

Smart and sustainable DC testing of high power conversion topologies

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1931 Congrescentrum Den Bosch

**POWER
ELECTRONICS**

2017

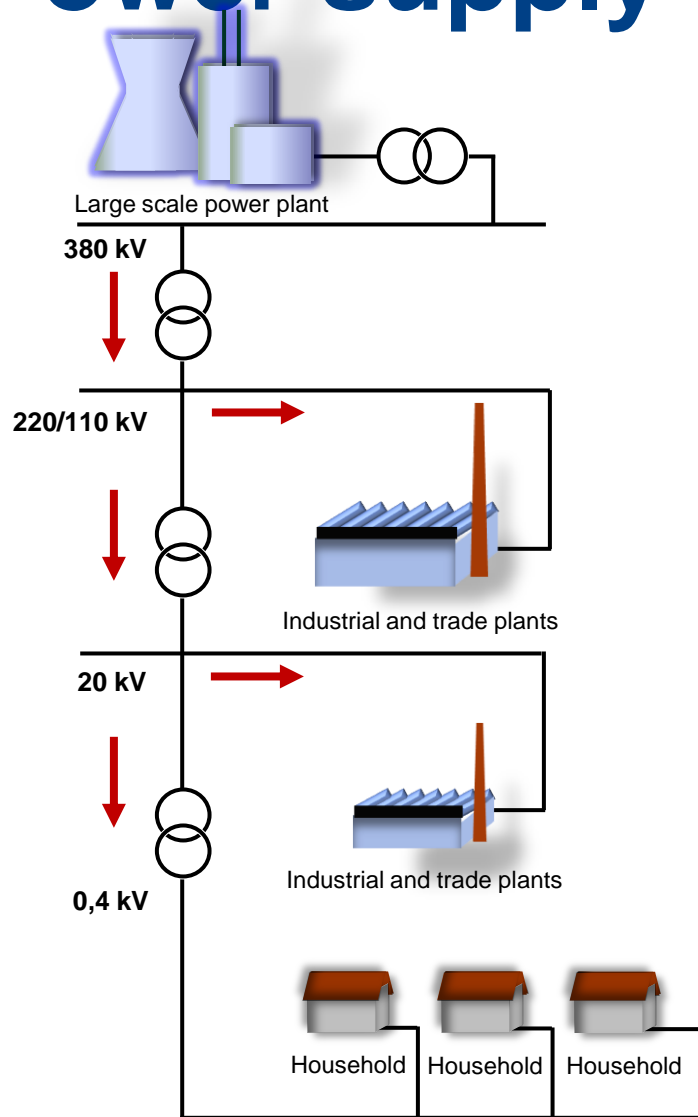
Introduction



Outline

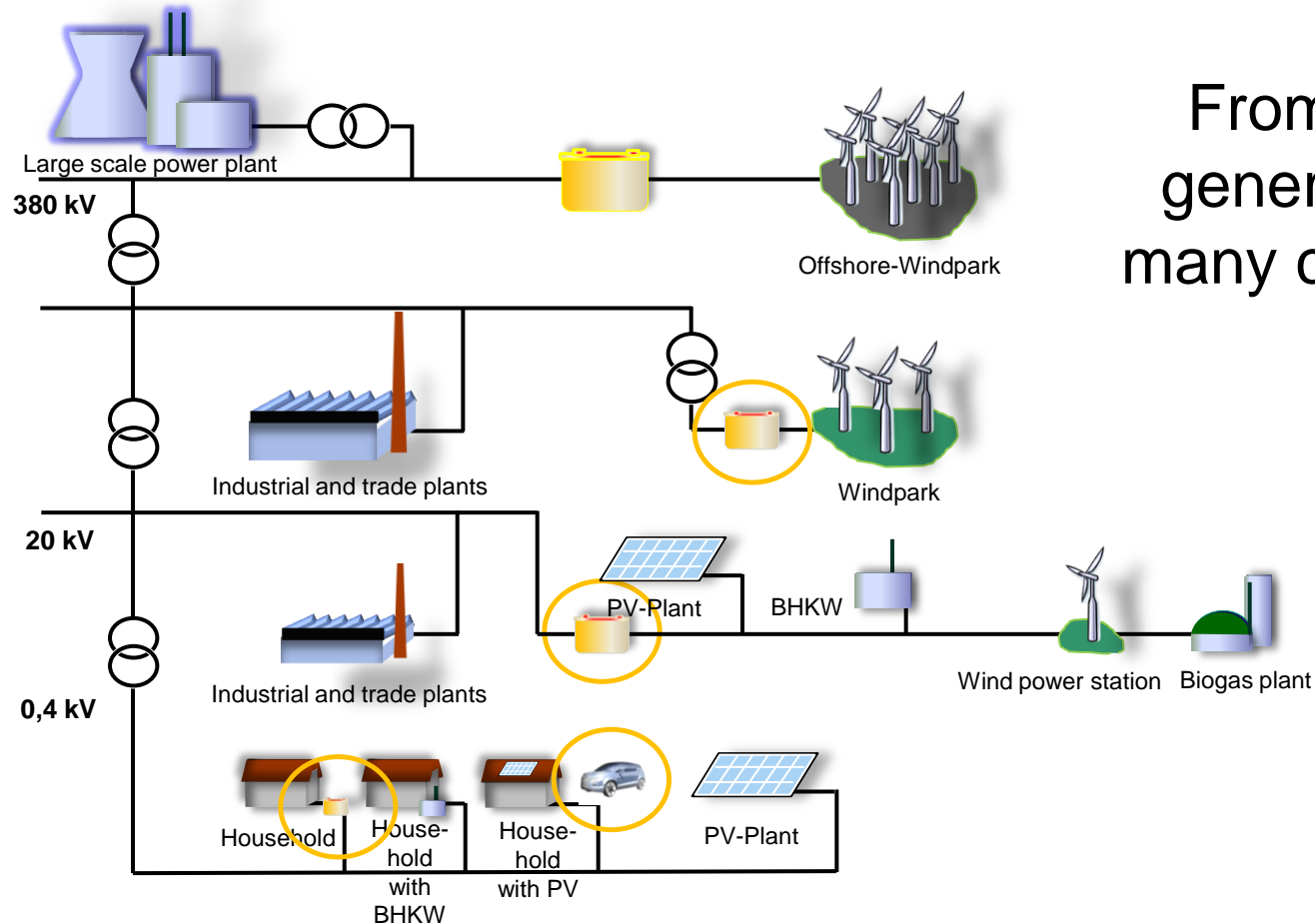
- 1. Power supply / Energy storage systems**
- 2. DC distribution grids**
- 3. Automotive batteries**
Chargers, cyclers, feedback, impedance-spectroscopy, multichannel
- 4. Automotive testing**
Battery simulator, application, data, discharge unit
- 5. Inverter for fuel cell testing**
- 6. Summary of benefits**
- 7. Additional information**

1. Power supply „yesterday“



From large scale
power plant to
consumer

1. Power supply „today“



From many
generators to
many consumer

1. Energy storage systems

- Island Pellworm: Converter plus Battery like Li-Ion and Redox-Flow



Question:
What do all they need?

