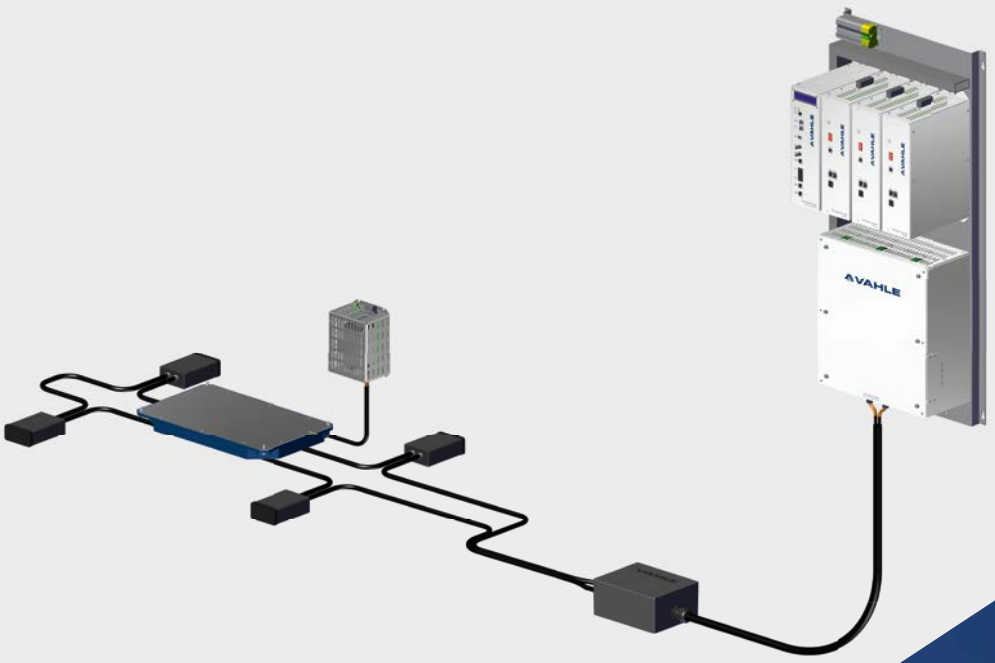
vPOWER – CONTACTLESS POWER SUPPLY

140 kHz TECHNOLOGY



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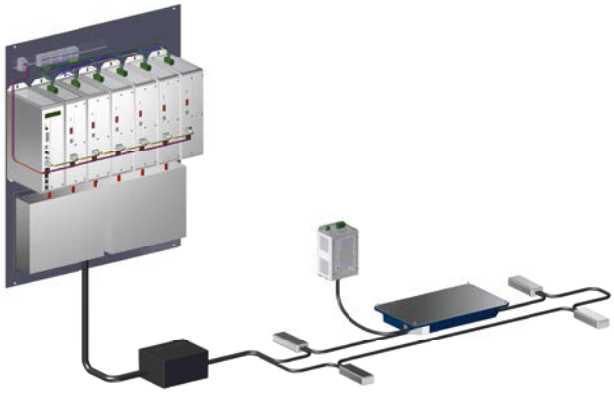
vPOWER - KEY HIGHLIGHTS

AGV SOLUTION



MODULAR DESIGN

Due to the modular structure of the vPOWER system, many diverse combinations of power ranges can be assembled. The primary side consists of 10kW elements for a modular equipment.
The secondary side uses 1.5kW, 2.5kW and 3.3kW elements. Additionally, it is possible to parallel the outputs from multiple secondaries to obtain higher power per vehicle. The top can switch from regulated DC output voltage to a DC-Bus that allows up to 10kW.

SPACE-SAVING COMPACT DESIGN

The extreme compact design of the vPOWER components means a contactless power system can be implemented on vehicles with minimum space availability. New compensation boxes can be laid underground to minimize hazards and space needed. This is possible, in part, due to the separation of Pickup and Regulator electronics. The Pickup needs to be mounted directly interfacing the primary track while the Regulator electronics can be mounted anywhere on the vehicle allowing for easier access and maintenance. The connection between Pickup and Regulator is by coaxial cable which minimizes any radiated interference.

