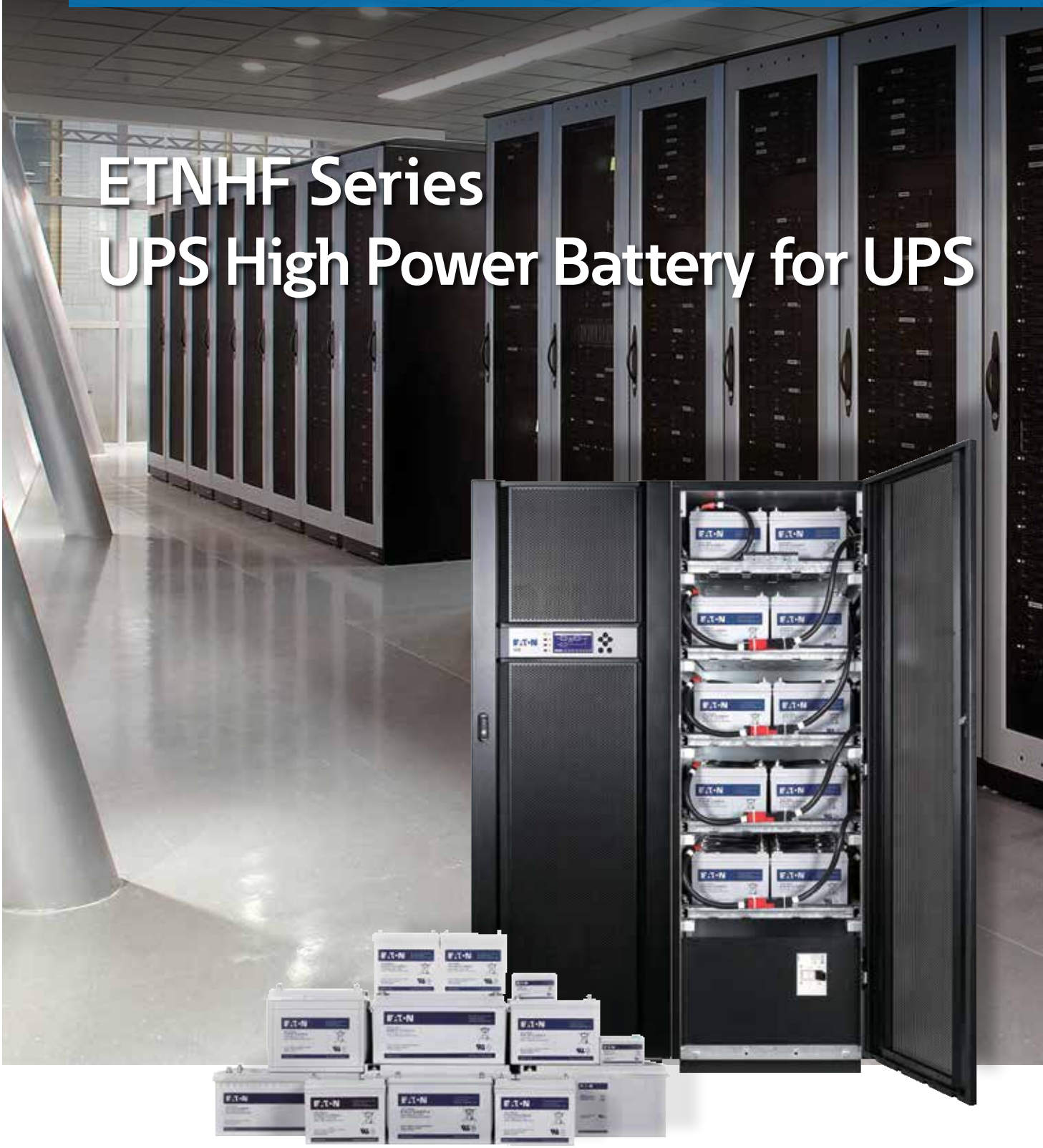
Eaton Battery Application Solutions

ETNHF Series
UPS High Power Battery for UPS



Powering Business Worldwide

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Battery Application Solutions

As a core component of UPS systems, batteries play a critically important role in UPS system reliability. The reliability and usability of battery systems are not fully determined by the batteries themselves, and in most cases, batteries need to be applied in combination with UPS and other ancillary facilities to truly guarantee their long-term usability of the battery system. This is why Eaton Group provides optimized battery integration solution services along with high quality power supply products and services.

Our solutions achieve a perfect combination of UPS main unit + UPS batteries + powerful built-in battery management functions + appropriate battery cabinets + system protection switches + proper connection methods + an intelligent battery monitoring system. Eaton's systematic and professional battery integration solutions can better guarantee the availability and reliability of customers' power supply systems and also save on system space, improve the overall aesthetics and optimize the cost. More importantly, with a rationalized system configuration and better parameter compatibility, battery life can be prolonged and intelligent monitoring and remote monitoring can be achieved with battery monitoring systems.

Product features

- Save system space
- More reliable parameter setup, superior compatibility
- Clean, tidy systems with better aesthetics
- More rational and reliable system configuration and optimized cost

Battery monitoring Battery Battery cabinet UPS

ETNHF Series UPS Battery

As an indispensable component of its power supply solutions, Eaton has long attached great importance to batteries. It has been ten years since Eaton first released battery products for high-end UPS applications in the USA in 2005. Products now cover a range of high-power batteries of different capacities. They have been widely used in data rooms and ancillary products for high-end customers, and their performance, reliability and safety have undergone long-term verification and received broad recognition.

For Eaton storage batteries, the emphasis in product design and model selection is on compatibility with UPS and system cost optimization. Designed with high power density, Eaton storage batteries can provide larger discharge capacity and longer backup power times than storage batteries of most brands with equivalent volume, saving both cost and space for customers; with design reliability based on redundant safeguards, they conform better to UPS application features. This ensures longer storage battery life, and at the same time increases high current discharge capability, reduces the risk of thermal runaway occurring and ensures safe and reliable system operation.

Eaton batteries can be widely applied in high-rate applications such as UPS, electrical drive systems, communication equipment, engine ignition systems, and railway signal systems.

Product Features

Maintenance-free Design

Using an optimized oxygen circulation path design and a rational valve pressure setup for safety valve opening and closing, the oxygen generated in the battery charging process can be compounded promptly and efficiently, thus overcoming valve-controlled battery water loss and better guaranteeing battery service life.

High Power Density

By adopting a computer-aided high power polar plate structure design with proper partitioning, the batteries exhibit more than 30% better high power discharge performance compared with conventional batteries in short-term backup power applications.

Excellent High Current Discharge Capability

The optimized battery polar plate structure and connection design effectively reduces the internal physical resistance of the battery, thus improving its ability to continuously discharge high current.

V0-Grade Flame Retarding Material

The whole series of batteries uses ABS housing covers that conform to UL-V0 requirements and minimize the impact for customers of any serious risk.

Long Life Design

Optimization of the alloy composition of battery polar plates and fine-tuning of the curing process and electrolyte parameters has effectively improved the theoretical life of batteries to as long as 12 years.

Low Self-discharge Rate

The adoption of high purity lead, calcium and tin alloys and the strict management of the production process to stop the inclusion of impurities have reduced the probability of side reactions and resulted in a monthly self-discharge rate of no more than 2%.

Strong Charge Acceptability

The optimized polar plate structure design in combination with a properly increased active substance specific area enable batteries to support 0.4CA high current charging and achieve a 90% recharge within 3 hours.

