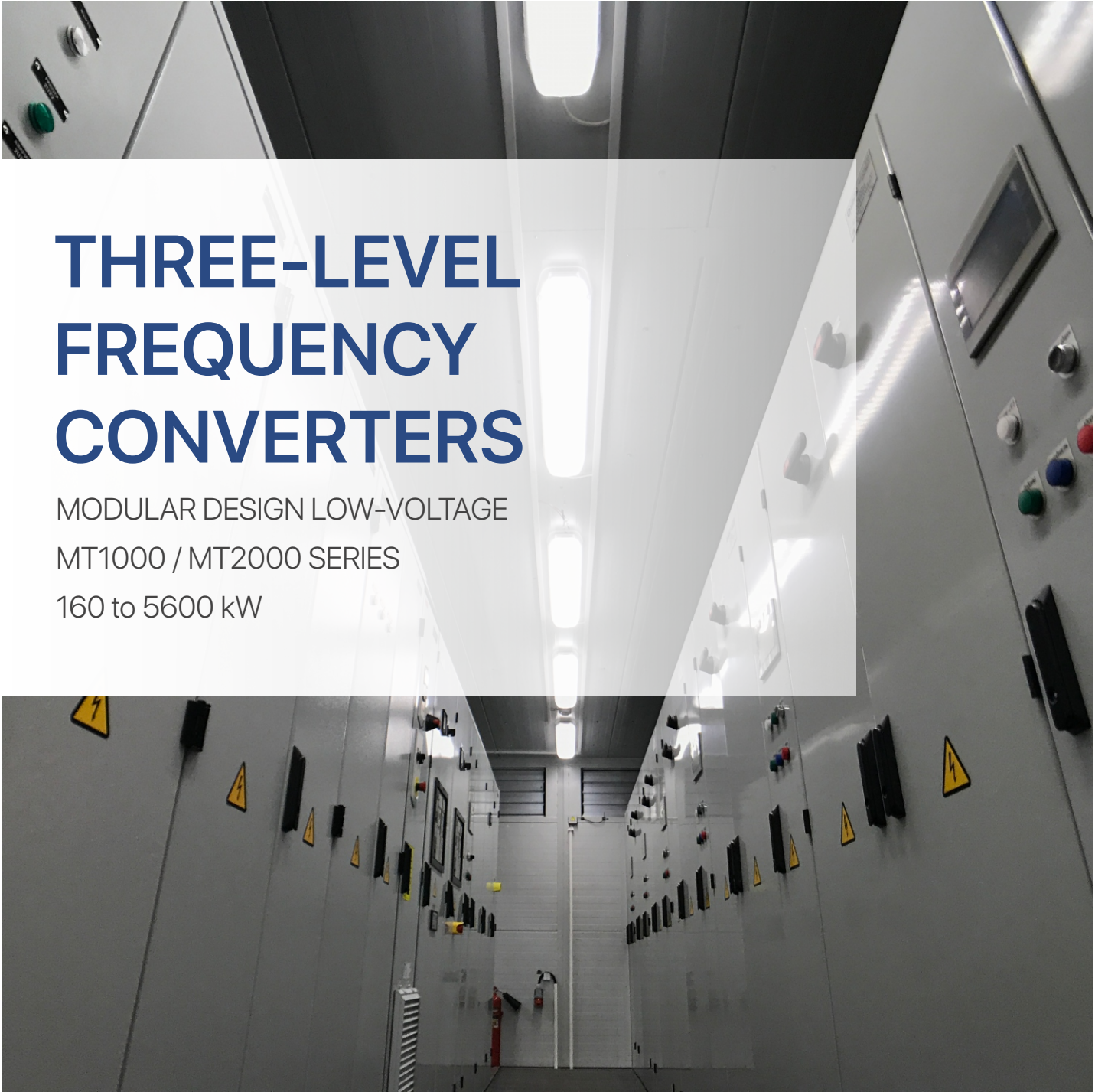




THREE-LEVEL FREQUENCY CONVERTERS

MODULAR DESIGN LOW-VOLTAGE

MT1000 / MT2000 SERIES

160 to 5600 kW



NEW GENERATION

CONVERSION EQUIPMENT OF
GENERAL INDUSTRIAL PURPOSE

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INTRODUCTION

Frequency converters MT1000 and MT2000 series are used to control rotation frequencies in:

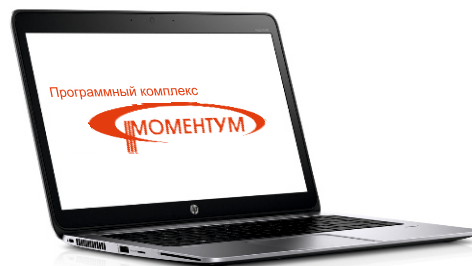
- asynchronous;
- synchronous;
- synchronous-reactive electric motors.

These converters, depending on the configuration of the power part and the software installed, can also be used as network inverters:

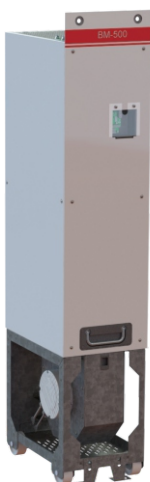
- for alternative energy sources;
- in industrial storage systems and electricity storage;
- in the dynamic compensators of voltage distortion;
- in static compensators of reactive power.



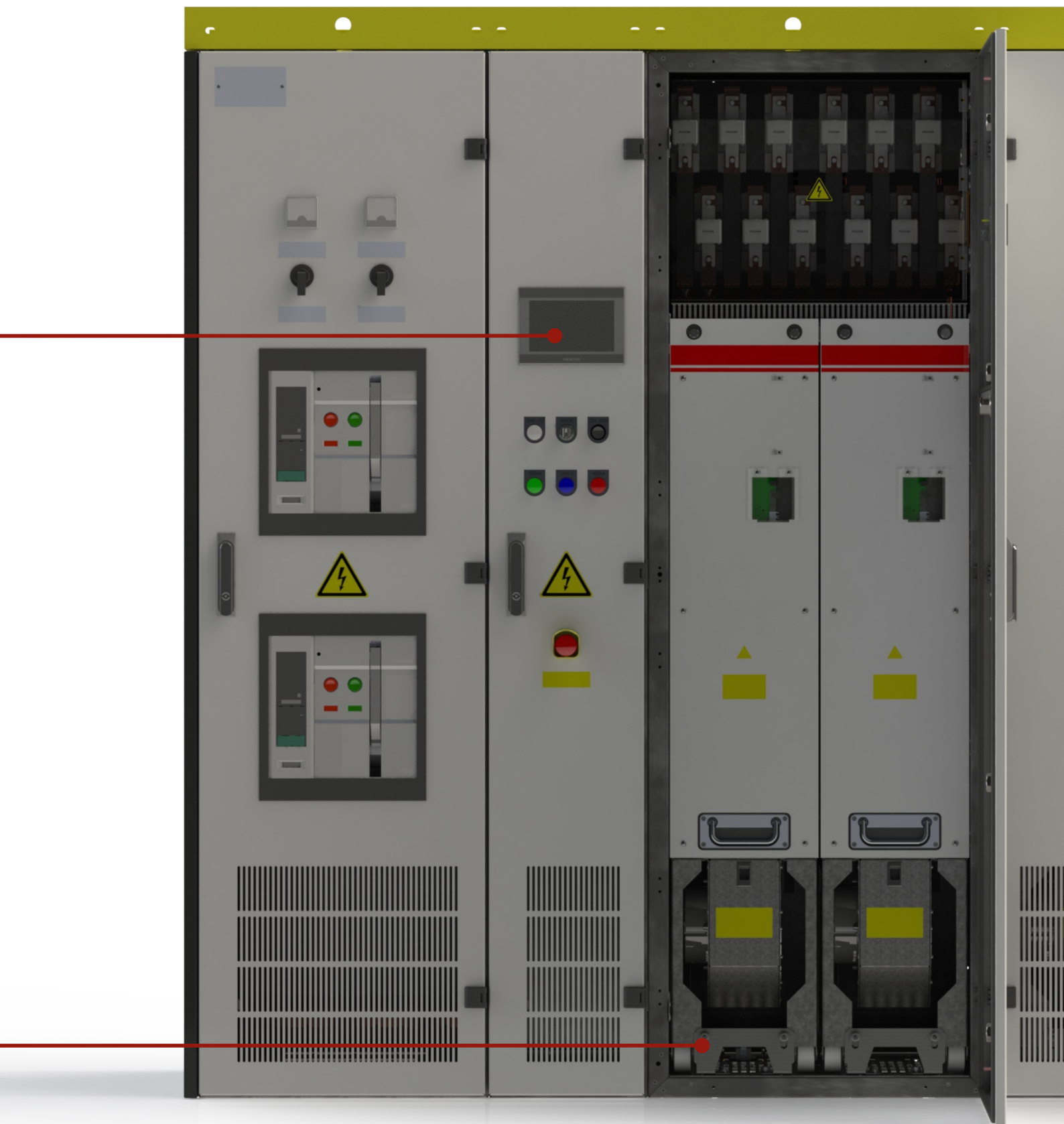
User-friendly
human-machine interface



Software for setup and
maintenance



Modular design





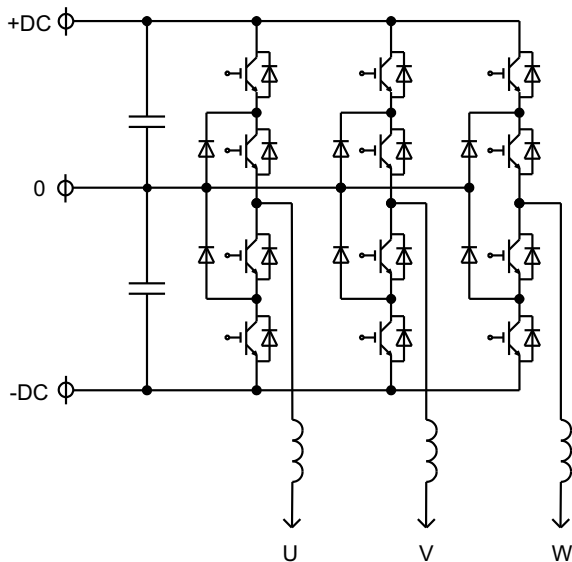
MODULAR DESIGN

Universal and flexible frequency converters MT1000 and MT2000 series can be configured in accordance with the requirements of specific tasks and operating conditions of industrial units. A modular design can significantly improve the product reliability.

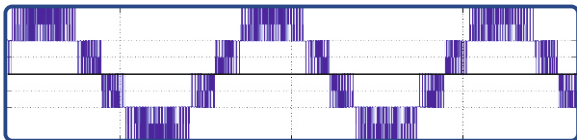
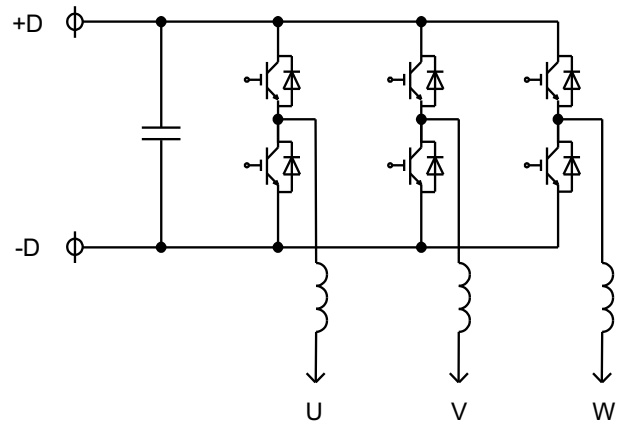
THREE-LEVEL FREQUENCY CONVERTER

Modular converters MT1000/MT2000 "Momentum",
are the first domestic frequency converters based on a three-level voltage inverter.

