# Drone Interfaces

Ladeplateteknologi fra Forus setter standarden for lading av Subsea teknologi

# Problem definisjon

- Teknologiutviklingen handler i stor grad om å utvikle autonome Subsea systemer.
- Gjennom å automatisere, digitalisere og fjernstyre produksjonssystemene kan operasjonene flyttes til operasjonssentre på land, og behovet for skip og faste installasjoner reduseres…med forbedret bærekraft
- Autonomi innen Subsea systemer innebære bruk av robuste økosystemer hvor komponentene krever lite vedlikehold og har lang levetid.
- Når produksjonen flyttes Subsea er det ønskelig at autonome droner tar over arbeidet med montering og fysisk vedlikehold av installasjonene.
- Utstyr fra ulike produsenter må fungere samme, ikke bare fysisk men også logisk, for et kontrollsenter effektivt skal kunne monitorere og styre operasjonene må systemene "snakke sammen".
- For å få det til må det benyttes felles dataformater og programmeringsgrensesnitt (API) slik at systemene som benyttes til styring av operasjoner på havbunnen ikke er bundet til den enkelte utstyrsleverandørens økosystem.



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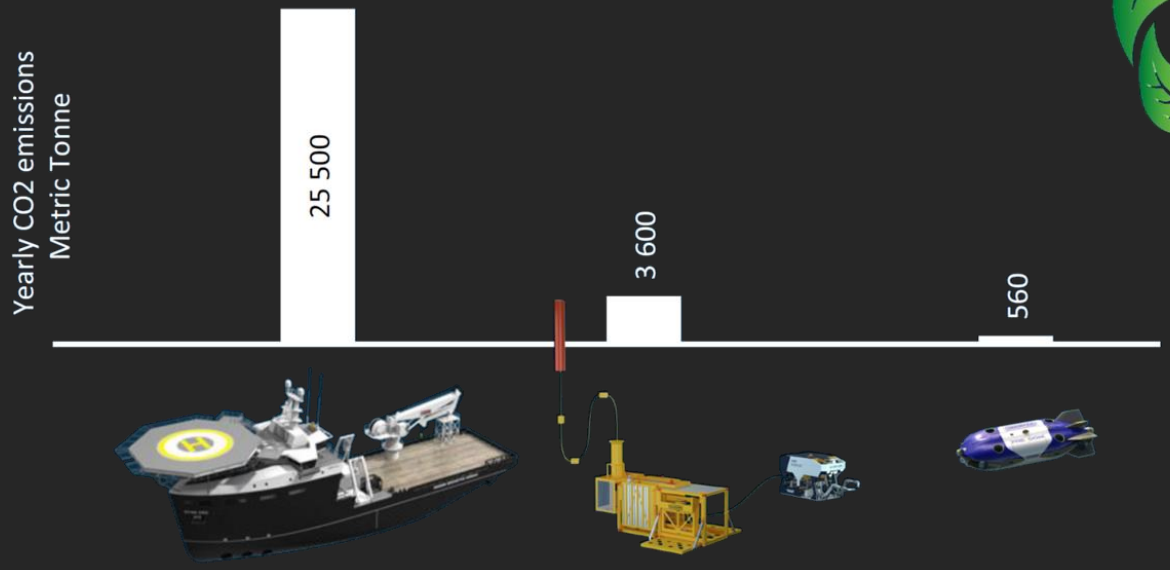
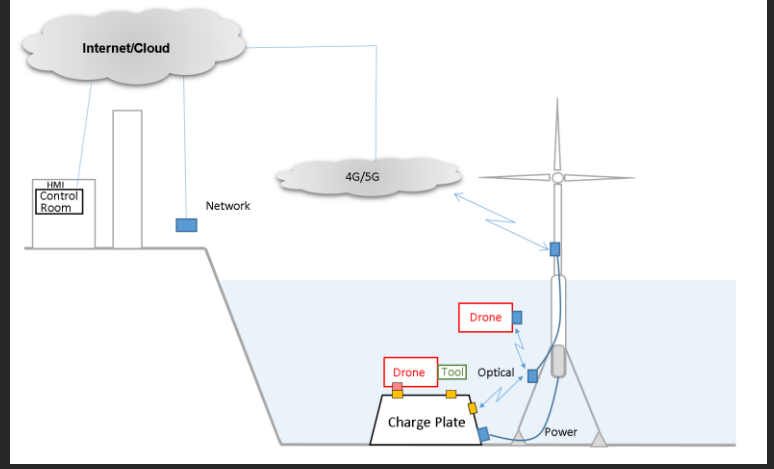
# Be Green or Be Gone

CO2 Foot Print the challenge of the future – UN Sustainable Development Goals

"wireless technology is an enabler for resident battery powered subsea drones…Powered by green power from floating wind"
Equinor








OCEANEERING

# Digitalisation and Remote Operation

- MMI vs HMI - API – Deep Net, Drone to Drone standard API
- Make SWiG Open Source API available in a open community
  - Standard ROV Panel
  - Standard Tooling Interface
  - Standard Docking Interface
  - Standard Charging Interface
  - Standard Skid Interface



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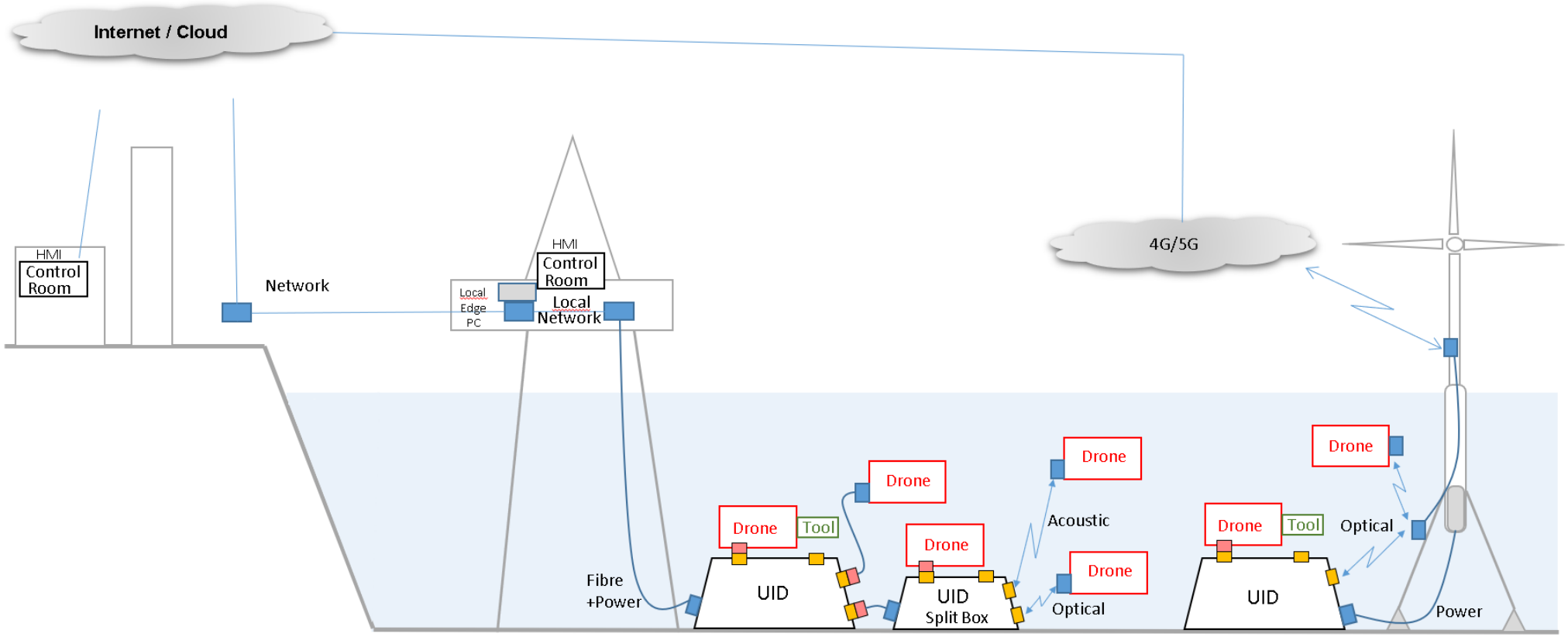
# Deep Net™: Drone to Drone to Cloud standard API?



