

**PRODUCT
MANUAL**

科技改变一切...

TECHNOLOGY
CHANGES EVERYTHING

高温直流无刷电机 & 驱动器

High-temperature Brushless DC Motor & Driver

水下直流无框电机 & 驱动器

Underwater Direct Current Frameless Motor & Driver

科技
改变能源
TECHNOLOGY
CHANGES ENERGY

合力 - 黑星合资公司/Heli - Black Star

Heli Tech Energy Co., Ltd. is Technology Enterprise focusing on solving clients' pain points. Its business covers: R&D and Experiments, Precision Core Component R&D and Manufacture, Intelligent Downhole Tool R&D and Manufacture, Smart Equipment R&D and Manufacture, Geo-Engineering IPM.

Heli Tech Energy Co., Ltd. is a scientific and technological oil service enterprise focusing on technology research and development and application in the field of oil and gas development, undertaking national key R&D projects, and is a national "Specialized Precision and Characteristic" Small Giant Enterprise, national key Small Giant Enterprise, national science and technology enterprise, national hi-tech enterprise, and a leading enterprise of strategic emerging industries in Tianjin, Tianjin Gazelle Enterprise, Tianjin Specialized and Specialized New Enterprises, Vice Chairman of Tianjin Offshore Industry Union, China Scientist Forum Science and Technology Innovation Demonstration Unit, National High-end Downhole Tool Technology Center.

This is a R&D platform created by HELI in order to improve the comprehensive R&D level in conjunction with universities. The laboratory is equipped with 59 large and medium-sized instruments and equipment with a total value of about 100 million RMB.

The R&D team consists of senior experts, technical experts, with technical fields covering mechanical, electrical, intelligent control, communication, Internet of Things and other disciplines.



Heli Energy has extensive experience in industry cooperation
The marketing system is spread all over the world

HELI TECHNOLOGY



Product Overview

The product system covers two core series: the downhole high-temperature special motor drive system and the motor drive system in the field of robotics. The downhole high-temperature special motor drive system is used to control brushless DC motors and can operate stably in an environment with a temperature of 200°C. The input voltage of the entire series of drive systems ranges from 12V to 500V DC, meeting the power adaptation requirements of complex industrial scenarios. The drive system integrates multiple protection mechanisms (overvoltage/undervoltage/overcurrent/stall/sensor failure/overtemperature protection). Based on the requirements of multi-motor collaborative debugging and system maintainability, it adopts a modular parameter configuration architecture, enabling parameter configuration and storage functions. The motor driver for underwater robots in the field of robotics features an overall design of stacked multi-layer boards, with a small size and high power. Its rated power ranges from 3 to 10 kW. It supports the customized development of downhole/underwater special motors: equipped with multi-protocol communication interfaces (RS485/CAN2.0B/Modbus RTU), it can have customized data storage functions and supports customized sensorless FOC control. Both series of products have passed the ISO 9001:2015 quality system certification, with an average mean time between failures (MTBF) of over 1,000 hours, and have been successfully applied in national key engineering fields such as intelligent downhole power units in the petroleum industry and deep-sea exploration.

Application scenario



Oil drilling



Aerospace



**Ocean underwater
equipment**

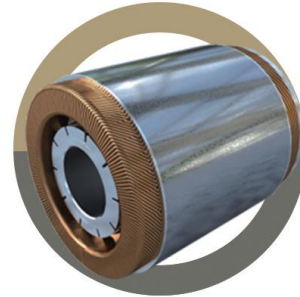


Industrial equipment

High-temp Micro Servo Electro-hydraulic Control System



Research, development and manufacturing of intelligent downhole tools and equipment



Research, development and manufacturing of underwater power systems

Intelligent drilling tools

Motors of models such as E3228525 (sensorless), E362830, E362860, E382830, E382860, E382823, etc. have been successfully applied in a variety of drilling tools.

Intelligent Injection and Production Tools

Motors of models such as E984815, E128170100, etc. have been successfully applied in a variety of well completion tools.

Intelligent Well Completion Tools

Motors of models such as E3228525 (sensorless), E3228525 (sensorless), E3850080, E60450150, E70450110, E984815, E128170100, etc. have been successfully applied in a variety of well completion tools.

Intelligent Drilling Equipment and Robots

Motors of models such as E6024556 have been successfully applied in a variety of drilling tools and robots.

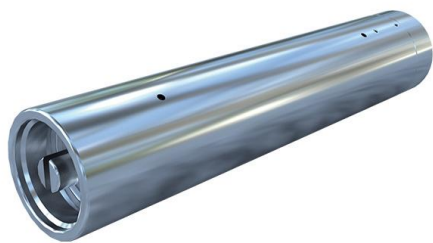
Underwater Remotely Operated Vehicle (ROV) Thruster

Motors of models such as E4530041, E6050039, E734822, E834840, etc. have been successfully applied in a variety of underwater robot thrusters.

Underwater Autonomous Vehicle (AUV) Thruster

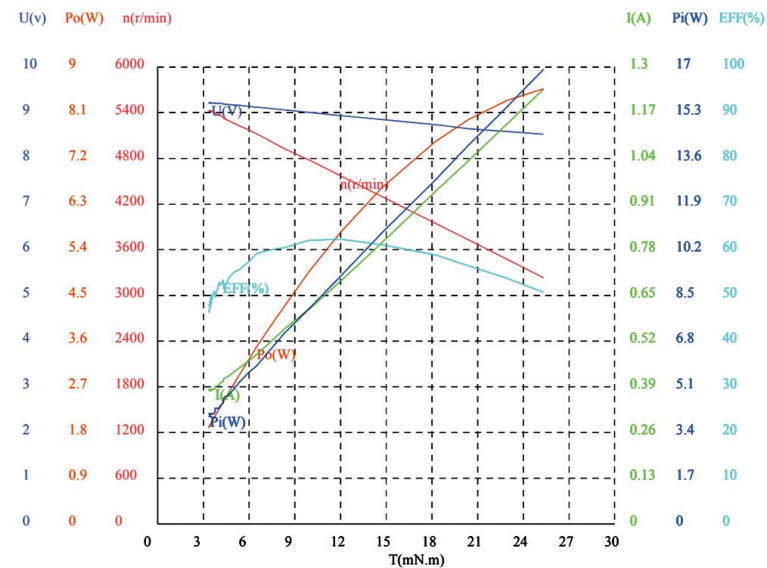
Motors of models such as E130350110 (frameless) have been successfully applied in a variety of thrusters of Underwater Autonomous Vehicles (AUV).

E201240



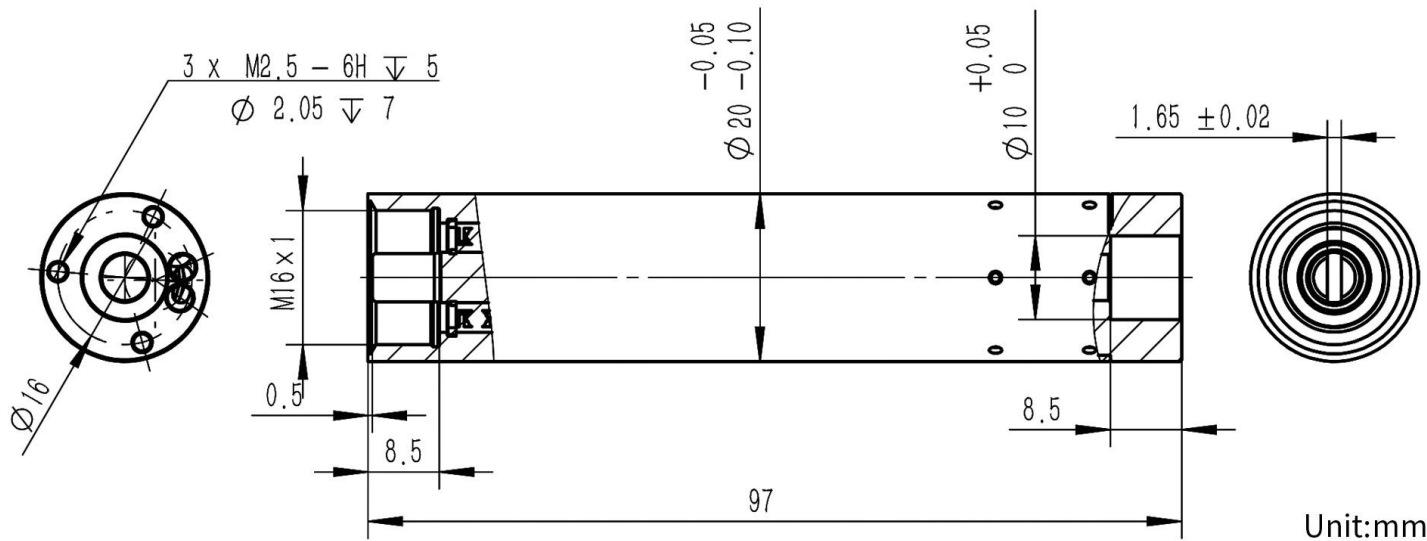
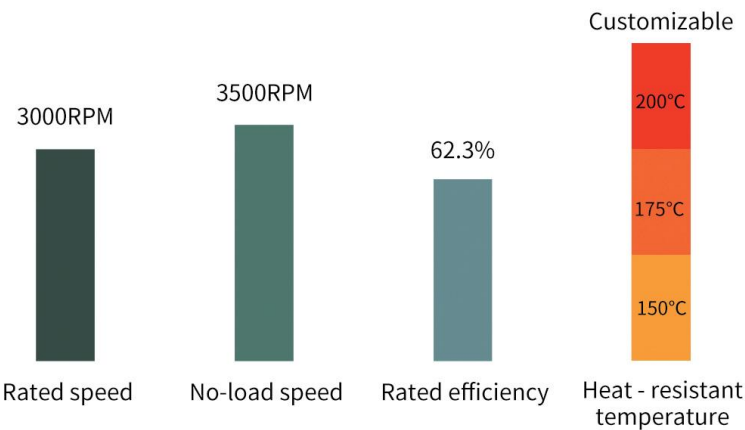
Application scenario

Intelligent Downhole Tools for Petroleum
Micro Electro-Hydraulic Power System

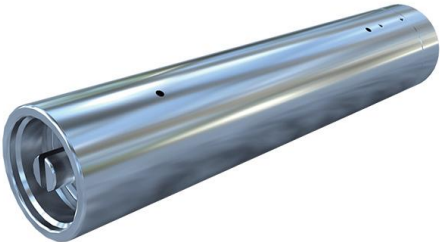


Detailed data

Rated voltage		12V
Rated current		0.67A
No-load current		0.25A
Rated power		3.8W
Rated torque		0.012NM
Inter - phase resistance		3.142Ω

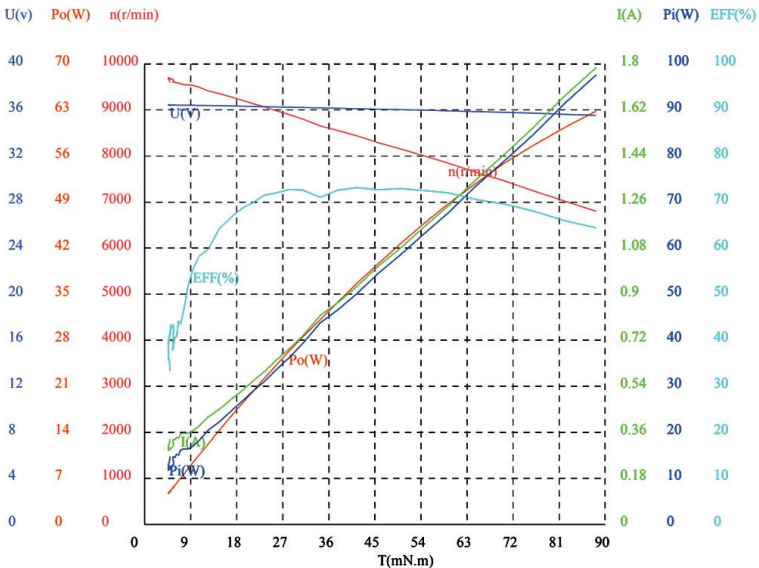


E2248545 (Inductive)



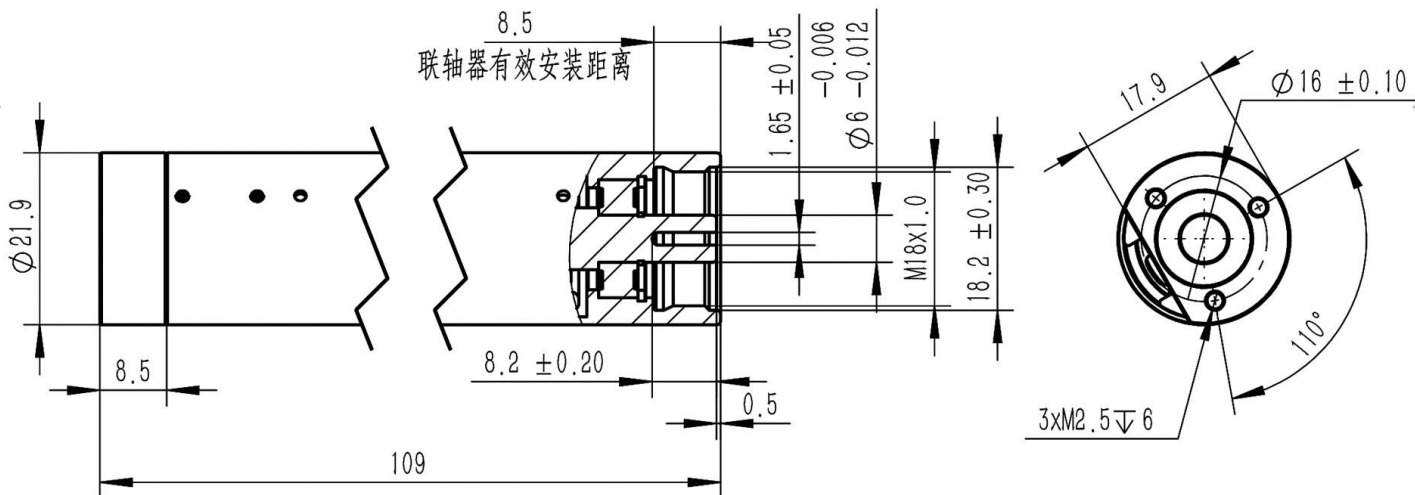
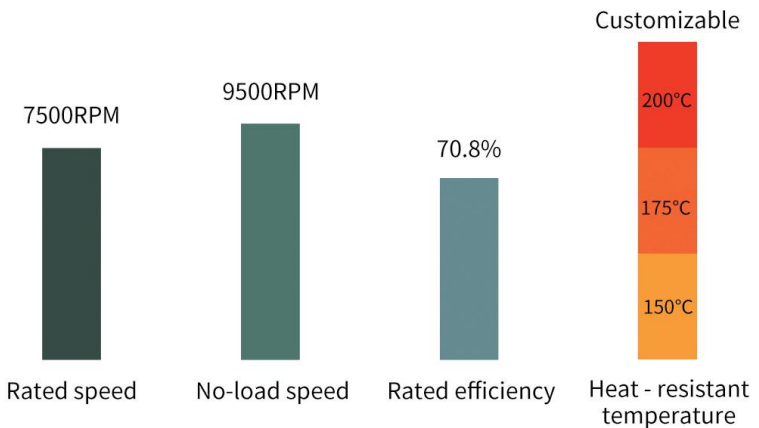
Application scenario

Intelligent Downhole Tools for Petroleum
Micro Electro-Hydraulic Power System



Detailed data

Rated voltage		48V
Rated current		1.40A
No-load current		0.35A
Rated power		47.1W
Rated torque		0.06NM
Inter - phase resistance		5.570Ω



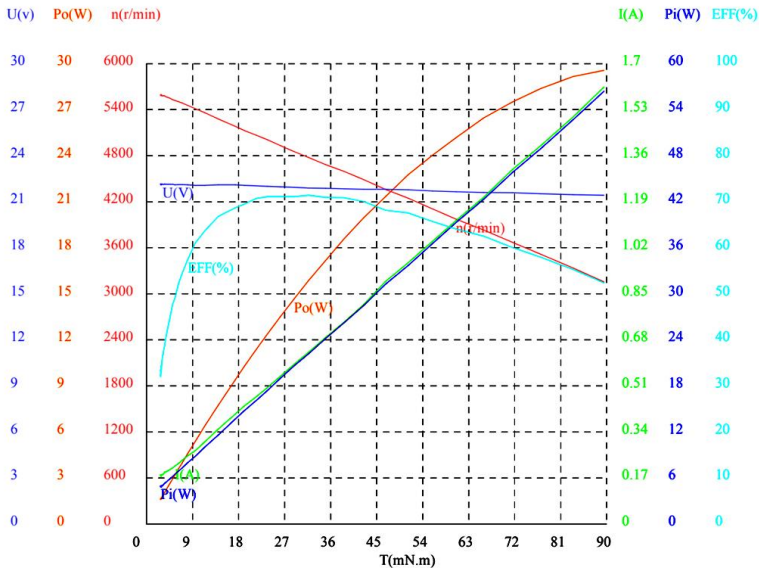
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E2248545 (Non-inductive)



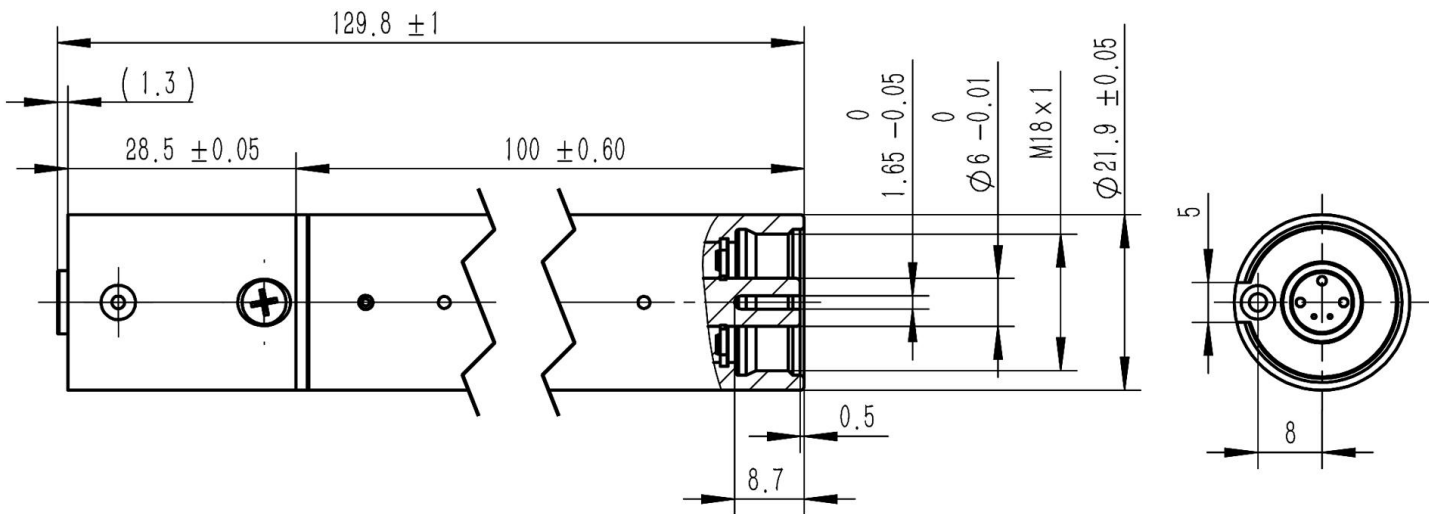
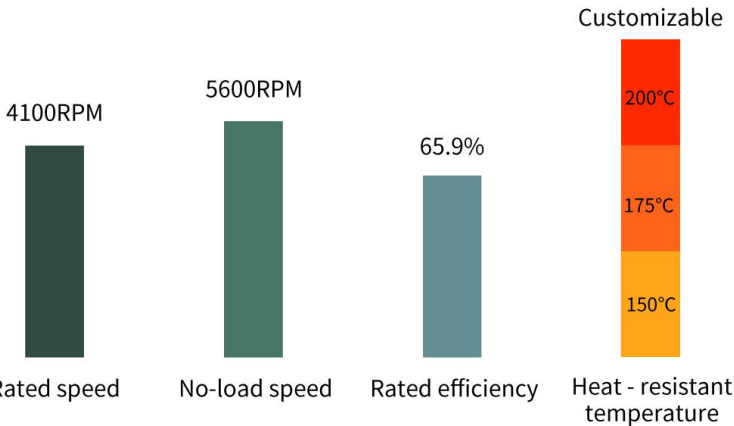
Application scenario

Intelligent Downhole Tools for Petroleum
Micro Electro-Hydraulic Power System



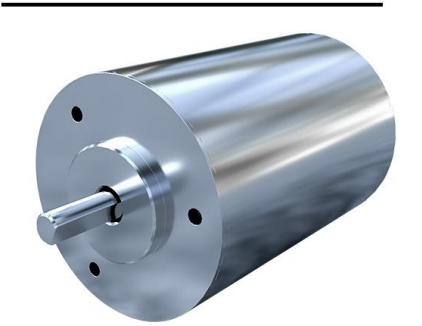
Detailed data

Rated voltage		30V
Rated current		1.30A
No-load current		0.20A
Rated power		23.6W
Rated torque		0.055NM
Inter - phase resistance		5.570Ω

