



**Michael Weisheit, Sales and  
product management eLION**

***Bosch Rexroth AG***

**An eLION system approach**

# Bosch Rexroth Forum 2023 – An eLION System Approach

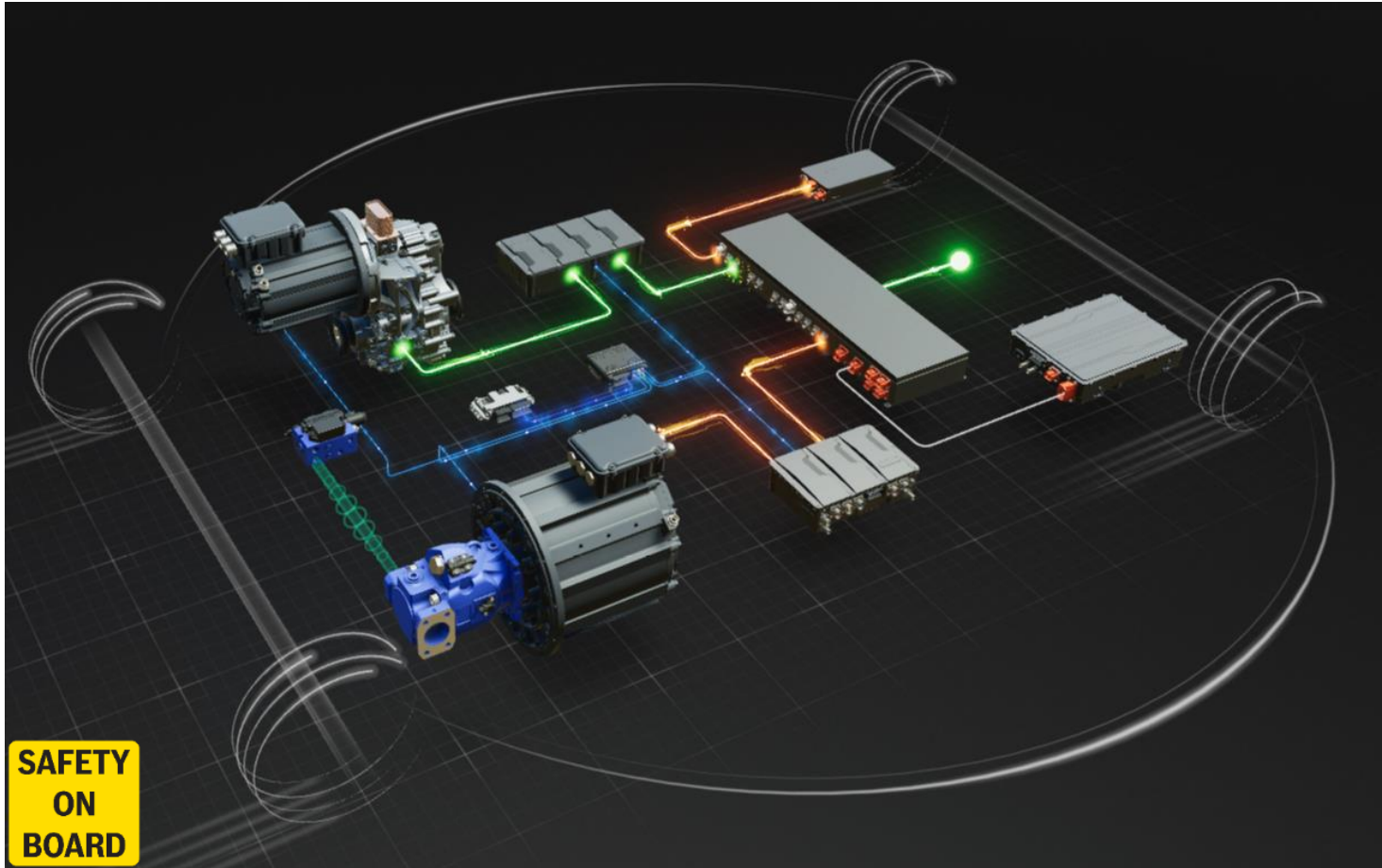
## Development Locations



- Development
- Production
- Development and production

# Bosch Rexroth Forum 2023 – An eLION System Approach

## eLION Portfolio Characteristics



### General Information

- **Designed for off-highway applications: robust – scalable – safe**
- **Designed for perfect interplay between all portfolio components**
- **Wide off-highway HV electrification portfolio:**
  - Inverter – 3 power classes
  - Motors – 80 Variants
