Technical Information Manual

Revision n. 2
10 February 2000

MODELS

SY527 FLOATING P.S. BOARDS

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CAEN will repair or replace any product within the guarantee period if the Guarantor declares that the product is defective due to workmanship or materials and has not been caused by mishandling, negligence on behalf of the User, accident or any abnormal conditions or operations.

CAEN declines all responsibility for damages or injuries caused by an improper use of the Modules due to negligence on behalf of the User. It is strongly recommended to read thoroughly the User's Manual before any kind of operation.

CAEN reserves the right to change partially or entirely the contents of this Manual at any time and without giving any notice.

1. INTRODUCTION

The CAEN UNIVERSAL MULTICHANNEL POWER SUPPLY SYSTEM, Model SY527, has been designed specifically to power the variety of detectors used in modern High Energy Physics Experiments, such as photomultipliers, wire chambers, streamer tubes, silicon detectors, etc. The System is modular and flexible enough to be adequate both for big experiments, where a large number of channels are to be monitored by an on-line computer, and for test labs where simple manual operation of a limited number of channels is often desired.

The system is organized into "crates". Each crate is a 19" wide 8 U high euro mechanics rack; the modules bearing the output channels (Channels Boards) are realized in 6 U plug-in modules, the remaining 2 U is dedicated to house the system Fan Tray unit. Up to 10 Channels Boards may be plugged into a single crate. Different plug-in modules are available (Positive, Negative, Floating or Distributor Boards) and can be freely mixed in a single system in order to obtain the necessary configuration.

Two voltage values (V0set, V1set) and two current limit values (I0set, I1set) can be programmed for each power channel. The switching from one value to the other is performed via two external (NIM or TTL) input levels (VSEL, ISEL).

The maximum rate of change of the voltage (Volt/sec), may be programmed for each channel. Two distinct values are available, depending on the sign of the change (Ramp-Up, Ramp-Down). Any attempt to change the voltage will result in a linear increase or decrease with time, the rate being determined by "Ramp-Up" or "Ramp-Down" parameter. This feature has been provided to protect those devices that could be harmed by a sudden voltage step-up.

For some Boards the ISET values of the channels represent a "software controlled" hardware protection on the channels' currents: the channel cannot draw a current higher than its programmed limit (**Boards with programmable current hardware protections**).

Other Boards has the current hardware protection fixed to a value common for all the channels; the ISET values are used to signal a fault, but the channels can draw a current larger than their ISET values (**Boards with fixed current hardware protections**).

The following types of Boards are currently available:

Floating Power Supply Boards

Board Type	Ch.	Voltage full scale	Voltage Resolution	Current Full scale	Current Resolution	Current protection
A515	16	100 V	40 mV	200 μA	50 nA	fixed (1 mA)
A516	8	12 V	10 mV	1.5 A	10 mA	programmable
A517	32	18 V	10 mV	10 mA	10 μA	fixed (30 mA)
A518	16	12 V	10 mV	150 mA	40 μA	fixed (170 mA)
A519	16	200 V	40 mV	40 μA	10 nA	fixed (200 μA)
A520	16	200 V	40 mV	1 mA	200 nA	fixed (1.2 mA)
A521	8	3 V	10 mV	3 A	10 mA	programmable
A523	8	14 V	10 mV	1.2 A	10 mA	programmable
A524	16	250 V	40 mV	40 μA	10 nA	fixed (200 μA)
A525	8	4 V	10 mV	3 A	10 mA	programmable

High Voltage Positive/Negative Boards (See CAEN's "High Voltage P. S. Boards User's Manual")

Board Type	Ch.	Voltage full scale	Voltage Resolution	Current Full scale	Current Resolution
A732	12	6 kV	0.5 V	1 mA	1 μA
A733A	16	2.5 kV	0.2 V	3 mA	1 μA
A734	16	3 kV	0.2 V	3 mA[1]	1 μA
A753	9	2.5 kV	0.2 V	13 mA	10 μA
A832	12	6 kV	0.5 V	200 μA	20 nA
A834	16	3 kV	0.2 V	200 μA	20 nA

Distributor Boards (See CAEN's "Distributor P. S. Boards User's Manual")
(ΔV = 900 Volt)

Board Type	Ch.	Voltage full scale	Voltage Resolution	Current Full scale
A932A	24	2.5 kV	200 mV	500 μA
A933A	24	2.5 kV	200 mV	900 μA
A933K	24	2.5 kV	200 mV	500 μA
A934A	24	2.5 kV	200 mV	20 μA

Other Board types are under development:

High Voltage Positive/Negative Boards (Preliminary Data)

Board Type	Ch.	Voltage full scale	Voltage Resolution	Current Full scale	Current Resolution
A833A	16	2.5 kV	0.2 V	200 μA	20 nA
A835	12	1 kV	0.1 V	50 μA	10 nA

N.B.: All CAEN High Voltage boards are available as "POSITIVE" or "NEGATIVE". The NEGATIVE boards are indicated by a white circle surrounding the channels' SHV output connector, or a white line surrounding the Multipin output connector where used. This Manual shows only the front panels for the Positive Boards.

[1] guaranteed on 14 channels only; slightly less on 16 channels.

2. FLOATING POWER SUPPLY BOARDS

2.1. MOD. A515 FLOATING CH. BOARD (100 V, 200 mA)

The Mod. A515, 16 CHANNEL FLOATING Board (100 V, 200 μA) houses 16 Floating channels, insulated up to 500 V from the ground of the mainframe; the polarity has to be fixed by the User by wiring the channels according to the detector specifications.

Each channel is capable to generate programmable voltage values in a range from 0 to 100 V. The current reading full scale is 200 μA.

The Mod. A515 has the current hardware protection fixed to a common value for all the channels (**Board with fixed current hardware protections**).

The maximum current hardware protection value is 1 mA.

Each channel is provided with an adjustment trimmer (MAXV) for the maximum output voltage setting (VMAX hardware). Moreover, via software it is possible to set for each channel another output voltage maximum limit (VMAX software).

The output voltage is programmable from 0 to the maximum value in 40 mV steps and the ISET is programmable from 0 to the maximum in steps of 50 nA.

For each channel two LEDs have been placed on the Front Panel of the Board: one signals when the channel is ON, the other signals when the channel output voltage has reached the VMAX hardware limit.

When a channel is OFF (LED off) the two outputs (+ and -) are connected together.

2.1.1. MOD. A515 PACKAGING

8 TE wide. Height: 6U.

2.1.2. MOD. A515 EXTERNAL COMPONENTS

CONNECTORS

- No. 1, "OUT", 37 pin female D type, for the 16x2 outputs of the Floating channels.

DISPLAYS

- No. 16, "ON 0÷15", red LEDs, signalling, when lit, that the corresponding channel is on.

- No. 16, "MAXV 0÷15", red LEDs, signalling, when lit, that the corresponding channel output voltage has reached the VMAX hardware value.

TRIMMERS

- No. 16, "MAXV", screwdriver trimmer, for the VMAX hardware setting.

2.1.3. MOD. A515 CHANNEL CHARACTERISTICS

Polarity	Floating voltages
Output Voltage:	0÷100 V
Current reading/set full scale:	200 μA
Voltage Set/Monitor Resolution:	40 mV
Current Set/Monitor Resolution:	50 nA
VMAX hardware:	0÷100 V settable for each channel
VMAX software:	0÷100 V settable for each channel
VMAX software resolution:	40 mV
Ramp Down:	1÷50 Volt/sec, 1 Volt/sec step
Ramp Up:	1÷50 Volt/sec, 1 Volt/sec step
Voltage Ripple:	3 mVpp
Max. current hardware protection:	Fixed (1 mA)

2.1.4. MOD. A515 VMAX HARDWARE SETTING

The VMAX hardware value cannot be readout via software.

Use the following procedure to set the desired VMAX Hardware limit:

1. Program the VSET greater than the VMAX hardware desired.
2. Adjust the trimmer until the VMON reaches the VMAX hardware desired.

2.1.5. MOD. A515 CURRENT PROTECTION

The Mod. A515 has the current hardware protection fixed to a common value for all the channels (**Board with fixed current hardware protections**).

The maximum current hardware protection value is 1 mA, while the current reading/set full scale is 200 μA. This causes the following:

- If a channel draws a current larger than the programmed limit, it is signalled to be in "overcurrent", but the channels can draw a current larger than the ISET values.
- If a channel is in "overcurrent", the IMON parameter may be not valid, because the current reading full scale is 200 μA.

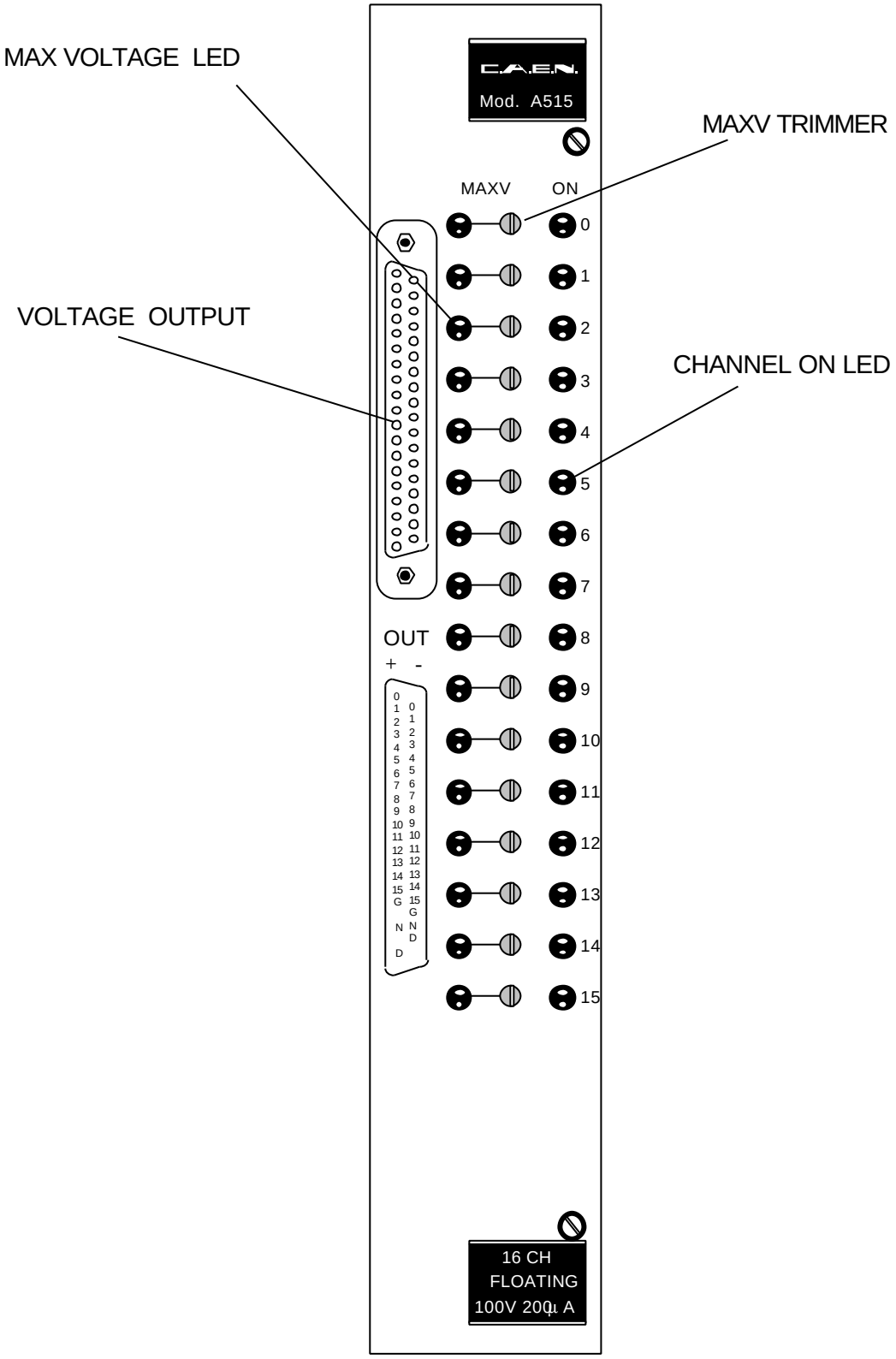


Fig. 2.1: Mod. A515 Front Panel

2.2. MOD. A516 FLOATING CH. BOARD (12 V, 1.5 A)

The Mod. A516, 8 CHANNEL FLOATING Board (12 V, 1.5 A) houses 8 Floating channels, insulated up to 500 V from the ground of the mainframe; the polarity has to be fixed by the User by wiring the channels according to the detector specifications.