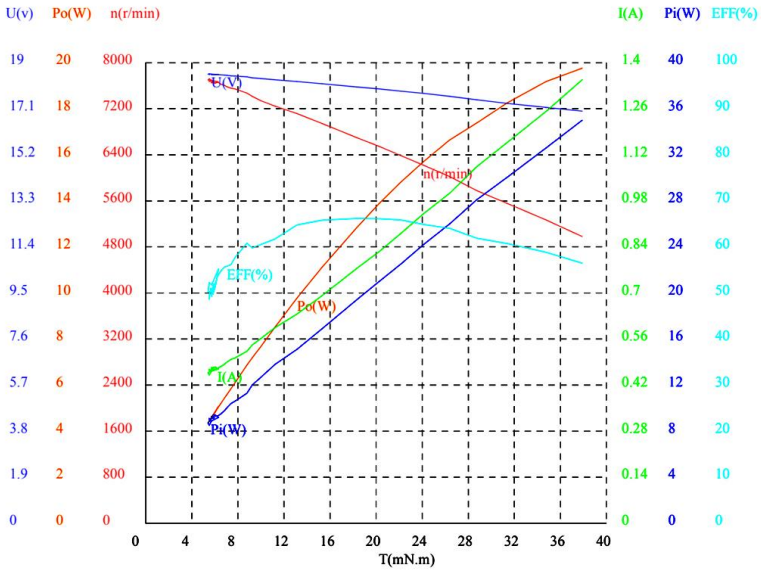


Unit:mm

E252415

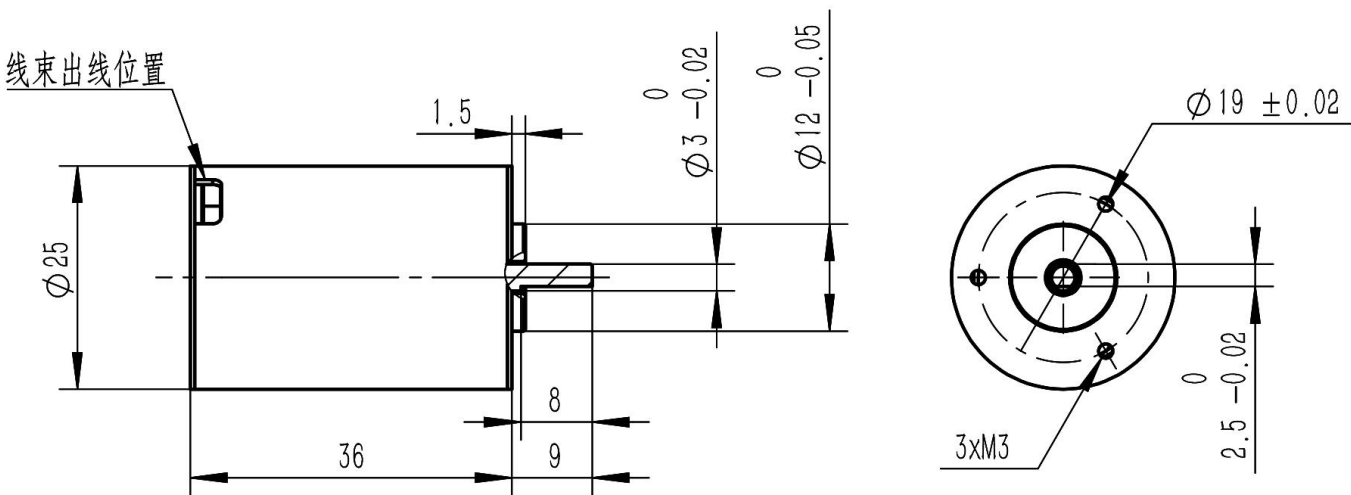
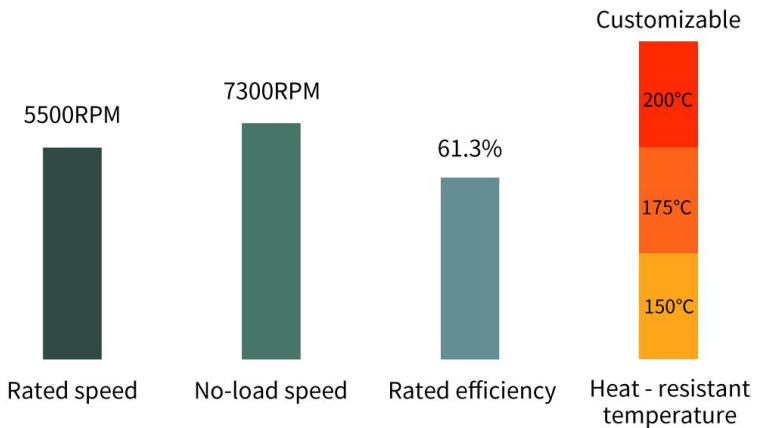


Application scenario
Intelligent Downhole Tools for Petroleum
Micro Electro-Hydraulic Power System



Detailed data

- Rated voltage 24V
- Rated current 1.20A
- No-load current 0.40A
- Rated power 17.3W
- Rated torque 0.03NM
- Inter - phase resistance 4.603Ω



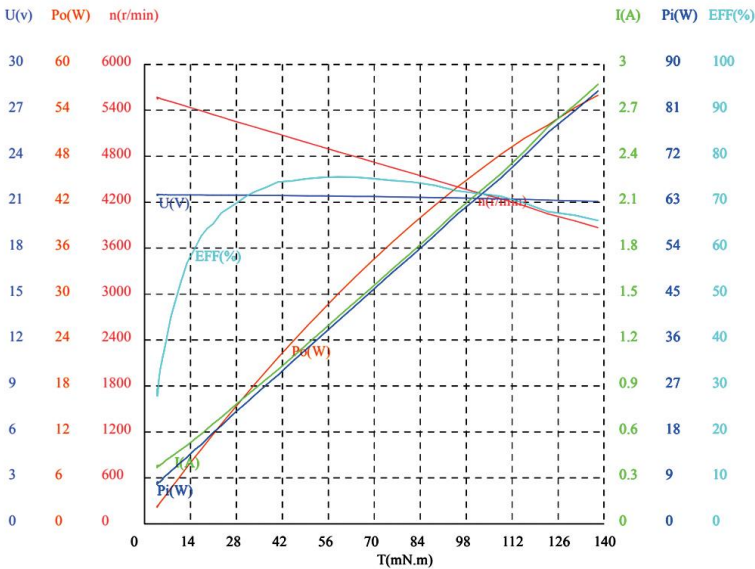
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E282848



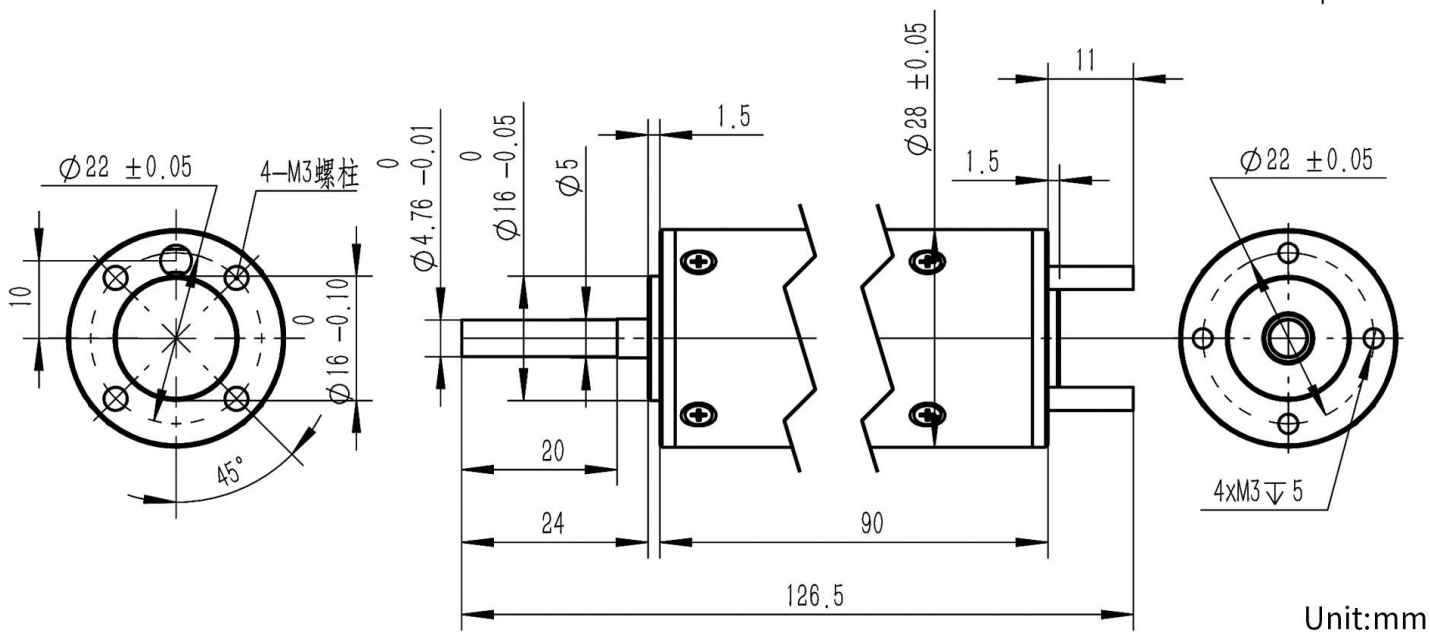
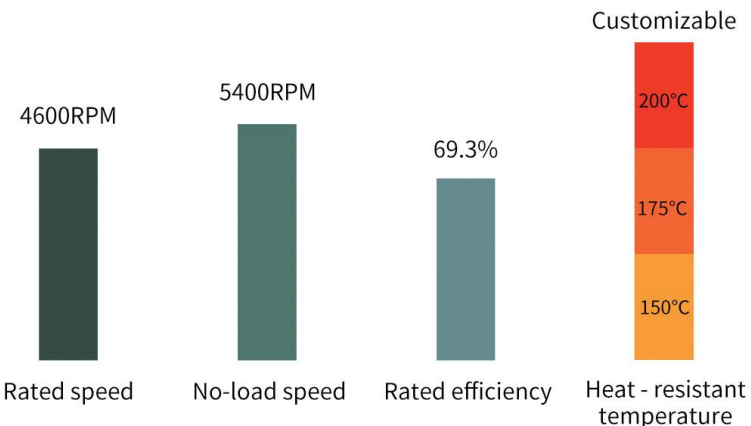
Application scenario

Intelligent Downhole Tools for Petroleum
Micro Electro-Hydraulic Power System



Detailed data

Rated voltage		28V
Rated current		1.75A
No-load current		0.35A
Rated power		33.7W
Rated torque		0.07NM
Inter - phase resistance		1.887Ω

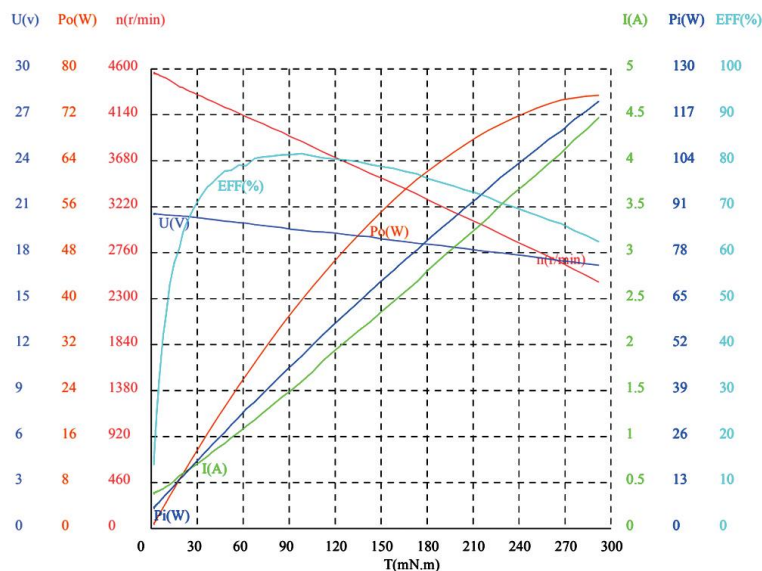


E3228525 (Inductive)



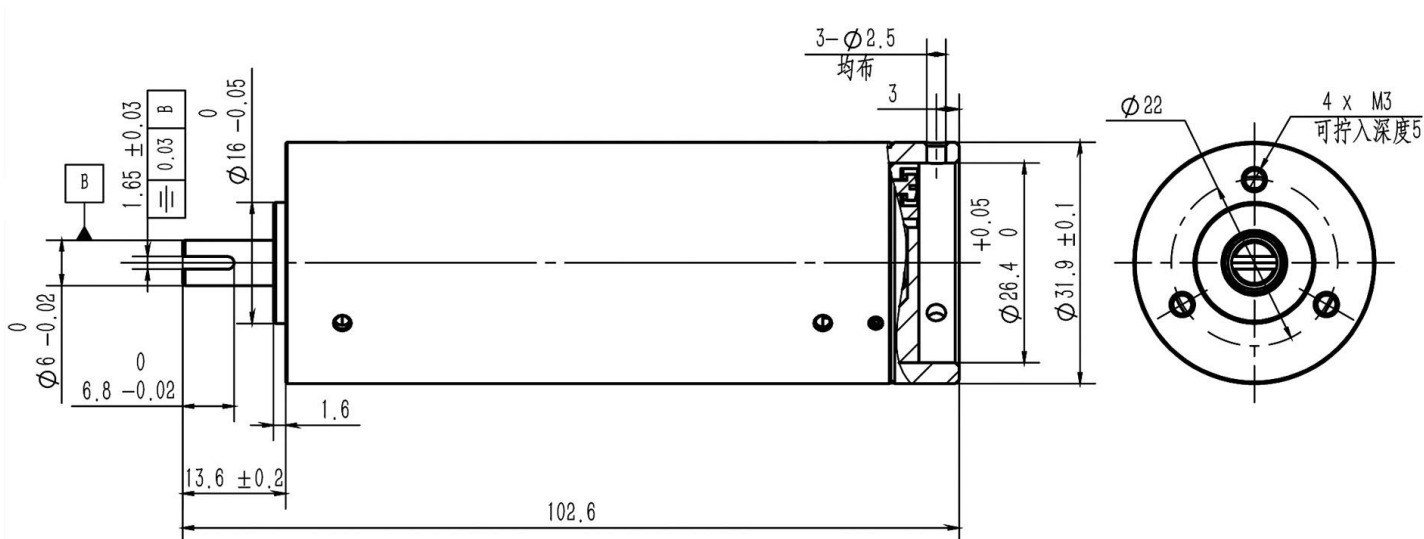
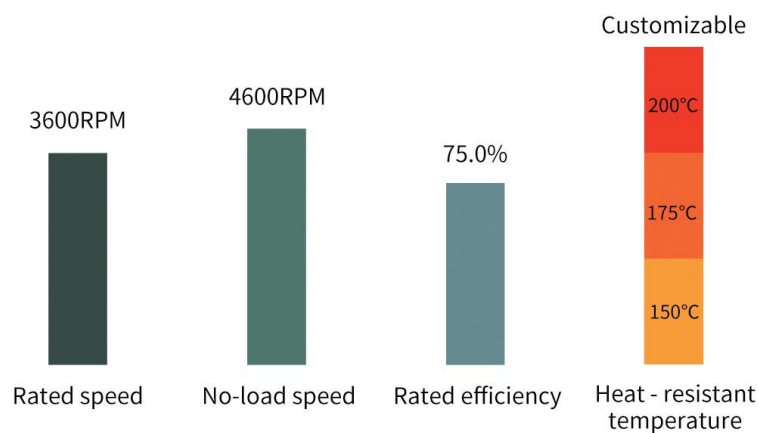
Application scenario

Intelligent downhole tools for the petroleum industry
Circulating and plugging subs while drilling
Electrically controlled internal cutting tools
Micro electro-hydraulic power system



Detailed data

Rated voltage	28V
Rated current	3.30A
No-load current	0.35A
Rated power	67.9W
Rated torque	0.18NM
Inter - phase resistance	1.208Ω



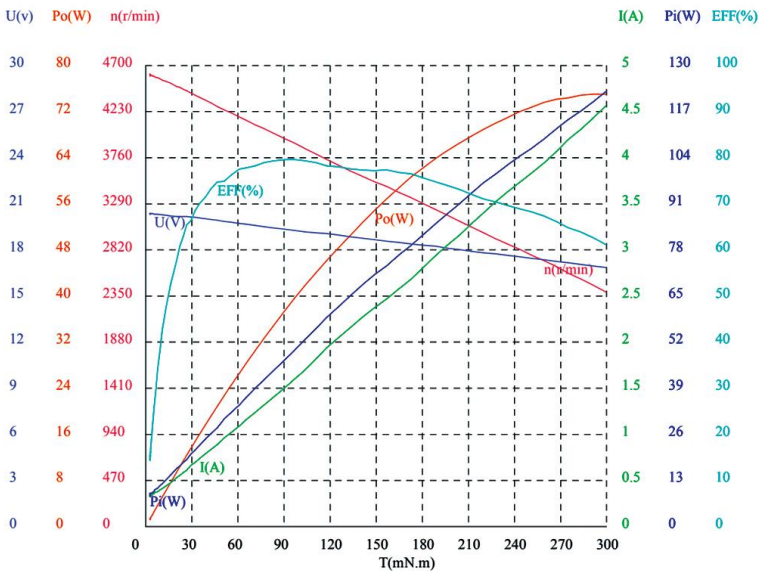
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E3228525 (Non-inductive)



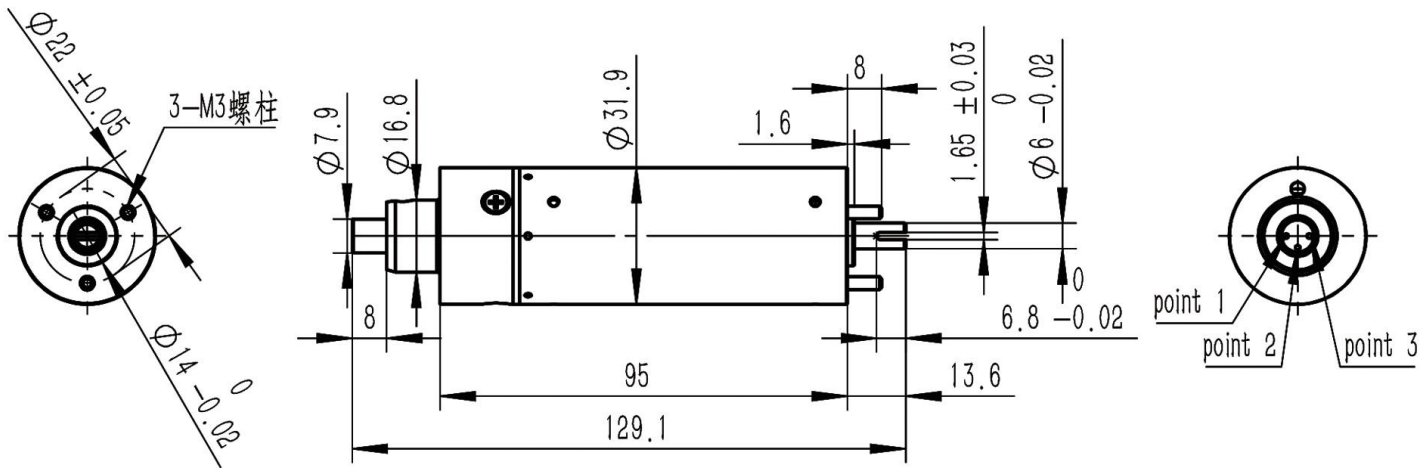
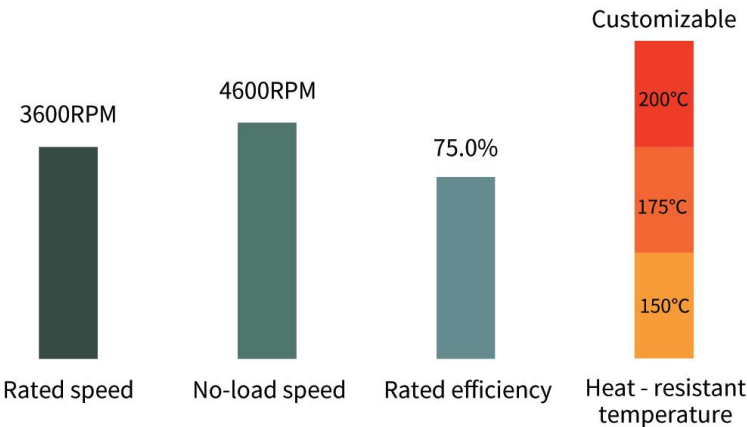
Application scenario

Intelligent Downhole Tools for Petroleum
Micro Electro-Hydraulic Power System



Detailed data

Rated voltage		28V
Rated current		3.30A
No-load current		0.35A
Rated power		67.9W
Rated torque		0.18NM
Inter - phase resistance		1.208Ω