  - Gearboxes – 7 types
  - On Board Charger 20kW, EUR & US
  - DC/DC-converter: 12V/24V bidirectional
  - HV-Cables
- **Voltage range: from 270V to 800V**
- **Power Range: nom 8 ... 220kW / max. up to 550kW**
- **Robust**
  - shock design: up to 50g
  - IP protection: IP6K7, IP6K9K
- **Safety on Board: ISO13849, ISO25119, ISO19014**
  - Inverter: up to PLd, CAT3-Architecture
  - OBC, DCDC-Converter: up to PLc
- **Standardized communication:**
  - CAN-Communication: J1939, J1939-76
  - Service Communication: UDS

Designed for off-highway:

robust – scalable – safe

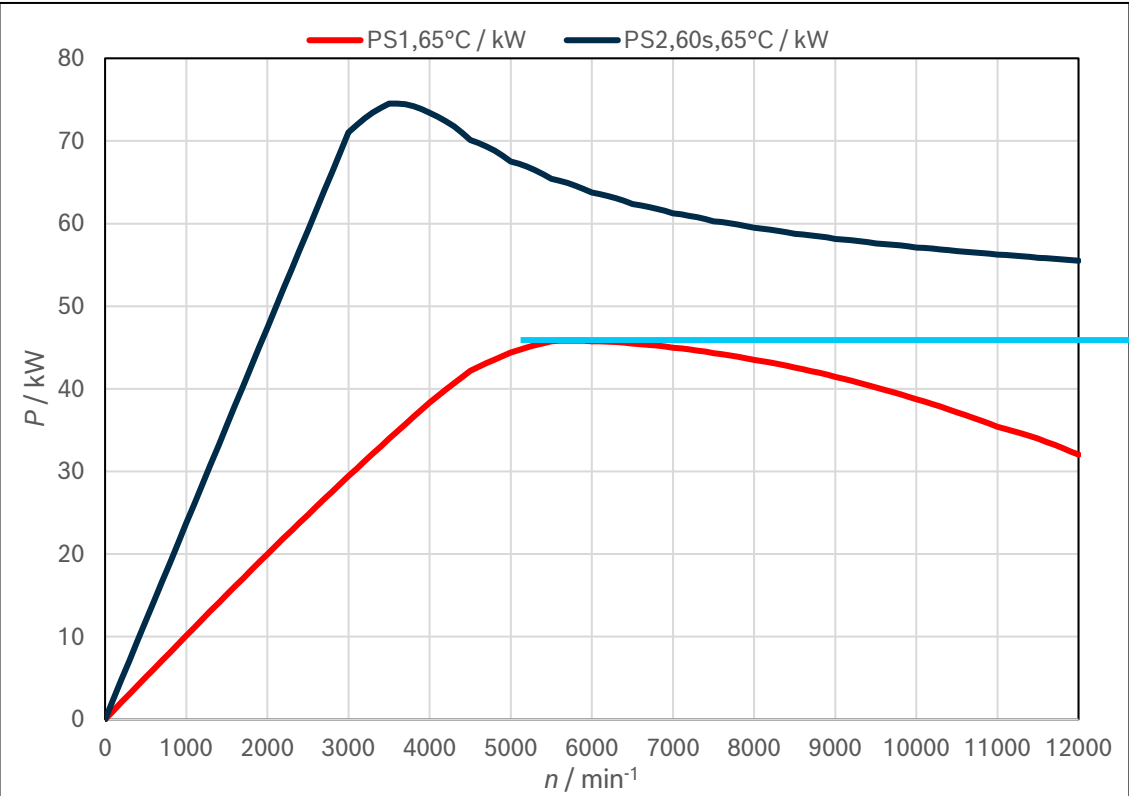
# Product Updates Motor-Generator EM(x)1



