



German Eol

for

Power Converters of SIS100

- SIS100 Dipole Power Converter 1678 k€
- DC-Circuit Breaker for SIS100 Dipole System 270 k€
- Adaptive Control Unit and DCCT for all SIS100 Pow. Con. 948 k€

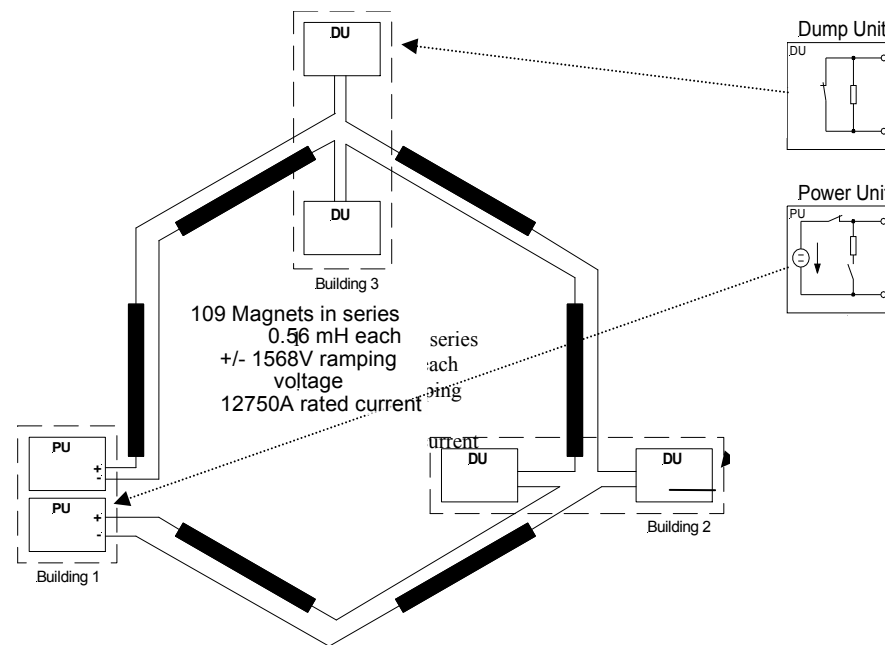
SIS100 Dipole Power Converter :

Topology of Power Converters Systems

System of Power Units PU

and Dump Units DU

in series connection



Dipole SIS100

SIS100 Dipole Power Converter :

