

## High-Speed Electric Motor Drives: Slotless Stators

### › REVOLVING AROUND EFFICIENCY AND RELIABILITY

Inpraise Systems is an SME specializing in prototyping and small series production of high-speed turbomachines integrated with power and control electronics for critical applications in space, power, chemical, and transportation industries.

The product range covers pumps, compressors, turbines, motors, generators, and inverters. Our technological approach prioritizes high reliability, lifetime, and performance.

We offer product lines of high-frequency stators and control electronics for tailored high-speed electromotive drive applications. Additionally, the portfolio includes low-viscosity hydrodynamic bearings and gas bearing technology.

### › APPLICATIONS

- + sCO<sub>2</sub> Technology
- + CO<sub>2</sub> Processing
- + Hydrogen Technology
- + Hydrogen Transport Vectors [NH<sub>3</sub>; CH<sub>3</sub>OH; CH<sub>4</sub>, LOHC]
- + Molten Salt Reactors
- + Distributed Energy Resources

### › ELECTRIC MOTOR DRIVES OVERVIEW

- + Shaft speeds: ranging from 10 000 rpm to 450 000 rpm
- + Shaft Power: 100 Watts to 100 kW [30 – 50 kW with possible designs up to 300 kW]
- + Designs: semi-hermetic and hermetic designs to effectively isolate the stator from the process fluid
- + Rotor encapsulation: possible welded encapsulation for complete isolation of the rotor from the process fluid
- + Windings: Equipped with slotless windings available in 2 or 4 pole designs
- + Controller compatibility: designed for use with commercial or custom controllers

- + Solid Oxide Fuel Cells
- + Synthetic Fuels Production
- + Green Ammonia Technology
- + Space Applications
- + Wastewater Treatment
- + Active Ceramic Membranes

# High-Frequency Stators

## › GENERAL PERFORMANCE PARAMETER RANGE

- + Motor power: up to 100 kW
- + Voltage: up to 800 V
- + Phase current: up to 300 A RMS
- + Number of pole pairs: 1 or 2 [adaptable to requirements]
- + Shaft speed: 10 000 rpm to 300 000 rpm
- + Thermal management: active liquid or gas flow cooling
- + Load profile: pump, compressor, turbine [acts as generator]

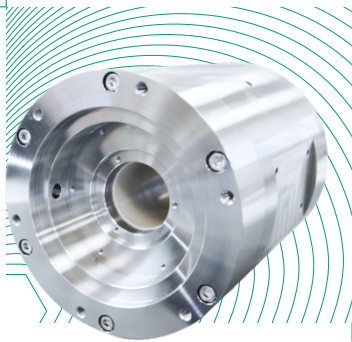
## › DESIGN OPTIONS

- + Hermetically isolated winding
- + Thermally optimised design with fluid-cooled housing
- + Single point failure free winding
- + Standard cost-optimized design
- + Stator cooling and heat recovery via liquid/gas flow

Features can be combined as desired

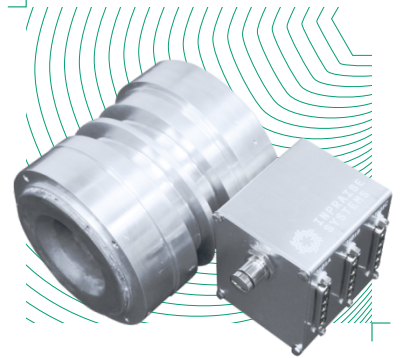
### › inPhase HFS-300

- + Nominal phase current: 85 A RMS
- + Voltage: 400 V
- + Dimensions [mm]:  
Ø = 300; l = 360



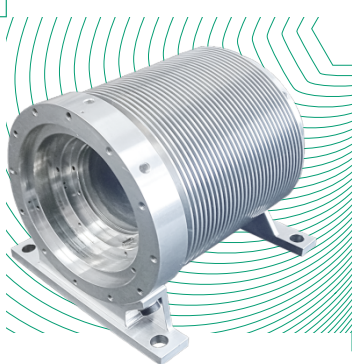
### › inPhase HFS-150

- + Nominal phase current: 120 A RMS
- + Voltage: 300 V
- + Dimensions [mm]:  
Ø = 110 ; l = 110



