

# WELCOME!

## VARTA MOBILE ROBOTICS WEBINAR



- ▶ **Presented by VARTA:** Friday April 23<sup>rd</sup> 2020 at 1:30pm CET
- ▶ We will begin in a few moments. We encourage you to use a separate phone to dial-in for the audio, especially in case any audio issues are experienced and use your computer for the presentation material only.
- ▶ Participants are automatically muted but may ask questions via the control panel. You can also chat via the control panel if you have an issue.
- ▶ We will handle any questions at the end but please feel free to submit questions at any time via your webinar control panel

# APPLICATION SPECIFIC BATTERIES

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DESIGNED FOR LOGISTICS,  
AGRICULTURAL, ROBOTICS AND  
AGV APPLICATIONS.



For more information: [www.varta-storage.com/asb](http://www.varta-storage.com/asb)

# Designing Mobile Robotics: A Few Questions



- ▶ What type of Mobile Robotics?
  - ▶ Large, Medium, or Small?
  - ▶ Usage profile?
- ▶ Motor Voltage Requirements?
  - ▶ Higher is more efficient, since motor currents are lower.
- ▶ How often is it Charged?
  - ▶ During operation? (During the day?)
    - ▶ Will Battery be replaced with a full one or charged briefly?
  - ▶ Overnight only?
- ▶ Capacity needs – fixed or expandable?
  - ▶ Mobile Robots all the same, or some need longer run-times?



# What Type of Mobile Robotics?



## Large:

### Traditional Fork-Lifts, Tuggers, & Cleaning Machines



- ▶ 24V, 36V, 48V
- ▶ 200 to 2000 Ah
- ▶ Majority Lead-Acid
- ▶ Battery easily removed
- ▶ Flexible usage

## Medium:

### Platforms, Goods-to-Person, & Robots on Rails (AS/RS)



- ▶ 24V, 36V, 48V
- ▶ 10 to 100Ah
- ▶ Mostly Li-Ion
- ▶ Battery embedded
- ▶ Dedicated usage profile

## Small:

### Small Goods-to-Person, Pick Assist, & Shelf to Shipping



- ▶ 12V, 24V
- ▶ 5 to 50Ah
- ▶ Majority Li-Ion, Some Lead
- ▶ Embedded or removable
- ▶ Variety of usage models

# What Type of Mobile Robotics?



Large:	Medium:	Small:
<p>Traditional Fork-Lifts, Tuggers, &amp; Cleaning Machines</p> <p><b>Custom Battery Solutions</b></p>	<p>Platforms, Goods-to-Person, &amp; Robots on Rails (AS/RS)</p> <p><b>Standard Battery Solutions</b></p>	<p>Small Goods-to-Person, Pick Assist, &amp; Shelf to Shipping</p> <p><b>Standard Battery Solutions</b></p>
<p><b>System Solution (Battery, Charger, Accessories)</b></p>		
<ul style="list-style-type: none"> <li>▶ 24V, 36V, 48V</li> <li>▶ 200 to 2000 Ah</li> <li>▶ Majority Lead-Acid</li> <li>▶ Battery easily removed</li> <li>▶ Flexible usage</li> </ul>	<ul style="list-style-type: none"> <li>▶ 24V, 36V, 48V</li> <li>▶ 10 to 100Ah</li> <li>▶ Mostly Li-Ion</li> <li>▶ Battery embedded</li> <li>▶ Dedicated usage profile</li> </ul>	<ul style="list-style-type: none"> <li>▶ 12V, 24V</li> <li>▶ 5 to 50Ah</li> <li>▶ Majority Li-Ion, Some Lead</li> <li>▶ Embedded or removable</li> <li>▶ Variety of usage models</li> </ul>

# Motor Voltage Requirements



- ▶ Higher is Better for Motors
  - ▶ Higher Voltage Motors are More Efficient
  - ▶ Lower Operating Currents
  - ▶ Lower Operating Temperatures (Why?  $\text{Power \& Heat} = I^2R$ )



**But** ‘stacking’ Batteries risks imbalance. And will the Battery be too BIG?

- ▶ Fixed Voltage Systems avoid Battery imbalance (it’s handled in the design)
- ▶ Li-Ion up to 60V has low weight

**Bigger** within limits: 48V Nominal is highest without added handling concerns

- ▶ “48V” is typically 50-52V nominal and up to 59V for Charging
- ▶ Batteries >60V have additional safety handling precautions