Each channel is capable to generate programmable voltage values in a range from 0 to 12V. The maximum output current is 1.5 A.

The Mod. A516 ISET values represent a "software controlled" hardware protection on the channels' currents: the channel cannot draw a current higher than its programmed limit (**Board with programmable current hardware protections**).

Each channel is provided with two sense inputs (S+ and S-) to detect the line loss. This allows the User to obtain the desired voltage at the end of the distribution line in case of substantial distance between the unit and the load to be supplied.

A 3-position jumper allows to adjust the power consumption for each channel (see Fig. 2.3 and 2.5).

The output voltage is programmable from 0 to the maximum value in 10 mV steps and the maximum output current is programmable from 0 to the maximum in steps of 10 mA.

For each channel a LED has been placed on the Front Panel of the Board to signal when the channel is ON.

A thermostatic device inhibits the channels' operations when the internal temperature exceeds 55 °C.

When a channel is OFF (LED off) the two outputs (+ and -) are connected together.

2.2.1. MOD. A516 PACKAGING

8 TE wide. Height: 6U.

2.2.2. MOD. A516 EXTERNAL COMPONENTS

CONNECTORS

- No. 2, 37 pin female, D type, for the 8x2 outputs of the Floating channels and the 8x2 inputs of the Sense inputs.

DISPLAYS

- No. 8, "0÷7", red LEDs, signalling, when lit, that the corresponding channel is on.

2.2.3. MOD. A516 INTERNAL COMPONENTS

Refer to Fig. 2.3.

JUMPERS

- No. 16, "J1", 3-position jumpers, to adjust the power consumption for each channel.

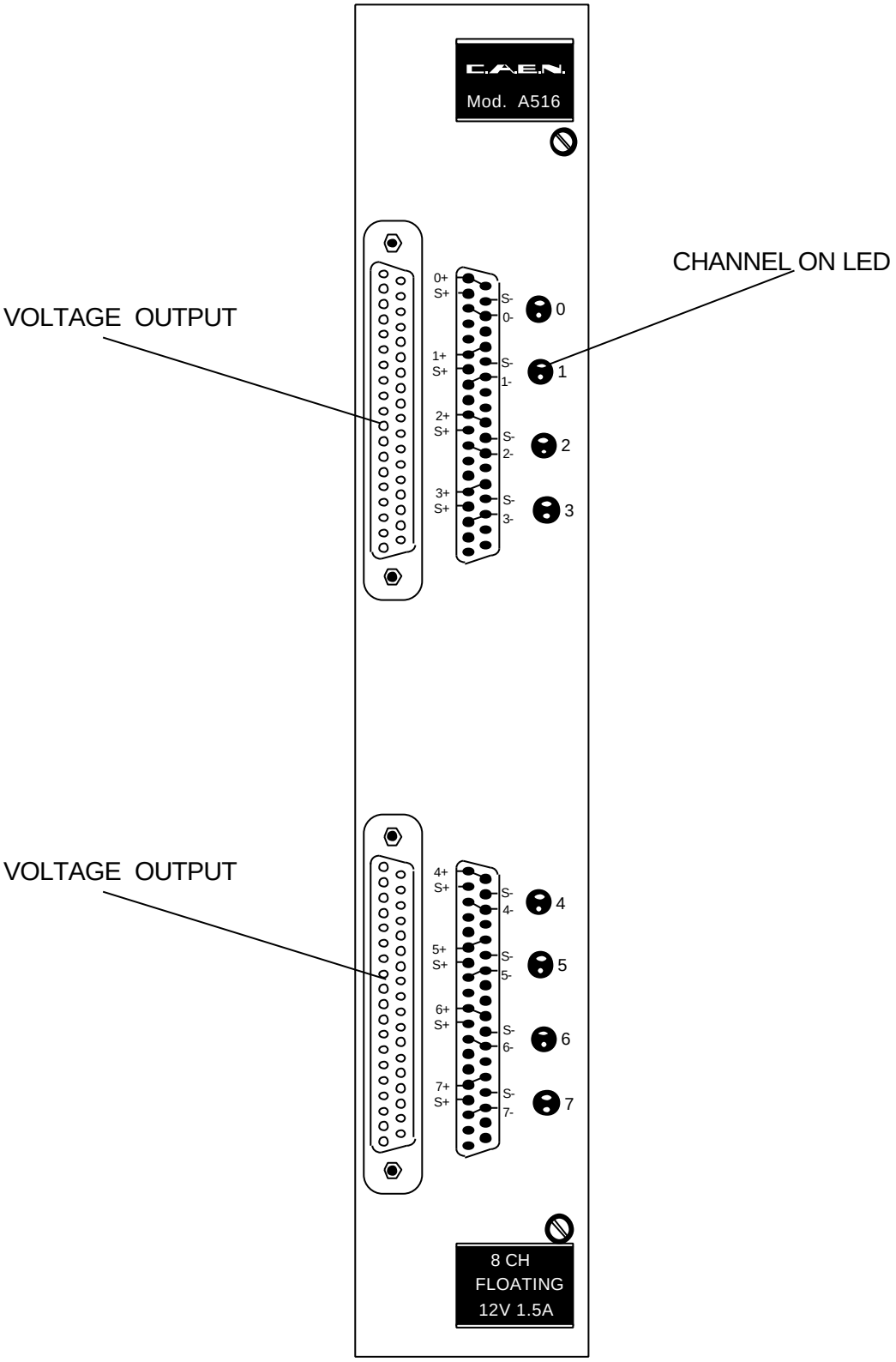


Fig. 2.2: Mod. A516 Front Panel

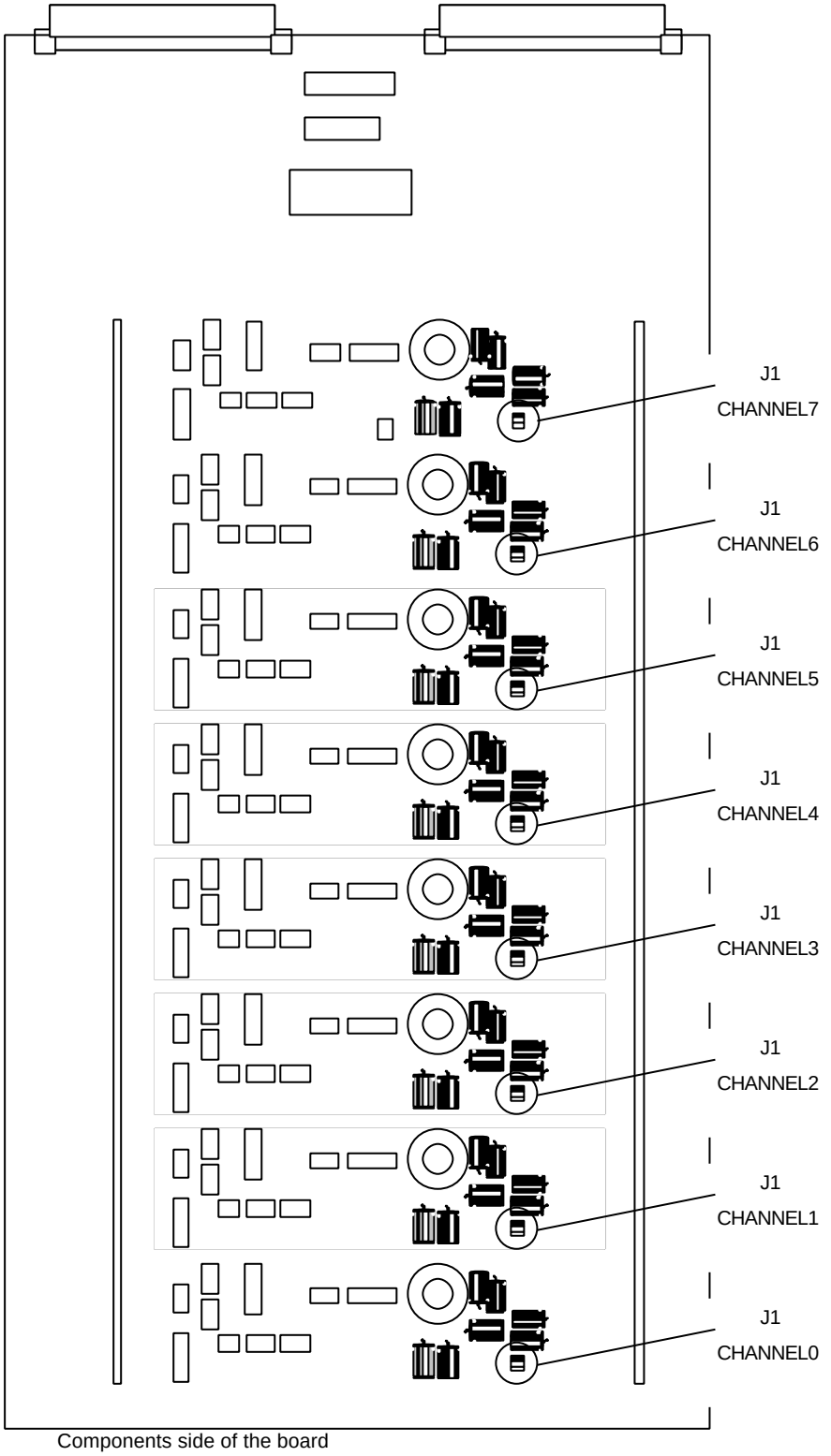


Fig. 2.3: Mod. A516 Components Locations

2.2.4. MOD. A516 CHANNEL CHARACTERISTICS

Polarity:	Floating voltages
Output Voltage:	0÷12 V
Max. Current:	1.5 A
Voltage Set/Monitor Resolution:	10 mV
Current Set/Monitor Resolution:	10 mA
VMAX hardware:	not available
VMAX software:	0÷12 V settable for each channels
VMAX software resolution:	10 mV
Ramp Down:	1÷10 Volt/sec, 1 Volt/sec step
Ramp Up:	1÷10 Volt/sec, 1 Volt/sec step
Voltage Ripple:	5 mVpp
Max. delivered power:	110 W
Max. delivered power per channel:	18 W
Max. internal temperature protection:	fixed (55°C)

2.2.5. MOD. A516 SENSE INPUTS

Two sense inputs (S+ and S-) per channel allows the User to obtain the correct voltage value at the load to be supplied, regardless of the line loss.

Connect each channel as shown in figure below:

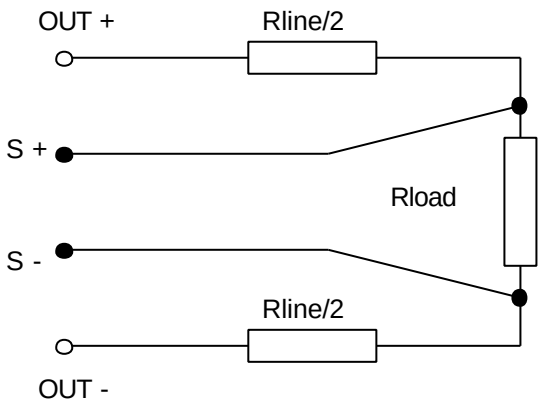


Fig. 2.4: Mod. A516 Channel Connection Diagram

2.2.6. MOD. A516 J1 SETTING

The 3-position jumper J1 allows to adjust the power consumption for each channel. The 3-positions are shown in the figure below:

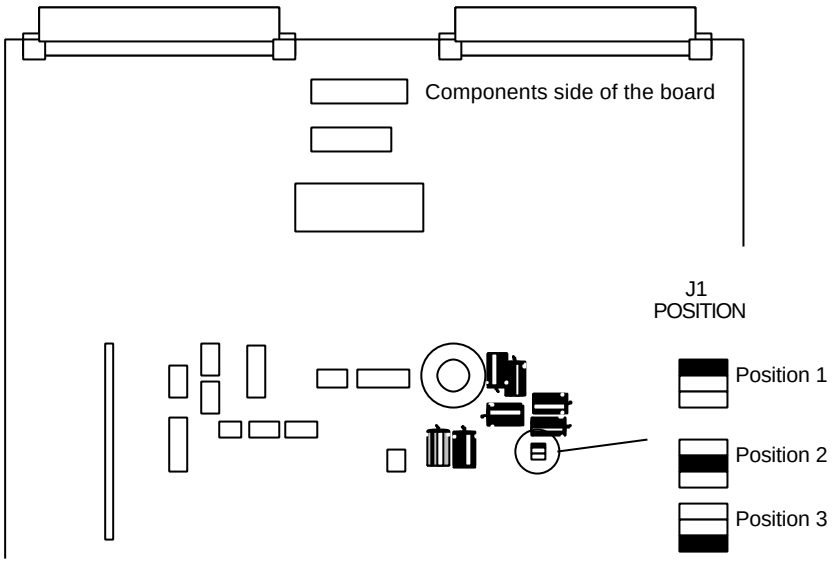


Fig. 2.5: Mod. A516 J1 Positions

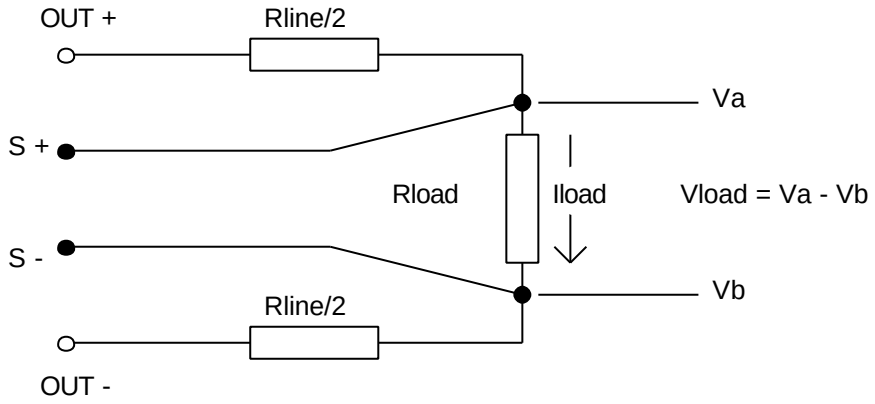


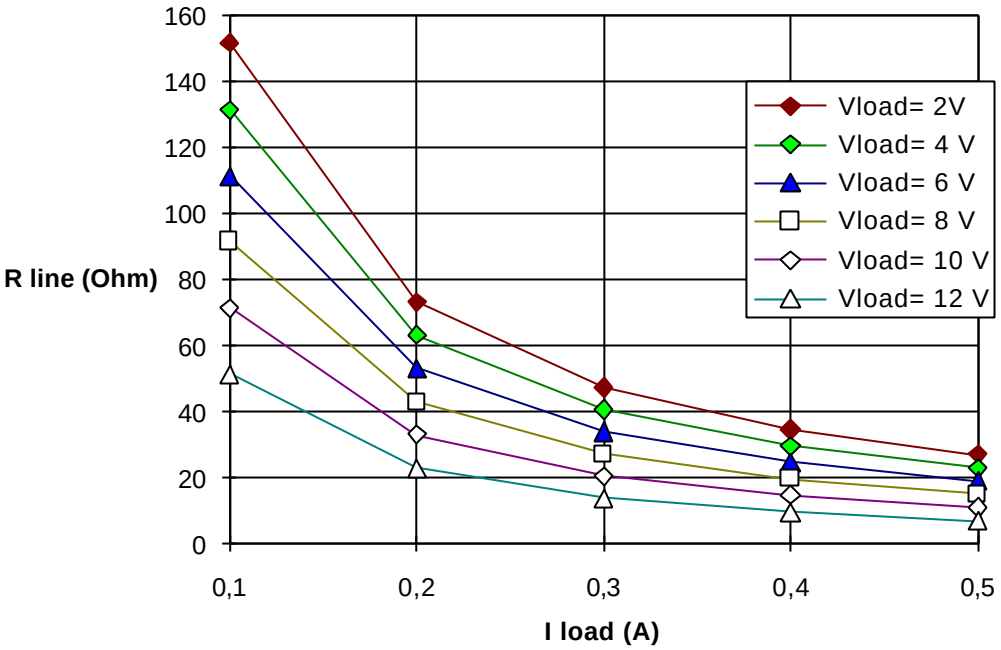
Fig. 2.6: Mod. A516 Channel Operating Parameters

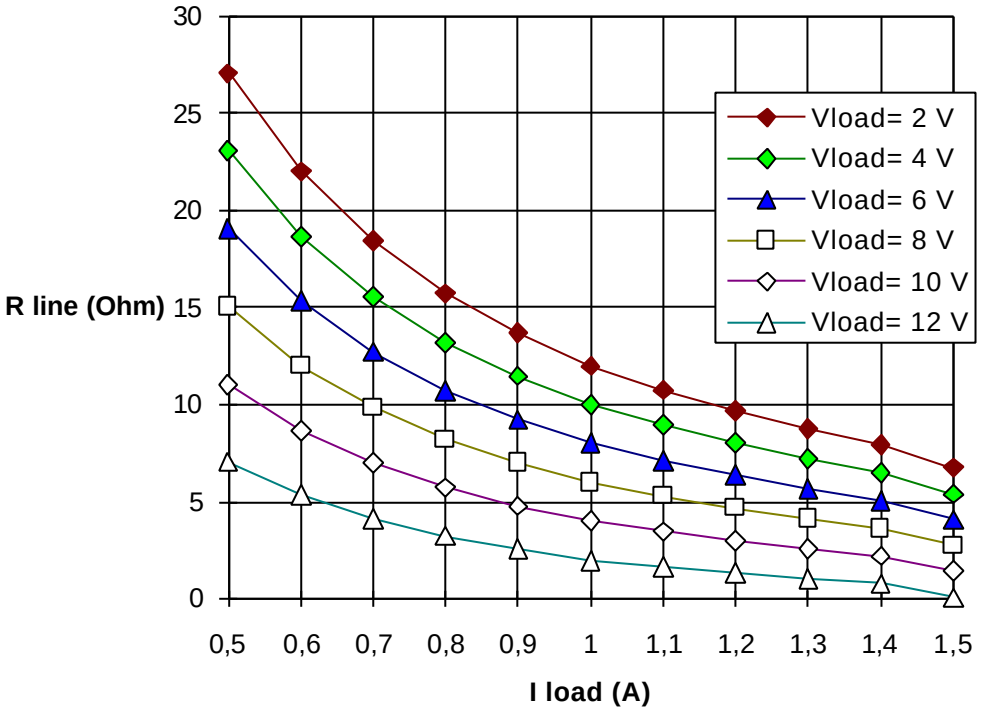
The following table shows the J1 position in function of the Vload, the Iload and the Rline:

Table 2.1: Mod. A516 J1 Jumper Position

11 V < (Vload + Rline Iload)	Position 1
5 V < (Vload + Rline Iload) < 11 V	Position 2
(Vload + Rline Iload) < 5 V	Position 3

In the following figures are shown the maximum Rline as a function of the load current, for different values of Vload (J1 set to Position 1).





This implies that the Rline value must be less than the value showed in the graphics in order to obtain the desired voltage value at the load to be supplied.

2.3. MOD. A517 FLOATING CH. BOARD (18 V, 10 mA)

The Mod. A517, 32 CHANNEL FLOATING Board (18 V, 10 mA) houses 32 Floating channels, insulated up to 500 V from the ground of the mainframe; the polarity has to be fixed by the User by wiring the channels according to the detector specifications.

Each channel is capable to generate programmable voltage values in a range from 0 to 18 V. The current reading full scale is 10 mA.

The Mod. A517 has the current hardware protection fixed to a value common for all the channels (**Board with fixed current hardware protections**).

The maximum current hardware protection value is 30 mA.

The output voltage is programmable from 0 to the maximum value in 10 mV steps and the ISET is programmable from 0 to the maximum in steps of 10 μA.

For each channel a LED has been placed On the Front Panel Board to signal when the channel is ON.

When a channel is OFF (LED off) the two outputs (+ and -) are connected together.

2.3.1. MOD. A517 PACKAGING

12 TE wide. Height: 6U.

2.3.2. MOD. A517 EXTERNAL COMPONENTS

CONNECTORS

- No. 2, "OUT", 37 pin female D type, for the 32x2 outputs of the Floating channels.

DISPLAYS

- No. 16, "0÷31", red LEDs, signalling, when lit, that the corresponding channel is on.

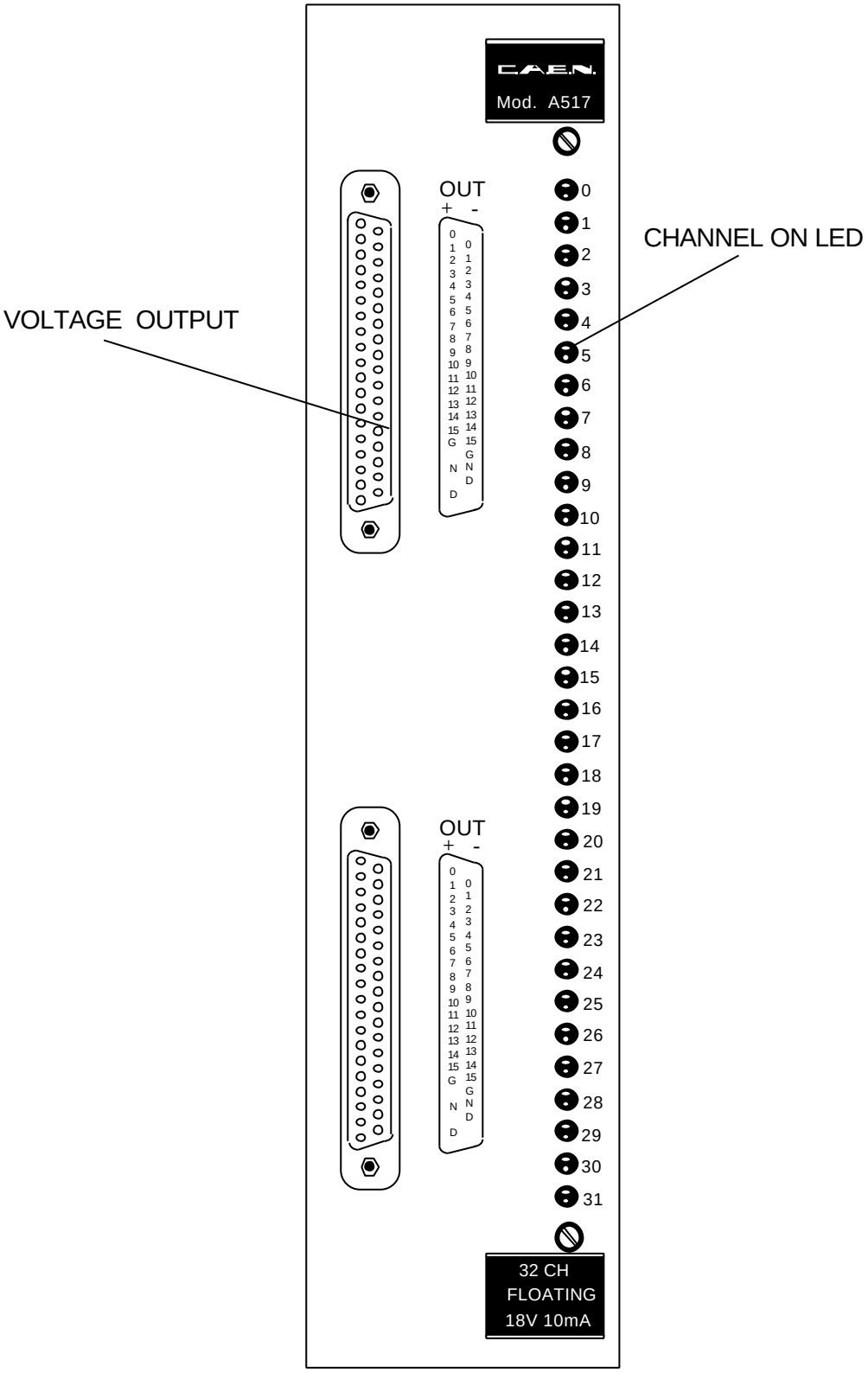


Fig. 2.7: Mod. A517 Front Panel

2.3.3. MOD. A517 CHANNEL CHARACTERISTICS

Polarity:	Floating voltages
Output Voltage:	0÷18 V
Current reading/set full scale:	10 mA
Voltage Set/Monitor Resolution:	10 mV
Current Set/Monitor Resolution:	10 μA
VMAX hardware:	not available
VMAX software:	0÷18 V settable for each channels
VMAX software resolution:	10 mV
Ramp Down:	1÷10 Volt/sec, 1 Volt/sec step
Ramp Up:	1÷10 Volt/sec, 1 Volt/sec step
Voltage Ripple:	5 mVpp
Max. current hardware protection:	fixed (30 mA)

2.3.4. MOD. A517 CURRENT PROTECTION

The Mod. A517 has the current hardware protection fixed to a common value for all the channels (**Board with fixed current hardware protections**).

The maximum current hardware protection value is 30 mA, while the current reading/set full scale is 10 mA. This causes the following:

- If a channel draws a current larger than the programmed limit, it is signalled to be in "overcurrent", but the channels can draw a current larger than the ISET values.
- If a channel is in "overcurrent", the IMON parameter may be not valid, because the current reading full scale is 10 mA.

