BENNING

World Class Charging Systems

Excellent Technology, Efficiency and Quality

BELATRON

High-efficiency charging systems
for traction batteries

BELATRON high-efficiency charging systems reduce operating costs and CO_2-emissions

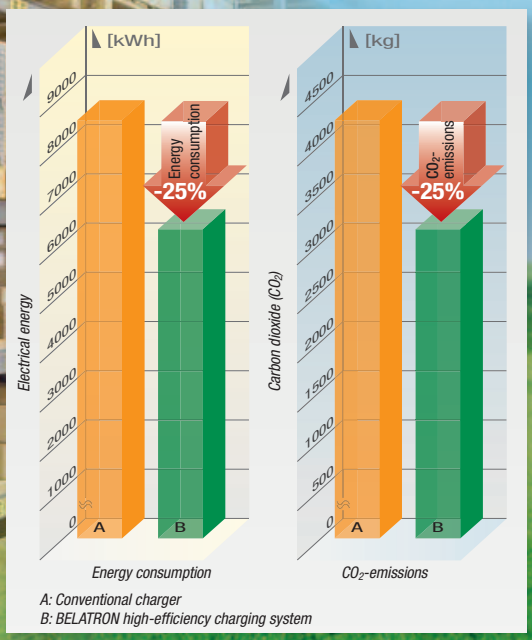


Fig. 1: Annual energy consumption and CO_2 emissions when charging a 48 V – 500 Ah traction battery (240 charges per year)

Fig. 2: BELATRON high-efficiency charging systems 48 V – 200 A and 80 V – 170 A

Cutting-edge technology for your charging station

For more than three decades, the name BELATRON has stood for advanced and future-oriented charging technology.

BELATRON high-efficiency charging systems operate with a controlled charging characteristic so that under and over charging is prevented independent of supply voltage variations.

These devices can be used to charge (E) PzS, (E) PzB and AGM batteries. The internal memory of the charger stores all relevant charging characteristics.

The high frequency switching technology of the power unit allows installation of the BELATRON high-efficiency charging systems in compact enclosures. (see technical data on page 7).

Energy efficiency and CO_2 emissions

The subject of energy efficiency encompasses both ecological and economic considerations.
Compared with conventional chargers, BELATRON high-efficiency charging systems reduce the amount of electrical energy consumed during the charging process by 25 %. This leads to reduced energy costs and lower CO_2 emissions (see Fig. 1).

When charging a 48 V – 500 Ah traction battery using a BELATRON high-efficiency charging system over 240 days a year (single-shift operation), the annual saving on electrical energy is approx. 1900 kWh compared with a conventional charger.
When generating the electrical energy required for charging the battery, 0.514 kg of CO_2 are released per kilowatt hour. Every kilowatt hour saved reduces the CO_2 emissions and therefore contributes to climate protection.

As a result of the energy saved, the CO_2 emissions are reduced by 980 kg, which is comparable with the CO_2 emissions of a diesel-engined car (135 g CO2/km) travelling a distance of 7259 km. This distance would be equivalent to a car journey to a place of work 16 km away on 230 days a year (return journey 32 km).

