



# YFT Batteries

*Technical manual 75 Ah à 200 Ah*

Valve regulated lead acid batteries

YFT

# YFT battery range

Yuasa's YFT range of stationary gas-recombination valve-regulated lead-acid batteries (VRLA) offers capacities from 75 to 200 Ah and features front access to terminals.

## General characteristics

- Front access to terminals
- Quick, safe installation
- Easy to maintain
- Ideal for 48 V and other systems
- In 19" or 23" racks or site cabinets
- VRLA battery with electrolyte immobilisation system (AGM)
- Over 99% gas recombination
- ABS UL94 HB container
- Series and parallel configuration
- High yield lead-calcium plates
- Long service life
- Low self-discharge / long storage life
- Wide operating temperature range
- Use in floating or cycling operation
- Good discharge and quick charge performance
- Good recovery after deep discharge

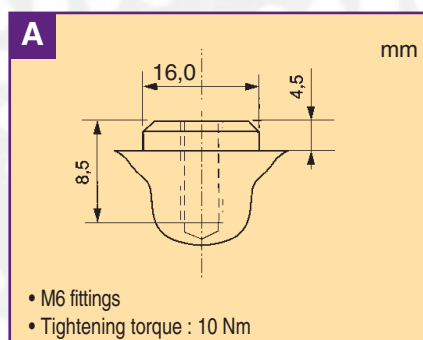
## Specifications

Type of Battery	Nominal voltage (V)	Capacity		Length (mm)	Width (mm)	Height incl. terminals (mm)	Weight (Kg)	Terminals (below)	Maximum current in 1 min (A)	Maximum current in 1 sec. (A)	Internal impedance (mΩ)**
		10h* (Ah)	20h* (Ah)								
YFT75-12	12	79	80	564	114	187	26	A	485	1150	5,4
YFT100-12	12	106	112	508	110	238,5	35,6	A	700	1300	4,6
YFT150-12	12	161	166	548	110	286	46	A	950	1800	3,2
YFT200-12	12	210	216	560	126	280	56	A	1200	2000	2,5

\* : Final voltage 1,75 V per cell - Temperature 20°C

\*\* : Battery charged, measured at 1000 Hz

## Terminals



# Performance for constant current discharge

Discharge current (Amp) for a final voltage of 1,6 V per cell, at 20°C

Type of Battery	AUTONOMY														
	Minutes						Hours								
	5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
YFT75-12	212	167	130	108	79,7	59,2	47,2	27,4	19,9	15,9	13,2	11,5	9,03	7,40	3,86
YFT100-12	303	239	186	155	114	84,6	67,5	39,2	28,1	22,5	18,5	16,2	12,6	10,5	5,51
YFT150-12	447	353	275	228	168	125	99,5	57,2	41,5	33,2	27,6	23,8	18,6	15,3	7,96
YFT200-12	497	392	305	254	187	139	111	64,2	46,6	37,3	31,0	27,0	21,2	17,3	9,04

Discharge current (Amp) for a final voltage of 1,67 V per cell, at 20°C

Type of Battery	AUTONOMY														
	Minutes						Hours								
	5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
YFT75-12	199	159	126	104	77,8	57,7	46,0	27,0	19,5	15,6	12,9	11,3	8,83	7,27	3,84
YFT100-12	284	228	179	148	111	82,4	65,7	38,5	27,7	22,2	18,3	16,1	12,5	10,3	5,48
YFT150-12	419	336	265	219	164	122	97,0	56,2	40,7	32,5	26,9	23,4	18,2	15,0	7,92
YFT200-12	466	373	294	243	182	135	108	63,2	45,7	36,5	30,2	26,6	20,7	17,0	8,99

Discharge current (Amp) for a final voltage of 1,7 V per cell, at 20°C

Type of Battery	AUTONOMY														
	Minutes						Hours								
	5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
YFT75-12	188	154	122	102	76,8	57,5	45,8	26,9	19,4	15,5	12,8	11,2	8,71	7,20	3,82
YFT100-12	269	220	175	145	110	82,1	65,5	38,4	27,7	22,1	18,2	16,0	12,4	10,2	5,45
YFT150-12	396	324	258	214	162	121	96,6	56,1	40,4	32,3	26,6	23,1	18,0	14,9	7,88
YFT200-12	440	361	287	238	180	135	107	63,0	45,4	36,3	29,9	26,2	20,4	16,9	8,94

