FANTOM

SEALED MAINTENANCE FREE CALCIUM BATTERY

INTRODUCTION

Fantom Batteries have technology suitabler for all types of passangers and high-end Cars. Adapting powerful, Optimising the electricity flow Calcium -Tin alloy prevents the life-Shortening by minimizing the decrease in electrolyte during charge and discharge as well as consolidates plate. Enhanced the life span by adding special additieves consolidating the crystal structure of active materials.

- Enhanced the Starting power by grid design which optimize electricity flows
- Enhanced the life span by adding special additive consolidating the crystal structure of active materials.
- Guarenteed user's saftey by adapting special structure of sealed covers

MANUFACTURING PROCESS

1.Lead Oxide

Barton pot process is the core of lead oxide spherically shaped particles

Fine Oxide with ca.50% by weight less than 4.5 microns

2.Strip Loading

Over 90% slab reduction rate

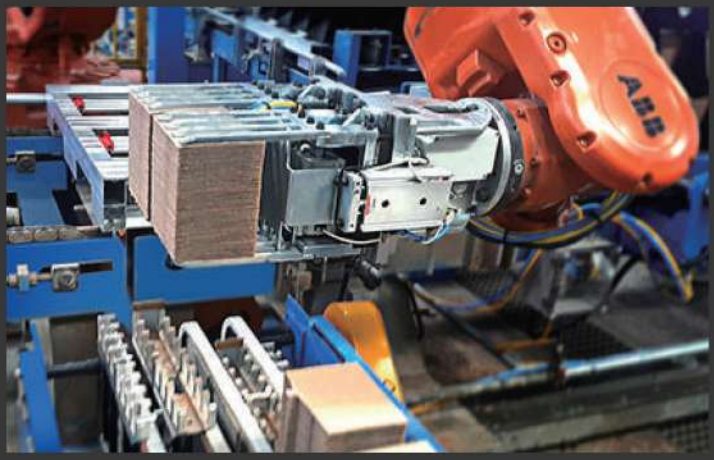
Excellent mechanical properties, fine and uniform strip

Anti-corrosion alloy

3.Strip Punching

Full Framed Grid constrains the active material and provides mechanical strength

Reduction of internal Resistance



4.Pasting

Double-sided pasting for minimizing corrosion of grid

Strong adhesion between grid and paste

MANUFACTURING PROCESS

5.Curing

Even plate quality by vertical loading

Optimal particle size for battery performance and life time

Advanced adhension and cohension of plate

6.Assembling

Plate quantity & weight measuring systems

Total inspection for all batteries

Spot welding quality measuring systems

7.Formation

Dynamic charging acceptability & less Self-discharge rate by multi-step charging

Optimised charging temperature management system

8.Finishing process

Electrolyte cooling system & inspection by High Rate Discharge(HRD)

Leser marking system & Robot packaging systems

Storage in Automatic warehouse for shipping

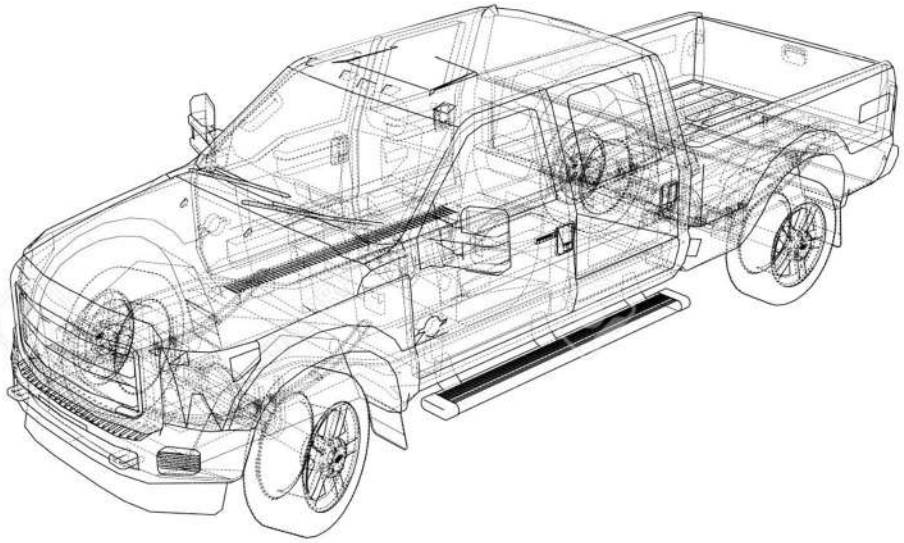
BATTERY STRUCTURE

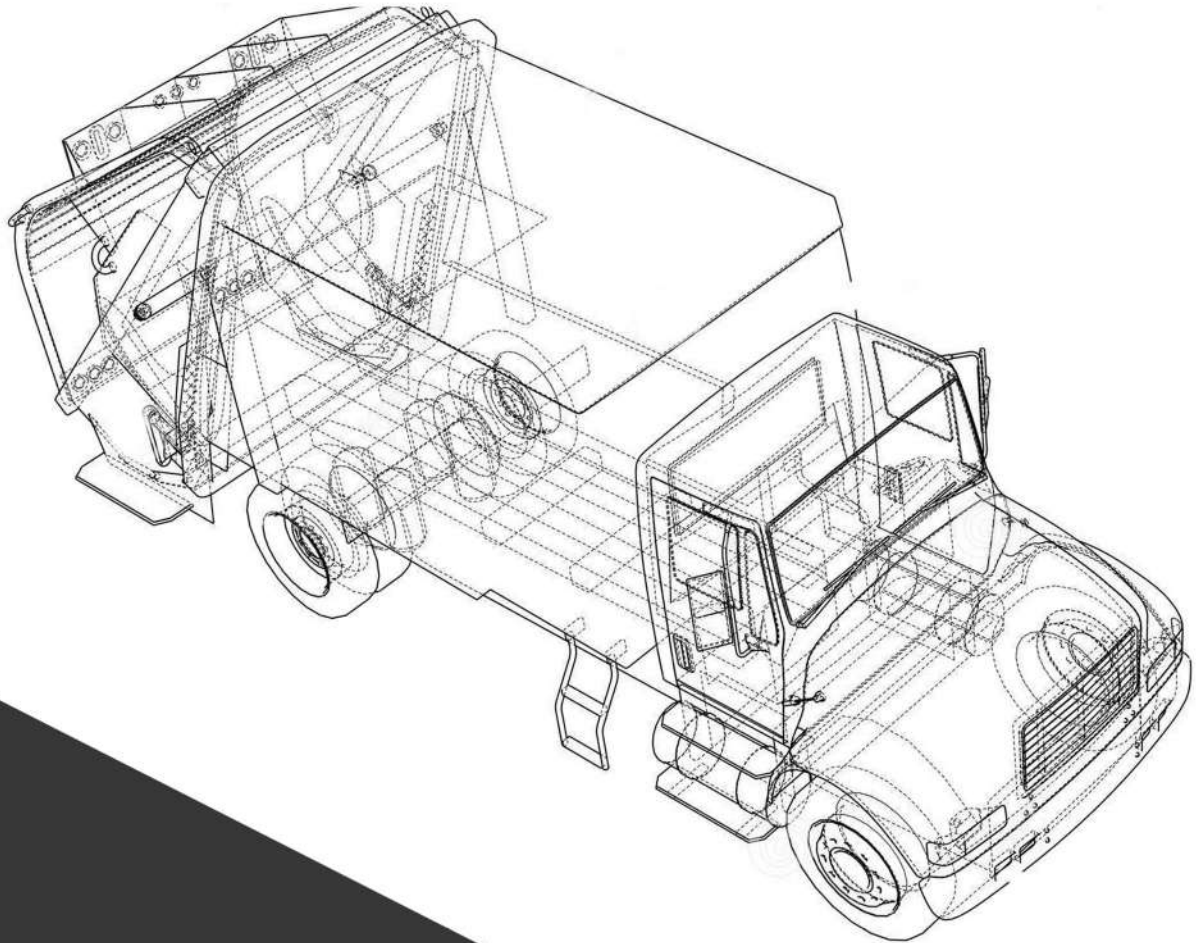
SPECIFICATION

JIS MF SERIES (For Japanese Vehicles)

