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World Class Charging Systems



TEBETRON Puls

Economical Charging System
for Traction Batteries



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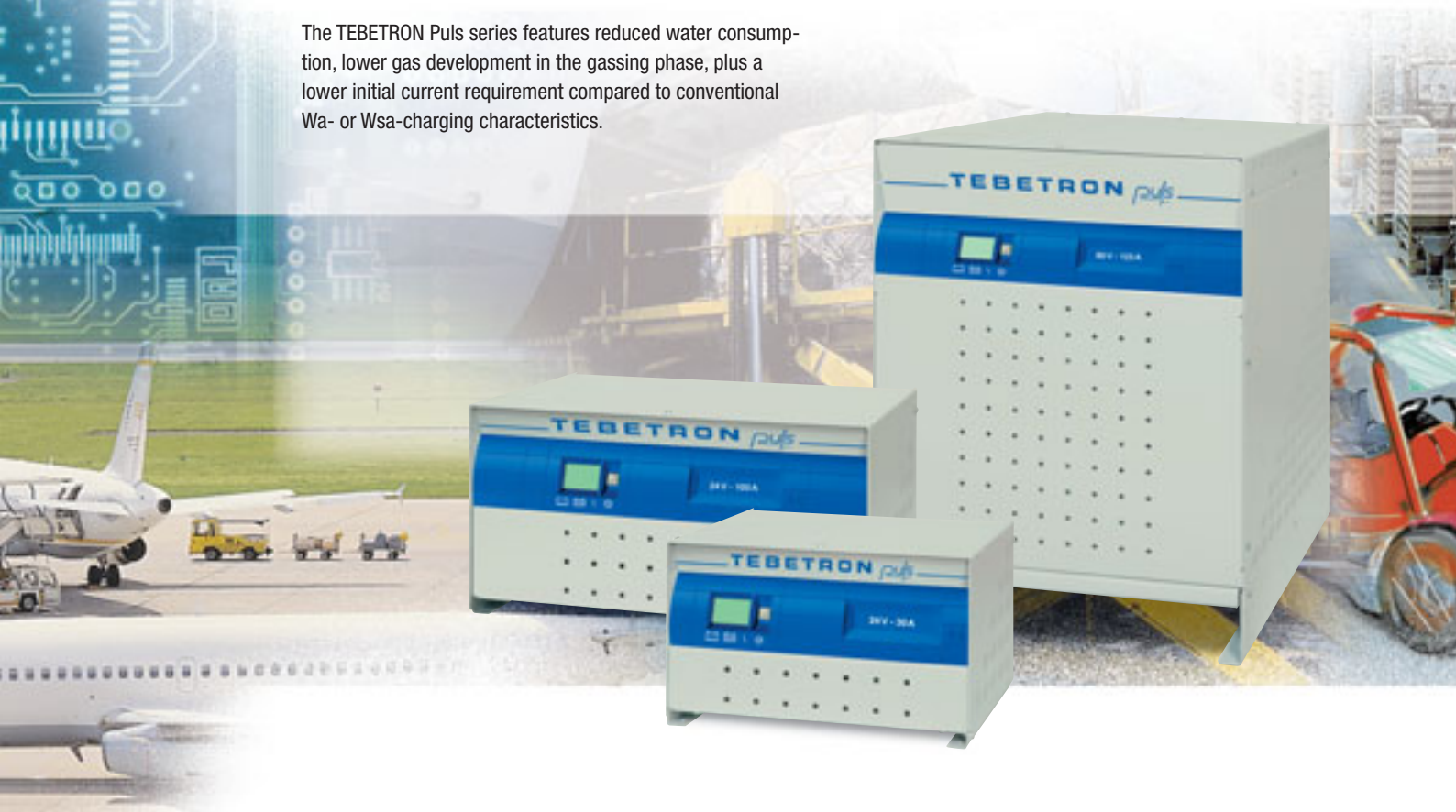
Economical Charging System for Traction Batteries

During its many years of operation, the TEBETRON Puls series has been characterised by both high reliability and optimum economy.

The well-established Puls curve based on a Wa-curve is used as the standard charging characteristic.

