

BUFFALO BULL_DURABLE

Banner

PATENTS

AccuSafe: joint patent with Gore – usufruct rights waived in favour of Gore DE 197 03 444

AccuSafe: new applicant Banner A – 943/2001

Double cover: joint patent with Moll U – 02027 9204 (process still continuing, registration also made in the USA)

AGM valve stopper: jointly registered design protection with Accumalux

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THE POWER COMPANY



Banner

BUFFALO BULL

FULL POWER FOR COMMERCIAL VEHICLES

SHD
SUPER HEAVY DUTY

A
AUSTRIA
made in



THE POWER COMPANY

BUFFALO BULL_POWERFUL

Banner

NEXT GENERATION POWER





BUFFALO BULL – **FULL POWER FOR COMMERCIAL VEHICLES**

Tough, constant use in commercial vehicles puts batteries to the severest test. In recent years, the Banner **BUFFALO BULL** has met these challenges with bravura. However, the demands made on modern batteries are changing and in addition to cycle and vibration resistance, characteristics such as cold start performance, ease of maintenance and operational reliability are more important than ever. In addition, today, starter batteries must supply an increasing number of extra consumers and comfort features with power.

Accordingly, we have poured our entire commercial vehicle know-how into the new **BUFFALO BULL SHD Professional** and the result is an extremely modern starter battery that is clearly trimmed to the toughest operations and offers decisively more power.

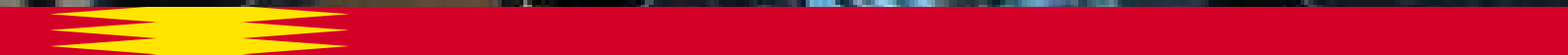


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BUFFALO BULL_ENERGISED

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NEXT GEN STOCK POWER





BUFFALO BULL PROFESSIONAL: PROFESSIONAL OFFERS DECISIVELY MORE POWER FOR COMMERCIAL VEHICLES!

The **SHD Professional** starts to show its new power when other batteries have long given up the ghost. Full calcium technology, the ConCast mesh production process, central degassing and patented four-chamber leak protection make the **SHD Professional** suitable for the most gruelling operations.

- Full calcium alloys on both the positive AND the negative electrodes. Absolute zero-maintenance and increased storage capacity.
- The ConCast mesh production process and optimised mesh design provide top cold start characteristics.
- Central degassing and patented four-chamber leak protection.
- Captive, welded-in backfire frits and safety screws.
- PinFin protection against short circuits caused by tools.
- SHD means extra cycle/vibration resistance in the highest category pursuant to EN 50342/Part 1.
- The dimensions and flat cover provide optimised installation capacity in line with EN 50342/Part 4.
- Three battery types, all filled and charged in A, B and C versions.



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BUFFALO BULL_ENERGY-FILLED

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FULL POWER AHEAD





BUFFALO BULL – **FOR TOUGH, CONTINUOUS OPERATIONS**

The proven starter battery in Super Heavy Duty (SHD) quality is ideal for modern commercial vehicles with a high energy requirement and provides sufficient power reserves for reliable starting.

THE ADVANTAGES

- **Zero maintenance:** hybrid technology guarantees minimum water consumption.
- **Vibration resistance:** in line with the strictest European test standards.
- **Cyclical resistance:** guaranteed power supply to the in-board systems without any detrimental effects on starting performance.
- **Optimised performance:** a perfect combination of capacity and cold start power trimmed precisely to the needs of commercial vehicles.
- **Operational reliability:** the use of special surge protectors prevents possible acid leaks when the battery is installed.
- **Backfire protection:** through integrated safeguards in the surge protectors and the battery cover.
- **Environment- and user-friendliness:** the BUFFALO BULL SHD is delivered in a filled and charged condition, thus removing the need for acid handling.



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BUFFALO BULL_POWER-PACKED


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NEXT GENERATION POWER



BUFFALO BULL – **A STRONG HEART FOR VERY HARD WORKERS**

The **BUFFALO BULL**  is designed for the toughest operations and constitutes the perfect battery for all commercial vehicles, which have to provide top performance on a day-to-day basis. Cold starts, short trips, loading platforms, air conditioning, extreme angles and refrigeration are all handled with ease by Banner's Bulls with their "buffalo power".