DIN MF SERIES (For European Vehicles)

BCI MF SERIES (For American Vehicles)





JIS MF SERIES (For Japanese Vehicles)

Group	JIS No.		Capacity 20HR	CCA (SAE)	RC (MIN)	Dimension(mm)				Layout	Terminal	B/Down
	New	Old				L	W	H	TH			
B19	32B19L	NS40L	32	270	48	187	127	200	222	0	B	B0
	32B19R	NS40	32	270	48	187	127	200	222	1	B	B0
	32B19LS	-	32	270	48	187	127	200	222	0	A	B0
	32B19RS	-	32	270	48	187	127	200	222	1	A	B0
	32B19FL	-	32	270	48	187	135	200	222	0	B	B1
	32B19FR	-	32	270	48	187	135	200	222	1	B	B1
	32B19FLS	-	32	270	48	187	135	200	222	0	A	B1
	32B19FRS	-	32	270	48	187	135	200	222	1	A	B1
	40B19L	NS40ZL	35	300	52	187	127	200	222	0	B	B0
	40B19R	NS40Z	35	300	52	187	127	200	222	1	B	B0
	40B19LS	NS40ZLS	35	300	52	187	127	200	222	0	A	B0
	40B19RS	NS40ZS	35	300	52	187	127	200	222	1	A	B0
	40B19FL	-	35	300	52	187	135	200	222	0	B	B1
	40B19FR	-	35	300	52	187	135	200	222	1	B	B1
	40B19FLS	-	35	300	52	187	135	200	222	0	A	B1
	40B19FRS	-	35	300	52	187	135	200	222	1	A	B1
	42B19L	-	38	340	55	187	127	200	222	0	B	B0
	42B19R	-	38	340	55	187	127	200	222	1	B	B0
	42B19LS	-	38	340	55	187	127	200	222	0	A	B0
	42B19RS	-	38	340	55	187	127	200	222	1	A	B0
	42B19FL	-	38	340	55	187	135	200	222	0	B	B1
	42B19FR	-	38	340	55	187	135	200	222	1	B	B1
	42B19FLS	-	38	340	55	187	135	200	222	0	A	B1
	42B19FRS	-	38	340	55	187	135	200	222	1	A	B1
	44B19L	-	40	370	60	187	127	200	222	0	B	B0
	44B19R	-	40	370	60	187	127	200	222	1	B	B0
	44B19LS	-	40	370	60	187	127	200	222	0	A	B0
	44B19RS	-	40	370	60	187	127	200	222	1	A	B0
	44B19FL	-	40	370	60	187	135	200	222	0	B	B1
	44B19FR	-	40	370	60	187	135	200	222	1	B	B1
	44B19FLS	-	40	370	60	187	135	200	222	0	A	B1
	44B19FRS	-	40	370	60	187	135	200	222	1	A	B1
B24	46B24LS	-	35	300	52	235	127	200	222	0	A	B0
	46B24RS	-	35	300	52	235	127	200	222	1	A	B0
	50B24L	N40LB	40	370	60	235	127	200	222	0	B	B0
	50B24R	N40B	40	370	60	235	127	200	222	1	B	B0
	50B24LS	N40L	40	370	60	235	127	200	222	0	A	B0
	50B24RS	N40	40	370	60	235	127	200	222	1	A	B0

JIS MF SERIES (For Japanese Vehicles)

Group	JIS No.		Capacity 20HR	CCA (SAE)	RC (MIN)	Dimension(mm)				Layout	Terminal	B/Down
	New	Old				L	W	H	TH			
B24	50B24FL	-	40	370	60	235	135	200	222	0	B	B1
	50B24FR	-	40	370	60	235	135	200	222	1	B	B1
	50B24FLS	-	40	370	60	235	135	200	222	0	A	B1
	50B24FRS	-	40	370	60	235	135	200	222	1	A	B1
	55B24L	NS60L	45	430	71	235	127	200	222	0	B	B0
	55B24R	NS60	45	430	71	235	127	200	222	1	B	B0
	55B24LS	NS60LS	45	430	71	235	127	200	222	0	A	B0
	55B24RS	NS60S	45	430	71	235	127	200	222	1	A	B0
	55B24FL	-	45	430	71	235	135	200	222	0	B	B1
	55B24FR	-	45	430	71	235	135	200	222	1	B	B1
	55B24FLS	-	45	430	71	235	135	200	222	0	A	B1
	55B24FRS	-	45	430	71	235	135	200	222	1	A	B1
	60B24L	-	48	470	75	235	127	200	222	0	B	B0
	60B24R	-	48	470	75	235	127	200	222	1	B	B0
	60B24FL	-	48	470	75	235	135	200	222	0	B	B1
	60B24FR	-	48	470	75	235	135	200	222	1	B	B1
	60B24LS	-	48	470	75	235	127	200	222	0	A	B0
	60B24RS	-	48	470	75	235	127	200	222	1	A	B0
	60B24FLS	-	48	470	75	235	135	200	222	0	A	B1
	60B24FRS	-	48	470	75	235	135	200	222	1	A	B1
D20	50D20L	-	50	450	80	200	172	200	220	0	A	B0/B1
	50D20R	-	50	450	80	200	172	200	220	1	A	B0/B1
D23	55D23L	-	60	550	100	231	172	200	220	0	A	B0/B1
	55D23R	-	60	550	100	231	172	200	220	1	A	B0/B1
	75D23L	-	65	580	110	231	172	200	220	0	A	B0/B1
	75D23R	-	65	580	110	231	172	200	220	1	A	B0/B1
	80D23L	-	70	630	120	231	172	200	220	0	A	B0/B1
	80D23R	-	70	630	120	231	172	200	220	1	A	B0/B1
D26	48D26L	N50L	50	430	80	258	172	200	220	0	A	B0/B1
	48D26R	N50	50	430	80	258	172	200	220	1	A	B0/B1
	55D26L	N50ZL	60	550	100	258	172	200	220	0	A	B0/B1
	55D26R	N50Z	60	550	100	258	172	200	220	1	A	B0/B1
	75D26L	NS70L	65	580	110	258	172	200	220	0	A	B0/B1
	75D26R	NS70	65	580	110	258	172	200	220	1	A	B0/B1
	80D26L	NX110-5L	70	600	120	258	172	200	220	0	A	B0/B1
	80D26R	NX110-5	70	600	120	258	172	200	220	1	A	B0/B1
	90D26L	-	75	630	130	258	172	200	220	0	A	B0/B1
	90D26R	-	75	630	130	258	172	200	220	1	A	B0/B1

JIS MF SERIES (For Japanese Vehicles)

