# EDS Distributor HV Modules

# 16, 24, 32 or 48 Channels with Common-Floating-GND

# Operator's Manual


## Contents



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# Attention!

-It is not allowed to use the unit if the covers have been removed.

-We decline all responsibility for damages and injuries caused by an improper use of the module. It is highly recommended to read the manual before any kind of operation.

# Note

The information in this manual is subject to change without notice. We take no responsibility for any error in the document. We reserve the right to make changes in the product design without notification to the users.

Filename ED301x as of 2012-08-24

# 1. General information

The EDS modules of this series are Distributor multichannel high voltage power supplies in 6U Eurocard format. The output voltage features a high stability, low ripple and noise and low temperature coefficient. Each single channel has an independent voltage control and voltage and current measurement. The data for set and measure values are given in a format of Floating Point Single Precision values. The modules are equipped with 24 bit ADC and 20 bit DAC circuits.
With the model versions EDS xx3xx a very cost-efficient option is provided. The only difference compared to the standard version is the reduced precision of the current measurement.
The channels share a Common Floating-GND (C-RTN), which avoids ground loops and reduces the noise level in large systems. The Common Floating-GND is isolated from the Crate-Ground (CCG) up to ± 50 V (with a 60 V hardware limit). The Common Floating-GND (C-RTN) and the Crate-Ground (CCG) can be connected by a jumper (see the attached drawing).

The HV output at the module is available as isolated built-in SHV connectors(16 channels), as a 51 pin REDEL HV connector(16/24/32 channels) or as a 52 pin Radiall 691803004 HV connector(48 channels).

# 2. Technical data

| | EDS F105x[J1] | EDS 18105x[J1] | EDS 20105x[J1] | EDS 30105x[J1] | EDS F130x[J1] | EDS 18130x[J1] | EDS 20130x[J1] | EDS 30130x[J1] | EDS F305x[J1] | EDS 18305x[J1] | EDS 20305x[J1] | EDS 30305x[J1] | EDS F330x[J1] | EDS 18330x[J1] | EDS 20330x[J1] | EDS 30330x[J1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HV channels per module | 16 | 24 | 32 | 48 | 16 | 24 | 32 | 48 | 16 | 24 | 32 | 48 | 16 | 24 | 32 | 48 |
| Output voltage $V_{O\,nom}$ [kV] | 0.5 | | | | 3 | | | | 0.5 | | | | 3 | | | |
| Output current $I_{O\,nom}$ [mA] | 1 | | | | 0.5 | | | | 1 | | | | 0.5 | | | |
| Resolution of voltage setting*) [mV] | 5 | | | | 10 | | | | 5 | | | | 10 | | | |
| voltage measurement*) [mV] | 5 | | | | 10 | | | | 5 | | | | 10 | | | |
| current measurement*) [nA] | 50 | | | | 50 | | | | 500 | | | | 200 | | | |
| Accuracy of current measurement | ± (0.2% ∗ ($I_O$ + $I_{O\,nom}$)) | | | | | | | | ± (0.5% ∗ ($I_O$ + $I_{O\,nom}$)) | | | | | | | |
| Accuracy of voltage measurement | ± (0.01% ∗ $V_O$ + 0.02% ∗ $V_{O\,nom}$) | | | | | | | | | | | | | | | |
| *) with standard sample rate 500/s and digital filter 64 | | | | | | | | | | | | | | | | |
| Ripple and noise [$mV_{P-P}$] | max 5 | | | | | | | | | | | | | | | |
| | - at max. load and $\lvert V_O \rvert$ > 1% ∗ $V_{O\,nom}$<br>- f > 10 Hz, | | | | | | | | | | | | | | | |
| Stability (no load/load and Δ $V_{IN}$) | 0.005% | | | | | | | | | | | | | | | |
| Sample rates [samples/s] | 5, 10, 25, 50, 60, 100, 500 | | | | | | | | | | | | | | | |
| Digital filter averages | 1, 16, 64, 256, 512, 1024 | | | | | | | | | | | | | | | |
| The resolution of measurable values depends on the settings of the sampling rate and the digital filter! | | | | | | | | | | | | | | | | |
| The measurement accuracy is guaranteed in the range 1% ∗ $V_{O\,nom}$ < $V_O$ ≤ $V_{O\,nom}$ and for 1 year | | | | | | | | | | | | | | | | |
| Voltage ramp up / down | 1∗10-6 ∗ $V_{O\,nom}$ up to 0.2 ∗ $V_{O\,nom}$ | | | | | | | | | | | | | | | |
| Temperature coefficient | < ± 50 ∗ $10^{-6}/_K$ | | | | | | | | | | | | | | | |
| Hardware limits $V_{max}$ / $I_{max}$ | potentiometer per module ($V_{max}$ / $I_{max}$ is the same for all channels) | | | | | | | | | | | | | | | |

