BENNING

World Class Charging Systems

TEBETRON expert

Intelligent charging systems
for traction batteries

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Intelligent charging systems

The TEBETRON expert series is a modern charging system, which combines the intelligence of the switch mode technology with the reliable taper charger technique which has been approved for decades.
The standard USB interface is new and unique in this class of traction chargers as well as the huge status light, the graphic display and modern control electronics with radio interface.

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

Special features

- **Modern Puls charging system for lead acid batteries**
- **Recharge times between 6,5 – 14 h**
- **W0Wa-charging characteristic for recharge times 5,5 – 6,5 h with electrolyte circulation**
- **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”**
- **Simple operation, charging starts automatically, “switch on” can’t be forgotten**
- **Radio interface for communication between charger and PC/Notebook or BATCOM basic**
- **Easy to maintain by service software via the external USB interface**
  - Storage of the last 10 charging data sets
  - Statistics functions
- **Additional facilities available:**
  - Graphic display with integrated real time clock
  - Battery temperature controlled charging process
  - Display of to low electrolyte level via blue LED
  - Electrolyte circulation
  - Automatic water topping up

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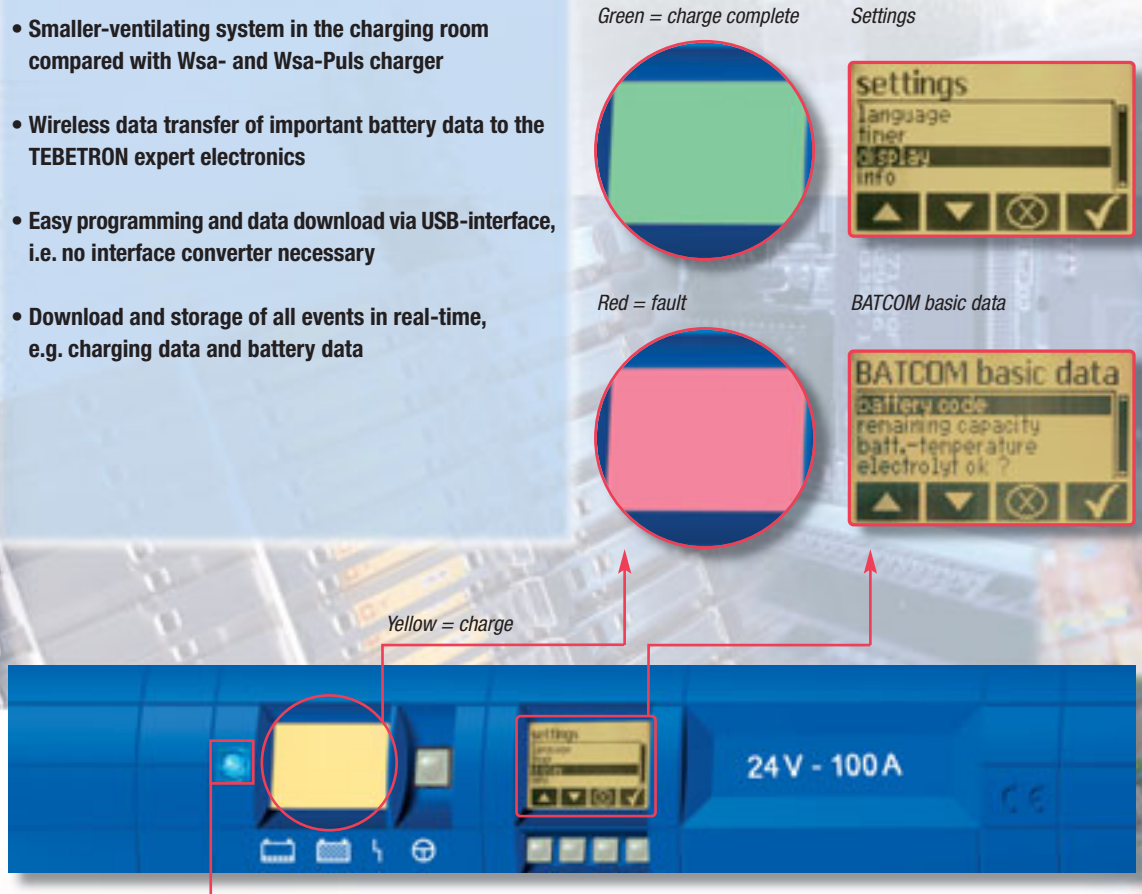
User Advantages

