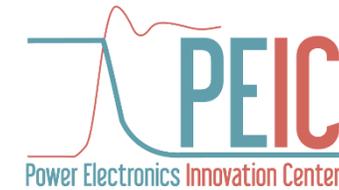




Politecnico  
di Torino



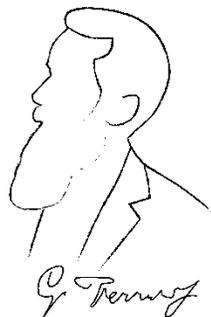
# Hardware per la prototipazione rapida di un inverter di trazione

Relatori:

Prof. Eric G. Armando  
Dr. Fabio Mandrile

Candidata:

Donatella Sponso



Dipartimento Energia "Galileo Ferraris"

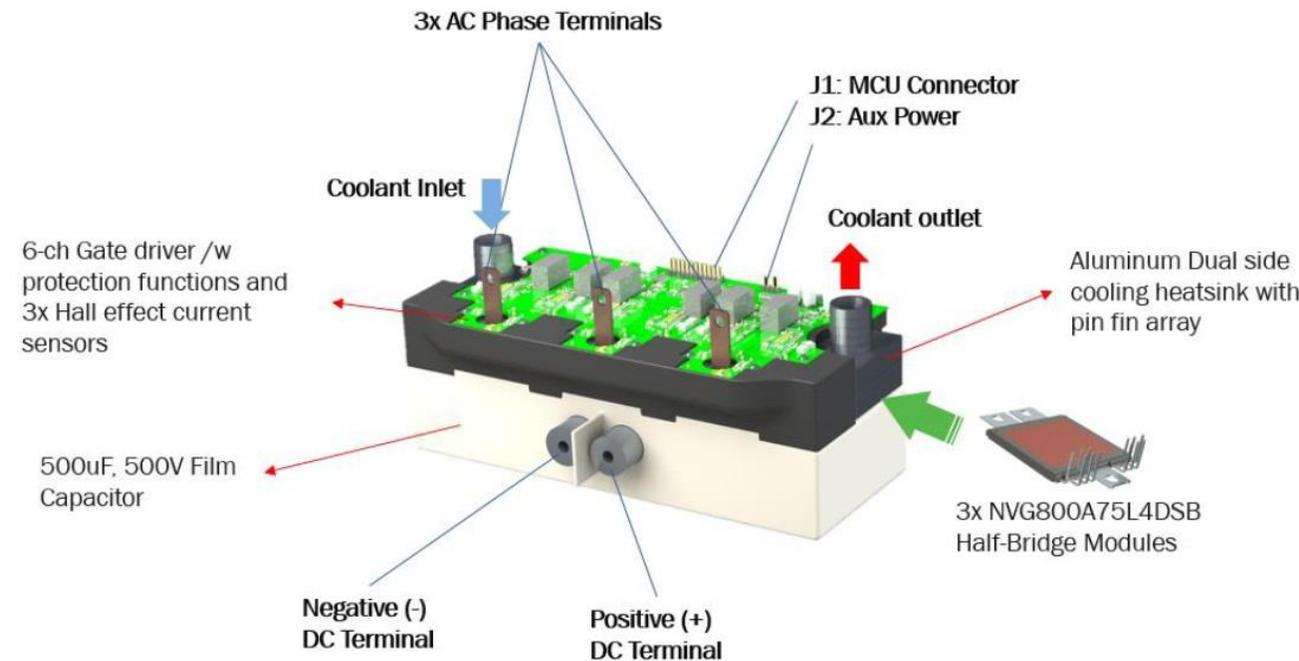
Politecnico di Torino, Italia

15/03/2024

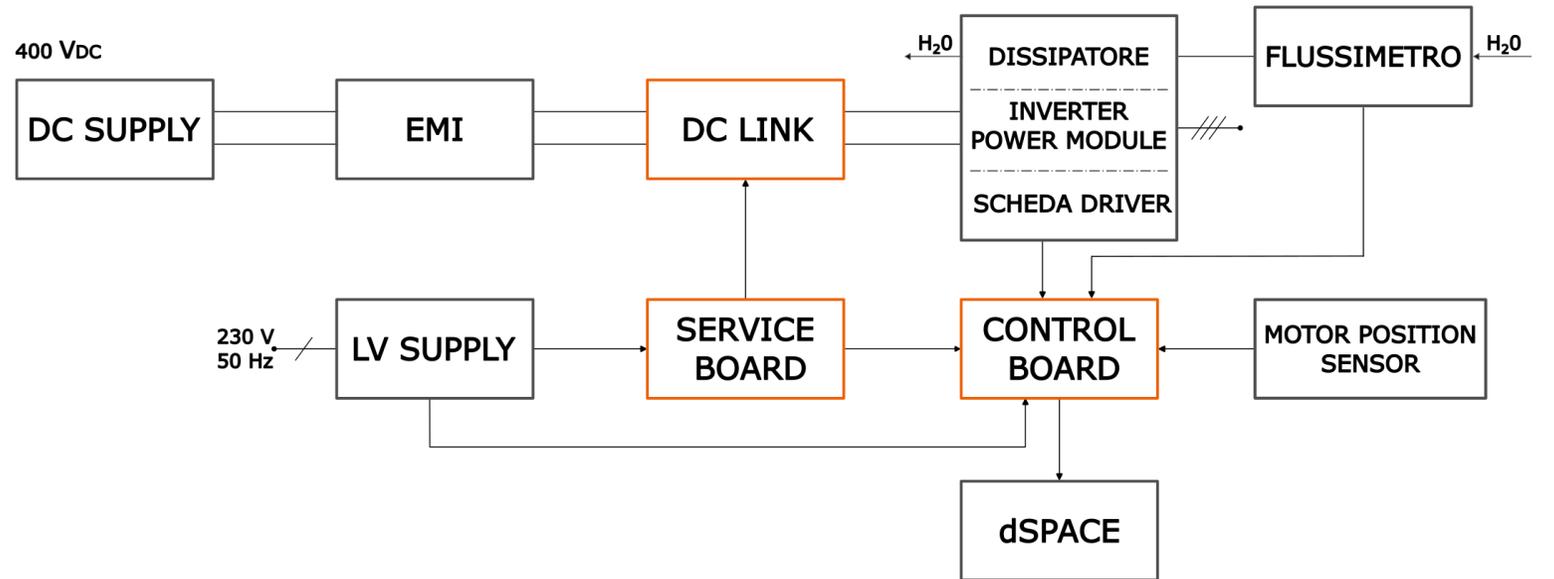
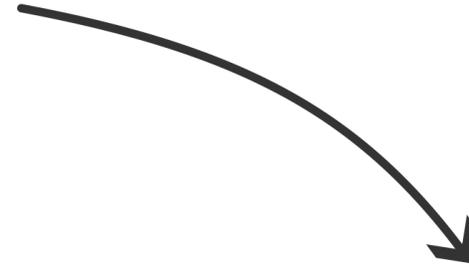
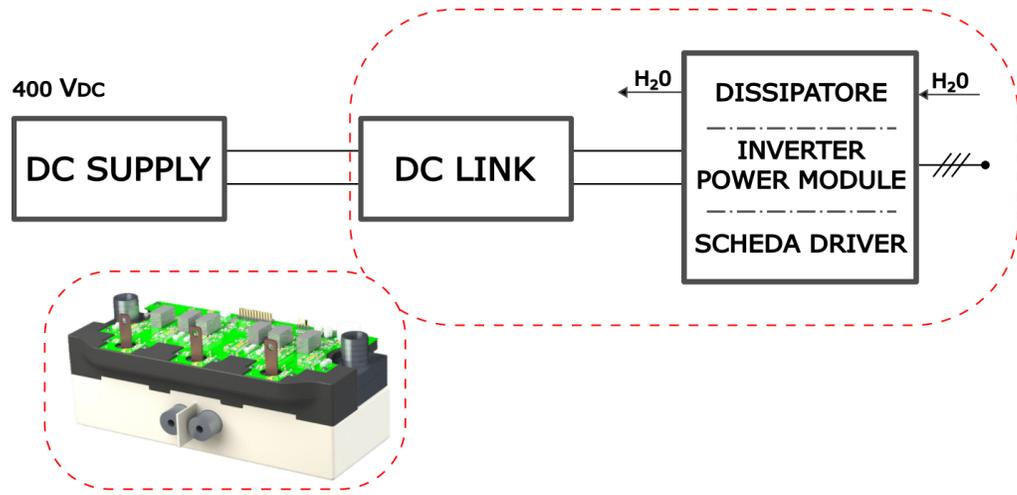


# Introduzione

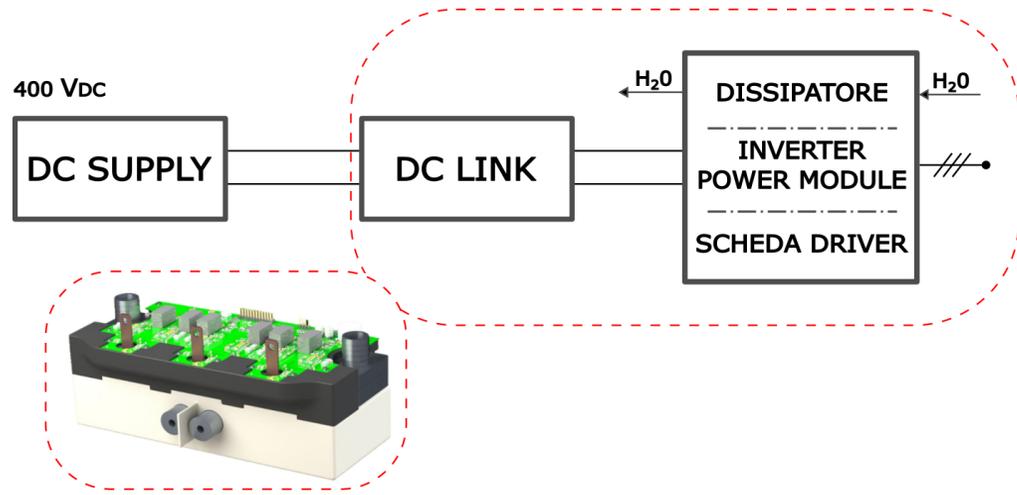
- Azionamento per banchi prova motori elettrici
- Power stack IGBT OnSemi
- Obiettivo tesi: rendere fruibile l'EV-Kit per test di laboratorio
- Necessario aggiungere funzionalità:
  - DC Link
  - Avviamento e spegnimento del DC Link
  - Controllo del convertitore
  - Comunicazione con dispositivi esterni