| | | EDS F105x[)1] | EDS 18105x[)1] | EDS 20105x[)1] | EDS 30105x[)1] | EDS F130x[)1] | EDS 18130x[)1] | EDS 20130x[)1] | EDS 30130x[)1] | EDS F305x[)1] | EDS 18305x[)1] | EDS 20305x[)1] | EDS 30305x[)1] | EDS F330x[)1] | EDS 18330x[)1] | EDS 20330x[)1] | EDS 30330x[)1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Interface | | CAN-Interface (potential free) | | | | | | | | | | | | | | | |
| Operating mode | | Full module and channel control via CAN interface in EHS mode: EDCP (Enhanced Device Control Protocol) | | | | | | | | | | | | | | | |
| Module status | | green LED turns on if all channels have the status “ready”<br>yellow LED turns on if one or more channels have the status “HV ON” | | | | | | | | | | | | | | | |
| Protection loop ($I_s$) potential free (2 pin Lemo-socket and REDEL SL) | | 5 mA <$I_s$ < 20 mA⇒ module on<br>$I_s$ < 0.5 mA⇒ module off | | | | | | | | | | | | | | | |
| Power requirements $V_{INPUT}$ +24 V | $V_{O\ nom}$ [kV] | 0.5 | | | | | | | | 3 | | | | | | | |
| | HV channels | 16 | | 24 | | 32 | | 48 | | 16 | | 24 | | 32 | | 48 | |
| | Input Current | 0.8 A | | 1.1 A | | 1.6 A | | 2.2 A | | 1.7 A | | 2.6 A | | 3.4 A | | 5.2 A | |
| Power requirements $V_{INPUT}$ +5 V | | 0.1 A | | | | | | | | | | | | | | | |
| Packing | | 6U Euro cassette (40.64 mm wide and 220 mm deep) | | | | | | | | | | | | | | | |
| Connector on the rear | | 96-pin connector according to DIN 41612 | | | | | | | | | | | | | | | |
| HV connector | | 16 SHV connectors 16 Channels<br>51 pin REDEL HV connector 16/24/32/ Channels<br>Radiall HV-Multipin connector 48 Channels | | | | | | | | | | | | | | | |
| Operating temperature | | 0 ... +40 °C | | | | | | | | | | | | | | | |
| Storage temperature | | -20 ... +60 °C | | | | | | | | | | | | | | | |

[)1] x=p polarity positive, [)1] x=n polarity negative

# 3. Handling

## 3.1 Connection

The supply voltages and the CAN interface are connected to the module via a 96-pin connector on the rear side of the module.
The Module is equipped with a Live insertion/extraction capability. The rear connector is staggered with longer ground pins C2 and C32.

## 3.2 Limits

The maximum output voltage for all channels (hardware voltage limit) is defined through the position of the corresponding potentiometer $V_{max}$.
The maximum output current for all channels (hardware current limit) is defined through the position of the corresponding potentiometer $I_{max}$.
The greatest possible set value for voltage and current is given by $V_{max}$ – 2% and $I_{max}$ – 2%, respectively.
It is possible to measure the hardware voltage and current limits at the sockets below the potentiometer. The socket voltages are proportional to the relative limits, where 2.5 V corresponds to 102 ± 2 % $V_{O\ nom}$ and 102 ± 2 % $I_{O\ nom}$.
The output voltage and current are limited to the specified value. If a limit is reached or exceeded in any channel the green LED on the front panel turns off.