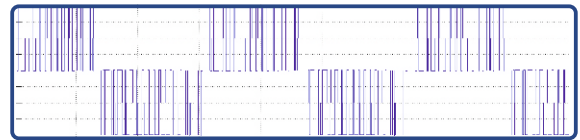
Three-level voltage inverter



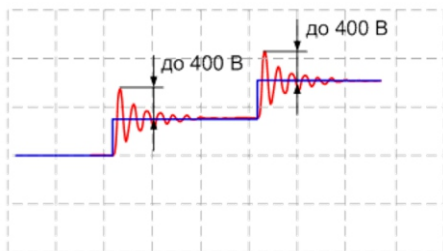
Two-level voltage inverter



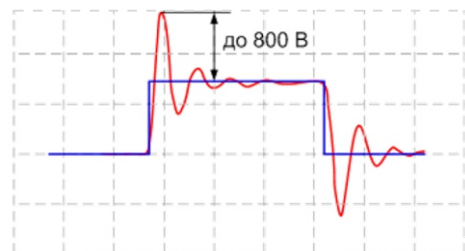
Oscillogram of the line voltage at
the output of a three-level inverter



Oscillogram of the line voltage at
the output of a two-level inverter



Overvoltage on the electric motor buses
when powered by a three-level FC
does not exceed 400 V



Overvoltage on the electric motor buses
when powered by a two-level FC
reaches 800 V

ADVANTAGES OF A THREE-LEVEL FREQUENCY CONVERTER

■ When working on an electric motor:



Reducing restrictions
by cable length and type



Reducing acoustic
electric motor noises



Reducing losses
in the electric motor



Reduced requirements to the electric motor
on the use of insulated bearings
and special insulation

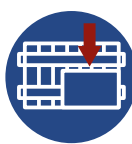
Three-level Momentum converters comply with the requirements for the rate of voltage increase on the motor windings according to GOST R 51330.8 "Explosion-proof electrical equipment" reducing overvoltage by 50% compared to two-level converters.

Acoustic noise of the electric motor when powered by a three-level FC "Momentum" by 5-10 dB (20%) less than when powered from conventional frequency converters.

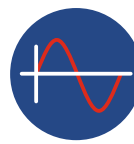
■ When working on the electrical network:



Reduced weight
of the reactor equipment
(Sine filter)



Reduced dimensions
of the reactor equipment
(Sine filter)



Current and voltage form
is close to **sinusoidal**



Reducing losses
in reactor equipment
(Sine filter) **by 2 times**



Reduction of
losses in IGBT
modules **by 1.5 times**

ISC CONTROL METHOD

The ISC (Indirect Stator-Quantities Control) control method is implemented in the electric drive control system.

ISC is characterized by a high response rate to a change in the torque setting comparable to direct torque control methods with relay control Direct Torque Control (DTC). At the same time, it has no such disadvantages as increased noise and torque pulsation at low speeds due to the fixed switching frequency at key transistors.

Compared to the vector control method (Field oriented control - FOC) **ISC** is less sensitive to the accuracy of determining the electric motor parameters which provides a higher quality of control for electric motors from various manufacturers.

Criterion	Vector management method	Direct torque control (DTC)	ISC (Momentum)
The response rate to changing the setting of the torque	Slow	Fast	Fast
Quality of controlling torque, flow, current	Small pulses of torque, flow, current	Big pulses of torque, flow, current	Small pulses of torque, flow, current
Quality of controlling at low rotation frequencies	Good	Good	Good
Sensitivity to evaluating parameters of an electric motor	High (an accurate assessment of all electric motor parameters is required)	Small (an accurate assessment for stator resistance is required)	Average (an accurate assessment for rotor resistance is required)
Switching frequency of power keys	Constant	Variable (Depending on the operating mode)	Constant
Acoustic noise	Low noise at the modulation frequency	Intense noise, (especially on a low rotation frequency)	Low noise at the modulation frequency

Due to a high accuracy of torque maintenance, the **Momentum** drives can be combined by the MASTER-SLAVE scheme.

Two or more converters can synchronously adjust the torque of electric motors providing equal loads between them.

The control signals are exchanged over a high-speed optical line protected from interference.

HOW TO CHOOSE A DRIVE MT1000/MT2000

Follow the instructions to choose the right product:

1

Find the product you are interested in and select the appropriate table of rated characteristics

2

Select the type of converter from the table of rated characteristics based on the voltage and load current.

3

The drive can be selected based on the motor power and rated currents.

ОДИНОЧНЫЕ ПРИВОДЫ MT1000. ТЕХНИЧЕСКИЕ ДАННЫЕ

Параметры модульных устройств автоматического регулирования с дисковым выпрямителем $U_n=400$ В									
Обозначение типа	Количество модулей		Темп-размер	Номинальные значения		Режим легкой нагрузки		Режим полной нагрузки	
	М-400	МТН-300	МТН-400	МДН-200	I_n	I_{n+1}	I_n	I_{n+1}	Расход энергии, кВт/час
6-ступенчатый дисковый выпрямитель									
MT1000-3-100-400 (HTT)	1	1	(1)	-	1	315	630	160	309 100 143 125 1800
MT1000-3-200-400 (HTT)	1	1	(1)	-	1	400	800	200	392 200 179 190 1800
MT1000-3-250-400 (HTT)	2	2	(2)	-	2	500	1250	250	490 220 224 220 2700
MT1000-3-315-400 (HTT)	2	2	(2)	-	2	630	1260	315	617 215 282 220 2700
MT1000-3-400-400 (HTT)	2	2	(2)	-	2	800	1200	400	784 400 358 315 2700
12-ступенчатый дисковый выпрямитель									
MT1000-3-500-400 (HTT)	2	3	-	(3)	3	1000	1800	500	980 500 447 400 5400
MT1000-3-630-400 (HTT)	2	3	-	(3)	3	1250	1800	630	1225 530 583 500 5400
MT1000-3-800-400 (HTT)	2	4	-	(4)	4	1600	2520	800	1567 600 716 630 6300
MT1000-3-1000-400 (HTT)	3	5	-	(5)	5	2000	3150	1000	1959 660 800 8100
MT1000-3-1250-400 (HTT)	3	6	-	(6)	6	2500	3780	1250	2449 1020 1118 1000 9000

Параметры модульных устройств автоматического регулирования с дисковым выпрямителем $U_n=690$ В									
Обозначение типа	Количество модулей		Темп-размер	Номинальные значения		Режим легкой нагрузки		Режим полной нагрузки	
	М-690	МТН-300	МТН-400	МДН-200	I_n	I_{n+1}	I_n	I_{n+1}	Расход энергии, кВт/час
6-ступенчатый дисковый выпрямитель									
MT1000-3-315-690 (HTT)	1	1	(1)	-	1	315	630	315	309 315 282 280 1800
MT1000-3-400-690 (HTT)	1	1	(1)	-	1	400	800	400	392 400 358 315 1800
MT1000-3-500-690 (HTT)	2	2	(2)	-	2	500	1250	500	490 480 447 400 2700
MT1000-3-630-690 (HTT)	2	2	(2)	-	2	630	1260	630	617 560 563 500 2700
MT1000-3-800-690 (HTT)	2	2	(2)	-	2	800	1200	800	784 600 716 630 2700
12-ступенчатый дисковый выпрямитель									
MT1000-3-1000-690 (HTT)	2	3	-	(3)	3	1000	1800	1000	980 800 894 800 5400
MT1000-3-1250-690 (HTT)	2	3	-	(3)	3	1250	1800	1250	1225 1118 1118 1000 5400
MT1000-3-1600-690 (HTT)	2	4	-	(4)	4	1600	2520	1600	1567 1425 1425 1280 6300
MT1000-3-2000-690 (HTT)	3	5	-	(5)	5	2000	3150	2000	1959 2000 1799 1900 8100
MT1000-3-2500-690 (HTT)	3	6	-	(6)	6	2500	3780	2500	2449 2000 2286 2000 9000

*Выход (М-400) устанавливается (М-2000).

ОДИНОЧНЫЕ ПРИВОДЫ MT1000.

ТЕХНИЧЕСКИЕ ДАННЫЕ

Параметры модульных устройств автоматического регулирования с дисковым выпрямителем U _n =400 В													
Обозначение типа	Количество модулей	Темп-размер	Номинальные значения		Режим легкой нагрузки		Режим полной нагрузки		Расход энергии, кВт/час				
	М-400 МТН-300 МТН-400 МДН-200		I _n	I _{n+1}	P _n , кВт	I _n	P _n , кВт	I _n	P _n , кВт				
6-ступенчатый дисковый выпрямитель													
MT1000-3-100-400 (HTT)	1	1	(1)	-	1	315	630	160	309	143	125	1800	
MT1000-3-200-400 (HTT)	1	1	(1)	-	1	400	830	200	392	200	179	1800	
MT1000-3-250-400 (HTT)	2	2	(2)	-	2	500	1260	250	490	250	224	2700	
MT1000-3-315-400 (HTT)	2	2	(2)	-	2	630	1260	315	617	315	282	2700	
MT1000-3-400-400 (HTT)	2	2	(2)	-	2	800	1200	400	784	400	358	2700	
12-ступенчатый дисковый выпрямитель													
MT1000-3-500-400 (HTT)	2	3	-	(3)	3	1000	1800	500	980	500	447	400	5400
MT1000-3-630-400 (HTT)	2	3	-	(3)	3	1250	1800	630	1225	630	563	500	5400
MT1000-3-800-400 (HTT)	2	4	-	(4)	4	1600	2520	800	1567	800	716	630	6300
MT1000-3-1000-400 (HTT)	3	5	-	(5)	5	2000	3150	1000	1959	1000	894	8100	
MT1000-3-1250-400 (HTT)	3	6	-	(6)	6	2500	3780	1250	2449	1250	1118	1000	9000

Параметры модульных устройств автоматического регулирования с дисковым выпрямителем U _n =690 В													
Обозначение типа	Количество модулей	Темп-размер	Номинальные значения		Режим легкой нагрузки		Режим полной нагрузки		Расход энергии, кВт/час				
	М-690 МТН-300 МТН-400 МДН-200		I _n	I _{n+1}	P _n , кВт	I _n	P _n , кВт	I _n	P _n , кВт				
6-ступенчатый дисковый выпрямитель													
MT1000-3-315-690 (HTT)	1	1	(1)	-	1	315	630	315	309	315	282	1800	
MT1000-3-400-690 (HTT)	1	1	(1)	-	1	400	830	400	392	400	358	1800	
MT1000-3-500-690 (HTT)	2	2	(2)	-	2	500	1260	500	490	500	447	400	2700
MT1000-3-630-690 (HTT)	2	2	(2)	-	2	630	1260	630	617	630	563	500	2700
MT1000-3-800-690 (HTT)	2	2	(2)	-	2	800	1200	800	784	800	716	630	2700
12-ступенчатый дисковый выпрямитель													
MT1000-3-1000-690 (HTT)	2	3	-	(3)	3	1000	1800	1000	980	1000	894	8100	
MT1000-3-1250-690 (HTT)	2	3	-	(3)	3	1250	1800	1250	1225	1250	1118	1000	9000
MT1000-3-1600-690 (HTT)	2	4	-	(4)	4	1600	2520	1600	1567	1600	1425	1200	6300
MT1000-3-2000-690 (HTT)	3	5	-	(5)	5	2000	3150	2000	1959	2000	1799	1600	8100
MT1000-3-2500-690 (HTT)	3	6	-	(6)	6	2500	3780	2500	2449	2500	2286	2000	9000

*Выход (М-400) устанавливается (М-2000).

4

Select options and add option codes for the order code.

Don't forget to put a "+" sign in front of each code

MT 1000 - 3 - 1250 - 690 MD

+ Options

no - Individual electric drive
MD - Multi-motor electric drive
ESS - Application for energy storage systems
PVA - Application for photovoltaic systems (solar inverter)
STATCOM - static reactive power compensator
DVDC is a dynamic voltage distortion compensator
Rated voltage, V
Rated power, kW
2 - two-level inverter, 3 - Three-level inverter.
1000 is an uncontrolled rectifier.
2000 - network inverter/active rectifier.
MT is the designation of the series.