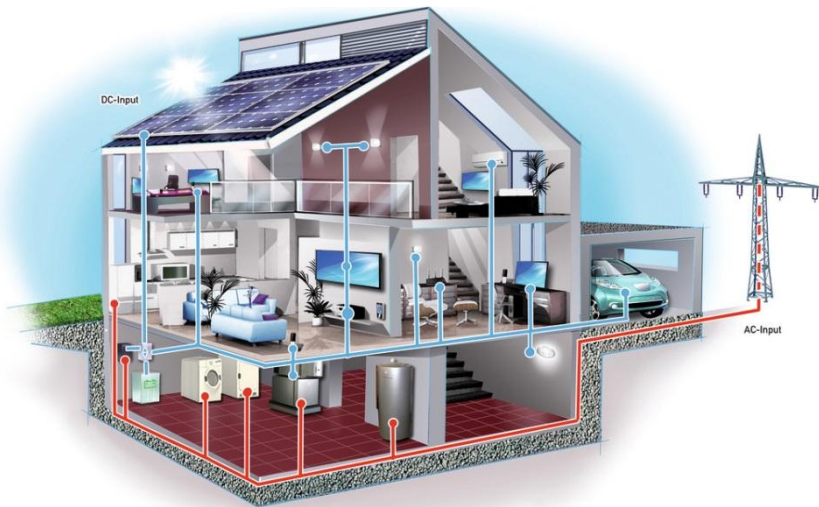
Power Converter!



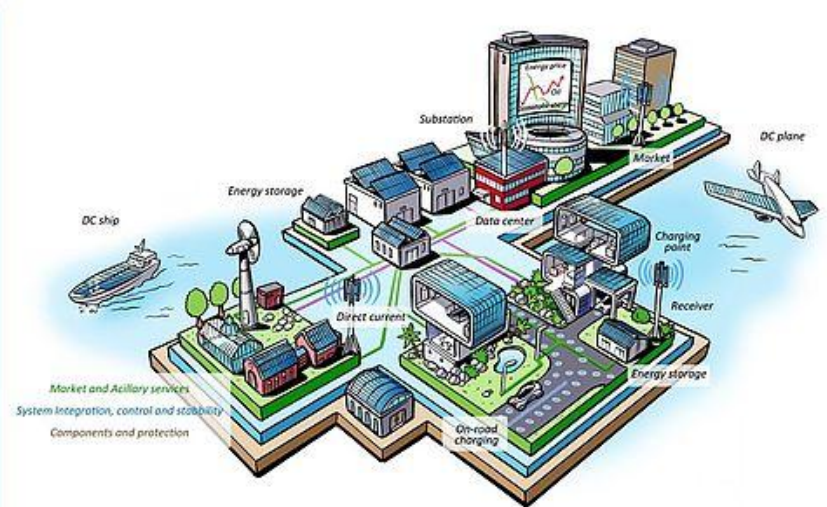
**Smart and sustainable DC testing of
high power conversion topologies**

2. DC distribution grids

Energy storage, charging, DC ships, DC plane.