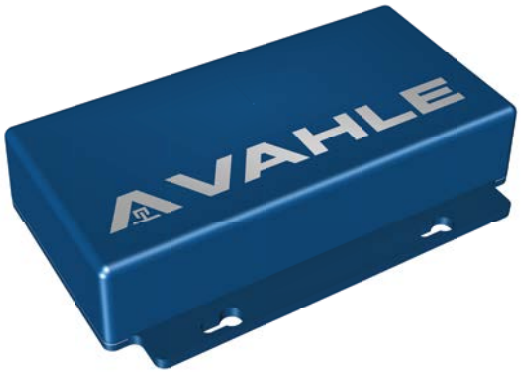
SIMPLE SERVICE AND DIAGNOSTIC TESTING

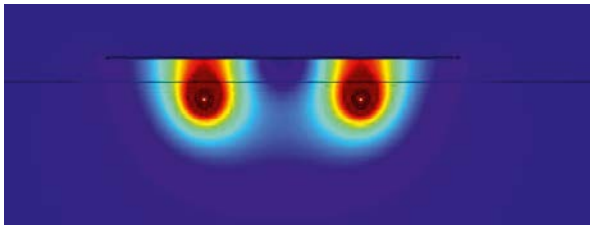
vPOWER's primary-sided service and diagnostic module allow for whole-system performance control and monitoring. Fieldbus partnered with offered protocols PROFINET-IO, EtherNet-IP, and CC-Link IE, enable worldwide operational capabilities. Important system vitals such as current, voltage, phase angle, and more can be read via an integrated LCD display of a vPOWER system. Failures and interferences are recorded internally and can be transmitted via a selectable interface allowing fast diagnostics and solutions in case of an event.

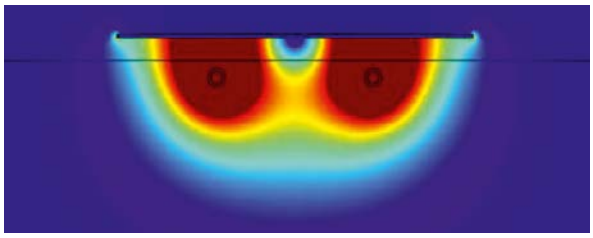
GUIDANCE

The main function of the track power cables in the floor is to transfer power to the Pickup(s) on AGVs. However, these cables can also be tracked, using a guidance sensor, to provide a guidance signal to the AGV controller.

The VAHLE Guidance sensor can navigate straight and curved pathways, as well as switches, crossing and power loops. RS485, CAN, PROFINET-IO, EtherNet-IP and CC Link interfaces are available, to provide range of communication options AGV controllers.







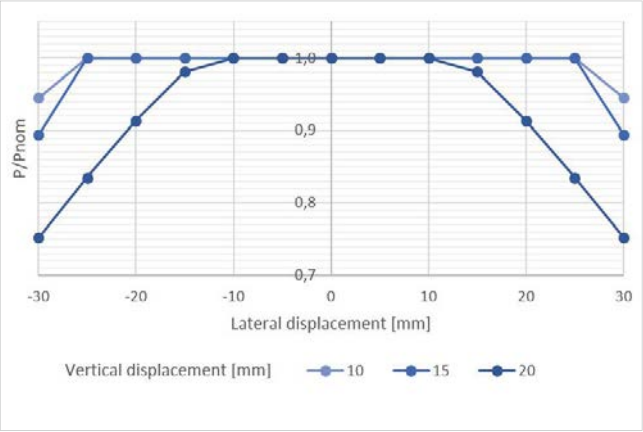
REDUCED IRON-FREE ZONE

By increasing the frequency by a factor of 7, the primary current compared to the former VAHLE inductive technology was reduced. This reduction has a great advantage – the distance to ferromagnetic metals can be reduced during power transfer significantly. When there is an aluminum plate within a distance of 20mm to the primary field, the power loss in the plate will be reduced by 56% compared to former VAHLE 124A 20kHz products, allowing a greater degree of autonomy in the laying of the primary cable.