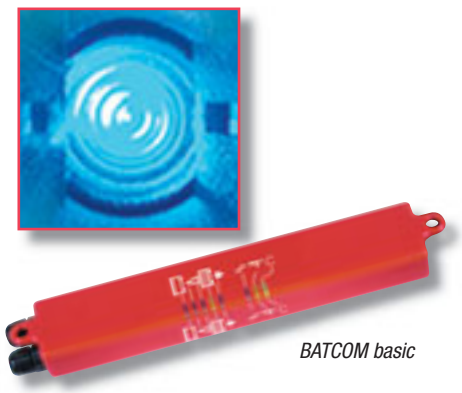
- **Ionic electrolyte circulation means you do not require hose system on the battery, the DC plug with air supply system and the air pump in the battery charger**
- **Cost saving by increased service intervals as well as increased life expectancy of the battery**
- **Smaller-ventilating system in the charging room compared with Wsa- and Wsa-Puls charger**
- **Wireless data transfer of important battery data to the TEBETRON expert electronics**
- **Easy programming and data download via USB-interface, i.e. no interface converter necessary**
- **Download and storage of all events in real-time, e.g. charging data and battery data**

Huge status light

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



BATCOM basic transmits its data via radio to the charger, the blue LED indicates a low electrolyte level of the battery



BATCOM basic

High degree of information by graphic display

A clearly structured menu is utilised to drive the operation of the charger with soft keys on the front panel. Messages are displayed in plain text in the chosen language. The backlit graphic display offers a high contrast and an increased viewing angle.
The menu driven operation affords the end-user easy access to the controls. Important operational parameters like the measuring values of the last charging cycles and charging parameters can be viewed. Also status and error messages are also displayed clearly in a plain text message.

BATCOM basic

If a battery is equipped with a BATCOM basic battery controller, all battery data is automatically transmitted by radio to the TEBETRON expert charger. The radio interface is a standard component in every TEBETRON expert charger. In this case the charging process is related to the battery temperature. A low electrolyte level can be indicated by a blue LED.

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USB- Interface

All chargers are equipped with a USB interface for data download and programming.
The TEBETRON expert charger can be connected easily with a standard USB cable to a PC/Laptop. No additional interface or tools are required. With the plug & play function the service software automatically recognizes if a charger is connected via the USB interface.

- Easy connection via USB cable without interface unit
- Plug & Play function
- USB 1.1 and 2.0 compatible

Service Software

Data downloading and programming can be easily done by the TEBETRON expert service software. The software is designed in a similar way to the well-known Windows Explorer interface enabling easy and intuitive use.

Data download and programming via software:

Statistic data:

- Number of started charging processes
- Number of correctly completed charges
- Number of forced switch-overs
- Number of max. charge times exceeded
- Number of current/voltage faults
- Number of electrolyte circulation faults
- Number of low electrolyte level

10 final charging data sets:

- Final charging voltage
- Final charging current
- Charging time
- Final charging temperature
- Display of low electrolyte level

BATCOM basic data:

- Intermediate storage of the BATCOM basic data for the transmission to a central data memory or PC.

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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 expert chargers the gas development in the gassing phase is approximately 50 % less compared to chargers with Wsa- or Puls-Wsa-characteristics. 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 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 as well as 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.