Discharge current (Amp) for a final voltage of 1,75 V per cell, at 20°C

Type of Battery	AUTONOMY														
	Minutes						Hours								
	5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
YFT75-12	172	144	116	97,7	74,6	56,2	45,2	26,5	19,2	15,4	12,7	11,1	8,59	7,13	3,79
YFT100-12	245	206	166	140	107	80,3	64,6	37,9	27,4	22,0	18,1	15,8	12,3	10,2	5,41
YFT150-12	362	303	245	206	157	118	95,3	55,3	40,0	32,1	26,5	22,8	17,7	14,7	7,82
YFT200-12	402	337	272	229	175	132	106	62,1	45,0	36,0	29,7	25,9	20,1	16,7	8,88

Discharge current (Amp) for a final voltage of 1,8 V per cell, at 20°C

Type of Battery	AUTONOMY														
	Minutes						Hours								
	5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
YFT75-12	151	131	107	91,6	71,0	54,1	43,7	26,0	18,9	15,0	12,4	10,9	8,49	7,05	3,73
YFT100-12	216	187	153	131	101	77,3	62,4	37,2	27,0	21,4	17,7	15,6	12,1	10,1	5,33
YFT150-12	318	276	226	193	150	114	92,0	54,2	39,4	31,3	25,9	22,5	17,5	14,5	7,71
YFT200-12	354	307	252	215	166	127	102	60,9	44,3	35,1	29,1	25,5	19,9	16,5	8,75

Discharge current (Amp) for a final voltage of 1,85 V per cell, at 20°C

Type of Battery	AUTONOMY														
	Minutes						Hours								
	5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
YFT75-12	130	116	96,4	82,7	64,9	50,3	40,9	24,6	17,7	14,3	11,8	10,4	8,08	6,74	3,57
YFT100-12	185	165	138	118	92,7	71,9	58,4	35,2	25,3	20,4	16,9	14,8	11,5	9,6	5,10
YFT150-12	273	244	203	174	137	106	86,2	51,4	37,0	29,7	24,6	21,4	16,7	13,9	7,37
YFT200-12	304	271	226	194	152	118	95,8	57,8	41,6	33,4	27,6	24,3	18,9	15,8	8,36

# Performance for constant power discharge

Discharge power (Watt) per cell for a final voltage of 1,6 V, at 20°C

Type of Battery	AUTONOMY														
	Minutes						Hours								
	5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
YFT75-12	353	288	231	196	147	111	89,7	52,6	38,4	30,9	25,8	22,6	17,8	14,7	7,67
YFT100-12	504	411	330	281	210	159	128	75,1	54,3	43,6	36,1	31,7	24,8	20,8	11,0
YFT150-12	743	607	486	414	310	234	189	110	80,1	64,5	53,8	46,6	36,8	30,3	15,8
YFT200-12	826	675	540	460	344	260	210	123	89,9	72,4	60,4	52,9	41,7	34,4	18,0

Discharge power (Watt) per cell for a final voltage of 1,67 V, at 20°C

Type of Battery	AUTONOMY														
	Minutes						Hours								
	5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
YFT75-12	343	282	227	191	145	109	88,3	52,2	37,9	30,4	25,3	22,2	17,5	14,5	7,64
YFT100-12	490	402	324	272	207	156	126	74,5	53,8	43,3	35,8	31,6	24,8	20,5	10,9
YFT150-12	722	594	478	402	306	231	186	109	79,0	63,5	52,7	45,9	36,1	29,8	15,8
YFT200-12	803	660	531	447	340	256	207	122	88,7	71,3	59,2	52,1	40,9	33,9	17,9

Discharge power (Watt) per cell for a final voltage of 1,7 V, at 20°C

Type of Battery	AUTONOMY														
	Minutes						Hours								
	5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
YFT75-12	327	273	222	188	144	109	88,1	52,1	37,7	30,2	25,0	22,0	17,3	14,3	7,61
YFT100-12	468	390	317	268	205	156	126	74,4	53,9	43,2	35,7	31,5	24,6	20,4	10,9
YFT150-12	690	576	468	396	303	231	186	109	78,7	63,1	52,2	45,5	35,6	29,6	15,7
YFT200-12	767	640	520	440	337	256	207	122	88,4	70,9	58,6	51,6	40,5	33,6	17,8

