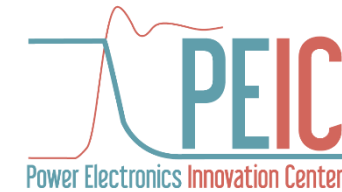




Politecnico
di Torino



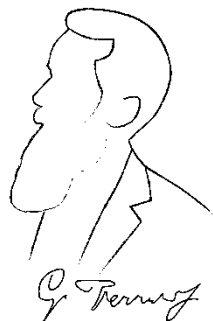
Hardware per la prototipazione rapida di un inverter di trazione

Relatori:

Prof. Eric G. Armando
Dr. Fabio Mandrile

Candidata:

Donatella Sponso



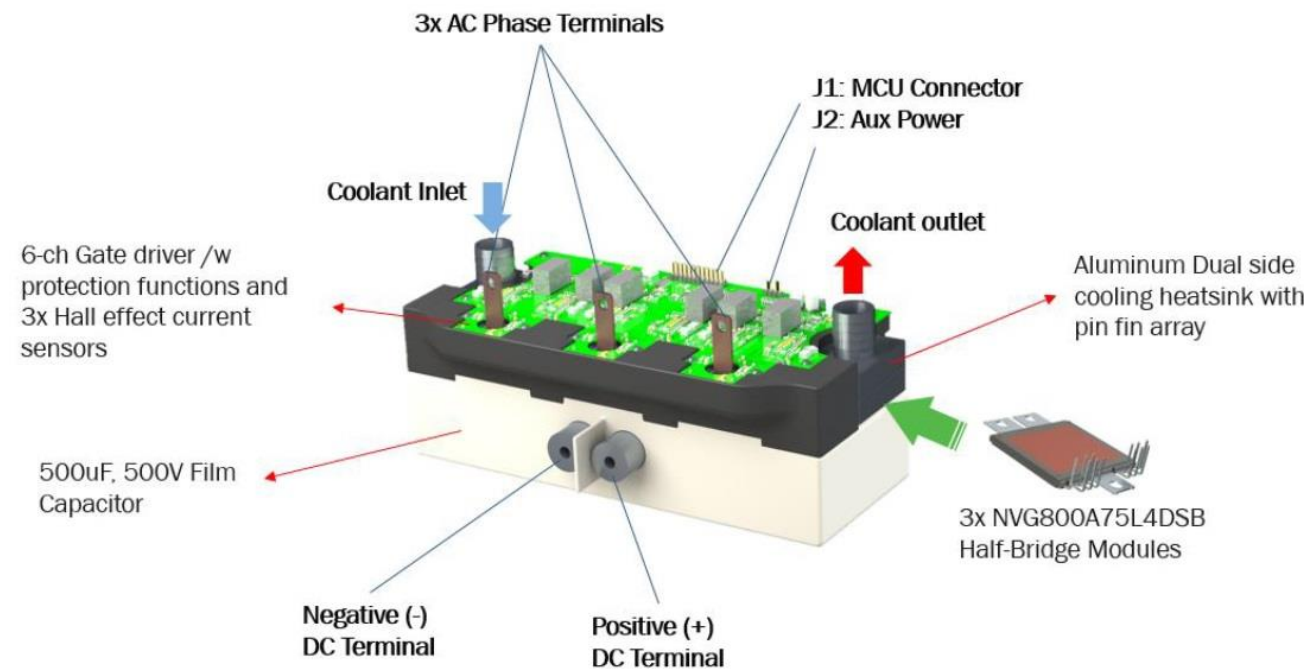
Dipartimento Energia "Galileo Ferraris"
Politecnico di Torino, Italia

15/03/2024

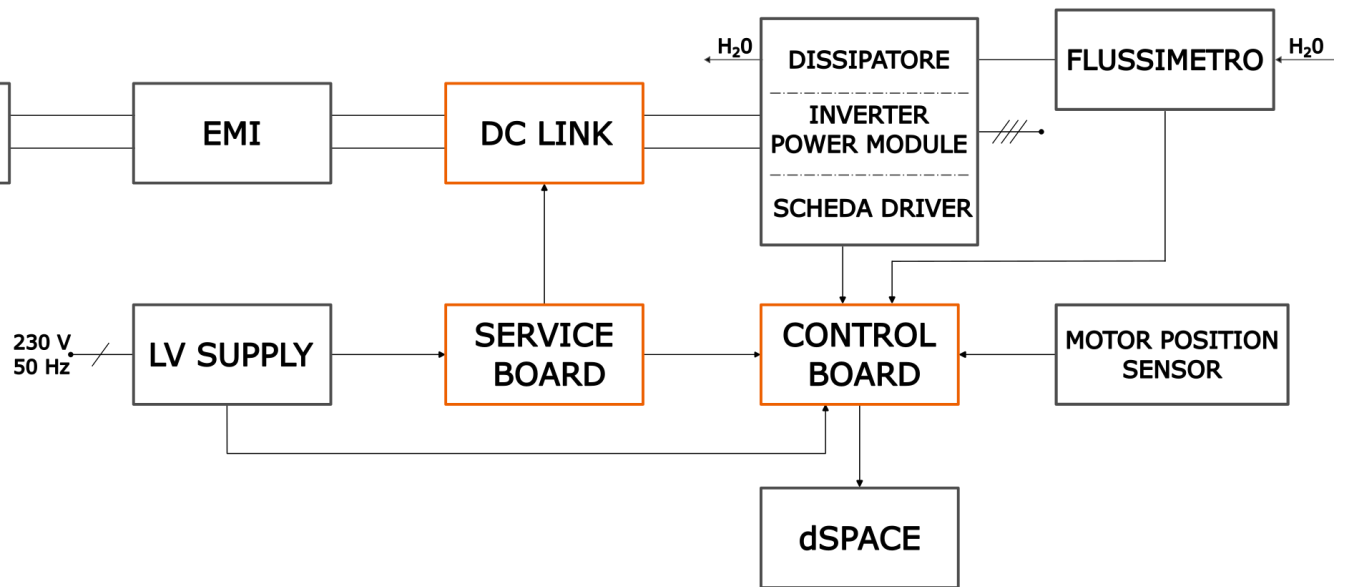
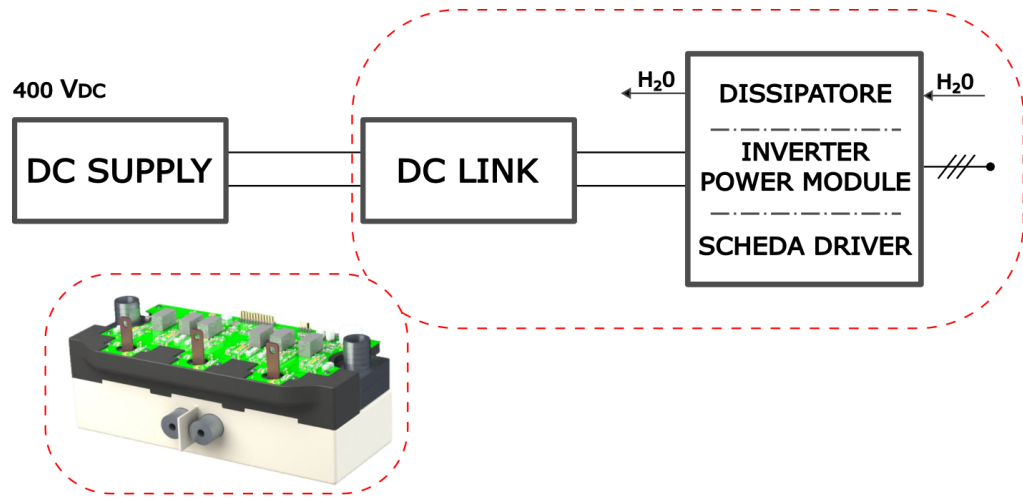


Introduzione

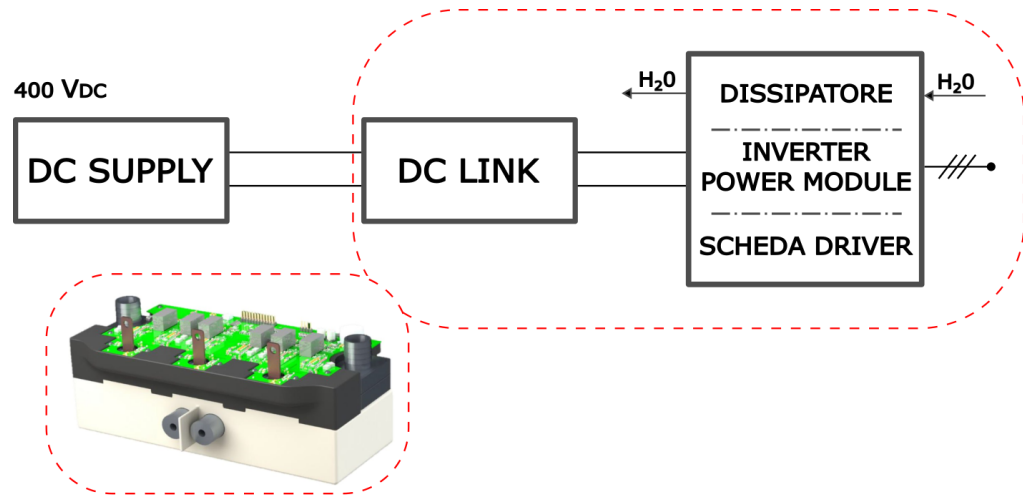
- Azionamento per banchi prova motori elettrici
- Power stack IGBT OnSemi
- Obiettivo tesi: rendere fruibile l'EV-Kit per test di laboratorio
- Necessario aggiungere funzionalità:
 - DC Link
 - Avviamento e spegnimento del DC Link
 - Controllo del convertitore
 - Comunicazione con dispositivi esterni