BELATRON high-efficiency charging systems increase battery life

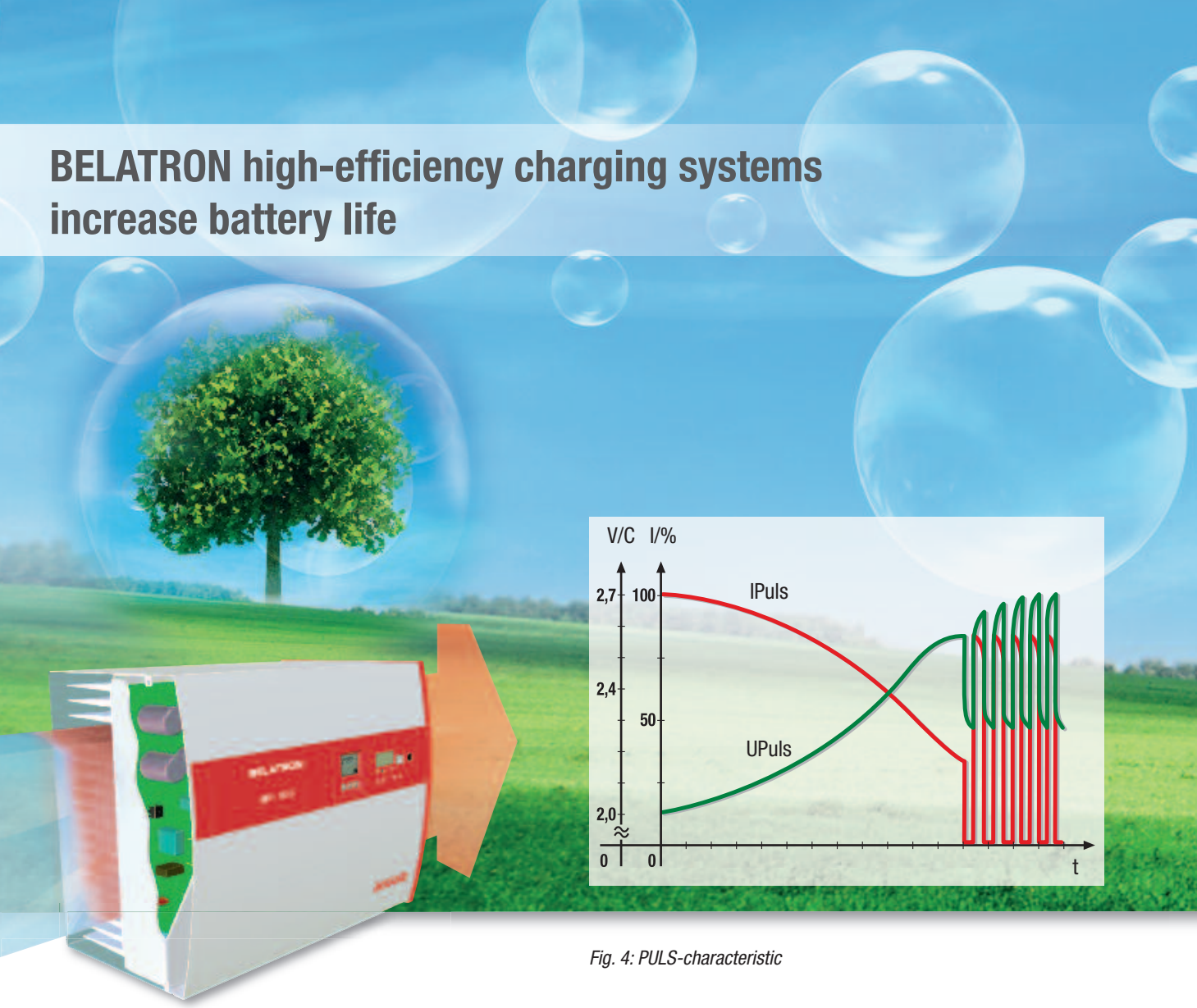


Fig. 4: PULS-characteristic

Fig. 3: Ventilation concept

Optimised ventilation concept

Particular importance has been placed on the new ventilation concept in the development of the new housing. Air enters and exits horizontally via the rear mounted heat sink (from a unit capacity of 2 kW).
Electronic components are generally encapsulated and located away from the main air flow in order to prevent damage by corrosion and/or contamination (see Fig. 3).

Maximum possible charging power with single-phase mains connection

Because of the excellent power factor of BELATRON charging systems (cos φ ~1), these units can draw higher power from the mains supply and, together with the excellent efficiency, have higher DC power (charging power) when compared with conventional chargers.
This is particularly important when a single-phase network is involved, as BELATRON high-efficiency charging systems with a charging power of 24 V – 120 A can still be connected to a single-phase supply with a permissible mains current consumption of 16 A.

