



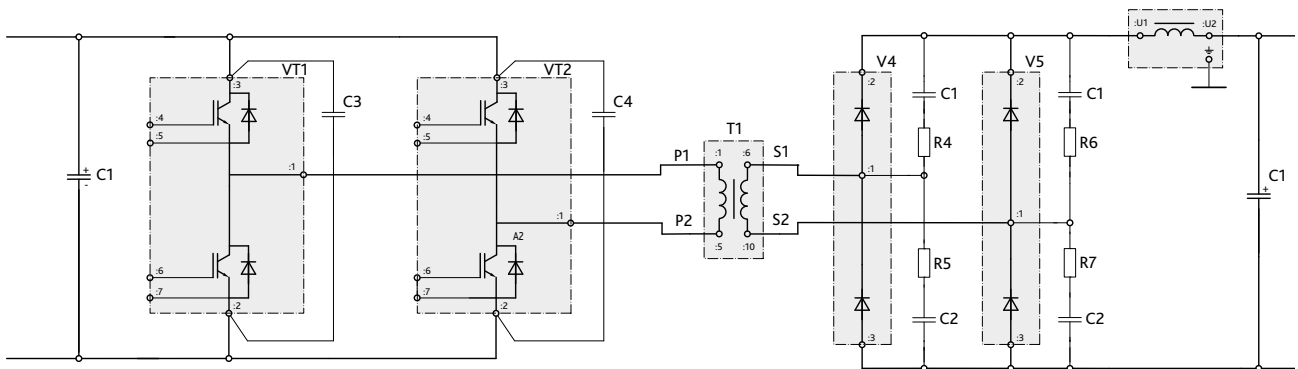
**OPERATIVE CURRENT CABINET SHOT1M
ON THE BASIS OF HIGH-FREQUENCY
VOLTAGE CONVERTER**

OPERATIVE CURRENT CABINET SHOT1M ON THE BASIS OF HIGH-FREQUENCY VOLTAGE CONVERTER

Operative current cabinet (hereinafter "SHOT1M") on the basis of high-frequency voltage converter being a charging-rectifying unit is provided to convert AC power into regulated DC power to charge accumulator batteries and supply consumers with DC voltage both in buffer connection with accumulator battery, and directly.

Charging-rectifying unit is based on double conversion with DC link: AC voltage rectification, DC voltage conversion.

Pulse DC voltage converter with modulation frequency 18 kHz and above, with transformer galvanic isolation is at the core of the unit.



▲ Fig.1.Pulse DC voltage converter structural diagram

SHOT1M implements accumulator battery IU, U, IUI charging methods in accordance with DIN41773. Deviations of output current in output current stabilization mode do not exceed $\pm 1\%$ of output current setting value. Deviations of output voltage in output voltage stabilization mode do not exceed $\pm 1\%$ of output voltage setting value upon permissible deviations of supply network voltage.

Output voltage ripple factor is maximum 1 % when operating under active load, rated output current and rated output voltage. It provides parallel operation with similar converters of overall load. Implementation of 2-modular design with 100 % parallel redundancy is provided. Dynamically and thermally resistant to internal and external short circuits.

DESIGN GENERAL INFORMATION

Structurally SHOT1M is made as a sheet steel cabinet with one-side maintenance, with protection level minimum IP23 according to IEC 60529. Controls, including console terminal, measuring devices and signaling lamps are located on front door of the cabinet.

Power units' cooling is forced air. Smoothing reactor is installed in the cooling air flow. External connections cables input is made through compacted with sealed lead-ins holes in the cabinet floor.

The number of circuit breakers and other switching devices is installed according to the Customer requirements.

STRUCTURE OF VOLTAGE CONVERTER

Voltage converter includes the following functional systems:

- power circuit;
- protection system;
- control, indication and alarm system.

The power circuit includes rectifier unit, a DC link, high-frequency pulse DC converter with transformer galvanic isolation, output LC-filter.

ADVANTAGES OF SHOT1M APPLICATION

- improved weight and overall dimensions due to the use of high frequency conversion;
- low output voltage and current ripple factor;
- $\cos \varphi \approx 0.96$, i.e. almost no reactive power consumption from network;
- galvanic isolation with high frequency power transformer;
- improved reliability of the rectifier due to microprocessor control system and galvanic isolation from supply network;
- several operation modes and several control logics, easy transition from one logic to another, thereby expanding of application field;
- automation of all control processes and diagnostics, availability of service programs for adjustment,

- monitoring of parameters and troubleshooting;
- all kinds of protections and load in all operating and emergency modes.

The rectifier unit is based on 3-phase semi-controlled bridge rectifier with pre-charge DC link capacitors. Input supply voltage is from 200 to 700 V AC, single-phase or three-phase, frequency from 45 to 65 Hz. There is also a possibility provided to power supply the unit with DC voltage from 200 to 1000 V. After precharge of DC link capacitors semi-controlled rectifier operates in diode rectifier mode.

Pulse converter is based on PUSH-PULL converter circuit (Fig.1). High-frequency transformer is produced to operate at frequency of 18 kHz, and provides galvanic isolation and conditioning of input and output voltage levels.

The transformer has small size and high efficiency. It is installed in a separate enclosure, being the screen and air duct. Transformer air cooling system together with temperature monitoring sensors provides transformer operating temperature mode.

