



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-graphitisation 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, $\cos \varphi$) 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.



Additional services

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



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).

Operation conditions

Name of parameter	Value	Unit
Height above sea level	up to 1000	m
Ambient temperature	+ 1 °C ...+ 40 °C	°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 X₁ X₂ - X₃ - X₄ - X₅

- V rectifier;
- T supply network current at input (three-phase);
- P current at output (DC);
- X₁ type of converter section cooling:
P – forced air,
V- water;
- X₂ D-diode rectifier
(no letter for the thyristor one);
- X₃ rated rectified current, kA;
- X₄ rated rectified voltage, V ;
- X₅ 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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