Discharge power (Watt) per cell for a final voltage of 1,75 V, at 20°C

Type of Battery	AUTONOMY														
	Minutes						Hours								
	5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
YFT75-12	308	261	214	182	140	107	87,3	51,5	37,4	30,1	24,9	21,8	17,0	14,2	7,56
YFT100-12	439	373	305	260	201	153	125	73,5	53,5	43,0	35,6	31,2	24,4	20,3	10,8
YFT150-12	648	551	451	383	296	226	184	107	78,1	62,8	52,0	45,1	35,2	29,3	15,6
YFT200-12	721	612	501	426	329	251	204	121	87,7	70,5	58,4	51,1	39,9	33,3	17,7

Discharge power (Watt) per cell for a final voltage of 1,8 V, at 20°C

Type of Battery	AUTONOMY														
	Minutes						Hours								
	5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
YFT75-12	276	242	200	172	135	104	84,6	50,7	37,0	29,5	24,5	21,6	16,9	14,1	7,46
YFT100-12	394	346	286	246	192	149	121	72,4	52,8	42,1	35,0	30,8	24,1	20,1	10,7
YFT150-12	582	510	421	362	284	220	178	106	77,2	61,5	51,0	44,5	34,8	29,0	15,4
YFT200-12	647	567	468	403	316	244	198	119	86,7	69,0	57,3	50,5	39,5	33,0	17,5

Discharge power (Watt) per cell for a final voltage of 1,85 V, at 20°C

Type of Battery	AUTONOMY														
	Minutes						Hours								
	5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
YFT75-12	241	216	182	158	125	97,7	79,7	48,4	34,9	28,2	23,4	20,6	16,1	13,5	7,14
YFT100-12	344	309	260	225	179	140	114	69,1	49,9	40,2	33,4	29,4	23,0	19,2	10,2
YFT150-12	508	455	383	332	263	206	168	101	72,9	58,7	48,7	42,5	33,3	27,8	14,7
YFT200-12	565	506	426	369	293	229	187	113	81,9	66,0	54,7	48,3	37,7	31,6	16,7

# Charging

The performance and service life of the batteries depend directly on the efficiency of charging.

## Floating charge

To recharge and correctly maintain the charge of these batteries, we recommend charging at a constant voltage of 2,275 V  $\pm$  1% per cell (at 20°C). At this voltage there is no need to limit the charge current. The batteries will limit the current peak ( $3 \times C_{10}^*$ ) at the start of charging.

The ripple current must be no more than  $0,05 C_{10}^*$ .

Note that for batteries connected in series, the floating voltages for each self-contained battery may vary due to gas recombination.

A dispersion of +6% / -3% may be observed at the start of the batteries' life, dropping to  $\pm$  2% after 6 months of use.

## Fast charge

For faster charging, charge at a constant voltage of 2,35 V to 2,50 V  $\pm$  1% per cell.

Precautions to avoid over-charging :

- At this voltage level the charge current must be limited to  $0,25 C_{10}^*$ .
- The fast charge should not last more than 20 hours or should be stopped to resume floating charge once the charge current drops to below  $0,07 C_{10}^*$ .

## Charging time

For a charge limited to  $0,1 C_{10}^*$  or  $0,25 C_{10}^*$ , fully discharged batteries (100% deep discharge) will take approximately 72 hours to recharge with a floating charge.

With a quick charge, fully discharged batteries cannot be recharged in less than 4 hours.

Figures 1, 2, 3 and 4 show the voltage, current and charge volume of the batteries as a function of time, for different charge methods.

Note that the charge volume :

- must reach 110 to 115% charge to obtain 100% available capacity.
- will be greater, for a given time, at high temperatures and less at low temperatures.

