

Power Electronic Solutions for Public Transport

EMUs & DMUs

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EMUs & DMUs

MEDCOM is a manufacturer of propulsion systems for electric multiple units and static converters used to supply AC and DC loads in EMU and DMU vehicles.

Medcom's drive inverters are based on the HV IGBT (6.5 kV) technology. A small number of switching components (14 ÷ 28 per vehicle) ensures a high level of reliability and easy maintenance of the vehicles.

Owing to the application of modern control systems, the inverters provide control of speed for each axle of the vehicle, effective electrodynamic braking with a driving torque within the whole range and also a possibility of emergency braking in case of blackout in the traction network.

The currently manufactured 300 kW and 800 kW inverters provide very high driving parameters of the motor units. Their main advantages are a very low noise level and a high driving comfort.

Auxiliary converters of the power range from 20 kW to 350 kW ensure power supply for the components of the power transmission system, as well as all other main loads (control, lighting, compressors, fans) of the traction unit. The heating, ventilation and air conditioning systems of vehicles are also supplied from the static converters.

All inverters and converters are equipped with a diagnostic-control system based on a MVB, CAN 2.0 B or RS232 interface.

Traction Inverters

		PSM-81	119
FT-350-750/PSM-60-226M	104	PSM-120	120
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FT-350-750 integrated with PSM-60-226M

Traction Inverter for Asynchronous Drives

One of the first deliveries to South Italy. Medcom supplied Polish Newag for the narrow-gauge train operating in one of the most majestic routes in Europe – around Etna volcano in Sicily.

Specification of the FT-350-750 inverter

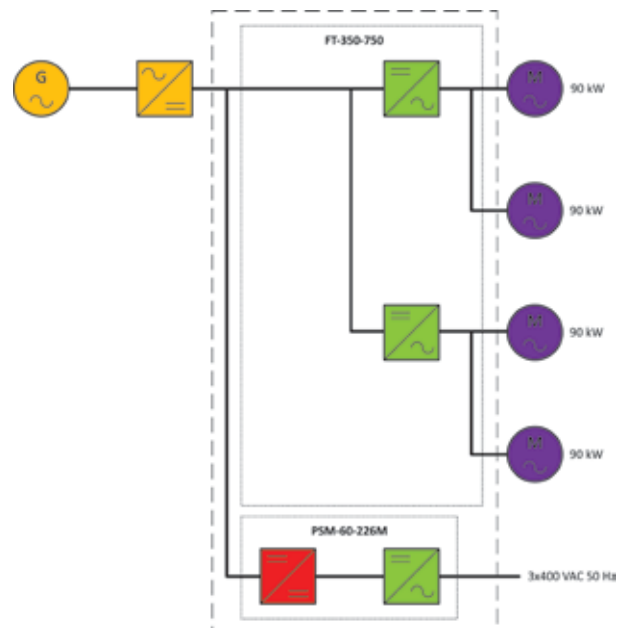
Input voltage	750 VDC, +25 ÷ -30%
Auxiliary voltage	24 VDC, +25 ÷ -30%
Rated current	2×300 Arms
Maximum output current	2×500 Arms
Rated power	2×180 kW
Frequency	0–160 Hz
PWM frequency	250–800 Hz
Insulation strength	4 kV
Cooling	forced-air
Weight	625 kg
Dimensions	1706×950×803 mm

Specification of the PSM-60-226M

Input voltage	750 VDC (operating range 250 V÷1000 V)
Control voltage DC	24 VDC
Output voltage AC	S = 60 kVA; Voltage stability ≤ ±5%; Frequency stability ≤ ±0.2%; THD(u) ≤ ±5%; Max. neutral current = 20A
Total output power	60 kVA
Total efficiency	≥ 92%
Ambient temperature	-30 ÷ +40°C
Protection ratio	IP54
Weight	625 kg
Dimensions	1706×950×803 mm



Block diagram



FT-400-3000-WKD

Traction Inverter for Asynchronous Drives



The FT-400-3000-WKD traction inverter is a modern chopperless system of the direct three-phase inverter based on the HV IGBT 6.5 kV technology. The control of the converter is performed in the DSP (Digital Signal Processor) technology with the application of the FOC SVPWM (Field Oriented Space Vector Pulse Width Modulation). Within the range of high speeds, the system co-operates with a synchronized Bus Clamping Pulse Width Modulation, which causes reduction of losses and noise. The control system ensures acceleration with a constant torque and low power losses. The drive can operate with rheostatic or regenerative braking. The inverter system guarantees very good traction parameters and a perfect stabilization of the driving torque. The control system is equipped with an event recorder with a non-volatile memory. It is also equipped with an anti-slip and an anti-skid systems for driving and braking. Applied braking resistors made of stainless steel guarantee a long service lifetime and low noise level. The applied system of busbars combined with a perfect IGBT driver guarantee a failure-free performance at short circuits. It also eliminates the possibility of secondary damages in case of the transistor's failure. The applied polypropylene capacitors ensure long service lifetime and resistance of the system against changes of voltage in the traction network. Additionally the inverter system is also protected with a thyristor crowbar. The inverter meets UIC and EN standards requirements in safety and electromagnetic compatibility. The system has very low levels of low frequency interferences

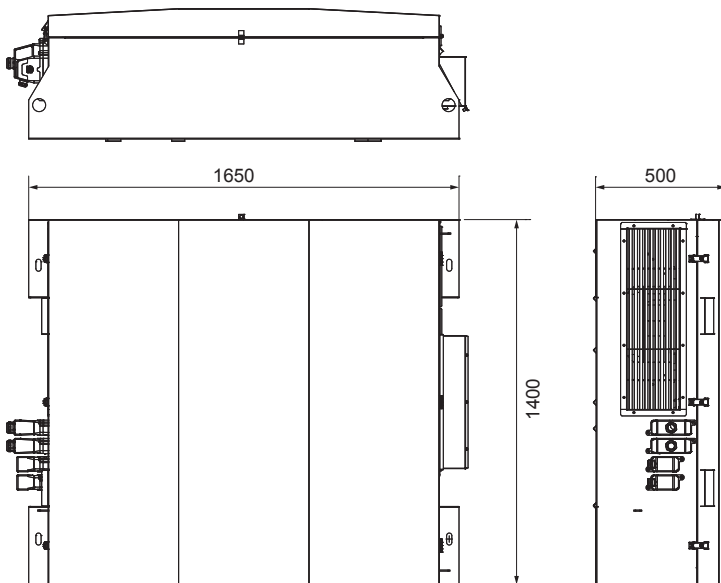
generated to the traction network. The inverter is equipped with forced air-cooling system and operates within the temperature range of $-40^{\circ}\text{C} \div 50^{\circ}\text{C}$. Lack of the cooling liquid increases the reliability and decreases the operating costs of the vehicle. The diagnostics and control of the inverter is possible through the CANbus interface.

The housings of inverters are made of stainless steel and are adapted for build-up on the vehicle's roof. The housing protection ratio is IP65. The housings are resistant to rain and snow and can operate in sun exposure of up to 650 W/m^2 .

Parameters of the EMU EN97 vehicle with the 2xFT-400-3000-WKD drive

Supply voltage	3000 VDC, +30 ÷ -30%
Rated power	8×180 kW
Number of motors per vehicle	8
EMU acceleration at the start to the speed of 40 km/h	1.2 m/s²
EMU deceleration at braking	1.1 m/s²
Maximum speed of the EMU at constant power	80 km/h

Housing



FT-400-3000-WKD

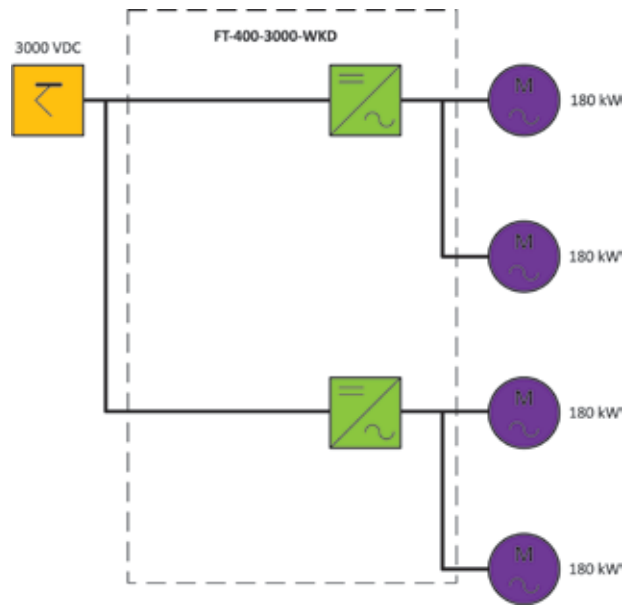
Traction Inverter for Asynchronous Drives

The 2×FT-400-3000-WKD traction drive applied in the middle of the EMU type EN97 vehicle consists of two FT-400-3000-WKD transistor inverters, driving M1, M2, M3 and M4 motors with speed and temperature sensors and an inverter's pre-charge system, installed in the same unit. Apart from that, the high voltage circuit consists of a pantograph and earthing disconnecting switch, high speed current breaker WSZ and a system of two PSM-60-WKD static converters, PS1 and PS2.

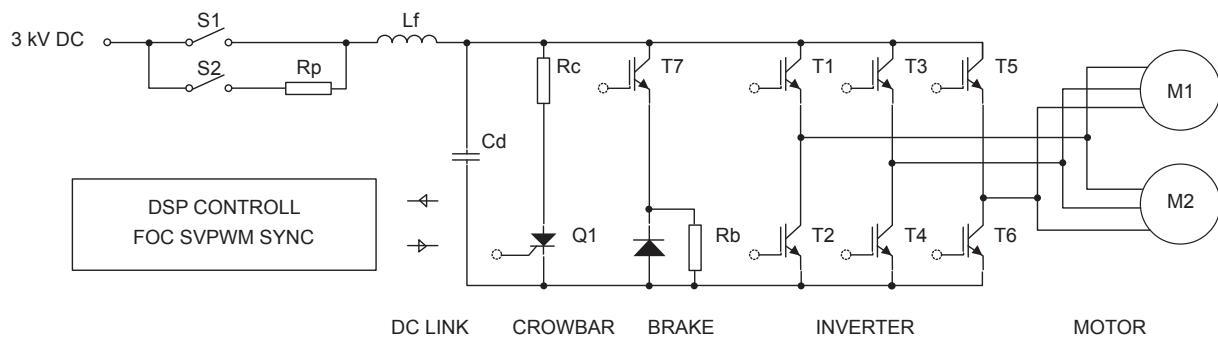
Specification

Rated input voltage	3000 VDC, +30 ÷ -30%
Auxiliary voltage	24 VDC, +2 ÷ -30%
Rated current	200 Arms
Maximum output current	300 Arms
Rated power	400 kW
Frequency	0-160 Hz
PWM frequency	460-1400 Hz
Insulation strength	10.2 kV
Cooling	forced-air
Weight	560 kg
Dimensions	1400×500×1650 mm

Block diagram of the half EMU EN97 power system



Schematic diagram of the FT-400-3000-WKD inverter



FT-500-3000D

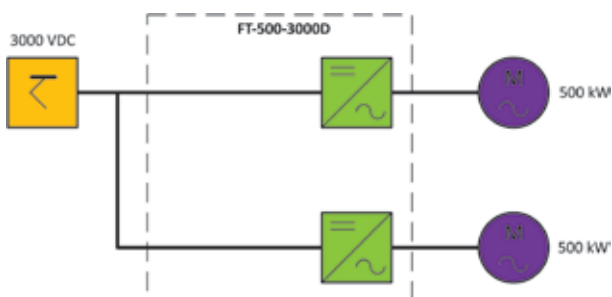
Traction Inverter for Asynchronous Drives

The FT-500-3000D traction inverter is a modern chopperless system of the direct three-phase inverter based on the HV IGBT 6.5 kV technology. The control of the converter is performed in the DSP (Digital Signal Processor) technology with the application of the FOC SVPWM (Field Oriented Space Vector Pulse Width Modulation). Within the range of high speeds, the system co-operates with a synchronized Bus Clamping Pulse Width Modulation, which causes reduction of losses and noise. The control system ensures acceleration with a constant torque and low power losses. The drive can operate with rheostatic or regenerative braking. The inverter system guarantees very good traction parameters and perfect stabilization of the driving torque. The applied system of busbars combined with a perfect IGBT driver guarantee a failure-free performance at short circuits. It also eliminates the possibility of secondary damages in case of the transistor's failure. The applied polypropylene capacitors ensure long service lifetime and resistance of the system to changes of voltage in the traction network. Additionally the inverter system is also protected with a thyristor crowbar. The inverter meets UIC and EN standards requirements with regard to safety and electromagnetic compatibility. The system has very low levels of low frequency interferences generated to the traction network. The inverter allows supplying two traction motors, each with power of 500 kW. The inverter is equipped with a forced air-cooling system, operates within the temperature range of $-40\text{ }^{\circ}\text{C} \div +40\text{ }^{\circ}\text{C}$. The diagnostics and control of the inverter is possible through the CANbus interface.