MODULAR CONVERTER MT1000/MT2000

SPECIFICATIONS

Technical data:

	MT1000	MT2000
Rectifier type	Unmanageable	Active (on IGBT transistors)
Connecting to the network		
Voltage range	3 phases 400 V, +10/-15 %	
	3 phases 690 V, +10/-15 %	
Power	500...5600 kW	
Frequency	50 Hz	
Power factor on the 1st harmonic	cosφ= 0.98	cosφ= 1.0
Coefficient of non-sinusoidal distortions	Standard, depending on the rectification scheme: 6 or 12-pulse	< 3%
EFFICIENCY	98.6 %	98.0%
Motor connection		
Voltage	0 to 400/690 V	
Frequency	0 to 400 Hz	
Motor control method	U/f, vector, ISC (direct torque control with a fixed frequency modulation)	
Interfaces and data transfer protocols		
Human-machine interface	7" Operator colored touch panel	
Modbus RTU	Standard	
Profibus DP	Option	
Modbus TCP	Option	
Ethernet IP	On request	
CANOpen	On request	
Climatic characteristics		
Ambient air temperature:		
Transportation/storage	from minus 40 to +70C	
Operation	from 0 to +40C	
	from +40 to +50C with a current reduction of 1% with a temperature increase by 1° C	
Other characteristics		
Module cooling method	Air	
Installation height above the sea level	Up to 1000 m without power reduction	
	Over 1000 m, with reduced characteristics and reduced current by 1 % per every 100 m	
Protection degree	IP 20 (Standard)	
	IP 54	
Coating color	RAL 7035	
Certificates of conformity	TR CU 004/2011	
	TR CU 020/2011	

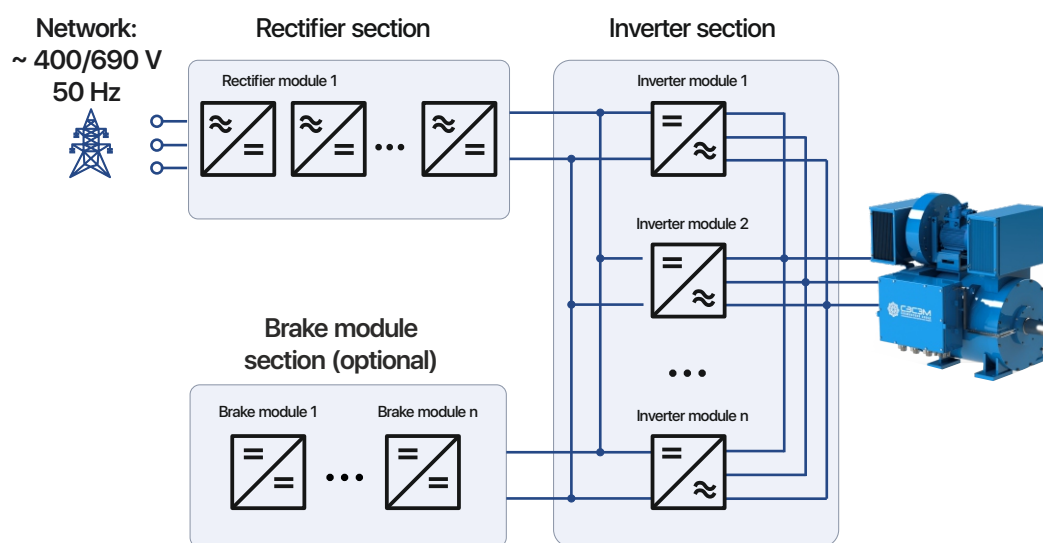


SINGLE MT1000 DRIVES

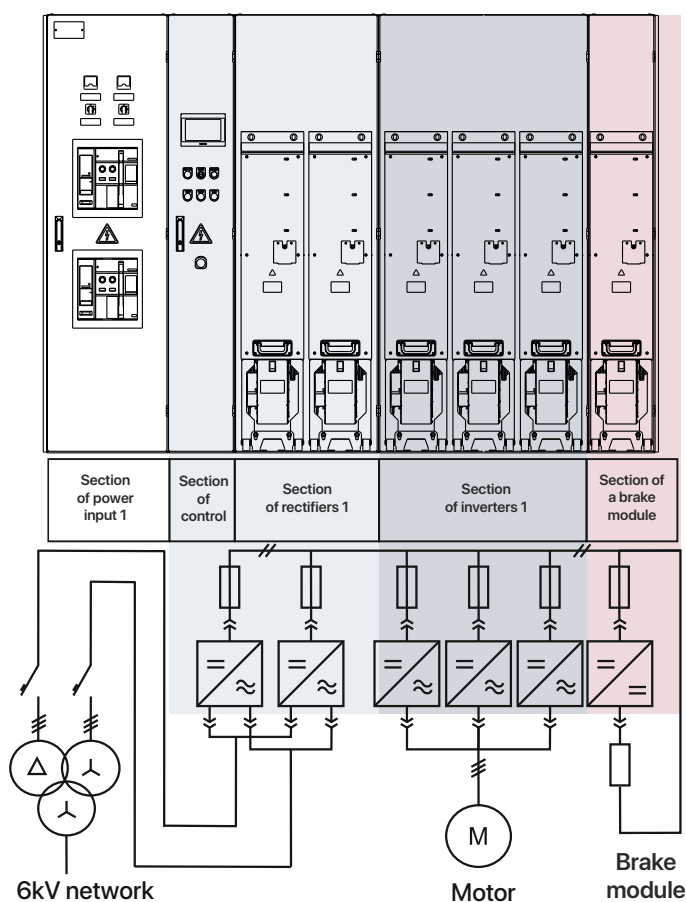
Single electric drives "Momentum" based on a three-level voltage inverter provide high-quality torque and speed control in various types of electric motors and can be used to control highly dynamic mechanisms.

The electric drives are built on the basis of standard modules that ensure interchangeability with other **Momentum** converters.

All **Momentum** electric drives in the database are equipped with an operator colored panel, a communication module with Modbus RTU/TCP support and other functions.



Example of a single-motor converter 1200 kW



SINGLE MT1000 DRIVES

TECHNICAL DATA

Parameters of modular automatic control devices with a diode rectifier U_N = 400 V

Type designation	Number of modules				Standard size	Rated values			Mode of light overload		Mode of heavy overload		Air flow, m ³ /hour
	VM-500	MTI-350	MTP-450	MDI-250		I _{Nr} A	I _{MAXr} A	P _{Nr} kW	I _{LDr} A	R _{LDr} kW	I _{HDr} A	R _{HDr} kW	
6-pulse diode rectifier													
MT1000-3-160-400 (+TP 1))	1 ²⁾	1	(1)	-	1	315	630	160	309	160	143	125	1800
MT1000-3-200-400 (+TP)	1	1	(1)	-	1	400	630	200	392	200	179	160	1800
MT1000-3-1000-690 (+TP)	1	2	(2)	-	2	500	1260	250	490	250	224	200	2700
MT1000-3-1250-690 (+TP)	1	2	(2)	-	2	630	1260	315	617	315	282	250	2700
MT1000-3-1600-690 (+TP)	1	2	(2)	-	2	800	1260	400	784	400	358	315	2700
12-pulse diode rectifier													
MT1000-3-500-400 (+TP)	2	3	-	(1)	3	1000	1890	500	980	500	447	400	5400
MT1000-3-630-400 (+TP)	2	3	-	(1)	3	1250	1890	630	1225	630	563	500	5400
MT1000-3-315-400 (+TP)	2	4	-	(1)	4	1600	2520	800	1567	800	716	630	7200
MT1000-3-1000-400 (+TP)	3	5	-	(1)	5	2000	3150	1000	1959	1000	894	800	9000
MT1000-3-400-400 (+TP)	3	6	-	(1)	6	2500	3780	1250	2449	1250	1118	1000	9000

Parameters of modular automatic control devices with a diode rectifier U_N = 690 V

Type designation	Number of modules				Standard size	Rated values			Mode of light overload		Mode of heavy overload		Air flow, m ³ /hour
	VM-500	MTI-350	MTP-450	MDI-250		I _{Nr} A	I _{MAXr} A	P _{Nr} kW	I _{LDr} A	R _{LDr} kW	I _{HDr} A	R _{HDr} kW	
6-pulse diode rectifier													
MT1000-3-315-690 (+TP)	1 ²⁾	1	(1)	-	1	315	630	315	309	315	282	250	1800
MT1000-3-400-690 (+TP)	1	1	(1)	-	1	400	630	400	392	400	358	315	1800
MT1000-3-630-690 (+TP)	1	2	(2)	-	2	500	1260	500	490	500	447	400	2700
MT1000-3-630-690 (+TP)	1	2	(2)	-	2	630	1260	630	617	630	563	500	2700
MT1000-3-800-690 (+TP)	1	2	(2)	-	2	800	1260	800	784	800	716	630	2700
12-pulse diode rectifier													
MT1000-3-1000-690 (+TP)	2	3	-	(1)	3	1000	1890	1000	980	1000	894	800	5400
MT1000-3-1250-690 (+TP)	2	3	-	(1)	3	1250	1890	1250	1225	1250	1118	1000	5400
MT1000-3-1600-690 (+TP)	2	4	-	(1)	4	1600	2520	1600	1567	1600	1431	1250	6300
MT1000-3-2000-690 (+TP)	3	5	-	(1)	5	2000	3150	2000	1959	2000	1789	1600	8100
MT1000-3-2500-690 (+TP)	3	6	-	(1)	6	2500	3780	2500	2449	2500	2236	2000	9000

¹⁾ See the section "Options and spare parts"

²⁾ VM-250D is installed instead of VM-500

I_{Nr} A - rated continuous current when the converter is operating without overload and the cooled air temperature is not higher than 40 ° C.

I_{MAXr} A - maximum output current (for 10 seconds when starting the electric motor or before reaching the limit temperature)

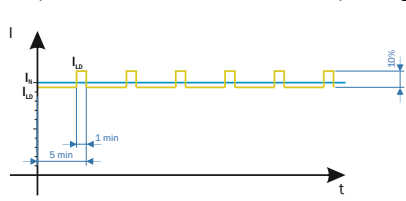
P_{Nr} kW - Rated power of the electric motor according to GOST IEC60034

I_{LDr} A - Long-term current in the light overload mode (at 10% overload for 1 min. The mode is repeated every 5 minutes.)

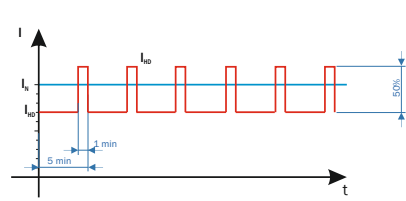
R_{LDr} kW - Electric motor power when operating in the light overload mode

I_{HDr} A - Long-term current in heavy overload mode (at 50% overload for 1 min. The mode is repeated every 5 minutes.)

P_{HDr} kW - is the power of the electric motor when operating in the heavy overload mode



Light overload mode



Heavy overload mode

SINGLE MT2000 DRIVES

TECHNICAL DATA

Parameters of modular automatic control devices with an active rectifier UN=400 V