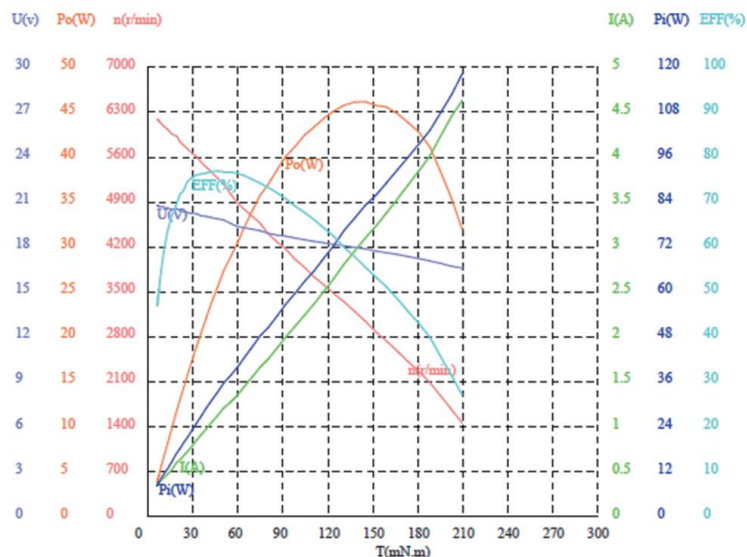
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E322840(Non-inductive)



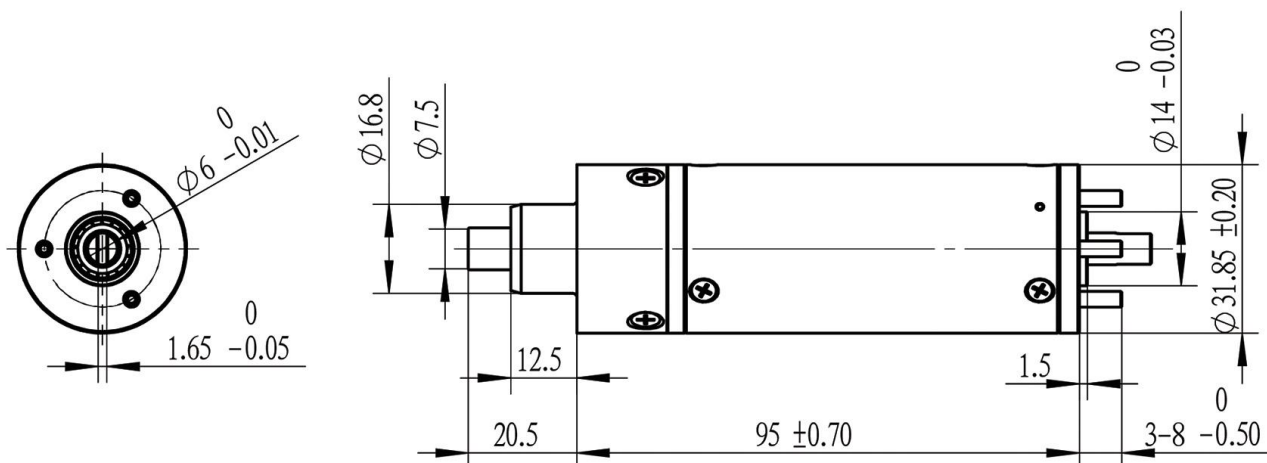
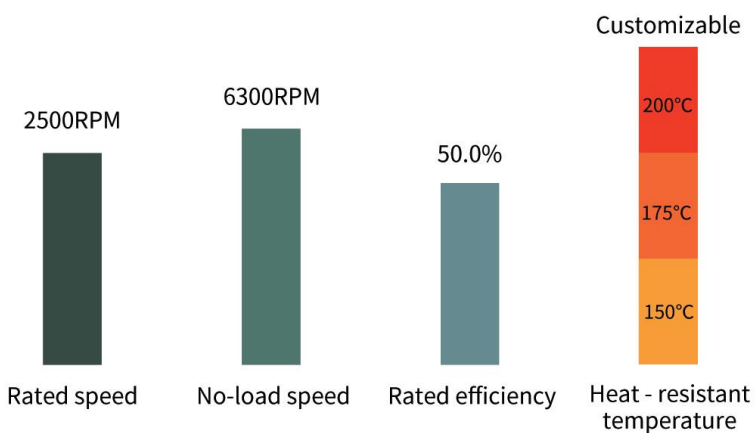
Application scenario

Rotary steerable hydraulic system



Detailed data

Rated voltage		28V
Rated current		3.10A
No-load current		0.30A
Rated power		48W
Rated torque		0.16NM
Inter - phase resistance		2.19Ω



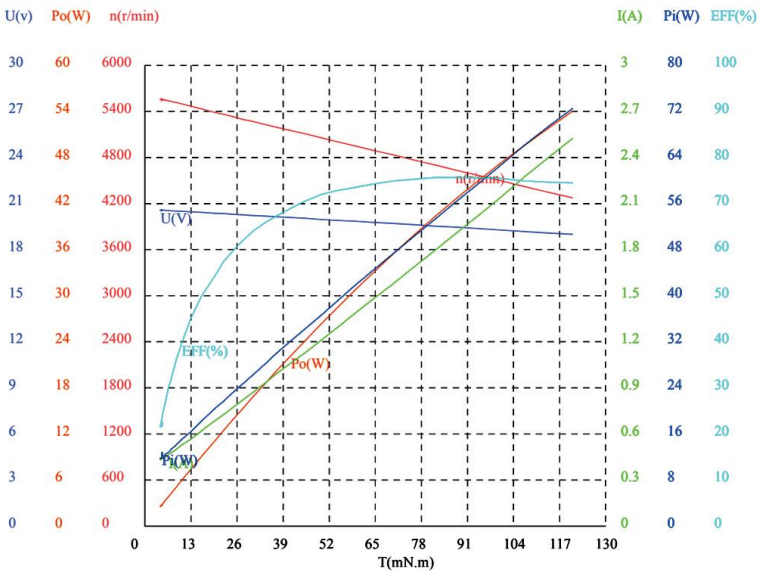
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E362830



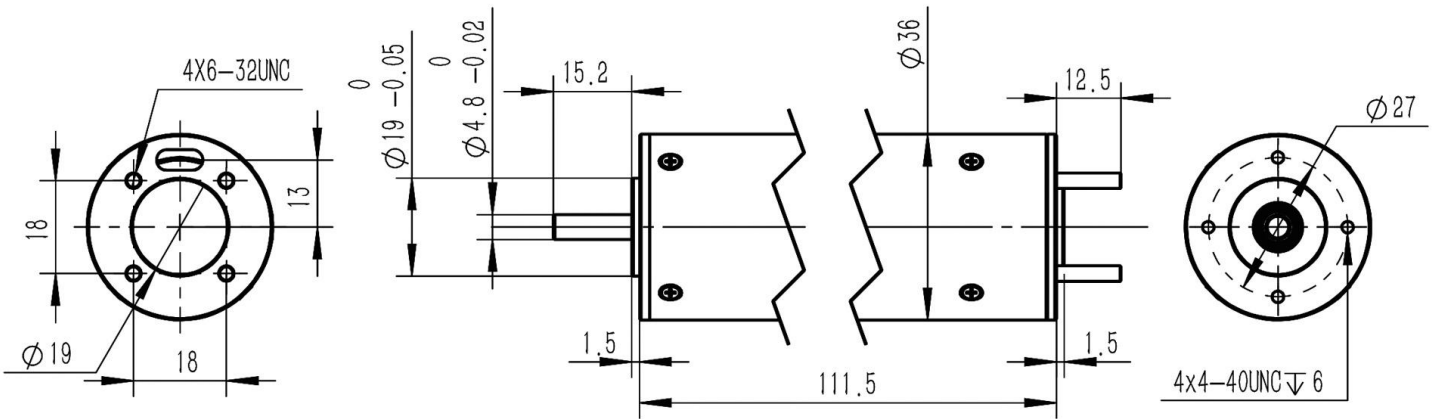
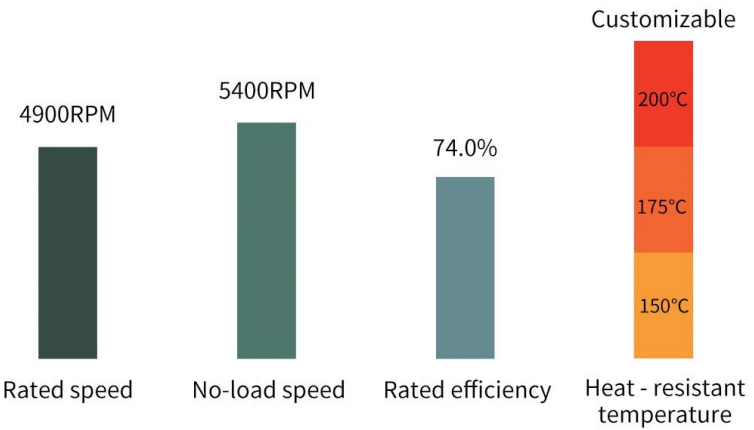
Application scenario

Intelligent Downhole Tools for Petroleum
Micro Electro-Hydraulic Power System



Detailed data

Rated voltage	30V
Rated current	1.80A
No-load current	0.40A
Rated power	35.9W
Rated torque	0.07NM
Inter - phase resistance	1.113Ω



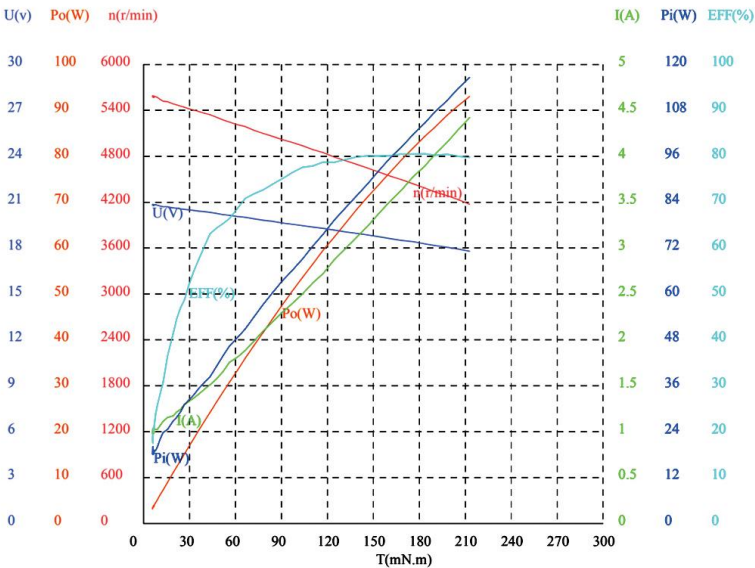
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E362860



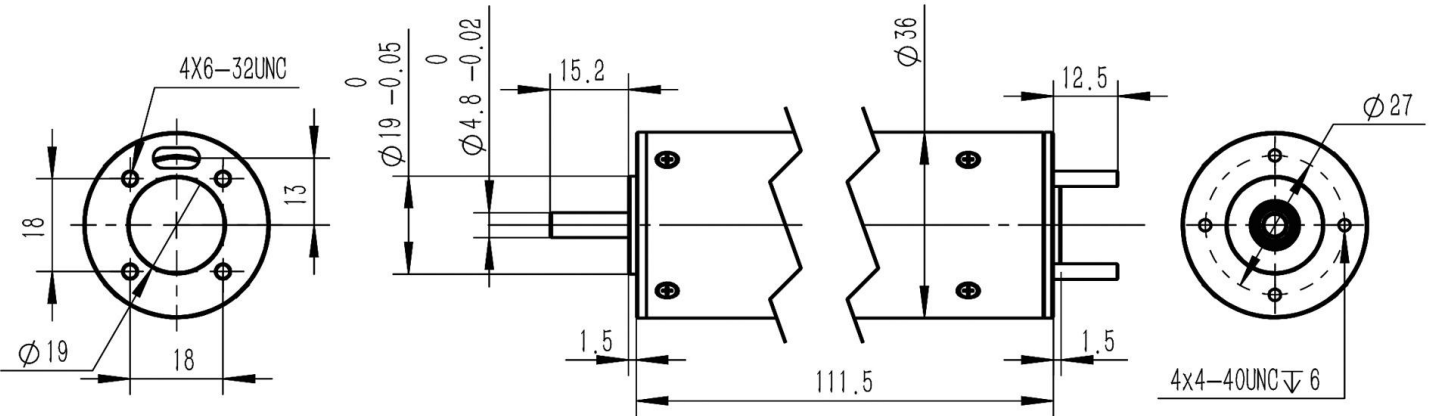
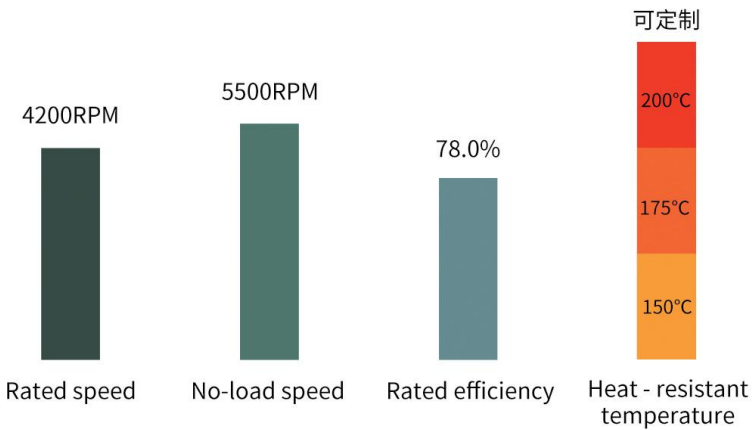
Application scenario

Intelligent Downhole Tools for Petroleum
Micro Electro-Hydraulic Power System



Detailed data

Rated voltage		30V
Rated current		4.30A
No-load current		0.80A
Rated power		87.9W
Rated torque		0.20NM
Inter - phase resistance		0.476Ω



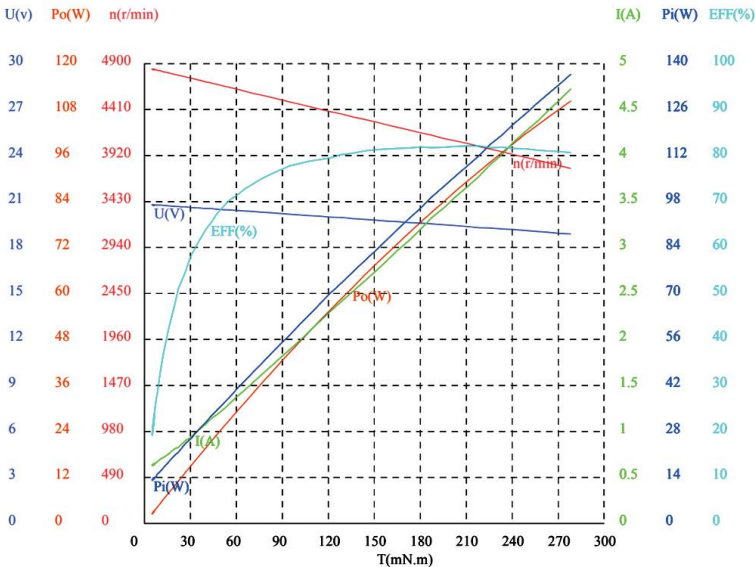
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E382823



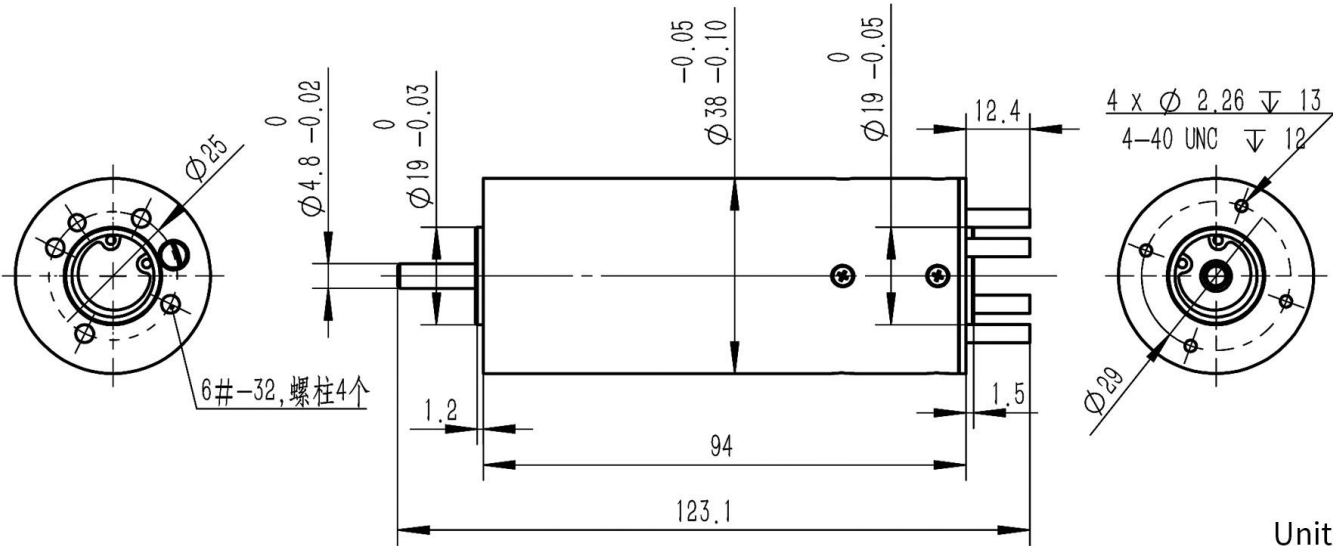
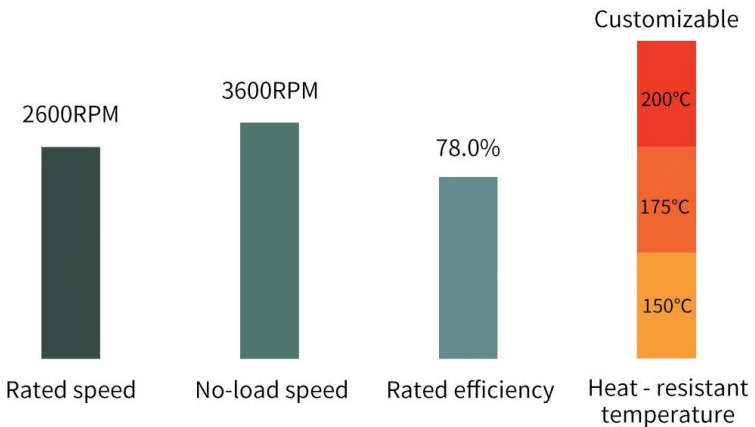
Application scenario

Intelligent Downhole Tools for Petroleum
The core power unit of the MWD rotary valve pulser



Detailed data

Rated voltage	28V
Rated current	1.10A
No-load current	0.20A
Rated power	19.1W
Rated torque	0.07NM
Inter - phase resistance	2.505Ω