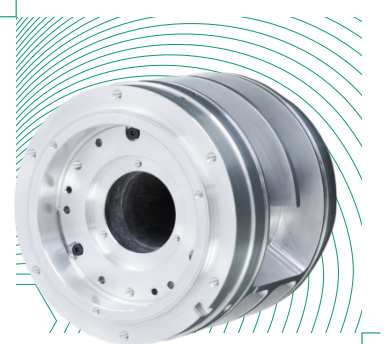
### › inPhase HFS-100

- + Nominal phase current: 22 A RMS
- + Voltage: 400 V
- + Dimensions [mm]:  
Ø = 120; l = 130



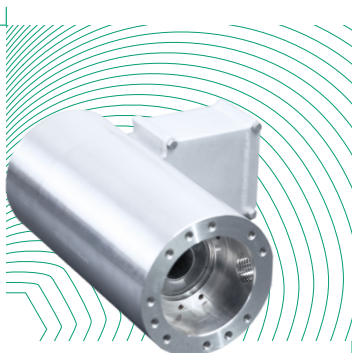
### › inPhase HFS-60

- + Nominal phase current: 15 A RMS
- + Voltage: 400 V
- + Dimensions [mm]:  
Ø = 110 ; l = 110



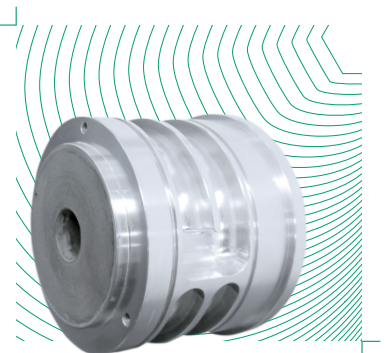
### › inPhase HFS-15

- + Nominal phase current: 3 A RMS
- + Voltage: 150 V
- + Dimensions [mm]:  
Ø = 80; l = 160



### › inPhase HFS-10

- + Nominal phase current: 24 A RMS
- + Voltage: 48 V
- + Dimensions [mm]:  
Ø = 90; l = 70



# Drive System Components

## Special High-Speed Bearings

### LOW-VISCOSITY HYDRODYNAMIC BEARINGS & GAS AERODYNAMIC AND AEROSTATIC BEARINGS

#### CHARACTERISTICS

- + Applicable gaseous lubricants such as air, ammonia, oxygen, helium, water steam, and more
- + Applicable liquid lubricants such as water, ammonia,  $H_2O_2$ , kerosene, LOX, ethanol, and more
- + Compatible with both green and conventional propellants
- + Theoretically unlimited lifetime and exceptional operating precision and stability
- + Eliminates contamination risks by oil lubricants in liquid or gaseous process media and the external environment



## High-Speed Rotors

### ELECTRIC MOTOR ROTORS FOR HIGH-SPEED APPLICATIONS

#### DESIGN OPTIONS [FEATURES CAN BE COMBINED AS DESIRED]

- + Semi-hermetic and hermetic designs to isolate the rotor from the process fluid
- + Complementary dynamic seal design
- + 2 or 4 pole design
- + NdFeB magnets
- + SmCo magnets