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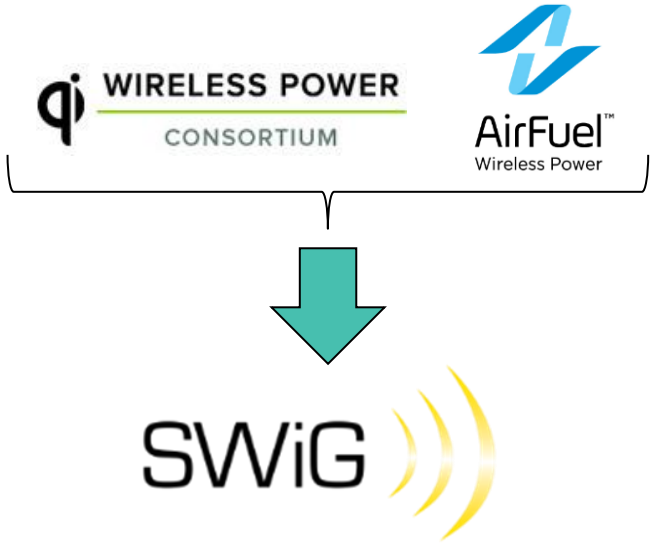
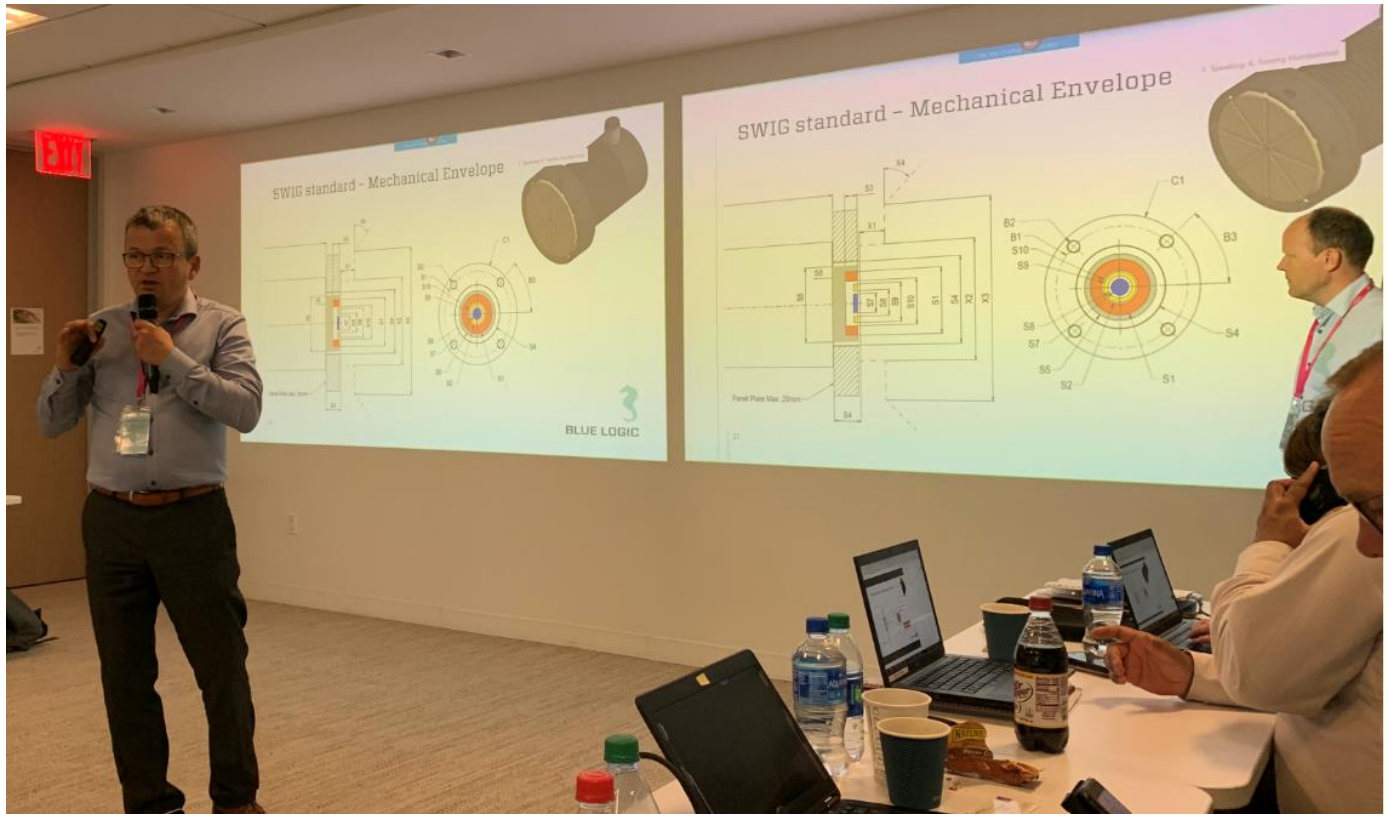
# BLUE LOGIC WRITES THE SWIG STANDARD