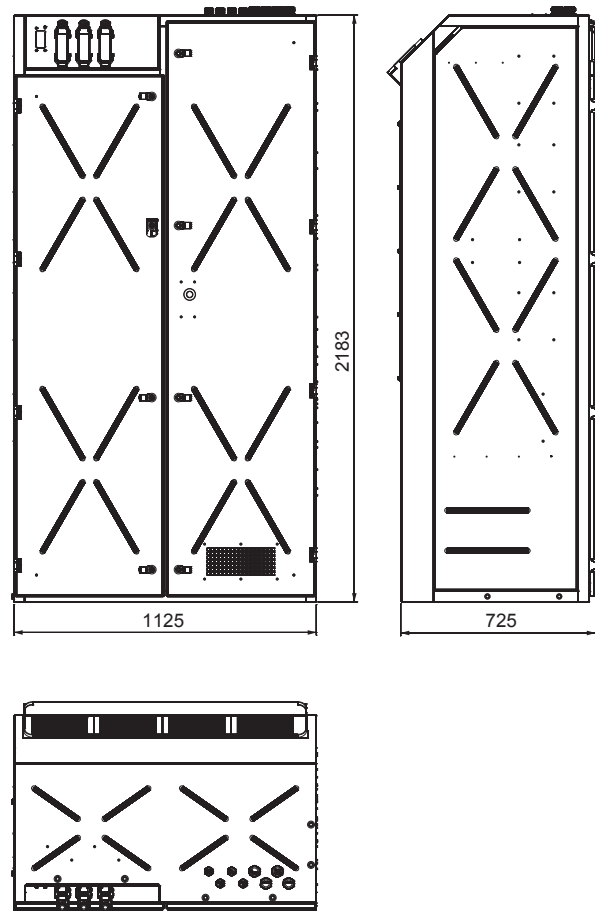
Specification

Input voltage	3000 VDC, $+30 \div -30\%$
Auxiliary voltage	24 VDC $+25 \div -30\%$
Rated current	2×150 Arms
Maximum output current	2×300 Arms
Rated power	2×500 kW
Frequency	0–160 Hz
PWM frequency	250–800 Hz
Insulation strength	10.2 kV
Cooling	forced-air
Weight	767 kg
Dimensions	1125×725×2183 mm

Schematic diagram



Housing



FT-500-3000D-LQC

Traction Inverter for Asynchronous Drives

The FT-500-3000D-LQC traction inverter is a modern chopperless system of the direct three-phase inverter based on the HV IGBT 6.5 kV technology. The control of the converter is performed in the DSP (Digital Signal Processor) technology with the application of the FOC SVPWM (Field Oriented Space Vector Pulse Width Modulation).

Within the range of high speeds, the system co-operates with a synchronized Bus Clamping Pulse Width Modulation, which causes reduction of losses and noise. The control system ensures acceleration with a constant torque and low power losses. The drive can operate with rheostatic or regenerative braking. The inverter system guarantees very good traction parameters and perfect stabilization of the driving torque. The applied system of busbars combined with a perfect IGBT driver guarantee a failure-free performance at short circuits. It also eliminates the possibility of secondary damages in case of the transistor's failure. The applied polypropylene capacitors ensure long service lifetime and resistance of the system to changes of voltage in the traction network. Additionally the inverter system is also protected with a thyristor crowbar. The inverter meets UIC and EN standards requirements with regard to safety and electromagnetic compatibility. The system has very low levels of low frequency interferences generated to the traction network. The inverter allows supplying two traction motors, each with power of 500 kW. The inverter is equipped with an external liquid cooling system, operates within the temperature range of $-40\text{ }^{\circ}\text{C} \div +40\text{ }^{\circ}\text{C}$. The diagnostics and control of the inverter is possible through the CANbus interface.

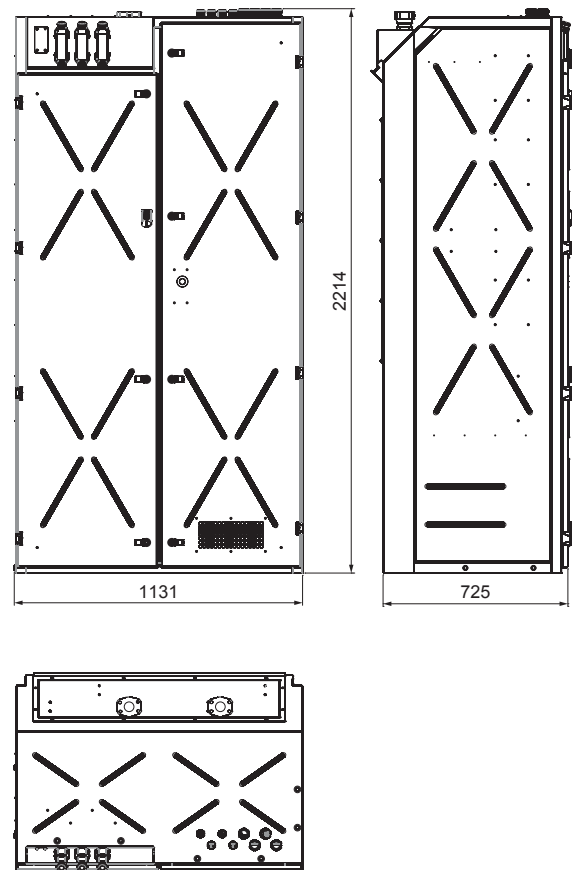


Housing

Specification

Input voltage	3000 VDC, $+30 \div -30\%$
Auxiliary voltage	24 VDC $+25 \div -30\%$
Rated current	2×150 Arms
Maximum output current	2×300 Arms
Rated power	2×500 kW
Frequency	460–1400 Hz
PWM frequency	250–800 Hz
Insulation strength	10.2 kV
Cooling	external, liquid
Weight	767 kg
Dimensions	1131×725×2214 mm

Schematic diagram



FT-500-3000-DS

Double System Traction Inverter for Asynchronous Drives

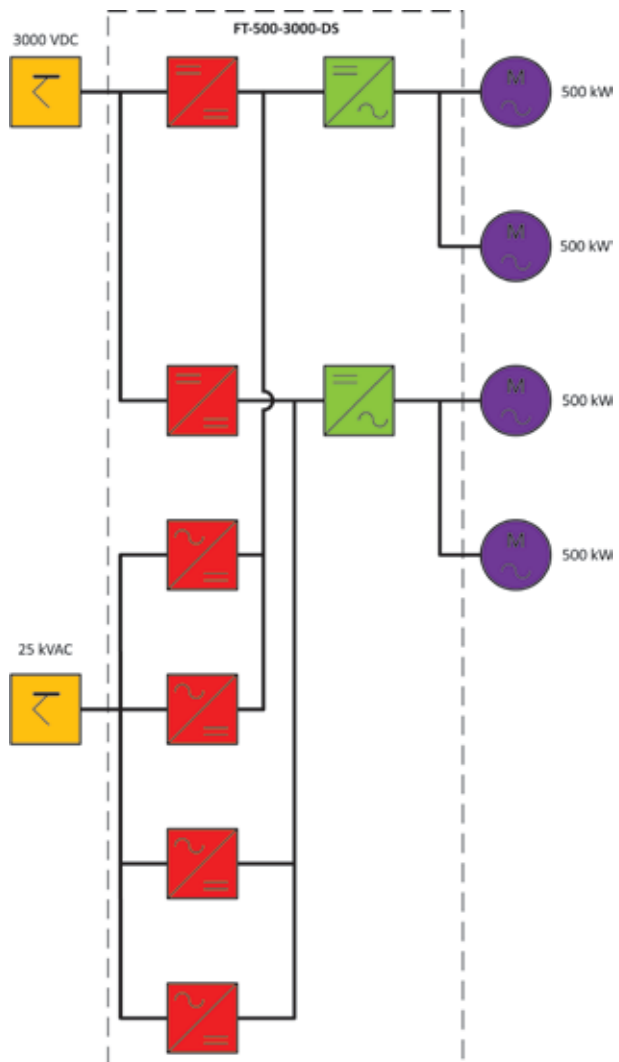
The FT-500-3000-DS traction inverter is a modern chopperless system of the direct three-phase inverter based on the HV IGBT 6.5 kV technology. The control of the converter is performed in the DSP (Digital Signal Processor) technology with the application of the FOC SVPWM (Field Oriented Space Vector Pulse Width Modulation). Within the range of high speeds, the system co-operates with a synchronized Bus Clamping Pulse Width Modulation, which causes reduction of losses and noise. The control system ensures acceleration with a constant torque and low power losses. The drive can operate with rheostatic or regenerative braking. The inverter system guarantees very good traction parameters and perfect stabilization of the driving torque. The applied braking resistors made of stainless steel guarantee a long service lifetime and low noise level. The applied system of busbars combined with a perfect IGBT driver guarantee a failure-free performance at short circuits. It also eliminates the possibility of secondary damages in case of the transistor's failure. The applied polypropylene capacitors ensure long service lifetime and resistance of the system to changes of voltage in the traction network. Additionally the inverter system is also protected with a thyristor crowbar. The inverter meets UIC and EN standards requirements with regard to safety and electromagnetic compatibility. The system has very low levels of low frequency interferences generated to the traction network. The inverter is equipped with a forced air-cooling system and operates within the temperature range of $-40^{\circ}\text{C} \div +40^{\circ}\text{C}$. Lack of the cooling liquid increases the reliability and lowers operating costs of the vehicle. The diagnostics and control of the inverter is possible through the CANbus interface.

Specification

Input voltage	25000 VAC 3000 VDC $\pm 30 \div -30\%$
Auxiliary voltage	24 VDC $\pm 30 \div -30\%$
Rated current	260 Arms
Maximum output current	311 Arms
Rated power	2×500 kW
Frequency	0–160 Hz
PWM frequency	460–1100 Hz
Insulation strength	10.2 kV
Cooling	forced-air
Weight	950 kg
Dimensions of cabinet with two inverters	2024×2242×918 mm