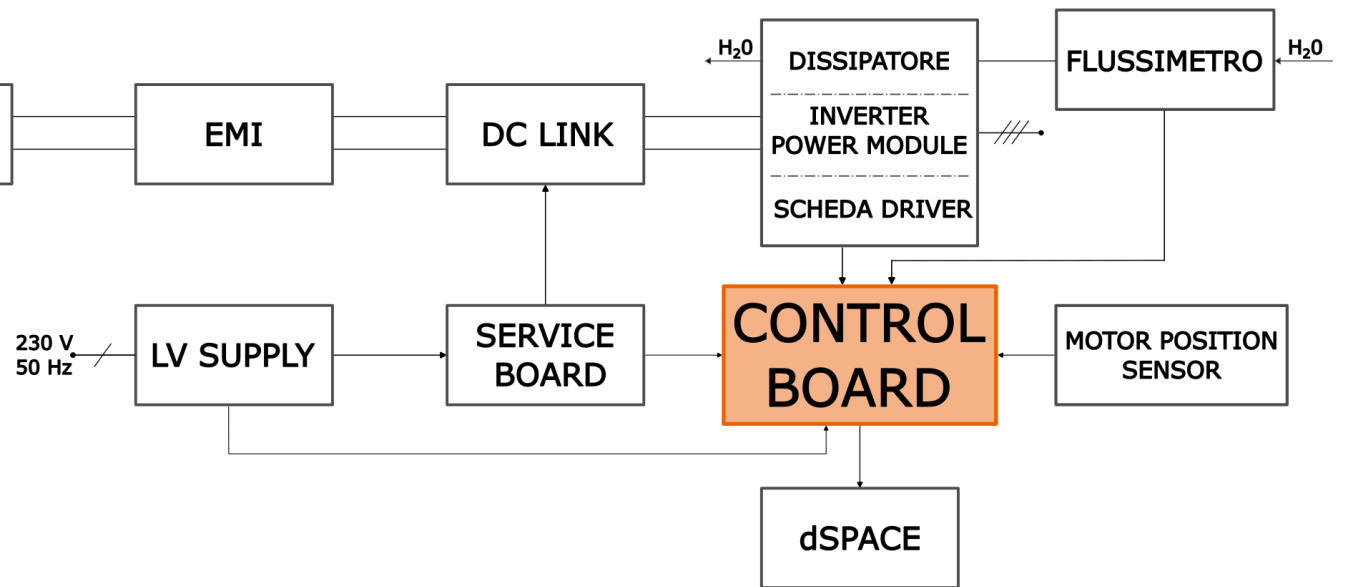
Introduzione



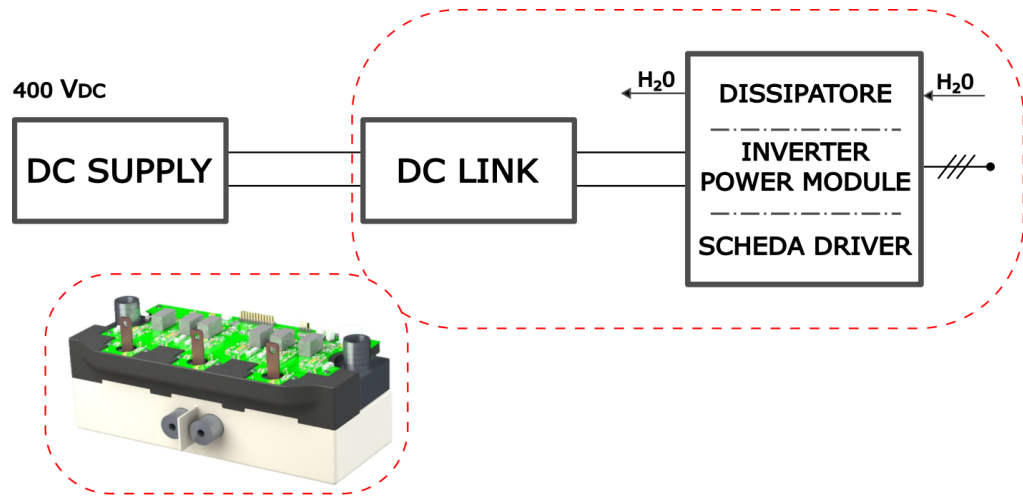
Introduzione



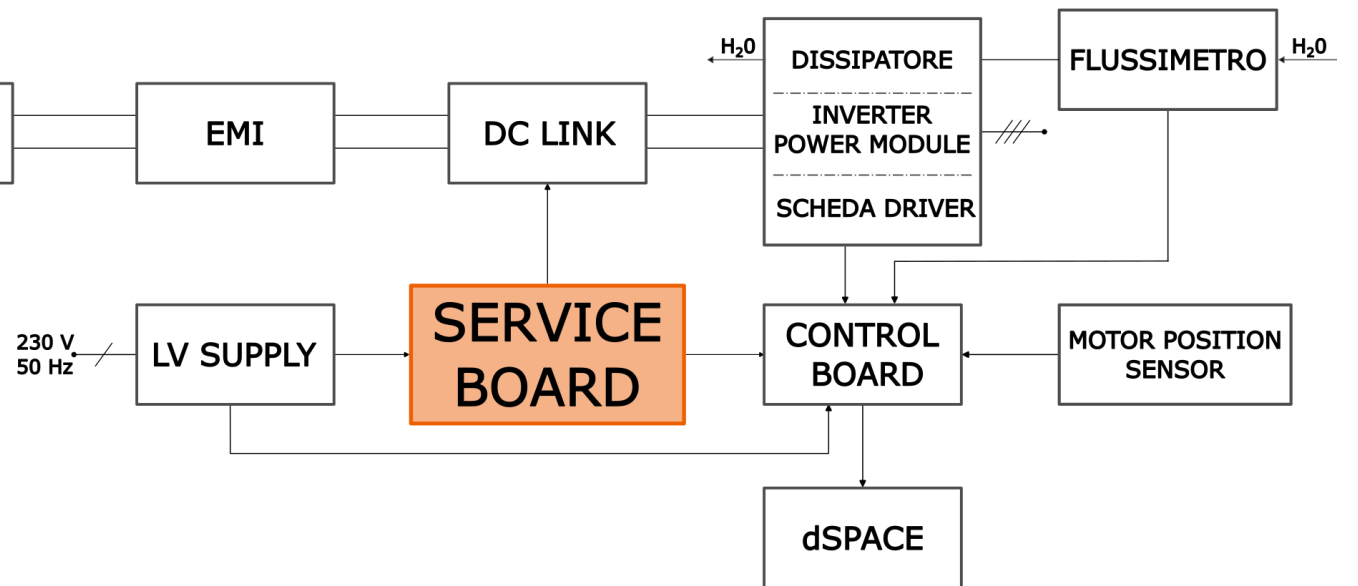
- Scheda di controllo



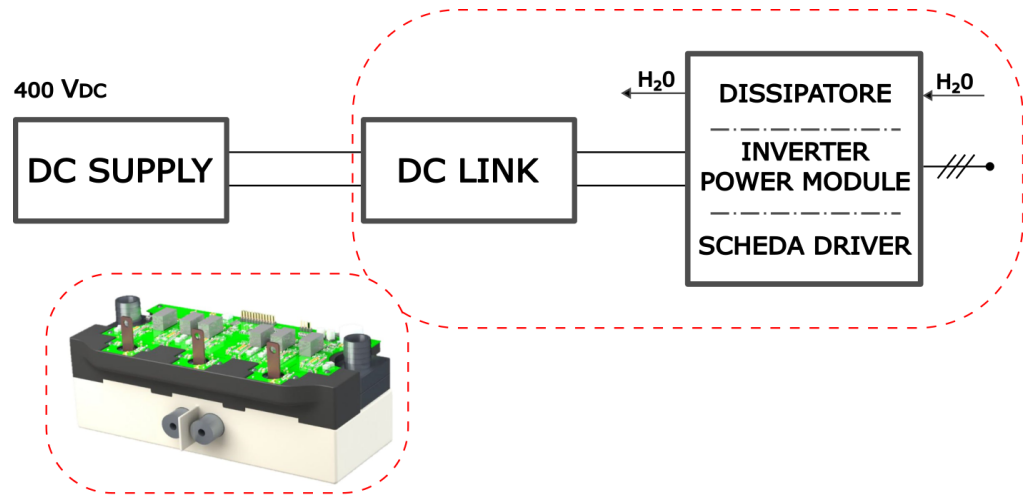
Introduzione



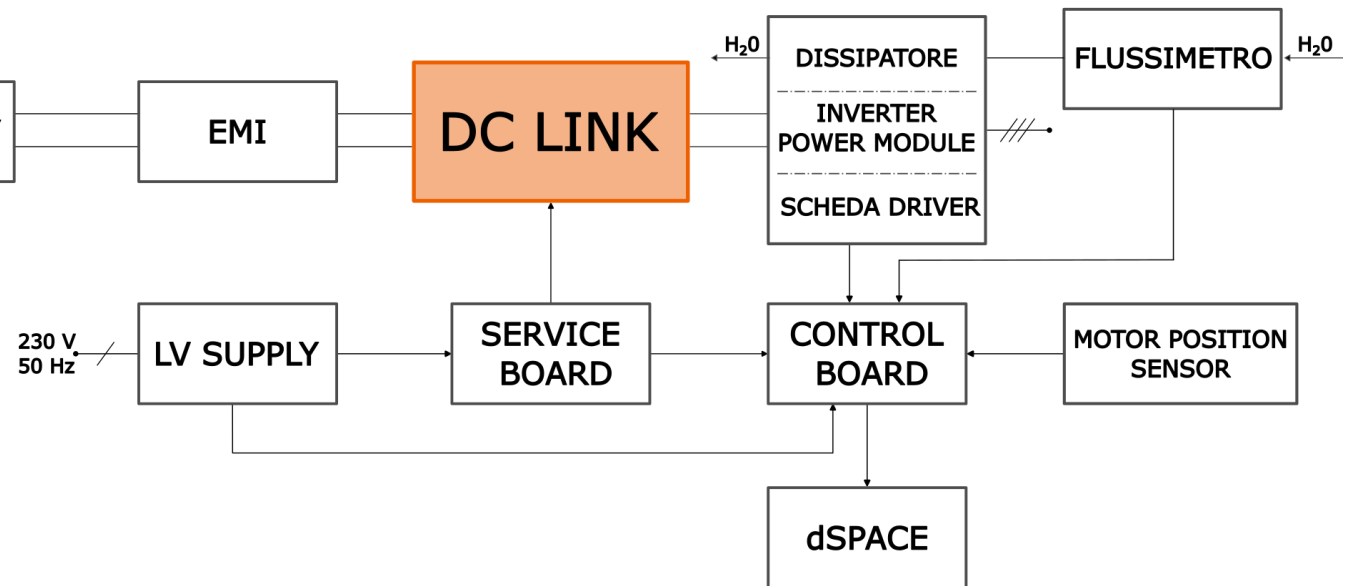
- Scheda di controllo
- Scheda di gestione del DC Link



