

Product:

MXR Series

Title:

Installation and User Guide



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6

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Change History

ISSUE	DATE	NAME	SECTION	CHANGE
A	N/A		All	Created from 80888-1 issue B
B	10/Apr/2018		1	HV output cable paragraph added.
C	15/Sep/2020		All	Revise and reformat for user guide
1	5/Mar/2021	JS	1 2.1	Mating cable ordering info and specs added Regulatory approvals info added
2	8/Nov/2021	JS	All 7.1.1 10 10 10.2 10.3.2	New document template Added peak reversing current info Connections and operation chapters and tables merged Connectors and mating part numbers, pin indication and other info added Analog unit connector info corrected from Molex KK5.08 to Samtec FWS RS485 communication option added
3	9/Nov/2022	DE	10.3.2	RS485 is Half-Duplex, RS485 available from Rev 4D for MXR20/DCC2 and 3C for MXR30/DCC2
4	12/Jun/2025	JS	10.1	Table and wording corrections
5	21/Nov/2025	JS	1 to 6 10.2 7.4 to 9 10.3.2	Safety Information Updated Removed accuracy as this is in the datasheet and has been updated there Installation Information Updated Communication protocol and GUI reference added
6	21/Apr/2026	DJE	10.3.2	Add digital polarity control

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1. Safety Information

Ensure you read this guide carefully and familiarise yourself with the unit before carrying out installation, maintenance or servicing activities.

This guide is subject to change without notice. Whilst every effort has been made to ensure the accuracy and completeness of information, Spellman High Voltage Electronics Limited shall not be held liable for errors and omissions herein.

DANGER

HAZARD OF ELECTRIC SHOCK

This power supply must always be connected to the Protective Earth Ground.

Do not touch or approach connections unless the equipment is turned off and the capacitance of both the load and power supply have been discharged by either:

- Allowing adequate time for the discharge of internal capacitance of the power supply.
- Using a properly rated discharge rod to ground the terminals.

Do not ground yourself or work under wet or damp conditions.

Always return to an authorised supplier for servicing.

Servicing and maintenance should only be performed by competent personnel with sufficient training, experience and knowledge working with high voltage equipment.

Extreme caution must be exercised when undertaking maintenance when the power supply cover is removed.

Any interlocks provided are solely for use as functional interlocks, and as such must not be used under any circumstances as a means of providing operator protection.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER**DANGER D'ELECTROCUTION**

Cette alimentation doit toujours être connectée à la terre de protection.

Ne pas toucher ou s'approcher des connexions à moins que l'alimentation et l'équipement haute tension connecté soit éteint et que la charge résiduelle dans l'alimentation et l'équipement haute tension ont été déchargé par:

- Suffisamment de temps pour la permettre la décharge interne de l'alimentation.
- Une tige de décharge appropriée pour mettre les bornes à la terre.

Ne vous connectez pas à la terre et ne travaillez pas dans des conditions mouillées ou humides.

Retournez toujours à un fournisseur agréé pour l'entretien.

Tous les verrouillages fournis sont uniquement destinés à être utilisés comme verrouillages fonctionnels et, en tant que tels, ne doivent en aucun cas être utilisés comme moyen de protection de l'opérateur.

L'entretien et la maintenance ne doivent être effectués que par du personnel compétent ayant une formation, expérience et des connaissances suffisantes pour travailler avec des équipements haute tension.

Une extrême prudence doit être exercée lors de la maintenance et lorsque le couvercle de l'alimentation est retiré.

Le non-respect de ces instructions entraînera la mort ou des blessures graves.

2. Reasonable Use and Responsibility

This power supply must only be used in compliance with applicable safety regulations and standards, its specified requirements, and all technical documentation provided.

This power supply is a component part intended to be incorporated into equipment, or machinery. It is the overall equipment manufacturer's responsibility to ensure compliance of their equipment to applicable regulations and standards.

Prior to the installation of this high voltage power supply, a risk assessment should be undertaken of how it is being incorporated into the overall equipment. Any risks identified must be addressed during the installation process.