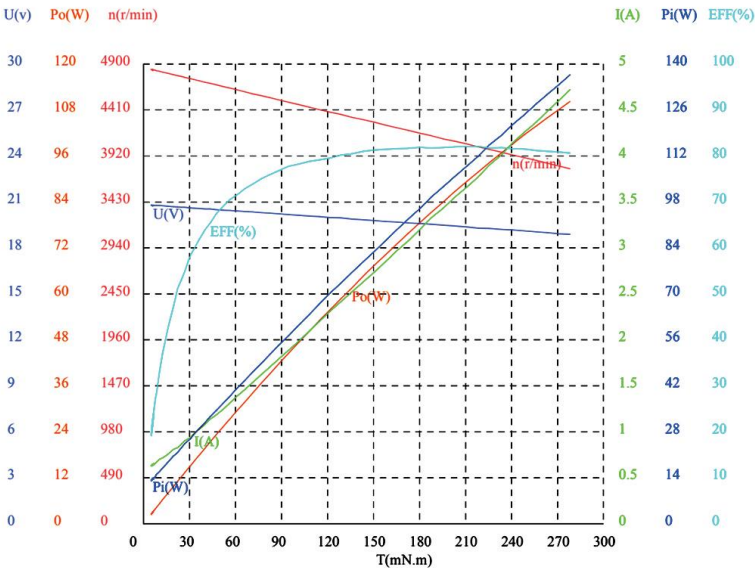
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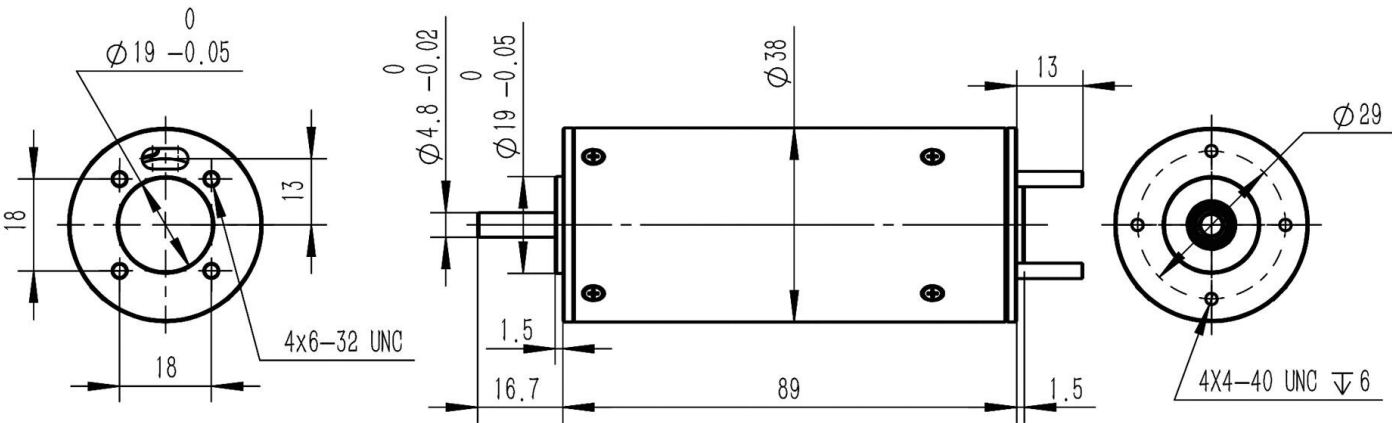
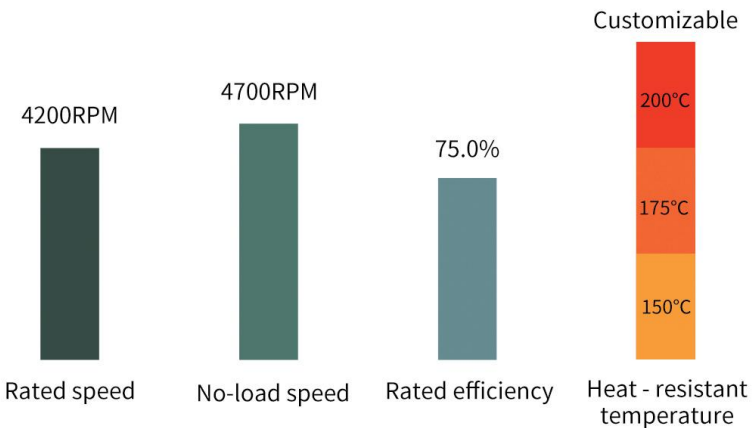
Application scenario

Intelligent Downhole Tools for Petroleum



Detailed data

Rated voltage		28V
Rated current		1.5A
No-load current		0.4A
Rated power		30.8W
Rated torque		0.07NM
Inter - phase resistance		1.142Ω



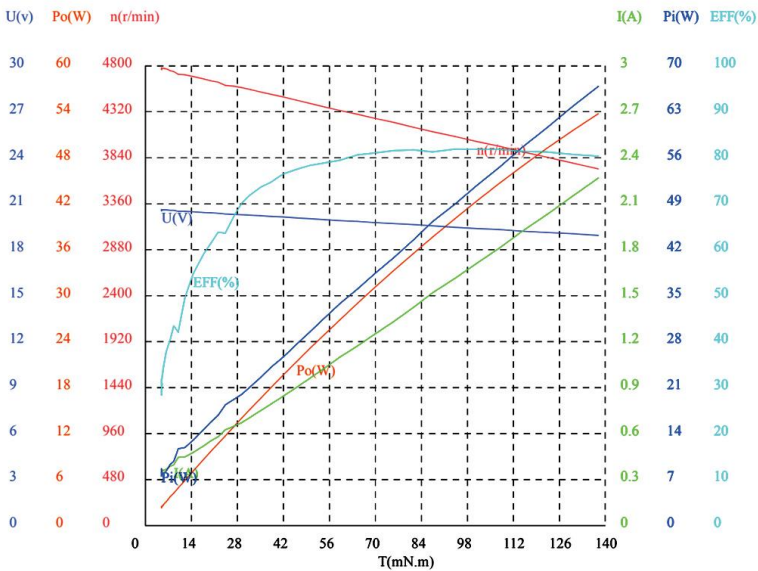
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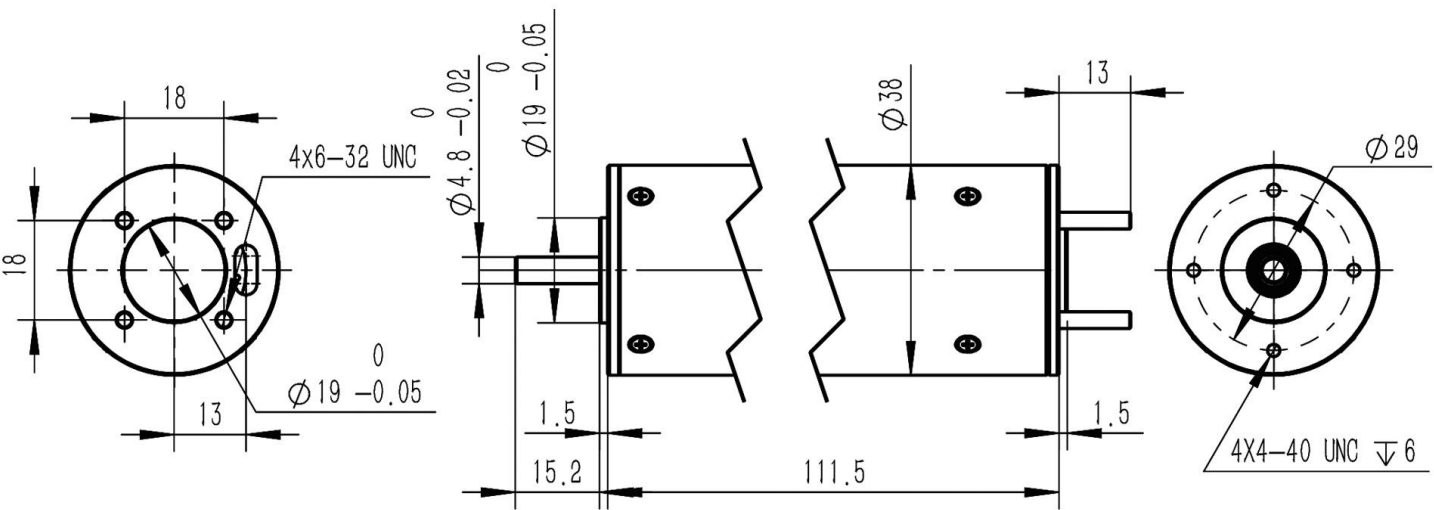
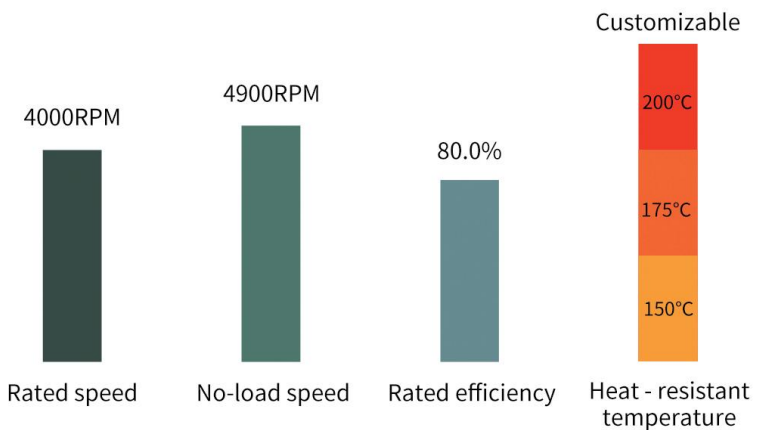
Application scenario

MWD rotary pulse
The core power unit of the device



Detailed data

Rated voltage		28V
Rated current		3.80A
No-load current		0.70A
Rated power		83.8W
Rated torque		0.20NM
Inter - phase resistance		0.465Ω



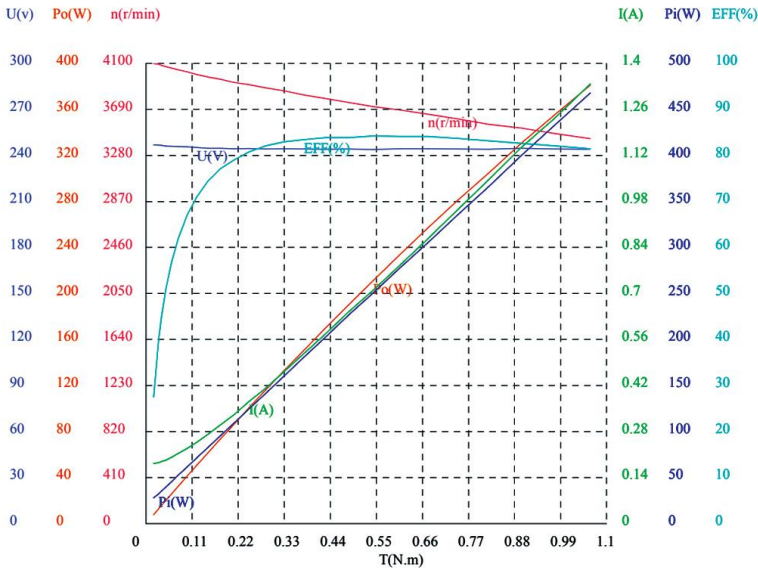
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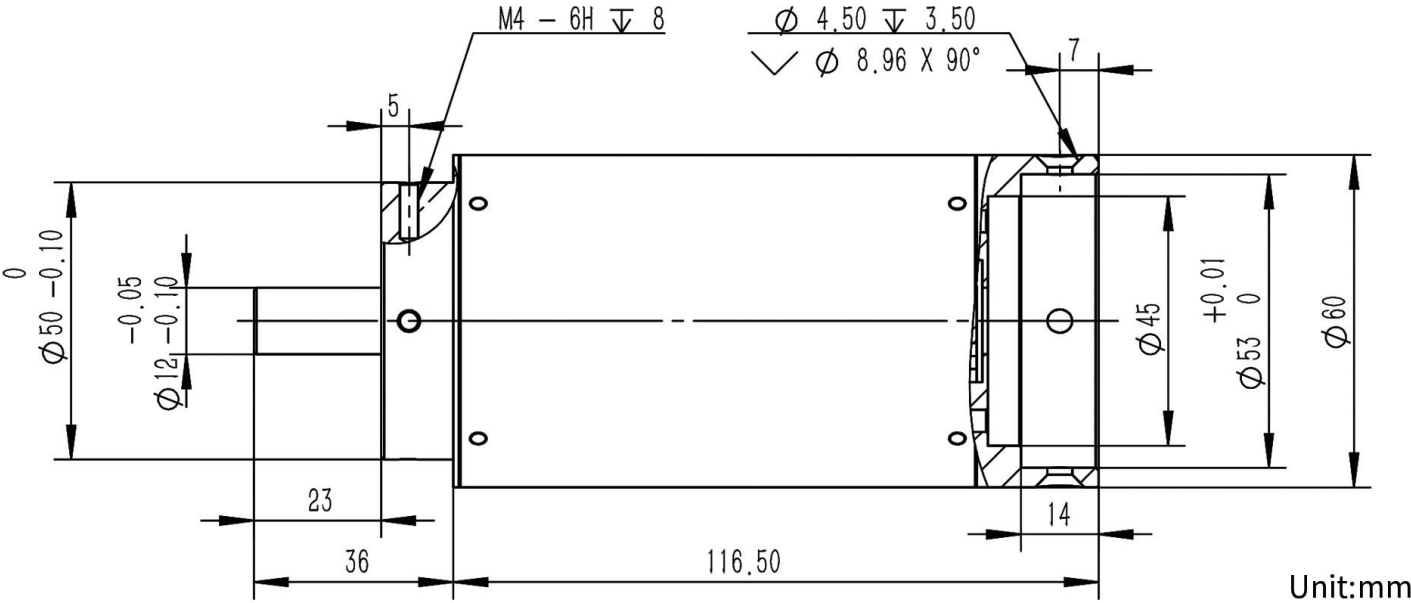
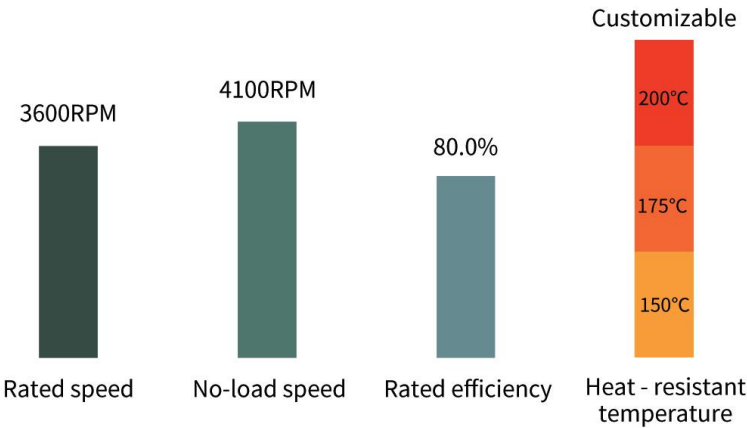
Application scenario

Intelligent downhole tools for petroleum with large diameter passageways
The power system of the downhole crawler



Detailed data

Rated voltage		340V
Rated current		1.10A
No-load current		0.20A
Rated power		280W
Rated torque		0.74NM
Inter - phase resistance		21.046Ω

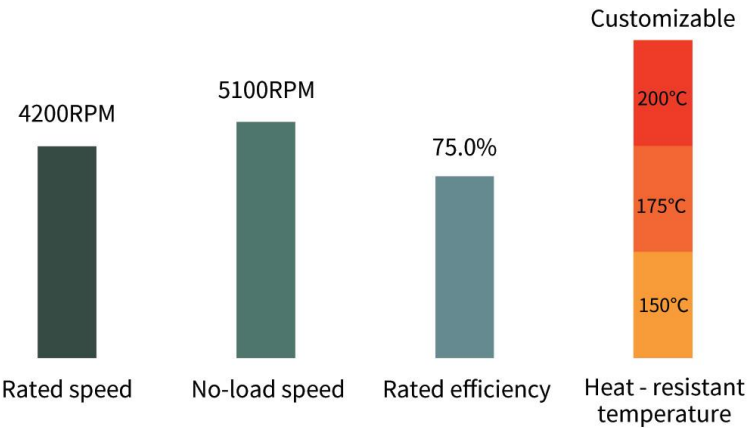


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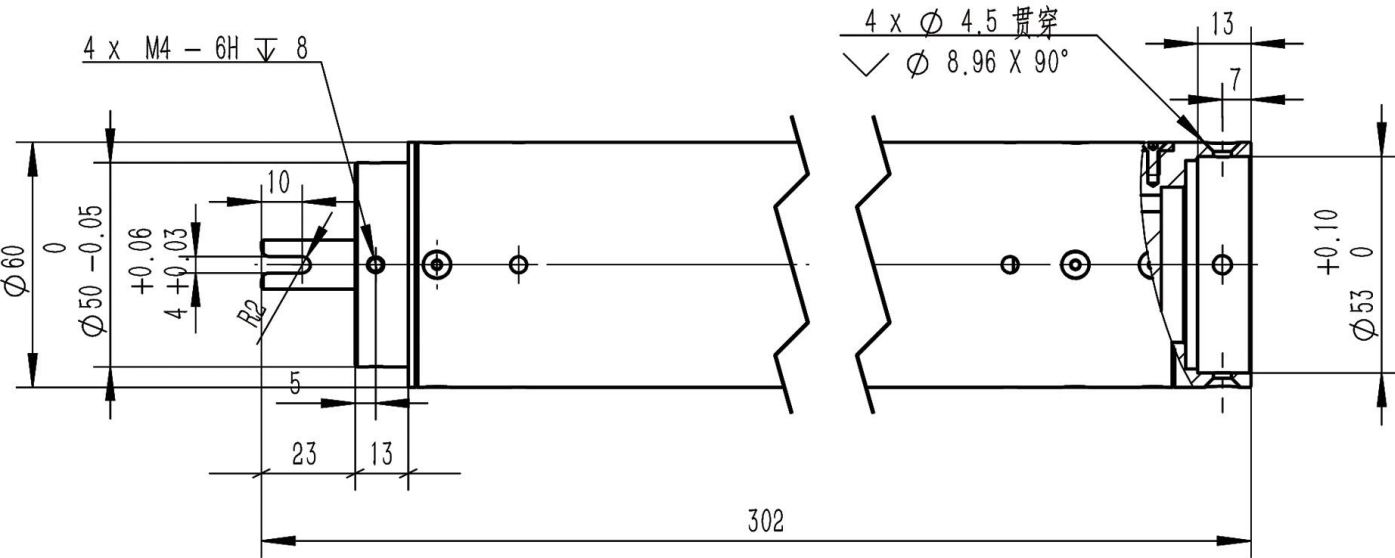
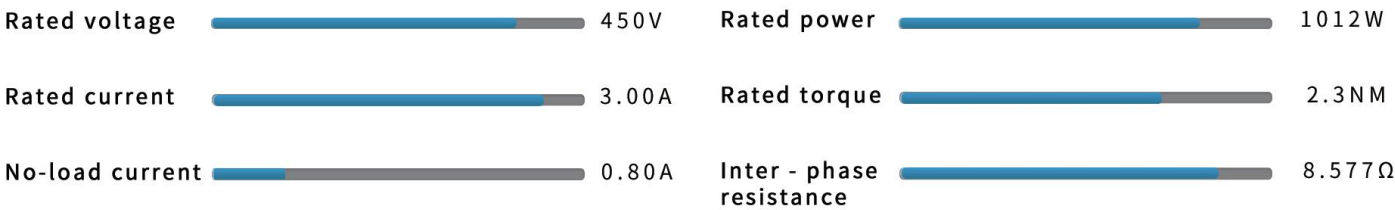


Application scenario

Intelligent Downhole Tools for Petroleum
Micro Electro-Hydraulic Power System

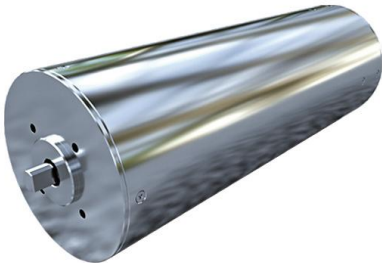


Detailed data



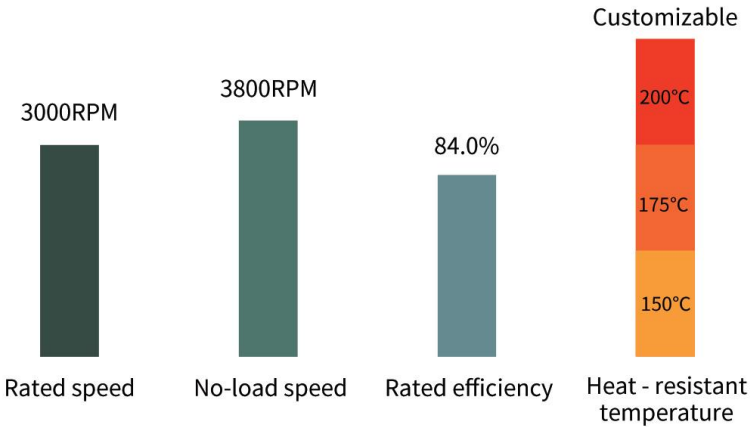
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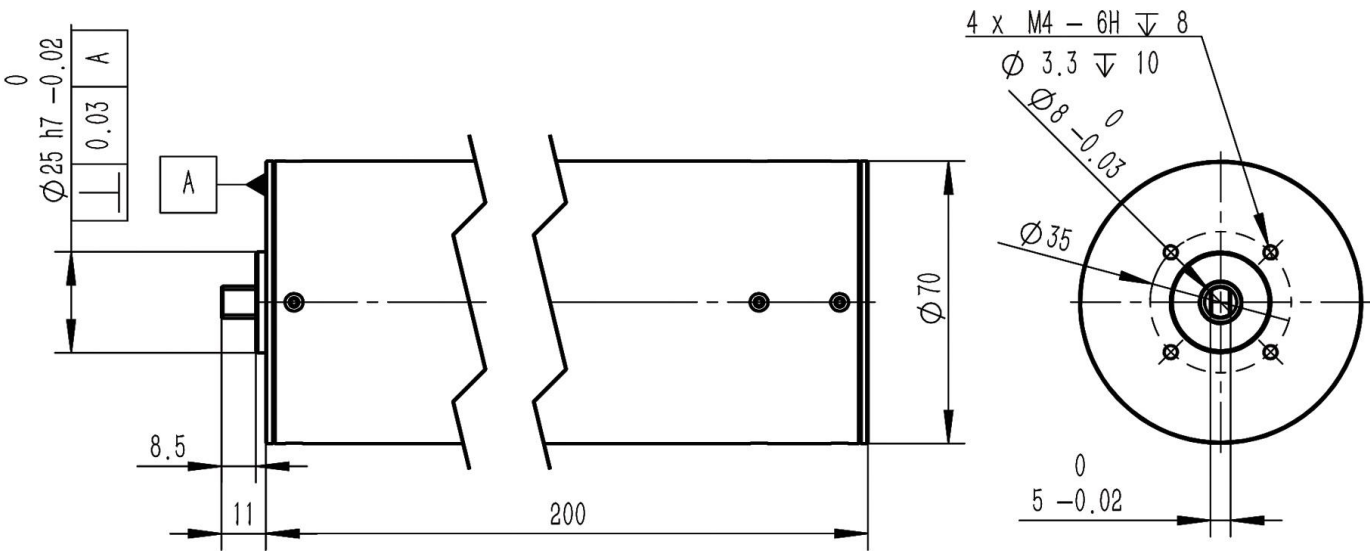
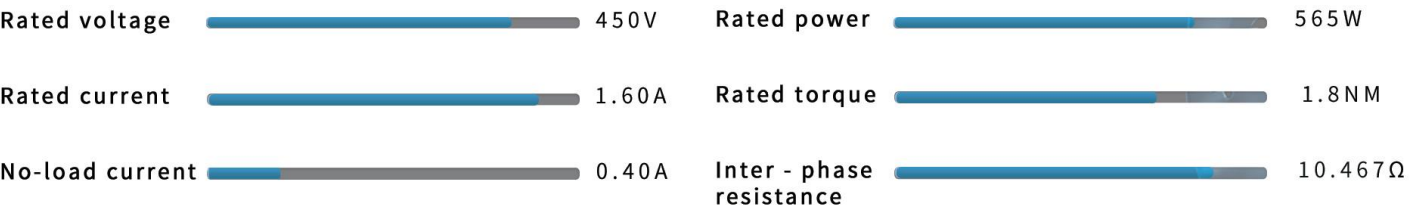