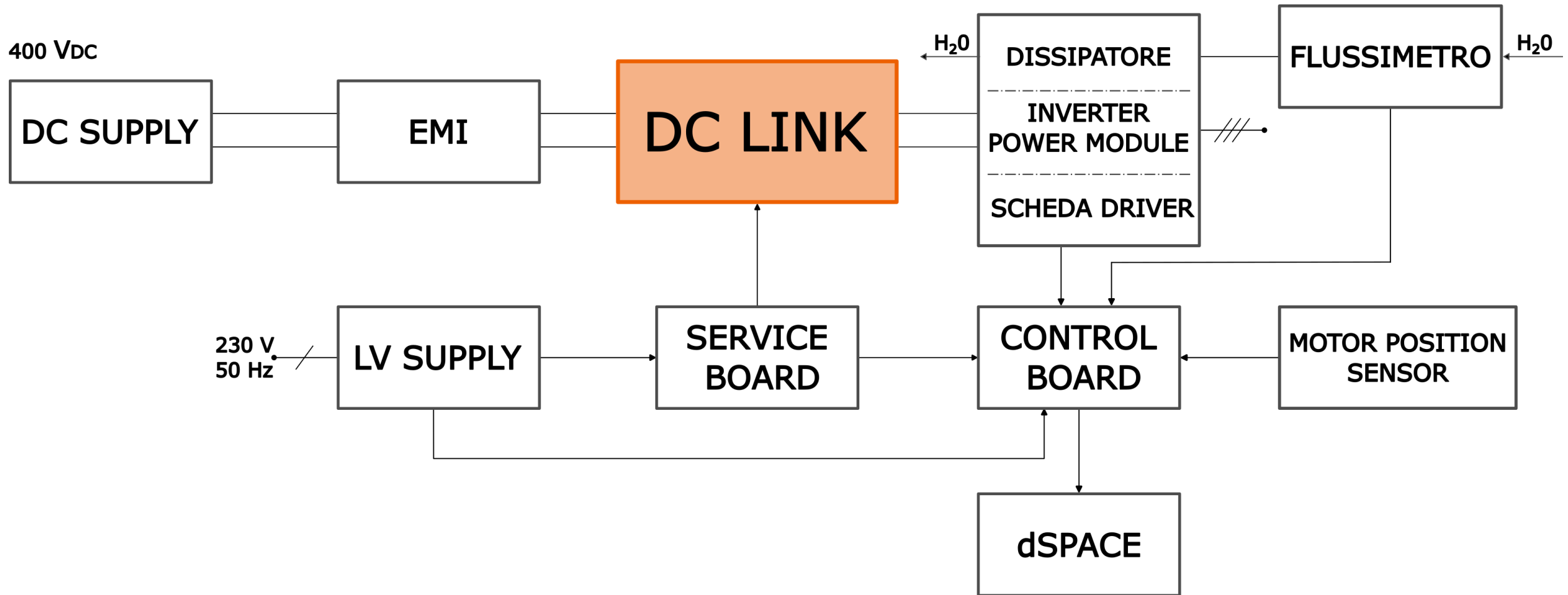
Introduzione



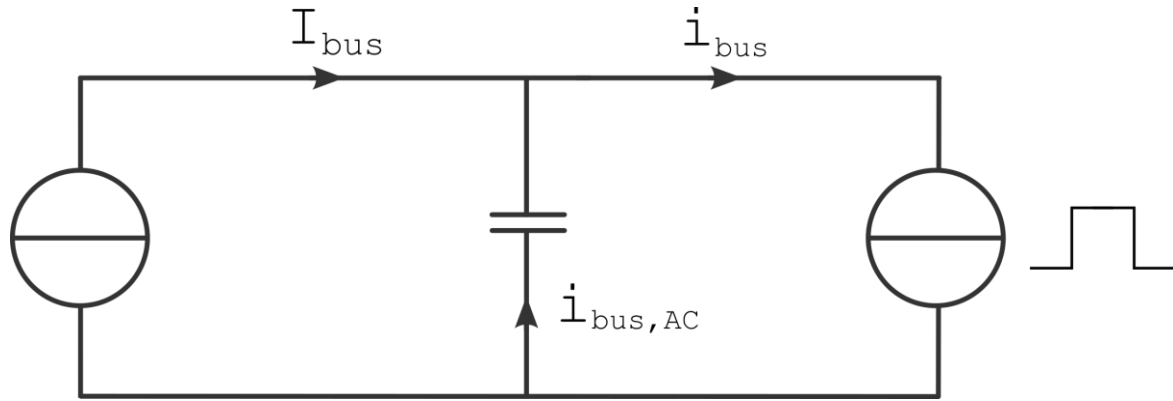
- Scheda di controllo
- Scheda di gestione del DC Link
- DC Link



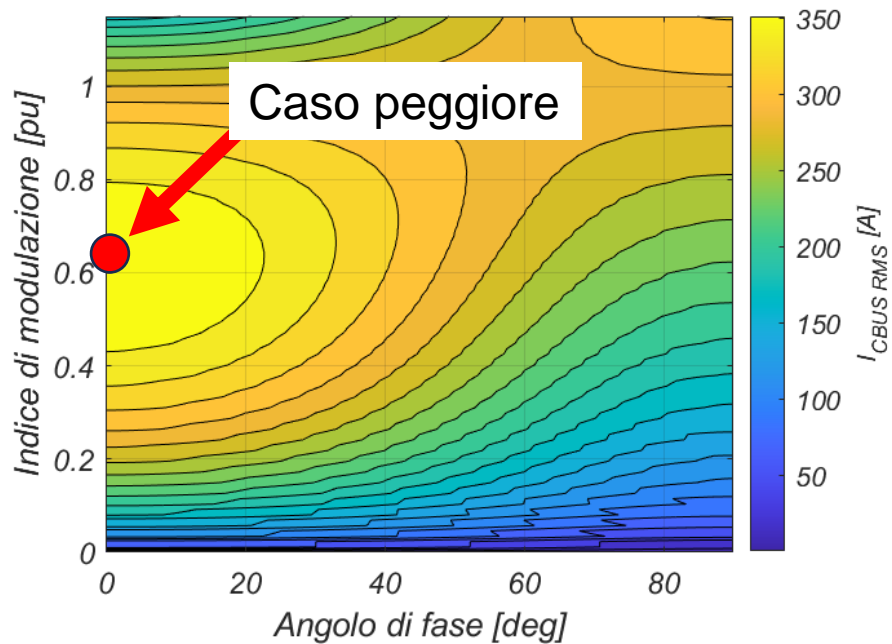
DC Link Board



Dimensionamento DC Link



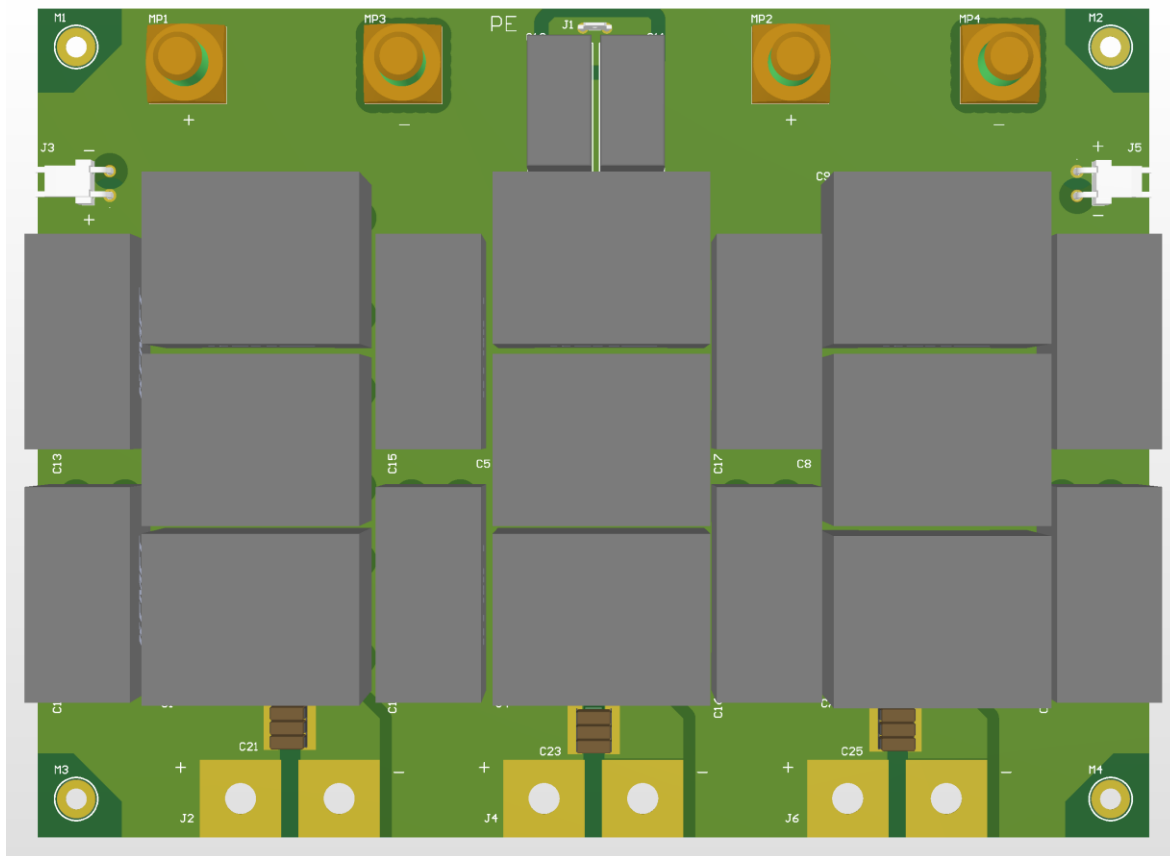
Specifiche DC Link	Valore
Corrente di picco di fase	800A
Tensione nominale	400 V
Tecnica di modulazione	CBSVM-PWM
Frequenza di commutazione	10 kHz
Massimo ripple di tensione DC	12 V



