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Оренбург (3532)37-68-04
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Пермь (342)205-81-47
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Технические характеристики на литий-ионные модули для промышленного и железнодорожного транспорта серии Modul’ion

Modul'ion®-35 24 V 205MFe

Super-Phosphate™ (SLFP) Medium Power module

Lithium-ion module combining Energy and Power
Suited for integration in advanced battery system of electric Material Handling Equipment

This **Modul'ion**®-35 is designed for parallel assembly in 24 V battery systems designed by .

For easier integration in application, the module management electronic is located in the battery system.

battery systems come equipped with battery management electronics, safety, communication and control interfaces to the host vehicle.

Applications

- Material Handling Equipment: pedestrian and stand on pallet trucks, reach stacker...

Module features

- High energy efficiency and density
- Quick and high recharge capabilities
- High life cycle performance
- Minimal maintenance (no water topping up) and emission-free (zero gassing)

Battery system features

- Battery Management System (SOC, SOH, protection devices, current sensor) ensures that the battery operates within its limits in terms of voltage, temperature, current ...
- Robust construction withstanding industrial vehicle standards (IP rating, shock and vibration (DIN EN 60068-2-27 and DIN EN 60068-2-6)

Nominal characteristics at + 25°C/+ 77°F	
Nominal voltage (V)	23.1
Rated capacity (C/5) (Ah)	195
Typical capacity (C/5) (Ah)	205
Typical energy (C/5) (Wh)	4 736
Volumetric energy (Wh/l)	142
Gravimetric energy (Wh/kg)	105
Mechanical characteristics	
Width (mm)	667
Height (mm)	196
Depth (mm)	255
Weight (kg)	45
Electrical characteristics at + 25°C/+ 77°F	
Voltage window (V)	26.6 to 17.5
Max. continuous discharge current (A)	200
Max. continuous charge current (A)	200
Max. pulse discharge current in 5 s (A)	300
Max. pulse charge current in 5 s (A)	300
Power peaks in 5 s (kW)	6.9
Operating conditions	
Operating temperature	- 25°C to + 60°C (- 13°F to 140°F)
Recommended temperature for transport and storage	+10°C to + 30°C (50°F to 86°F)
Allowable temperature for transport and storage	- 40°C to + 70°C (- 40°F to 158°F)

Data are typical value, please consult for battery sizing and module integration in battery system

Benefits at battery system level

- Facilitates battery system development and integration thanks to its modular architecture
- Longer operating hours with constant performance
- Fast charging allows opportunity charging
- Minimize maintenance cost
- Enhanced cycling performance improves TCO of vehicles
- Accurate real time battery data monitoring thanks to the CAN bus communication with the host vehicle
- Environmentally friendly

Safety

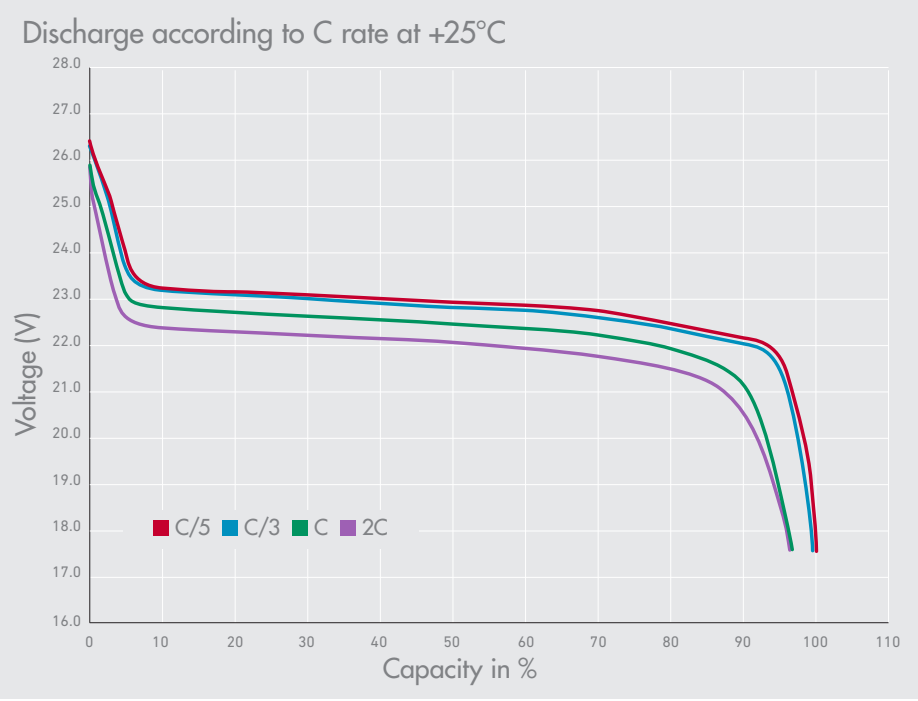
Safety driven design for cells, modules and systems guarantees safe behavior in case of abuse usage or component failure. This includes:

- Stringent design rules and qualification
- Implementation of redundant safety features
  - at cell level (e.g. shutdown effect separator and mechanical vent)
  - at module level (e.g. electronic board, voltage and temperature monitoring, balancing)
  - at battery level (e.g. electronic board, power switch and current sensor)

Compliance to standards	
Cell safety	UL 1642
Module safety	EN 50 178
Transportation regulation	ADR, IMDG Code, OACI/IATA
Transportation classification	UN 3480, class 9 (group II)
Marking	CE
Fire and smoke	UL94 V0
Directives/Regulations	REACH*, Voluntary RoHS**

**REACH: The group has adopted internal procedures to ensure conformity with the European REACH Regulation*

***RoHS: Also batteries are not within the scope of the RoHS Directive, has taken voluntary measures to ensure that the substances forbidden by RoHS are not present in the battery, with the exception of the electrochemical core.*



Modul'ion®-14 24 V 82MFe

Super-Phosphate™ (SLFP) Medium Power module

Lithium-ion module combining Energy and Power
Suited for integration in advanced battery system of electric Material Handling Equipment

This **Modul'ion**®-14 is designed for parallel assembly in 24 V battery systems designed by .

For easier integration in application, the module management electronic is located in the battery system.

battery systems come equipped with battery management electronics, safety, communication and control interfaces to the host vehicle.

Applications

- Material Handling Equipment: pedestrian and stand on pallet trucks, reach stacker...

Module features

- Vertical or horizontal implementation
- High energy efficiency and density
- Quick and high recharge capabilities
- High life cycle performance
- Minimal maintenance (no water topping up) and emission-free (zero gassing)

Battery system features

- Battery Management System (SOC, SOH, protection devices, current sensor) ensures that the battery operates within its limits in terms of voltage, temperature, current...
- Robust construction withstanding industrial vehicle standards (IP rating, shock and vibration (DIN EN 60068-2-27 and DIN EN 60068-2-6)

Nominal characteristics at + 25°C/+ 77°F	
Nominal voltage (V)	23.1
Rated capacity (C/5) (Ah)	78
Typical capacity (C/5) (Ah)	82
Typical energy (C/5) (Wh)	1 894
Volumetric energy (Wh/l)	124
Gravimetric energy (Wh/kg)	109
Mechanical characteristics	
Width (mm)	445
Height (mm)	269
Depth (mm)	128
Weight (kg)	17.3
Electrical characteristics at + 25°C/+ 77°F	
Voltage window (V)	26.6 to 17.5
Max. continuous discharge current (A)	200
Max. continuous charge current (A)	82
Max. pulse discharge current in 5 s (A)	300
Max. pulse charge current in 5 s (A)	300
Power peaks in 5 s (kW)	6.9
Operating conditions	
Operating temperature	- 25°C to + 60°C (- 13°F to 140°F)
Recommended temperature for transport and storage	+10°C to + 30°C (50°F to 86°F)
Allowable temperature for transport and storage	- 40°C to + 70°C (- 40°F to 158°F)

Data are typical value, please consult for battery sizing and module integration in battery system

Benefits at battery system level

- Facilitates battery system development and integration thanks to its modular architecture
- Longer operating hours with constant performance
- Fast charging allows opportunity charging
- Minimize maintenance cost
- Enhanced cycling performance improves TCO of vehicles
- Accurate real time battery data monitoring thanks to the CAN bus communication with the host vehicle
- Environmentally friendly

Safety

Safety driven design for cells, modules and systems guarantees safe behavior in case of abuse usage or component failure. This includes:

- Stringent design rules and qualification
- Implementation of redundant safety features
  - at cell level (e.g. shutdown effect separator and mechanical vent)
  - at module level (e.g. electronic board, voltage and temperature monitoring, balancing)
  - at battery level (e.g. electronic board, power switch and current sensor)