Design of dedicated Power Converters

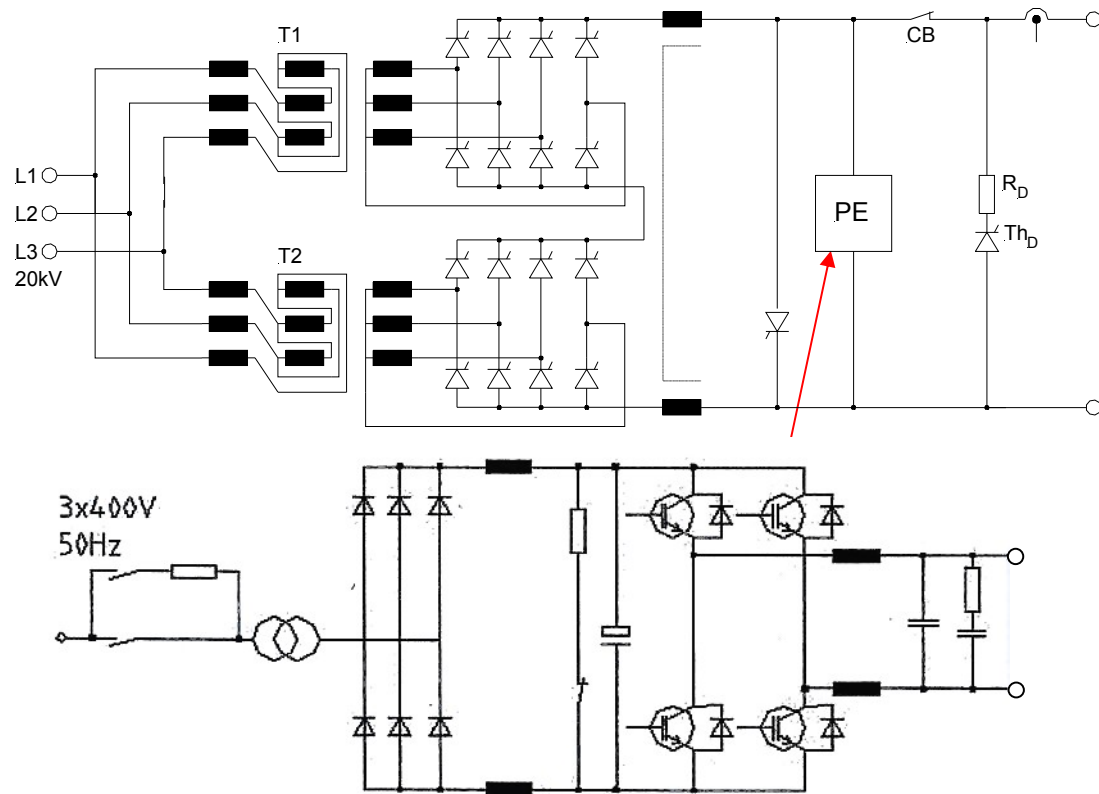
Type SCR_ramped

A power unit PU has basically 3 major components:

a twelve pulse SCR with controlled freewheeling thyristors. This component handles the large power.

an active parallel filter PE. This component takes care of the current ripple and current dynamics.

a quench protection circuit. This component absorbs the magnet energy and disconnects the magnet string from the active power part of the converter. For the SIS 100 power converters a circuit breaker with an opening time of <1ms is necessary.





Description on Eol for SIS100 Dipole Power Converters :

Included in the delivery is :

- two power converter groups
- two active parallel filters (PE)
- the dump units without DC-circuit breakers
- the internal cabling
- the integration of additional Eol-components
 - 6 DC-circuit breakers for quench protection
 - 1 Adaptive Control Unit (ACU)

Not included in the delivery is :

- the 20kV circuit breakers for the main transformers
- the 20kV cables to the transformers
- the warm cables to the feed boxes of the magnet system



Schedule of Eol for SIS100 Dipole Power Converters :

| | | |
|---------|--|---|
| 2009 | Call for tender and order | <i>Precondition: magnet and system data are verified</i> |
| 2010 | Design and design review | |
| 2011 | Production and Factory acceptance test of components | <i>Precondition: ACU and DCCT are available</i> |
| 2012 | Installation and integration on site | <i>Precondition: buildings are ready, DC-circuit breakers are available</i> |
| 01/2013 | First test with real load | <i>Precondition: magnets are ready, quench detection is tested</i> |
| 06/2013 | Final acceptance test | |