- Small trucks
- Agricultural machinery
- Construction machinery
- Snow grooming vehicles
- Travel and urban buses
- Trucks with loading platforms
- Refrigerated trucks
- Long haul and articulated trucks

The following all trust Banner:

MAN • Liebherr • Kramer/Neuson BOMAG • Rammax • Kässbohrer • Kubota • Lindner • Caterpillar



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BUFFALO BULL_INNOVATIVE

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NEXT GENERATION POWER



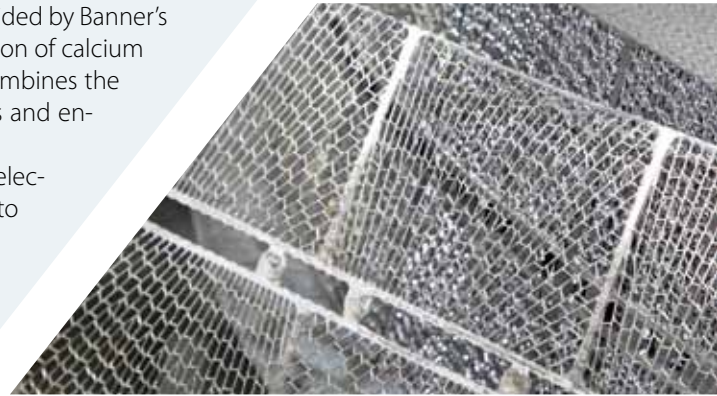


TECHNOLOGY FOR MORE POWER

The ConCast process – for full starting performance

A new feature of both the **SHD Professional** and the **SHD** is provided by Banner's use of the innovative, continuous ConCast process for the production of calcium negative electrodes. ConCast is based on cast meshes and thus combines the advantages of stable frames with minimum production tolerances and enhanced process stability.

A complete redesign of the mesh and plates ensures optimum, electrical conductance and the insensitivity of the negative electrode to high current loads, which is a clear advantage for full cold start performance under all operational conditions.



ADVANTAGES

- Mechanical stability of the frame
- Minimum production tolerances
- High levels of process stability
- Optimum current conductance



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BUFFALO BULL_INNOVATIVE

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INNOVATION & TECHNOLOGY






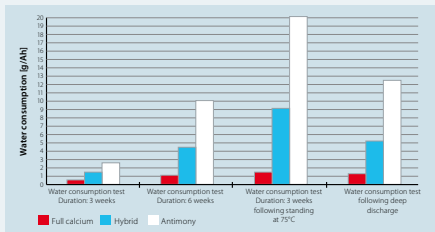
TECHNOLOGY FOR MORE POWER

Full calcium power or hybrid technology for enhanced performance

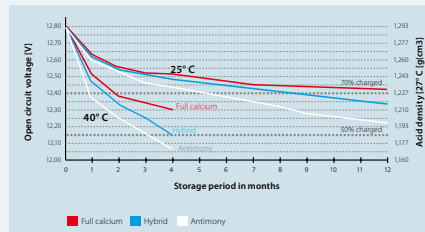
The new **BUFFALO BULL SHD PROFESSIONAL** batteries have calcium alloys on both their negative and positive electrodes. This results in two special advantages:

- Very low water consumption pursuant to EN 50342 Part 1 and thus zero maintenance
- Increased storage capacity due to minimal self-discharge

During the majority of applications under normal operational conditions, the **BUFFALO BULL**  with hybrid technology is also maintenance-free, i.e. it does not require refilling with battery water during its service life. However, Banner's service recommendations with regard to intensive and extreme applications should be noted.



WATER CONSUMPTION: FULL CALCIUM - HYBRID - ANTIMONY



SELF-DISCHARGE: FULL CALCIUM - HYBRID - ANTIMONY



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BUFFALO BULL_QUALITY

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NEXT GENERATION POWER





TECHNOLOGY FOR INCREASED QUALITY

Separators

The choice of separator is of decisive importance with regard to battery characteristics. In the case of the **BUFFALO BULL SHD Professional** and the **BUFFALO BULL SHD**, Banner has opted for PE bag separators. This solution increases vibration resistance, without neglecting the cold start characteristics vital to commercial vehicle batteries. Moreover, a separator with a special nonwoven covering is employed and the sets in the battery casing are bonded. In combination, these features enable the batteries to attain the highest ratings in cyclical and vibration testing according to EN 50342-Part1.



