

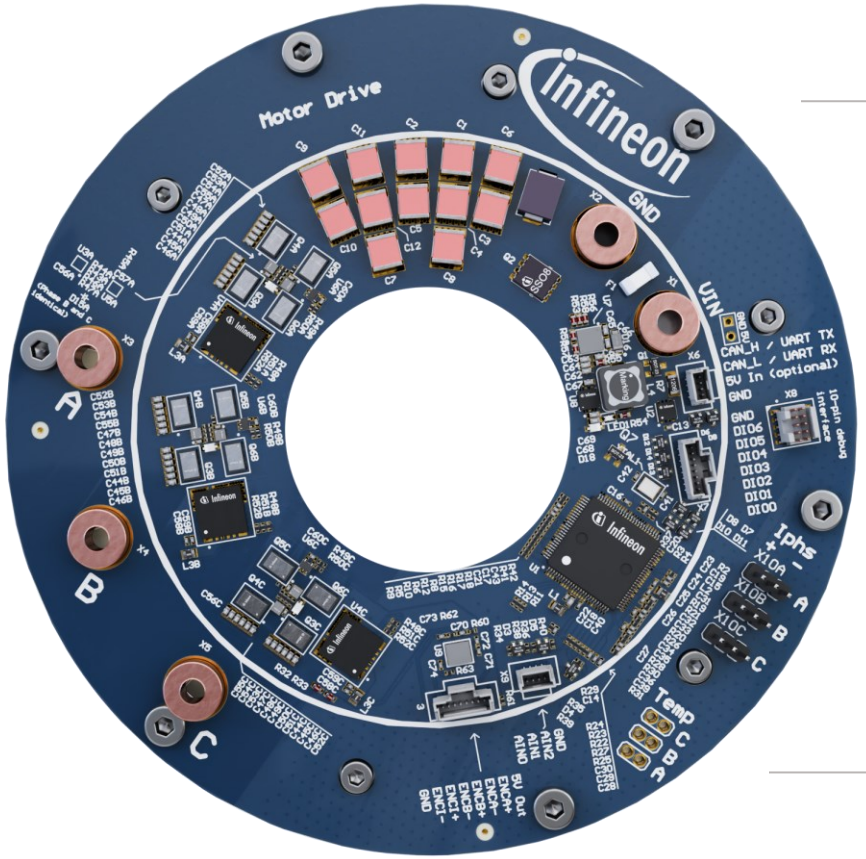
Humanoid Summit Tokyo 2026
REF Designs for Motor Drive

Infineon Technologies

May 2026

Restricted

Scalable, discrete system solutions



Microcontroller

AURIX™ or PSOC™



Gate drivers

EiceDRIVER™



Power switches

OptiMOS™ or CoolGaN™



Current and position sensor

XENSIV™



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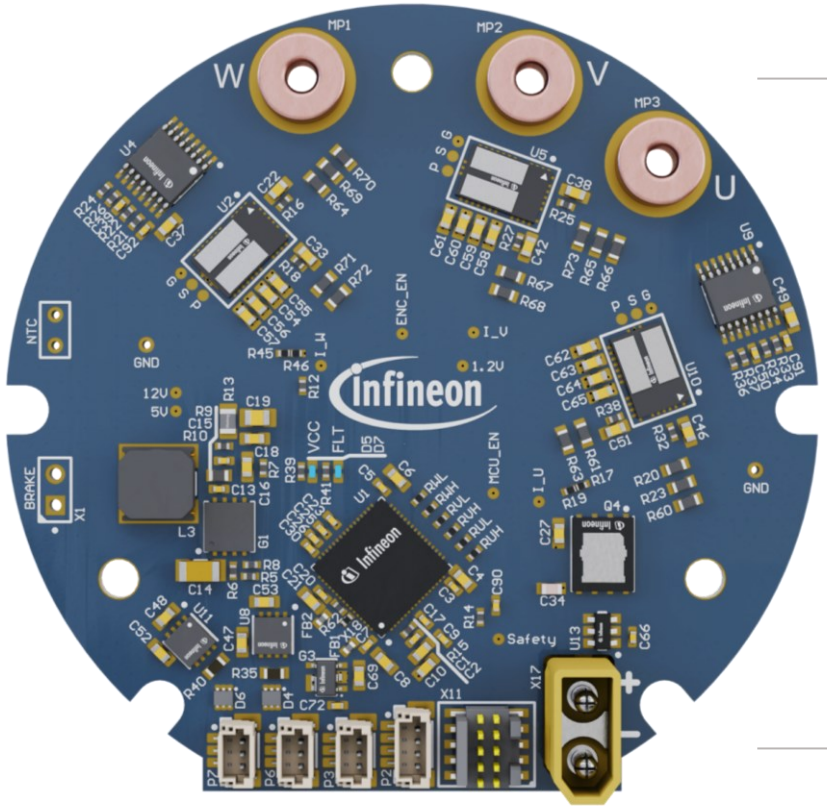
Integrated system solutions for every movement