2.4. MOD. A518 FLOATING CH. BOARD (12 V, 150 mA)

The Mod. A518, 16 CHANNEL FLOATING Board (12 V, 150 mA) houses 16 Floating channels, insulated up to 500 V from the ground of the mainframe; the polarity has to be fixed by the User by wiring the channels according to the detector specifications.

Each channel is capable to generate programmable voltage values in a range from 0 to 12 V. The current reading full scale is 150 mA.

The Mod. A518 has the current hardware protection fixed to a common value for all the channels (**Board with fixed current hardware protections**).

The maximum current hardware protection value is 170 mA.

Via software it is possible to set for each channel an output voltage maximum limit (VMAX software).

The output voltage is programmable from 0 to the maximum value in 10 mV steps and the ISET is programmable from 0 to the maximum in steps of 100 μA.

For each channel a LED placed on the Front Panel of the Board signals when the channel is ON.

When a channel is OFF (LED off) the two outputs (+ and -) are connected together.

2.4.1. MOD. A518 PACKAGING

8 TE wide. Height: 6U.

2.4.2. MOD. A518 EXTERNAL COMPONENTS

CONNECTORS

- No. 1, "OUT", 37 pin female D type, for the 16x2 outputs of the Floating channels.

DISPLAYS

- No. 16, "ON 0÷15", red LEDs, signalling, when lit, that the corresponding channel is on.

2.4.3. MOD. A518 CHANNEL CHARACTERISTICS

Polarity	Floating voltages
Output Voltage:	0 to 12 V
Current reading/set full scale:	150 mA
Voltage Set/Monitor Resolution:	10 mV
Current Set/Monitor Resolution:	100 μA
VMAX hardware:	not available
VMAX software:	0 to 12 V settable for each channel
VMAX software resolution:	10 mV
Ramp Down:	1 to 10 Volt/sec, 1 Volt/sec step
Ramp Up:	1 to 10 Volt/sec, 1 Volt/sec step
Voltage Ripple:	5 mVpp
Max. current hardware protection:	Fixed (170 mA)

2.4.4. MOD. A518 CURRENT PROTECTION

The Mod. A518 has the current hardware protection fixed to a common value for all the channels (**Board with fixed current hardware protections**).

The maximum current hardware protection value is 170 mA, while the current reading/set full scale is 150 mA. This causes the following:

- If a channel draws a current larger than the programmed limit, it is signalled to be in "overcurrent", but the channels can draw a current larger than the ISET values. The Power-Off of a channel upon occurrence of an Overcurrent condition (TRIP mode) is performed automatically after a certain time that is the sum of a fixed offset time of approximately 2 seconds plus the TRIP parameter (Display menu of the SY527). This implies the following:

  - in order to be detected and monitored on the Display, each overcurrent MUST last longer than 2 seconds;
  - the counting of the TRIP time starts after the detection of the Overcurrent.

- If a channel is in "overcurrent", the IMON parameter may be not valid, because the current reading full scale is 150 mA.

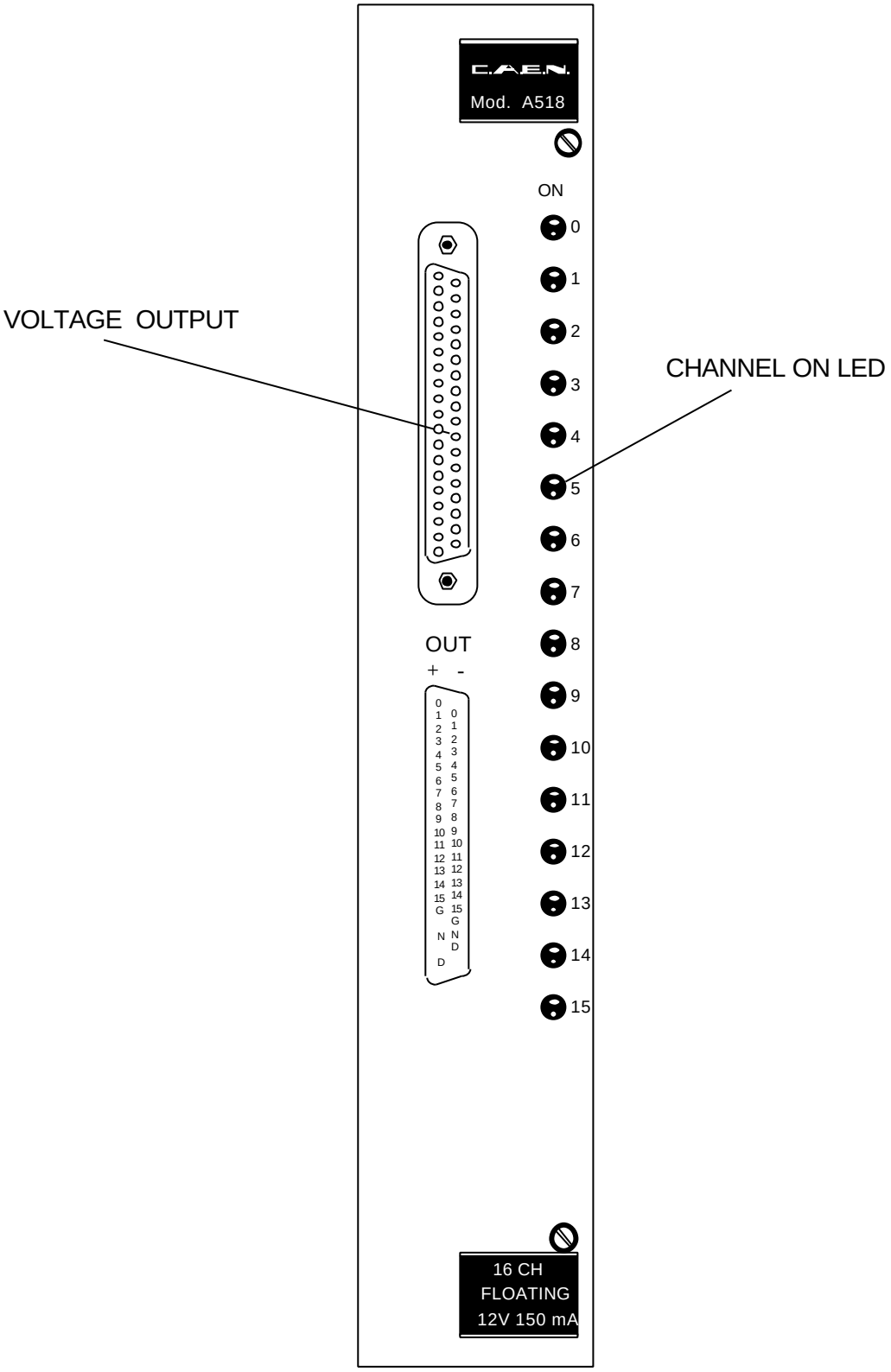


Fig. 2.8: Mod. A518 Front Panel

2.5. MOD. A519 FLOATING CH. BOARD (200 V, 40 mA)

The Mod. A519, 16 CHANNEL FLOATING Board (200 V, 40 μA) houses 16 Floating channels, insulated up to 500 V from the ground of the mainframe; the polarity has to be fixed by the User by wiring the channels according to the detector specifications.

Each channel is capable to generate programmable voltage values in a range from 0 to 200 V. The current reading full scale is 40 μA.

The Mod. A519 has the current hardware protection fixed to a common value for all the channels (**Board with fixed current hardware protections**).

The maximum current hardware protection value is 200 μA.

Each channel is provided with an adjustment trimmer (MAXV) for the maximum output voltage setting (VMAX hardware). Moreover, via software it is possible to set for each channel another output voltage maximum limit (VMAX software).

The output voltage is programmable from 0 to the maximum value in 40 mV steps and the ISET is programmable from 0 to the maximum in steps of 10 nA.

For each channel two LEDs have been placed on the Front Panel Board: one signals when the channel is on, the other signals when the channel output voltage has reached the VMAX hardware limit.

When a channel is OFF (LED off) the two outputs (+ and -) are connected together.

2.5.1. MOD. A519 PACKAGING

8 TE wide. Height: 6U.

2.5.2. MOD. A519 EXTERNAL COMPONENTS

CONNECTORS

- No. 1, "OUT", 37 pin female D type, for the 16x2 outputs of the Floating channels.

DISPLAYS

- No. 16, "ON 0÷15", red LEDs, signalling, when lit, that the corresponding channel is on.

- No. 16, "MAXV 0÷15" red LEDs, signalling, when lit, that the corresponding channel output voltage has reached the VMAX hardware value.

TRIMMERS

- No. 16, "MAXV", screwdriver trimmer, for the VMAX hardware setting.

2.5.3. MOD. A519 CHANNEL CHARACTERISTICS

Polarity	Floating voltages
Output Voltage:	0÷200 V
Current reading/set full scale:	40 μA
Voltage Set/Monitor Resolution:	40 mV
Current Set/Monitor Resolution:	10 nA
VMAX hardware:	0÷200 V settable for each channel
VMAX software:	0÷200 V settable for each channel
VMAX software resolution:	40 mV
Ramp Down:	1÷50 Volt/sec, 1 Volt/sec step
Ramp Up:	1÷50 Volt/sec, 1 Volt/sec step
Voltage Ripple:	10 mVpp
Max. current hardware protection:	Fixed (200 μA)

2.5.4. MOD. A519 VMAX HARDWARE SETTING

The VMAX hardware value cannot be readout via software.

Use the following procedure to set the desired VMAX Hardware limit:

1. Program the VSET greater than the VMAX hardware desired.
2. Adjust the trimmer until the VMON reaches the VMAX hardware desired.

2.5.5. MOD. A519 CURRENT PROTECTION

The Mod. A519 has the current hardware protection fixed to a common value for all the channels (**Board with fixed current hardware protections**).

The max. current hardware protection value is 200 μA, while the current reading/set full scale is 40 μA. This causes the following:

- If a channel draws a current larger than the programmed limit, it is signalled to be in "overcurrent", but the channels can draw a current larger than the ISET values.
- If a channel is in "overcurrent", the IMON parameter may be not valid, because the current reading full scale is 40 μA.

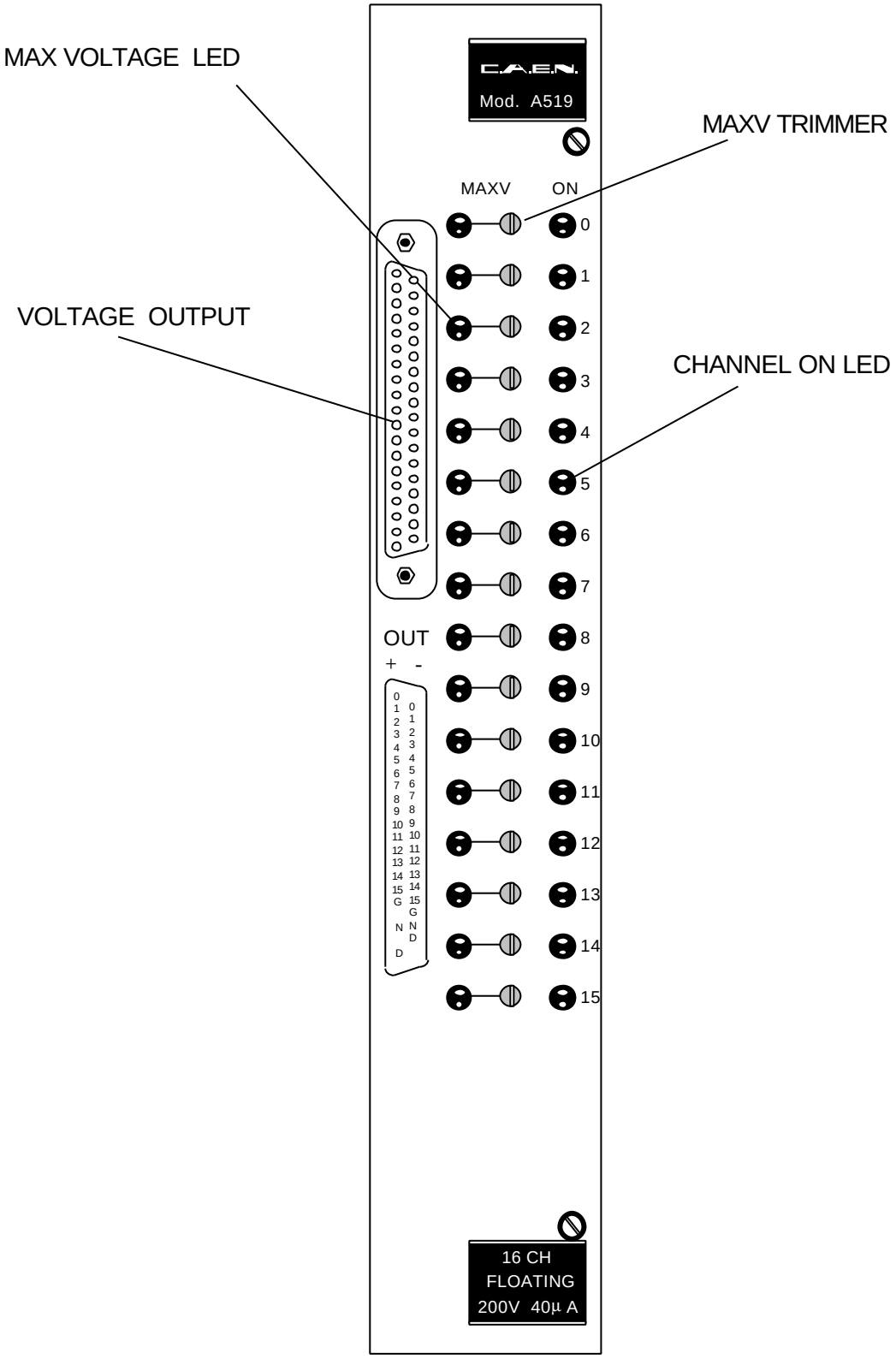


Fig. 2.9: Mod. A519 Front Panel

2.6. MOD. A520 FLOATING CH. BOARD (200 V, 1 mA)

The Mod. A520, 16 CHANNEL FLOATING Board (200 V, 1 mA) houses 16 Floating channels, insulated up to 500 V from the ground of the mainframe; the polarity has to be fixed by the User by wiring the channels according to the detector specifications.