- ▶ Fast Charge Options: Some Lithium Battery chemistries like it, others do not!
- ▶ How often is it Charged?
  - ▶ During operation? (During the day?)
    - ▶ If Charging during Operating time then “usage up-time” is decreased
  - ▶ Will Battery be replaced with a full one or charged briefly?
    - ▶ “Opportunity” charging during breaks vs. Battery “swap-out”
  - ▶ Overnight only?
    - ▶ Are there enough Chargers? Added cost if need 1:1 Charger to Robot
- ▶ Wireless Charging: A nice option, but may require a larger charger due to losses.
- ▶ Regenerative Charging: Can the Mobile Robot put energy back to the Battery?

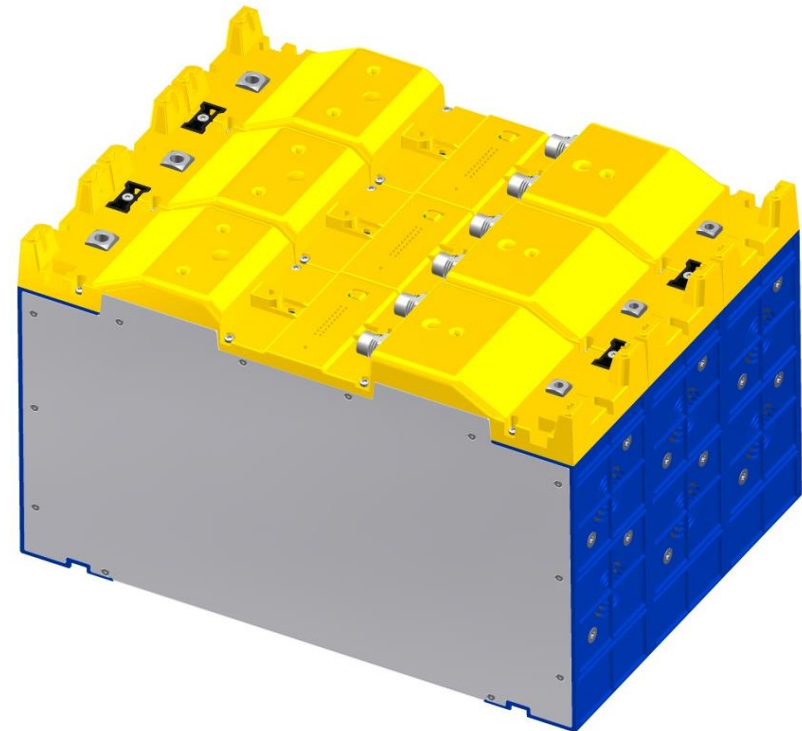
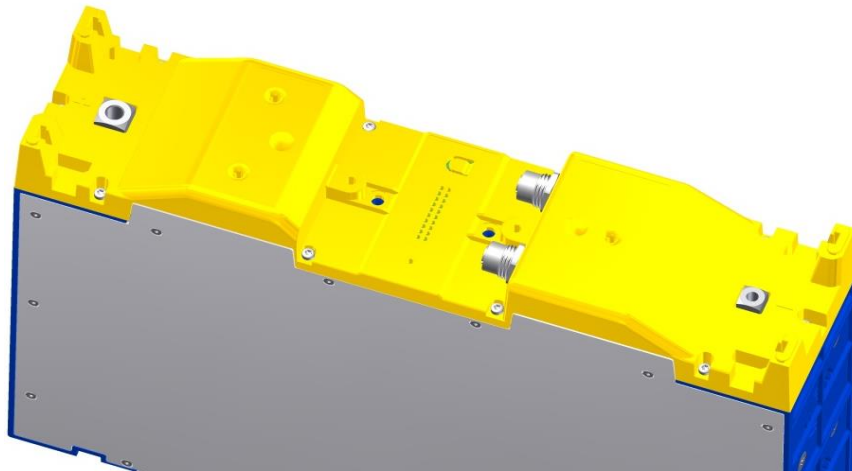


# Capacity Needs

- ▶ Capacity needs – fixed or expandable?
  - ▶ All the same, or a mixed fleet with some need longer run-times?
    - ▶ Ability to easily add capacity: “Parallel-ing” same voltage Batteries

From one...

to many...

