GNB
INDUSTRIAL POWER
A Division of Exide Technologies

SONNENSCHEIN LITHIUM

INDUSTRIAL BATTERIES / MOTIVE POWER

Sonnenschein Lithium

SONNENSCHEIN LITHIUM
FEATURES AND TECHNOLOGY

The Intelligent Energy Source Maximizing Your Productivity

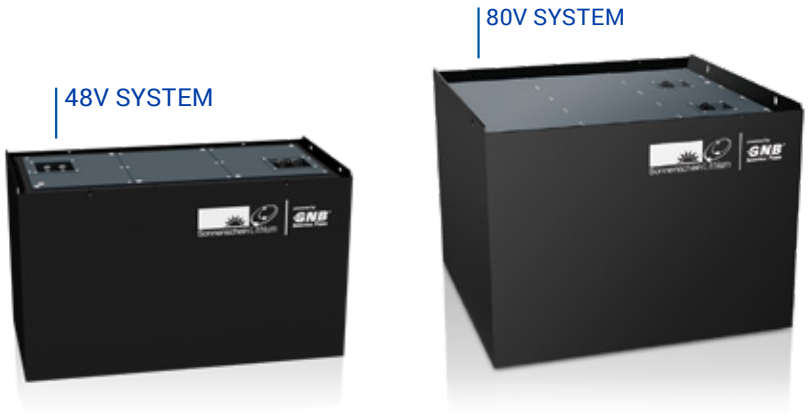
GNB's traction batteries based on Lithium-ion technology are always a perfect fit for the application because Sonnenschein Lithium stands for customized batteries taking advantage of the latest development in cell chemistry.

The modular architecture of the Sonnenschein Lithium battery system allows GNB to retrofit practically all existing tray designs and to customize new battery designs for fully integrated battery solutions.

Typical applications: Material handling where battery change is necessary with lead-acid technology, fast charge applications like AGV which are in service 24/7 and demanding applications with very high energy throughput.

Advantages Over Conventional Traction Batteries

- Maximum uptime
- Minimized charging time
- No water refilling required
- Superior cycle life



CHOOSE THE EXPERT!

More than 100 successfully accomplished Sonnenschein Lithium projects in Europe

- **Application experts – fitting lead and lithium battery solutions for every need**
- **Extensive Sales, Consulting and Service network across Europe**
- **More than batteries - chargers, fleet management, accessories and service from one hand**

LITHIUM TECHNOLOGY

Lithium Technology Combines High Performance With “Install & Forget“

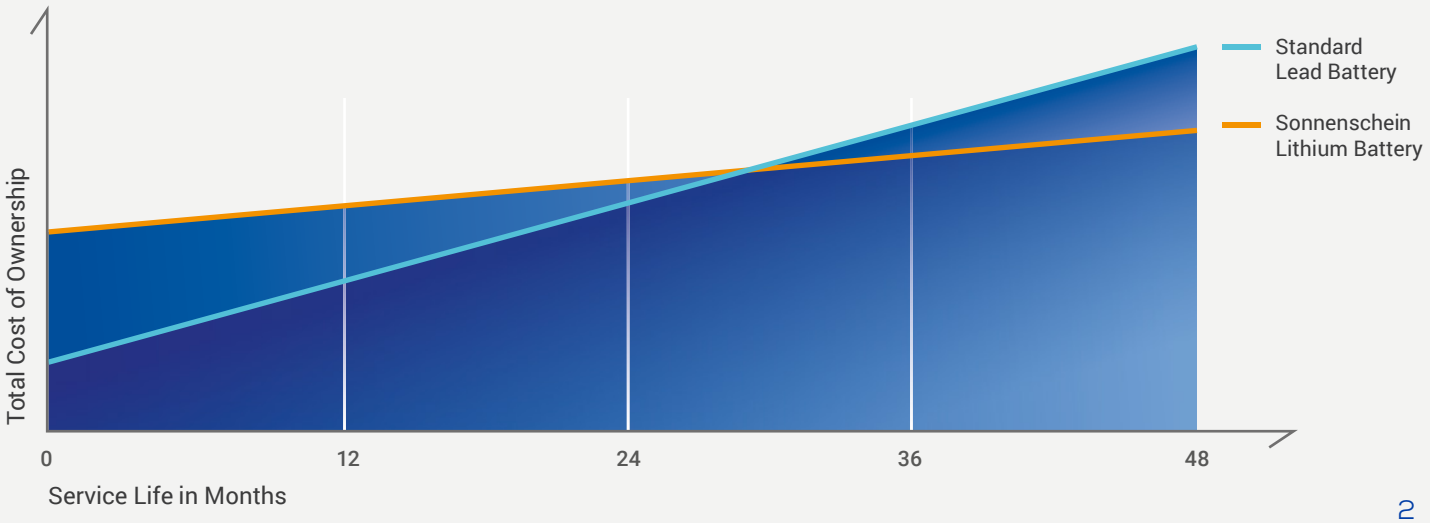
- **High cycle life**
- **Ultra-fast charging and frequent opportunity charging**
- **No gas emission**
- **High energy density**
- **24/7 applications & Multi-shift**
- **Maintenance-free during the whole service life**