Only operate the power supply with the specified connectors, cables and accessories. Always use genuine parts and accessories.

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3. Electrostatic Sensitivity



Caution: This unit is not particularly susceptible to electrostatic discharge damage when the covers are in place, nevertheless it is good practice to avoid directly touching connector terminals, especially in a low humidity environment.

4. Hazardous Substances

This module complies to European /United Kingdom Restriction of Hazardous Substances (RoHS) (using exemptions) and the Restriction, Evaluation, Authorization and Restriction of Chemicals (REACH) legislation.

Californian Proposition 65



WARNING: This product can expose you to chemicals including lead and lead compounds which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to: <http://www.P65Warnings.ca.gov>

Spellman High Voltage Electronics power supplies are specialist industrial components and are not intended to be used by consumers. Within the state of California, occupational exposure may occur if employees handle the module at their place of employment. Because Spellman High Voltage Electronics does not control how our products are used in an occupational environment, it is the responsibility of the employer to make available any necessary Proposition 65 warnings to their employees.

5. Electromagnetic Compatibility (EMC)

This power supply is a component designed to be incorporated as a part of an overall piece of equipment. The EMC characteristic of the end equipment in which it is installed, will be influenced by all the component parts and system design. When installing this unit, please ensure good EMC practice is followed. The protective earth ground point used for safety will also act as a functional ground for EMC purposes.

6. Cleaning



WARNING: Do not clean.

This module is designed to be built into finished equipment and as such, its case does not provide any protection from fluids. Never use any form of cleaning fluid or spray, either directly or close to the module. Always ensure that it is protected from fluids once incorporated into the finished equipment.

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7. Unit Description

The HV power supply units MXR20PN24 and MXR30PN24 are intended for use in mass spectrometry, electron microscopy, capillary electrophoresis and electrostatic printing applications, they consist of one aluminium chassis containing the high voltage power supply.

Control and monitoring of the units is accomplished via either analogue controls on the standard unit or serial communication interface on the DCC2 option:

Analogue for MXR20PN24 and MXR30PN24

Serial for MXR20PN24/DCC2 and MXR30PN24/DCC2

A 2 meters HV output mating cable is available to order, with the following part number: HVC30/1S/1279, see section 10.1 for further details.

7.1 Unit Ratings

7.1.1 Power Input

Input Voltage: 24 Vdc $\pm$ 10%
Input Current: $\leq$ 1.25 A nominal continuous
 $\leq$ 4.5 A peak during reversing

7.1.2 HV Output

Unit	Output Voltage range	Max Output Current
MXR20	-20 kV to +20 kV	300 μ A
MXR30	-30 kV to +30 kV	300 μ A

7.1.3 Protection

Current limit: $\pm$ 330 μ A +10% -5%
Protection: Arc and short-circuit protected

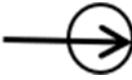
7.2 Environmental conditions

Operating Temperature: 10°C to +50°C
Storage Temperature: -35°C to +85°C
Humidity: 0% to 80% RH (non-condensing)
Altitude: 0 to 2000m ASL

7.3 Regulatory Approvals

The unit is designed to meet the requirements of EN 61010-1, UL 61010-1 and CAN/CSA-22.2 No. 61010-1. Please consult datasheet or the factory for further approval information.

7.4 Meaning of Symbols

SYMBOL	MEANING
	Refer to manual before operating
	Danger, risk of electric shock
	Protective conductor terminal (PE)
	Functional Earth
	Caution, hot surface
	Unit input rating
	Unit output rating

8. Unit Protective Earth Grounding

The power supply must be suitably connected to the main protective earth ground termination of the equipment in which it is incorporated. Connection to the power supply must be made using the protective earth ground stud (binding screw), identified with this symbol to the left. If the equipment will be subjected to any mechanical stress during use, connections must not be solely reliant on soldered joints and the use of braided wire is recommended. The stud nut must be tightened securely, and it is recommended to use the torque settings below:

Stud thread size	(mm)	4.0	5.0	6.0
Tightening torque	(N.m)	1.2	2.0	3.0
	(ft-lb)	0.9	1.5	2.2