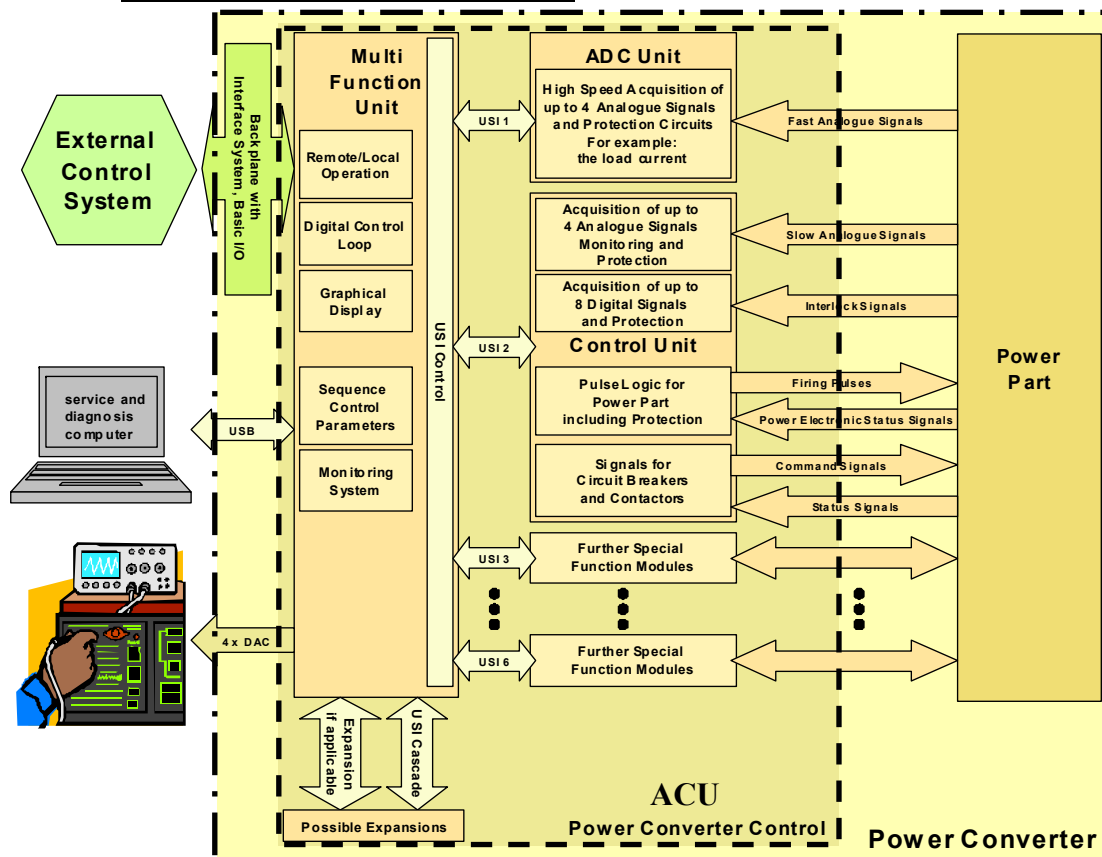
Adaptive Control Unit (ACU) and DCCT

Because of standardization in FAIR the implementation of a digital control unit is foreseen for all power converters (German In-kind contribution ACU)

Because of standardization in FAIR all high precision load current measuring devices in power converters, the DCCTs, are In-kind contributions of Germany.

Adaptive Control Unit and DCCT:

- Power Converter Control:



In-kind contribution

Adaptive Control Unit **ACU**

- Multifunction unit
- control unit
- [ADC unit]

The digital control algorithm is based on analogue control strategies enhanced by the possibilities of digital signal processing.

All parameters of the control algorithm can be loaded and read by the external control system.

In-kind contribution

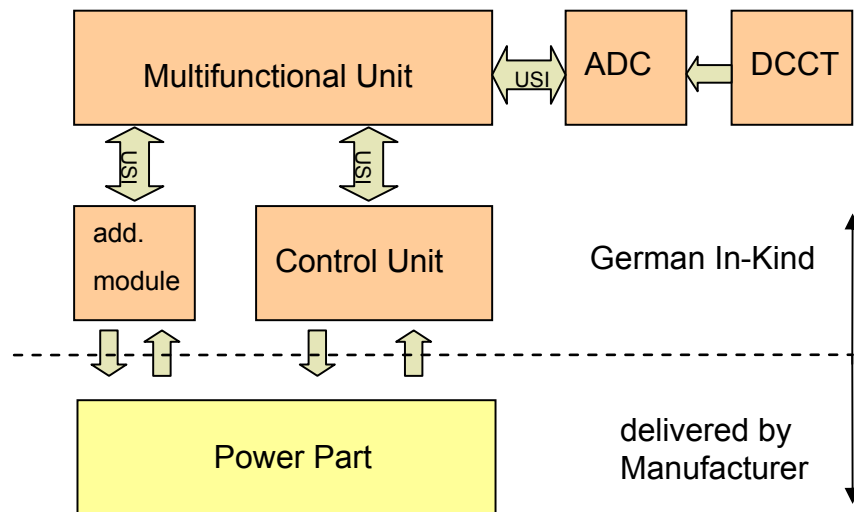
DCCT (with digital output)

ACU is second generation of digital control hardware and is used in new Alvarez Power Converters 09/2008

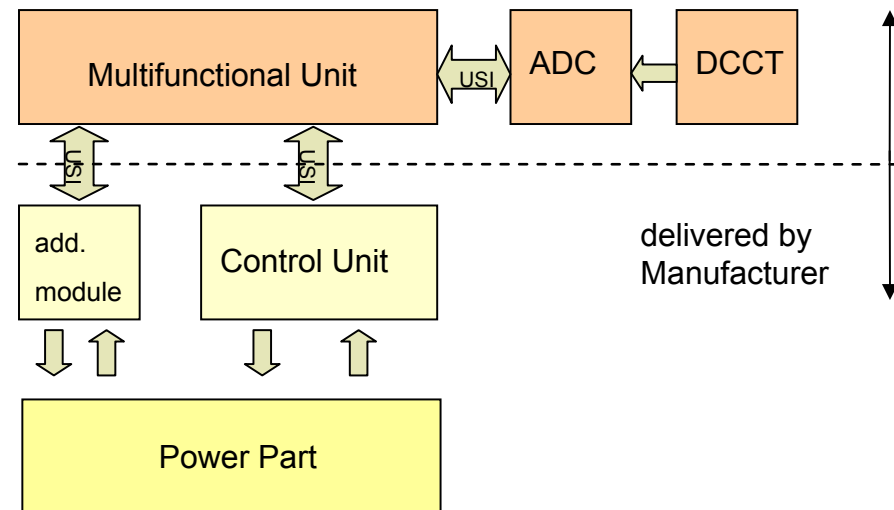
Adaptive Control Unit and DCCT:

Use of ACU

Example 1



Example 2

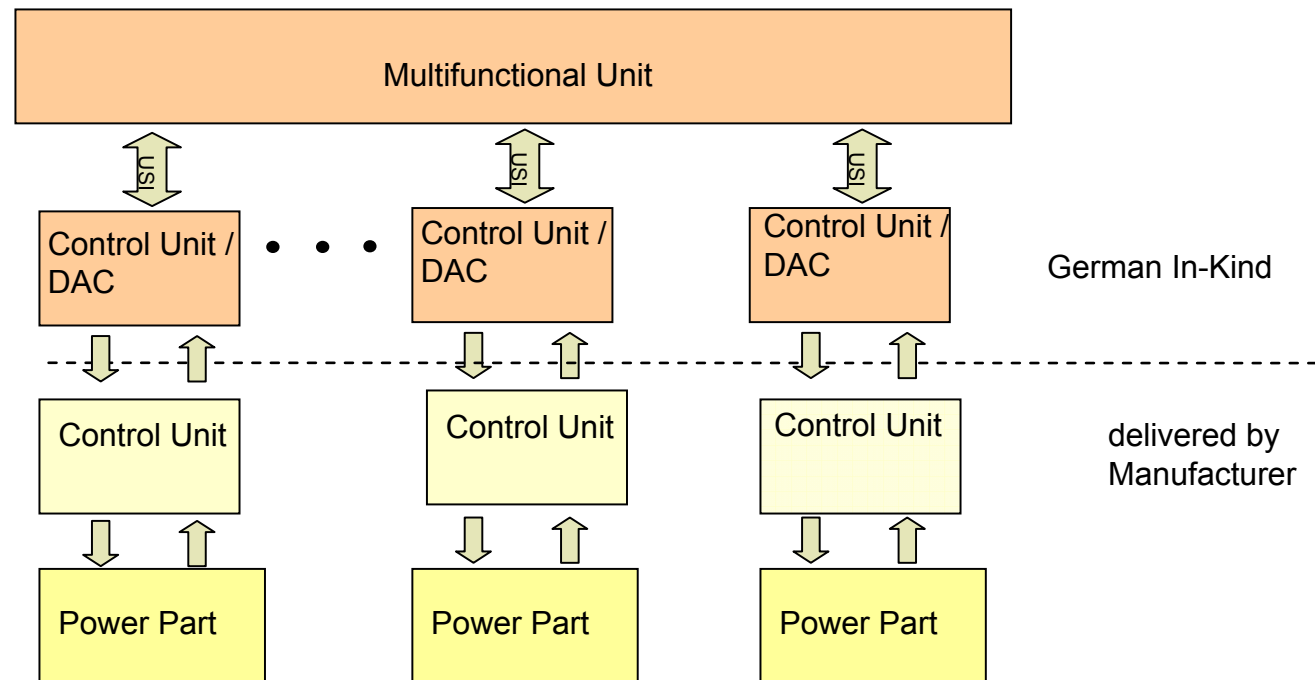


Manufacturer will be responsible for the functionality of the complete system in both cases.
In-kind components have to be used like other commercial components on the market.

Adaptive Control Unit and DCCT:

Use of ACU

Example 3



The analogue current regulation and current measurement is included in the delivery of the Manufacturer. Up to six devices can be supplied by one multifunctional unit.



Description on Eol for ACU and DCCT for all power converters of FAIR:

Included in the delivery is :

- backplane
- multi function unit
- control unit
- ADC board (if necessary)
- DCCT (with digital output)
- graphical user interface
- drivers and interface protocol
- documentation and interface description
- support for integration into the power converter

Not included in the delivery is :

- more than 1 ACU and DCCT for one power converter
- adaption to exotic control strategies
- support for new user development



Schedule of Eol for ACU and DCCT:

- 11/2008** **First series in operation in Alvarez power converters**
- 08/2009** **Operational experience during accelerator runs**
- 12/2009** **Redesign with improvements (if any)**
- 2010** **Start of series production and delivery**
- 05/2010** **Documentation available, detailed interface description, drivers**

Additional FTE for Power Converters in FAIR (not only SIS100)