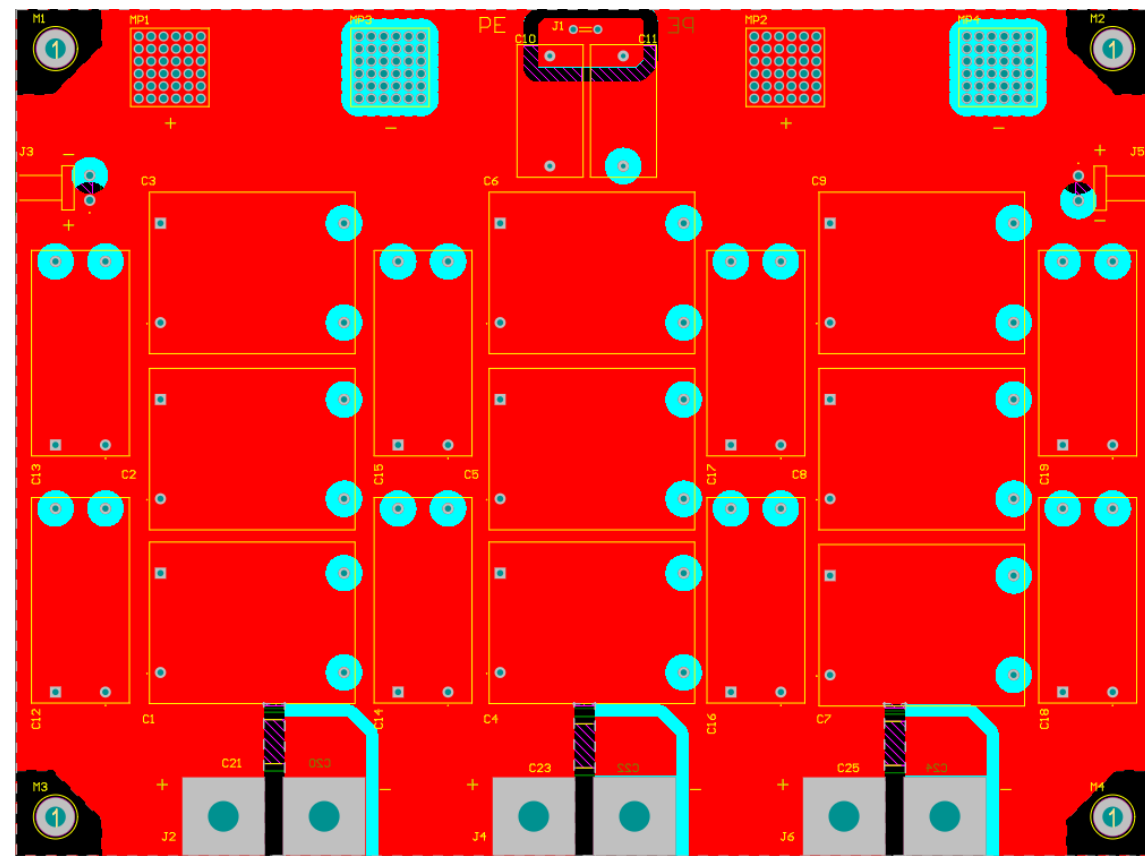
Risultato dimensionamento	Valore
Capacità totale	872μF
Massima corrente efficace condensatori DC	367.61A
$\Delta v_{pp} @ 872\mu F$	5.45V