Each channel is capable to generate programmable voltage values in a range from 0 to 200 V. The current reading full scale is 1 mA.

The Mod. A520 has the current hardware protection fixed to a common value for all the channels (**Board with fixed current hardware protections**).

The maximum current hardware protection value is 1.2 mA.

Each channel is provided with an adjustment trimmer (MAXV) for the maximum output voltage setting (VMAX hardware). Moreover, via software it is possible to set for each channel another output voltage maximum limit (VMAX software).

The output voltage is programmable from 0 to the maximum value in 40 mV steps and the ISET is programmable from 0 to the maximum in steps of 200 nA.

For each channel two LEDs have been placed on the Front Panel Board: one signals when the channel is on, the other signals when the channel output voltage has reached the VMAX hardware limit.

When a channel is OFF (LED off) the two outputs (+ and -) are connected together.

2.6.1. MOD. A520 PACKAGING

8 TE wide. Height: 6U.

2.6.2. MOD. A520 EXTERNAL COMPONENTS

CONNECTORS

- No. 1, "OUT", 37 pin female D type, for the 16x2 outputs of the Floating channels.

DISPLAYS

- No. 16, "ON 0÷15", red LEDs, signalling, when lit, that the corresponding channel is on.

- No. 16, "MAXV 0÷15" red LEDs, signalling, when lit, that the corresponding channel output voltage has reached the VMAX hardware value.

TRIMMERS

- No. 16, "MAXV", screwdriver trimmer, for the VMAX hardware setting.

2.6.3. MOD. A520 CHANNEL CHARACTERISTICS

Polarity	Floating voltages
Output Voltage:	0÷200 V
Current reading/set full scale:	1 mA
Voltage Set/Monitor Resolution:	40 mV
Current Set/Monitor Resolution:	200 nA
VMAX hardware:	0÷200 V settable for each channel
VMAX software:	0÷200 V settable for each channel
VMAX software resolution:	40 mV
Ramp Down:	1÷50 Volt/sec, 1 Volt/sec step
Ramp Up:	1÷50 Volt/sec, 1 Volt/sec step
Voltage Ripple:	10 mVpp
Max. current hardware protection:	Fixed (1.2 mA)

2.6.4. MOD. A520 VMAX HARDWARE SETTING

The VMAX hardware value cannot be readout via software.

Use the following procedure to set the desired VMAX Hardware limit:

1. Program the VSET greater than the VMAX hardware desired.
2. Adjust the trimmer until the VMON reaches the VMAX hardware desired.

2.6.5. MOD. A520 CURRENT PROTECTION

The Mod. A520 has the current hardware protection fixed to a common value for all the channels (**Board with fixed current hardware protections**).

The max. current hardware protection value is 1 mA, while the current reading/set full scale is 1 mA. This causes the following:

- If a channel draws a current larger than the programmed limit, it is signalled to be in "overcurrent", but the channels can draw a current larger than the ISET values.
- If a channel is in "overcurrent", the IMON parameter may be not valid, because the current reading full scale is 1 mA.

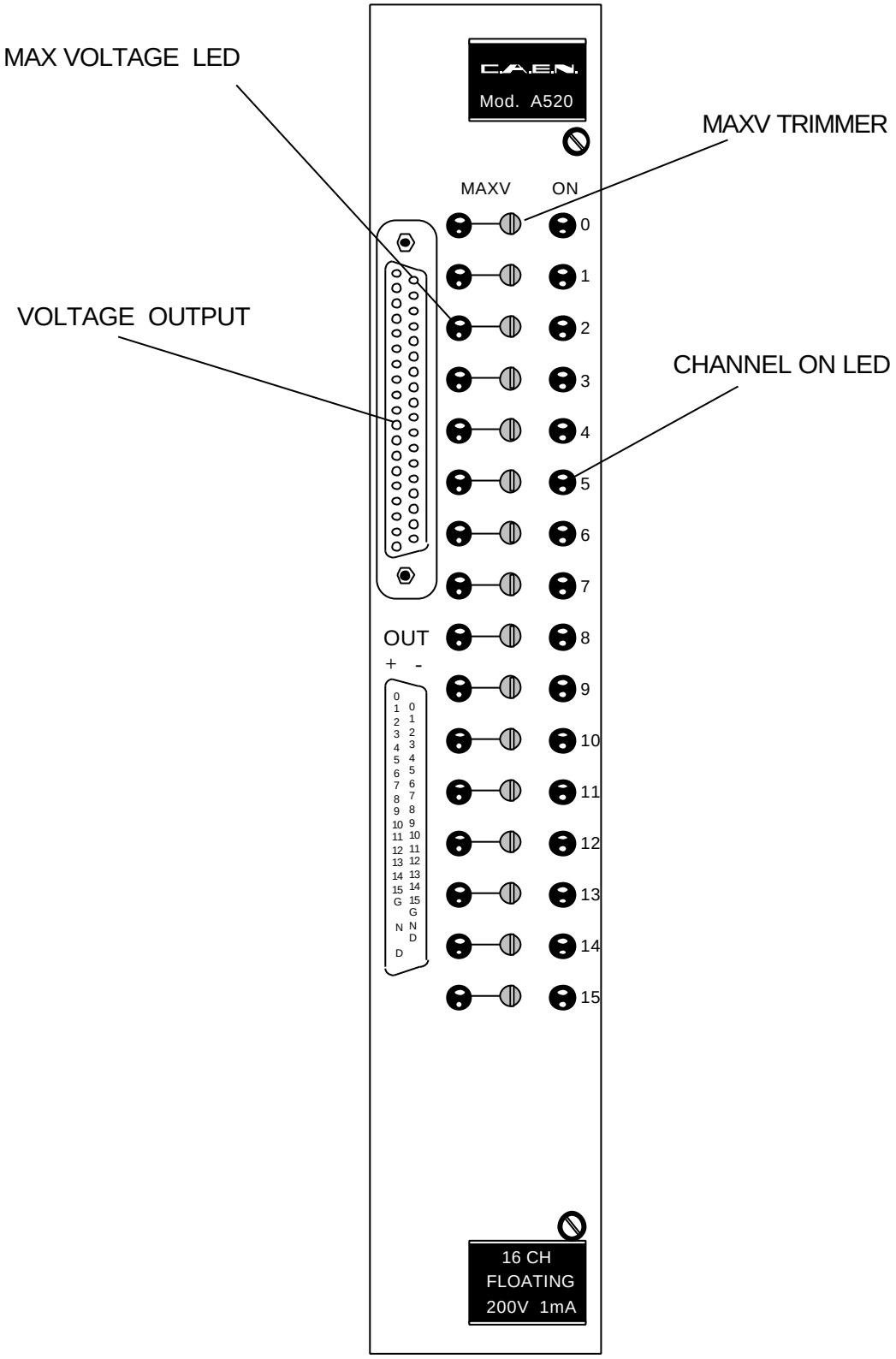


Fig. 2.10: Mod. A520 Front Panel

2.7. MOD. A521 FLOATING CH. BOARD (3 V, 3 A)

The Mod. A521, 8 CHANNEL FLOATING Board (3 V, 3 A) houses 8 Floating channels, insulated up to 500 V from the ground of the mainframe; the polarity has to be fixed by the User by wiring the channels according to the detector specifications.

Each channel is capable to generate programmable voltage values in a range from 0 to 3 V. The maximum output current is 3 A.

The Mod. A521 ISET values represent a "software controlled" hardware protection on the channels' currents: the channel cannot draw a current higher than its programmed limit (**Board with programmable current hardware protections**).

Each channel is provided with two sense inputs (S+ and S-) to detect the line loss. This allows the User to obtain the desired voltage at the end of the distribution line in case of substantial distance between the unit and the load to be supplied.

The output voltage is programmable from 0 to the maximum value in 10 mV steps and the maximum output current is programmable from 0 to the maximum in steps of 10 mA.

For each channel a LED has been placed on the Front Panel of the Board to signal when the channel is ON.

A thermostatic device inhibits the channels' operations when the internal temperature exceeds 55 °C.

When a channel is OFF (LED off) the two outputs (+ and -) are connected together.

2.7.1. MOD. A521 PACKAGING

8 TE wide. Height: 6U.

2.7.2. MOD. A521 EXTERNAL COMPONENTS

CONNECTORS

- No. 2, 37 pin female, D type, for the 8x2 outputs of the Floating channels and the 8x2 inputs of the Sense inputs.

DISPLAYS

- No. 8, "0÷7", red LEDs, signalling, when lit, that the corresponding channel is on.

