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Interface Specification

Magnet Power Supply

ESS raster system

Interface specification RSMS-PS
Rev A
DF project no: 502446

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2017-12-01	A	CN	Initial version

Reference Documents

- Detailed Design Report: 502446 DDR-RSMS-PSU
- System 8700 User Manual

Content

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1. Introduction

The document is based on the Detailed Design Report for the RSMS-PS and contains updated information about the interface to the RSMS.

2. Interface

2.1. HW Interfaces

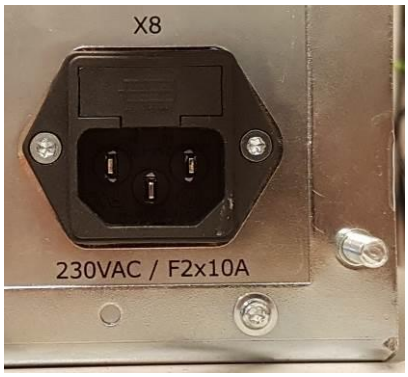
The HW interfaces to the RSMS-PS are:

- 230V/50Hz line power
- HW control signals (electrical and fibre optic)
- Remote control line (Ethernet)
- B-Dot signal
- Output terminals

2.1.1. 230V Line power

The system is supplied with 230V / 50Hz on a common IEC C14 socket (**X8** on the **Control Crate** rear). Their power demands are:

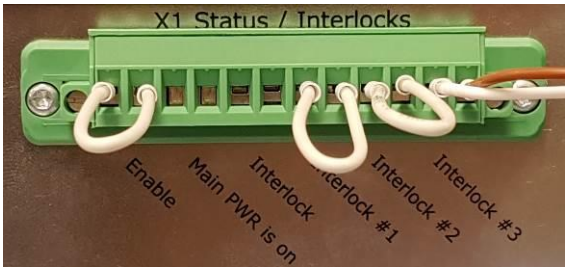
- 8A Peak (1800W)
- 4.5A Average (1000W)
- 25A inrush current



2.1.2. HW Control Signals

Potential free contact inputs/outputs for state signalling and interlock input.

Connector type: IC 2,5/12-STGF-5,08 (mating counterpart, supplied: MSTB 2,5/12-STF-5,08).



X1 on Control Crate rear

Pin	Name	Value	I/O	Description
1-2	Enable	NC	I	External closed contact to enable PS. Power supply can be turned on, output current can be set and voltage will be charged up, but trigger pulses will be ignored if circuit is left open.
3-4	Main PW is ON	NO	O	Closed contact when PS is turned ON
5-6	/INTL	NO	O	Closed contact when PS is interlock free
7-8	INTL#1	NC	I	Normally Closed Contact for interlock input 1
9-10	INTL#2	NC	I	Normally Closed Contact for interlock input 1
11-12	INTL#3	NC	I	Normally Closed Contact for interlock input 1

Enable/Interlock inputs are designed for external potential free contacts. The open circuit voltage is <30V and the closed circuit current is <20mA.

Status outputs are potential free contacts.

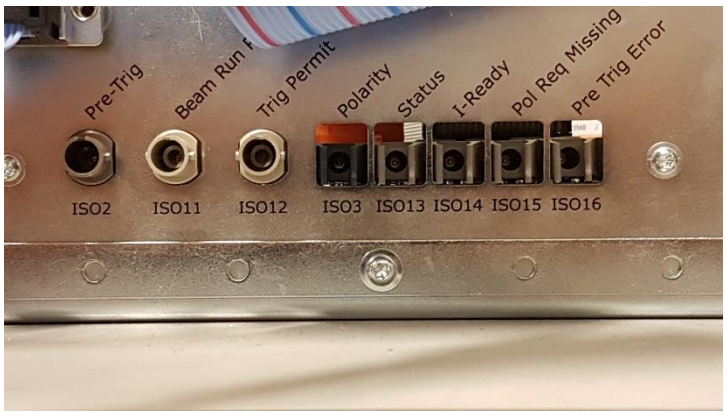
2.1.3. Fiber I/O

Fiber optic inputs/outputs for high speed synchronization, trigging and control:

Connectors denoted “ST” in the table below are 820nm (infra-red) transmitters/ receivers with ST connection (HFBR-1414/HFBR-2412).

Connectors denoted “Versatile” in the table below are 650nm (red) transmitters/ receivers with “Versatile” connection (HFBR-1528/HFBR-2521).

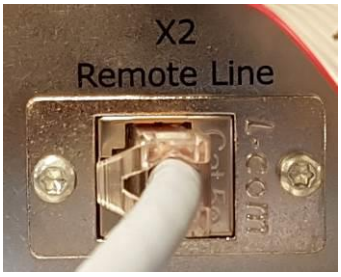
”High” refers to “light”, “Low” refers to “no light” and “rising edge” refers to change from “no light” to “light”.