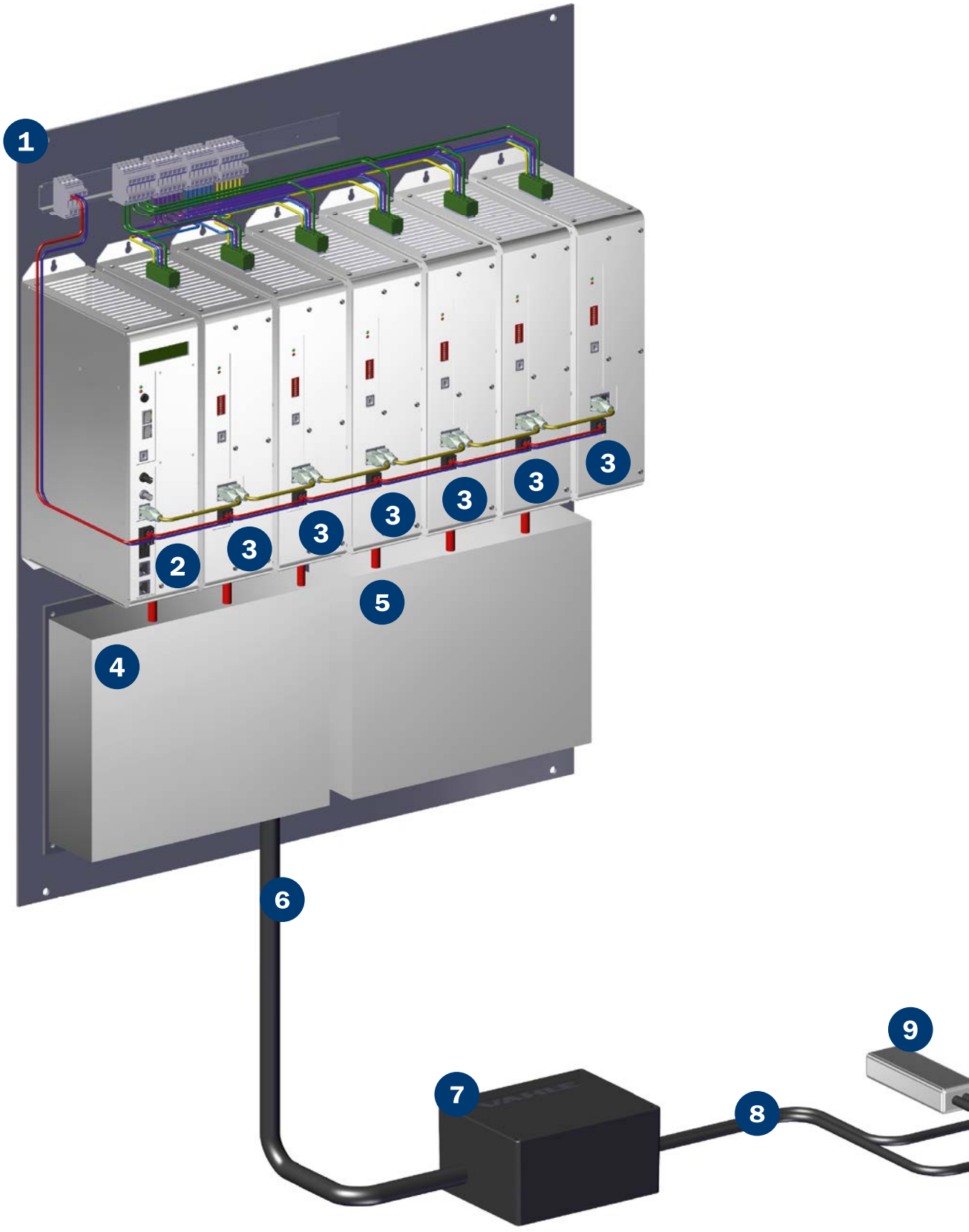
LARGE LATERAL TOLERANCE

The goal during development was to increase the vertical and lateral displacement tolerances to a world class level never achieved before in the industry.