Group	JIS No.		Capacity 20HR	CCA (SAE)	RC (MIN)	Dimension(mm)				Layout	Terminal	B/Down
	New	Old				L	W	H	TH			
D31	55D31L	-	60	510	100	303	172	200	220	0	A	B0/B1
	55D31R	-	60	510	100	303	172	200	220	1	A	B0/B1
	60D31L	-	65	560	120	303	172	200	220	0	A	B0/B1
	60D31R	-	65	560	120	303	172	200	220	1	A	B0/B1
	65D31L	N70L	70	600	120	303	172	200	220	0	A	B0/B1
	65D31R	N70	70	600	120	303	172	200	220	1	A	B0/B1
	75D31L	N70ZL	75	630	130	303	172	200	220	0	A	B0/B1
	75D31R	N70Z	75	630	130	303	172	200	220	1	A	B0/B1
	95D31L	NX120-7L	80	670	140	303	172	200	220	0	A	B0/B1
	95D31R	NX120-7	80	670	140	303	172	200	220	1	A	B0/B1
	105D31L	-	90	750	160	303	172	200	220	0	A	B0/B1
	105D31R	-	90	750	160	303	172	200	220	1	A	B0/B1
	115D31L	-	95	830	170	303	172	200	220	0	A	B0/B1
	115D31R	-	95	830	170	303	172	200	220	1	A	B0/B1
	125D31L	-	100	830	180	303	172	200	220	0	A	B0/B1
	125D31R	-	100	830	180	303	172	200	220	1	A	B0/B1
D33	MF90L	-	90	750	160	326	172	203	223	0	A	B0
	MF90R	-	90	750	160	326	172	203	223	1	A	B0
	MF100L	-	100	830	180	326	172	203	223	0	A	B0
	MF100R	-	100	830	180	326	172	203	223	1	A	B0
E41	95E41L	N100L	100	830	180	408	172	210	230	0	A	B0
	95E41R	N100	100	830	180	408	172	210	230	1	A	B0
	115E41L	NS120L	110	900	200	408	172	210	230	0	A	B0
	115E41R	NS120	110	900	200	408	172	210	230	1	A	B0
F51	135F51L	N120L	120	870	230	506	182	213	233	3	A	B0
	135F51R	N120	120	870	230	506	182	213	233	4	A	B0
	150F51L	-	130	900	250	506	182	213	233	3	A	B0
	150F51R	-	130	900	250	506	182	213	233	4	A	B0
G51	155G51L	-	135	920	290	506	215	213	233	3	A	B0
	155G51R	-	135	920	290	506	215	213	233	4	A	B0
	160G51L	N150L	150	1000	300	506	215	213	233	3	A	B0
	160G51R	N150	150	1000	300	506	215	213	233	4	A	B0
	165G51L	NS200L	170	1050	325	506	215	213	233	3	A	B0
	165G51R	NS200	170	1050	325	506	215	213	233	4	A	B0
H52	180H52L	-	180	1000	350	509	274	220	240	3	A	B0
	180H52R	-	180	1000	350	509	274	220	240	4	A	B0
	210H52L	N200L	200	1200	430	509	274	220	240	3	A	B0
	210H52R	N200	200	1200	430	509	274	220	240	4	A	B0
	225H52L	-	210	1300	440	509	274	220	240	3	A	B0
	225H52R	-	210	1300	440	509	274	220	240	4	A	B0
	245H52L	-	220	1400	460	509	274	220	240	3	A	B0
	245H52R	-	220	1400	460	509	274	220	240	4	A	B0

DIN MF SERIES (For European Vehicles)

Group	DIN No.	Capacity 20HR	CCA (EN)	RC (MIN)	Dimension(mm)				Layout	Terminal	B/Down
					L	W	H	TH			
LB1	53518	35	330	60	207	173	175	175	0	A	B13
	53519	35	330	60	207	173	175	175	1	A	B13
	53624	36	330	60	207	173	175	175	0	A	B1
	53638	36	330	60	207	173	175	175	1	A	B1
	53646	36	330	60	207	173	175	175	0	A	B14
	54316	43	400	70	207	173	175	175	0	A	B13
	54318	43	400	70	207	173	175	175	1	A	B13
	54321	43	450	71	207	173	175	175	0	A	B13
	54322	43	450	71	207	173	175	175	1	A	B13
L1	54459	44	390	71	207	173	190	190	0	A	B13
	54464	44	390	71	207	173	190	190	1	A	B13
	55054	50	420	80	207	173	190	190	0	A	B13
	55055	50	420	80	207	173	190	190	1	A	B13
LB2	54518	45	390	71	242	173	175	175	1	A	B14
	54519	45	390	71	242	173	175	175	0	A	B14
	55040	50	450	80	242	173	175	175	0	A	B13
	55040R	50	450	80	242	173	175	175	1	A	B13
	55044	50	450	80	242	173	175	175	0	A	B4
	55045	50	450	80	242	173	175	175	1	A	B4
	55457	54	480	90	242	173	175	175	0	A	B13
	55458	54	480	90	242	173	175	175	1	A	B13
	56009	60	510	100	242	173	175	175	0	A	B13
	56009R	60	510	100	242	173	175	175	1	A	B13
	56077	60	540	100	242	173	175	175	0	A	B13
	56077R	60	540	100	242	173	175	175	1	A	B13
L2	55071	50	420	80	242	173	190	190	0	A	B13
	55076	50	420	80	242	173	190	190	1	A	B13
	55559	55	480	90	242	173	190	190	0	A	B13
	55565	55	480	90	242	173	190	190	1	A	B13
	56219	62	540	100	242	173	190	190	0	A	B13
	56220	62	540	100	242	173	190	190	1	A	B13
	56203	62	600	100	242	173	190	190	0	A	B13
	56204	62	600	100	242	173	190	190	1	A	B13
LB3	55415	54	480	90	276	173	175	175	0	A	B13
	56318	63	540	105	276	173	175	175	0	A	B14
	56320	63	540	105	276	173	175	175	0	A	B1
	56319	63	540	105	276	173	175	175	1	A	B1
	56330	63	540	105	276	173	175	175	0	A	B13
	56331	63	540	105	276	173	175	175	1	A	B13
	56828	68	570	113	276	173	175	175	0	A	B13
	56821	68	570	113	276	173	175	175	1	A	B13
	57113	71	640	120	276	173	175	175	0	A	B13
	57112	71	640	120	276	173	175	175	1	A	B13

DIN MF SERIES (For European Vehicles)