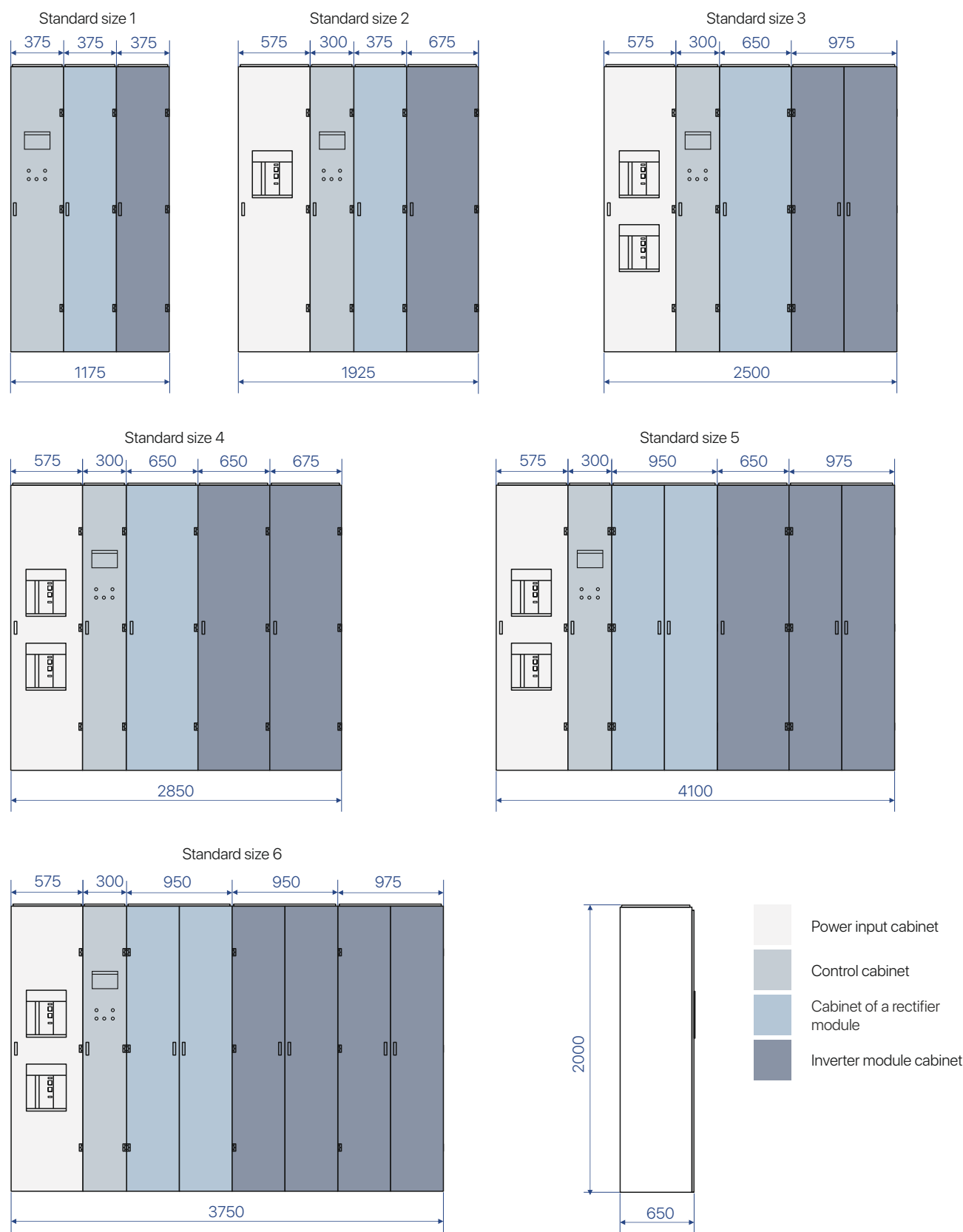
Type designation	Number of modules MTI - 350	Standard size	Rated values			Mode of light overload		Mode of heavy overload	
			I _{Nr} A	I _{MAXr} A	P _{Nr} kW	I _{LDr} A	R _{LDr} kW	I _{HDr} A	R _{HDr} kW
MT2000-3-160-400	2	On request	315	1260	160	309	160	143	125
MT2000-3-200-400	2		400	1260	200	392	200	179	160
MT2000-3-250-400	4		500	2520	250	490	250	224	200
MT2000-3-315-400	4		630	2520	315	617	315	282	250
MT2000-3-400-400	4		800	2520	400	784	400	358	315
MT2000-3-500-400	6		1000	3780	500	980	500	447	400
MT2000-3-630-400	6		1250	3780	630	1225	630	563	500
MT2000-3-800-400	8		1600	5040	800	1567	800	716	630
MT2000-3-1000-400	10		2000	6300	1000	1959	1000	894	800
MT2000-3-1250-400	12		2500	7560	1250	2449	1250	1118	1000

Parameters of modular automatic control devices with an active rectifier UN=690 V

Type designation	Number of modules MTI - 350	Standard size	Rated values			Mode of light overload		Mode of heavy overload	
			I _{Nr} A	I _{MAXr} A	P _{Nr} kW	I _{LDr} A	R _{LDr} kW	I _{HDr} A	R _{HDr} kW
MT2000-3-315-690	2	On request	315	1260	315	309	315	282	250
MT2000-3-400-690	2		400	1260	400	392	400	358	315
MT2000-3-500-690	4		500	2520	500	490	500	447	400
MT2000-3-630-690	4		630	2520	630	617	630	563	500
MT2000-3-800-690	4		800	2520	800	784	800	716	630
MT2000-3-1000-690	6		1000	3780	1000	980	1000	894	800
MT2000-3-1250-690	6		1250	3780	1250	1225	1250	1118	1000
MT2000-3-1600-690	8		1600	5040	1600	1567	1600	1431	1250
MT2000-3-2000-690	10		2000	6300	2000	1959	2000	1789	1600
MT2000-3-2500-690	12		2500	7560	2500	2449	2500	2236	2000

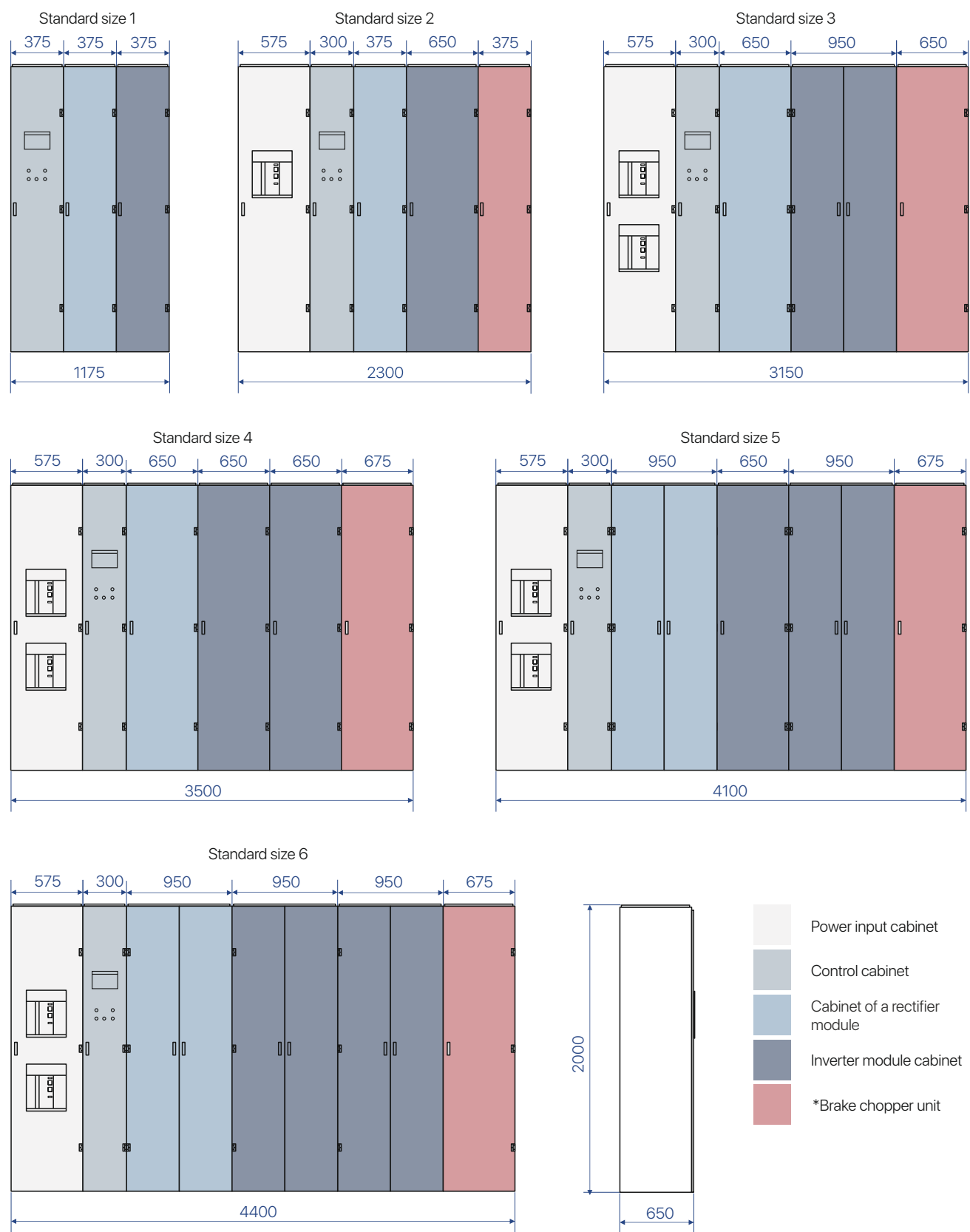
SINGLE MT1000 DRIVES

OVERALL DIMENSIONS



SINGLE DRIVES MT1000 + TP

OVERALL DIMENSIONS





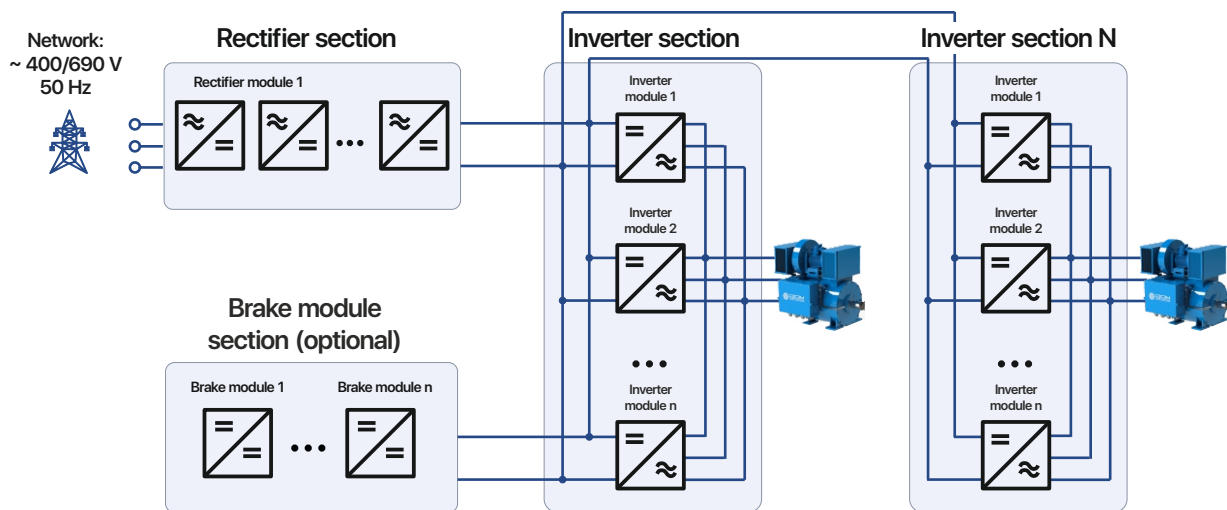
MT1000/MT2000 MULTI-MOTOR DRIVES

Multi-motor electric drives "**Momentum**" are designed with a single power source and a common DC bus, providing for a free exchange of energy between inverters.

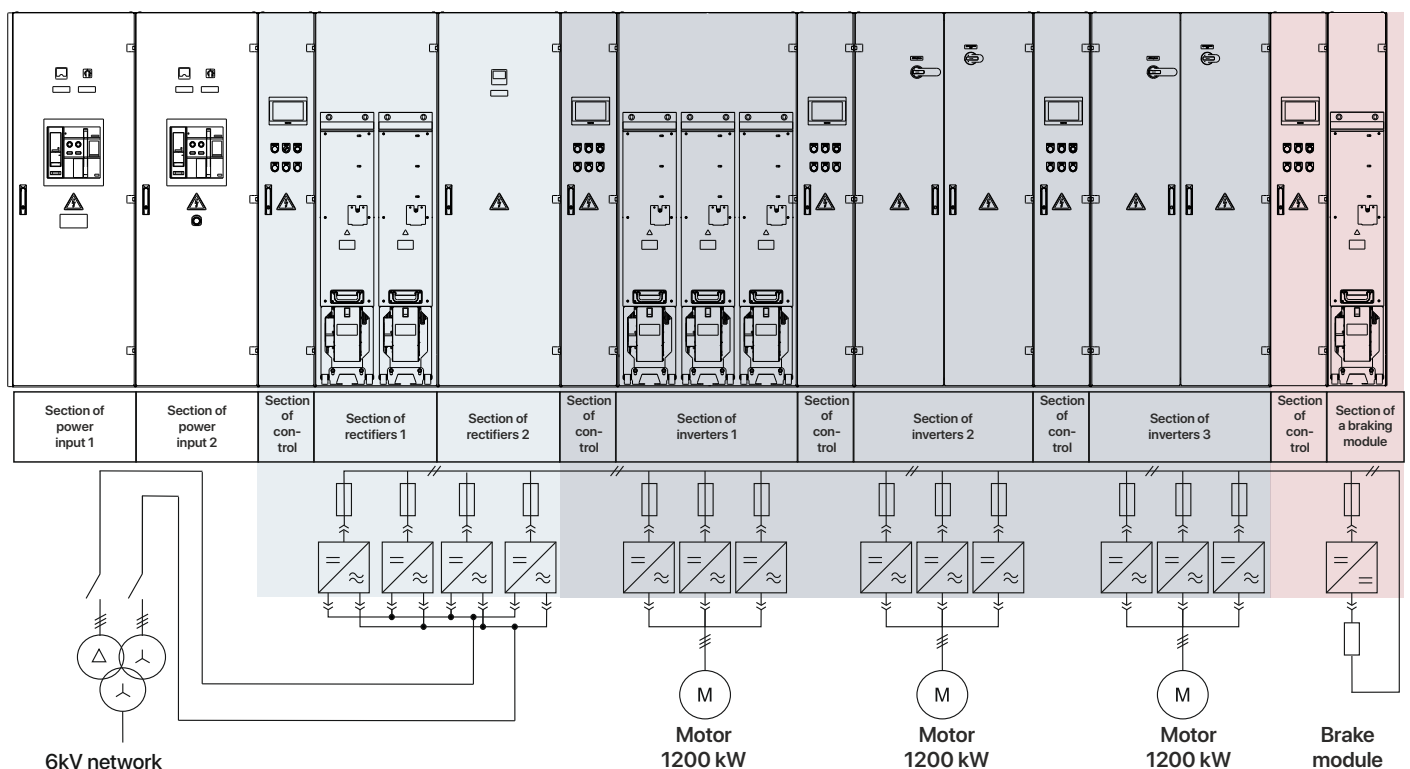
Multi-motor electric drives "**Momentum**" allow reducing the cost and dimensions of equipment for joint operation of electric drives by reducing the power of a common power source and using a common brake chopper unit.