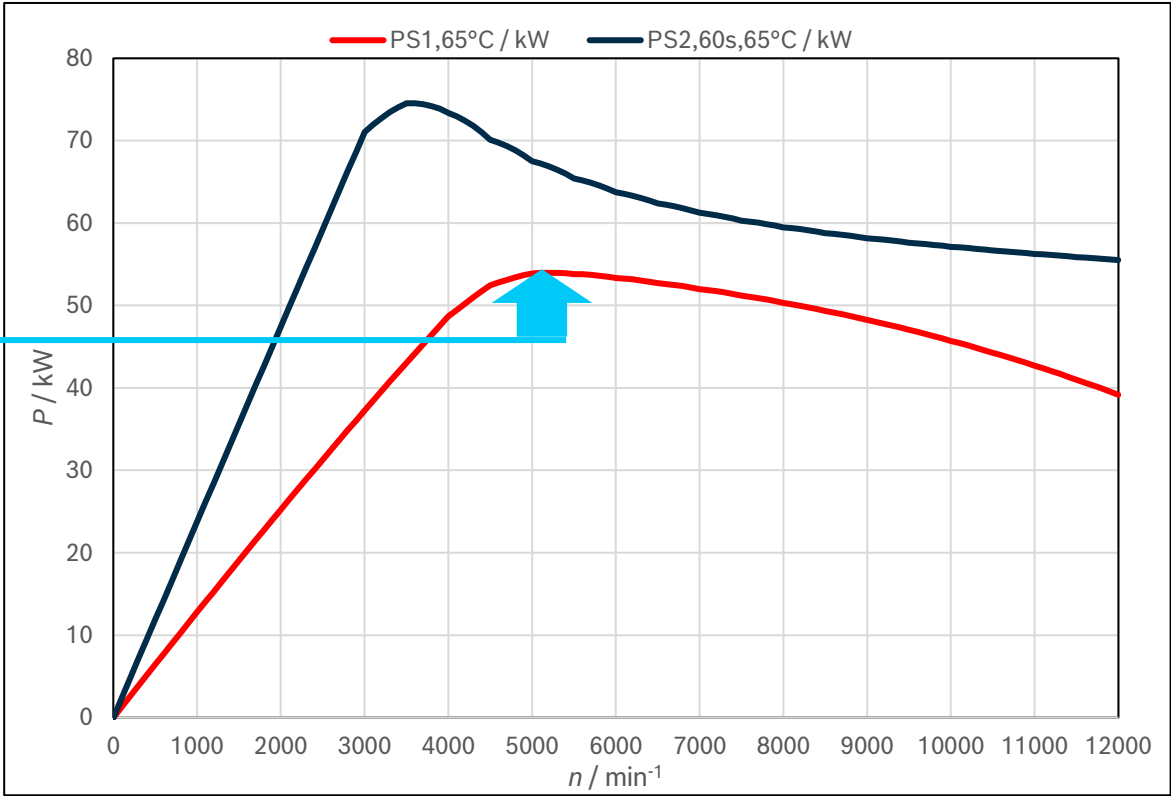
## Improved Power Density

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## EMS1 Motors: Improvement of Cooling