## Standard solutions

- Interoperability
- Inercangeablitity
- Standardised Power Transfer




SWiG Meeting, Equinor HQ, Houston Texas, May 2019



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# One Shape Fits All





SWiG STANDARD INTERFACE energy API

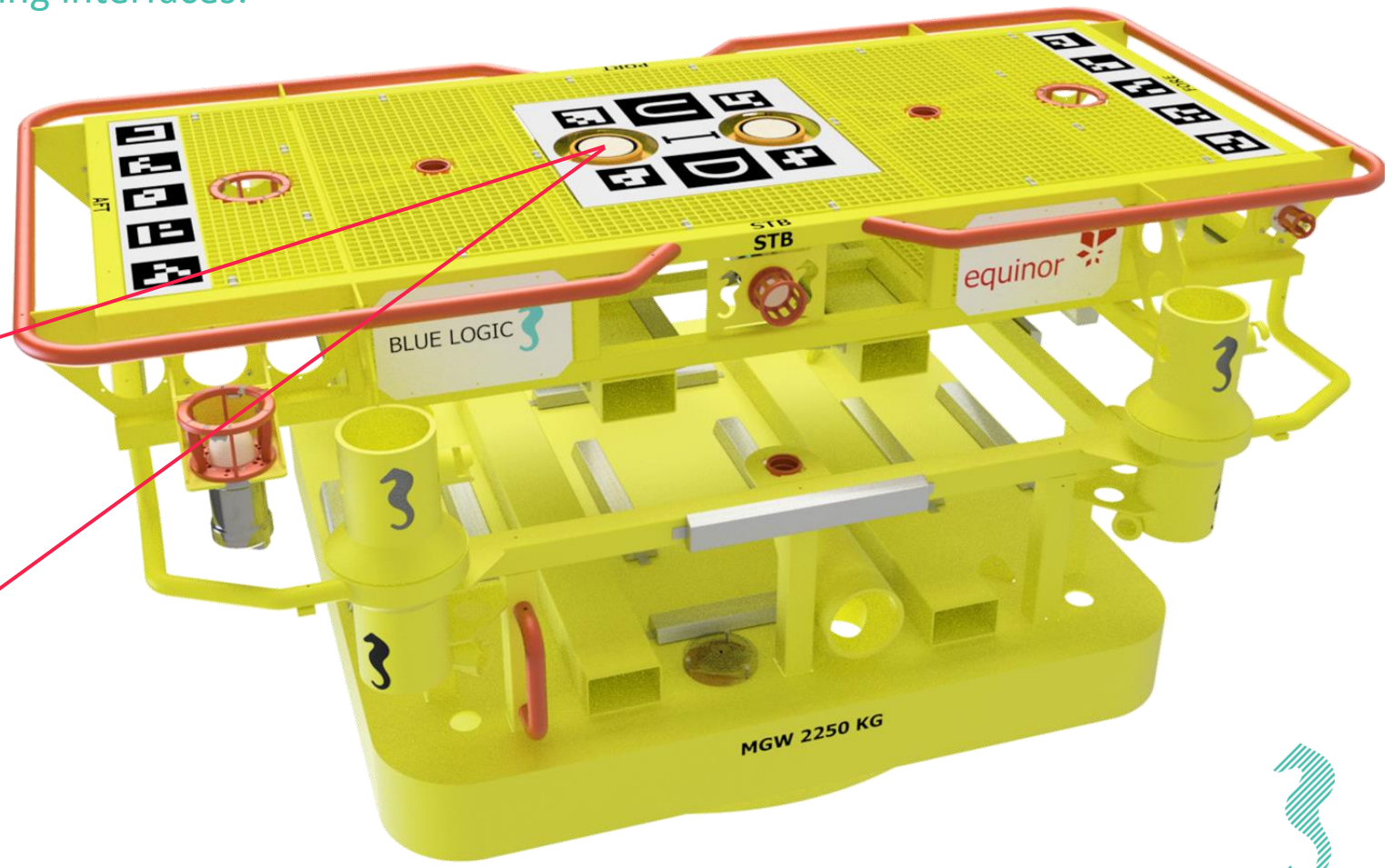
Shell equinor Chevron AkerBP wintershall Shaping the future.

vår energi TOTAL Lundin Petroleum BLUE LOGIC

# One Shape Fits All

## Open Innovation with standard docking interfaces:

- Mechanical
- Electrical
- Network infrastructure

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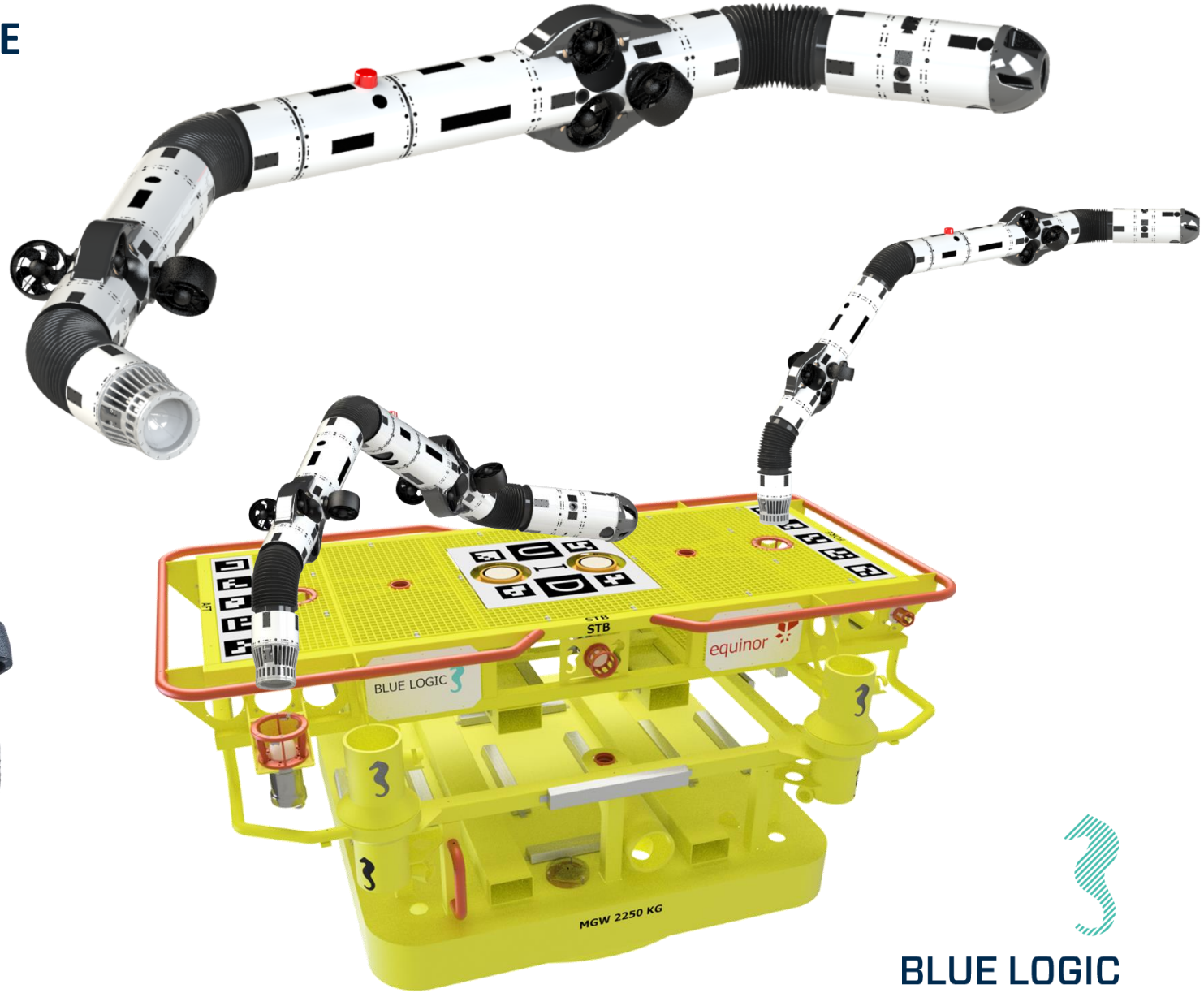
# STANDARD TOOLING INTERFACE

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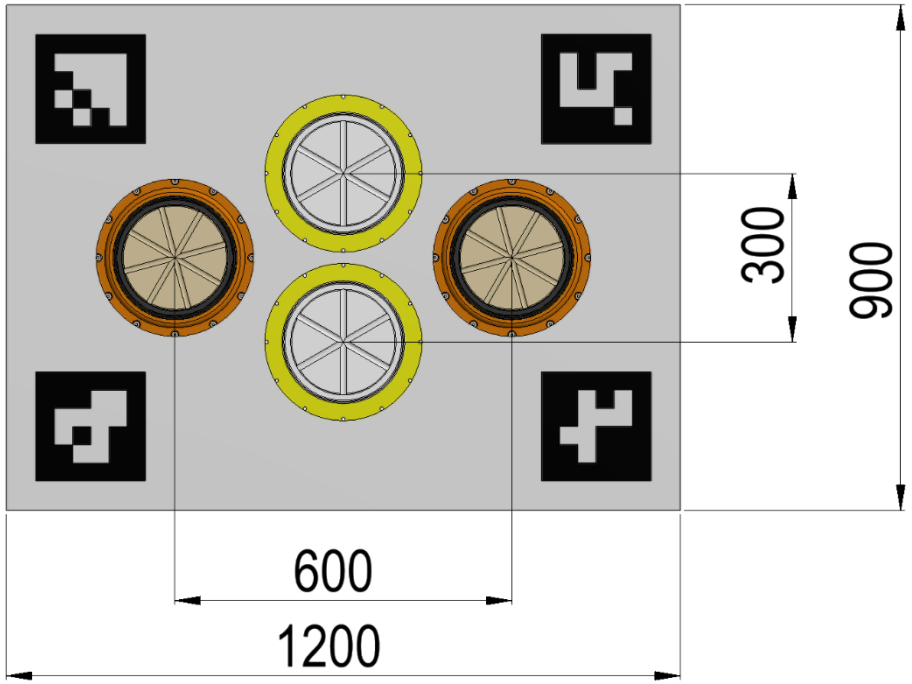
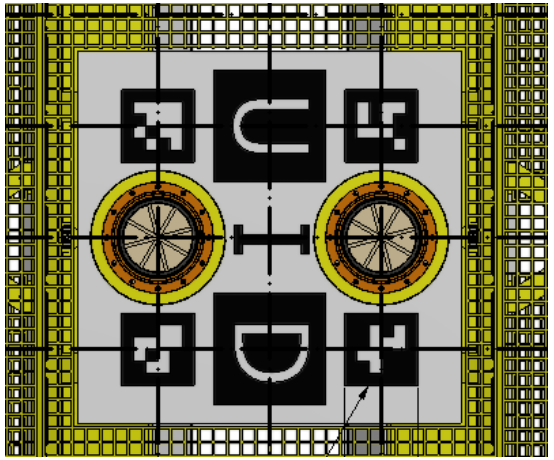
# Standard Skid Interface – Launch and recovery