Convenient Installation

The whole series of medium capacity batteries adopts an embedded terminal design, enabling more convenient battery installation and higher system reliability.

Environmental Friendliness

The ultra-high power batteries adopt pure lead expanded grid technology which greatly increases high rate performance while simultaneously saving on materials and reducing energy consumption in production, making it friendlier to the environment than conventional technology.

Battery specifications

Model	W/cell/ 1.67V	Equivalent C20	Equivalent C10	Weight	Internal resistance	Dimensions (mm)				Terminal
	(15min)	(Ah)	(Ah)	(Kg)	(m Ω)	Length	Width	Height	Total height	
ETNHF12-75W	75	25	24	8.1	≤12	166	175	125	125	M5 *12
ETNHF12-125W	125	42	40	14.7	≤9.5	197.5	165.5	170	170	M6 *14
ETNHF12-190W	190	65	55	17.2	≤5.8	229	138	208	213	M6 *14
ETNHF12-235W	235	78	75	23	≤5.5	258	166	206	215	M6 *14
ETNHF12-320W	320	100	90	28	≤5.0	306	169	210	215	M8 *16
ETNHF12-390WP*	390	120	90	28.5	≤4.0	306	170	220	225	M8 *16
ETNHF12-420WP*	420	135	100	31.5	≤3.5	339	173	215	220	M8 *16
ETNHF12-430W	430	140	120	37.7	≤4.0	410	176	224	224	M8 *16
ETNHF12-460W	460	150	134	41.5	≤4.0	341	173	283	287	M8 *19
ETNHF12-520W	520	158	150	46.4	≤4.0	482	170	240	240	M8 *16
ETNHF12-550W	550	160	150	45	≤3.5	482	170	240	240	M8 *20
ETNHF12-690W	690	210	200	67.5	≤3.0	522	238	218	223	M8 *20
ETNHF12-750W	750	220	210	67	≤3.0	522	238	218	223	M8 *22
ETNHF12-850WP*	850	250	200	67.5	≤2.5	526	238	246	246	M8 *22
ETNHF6-650W	650	235	225	30.5	≤3.2	320	176	225	230	M8 *16

Note: Those marked with * are ultra-high power batteries. The equivalent C10/C20 capacity values are taken at a 15 min rate. Compared with the conventional models, this model has C10/C20 capacity values more suitable where the time demanded for backup power is within 2h.

Basic parameters

Designed life	12 years
Rate voltage	2V/6V/12V
Partition	Adsorptive fiberglass
Electrolyte	Analytical grade sulfuric acid
Positive and negative terminals	Embedded terminal
Exhaust valve	EPDM rubber
Grid alloy	Lead, calcium and tin alloy
Valve opening pressure	25KPa -35KPa
Valve closing pressure	20KPa -30KPa
Float charging voltage	2.25V -2.30V/Cell @25°C
Application temperature range	-20°C - 50°C
Connecting terminal	Copper connecting cord or copper bar (optional)

Note: Eaton's 2V battery is for bidding and is also designed for high power.

Battery Model Selection and Configuration Method

The UPS battery model selection and configuration methods include ampere-hour capacity method, constant power method, rapid calculation method, ladder summation method, etc. In light of most UPS application conditions, we recommend adopting the constant power algorithm in most cases as it can realize the best configuration in terms of cost control and performance satisfaction. For customer-designated methods or special applications, please consult Eaton service personnel.

1. Calculation Factors

Ptotal	UPS apparent power (VA)	P	Battery total required power (W)
Vtotal	Total float charging voltage	Vfloating	12V or 2V single unit float charging voltage
Pc	Discharge power per cell (W/cell)	Pb	12V battery discharge power (W/battery)
Pf	Output power factor	η	Inverter efficiency
K	Reliability coefficient (1.0, 1.25)	Sn	Battery string number and cell number
Pn	Number of battery packs in parallel connection (1, 2, 3, 4)	t	Backup power time

2. Calculation Procedure

Total battery power required P=K*Ptotal * Pf/ η

Calculation of number of cells in series
Sn= Vtotal / Vfloat

Single unit float charging voltage Pb=P/(Sn*Pn)

Discharge power per cell Pc=Pb/6

Calculate Pb or Pc <CharacterStyleRange>1 when Pn=1,2,3,or 4

3. Model Selection from Table

Consult the constant discharge data sheet of ETNHF series batteries, and select the battery specification with satisfactory performance at the corresponding backup time and cutoff voltage.

Constant Power Discharge Data

(W/cell, 25°C)

Specification	Corresponding constant power value at a discharge cutoff pressure of 1.67V											
	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45 min	50 min	60 min	90 min	120 min
ETNHF12-75W	101	77.7	62.7	54.2	47.4	42.0	37.8	34.8	32.0	27.9	20.8	17.1
ETNHF12-125W	163	128	105	91.9	82.9	74.7	68.6	63.8	58.8	51.2	36.5	29.1
ETNHF12-190W	245	190	154	132	118	106	96.9	89.8	83.2	73.4	52.8	42.5
ETNHF12-235W	302	235	190	163	145	130	119	110	102	87.6	65.0	52.3
ETNHF12-320W	396	320	257	223	200	177	160	147	135	116	82.3	65.4
ETNHF12-390WP	477	390	289	247	225	192	174	160	142	121	84.9	66.8
ETNHF12-420WP	538	420	335	297	285	240	205	178	161	134	85.6	70.1
ETNHF12-430W	528	430	357	309	278	246	221	203	186	162	115	91.4
ETNHF12-460W	566	460	383	335	303	269	243	223	204	175	126	102
ETNHF12-520W	614	520	434	383	348	309	280	258	235	201	143	113
ETNHF12-550W	669	550	453	385	324	295	264	234	220	186	128	105
ETNHF12-690W	841	690	577	506	459	406	366	334	308	268	193	156
ETNHF12-750W	942	750	612	533	487	434	388	360	328	279	193	153
ETNHF12-850WP	1056	850	642	562	494	444	398	365	338	285	171	140
ETNHF6-650W		650	539	472	428	382	348	321	299	265	192	156

(W/cell, 25°C)

Specification	Corresponding constant power value at a discharge cutoff pressure of 1.70V											
	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45 min	50 min	60 min	90 min	120 min
ETNHF12-75W	94.3	73.1	59.2	51.2	44.8	39.9	35.9	33.0	30.5	26.8	20.1	16.4
ETNHF12-125W	155	124	102	89	80.3	71.8	65.5	60.5	56.4	50.3	35.6	28.3
ETNHF12-190W	241	187	152	130	116	104	95.5	88.6	82.1	72.3	52.1	41.9
ETNHF12-235W	296	230	187	161	143	128	117	109	101	86.0	64.1	51.6
ETNHF12-320W	389	309	253	219	197	175	158	145	133	115	81.2	64.6
ETNHF12-390WP	463	365	280	240	216	185	166	155	137	115	81.9	64.9
ETNHF12-420WP	508	395	323	286	272	228	198	172	155	130	84.1	68.9
ETNHF12-430W	518	428	351	304	273	242	218	200	184	160	113	90.2
ETNHF12-460W	554	455	377	330	298	265	240	220	201	173	125	101
ETNHF12-520W	602	511	426	376	342	304	276	254	232	199	141	112
ETNHF12-550W	639	546	441	377	316	285	256	228	214	183	126	103
ETNHF12-690W	824	681	567	498	452	399	360	329	303	265	191	154
ETNHF12-750W	920	743	600	525	480	428	383	355	324	275	191	151
ETNHF12-850WP	1013	816	624	543	480	433	389	360	327	280	168	137
ETNHF6-650W		629	521	456	413	371	340	315	293	259	186	150