Status 2023



Improved Cooling 2024: +18% Power\*

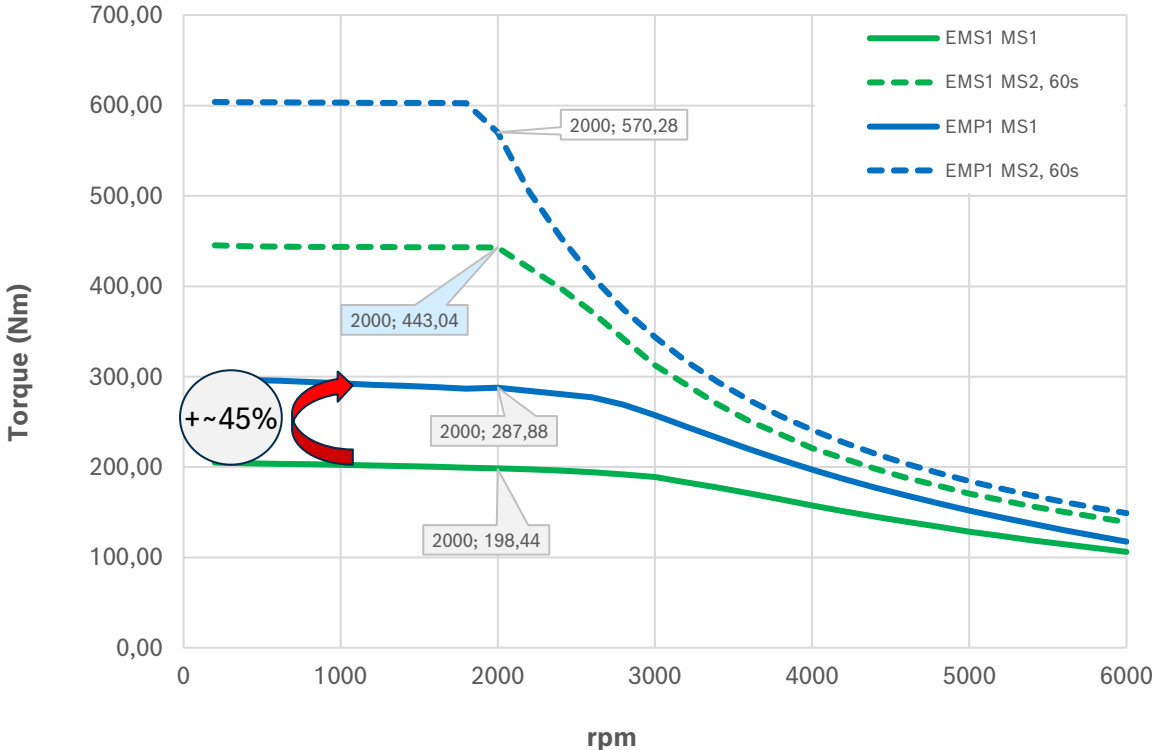
\* Continuous, maximum value

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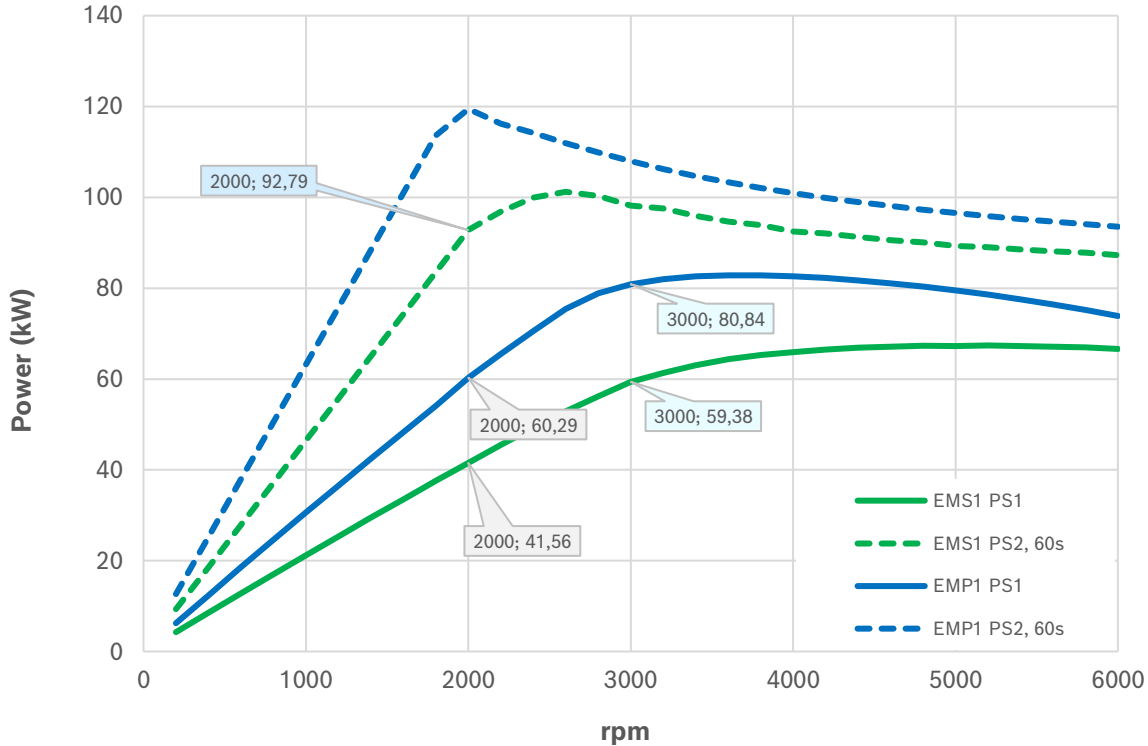
## EMP1-13H vs EMS1-13H Performance Comparison



Torque



Power



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## Specification and Variants