The model range of multi-motor electric drives "**Momentum**" includes a wide range of rectifier, inverter and brake sections, which makes it possible to assemble a system with necessary characteristics.

All sections are fully finished products with their own control module, power supply and communication. **The sections can be used independently.**



Example of a multi-motor drive implementation



MT1000/MT2000 MULTI-MOTOR DRIVES

TECHNICAL DATA

The main parameters of the inverter sections UN = 400 V

Type designation	Number of modules MTI-350	Standard size	Rated values			Mode of light overload		Mode of heavy overload		Air flow, m ³ /hour
			I _{Nr} A	I _{MAXr} A	P _{Nr} kW	I _{LDr} A	R _{LDr} kW	I _{HDr} A	R _{HDr} kW	
SI-3-160-400	1	1	315	630	160	309	160	282	125	900
SI-3-200-400	1	1	400	630	200	392	200	358	160	900
SI-3-250-400	2	2	500	1260	250	490	250	447	200	1800
SI-3-315-400	2	2	630	1260	315	617	315	563	250	1800
SI-3-400-400	2	2	800	1260	400	784	400	716	315	1800
SI-3-500-400	3	3	1000	1890	500	980	500	894	400	2700
SI-3-630-400	3	3	1250	1890	630	1225	630	1118	500	2700
SI-3-800-400	4	4	1600	2520	800	1567	800	1431	630	3600
SI-3-1000-400	5	5	2000	3150	1000	1959	1000	1789	800	4500
SI-3-1250-400	6	6	2500	3780	1250	2449	1250	2236	1000	5400

The main parameters of the inverter sections U N= 690 V

Type designation	Number of modules MTI-350	Standard size	Rated values			Mode of light overload		Mode of heavy overload		Air flow, m ³ /hour
			I _{Nr} A	I _{MAXr} A	P _{Nr} kW	I _{LDr} A	R _{LDr} kW	I _{HDr} A	R _{HDr} kW	
SI-3-315-690	1	1	315	630	315	309	315	282	250	900
SI-3-400-690	1	1	400	630	400	392	400	358	315	900
SI-3-500-690	2	2	500	1260	500	490	500	447	400	1800
SI-3-630-690	2	2	630	1260	630	617	630	563	500	1800
SI-3-800-690	2	2	800	1260	800	784	800	716	630	1800
SI-3-1000-690	3	3	1000	1890	1000	980	1000	894	800	2700
SI-3-1250-690	3	3	1250	1890	1250	1225	1250	1118	1000	2700
SI-3-1600-690	4	4	1600	2520	1600	1567	1500	1431	1250	3600
SI-3-2000-690	5	5	2000	3150	2000	1959	1900	1789	1500	4500
SI-3-2500-690	6	6	2500	3780	2500	2449	2400	2236	1900	5400

MT1000/MT2000 MULTI-MOTOR DRIVES

TECHNICAL DATA

The main parameters of the rectifier sections $U_N = 400\text{ V}$

Type designation*	Number of modules		Standard size	Rated values		Air flow, m3/hour
	VM-250	VM-500		I _{Nr} A	S _{Nr} kVA	
6-pulse diode rectifier						
SV-D6-400-400	1	-	1	400	315	900
SV-D6-500-400	-	1	1	500	400	900
SV-D6-630-400	-	1	1	630	500	900
SV-D6-800-400	-	1	1	800	630	900
12-pulse diode rectifier						
SV-D12-1000-400	-	2	2	1000	800	1800
SV-D12-1250-400	-	2	2	1250	1000	1800
SV-D12-1600-400	-	2	2	1600	1250	1800
SV-D12-2000-400	-	3	3	2000	1600	2700
SV-D12-2500-400	-	3	3	2500	2000	2700
SV-D12-3600-400	-	4	4	3150	2500	3600
SV-D12-4200-400	-	5	5	4000	3150	4500

The main parameters of the rectifier sections $U_N = 690\text{ V}$

Type designation*	Number of modules		Standard size	Rated values		Air flow, m ³ /hour
	VM-250	VM-500		I _{Nr} A	S _{Nr} kVA	
6-pulse diode rectifier						
SV-D6-400-690	1	-	1	400	400	900
SV-D6-500-690	-	1	1	500	500	900
SV-D6-630-690	-	1	1	630	630	900
SV-D6-800-690	-	1	1	800	800	900
12-pulse diode rectifier						
SV-D12-1000-690	-	2	2	1000	1000	1800
SV-D12-1250-690	-	2	2	1250	1250	1800
SV-D12-1600-690	-	2	2	1600	1600	1800
SV-D12-2000-690	-	3	3	2000	2000	2700
SV-D12-2500-690	-	3	3	2500	2500	2700
SV-D12-3600-690	-	4	4	3150	3150	3600
SV-D12-4200-690	-	5	5	4000	4000	4500

MT1000/MT2000 MULTI-MOTOR DRIVES

TECHNICAL DATA

Brake section for multi-motor electric drives based on 3-phase brake chopper units							
$U_N = 400\text{ V}$							
Type designation	Number of modules MDI-250	Standard size	Rated values				Air flow, m ³ /hour
			R_{MIN} Ohm	R_{MAX} Ohm	$P_{BR,MAX}(R_{MIN})$, kW	$P_{BR,MAX}(R_{MIN})$, kW	
ST-450-400	1	1	2.5	3.0	450	390	900
ST-900-400	2	2	2.5	3.0	900	780	1800
ST-1350-400	3	3	2.5	3.0	1350	1170	2700
ST-1800-400	4	4	2.5	3.0	1800	1560	3600
ST-5400-400	5	5	2.5	3.0	2250	1950	4500

Brake section for multi-motor electric drives based on 3-phase brake chopper units							
$U_N = 690\text{ V}$							
Type designation	Number of modules MDI-250	Standard size	Rated values				Air flow, m ³ /hour
			R_{MIN} Ohm	R_{MAX} Ohm	$P_{BR,MAX}(R_{MIN})$, kW	$P_{BR,MAX}(R_{MIN})$, kW	
ST-1350-690	1	1	2.5	3.0	1350	1200	900
ST-2700-690	2	2	2.5	3.0	2700	2400	1800
ST-4050-690	3	3	2.5	3.0	4050	3600	2700
ST-5400-690	4	4	2.5	3.0	5400	4800	3600
ST-6750-690	5	5	2.5	3.0	6750	6000	4500

R_{MIN} Ohm - Minimum permitted value of the resistance of the brake resistor for one phase of the brake module.

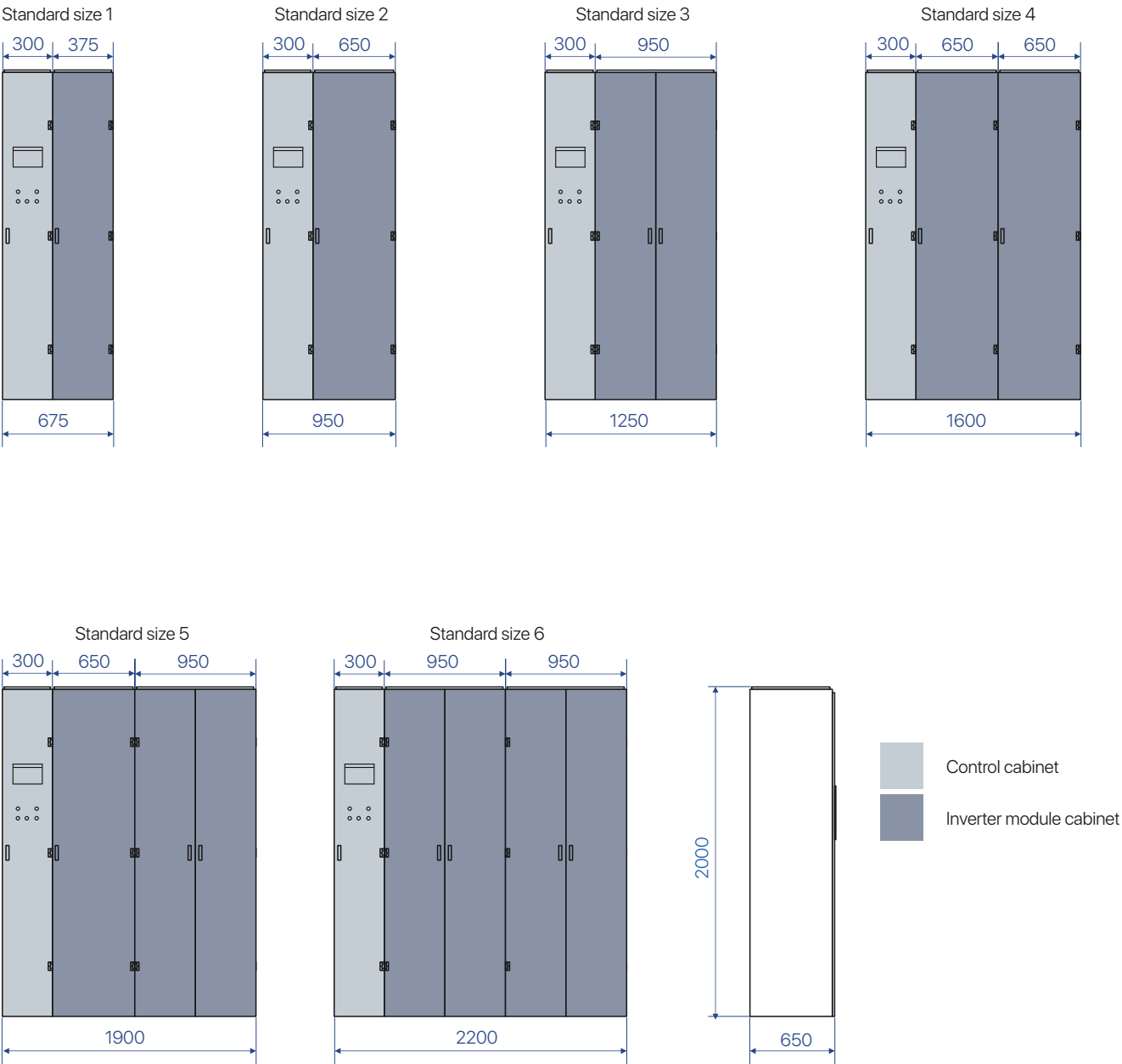
R_{MAX} Ohm - Value of the resistance of the brake resistor for one phase of the brake module corresponding to the maximum achieved long-term braking power.

NOTE - Connect one resistor per phase of the brake module.