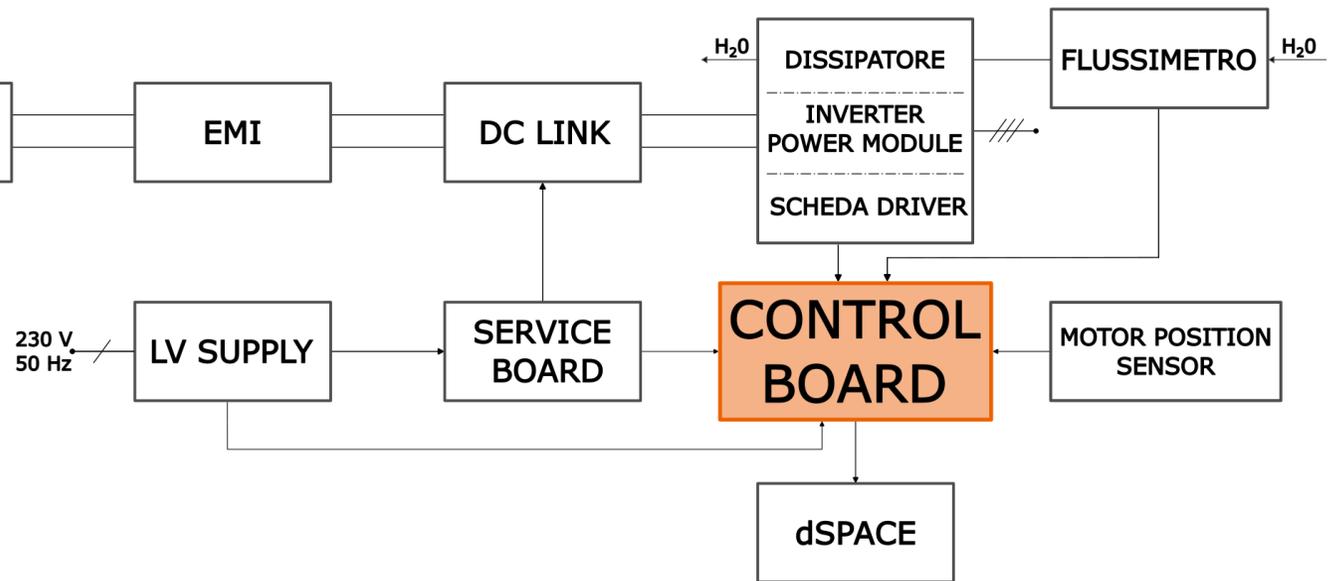
# Introduzione



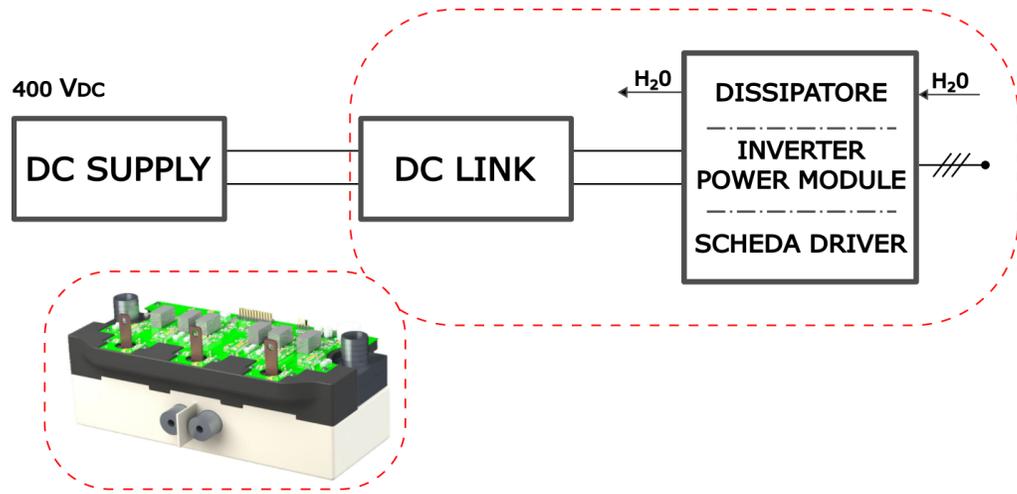
# Introduzione



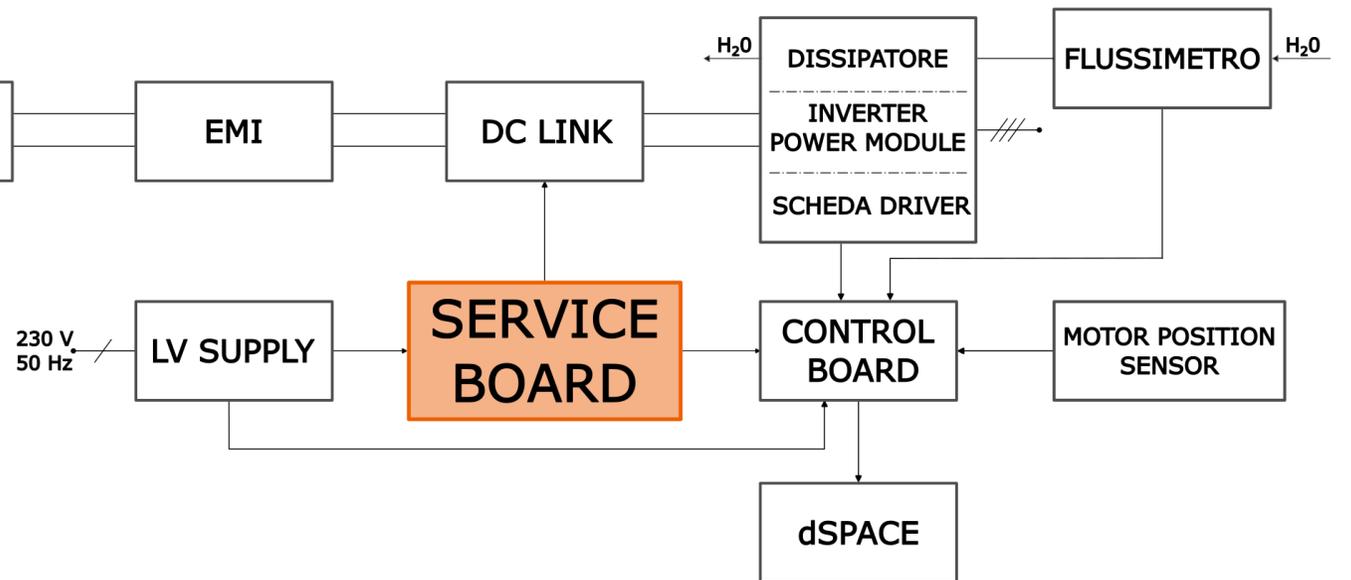
- Scheda di controllo



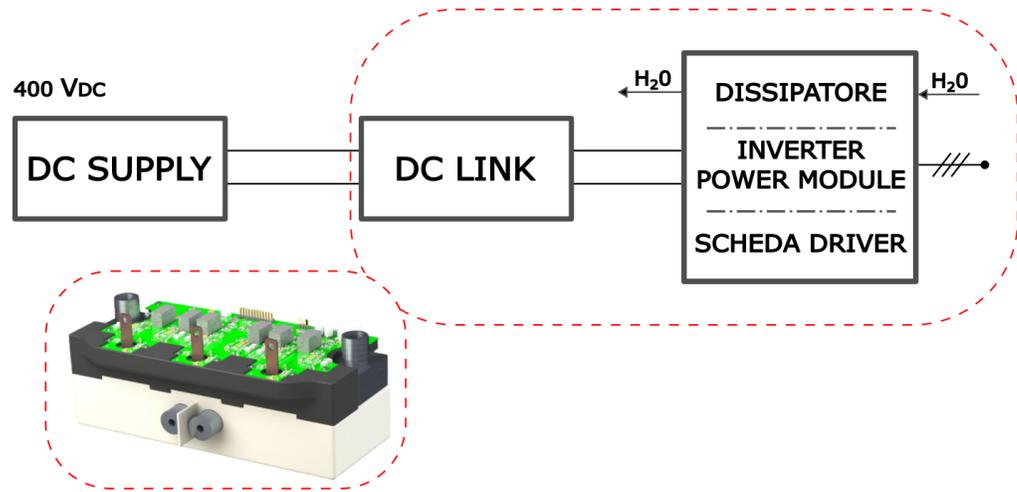
# Introduzione



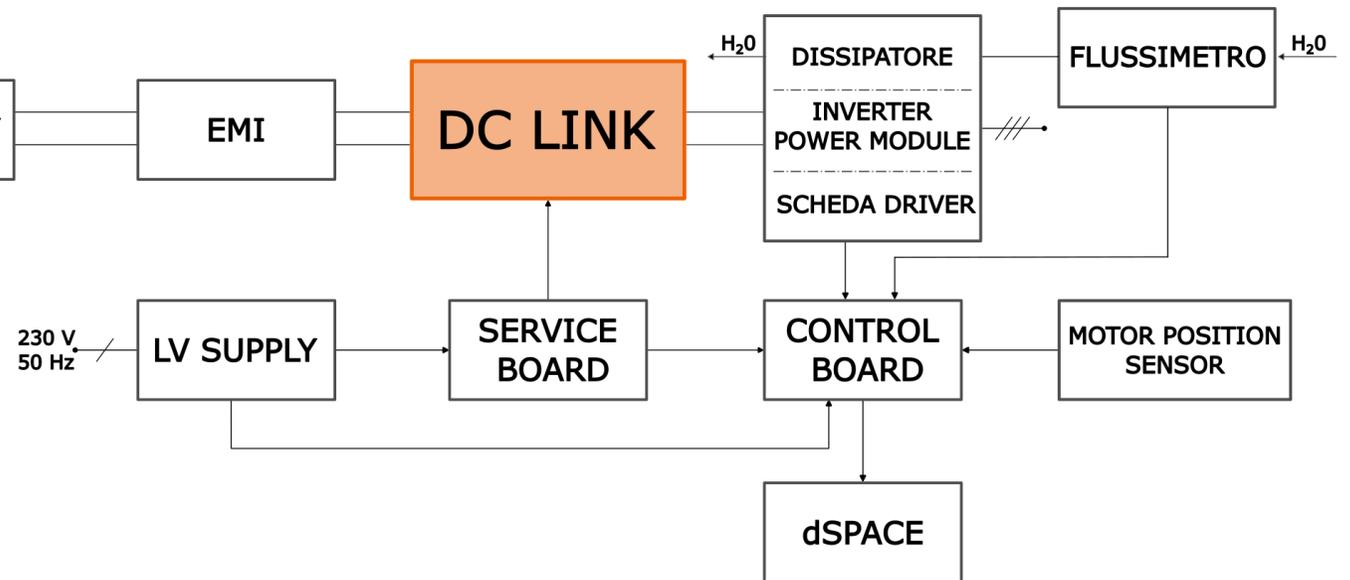
- Scheda di controllo