Compliance to standards	
Cell safety	UL 1642
Module safety	EN 50 178
Transportation regulation	ADR, IMDG Code, OACI/IATA
Transportation classification	UN 3480, class 9 (group II)
Marking	CE
Fire and smoke	UL94 V0
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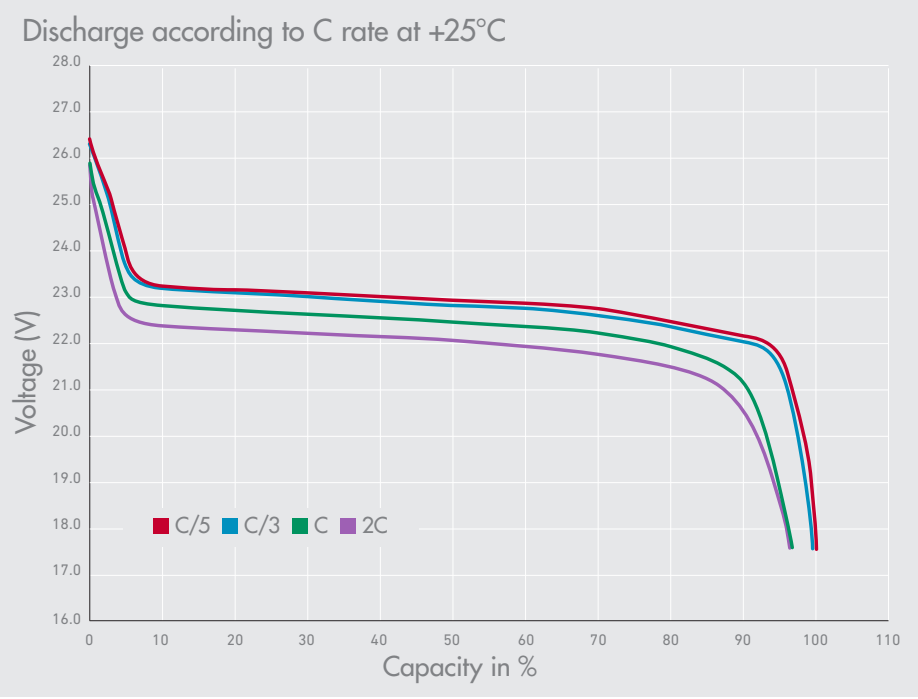

Modul'ion®-12 Power

Super-Phosphate™ (SLFP) 20 V or 40 V module

High Power in a versatile module for battery systems.
Designed for industrial vehicles and railway applications.

Its modular design allows engineering of different battery configurations, meeting customers' application requirements, in one high performance system.

The battery system comes equipped with battery management electronics, thermal management (when application requires it), safety, communication and control interfaces to the host vehicle.

Applications

- Electric and hybrid vehicles
- Railway applications

Module features

- Quick and high recharge capabilities (e.g. regenerative braking application)
- High life cycle performance
- Light weight and compact design
- Robust construction withstanding onboard vehicle shocks and vibrations
- Liquid cooling/heating system
- CAN BUS communication

Benefits

- Facilitates on time vehicle development and integration thanks to its modular architecture
- Improves vehicle's driving range and reduces CO_2 footprint

Battery system features

- Modular system approach
- Scalable (series or parallel configurations) up to 1000 V or 200 kWh
- Battery Management System (SOC, SOH, protection devices, current sensor)
- Active or passive thermal management

	Modul'ion®-12 Power	
	40.30 PFe	20.60 PFe
Nominal characteristics at + 25°C / + 77°F		
Nominal voltage (V)	39.6	19.8
Rated capacity (C/5) (Ah)	28	56
Typical capacity (C/5) (Ah)	30	60
Typical energy (C/5) (Wh)	1188	1188
Volumetric energy (Wh/l)	103	103
Gravimetric energy (Wh/kg)	77	77
Mechanical characteristics		
Width (mm)	375	375
Height (mm)	270	270
Depth (mm)	114	114
Weight (kg)	15.4	15.4
Thermal management	Liquid cooled /heated	Liquid cooled /heated
Electrical characteristics at + 25°C / + 77°F		
Voltage window (V)	45.6 to 30	22.8 to 15
Max. continuous discharge current (A)	200	200
Max. continuous charge current (A)	120	200
Max. pulse discharge current in 10 s (A)	450	600
Max. pulse charge current in 10 s (A)	200	360
Power peaks in 10 s (kW)	17.8	11.8