Application scenario

Intelligent downhole petroleum tools with a large bore diameter
Intelligent water distribution system



Detailed data



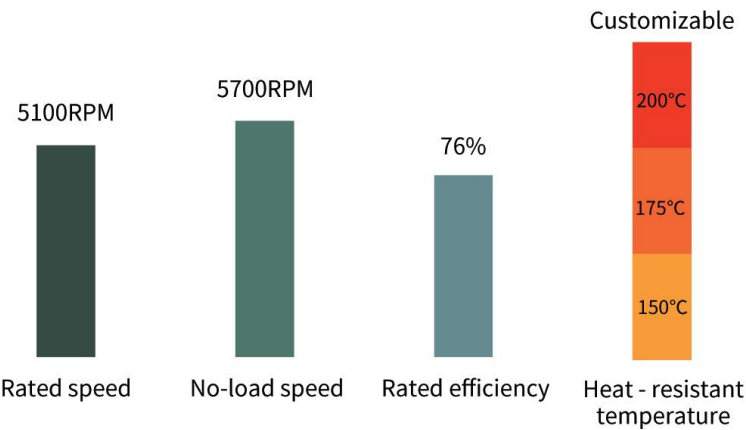
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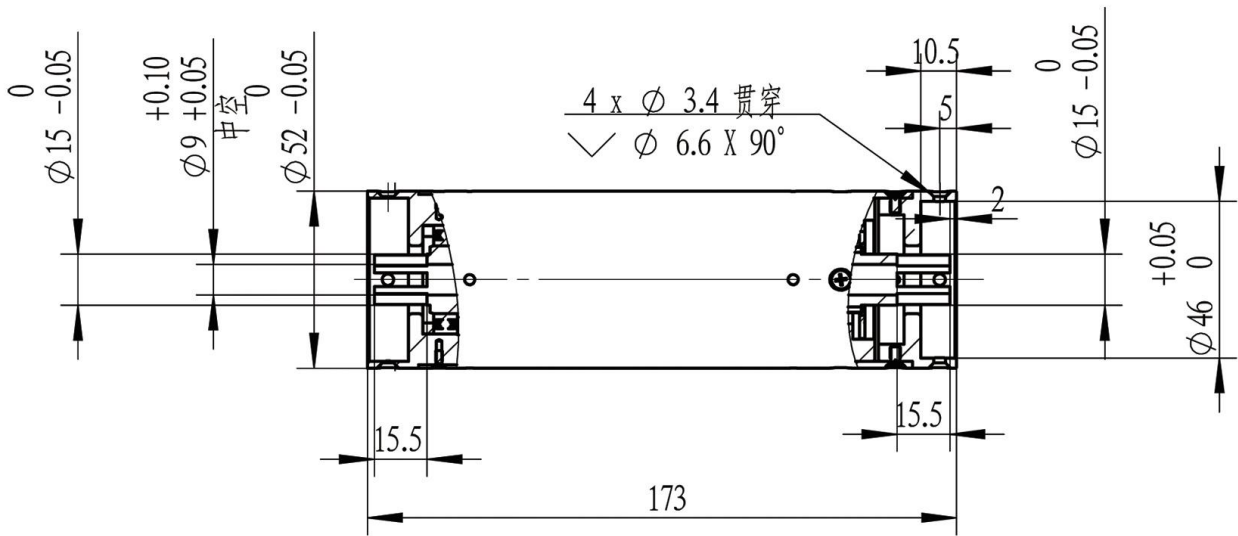
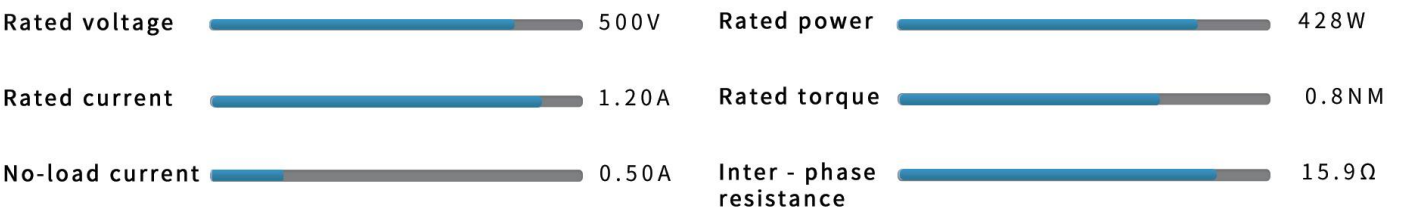


Application scenario

The power system of the electric cutting tool



Detailed data



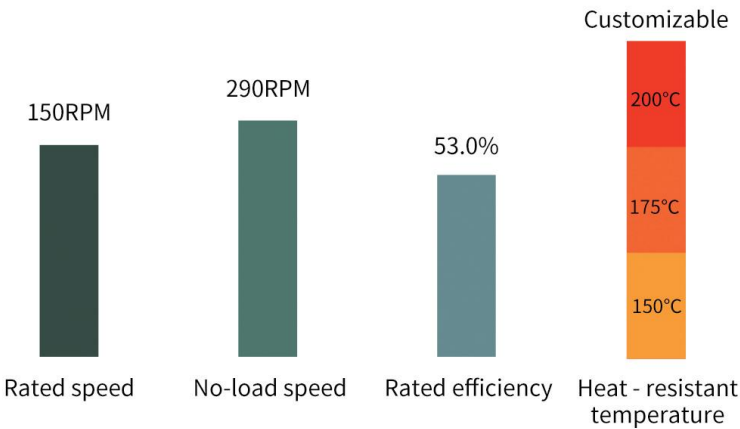
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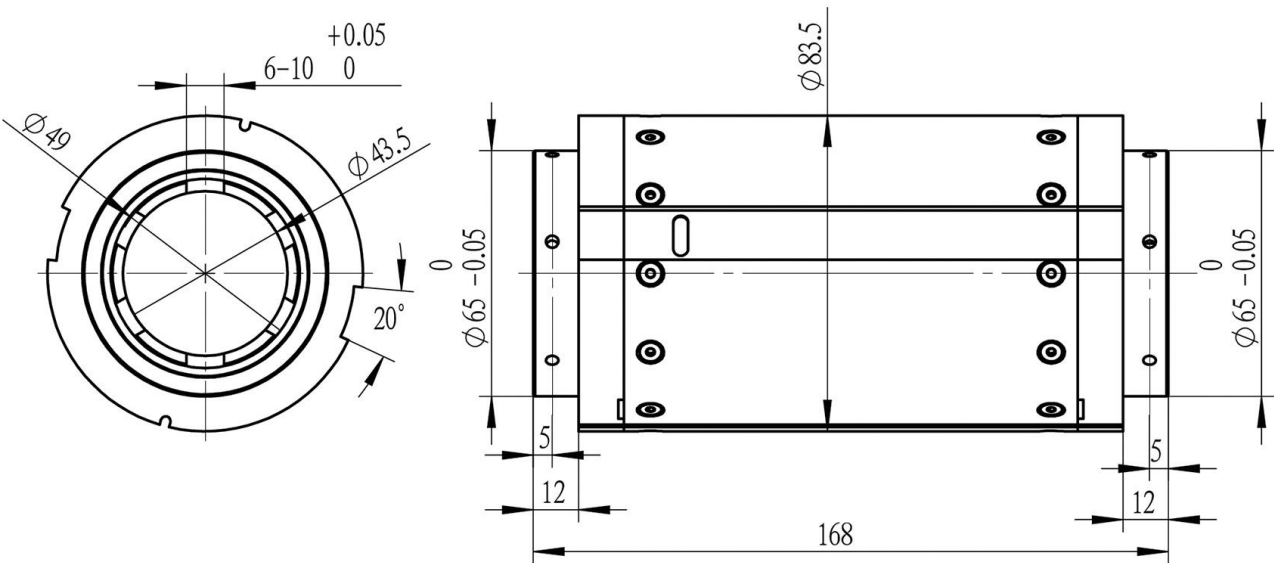
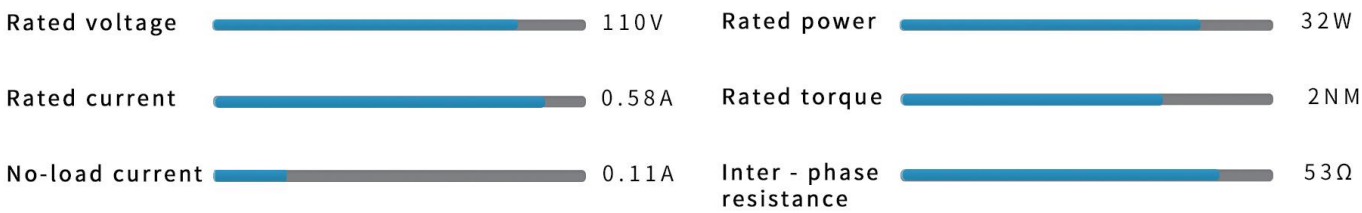


Application scenario

Intelligent sliding sleeve motor



Detailed data



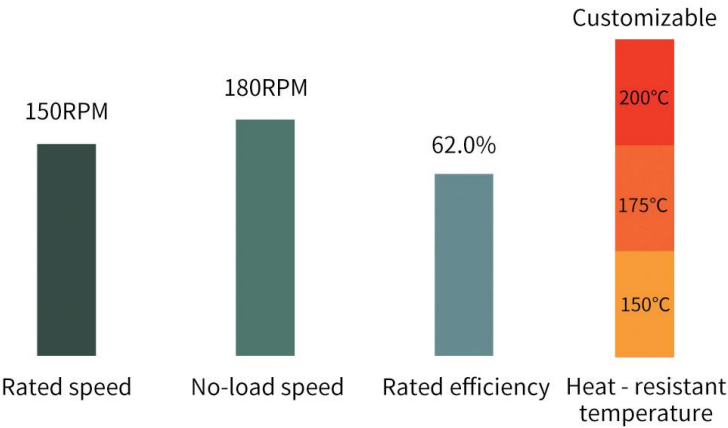
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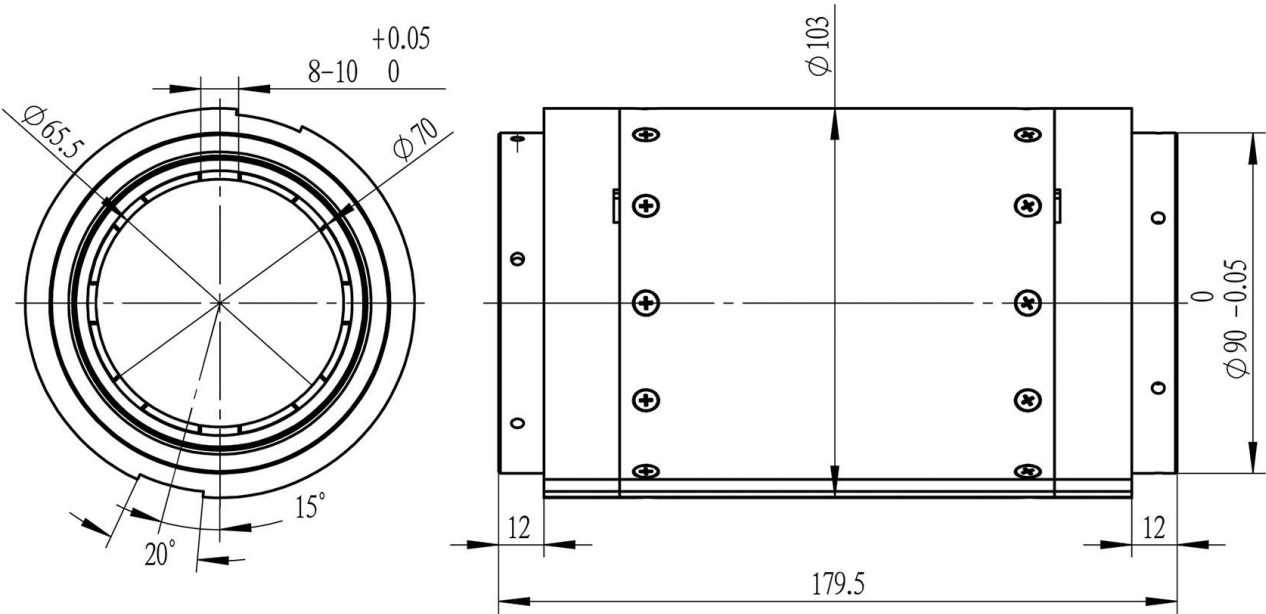
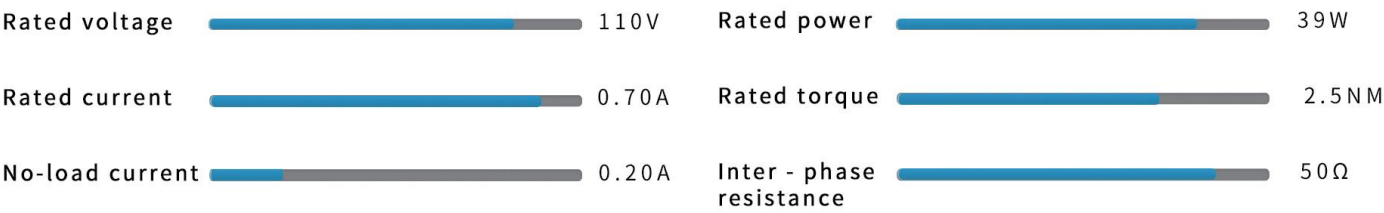


Application scenario

Intelligent sliding sleeve motor



Detailed data



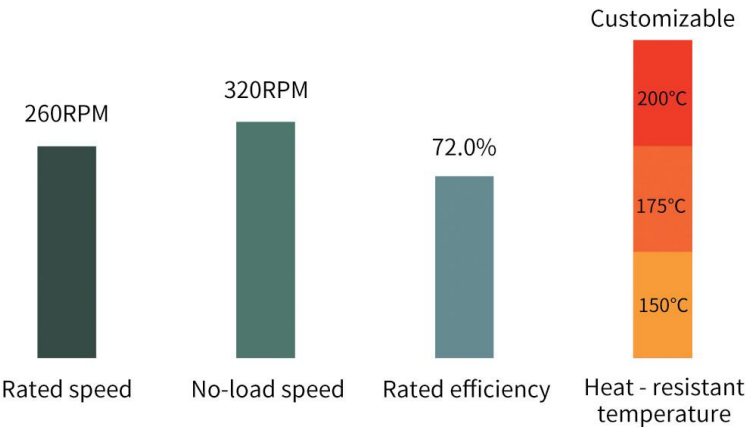
Unit:mm

E128170100

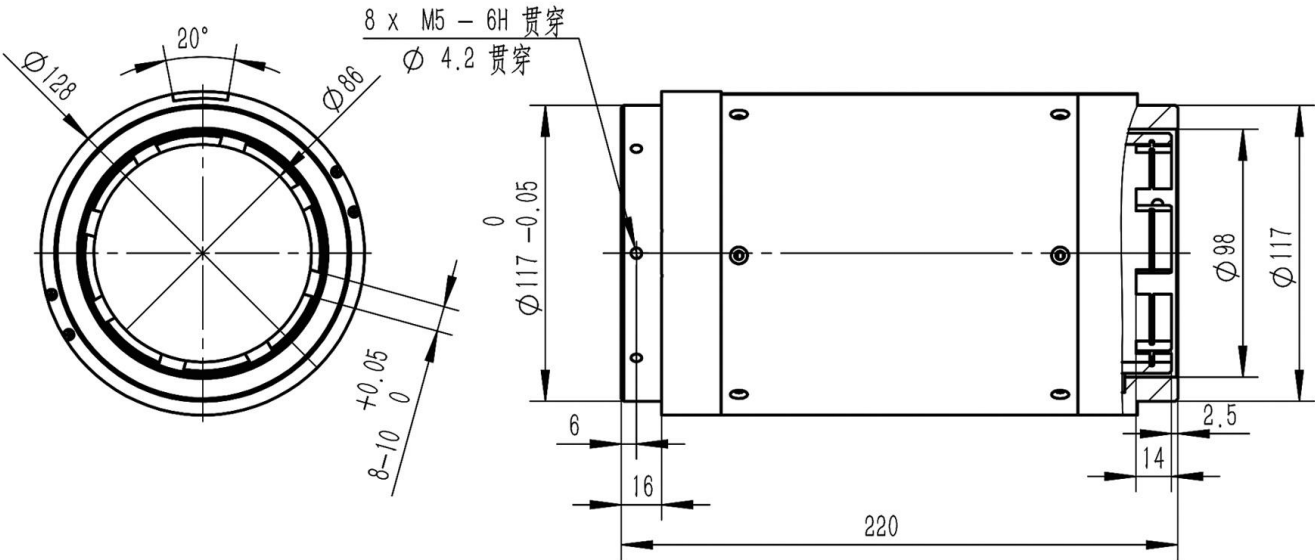


Application scenario

Sliding sleeve with a large diameter passage



Detailed data



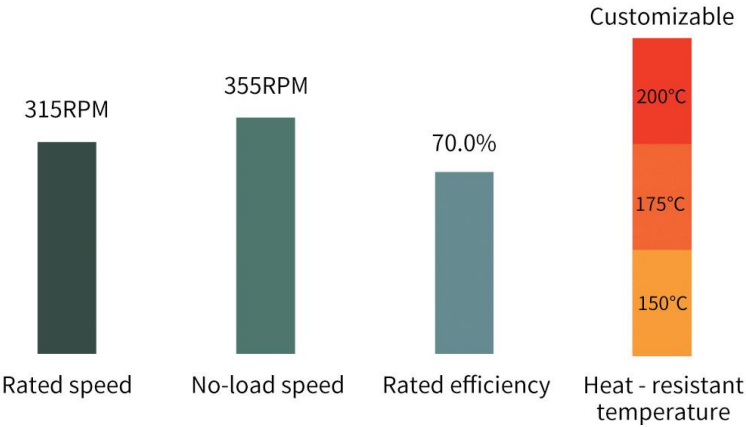
Unit:mm

E15117050

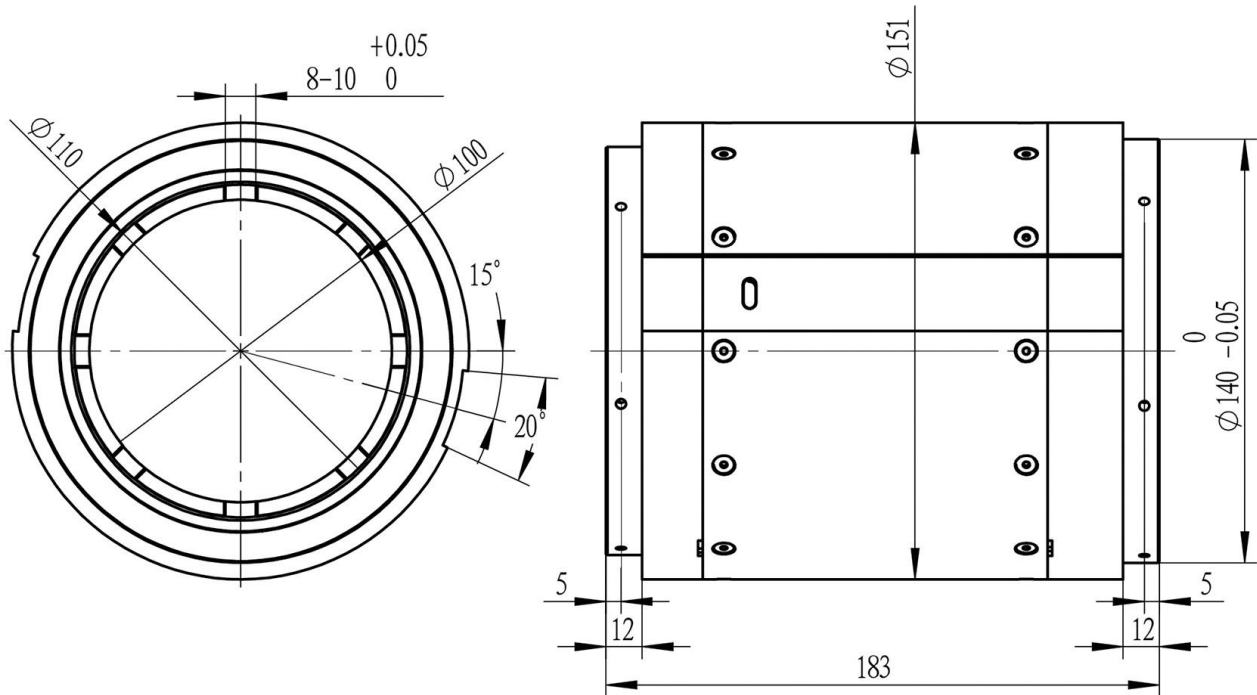
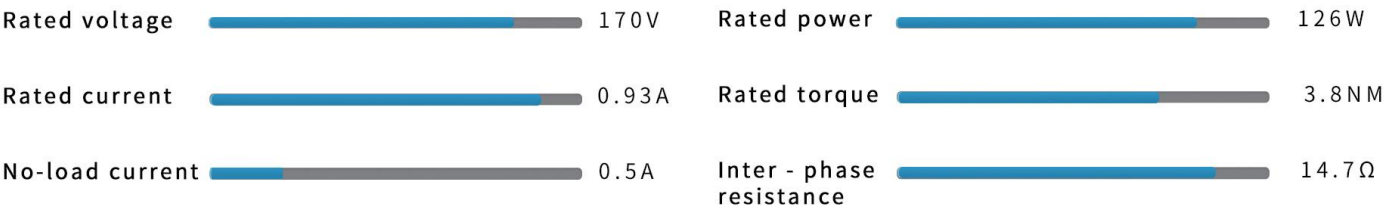