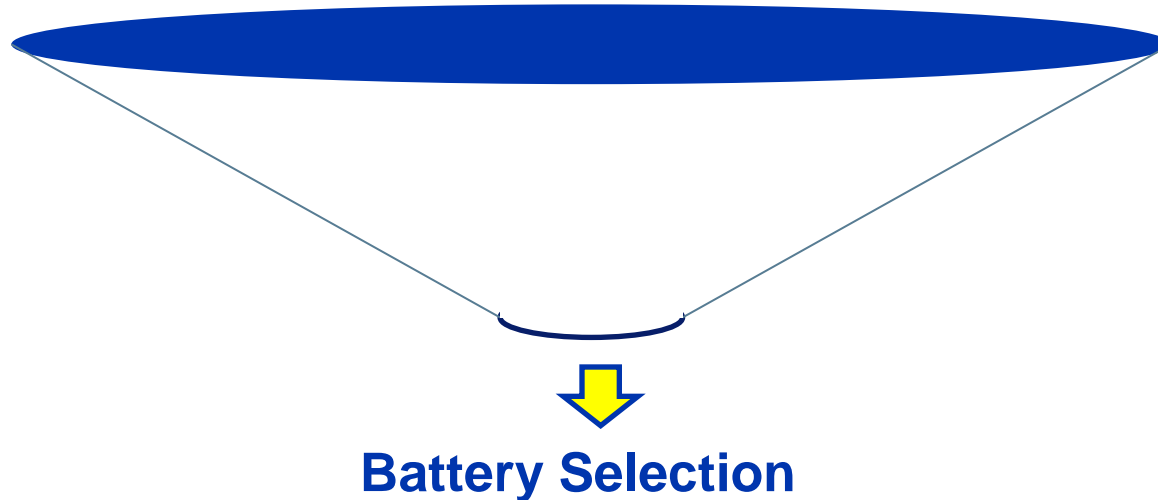




# Summary: Factors in Battery Selection



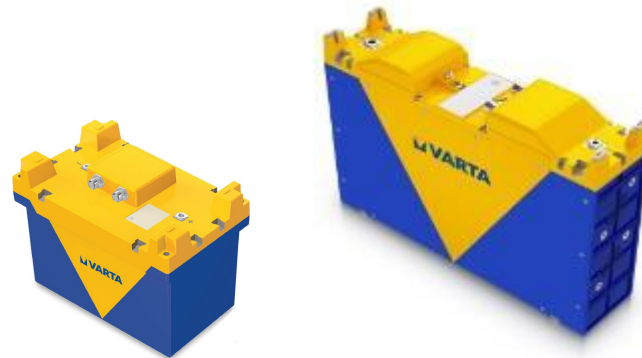
- ▶ What type of Mobile Robotics? Small – Medium – Large
- ▶ Motor Voltage Requirements? 12V, 24V, 36V, 48V
- ▶ How often is it Charged? Fast Charge & Regenerative Capability
- ▶ Capacity needs – fixed or expandable? Single or Expandable



# Mobile Robotics Batteries by VARTA



## MODULAR



## STANDALONE



	Easy Block	Easy Blade	Easy Stack	Easy Slice
12 V	-	-	161 Ah	80.5 Ah
24 V	22.8 Ah	64 Ah	80 Ah	40 Ah
36 V	-	-	47 Ah	23.5 Ah
48 V	11.4 Ah	32 Ah	40 Ah	20 Ah

**Connect up to 25 in Parallel  
No Master BMS Needed**

**Easily Removeable for  
Swappable Battery Options**

# Shared Features of EasyBlock & EasyBlade



- ▶ Modular design for parallel connection up to 25 modules
- ▶ Fast charging to 80% within 1 hour, fully charged in <3 hours
- ▶ Allows Re-generative Charging
- ▶ Automatic Master-Slave Identification: One Battery controls the whole system
- ▶ Lightweight, compact modular designs with stacking and locking features for robust mechanical horizontal and vertical stacking
- ▶ Zero maintenance or service requirements from the user
- ▶ Balanced energy density, power and lifetime performance.
- ▶ Integrated communications – CAN Bus (CANopen)
- ▶ 4-level safety integrated into each pack
- ▶ Comprehensive design-in resources