## 4 x 2,5kW Flat Connectors = DCFO @ 400V and max power capacity of 5kW



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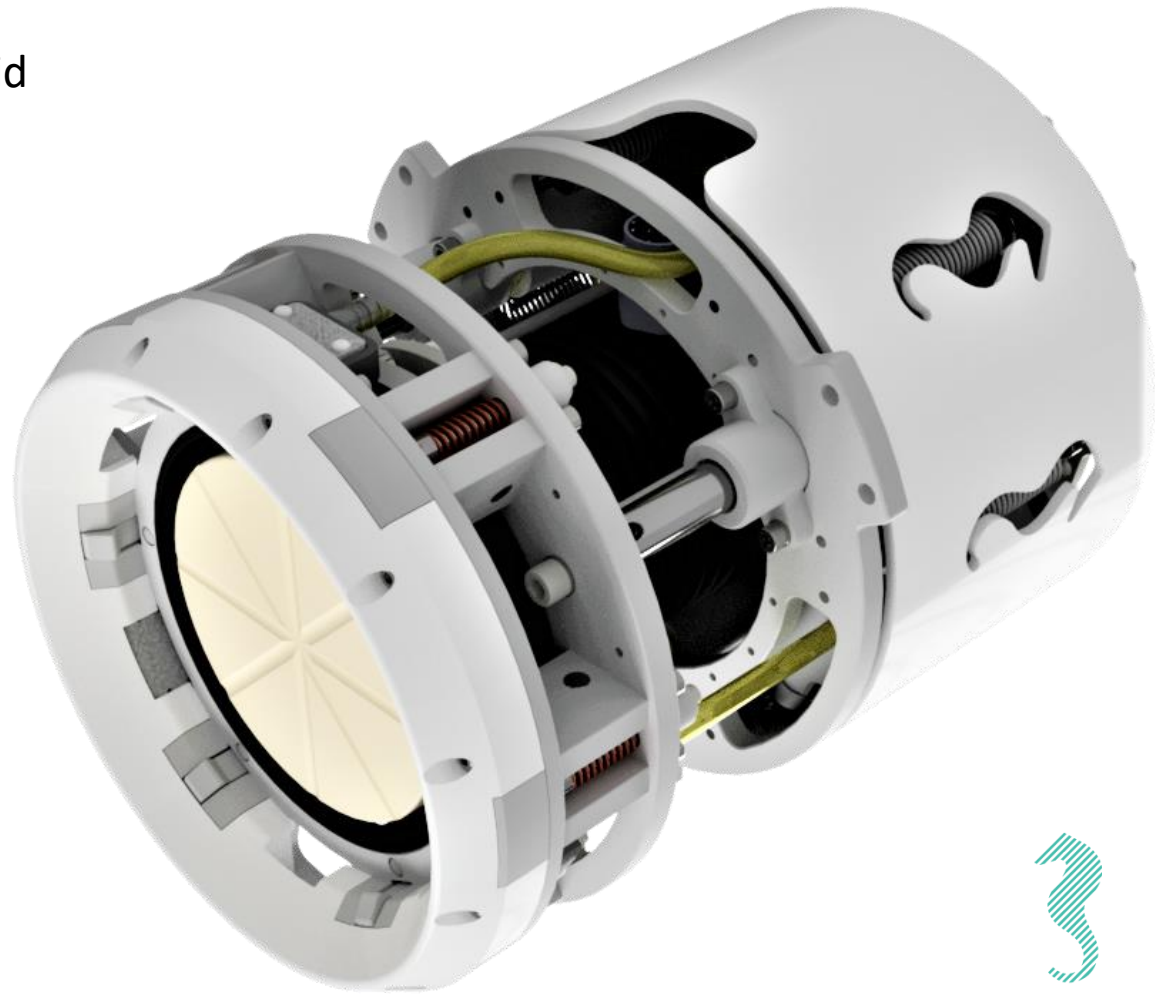
# Drone Homing Connector with Lock, lifting, and stroke

- 10cm Stroke to hide the connector inside the hull
- Mechanical Lock to hold onto the Station and/or Skid
- 100Mbit Ethernet
- 2,5kW Power
- 230kbit RS485/RS232
- Power supply 350V +/- 20% regulated by SW from Drone BMS (2,8V to 4,2V)



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# Peer Rescue -





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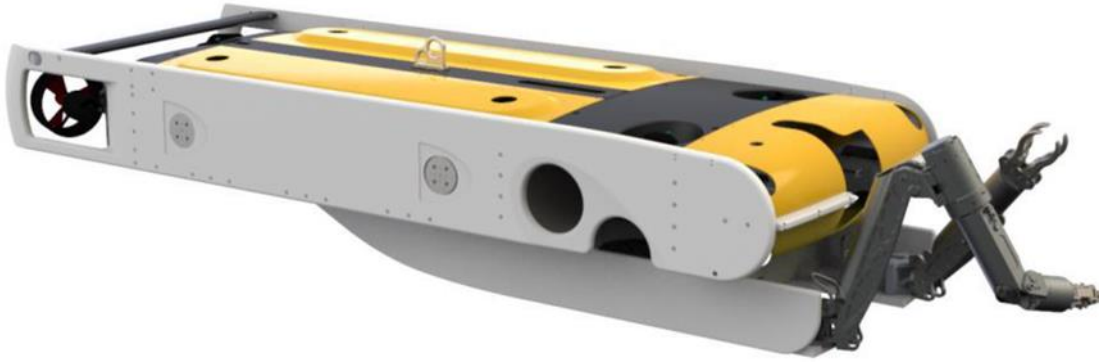
# SKID MOUNTED TOOLS

By using skid interface in the same way as the inductive interface on the Subsea Docking you do not need manipulators to connect and disconnect different cleaning tools, instrumentation, and survey equipment. Landing on and connect without manipulators will open flexibility and increase MTBF. Sabertooth has 6 degrees of freedom and can handle all types of tools in any angle. If you for some tasks need manipulators