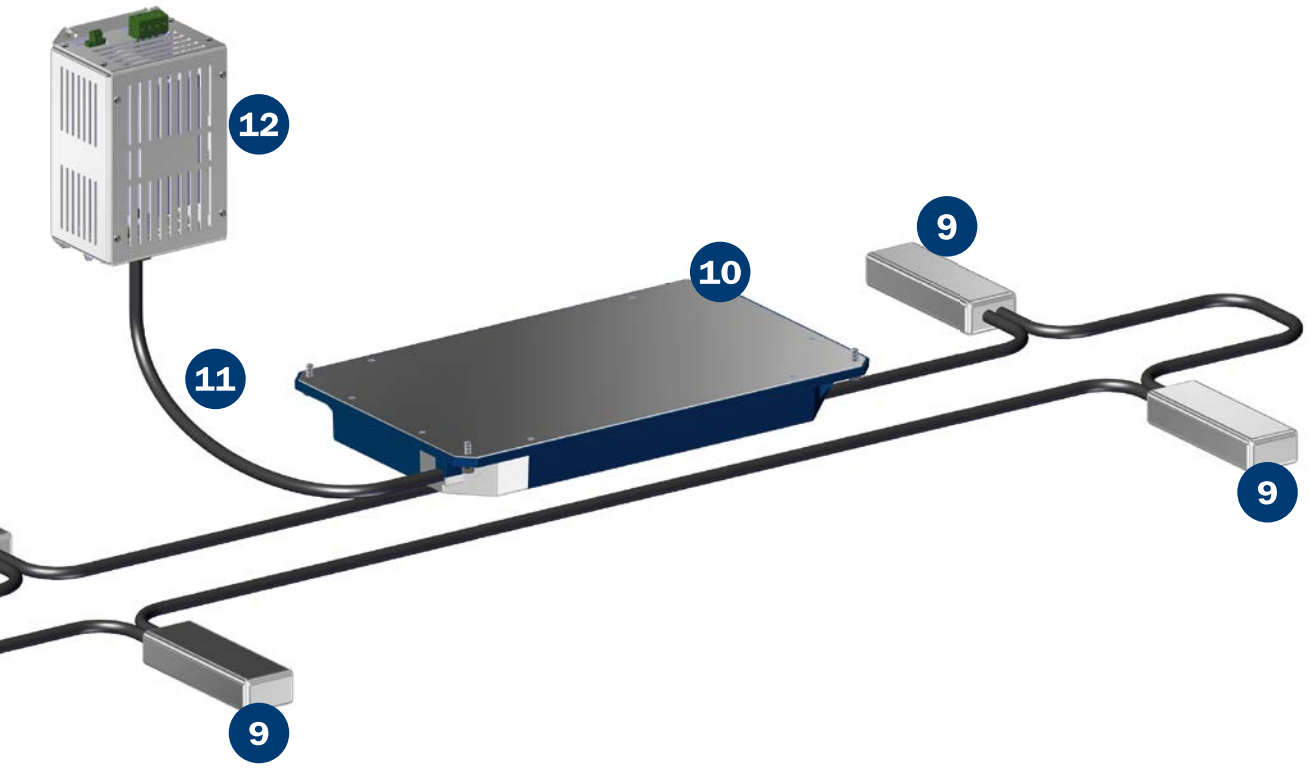
When the tolerances are exceeded only a small derating occurs. Even when the specified tolerance range is exceeding closely to the specified, only a small derating will occur. This makes it possible, to drive through most of the trajectory reliable.



vPOWER– SYSTEM OVERVIEW



1. PPU20: 2 x 10 kW Primary Power Unit
2. PPS: Primary Power Synchronization
3. PPC: Primary Power Controller
4. PPGCM: Primary Power Gyrator Compensation Master
5. PPGCS: Primary Power Gyrator Compensation Slave
6. CX45: Track Power Coaxial Cable (optional, only required for track feeds longer than 10 meters)
7. TPFB: Track Power Feed Box (optional, only required when Track Power Coaxial Cable is being used)
8. PX45: Track Power Litz Cable
9. TPCB: Track Power Compensation Box
10. F-PU: Flat Pickup
11. CX12: Mobile Power Coaxial Cable
12. RE: Regulator electronic



PRIMARY EQUIPMENT – OVERVIEW

PPU10 M
PRIMARY POWER UNIT 10 KW MASTER

PPU10 S
PRIMARY POWER UNIT 10 KW SLAVE

PRIMARY POWER UNIT – PPU10

TECHNICAL DATA

Power Specification

Power (nominal/peak) ..... 10 kW
Supply voltage ..... 400 ... 480 VAC ±10%
3 phase symmetric
Supply frequency ..... 50 ... 60 Hz
Supply net system ..... TT, TN (grounded neutral)
Output current/frequency ..... 45 A/140 kHz
Efficiency PPU ..... 95 %
Auxilliary (required) ..... 24 VDC ±10 %, 4 A/5 A/7 A