Block diagram of the set FT-500-3000-DS electric multiple unit

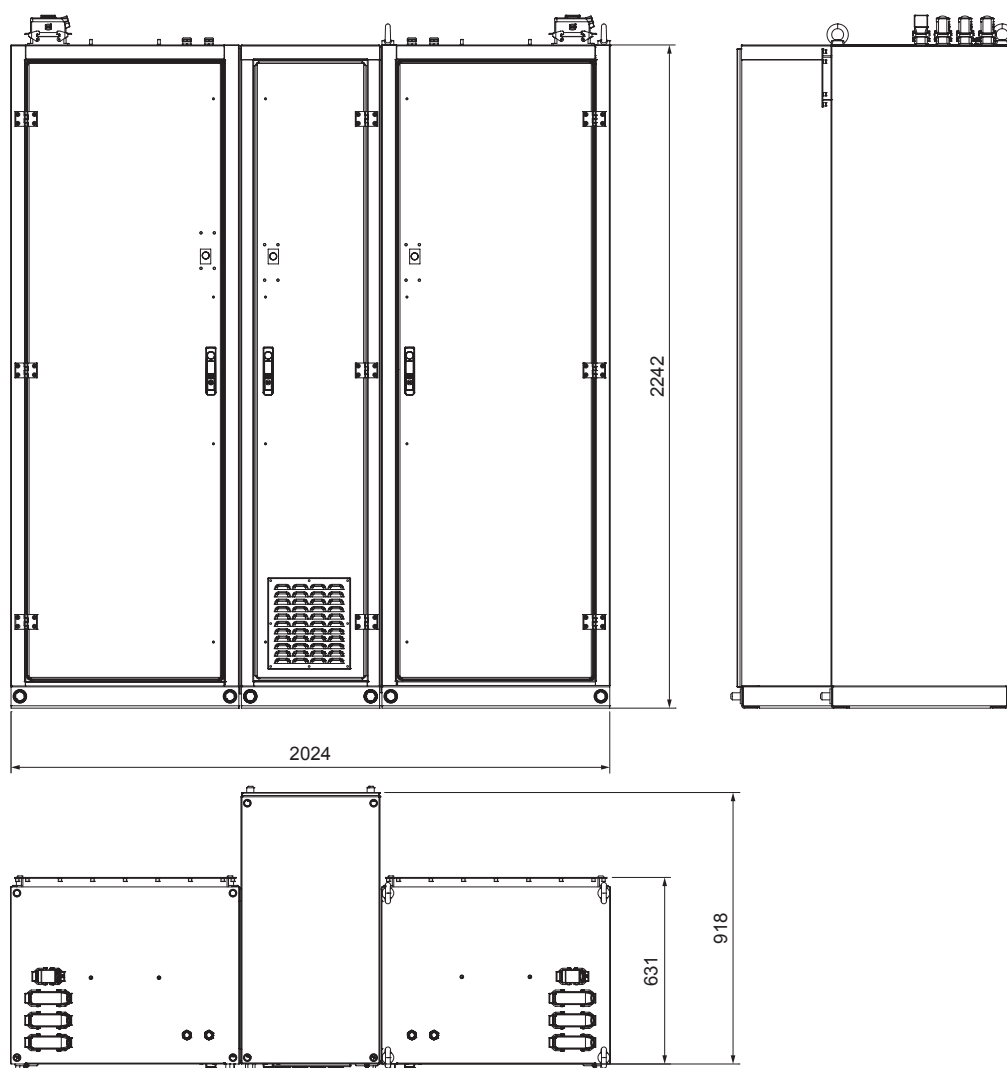


FT-500-3000-DS

Double System Traction Inverter
for Asynchronous Drives

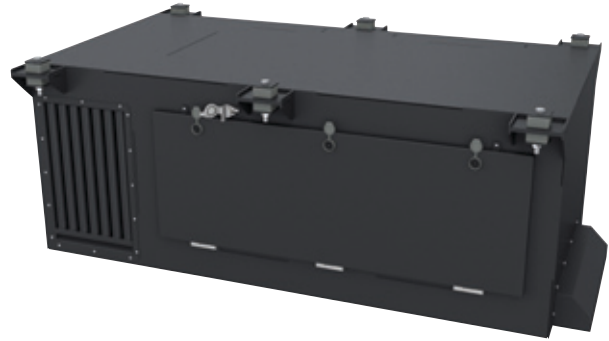


Housing of the FT-500-3000-DS inverter



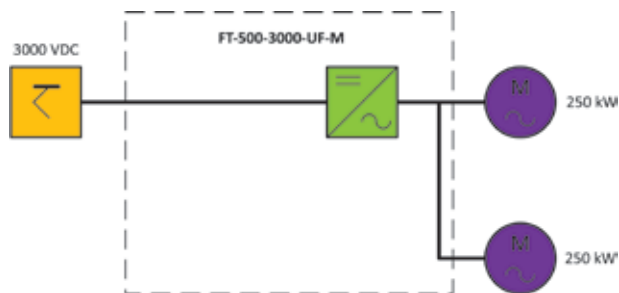
FT-500-3000-UF-M

Traction Inverter for Asynchronous Drives



The FT-500-3000-UF-M traction inverter is a modern chopperless system of the direct three-phase inverter based on the HV IGBT 6.5 kV technology. The control of the converter is performed in the DSP (Digital Signal Processor) technology with the application of the FOC SVPWM (Field Oriented Space Vector Pulse Width Modulation). Within the range of high speeds, the system co-operates with a synchronized Bus Clamping Pulse Width Modulation, which causes reduction of losses and noise. The control system ensures acceleration with a constant torque and low power losses. The drive can operate with rheostatic or regenerative braking. The inverter system guarantees very good traction parameters and perfect stabilization of the driving torque. The applied braking resistors made of stainless steel guarantee a long service lifetime and low noise level. The applied system of busbars combined with a perfect IGBT driver guarantee a failure-free performance at short circuits. It also eliminates the possibility of secondary damages in case of the transistor's failure. The applied polypropylene capacitors ensure long service lifetime and resistance of the system to changes of voltage in the traction network. The inverter system is also protected with a thyristor crowbar. The inverter meets UIC and EN standards requirements with regard to safety and electromagnetic compatibility. The system has very low levels of low frequency interferences generated to the traction network. The inverter is equipped with a forced air-cooling system and operates within the temperature range of $-40\text{ }^{\circ}\text{C} \div +40\text{ }^{\circ}\text{C}$. Lack of the cooling liquid increases the reliability and decreases the operating costs of the vehicle. The diagnostics and control of the inverter is possible through the CANbus interface.

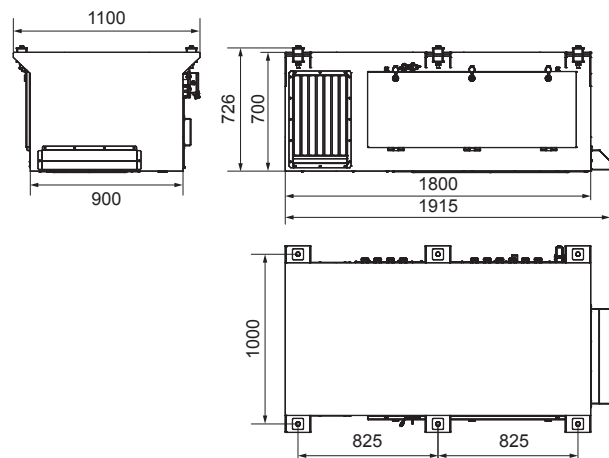
Block diagram



Specification

Input voltage	3000 VDC $+30 \div -30\%$
Auxiliary voltage	24 VDC $+10 \div -40\%$
Rated current	200 Arms
Maximum output current	250 Arms
Rated power	500 kW
Frequency	0–160 Hz
PWM frequency	300–700 Hz
Insulation strength	10.2 kV
Cooling	forced-air
Weight (without output chokes)	510 kg
Dimensions	1915×700×1100 mm

Housing



FT-800-3000

Traction Inverter for Asynchronous Drives

The FT-800-3000 traction inverter is a modern chopperless system of the direct three-phase inverter based on the HV IGBT 6.5 kV technology. The control of the converter is performed in the DSP (Digital Signal Processor) technology with the application of the FOC SVPWM (Field Oriented Space Vector Pulse Width Modulation).

Within the range of high speeds, the system co-operates with a synchronized Bus Clamping Pulse Width Modulation, which causes reduction of losses and noise. The control system ensures acceleration with a constant torque and low power losses. The drive can operate with rheostatic or regenerative braking. The inverter system guarantees very good traction parameters and perfect stabilization of the driving torque. The applied braking resistors made of stainless steel guarantee a long service lifetime and low noise level. The applied system of busbars combined with a perfect IGBT driver guarantee a failure-free performance at short circuits. It also eliminates the possibility of secondary damages in case of the transistor's failure. The applied polypropylene capacitors ensure long service lifetime and resistance of the system to changes of voltage in the traction network. Additionally the inverter system is also protected with a thyristor crowbar. The inverter meets UIC and EN standards requirements with regard to safety and electromagnetic compatibility. The system has very low levels of low frequency interferences generated to the traction network.

The inverter is also equipped with:

- main fuse,
- pre-charge resistor and contactor,
- main contactor,
- earthing switch.

The inverter allows supplying two traction motors, each with power of 400 kW.

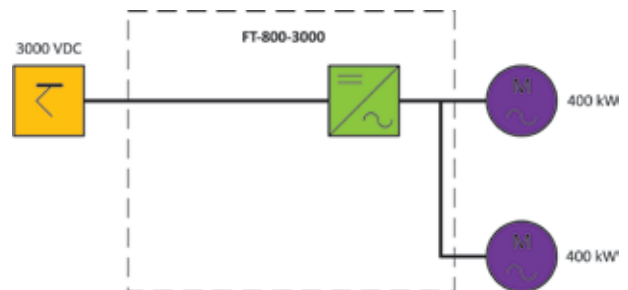
The inverter is equipped with a forced air-cooling system, operates within the temperature range of $-4^{\circ}\text{C} \div +40^{\circ}\text{C}$. Lack of the cooling liquid increases the reliability and lowers operating costs of the vehicle. The diagnostics and control of the inverter is possible through the CANbus interface.

Specification

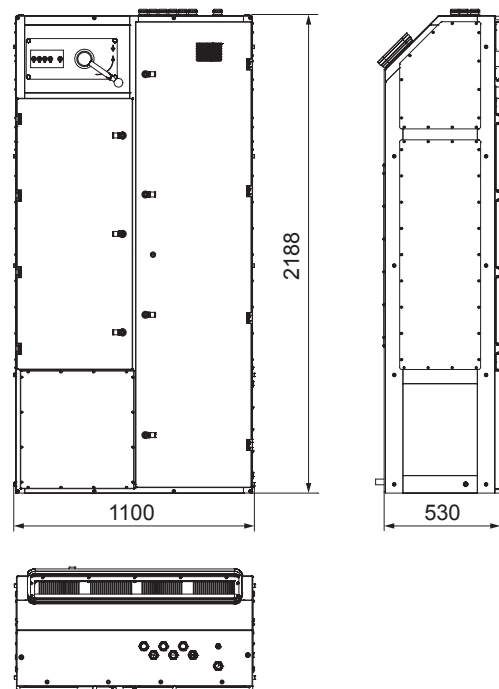
Input voltage	3000 VDC, $+30 \div -30\%$
Auxiliary voltage	24 VDC, $+10 \div -40\%$
Rated current	266 Arms
Maximum output current	350 Arms
Rated power	800 kW
Frequency	0–160 Hz
PWM frequency	460–1100 Hz
Insulation strength	10.2 kV
Cooling	forced-air
Weight	600 kg
Dimensions	1100×530×2188 mm



Block diagram



Housing



FT-800-3000-UF

Traction Inverter for Asynchronous Drives

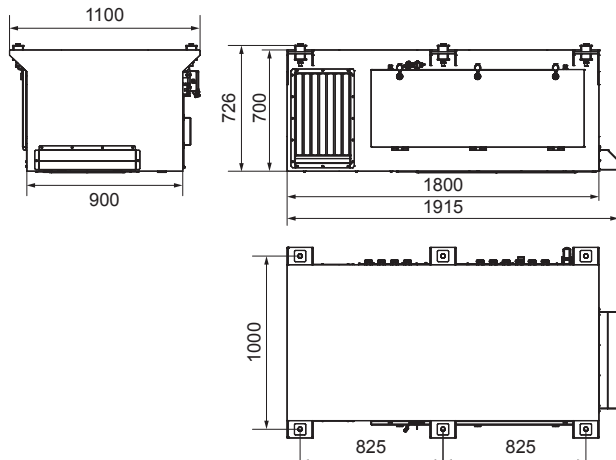


The FT-800-3000-UF traction inverter is a modern chopperless system of the direct three-phase inverter based on the HV IGBT 6.5 kV technology. The control of the converter is performed in the DSP (Digital Signal Processor) technology with the application of the FOC SVPWM (Field Oriented Space Vector Pulse Width Modulation). Within the range of high speeds, the system co-operates with a synchronized Bus Clamping Pulse Width Modulation, which causes reduction of losses and noise. The control system ensures acceleration with a constant torque and low power losses. The drive can operate with rheostatic or regenerative braking. The inverter system guarantees very good traction parameters and perfect stabilization of the driving torque. The applied braking resistors made of stainless steel guarantee a long service lifetime and low noise level. The applied system of busbars combined with a perfect IGBT driver guarantee a failure-free performance at short circuits. It also eliminates the possibility of secondary damages in case of the transistor's failure. The applied polypropylene capacitors ensure long service lifetime and resistance of the system to changes of voltage in the traction network. Additionally the inverter system is also protected with a thyristor crowbar. The inverter meets UIC and EN standards requirements with regard to safety and electromagnetic compatibility. The system has very low levels of low frequency interferences generated to the traction network.

The inverter is also equipped with:

- main fuse,
- precharge resistor and contactor,
- main contactor,
- earthing switch.

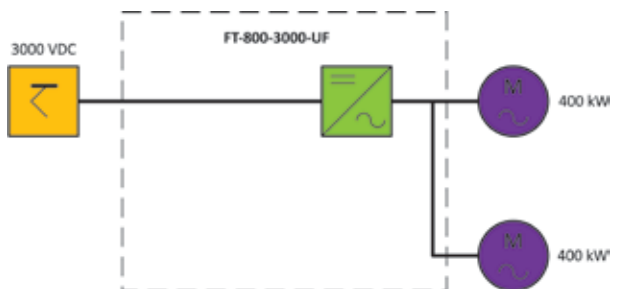
Housing



Specification

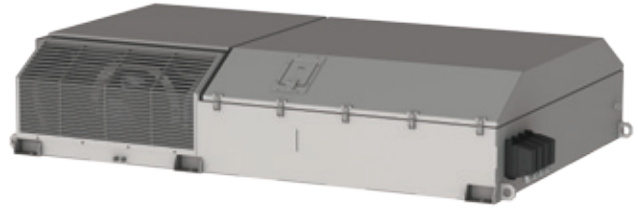
Input voltage	3000 VDC, +30 ÷ -30%
Auxiliary voltage	24 VDC, +10 ÷ -40%
Rated current	255 Arms
Maximum output current	350 Arms
Rated power	800 kW
Frequency	0-160 Hz
PWM frequency	250-800 Hz
Ambient temperature	-40 ÷ +40°C
Insulation strength	10.2 kV
Cooling	forced-air
Weight	470 kg
Dimensions	1915×726×1000 mm

Block diagram



FT-800-3000-LQC integrated with PSM-82-LQC

Traction Inverter for Asynchronous Drives



The FT-800-3000-LQC traction inverter is a modern chopperless system of the direct three-phase inverter based on the HV IGBT 6.5 kV technology. The control of the converter is performed in the DSP (Digital Signal Processor) technology with the application of the FOC SVPWM (Field Oriented Space Vector Pulse Width Modulation). Within the range of high speeds, the system co-operates with a synchronized Bus Clamping Pulse Width Modulation, which causes reduction of losses and noise. The control system ensures acceleration with a constant torque and low power losses. The drive can operate with rheostatic or regenerative braking. The inverter system guarantees very good traction parameters and perfect stabilization of the driving torque. The applied system of busbars combined with a perfect IGBT driver guarantee a failure-free performance at short circuits. It also eliminates the possibility of secondary damages in case of the transistor's failure. The applied polypropylene capacitors ensure long service lifetime and resistance of the system to changes of voltage in the traction network. Additionally the inverter system is also protected with a thyristor crowbar. The inverter meets UIC and EN standards requirements with regard to

safety and electromagnetic compatibility. The system has very low levels of low frequency interferences generated to the traction network. The inverter allows supplying two traction motors, each with power of 400 kW. The diagnostics and control of the inverter is possible through the CANbus interface.