ADVANTAGES

- Maximum vibration resistance.
- Extra-long cyclical resistance through the use of a nonwoven cover.
- High short circuit safety.

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TECHNOLOGY FOR GREATER SAFETY

A flat cover with central degassing ensures optimum leak protection

Safety is Banner's number one priority. In this regard, the **BUFFALO BULL SHD PROfessional** leaves no wish unanswered and therefore makes a major contribution to the working and operational safety of commercial vehicles. An extremely important safety factor is the newly developed flat battery cover with patented, four-chamber leak protection and central degassing. Integrated, captive backfire protection, safety screws and innovative "PinFin" short circuit protection round off the **BUFFALO BULL SHD PROfessional** safety package. The dimensions of the battery correspond with the stipulations of the EN 50342 Part 6 standard.




ADVANTAGES

- Optimised leak protection
- Highest operational safety levels
- Top installation suitability



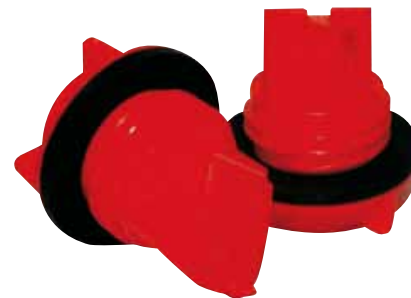
TECHNOLOGY FOR GREATER SAFETY

Surge protectors

Special surge protector safety screws are used in the **BUFFALO BULL**  battery. They have been developed by Banner in order to hinder battery acid leaks under extreme vibrations or vehicle tilting. In addition, reliable back-fire protection is integrated into the surge protectors, thus fulfilling the first fitting demands of leading commercial vehicle manufacturers.

ADVANTAGES

- improved operational safety
- integrated back-fire protection



BUFFALO BULL_POWERFUL

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FORMIDABLE POWER



	Type	Box	Ah 20h	A EN									N	Classification
							Length	Width	Height	Total Height				
1	SHD PRO 645 03	A	145	800	3	1	514	189	195	220	mGGA	B00	✓	
2	SHD PRO 680 08	B	180	1000	3	1	514	223	195	220	mGGA	B00	✓	
3	SHD PRO 725 03	C	225	1150	3	1	517	273	212	240	mGGA	B00	✓	
4	SHD 610 40	MAC110	110	760	3	1	514	175	210	210	mGGA	B03	✓	MAN, Mercedes, Roman, Robur
5	SHD 62034	A	120	760	3	1	514	189	195	220	mGRZS	B00	✓	MAN, Mercedes, Roman, MAZ
6	SHD 635 44	MAC110	135	900	3	1	514	175	210	210	mGGA	B03	✓	MAN, Mercedes, Roman
7	SHD 640 35	A	140	800	3	1	514	189	195	220	mGRZS	B00	✓	Steyr trucks, MAN, Mercedes
8	SHD 670 33	MAC140	170	1000	3	1	514	218	210	210	mGGA	B03	✓	MAN, Mercedes, Liaz
9	SHD 670 43	B	170	950	3	1	514	223	195	220	mGRZS	B00	✓	Steyr trucks MAN, Magirus, Roman, Multicar
10	SHD 680 32	B	180	1000	3	1	514	223	195	220	mGRZS	B00	✓	Steyr trucks, MAN, Roman, Multicar
11	SHD 700 27	C	200	1100	3	1	517	273	212	240	mGRZS	B00	✓	Construction machinery (Caterpillar), trucks, Tatra
12	SHD 725 11	C	225	1150	3	1	517	273	212	240	mGRZS	B00	✓	Steyr, MAN, Volvo trucks
13	600 26		100	600	0	1	413	175	195	220	mG	B00	✓	Mercedes D, Steyr tractors, Daihatsu D, Barkas, Ursus
14	600 35		100	600	1	1	413	175	195	220	mG	B00	✓	Daihatsu, Nissan, Mitsubishi D
15	605 11		105	720	0	1	344	172	214	230	mG	B01	✓	Iveco Daily 01.05-, Renault
16	605 27		105	680	1	1	344	172	214	230	mG	B00	✓	IHC, MAC Cormick
17	605 28		105	680	0	1	344	172	214	230	mG	B00	✓	IHC, Massey Ferguson
18	620 34	A	120	720	3	1	514	189	195	220	mG	B00	✓	MAN, Mercedes, Roman, MAZ
19	625 11		125	720	0	1	345	172	260	283	mG	B00	✓	Massey Ferguson
20	625 13		125	270	1	1	345	172	260	283	mG	B00	✓	Mac Cormick
21	640 35	A	140	760	3	1	514	189	195	220	mG	B00	✓	Steyr trucks, MAN, Mercedes
22	670 43	B	170	900	3	1	514	223	195	220	mG	B00	✓	Steyr trucks, MAN, Magirus, Roman, Multicar
23	680 32	B	180	950	3	1	514	223	195	220	mG	B00	✓	Steyr trucks, MAN, Roman, Multicar
24	700 27	C	200	1000	3	1	517	273	212	240	mG	B00	✓	Construction machinery (Caterpillar), trucks, Tatra
25	725 11	C	225	1050	3	1	517	273	212	240	mG	B00	✓	Steyr, MAN, Volvo trucks