Microcontroller

AURIX™ or PSOC™



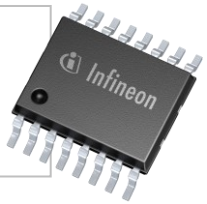
Integrated power stages

CoolGaN™ Drive



Current sensors

XENSIV™



Position sensor

XENSIV™



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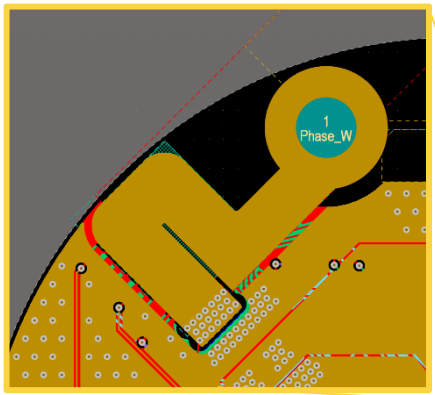
100V GaN motor drive reference design for humanoid robotics



TLE5571

IGJ022H10S1

TLE5571

External NTC

Auxiliary Supply

PSC3M5FDS2ACQ1

Communication Interfaces

Debug Connector

DC Input Connector

Input Current Sensor
&
7th - Safety Switch

66 mm

DC-Link Capacitors

TLI49012
or
TLV5012B

Auxiliary Supply

RS-485 Transceiver

Communication Interfaces

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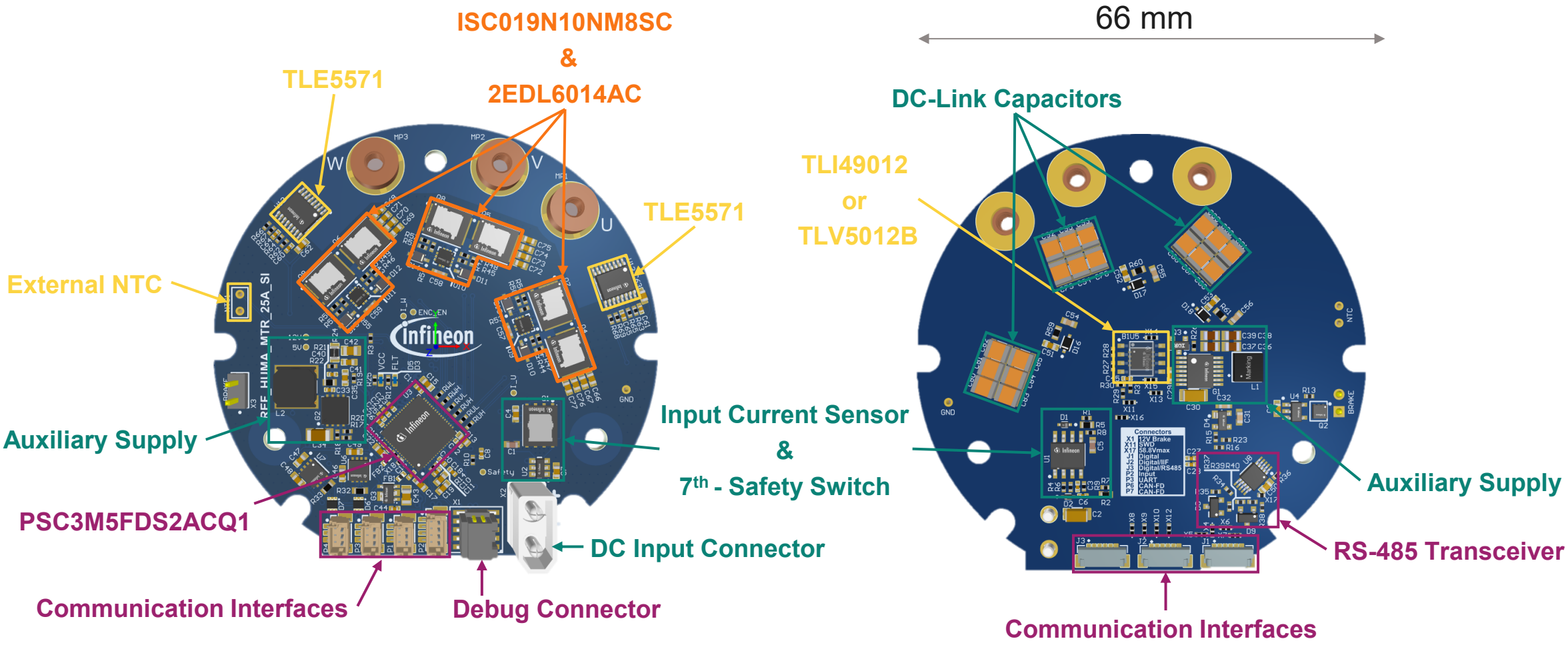
100V SI motor drive reference design for humanoid robotics