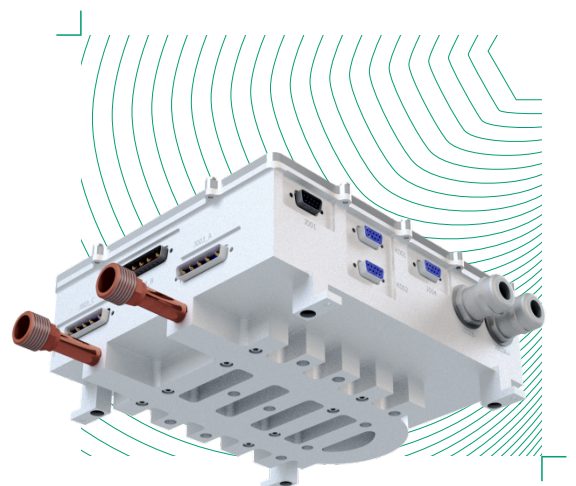


## Variable-Frequency Drive Inverters

### MOTOR INVERTERS FOR HIGH-SPEED SYNCHRONOUS MOTORS

#### CHARACTERISTICS

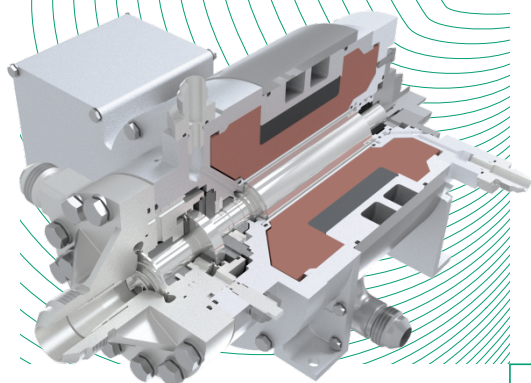
- + Sensor controlled and sensorless technology
- + FOC control, six-step control, PAM control
- + Motor speeds up to ~ 480 000 rpm [output frequency up to 8 kHz]
- + Motor power up to 30 kW
- + High-reliability applications [space]
- + Industrial applications [energy, research]



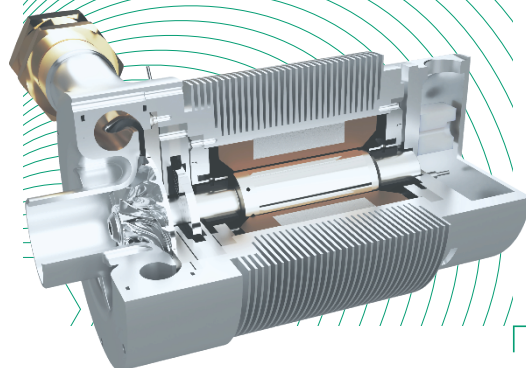


# Exemplary Applications

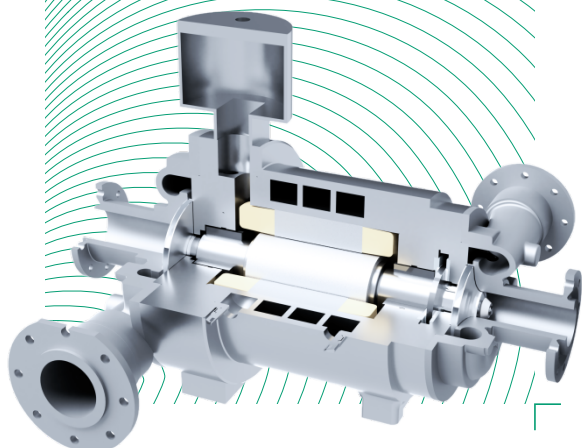
[PROPELLANT PUMP FOR ROCKET ENGINE]



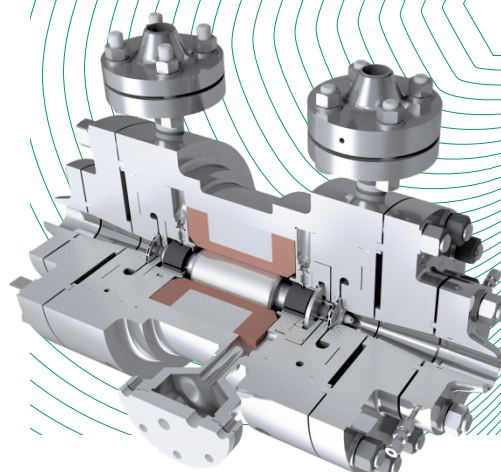
[HIGH PURITY AIR ELECTRIC COMPRESSOR]



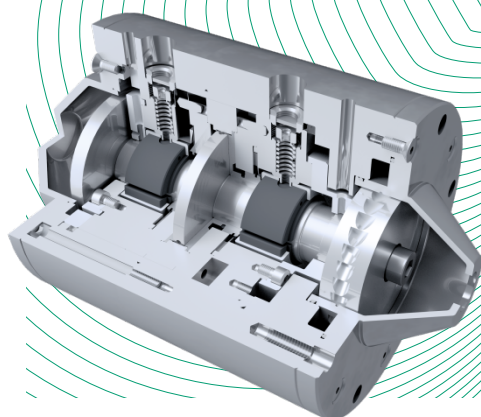
[STEAM MICROTURBINE]



[GAS EXPANDER]



[sCO2 COMPANDER]



[AMMONIA PUMP FOR SATELLITE THERMAL CONTROL]