Mechanical Specification

Dimensions ..... 1030 x 445 x 240 mm (10 kW unit)
Ambient temperature ..... 0 ... + 40 °C non-condensing
Operation 3M4, 7M2
Environment ..... General industrial
Cooling ..... Convection
Protection rating IP20
Connection power ..... Cage clamp 4 mm²
Connection auxiliary ..... Cage clamp 1.5 mm²
Connection fieldbus RJ45

Control Interface

Interface ..... Profinet-IO
EtherNet/IP
CC-Link IE
Data rate ..... 500 kBit/s
Status information ..... Enable 140 kHz, Fieldbus Reset,
Fieldbus Error, System Error,
Warning*

PRIMARY EQUIPMENT CONFIGURATION

Based on the 10 kW primary unites, it is possible to configurate primary units with a higher performace.
A 40 kW base consists of a 10 kW primary unit master and three 10 kW primary units slave.

RANGE OF PRODUCTS

Description		Order No.
vPOW_PPU10k.1-140-045-M-PN	Primary Power Unit 10kW / 140kHz / 45A / Master / Profinet IO	10017414
vPOW_PPU10k.1-140-045-M-EI	Primary Power Unit 10kW / 140kHz / 45A / Master / EtherNet/IP	10017415
vPOW_PPU10k.1-140-045-M-CI	Primary Power Unit 10kW / 140kHz / 45A / Master / CC-Link IE	10017416
vPOW_PPU10k.1-140-045-M-IO	Primary Power Unit 10kW / 140kHz / 45A / Master / Digitale I/O	10017417
vPOW_PPU10k.1-140-045-S-NI	Primary Power Unit 10kW / 140kHz / 45A / Slave / No Interface To extend the Primary Power up to 20kW or 40kW	10017420

* Further status information will be available at soonest: Temperature, voltage, current, phase angle, real POWER.

TRACK EQUIPMENT

Power Cables

Power Boxes

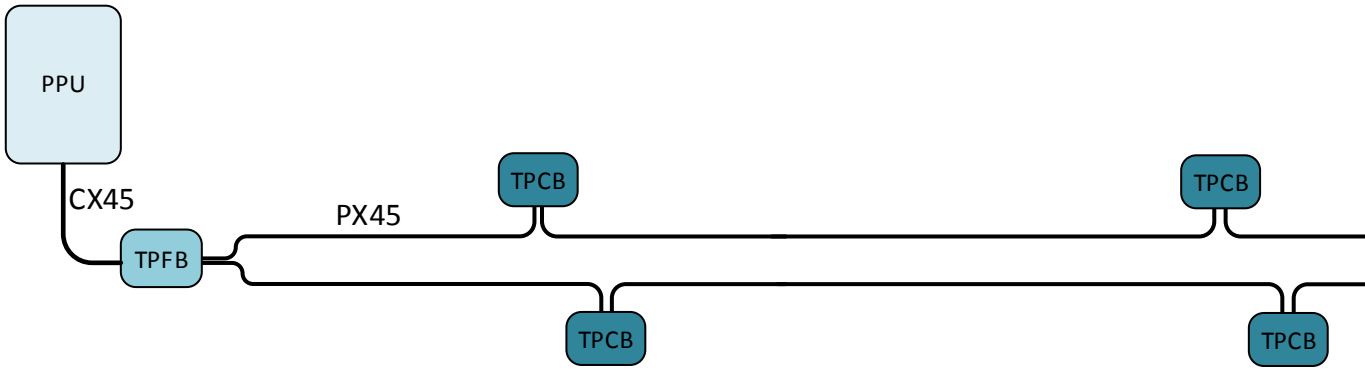
RANGE OF PRODUCTS

Description		Order No.
vPOW_CX45	Track Power Coaxial Cable between PPU and TPFB / 140kHz / 45A	10018429
vPOW_PX45	Track Power Litz Cable / 140kHz / 45A	10018430
vPOW_TPCB.1-45-140-F	Track Power Compensation Box / 140kHz / 45A / fixed capacity	10017421
vPOW_TPFB.1-45-140-1	Track Power Feed Box / 140kHz / 45A / 1 Power output Box for connection between Coaxial Cable CX45 and Primary Cable PX45	10017422