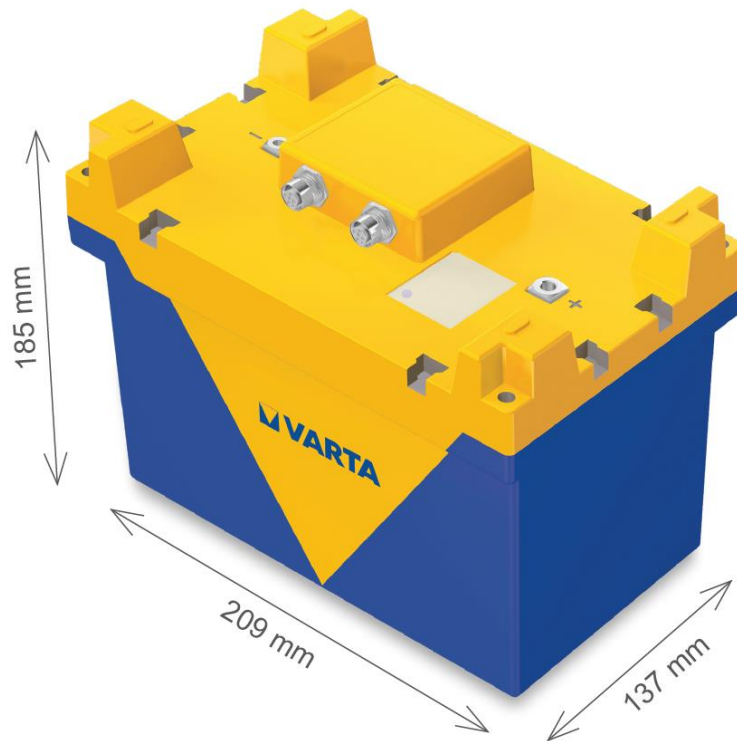


# VARTA Easy Blade Modular



- ▶ High Energy Li-Ion Technology
- ▶ Available in 24V and 48V versions
- ▶ Active Cooling for improved cycle life performance
- ▶ Zero Maintenance during life cycle
- ▶ Up to 64Ah per module (24V)
- ▶ 1,000 cycles to 80%
- ▶ UN38.3 & IEC-62133-2 Certifications
- ▶ Connect up to 25 modules in parallel for more than 41kWh total system energy!

# VARTA Easy Block Modular



- ▶ Long Life Li-Ion Technology
- ▶ Available in 24V and 48V versions
- ▶ 4,000 cycles to 80%
- ▶ Zero Maintenance during life cycle
- ▶ Up to 22.8Ah per module (24V)
- ▶ Connect up to 25 modules in parallel for more than 14kWh total system energy!

# VARTA Easy Stack Standalone



- ▶ > 2kWh High Energy Li-Ion Technology
- ▶ Available in 12V, 24V, 36V, and 48V options
- ▶ LED State of Charge Indicator
- ▶ Zero Maintenance during life cycle
- ▶ Up to 161Ah per module
- ▶ 1,000 cycles to 80%
- ▶ Easy Exchange with standard connector and lifting/carrying handle

# VARTA Easy Slice Standalone



- ▶ > 1kWh High Energy Li-Ion Technology
- ▶ Available in 12V, 24V, 36V, and 48V options
- ▶ LED State of Charge Indicator
- ▶ Zero Maintenance during life cycle
- ▶ Up to 80.5 Ah per module
- ▶ 1,000 cycles to 80%
- ▶ Easy Exchange with standard connector and lifting/carrying handle



# Design-In Resources



► Datasheets for quick reference and product selection

► Technical Handbook containing detailed info and set-up guidance

► [www.varta-storage.com/asb](http://www.varta-storage.com/asb)