DC Link Board

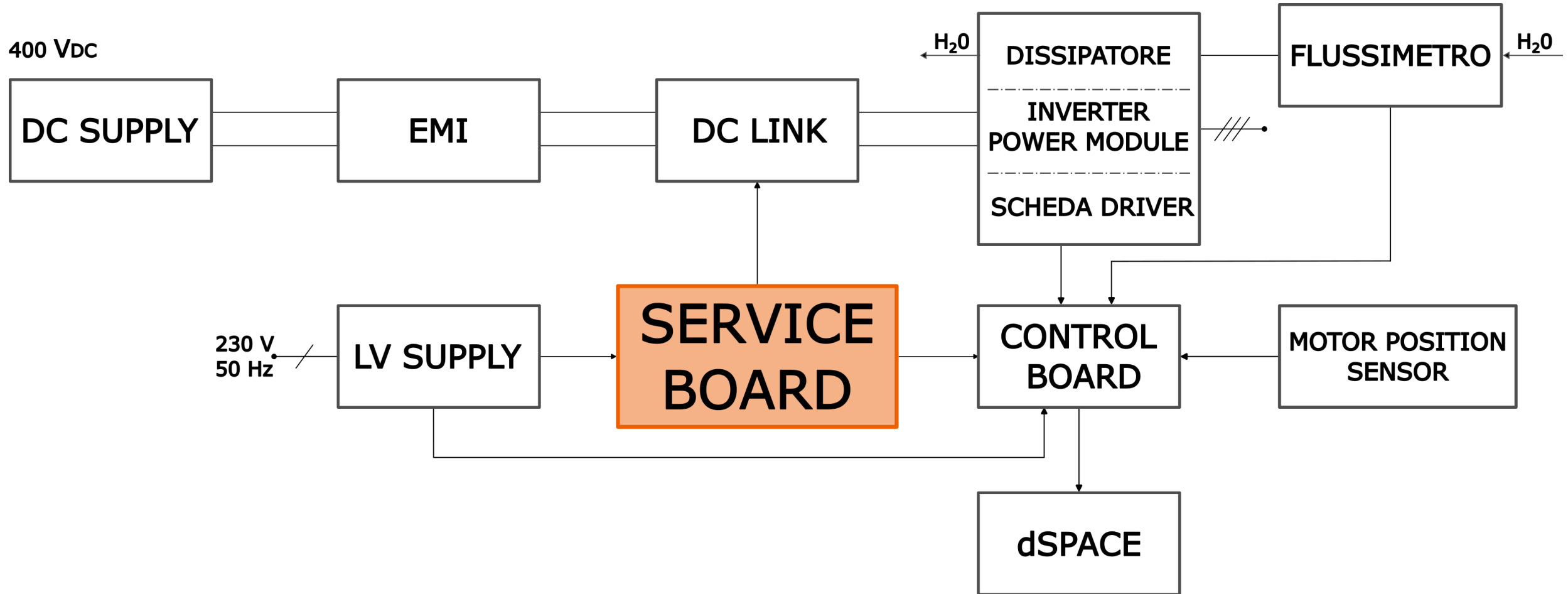
Layout della DC Link Board



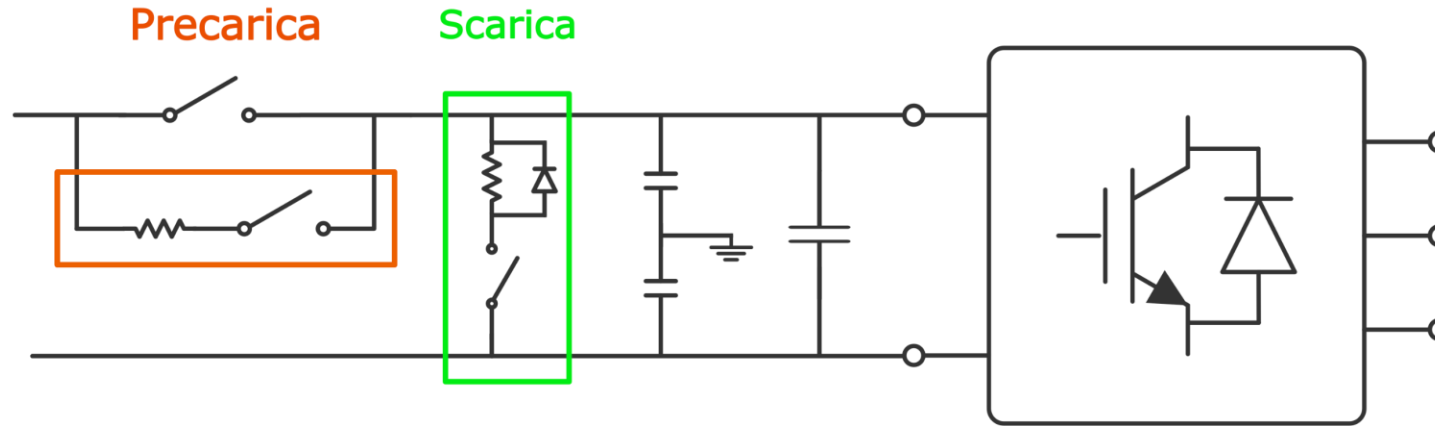
Routing della DC Link Board



Service Board



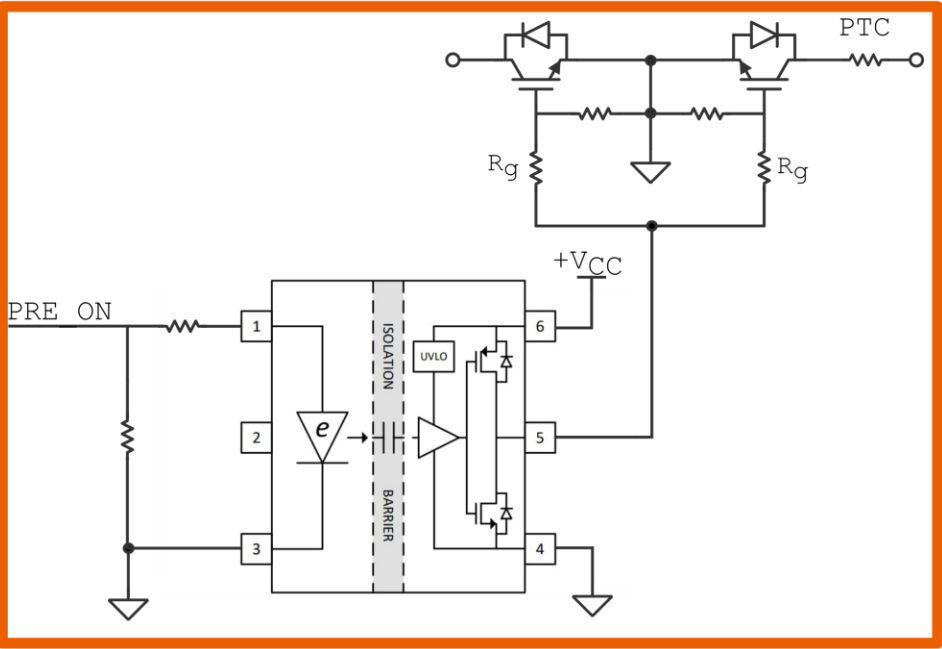
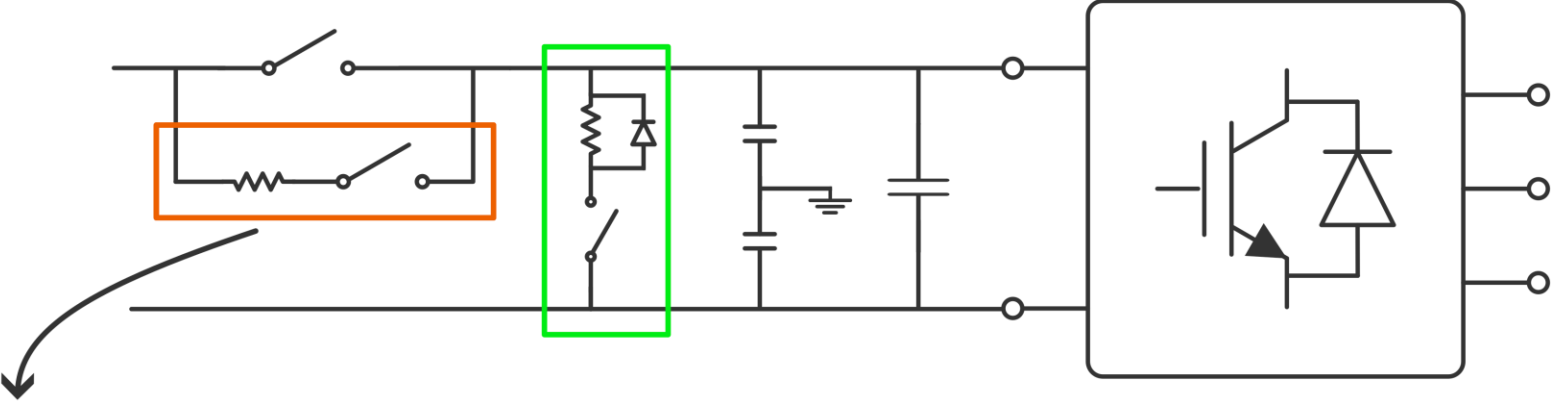
Gestione del DC Link



Gestione del DC Link

Pre carica

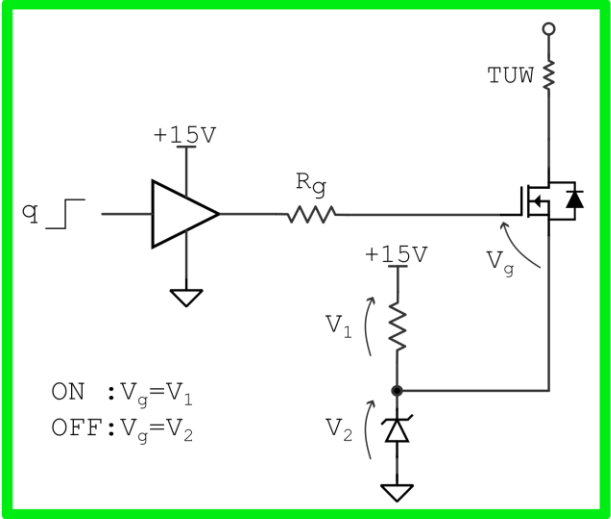
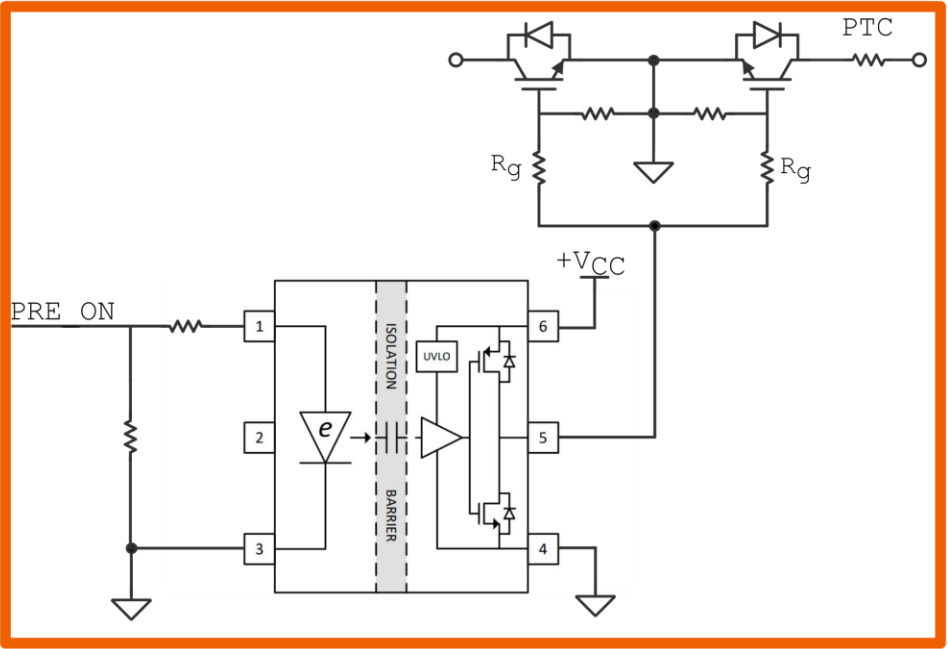
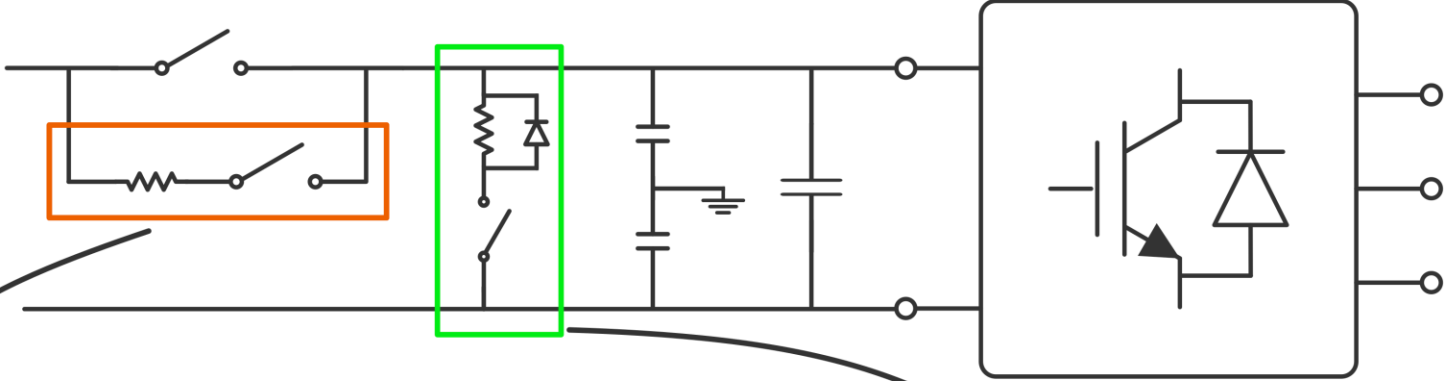
Scarica