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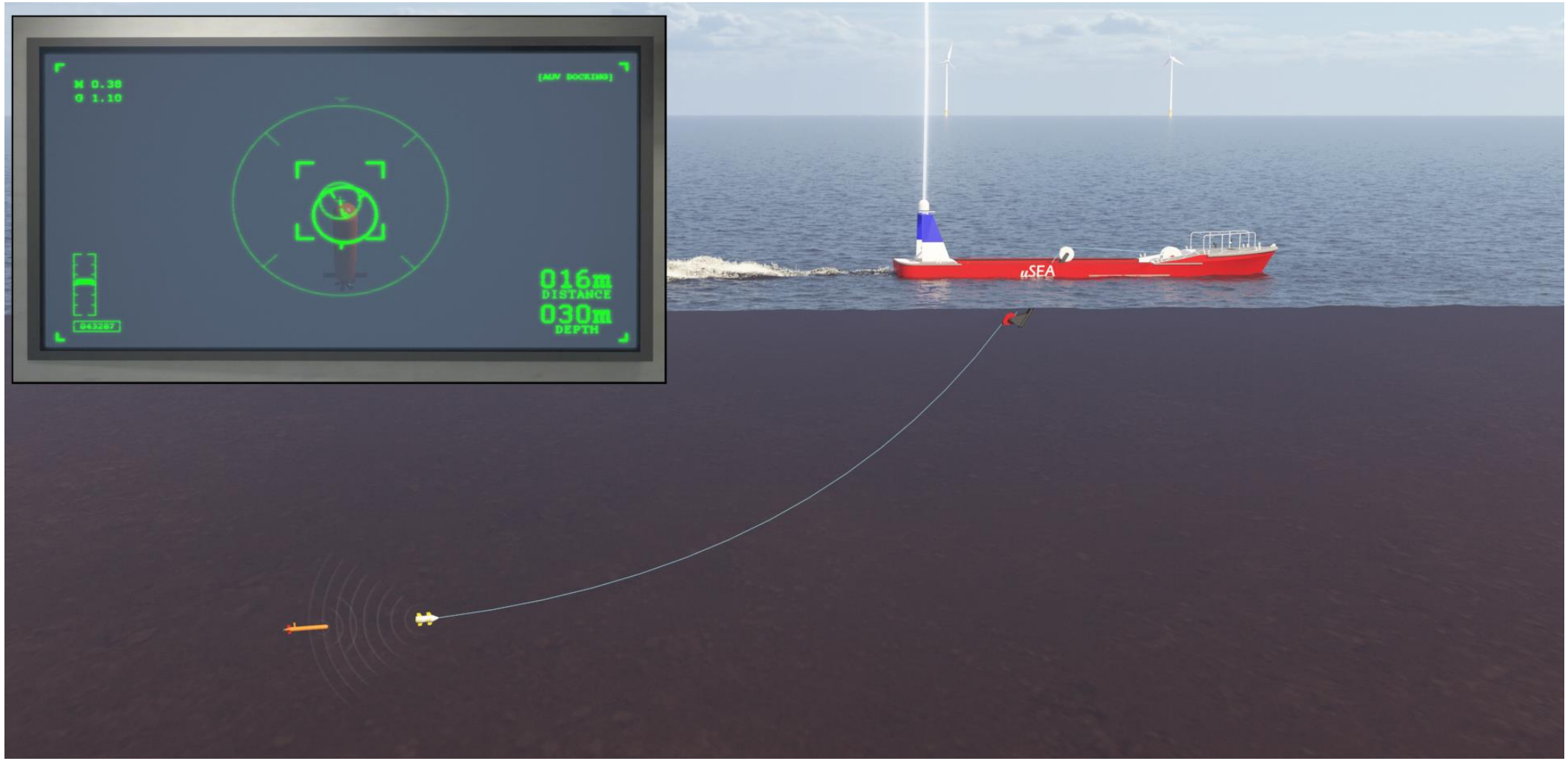
# TOWED CHARGING SYSTEMS



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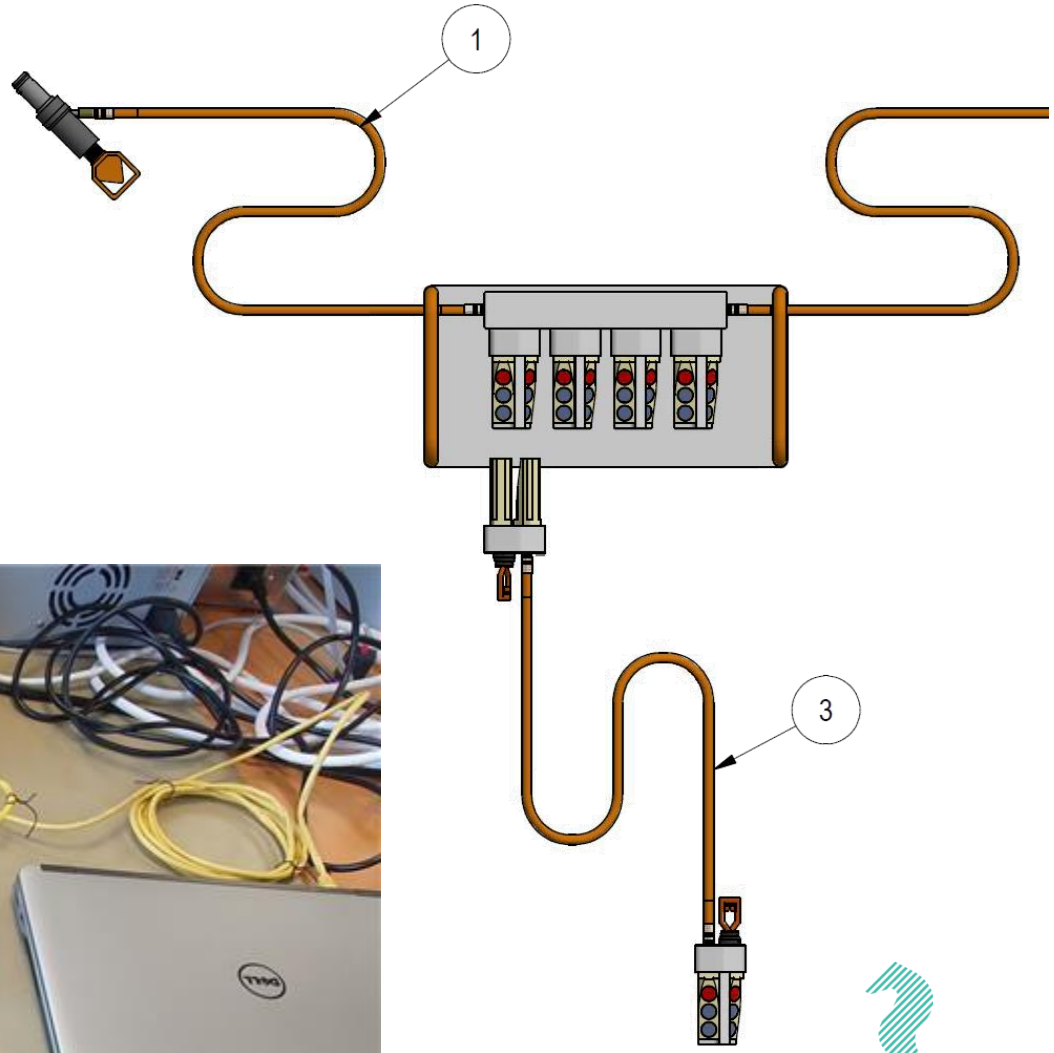
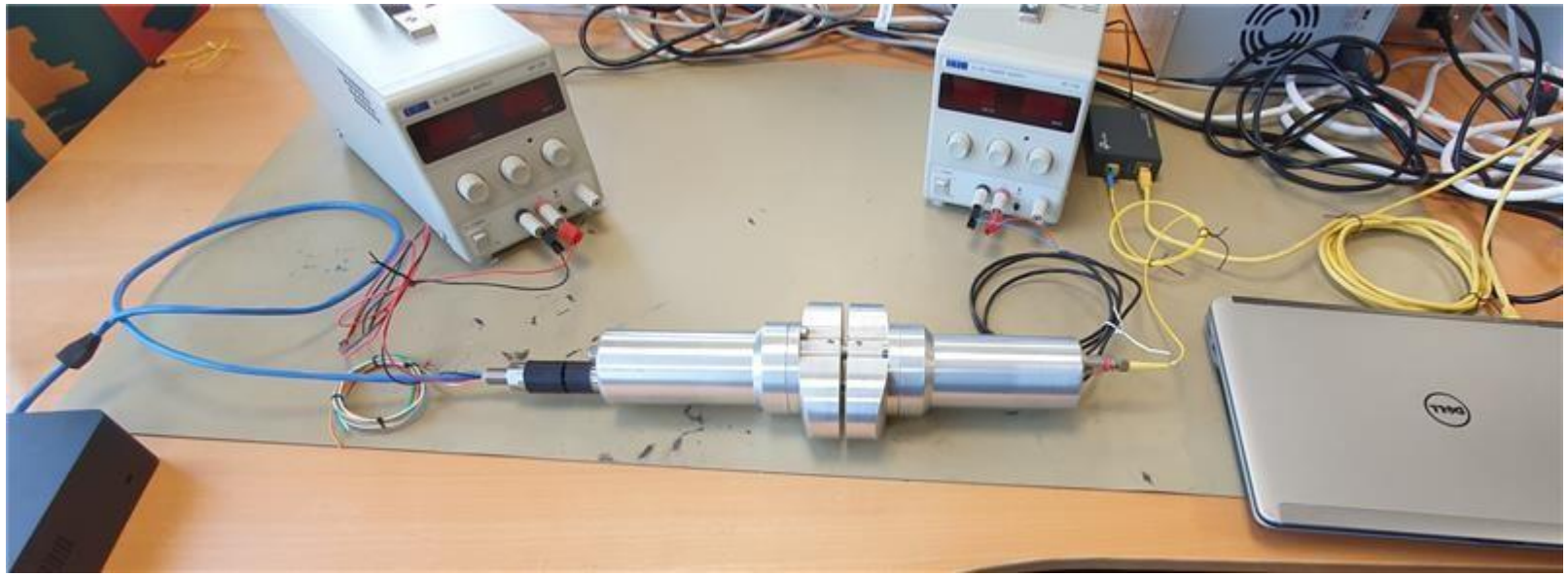
# BIG DATA: GIGABIT CONNECTOR