MT1000/MT2000 MULTI-MOTOR DRIVES

OVERALL DIMENSIONS

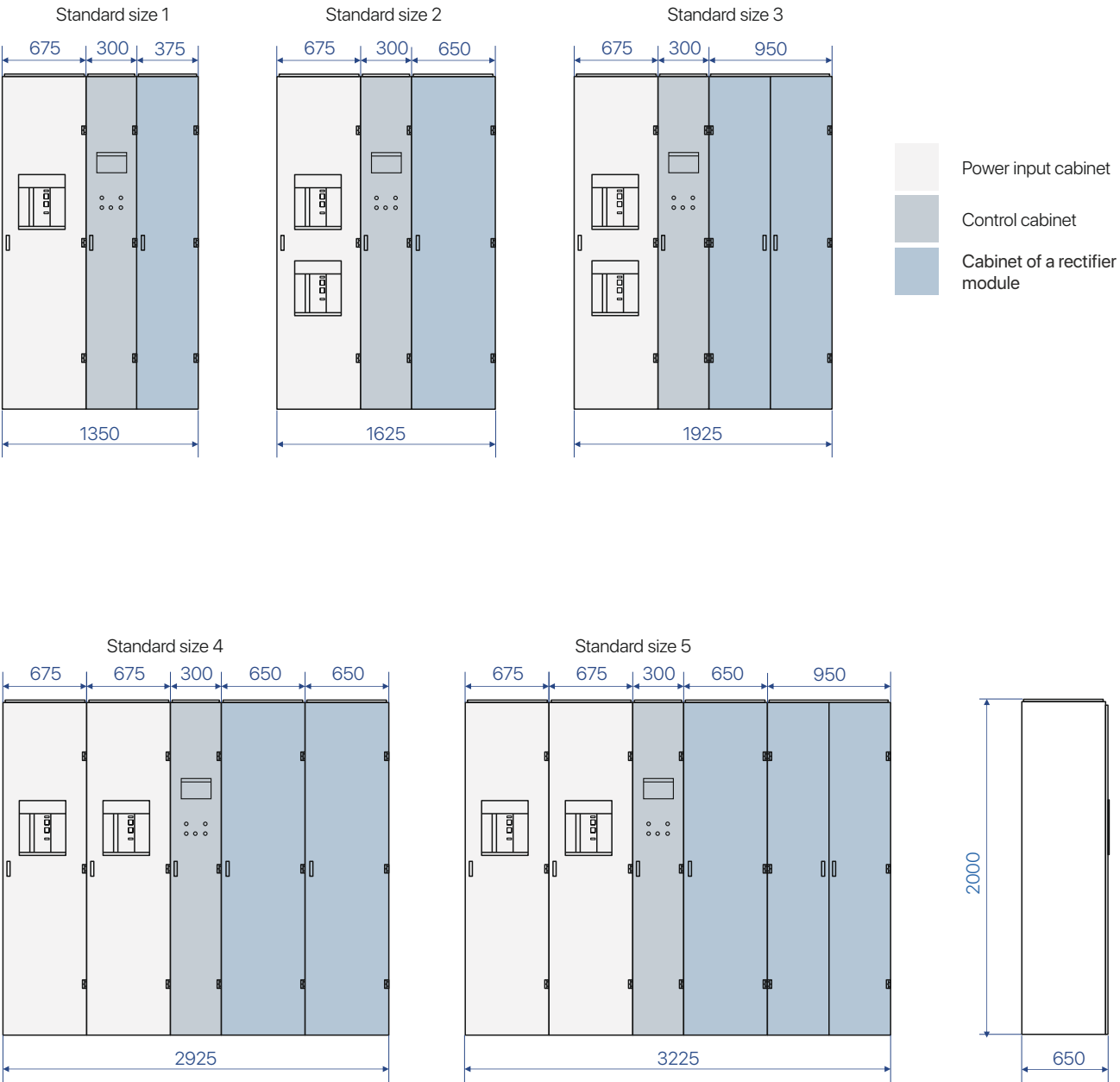
■ Overall dimensions of the inverter sections



MT1000/MT2000 MULTI-MOTOR DRIVES

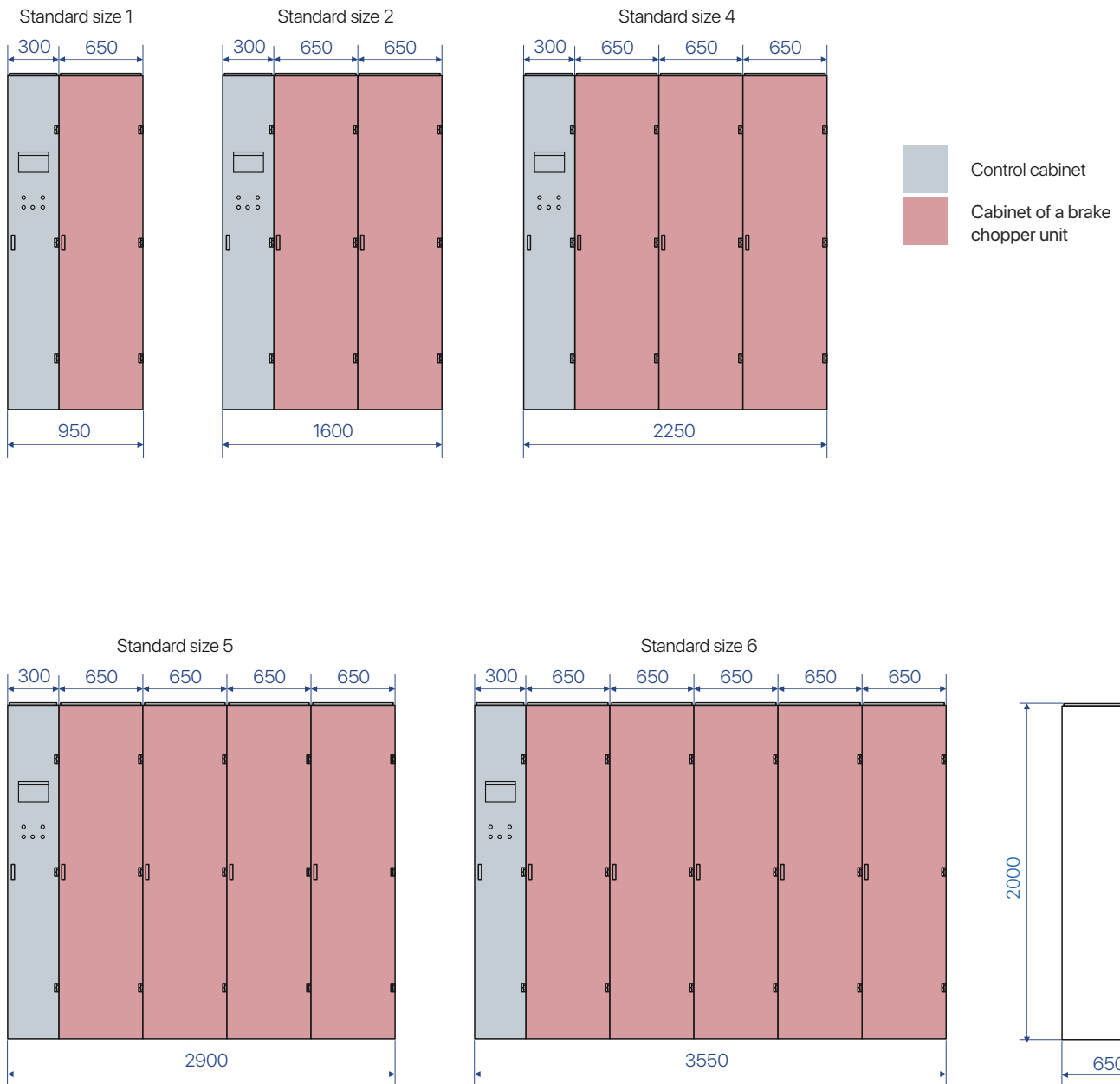
OVERALL DIMENSIONS

■ Overall dimensions of the rectifier sections



MT1000/MT2000 MULTI-MOTOR DRIVES OVERALL DIMENSIONS

- Overall dimensions of the brake chopper unit





NETWORK INVERTERS. SPECIFICATIONS

Technical data:

Parameter	Value
AC output parameters	
Connection diagram	3ph + PE (For a circuit with a grounded neutral an external transformer is required)
Rated power, kW	200...1600
Rated voltage, V	400±10%
Rated frequency, Hz	50±5%
Rated current, A	315...2400
Power factor	0.7...1.0
Degree of current distortion THDi, %	< 3
DC output parameters	
Minimum voltage DC, V	550
Maximum voltage DC, V	1100
Function	
Source P/Q	Standard
U/f source with droop control	Standard
Peak shaving	for ESS
Peak load compensation	for ESS
Spinning reserve	for ESS
Dark start	Standard
Islanding detection	Standard
Maximum Power Point Tracking (MPPT)	for PVA
Interfaces and data transfer protocols	
Human-machine interface	7" Color operator touch panel
Modbus RTU	Standard
Profibus DP	Option
Modbus TCP	Option
Ethernet IP	On request
CANOpen	On request
Climatic characteristics	
Ambient air temperature:	
Transportation/storage	minus 40 to +70C
Operating temperature	from minus 10 to +40 °C without power reduction from +40 to +50C with a current reduction by 1% at the temperature increase 1 °C
Other characteristics	
Module cooling method	Air
Installation height above the sea level	Up to 1000 m without power reduction Over 1000 m, with reduced performance and current reduction by 1% per every 100 m
Protection degree	IP 20 (Standard) IP 54 (Optional)
Coating color	RAL 7035
Certificates of conformity	TR CU 004/2011 TR CU 020/2011

NETWORK INVERTERS. TECHNICAL DATA

The main parameters of network inverters $U_N = 400 \text{ V}$

Type designation	Number of modules MTI - 350	Standard size	Rated values		
			P_N , kW	I_{CONT} , A	S_{CONT} , kVA
MT2000-3-200-400 xxx	1	On request	200	480	332
MT2000-3-250-400 xxx	1		250	480	332
MT2000-3-315-400 xxx	1		315	480	332
MT2000-3-400-400 xxx	2		400	960	664
MT2000-3-500-400 xxx	2		500	960	664
MT2000-3-630-400 xxx	2		630	960	664
MT2000-3-800-400 xxx	3		800	1440	996
MT2000-3-1000-400 xxx	4		1000	1920	1329
MT2000-3-1250-400 xxx	4		1250	1920	1329
MT2000-3-1600-400 xxx	5		1600	2400	1661

where - xxx is replaced by:

ESS - Application for energy storage systems

PVA - Application for photovoltaic systems (solar inverter)

STATCOM - static reactive power compensator

DVDC is a dynamic voltage distortion compensator

SERVICE SOFTWARE

Multiplatform software

The setup and maintenance of the Momentum converters are conducted by a single ServicePanel software which allows the user to view and edit the drive parameters.

The ServicePanel software is used for commissioning the converter and for subsequent maintenance. The Service Panel software is connected to the converter over an Ethernet network and does not require the purchase of additional equipment.

It is possible to work simultaneously with several converters through a single information network.

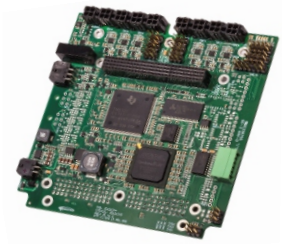
ServicePanel features:

- The converter parameters are presented in the form of mnemonic diagrams. A conventional tabular representation of the parameters is also available.
- The signals can be observed in real time on a graph as well as saved in a graphic file.
- Converter parameters can be saved and downloaded from a file, as well as parameter sets can be compared between devices.
- The converter can be controlled via a virtual control panel. Virtual remote controls can be created using the built-in editor and linked to all available signals and converter parameters.
- ServicePanel software works on several platforms, including those running Android OS on mobile devices.



Built-in electronics and the control stem

The uniqueness of the control algorithms and non-standard solutions made us to switch to electronics and a control system of our own design.



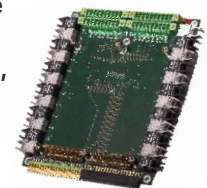
Due to this, we were able to expand the capabilities of modular Momentum frequency converters and provide you with the opportunity to experience all the benefits of using our equipment.

Large selection of additional devices

Momentum frequency converters can connect many additional devices: communication modules, signal processing and conversion modules, protection devices, etc.

Our converter supports both its own equipment and third-party equipment.