Charging characteristics

For wet batteries (PzS, PzB, GiS) particular emphasis was placed on reducing the charging factor.

The acid mixing that is required when recharging these types of battery with a low charge factor is achieved by a very effective pulse charge (ionic mixing). This allows the gassing phase to be shortened, so that the temperature rise in the battery is lower and water consumption is reduced.

The shortened recharge time results in a reduced consumption of electrical energy.

Even with the recharge of partially discharged batteries the optimized charging characteristic ensures a full charge with low temperature rise and reduced water consumption.

BELATRON high-efficiency charging systems reduce operating costs thanks to high energy efficiency

BELATRON high-efficiency charging systems 24 V – 50 A and 48 V – 200 A

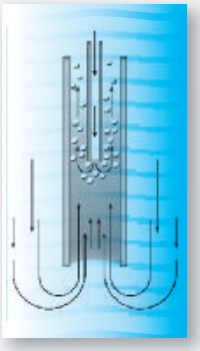
Further advantages of BELATRON high-efficiency charging systems

1. Sinusoidal current consumption and excellent power factor:	• Reduction of required mains power and therefore investment and installation costs • Reduction of peak current values and no increase in the size of the reactive power compensator
2. Low ripple charging current:	• Minimises temperature rise during charging • Increases traction battery life • Reduces service costs (top-up intervals) for battery maintenance
3. BELATRON high-efficiency charging systems comply with the EMC limits for domestic and industrial areas:	• BELATRON high-efficiency charging systems are not restricted to use in industrial areas (as with many competitors´ units) but can also be used in business, domestic and commercial areas
4. Charge state traffic lights:	• The battery charge state can be easily determined from a distance thanks to large coloured indicator lights (charge state traffic lights) (from housing size WT60). In smaller units, LEDs provide continuous indication of the current charging state.

Collect and analyze the status of your battery and charging device pools

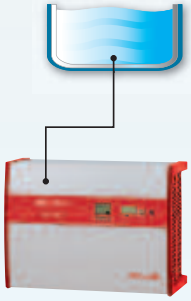
Figure 5: With the graphical user interface all devices and Battery information can be accessed quickly and easily

Options



Electrolyte circulation (EC)

- Shorter charging times
- Intermediate charging mode
- Reduced water consumption
- Smaller temperature rise



Aquamatik

- 230 V relay contact for energising a solenoid valve
- Automatic battery filling
- Optimum electrolyte level in battery cell at all times

Traction monitor increases availability and operational safety

For larger charging stations clear information about the status of the batteries and chargers being used is the prerequisite for good availability and reliability for the battery-powered industrial trucks.

The BENNING traction monitoring system allows control of the entire battery and charger pool and management of relevant battery and charger data.

Error messages, status information and data are transmitted with the help of USB / Ethernet adapters, wireless interfaces, and a LAN connection to a standard Windows PC.
Data is displayed on a user-friendly graphical interface. Via the Internet the data can be collected from any location

Special Features:

- Views can be freely designed
- State of charge indicator
- Display all information relevant for the operation
- Chargers and RF interfaces are grouped and represent different
- Remote access possible via Internet

BELATRON high-efficiency charging systems specifically for industrial requirements

BELATRON IS

BELATRON UC

Individual configuration options for the BEALTRON UC industrial system

BELATRON high-efficiency charging systems industrial design

The BELATRON high-efficiency charging systems are now also available in a special industrial version. With the BELATRON IS and BELATRON UC BENNING offers reliable and economic high-efficiency charging systems in robust free standing housings for industrial use.

IS series devices are housed in enhanced protection housings.

UC series devices offer a configurable modular concept.

Industrial housings

Type	Dimensions [mm]		
	Height	Width	Depth
BELATRON IS	1103	601	282
BELATRON UC 1666	1600	600	600
BELATRON UC 2066	2000	600	600

Individual configuration of the charging devices in the BELATRON UC series

As the floor space for battery chargers in charging stations can be very limited the BELATRON UC series is available.
This series offers a vertical modular system design for up to 12 charging devices with different output voltages all housed within a single cabinet.