- 8 off fiber with wet-mate connector
- Break out 4 off x 2 (A + B) = 8 off fibre to each station
- 2 x 1 Gigabit  + 50W inductive Power (red)
- Oil-filled jumper for permanent installation
- Power drawn from Docking station to power fiber modem
- Robust galvanically insulated solution



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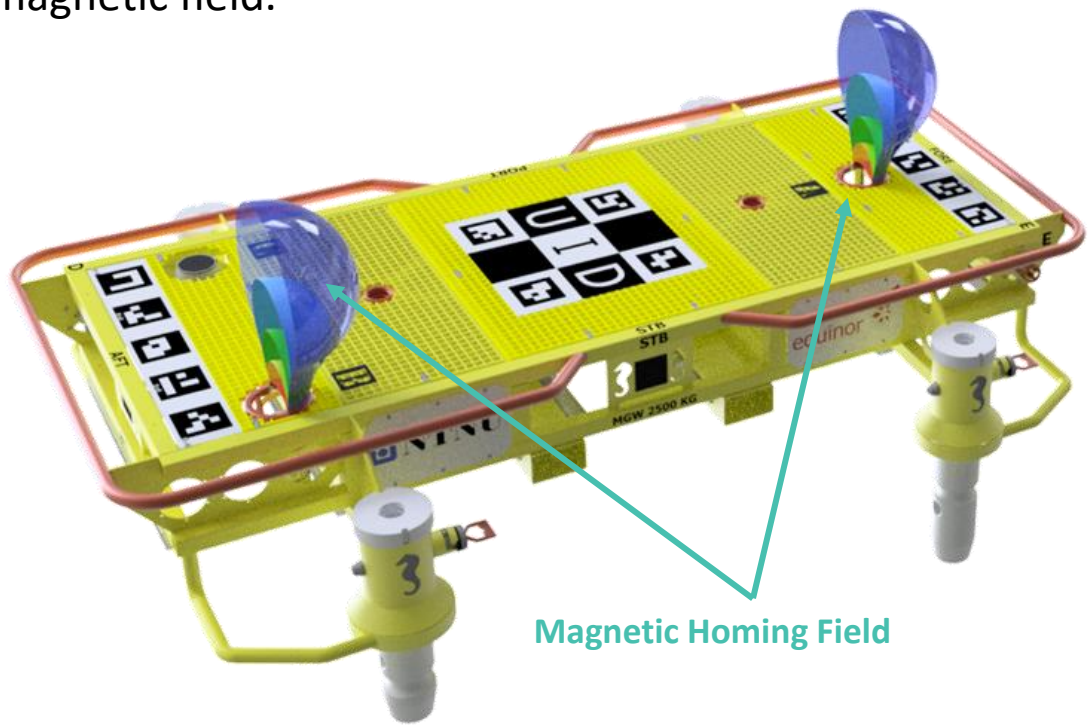
# Magnetic Homing – Auto Docking

Onboard navigation system detects the charging station and enables manoeuvring within approx. 50cm with high accuracy.

Charging Station primary side inductive connectors activate homing mode and the drone detects the magnetic field.




When the drone is approaching the magnetic field, identification information is received and correct position and charging station is verified. The drone enters homing mode and will use the magnetic field to precisely dock onto the inductive connectors.

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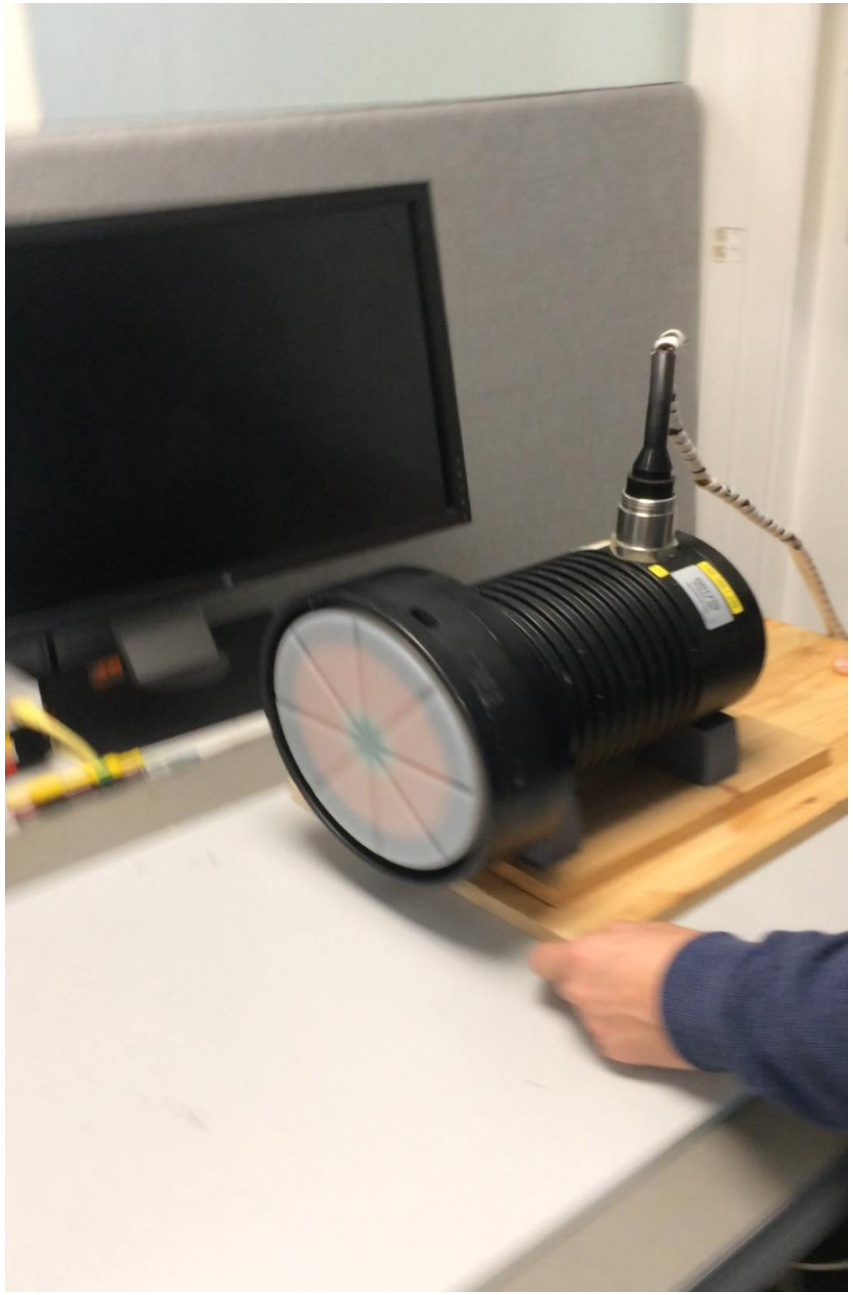

