OPUS HE DC Power Systems
MHE Rectifiers

MHE 24-1500
MHE 48-2000
MHE 60-2000
MHE 110-2000
MHE 125-2000
MHE 220-2000

Rail

UTILITY RAIL INDUSTRIAL TELECOM

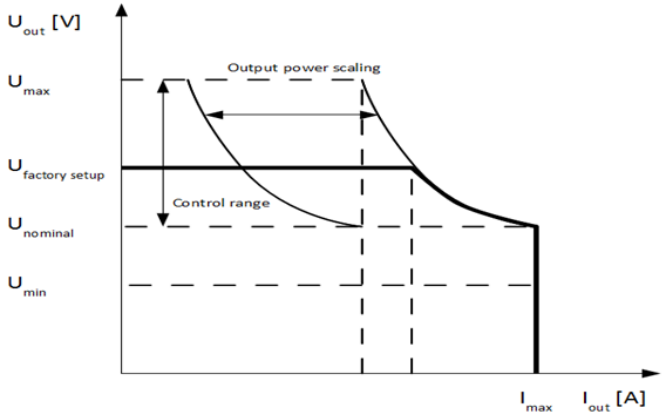
NO FAN EFFICIENCY 5 YEAR WARRANTY

Product Description

The MHE rectifier utilizes Enedo's long experience and latest technology on high performance industrial power supplies. On top of generic IEC and UL/CSA certifications MHE rectifiers are certified for rail and metro system applications. Rectifiers meet demanding requirements of utility, industrial, rail and telecom applications with modern high efficiency modular technology.

MHE rectifiers are convection cooled and requires no fans. Rated output power is 2000 W in 48 V – 220 V output versions and 1500 W in 24 V version. Rectifier input is single phase, range 85-300 VAC.

Rectifiers can be operated either with a VIDI+ system controller or as stand-alone modules with or without batteries in the output.



Features

- Efficiency up to 97 %
- Convection cooled – *No Fans*
- MTBF 1 800 000 h @ 25ºC, Telcordia SR-332
- Output models 24, 48, 60, 110, 125, 220 VDC
- 2000 W output power, 24 VDC 1500 W
- Lacquered PCB for rail and metro applications
- Nominal Input voltage 100-250 VAC, range 85-300 VAC
- Soft-start generator input feature
- Active load current sharing
- Internal over temperature protection
- Digital communication over CAN bus with VIDI controller
- Flexible design with full front cabling
- EMC:
  Generic EN 61000-6 -1 / -2 / -3 / -4
  Power Utility EN61000-6-5, surge level 2
  Railway EN 50121-4 / -5 (signaling & substation)
  Telecom ETSI EN 300386
- Safety:
  EN/IEC/UL/CSA 62368-1
  EN 50124-1 Railway insulation coordination

Technical Specifications

AC Input	MHE 24-1500	MHE 48-2000	MHE 60-2000	MHE 110-2000	MHE 125-2000	MHE 220-2000
Input voltage	Nominal 100VAC - 250VAC					
Input range	Max range 85 – 300 VAC Rated full power range: 48-220V models 180VAC – 275VAC, 24V models 140-275VAC See derating curves at page 3, 1200W power available at nominal 120VAC input Temporary high voltage range 275-300VAC, continuous supply voltage above 275VAC not recommended					
Start-up / shut down limits	Start-up voltage 90VAC / Shut down at 85 VAC Shut down over voltage limit 300VAC / re-start at 290VAC					
Input frequency	Rated 45 - 66 Hz, reduced power at 35 - 45 Hz. Shut down at 35 Hz					
Maximum current	12.5A @ U_{in} 85-130V	12.5A @ U_{in} 85-180V	12.5A @ U_{in} 85-180V	12.5A @ U_{in} 85-180V	12.5A @ U_{in} 85-180V	12.5A @ U_{in} 85-180V
Max current at U_{nom} 220VAC	8 A	11 A	11 A	11 A	11 A	11 A
Inrush current	ETS 300 132-1, Active limitation typical <20A					
Power factor (typical)	>0.99 at 85-275VAC input					
THD (typical)	< 5% @ 100%, < 9% @ 50% at 85-275VAC input					
Standby power	5W-6W input power at no load conditions					
Input protection	External MCB 16A C-curve (24V C10A or C16A), Internal varistor and gas discharge tube for transient surge protection, Automatic shut-off above 300 VAC (restart at 290 VAC)					
Generator start-up ramp	7 seconds ramp from 200W to full 2kW controlled by Input power, used with generator input supply (User programmable feature, enable/disable, default disable)					
Start-up delay	Default start-up time approx. 5 sec, User Programmable additional delay 0-120s (+15% / 0%).					