(W/cell, 25°C)

Specification	Corresponding constant power value at a discharge cutoff pressure of 1.75V											
	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45 min	50 min	60 min	90 min	120 min
ETNHF12-75W	87.9	68.6	55.7	48.1	42.1	37.9	34.1	31.3	29.0	25.6	19.4	15.8
ETNHF12-125W	148	120	98.9	86.2	77.7	69.8	63.9	59.3	55.4	49.5	35.1	27.8
ETNHF12-190W	231	180	146	126	112	101	92.0	85.3	79.3	70.2	50.6	40.8
ETNHF12-235W	284	222	180	155	138	124	114	105	97.8	83.4	62.3	50.2
ETNHF12-320W	373	298	244	211	190	169	153	141	129	111	79.0	62.8
ETNHF12-390WP	445	348	267	232	209	177	159	148	132	111	79.7	63.0
ETNHF12-420WP	477	372	303	276	260	218	191	168	151	126	81.6	66.8
ETNHF12-430W	497	412	338	293	264	233	211	193	178	155	110	87.7
ETNHF12-460W	526	438	363	318	288	256	232	213	196	169	122	98
ETNHF12-520W	577	492	411	362	330	294	267	246	225	193	137	109
ETNHF12-550W	609	527	429	364	308	276	249	223	209	181	122	100
ETNHF12-690W	790	656	546	480	436	386	348	319	294	257	185	150
ETNHF12-750W	875	712	575	507	465	414	371	345	314	268	185	147
ETNHF12-850WP	966	767	600	530	465	417	376	350	321	269	163	133
ETNHF6-650W		608	502	438	396	358	330	308	286	254	183	147

(W/cell, 25°C)

Specification	Corresponding constant current value at a discharge cutoff pressure of 1.80V											
	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45 min	50 min	60 min	90 min	120 min
ETNHF12-75W	81.5	64.0	52.2	45.0	39.5	35.8	32.2	29.5	27.5	24.5	18.7	15.1
ETNHF12-125W	140	116	95.5	83.2	75	67.7	62.3	58	54.2	48.6	34.4	27.3
ETNHF12-190W	221	173	141	121	108	97.3	89.2	82.9	77.0	68.1	49.1	39.7
ETNHF12-235W	272	213	173	149	133	120	110	100	94.7	81.8	60.5	48.8
ETNHF12-320W	357	286	235	204	183	163	148	136	125	108	76.7	61.1
ETNHF12-390WP	428	333	257	224	200	170	155	140	126	103	77.5	61.6
ETNHF12-420WP	454	349	290	268	251	209	183	161	145	119	78.9	64.8
ETNHF12-430W	476	396	325	282	254	225	204	187	172	150	107	85.2
ETNHF12-460W	504	421	350	306	277	247	224	206	189	165	118	94.7
ETNHF12-520W	553	473	396	349	318	284	258	238	218	187	133	106
ETNHF12-550W	572	502	411	350	297	265	241	217	201	175	118	97.2
ETNHF12-690W	757	630	525	462	420	372	336	308	284	249	180	146
ETNHF12-750W	830	680	550	489	450	400	360	335	305	260	180	143
ETNHF12-850WP	922	744	582	508	450	406	367	340	312	262	157	129
ETNHF6-650W		572	481	426	389	352	324	302	278	242	176	143

Constant Current Discharge Data

(ampere, 25°C)

Specification	Corresponding constant current value at a discharge cutoff pressure of 1.67V											
	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45 min	50 min	60 min	90 min	120 min
ETNHF12-75W	56.3	43.3	34.9	30.1	26.3	23.3	20.9	19.2	17.6	15.1	11.1	9.0
ETNHF12-125W	88.4	68.9	54.8	46.3	40.7	36.4	33.1	30.6	28.6	25.6	18.0	14.2
ETNHF12-190W	132	104	85.9	74.8	67.4	60	54.4	50.1	46.2	40.5	28.2	22.1
ETNHF12-235W	162	128	106	92.1	83	69.2	62.2	56.7	52.9	45.4	35.0	27.6
ETNHF12-320W	203	167	135	115	103	91.8	83.5	76.8	70.2	60.1	42.2	33.2
ETNHF12-390WP	258	213	167	147	128	108	95.0	85.0	77.1	64.7	46.2	36.2
ETNHF12-420WP	295	225	178	161	152	131	112	95.7	88.0	70	45	36.7
ETNHF12-430W	288	239	195	170	152	133	119	108	98.6	85.3	60.9	48.7
ETNHF12-460W	303	248	209	183	166	146	130	118	108	93.5	66.2	52.5
ETNHF12-520W	336	282	237	209	191	168	150	136	125	107	75.5	59.6
ETNHF12-550W	382	312	253	214	183	163	139	127	118	99	67.5	55.1
ETNHF12-690W	480	397	329	288	261	232	209	192	174	150	105	83.5
ETNHF12-750W	475	380	313	272	248	217	197	180	165	141	102	81
ETNHF12-850WP	570	440	354	309	277	247	224	202	188	158	90.0	73.4
ETNHF6-650W		367	297	255	227	207	191	179	166	147	104	82.6

(ampere, 25°C)

Specification	Corresponding constant current value at a discharge cutoff pressure of 1.70V											
	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45 min	50 min	60 min	90 min	120 min
ETNHF12-75W	52.5	40.5	32.8	28.3	24.7	22.0	19.8	18.1	16.7	14.4	10.7	8.7
ETNHF12-125W	83.7	66.7	52.8	44.5	39.0	35.3	32.6	30.5	28.4	25.2	17.7	14.0
ETNHF12-190W	128	102	83.6	72.8	65.6	58.4	53.0	48.8	45.0	39.5	27.6	21.7
ETNHF12-235W	157	125	103	89.6	80.7	68.6	61.5	56.0	52.4	45.0	34.2	27.0
ETNHF12-320W	210	172	139	119	106	94.5	85.8	79.0	72.1	61.7	43.3	34.1
ETNHF12-390WP	247	205	159	138	123	104	90.0	81.0	72.8	62.6	44.0	34.8
ETNHF12-420WP	280	210	167	151	140	125	107	92	83.6	68	44.1	36
ETNHF12-430W	280	233	190	165	148	130	116	105	96.3	83.2	59.5	47.6
ETNHF12-460W	294	240	204	178	162	142	127	115	106	91.3	64.6	51.3
ETNHF12-520W	326	274	230	203	185	163	146	133	122	105	73.7	58.2
ETNHF12-550W	365	301	246	208	178	155	135	124	114	97.5	66.1	54
ETNHF12-690W	466	386	320	280	254	225	203	187	170	146	103	81.5
ETNHF12-750W	514	409	338	293	266	234	212	194	176	151	101	80
ETNHF12-850WP	536	415	338	296	266	238	216	197	181	155	88.2	72.0
ETNHF6-650W		358	294	255	230	207	190	176	161	139	99.8	80.4