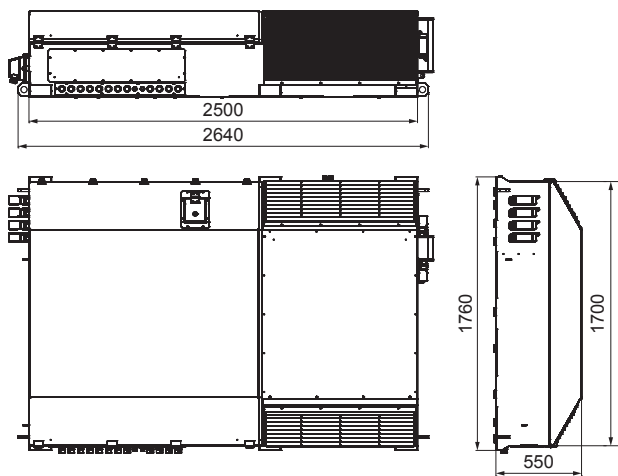
The PSM-82-LQC static converter has been designed to convert 3000 VDC traction voltage into 3x400 VAC, used in the EMU 36WE_LQC and 37WE_LQC vehicle traction system.

The inverter and static converter are equipped with a liquid cooling system, operates within the temperature range of $-30^{\circ}\text{C} \div +40^{\circ}\text{C}$.

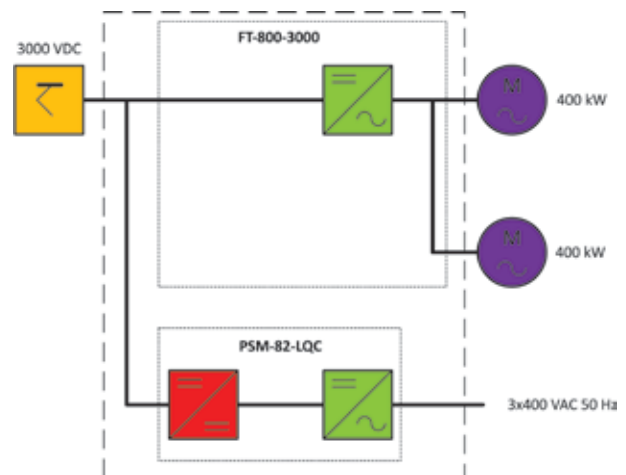
The system are also equipped with:

- main fuse,
- precharge resistor and contactor,
- main contactor.

Housing



Block diagram



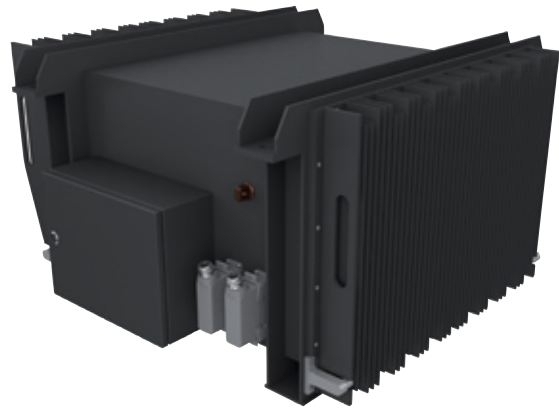
FT-800-3000-LQC integrated with PSM-82-LQC

Traction Inverter for Asynchronous Drives

Specification	
FT-800-3000D-LQC	
Input voltage	3000 VDC, +30 ÷ -30%
Auxiliary voltage	24 VDC, +25 ÷ -30%
Rated current	250 Arms
Maximum output current	480 Arms
Rated power	800 kW
Frequency	0-200 Hz
PWM frequency	250-1000 Hz
Insulation strength	10.2 kV
PSM-82-LQC static converter	
Input voltage	3000 VDC +30 ÷ -30%
Auxiliary voltage	24 VDC +25 ÷ -30%
Power	90 kVA
Voltage stability	≤ 5%
Nominal current In	130 A
Frequency	50 Hz ±1 Hz
3-wire output	L1, L2, L3 + PE
Overload	160%, 5 s
Unbalanced load	max 10%
Output waveform	sinusoidal THD ≤ 5%
Efficiency	>90%
Electronic (overload and short-circuit)	
Cooling system	
Power supply	3×400 V/50 Hz
Auxiliary voltage	24 VDC +25 ÷ -30%
Fan power	1.8/0.5 kW
Pump motor power	0.55 kW
Coolant	N 50%
Air flow	5000 m³/h
Weight (inverter together with a static converter and cooling system)	1285 kg
Dimensions	1760×2640×550 mm

PSM-26NS

Static Converter

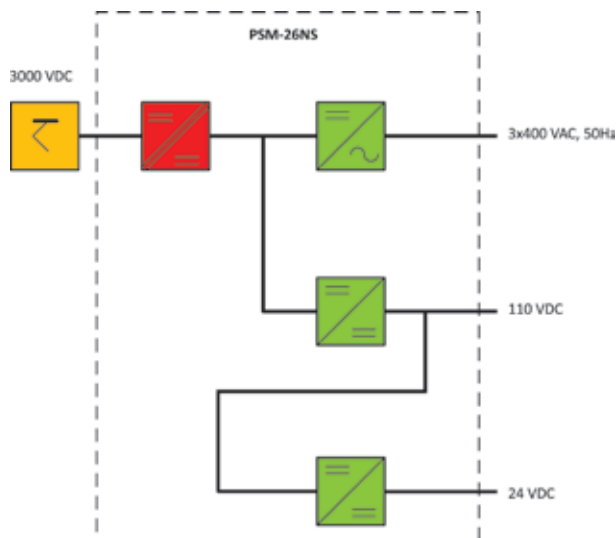


The PSM-26NS (for EMUs EN57 and EN71 type) static converter has been designed to convert traction DC voltage of 3000 V into low DC voltages 110 VDC and 24 VDC and 3×400 VAC voltage used in the low voltage installations of the EMU EN57. The load of 3×400 VAC voltage may be asymmetric, which enables the power supply of 230 VAC max 3 kVA circuits without exceeding the load of 6 kVA per phase. The high voltage stage uses 3.3 kV IGBT modules.

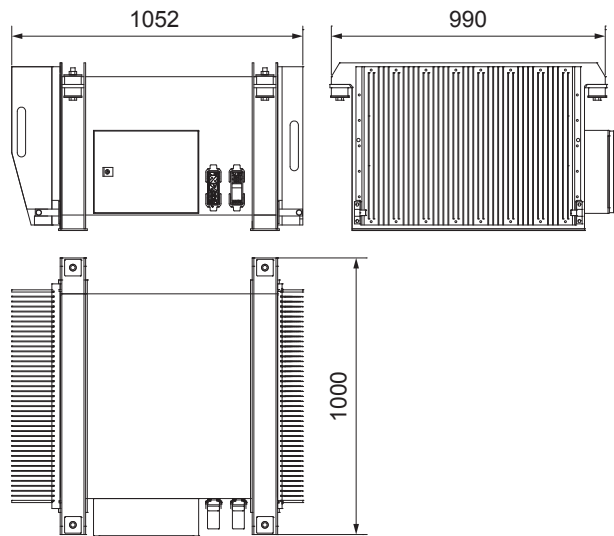
Specification	
Input voltage	3000 VDC operating range 1800÷4000 V (1800–4200 V short time)
Output voltage 1	3×400 VAC
Output power 18 kVA; Output frequency 50–1 Hz; 5 wire output L1, L2, L3, N, PE; Voltage stability ≤ 5%; overload capability 500%/5 s (inrush current of motors); maximum load unbalancing 50%; Sinusoidal output voltage (THD(u) ≤ 5%); Electronic (overload and short circuit) protection	
Output voltage 2	110 VDC
Output power 6 kW; Voltage stability ≤ 1%; Voltage ripples ≤ 0.5%; Limitation of battery charging current to 15–30 A; Electronic (overload and short circuit) protection; Electronic over-voltage protection	
Output voltage 3	24 VDC
Output power 2 kW; Voltage stability ≤ 5%; Voltage ripples ≤ 1%; Electronic (overload and short circuit) protection; Electronic overvoltage protection	
Total output power	26 kW
Total efficiency	≥ 90%
Ambient temperature	–30 ÷ +40°C
Protection ratio	IP56
Weight	280 kg
Dimensions	1030×1052×606 mm

NOTE: In case the voltage of 4200 V is exceeded, the operation of the converter is stopped. The converter starts to operate automatically when traction voltage is lowered.

Block diagram

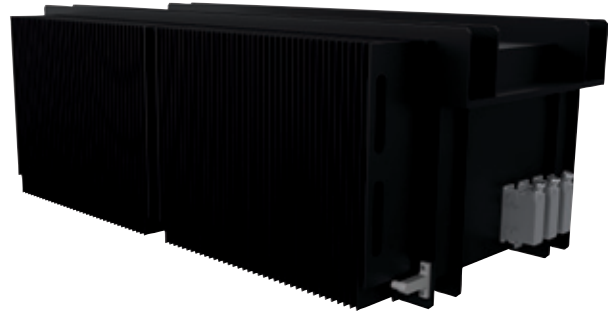


Housing



PSM-44

Static Converter

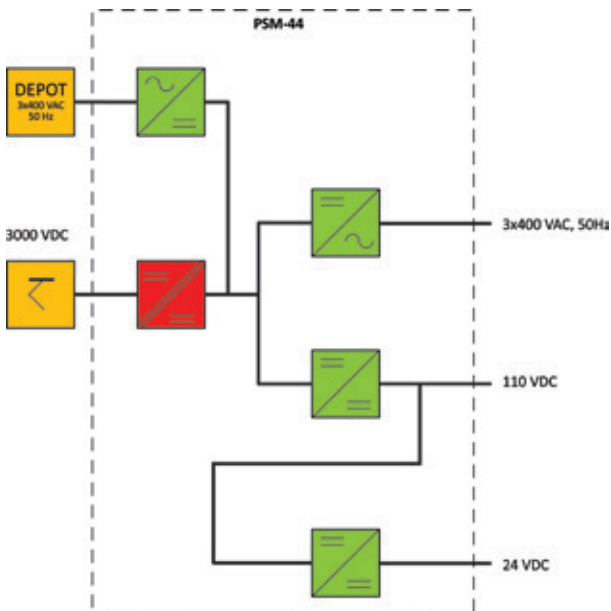


The PSM-44 static converter has been designed to convert 3000 VDC voltage used in the railway traction networks into 110 VDC and 24 VDC as well as 3×400 VAC and 220 VAC, used in the low voltage systems of EMUs (EN57). Static converter can be loaded with an unbalanced load of up to 6 kVA per line. In standstill conditions, (when the power supply with 3000 V is off) the converter may be powered from the 3×400 VAC industrial network.

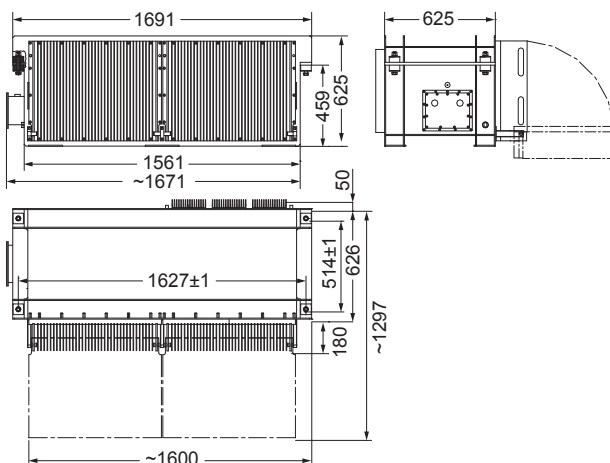
Specification

Input voltage	3000 VDC operating range 1800÷4000 V (1800÷4200 V short time)
Output voltage DC	110 VDC
P = 10.5 kW; Co-operation with the battery; Current stability $\leq \pm 2\%$; Voltage stability $\leq \pm 1\%$; Voltage ripples $\leq 0.5\%$; Battery charging current 15–30 A (adjustable); Electronic (overvoltage, overload, short circuit) protection	
Output voltage AC 1	3×400 V (50 Hz)
P = 23 kW; Voltage stability $\leq \pm 5\%$; Frequency stability $\leq \pm 2.0\%$; THD(u) $\leq 5\%$; Overload 300%/5 s; Unbalanced load max 30%; Electronic (overload, short circuit) protection	
Output voltage DC 2	24 VDC
P = 7.5 kW; Voltage stability $\leq \pm 5\%$; Voltage ripples $\leq 1\%$; Electronic (overvoltage, overload, short circuit) protection	
Total output power	44 kW
Total efficiency	$\geq 90\%$
Monitoring	CANopen
Ambient temperature	$-40 \div +40^\circ\text{C}$
Protection ratio	IP56
Weight	530 kg $\pm 10\%$
Dimensions	856×1691×626 mm