A unified set of peripheral boards with analog and discrete I/O for the installation as part of the MIT-350 modules, MDI-250, VM-500, etc.



Communication board supporting interfaces Modbus RTU, Modbus TCP, Profibus DP, CANOpen



Signal Level Converter for incremental encoders with a 24 V HTL output



BASIC MODULES:

RECTIFIER MODULE VM-500D

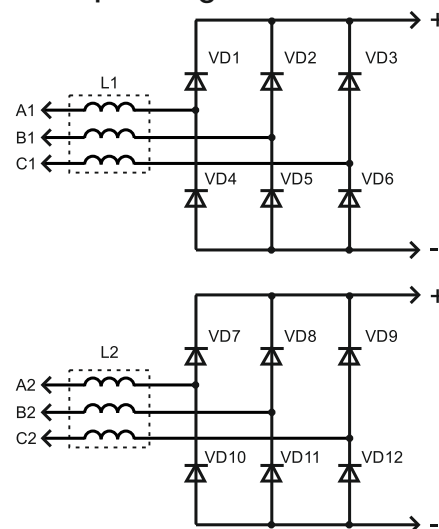
Technical specifications:

The **VM-500D** rectifier module has two uncontrolled rectifiers made according to a three-phase bridge circuit.
The **VM-500D** rectifier module has a **built-in mains choke**, as well as a cooling fan with an adjustable rotation frequency.



Power Pr	800 kW
Cooling	Air
Dimensions, WxHxD	281x1429x432 mm
Weight	145 kg

Power part diagram:



RECTIFIER MODULE VM-500T

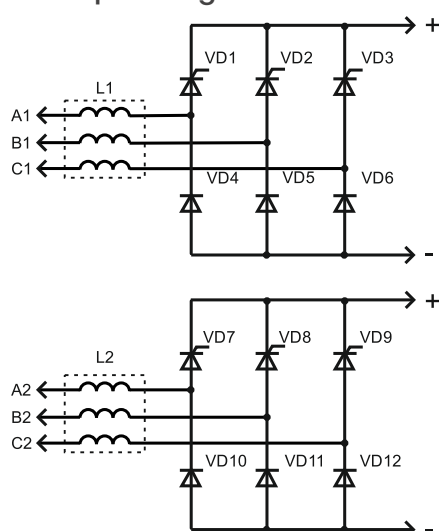
Technical specifications:

The **VM-500T** rectifier module has two semi-controlled rectifiers made according to a three-phase bridge circuit.
The **VM-500T** rectifier module has a **built-in mains choke**, as well as a cooling fan with an adjustable rotation frequency.

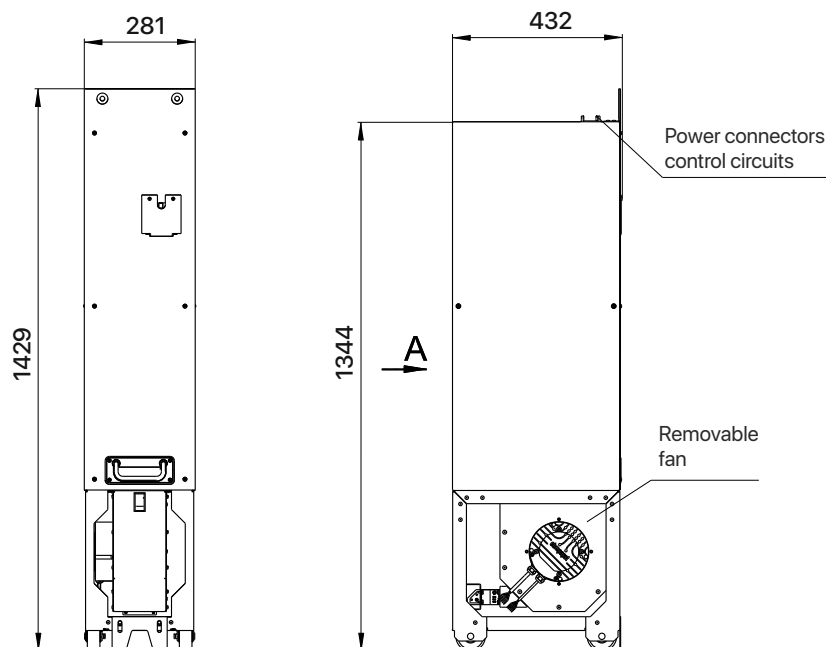


Power Pr	800 kW
Cooling	Air
Dimensions, WxHxD	281x1430x432 mm
Weight	145 kg

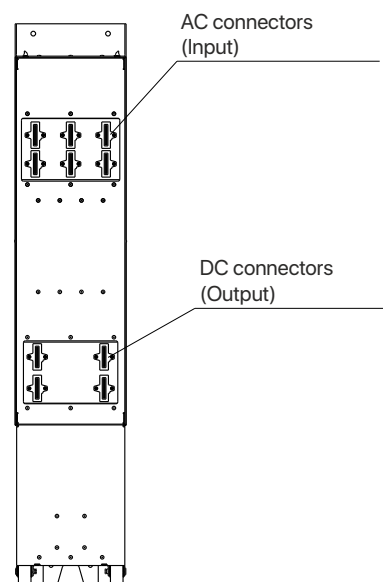
Power part diagram:



Overall dimensions:



A



BASIC MODULES:

MTI-350 INVERTER MODULE (Three-level)

Technical specifications:

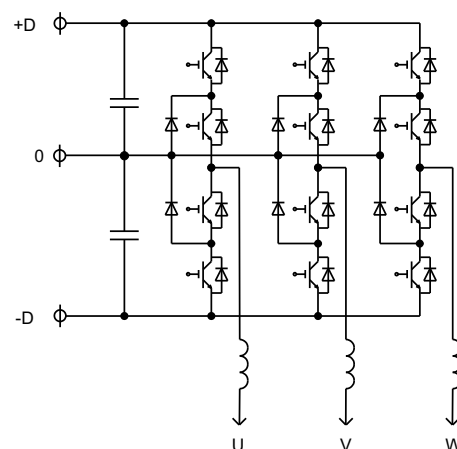
The power part of the **MTI-350** inverter module is made according to a three-level circuit.

The **MTI-350** inverter module has a built-in dU/dt filter, as well as a cooling fan with an adjustable rotation frequency.



Power P_r	450 kW
Output voltage, U_r	from 0 to 690 V
Frequency, f_r	from 0 to 400 Hz
Cooling	Air
Dimensions, $W \times H \times D$	281x1430x590 mm
Weight	45 kg

Power part diagram:



INVERTER MODULE MDI-350 (Two-level)

Technical specifications:

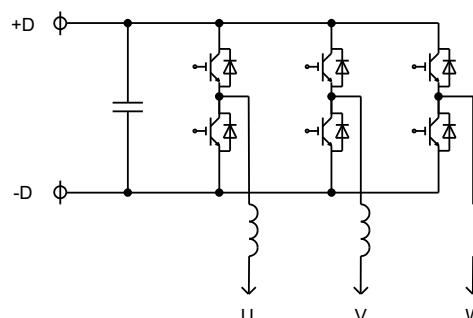
The power part of the **MDI-350** inverter module is made according to a three-phase bridge circuit.

The **MDI-350** inverter module has a built-in dU/dt filter, as well as a cooling fan with an adjustable rotation frequency.

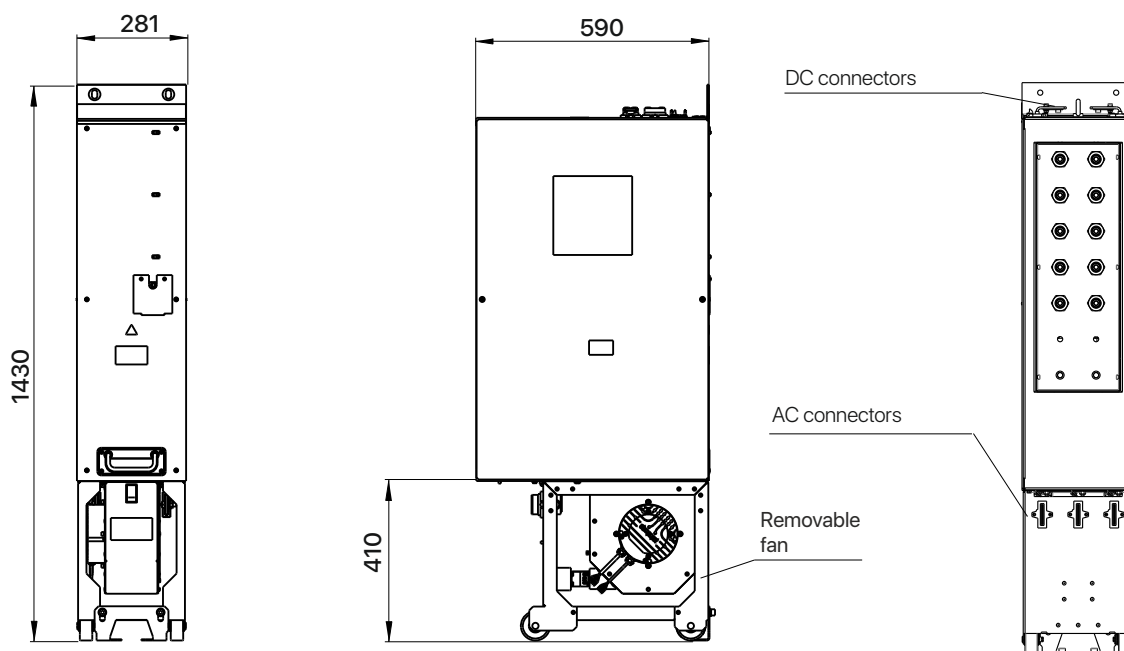


Power P_r	450 kW
Output voltage, U_r	from 0 to 690 V
Frequency, f_r	from 0 to 400 Hz
Cooling	Air
Dimensions, $W \times H \times D$	282x1430x590 mm
Weight	145 kg

Power part diagram:



Overall dimensions:



BASIC MODULES:

CHARGE-DISCHARGE MODULE **PZR-250**

Technical specifications:



The **charge/discharge converter PZR-250** is a bidirectional DC converter (DC/DC converter) with the ability to increase/decrease voltage and limit current.

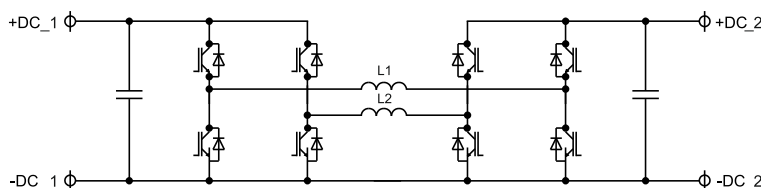
The **PZR-250** is designed for controlled charge/discharge of high-power energy storage devices based on rechargeable batteries and supercapacitors, as well as for matching DC circuits with different voltage levels.

A unique patented solution that will allow controlling the process of charging/discharging energy storage devices of high energy intensity.

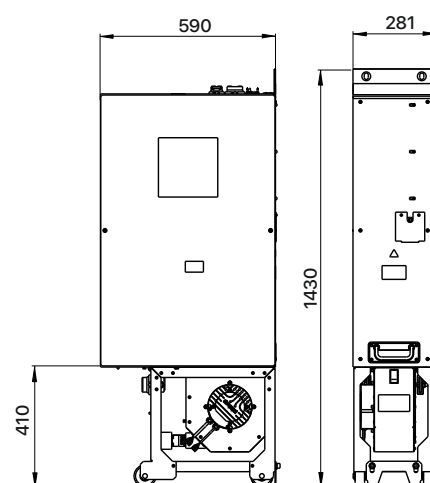
The **PZR-250** module has a built-in cooling fan with an adjustable rotation frequency.