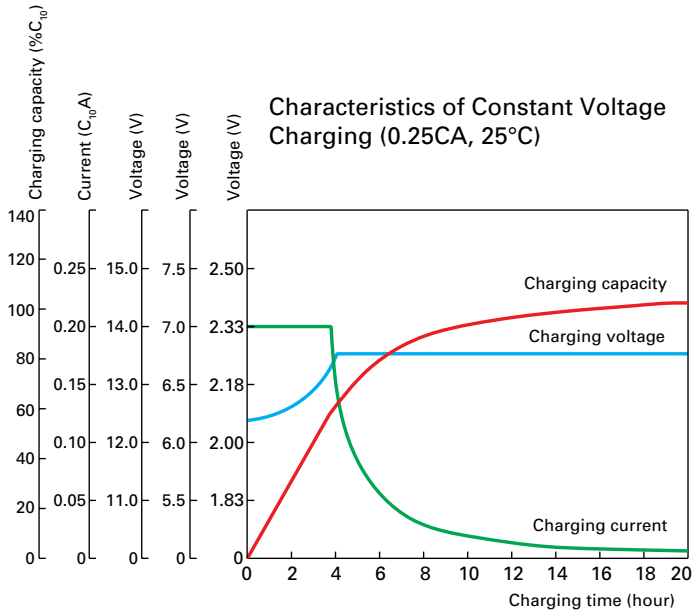
(ampere, 25°C)

Specification	Corresponding constant current value at a discharge cutoff pressure of 1.75V											
	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45 min	50 min	60 min	90 min	120 min
ETNHF12-75W	48.8	37.8	30.6	26.4	23.1	20.8	18.6	17.1	15.7	13.7	10.2	8.28
ETNHF12-125W	79.1	64.9	51.5	43.4	38.0	34.3	31.5	29.3	27.5	24.9	17.4	13.7
ETNHF12-190W	120	95.9	78.9	68.6	61.8	55.1	50.1	46.2	42.7	37.5	26.4	20.9
ETNHF12-235W	148	118	96.8	84.4	76.1	66.9	60.0	54.5	50.5	44.1	32.5	25.7
ETNHF12-320W	197	162	131	112	100	89.2	81.1	74.7	68.3	58.6	41.1	32.4
ETNHF12-390WP	236	197	153	132	117	99.4	86.5	76.5	69.7	59.5	42.7	33.7
ETNHF12-420WP	267	200	162	145	135	119	102	89	80.5	66	42.5	34.7
ETNHF12-430W	263	219	179	156	140	122	110	99.5	91.3	79.0	56.5	45.3
ETNHF12-460W	276	227	192	168	153	134	120	109	100	86.5	61.4	48.8
ETNHF12-520W	306	258	216	191	175	154	138	126	115	99.3	70.0	55.3
ETNHF12-550W	348	291	240	199	174	150	131	121	110	96	63.8	52.1
ETNHF12-690W	437	364	301	264	239	212	192	176	161	139	98	77.6
ETNHF12-750W	488	390	321	279	254	223	202	185	169	144	98.1	77.9
ETNHF12-850WP	505	395	321	282	254	227	206	189	172	150	85.1	69.5
ETNHF6-650W		345	282	244	219	196	178	165	155	141	101	80.3

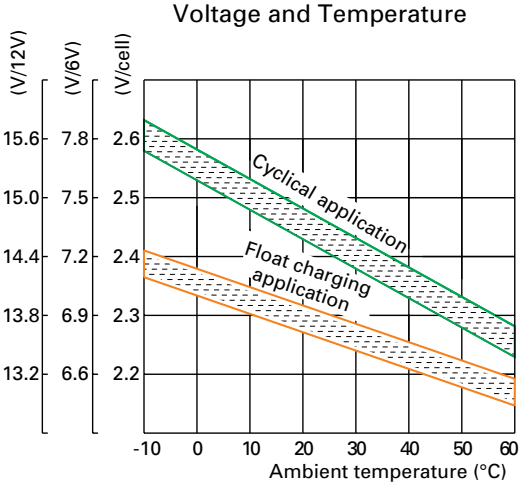
(Ampere, 25°C)

Specification	Corresponding constant current value at a discharge cutoff pressure of 1.80V											
	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45 min	50 min	60 min	90 min	120 min
ETNHF12-75W	45.0	35.0	28.5	24.5	21.5	19.5	17.5	16.0	14.8	13.0	9.8	7.9
ETNHF12-125W	71.9	58.7	47.5	40.8	36.3	33.1	30.8	28.9	26.9	23.8	16.8	13.2
ETNHF12-190W	115	92.6	76.4	66.7	60.2	53.7	48.8	45.0	41.7	36.6	25.8	20.4
ETNHF12-235W	142	114	93.8	82	74.1	65.6	59.3	51.5	49.3	42.4	31.8	25.2
ETNHF12-320W	190	156	127	109	97.4	86.9	79.1	73.0	66.7	57.3	40.3	31.7
ETNHF12-390WP	227	187	146	126	111	93.9	82.2	74.2	67.3	57.6	41.1	32.0
ETNHF12-420WP	250	191	156	139	127	113	97.6	85.1	78.0	62	40.9	33.5
ETNHF12-430W	253	211	174	151	136	119	107	97.1	89.1	77.2	55.3	44.4
ETNHF12-460W	265	218	186	163	148	130	117	107	98.0	84.5	60.0	47.8
ETNHF12-520W	294	249	210	186	170	150	135	123	113	97.1	68.5	54.2
ETNHF12-550W	327	277	230	192	168	145	127	118	107	93	61.3	50.2
ETNHF12-690W	421	351	292	257	233	207	187	172	158	136	95.9	76
ETNHF12-750W	463	371	305	265	242	212	192	176	161	138	95.5	75.9
ETNHF12-850WP	485	381	305	268	242	217	198	180	164	142	81.8	67.0
ETNHF6-650W		299	249	219	199	181	168	157	145	126	90.6	72.6

Characteristics Curve

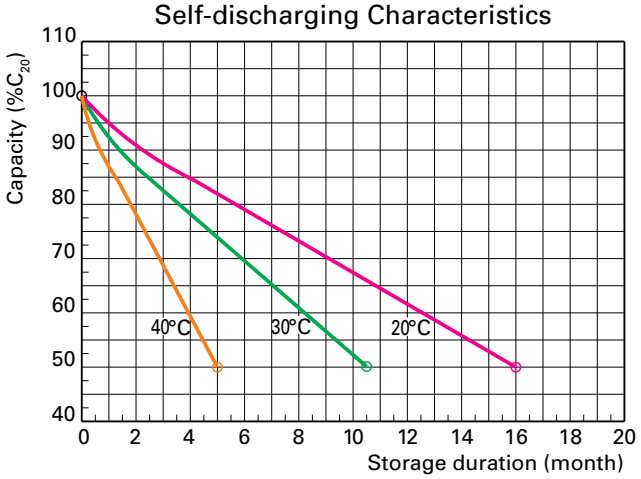


Characteristics of Constant Voltage Charging (0.25CA, 25°C)