Block diagram

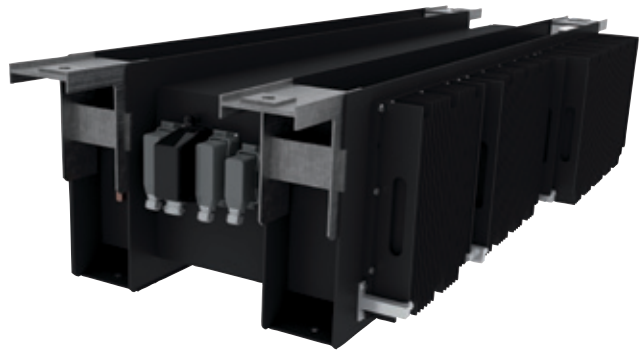


Housing



PSM-60

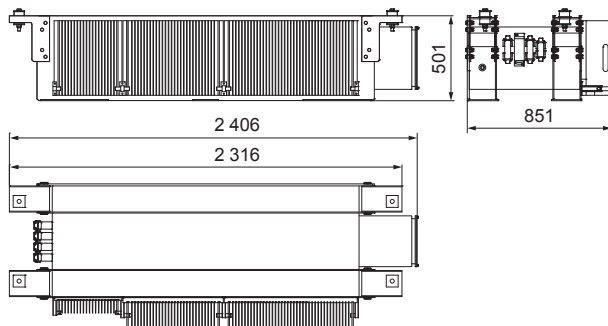
Static Converter



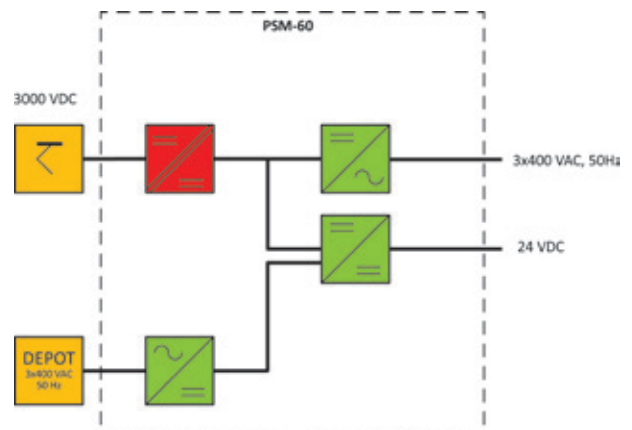
The PSM-60 static converter is a device designed to convert 3000 VDC traction voltage into 24 VDC and 3×400 VAC, 230 VAC, used as power supply for the circuitry of the four-car EMU.

Specification	
Input voltage	3000 VDC (operating range 2000÷4000 V)
Output voltage	24 VDC
P = 6 kW, In = 230 A; Voltage stability ≤ 1%; Voltage ripples ≤ 0.5%; Battery charging current 10–100 A (adjustable); Temperature compensation of the battery charging voltage (from –10 to +50°C) 28.8–25.6 V	
Output voltage	3×400 V (50 Hz)
S = 55 kVA, In = 80 A; Voltage stability ≤ ±5%; Frequency stability ≤ ±0.2%; THD(u) ≤ 5%; Overcurrent 90–120 A / 1 min and 120–136 A / 10 s; Current reduction above 136 A; Above 10 s – operation block for 30 s (auto-start); Possibility of asymmetric load (up to 50% – up to 40 A in the neutral wire)	
Total output power	60 kW
Total efficiency	≥ 83%
Ambient temperature	–30 ÷ +40°C
Protection ratio	IP56
Weight	750±50 kg
Dimensions	501×2406×851 mm

Housing

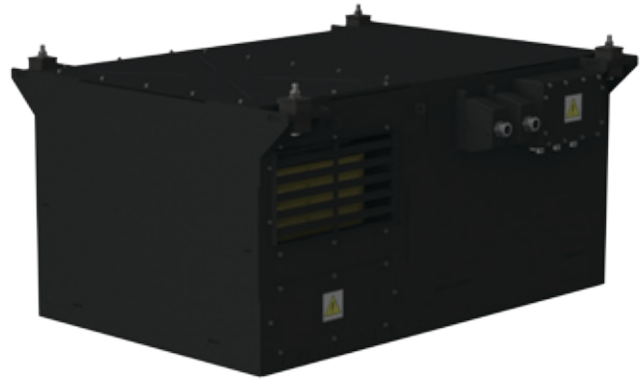


Block diagram



PSM-81

Static Converter

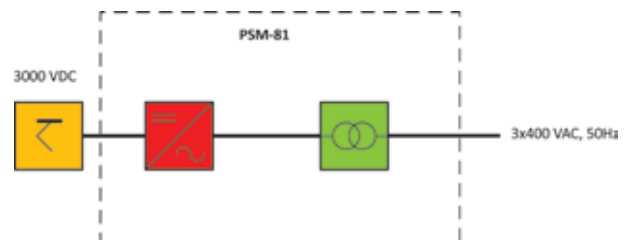
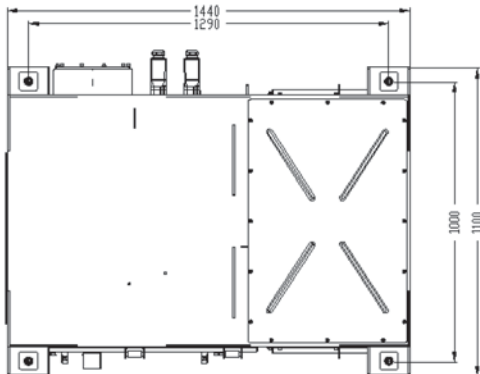
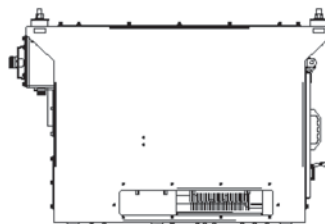
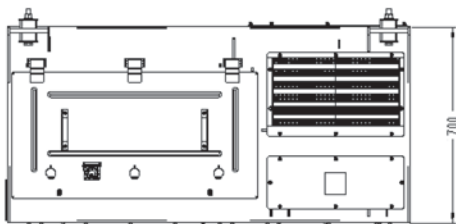


The PSM-81 static converter has been designed to convert 3000 VDC traction voltage into 3×400 VAC, used in the EMU EN57 vehicle traction system.

Specification

Input voltage	
WN	3000 VDC z FT-500-3000-UF-M (range 2000÷4000 V)
NN	Auxiliary 24 VDC (–30 ÷ +25%)
Output voltage	3×400 V (50 Hz)
Total power	86 kVA (78 kW)
Voltage stability	≤ 5%
Nominal current In	125 A
Frequency	50±1 Hz
3-wire output	L1, L2, L3 + PE
Overload	80%, 5 s
Unbalanced load	max 10%
Output waveform	sinusoidal THD ≤ 5%
Electronic (overload and short-circuit) protection	
Efficiency	> 90%
Ambient temperature	–30 ÷ +40°C
Protection ratio	IP55/IP20
Weight	700 ±20 kg
Dimensions	1100×1440×700 mm

Housing



PSM-120

Static Converter with High Voltage Switchgear

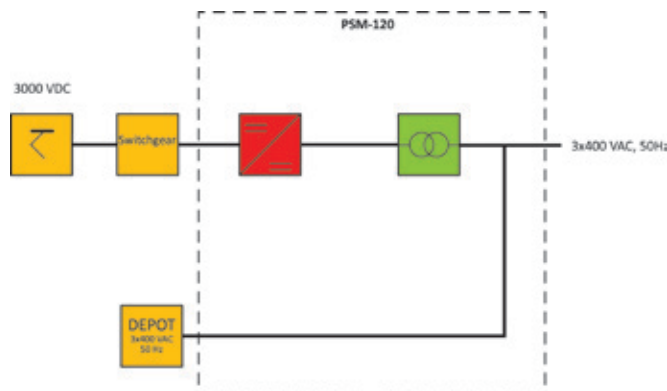
Static converter type PSM-120 has been designed to supply the circuitry of the railway wagon with 3×400 V 50 Hz. Input power supply for this converter is 3000 VDC. It is possible to supply the converter from a 3×400 V 50 Hz depot supply. The PSM-120 static converter is built-in in a tight metal housing made of steel profiles and sheets. In one cabinet there are auxiliary converter and high voltage switchgear for EMU (for propulsion drives). The main high voltage transformer of the converter is design in separate container mounted on the roof of the train.



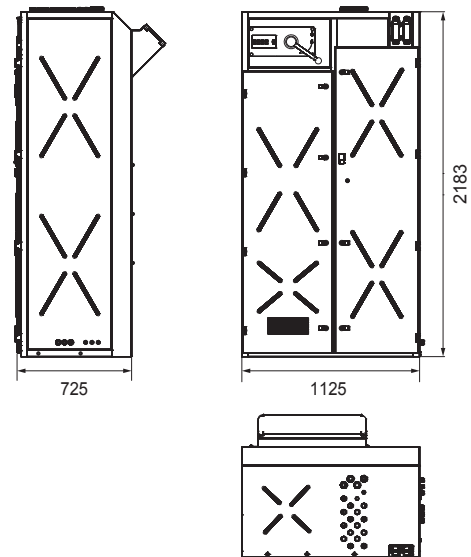
Specification

Input voltage HVDC	3000 VDC (range 2000÷4000 V)
Switchgear outputs	two 500 kW for propulsions drives 120 kW for auxiliary converter
Overvoltage protection	MOV, SCR Crowbar
Converter Input voltage	3000 VDC traction 3×400 VAC DEPOT
Power 44 kVA; Frequency 50 Hz; 3-wire input L1, L2, L3, Necessary short circuit protection in front of the depot source	
Converter output voltage AC	3×400 VAC
Power 120 kVA; $\cos \phi \geq 0.85$; Output frequency 50 ± 1 Hz; 3-wire output L1, L2, L3, Voltage stability 5%; Overload 200%/3 s (motor start-up); Load asymmetry max 10%; Output waveform sinusoidal (THDu < 5%); Electronic overload and short circuit protection	
Total power	120 kVA/112 kW
Efficiency	> 90%
Weight	530 kg main cabinet
Dimension	1125×725×2183 mm main cabinet

Block diagram



Housing



PSM-140

Static Converter

Static converter type PSM-140 has been designed to supply the circuitry of the railway wagon with 3×400 V 50 Hz. Input power supply for this converter is 3000 VDC. It is possible to supply the converter from a 3×400 V 50 Hz depot supply. The PSM-120 static converter is built-in in a tight metal housing made of steel profiles and sheets. In one cabinet there are auxiliary converter and high voltage switchgear for EMU (for propulsion drives). The main high voltage transformer of the converter is design in separate container mounted on the roof of the train.



PSM-140

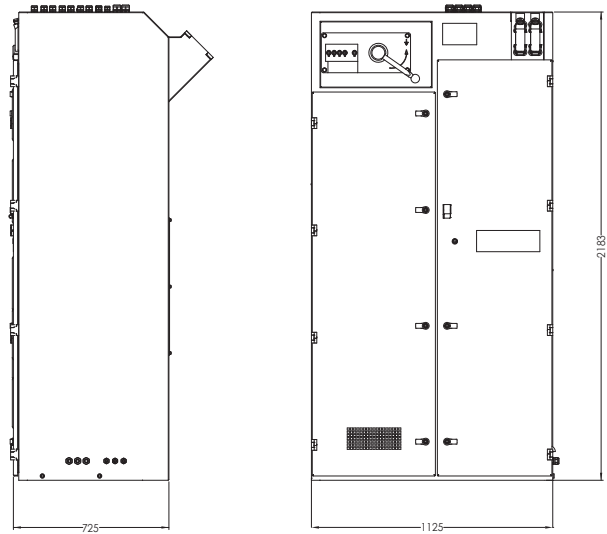
Input voltages	3000 VDC
AC Output	3×400 VAC / 50 Hz / 140 kVA
DC Output 1 (from switchgear to propulsion system)	3000 VDC / 500 kW

DC Output 2 (from switchgear to propulsion system)	3000 VDC / 500 kW
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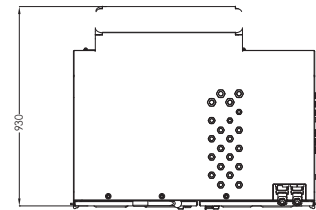
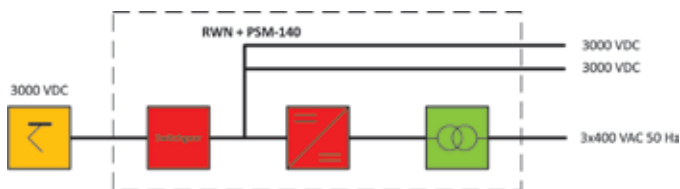
Housing

Cooling method	forced-air
Weight	540 kg
Dimensions	1125×725×2183 mm
Protection ratio	Clean section IP 22 (housing inside vehicle)

Housing



Block diagram



PSM-160

Static Converter



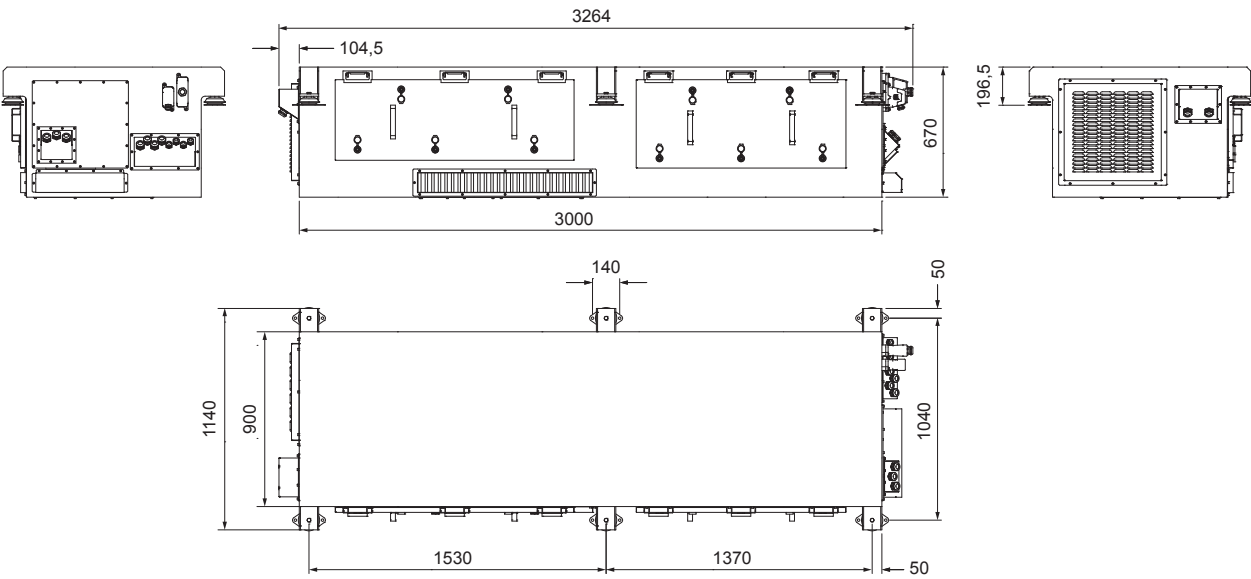
Static converter type PSM-160 has been designed to supply the circuitry of the railway coach with 3×380 V and 3×220 V, both 60 Hz and 72 VDC. Input power supply for this converter is 3000 VDC. It is possible to supply the converter from a 3×380 V 60 Hz depot supply. The PSM-160 static converter is built-in in a tight metal housing made of aluminum profiles and sheets. Some of these profiles are used for heat dissipation.