- Scheda di gestione del DC Link



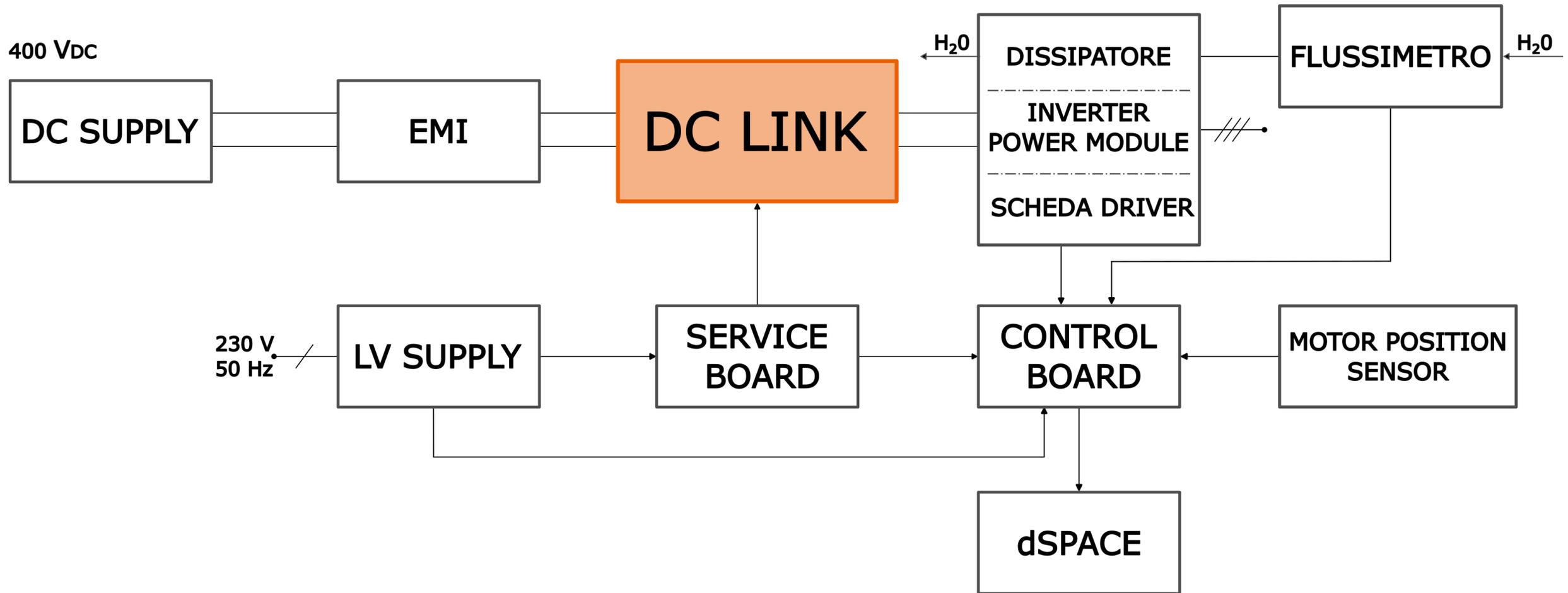
# Introduzione



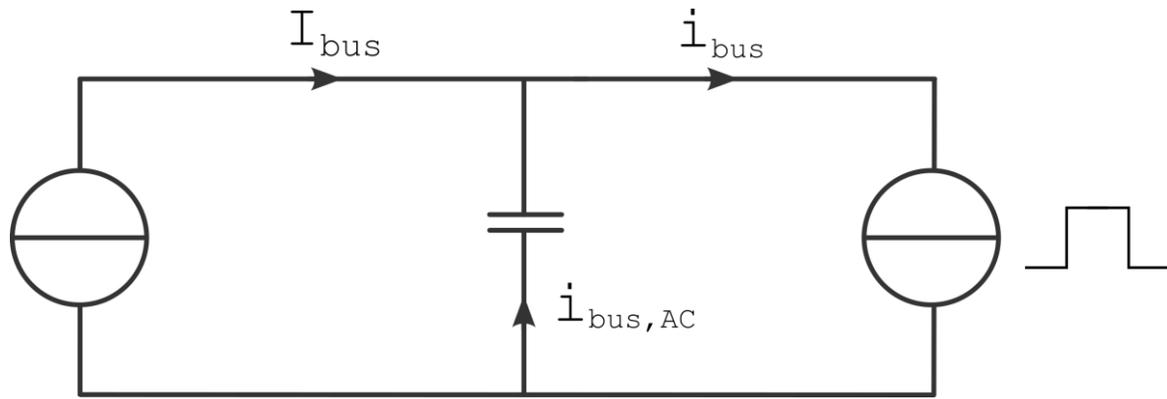
- Scheda di controllo
- Scheda di gestione del DC Link
- DC Link



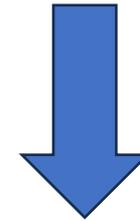
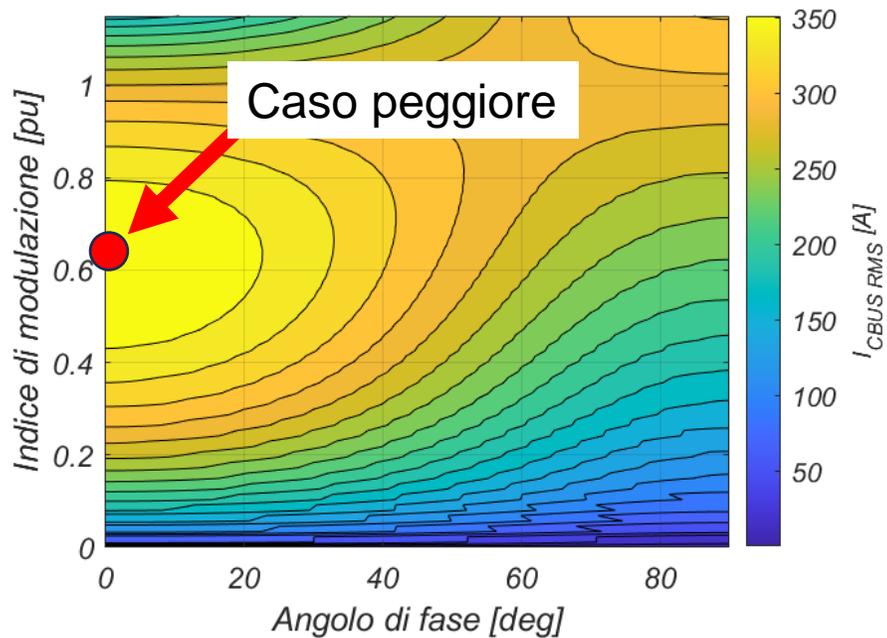
# DC Link Board