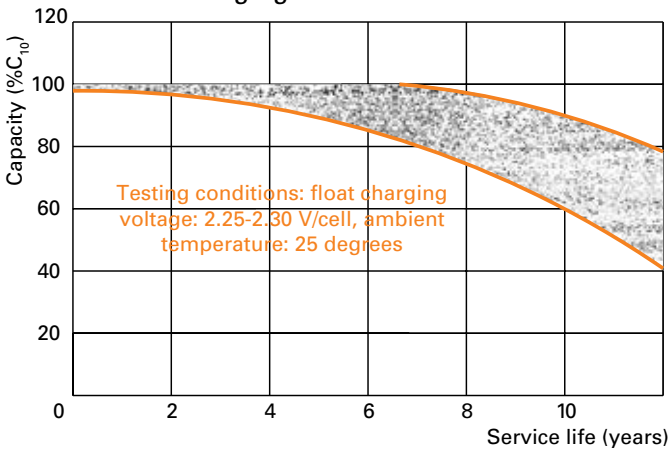


Relation between Charging Voltage and Temperature

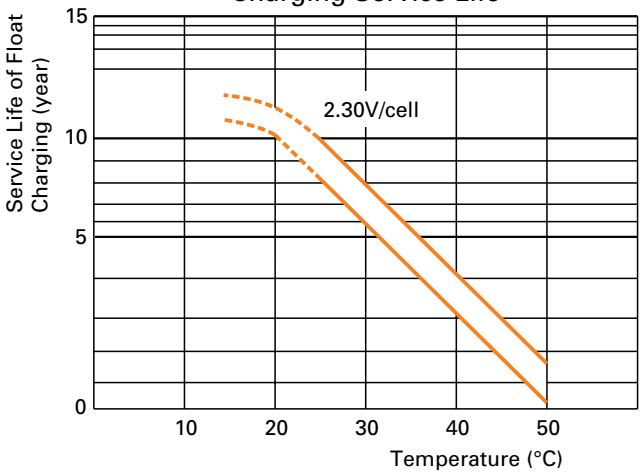
Self-discharging Characteristics



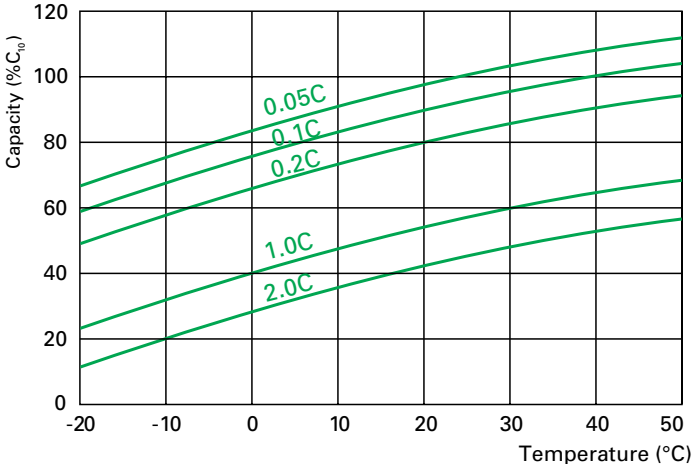
Float Charging Service Life Characteristics



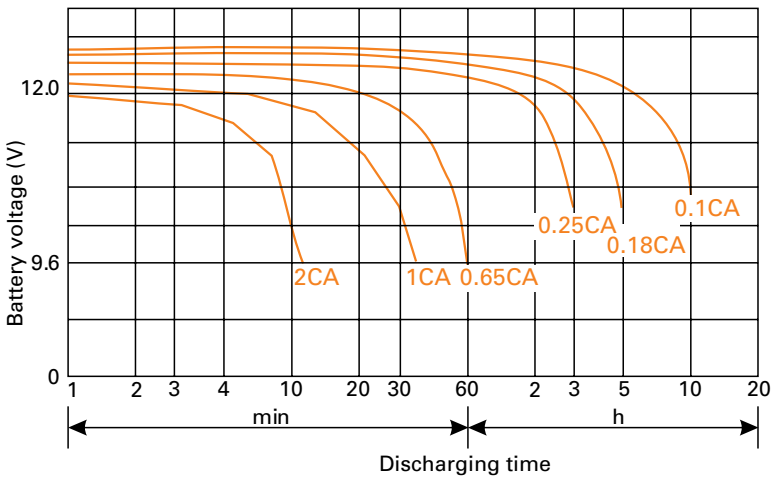
Influence of Temperature on Float Charging Service Life



Influence of Temperature on Capacity



Characteristic Curve of Discharging (25°C)



Charging and Maintenance

Float Charging Voltage

At ambient temperature, the battery float charging voltage range is 2.25V-2.30V/cell. Based on its battery application temperature range, each Eaton UPS has a corresponding built-in temperature compensation scheme.

Equalized Charging

At ambient temperature, the equalized charging voltage range for batteries is 2.30V-2.35V/cell. Eaton UPS has a corresponding logic for equalized charging based on the battery specification difference and application features, guaranteeing battery life to the maximum extent possible.

Routine Maintenance

- Inspect the voltage of single batteries and battery packs once a month.
- Inspect if the housing cover of single batteries has damage, bulging or leakage once a month.
- Inspect if there is liquid seepage or acid mist on the periphery of safety valves once a month.
- Inspect if the single battery connection is loose or rusted once a quarter.
- It is recommended that an actual load checking discharge be made every half-year and that the discharge capacity not be lower than 30% of the theoretical value.
- It is recommended to perform a capacity inspection every year and that the discharge capacity not be lower than 80% of the theoretical value.

Emergency Handling

Fault Model	Troubleshooting Method	Remark
Liquid seepage	Replacement	
Damage	Replacement	
Ignition	Replacement	Please use a dry powder fire extinguisher.
Abnormal appearance	Please contact Eaton	
Too high temperature	Please verify the discharge parameter or replace the defective battery.	
Insufficient capacity	Perform equalized charging of single battery for not less than 24h.	If the capacity is still insufficient, replace it.
The single battery voltage is too low.	Perform equalized charging of single battery for not less than 24h.	

Charging Management Technology

ABM® three-stage battery management technology is Eaton's patented charging management solution. It has been applied in Eaton's UPS products at home and abroad for over 20 years and is well recognized by customers worldwide Unlike conventional constant power rechargeable battery management technology, Eaton's ABM® technology uses precise control of the UPS internal charger to quickly charge batteries "when necessary" and switch to a lower charging current or even shut down the charger when little or no charging is required. As a result, management of the whole battery pack undergoes a three-stage (charging, float charging and resting) cyclical process of charging and discharging. During the ABM® process, the "float charging" process accounts for only 2% of the charge and discharge management of the whole battery pack, which reduces the effect of "float charging" current on battery life, and allows the battery to operate in an ideal charge and discharge environment, thus effectively prolonging the battery's service life.

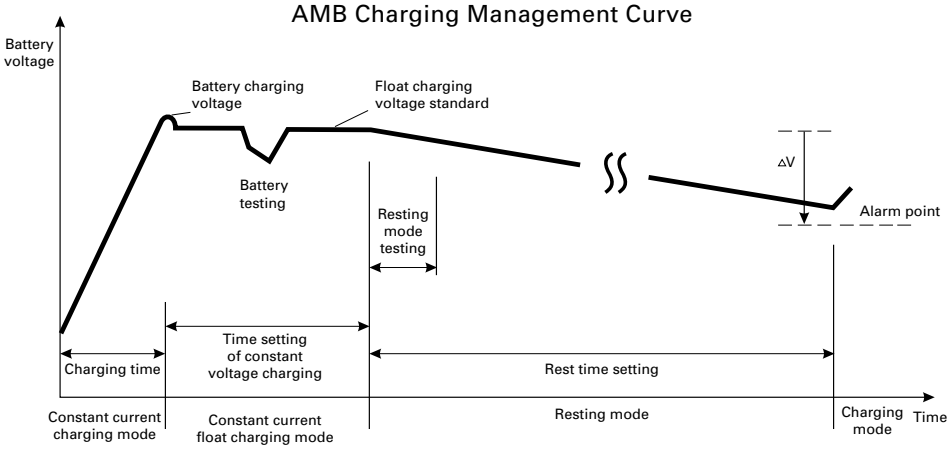
A great deal of evidence from applications in practice indicates that, in the same operating environment, the long-term use of Eaton's unique ABM® technology prolongs battery service life by more than 50% compared with conventional battery management technology.

