

# Bidirectional frequency converter PAPIR series with power up to 5 MW



## Description

Bidirectional frequency converter PAPIR is produced in power range 1 to 5 MW. It is widely used in the propulsion control systems of the vessels – the propulsion/steering unit and thruster. PAPIR ensures a smooth start and stop of the electric motor, controls its temperature, power and speed, as well as protects the electric drive.

The Frequency converter functions as a voltage converter with pulse width modulation and active rectifier based on high-power IGBT transistors. It is highly resistant to harsh environmental conditions and temperature cycling.

PAPIR microcontrollers are based on up-to-date processor with 180 million flops performance. The control system maintains high accuracy of output frequency at 0.1%. The converter supports vector (both with and w/o encoder) and scalar (w/o encoder) types of the electric motor control.

Additional section of water circulation system is available on request.



Control panel

## Brief technical specifications

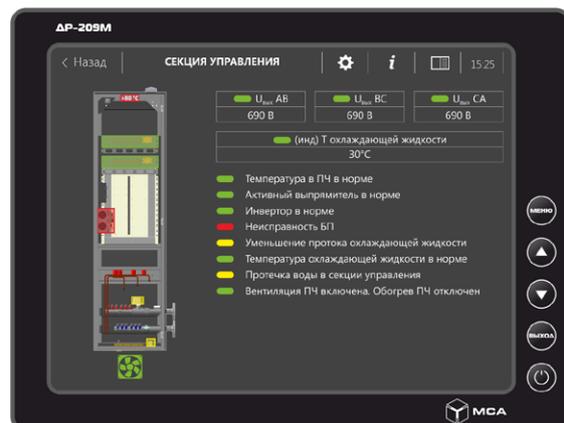
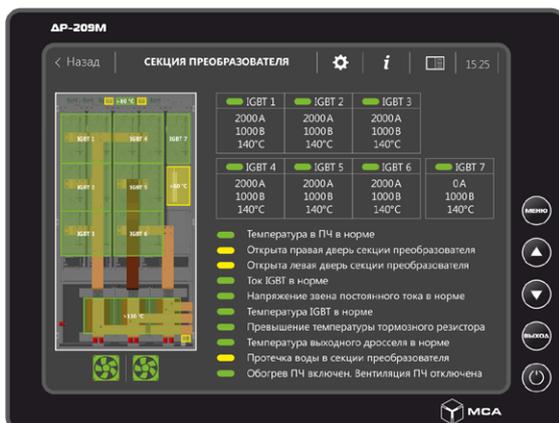
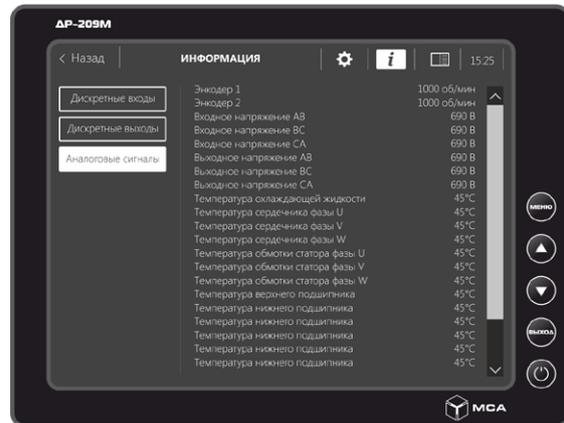
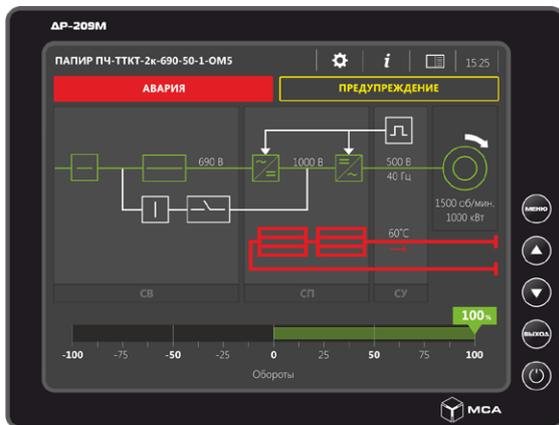
<b>Rated output power, MW</b>	1.2	2.4
<b>Max. power consumption (incl. overload), MW</b>	1.855	3.711
<b>Input power supply</b>	3x690V, 50Hz	
<b>Output voltage, V</b>	0 - 690	
<b>Rated output current, A</b>	1005	2010
<b>Overload capacity, %</b>	120% - 60s, 150% - 3s (after 10 minutes)	
<b>Output frequency, Hz</b>	0...60	
<b>Power factor <math>\cos \varphi</math> (rated speed)</b>	0.95	
<b>Efficiency, %</b>	97	
<b>Generated thermal power, kW</b>	42	78
<b>Nominal flow rate of cooling fluid, l/min</b>	40	72

## Features

The frequency converter operates together with the control systems of higher level via RS-422/485 interface. Additional devices such as temperature sensors, encoders, tachometers, etc. can be connected. The converter's software performs in-depth diagnostics of its condition, non-volatile error and alarm history ensures operation monitoring.

The control panel has 8" touch screen produced by «NPK Morsvyazavtomatica» with user-friendly interface, as well as duplicate control buttons, rpm and motor load indicators, sound and light signaling units and emergency stop button.

The main screen displays key information on the FC status: a position of the power contactors, cooling system status, rpm and motor load indicators and warning / alarm notifications. Additional screens enable to perform in-depth diagnostics of the electric drive.