### 3.3 Safety Loop

A safety loop can be implemented via the safety loop socket (SL) on the front panel and between the SL-contacts (Pin 22 and PIN 30) at the REDEL-connector or (Pin 21 and Pin 42) at the Radiall-connector if equipped. If the safety loop is active then an output voltage in any channel is only present if the safety loop is closed and an external current in a range of 5 to 20 mA of any polarity is driven through the loop. (For modules with a REDEL or Radiall-connector the other SL input must be closed.) If the safety loop is opened during the operation the output voltages are shut off without ramp and the corresponding bits in the 'ModuleStatus' (see manual "Operator's Manual CAN-Interface" 5.5.2.1 ModuleStatus) and ModuleEventStatus (5.5.2.3 ModuleEventStatus) are cancelled. After closing the loop again the ModuleEventStatus has to be reset and the channels have to be switched ON.
The loop connectors are potential free, the internal voltage drop is approx. 3 V. In the factory setup the safety loop is not active (the corresponding bits are always set). The loop can be activated by removing the internal jumper. (see the attached drawing).

## 4. Pin assignment and connector layout

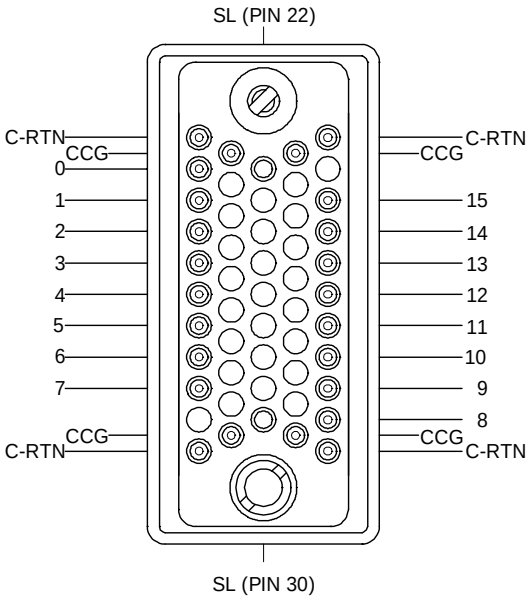
Pin assignment of the 96-pin connector according to DIN 41612:

| pin | | pin | | pin | | comment |
|---|---|---|---|---|---|---|
| a1 | +5V | b1 | +5V | c1 | +5V | power supply |
| a2 | GND | b2 | GND | c2 | GND | |
| a3 | +24V | b3 | +24V | c3 | +24V | |
| a5 | GND | b5 | GND | c5 | GND | |
| a11 | @CAN_GND | b11 | @CAN_L | c11 | @CAN_H | CAN bus interface, potential free |
| a13 | /RESET | b13 | /HW_RMPDWN | | | external control signals |
| a30 | A4 | b30 | A5 | | | address field:<br>set module address (A0 ... A5);<br>pin connected to GND => address bit = 0<br>pin open => address bit = 1 |
| a31 | A2 | b31 | A3 | c31 | GND | |
| a32 | A0 | b32 | A1 | c32 | GND | |