Group	DIN No.	Capacity 20HR	CCA (EN)	RC (MIN)	Dimension(mm)				Layout	Terminal	B/Down
					L	W	H	TH			
L3	56638	66	540	110	276	173	190	190	0	A	B13
	56640	66	540	110	276	173	190	190	1	A	B13
	57219	72	610	120	276	173	190	190	1	A	B13
	57220	72	610	120	276	173	190	190	0	A	B13
	57412	74	680	130	276	173	190	190	0	A	B13
	57413	74	680	130	276	173	190	190	1	A	B13
LB4	57539	75	640	130	315	173	175	175	0	A	B13
	57538	75	640	130	315	173	175	175	1	A	B13
	58014	80	680	140	315	173	175	175	0	A	B13
L4	58043	80	640	140	315	173	190	190	0	A	B13
	58043R	80	640	140	315	173	190	190	1	A	B13
	59042	90	720	160	315	173	190	190	0	A	B13
	59043	90	720	160	315	173	190	190	1	A	B13
LB5	58515	85	720	145	351	173	175	175	0	A	B13
	59015	90	740	160	351	173	175	175	0	A	B13
L5	58821	88	680	150	351	173	190	190	1	A	B13
	58827	88	680	150	351	173	190	190	0	A	B13
	59218	92	720	165	351	173	190	190	0	A	B13
	59219	92	720	165	351	173	190	190	1	A	B13
	60044	100	850	180	351	173	190	190	0	A	B13
	60044R	100	850	180	351	173	190	190	1	A	B13
B19	54026	40	330	60	187	127	200	222	0	B	B0
	54027	40	330	60	187	127	200	222	1	B	B0
B24	54523	45	360	71	235	127	200	222	0	A	B0
	54524	45	360	71	235	127	200	222	1	A	B0
	54551	45	360	71	235	127	200	222	1	B	B0
	54584	45	360	71	235	127	200	222	0	B	B0
D20	55041	50	390	80	200	172	200	220	0	A	B1
	55042	50	390	80	200	172	200	220	1	A	B1
D23	56068	60	480	100	231	172	200	220	0	A	B1
	56069	60	480	100	231	172	200	220	1	A	B1
D26	56048	60	480	100	266	172	200	220	0	A	B9
	56049	60	480	100	266	172	200	220	1	A	B9
	57024	70	540	120	266	172	200	220	1	A	B9
	57029	70	540	120	266	172	200	220	0	A	B9
D31	57512	75	600	130	303	172	200	220	0	A	B1
	57513	75	600	130	303	172	200	220	1	A	B1
	58513	85	680	145	303	172	200	220	0	A	B1
	58514	85	680	145	303	172	200	220	1	A	B1
	59518	95	720	170	303	172	200	220	0	A	B1
	59519	95	720	170	303	172	200	220	1	A	B1
	60045	100	760	180	303	172	200	220	0	A	B1
	60046	100	760	180	303	172	200	220	1	A	B1

DIN MF SERIES (For European Vehicles)

Group	DIN No.	Capacity 20HR	CCA (EN)	RC (MIN)	Dimension(mm)				Layout	Terminal	B/Down
					L	W	H	TH			
D33	59615	96	760	170	326	172	203	223	0	A	B1
	59616	96	760	170	326	172	203	223	1	A	B1
E41	60016	100	760	180	408	172	210	230	0	A	B0
A	62034	120	680	230	514	189	196	215	3	A	B0
	62035	120	680	230	514	189	196	215	3	A	B13
	62036	120	680	230	514	189	196	215	4	A	B13
	62038	120	680	230	514	189	196	215	4	A	B0
	63530	135	720	250	514	189	196	215	3	A	B0
	63532	135	720	250	514	189	196	215	4	A	B0
	64589	145	800	260	514	189	196	215	3	A	B0
	64590	145	800	260	514	189	196	215	4	A	B0
	65038	150	900	300	514	189	196	215	3	A	B0
B	64317	143	900	270	514	223	196	215	3	A	B0
	64318	143	900	270	514	223	196	215	4	A	B0
	66016	160	900	320	514	223	196	215	3	A	B0
	66017	160	900	320	514	223	196	215	4	A	B0
	67018	170	950	320	514	223	196	215	3	A	B0
	67019	170	950	320	514	223	196	215	4	A	B0
	67025	170	950	320	514	223	196	215	4	A	B13
	68032	180	1000	370	514	223	196	215	3	A	B0
	68033	180	1000	370	514	223	196	215	4	A	B0
	68035	180	1000	370	514	223	196	215	3	A	B13
	68036	180	1000	370	514	223	196	215	4	A	B13
C	70027	200	1050	430	518	273	216	235	3	A	B0
	70029	200	1050	430	518	273	216	235	4	A	B0
	71014	210	1150	430	518	273	216	235	3	A	B0
	71015	210	1150	430	518	273	216	235	4	A	B0
	72512	225	1150	460	518	273	216	235	3	A	B0
	72512R	225	1150	460	518	273	216	235	4	A	B0
	73011	230	1200	460	518	273	216	235	3	A	B0
	73012	230	1200	460	518	273	216	235	4	A	B0

BCI MF SERIES (For American Vehicles)

Group	BCI No.	CCA (SAE)	RC (MIN)	Dimension(mm)				Layout	Terminal	B/Down
				L	W	H	TH			
26	26-525	525	80	208	172	181	201	10	A	B1
26R	26R-525	525	80	208	172	181	201	11	A	B1
85	85-450	450	75	231	172	180	200	11	A	B1
	85-500	500	85	231	172	180	200	11	A	B1
	85-550	550	95	231	172	180	200	11	A	B1
86	86-450	450	75	231	172	180	200	10	A	B1
	86-500	500	85	231	172	180	200	10	A	B1
	86-550	550	95	231	172	180	200	10	A	B1
24	24-430	430	80	258	172	200	220	10	A	B1
	24-500	500	90	258	172	200	220	10	A	B1
	24-550	550	100	258	172	200	220	10	A	B1
	24-580	580	110	258	172	200	220	10	A	B1
	24-600	600	120	258	172	200	220	10	A	B1
	24-630	630	130	258	172	200	220	10	A	B1
	24-670	670	140	258	172	200	220	10	A	B1
	24-700	700	140	258	172	200	220	10	A	B1
24R	24R-430	430	80	258	172	200	220	11	A	B1
	24R-500	500	90	258	172	200	220	11	A	B1
	24R-550	550	100	258	172	200	220	11	A	B1
	24R-580	580	110	258	172	200	220	11	A	B1
	24R-600	600	120	258	172	200	220	11	A	B1
	24R-630	630	130	258	172	200	220	11	A	B1
	24R-670	670	140	258	172	200	220	11	A	B1
	24R-700	700	140	258	172	200	220	11	A	B1
24F	24F-500	500	90	266	172	200	220	11F	A	B9
25	25-450	450	80	231	172	200	220	10	A	B1
	25-500	500	90	231	172	200	220	10	A	B1
	25-550	550	100	231	172	200	220	10	A	B1
	25-580	580	110	231	172	200	220	10	A	B1
	25-630	630	120	231	172	200	220	10	A	B1
35	35-450	450	80	231	172	200	220	11	A	B1
	35-500	500	90	231	172	200	220	11	A	B1
	35-550	550	100	231	172	200	220	11	A	B1
	35-580	580	110	231	172	200	220	11	A	B1
	35-630	630	120	231	172	200	220	11	A	B1

BCI MF SERIES (For American Vehicles)

