

## nanotRONIC K-SADE

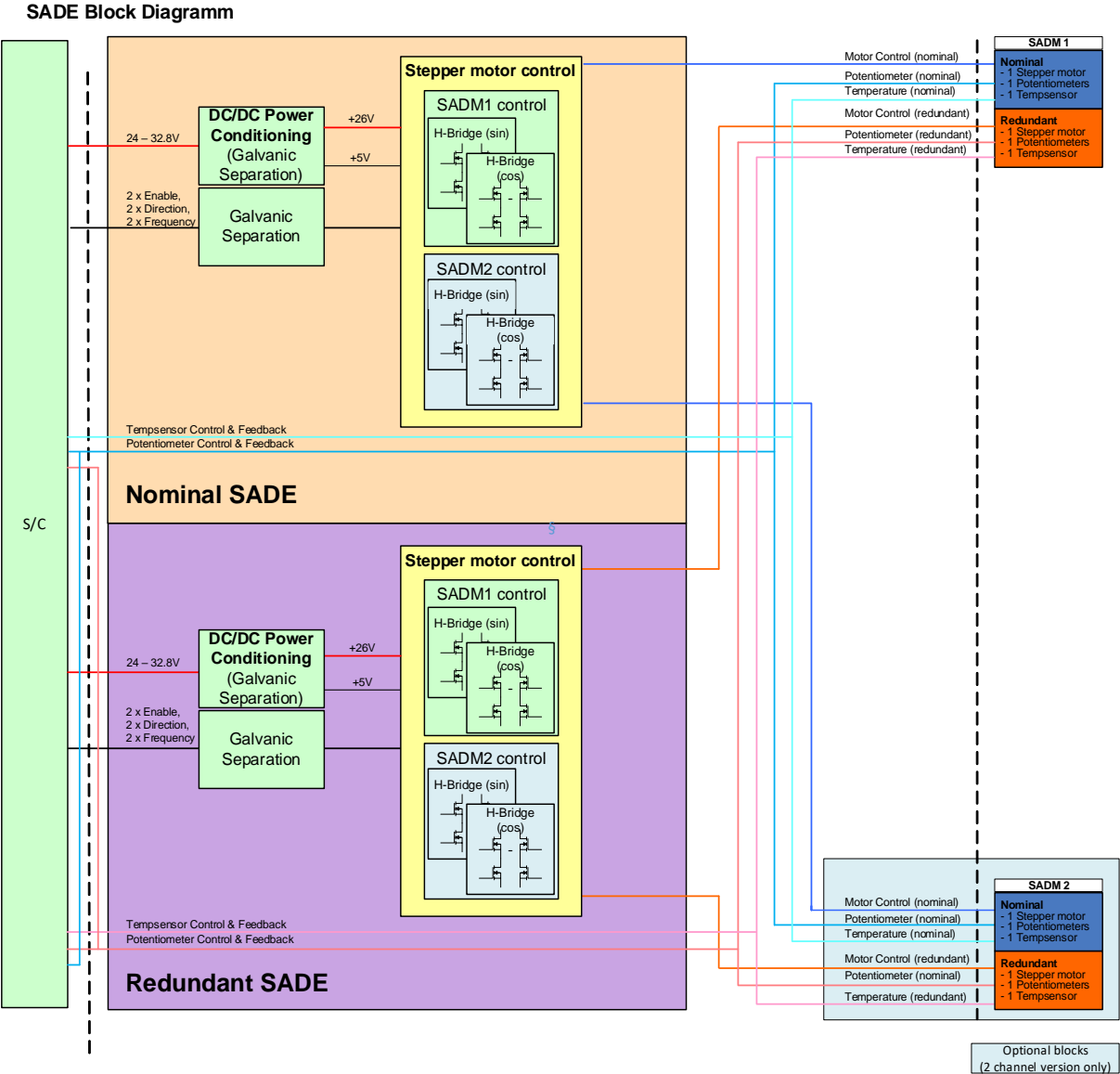
### Solar Array Drive Electronics



The K-SADE is a 2 axis redundant drive electronics to be used with stepping motor-based actuators (mainly SADM), with the following characteristic:

- Independent drive of both actuators
- Commanded by commands (Frequency, Direction, On/Off)
- High reliable
- Full redundancy (cold)
- Single Point Failure Free
- Radiation hardness up to 100kRAD TID possible
- Modularity
- Compact size