Gestione del DC Link

Pre carica

Scarica

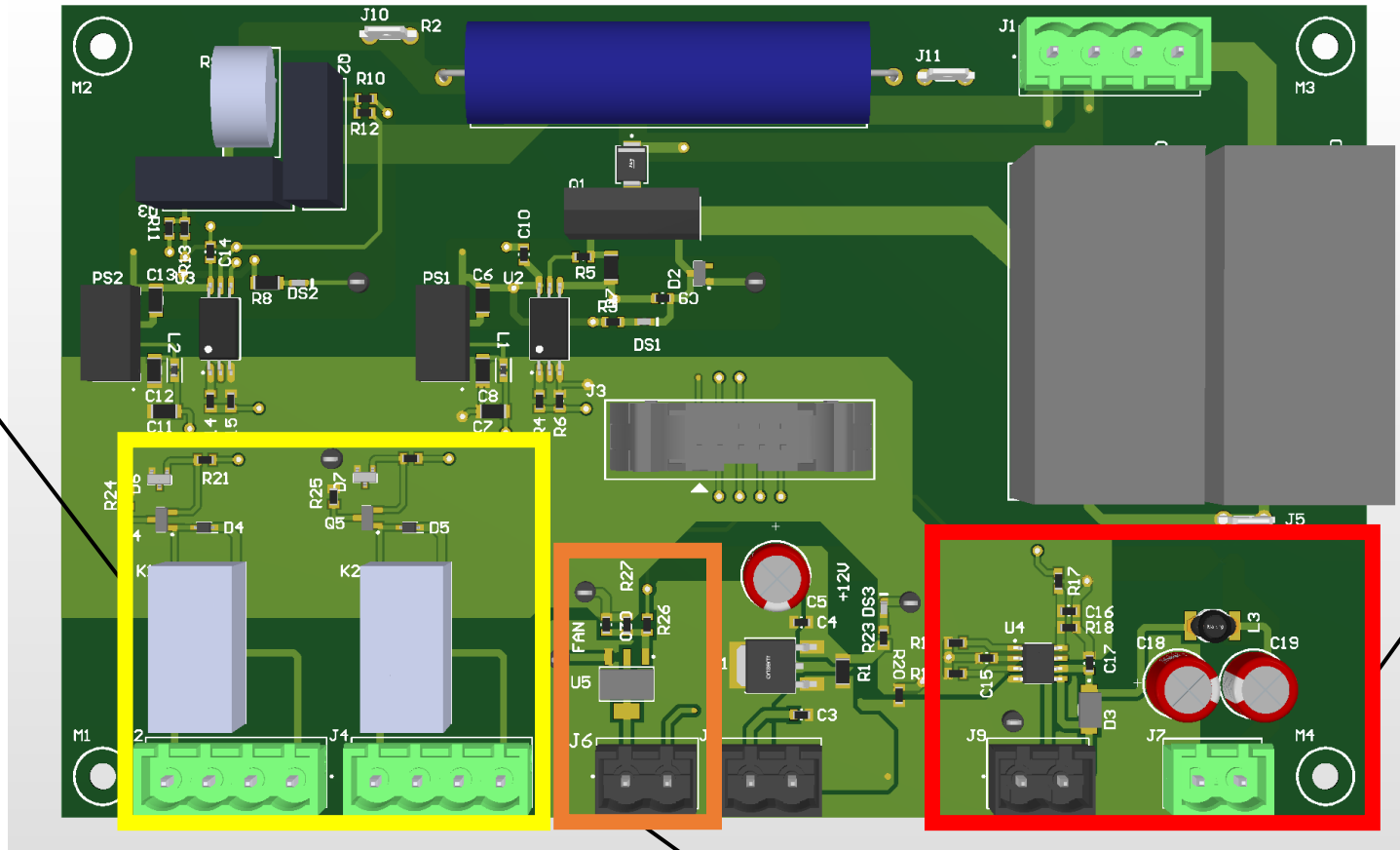


Service Board

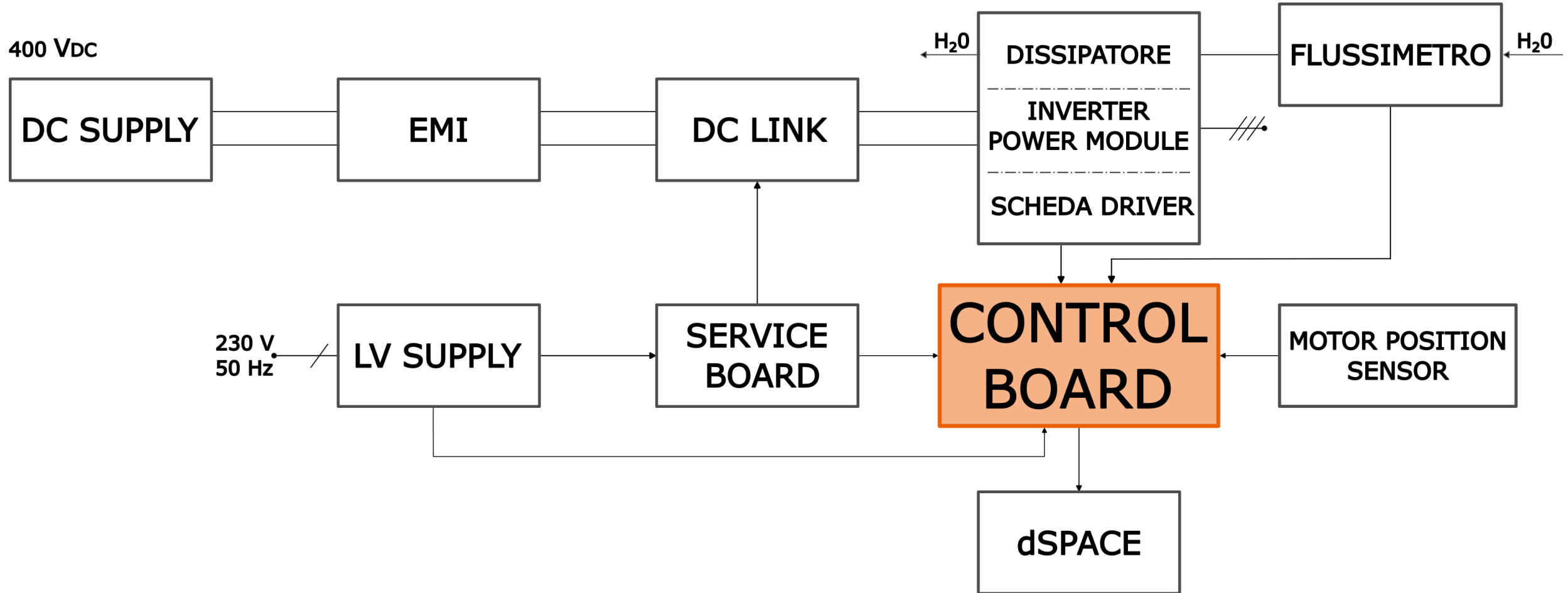
Comando relè

Gestione del sezionatore DC

Comando ventola



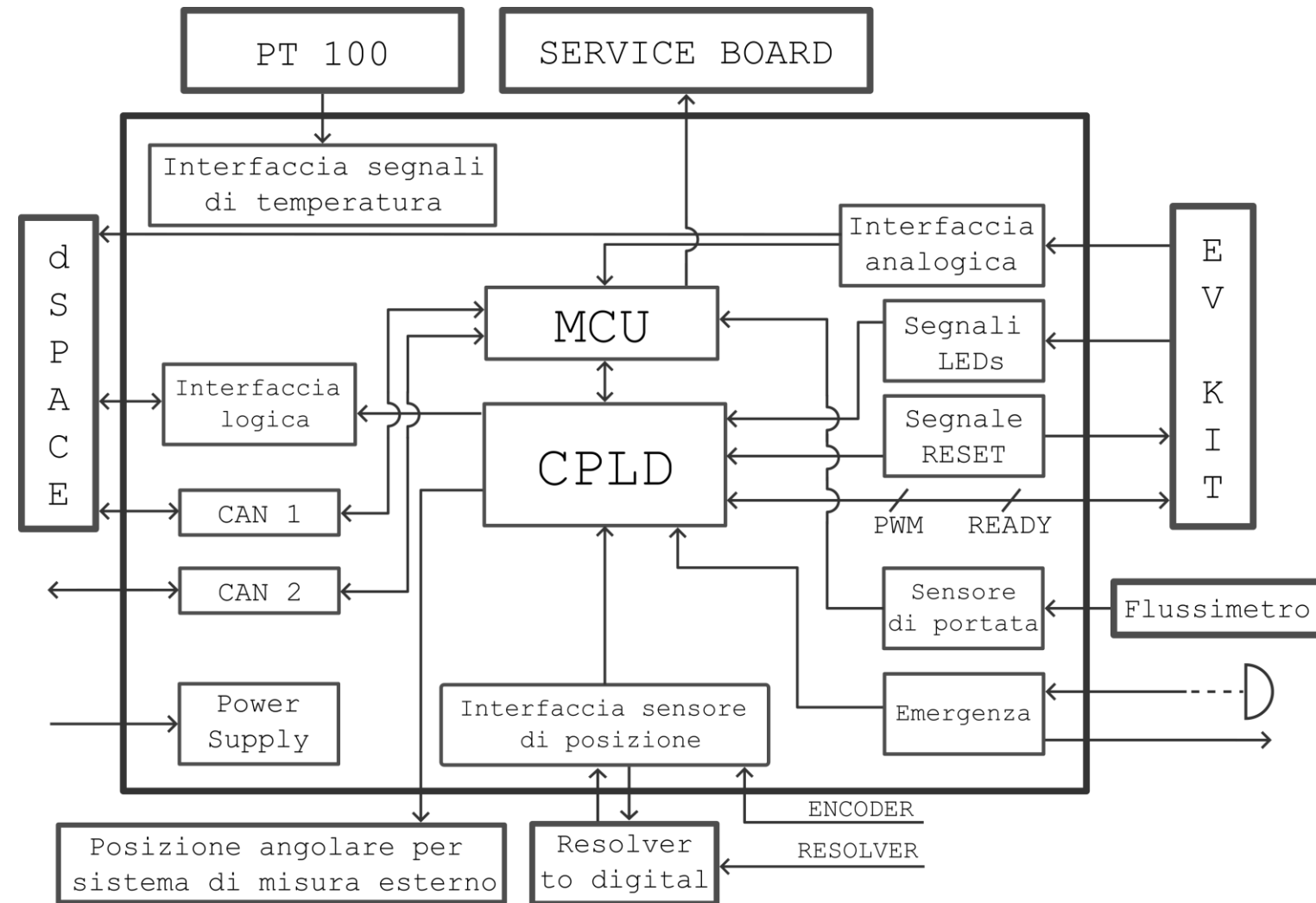
Control Board



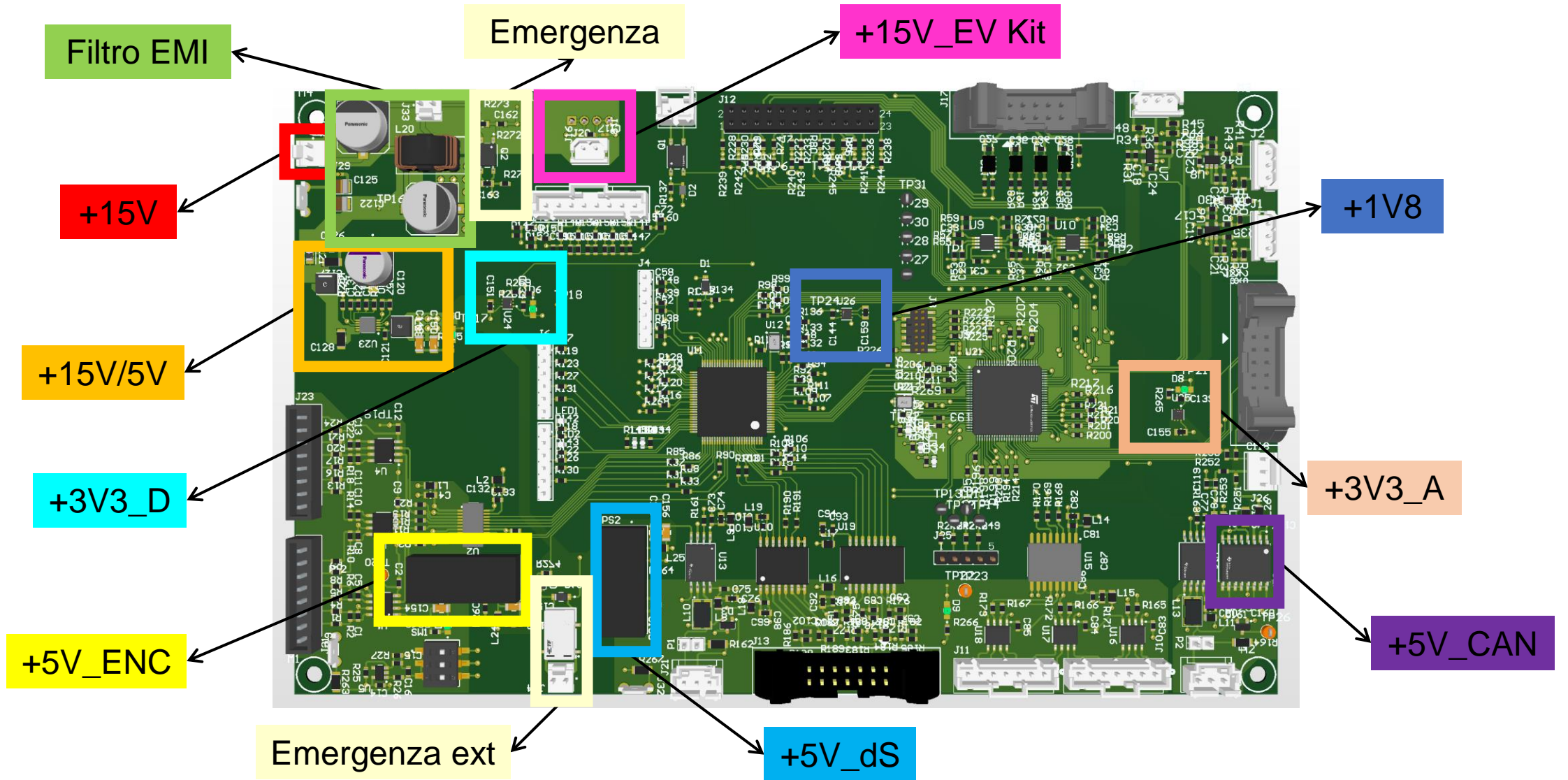
Funzionalità della Control Board

Lista delle funzionalità integrate:

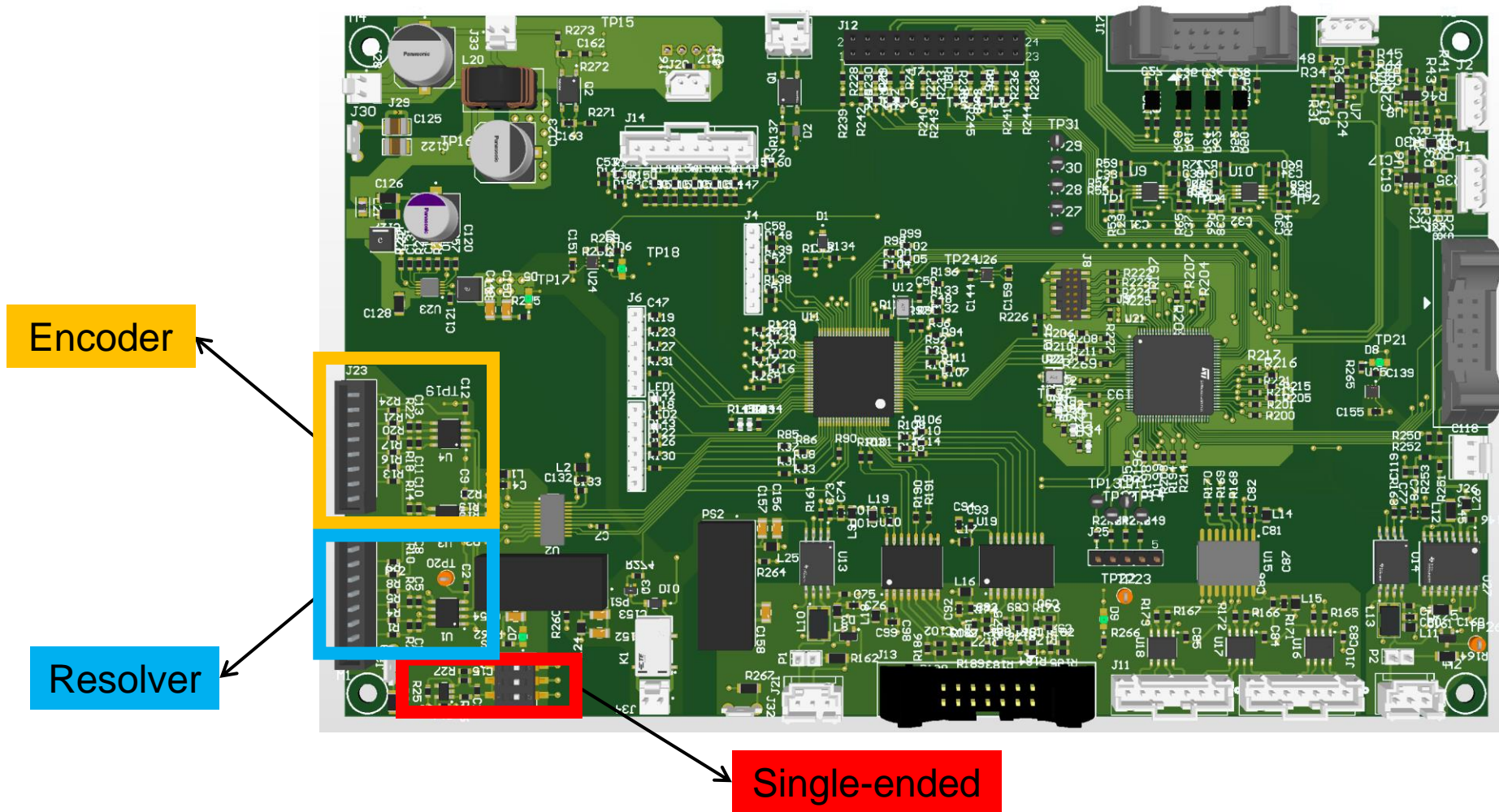
- Alimentazioni
- Emergenza
- Interfacce sensori di
 - Posizione angolare motore
 - Temperatura
 - Flusso acqua dissipatore
- Interfaccia dei segnali provenienti da
 - dSPACE
 - EV Kit
- Interfaccia dei segnali
 - Digitali
 - Analogici
- Gestione dei segnali tramite
 - Microcontrollore
 - CPLD