BUFFALO BULL_FLEXIBLE

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IMPRESSIVE VERSATILITY





Banner **POWER TIPS FOR EXTRA-LONG BATTERY LIFE**

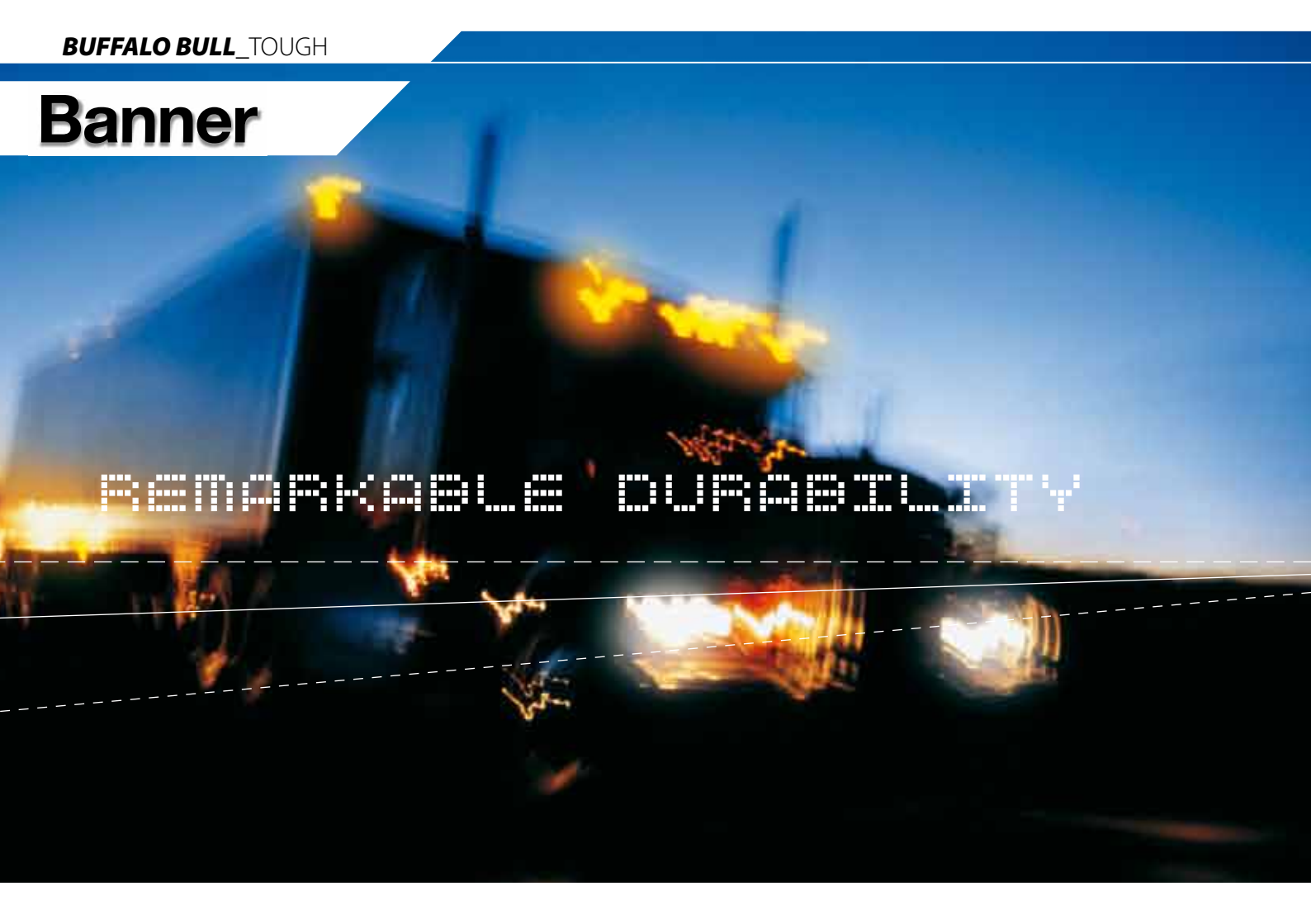
Tips to ensure that the Buffalo Bull continues to be a reliable power source even under the toughest and most intensive operating conditions!