Power units of modular structure are installed on group cooler. Temperature sensors are installed in cooler in the areas of excessive heat to control thermal conditions.

There is a number of protections provided to switch off the device in case of emergencies both in load and converter:

- protection against internal and external short circuits;
- protection against short circuit in transformer;
- protection against converter overload and load;
- protection of maximum allowed output voltage;
- overheating of power units;

- wrong connection of accumulator battery;
- protection against drop or loss of supply voltage, as well as automatic reclosing after supply network recovery;
- a number of protections to monitor control system individual elements condition.

Insulation control of positive and negative poles of output voltage to ground with indication of warning status is provided.

SHOT1M includes measuring instruments: AC input voltage voltmeter, DC output voltage voltmeter and ammeter.

Microprocessor control system provides:

- setting of necessary operating modes and parameters by console terminal buttons, switches and buttons on the cabinet door with input values control on the display (LCD graphic);

- processing of input analog, discrete signals and the formation of converter power keys control pulses, as well as formation of a number of hardwire signals for the Customer's protection and indication circuits;
- automatic supply of load voltage at start-up, operation and stop of the unit in accordance with set parameters;
- interfaces for connection to the upper level system: RS-485 (Modbus RTU), CAN;
- service modes for adjustment, maintenance and control of the unit systems.

All control system tasks are performed by software and hardware.

Output voltage setting can be adjusted from 0.5 to 1.35 of rated output voltage. Load current setting can be adjusted from 0.05 to 1.1 of rated output current.

MAIN TECHNICAL DATA

Name of parameter	Unit	Value
Rated input voltage	V	220; 380; 690 +15 %, -20 %
Rated frequency	Hz	50; 60 ±2
Number of phases	pc.	1; 3
Number of inputs	pc.	1; 2
Operation mode	-	continuous
Accumulator battery capacity	AxH	Up to 1000
Rated rectified voltage	V	Up to 500
Rated rectified current	A	Up to 400
Output voltage adjustment range	%	50-135
Power factor, minimum (under rated parameters)	-	0.96
Efficiency, minimum (under rated parameters)	-	0.94
Input dynamical stability	kA	10
Specific weight under supply voltage 380 V	kG/kW	3.8

ENVIRONMENT CONDITIONS

Name of parameter	Unit	Value
Disposition altitude	m	up to 1000
Operating temperature range	°C	-25°C ...+55°C (option -40°C) In the range -25°C ...+40°C operation with rated parameters. In the range +41°C ...+55°C 3 % decrease of rated current per each 1°C
Storage temperature range	°C	- 40 °C...+60 °C
Relative humidity upper value at 25 °C	%	90
Environment	-	non-hazardous, contains no chemically active gases and vapors in concentrations destroying insulation

TYPE DESIGNATION

SHOT1M – XXX – XXX – XXX⁽¹⁾⁽²⁾⁽³⁾

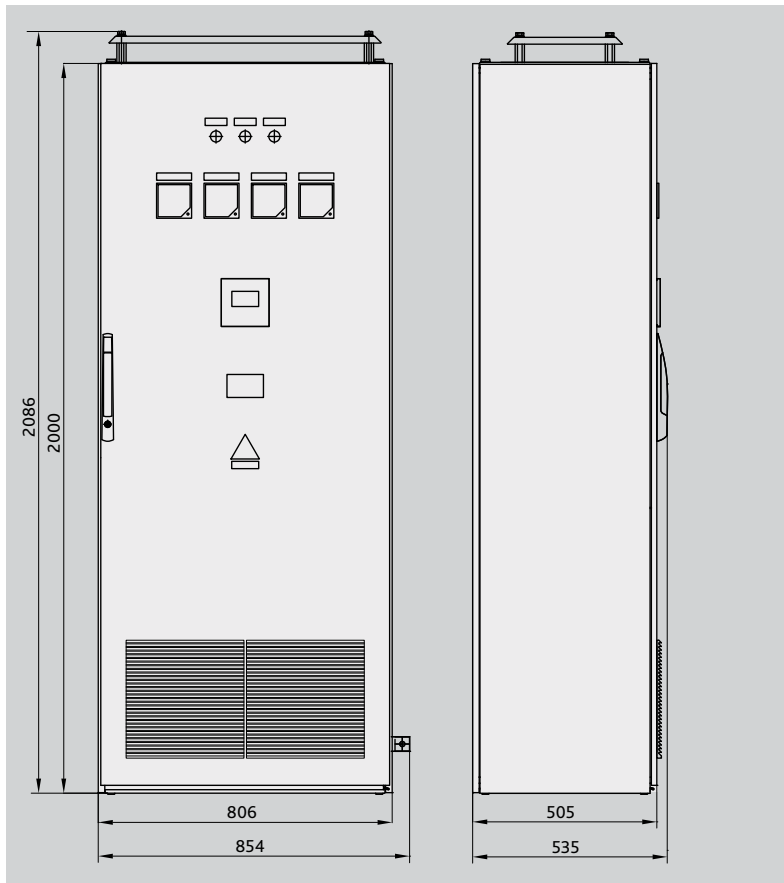
SHOT1M operating current cabinet,
1st modification;

XXX⁽¹⁾ rated supply voltage of
cabinet, V;

XXX⁽²⁾ rated output current, A;

XXX⁽³⁾ rated output voltage, V;

OUTLINE DRAWING



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