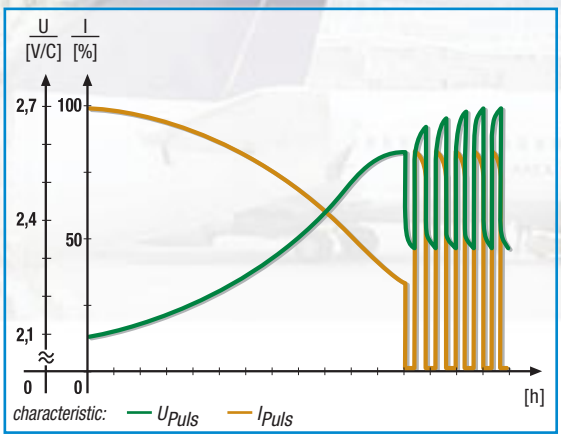
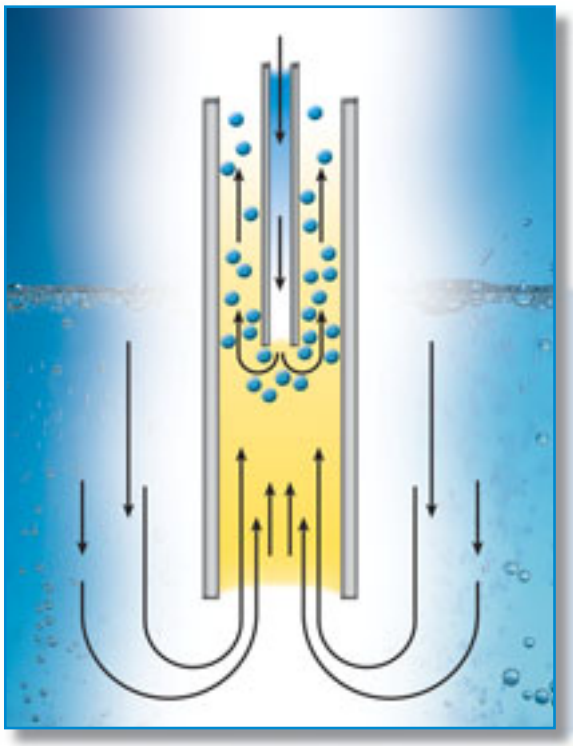


Fig. 1: Wa-Puls-characteristic

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**



Electrolyte Circulation

The TEBETRON expert 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 by approx. 0,75 h.