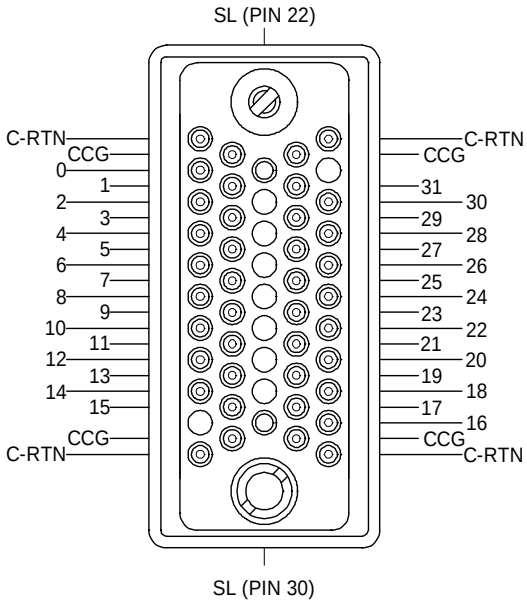
| | | |
|---|---|---|
| /RESET | active low; global reset of the module; HV generation is stopped immediately | |
| /HW_RMPDWN | pulse form: | high – low – high with a puls-width from 1µs to 100 µs |
| | function: | ramp down all channels immediately with a ramp speed of $V_{nom}$/50s |
| | | Note: after activating this signal the ramp speed is set to $V_{nom}$/50s |