\* :  $C_{10}$  represents the battery capacity at 10 hours (final voltage = 1,75 V/cell)

## Floating charge at constant voltage

2,275V/cell / current limit :  $0,1 C_{10}$

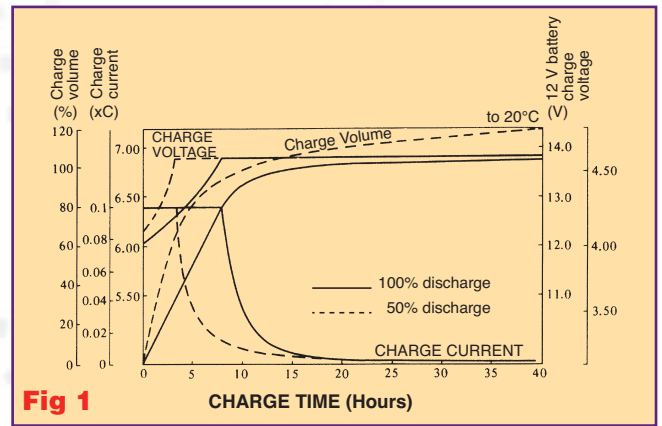


Fig 1

## Floating charge at constant voltage

2,275V/cell / current limit :  $0,25 C_{10}$

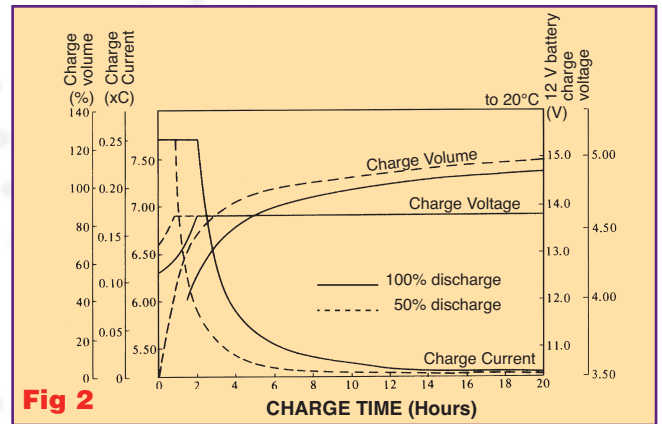


Fig 2

## Fast charge at constant voltage

2,4V/cell / current limit :  $0,1 C_{10}$

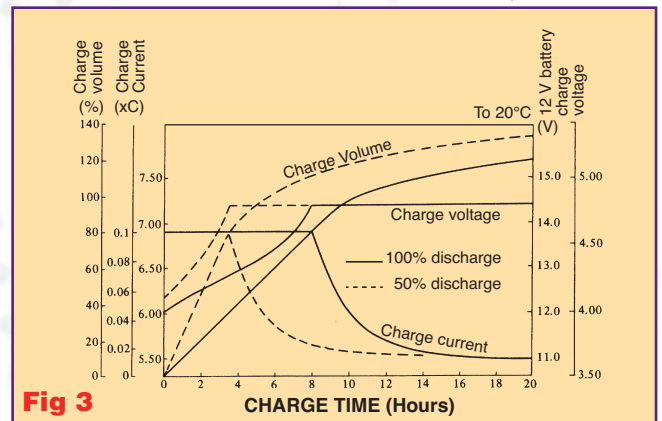


Fig 3

## Fast charge at constant voltage

2,5V/cell / current limit :  $0,25 C_{10}$

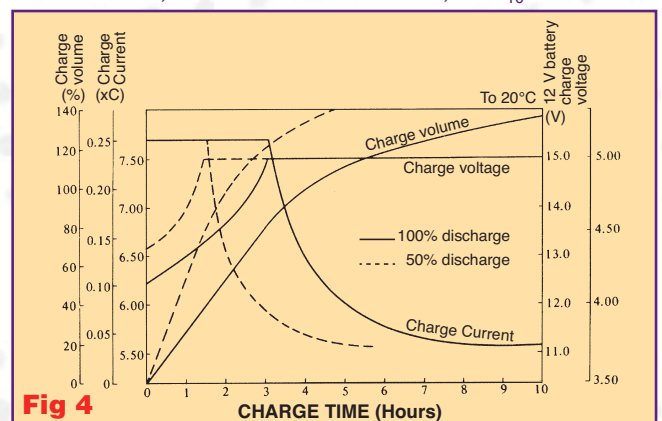


Fig 4

## Temperature compensation

In order to optimise the service life of batteries, it is important to avoid over-charging at high temperatures (risk of thermal runaway) or under-charging at low temperatures. For outdoor use, for example, the floating charge voltage should be compensated by  $-3 \text{ mV}/^\circ\text{C}$  for temperatures above  $25^\circ\text{C}$  and  $+3 \text{ mV}/^\circ\text{C}$  for temperatures below  $15^\circ\text{C}$  (central point  $2,275 \text{ V/cell}$  at  $20^\circ\text{C}$ ). charging should preferably be stopped at  $45^\circ\text{C}$  (upper limit  $+50^\circ\text{C}$ ).