# Dimensionamento DC Link



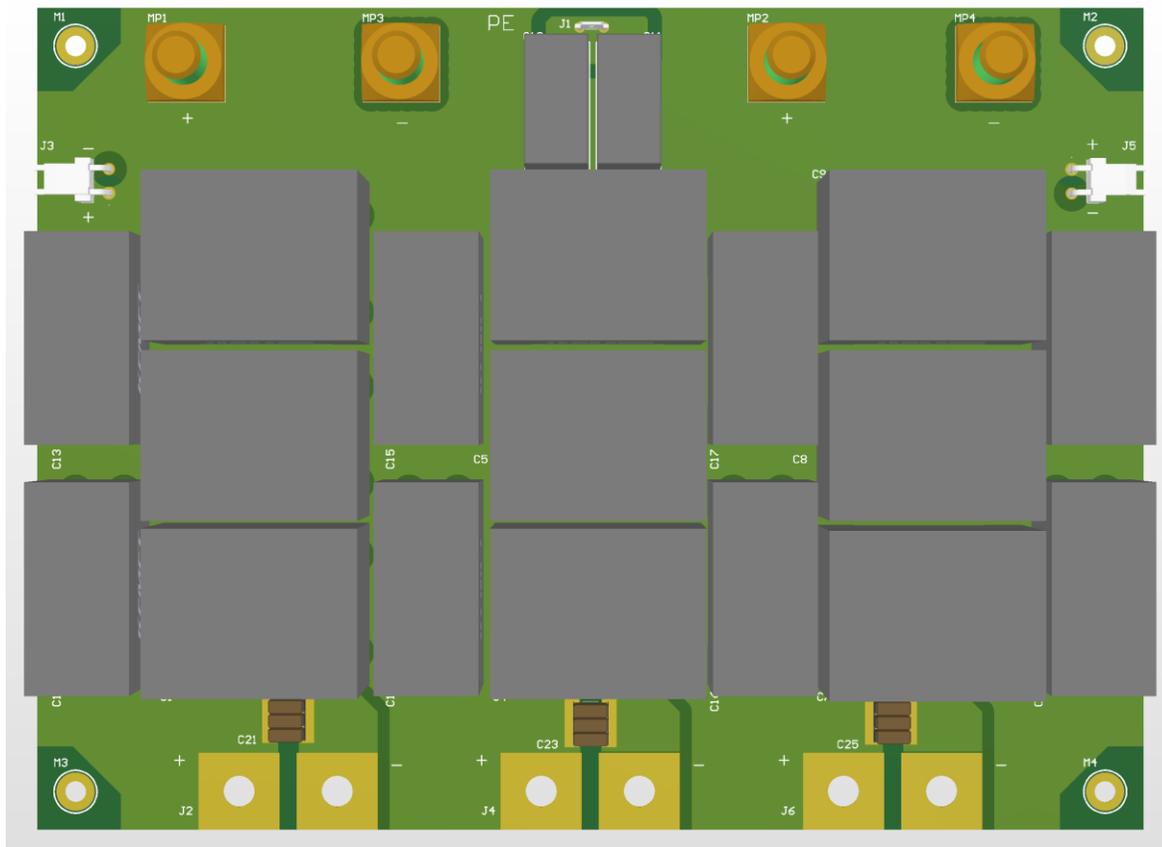
Specifiche DC Link	Valore
Corrente di picco di fase	800A
Tensione nominale	400 V
Tecnica di modulazione	CBSVM-PWM
Frequenza di commutazione	10 kHz
Massimo ripple di tensione DC	12 V



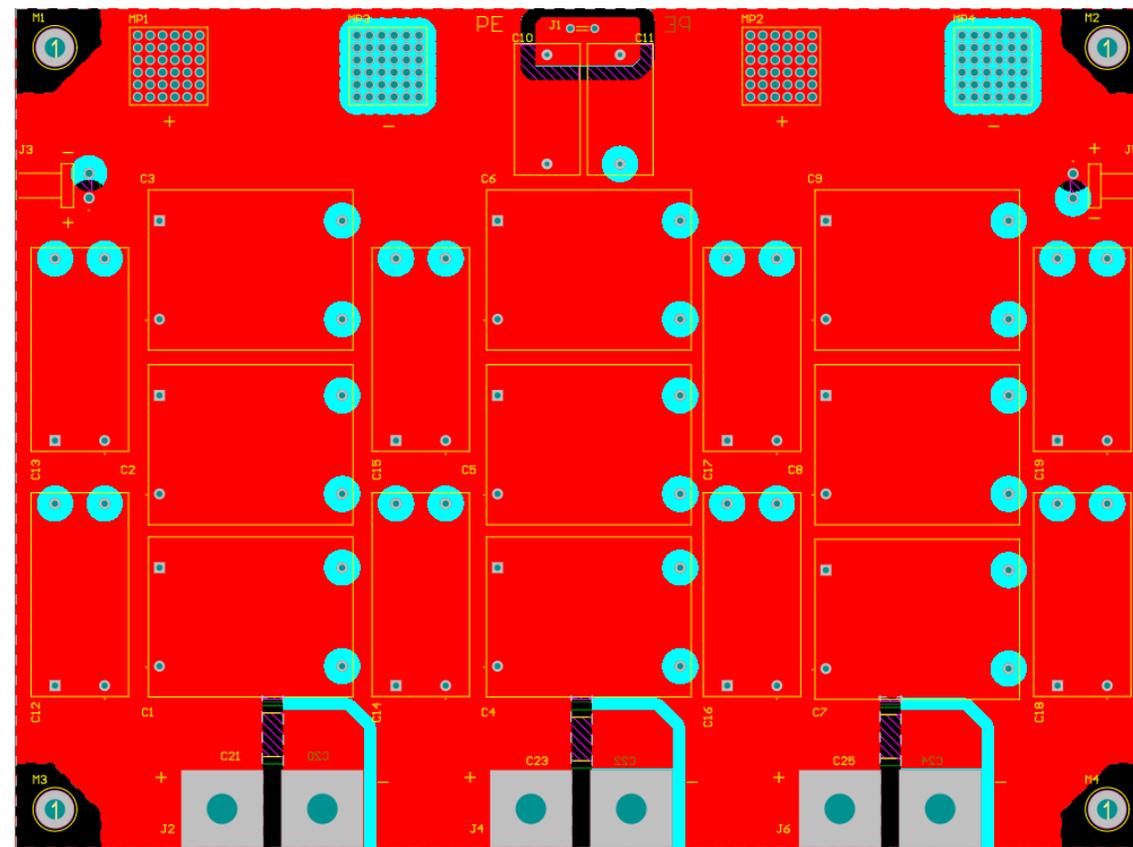
Risultato dimensionamento	Valore
Capacità totale	872μF
Massima corrente efficace condensatori DC	367.61A
$\Delta v_{pp} @ 872\mu F$	5.45V