SONNENSCHEIN LITHIUM
TOTAL COST OF OWNERSHIP

There Are Many Elements That Contribute To The Low TCO Of Lithium-Ion Batteries

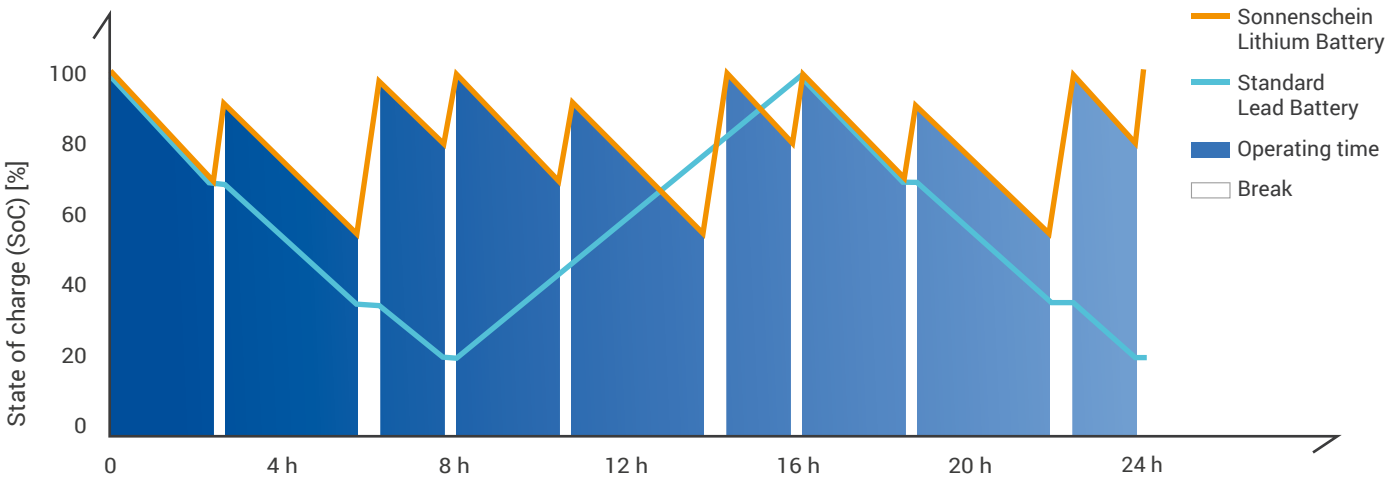
- Longer operating times - maximum autonomy
- Fast recharge and opportunity charging - avoiding battery changes
- Maintenance-free - no infrastructure for water refilling needed
- Highly efficient - saves energy costs
- Real-time data - improves fleet management

