



## ELECTROLYSIS RECTIFIER

■ INDUSTRY ■ METALLURGY

# DC POWER SUPPLY FOR THE ELECTROLYSIS, ELECTROCHEMISTRY AND HEATING PROCESS UNITS

## FUNCTIONS

- power supply of electrolysis units for nonferrous metals electrowinning from melts (aluminum, magnesium) and solutions (zinc, copper, nickel, sodium, cadmium, lead, manganese, water, etc.);
- power supply of electrolysis units for gas production (chloro, fluoro);
- power supply of electro-graphitization furnaces;
- similar loads with necessity of high operating currents.

## APPLICATION

- nonferrous metallurgy;
- industry.

## RECTIFYING CIRCUIT

- Bridge (B).
- «Y-reverse Y with smoothing reactor» (N). Regulation of output current under load – OLTC, angle of thyristors control.



## BENEFITS:

- high power characteristics (efficiency,  $\cos \phi$ ) combined with the possibility of smooth-step current control;
- high accuracy of high currents measurement up to 0.1%;
- centralized control and diagnostics using modern microprocessor systems and industrial computers, automatic generation of reporting documents, and protocols; optimization of process control;
- high installation and commissioning readiness;
- minimal impact on supply network when running several rectifiers, due to the use of multi-pulse rectifying circuits and phase-rotation devices and compensation winding built in power transformer.

## PRODUCT STRUCTURE:

- transformer part,
- converter part,
- heat exchanger,
- DC disconnectors,
- current meters,
- auxiliaries autoreclose cabinet,
- remote control of one or several rectifiers.

### Transformer part:

- Transformer - oil or dry, with NLTC (no-load tap changer). Connection to primary winding network is through OLTC device (on-load tap changer).



Secondary winding is connected to the converter part.

- transformer cooling cabinet providing circulation oil cooling of the transformer;
- saturable core reactor in diode-throttle type of rectifier (embedded / external).

### Converter part:

- power converting sections (rectifier units);
- control system.

Power converting sections are made with bridge or neutral rectification circuit, with an equal number of bridges and transformer secondary windings connected in Y and delta to increase pulse number.

Applied power semiconductors: thermodynamic diodes (thyristors) of TDC type, without plasma emission. Devices are connected in parallel arms, which number is determined by the rectifier output current.

Each arm consists of a series-connected diode (thyristor) and fuse (one or more in parallel) protecting power circuit against short-circuit current.

Parallel connection of several circuits «Y-reverse Y with smoothing reactor» with thyristor control of line current value are applied in low-voltage multiampere rectifiers.

Power semiconductor devices can be cooled with forced circulation of distilled water, liquid (with antifreeze) or forced air.

**Heat exchanger** for cooling of power converter sections (thyristor or diode) and valveside windings of power transformer, type «water-water», «water-air», «antifreeze-air», is made with coolant ion exchange filters and pumps back-up.

Heat exchanger is equipped with necessary means of measurement, control and automation, and is connected with control cabinet (ShU) by signals. Fans are available for the rectifiers with air cooling.



### CONTROL SYSTEM (CS)

Control system is a two-level software and hardware system:

- rectifier control system controllers (control cabinet);
- remote control panel for a group of rectifiers (functions of process controller and operator interface).
- analog remote control panel (operator interface functions).

#### Control system functions:

- current setup and regulation;
- protection and signaling;
- current and voltage control;
- high voltage breaker closing/opening;
- automatic and manual control of transformer OLTC and NLTC;
- processing of information from transformer monitoring cabinet;
- DC disconnectors control;
- data reception-transmission from control cabinet to remote control panel.

### REMOTE CONTROL PANEL (RCP)

#### RCP includes:

- industrial PC with LCD display,
- process controller,
- I/O units,
- switching processor,
- other equipment.

#### RCP functions:

- generation of commands for the rectifier switching on/off;
- current setting for each rectifier;
- signals processing and receiving from each rectifier of the group;
- alarms, warnings archives creation;
- current on load graphs making;
- rectifiers current and voltage data array formation;
- current and voltage average values archiving;
- data transfer to process automatic control system database via any of the following networks: Profibus-DP, Ethernet, Modbus, CAN or other;
- equipment operation charts and graphs displaying and printing.

#### Components arrangement:

- integrated: maximum approaching of power units to the transformer;
- loose: separate placement of rectifier components.

#### Version:

- indoor installation;
- outdoor installation - modular (container).

### ADDITIONAL SERVICES

- installation supervision, commissioning;
- personnel training;
- service maintenance.



## OPERATION CONDITIONS

Name of parameter	Unit	Value
Height above sea level	m	up to 1000
Ambient temperature	°C	+ 1 °C ...+ 40 °C
Upper value of relative humidity at 25 °C	%	80
Environment	-	non-explosive, not fire hazardous environment; type II (industrial atmosphere) of corrosion-active agents content; mechanical resistance - group M1.

## TYPE DESIGNATION

V - T P X<sub>1</sub> X<sub>2</sub> -X<sub>3</sub> - X<sub>4</sub> -X<sub>5</sub>

- V rectifier;
- T supply network current at input (three-phase);
- P current at output (DC);
- X<sub>1</sub> type of converter section cooling:  
P – forced air,  
V- water;
- X<sub>2</sub> D-diode rectifier (no letter for the thyristor one);
- X<sub>3</sub> rated rectified current, kA;
- X<sub>4</sub> rated rectified voltage, V ;
- X<sub>5</sub> version modification code.

## TECHNICAL FEATURES OF RECTIFIERS

Rated current, kA	Rated rectified voltage, V	Cooling	Type of rectifying element	Rectifying circuit	Transformer
2	60	water	thyristor	M	dry
3	60				
7.5	230	water	thyristor	M	oil
12.5	75			N	oil
12.5	450	air, water	thyristor	M	oil
18	32, 64	water	thyristor	N	dry
20	42				
25, 36	24				
25	75				
25	450	air, water	diode/ thyristor	M	oil
25	850	water	diode/ thyristor	M	oil
32	950	air	diode	M	oil
35	520	water	thyristor	M	oil
50	450				oil
63	250 (300), 450, 850	water	diode	M	oil
75	150	water	thyristor	M	oil
100	115	water	thyristor	M	oil

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