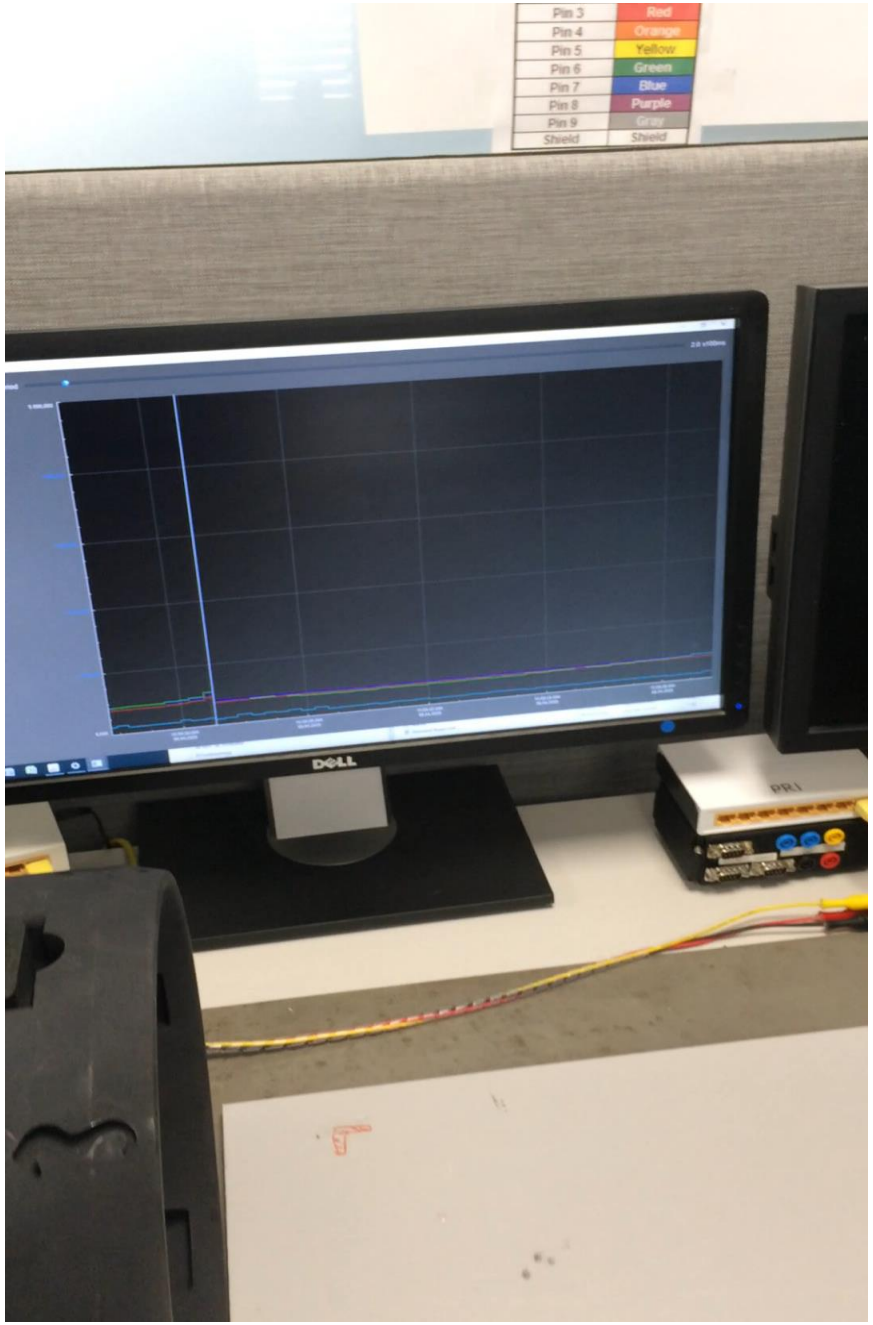
Pin 3 Red
Pin 4 Orange
Pin 5 Yellow
Pin 6 Green
Pin 7 Blue
Pin 8 Purple
Pin 9 Gray
Shield Shield
DELL