VARTA AG

MICROBATTERIES & SOLUTIONS

HOUSEHOLD BATTERIES

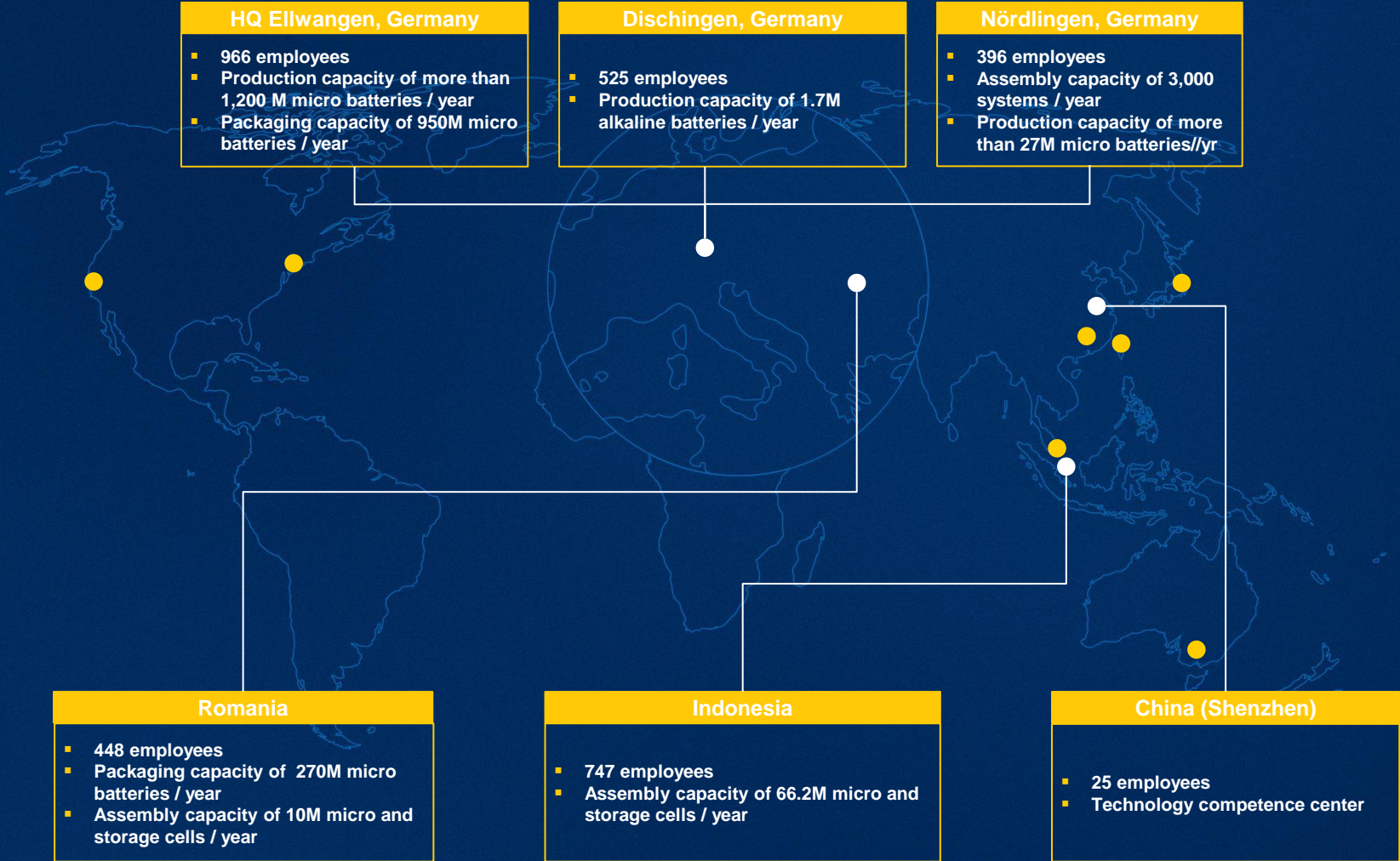


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# Global Footprint



● Production  
● Sales Office

# Batteries for Mobile Robotics

[www.varta-storage.com/asb](http://www.varta-storage.com/asb)



## MODULAR



## STANDALONE



	Easy Block	Easy Blade	Easy Stack	Easy Slice
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24 V	22.8 Ah	64 Ah	80 Ah	40 Ah
36 V	-	-	47 Ah	23.5 Ah
48 V	11.4 Ah	32 Ah	40 Ah	20 Ah

**Connect up to 25 in Parallel  
No Master BMS Needed**

**Easily Removeable for  
Swappable Battery Options**



CHOOSE WISELY – CHOOSE VARTA

**THANK YOU!**

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Find more information here: [www.varta-storage.com/asb](http://www.varta-storage.com/asb)

Or email [asb@varta-storage.com](mailto:asb@varta-storage.com)

# Start Today!



Contact person:

Alex Stapleton  
[alex.stapleton@varta-storage.com](mailto:alex.stapleton@varta-storage.com)

Tel: +44 7766 903 559

[www.varta-storage.com](http://www.varta-storage.com)