Group	BCI No.	CCA (SAE)	RC (MIN)	Dimension(mm)				Layout	Terminal	B/Down
				L	W	H	TH			
21	21-430	430	80	200	172	200	220	10	A	B1
	21-450	450	80	200	172	200	220	10	A	B1
21R	21R-430	430	80	200	172	200	220	11	A	B1
	21R-450	450	80	200	172	200	220	11	A	B1
34	34-550	550	100	260	172	181	201	10	A	B1
	34-600	600	113	260	172	181	201	10	A	B1
	34-670	670	120	260	172	181	201	10	A	B1
	34-750	750	130	260	172	181	201	10	A	B1
34R	34R-550	550	100	260	172	181	201	11	A	B1
	34R-600	600	113	260	172	181	201	11	A	B1
	34R-670	670	120	260	172	181	201	11	A	B1
	34R-750	750	130	260	172	181	201	11	A	B1
27	27-510	510	100	303	172	200	220	10	A	B1
	27-560	560	120	303	172	200	220	10	A	B1
	27-600	600	120	303	172	200	220	10	A	B1
	27-630	630	130	303	172	200	220	10	A	B1
	27-650	650	120	303	172	200	220	10	A	B1
	27-670	670	140	303	172	200	220	10	A	B1
	27-750	750	160	303	172	200	220	10	A	B1
	27-800	800	170	303	172	200	220	10	A	B1
	27-830	830	170	303	172	200	220	10	A	B1
27R	27R-510	510	100	303	172	200	220	11	A	B1
	27R-560	560	120	303	172	200	220	11	A	B1
	27R-600	600	120	303	172	200	220	11	A	B1
	27R-630	630	130	303	172	200	220	11	A	B1
	27R-650	650	120	303	172	200	220	11	A	B1
	27R-670	670	140	303	172	200	220	11	A	B1
	27R-750	750	160	303	172	200	220	11	A	B1
	27R-800	800	170	303	172	200	220	11	A	B1
	27R-830	830	170	303	172	200	220	11	A	B1
27F	27F-560	560	120	311	172	200	220	11F	A	B9
	27F-650	650	120	311	172	200	220	11F	A	B9
	27F-750	750	160	311	172	200	220	11F	A	B9
	27F-830	830	180	311	172	200	220	11F	A	B9

BCI MF SERIES (For American Vehicles)

Group	BCI No.	CCA (SAE)	RC (MIN)	Dimension(mm)				Layout	Terminal	B/Down
				L	W	H	TH			
51	51-300	300	52	235	135	200	222	10	A	B1
	51-370	370	60	235	135	200	222	10	A	B1
	51-430	430	71	235	135	200	222	10	A	B1
	51-470	470	75	235	135	200	222	10	A	B1
51R	51R-300	300	52	235	135	200	222	11	A	B1
	51R-370	370	60	235	135	200	222	11	A	B1
	51R-430	430	71	235	135	200	222	11	A	B1
	51R-470	470	75	235	135	200	222	11	A	B1
47	47-430	430	80	242	173	190	190	24	A	B13
	47-500	500	90	242	173	190	190	24	A	B13
	47-550	550	90	242	173	190	190	24	A	B13
	47-580	580	100	242	173	190	190	24	A	B13
	47-650	650	120	242	173	190	190	24	A	B13
48	48-550	550	90	276	173	190	190	24	A	B13
	48-580	580	100	276	173	190	190	24	A	B13
	48-630	630	130	276	173	190	190	24	A	B13
	48-700	700	130	276	173	190	190	24	A	B13
	48-750	750	130	276	173	190	190	24	A	B13
49	49-710	710	150	351	173	190	190	24	A	B13
	49-750	750	160	351	173	190	190	24	A	B13
	49-800	800	170	351	173	190	190	24	A	B13
	49-850	850	170	351	173	190	190	24	A	B13
	49-870	870	180	351	173	190	190	24	A	B13
58	58-500	500	90	234	182	157	177	26	A	B8
	58-550	550	100	234	182	157	177	26	A	B8
58R	58R-500	500	90	234	182	157	177	19	A	B8
	58R-550	550	100	234	182	157	177	19	A	B8
65	65-650	650	120	287	187	172	192	10	A	B8
	65-750	750	140	287	187	172	192	10	A	B8
	65-800	800	135	287	187	172	192	10	A	B8
	65-850	850	160	287	187	172	192	10	A	B8
65R	65R-650	650	120	287	187	172	192	11	A	B8
	65R-750	750	140	287	187	172	192	11	A	B8
	65R-800	800	135	287	187	172	192	11	A	B8
	65R-850	850	160	287	187	172	192	11	A	B8

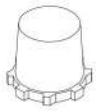
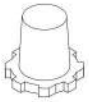
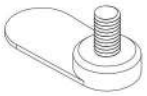
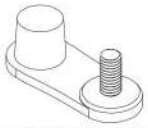
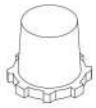
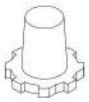
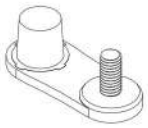
BCI MF SERIES (For American Vehicles)

Group	BCI No.	CCA (SAE)	RC (MIN)	Dimension(mm)				Layout	Terminal	B/Down
				L	W	H	TH			
75	75-500	500	90	230	179	181	181	17	SIDE	B1
	75-550	550	100	230	179	181	181	17	SIDE	B1
	75-600	600	113	230	179	181	181	17	SIDE	B1
	75-650	650	120	230	179	181	181	17	SIDE	B1
75DT	75DT-500	500	90	230	179	181	201	17	DT	B1
	75DT-550	550	100	230	179	181	201	17	DT	B1
	75DT-600	600	113	230	179	181	201	17	DT	B1
	75DT-650	650	120	230	179	181	201	17	DT	B1
78	78-550	550	100	260	179	181	181	17	SIDE	B1
	78-600	600	113	260	179	181	181	17	SIDE	B1
	78-670	670	120	260	179	181	181	17	SIDE	B1
	78-750	750	130	260	179	181	181	17	SIDE	B1
78DT	78DT-550	550	100	260	179	181	201	17	DT	B1
	78DT-600	600	113	260	179	181	201	17	DT	B1
	78DT-670	670	120	260	179	181	201	17	DT	B1
	78DT-750	750	130	260	179	181	201	17	DT	B1
90	90-370	370	60	242	173	175	175	24	A	B13
	90-430	430	71	242	173	175	175	24	A	B13
	90-450	450	71	242	173	175	175	24	A	B13
	90-480	480	80	242	173	175	175	24	A	B13
	90-500	500	80	242	173	175	175	24	A	B13
	90-550	550	90	242	173	175	175	24	A	B13
	90-570	570	100	242	173	175	175	24	A	B13
91	91-500	500	90	276	173	175	175	24	A	B13
	91-580	580	105	276	173	175	175	24	A	B13
	91-630	630	110	276	173	175	175	24	A	B13
	91-670	670	120	276	173	175	175	24	A	B13
92	92-670	670	120	315	173	175	175	24	A	B13
	92-710	710	130	315	173	175	175	24	A	B13
	92-750	750	140	315	173	175	175	24	A	B13
	92-830	830	145	315	173	175	175	24	A	B13
93	93-750	750	140	351	173	175	175	24	A	B13
	93-780	780	160	351	173	175	175	24	A	B13

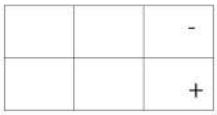
BCI MF SERIES (For American Vehicles)