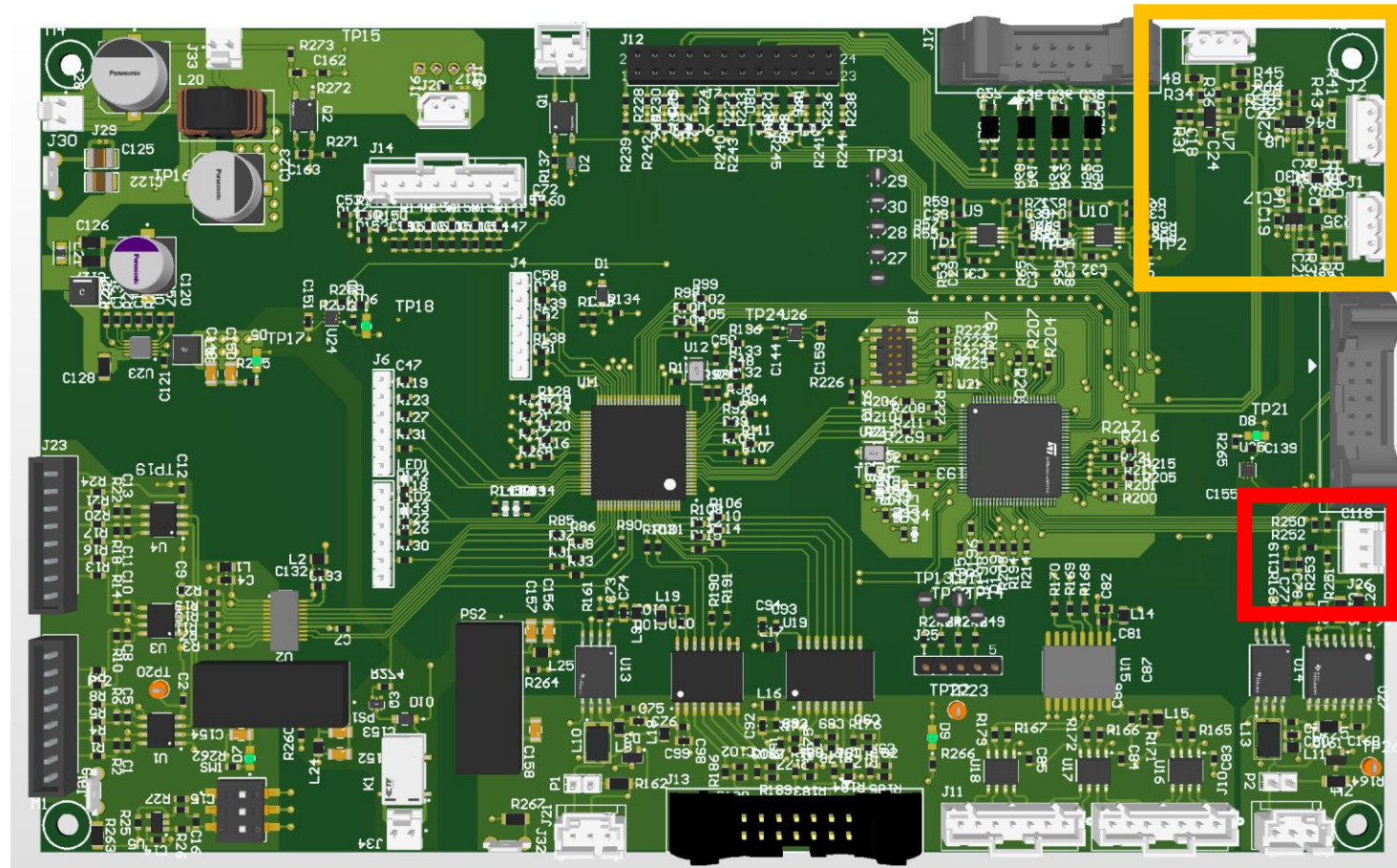
Alimentazioni



Interfaccia sensori di posizione



Interfaccia sensori di temperatura e flusso



Sensori di temperatura

Flussimetro

Gestione dei segnali

Interfaccia EV Kit

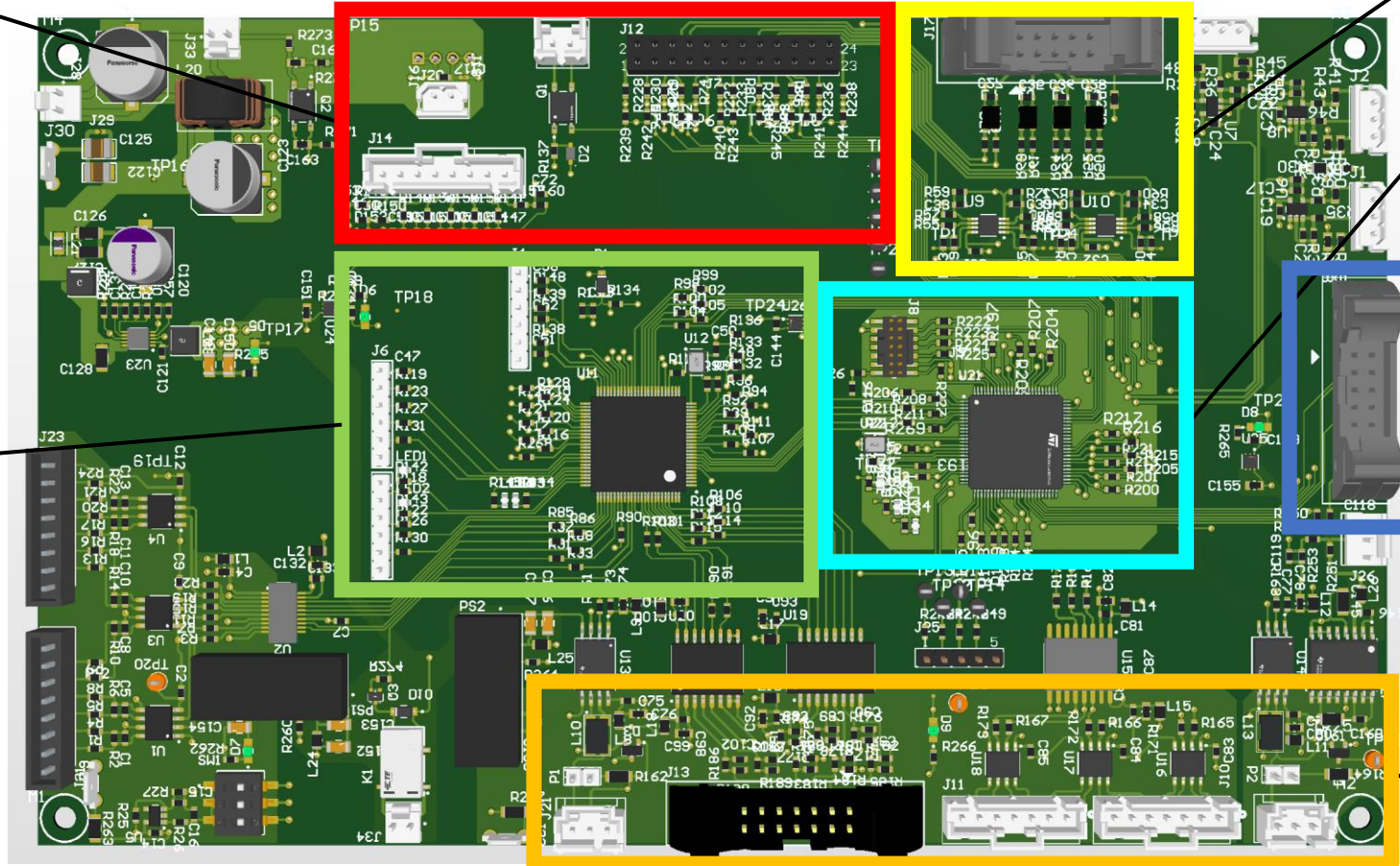
Segnali analogici

Microcontrollore

CPLD

Segnali Service Board

Interfaccia dSPACE



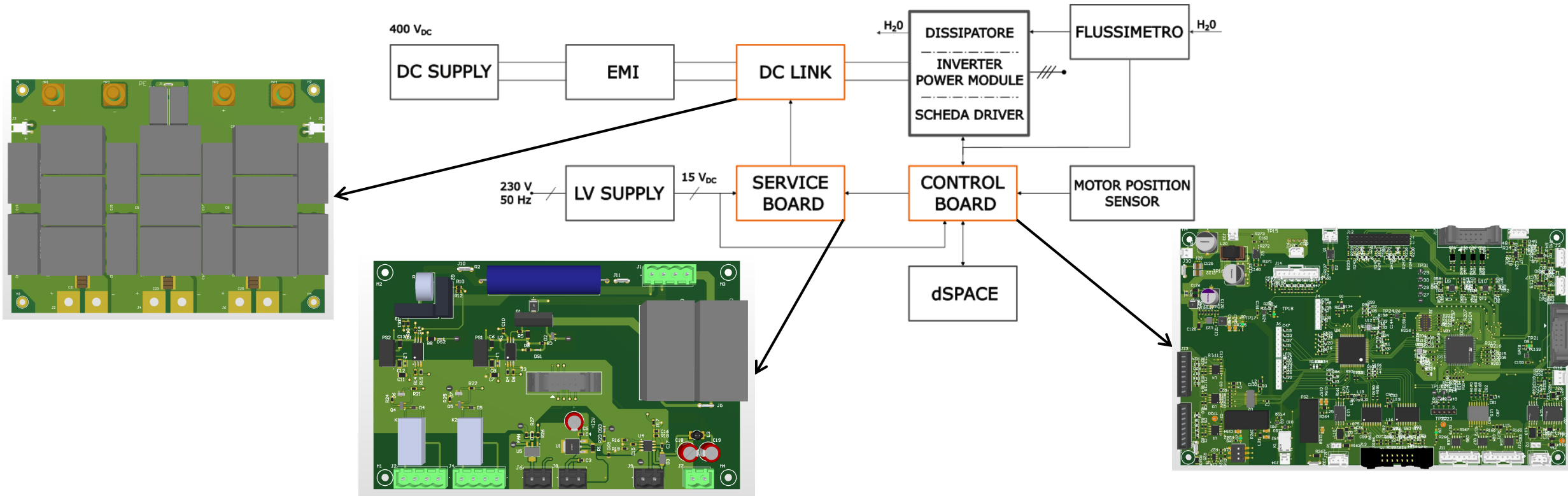
Conclusioni

Contributi personali:

- Progettazione e sbroglio delle tre schede PCB

Prossimi passi:

- Stampa e assemblaggio dei PCB
- Montaggio convertitore e testing



Grazie per l'attenzione!