Lithium vs. Lead In High Intensity Operation



SONNENSCHEIN LITHIUM
MAXIMUM PRODUCTIVITY

Driving profile in 24/7



No Need For Battery Changing

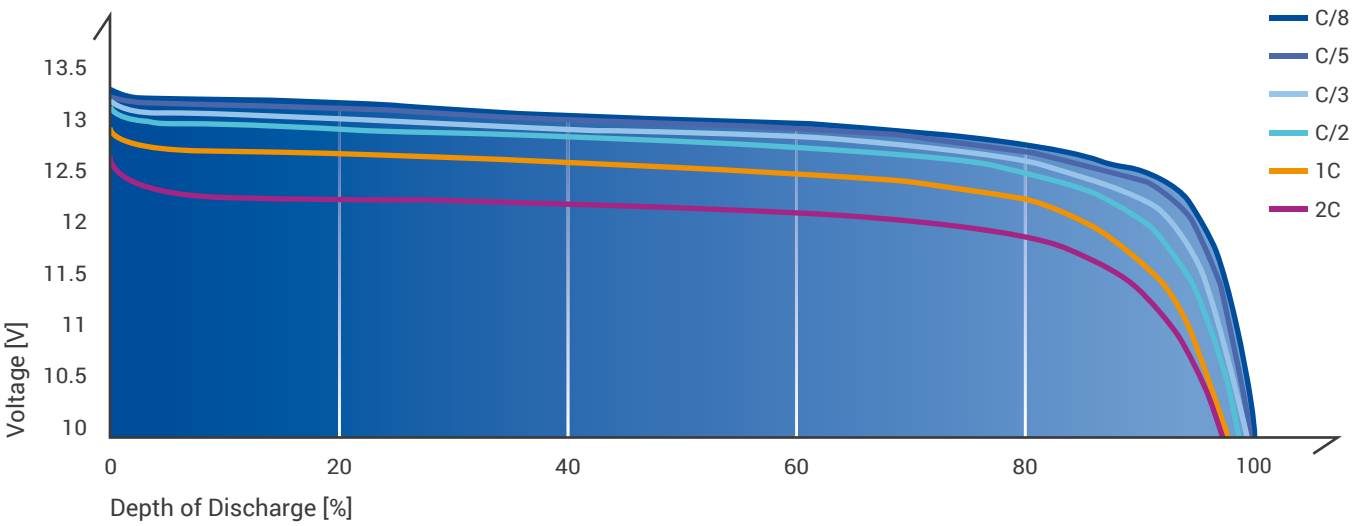
Thanks to the fast charge and opportunity charge capability of Sonnenschein Lithium there is no longer any need to change batteries. Avoiding downtime increases directly operational efficiency and reduces costs. Furthermore the removal of spare batteries means reduction of the battery fleet size, less chargers and no battery exchange equipment resulting in more space for core business.

Maintenance-Free

The GNB Sonnenschein Lithium system is a maintenance free solution. There is no need for water filling which greatly decreases your operating costs and increases your vehicle availability.

SONNENSCHEIN LITHIUM
HIGH POWER AND EFFICIENCY

Sonnenschein Lithium voltage profiles at various discharge rates



Extremely Stable Voltage Level

The Sonnenschein Lithium solution maintains a very stable voltage profile even under high discharge conditions. This ensures that in a demanding environment the Sonnenschein Lithium battery delivers significantly more energy than conventional batteries. This means that smaller capacity Lithium batteries can provide the same usable energy as lead batteries with higher nominal capacity.

Charge Efficiency

The Sonnenschein Lithium solution has an extremely high ampere hour charge efficiency of greater than 98%. This means that more of the energy which was paid for is used to move your goods and less energy is wasted in overcharge which, in consequence, lowers costs and reduces your CO_2 footprint.
The battery performs particularly well with recuperation systems. Energy recovery and charge acceptance is high making the entire system more efficient and the running costs lower.

SONNENSCHEIN LITHIUM
BATTERY MANAGEMENT SYSTEM

Features

- Ensuring operational safety by monitoring and managing system parameters such as voltage, current and temperature
- Maximizing operational performance and delivered capacity through controlled balancing
- Control of the GNB Lithium Charger, ensuring the fastest and safest charge possible
- Accurate state of charge calculation using algorithms developed over many years
- Managing the communication of data between the modules via an internal communication bus
- Operation of thermal management systems (if required)
- GNB's Battery Management System can fully integrate and communicate with the vehicle (optional)

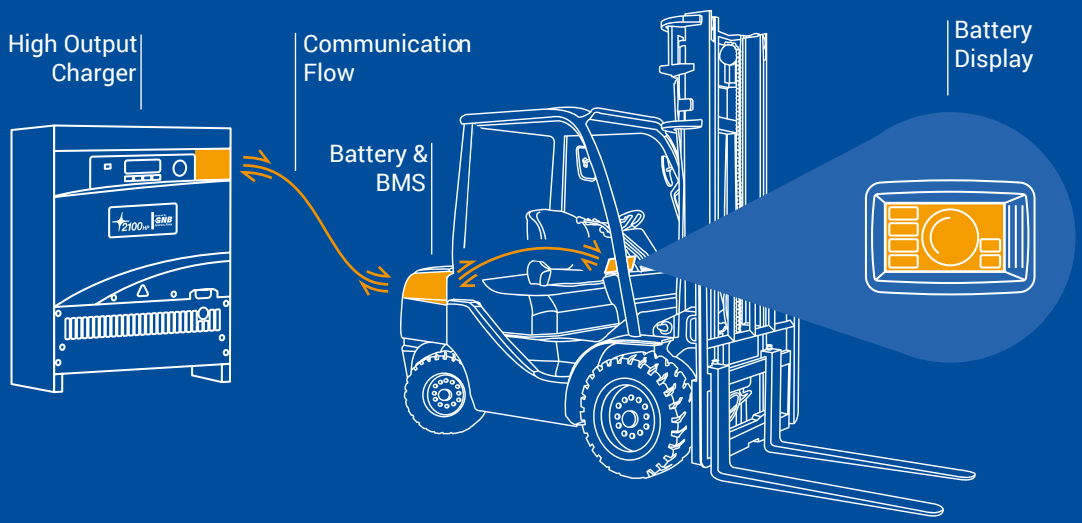
Accessories

HC- / LC-Logger (optional)
The ideal complement to the Battery Managment System in order to record data