Group	BCI No.	CCA (SAE)	RC (MIN)	Dimension(mm)				Layout	Terminal	B/Down
				L	W	H	TH			
30H	30H-750L	750	160	326	172	203	223	11	A	B1
	30H-750	750	160	326	172	203	223	10	A	B1
	30H-830L	830	180	326	172	203	223	11	A	B1
	30H-830	830	180	326	172	203	223	10	A	B1
	30H-900L	900	180	326	172	203	223	11	A	B1
	30H-900	900	180	326	172	203	223	10	A	B1
4D	4D-820	820	270	506	215	213	233	8	A	B0
	4D-920	920	290	506	215	213	233	8	A	B0
	4D-1000	1000	300	506	215	213	233	8	A	B0
	4D-1050	1050	325	506	215	213	233	8	A	B0
8D	8D-1000	1000	350	509	274	220	240	8	A	B0
	8D-1200	1200	430	509	274	220	240	8	A	B0
	8D-1250	1250	430	509	274	220	240	8	A	B0
	8D-1300	1300	440	509	274	220	240	8	A	B0
	8D-1400	1400	460	509	274	220	240	8	A	B0
22F	22F-450	450	75	240	172	180	203	11F	DUAL FIT	B9
	22F-450R	450	75	240	172	180	203	10F	DUAL FIT	B9
	22F-500	500	85	240	172	180	203	11F	DUAL FIT	B9
	22F-500R	500	85	240	172	180	203	10F	DUAL FIT	B9
	22F-550	550	95	240	172	180	203	11F	DUAL FIT	B9
	22F-550R	550	95	240	172	180	203	10F	DUAL FIT	B9
C31	C31-670	670	150	330	172	217	240	18	TOP	B0
	C31-750	750	160	330	172	217	240	18	TOP	B0
	C31-800	800	170	330	172	217	240	18	TOP	B0
	C31-850	850	180	330	172	217	240	18	TOP	B0
	C31-900	900	185	330	172	217	240	18	TOP	B0
	C31-950	950	185	330	172	217	240	18	TOP	B0
	C31-1000	1000	190	330	172	217	240	18	TOP	B0
C31S	C31S-670	670	150	330	172	217	240	18	STUD	B0
	C31S-750	750	160	330	172	217	240	18	STUD	B0
	C31S-800	800	170	330	172	217	240	18	STUD	B0
	C31S-850	850	180	330	172	217	240	18	STUD	B0
	C31S-900	900	185	330	172	217	240	18	STUD	B0
	C31S-950	950	185	330	172	217	240	18	STUD	B0
	C31S-1000	1000	190	330	172	217	240	18	STUD	B0

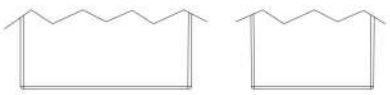
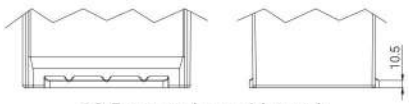
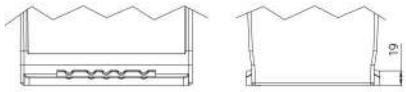
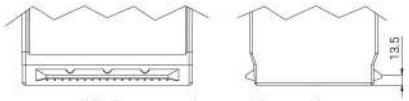
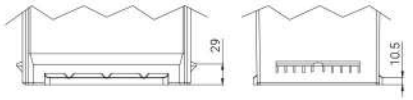
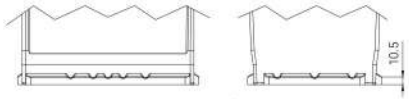
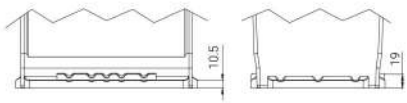
TERMINAL

	A(Standard)	B(Small)	STUD	TOP	DUAL	MARINE TWIN	SIDE
Positive Terminal			 3/8"-16 THREADS			 5/16"-18 THREADS	
Negative Terminal			 3/8"-16 THREADS			 5/16"-18 THREADS	