VEHICLE EQUIPMENT

OVERVIEW CONFIGURATION PICKUP UND REGULATOR

Regulator REXXX / Pickup FXXX	vPOW_RE330.1 10017430	vPOW_RE250.1 10018452	vPOW_RE150.1 10018453
vPOW_F330.1_140 10017429	✓		
vPOW_F250.1_140 10018442		✓	
vPOW_F150.1_140 10018443			✓

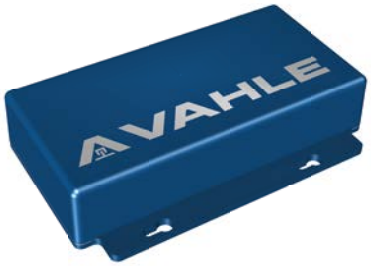


VEHICLE EQUIPMENT - GUIDANCE

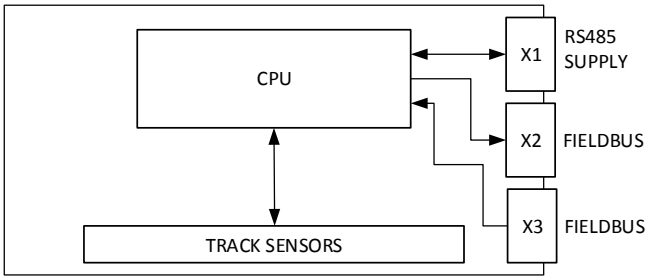
TECHNICAL DATA

Mechanical Data

Dimension ..... 239.45 x 155 x 48.50 mm
Mounting holes ..... 140 x 141 mm
Weight ..... 1 kg
Protecting rating IP54
Ambient temperature ..... 0 ... 40 °C non-condensing
Environment ..... General industrial