Cool and dry storage >>	Always keep filled, ready to use batteries in dry and cool storage (cellar temperature). This reduces self-discharge.
Installation and servicing >>	<ul style="list-style-type: none">· Always install two batteries, never replace just one.· Open circuit voltage during installation: min.12.50 V.· To check charging levels, measure the open circuit voltage, min. 5 h standing time (after charging or operation).· Charging levels can be determined by acid density measurement.· Use deep discharge protection wherever possible.· If batteries are discharged to below 12.50 V (25.0 V) they must be removed and charged separately.· Electrolyte refilling = add distilled water up to the acid level mark and subsequently charge up the battery (otherwise electrolyte layering!). Check at regular intervals! In the case of extreme operational conditions, BUFFALO BULL SHD batteries must also be examined periodically!
Avoid deep discharge >>	Deep discharge (12.0 V / 24.0 V) must be avoided during battery standing times. Should deep charging occur, the battery may be permanently damaged. Therefore, recharge discharged batteries immediately, as otherwise they can lose capacity! For preference, employ deep discharge protection!

BUFFALO BULL_TOUGH

Banner

REMARKABLE DURABILITY





Banner *POWER TIPS FOR CONSTANT PERFORMANCE*

Tips to ensure that the Buffalo Bull continues to be a reliable power pack even under the toughest and most intensive operating conditions!

Full power demands top performance >>

In its range, Banner has the appropriate chargers and testing devices from leading producers. A current overview is available on the company website under www.bannerbatterien.com

Correct battery charging >>

- Check the electrolyte level before charging and if necessary, top up with distilled water to the max. acid level mark or 15 mm above the plate surface.
- The battery must be removed for recharging, in order to prevent damage to the vehicle. **WARNING!** Follow the instructions of the vehicle manufacturer when disconnecting.
- Batteries may only be charged with d.c. Connect the positive terminal (+) of the battery with the positive terminal (+) of the charger and the negative terminal (-) of the battery with the negative terminal (-) of the charger.
- Only switch on the charger once the battery has been connected. At the end of charging, turn the charger off first.
- A tenth of capacity is recommended as charging current (e.g. 180 Ah: 10 = 18 A charging current)
- The acid temperature may not exceed 55 °C during charging. Should this occur, charging must be interrupted.
- Charging is complete when the power approaches 0, is no longer accepted, or the automatic charging device shuts down.
- Ensure good ventilation when charging. **WARNING!** Highly explosive oxyhydrogen gas forms during charging. Fire, sparks, open lights and smoking are therefore forbidden!
- A charging voltage of 14.4-14.8V is recommended for the charging of the new **BUFFALO BULL SHD Professional** batteries.