Display (optional)
The Opus Display provides the most important information at one glance

COMMUNICATION FLOW

Fully Integrated Sonnenschein Lithium System



SONNENSCHEIN LITHIUM
TRAY BATTERIES

GNB offers an extensive range of tray batteries based on the modular Sonnenschein Lithium System which allows to build DIN batteries (see examples below) as well as customized (fully integrated) battery solutions. GNB's Lithium-ion batteries are suitable for all classes of industrial trucks (I, II and III), from the warehouse pedestrian and the order picker up to the counterbalance trucks.

	TRADITIONAL VOLTAGE	NOMINAL VOLTAGE	CAPACITY [AH]	ENERGY CONTENT [KWH]	CONSTANT DISCHARGE CURRENT [A]	PEAK DISCHARGE CURRENT [A]
	24	25.6	80	2.0	160	240
			110	2.8	220	420
			120	3.1	240	360
			138	3.5	280	420
			165	4.2	330	630
			207	5.3	420	630
			220	5.6	440	840
			276	7.1	560	840
			330	8.4	660	1260
			345	8.8	700	1050
			385	9.9	770	1470
			414	10.6	840	1260
			440	11.3	880	1680
	36	38,4	80	3.1	160	240
			110	4.2	150	300
			138	5.3	150	300
			220	8.4	300	600
			276	10.6	300	600
			330	12.7	300	600
			414	15.9	450	900
			440	16.9	600	1200
	48	51.2	110	5.6	220	420
			138	7.1	280	420
			165	8.4	330	630
			207	10.6	420	630
			220	11.3	440	840
			276	14.1	560	840
			330	16.9	660	1260
			345	17.7	700	1050
			385	19.7	770	1470
			414	21.2	840	1260
			440	22.5	880	1680
			483	24.7	980	1470
			495	25.3	990	1890
			552	28.3	1120	1680
	80	76.8	110	8.4	220	420
			138	10.6	280	420
			165	12.7	330	630
			207	15.9	420	630
			220	16.9	440	840
			276	21.2	560	840
			330	25.3	660	1260
			414	31.8	840	1260
			440	33.8	880	1680
			483	37.1	980	1470
			495	38.0	990	1890
			550	42.2	1120	1680
			552	42.4	1100	2100
			605	46.5	1210	2310
			660	50.7	1320	2520
			690	53.0	1400	2100
			759	58.3	1540	2310
			828	63.6	1680	2520
			897	68.9	1820	2730
			966	74.2	1960	2940

GNB INDUSTRIAL POWER

Exide Technologies, with operations in more than 80 countries and more than 120 years of experience, is one of the world's largest producers and recyclers of lead-acid batteries. The company develops state-of-the-art energy storage solutions for the automotive and industrial market. Leading car, truck and lift truck manufacturers trust in Exide Technologies as an original equipment supplier. Exide also serves the aftermarket through a portfolio of successful and well-known brands.

Exide Transportation manufactures batteries for light and commercial vehicles, as well as agricultural and marine leisure applications. Industrial markets – under the division **GNB Industrial Power** – include efficient energy storage solutions for motive power applications such as lift trucks, cleaning machines and other commercial electrical vehicles, and network power applications such as telecommunications systems, renewables, and uninterruptible power supply (UPS).

Exide's engineers have always been at the forefront of bringing important innovations to the industry. Exide's ISO/TS-certified manufacturing facilities ensure that customers receive products that are produced with maximum efficiency and fulfill the highest quality standards, while minimizing impact on the environment.

Exide's extensive sales and distribution network provides quality service and delivers on time to its customers. Its world-class recycling facilities ensure that batteries will be reused, helping to make a positive contribution to the environment. Exide also provides services, accessories and energy consulting to its clients.

- Manufacturing plants
- Recycling plants
- Additional distribution centers
- European headquarter
- Main sales offices

All production facilities ISO 9001 certified
Automotive plants ISO/TS 16949 approved
Manufacturing plants ISO 14001 certified

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EXIDE TECHNOLOGIES | POWERING THE WORLD **FORWARD**

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