Elektronikpraxis, Bild Recom



TU Delft, DC distribution smart grids

2. DC distribution grids



Liander presentation about Lelystad Airport, Hans.Schneider2014



ABB Dina Star

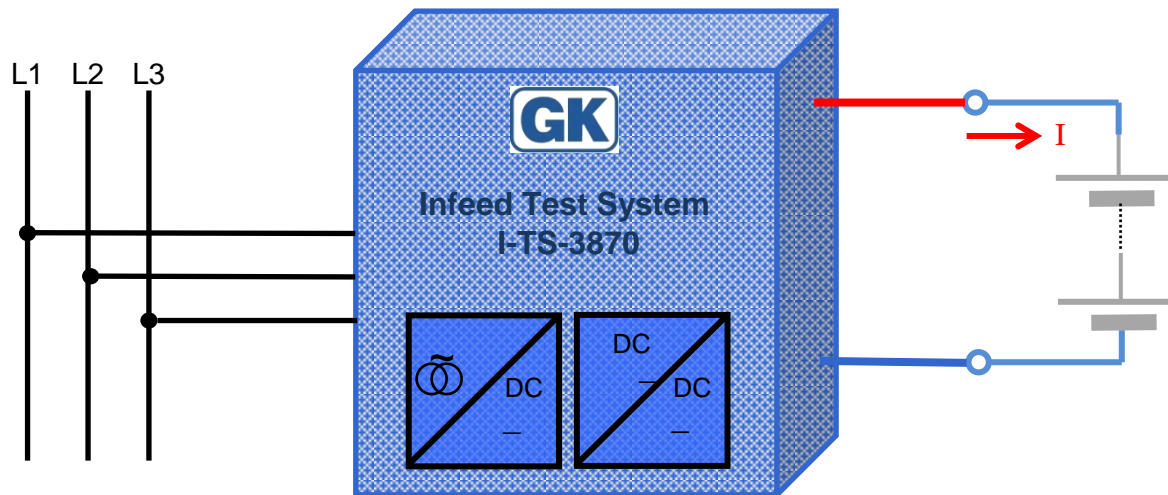
3. Automotive battery



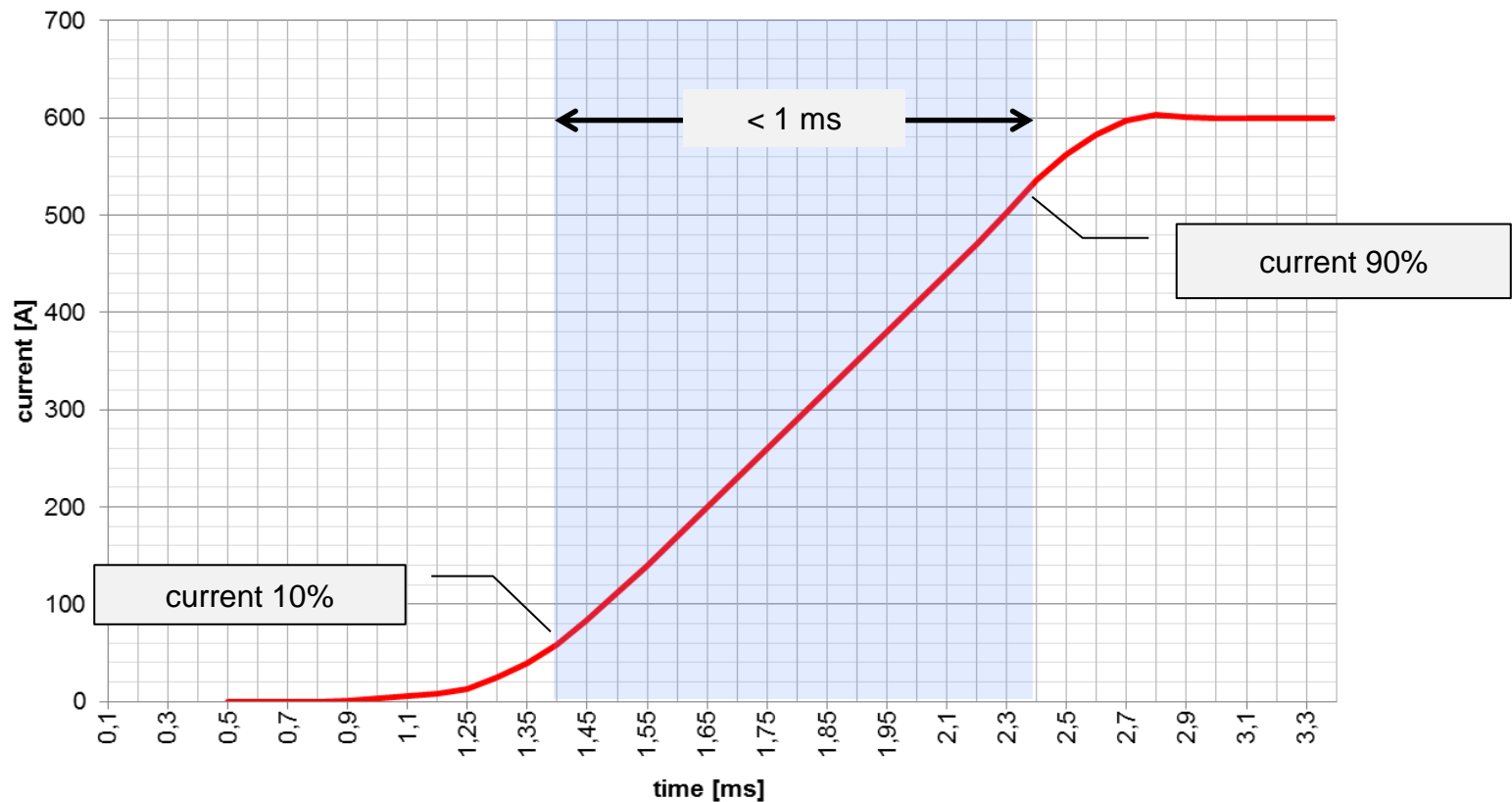
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I-TS as „Battery Tester“

- Mode DC-source and DC-sink
 - Operation in current control
 - High current rise times
 - Seamless transition from -1000A to +1000A



Current Rise Time mode „Battery Tester“

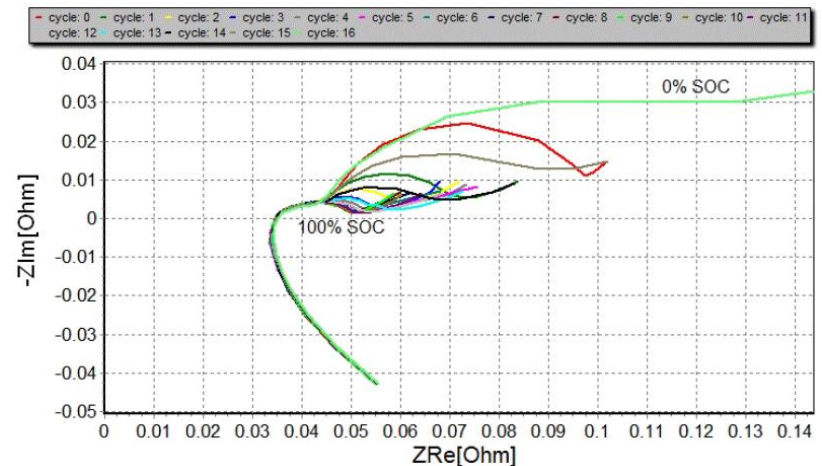
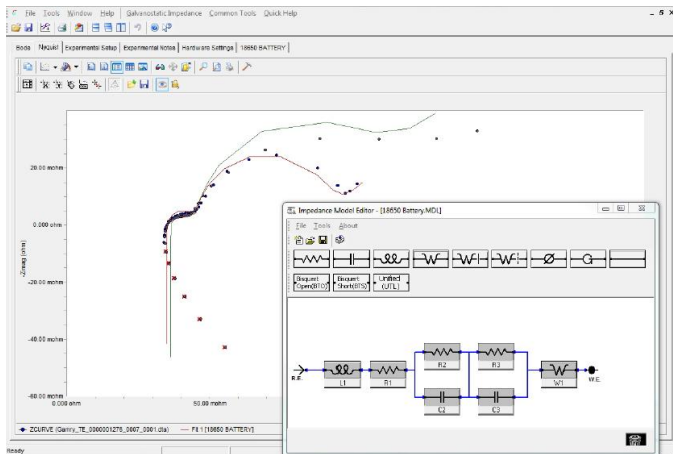


DC-Source / Sink as battery-tester with BaSyTec EIS (Enhanced Impedance Spectroscopy)