# DC Link Board

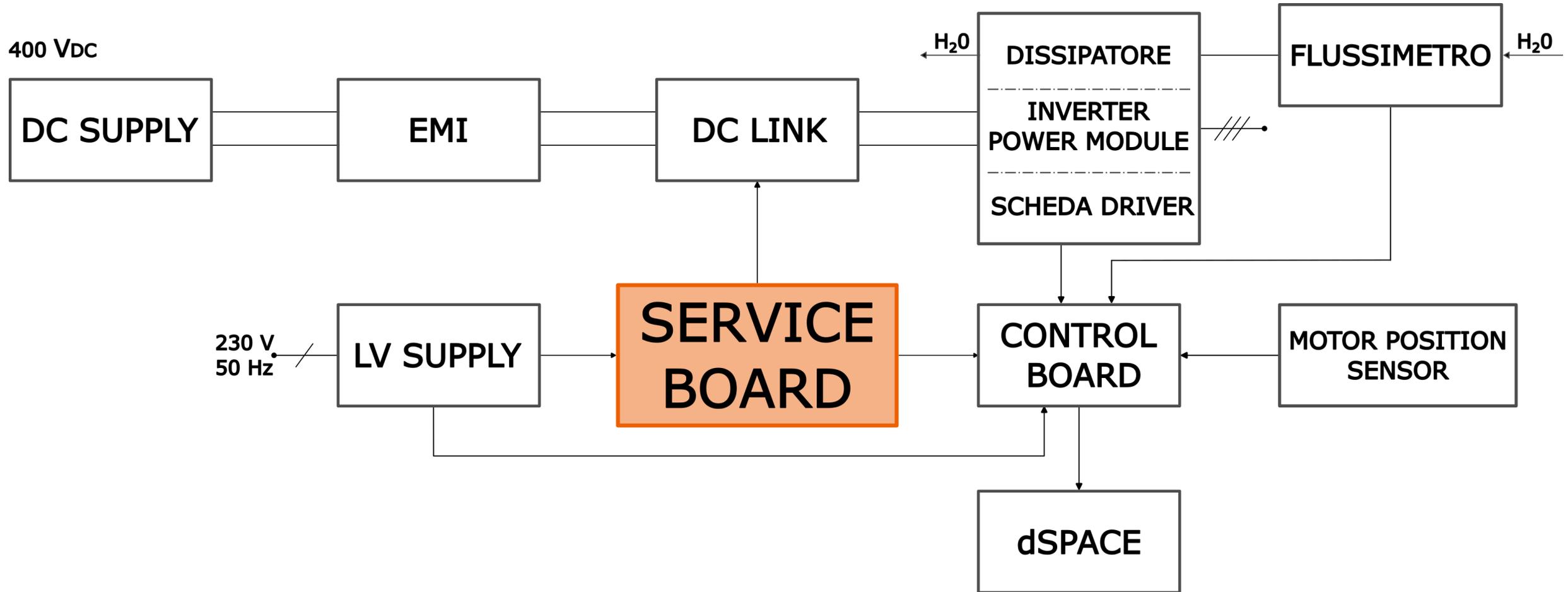
## Layout della DC Link Board



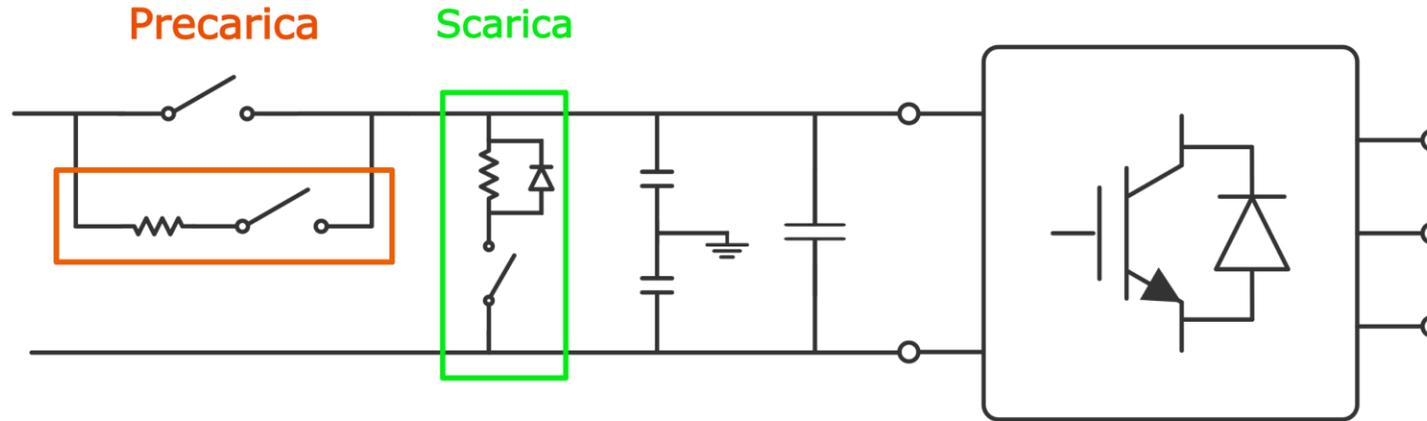
## Routing della DC Link Board



# Service Board



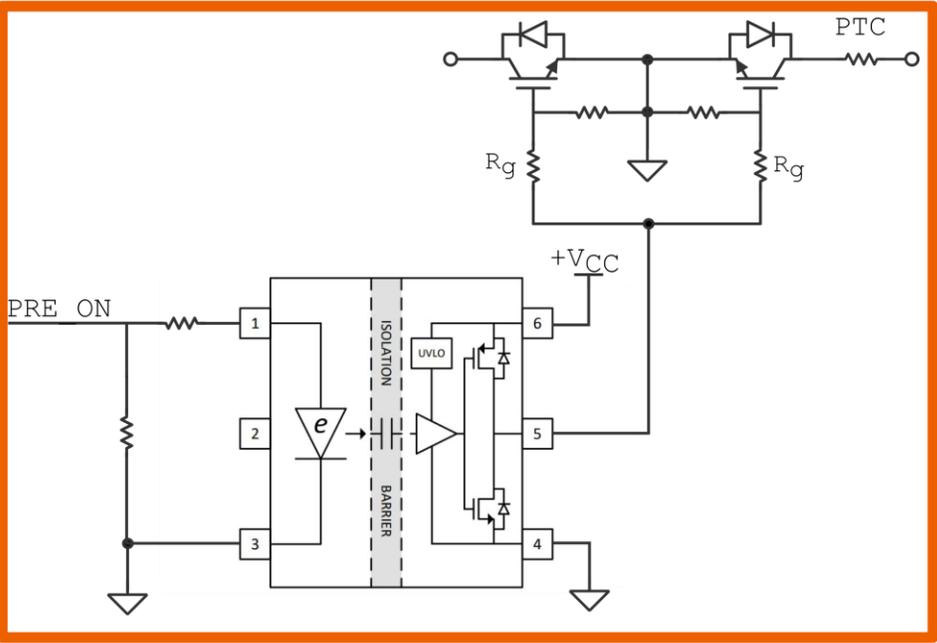
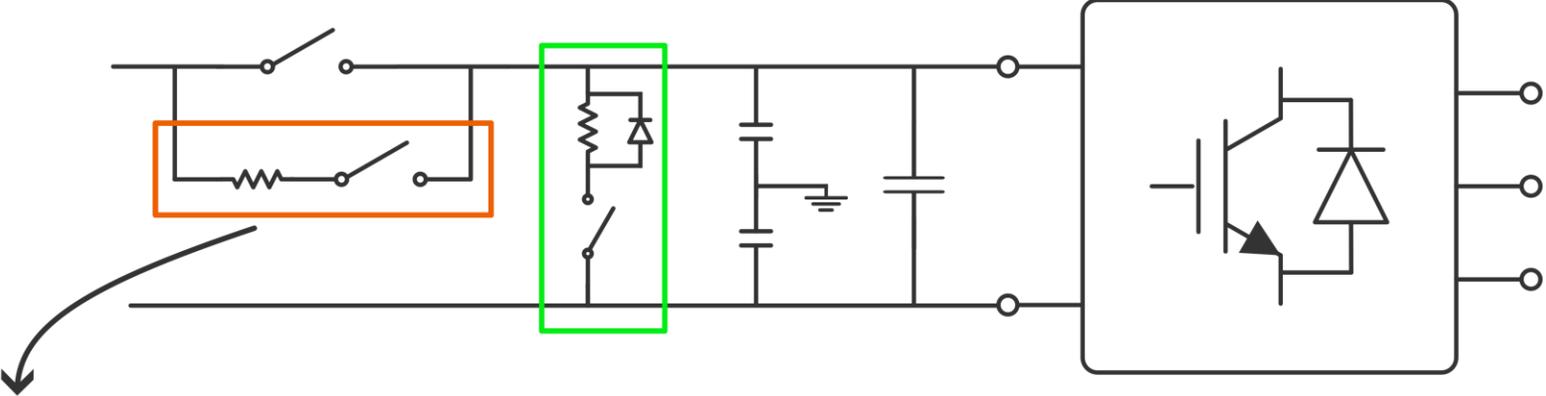
# Gestione del DC Link



# Gestione del DC Link

Pre carica

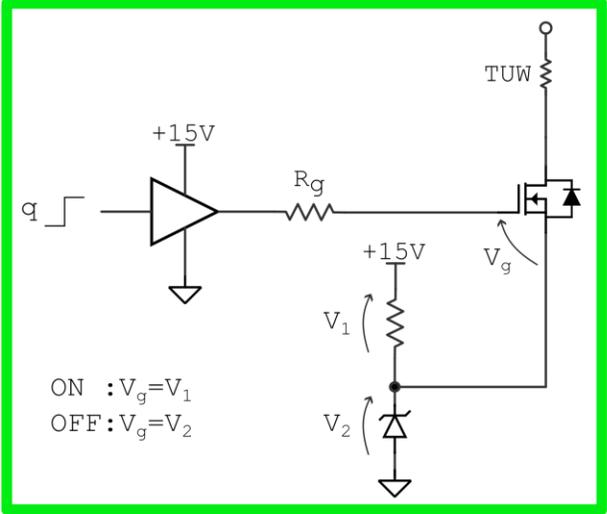
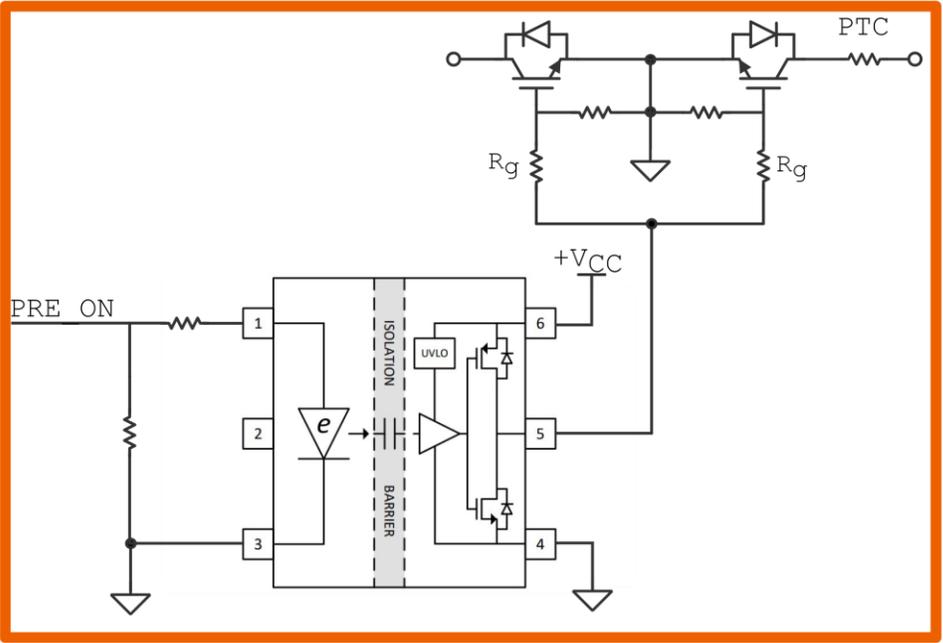
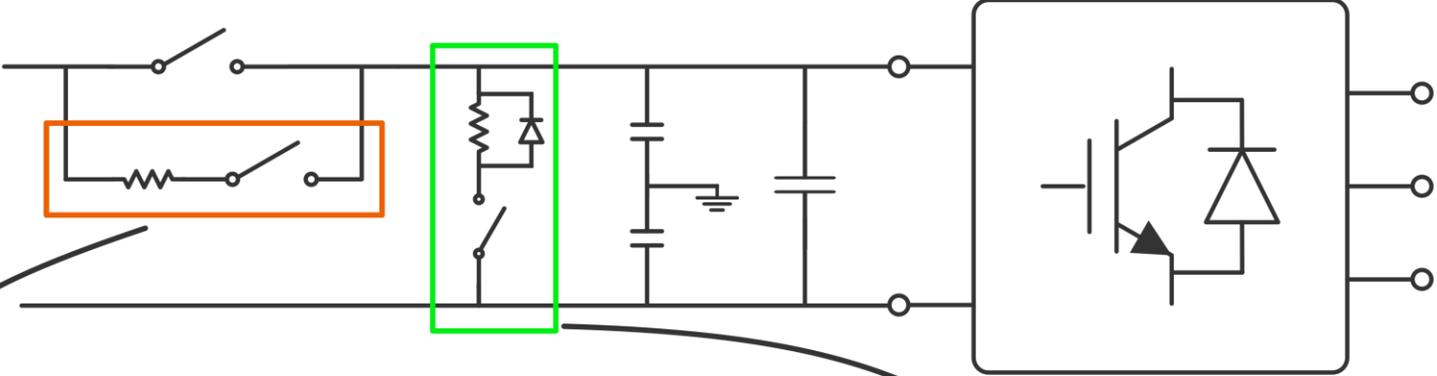
Scarica