	EMS1 ( <i>current</i> )	EMP1 ( <i>new</i> )
# Number of pole pairs	<b>3 pole pairs</b>	<b>4 pole pairs</b>
# Design optimization with regard to	<b>Speed</b> <ul style="list-style-type: none"><li>• High efficiency at high speeds (&gt; 5,000 rpm)</li><li>• Wide constant power range</li></ul>	<b>Power</b> <ul style="list-style-type: none"><li>• High efficiency at low to medium speeds (&lt; 8,000 rpm)</li><li>• Increased torque at low to medium speeds</li></ul>
# Maximum Speed	<b>10,500 rpm</b> <ul style="list-style-type: none"><li>• Dual use limitation: none</li></ul>	<b>10,500 rpm</b> <ul style="list-style-type: none"><li>• Dual use limitation: 8985 rpm (required inverter output frequency &gt;599Hz)</li></ul>
# Standard Lengths	<b>4 different standard length</b> <ul style="list-style-type: none"><li>• Active length: 150 to 300 mm</li></ul>	<b>5 different standard length</b> <ul style="list-style-type: none"><li>• Active length: 100 to 300 mm</li></ul>

### EMP1 benefits

- ✓ Much shorter motor for pump applications
- ✓ Higher efficiency for pump applications
- ✓ Extended power range of axial height 130 mm portfolio (130 → 165 kW)
- ✓ Significantly higher traction force
- ✓ Reduction of gear box ratio
- ✓ Lighter motor at the same torque

# Product Updates Inverter EDS1



## Extended Voltage Range



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## eLION High Voltage Inverter EDS1



**SAFETY  
ON  
BOARD**

### General Information

- PWM inverter for motor and generator operation
- Designed for off-highway machines
- High efficiency and compact design
- Overload factor up to 2.5
- Liquid cooling
- Safety functions according to ISO 13849, ISO 25119, ISO 19014 up to PLd
- Certifications: CE
- Communication: CAN 2.0, J1939, J1939-76
- Service Communication: UDS
- Reliable HV cable mounting: HVIL, mechanically coded plugs

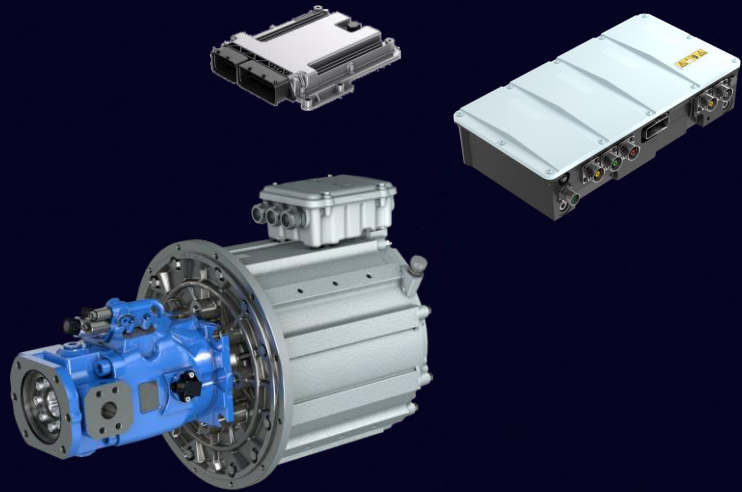
### Technical Data

- 3 Power classes
- Protection class:
- Mechanical resis
- Operating temp
- Voltage range:
- Continuous po
- HV cable conne

270 – 850 V

**New battery chemistries require higher operation voltages**

# Product Updates Pump Control Software




## Sytronix eOC SW

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## Electrics meets Hydraulics: Our Solution

Our eLION electric drives

An image showing two components of the eLION electric drive system: a white rectangular control unit with various ports and a grey cylindrical electric motor.

Our electrified pump control

**eOC**  
Electronic Open Circuit

An image showing the eOC (Electronic Open Circuit) components, including a blue hydraulic pump, a grey control unit, and a software box labeled 'Software'.

Our industrial hydraulics experience

An image showing industrial hydraulic components, including a grey control unit and a blue hydraulic pump.

SW control

A 3D icon representing software control, consisting of a grey cube with a green square on one of its faces.