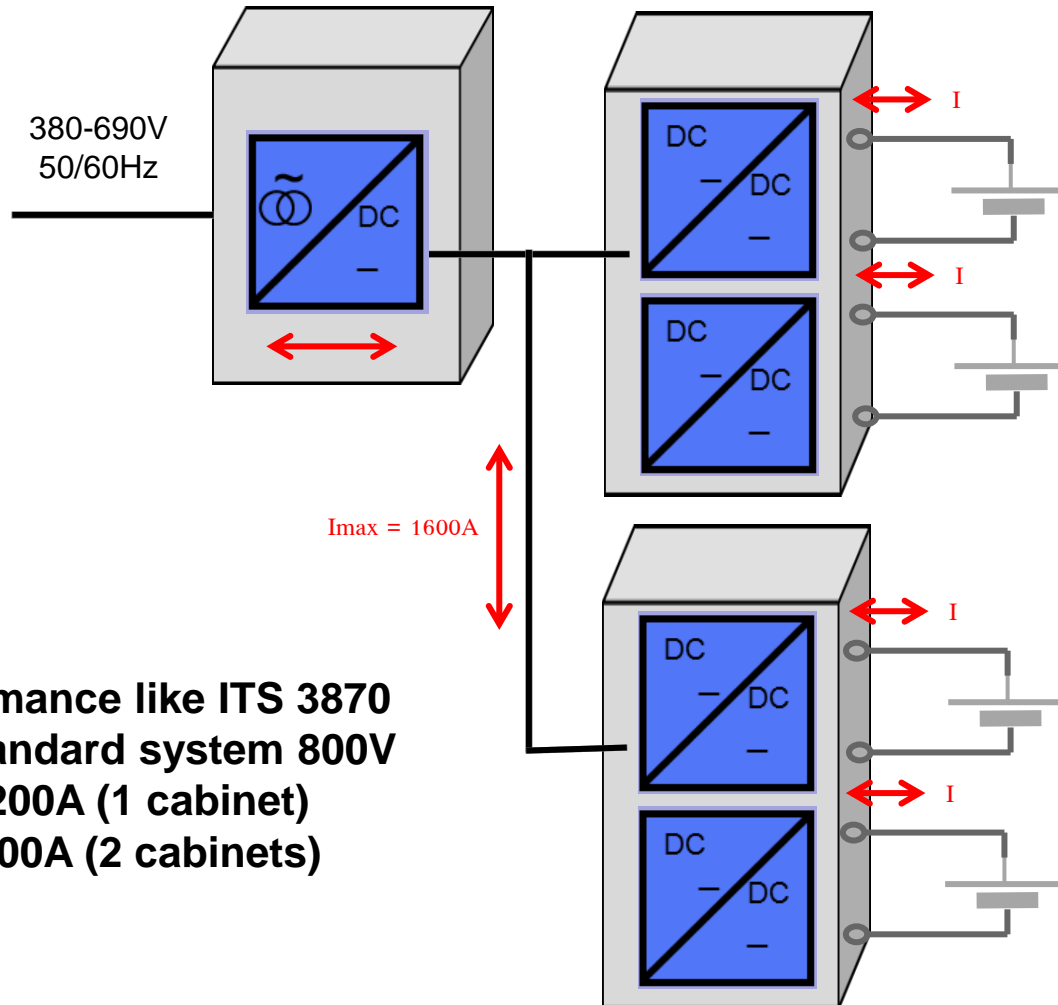
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- Modulation of AC voltage to DC Voltage and Current
- Measuring of AC Impedance
- Comparing with models of battery type
- Information about SOC (State of Charge) SOH (State of Health of battery)



Multi Channel - Test System

MI-TS 3871



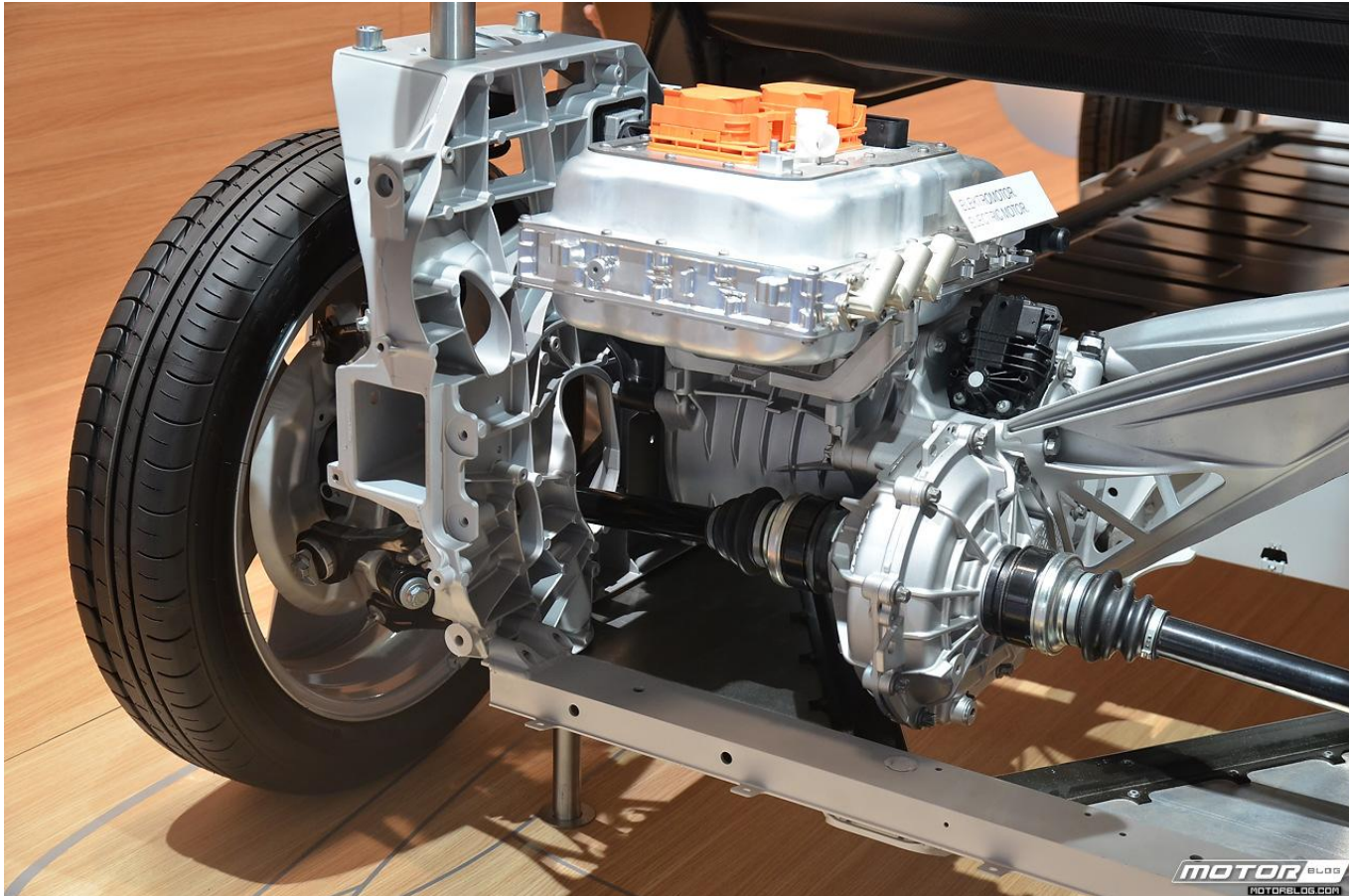
Power performance like ITS 3870
Outputs of standard system 800V
Max. 4 x 200A (1 cabinet)
Max. 4 x 600A (2 cabinets)