9. Installing the Unit

- The power supply must only be used in a Pollution Degree 2 Installation, Category II environment at an altitude of no more than 2000 m.
- It must not be used in wet or damp locations.
- The power supply must be securely fixed in place using appropriate mounting.
- The power supply is solely intended for use as a component part for incorporation into piece of end equipment. No parts of the power supply should be accessible once installed in the end equipment. The end equipment must also provide a suitable fire enclosure.
- The input and output connectors are not intended for field connections and should only be connected to internal wiring inside the piece of equipment in which it is installed.
- The unit has an enclosed case and can be mounted in any orientation. A cooling airflow is recommended.
- All output connections from the device are considered as Hazardous Outputs and must not be accessible in end equipment.
- Ensure the maximum operating temperature of the power supply cannot be exceeded when operating in the end equipment at its maximum operating temperature.
- Suitable separation of accessible parts from the high voltage output of the device must be provided in the end equipment.
- The power supply chassis does not provide protection against spilled liquids.
- The unit is designed for indoor use and must be supplied from a double insulated or SELV, UL Recognized, appropriately rated 24V dc supply.
- Ensure ground bond continuity is maintained between the power supply and the equipment in which it is installed (Class I construction). Always use the power supply dedicated protective earth termination where available, such as a binding post (threaded stud). Ensure you check the protective earth connection by conducting a resistance continuity (earth bond) test.

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10. Connections and Unit Operation

10.1 HV Output connector and mating cable



High Voltage output is via a GES HB30 high voltage receptacle for both analog and digital product versions. GES Part number: 7331051

A 2 meters HV output mating cable is available to order, with the following part number:

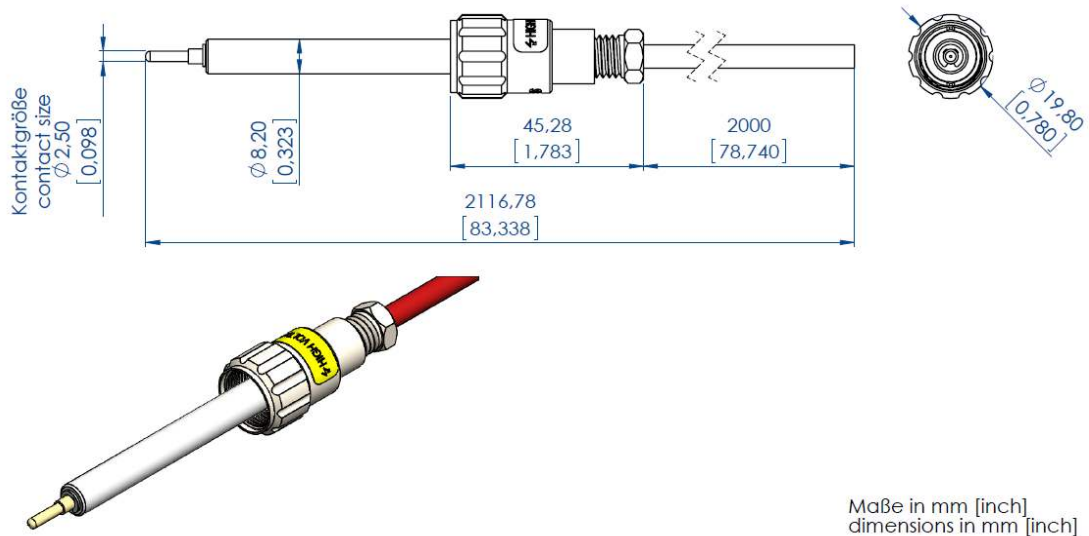
HV Output cable part number: HVC30/1S/1279	Length: 2m
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Different cable lengths might be available upon request.

This cable is screened, and the shield provides the load return ground.