### eLION Sytronix eOC

Smart Interplay of Hydraulics and Electronics

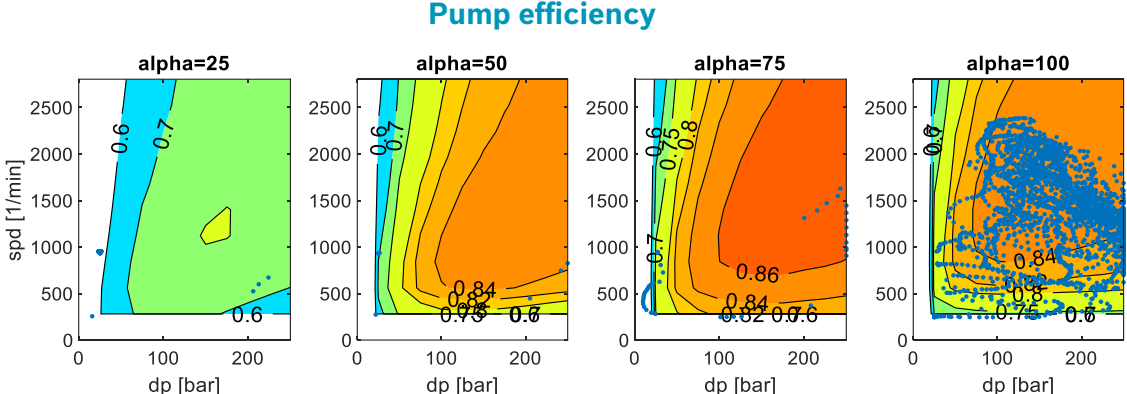
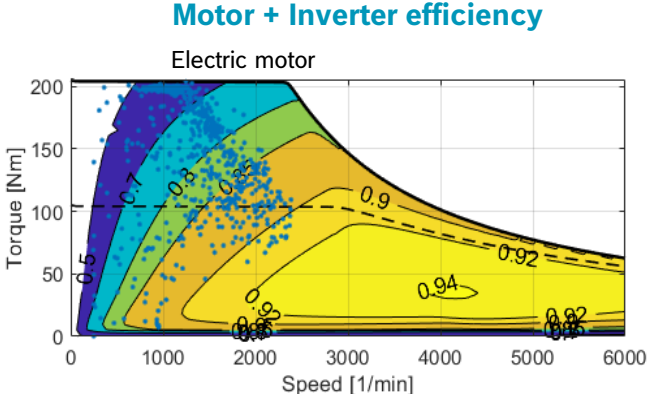
An image showing the eLION Sytronix eOC system components, including the white control unit, the blue hydraulic pump, the grey control unit, and the software box, all arranged together.

With the independent speed possibility, electric pump drives offer an additional degree of freedom

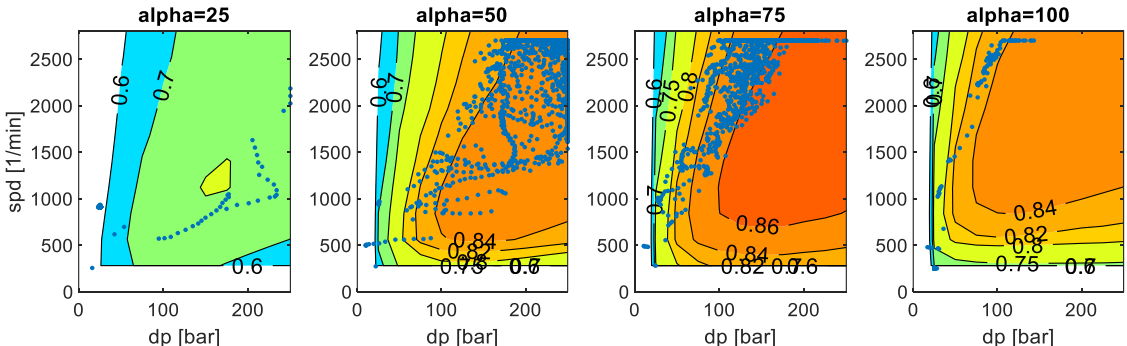
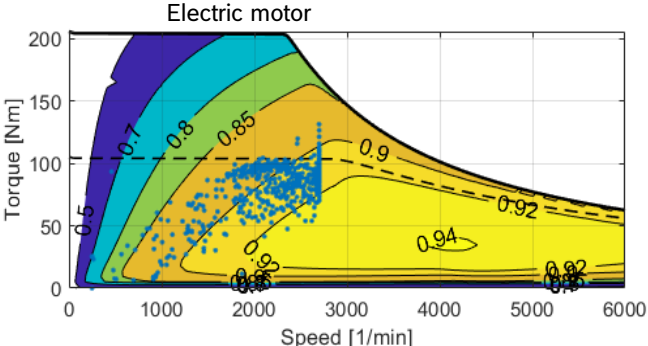
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## Efficiency Optimization of Electric-Hydraulic Power Supplies

Minimum speed approach



Optimum speed approach



Different optimization possibilities by pump speed strategy



**Let's get electrified with eLION!**

**Thank you!**