The TEBETRON Puls series features reduced water consumption, lower gas development in the gassing phase, plus a lower initial current requirement compared to conventional Wa- or Wsa-charging characteristics.

The well-known reliability and thus high availability are the result of our many years of experience designing many types of battery charging systems. The TEBETRON Puls series is therefore one of the most economical charging systems on the market.



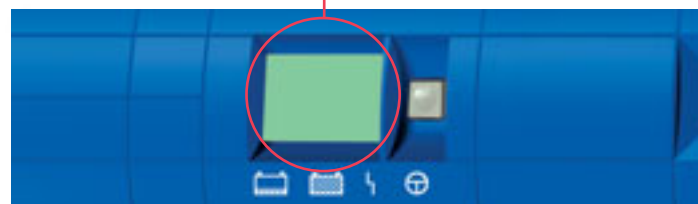
Special features

- Modern Puls charging system for lead acid batteries
- Recharge time between 6,5 – 14 h
- Lower water consumption of the battery and thus reduced maintenance (Low Maintenance)
- Less gas development in the gassing phase, calculation according ZVEI data sheet "ventilation of the battery rooms for batteries"
- Automatic charging process, automatic equalizing charge
- Energy saving and battery protection by variable recharge time (increase life time of the battery)
- Simple operation, charging starts automatically, "switch on" can't be forgotten
- Additional facilities available:
 - Electrolyte circulation
 - Automatic water topping up
- Easy to service due to simple and partly automatic features of the control electronics, no software or special tools necessary

Huge status light

The unique status light offers the increased visibility of the state of the charger from substantial distances, especially in large installations or charging rooms. The actual status of the charging process is clearly visible.

Green = charge complete



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Puls-Wa-characteristic

The TEBETRON Puls charging process corresponds to a Wa-Puls-characteristic. In the bulk charge phase as well as in the gassing phase the charging curve follows a Wa-characteristic, i.e. the current falls with rising battery voltage. Compared to a standard Wa-curve the gassing phase is shorter. Using this technology, the electrolyte is mixed through the use of current pulses during the gassing phase. With TEBETRON Puls chargers the gas development in the gassing phase is approximately 50 % less compared to chargers with Wsa- or Puls-Wsa-characteristic.

Thus the charging factor of the battery amounts to only 8 - 10 %. This leads to a lower temperature rise in the battery and thus to a smaller water consumption. Thereby maintenance costs for the battery are reduced by up to 50 %.

The Pulse-Wa-characteristic allows selection of a smaller initial charging current compared with conventional battery chargers with DIN-Wa characteristic or Wsa-characteristic. This leads to selection of a charger size one or two steps lower than normal to charge a specific capacity within a given time.

Benefits of Puls Technology

- Reduction of the battery maintenance times due to smaller temperature rise and thus smaller water consumption
- The ventilating system in charging rooms can be designed up to 50 % smaller compared with the Wsa- or Pulse-Wsa-characteristic
- Less investment costs (no air pump necessary)
- No hose systems on the battery
- Use of standard DC plugs
- Energy saving through a low charging factor of the battery (approx. 1,08 - 1,10)

Combination with air pump for opportunity charges and charging times up to 6,5 h is possible.

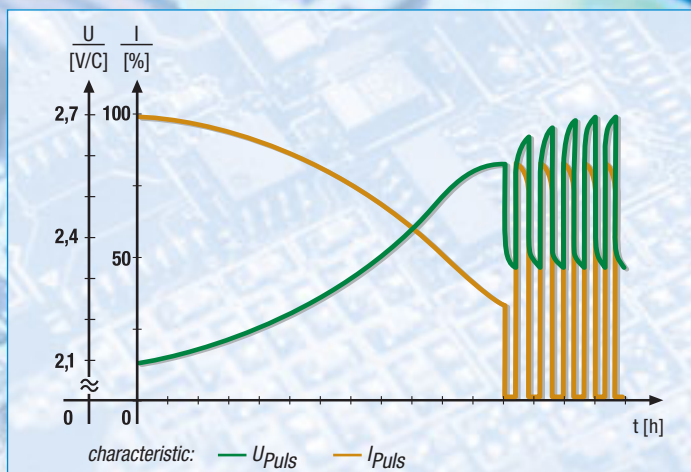
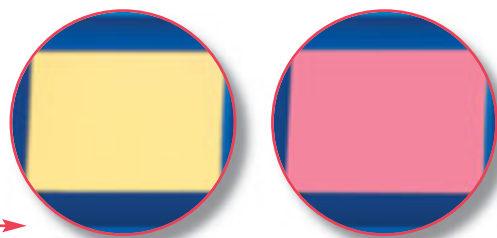