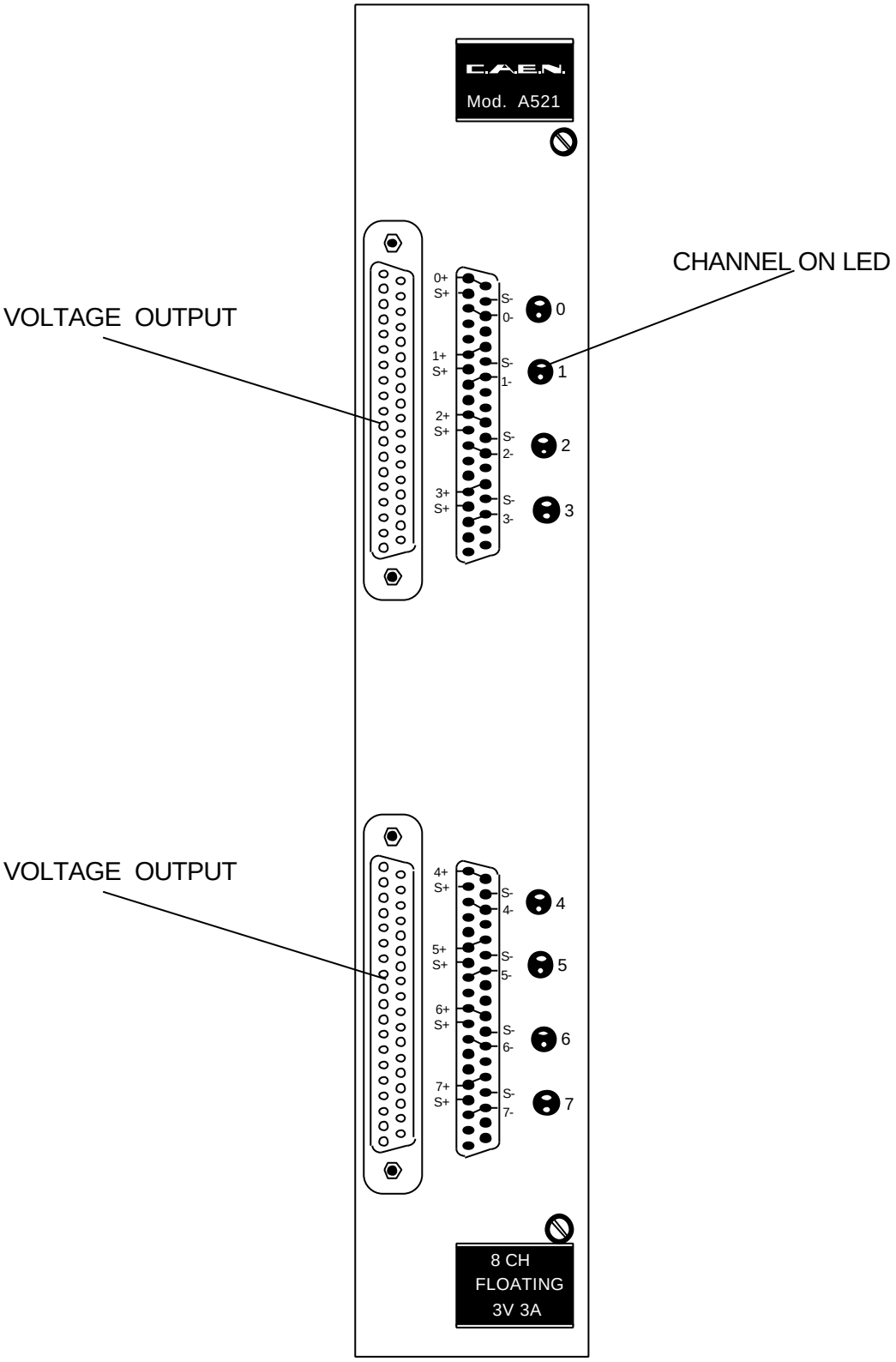


Fig. 2.11: Mod. A521 Front Panel

2.7.3. MOD. A521 CHANNEL CHARACTERISTICS

Polarity:	Floating voltages
Output Voltage:	0÷3 V
Max. Current:	3 A
Voltage Set/Monitor Resolution:	10 mV
Current Set/Monitor Resolution:	10 mA
VMAX hardware:	not available
VMAX software:	0÷3 V settable for each channels
VMAX software resolution:	10 mV
Ramp Down:	1÷3 Volt/sec, 1 Volt/sec step
Ramp Up:	1÷3 Volt/sec, 1 Volt/sec step
Voltage Ripple:	5 mVpp
Max. delivered power:	72 W
Max. delivered power per channel:	9 W
Max. internal temperature protection:	fixed (55°C)

2.7.4. MOD. A521 SENSE INPUTS

Two sense inputs (S+ and S-) per channel allows the User to obtain the correct voltage value at the load to be supplied, regardless of the line loss.

Connect each channel as shown in figure below:

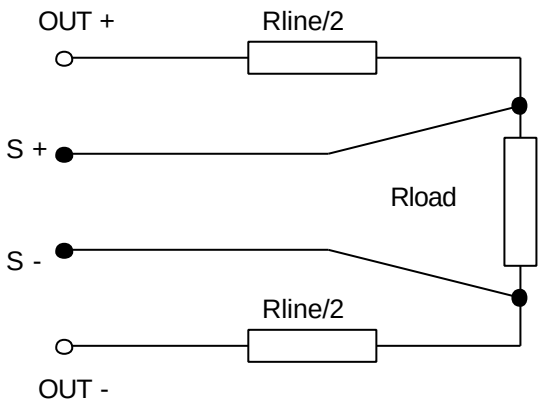


Fig. 2.12: Mod. A521 Channel Connection Diagram

2.8. MOD. A523 FLOATING CH. BOARD (14 V, 1.2 A)

The Mod. A523, 8 CHANNEL FLOATING Board (14 V, 1.2 A) houses 8 Floating channels, insulated up to 500 V from the ground of the mainframe; the polarity has to be fixed by the User by wiring the channels according to the detector specifications.

Each channel is capable to generate programmable voltage values in a range from 0 to 14V. The maximum output current is 1.2 A.

The Mod. A523 ISET values represent a "software controlled" hardware protection on the channels' currents: the channel cannot draw a current higher than its programmed limit (**Board with programmable current hardware protections**).

Each channel is provided with two sense inputs (S+ and S-) to detect the line loss. This allows the User to obtain the desired voltage at the end of the distribution line in case of substantial distance between the unit and the load to be supplied.

A 3-position jumper allows to adjust the power consumption for each channel (see Fig. 2.14 and 2.16).

The output voltage is programmable from 0 to the maximum value in 10 mV steps and the maximum output current is programmable from 0 to the maximum in steps of 10 mA.

For each channel a LED has been placed on the Front Panel of the Board to signal when the channel is ON.

A thermostatic device inhibits the channels' operations when the internal temperature exceeds 55 °C.

When a channel is OFF (LED off) the two outputs (+ and -) are connected together.

2.8.1. MOD. A523 PACKAGING

8 TE wide. Height: 6U.

2.8.2. MOD. A523 EXTERNAL COMPONENTS

CONNECTORS

- No. 2, 37 pin female, D type, for the 8x2 outputs of the Floating channels and the 8x2 inputs of the Sense inputs.

DISPLAYS

- No. 8, "0÷7", red LEDs, signalling, when lit, that the corresponding channel is on.

2.8.3. MOD. A523 INTERNAL COMPONENTS

Refer to Fig. 2.3.

JUMPERS

- No. 16, "J1", 3-position jumpers, to adjust the power consumption for each channel.

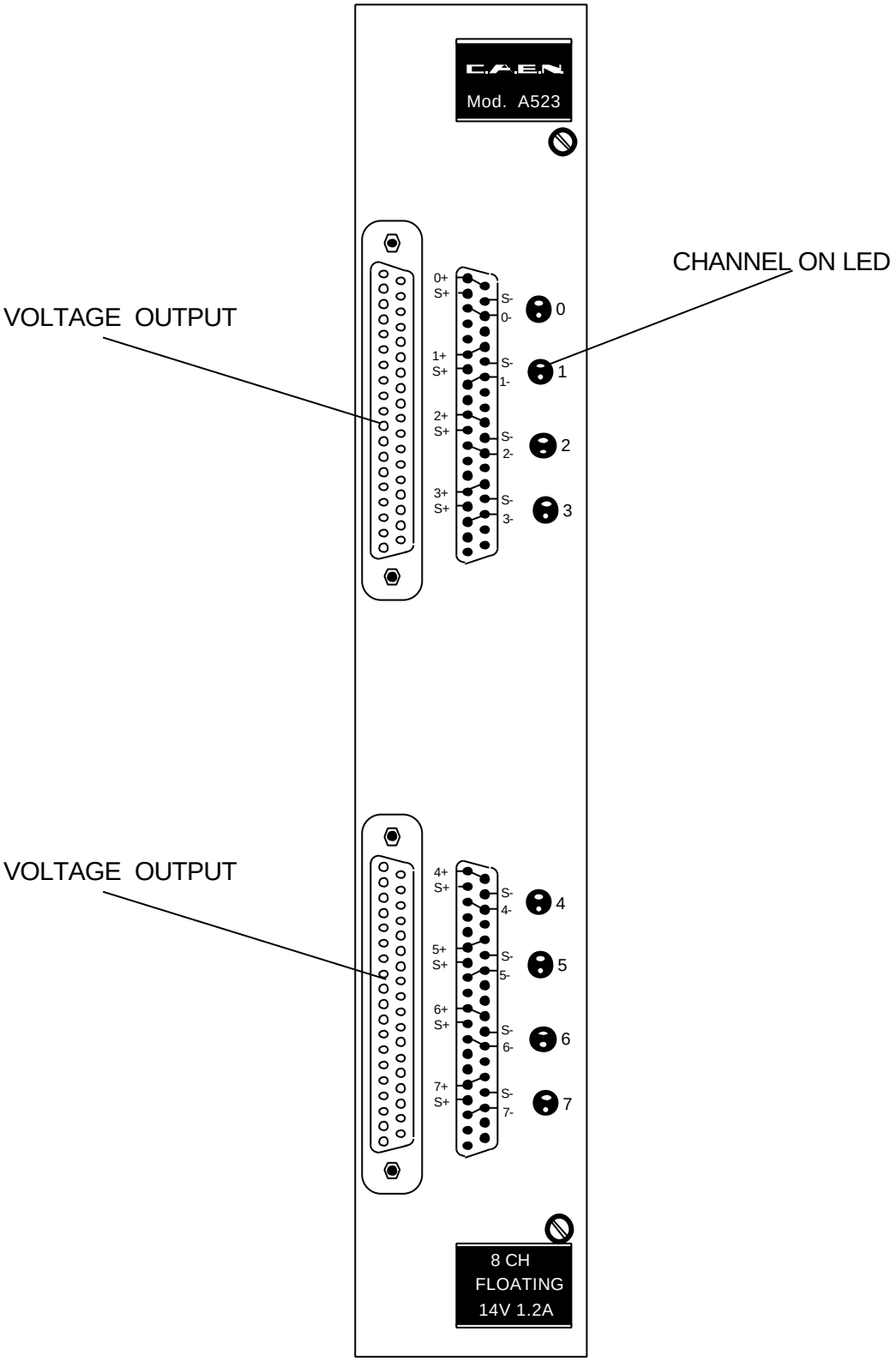


Fig. 2.13: Mod. A523 Front Panel

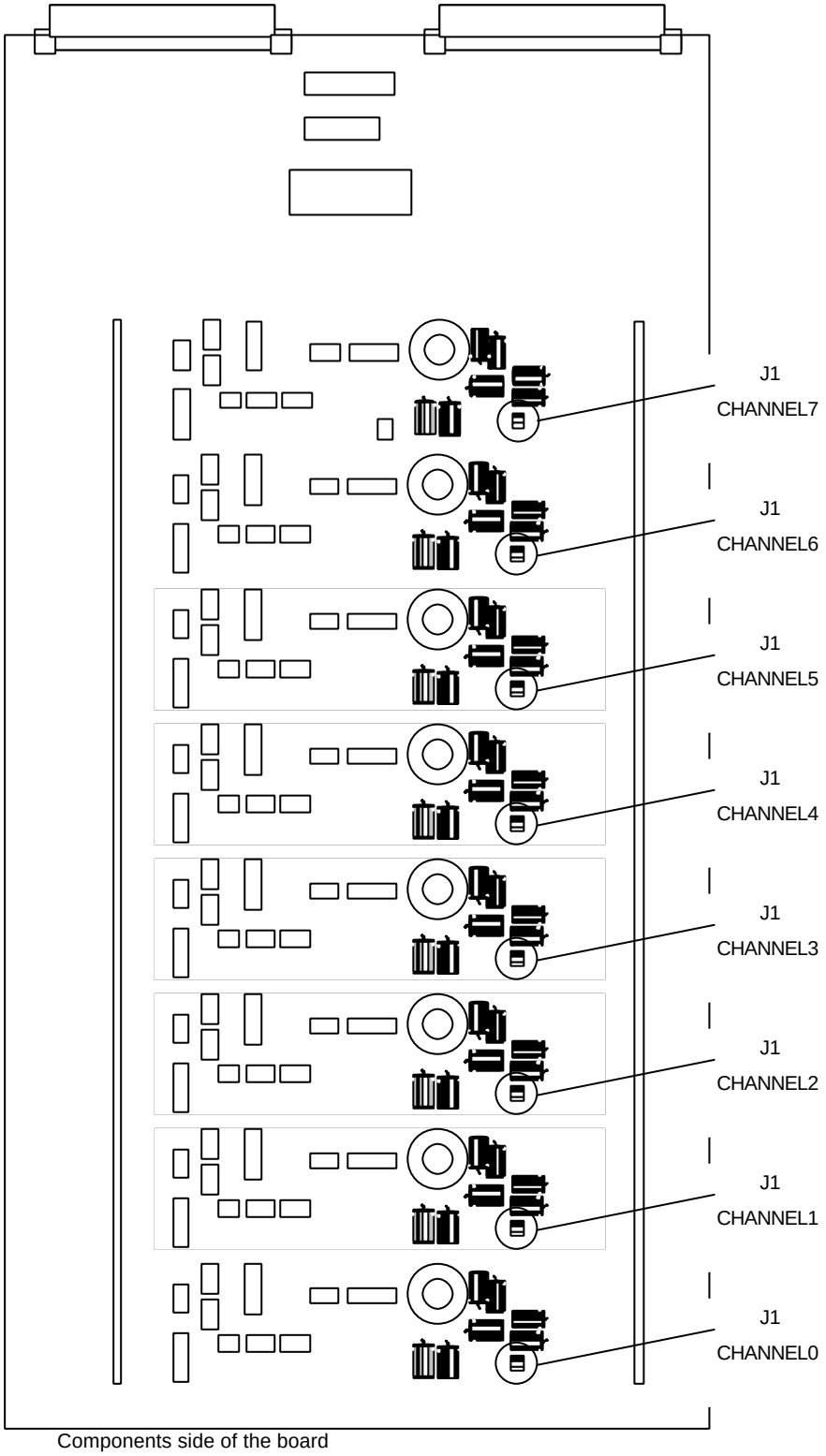


Fig. 2.14: Mod. A523 Components Locations

2.8.4. MOD. A523 CHANNEL CHARACTERISTICS

Polarity:	Floating voltages
Output Voltage:	0÷14 V
Max. Current:	1.2 A
Voltage Set/Monitor Resolution:	10 mV
Current Set/Monitor Resolution:	10 mA
VMAX hardware:	not available
VMAX software:	0÷14 V settable for each channels
VMAX software resolution:	10 mV
Ramp Down:	1÷10 Volt/sec, 1 Volt/sec step
Ramp Up:	1÷10 Volt/sec, 1 Volt/sec step
Voltage Ripple:	5 mVpp
Max. delivered power:	110 W
Max. delivered power per channel:	16.8 W
Max. internal temperature protection:	fixed (55°C)

2.8.5. MOD. A523 SENSE INPUTS

Two sense inputs (S+ and S-) per channel allows the User to obtain the correct voltage value at the load to be supplied, regardless of the line loss.