Specification	
Input voltage HVDC	3000 VDC (range 2000÷4000V)
Overvoltage protection	MOV, SCR Crowbar
Input voltage AC DEPOT	3×380 V
Power 83 kVA; Frequency 60 Hz; 4-wire input L1, L2, L3, N; Necessary short circuit protection in front of the depot source	
Output voltage AC1	3×380 VAC
Power 120 kVA; $\cos \varphi \geq 0.8$; Output frequency 60±1 Hz; 4-wire output L1, L2, L3, N; Voltage stability 5%; Overload 200%, 3 s (motor start-up); Load asymmetry max 10%; Output waveform sinusoidal (THD<5%); Electronic overload and short circuit protection	
Output voltage AC2	3×220 VAC
Power 25 kVA; $\cos \varphi \geq 0.8$; Frequency 60±1 Hz; 4-wire output L1, L2, L3, N; Voltage stability 5%; Load asymmetry max 10%; Output waveform sinusoidal (THD < 5%); Fuse 100 A overload and short circuit protection	
Output voltage LVDC	72 VDC
Power 10 kW; Voltage stability 1%; Voltage ripples < 0.5%; Battery current limit adjustable level (range 20÷60 A); Electronic overload and short circuit protection; Electronic overvoltage protection; Thermal compensation of output voltage	
Total power	160 kVA/150 kW
Efficiency	> 90%
Data bus	CANopen
Ambient temperature	0 ÷ +40°C
Cooling	forced-air
Assembling	under the floor
Protection ratio	IP55 (IP22 cooling compartment)
Weight	1250 ± 50 kg
Dimensions (W×D×H)	3000×910×670 mm

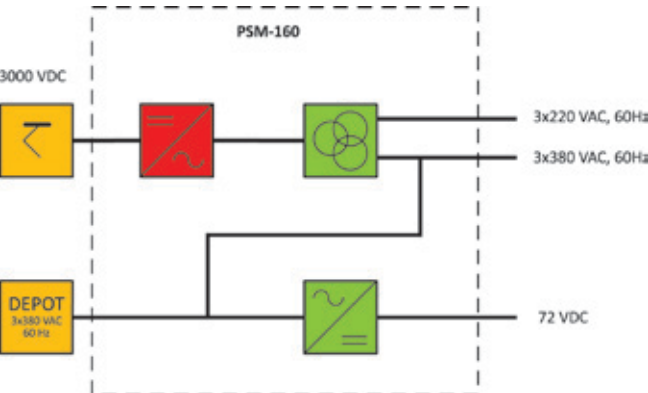
PSM-160

Static Converter

Housing



Block diagram



PSM-195

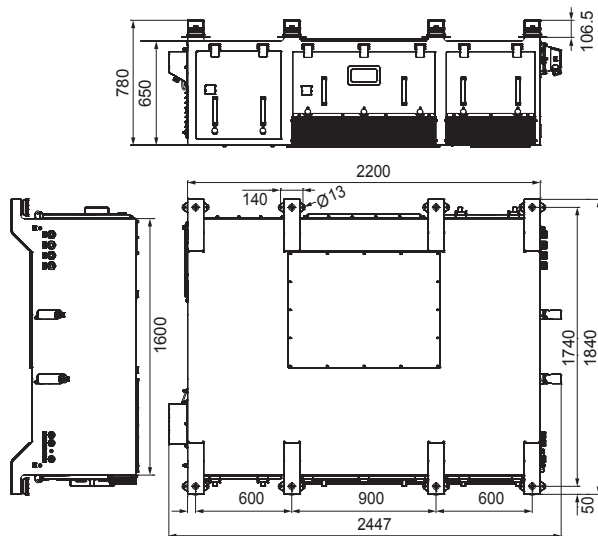
Static Converter



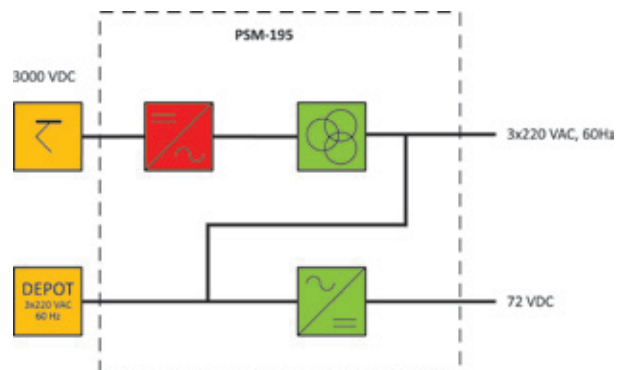
Static converter type PSM-195 has been designed to supply the circuitry of the railway coach with $3 \times 380 \text{ V} / 60 \text{ Hz}$ and 72 VDC . Input power supply for this converter is 3000 VDC . It is possible to supply the converter from a $3 \times 380 \text{ V} 60 \text{ Hz}$ depot supply. The PSM-195

static converter is built-in in a tight metal housing made of aluminum profiles and sheets. Some of these profiles are used for heat dissipation.

Housing



Block diagram



PSM-195

Static Converter

Specification	
Mounting	under the frame
Protection level	IP66/IP21 (open areas for transformer and filter inductors)
Cooling	forced-air
Converter dimensions (L×W×H)	2210×1840×780 mm
Converter weight	1500 kg ±5%
Ambient temperature	0–40°C – full power > 40°C – reduced load 3% per °C Max temperature 70°C
Input parameters	
Catenary	
Input voltage	3000 VDC (2000–3900 VDC)
Overvoltage protection	MOV, SCR Crowbar
Efficiency	≥ 90%
Depot supply	
Depot input power limitation (performed in the depot)	35 kW
Depot input voltage	3×380 VAC/60 Hz
Output parameters	
Input-output galvanic isolation	yes
AC output	
AC output voltage	3×380 V/60 Hz
AC output voltage stability	±5%
AC output load	195 kVA/160 kW
AC nominal frequency	60 Hz ±1%
Output configuration	3 phases + N
Waveform	Sinus
AC rated power factor	≥ 0.85
AC overload capacity	327 kVA, PF>0,64, 2 s
AC THD(u)	< 6 %, at THDi of loads < 10%
100 first harmonics are analyzed in the measurement of THDu of AC output; no information of THD is available in the system	
AC output contactor	yes
AC overvoltage protection	yes
AC overload protection	yes
AC overcurrent protection	yes
The tolerance for the static adjustment of the voltage	±5%
DC output	
DC output voltage range	72 V (50÷90 V)
DC load capacity	16,5 kW
DC ripples	< 1%
DC output voltage stability	±1%
Maximum DC current (including charging)	230 A

PSM-200

Static Converters

The static converter PSM-200 has been designed to supply the circuitry of a railway wagon with 3×400 V/50 Hz. Input power supply for this converter is 3000 VDC. It is possible to supply the converter from 3×400 V 50 Hz depot supply. The control unit of the PSM-200 is supplied from a 24 VDC source.

Specification

Input voltage HVDC **3000 VDC**
(range 2000÷4000 V)

Overvoltage protection **MOV, SCR Crowbar**

Input voltage AC DEPOT **3×400 VAC**

Power 83 kVA,
Frequency 50 Hz, 3-wire input L1, L2, L3;
Necessary short circuit protection in front of depot source

Input voltage LVDC **24 VDC**

Power 200 W; Voltage range $-30 \div +25\%$; Necessary short circuit protection in front of the PSM 24 VDC input

Output voltage AC **3×400 VAC**

Power 200 kVA; $\cos \phi \geq 0.8$;
Frequency 50 ± 1 Hz, 3-wire output L1, L2, L3;
Voltage stability $\pm 5\%$;
Overload 200%, 3 s (motor start-up);
Load asymmetry max 10%;
Voltage waveform sinusoidal (THD $< 5\%$);
Electronic overload and short circuit protection

Total power **200 kVA/190 kW**

Efficiency **> 90%**

Dielectric Strength Test HVDC **9.5 kV, 50 Hz, 1 min**
to remaining terminals

Dielectric Strength Test 400 VAC **2.5 kV, 50 Hz, 1 min**
to remaining terminals

Dielectric Strength Test 24 VDC **500 V, 50Hz, 1 min**
to remaining terminals

Monitoring **CANopen**

Ambient temperature **$-30 \div +40^\circ\text{C}$**

Cooling **forced-air**

Assembling **in the cabinet**

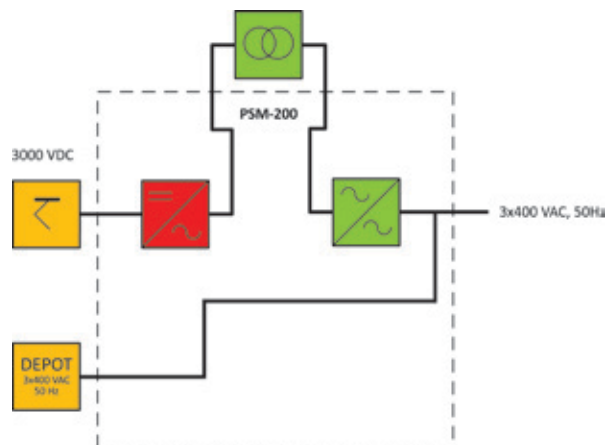
Protection ratio **IP54 (IP54 cooling compartment too)**

Weight **700 kg**

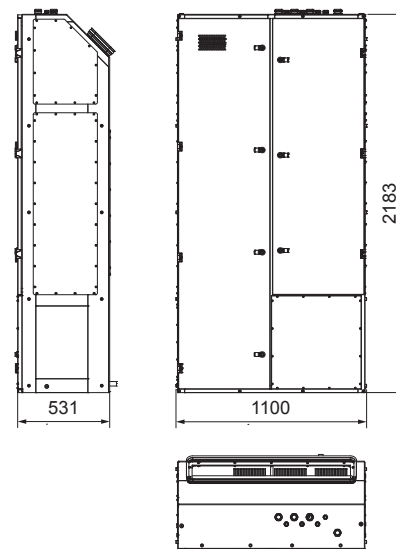
Dimensions **1100×531×2183 mm**



Block diagram



Housing



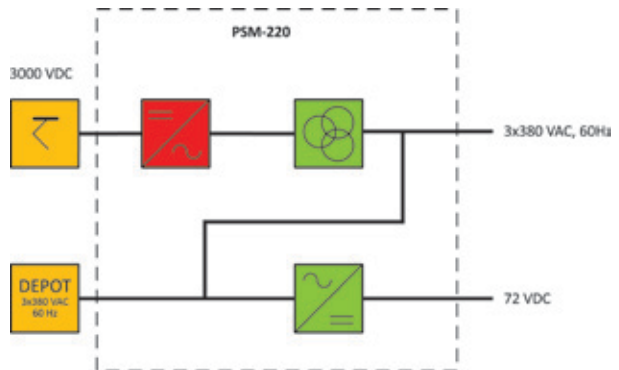
PSM-220

Static Converter

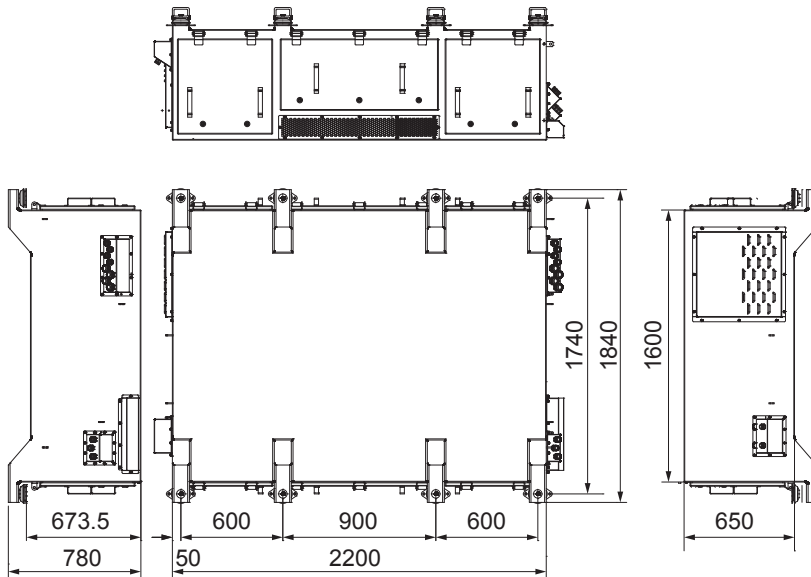


Block diagram

The static converter type PSM-220 has been designed to supply the circuitry of a railway wagon with the 3x380 V/60 Hz and 72VDC. Input power supply for this converter is 3000VDC. It is possible to use a 3x380 V 60 Hz depot power supply. The PSM-220 static converter is built-in in a tight metal housing made of aluminum profiles and sheets. Some of these profiles are used for heat dissipation. The housing is prepared to be assembled under the floor. The control unit of the PSM-220 is supplied from a 72 VDC source.



