

Premagnetization panel for Diode High Power Rectifiers



Aluminum electrolysis plants are typically powered by diode high power rectifiers. The output voltage of a diode rectifier is controlled with an on load tap changer for coarse control and saturable reactors for finetuning.

— Premagnetization panel

Description

The premagnetization panel is controlling the OLTC tap position and the saturation levels of the saturable reactors to control the output DC current of the rectifier system. Furthermore the ABB premagnetization panel has built in overcurrent protection with curves for n-0 and n-1 diodes.

To finetune the rectifier output voltage, two types of circuits are used: one bias circuit and one control circuit. The bias circuits are realized by uncontrolled three phase diode bridge rectifiers and the control circuit is realized with two ABB DC drives DCS880. These high reliable drives are equipped with precise and robust PI controllers.

Features

- Robust design and reliable components
- Local operator interface
- Accurate high speed dynamic response
- Constant current regulation with high accuracy
- Compensation of anode effects
- Overcurrent protection of rectifier
- Automatic switchover to backup metering
- OLTC tap logic
- Emergency mode in case of rectifier control system failure
- Self-diagnosis function of DCS880
- Field bus communication over Ethernet IP, DeviceNet or Profibus DP

- EMC conformity according to IEC 61800-3
- LVD conformity according to IEC 60146-1-1
- Short installation and commissioning time due to compact and modular setup
- Easy maintenance according to maintenance plan
- Moderate maintenance efforts over product-lifetime

Current control

The control units of the two DC drives are linked together, one is master and one is slave. The master drive unit is equipped with two PI closed loop current controllers, for main DC current control and for balancing the two six-pulse systems. Customer specific current ramp up and down rates can be set in the controller, these ramps can be bypassed once the unit is in master current control.

As a current feedback the premagnetization panel can read the AC CT's from the transformer or any standard analog input signal. A backup metering source with automatic switchover can be selected optionally.

The output of the PI controllers are used to control the OLTC tap position. High DC voltage will prevent of tapping up, overcurrent will force to tap down. Once the main AC breaker is open the premagnetization panel will automatically tap down the OLTC to lowest position.

Overcurrent protection

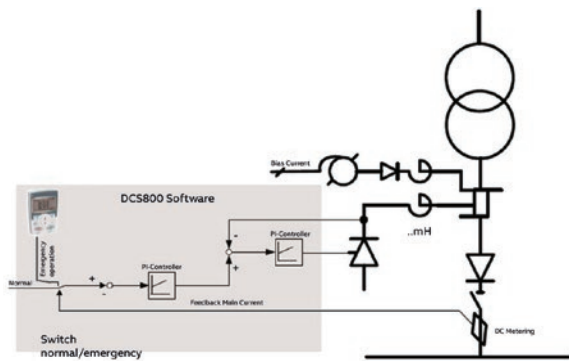
Time inverse protection curves with five different set points can be defined to protect the rectifier against overcurrent. Different curves for n-0 and n-1 operation are implemented. Furthermore a system unbalance protection to protect the rectifier transformer is included.

Interface to rectifier control system

The interface to the local rectifier control system can be done hardwired or with a fieldbus. Three different protocols are available: Ethernet IP, DeviceNet or Profibus DP.

Emergency mode

In case the rectifier control system fails, the premagnetization panel can run in emergency mode. In this mode the operator can switchover the DC current set point to local. In emergency control all the basic functions such as OLTC tap control, closed loop current control and rectifier overcurrent protection are still active.



Current control principle

Internal protection

All internal power circuits are protected with miniature circuit breakers, the bias and control circuits are protected with fuses. MCB's and fuses are monitored.

Panel for external DC chokes

DC chokes and output fuses can be optionally placed in an individual panel, this might be required if the premagnetization panel is placed in a control room where voltages above 1000 VAC are not permitted.



DC choke panel

Technical data premagnetization panel

Cubicle type:	Aluminum, free standing
Color:	RAL 7035, powder coating
Protection degree:	IP 54
Dimension (HxWxD):	2200x1560x602
Installation:	Indoor
Cubicle cooling:	Fans with filters
Ambient temperature range:	0...55 °C
Cable entry:	Bottom or top
Main power supply:	3x380...690 VAC
Control power supply:	110/230 VAC
Auxiliary power supply:	110/230 VAC
Wiring colors:	Black, green-yellow
Control current range:	0...30 A
Bias current range:	0...30 A
Standards:	IEC/CSA

Technical data DC choke panel

Cubicle type:	Aluminum, free standing
Color:	RAL 7035, powder coating
Protection degree:	IP 41
Dimension (HxWxD):	1200x1000x402
Installation:	Outdoor
Cubicle cooling:	Air natural
Ambient temperature range:	0...55 °C
Cable entry:	Bottom or top
Wiring colors:	Black, green-yellow
Standards:	IEC/CSA

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