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Title EXERCISE 0 - INTRODUCTION		
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This exercise will not graded.

EXERCISE 0: CONTROL OF DC AND AC CURRENTS

Consider the PETS connected to a DC load machine described in Tab. 1 and answer the following questions:

Table 1 PETS and Load Specifications

Delta Power Supply	
Voltage	0 V - 660 V
Current	0 A - 11 A
Power	3.6 kW

Load	
Resistance	45 Ω - 280 Ω

DC Inductors	
Inductance	28 mH
Resistance	45 mΩ
Current	8 A

LCL Filter	
Capacitance	2.836 µF
Inductance	6.2 mH
Resistance	17 mΩ
Current	10 A

Inverter	
Power	5.5 kW
Nominal AC Voltage	400 Vac
Rated AC Current	12 A
DC Voltage	300 V 800 V
DC Capacitance	705 µF
Switching Frequency	1 kHz - 10 kHz

1. Implement a current controller for a DC load connected to one switching leg of the MOT inverter of the PETS. Keep $V_{DC} = 310V$.Demonstrate the operation with a step from 0 A to 3 A.
   Suggestions:
   - Implement your control in the MOT DSP
   - Use a PI control you can use as parameters kp_current and ki_current, add saturations to and anti-windup back-calculation. You can fine-tune the control if you want, but this is not the objective of this exercise.
   - For the experimental validation, adjust the physical variable load to the desired resistance value (given in the initialization files) - Remember to turn on Resistor ventilation and to connect it to ground

2. Implement a current controller for an AC load connected to the switching legs of the MOT inverter of the PETS. Keep $V_{DC} = 600V$. Demonstrate the operation with a step from 0 A to 3 A with an AC frequency ω of 100π rad/s and then a constant 3 A with a varying frequency from 0π rad/s to 200π rad/s (40π rad/s^2).
   Suggestions:
   - Use a PI control in the dq-frame you can use as parameters kp_current and ki_current, add saturation limits and anti-windup back-calculation. You can fine-tune the control if you want, but this is not the objective of this exercise.
   - For the experimental validation, adjust the physical variable load to the desired resistance value (given in the initialization files) - Remember to turn on Resistor ventilation and to connect it to ground