Connect each channel as shown in figure below:

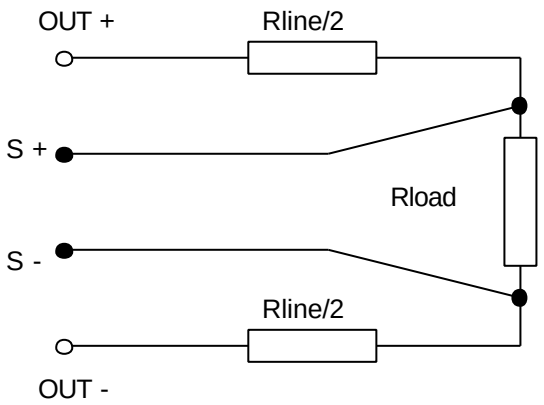


Fig. 2.15: Mod. A523 Channel Connection Diagram

2.8.6. MOD. A523 J1 SETTING

The 3-position jumper J1 allows to adjust the power consumption for each channel. The 3-positions are shown in the figure below:

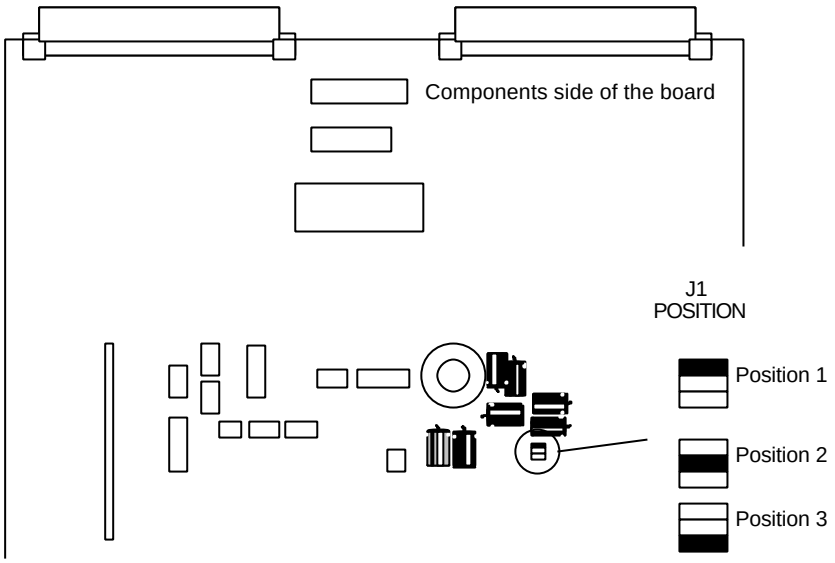


Fig. 2.16: Mod. A523 J1 Positions

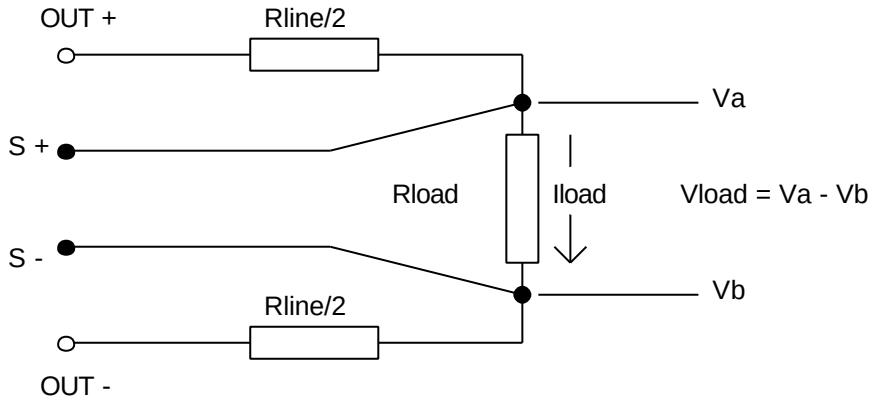


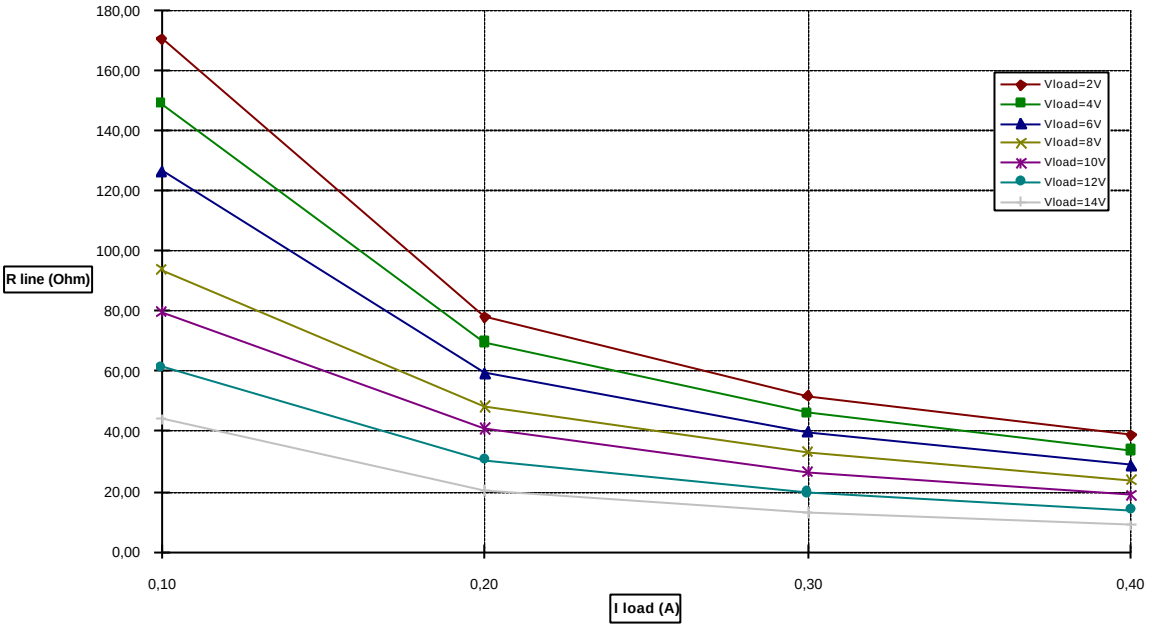
Fig. 2.17: Mod. A523 Channel Operating Parameters

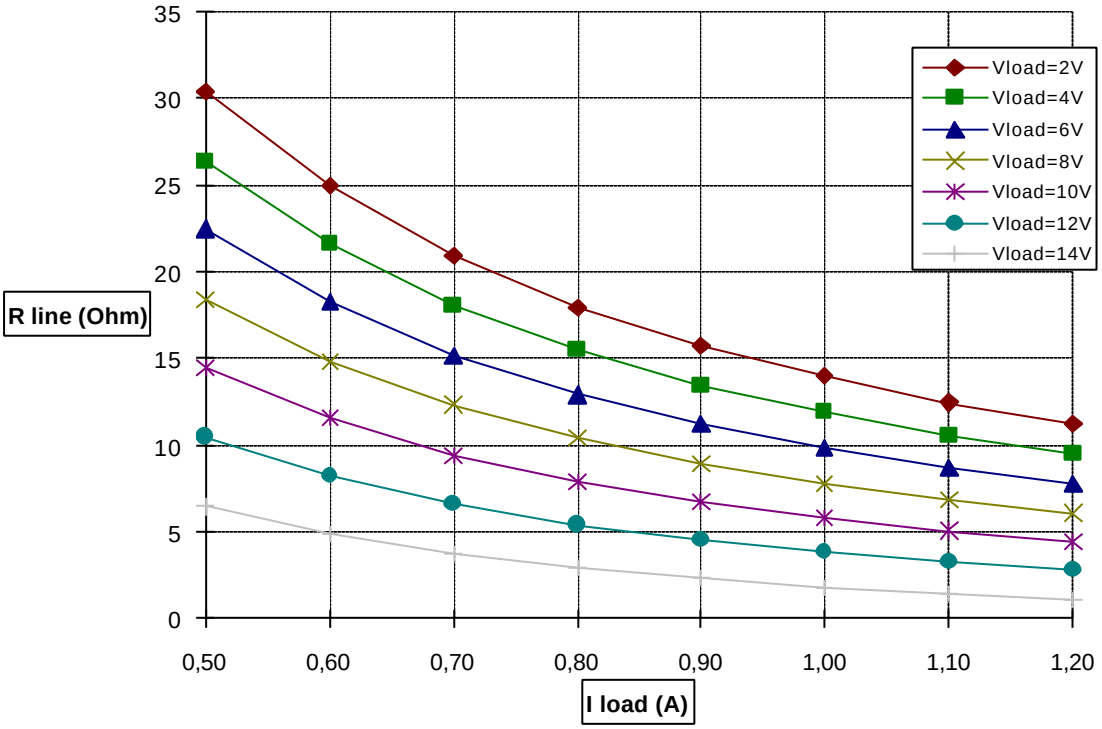
The following table shows the J1 position in function of the Vload, the Iload and the Rline:

Table 2.2: Mod. A523 J1 Jumper Position

12 V < (Vload + Rline Iload)	Position 1
6 V < (Vload + Rline Iload) < 12 V	Position 2
(Vload + Rline Iload) < 6 V	Position 3

In the following figures are shown the maximum Rline as a function of the load current, for different values of Vload (J1 set to Position 1).





This implies that the Rline value must be less than the value showed in the graphics in order to obtain the desired voltage value at the load to be supplied.

2.9. MOD. A524 FLOATING CH. BOARD (250 V, 40 mA)

The Mod. A524, 16 CHANNEL FLOATING Board (250 V, 40 μA) houses 16 Floating channels, insulated up to 500 V from the ground of the mainframe; the polarity has to be fixed by the User by wiring the channels according to the detector specifications.

Each channel is capable to generate programmable voltage values in a range from 0 to 250 V. The current reading full scale is 40 μA.

The Mod. A524 has the current hardware protection fixed to a common value for all the channels (**Board with fixed current hardware protections**).

The maximum current hardware protection value is 200 μA.

Each channel is provided with an adjustment trimmer (MAXV) for the maximum output voltage setting (VMAX hardware). Moreover, via software it is possible to set for each channel another output voltage maximum limit (VMAX software).

The output voltage is programmable from 0 to the maximum value in 40 mV steps and the ISET is programmable from 0 to the maximum in steps of 10 nA.

For each channel two LEDs have been placed on the Front Panel Board: one signals when the channel is on, the other signals when the channel output voltage has reached the VMAX hardware limit.

When a channel is OFF (LED off) the two outputs (+ and -) are connected together.

2.9.1. MOD. A524 PACKAGING

8 TE wide. Height: 6U.

2.9.2. MOD. A524 EXTERNAL COMPONENTS

CONNECTORS

- No. 1, "OUT", 37 pin female D type, for the 16x2 outputs of the Floating channels.

DISPLAYS

- No. 16, "ON 0÷15", red LEDs, signalling, when lit, that the corresponding channel is on.

- No. 16, "MAXV 0÷15" red LEDs, signalling, when lit, that the corresponding channel output voltage has reached the VMAX hardware value.

TRIMMERS

- No. 16, "MAXV", screwdriver trimmer, for the VMAX hardware setting.

2.9.3. MOD. A524 CHANNEL CHARACTERISTICS

Polarity	Floating voltages
Output Voltage:	0÷250 V
Current reading/set full scale:	40 μA
Voltage Set/Monitor Resolution:	40 mV
Current Set/Monitor Resolution:	10 nA
VMAX hardware:	0÷250 V settable for each channel
VMAX software:	0÷250 V settable for each channel
VMAX software resolution:	40 mV
Ramp Down:	1÷50 Volt/sec, 1 Volt/sec step
Ramp Up:	1÷50 Volt/sec, 1 Volt/sec step
Voltage Ripple:	10 mVpp (20 MHz bandwidth)
Max. current hardware protection:	Fixed (200 μA)

2.9.4. MOD. A524 VMAX HARDWARE SETTING

The VMAX hardware value cannot be readout via software.