Mating Cable Details:

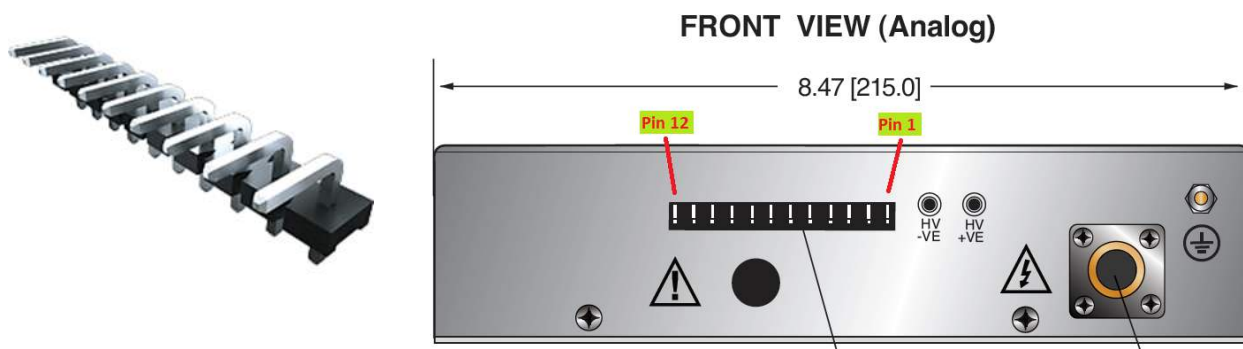
Part	Manufacturer	Part description	Manufacturer part number
Plug, cable mount	GES	HS30/Au PTFE	7331150
HV cable	GES	HV cable, 30kVDC, coaxial cable	3330007



Note: Customised versions of the MXR units can be developed with an HV output cable encapsulated into the unit, UL style 3873. Please consult with factory.

10.2 Analog version - Connections and Operation

Both power input and control are via a 12-way Samtec connector:



Manufacturer : Samtec			Series: FWS	Part number : FWS 12-04-T-S-RA
pin#	Signal	I/O	Description	Levels
1	I _{MON}	O	Current Monitor	0 to 10V for 0 to 500uA, always positive, Z _{out} = 10kΩ
2	+24VDC	I	DC in	
3	V _{MON}	O	Voltage Monitor	0V to 10V for 0 to 20kV (MXR20) or 30kV (MXR30) always positive. Z _{out} = 10kΩ
4			NC	
5			NC	
6			NC	
7	V _{SET}	I	Voltage Control	0V to 10V for 20kV (MXR20) or 30kV (MXR30), always positive Z _{in} >1MΩ
8	POL _{SET}	I	Polarity Change	TTL: Low = positive HV High/open = negative HV
9	SGND	I/O	Signal ground	
10	+24VDC RTN	I	DC in return	
11			NC	
12	POL STATUS	O	Polarity monitor	positive HV: 0V (<200mV), source 1.5kΩ negative HV: +24V, source 2.2kΩ

Mating connector is not provided.

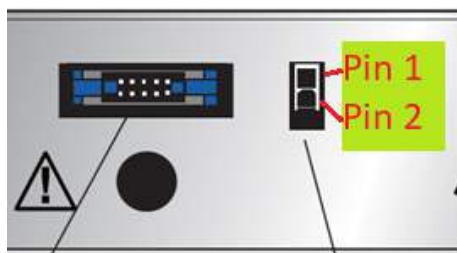
Mating receptacle: for example, Molex KK 508 3001 part number 10-01-1124, with Molex crimps: KK 396 part number: 08-55-0106, and wire gauge of 18 to 26 AWG.

10.3 Digital Version - Connections and Operation

10.3.1 Power input connector

24V power input connections are via a 2-way Molex

Manufacturer: Molex		Series: Mini-fit Jr	Part number : 39-30-1022
pin#	Signal	I/O	Description
1	+24VDC	I	DC in
2	+24VDC RTN	I	DC in return



Please see Molex connector product page for range of mating receptacles (for example, Molex receptacle part number: 39012020, crimps part number: 39000038, and wire gauge of 18 to 24 AWG):

https://www.molex.com/molex/products/part-detail/pcb_headers/0039301022

10.3.2 Control connector

The serial communication link (default RS232, see details below about RS485 Half duplex options) is via a 10 way "IDC ribbon cable" connector. See table below for pin out details.

