



EMC Test Method for Servo Drive System with Hybrid Motor Cable

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Purpose

- Discuss the EMC test method for Servo Drive System with hybrid motor cable

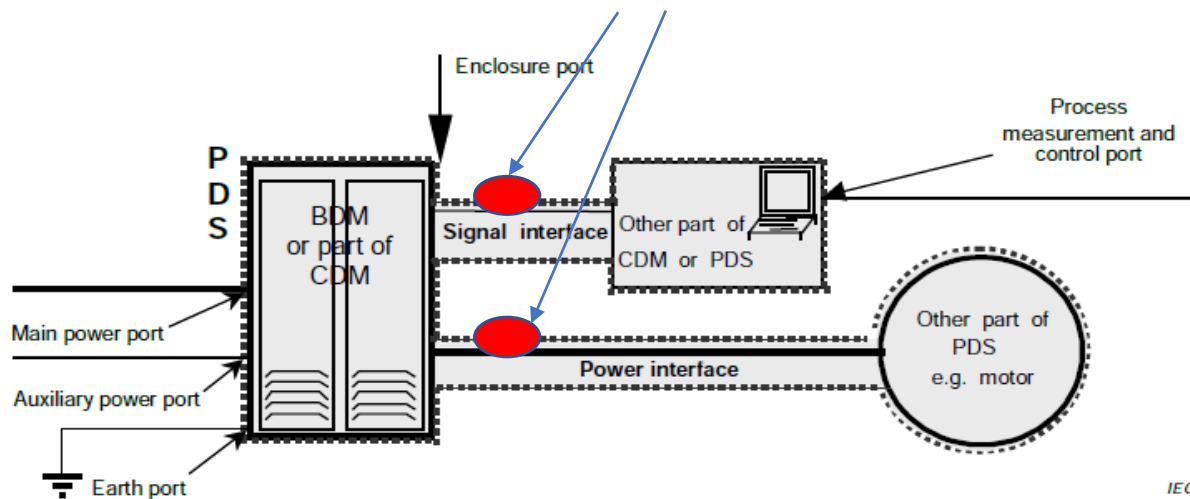
Related contributions

- [Building signal integrity for PWM disturbed SPE links](#), Peter Fischer
 - Discuss EMC test method for drive
- [IEEE 802.3dg – Noise Environment Definition](#), Piergiorgio Beruto
 - Discuss EFT and CI test, and their impact on the PHY receiver
- [Standardization activities related to servo drives](#), Bernd Horrmeyer
 - Discuss standards related to servo drives
- **Question: How to test the hybrid power and signal interface?**

EMC test standards for servo drive system

- IEC61800-3:2017 (CE Mark, Level 3)
- IEC61800-5-2:2016 (Functional Safety, Level 4)

Methods only standardized for separated power interface and signal interface. **How to test hybrid power and signal interface?**