Data are typical value, please consult for battery sizing

Safety

Safety driven design for cells, modules and systems guarantees safe behavior in case of abuse usage or component failure. This includes:

- Stringent design rules and qualification
- Implementation of redundant safety features
  - at cell level (e.g. shutdown effect separator and mechanical vent)
  - at module level (e.g. electronic board, voltage and temperature monitoring, balancing)
  - at battery level (e.g. electronic board, power switch and current sensor)

Operating conditions	
Operating temperature	-25°C to +60°C (-13°F to 140°F)
Calendar lifetime (+25°C/+77°F)	20 years
Recommended temperature for transport and storage	+10°C to +30°C (50°F to 86°F)
Allowable temperature for transport and storage	-40°C to +70°C (-40°F to 158°F)
Storage time for self-discharge	6 months
Design to comply with	
Cell safety	UL 1642
Transport qualification	UN 3480, class 9 (group II)
Marking	CE
Fire and smoke	NFF 16-101/102 (cat. A1) NFPA 130
Shock and vibration	IEC 61373
Directives / Regulations	REACH*, Voluntary RoHS**

**REACH: The group has adopted internal procedures to ensure conformity with the European REACH Regulation*
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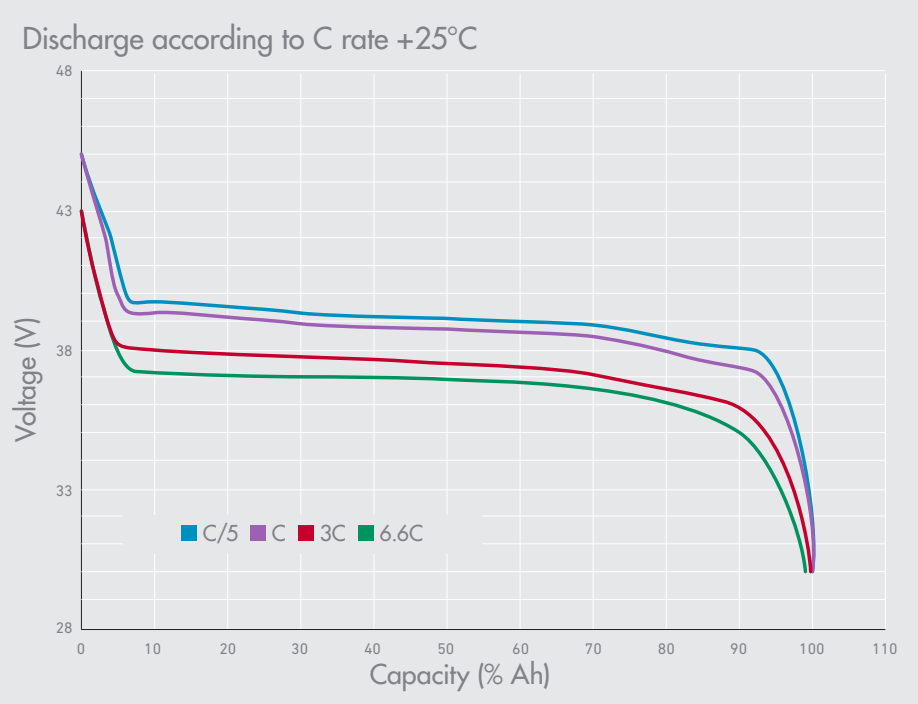

Contact Technical Support for the performance of your specific configuration
Data are typical value, please consult for battery sizing upon specific profile

Modul'ion®-12 Medium Power

Super-Phosphate™ (SLFP) 20 V or 40 V module

Li-ion module combining Energy and Power.
Suited for industrial vehicles and railway advanced battery systems.

Its modular design allows adaptation of the battery configuration, through serial or parallel connection, to reach the required energy and power for driving profile levels, up to hundreds of kWh in one functional entity.

The battery system comes equipped with battery management electronics, thermal management (when application requires it), safety, communication and control interfaces to the host vehicle.