# Gestione del DC Link

Pre carica

Scarica

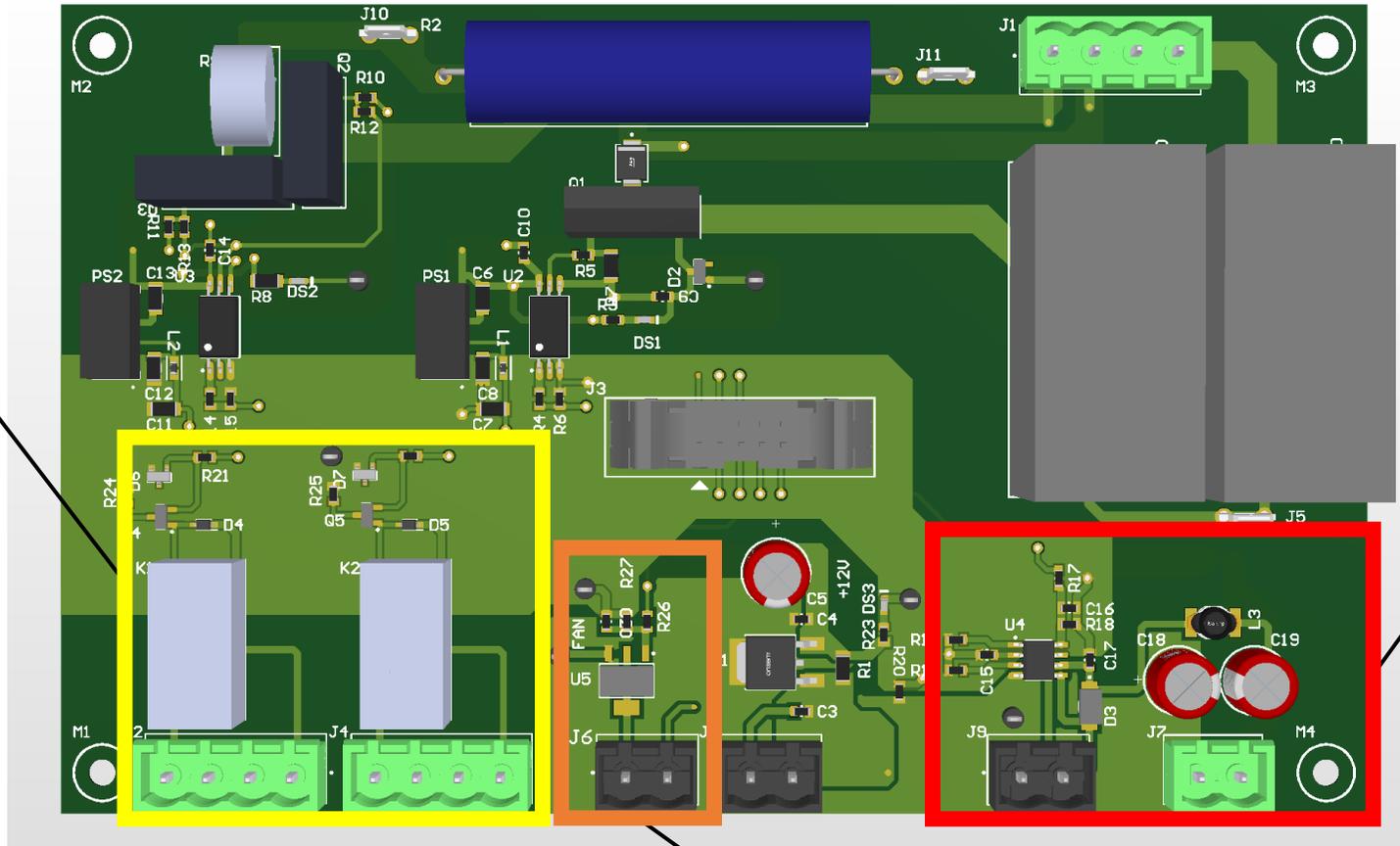


# Service Board

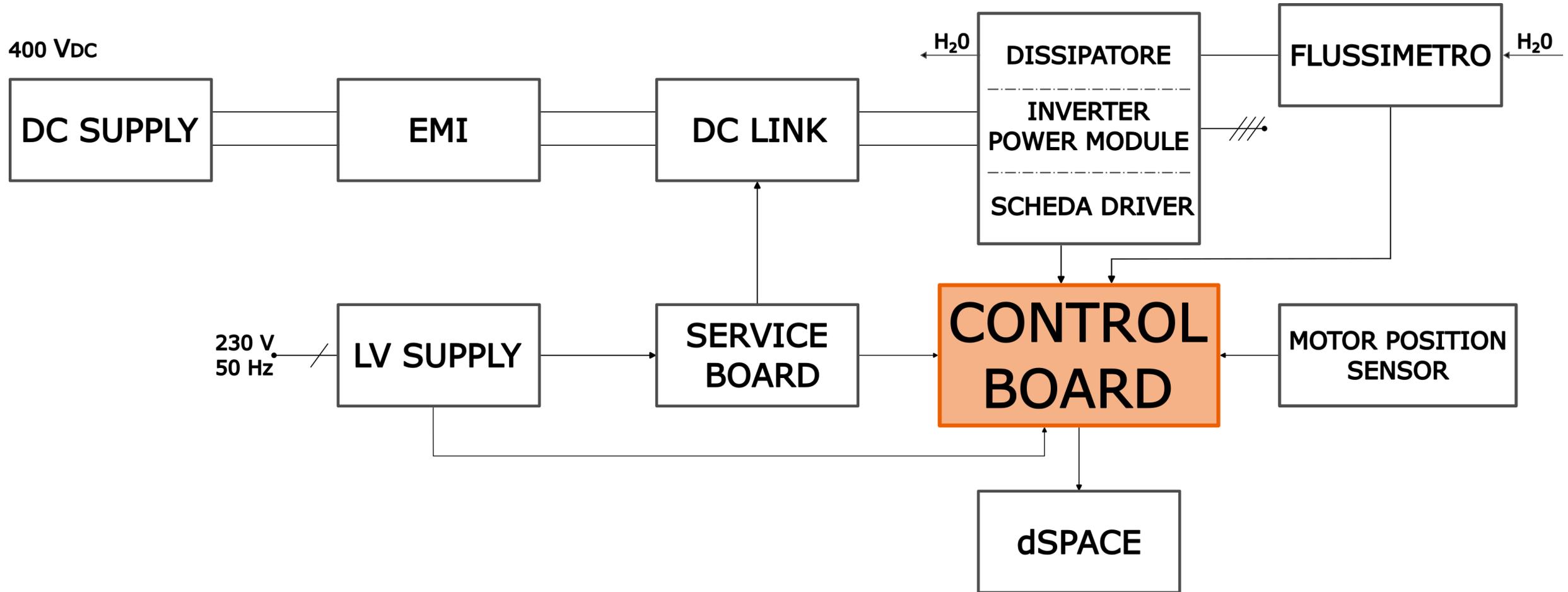
Comando relè

Gestione del sezionatore DC

Comando ventola



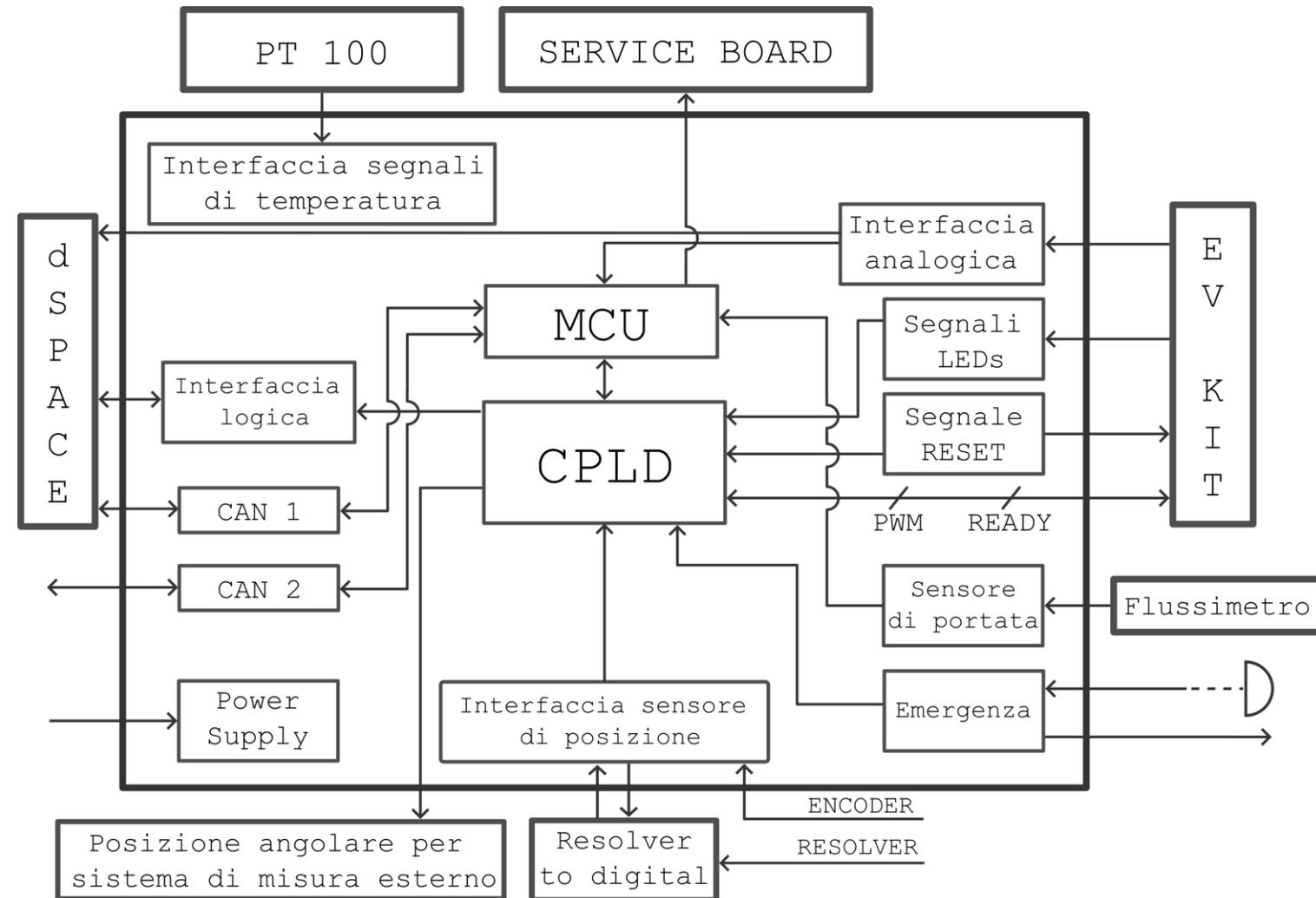
# Control Board



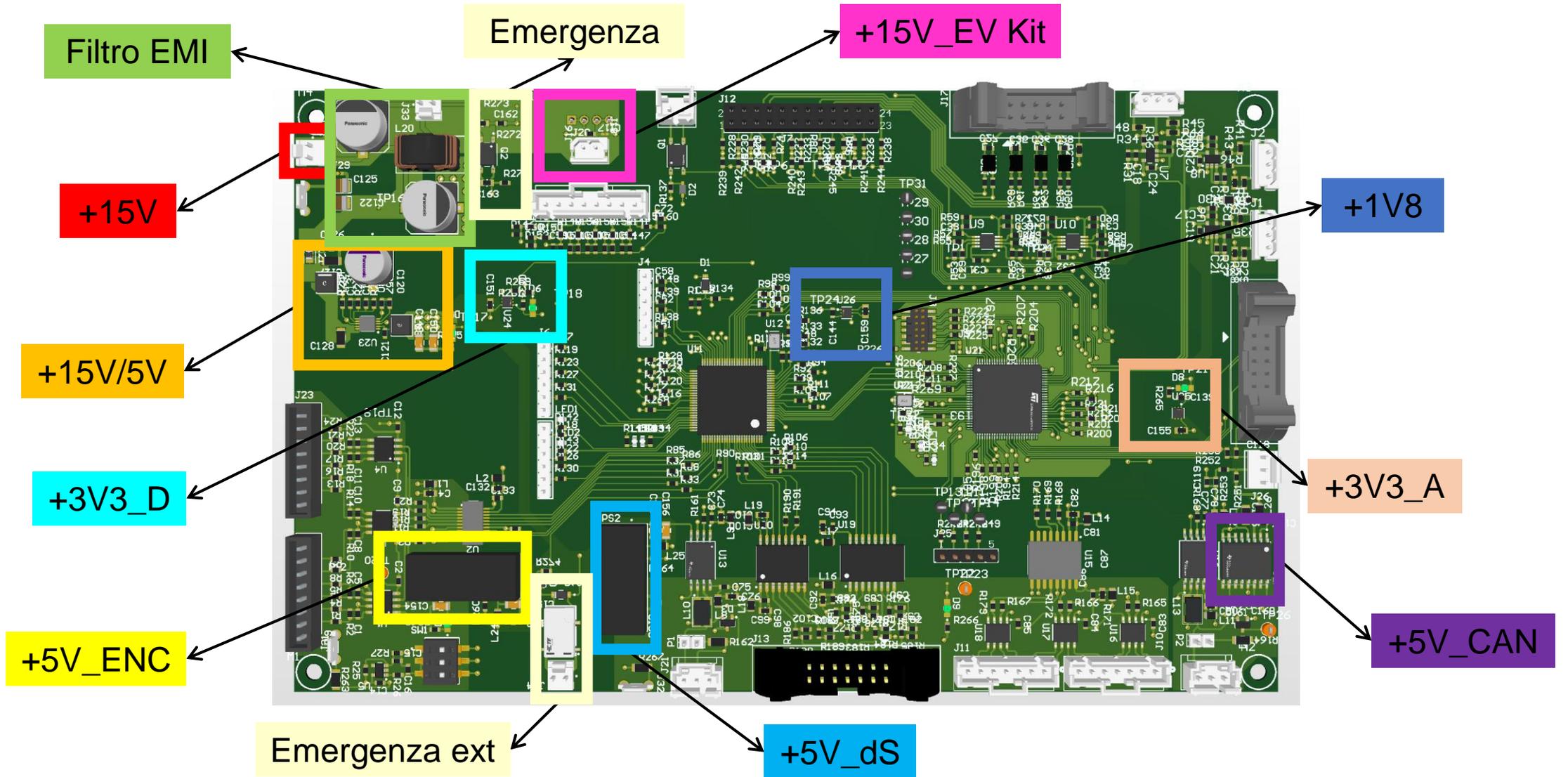
# Funzionalità della Control Board

Lista delle funzionalità integrate:

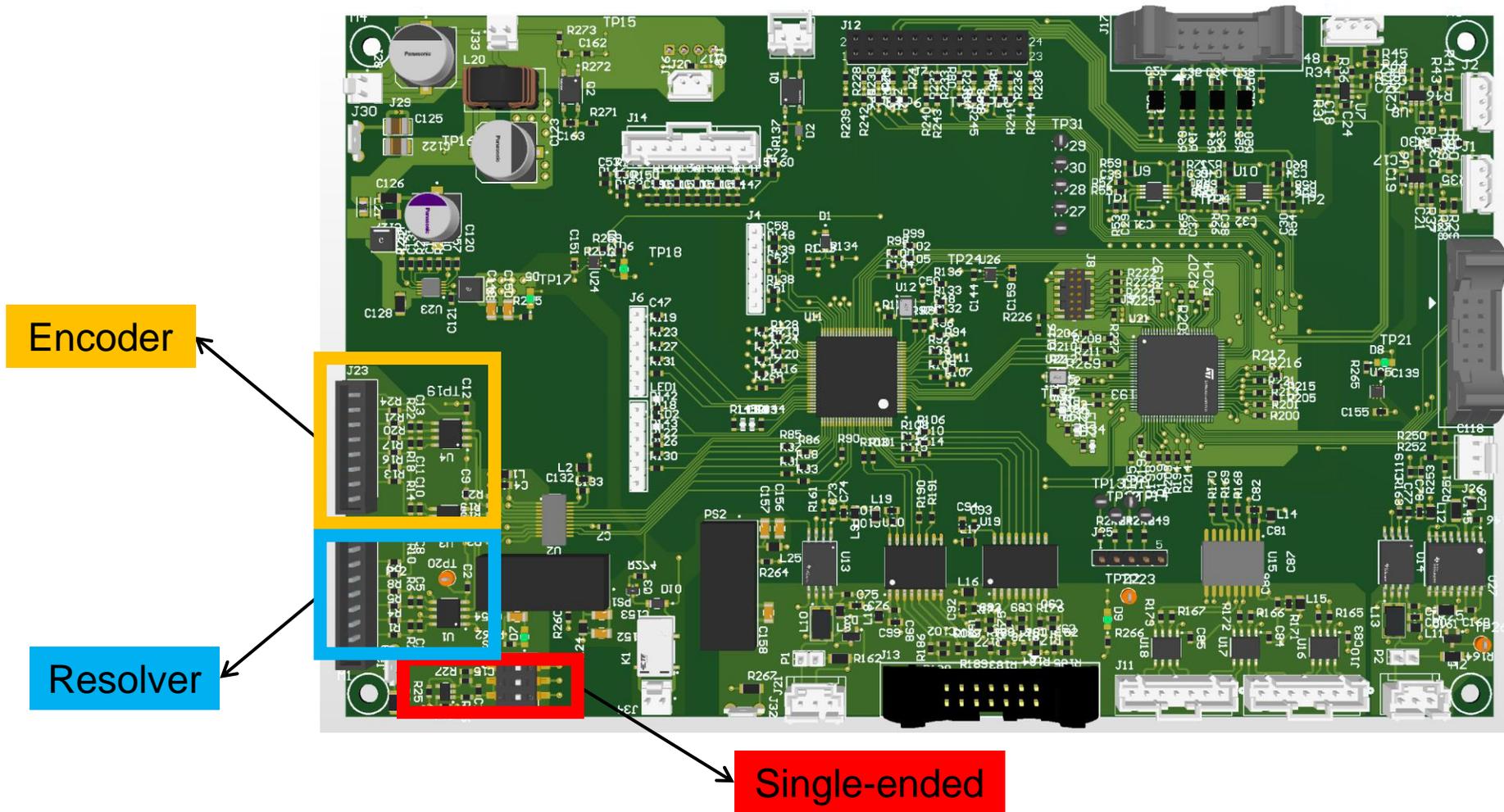
- Alimentazioni
- Emergenza
- Interfacce sensori di
  - Posizione angolare motore
  - Temperatura
  - Flusso acqua dissipatore
- Interfaccia dei segnali provenienti da
  - dSPACE
  - EV Kit
- Interfaccia dei segnali
  - Digitali
  - Analogici
- Gestione dei segnali tramite
  - Microcontrollore
  - CPLD