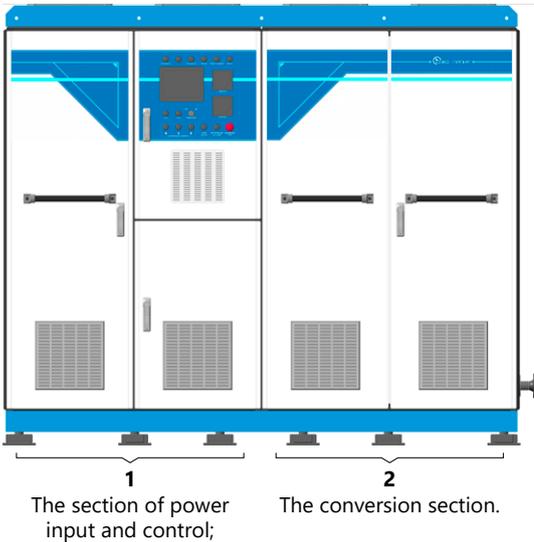


Interface screen

## PAPIR frequency converter has two components

All mounting operations are much easier now due to the separate transportation and installation of the sections onboard. The enclosures of the sections have heightened rigidity and mechanical reliability. Simultaneous operation of two converters enables to reach maximum power of 5 MW.

Max. weight of the FC with power 2.4 MW is 2,800 kg under the dimensions 2400x2000x800 (WxHxD). The converter's power-to-weight ratio is more than 800 W / kg and 625 W / dm<sup>3</sup>. IP rating – IP44.



### The converter consists of two sections:

- The power input and control section is in charge of power input, switching and distribution, control and protection of the internal devices, control from the local panel, interfacing with external ship systems and units. The section includes voltage control relay, automatic circuit breaker, input filters, voltage sensors, controllers and other equipment.
- The conversion section ensures voltage level and frequency conversion, and consists of the controlled rectifier, DC link with water-cooled brake resistor and voltage inverter.



*Frequency converter  
model 2 «left» 2.4 MW (1.2 MW)*

Two models with mirror arrangement of the sections make on-board installation of the converters easy and convenient. Model codes are arranged at order:

### ■ Model 1 «Right»

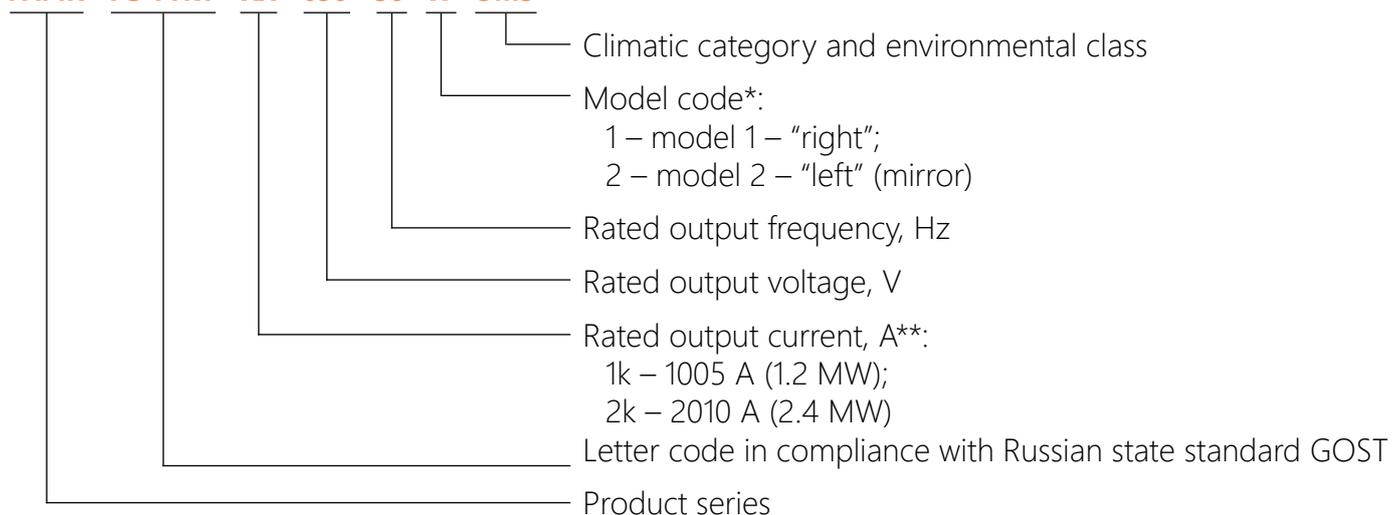
Power input is on the left side, output – on the right; the sections are located from the left to right.

### ■ Model 2 «Left»

Power input is on the right side, output – on the left; mirror arrangement of the sections.

## Model code (Codes to order)

**PAPIR - FC-TTKT - XX - 690 - 50 - X - OM5**



\* Model code helps to define a position of the sections relative to each other.

\*\* To increase power up to 4.8 MW connect two converters (in parallel) with power 2.4 MW “left” or “right” models in any combinations.

Sample order code for the converter with output current 2010 A (power 2.4 MW), “right” model: the frequency converter PAPIR series FC-TTKT-2k-690-50-1-OM5.

The frequency converter PAPIR series by Russian manufacturer REC Ltd is produced in compliance with the Russian State Standard and granted with the RMRS certificate. State-of-the-art science-based production facilities with several parallel assembly lines enable us to provide reliable equipment in the shortest time.



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by Russian Maritime  
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