

IGBT Direct Pulse Inverter

Description

The Kiepe Direct Pulse Inverter (DPU) is an indirect converter constructed using IGBT technology. It converts the overhead line's DC voltage into a three-phase AC current system with variable amplitude and frequency in order to supply the three-phase asynchronous traction motor for operation. The traction motor, functioning as a generator, effects electrical energy during braking which is rectified via the direct pulse converter and fed back into the overhead lines. With the DPU 400 series, Vossloh Kiepe offers traction converters suitable for a nominal input voltage of DC 600 V and/or DC 750 V. The DPU 700 series traction converters are designed for a nominal input voltage of DC 1500 V.

In addition to the power semiconductors and the filter capacitor the DPU also contains the respective control electronics as well as the measurement

value logging. All DPU components are mounted on a heat sink. Due to this modular construction the direct pulse inverter is distinguished by its small dimensions and low weight. It is suitable for integration into new traction systems as well as already existing drive containers.

In order to complete the traction current circuit the direct pulse inverter has to be connected with additional components such as e.g. the input reactor, mains contactor, charging contactor and du/dt output filter. Components already existing can be reused within the framework of modernisation projects.

The DPU module contains a central USM (converter control module) control unit for realising the DPU's internal tasks concerning regulation and control. This unit calculates the accentuation signals of the IGBTs in

correspondence with the externally prescribed setpoint and the operation mode. Speed and up-to-date line voltage are taken into consideration at the same time.

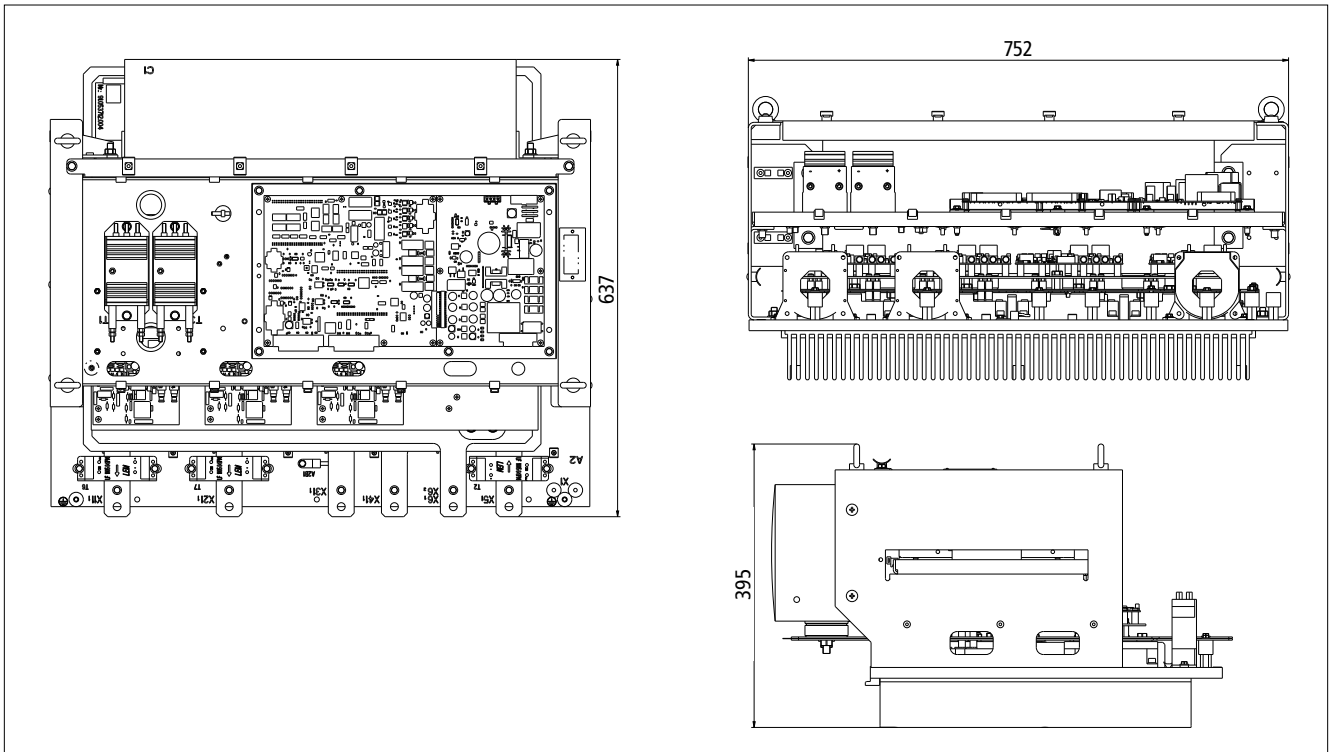
All DPU internal monitoring functions are realised via the USM. The USM is connected to the so-called ASM (traction drive control module) via bus connection for the reading of control commands from the vehicle. Here, the ASM serves as an interface between the actual drive control and the vehicle control. The ASM can be connected to other vehicle internal components via a CANopen connection.