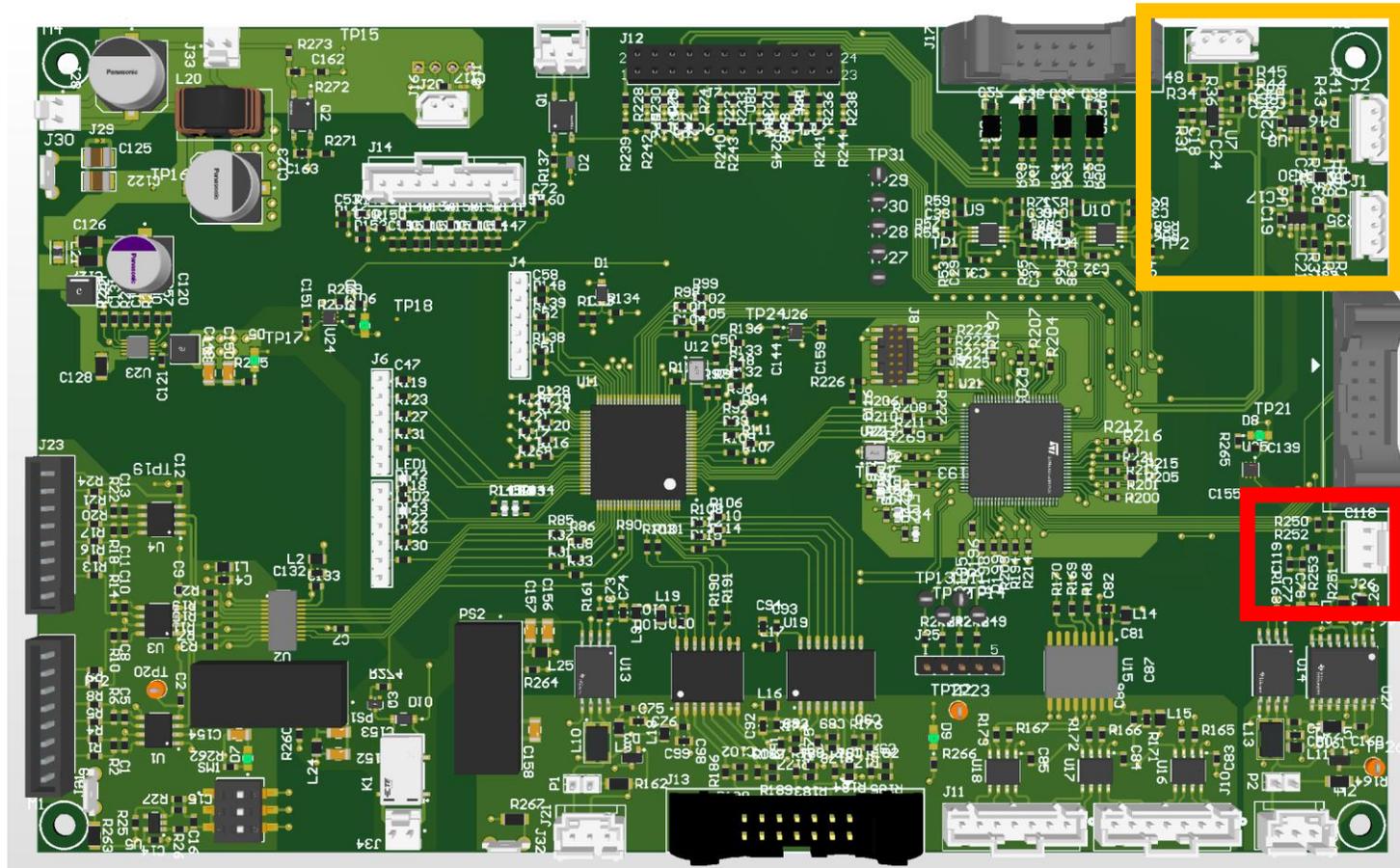
# Alimentazioni



# Interfaccia sensori di posizione



# Interfaccia sensori di temperatura e flusso



Sensori di temperatura

Flussimetro

# Gestione dei segnali

Interfaccia EV Kit

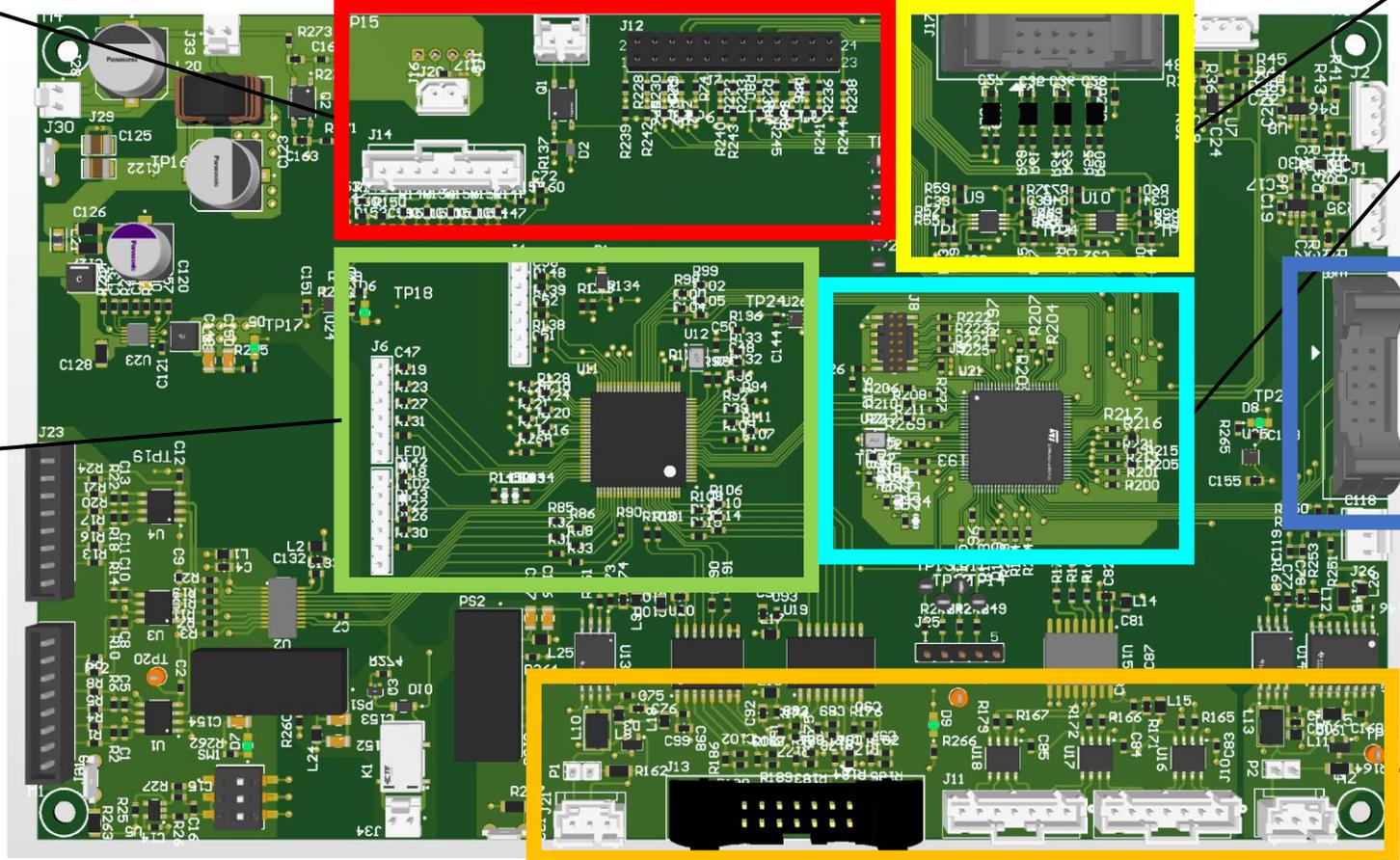
Segnali analogici

Microcontrollore

CPLD

Segnali Service Board

Interfaccia dSPACE



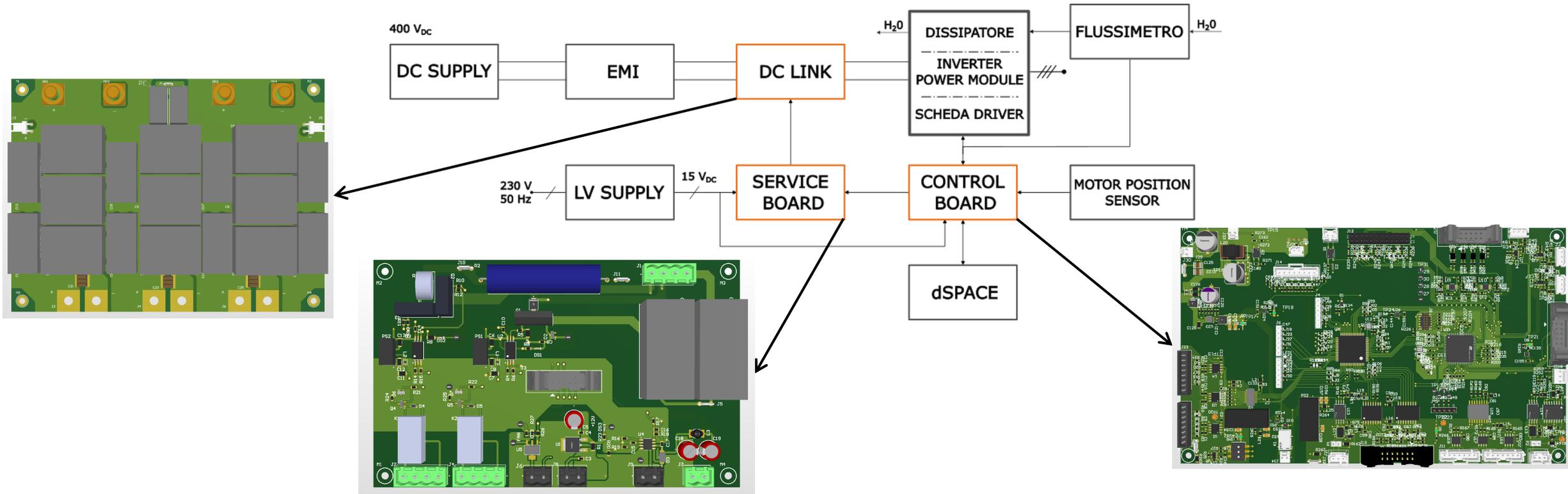
# Conclusioni

## Contributi personali:

- Progettazione e sbroglio delle tre schede PCB

## Prossimi passi:

- Stampa e assemblaggio dei PCB
- Montaggio convertitore e testing



Grazie per l'attenzione!