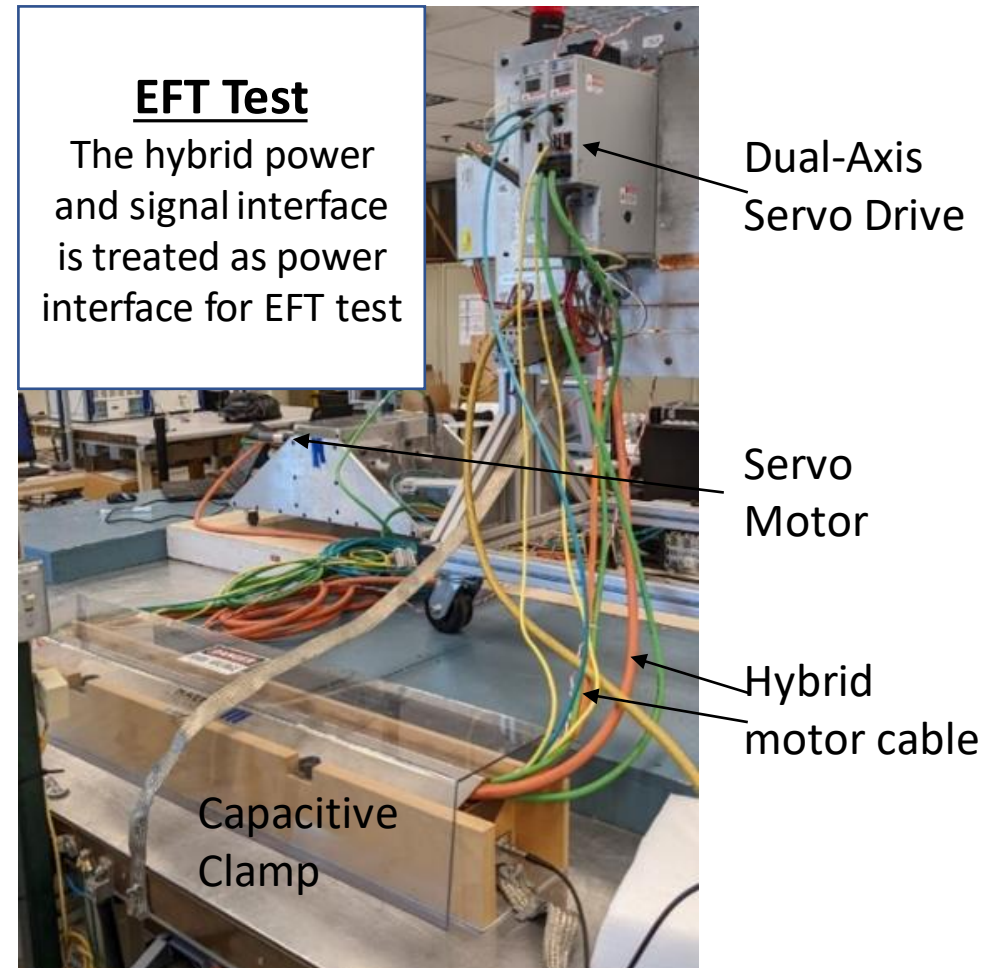


Port	Phenomenon	Basic standard for test method	CE Level 3	Performance (acceptance) criterion	FS Level 4
Enclosure port	ESD (electrostatic discharge)	IEC 61000-4-2	4 kV CD or 8 kV AD if CD impossible	B	6 kV CD or 8 kV AD if CD impossible 8kV CD or 15 kV AD ^m
	Radio-frequency electromagnetic field, amplitude modulated	IEC 61000-4-3 see also 5.3.4	80 MHz to 1 000 MHz 10 V/m 80 % AM (1 kHz)	A	80 MHz to 1 000 MHz 20 V/m ^{i g} 80 % AM (1 kHz)
	Radio-frequency electromagnetic field, amplitude modulated	IEC 61000-4-3 see also 5.3.4	1,4 GHz to 2,0 GHz 3 V/m 80 % AM (1 kHz)	A	1,4 GHz to 2,0 GHz 10 V/m ^{i g} 80 % AM (1 kHz)
	Radio-frequency electromagnetic field, amplitude modulated	IEC 61000-4-3 see also 5.3.4	2,0 GHz to 2,7 GHz 1 V/m 80 % AM (1 kHz)	A	2,0 GHz to 6 GHz 3 V/m ^{i g} 80 % AM (1 kHz)
Power ports (except auxiliary DC power ports below 60 V)	Fast transient-burst	IEC 61000-4-4	2 kV/5 kHz ^a	B	4 kV/5kHz ^a
	Surge ^b 1,2/50 μs, 8/20 μs	IEC 61000-4-5	1 kV ^c 2 kV ^d	B	2 kV ^c 4 kV ^d
	Conducted radio-frequency common mode ^e	IEC 61000-4-6 see also 5.3.4	0,15 MHz to 80 MHz 10 V 80 % AM (1 kHz)	A	0,15 MHz to 80 MHz ^k 20 V ^g 80 % AM (1 kHz)
Power Interfaces	Fast transient-burst ^e	IEC 61000-4-4	2 kV/5 kHz Capacitive clamp	B	4 kV/5 kHz Capacitive clamp
Signal interfaces	Fast transient-burst ^e	IEC 61000-4-4	1 kV/5 kHz Capacitive clamp	B	2 kV/5 kHz Capacitive clamp
	Conducted radio-frequency common mode ^e	IEC 61000-4-6 see also 5.3.4	0,15 MHz to 80 MHz 10 V 80 % AM (1 kHz)	A	0,15 MHz to 80 MHz ^k 20 V ^g 80 % AM (1 kHz)
Ports for process measurement control lines Auxiliary DC power ports below 60 V	Fast transient-burst ^e	IEC 61000-4-4	2 kV/5 kHz Capacitive clamp	B	4 kV/5 kHz Capacitive clamp
	Surge ^f 1,2/50 μs, 8/20 μs	IEC 61000-4-5	1 kV ^{d, f}	B	2 kV ^{d, f}
	Conducted radio-frequency common mode ^e	IEC 61000-4-6 see also 5.3.4	0,15 MHz to 80 MHz 10 V 80 % AM (1 kHz)	A	0,15 MHz to 80 MHz ^k 20 V ^g 80 % AM (1 kHz)

CD: contact discharge AD: air discharge AM: amplitude modulation

EMC test method for hybrid interface

- EFT Test, use Power Interface test specification
 - Capacitive Clamp, Criteria B
 - CE L3: 2KV/5Khz (1minute)
 - FS L4: 4KV/5Khz (5minutes)
- CI Test, use Signal Interface test specification
 - 150Khz - 80Mhz, Criteria A
 - CE L3: 10V, 80% AM (1Khz)
 - FS L4: 20V, 80% AM (1Khz)



Observation

- The signal interface inside the motor cable could pass EFT and CI tests with less challenges due to the robust shield of the motor cable (overall shield of motor cable and 2nd shield of signal cable)



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