Advantages of electrolyte circulation

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

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Type table TEBETRON expert

Output-voltage [V]	Battery capacity [Ah]* (with EC, charging time approx. 0,75 h shorter) Charging time 5,5-6 h WOWa with EC	Charging time 7,5-8,5 h Puls-Wa	Charging time 9-11 h Puls-Wa	Charging time 12-14 h Puls-Wa	Nom. output current [A]	Nom. input voltage [V]	Mains fuse [A]	Cabinet	Weight [kg]	Type
12 / 24			70 - 84	90 - 110	10	230	16	FWT 1	10	E 230 G 24 / 10 B-FTX
		85 - 105	110 - 130	145 - 180	16	230	16	FWT 1	12	E 230 G 24 / 16 B-FTX
		110 - 130	140 - 168	180 - 220	20	230	16	FWT 1	13	E 230 G 24 / 20 B-FTX
	90 - 100	140 - 165	180 - 210	220 - 275	25	230	16	FWT 1	14	E 230 G 24 / 25 B-FTX
	110 - 130	160 - 180	210 - 250	275 - 330	30	230	16	FWT 1	20	E 230 G 24 / 30 B-FTX
	130 - 150	190 - 230	250 - 290	315 - 385	35	230	16	FWT 2	23	E 230 G 24 / 35 B-FTX
	150 - 170	220 - 260	290 - 330	350 - 440	40	230	16	FWT 2	24	E 230 G 24 / 40 B-FTX
	170 - 190	250 - 300	320 - 375	420 - 500	45	230	16	FWT 2	28	E 230 G 24 / 45 B-FTX
	190 - 210	275 - 330	360 - 420	450 - 550	50	230	16	FWT 2	30	E 230 G 24 / 50 B-FTX
	210 - 260	330 - 400	430 - 500	540 - 660	60	230	16	FWT 2	30	E 230 G 24 / 60 B-FTX
	260 - 320	384 - 465	500 - 575	630 - 775	70	230	16	FWT 2	31	E 230 G 24 / 70 B-FTX
	290 - 360	440 - 530	575 - 660	720 - 880	80	230	16	FWT 2	36	E 230 G 24 / 80 B-FTX
	330 - 420	500 - 600	650 - 750	810 - 1000	90	230	16	FWT 2	38	E 230 G 24 / 90 B-FTX
	365 - 480	550 - 660	720 - 825	900 - 1100	100	400	16	FWT 2	40	D 400 G 24 / 100 B-FTX
	450 - 600	675 - 825	860 - 1035	1120 - 1350	125	400	16	FST 1	55	D 400 G 24 / 125 B-FTX
	540 - 660	825 - 1000	1050 - 1250	1360 - 1600	150	400	20	FST 1	70	D 400 G 24 / 150 B-FTX
	620 - 770	930 - 1125	1250 - 1400		170	400	16	FST 1	85	D 400 G 24 / 170 B-FTX
	710 - 810	1050 - 1260	1400 - 1550		190	400	16	FST 1	105	D 400 G 24 / 190 B-FTX
36		85 - 105	110 - 130	145 - 180	16	230	16	FWT 1	21	E 230 G 36 / 16 B-FTX
		110 - 130	140 - 168	180 - 220	20	230	16	FWT 1	22	E 230 G 36 / 20 B-FTX
	90 - 110	140 - 165	180 - 210	220 - 275	25	230	16	FWT 1	25	E 230 G 36 / 25 B-FTX
	110 - 130	160 - 180	210 - 250	275 - 330	30	230	16	FWT 2	30	E 230 G 36 / 30 B-FTX
	130 - 150	190 - 230	250 - 290	315 - 385	35	230	16	FWT 2	30	E 230 G 36 / 35 B-FTX
	150 - 170	220 - 260	290 - 330	350 - 440	40	230	16	FWT 2	31	E 230 G 36 / 40 B-FTX
	170 - 190	250 - 300	320 - 375	420 - 500	45	230	16	FWT 2	33	E 230 G 36 / 45 B-FTX
	190 - 210	275 - 330	360 - 420	450 - 550	50	230	16	FWT 2	36	E 230 G 36 / 50 B-FTX
	210 -260	330 - 400	430 - 500	540 - 660	60	230	16	FWT 2	55	E 230 G 36 / 60 B-FTX
	260 - 320	384 - 465	500 - 575	630 - 775	70	400	16	FWT 2	57	D 400 G 36 / 70 B-FTX
	290 - 360	440 - 530	575 - 660	720 - 880	80	400	16	FST 1	75	D 400 G 36 / 80 B-FTX
	330 - 420	500 - 600	650 - 750	810 - 1000	90	400	16	FST 1	80	D 400 G 36 / 90 B-FTX
	365 - 480	550 - 660	720 - 825	900 - 1100	100	400	20	FST 1	85	D 400 G 36 / 100 B-FTX
	450 - 600	675 - 825	860 - 1035	1120 - 1350	125	400	16	FST 1	105	D 400 G 36 / 125 B-FTX
	540 - 660	825 - 1000	1050 - 1250	1360 - 1600	150	400	16	FST 1	115	D 400 G 36 / 150 B-FTX