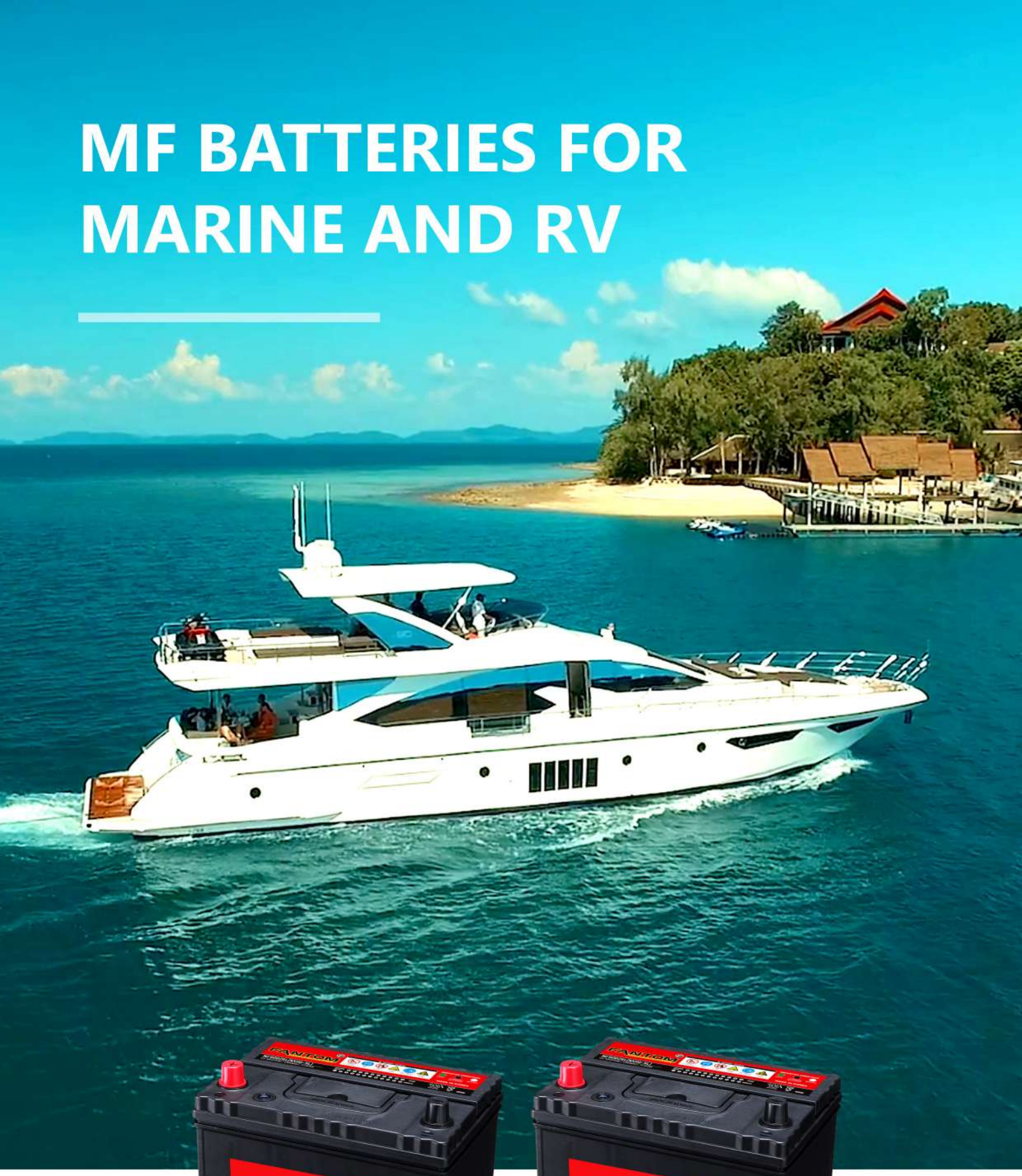
JIS, DIN Cell Layout

0	1	3	4
			

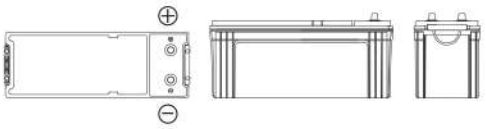
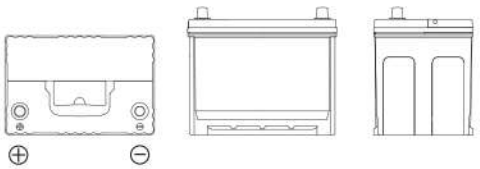
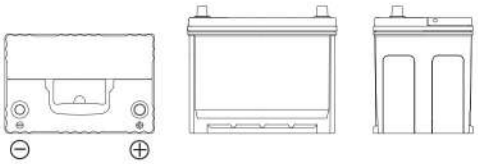
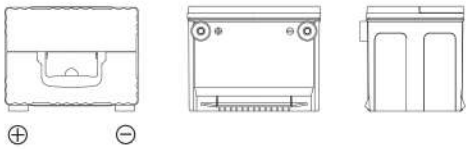
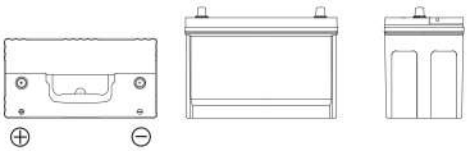
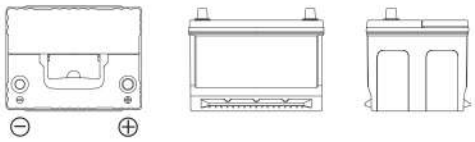
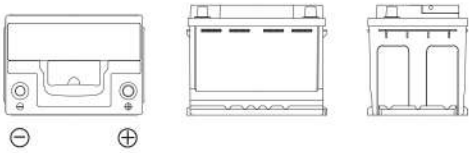
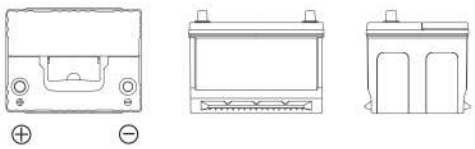
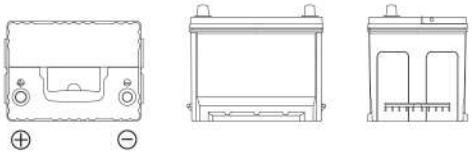
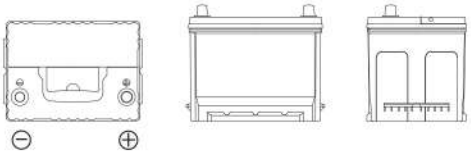
HOLD-DOWN

B0		B1	 10.5mm on long sides only
B4	5 notches  19mm on long sides only	B8	 13.5mm on long sides only
B9	 10.5mm on long sides, 29mm on short sides	B13	5 notches  10.5mm on all four sides
B14	 19mm on long sides, 10.5mm on short sides		

MF BATTERIES FOR MARINE AND RV



BCI Cell Layout

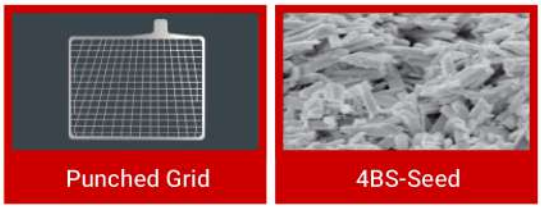
FIG.8		FIG.10	
FIG.11		FIG.17	
FIG.18		FIG.19	
FIG.24		FIG.26	
FIG.10F		FIG.11F	

Construction Features & Benefits

Features	Benefits
Dual Purpose Plate(Starting & Deep Cycling) - Full Frame Grid (Punched Grid)Technology - Special (Thicker) Plate with High Density Active Material - Calcium + High Tin Alloy - Micro Fiber & New Special Tissue - Twin Terminal	Longer Life & High Cycle Stability - Longer life, stable starting power, and secure durability - Flexible design for semi-traction (deep cycling) and starting - Compatibility with TOP and STUD Terminal - Corrosion Resistance due to circulated cycling improvements
Anti-Vibration - Low Resistance Envelope Separator with Non-woven fabric - Hot Melt Glue & Reinforced container	Designed for withstanding the pounding and vibration of marine, 4WD and heavy vehicle application

Special Material

GRID



Calcium-Tin Alloy
- Preventing transformation of grid surface from corrosion
- Reducing self-discharge by chemical bonding with Calcium-Tin alloy

Optimized Mesh Pattern
- Quick transmission of electrical power
- Improvement of charging acceptability

Specialized Processing Methods
- The strong adhesion of active materials by unique designed punched grid
- High durability from poly fleece

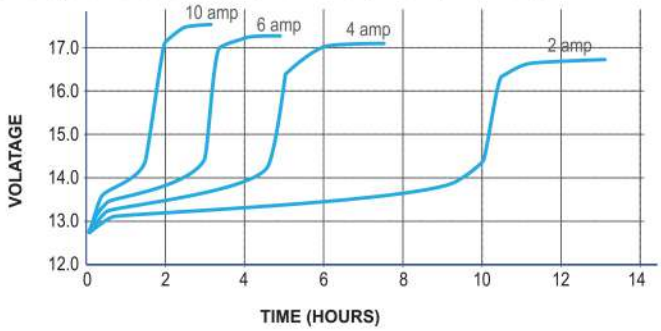
Active Materials
- Stable performance during deep cycle by applying special additives(4BS-Seed) and high-density active materials

Common Structure & Advantage (Marine)

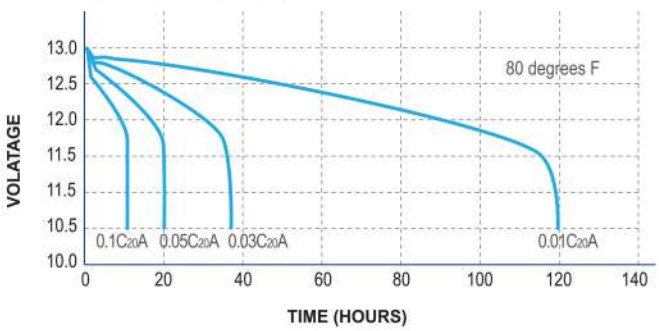
Micro Fiber & Special Tissue
- Enhancing adhesion of Active materials
- Improving starting power and longer service life

Charge and Discharge Characteristics

Charge characteristics from 20% DOD, M31-800 MF



Discarge characteristics



Charging Method

※ Batteries should be recharged within 24hours after each period of use.
※ Charging time by various charging rate can be determined by the the SOC(state of charge)

Method 1 ; Constant Voltage Charge
(Recommended Method)

Type	Voltage Setting
Daily Cycle Service	14.4~14.8
Floating Service	13.2~13.7
Equalizing	15.5

* Unit Average at 77°F (25℃)

※ Every 30 to 90 days, conduct the equalizing charge. Daily cycle service and deep discharging service need more frequent equalizing.

End of charge
- Current : below 1.0A during charge.
- Stabilized open circuit voltage : 12.75V or higher.

Method 2 ; Constant Current charge

Battery		M24-700	M27-750	M31-800
SOC	OCV	3.75A	4.5A	5.0A
100%	12.75V	-		
75%	12.40V	6Hr		
50%	12.20V	12Hr		
25%	12.00V	18Hr		
0%	11.90V	24Hr		

End of charge
- Maximum voltage output across the battery terminals is maintained at constant level for 2 hours during the charge.
- Stabilized open circuit voltage : 12.75V or higher.