DC-Source / Sink as Battery-Tester

Prototype testing of Li-Ion Batteries for
Manufacturers of EV



4. Automotive testing of motor, inverter + components



Von MotorBlog from Ca, USA - IAA 2013: BMW i3Uploaded by AVIA BavARia, CC BY 2.0, <https://commons.wikimedia.org/w/index.php?curid=29302575>

DC-Source / Sink for Battery Simulation

- To Test Electric Driven Accessories in
Agriculture Technology



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DC-Source / Sink for Battery Simulation

- To Test Inverter in Electric and Hybrid Vehicles



Von Norbert Aepli, Switzerland, CC BY 3.0,
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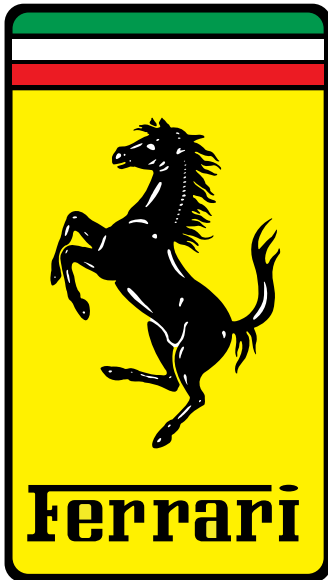
PORSCHE



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DC-Source / Sink for Battery Simulation

- Formula 1: Testing KERS
Kinetic Energy Recovery System



Von unbekannt Ferrari S.p.A. –
Eigene Vektorisierung, Logo,
<https://de.wikipedia.org/w/index.php?curid=3322356>



Von Magic Aviation - Ferrari F2013 - Fernando AlonsoUploaded by Dura-Ace, CC BY 2.0,
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DC-Source / Sink for Battery Simulation

- Supply of Electronic Circuits of
High Speed Trains during Maintenance

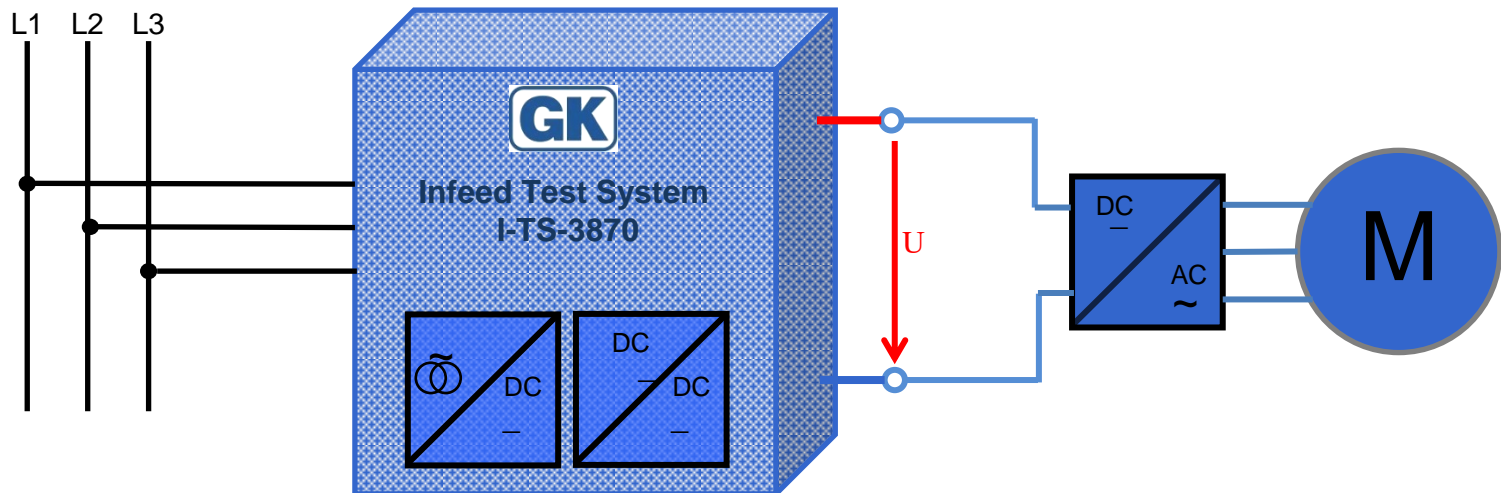


Von Martin Lechler - Eigene Aufnahme mit Handy, Gemeinfrei, <https://commons.wikimedia.org/w/index.php?curid=44976930>