DC Output	MHE 24-1500	MHE 48-2000	MHE 60-2000	MHE 110-2000	MHE 125-2000	MHE 220-2000
Voltage range	21-33 VDC	42-59 VDC	51-72 VDC	90-150 VDC	100-160 VDC	178-280 VDC
Voltage factory setting	27.24 VDC	54.48 VDC	68.10 VDC	122.58 VDC	136.20 VDC	245.16 VDC
Maximum current @ nominal output	62.5 A @ 24 V	41.7 A @ 48 V	33.3 A @ 60 V	18.5 A @ 108 V	16.7 A @ 120 V	9.3 A @ 216 V
Constant output power	1500 W	2000 W				
Current limit	< 65 A	< 45 A	< 35 A	< 20 A	< 20 A	< 10 A
Type of Current limit	MHE rectifier supplies constant short circuit current 500sec, then hiccup mode in 500sec cycles					
Hold-up time	> 20 ms at 80% load, output voltage reduces from float voltage to nominal					
Static voltage regulation	± 0.5 % (load, line, temperature)					
Dynamic load regulation	± 5.0 % for 10%-90% or 90%-10% load step, recovery time < 2.0 ms					
Ripple and noise	< 50 mVp-p	< 100 mVp-p	< 115 mVp-p	< 225 mVp-p	< 250 mVp-p	< 450 mVp-p
Output protection	Output overvoltage shutdown Power limiting & shutdown based on: temperature, input voltage and frequency, derating curves page 3					

Features	MHE 24-1500	MHE 48-2000	MHE 60-2000	MHE 110-2000	MHE 125-2000	MHE 220-2000
Efficiency, typical 30-70% load, V_{in} 230VAC	> 95 %	> 96 %	> 96 %	> 96 %	> 96%	> 95%
MTBF, calculated	> 1 800 000 h @ 25ºC, Telcordia SR-332, Method I-D, Ground Fixed uncontrolled environment					
Dielectric strength, type test	Input – GND (basic), 2 kVAC or 2.83 kVDC, 1 min Input - Output (reinforced) 3.75kVac or 5.3 kVDC, 1 min Output – GND (basic) 2 kVAC or 2.83 kVDC, 1 min					
Load current share	± 5 % from true average current between the modules (>50% load, controlled by VIDI)					
Alarms	Mains fault alarm, Low output voltage alarm, Overvoltage shutdown alarm, Rectifier alarm, Temperature Alarm, Totally +40 configurable system alarms via VIDI controller					
Visual Indications	LED: Green/Red/Yellow, see the rectifier user manual for more details					
Energy saving mode	See Enedo VIDI controller manual					

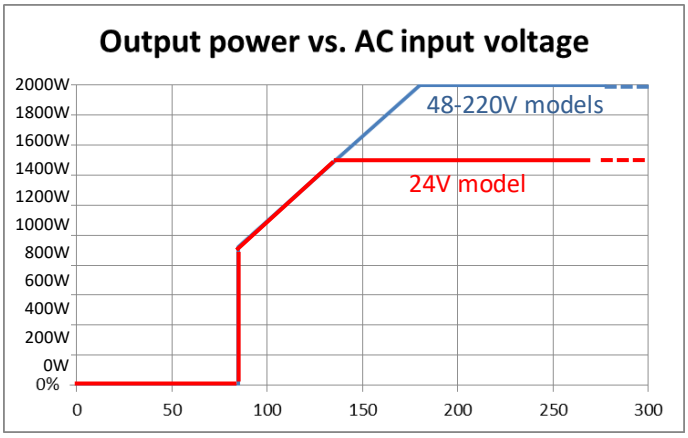
Mechanical	
Dimensions (HxWxD)	169 x 83 x 357 mm, see drawing
Weight	4.6 kg
Protection class, IEC 60529	IP20 when counter-connector in place, DC connector IP10 without counter-connector