**51 pin REDEL HV connector**

EDS Fxxxx

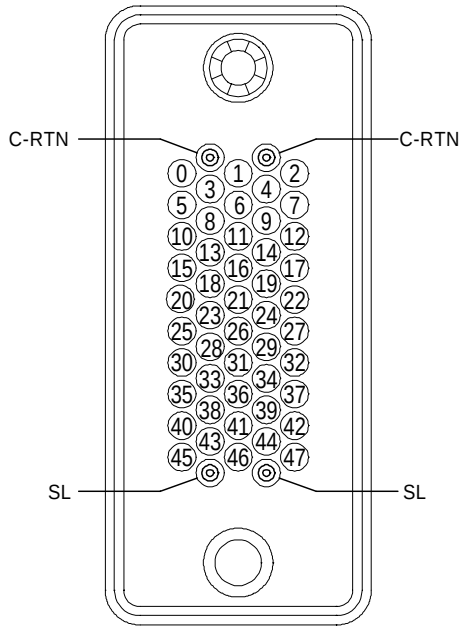



EDS 20xxxx

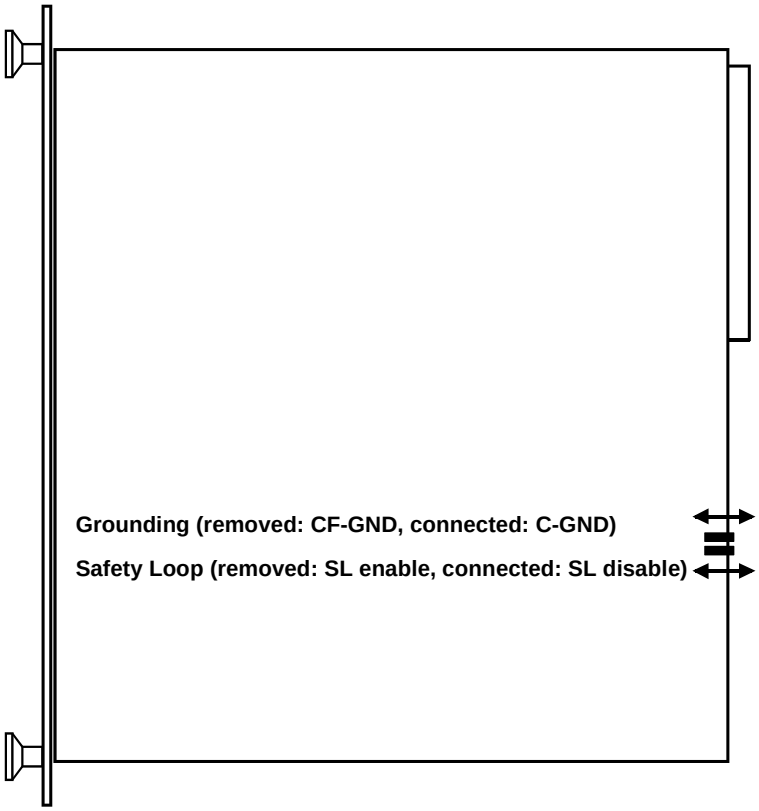



CCG is connected with the Crate-GND and the shield

**52 pin Radiall 691803004 HV connector**




**Jumpers for safety loop and grounding**




The shield is connected with the Crate-GND

# 5. Order Information

| Item Code | Type | Polarity | Channels | $V_{nom}$ | $I_{nom}$ | HV Connector |
|---|---|---|---|---|---|---|
| ED161-05p105R51 | EDS F105p | positive | 16 | 500V | 1mA | REDEL)1 |
| ED161-05n105R51 | EDS F105n | negative | 16 | 500V | 1mA | REDEL)1 |
| ED161-30p504R51 | EDS F130p | positive | 16 | 3.000V | 0,5mA | REDEL)1 |
| ED161-30n504R51 | EDS F130n | negative | 16 | 3.000V | 0,5mA | REDEL)1 |
| ED241-05p105R51 | EDS 18105p | positive | 24 | 500V | 1mA | REDEL |
| ED241-05n105R51 | EDS 18105n | negative | 24 | 500V | 1mA | REDEL |
| ED241-30p504R51 | EDS 18130p | positive | 24 | 3.000V | 0,5mA | REDEL |
| ED241-30n504R51 | EDS 18130n | negative | 24 | 3.000V | 0,5mA | REDEL |
| ED321-05p105R51 | EDS 20105p | positive | 32 | 500V | 1mA | REDEL |
| ED321-05n105R51 | EDS 20105n | negative | 32 | 500V | 1mA | REDEL |
| ED321-30p504R51 | EDS 20130p | positive | 32 | 3.000V | 0,5mA | REDEL |
| ED321-30n504R51 | EDS 20130n | negative | 32 | 3.000V | 0,5mA | REDEL |
| ED481-05p105I52 | EDS 30105p | positive | 48 | 500V | 1mA | Radiall 52 |
| ED481-05n105I52 | EDS 30105n | negative | 48 | 500V | 1mA | Radiall 52 |
| ED481-30p504I52 | EDS 30130p | positive | 48 | 3.000V | 0,5mA | Radiall 52 |
| ED481-30n504I52 | EDS 30130n | negative | 48 | 3.000V | 0,5mA | Radiall 52 |
| ED163-05p105R51 | EDS F305p | positive | 16 | 500V | 1mA | REDEL)1 |
| ED163-05n105R51 | EDS F305n | negative | 16 | 500V | 1mA | REDEL)1 |
| ED163-30p504R51 | EDS F330p | positive | 16 | 3.000V | 0,5mA | REDEL)1 |
| ED163-30n504R51 | EDS F330n | negative | 16 | 3.000V | 0,5mA | REDEL)1 |
| ED243-05p105R51 | EDS 18305p | positive | 24 | 500V | 1mA | REDEL |
| ED243-05n105R51 | EDS 18305n | negative | 24 | 500V | 1mA | REDEL |
| ED243-30p504R51 | EDS 18330p | positive | 24 | 3.000V | 0,5mA | REDEL |
| ED243-30n504R51 | EDS 18330n | negative | 24 | 3.000V | 0,5mA | REDEL |
| ED323-05p105R51 | EDS 20305p | positive | 32 | 500V | 1mA | REDEL |
| ED323-05n105R51 | EDS 20305n | negative | 32 | 500V | 1mA | REDEL |
| ED323-30p504R51 | EDS 20330p | positive | 32 | 3.000V | 0,5mA | REDEL |
| ED323-30n504R51 | EDS 20330n | negative | 32 | 3.000V | 0,5mA | REDEL |
| ED483-05p105I52 | EDS 30305p | positive | 48 | 500V | 1mA | Radiall 52 |
| ED483-05n105I52 | EDS 30305n | negative | 48 | 500V | 1mA | Radiall 52 |
| ED483-30p504I52 | EDS 30330p | positive | 48 | 3.000V | 0,5mA | Radiall 52 |
| ED483-30n504I52 | EDS 30330n | negative | 48 | 3.000V | 0,5mA | Radiall 52 |

)1 Option: SHV instead of R51 => Connector SHV