With this type of construction, the space requirement (area) when compared with single devices, is considerably less.

Devices with different output voltage and current requirements can be accommodated together.

The standard cabinet can take up to a max. of 12 chargers; 24 V / 80 A or 48 V to 60 A or max. 3 chargers 80 V up to 170 A.

These configuration options give the BELATRON UC cabinet an appropriate design for a large number of batteries with different voltages and capacities.

Output voltage	Assignment of battery capacity [Ah]** Charging times Flooded battery	GiS, (E)PzS battery	Maintenance-free battery GiV, (E)PzV	Nominal Current	Nominal input voltage	Mains current	Cabinet with LED	Traffic lights	Weight Cabinet with LED	Traffic lights	Type
[V]	7,5 – 9 h***	11 – 13 h***	11 – 14 h	[A]	[V]	[A]			[kg]	[kg]	
24	100 – 133	145 – 200	80 – 122	16	230	1,9	WT7		2,4		E 230 G 24/16 B-FB*
	125 – 167	180 – 250	100 – 150	20	230	2,4	WT7	–	2,4	–	E 230 G 24/20 B-FB*
	156 – 208	220 – 310	125 – 190	25	230	3	WT7	–	2,4	–	E 230 G 24/25 B-FB*
	187 – 250	270 – 375	150 – 230	30	230	3,6	WT7	–	2,4	–	E 230 G 24/30 B-FB*
	218 – 291	315 – 430	175 – 270	35	230	4	WT13	–	3,5	–	E 230 G 24/35 B-FB*
	300 – 416	450 – 625	250 – 385	50	230	5,7	WT13	–	3,5	–	E 230 G 24/50 B-FB*
	406 – 541	590 – 810	325 – 500	65	230	7,6	WT20	–	9	–	E 230 G 24/65 B-FB
	500 – 666	720 – 1000	400 – 615	80	230	9,4	WT20	–	9	–	E 230 G 24/80 B-FB
	625 – 833	900 – 1250	500 – 770	100	230	11,7	–	WT30	–	19	E 230 G 24/100 B-FB
	750 – 1000	1085 – 1500	600 – 920	120	230	14	–	WT30	–	19	E 230 G 24/120 B-FB
	937 – 1250	1350 – 1875	750 – 1150	150	3 x 400	6,7	–	WT60	–	30	D 400 G 24/150 B-FB
	1062 – 1416	1550 – 2125	850 – 1300	170	3 x 400	7,1	–	WT60	–	38	D 400 G 24/170 B-FB
	1250 – 1665	–	1000 – 1540	200	3 x 400	8,3	–	WT60	–	38	D 400 G 24/200 B-FB
	1500 – 2000	–	1200 – 1850	240	3 x 400	10	–	WT60	–	38	D 400 G 24/240 B-FB
36	75 – 100	110 – 150	60 – 93	12	230	2	WT7	–	2,4	–	E 230 G 36/12 B-FB
	100 – 133	145 – 200	80 – 122	16	230	2,7	WT7	–	2,4	–	E 230 G 36/16 B-FB
	125 – 167	180 – 250	100 – 150	20	230	3,4	WT7	–	2,4	–	E 230 G 36/20 B-FB
	156 – 208	220 – 310	125 – 190	25	230	4,3	WT13	–	3,5	–	E 230 G 36/25 B-FB
	218 – 291	315 – 430	175 – 270	35	230	6	WT13	–	3,5	–	E 230 G 36/35 B-FB
	300 – 416	450 – 625	250 – 385	50	230	8,8	WT20	–	9	–	E 230 G 36/50 B-FB
48	75 – 100	110 – 150	60 – 93	12	230	2,7	WT7	–	2,4	–	E 230 G 48/12 B-FB