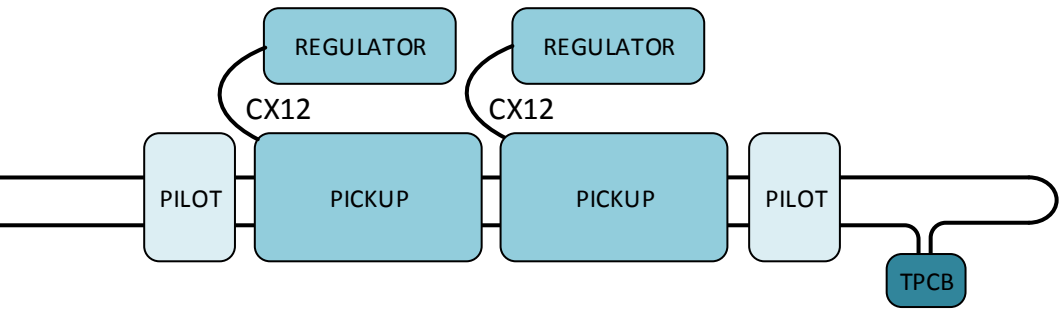


BLOCK DIAGRAM



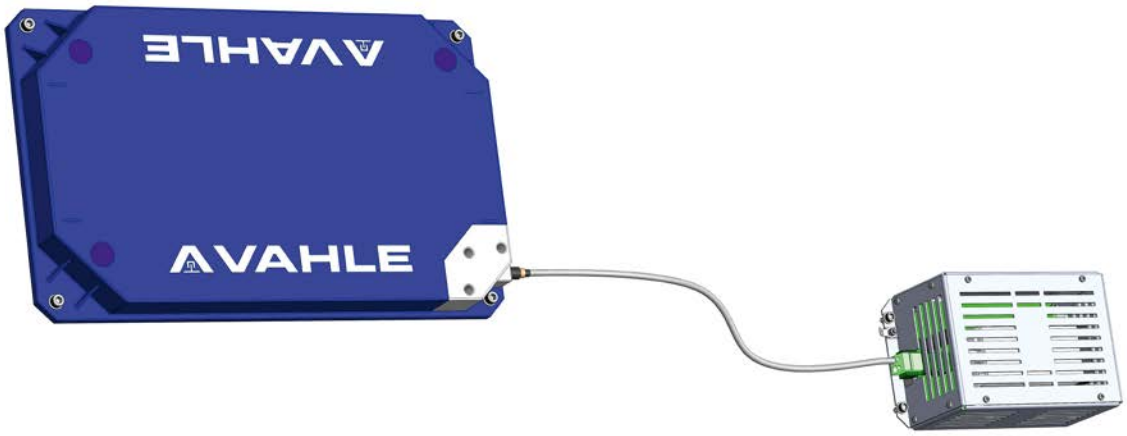
RANGE OF PRODUCTS

Description		Order No.
vPOW_Pilot.x-45-140-PN	Guidance Sensor / 140kHz /45A Profinet IO	10018392
vPOW_Pilot.x-45-140-EI	Guidance Sensor / 140kHz /45A EtherNet/IP	10018394

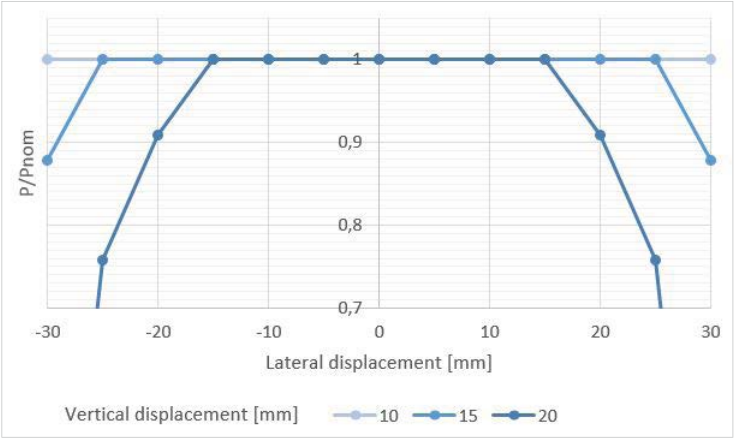


VEHICLE EQUIPMENT FOR 560 VDC

PICK-UP FXXX-140 AND REGULATOR REXXX



POWER CURVE



RANGE OF PRODUCTS

Description		Order No.
vPOW_F330.1-140	F-Pickup / 3.3kW / 140kHz / 45A / Duty 40%/ Linear / 235...362VAC Nominal Power 1.3kW, Peak Power 3.3kW, Duty Cycle 40% at 10min cycle	10017429
vPOW_F250.1-140	F-Pickup / 2.5kW / 140kHz / 45A / Duty 40% / Linear / 235...362VAC Nominal Power 1kW, Peak Power 2.5kW, Duty Cycle 40% at 10min cycle	10018442
vPOW_F150.1-140	F-Pickup / 1.5kW / 140kHz / 45A / Duty 40% / Linear / 235...362VAC Nominal Power 0.6W, Peak Power 1.5kW, Duty Cycle 40% at 10min cycle	10018443
vPOW_RE330.1	Regulator / 3.3kW / 560V / Duty 40% / No thermal monitoring / Standard / Relay contact / No Auxiliary / DC-Output 560VDC +-5% / Peak power 3,3kW / Duty cycle 40% / No battery charging, parallelizable output	10017430
vPOW_RE250.1	Regulator / 2.5kW / 560V / Duty 40% / No thermal monitoring / Standard / Relay contact / No Auxiliary / DC-Output 560VDC +-5% / Peak power 2.5kW / Duty cycle 40% / No battery charging, parallelizable output	10018452
vPOW_RE150.1	Regulator / 1.5kW / 560V / Duty 40% / No thermal monitoring / Standard / Relay contact / No Auxiliary / DC-Output 560VDC +-5% / Peak power 1.5kW / Duty cycle 40% / No battery charging, parallelizable output	10018453
vPOW_CX12-1	Mobile Power Coaxial Cable between Pickup and Regulator / 140kHz / 12A / 1 Meter	10018432
vPOW_CX12-2	Mobile Power Coaxial Cable between Pickup and Regulator / 140kHz / 12A / 2 Meter	10018433
vPOW_CX12-4	Mobile Power Coaxial Cable between Pickup and Regulator / 140kHz / 12A / 4 Meter	10018434
vPOW_CX12-6	Mobile Power Coaxial Cable between Pickup and Regulator / 140kHz / 12A / 6 Meter	10018435