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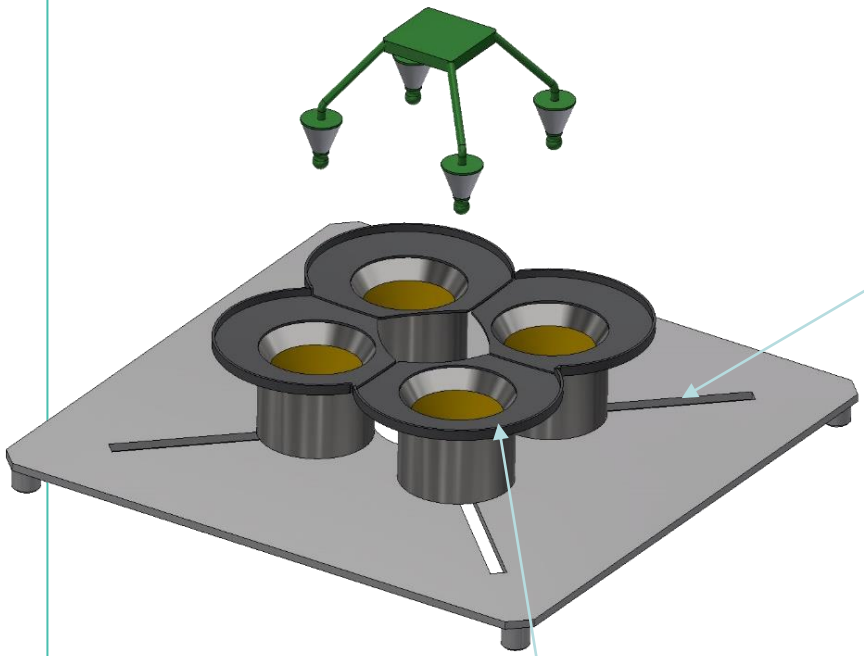
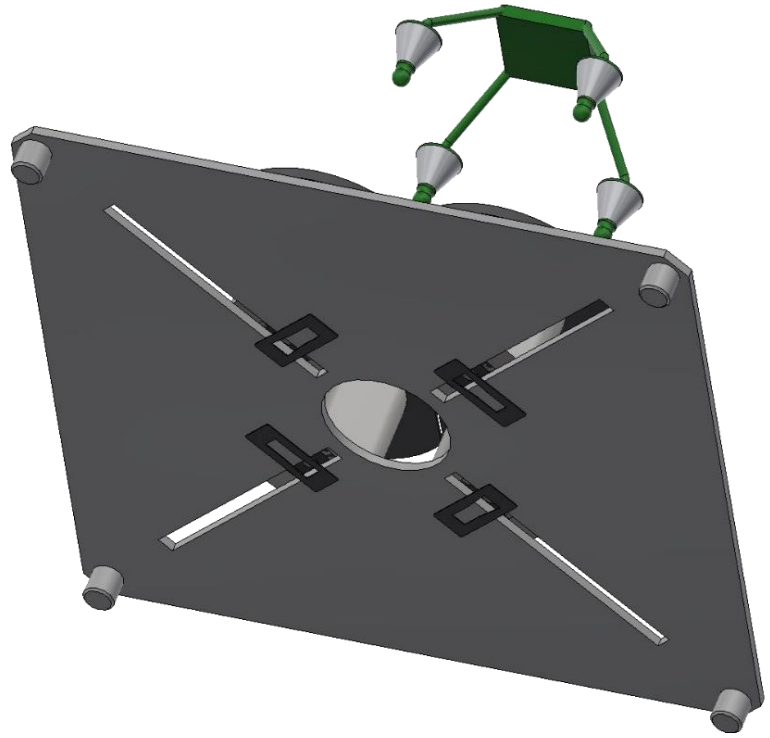
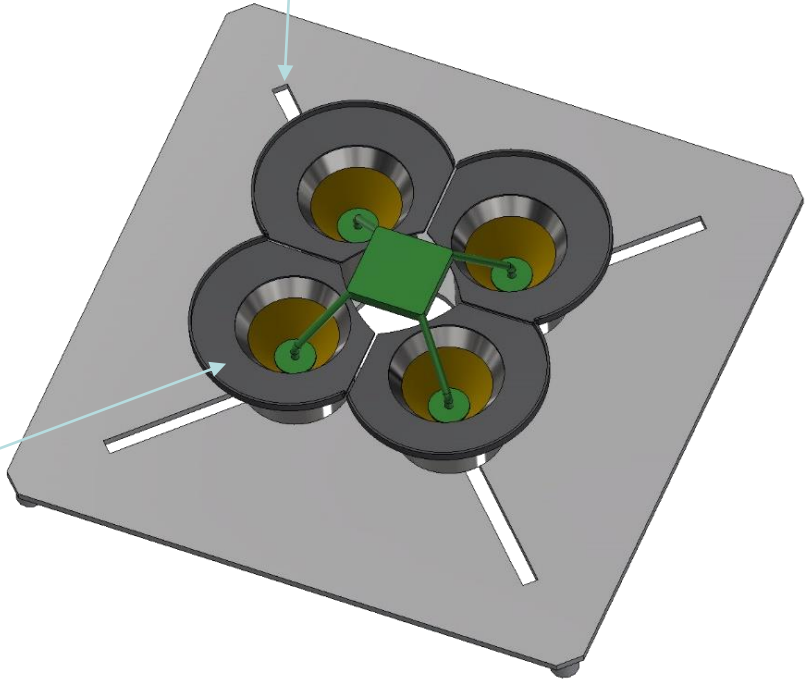
# Air Drones Charging





Grove for adjustment to fit different size drones



Increased guide cone landing area to prevent crash

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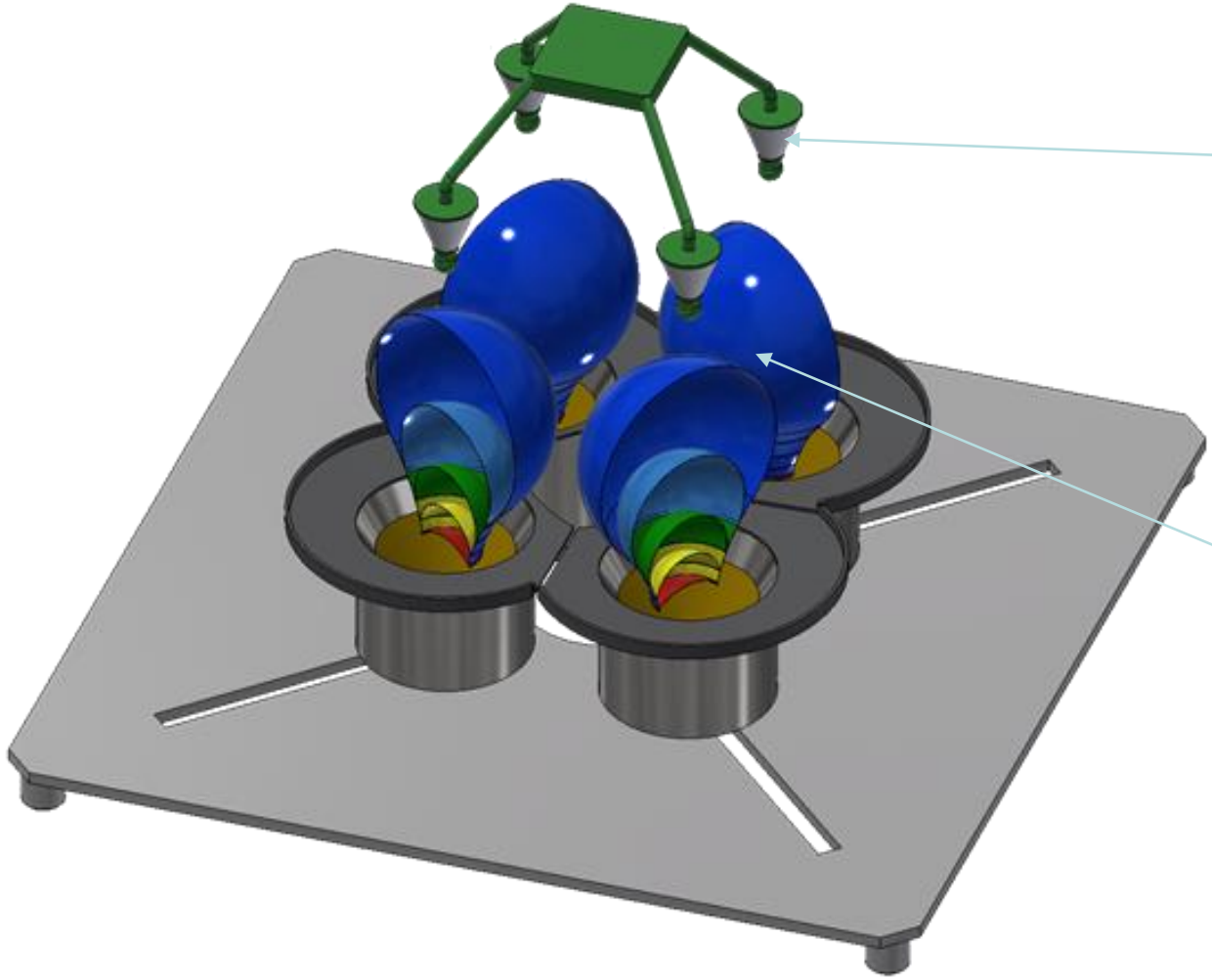
# Air Drones Navigation – Auto Guide



Secondary Coil will give feed-back to auto pilot of relative position of each leg in order to define heading

Magnetic Homing field for fine positioning of drone for auto docking

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# Det Grønne Skifte


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# QUESTIONS?

**Sales & Support**

**Phone :: +47 9100 6950**

**E-mail :: sales@bluelogic.no**



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