Integration of a DPU into an underfloor traction container

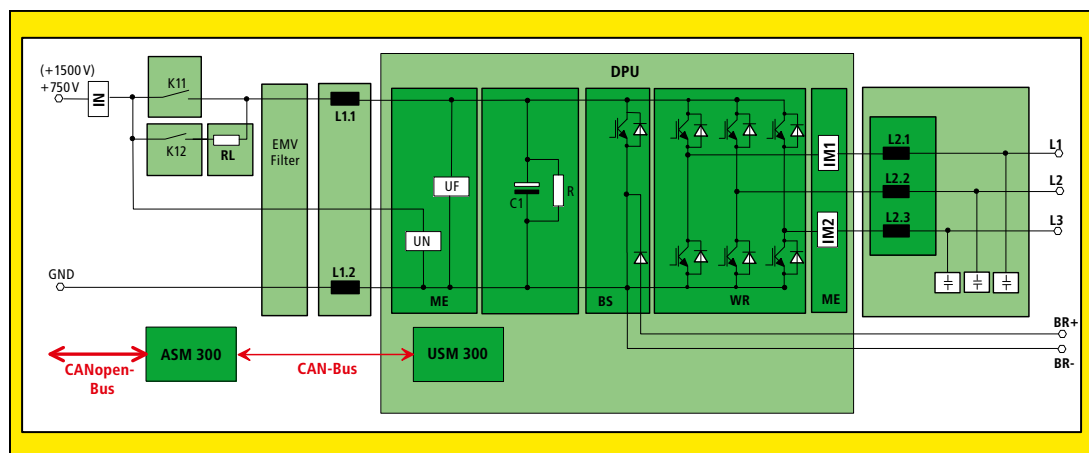


Example of an underfloor traction container

Dimensions



DPU Circuit Design



K11 → Line Contactor
 K12 → Charging Contactor
 RL → Charging Resistor
 C1 → Filter Capacitor

ME → Measurement Value Logging
 BS → Brake Chopper
 WR → Inverter
 DPU → Direct Pulse Inverter
 ASM → Traction Drive Control Module
 USM → Inverter Drive Control Module

DPU 400 → Nominal Input $U_e = DC 750V$
 DPU 700 → Nominal Input $U_e = DC 1500V$

Direct Pulse Inverter Circuit Design for DPU 400 and DPU 700 series



Tramcars Düsseldorf

Vossloh Kiepe received a delivery order of electrical equipment for 36 NF10-, 15 NF8- and 76 NF8U tramcar articulated light rail

vehicles from Rheinbahn AG Düsseldorf. This order also included the delivery of 416 modern IGBT Direct Pulse Inverters.



Protos Regional Motor Train, The Netherlands

Five new regional multiple-unit trains were delivered to the Dutch operator Connexxion by Vossloh Kiepe in consortium with Fahrzeugtechnik Dessau GmbH. The scope of delivery also included the on-board power

supply and drive equipment, consisting of four modern DC 1500V IGBT direct pulse inverters each. Two additional direct pulse inverters are used for the supply of the on-board power with three phase current.



Dual-system Light-rail Vehicles Saarbrücken

The transport operator Saarbahn ordered the complete electrical equipment for 28 dual-system light-rail vehicles from Vossloh Kiepe.

In order to accelerate the vehicles to a max. speed of 100 km/h, each of the direct pulse inverters feeds four 120 kW asynchronous traction motors.



Tramcars Manchester, Great Britain

In consortium with Bombardier Transportation, Vossloh Kiepe is delivering 48 new M5000 type light-rail vehicles for the existing Metrolink route network and the new lines in the route expansion within the Greater Manchester region.

Vossloh Kiepe is responsible for the complete electrical equipment of the vehicles. In order to accelerate the vehicle to a max. speed of 80 km/h, the four 120 kW traction motors are fed by two modern IGBT direct pulse inverters.



Tramcars Philadelphia, USA

Apart from ordering on-board power supply static inverters for the modernization of their 18 historic PCC tram railcars, the Southeastern Pennsylvania Transportation Authority (SEPTA) also ordered 36 modern IGBT traction inverters from the DPU 400 series.



Trolleybuses Vancouver, Canada

In consortium with New Flyer Industries, Vossloh Kiepe delivered 188 new low-floor solo trolleybuses and 40 low-floor articulated trolleybuses. The scope of delivery

also included the complete drive train, the on-board power supply and the current collector system. Each drive train also contained one IGBT direct pulse inverter.