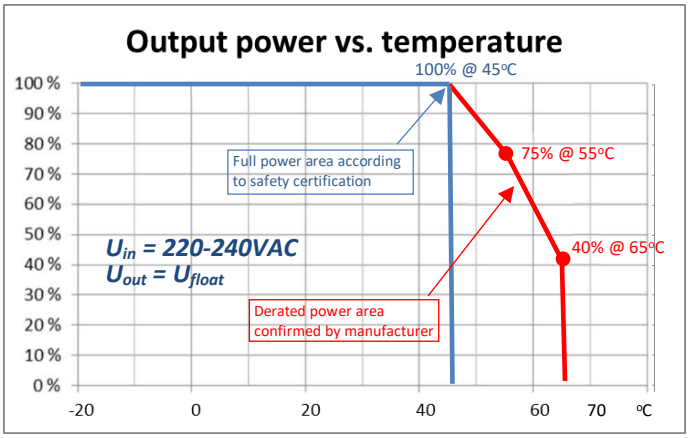
Connections	
Connector, AC	Appliance inlet IEC 60320-1, C20 style, 16 A male
Connector, DC	Phoenix terminal PC 5/ 4-G-7.62, 4 x 4mm^2 (+ + - -)
Connector, PowerCAN	2 pcs RJ-45

Environmental	
Cooling	Natural convection
Acoustic noise	< 40 dB
Operating temperature	Full power according to Safety Certification -25°C … +45°C, Start-up at -40°C Derated power at +45°C … +65°C, max 40% power at 65°C, see curve below
Storage temperature	-40 °C … +85 °C
Environmental protection	Lacquered PCB
Humidity	95 % relative humidity, non-condensing
Altitude according to EN 62368-1	Full power: 2000 m (6500 feet) above sea level De-rating -2% / 100m above 2000m, max altitude 5000m

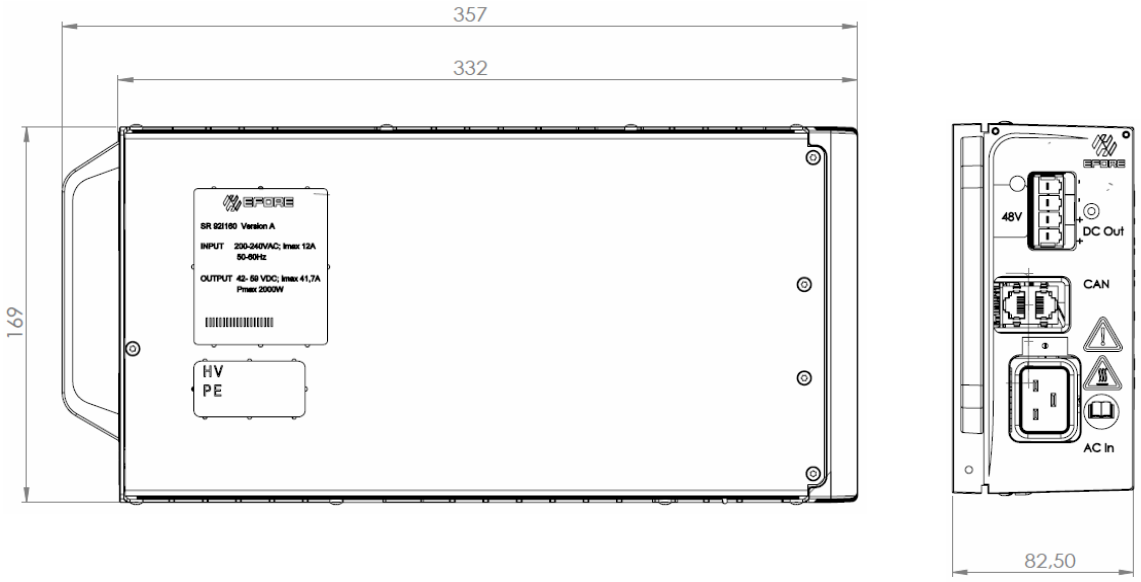
Applicable Standards	
EMC	Generic IEC61000-6-1, IEC61000-6-2, IEC61000-6-3, IEC61000-6-4 Power Utility immunity EN61000-6-5, surge level 2, 2kV line to ground Railway EN 50121-4 signaling systems, EN50121-5 substation environment Telecom ETSI EN 300 386
Safety	EN 62368-1:2014+A11:2017, UL 62368-1 2nd Ed. CAN/CSA C22.2 NO. 62368-1-14 Railway EN 50124-1, Indoor use, Not connected to contact line, Pollution degree 2, Overvoltage category 2
Environment	Operation: ETS 300 019-2-3 cl T3.2 Storage: ETS 300 019-2-1 cl T1.2
Certifications	CE Declaration of Conformity CB Certificate, CB test report UL 62368-1 and CAN/CSA C22.2 NO. 62368-1-14 Certificate & Listing report TÜV Rail and metro system certification: 50121-4/-5, EN 50124-1
Quality	Manufacturing and design conform to ISO 9001, ISO 14001