Application scenario

Intelligent sliding sleeve motor



Detailed data



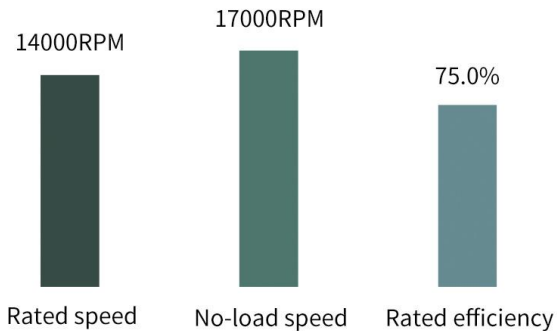
Unit:mm

E4530041 (Frameless)

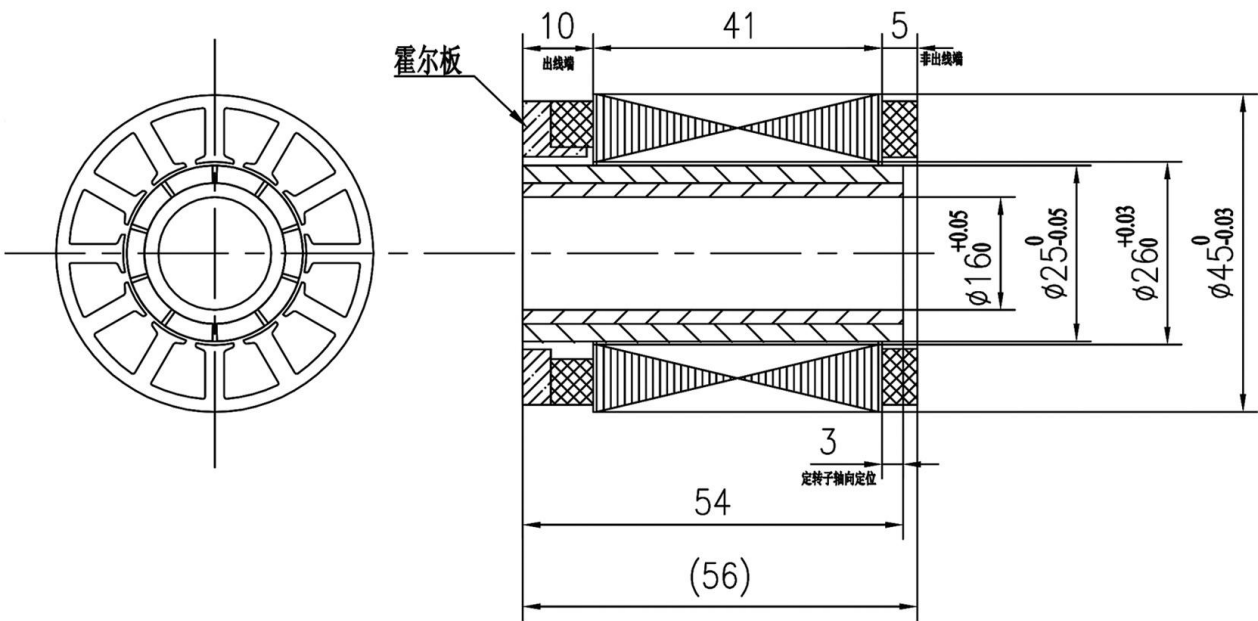
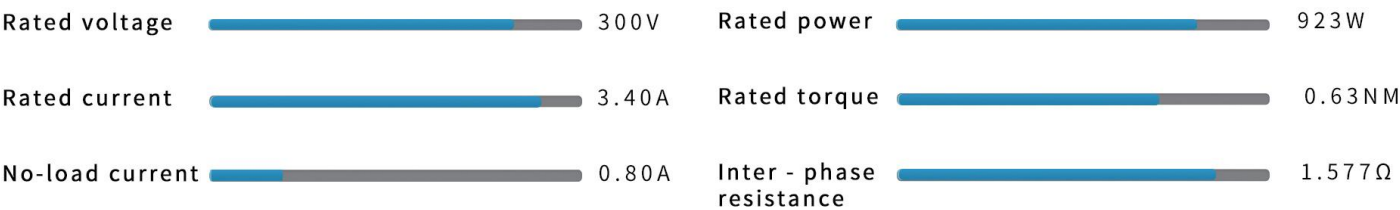


Application scenario

Power systems such as underwater thrusters

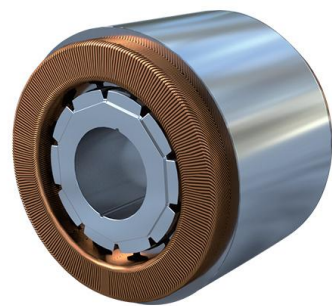


Detailed data



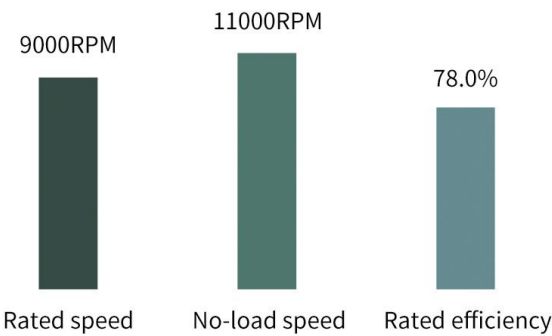
Unit:mm

E6050039 (Frameless)

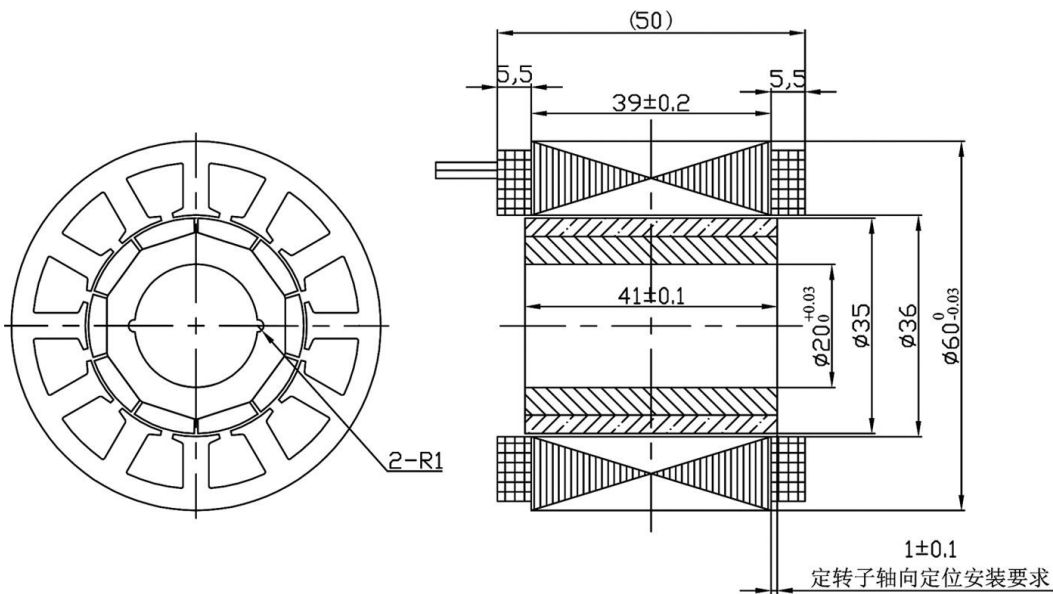
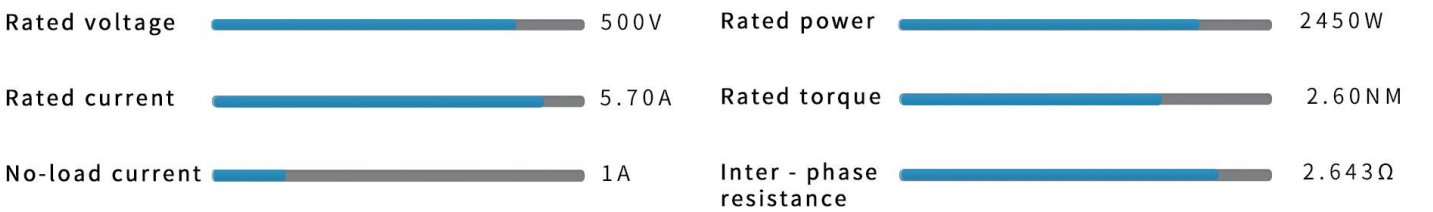


Application scenario

Power systems such as underwater thrusters



Detailed data



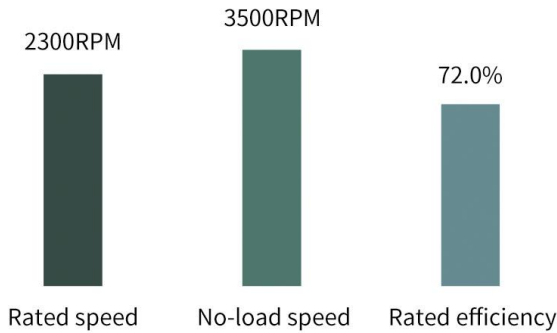
Unit:mm

E734822 (Frameless)

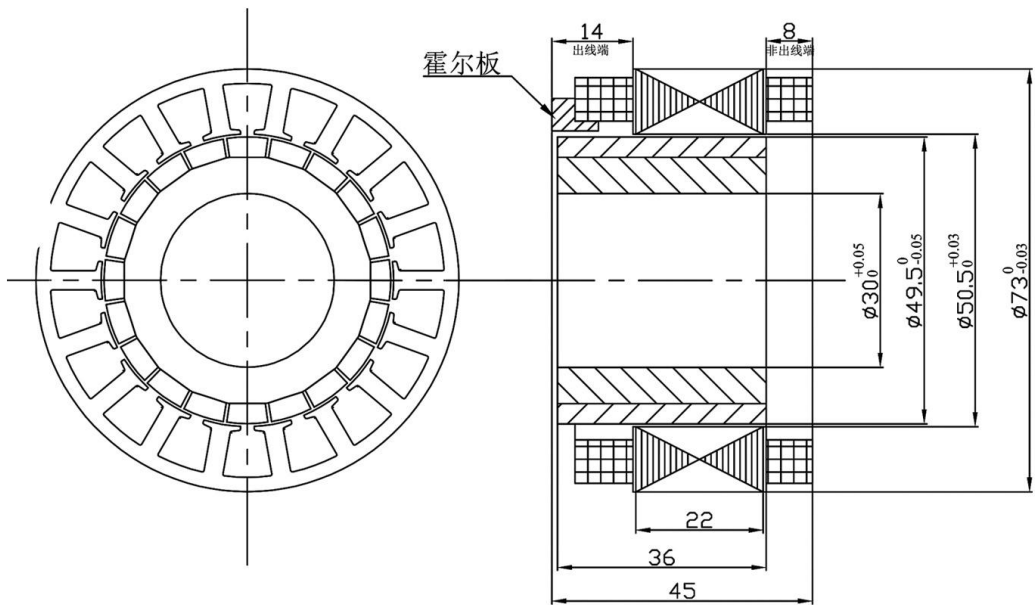
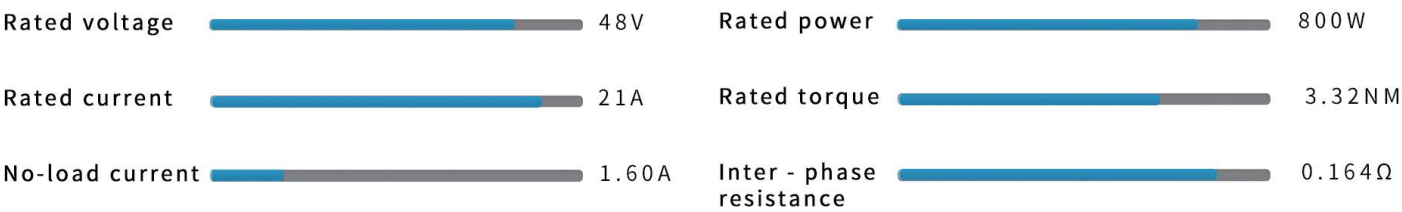


Application scenario

Power systems such as underwater thrusters



Detailed data



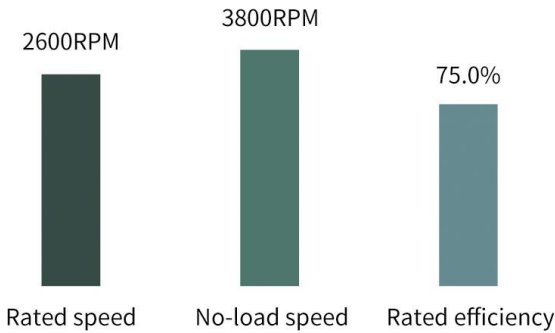
Unit:mm

E834840 (Frameless)

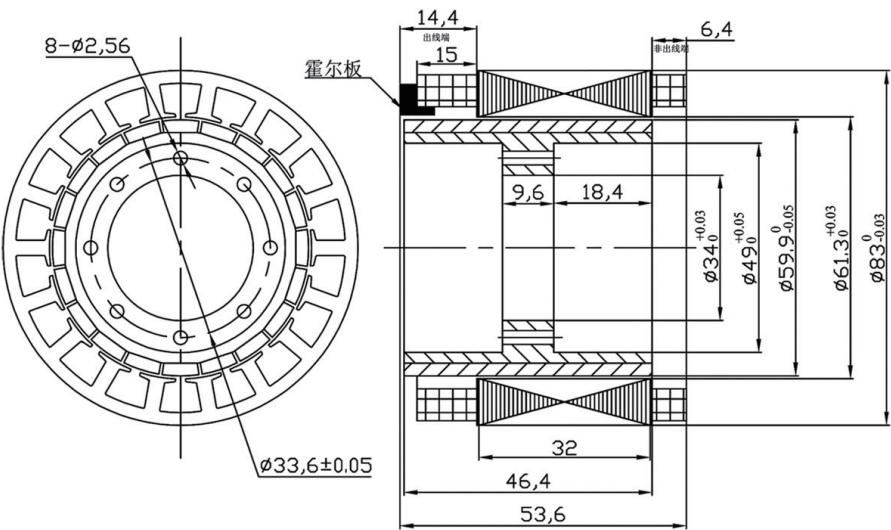
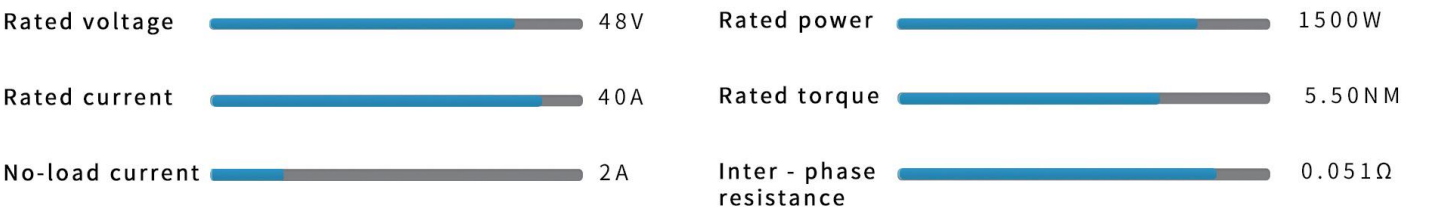


Application scenario

Power systems such as underwater thrusters

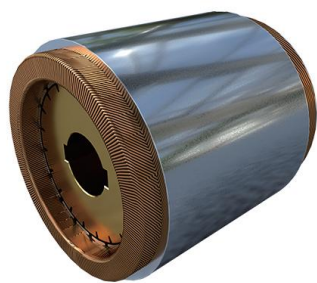


Detailed data



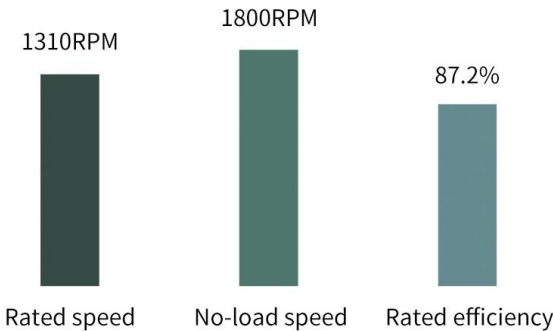
Unit:mm

E130350110 (Frameless)

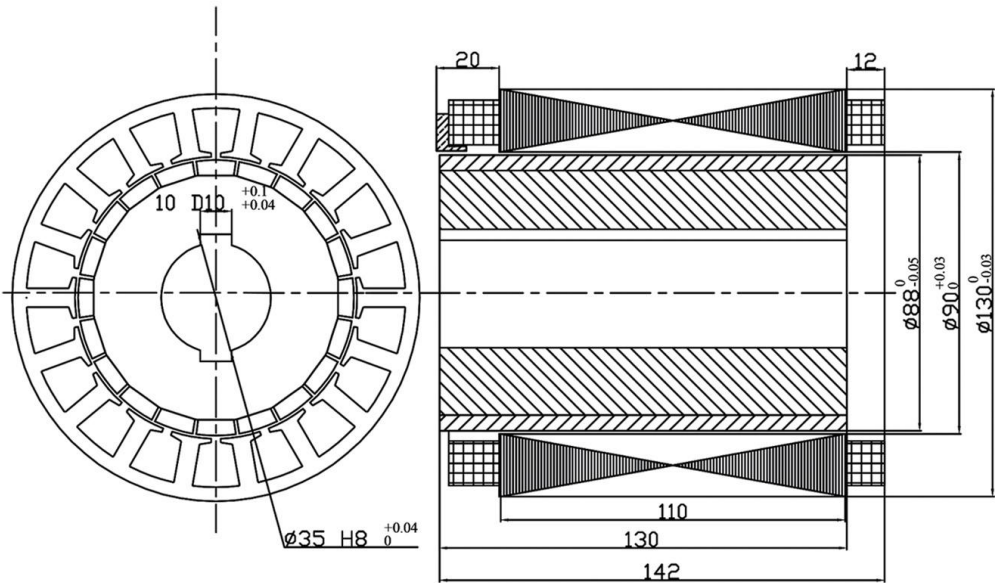
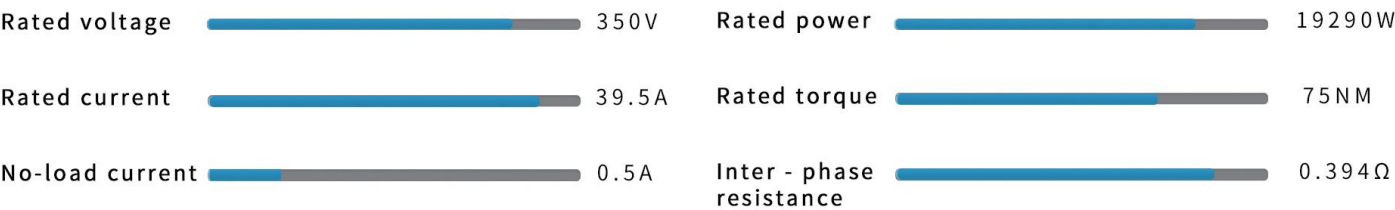


Application scenario

Power systems such as underwater thrusters

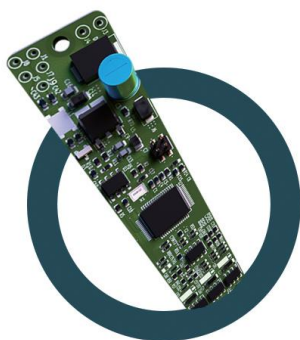


Detailed data



Unit:mm

High-temp Micro Servo Electro-hydraulic Control System



Motor driver for the downhole
high-temperature field



Motor driver in the field of
underwater robots

Intelligent downhole power unit for the petroleum industry

CEDM014T150DC12A0、CEDM002T150DC48C0、CEDM015T150DC90A0、CEDM008T150DC170A0、CEDM009T150DC450A0、CEDM013T150DC500A0、Drivers of the above-mentioned models have been successfully applied in a variety of downhole tools.