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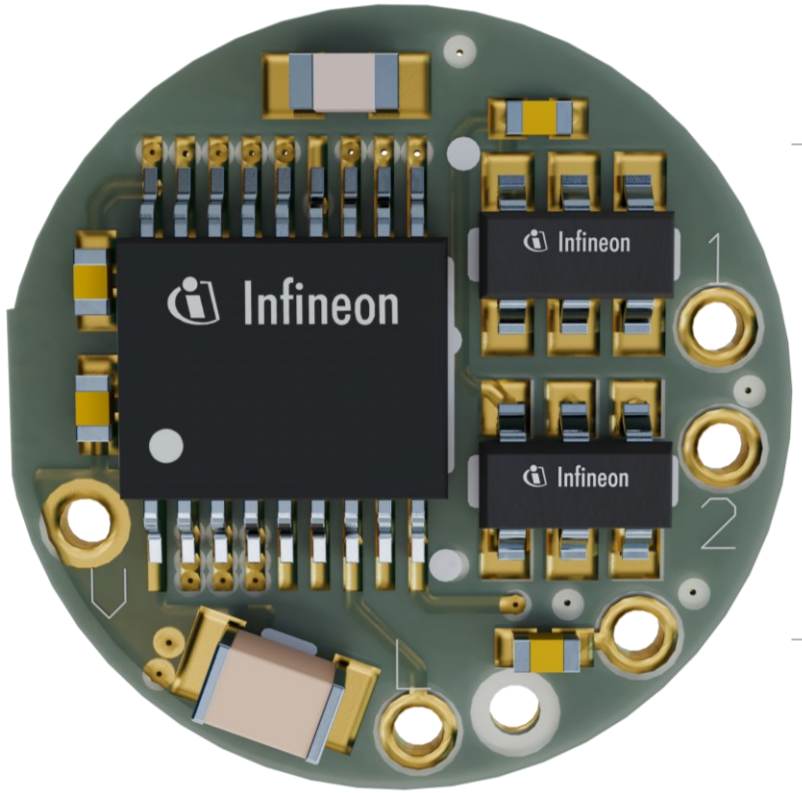
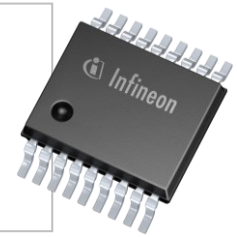
Integrated system solutions for dexterous hands



Fully integrated motor control

MOTIX™



Current sensor

XENSIV™



Position sensor

XENSIV™



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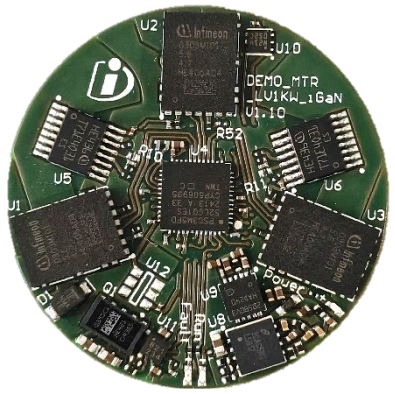
Motor drive system overview







34 mm diameter
(1.3 inch)



Parameter	Value
Input voltage	30~80 V_{DC}, 48 V typ.
Output current	20 $A_{RMS,typ}$
Output power	>1 kW
Switching frequency	100 kHz
Dimensions	34 mm diameter, 5.5 mm height (10 mm w/connectors)
Power density	3.3 kW/in^3 (2 kW/in^3 w/connectors)

Features

- All in one system (inverter + controller + aux circuits)
- Sensored or sensorless FOC with CAN/UART communication
- TMR current sensors with fast OCP shutdown
- High-side inrush limiting with fast disconnect in short-circuit