Derating curves

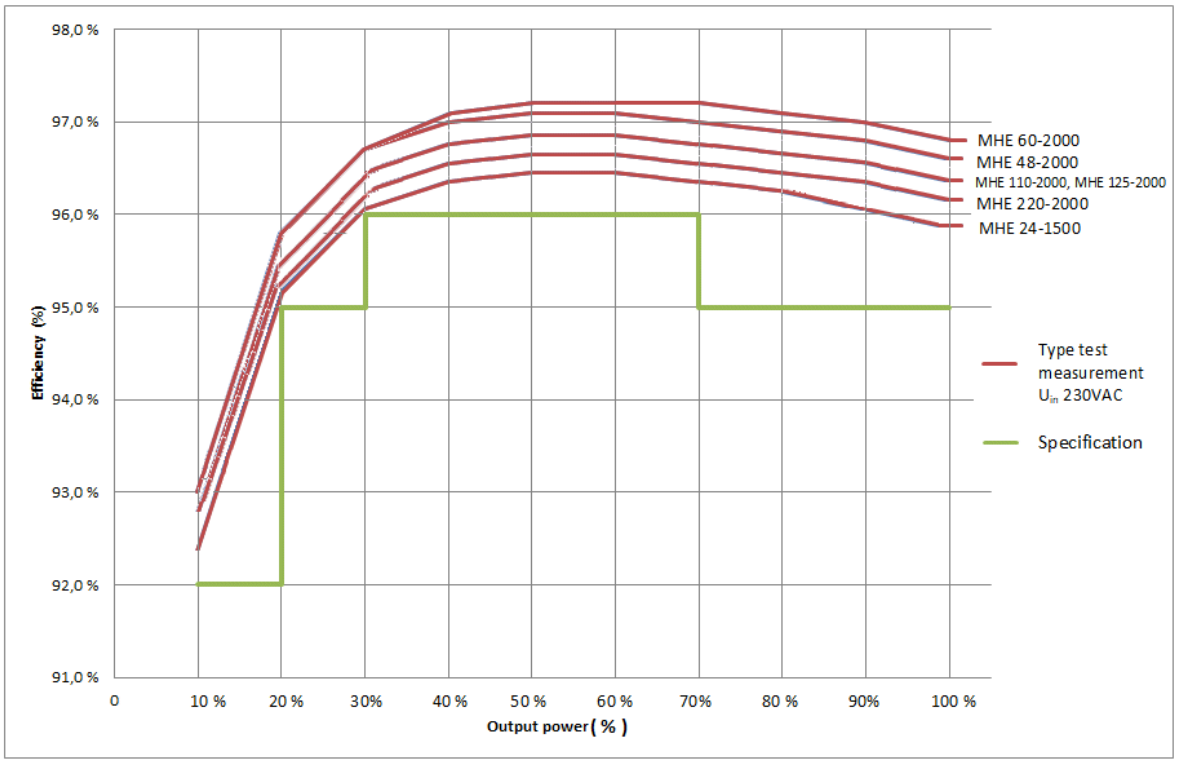




Main dimensions



Efficiency curves



Order Information

Description	Order number	Voltage / Current
MHE 24-1500	92I280	24VDC / 62.5A
MHE 48-2000	92I160	48VDC / 41.7A
MHE 60-2000	92I290	60VDC / 33.3A
MHE 110-2000	92I250	110VDC / 18.5A
MHE 125-2000	92I260	125VDC / 16.7A
MHE 220-2000	92I270	220VDC / 9.3A