Micro electro-hydraulic power system

CEDM014T150DC12A0、CEDM002T150DC48C0、CEDM015T150DC90A0、Drivers of the above-mentioned models have been successfully applied in a variety of micro electro-hydraulic power systems.

The core power unit of the MWD rotary valve pulser

CEDM004T150DC48A0、CEDM005T150DC48B0、Drivers of the above-mentioned models have been successfully applied in various MWD rotary valve pulsers.

The power system of the underwater thruster CEDM016T150DC48A0、CEDM010T085DC300A0、CEDM011T085DC350A0、CEDM01T100DC48A0、Drivers of the above-mentioned models have been successfully applied in the power systems of various underwater thrusters.

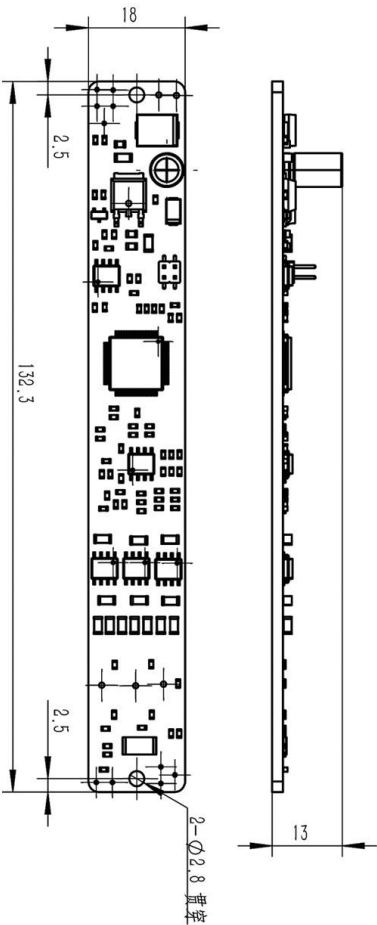
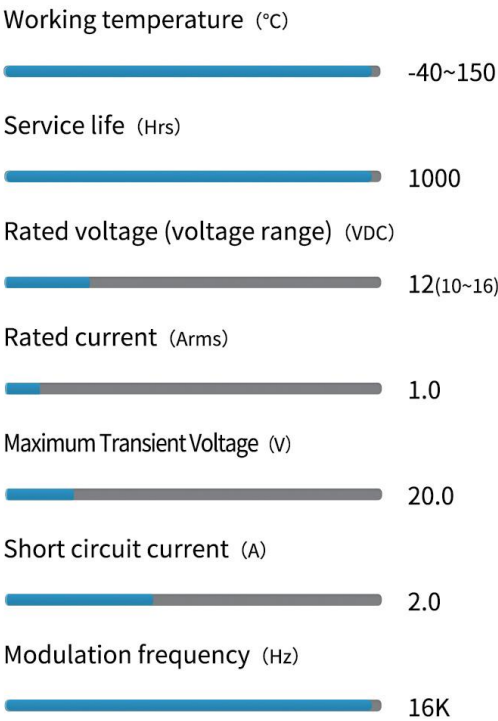
12V Motor Driver

CEDM014T150DC12A0

Application range

Motor Control for oil intelligent downhole tool micro-electric control hydraulic dynamical system

Detailed data



Motor type	Brushless DC
Position feedback	Hall
Control loop	Voltage open loop / speed closed loop
Modulation mode	Six-step commutation
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	RS485
Upper computer	Provide the upper computer for debugging
Extended function	

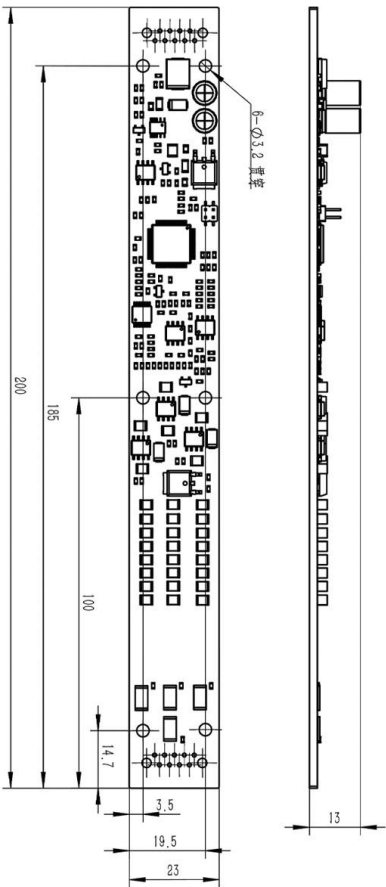
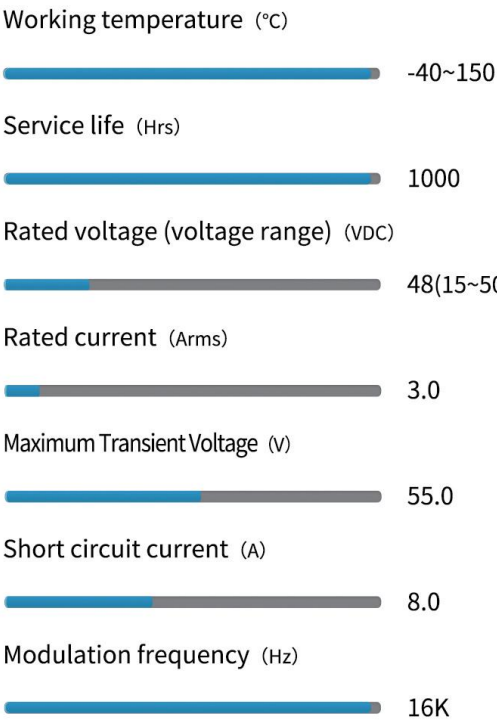
48V Motor Driver

CEDM002T150DC48C0

Application range

Motor Control for oil intelligent downhole tool micro-electric control hydraulic dynamical system

Detailed data



Motor type	Brushless DC
Position feedback	Hall / Back Electromotive Force
Control loop	Voltage open loop / Speed closed loop
Modulation mode	Six-step commutation / Customizable FOC
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	RS485 /Customizable CAN
Upper computer	Provide the upper computer for debugging
Extended function	

90V Medium Voltage Motor Driver

CEDM015T150DC90A0

Application range

Motor Control for oil intelligent downhole tool micro-electric control hydraulic dynamical system

Detailed data

Working temperature (°C)



Service life (Hrs)



Rated voltage (voltage range) (VDC)



Rated current (A_{rms})



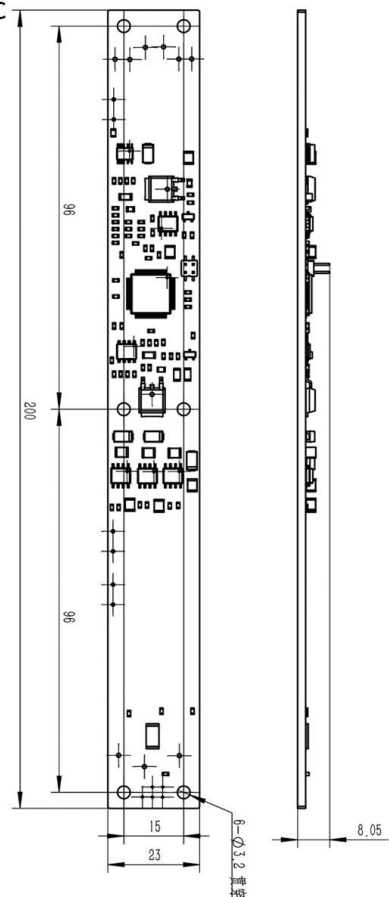
Maximum Transient Voltage (V)



Short circuit current (A)



Modulation frequency (Hz)



Motor type	Brushless DC
Position feedback	Hall
Control loop	Voltage open loop / Speed closed loop
Modulation mode	Six-step commutation
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	RS485
Upper computer	Provide the upper computer for debugging
Extended function	

170V Medium Voltage Motor Driver

CEDM008T150DC170A0

Application range

Main Drive Power Unit of Intelligent Downhole Tools
for Petroleum

Detailed data

Working temperature (°C)



Service life (Hrs)



Rated voltage (voltage range) (VDC)



Rated current (Arms)



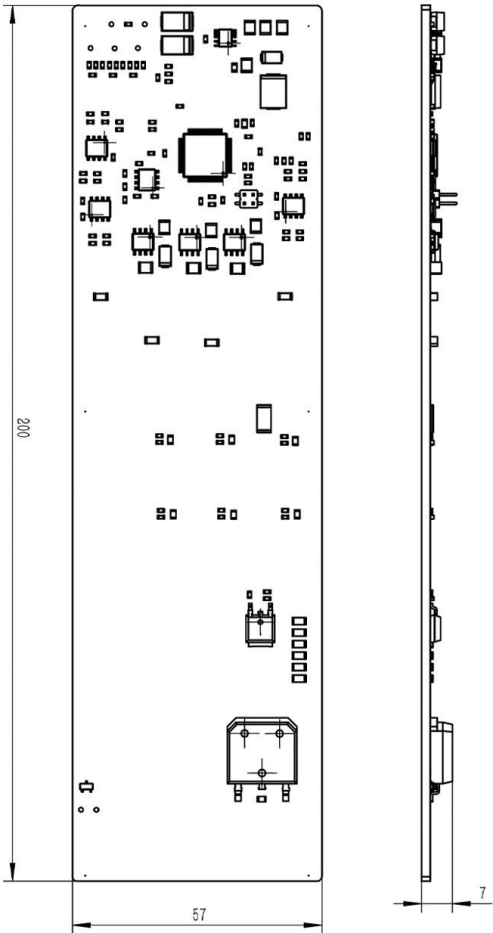
Maximum Transient Voltage (V)



Short circuit current (A)



Modulation frequency (Hz)



Motor type	Brushless DC
Position feedback	Hall
Control loop	Voltage open loop / Speed closed loop
Modulation mode	Six-step commutation
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	RS485
Upper computer	Provide the upper computer for debugging
Extended function	

450V High Voltage Motor Driver

CEDM009T150DC450A0

Application range

Main Drive Power Unit of Intelligent Downhole Tools
for Petroleum

Detailed data

Working temperature (°C)



Service life (Hrs)



Rated voltage (voltage range) (VDC)



Rated current (Arms)



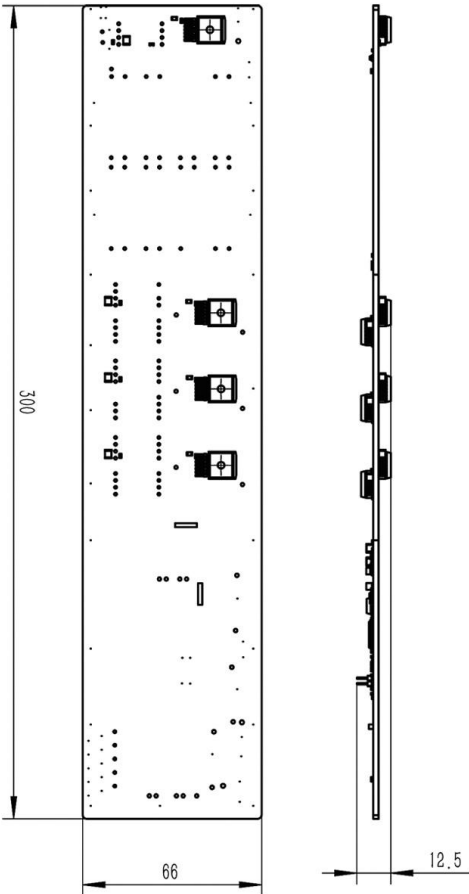
Maximum Transient Voltage (V)



Short circuit current (A)



Modulation frequency (Hz)



Motor type	Brushless DC
Position feedback	Hall
Control loop	Voltage open loop / Speed closed loop
Modulation mode	Six-step commutation
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	RS485
Upper computer	Provide the upper computer for debugging
Extended function	

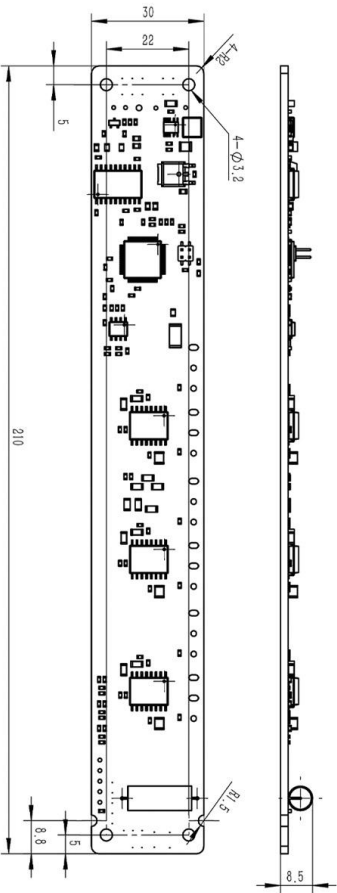
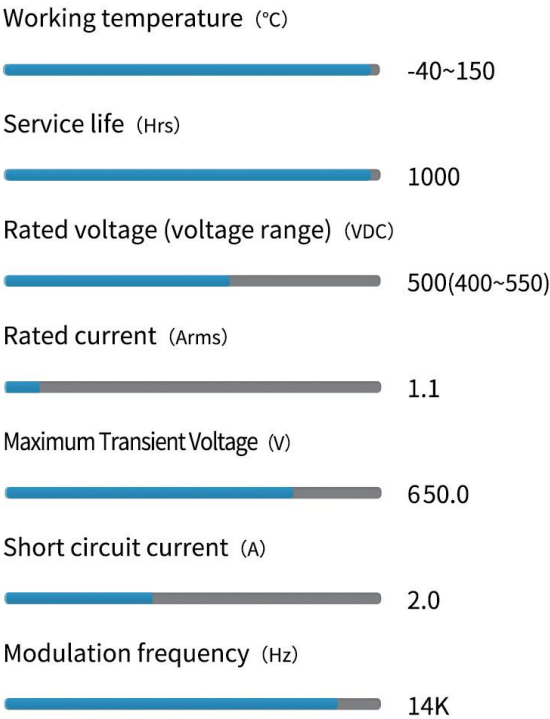
500V High Voltage Motor Driver

CEDM013T150DC500A0

Application range

Main Drive Power Unit of Intelligent Downhole Tools
for Petroleum

Detailed data



Motor type	Brushless DC
Position feedback	Hall / Back Electromotive Force
Control loop	Voltage open loop / Speed closed loop
Modulation mode	Six-step commutation
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	RS485 /CAN
Upper computer	Provide the upper computer for debugging
Extended function	

28V Special Motor Driver for Rotary Valve Pulsator (Single Board)

CEDM004T150DC48A0

Application range

Core Power Unit of the Pulsator for the MWD Rotary Valve

Detailed data

Working temperature (°C)



Service life (Hrs)



Rated voltage (voltage range) (VDC)



Rated current (Arms)



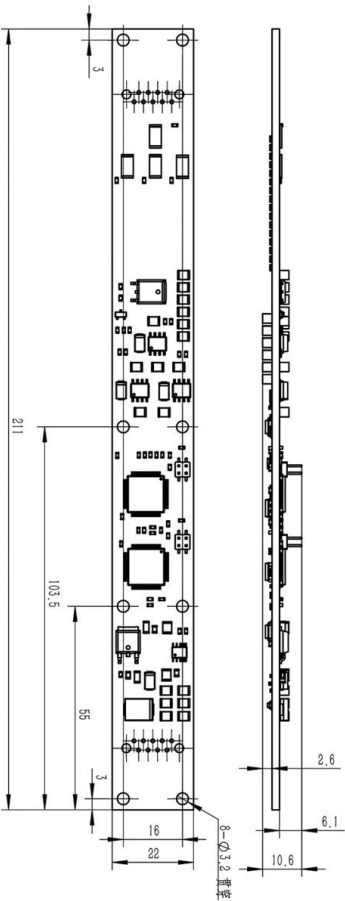
Maximum Transient Voltage (V)



Short circuit current (A)



Modulation frequency (Hz)



Motor type	Brushless DC
Position feedback	Hall
Control loop	Position control
Modulation mode	Six-step commutation
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	RS485
Upper computer	Provide the upper computer for debugging
Extended function	1000-hour log storage

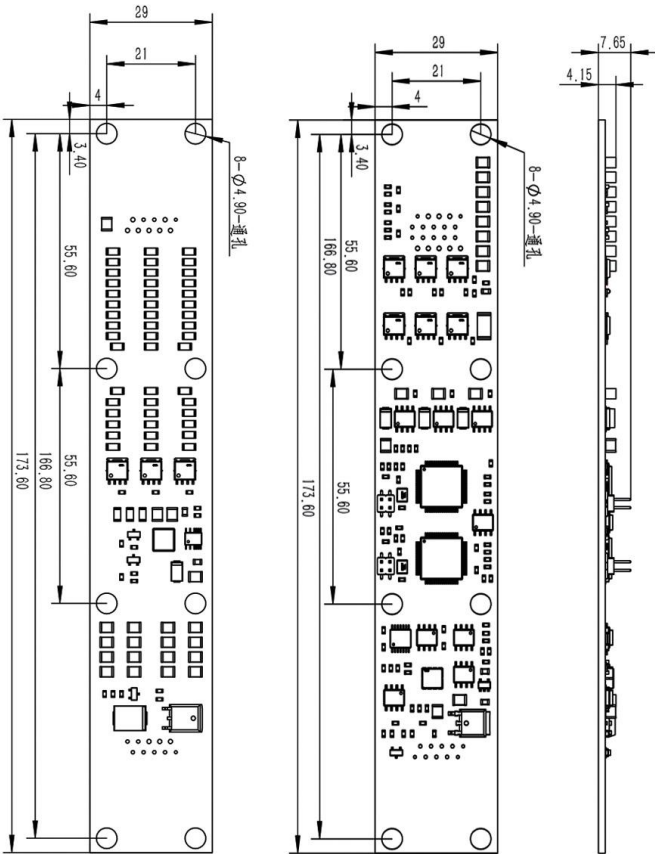
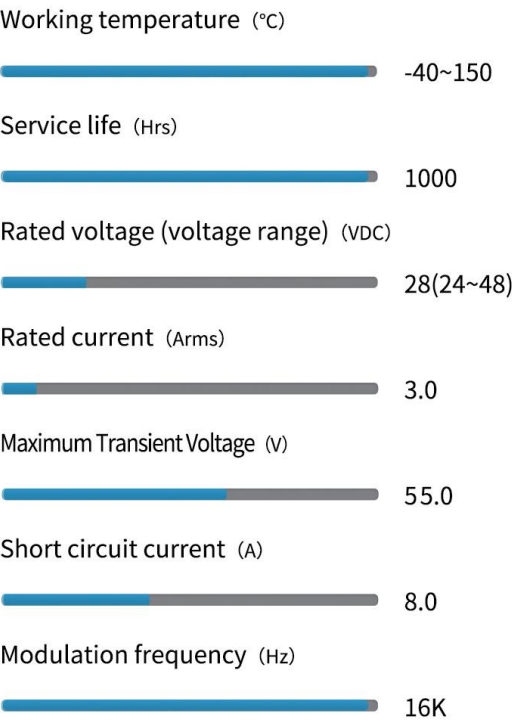
28V Special Motor Driver for Rotary Valve Pulsator (150°C)

CEDM017T150DC28A0

Application range

Core Power Unit of the Pulsator for the MWD Rotary Valve

Detailed data



Motor type	Brushless DC
Position feedback	Hall
Control loop	Position control
Modulation mode	Six-step commutation
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	RS485
Upper computer	Provide the upper computer for debugging
Extended function	1000-hour log storage