TECHNICAL DATA

Electrical Data System

Peak power ..... 3.3 kW / 2.5 kW / 1.5 kW
Duty cycle ..... 40 % ED @ 10 min cycle
Nominal power ..... 1.3 kW / 1.0 kW / 0.6 kW
Track current ..... 45 A
Track frequency ..... 140 kHz
Track conductor spacing ..... 110 mm
Output voltage ..... 560 VDC ± 5%
Output current ..... 6.5 A

Protection

Output over voltage ..... Yes
Over temperature ..... Yes
Max. reverse voltage ..... 750 VDC

Regulator Mechanical Data

Dimensions ..... 190 x 120 x 85 mm
Mounting holes ..... 180.5 x 80 mm
Weight ..... 1 kg
Protection rating IP20
Ambient temperature ..... 0 ... +40 °C non-condensing
Environment ..... General industrial

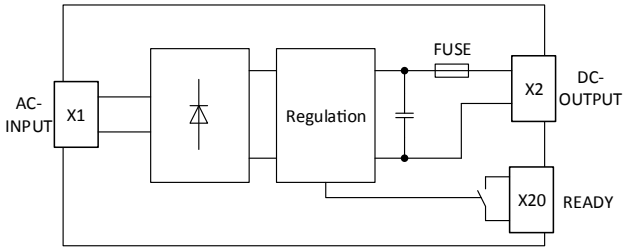
Pickup Connection Cable Data

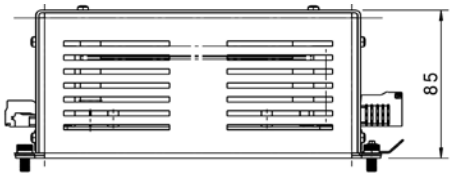
Length ..... 1/2/4/6 m
Outer diameter ..... 11 mm
Connections ..... Pre-terminated
Flexibility ..... Flexible
Min. bending radius ..... 90 mm

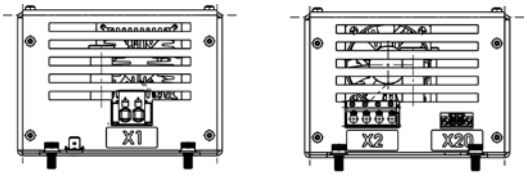
Pickup Mechanical Data

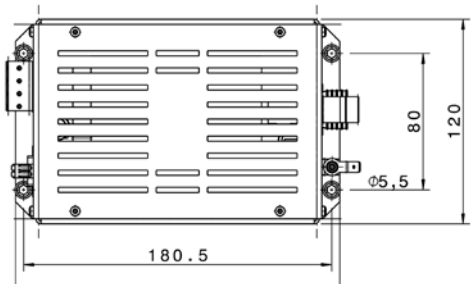
Dimensions ..... 415 x 255 x 39,5mm
Mounting holes ..... 385x225 mm
Weigth ..... 10 kg
Nominal air gap (from top of track
cable to cottom of Pick-Up) ..... 15 mm
Vertical displacement ..... ± 5 mm
Lateral discplacement ..... ± 20 mm
Protection rating IP54
Color ..... RAL 5002
Ambient temperature ..... 0 ... +40°C non-condensing
Environment ..... General industrial
Cooling ..... Natural convection

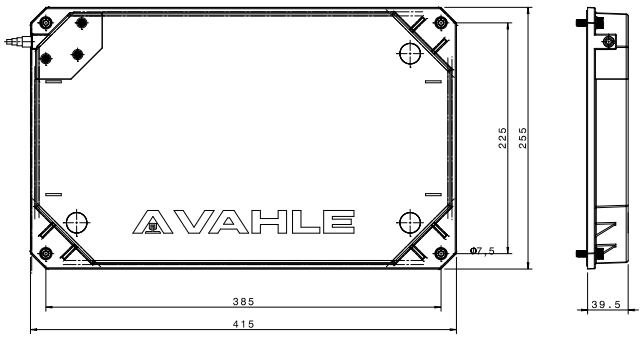
DIMENSIONS











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