Hours of Usable Power(H.U.P)			
Amp.Draw	5A	15A	25A
M24-700	16.0hrs.	4.4hrs.	2.5hrs.
M27-750	17.8hrs.	4.9hrs.	2.7hrs.
M31-800	20.0hrs.	5.6hrs.	3.1hrs.

EFB FOR START AND STOP VEHICLE

- Activate material Particle control
- Low Electrical Resistance Seperator
- Carbon Plus Technology in the negative active material

2 TIMES
higher cycling performance

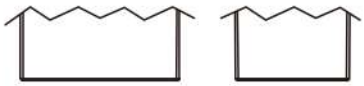
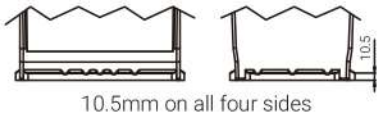
SUPPORTING REDUCED CARBON
dioxide emission

Starting power
UP TO 115%

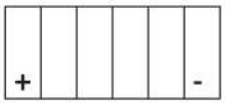
NEARLY 100% RECYCLING
capability of all products

Group	DTR No.	Capacity 20HR	CCA		Dimension(mm)				Layout	Terminal	B/Down
			SAE	EN	L	W	H	TH			
B24	ECN55	45	460		235	127	200	222	0	B	B0
	ECN55R	45	460		235	127	200	222	1	B	B0
D23	ECQ85	65	670		231	172	200	220	0	A	B1
	ECQ85R	65	670		231	172	200	220	1	A	B1
D26	ECS95	68	730		258	172	200	220	0	A	B1
	ECS95R	68	730		258	172	200	220	1	A	B1
D31	ECT110	80	800		303	172	200	220	0	A	B1
	ECT110R	80	800		303	172	200	220	1	A	B1
L2	EC60	60		560	242	173	190	190	0	A	B13
L3	EC70	70		650	276	173	190	190	0	A	B13
L4	EC80	80		730	315	173	190	190	0	A	B13
L5	EC95	95		900	351	173	190	190	0	A	B13

HOLD-DOWN

B0	B1	B13
	 10.5mm on long sides only	5 notches  10.5mm on all four sides

LAYOUT

0	1
	

B19

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
B19	54026	-	187	127	200	222	B0

B24

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
B24	-	-	235	127	200	222	B0

D20

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
D20	55041	21	200	172	200	220	B1

D23

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
D23	-	35	231	172	200	220	B1

D26

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
D26	-	24	258	172	200	220	B1

D31

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
D31	60045	27	303	172	200	220	B1

D33

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
D33	-	-	326	172	203	223	B0

E41

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
E41	-	-	408	172	210	230	B0

F51

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
F51	-	-	506	182	213	233	B0

G51

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
G51	-	-	506	215	213	233	B0

H52

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
H52	-	-	509	274	220	240	B0

L1

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	L1	-	207	173	190	190	B13

L2

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	L2	47	242	173	190	190	B13

L3

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	L3	48	276	173	190	190	B13

L4

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	L4	-	315	173	190	190	B13

L5

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	L5	49	351	173	190	190	B13

LB1

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	LB1	-	207	173	175	175	B13

LB2

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	LB2	90	242	173	175	175	B13

LB3

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	LB3	91	276	173	175	175	B13

LB4

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	LB4	92	315	173	175	175	B13

LB5

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	LB5	93	351	173	175	175	B13

A

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	A	-	514	189	196	215	B0

B

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	B	-	514	223	196	215	B0

C

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	C	-	518	273	216	235	B0

26

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	26	208	172	181	201	B1

85

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	85	231	172	180	200	B1

C31

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	C31	330	172	217	240	B0

65

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	65	287	187	172	192	B8

75

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	75	230	179	181	181	B1

75DT

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	75DT	230	179	181	201	B1

34

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	34	260	172	181	201	B1

78

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	78	260	179	181	181	B1

78DT

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	78DT	260	179	181	201	B1

58

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	58	234	182	157	177	B8

M24

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	M24	258	172	200	221	B1

M27

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	M27	303	172	200	221	B1

M31

JIS	DIN	BCI	Dimension(mm)				HOLD DOWN
			L	W	H	TH	
-	-	M31	330	172	217	238	B0

BATTERY SERVICE MANUAL

Handling the battery in stock

- A wet-charged battery will be discharged by itself even under not-in-use condition.
  Keep the battery in a dark, cool place and measure the open circuit voltage once a month.
- When the open circuit voltage is below 12.4V/25˚C, carry out an auxiliary charge, following the procedure described in para.3.
- If the battery has been left for a long period at a low open circuit voltage, battery will be sulfated and the battery cannot be fully recharged, or at the worst, cannot be recharged at all.

Before selling to consumer

- Usually a storage battery will not have full capacity because of self-discharge
- Therefore before selling, we recommend to following the procedure in para.3 to recover the amount of capacity which has discharged during transportation and storage.

Charge

Constant current charge

- Charge the battery at a constant current 1/10 of its 20 hours rate capacity until three or more consecutive reading figures of the terminal voltage are the same.
- This method is very effective when the discharged ampere-hour of the battery is measured because the charging rate can be determined before charging. Typically 120 to 130% volume of discharged ampere-hour will be charged. Do not forget to disconnect the charging power source when the battery is completely charged. If not it will continue feeding the same amount of current to the battery resulting in the overcharge of the battery

External environment

- Perform charging at a place which is free from direct sunshine, rain, dew, moisture, but well ventilated, acid proof, washable and well drained.
- Connect the charger terminals to the battery terminals tightly and correctly. Incorrect connection will deteriorate the functions, and may cause damage to not only the battery but also the charger.
- Have a good judgement at the end of charging. Do not overcharge. Excessive charge may cause overcharging, resulting in damaged plates and separators and distortion of softening container due to high temperature.
- Never bring the battery close to fire: Explosive hydrogen and oxygen gas from the battery will catch fire.
- Keep battery temperature below 45˚C. When it reaches near such temperature, decrease the charging current by half or stop charging until the fluid goes down to 35˚C.

Charging indicator

- The indicator on the lid of the battery can help to check the charging status of the battery.

STATE OF CHARGE

Approximate Sate of Charge	OCV
100%	12.75
75%	12.40
50%	12.20
25%	12.00
Discharged	11.90

Safety precautions

- Batteries are dangerous to handle or work on. They are filled with dilute sulfuric acid. If the electrolyte gets on your skin or cloth, flush with plenty completely clean water and take medical care immediately.
- Never bring cigarettes, flames or sparks near the battery.
- It may produce explosive hydrogen and oxygen gas when charging.
- Keep battery cover clean so that the holes in the vent plugs are free from clogging materials. Clogged up battery will have high internal pressure which may crack the container or leak electrolyte out of sealed portion.
- Battery should not be put at sealed location in any conditions. Especially, when charging, please do it in well-ventilated place.
- Jump start by booster cable should be done in accordance with following method to prevent explosion of battery.
  There is still energy left of used battery. Please be careful with spark, short circuit, flow of battery electrolyte.
- Please refrain from dismantlement of battery since it is too dangerous.
- This battery is designed and manufactured in accordance with conditions of vehicle operations. Please note that prescribed performance of battery can not be obtained when battery is used for other equipment

Safety labeling

- Each battery is marked with six kinds of symbols as follows. The meanings of the symbols are:

WWW.FANTOMBATTERIES.COM

FANTOM

SEALED MAINTENANCE FREE CALCIUM BATTERY

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WORLD INVESTMENTS

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