	100 – 133	145 – 200	80 – 122	16	230	3,6	WT13	–	3,5	–	E 230 G 48/16 B-FB
	125 – 167	180 – 250	100 – 150	20	230	4,6	WT13	–	3,5	–	E 230 G 48/20 B-FB
	156 – 208	220 – 310	125 – 190	25	230	5,7	WT13	–	3,5	–	E 230 G 48/25 B-FB
	218 – 291	315 – 430	175 – 270	35	230	7,9	WT20	–	9	–	E 230 G 48/35 B-FB
	300 – 416	450 – 625	250 – 385	50	230	11,7	–	WT30	–	19	E 230 G 48/50 B-FB
	375 – 500	540 – 750	300 – 460	60	230	14	–	WT30	–	19	E 230 G 48/60 B-FB
	516 – 708	774 – 1050	400 – 615	85	3 x 400	7,5	–	WT60	–	30	D 400 G 48/85 B-FB
	625 – 833	900 – 1250	500 – 770	100	3 x 400	8,9	–	WT60	–	30	D 400 G 48/100 B-FB
	750 – 1000	1085 – 1500	600 – 920	120	3 x 400	10,7	–	WT60	–	30	D 400 G 48/120 B-FB
	937 – 1250	1350 – 1875	750 – 1150	150	3 x 400	12,4	–	WT60	–	38	D 400 G 48/150 B-FB
	1062 – 1416	1550 – 2125	850 – 1300	170	3 x 400	14	–	WT60	–	38	D 400 G 48/170 B-FB
	1250 – 1665	–	1000 – 1540	200	3 x 400	16,5	–	WT60	–	38	D 400 G 48/200 B-FB
80	125 – 167	180 – 250	100 – 150	20	230	7,8	WT20	–	9	–	E 230 G 80/20 B-FB
	156 – 208	220 – 310	125 – 190	25	230	9,8	WT20	–	9	–	E 230 G 80/25 B-FB
	218 – 291	315 – 430	175 – 270	35	230	13,5	–	WT30	–	19	E 230 G 80/35 B-FB
	300 – 416	450 – 625	250 – 385	50	3 x 400	6,7	–	WT60	–	30	D 400 G 80/50 B-FB
	406 – 541	590 – 810	325 – 500	65	3 x 400	8,8	–	WT60	–	30	D 400 G 80/65 B-FB
	516 – 708	774 – 1050	400 – 615	85	3 x 400	11,5	–	WT60	–	30	D 400 G 80/85 B-FB
	625 – 833	900 – 1250	500 – 770	100	3 x 400	13,3	–	WT60	–	38	D 400 G 80/100 B-FB
	750 – 1000	1085 – 1500	600 – 920	120	3 x 400	16	–	WT60	–	38	D 400 G 80/120 B-FB
	937 – 1250	1350 – 1875	750 – 1150	150	3 x 400	20,3	–	WT120	–	70	D 400 G 80/150 B-FB
	1062 – 1416	1550 – 2125	850 – 1300	170	3 x 400	23	–	WT120	–	70	D 400 G 80/170 B-FB

* *Also available as 12 V version*
** *Guide values; refer to battery manufacturer´s specifications*
*** *Electrolyte circulation, approx. 0.5 h shorter charging time*
**** *WT7 and WT13 also as on-board version available*

Subject to technical changes

Housing (on-board version)

Type	Dimensions [mm] Heigth	Width	Depth
EG7****	77	166	230
EG13****	77	200	280

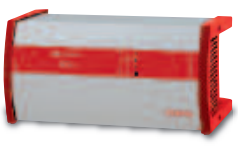
Housing

Type	Dimensions [mm] Heigth	Width	Depth
WT7	218	207	127
WT13	218	294	127
WT13 E***	218	294	260
WT20	218	460	166
WT20 E***	218	460	299
WT30	405	426	318
WT60	405	564	318
WT120	905	564	392

WT120

WT60

WT30



WT20

WT13

WT7

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