## System Overview



## Electrical Interfaces

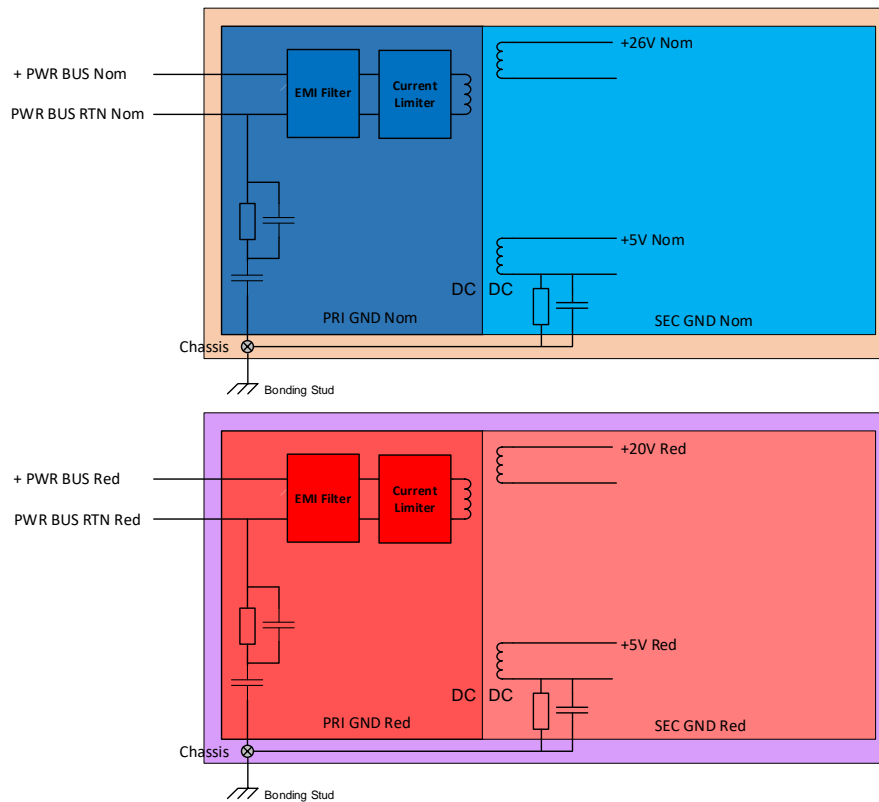
Unit-Name	Unit-Con	Connector Function	Connector Type	EMC-Code	Magn. Level
SADE-MAIN	M_J01	SADE Input nominal	DAM26P-1CON	1R/2	NMB
SADE-MAIN	M_J02	SADM1 nominal	DEM15S-1CON	2	NMB
SADE-MAIN	M_J03	SADM2 nominal (optional, 2-channel version only)	DEM15S-1CON	2	NMB
SADE-RED	R_J01	SADE Input redundant	DAM26P-1CON	1R/2	NMB
SADE-RED	R_J02	SADM1 redundant	DEM15S-1CON	2	NMB
SADE-RED	R_J03	SADM2 redundant (optional, 2-channel version only)	DEM15S-1CON	2	NMB

The SADE provides following electrical interfaces for each unit (nominal and redundant):

- System I/F towards S/C:
  - Input
    - Power bus interface (24V – 32.8 V)
    - 2 x Enable signal
    - 2 x Frequency input (up to 1 kHz, Pulsewidth: min 0.5 ms)
    - 2 x Direction
    - Throughputs:
      - 2 x Potentiometer power (2 lines: Excitation, RTN)
      - 2 x Temperature (2 lines)
  - Output Throughputs
    - 2 x Potentiometer feedback (1 line: Telemetry)
- I/Fs to the SADM's (nominal or redundant windings):
  - Output
    - 2 x Stepping motor signals (4 lines for the 2 windings)
    - 2 x Potentiometer power (2 lines: Excitation, RTN)
  - Input
    - 2 x Potentiometer feedback (1 line: Telemetry)

The electrical interconnection is achieved by means of DSUB and High-Density DSUB connectors.

## Grounding Concept



The Power Supply Unit has a primary ground and one single secondary ground for all type circuitries (analogue and digital). Between primary and secondary ground there is a galvanic isolation. The primary ground is routed through the EMI: this is the star-point and is connected to the bonding stud. Secondary ground is connected by 5.6M//10nF to chassis.

<b>Specifications</b>													
<b>Control Interface</b>													
Step frequency	0 – 1'000 Hz												
Enable													
Direction													
Housekeeping	No internal housekeeping handling, throughput of Housekeeping data												
<b>Mechanical Properties</b>													
Mass	< 2kg												
Dimension	156 x 145.2 x 90 mm												
Housing Thickness	3.2 mm Al												
Interface contacting	Four M5 x 25mm												
Surface coating	Surtec 650 (where electrical connective) Ematal (not electrical connective)												
Thermal Emissivity Ematal	> 0.9												
1. Eigenfrequency	~1'400 Hz												
Vibration loads:	<table border="0"> <tr> <td>Sine:</td> <td>0-20 Hz:</td> <td>11mm</td> </tr> <tr> <td></td> <td>20-100Hz:</td> <td>±20 g</td> </tr> <tr> <td>Random:</td> <td>⊥ MP:</td> <td>18.4 grms</td> </tr> <tr> <td></td> <td>// MP:</td> <td>14.1 grms</td> </tr> </table>	Sine:	0-20 Hz:	11mm		20-100Hz:	±20 g	Random:	⊥ MP:	18.4 grms		// MP:	14.1 grms
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	// MP:	14.1 grms											
Shock loads	<table border="0"> <tr> <td>100 Hz:</td> <td>10 g</td> </tr> <tr> <td>500 Hz:</td> <td>100 g</td> </tr> <tr> <td>1'300 Hz:</td> <td>300 g</td> </tr> <tr> <td>2'000 – 10'000 Hz:</td> <td>700 g</td> </tr> </table>	100 Hz:	10 g	500 Hz:	100 g	1'300 Hz:	300 g	2'000 – 10'000 Hz:	700 g				
100 Hz:	10 g												
500 Hz:	100 g												
1'300 Hz:	300 g												
2'000 – 10'000 Hz:	700 g												
<b>Electrical Properties</b>													
Supply voltage	28 V (24V to 32.8V)												
Nominal Current	1.55 A												
Limiting current	2.1 A												
Power consumption	5 W (not including power transferred to motors)												
<b>Qualification Temperature</b>													
Non-op.	-40°C; +75°C												
Operating	-25°C; +65°C												
<b>Radiation on component level</b>													
Total Ionizing Dose (TID)	>30 kRAD (Possible to increase up to 100 kRAD)												
<b>Additional information</b>													
Heritage	Lunar orbit. 1 FM and 1 QM delivered												
TRL	8												
Reliability	0.99998 for 5 years in orbit												
Export regulations	non												
ITAR	no												

## Mechanical Interface (new design)