Fig. 1: Wa-Puls-characteristic

Yellow = charge

Red = fault



24 V - 100 A

Electrolyte Circulation

The TEBETRON Puls chargers can be fitted with air pump equipment to assist in electrolyte circulation. The pump is necessary for opportunity charges and further reduction of the charging time.

The electronic board is controlling the pulse cycles. Thereby the charging time will be reduced approx. 0,75 h.

Advantages of electrolyte circulation

- Reduced charging time (approx. 0,75 h shorter compared with standard allocation)
- Opportunity charge
- Energy saving
- Reduced water usage
- Decreased cell temperature



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Type table TEBETRON Puls

Output-voltage	Battery capacity [Ah]* (with EC, charging time approx. 0,75 h shorter)			Nom. output current	Nom. input voltage	Mains fuse	Cabinet	Weight	Type
	charging time	charging time	charging time						
	7,5-8,5 h	9-11 h	12-14 h						
[V]				[A]	[V]	[A]		[kg]	
12 / 24		70 - 84	90 - 110	10	230	16	FWT 1	10	E 230 G 24 / 10 B-FTP
	85 - 105	110 - 130	145 - 180	16	230	16	FWT 1	12	E 230 G 24 / 16 B-FTP
	110 - 130	140 - 168	180 - 220	20	230	16	FWT 1	13	E 230 G 24 / 20 B-FTP
	140 - 165	180 - 210	220 - 275	25	230	16	FWT 1	14	E 230 G 24 / 25 B-FTP
	160 - 180	210 - 250	275 - 330	30	230	16	FWT 1	20	E 230 G 24 / 30 B-FTP
	190 - 230	250 - 290	315 - 385	35	230	16	FWT 2	23	E 230 G 24 / 35 B-FTP
	220 - 260	290 - 330	350 - 440	40	230	16	FWT 2	24	E 230 G 24 / 40 B-FTP
	250 - 300	320 - 375	420 - 500	45	230	16	FWT 2	28	E 230 G 24 / 45 B-FTP
	275 - 330	360 - 420	450 - 550	50	230	16	FWT 2	30	E 230 G 24 / 50 B-FTP
	330 - 400	430 - 500	540 - 660	60	230	16	FWT 2	30	E 230 G 24 / 60 B-FTP
	384 - 465	500 - 575	630 - 775	70	230	16	FWT 2	31	E 230 G 24 / 70 B-FTP
	440 - 530	575 - 660	720 - 880	80	230	16	FWT 2	36	E 230 G 24 / 80 B-FTP
	500 - 600	650 - 750	810 - 1000	90	230	16	FWT 2	38	E 230 G 24 / 90 B-FTP
	550 - 660	720 - 825	900 - 1100	100	400	16	FWT 2	40	D 400 G 24 / 100 B-FTP
	675 - 825	860 - 1035	1120 - 1350	125	400	16	FST 1	55	D 400 G 24 / 125 B-FTP
	825 - 1000	1050 - 1250	1360 - 1600	150	400	20	FST 1	70	D 400 G 24 / 150 B-FTP
930 - 1125	1250 - 1400		170	400	16	FST 1	85	D 400 G 24 / 170 B-FTP	
1050 - 1260	1400 - 1550		190	400	16	FST 1	105	D 400 G 24 / 190 B-FTP	
48	85 - 105	110 - 130	145 - 180	16	230	16	FWT 1	21	E 230 G 48 / 16 B-FTP
	110 - 130	140 - 168	180 - 220	20	230	16	FWT 2	24	E 230 G 48 / 20 B-FTP
	140 - 165	180 - 210	220 - 275	25	230	16	FWT 2	30	E 230 G 48 / 25 B-FTP
	160 - 180	210 - 250	275 - 330	30	230	16	FWT 2	31	E 230 G 48 / 30 B-FTP