If the batteries are at constant temperature (for example in indoor use) and the charger is not compensated, adjust the floating voltage as a function of the battery temperature.

## Discharge

### Battery selection

The tables on pages 2 and 3 can be used to select batteries depending on the discharge power or current (at  $20^\circ\text{C}$ ) and desired autonomy.

Recharge batteries as soon as possible after any discharge.

### Final voltage / deep discharge

Figure 5 shows how battery voltage varies depending on discharge rates and times (autonomy).

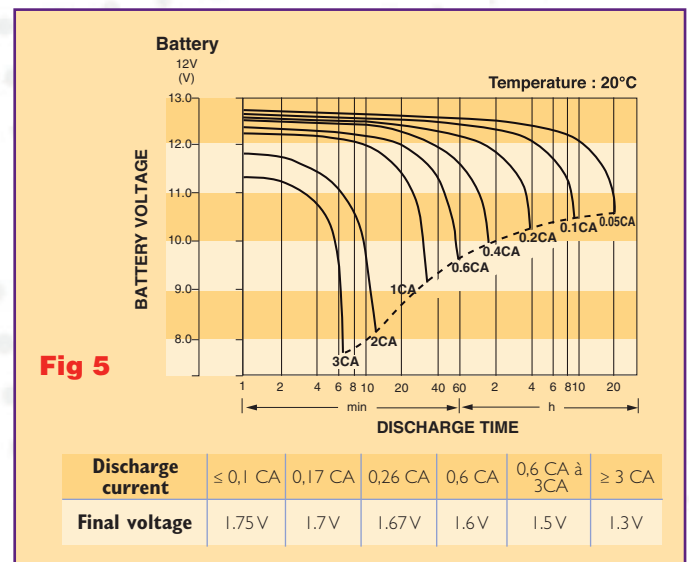
The dotted line shows the minimum recommended discharge voltage. To avoid deep discharge and deterioration of the batteries by sulphatation of the plates, do not go below this final voltage.

If batteries are accidentally discharged below this limit, recharge them as soon as possible.

### Capacity and temperature

Battery capacity varies with temperature. The table below shows the correction coefficients to be applied to the capacity as a function of temperature, which should be taken into account when selecting a battery.

### Discharge curves



Temperature ( $^\circ\text{C}$ )	-20	-15	-10	-5	0	+5	+10	+15	+20	+25	+30	+35	+40	+45	+50
Coefficient	0,65	0,67	0,73	0,78	0,84	0,89	0,94	0,97	1,00	1,02	1,05	1,07	1,09	1,10	1,11

# Self-discharge

The self-discharge rate for YFT batteries is approximately 3% per month when stored at 20°C. The self-discharge rate increases with temperature (see fig. 6)

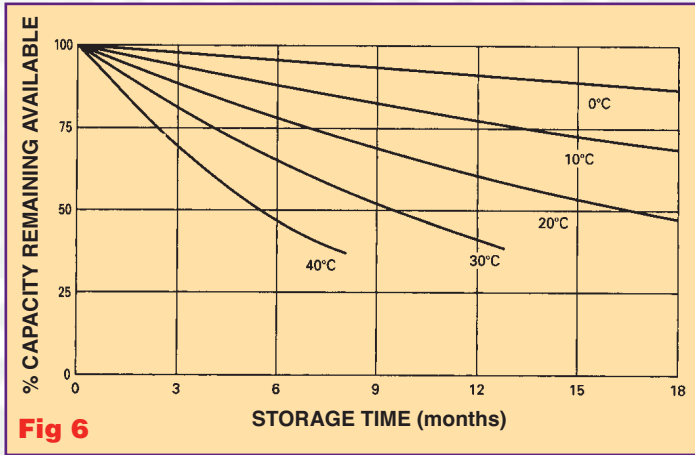
Batteries should be stored in a cool, dry place. Storage times should be limited to avoid any deterioration of the battery or difficulty in recharging.