Eaton UPS products also support other optional charging management solutions to suit different customer application conditions and offer maximum satisfaction of customer demands.

Features of charging management technology:

- Intelligent charging management
- Quick charging parameters for better conformity with lead acid battery characteristics
- Integration of multiple battery health status detection logics
- Automatic realization of battery fault diagnosis/ maintenance functions
- Regular weak battery restoration function
- Reduced effect of long term float charging on battery life, and effective prolonging of battery service life by more than 50%
- Automatic realization of charging temperature compensation at 0~50°C
- Reduced system application power consumption and environmental friendliness
- Multiple optional charging solutions to satisfy different customer application requirements

AMB Charging Management Curve



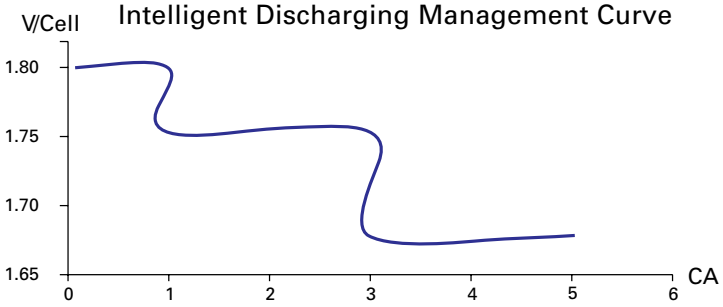
Intelligent Discharge Management

Eaton intelligent discharge management integrates periodic battery performance inspection, float cutoff voltage setup, multiple cutoff condition setting and other functions. From the perspective of battery upkeep, convenient operation and optimal application, it gives comprehensive consideration to safeguarding battery life, customer convenience and maintenance of system reliability.

Features of intelligent discharge management:

- Setting of float cutoff voltage
- Setting of multiple discharge cutoff conditions
- Intelligent evaluation of discharge performance
- Intelligent analysis of aging and weakening performance

Intelligent Discharging Management Curve



Compatibility Verification Platform

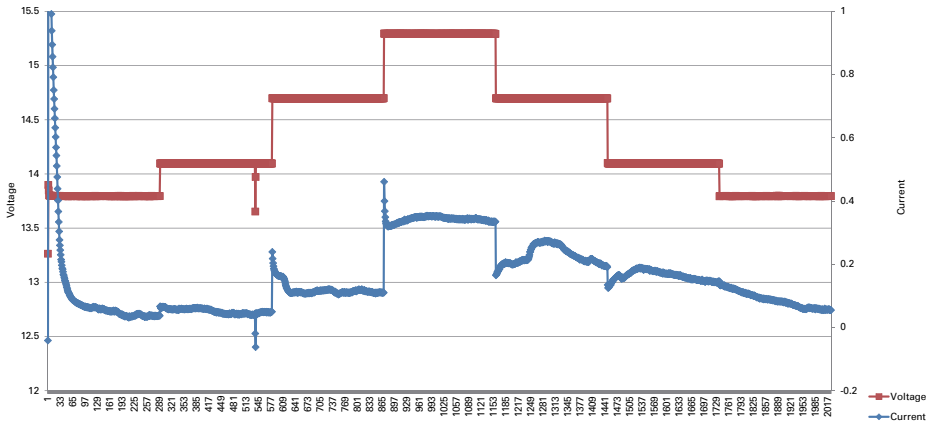
Since batteries and USPs are independent products, they could not be put to their maximum use unless connected by an effective language. Eaton's compatibility verification platform has, from the technical angle, solved the core problems of battery and UPS connection, including UPS battery performance verification, reliability verification, charge and discharge parameter setting and prediction of backup power time.

Battery specifications that have passed testing on the compatibility verification platform are more suitable for applications in UPS industry, especially applications in IDC computer rooms. By analyzing specific reliability indexes and adjusting battery design, runaway risk in battery applications is minimized. At the same time, using the databases derived from specific single battery and battery pack verification processes, and integrating professional data analysis and UPS unit design, a complete database has been formed for battery backup time predication, enabling more accurate prediction of a battery's health status over its lifecycle and its current remaining backup power time.

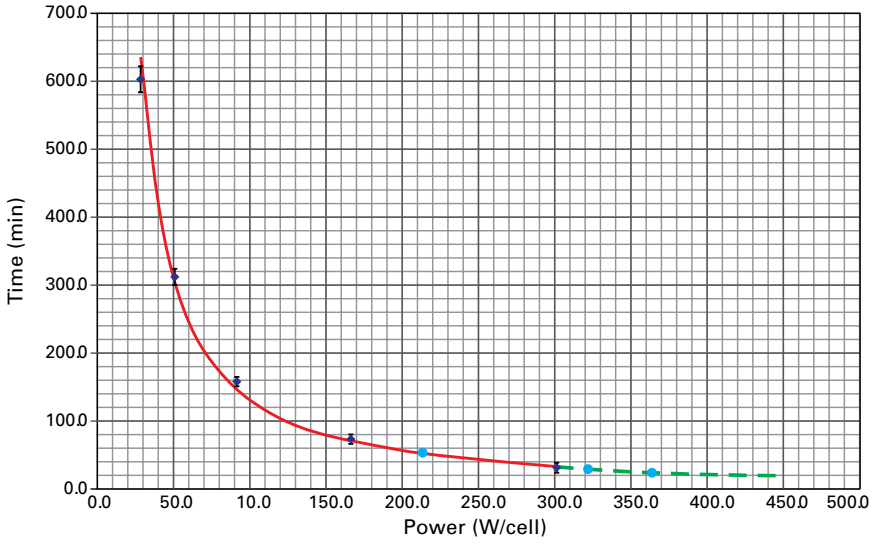
Compatibility Verification Platform

- Verification and analysis platform with strong pertinence
- Long acting reliability analysis and verification
- Continuously optimized battery theoretical model design
- Professional data analysis and simulation capability
- Analysis and storage of battery performance databases of multiple brands and specifications
- A coordinated testing platform covering China, the USA and Europe, and global resource integration