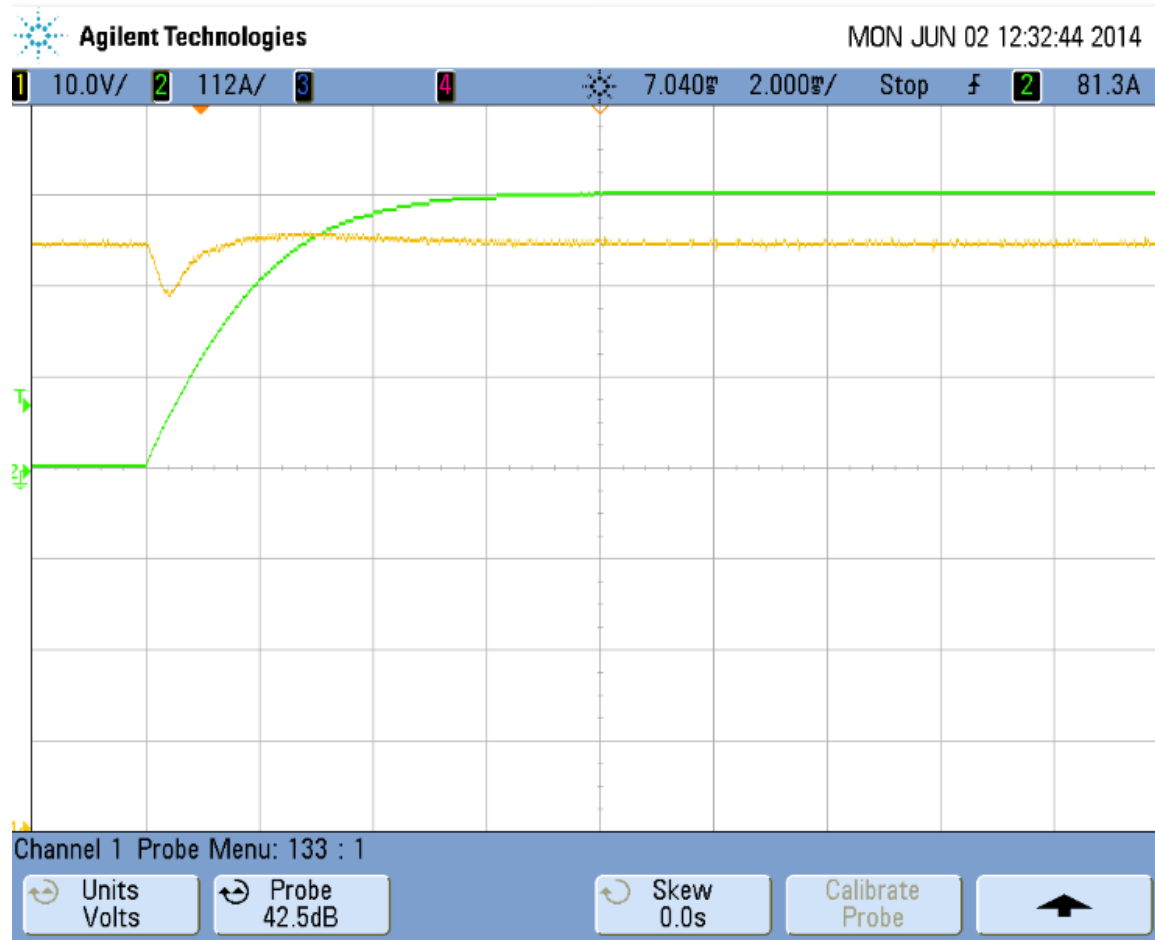
I-TS as „Battery Simulator“

Mode DC source and sink

- Operation in voltage control
- Increased output capacity for small voltage dips at load changes



Original Measured Curve „Battery Tester“



330 A / 600 μ F
(Basic unit equipment)

Original Measured Curve „Battery Simulator“



330 A / 7200 μ F

Discharge Unit for operating mode „simulator“ (I-TS-3870-DCU-xxx)

- Operates according to the closed circuit principle
- Sinks the "residual energy" of the DUT after System-Stop
- Installation in the PDSB possible
- Only for "simulator" usable
 - Activation after "stop" or "emergency stop" or overvoltage (eg >850 V with Standard - System)
 - Resistor is connected to the DC output (after the output contactor) -> always active
 - Customer has to ensure that max. Energy is not exceeded (1sec @ nominal power)



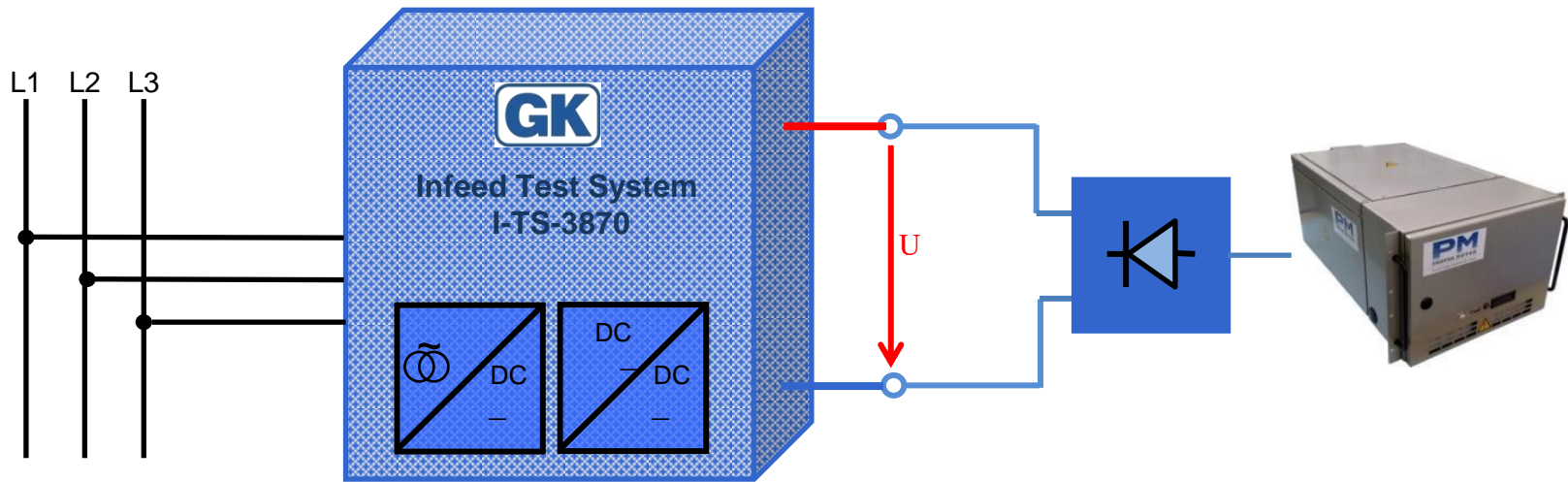
5. Inverter for fuel cell testing



Bild: BMW

5. Inverter for fuel cell testing

Mode: inverter (DC-sink)