ISO2-16 on Control Crate rear

Plug	Name	Type	I/O	Description
ISO2	Pre-Trig	ST	I	Pre-trig signal telling PS to start a pulse burst. If power supply is on and "Trig Permit" is active, a raster burst will be initiated by a rising edge on this input.
ISO3	Polarity	Versatile	I	Sets the starting pulse polarity. With constant "**High**" input, raster bursts will start with **positive** polarity. With **10kHz*** modulated input, raster bursts will start with **negative** polarity. With constant "Low" input, raster bursts will start with negative polarity, and the "Pol. Req. Missing" warning is given. *) ±1kHz, d=40%-60%.
ISO11	Beam Run Permit	ST	O	Beam may be issued. High when rastering is active (maximum 500us after Pre-Trig when operating at 29-40kHz output).
ISO12	Trig Permit	ST	O	PS ready to start a pulse burst. High when power supply is ON and Enabled, internal charge voltage has settled and minimum time since previous burst has elapsed.
ISO13	Status	Versatile	O	Logic sum of "Pol. Req. Missing" and "Pre-Trig Error" warning signals. High when both are high (OK).
ISO14	I-Ready	Versatile	O	Indicates the control loop state. High when output current is within 1% of set value. Maintains its state between bursts.
ISO15	Pol. Req. Missing	Versatile	O	Indicates the presence of an external "Polarity" command input. High when external signal is present and OK. Low if external signal is missing or outside spec. Signal is non-latched.
ISO16	Pre-Trig Error	Versatile	O	High is OK (no warning) Low Indicates the reception of a "Pre-Trig" without "Trig Permit". Signal is latched, and can be reset via GUI/Remote. .

2.1.4. Remote Control Line (Ethernet)



Connector X2 (RJ45) on the Control Crate rear provides Ethernet interface for remote control of the power supply.

For available commands and protocol, please refer to:
"User Manual, 8700 MPS"

2.1.5. B-Dot

The B-Dot signal comes from a single winding on the magnet. Signal is attenuated and impedance matched to 50Ω in the cable termination box (on girder under magnet).

Attenuation is scaled to ensure <±10Vpk at highest dB/dt (highest output current and highest frequency).

Signal is passed without modification from the input BNC plug (X6, Control Crate rear) to the output BNC plug (X7, Control Crate front).

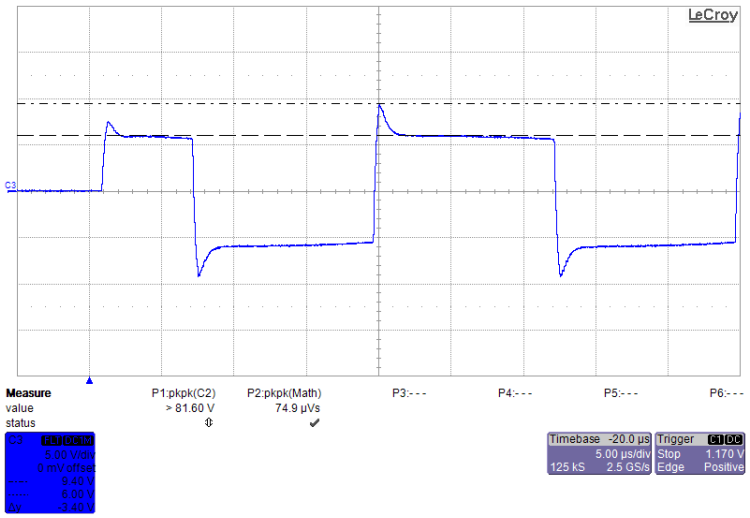
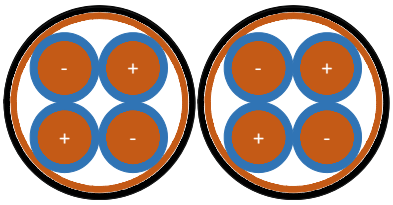


Figure 1: B-Dot output example, 340Apk/40kHz

The output should always be terminated with 50Ω. If connected with a 50Ω cable, the termination should be mounted at the far end of the cable.

2.1.6. Output terminals



The power supply connects with the magnet via two parallel cables, each 4x16mm^2 + shield. Each cable carries output and return in a "star quad" configuration.

The output terminals (X4) are located at the rear of the Output Converter cabinet. An angled, panel feed-through terminal block type is used, allowing easy output cable connection from below. Below the output terminals, saddle clamps provide mechanical relief and terminates the screens of the output cables to the output converter cabinet (chassis/ground):

Figure 2: Output cable screw terminals

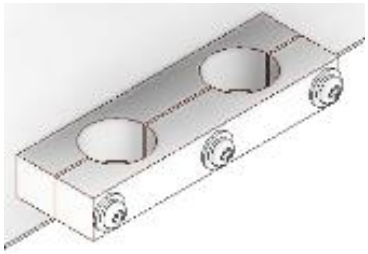


Figure 3: Output cable saddle clamp

Output cable installation (power supply end):

- Remove approx.. 100mm of the cable outer sheath.
- Fold back the exposed copper wires (screen) and tape/heat-shrink the ends to the cable, leaving approx.. 50mm exposed to allow electrical connection to the saddle clamp.
- Trim away the thin copper tape/foil.
- Remove 12-14mm of the inner insulation (four ends).
- Arrange the four ends respecting the star-quad configuration and the " + - + - "sequence of the output terminals.
- Install the output cable in the screw terminals and fit the saddle clamp to ensure good grounding of the cable screen.

Output cable installation (magnet end):

- Remove approx.. 400mm of the cable outer sheath.
- Gather and twist the exposed copper wires (screen) and crimp on a suitable 16mm2/Ø8 cable shoe.
- Trim away the thin copper tape/foil.
- Remove 12-14mm of the inner insulation (four ends).
- Crimp on suitable 16mm2/Ø6 cable shoes.
- Insert the cable through the cable glands on the termination box and bend the inner conductors in shape.
- Connect the inner conductors to the internal stud terminals respecting the polarity in the power supply end, and connect the screen to the termination box PE stud.