I-V Characteristic Reliability Verification Curve



High Power Characteristic Curve of Single Cells



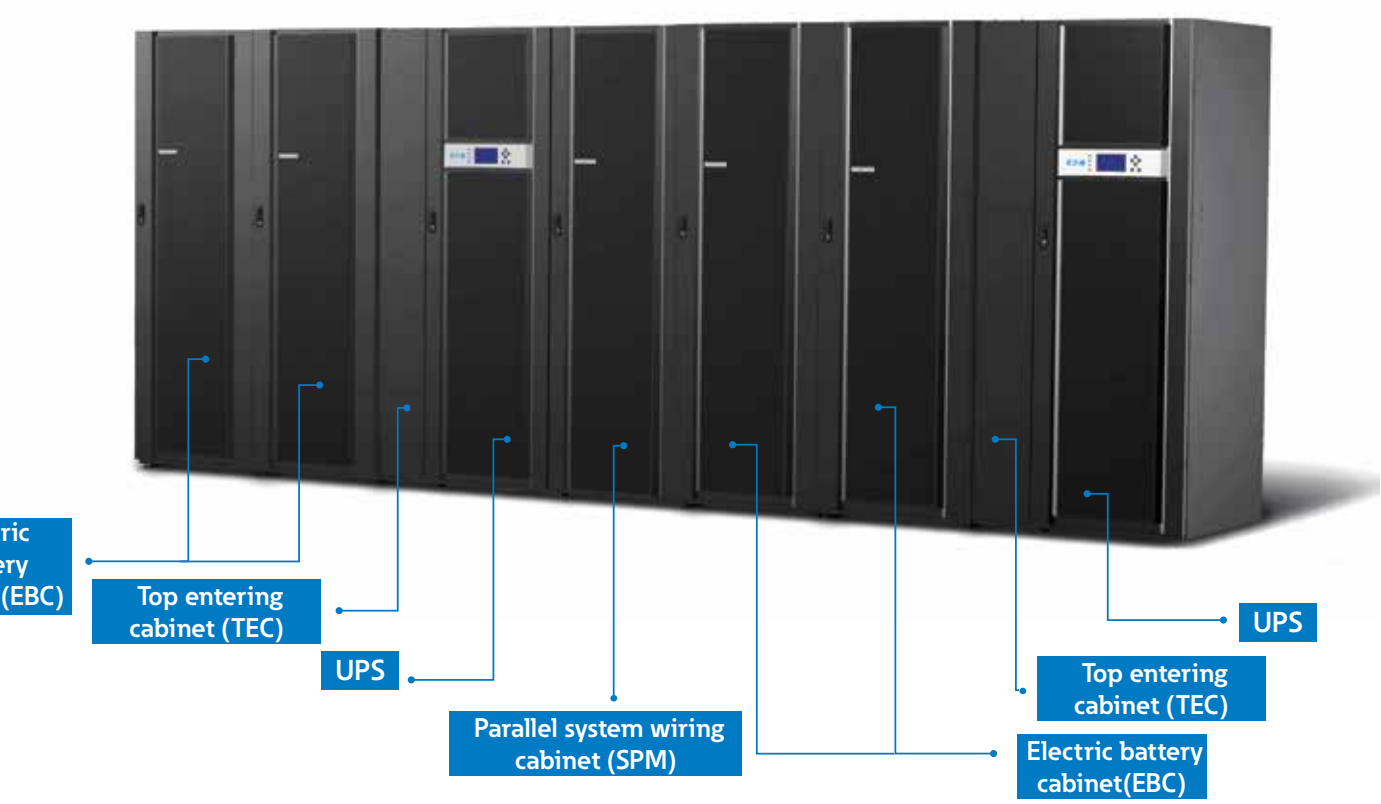
Battery Cabinet

Eaton's standard battery cabinets feature a fully modular design and built-in DC protection switches, perfectly matched with UPS, and combine a small footprint with high levels of safety and maintainability. They provide battery installation solutions for UPS products of different power ranges and different backup power time requirements. They can also be directly delivered with built-in batteries, reducing site installation time, providing an integral solution for customers while improving system reliability.

Product Features

- By sharing the same housing design as the UPS, the whole system is more attractive.
- The pluggable battery rack design enables wide suitability and lowers customer costs.
- Built-in battery cables make connection tidier and more reliable.
- Built-in Eaton brand DC protective switch circuit breaker guarantees a safer system.
- Front panel maintenance design and detachable right and left guard plates make system installation and maintenance more convenient.
- Proper IP-rated designs offer effective protection against water, fire and dust.
- Trolley wheel design facilitates the installation and movement of battery cabinets
- Support for parallel connection of battery cabinets can satisfy the application requirements of different backup power customers.
- Perforated cover plate design facilitates venting and heat dissipation.
- Side and rear wiring designs match the UPS perfectly and make the whole layout elegant and graceful.

Battery Cabinet and Protective Switch



	Model	EBC I	EBC II
Battery cabinet (EBC)	Product name	EBC-93E-500A-WD	EBC-93E-500A-H-WD EBC-93E-Secondary-WD
	Installable battery sizes and dimensions (L*W*H)mm	Size 1: 229*139*203	Size 3: 309*169*215
		Size 2: 261*174*215	Size 4: 319*173*205
			Size 5: 342*173*217
			Size 6: 345*173*278
	Battery cell number	36-40	36-40
	Dimensions (W*D*H) mm	635*830*1876	635*830*1876 635*830*1876
	Cabinet color	Black HBT100730	
	Weight (without battery)	236.5kg	218kg+186kg
	Protection rating	IP21	

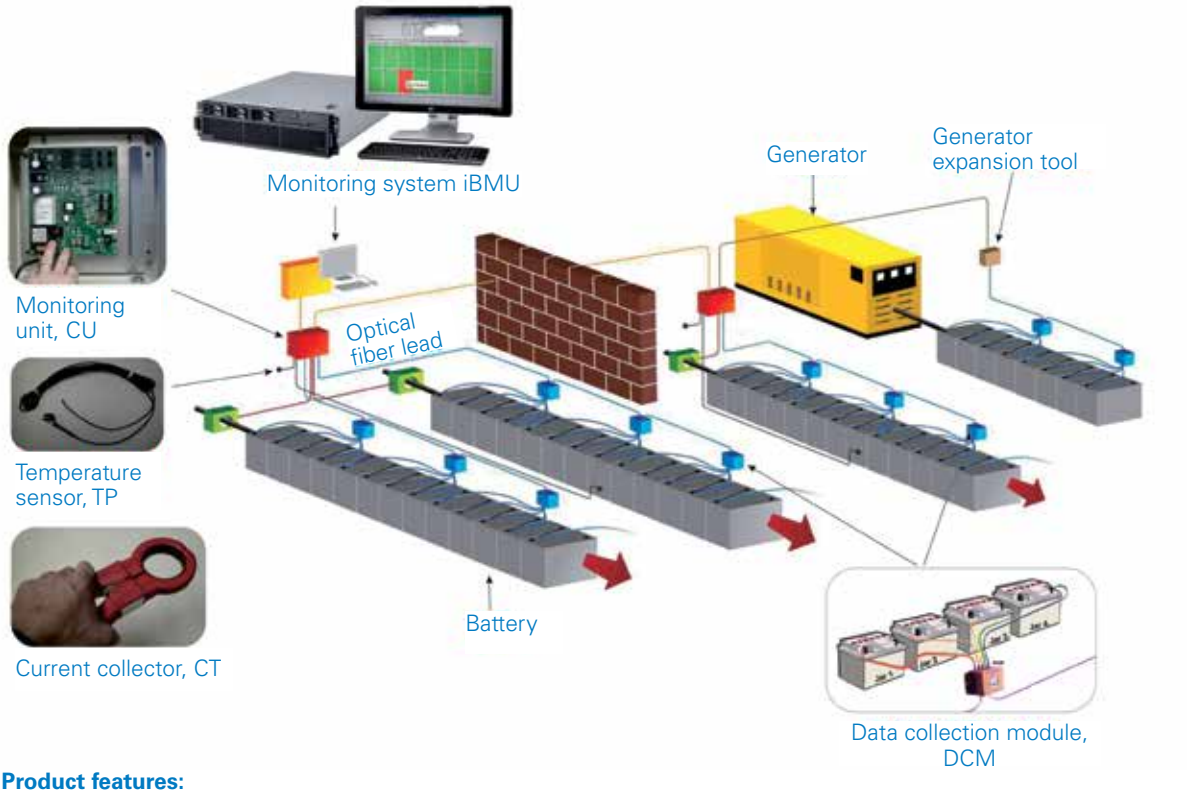
	Model	EBCB120	EBCB200
Battery DC protective switch (EBCB)	Product name	EBCB-93x-60-120	EBCB-93x-160-200
	Support for 93E UPS	60/80/100/120kVA	160/200kVA
	Rated value	750V, 320A	750V, 500A
	Dimensions (W*D*H) mm	430*150*500	
	Cabinet color	Black HBT100730	
	Weight	18.9kg	18.9kg
	Protection rating	IP20	
	Operating temperature	0-40°C	
	Relative humidity	5-95%	