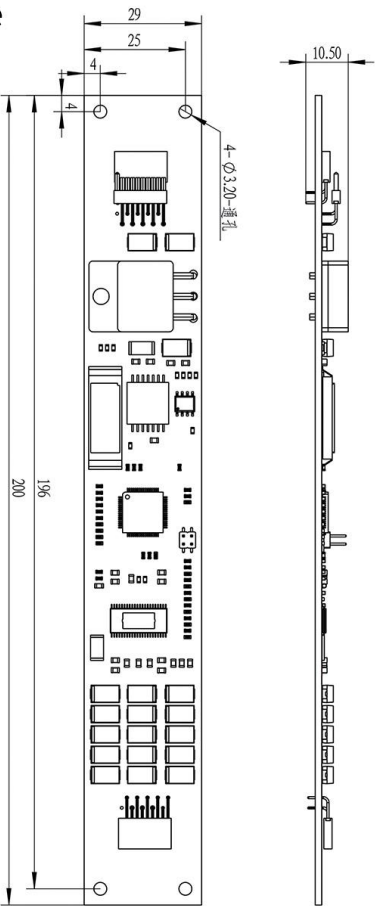
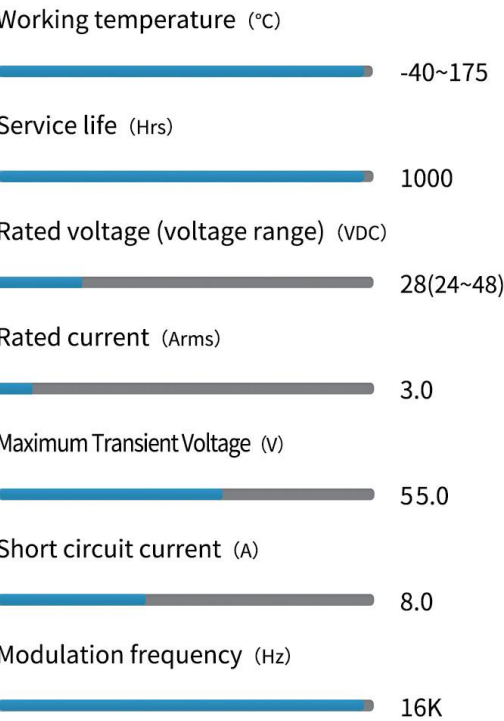
28V Special Motor Driver for Rotary Valve Pulsator (175°C)

CEDM018T150DC28A0

Application range

Core Power Unit of the Pulsator for the MWD Rotary Valve

Detailed data



Motor type	Brushless DC
Position feedback	Hall
Control loop	Position control
Modulation mode	Six-step commutation
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	RS485
Upper computer	Provide the upper computer for debugging
Extended function	500-hour log storage

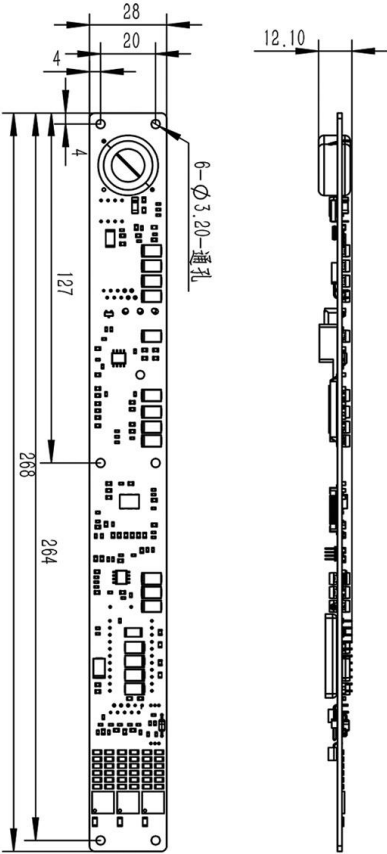
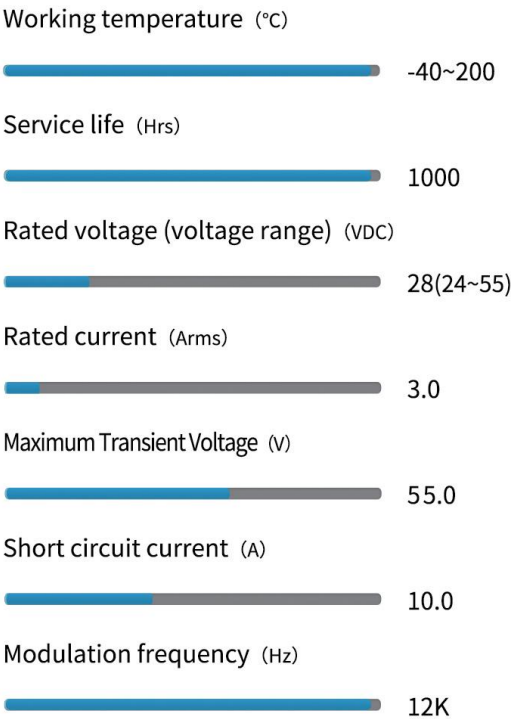
28V Special Motor Driver for Rotary Valve Pulsator (200°C)

CEDM006T200DC48B0

Application range

Core Power Unit of the Pulsator for the MWD Rotary Valve

Application range



Motor type	Brushless DC
Position feedback	Hall
Control loop	Position control
Modulation mode	Six-step commutation
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	RS485
Upper computer	Provide the upper computer for debugging
Extended function	200-hour log storage

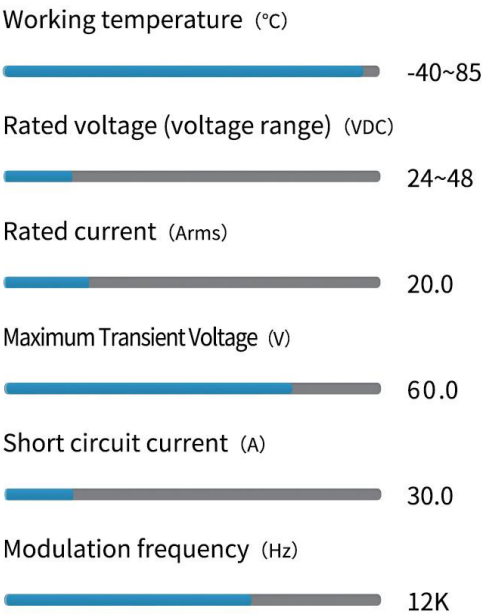
48V Low Voltage Underwater Propulsion Driver

CEDM016T150DC48A0

Application range

Power System of Underwater Thruster

Application range



Motor type	Brushless DC
Position feedback	Hall
Control loop	Voltage open loop / Speed closed loop
Modulation mode	Six-step commutation/FOC
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	RS485/CAN
Upper computer	Provide the upper computer for debugging
Extended function	

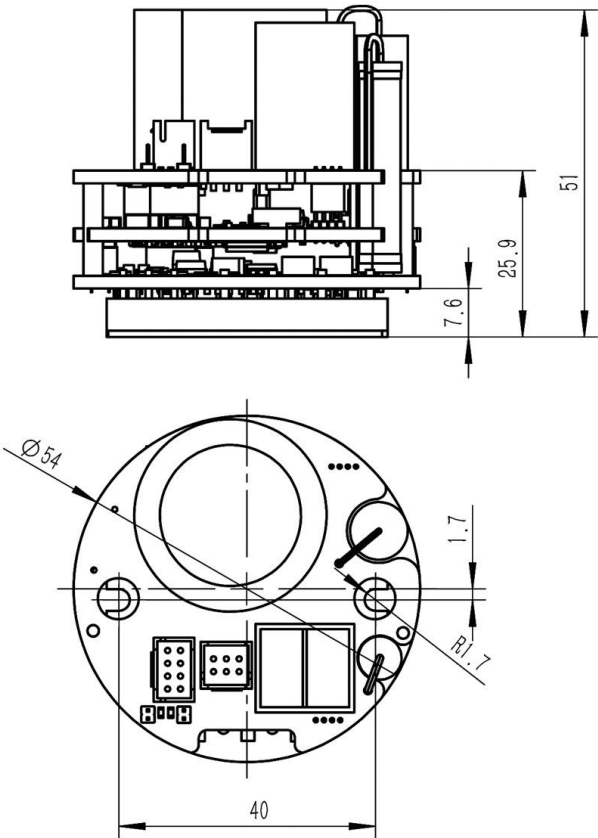
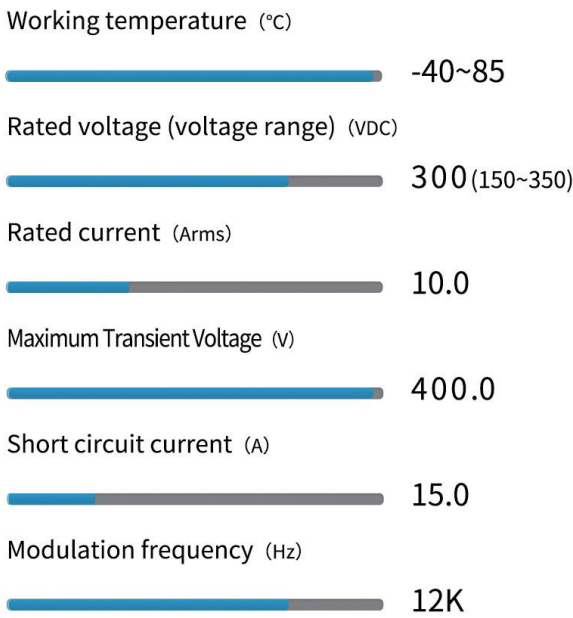
300V High Voltage Underwater Propulsion Driver

CEDM010T085DC300A0

Application range

Power System of Underwater Thruster

Application range



Motor type	Brushless DC
Position feedback	Observer
Control loop	Voltage open loop / Current closed loop / Speed closed loop
Modulation mode	Six-step commutation/FOC
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	RS485/ CAN
Upper computer	Provide the upper computer for debugging
Extended function	

350V High Voltage Underwater Propulsion Driver

CEDM011T085DC350A0

Application range

Power System of Underwater Thruster

Application range

Working temperature (°C)

 -40~85

Rated voltage (voltage range) (VDC)

 350 (150~300)

Rated current (Arms)

 25.0

Maximum Transient Voltage (V)

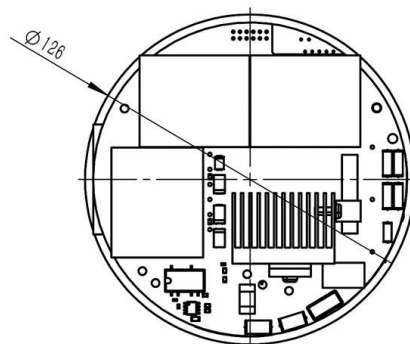
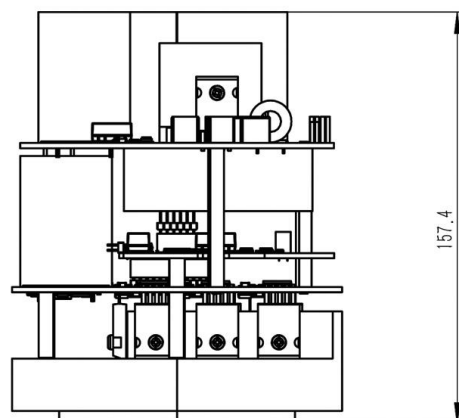
 550.0

Short circuit current (A)

 35.0

Modulation frequency (Hz)

 12K



Motor type	Brushless DC
Position feedback	Hall / Back Electromotive Force
Control loop	Voltage open loop / Current closed loop / Speed closed loop
Modulation mode	Six-step commutation/FOC
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	CAN
Upper computer	Provide the upper computer for debugging
Extended function	

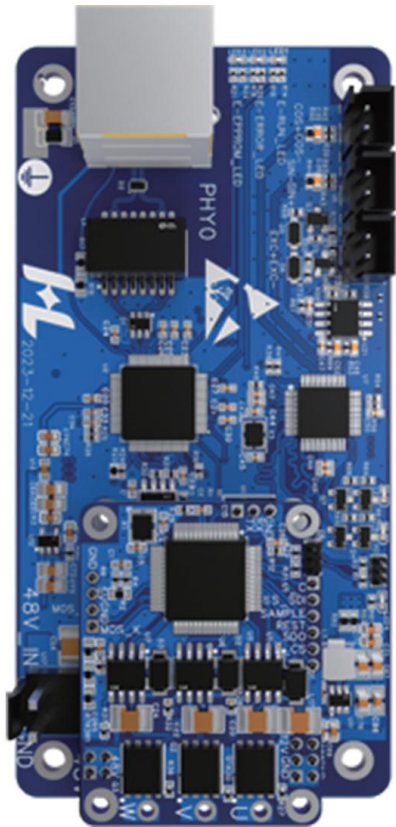
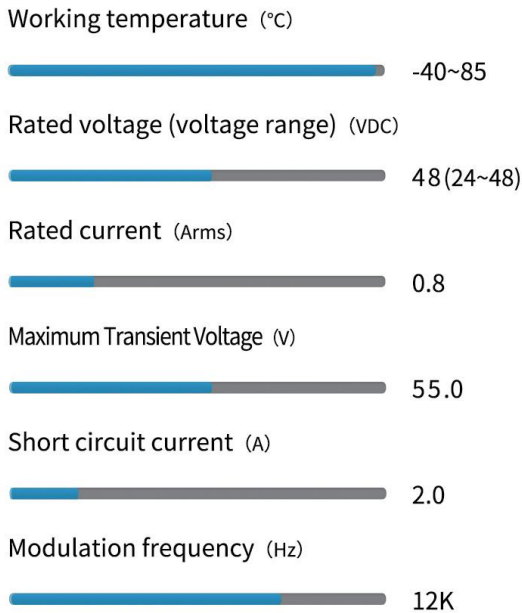
48V Resolver Motor Driver

CEDM01T100DC48A0

Application range

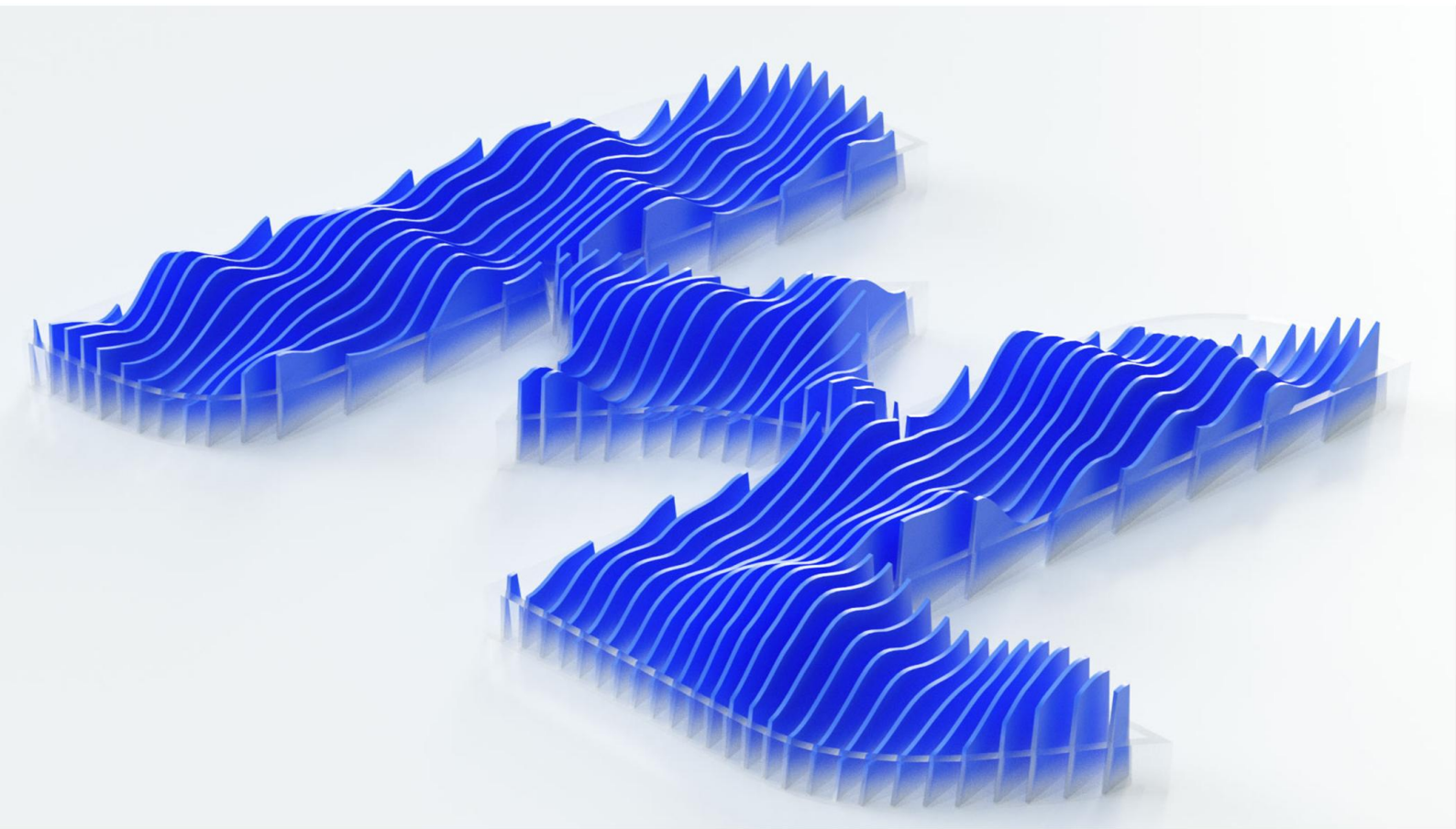
Auxiliary Power Unit of 3D Printer

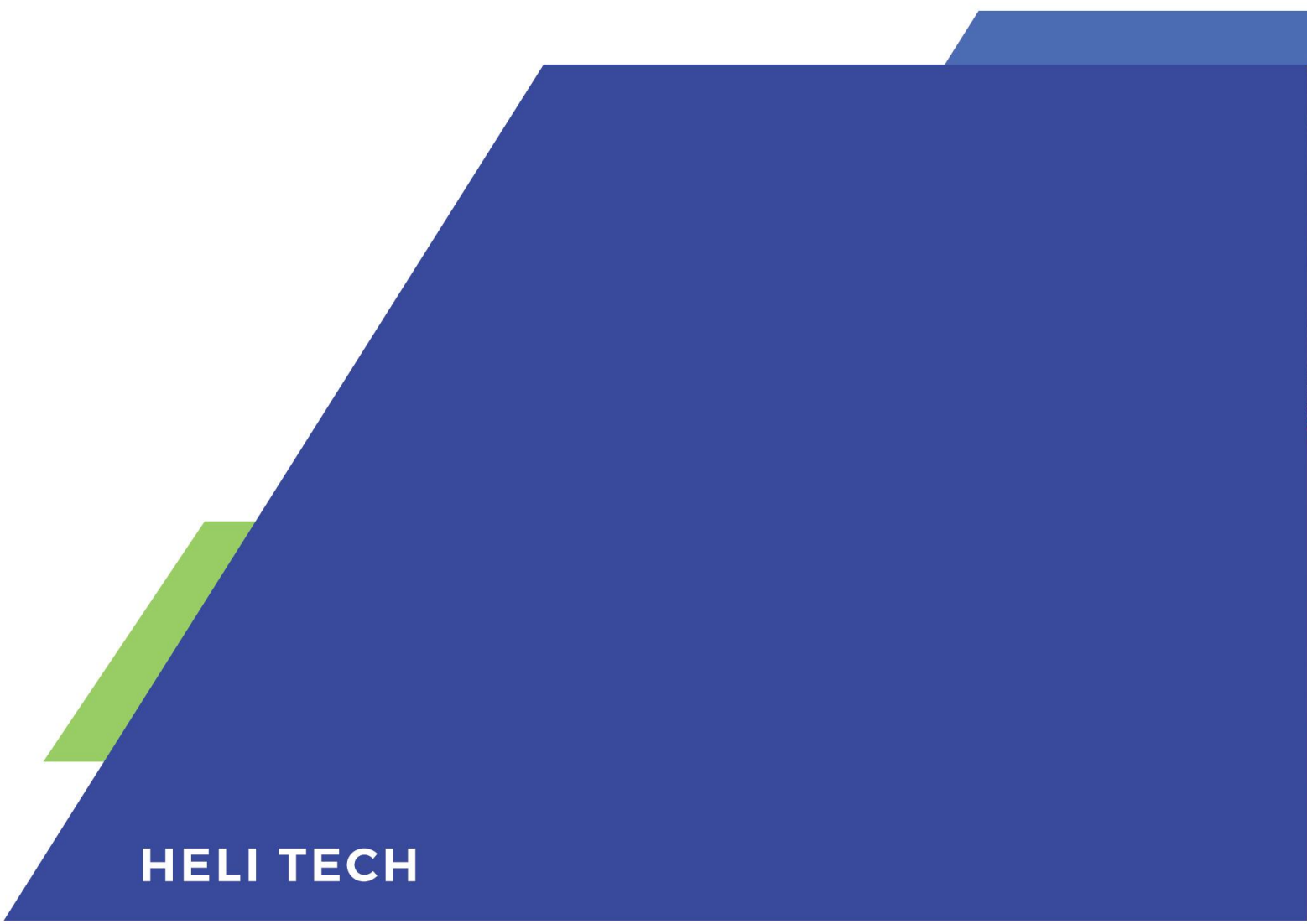
Application range



Motor type	Brushless DC
Position feedback	Resolver
Control loop	Voltage open loop / Current closed loop / Speed closed loop / Position control
Modulation mode	FOC
Ambient temperature detection	NTC
Status monitoring	Voltage, current, rotational speed, temperature, and other parameters can be customized
Communication interface	EtherCat
Upper computer	Provide the upper computer for debugging
Extended function	

TECHNOLOGY CHANGES EVERYTHING





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