	190 - 230	250 - 290	315 - 385	35	230	16	FWT 2	33	E 230 G 48 / 35 B-FTP
	220 - 260	290 - 330	350 - 440	40	230	16	FWT 2	37	E 230 G 48 / 40 B-FTP
	250 - 300	320 - 375	420 - 500	45	400	16	FWT 2	39	D 400 G 48 / 45 B-FTP
	275 - 330	360 - 420	450 - 550	50	400	16	FWT 2	40	D 400 G 48 / 50 B-FTP
	330 - 400	430 - 500	540 - 660	60	400	16	FST 1	55	D 400 G 48 / 60 B-FTP
	384 - 465	500 - 575	630 - 775	70	400	16	FST 1	60	D 400 G 48 / 70 B-FTP
	440 - 530	575 - 660	720 - 880	80	400	16	FST 1	75	D 400 G 48 / 80 B-FTP
	500 - 600	650 - 750	810 - 1000	90	400	16	FST 1	85	D 400 G 48 / 90 B-FTP
	550 - 660	720 - 825	900 - 1100	100	400	16	FST 1	95	D 400 G 48 / 100 B-FTP
	675 - 825	860 - 1035	1120 - 1350	125	400	20	FST 1	105	D 400 G 48 / 125 B-FTP
	825 - 1000	1050 - 1250	1360 - 1600	150	400	20	FST 1	115	D 400 G 48 / 150 B-FTP
	930 - 1125	1250 - 1400		170	400	25	FST 1	135	D 400 G 48 / 170 B-FTP
80	110 - 130	140 - 168	180 - 220	20	230	16	FWT 2	31	E 230 G 80 / 20 B-FTP
	140 - 165	180 - 210	220 - 275	25	230	16	FWT 2	37	E 230 G 80 / 25 B-FTP
	160 - 180	210 - 250	275 - 330	30	400	16	FWT 2	40	D 400 G 80 / 30 B-FTP
	190 - 230	250 - 290	315 - 385	35	400	16	FST 1	45	D 400 G 80 / 35 B-FTP
	220 - 260	290 - 330	350 - 440	40	400	16	FST 1	50	D 400 G 80 / 40 B-FTP
	250 - 300	320 - 375	420 - 500	45	400	16	FST 1	60	D 400 G 80 / 45 B-FTP
	275 - 330	360 - 420	450 - 550	50	400	16	FST 1	75	D 400 G 80 / 50 B-FTP
	330 - 400	430 - 500	540 - 660	60	400	16	FST 1	85	D 400 G 80 / 60 B-FTP
	384 - 465	500 - 575	630 - 775	70	400	16	FST 1	95	D 400 G 80 / 70 B-FTP
	440 - 530	575 - 660	720 - 880	80	400	20	FST 1	105	D 400 G 80 / 80 B-FTP
	500 - 600	650 - 750	810 - 1000	90	400	20	FST 1	115	D 400 G 80 / 90 B-FTP
	550 - 660	720 - 825	900 - 1100	100	400	20	FST 1	125	D 400 G 80 / 100 B-FTP
	675 - 825	860 - 1035	1120 - 1350	125	400	25	FST 1	145	D 400 G 80 / 125 B-FTP
	825 - 1000	1050 - 1250	1360 - 1600	150	400	35	FST 1	155	D 400 G 80 / 150 B-FTP
	930 - 1125	1250 - 1400		170	400	50	FST 1	165	D 400 G 80 / 170 B-FTP

* Reference values. Generally, the current battery sizes of the battery manufacturers are valid
Technical details are subject to change without notice

Cabinet dimensions

Type	FWT 1	FWT 2	FST 1
HxWxD [mm]	230 x 360 x 260	260 x 500 x 300	690 x 500 x 490

Charging time

Charging time is dependent on the state of discharge of the battery and the ability of the charging equipment to deliver the current for the capacity of the battery. Charging output currents shown in the type table relate to 80 % battery discharge.

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