The table below shows the maximum storage time as a function of temperature.

STORAGE TEMPERATURE	MAXIMUM STORAGE TIME
0°C à 25°C	12 months
25°C à 30°C	9 months
31°C à 40°C	5 months
41°C à 50°C	2,5 months

If the storage limits are reached, batteries must be recharged at 2,4 V/cell. (current limited to 0,25 C10) for 24 hours in order to compensate for the loss of capacity due to self-discharge.

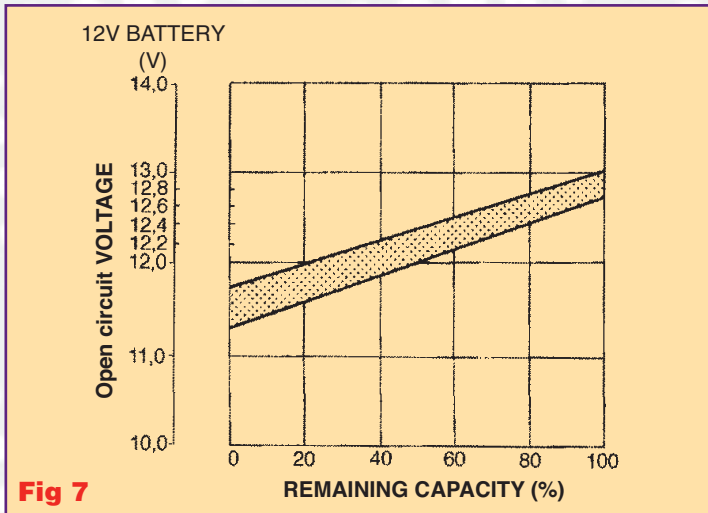
## Self-discharge



# Open circuit voltage and capacity

The remaining capacity of a battery can be determined empirically by measuring its open circuit voltage after at least 24 hours of non use (see fig. 7).

## Open circuit voltage and remaining capacity



# Service life with floating charge

YFT batteries are designed to operate for 10 years with floating charge and under normal usage conditions :

- Floating voltage : 2,275V/cell (at 20°C).
- Temperature less than or equal to 20°C.
- Use for battery backup (fully discharged approx. every three months).

Figure 8 shows how capacity varies over time.

It should be noted that the service life of the batteries is directly affected by :

- Battery temperature (see fig.9). The service life is halved for every 10°C above 20°C. Note that the loss of service life can be reduced by 20% by compensating the floating voltage as a function of temperature.
- Floating voltage (see fig.10).
- Number of discharges.
- Discharge depth and failure to stop at the specified final voltage.
- Poor charge current quality.