Power, Pr	250 kW
Cooling	Air
Dimensions, WxHxD	281x1430x590 mm
Weight	200 kg

Power part diagram:



Overall dimensions:



BRAKE CHOPPER UNIT **MTP-450**

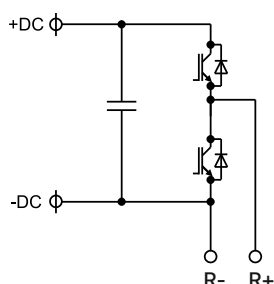
Technical specifications:



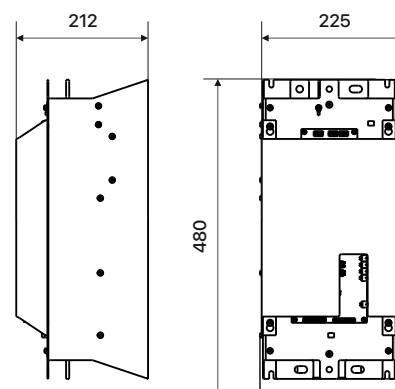
During regenerative braking, when the voltage in the intermediate circuit of the frequency converter exceeds a certain limit, the brake module connects the DC bus to the brake resistor.

Peak power Pbr.max	450 kW
Continuous power Pbr.const	90 kW
Cooling	Air passive
Dimensions, WxHxD	225x480x212 mm
Weight	13.5 kg

Power part diagram:



Overall dimensions:



OPTIONS AND SPARE PARTS

Order codes for spare parts and accessories

Name	Order code
I/O module for MTI-350	MT1000.468373.0002-01
I/O module for VM-500D	MT1000.468373.0002-02
I/O module for MDI-250	MT1000.468373.0002-03
Snubber board	MT1000.673841.0004
HTL Encoder Signal Converter	MT1000.468153.0002
The IGBT IGBT driver of the 12th class in the PrimePack case	EPT.421413.001-01
The IGBT IGBT driver of the 17th class in the PrimePack package	EPT.421413.001-02
Temperature meter board	EPT.426419.001
Power supply +/-15V, 15V	MT1000.436635.0001-01
SSI Converter	MT1000.408118.0001
Ethernet + Profibus DP communication board	MT1000.468351.0001-01
Communication module with 4 optical channels	MT1000.468373.0001
Control module	MT1000.468332.0001
Fan for MTI, VM and MDI modules (complete)	MT1000.345229.0001
Power modules	
Inverter module MTI-350-690	MT1000.435531.002
Inverter module MDI-250-690	MT1000.435531.007
Rectifier module VM-500-690D	MT1000.435514.002
MTP-450 Brake Chopper Unit Module	MT2000.435451.0003
Balancing device	MT1000.435251.835

OPTIONS AND SPARE PARTS

Ordering options

	Option	Order code	MT1000- X-XXX-XXX ind.	SI-X-XXX	SV-D12-XXX	ST-XXX
Constructive						
Cooling air intake through the cabinet bottom			●	●	●	●
Cooling air intake through the doors	+ZVD		■	■	■	■
IP54 shell	+IP54		■	■	■	■
Additional equipment						
Anti-condensation heater			●	●	●	●
Red button of emergency stop on the front cabinet door			●	-	●	-
Voltmeter with a switch of phase selection			●	-	●	-
Device for measuring insulation resistance Bender IRDH 265-4 for networks with an insulated neutral			●	-	●	-
Balancing device ¹⁾	+UB	MT1000. 435251.835	■	■	-	-
Additional converter of an encoder with HTL interface ²⁾	+HTL2	MT1000. 468153.0002	■	■	-	-
Converter for an absolute encoder with SSI interface	+SSI	MT1000. 408118.0001	■	■	-	-
Brake chopper unit						
Integrated brake chopper unit ³⁾	+TP		■	-	-	-
Resistor panel ⁴⁾	+PR	MT1000. 434313.0005	■	-	-	■
Control panel						
Colored graphic control panel			●	●	●	●
Communication interfaces						
Interface/protocol RS-485/Modbus RTU			●	●	●	●
Ethernet interface module	+ETN		■	■	■	■
Profibus DP Interface module	+ DP	MT1000. 468351.0001-01	■	■	■	■
CAN interface module	+CAN		■	■	■	■

● standard

■ option

OPTIONS AND SPARE PARTS

Ordering options

	Option	Order code	MT1000- X-XXX-XXX ind.	SI-X-XXX	SV-D12-XXX	ST-XXX
Cable input						
Pins to connect external voltage for power supply of the control system (230V, for UPS connection)			●	●	●	●
Power supply by cables			●	●	●	●
Feeding control cables from below			●	●	●	●
Documentation						
User Manual in Russian			●	●	●	●
Firmware software						
Control program for AD			●	●	-	-
Control program for SRM ⁵⁾	+ SRM		■	■	-	-

● standard

■ option

NOTES:

¹⁾ The MT1000.435251.835 balancing device is necessary for the MTI-350 modules;

²⁾ The MT1000.468332.0001 control module allows connecting up to two encoders. Using the second encoder in the software - on request;

³⁾ See the type of brake chopper unit in the technical data tables;

⁴⁾ The MT1000.434313.0005 resistor panel is designed to use the MTI-350 as a brake chopper unit;

⁵⁾ The +SSI option is required to work with the SRD.

APPLICATIONS



FREQUENCY CONVERTERS FOR A SYNCHRONOUS REACTIVE ELECTRIC DRIVE

With the help of a special software version (option +SRM + SSI), commercially available MT1000 electric drives **can work with synchronous jet motors (SJM)**. SJMs have a high torque overload capacity and a "cold rotor" without electrical losses that does not require forced cooling.

At the same time, the motor design is similar to an asynchronous motor: it does not contain expensive materials, it is easy to manufacture and mechanically reliable.

The absence of rotor electrical losses makes it possible to make electric motors without forced purging, which may be in demand for applications with a polluted environment or explosion-proof design.

The SJM electromagnetic torque is proportional to the current and allows for a five-fold overload, providing unsurpassed dynamic characteristics, which is especially important for positional electric drives with extreme speed.

The SJM is developed by the **Snezhinsky plant of special electric machines**, which is part of the **Group of Companies "Drive Technique"**.

We are ready to supply a complete tested electric drive kit.

FREQUENCY CONVERTERS FOR MAGNETIC LIQUID STEEL AGITATORS

On the basis of commercially available **MT1000/MT2000** frequency converters, it is possible to develop solutions for powering a three-phase stator of a magnetic agitator of liquid steel.

According to the customer's technical specification, special functions can be implemented to change the current value, frequency, mixing direction and other necessary parameters for the FC correct operation in the technological process, as well as special protection types for the constant component in phase currents, for phase current asymmetry and reduction of stator insulation resistance.

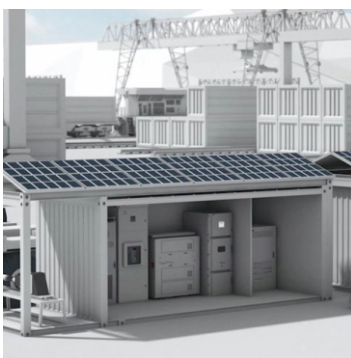
APPLICATIONS



NETWORK ENERGY STORAGE DEVICE (ESS)

Network energy storage devices (ESS) are designed to provide high-quality power supply to industrial facilities and allow for:

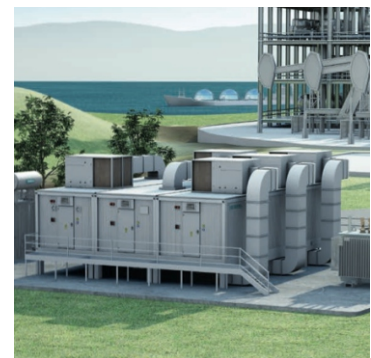
- protecting gas piston units from sudden load changes;
- saving diesel fuel and engine life, running on fewer diesel engines;
- cut off peaks in power consumption;
- working without downtime when the main power source is turned off until the commissioning of spare generators;
- preventing voltage subsidence;
- limiting electricity consumption during peak cost hours due to accumulated cheap energy;
- eliminating limitations on peak power transmission lines, asymmetry, non-sine shape, frequency deviations;
- integrating renewable energy sources into the grid.



ESS for traction networks of railway and urban electric transport



ESS for insulated energy systems (including renewable energy sources)



ESS for energy complexes of oil and gas, metallurgical and energy companies

The choice of the type of chemical energy storage depends on the required capacity, power, number of operating cycles, operating temperature and economic feasibility of application. STC "Drive Technique" has experience in creating hybrid ESS that combine the advantages of using different energy storage technologies.

APPLICATIONS



INVERTER FOR SOLAR POWER PLANTS

Our company places a special focus on the development of promising areas, one of which is alternative energy.

Modular inverters of the MT2000 FVC series are adapted to the use as frequency converters for solar power plants.

The use of three-level inverters will allow for:

- To reduce the cost of reactor equipment by 2 times;
- To increase the efficiency of the system up to 98.5%;
- To obtain an almost perfectly sinusoidal shape of voltage and current.

Inverter protection:

On the DC side

- High-speed PV fuses;
- Surge arresters;
- Protection against pulse interference;
- Load resistor for discharging energy from a DC link in case of a sudden load break.

On the AC side

- High-speed fuses to protect the inverter power switches;
- Surge arresters;
- Protection against pulse interference;
- Earth fault protection and insulation monitoring in the IT system (for inverters connected in a star to 0.4 kV windings).

General protections

- Thermal protection of the inverter, which monitors thermal conditions and controls the rotation speed of the cooling fans in the cabinet;
- Anti-condensate heating.

The MPPT function:

The MPPT controller has control channels for voltages and currents, frequency, and other parameters.

The mathematics is implemented on a controller with high-speed inputs and outputs. The controller also has the function of dynamic network support which significantly improves the static and dynamic stability of the power system node.

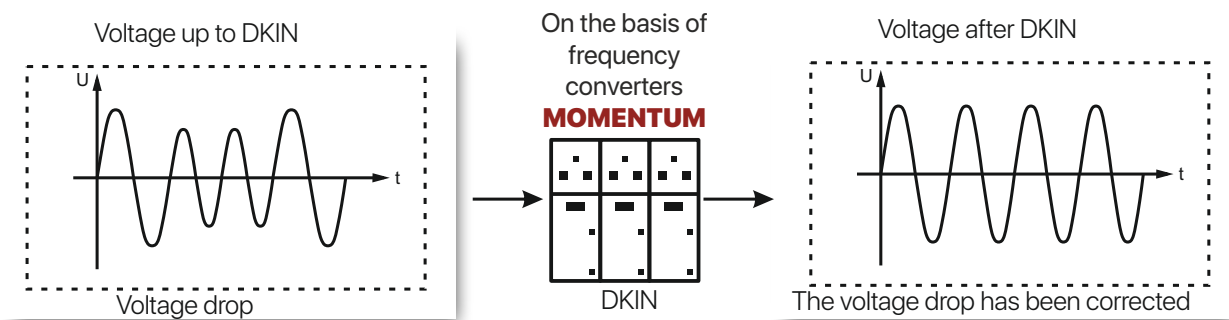
Synchronization with the network:

Synchronization occurs automatically and without current surges. All processes are controlled by the control system. Voltage and current in the industrial circuit are controlled by each inverter separately, keeping them at a level that allows them to obtain maximum power (MPPT). The function of dynamic network support is implemented.

APPLICATIONS

DYNAMIC COMPENSATOR VOLTAGE DISTORTION (DKIN)

DKIN is a three-phase medium or low voltage device that corrects voltage dips, phase angles of voltage vectors, unbalance and overvoltage, providing continuous voltage control. The standard DKIN does not require energy accumulation and storage, as it extracts the necessary additional power to provide voltage correction from the power supply source.



■ DKIN without an energy storage device

In case of a droop/increase in the mains voltage or phase distortion, the DKIN corrects the mains voltage using the TV surge transformer. In case of malfunction, the booster transformer is shunted by a bypass contactor BC.

The transformer voltage is added to the mains voltage, so the voltage at the consumer remains in the acceptable range.

The additional voltage is generated by a frequency converter consisting of an inverter module IM, a sine filter FS and a rectifier module VM.

Such a scheme has the following advantages:

- The power of the frequency converter is two to three times less than the full power of the protected consumer, which reduces the cost and dimensions of the converter.
- The installation does not require an additional energy source (rechargeable battery) for operation – the energy for compensation is taken from the mains.

■ DKIN with an energy storage device

In this option, a charge/discharge converter (CDC) and an energy storage device (ESS) on supercapacitors are added to the DKIN circuit.

Supercapacitors are chosen because of their longer service life and ease of maintenance compared to batteries.

The CDC is needed to coordinate the voltage levels of the storage device and the converter, and to control the energy flows from the storage device to the industrial circuit and back.



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