Battery Monitoring Solution

Eaton Battery Monitoring System

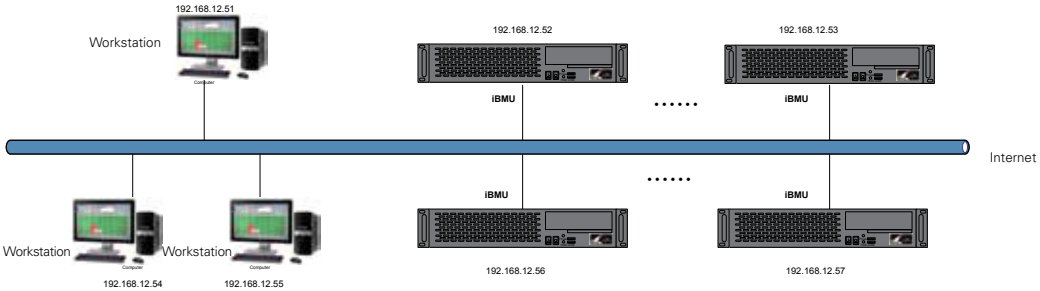
Eaton battery monitoring and detection equipment is a set of intelligent battery monitoring equipment for judging battery health status and system reliability based on analysis of the internal resistance, voltage, temperature, current, etc. of individual batteries. Designed around UPS industrial application characteristics, the equipment achieves intelligent remote monitoring through the analysis of huge amounts of monitoring data, and is especially suitable for multiple batteries and large system applications. It reduces system application risk, maintains and prolongs battery system life, and effectively decreases unexpected power interruption incidents in emergency power supplies.

Eaton Battery Monitoring System



Product features:

- Three-stage modular system design and very strong expandability facilitates system expansion
- Automatic address definition with high accuracy after the installation of battery monitoring equipment makes positioning more convenient
- High ohm value detection accuracy with a resolution as high as 6.3μΩ
- Quick detection and transmission and clear judging logic enable a quick positioning of weakened batteries
- Good system reliability and a design life as long as 20 years
- High accuracy: There have been no false alarms in more than 15 years of operation in the USA
- Effective prevention of thermal runaway and capable of accurate early warning of battery thermal runaway based on current, voltage and temperature information
- Battery status remote signaling function makes it possible to inform the customer promptly of any battery abnormity
- Good compatibility among battery modelsmodel makes it possible to synchronously detect power supply systems with different voltage levels by the same equipment, specifically 2V, 6V and 12V batteries, even engine ignition batteries
- Good compatibility among power supply systems also makes it possible to synchronously detect power supply systems with different voltage levels with the same system, specifically UPS systems with different DC voltages, 48V power supply systems, EPS systems, etc.
- Routine inspection of float charging status for timely tracking of battery health status
- Detection of system connection faults and timely battery maintenance reminders
- Free customer-end software and realization of remote monitoring



Part Specifications of Battery Monitoring System

Equipment model no.	Parameter name	Parameter value
iBMU integrated monitoring unit		
	Operating system	Microsoft Windows operating system
	Memory size	8Gb (SSD)
	Dimensions (H x W x D)	89mm (2U) x 445mm x 534mm
	Housing material	Powder-coated steel
	Color	Black
	Fixed installation	For 19-inch rack-mount installations, wall-brackets may be installed.
	Power supply	110V or 22V AC
CU control unit		
	Operating environment temperature	0°C ~ 50°C
	Power supply	Voltage: 110V AC or 230V AC
	Power supply frequency	50 Hz ~ 60 Hz
	Power supply specification	Maximum 5VA (15mA static current)
	Dry contacts for alarm output	4
	Data signal input and output	RS485, optical fiber
	Withstand voltage	600V DC
	Housing material	Powder-coated steel
	Color	Light grey-green
DCM data acquisition module		
	Voltage measurement range	0 V~ 60 V/ 4 strings
	Resolution	15mV
	Accuracy	2 V battery +/-1.0%, 6 V battery +/-0.5%, 12V battery +/-0.25%
	Protection function	Insulation protection, short-circuit protective polarity and reversed connection protection
	Ohm value measurement range	200 µOhms ~ 25.9 mOhms
	Resolution	6.3 µOhms
	Data signal modelmodel	Optical fiber signal
	Operating environment temperature	0°C~35°C
	Static operation current	25 mA
	Housing material	Non-flammable ABS
	Color	Black
Temperature sensor		
	Sensor model	Solid state semi-conductor temperature sensor
	Resolution	0.05°C
	Accuracy	+/-1°C
	Measurement range	2°C~80°C
Current sensor		
	Sensor model	DC solid state Hall-effect current clamp
	Sensitivity	1mV/1A
	Resolution	0.5A
	Current measurement range	-1000A ~ +1000A

Eaton Professional Services

With its mission of satisfying all aspects of customer demand, Eaton Power Quality is committed to improving service content and value. It has established a comprehensive, high-quality, standardized customer service system in a five-in-one service architecture with customer calling center, site service outlets and repair, technical support and training, spare part support and service solutions. Several hundred skilled engineers are always ready to provide you one-stop service and support. The customer experience-oriented service architecture lets our customers enjoy Eaton's world-class level of service conveniently and quickly, and also satisfies the demand for customized service with a comprehensive selection of service products, helping customers maximize the value of their investment.

After-sales Service

- Eaton batteries are backed by technical support and training from Eaton professional engineers or Eaton authorized engineers.
- Eaton power supply products enjoy three years of warranty services by original manufacturers within the local region.

Eaton Power Quality service outlet network covers almost all capital cities in China. More than 100 technically skilled service engineers are always ready to response to customers' calls, and allow customers to experience world-class service. Customer service demands are met with enthusiastic on-site service "closest to the customer and quickest to respond," stringent service standards, "one-time problem solving and timely arrival at the service site".

Customers just have to contact our customer service center and we will quickly assign engineers to contact them and solve their problems.

Customer Training

Eaton Power Quality has training centers and product exhibit centers in Beijing, Shanghai and Shenzhen displaying a variety of products and sample units, and offering customer training in operation, unit startup and repair services at both the theoretical and practical level. Each year, Eaton Power Supply issues an annual training plan targeted to users and dealers to help customers better understand and use Eaton power supply products.

Please contact the call center to learn more about training courses and arrangements.

Eaton Power Quality China Service System

Customer Service Center	On-site Service Outlets and Repair Centers	Technical Support and Training Center	Spare Part Support
• One-stop service dispatching • Service tracking • Customer complaints	• On-site service or repair in repair center	• Solving customer's or site engineer's technical problems • Service handling quality feedback or analysis	• Provision of quick spare part support • Spare part plan

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