Benefits

- Small size form factor, enables embedding inverter within motor
- Improved system efficiency due to motor core loss savings at higher f_{sw}
- GaN integrated power stage + new controller and current sensors enable a simple and flexible system design to fit any form factor

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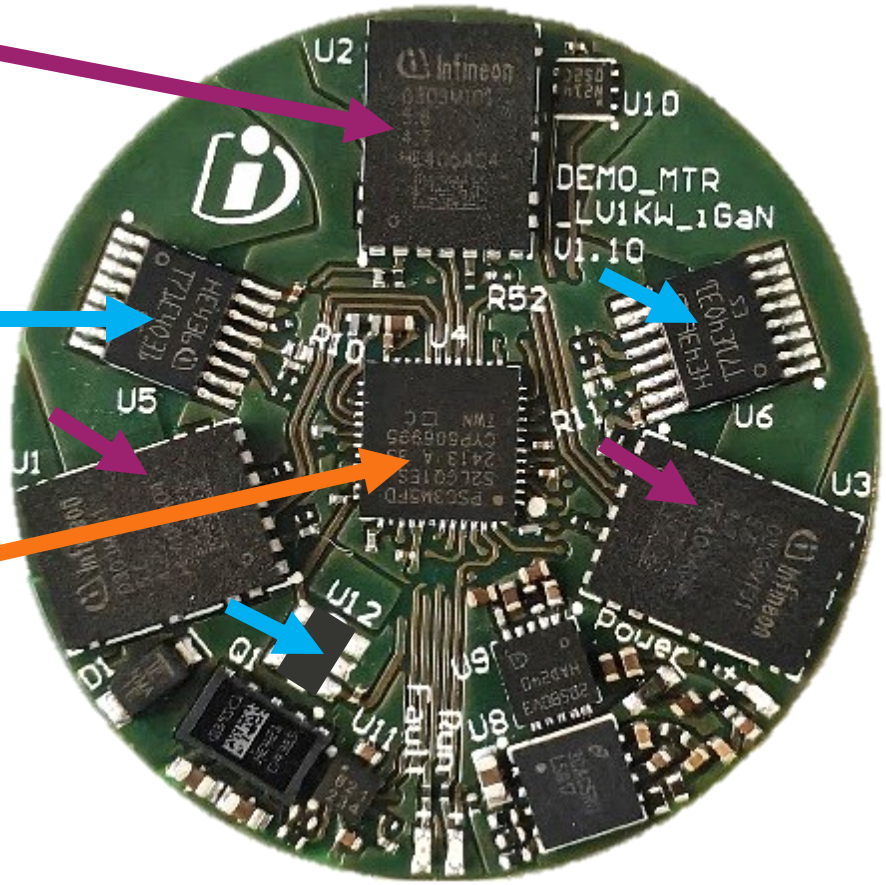
Key components

- **CoolGaN™ Drive integrated power stage (x3)**
  - Two 100 V CoolGaN™ transistors with 2.4 $m\Omega_{typ}$
  - 120 V EiceDRIVER™ half-bridge gate driver IC with level-shifting and bootstrapping features
- **Xensiv™ TLI5571 (x2) and TLI5572 tunnel magnetoresistance (TMR) current sensors**
  - Non-invasive design-in by detecting magnetic fields in PCB layers below and around the sensor
  - High bandwidth >1 MHz
  - OCP with adjustable threshold, response time <150 ns
- **PSOC Control C3 microcontroller unit (MCU)**
  - Arm® Cortex® M33-based 180 MHz microcontroller
  - ADCs with sync. S&H @ 12 MS/s, integrated fast comparator
  - PWM timing resolution as low as <100 ps
  - Sensored or sensorless FOC with up to 100 kHz control
  - Multiple package options from 6x6 to 12x12 mm
  - Highly flexible pinouts simplify layout in tight spaces