## Service life with floating charge at 20°C

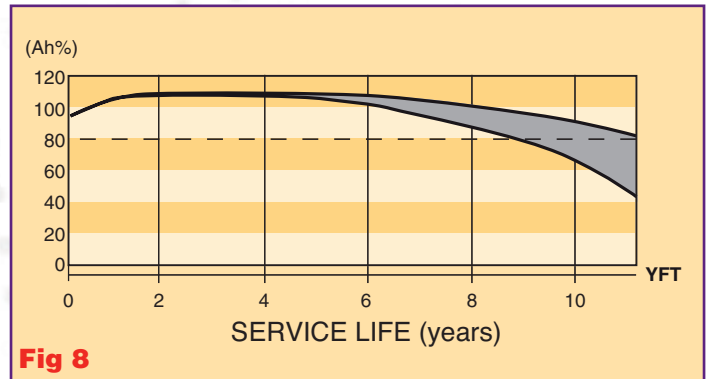


Fig 8

## Service life and temperature

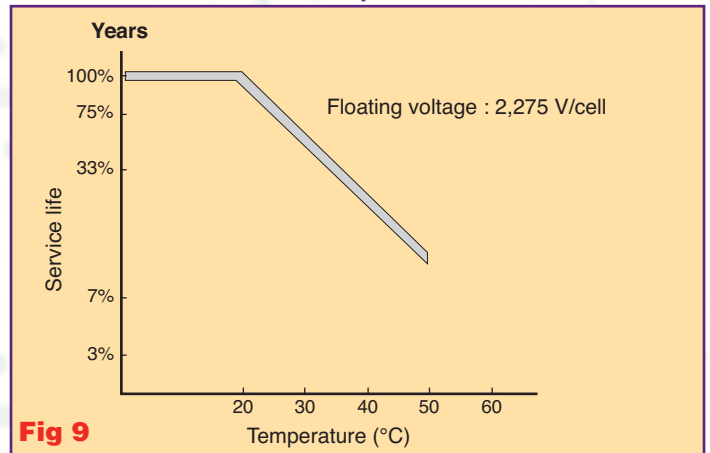


Fig 9

# Temperature

For charging :  
20°C recommended, limit of -15°C to +50°C.

For discharging :  
20°C recommended, limit of -15°C to +60°C.

For storage :  
0 to 20°C recommended, limit of -20°C to +50°C.

## Service life and floating voltage

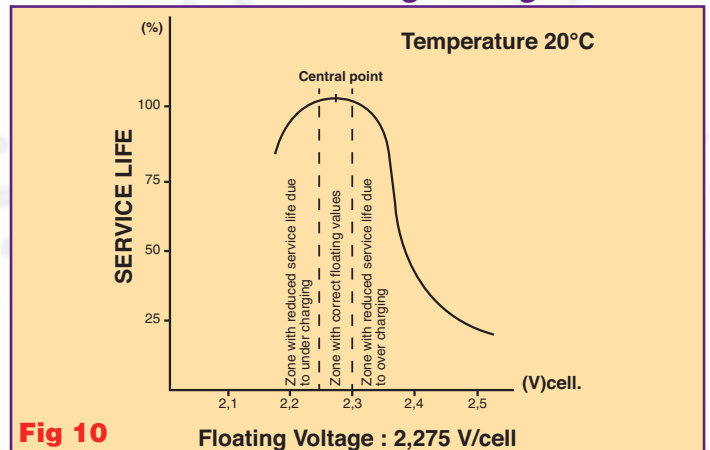


Fig 10



# Standards

YFT batteries comply with or are compatible with the following standards : IEC 896-2, UL 94 HB, IEC 61056, UL MH 28018. They are manufactured using an ISO 9001:2000 quality system.

# Transport

IATA classification : class 8, group 3, UN 2800 **A67** (non-hazardous goods).

# Usage recommendations

Persons handling the batteries must be qualified to work with live electrical equipment (in accordance with UTE C 18-510 in France or equivalent standards).

Terminals must never be short-circuited. Insulated tools which meet applicable standards must be used.

Batteries must not be used in an enclosed space. Natural ventilation is required, in compliance with standard EN 50272-2 or NFC 15-100.

We recommend leaving a gap of 5 to 10 mm between batteries to allow for ventilation and avoid heat dissipation.

Safety cabling must be used if several self-contained batteries are to be connected together, avoiding high voltages between adjacent terminals, and any risk of electric shock.

The cross-section and length of the connectors must be appropriate for the maximum current.

Tighten terminals to the specified torque (see page 3).

Although the batteries are supplied charged, we recommend recharging them with a floating charge for 72 hours before any discharge.

# Installation

Our commercial and technical services are at your disposal for any further information and quotations for :

- Supply of batteries in cabinets or on wooden or metal stands, with appropriate connection equipment, accessories and wiring diagrams.
- On site installation and wiring by qualified and authorised installers.



# Environnement

Used batteries must be recovered and recycled in accordance with applicable directives.

The WEEE directive and batteries directive are applicable within EC countries.

# Servicing

Ensure that batteries and connectors are kept clean.

Clean batteries with a damp cloth. Do not use solvents.

Every three months, check that the total battery voltage is equal to  $2,275 \text{ V} \times \text{N}$  cells in series for a temperature of  $20^{\circ}\text{C}$ .

Every year, check the individual voltages of each self-contained battery. Dispersion of + or - 2% due to gas recombination may be observed.

An annual battery life test may be performed, either by discharging or by measuring the impedance.

Do not suspend batteries by their handles.



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