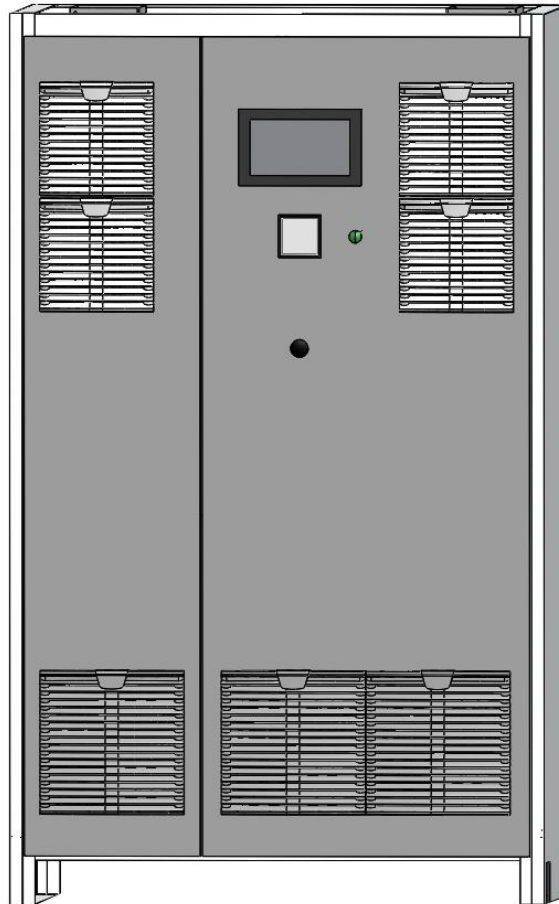


6. Summary of benefits

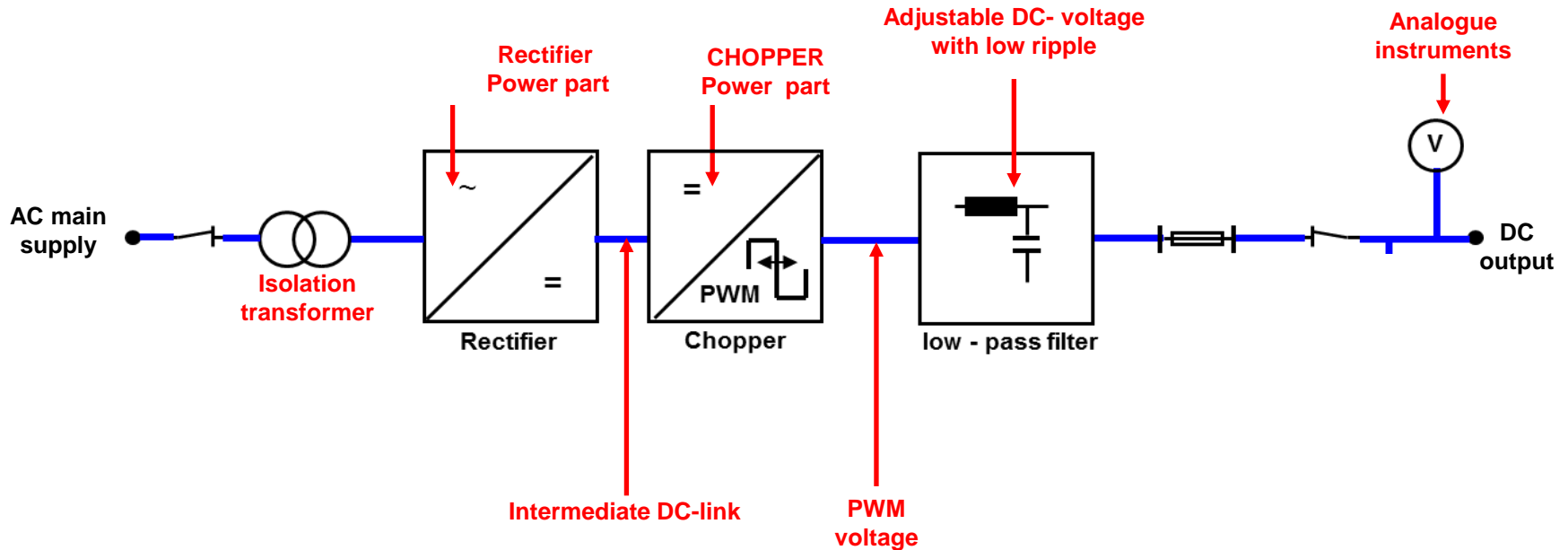
- Time saving as you can replace the battery and do not need to charge and watch the SOC (State of charge) during test.
- You can test your electrical drive or inverter if the battery is not available.
- Feed back energy will be transferred to the grid versus lost in heating resistors
- Wide range of options to suit best for your needs
- Huge amount of applications in the field