Housing



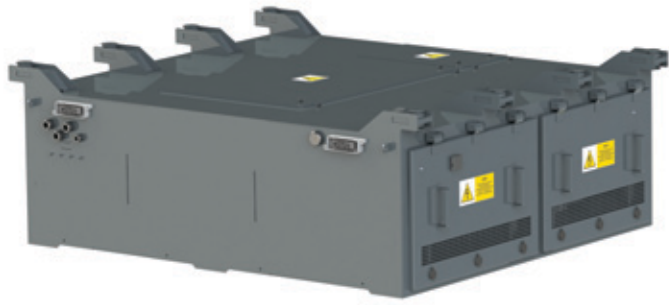
PSM-220

Static Converter

Specification	
Input voltage HVDC	3000 VDC (range 2000÷3900 V)
Overvoltage protection	MOV, SCR Crowbar
Input-output galvanic isolation	yes
Input voltage AC DEPOT	3×380 VAC/60 Hz
Input power	83 kVA
4-wire input	L1, L2, L3, N
Necessary short circuit protection before depot input	
Output voltage AC	3×380 VAC/60 Hz
Power	180 kVA
4-wire output	L1, L2, L3, N neutral grounded
Power factor	≥ 0,85
Voltage stability	≤ 5%
Frequency stability	≤ 1%
Overload/short circuit capacity	2×In/3 s (200%/3 s)
THD(u)	≤ 5%, typical 3%
Electronic overload and short circuit protection	yes
Output voltage LVDC	72 VDC (range 50÷90 V)
Output power	40 kW
Output current	550 A
Voltage stability	≤ 1%
Voltage ripples	≤ 2%
Battery current limit	0.1–1 In
Electronic overload and short circuit protection	yes
Output voltage thermal compensation	option
General	
Total output power	220 kVA/200 kW
Efficiency	≥ 90%
Dielectric Strength Test HV/LV	9.5 kV, 50 Hz, 1 min
Dielectric Strength Test LVAC/LVDC	2.5 kV, 50 Hz, 1 min
Monitoring	CANopen, MVB
Ambient temperature	0 ÷ +40°C full power > +40°C reduced load 3% per 1°C
Max temperature	+70°C
Cooling	forced-air
Mounting	under the floor
Protection ratio	IP65/IP20 cooling compartment
Weight	1500±50 kg
Dimensions	2200×1840×780 mm

PSM-230

Static Converter



The static converters PSM-230 (APS) were designed applying state of the art technologies: IGBT modules, Digital Signal Processors, modern magnetic materials, resin stabilization and others. The modern technological and circuitry solution provides excellent output parameters. The converter shares the input filter with the traction inverter that eliminates the fluctuations or transient inputs that may introduce noise into the equipment or from the APS to the catenary.

The static converter is supplied from the DC link voltage of the propulsion converter of the train. Using LF power conversion technology and modern PWM algorithms, it generates a pure sinusoidal three-phase output voltage.

Static converter PSM-230 (APS) was designed to supply the auxiliary circuits and to charge batteries in train cars through a 110 VDC rectifier.

APS will be built in tight metal housing made of welded aluminium profiles and sheets. Some of these profiles are used for heat dissipation.

Cooling of the converter PSM-230 is a result of forced air along the inner heatsink of the converter. The air cooling channel is in the dirty zone of the APS. The converter has an automatic control system that monitors the states of the outputs and protects it against overloads or short circuits. Every fault state is detected and followed by an appropriate alarm signal sent through CANBUS.

Maintenance access of the APS is provided by means of the modular construction of the main functional block of the converter such as: its pre-charge block, 3AC inverter, battery charger, output filter. Each block is easily removable, so maintenance replacement is short and simple.

The PSM converter is a high-power single-system auxiliary converter based on IGBT technology. The control of the converter is performed in DSP (Digital Signal Processor) technology.

The system is characterized by a low level of harmonics distortion in the output voltage, very high efficiency and high overload capability.

The applied bus-bar system in combination with a perfect IGBT driver guarantees a failure free performance upon short-circuits and eliminates the possibility of secondary damages in case of transistor failure.

The applied polypropylene capacitors ensure a long service lifetime and resistance of the system against voltage changes in the traction network.

The converter meets the international and EN standards in safety and electromagnetic compatibility.

The system provides a very low level of interferences emitted to the traction network and loads.

The converter equipped with a forced air-cooling system operates within a wide range of external temperatures.

The diagnostics and control of the converter is provided via the CANBUS and CAN gateway interface.

Control is provided via the CAN interface. Diagnostics is provided via the ETH interface. The battery charging block operates in a mode which is optimal for the battery.

The modes are set automatically – in order to protect and extend the lifetime and ensure optimal operation of the batteries. The PSM-230 converter is mounted under the frame of the vehicle. Access to its components is provided on the side of the vehicle, after removing the side flaps.

The inverter is designed to withstand the starting of all AC loads following a starting sequence.

Auxiliary 110 V DC power is supplied by the inverter / rectifier and battery. Therefore, the outputs of one 110 V DC rectifier are operated in parallel, feeding batteries and train equipment, so it automatically adjusts its loads without overload (regulation curves).

The batteries are charged permanently. The charging of the battery is always done controlling the voltage (depending on the battery temperature and checking that the current limit is not reached) as specified by the battery supplier.

PSM-230

Input voltages	1500 VDC (catenary) 3×400 VAC / 50 Hz (DEPO) 3×400 VAC / 50 Hz (DEPO)
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AC Output	3×400 VAC / 50 Hz / 210 kVA
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DC Output	110 VDC / 20 kW
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Housing

Cooling method	forced-air
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Weight	1350 kg
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Dimensions	2037×1500×673 mm
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Protection ratio	Clean section	IP 65
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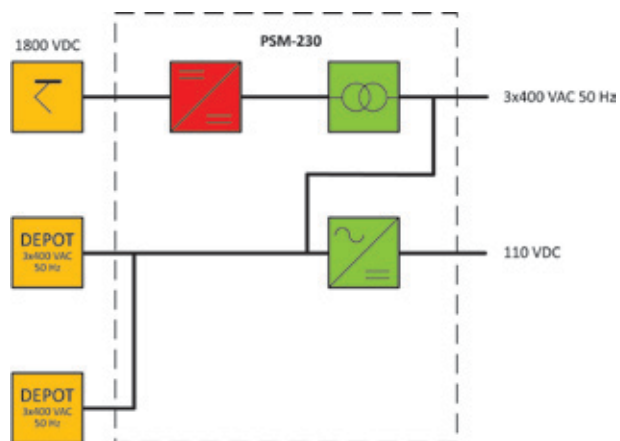
	Dirty section	IP 21
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PSM-230

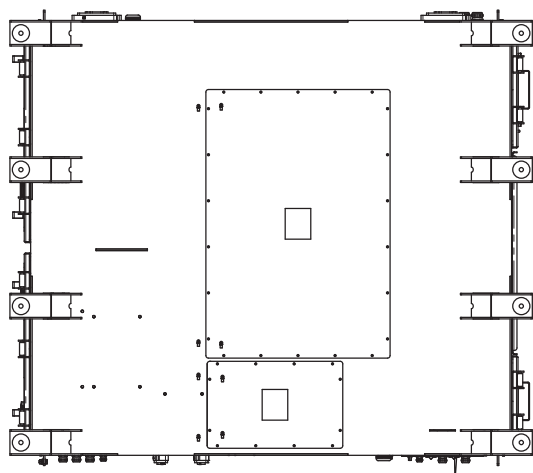
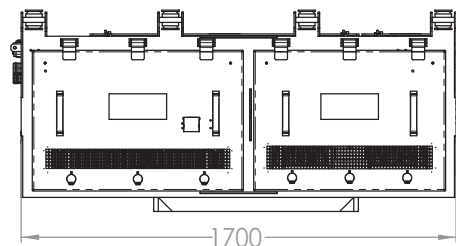
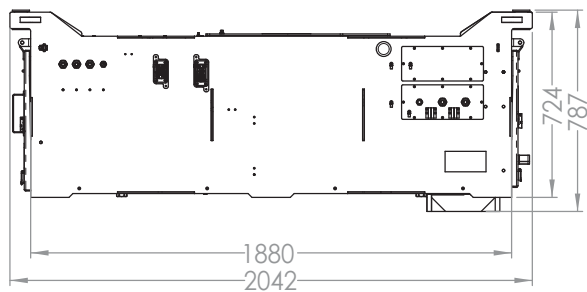
Static Converter



Block diagram



Housing



PSM-350

Static Converter

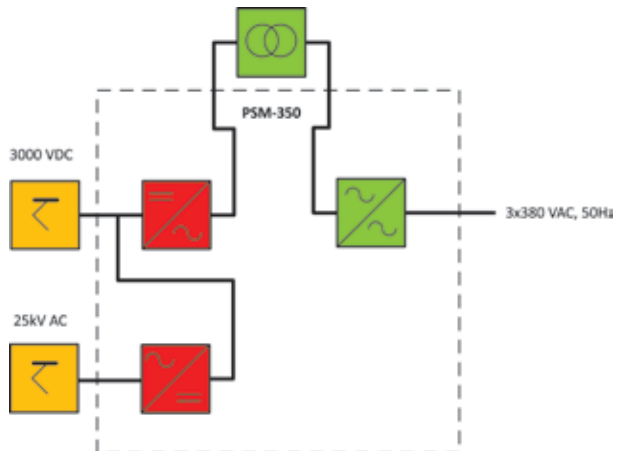
The PSM-350 static converter has been designed to supply the circuits of train cars with 3×380 V/50 Hz. Input power supply for this converter is 3000 VDC or 25 kVAC depending on the train's operation mode. In the 3000 VDC operation mode the converter is supplied from the DC link circuit of FT-500-3000-DS propulsion inverter. In the 25 kVAC operation mode the converter is supplied from the HV transformer of the train. Active Front End structure on the front of the PSM-350 results in pure sinusoidal current collected from the AC traction. The housing is prepared for in-car assembly. The control unit of the PSM-350 is supplied from a 24 VDC source.

Specification

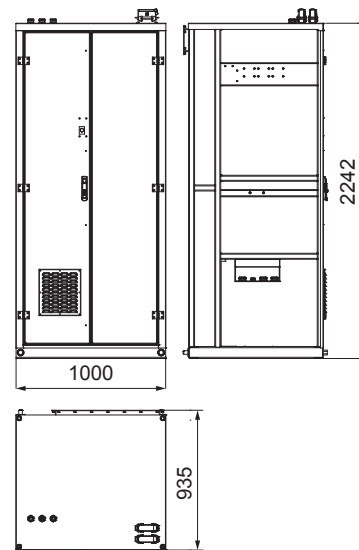
Input voltage HV	3000 VDC direct from FT-500-3000-DS (operating range 2000÷4000 VDC) 25 kVAC through external HV transformer 2083 VAC (operating range 1583÷2292 VAC)
Overvoltage protection	MOV
Input-output galvanic isolation	yes
Output voltage AC	3×380 VAC/50 Hz
Output power	350 kVA
3-wire output	L1, L2, L3 neutral grounded
Power factor	≥ 0.8
Voltage stability	≤ 5%
Frequency stability	≤ 1%
Overload/short circuit capacity	2×In/3 s (200%/3 s)
THD(u)	≤ 5% typical 3%
Electronic overload and short circuit protection	yes
General	
Total output power	350 kVA/330 kW
Efficiency	≥ 90%
Dielectric Strength Test HV/LV	9.5 kV, 50 Hz, 1 min
Dielectric Strength Test LVAC C	2.5 kV, 50 Hz, 1 min
Monitoring	CANopen
Ambient temperature	-40 ÷ +40°C
Cooling	forced-air
Mounting	inside the car
Protection ratio	IP55/IP20 cooling compartment
Weight	825±50 kg
Dimensions	1003×902×2242 mm



Block diagram



Housing



ZB24DC200

Battery Charger



The ZB24DC200 series battery charger has been designed to charge batteries and supply DC loads of the rated voltage of 24 VDC – in co-operation with the battery. The charger may operate without the battery or with any type of battery. The charger incorporates the IGBT technology with primary switching, control is performed by the microcontroller, whose algorithm provides:

- constant monitoring of the supply voltage,
- monitoring of output currents and voltages,
- generation of alarm signals,
- independent stabilisation of output current and battery current,
- thermal compensation of the battery voltage,
- battery diagnostics (circuit continuity).