Please refer to the communication protocol document 81318-21, available on request.

A free GUI is available on request to facilitate testing and integration work.

Note: the polarity is switchable by analogue command (pins 9 and 10 below) and by serial command.

Manufacturer: 3M		Series: 3000	Part number: N3793-5302RB	
pin#	Signal	I/O	Description	Level
1	Z/TXD	O	Transmit data (output) with respect to pin 2	Serial
2	GND	I/O	Serial signal ground return (if required)	RTN (see *)
3	Y/RXD	I	Receive data (input) with respect to pin 2	Serial
4		-	NC	
5	RS485 mode**	-	Link these two pins together for RS485 communication. Only supported in latest Product revisions. See **Note 2 below	
6		-		
7	INTER LOCK	I	Opto-isolator input – [0mA = INHIBIT]	3V3 @ 6mA
8		I	Opto-isolator signal return	5V @ 10mA
9	POL _{SET} ***	I	Polarity Change Signal opto-isolator input 0mA = -VE	3V3 @ 6mA
10		I	Polarity Change Signal opto-isolator signal return	5V @ 10mA

* Note 1: Take care in choosing suitable ground connection for pin 2.

****Note 2:** RS485 (Half Duplex) is supported for:

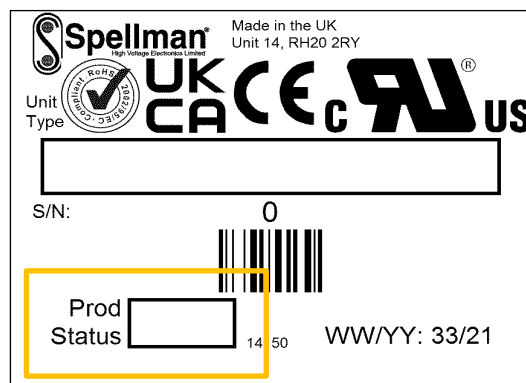
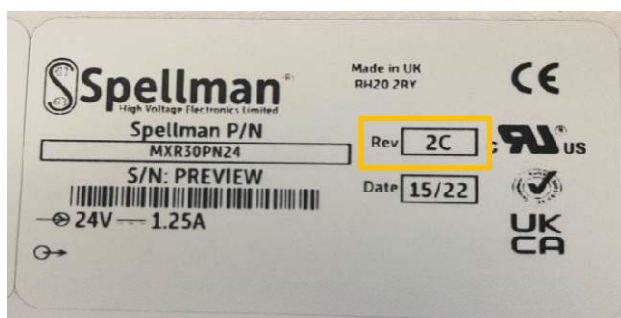
- Revision 4D and onwards (5D or 4E etc.) for the MXR20 units
- Revision 3C and onwards for the MXR30 units

*****Note 3:** MXR always starts up under analogue polarity control in the polarity set by pins 9 and 10, the MXR will remain in analogue polarity control until a digital polarity command is received. When a digital polarity command is received the MXR is under digital polarity control and will ignore any analogue commands to change polarity, cycle power to reset.

*****Note 4:** Digital polarity control is available for:

- Revision 7F and onwards (8F or 7G etc.) for the MXR20 units
- Revision 6E and onwards for the MXR30 units

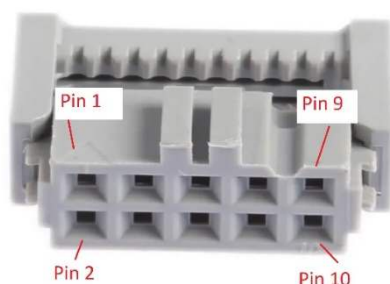
The unit's revision is indicated on the product label, see highlighted in the label examples below.



Mating connector is not provided.

Please see 3M product page for range of mating receptacles (for example 3M part number 89110-0101HA)

Mating receptacle pin positions:



10.4 HV On Indicators

The MXR units use the following LEDs to indicate polarity when the unit is powered, and the optional interlock is enabled:



Appendix A - Mechanical layout