7. Additional information

I-TS V3.0

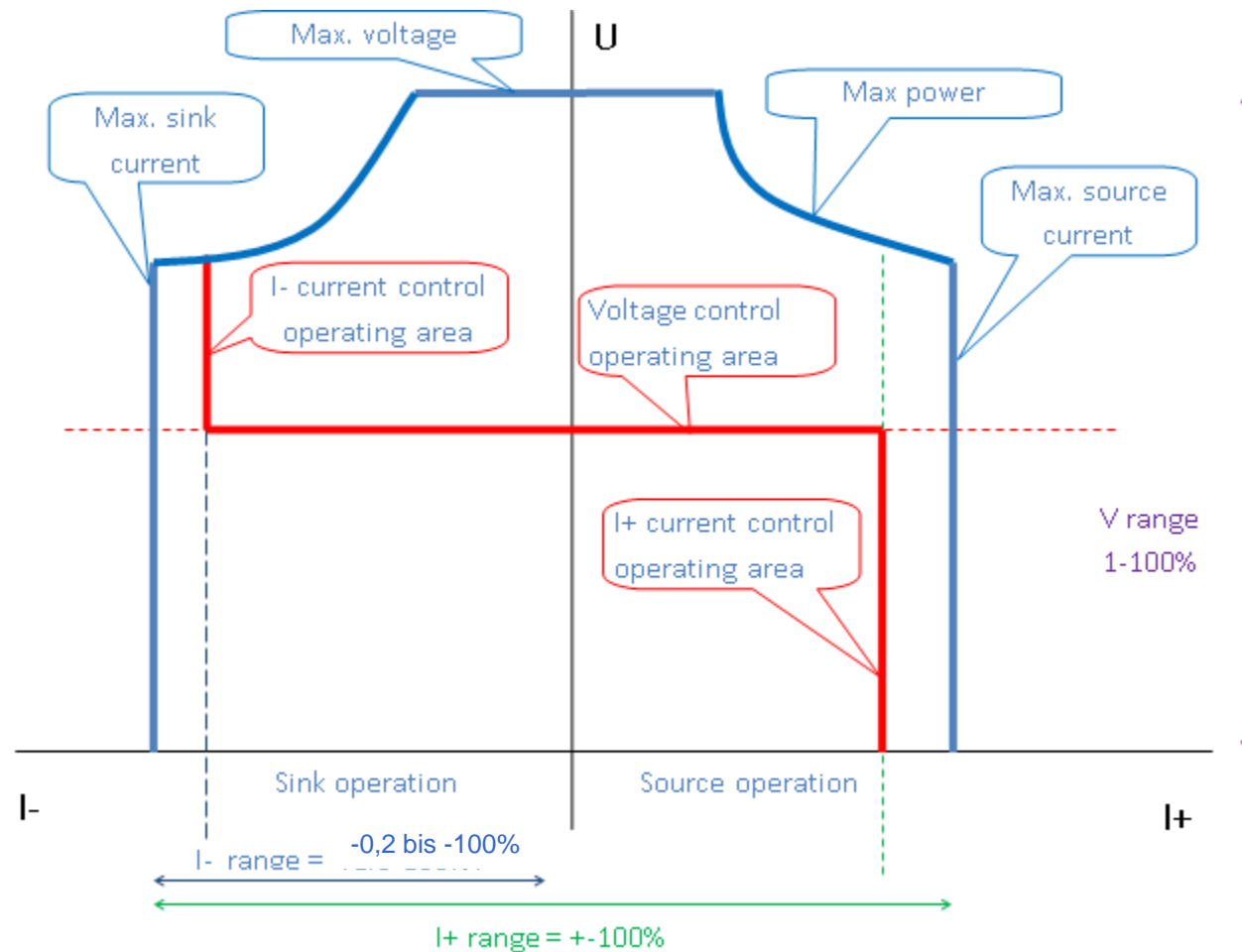


SLD of Infeed Test System

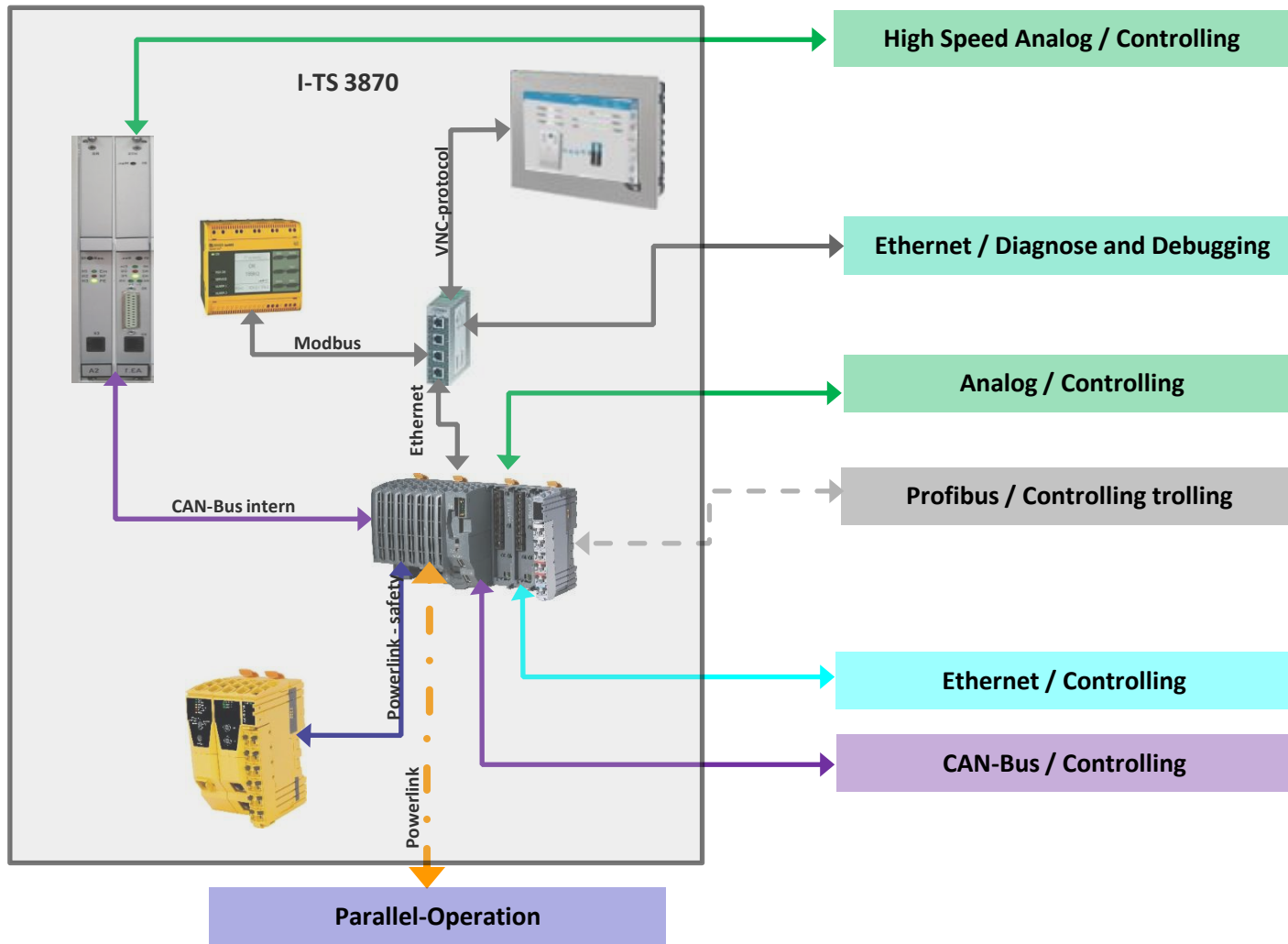


- Bi-directional DC power supply
- High dynamic performance
- High control accuracy

Working of DC Source / Sink



Interfaces





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Thank you for your attention!

- Questions?



- Meet you here at: **ar** benelux B.V.



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