The charger has 3 alarm contacts which signal:

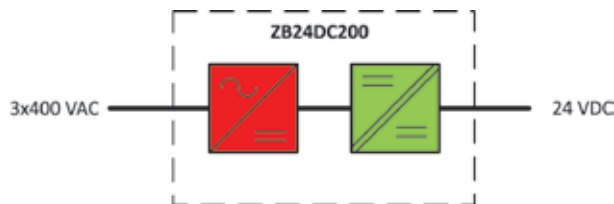
- lack of battery charging,
- overload,
- low output voltage.

Control and diagnostics are possible via RS232 or MVB, CAN 2.0 B interface. The charger may operate in the following modes: “float charging”, “boost charging”, “equalising charging”. The modes can be set manually or automatically.

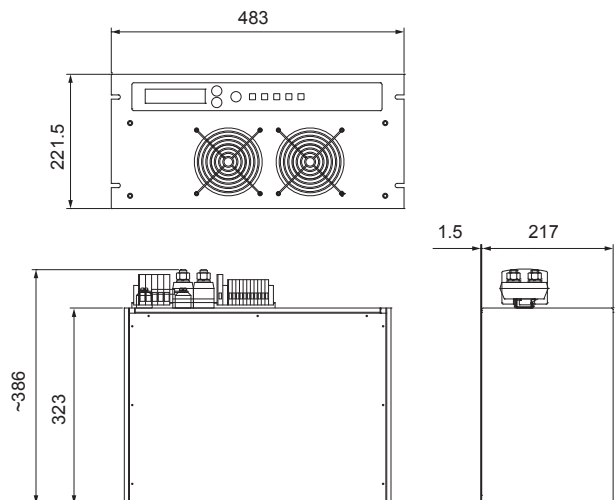
Specification

Input voltage	3×400 VAC, 50 Hz -15 ÷ +15%
Output voltage (Un)	24 VDC
Output voltage stability	≤ 1%
Output voltage ripples	≤ 0.5%
Range of output voltage thermal compensation Un [option]	-10 ÷ +40°C
Output current (In)	200 A
Battery current reduction regulation	(0.1–1) In
Housing type	Rack 19"
Protection ratio	IP21
Ambient temperature	-40 ÷ +45°C
MTBF (measured)	200,000 h
Dimensions	222×483×386 mm (5U)

Block diagram



Housing



ZB24DC300

Battery Charger



The ZB24DC300 series battery charger has been designed to charge batteries and supply DC loads of the rated voltage of 24 VDC – in co-operation with the battery. The charger may operate without the battery or with any type of battery. The charger incorporates the IGBT technology with primary switching, control is performed by the microcontroller, whose algorithm ensures:

- constant monitoring of the supply voltage,
- monitoring of output currents and voltages,
- generation of alarm signals,
- independent stabilisation of output current and battery current,
- thermal compensation of the battery voltage,
- battery diagnostics (circuit continuity).

The charger has 3 alarm contacts which signal:

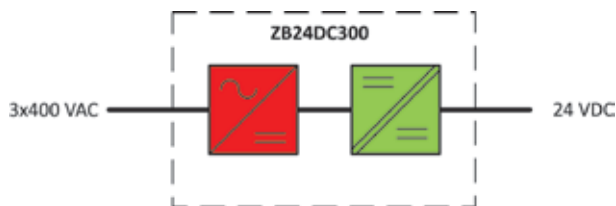
- lack of battery charging,
- overload,
- low output voltage.

Control and diagnostics are possible via RS232 or MVB, CAN 2.0 B interface. The charger may operate in the following modes: “float charging”, “equalising charging”, “boost charging”. The modes can be set manually or automatically. The design of the charger allows it to be installed inside the battery compartment.

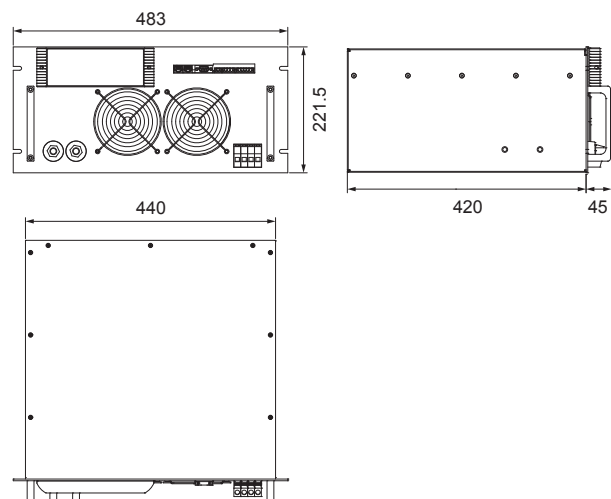
Specification

Input voltage	3×400 VAC, 50 Hz -15 ÷ +15%
Output voltage (Un)	24 VDC
Output voltage stability	≤ 1%
Output voltage ripples	≤ 0.5%
Output current (In)	300 A
Battery current reduction regulation	(0.1–1) In
Protection ratio	IP55
Ambient temperature	-40 ÷ +45°C
MTBF (measured)	200,000 h
Dimensions	483×420×222 mm (5U)

Block diagram



Housing



ZB24DC300E

Battery Charger



The ZB24DC300E series battery charger has been designed to charge batteries and supply DC loads of the rated voltage of 24 VDC – in co-operation with the battery. The charger may operate without the battery or with any type of battery. The charger incorporates the IGBT technology with primary switching, control is performed by the microcontroller, whose algorithm ensures:

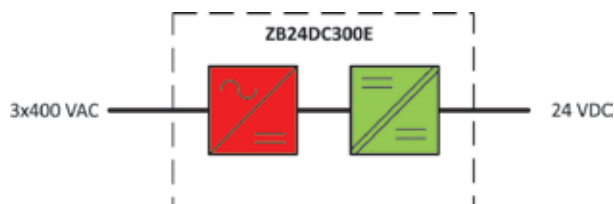
- constant monitoring of the supply voltage,
- monitoring of output currents and voltages,
- generation of alarm signals,
- independent stabilisation of output current and battery current,
- thermal compensation of the battery voltage,
- battery diagnostics (circuit continuity).

The charger has 3 alarm contacts which signal:

- lack of battery charging,
- overload,
- low output voltage.

Control and diagnostics are possible via RS232 or MVB, CAN 2.0 B interface. The charger may operate in the following modes: “float charging”, “equalising charging”, “boost charging”. The modes can be set manually or automatically. The design of the charger allows it to be installed inside the battery compartment.

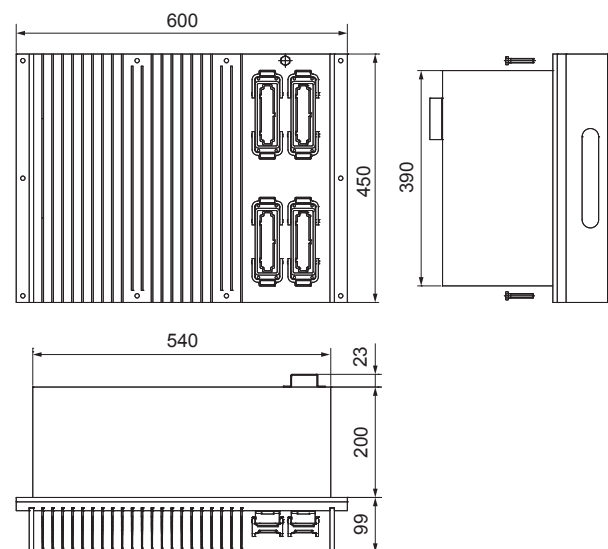
Block diagram



Specification

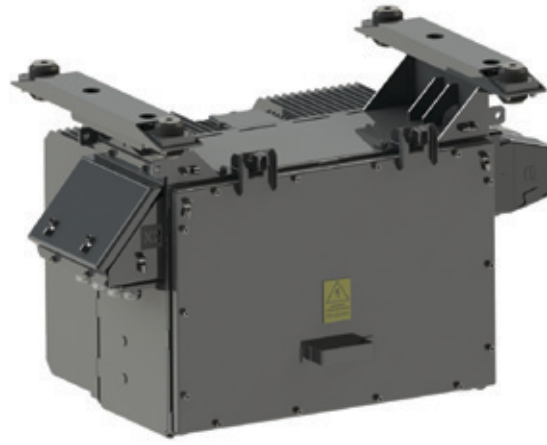
Input voltage	3×400 VAC, 50 Hz -15 ÷ +15%
Output voltage (Un)	24 VDC
Output voltage stability	≤ 1%
Output voltage ripples	≤ 0.5%
Output current (In)	300 A
Battery current reduction regulation	(0.1–1) In
Protection ratio	IP55
Ambient temperature	-40 ÷ +45°C
MTBF (measured)	200,000 h
Dimensions	600×450×322 mm (5U)

Housing



ZB24DC400E

Battery Charger



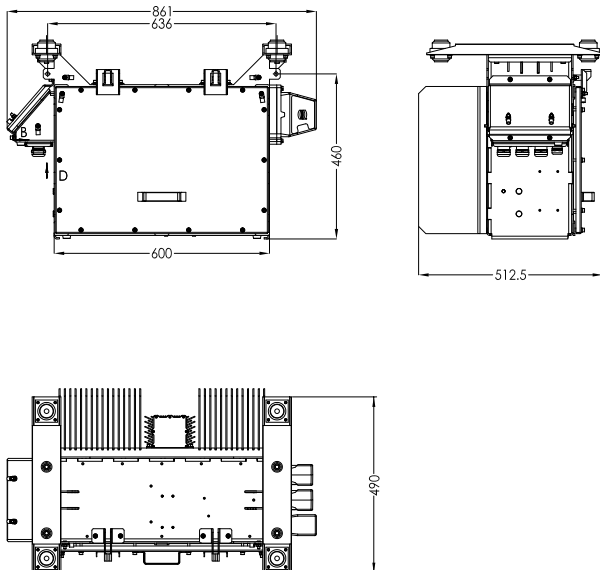
The device draws energy from a 3×400V 50Hz platform grid and converts it into the 24 V used in the LV carriage supply grid and for battery charging. The main features of the charger are: very good stability of the output voltage and temperature correction of the battery charging voltage. The device is fitted with a microprocessor control system which limits the output current in case of overload or short-circuits.

The charger has galvanic insulation between the input and output circuits.

Block diagram



Housing



ZB24DC400E

Input voltage	3×400V AC
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Rated output power	10kW
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Rated output voltage	24V DC
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Range of output voltage regulation	± 15%
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Rated output current	417 A
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Output voltage stability	≤ ± 1%
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Output voltage ripples	≤ ± 0.5%
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Efficiency at load (incl. output blocking diode):	
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100%	86%
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75%	85%
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50%	84%
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Ambient temperature	-30°C ÷ +45°C
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Cooling	natural
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Protection ratio	IP 65
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Weight	96 kg
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Dimensions	557×423×835 mm
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ZB36DC150

Battery Charger



The ZB36DC150 series battery charger has been designed to charge batteries or supply DC loads of the rated voltage of 36 VDC – in co-operation with the battery. The charger incorporates the IGBT technology with primary switching, control is performed by the microcontroller, whose algorithm ensures:

- constant monitoring of the supply voltage,
- monitoring of output currents and voltages,
- independent stabilisation of output current and battery current,
- thermal compensation of the battery voltage,
- battery diagnostics (load, continuity).

The charger has 3 alarm contacts which signal:

- lack of battery charging,
- overload,
- low output voltage.

Control and diagnostics are possible via RS232 or MVB, CAN 2.0 B interface. The charger may operate in the following modes: “float charging”, “equalising charging”, “boost charging”. The modes can be set manually or automatically.

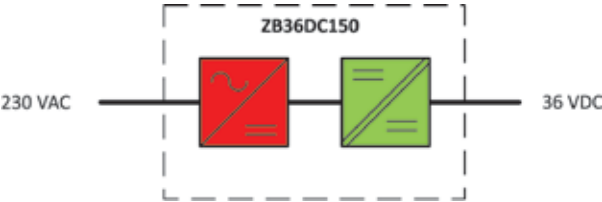
Specification

Input voltage	230 VAC, +40 ÷ -40%
Rated output power	6 kW
Rated output voltage	36 VDC
Range of output voltage regulation	25÷43 V
Rated output current	150 A
Output voltage stability	≤ 1%
Output voltage ripples	≤ 2%
Efficiency	≥ 93%
THD of the input current	≤ 5%
Ambient temperature	-40 ÷ +50°C
Cooling	forced-air
Protection ratio	IP20
Weight	35 kg
Dimensions	450×276×380 mm

ZB36DC150

Battery Charger

Block diagram



Housing