Applications

- Electric and hybrid vehicles
- Railway applications

Module features

- Quick recharge capabilities (e.g. regenerative braking application)
- High life cycle performance
- Light weight and compact design
- Robust construction withstanding onboard vehicle shocks and vibrations
- Liquid cooling/heating system
- CAN BUS communication

Benefits

- Facilitates on time vehicle development and integration thanks to its modular architecture
- Improves vehicle's driving range and reduces CO_2 footprint

Battery system features

- Modular system approach
- Scalable (series or parallel configurations) up to 1000 V or 200 kWh
- Battery Management System (SOC, SOH, protection devices, current sensor)
- Active or passive thermal management

	Modul'ion®-12 Medium Power	
	40.41 MFe	20.82 MFe
Nominal characteristics at + 25°C / + 77°F		
Nominal voltage (V)	39.6	19.8
Rated capacity (C/5) (Ah)	39	78
Typical capacity (C/5) (Ah)	41	82
Typical energy (C/5) (Wh)	1624	1624
Volumetric energy (Wh/l)	141	141
Gravimetric energy (Wh/kg)	105	105
Mechanical characteristics		
Width (mm)	375	375
Height (mm)	270	270
Depth (mm)	114	114
Weight (kg)	15.4	15.4
Thermal management	Liquid cooled /heated	Liquid cooled /heated
Electrical characteristics at + 25°C / + 77°F		
Voltage window (V)	45.6 to 30	22.8 to 15
Max. continuous discharge current (A)	150	200
Max. continuous charge current (A)	41	82
Max. pulse discharge current in 10 s (A)	300	600
Max. pulse charge current in 10 s (A)	180	360
Power peaks in 10 s (kW)	17.8	11.8

Data are typical value, please consult for battery sizing

Safety

Safety driven design for cells, modules and systems guarantees safe behavior in case of abuse usage or component failure. This includes:

- Stringent design rules and qualification
- Implementation of redundant safety features
  - at cell level (e.g. shutdown effect separator and mechanical vent)
  - at module level (e.g. electronic board, voltage and temperature monitoring, balancing)
  - at battery level (e.g. electronic board, power switch and current sensor)

Operating conditions	
Operating temperature	-25°C to +60°C (-13°F to 140°F)
Calendar lifetime (+25°C/+77°F)	20 years
Recommended temperature for transport and storage	+10°C to +30°C (50°F to 86°F)
Allowable temperature for transport and storage	-40°C to +70°C (-40°F to 158°F)
Storage time for self-discharge	6 months
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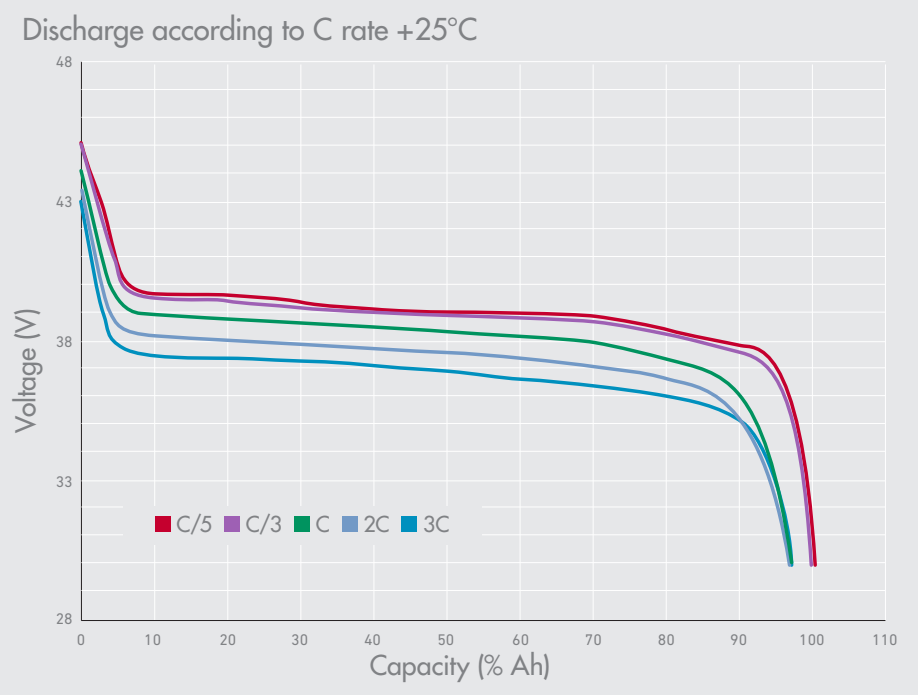

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