	620 - 770	930 - 1125	1250 - 1400		170	400	20	FST 1	125	D 400 G 36 / 170 B-FTX
48		85 - 105	110 - 130	145 - 180	16	230	16	FWT 1	21	E 230 G 48 / 16 B-FTX
		110 - 130	140 - 168	180 - 220	20	230	16	FWT 2	24	E 230 G 48 / 20 B-FTX
	90 - 110	140 - 165	180 - 210	220 - 275	25	230	16	FWT 2	30	E 230 G 48 / 25 B-FTX
	110 - 130	160 - 180	210 - 250	275 - 330	30	230	16	FWT 2	31	E 230 G 48 / 30 B-FTX
	130 - 150	190 - 230	250 - 290	315 - 385	35	230	16	FWT 2	33	E 230 G 48 / 35 B-FTX
	150 - 170	220 - 260	290 - 330	350 - 440	40	230	16	FWT 2	37	E 230 G 48 / 40 B-FTX
	170 - 190	250 - 300	320 - 375	420 - 500	45	400	16	FWT 2	39	D 400 G 48 / 45 B-FTX
	190 - 210	275 - 330	360 - 420	450 - 550	50	400	16	FWT 2	40	D 400 G 48 / 50 B-FTX
	210 - 260	330 - 400	430 - 500	540 - 660	60	400	16	FST 1	55	D 400 G 48 / 60 B-FTX
	260 - 320	384 - 465	500 - 575	630 - 775	70	400	16	FST 1	60	D 400 G 48 / 70 B-FTX
	290 - 360	440 - 530	575 - 660	720 - 880	80	400	16	FST 1	75	D 400 G 48 / 80 B-FTX
	330 - 420	500 - 600	650 - 750	810 - 1000	90	400	16	FST 1	85	D 400 G 48 / 90 B-FTX
	365 - 480	550 - 660	720 - 825	900 - 1100	100	400	16	FST 1	95	D 400 G 48 / 100 B-FTX
	450 - 600	675 - 825	860 - 1035	1120 - 1350	125	400	20	FST 1	105	D 400 G 48 / 125 B-FTX
	540 - 660	825 - 1000	1050 - 1250	1360 - 1600	150	400	20	FST 1	115	D 400 G 48 / 150 B-FTX
	620 - 770	930 - 1125	1250 - 1400		170	400	25	FST 1	135	D 400 G 48 / 170 B-FTX
80		110 - 130	140 - 168	180 - 220	20	230	16	FWT 2	31	E 230 G 80 / 20 B-FTX
	90 - 110	140 - 165	180 - 210	220 - 275	25	230	16	FWT 2	37	E 230 G 80 / 25 B-FTX
	110 - 130	160 - 180	210 - 250	275 - 330	30	400	16	FWT 2	40	D 400 G 80 / 30 B-FTX
	130 - 150	190 - 230	250 - 290	315 - 385	35	400	16	FST 1	45	D 400 G 80 / 35 B-FTX
	150 - 170	220 - 260	290 - 330	350 - 440	40	400	16	FST 1	50	D 400 G 80 / 40 B-FTX
	170 - 190	250 - 300	320 - 375	420 - 500	45	400	16	FST 1	60	D 400 G 80 / 45 B-FTX
	190 - 210	275 - 330	360 - 420	450 - 550	50	400	16	FST 1	75	D 400 G 80 / 50 B-FTX
	210 - 260	330 - 400	430 - 500	540 - 660	60	400	16	FST 1	85	D 400 G 80 / 60 B-FTX
	260 - 320	384 - 465	500 - 575	630 - 775	70	400	16	FST 1	95	D 400 G 80 / 70 B-FTX
	290 - 360	440 - 530	575 - 660	720 - 880	80	400	20	FST 1	105	D 400 G 80 / 80 B-FTX
	330 - 420	500 - 600	650 - 750	810 - 1000	90	400	20	FST 1	115	D 400 G 80 / 90 B-FTX
	365 - 480	550 - 660	720 - 825	900 - 1100	100	400	20	FST 1	125	D 400 G 80 / 100 B-FTX
	450 - 600	675 - 825	860 - 1035	1120 - 1350	125	400	25	FST 1	145	D 400 G 80 / 125 B-FTX
	540 - 660	825 - 1000	1050 - 1250	1360 - 1600	150	400	35	FST 1	155	D 400 G 80 / 150 B-FTX
	620 - 770	930 - 1125	1250 - 1400		170	400	50	FST 1	165	D 400 G 80 / 170 B-FTX

* 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
H x W x D [mm]	230 x 360 x 260	260 x 500 x 300	690 x 500 x 490

Charging time

Charging time is depending 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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BENNING Power Electronics (UK) Ltd. • Oaklay House
Hogwood Lane • Fincampstead • GB-Berkshire RG 40 4QW
Tel.: 0118 / 9731506
Fax: 0118 / 9731508
www.benninguk.com • E-Mail: info@benninguk.com

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