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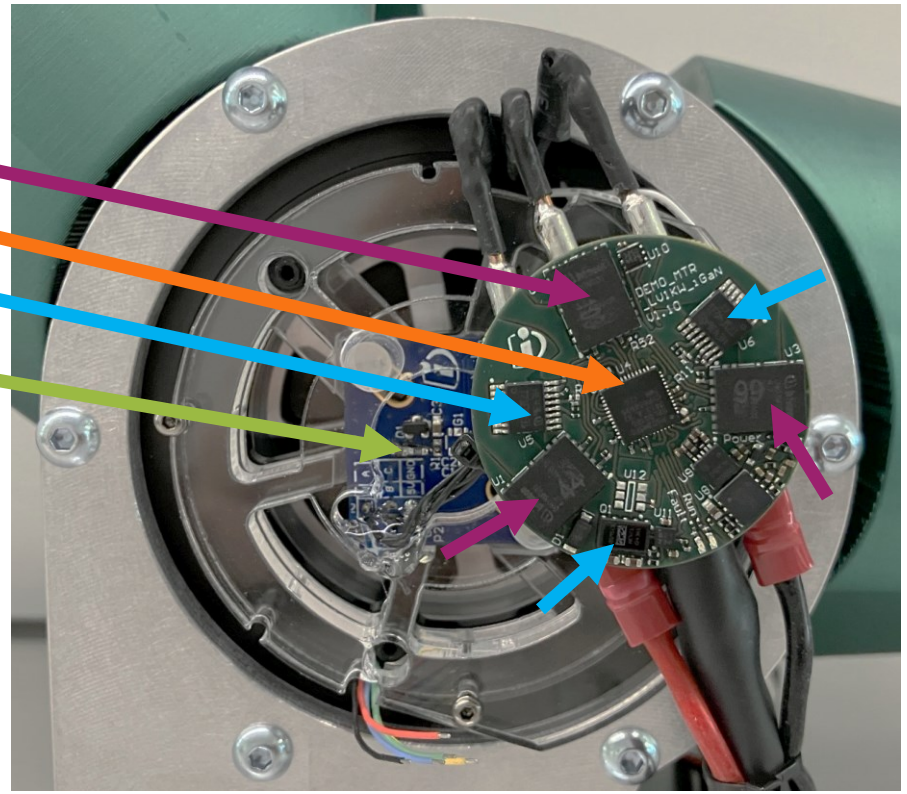
Robotic arm demo

- CoolGaN™ Drive (x3)
- PSOC™ Control C3 microcontroller unit (MCU)
- XENSIV™ TLx5571 (x2) and TLx5572 TMR current sensors
- XENSIV™ TLE5012 angle sensor





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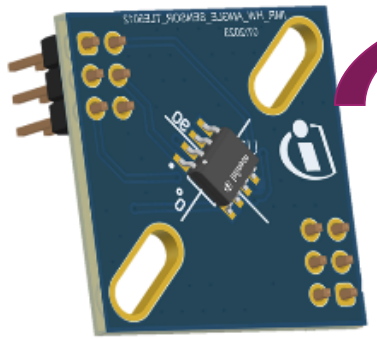
Robotic arm demonstrator: motor and position sensing overview

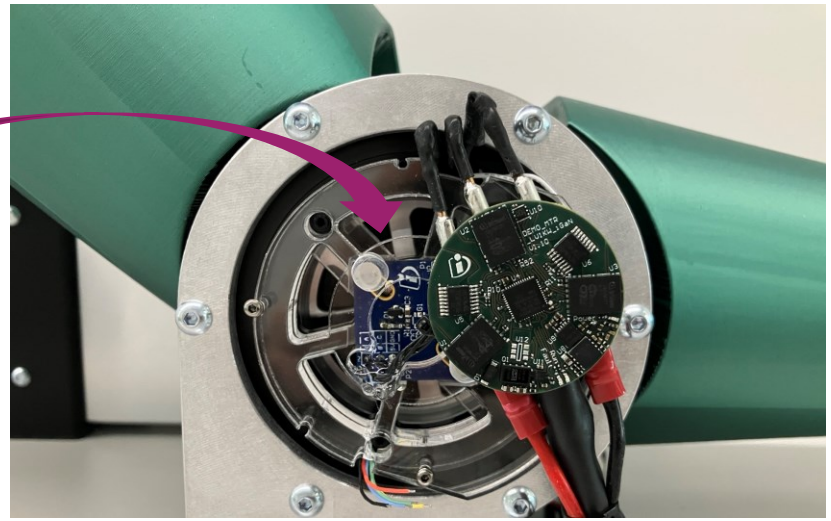


AK10-9 V2.0 KV60 motor specifications	
Planetary gear ratio	9:1
Rated torque	18 Nm
Current at rated torque	10 A
Output magnetic encoder resolution	15 bits
Phase-phase inductance	181 µH
Phase-phase resistance	195 mΩ

Input magnetic encoder:

- Based on GMR angle sensor TLE5012B
  - Giant magneto-resistance principle
  - 360° angle w/rev counter & speed
  - Max. 1° error over lifetime w/auto-cal.
- Incremental Interface (IIF):
  - Quadrature encoder emulation
  - 12 bit (4096 steps)
  - Stored last position





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