Use the following procedure to set the desired VMAX Hardware limit:

1. Program the VSET greater than the VMAX hardware desired.
2. Adjust the trimmer until the VMON reaches the VMAX hardware desired.

2.9.5. MOD. A524 CURRENT PROTECTION

The Mod. A524 has the current hardware protection fixed to a common value for all the channels (**Board with fixed current hardware protections**).

The max. current hardware protection value is 200 μA, while the current reading/set full scale is 40 μA. This causes the following:

- If a channel draws a current larger than the programmed limit, it is signalled to be in "overcurrent", but the channels can draw a current larger than the ISET values.
- If a channel is in "overcurrent", the IMON parameter may be not valid, because the current reading full scale is 40 μA.

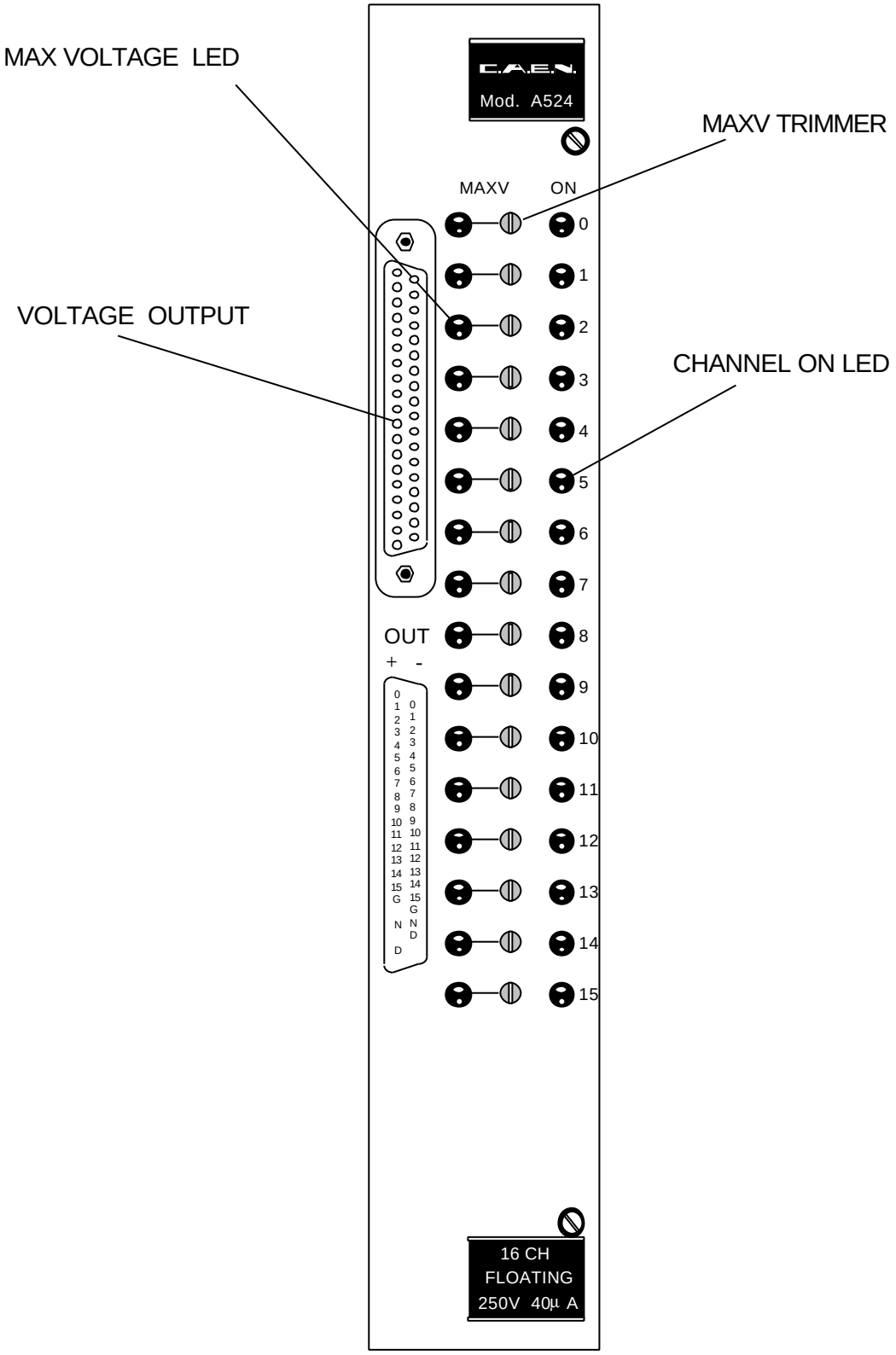


Fig. 2.18: Mod. A524 Front Panel

2.10. MOD. A525 FLOATING CH. BOARD (4 V, 3 A)

The Mod. A525, 8 CHANNEL FLOATING Board (4 V, 3 A) houses 8 Floating channels, insulated up to 500 V from the ground of the mainframe; the polarity has to be fixed by the User by wiring the channels according to the detector specifications.

Each channel is capable to generate programmable voltage values in a range from 0 to 4V. The maximum output current is 3 A.

The Mod. A525 ISET values represent a "software controlled" hardware protection on the channels' currents: the channel cannot draw a current higher than its programmed limit (**Board with programmable current hardware protections**).

Each channel is provided with two sense inputs (S+ and S-) to detect the line loss. This allows the User to obtain the desired voltage at the end of the distribution line in case of substantial distance between the unit and the load to be supplied.

A 3-position jumper allows to adjust the power consumption for each channel (see Fig. 2.14 and 2.16).

The output voltage is programmable from 0 to the maximum value in 10 mV steps and the maximum output current is programmable from 0 to the maximum in steps of 10 mA.

For each channel a LED has been placed on the Front Panel of the Board to signal when the channel is ON.

A thermostatic device inhibits the channels' operations when the internal temperature exceeds 55 °C.

When a channel is OFF (LED off) the two outputs (+ and -) are connected together.

2.10.1. MOD. A525 PACKAGING

8 TE wide. Height: 6U.

2.10.2. MOD. A525 EXTERNAL COMPONENTS

CONNECTORS

- No. 2, 37 pin female, D type, for the 8x2 outputs of the Floating channels and the 8x2 inputs of the Sense inputs.

DISPLAYS

- No. 8, "0÷7", red LEDs, signalling, when lit, that the corresponding channel is on.

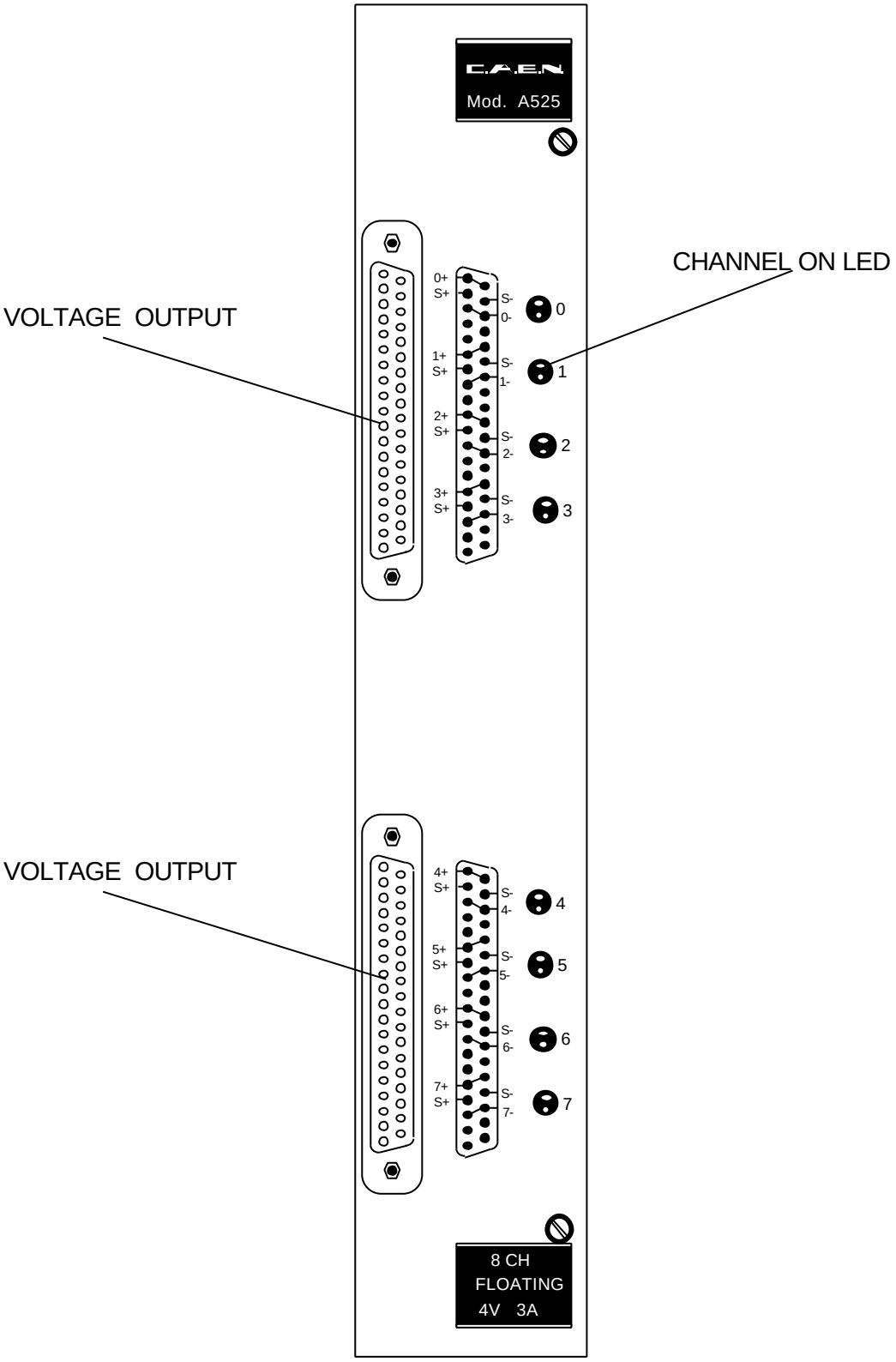


Fig. 2.19: Mod. A52 5 Front Panel

2.10.3. MOD. A525 CHANNEL CHARACTERISTICS

Polarity:	Floating voltages
Output Voltage:	0÷4 V
Max. Current:	3 A
Voltage Set/Monitor Resolution:	10 mV
Current Set/Monitor Resolution:	10 mA
VMAX hardware:	not available
VMAX software:	0÷4 V settable for each channels
VMAX software resolution:	1 V
Ramp Down:	1÷4 Volt/sec, 1 Volt/sec step
Ramp Up:	1÷4 Volt/sec, 1 Volt/sec step
Voltage Ripple:	< 5 mVpp (on 100 μF load capacitance)
Max. delivered power:	72 W (*), 60 W (**)
Max. internal temperature protection:	fixed (55°C)

(*): For 6 Active channels only (see §2.10.4).

(**): For 8 Active channels (see §2.10.4).

2.10.4. MOD. A525 SENSE INPUTS

Two sense inputs (S+ and S-) per channel allows the User to obtain the correct voltage value at the load to be supplied, regardless of the line loss.

Connect each channel as shown in figure below:

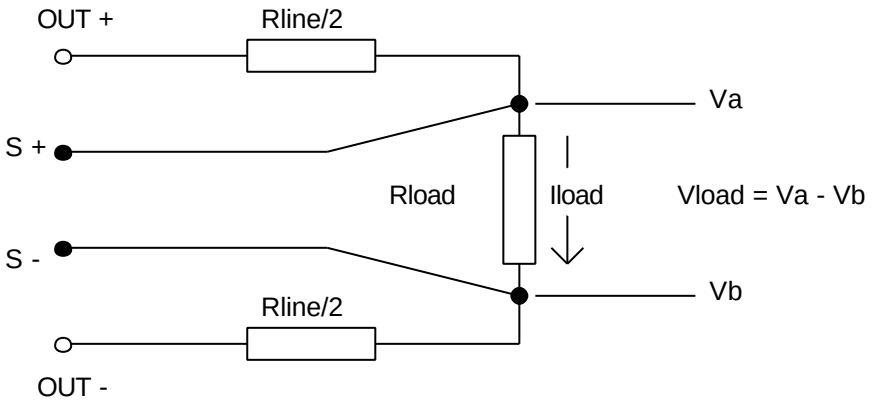
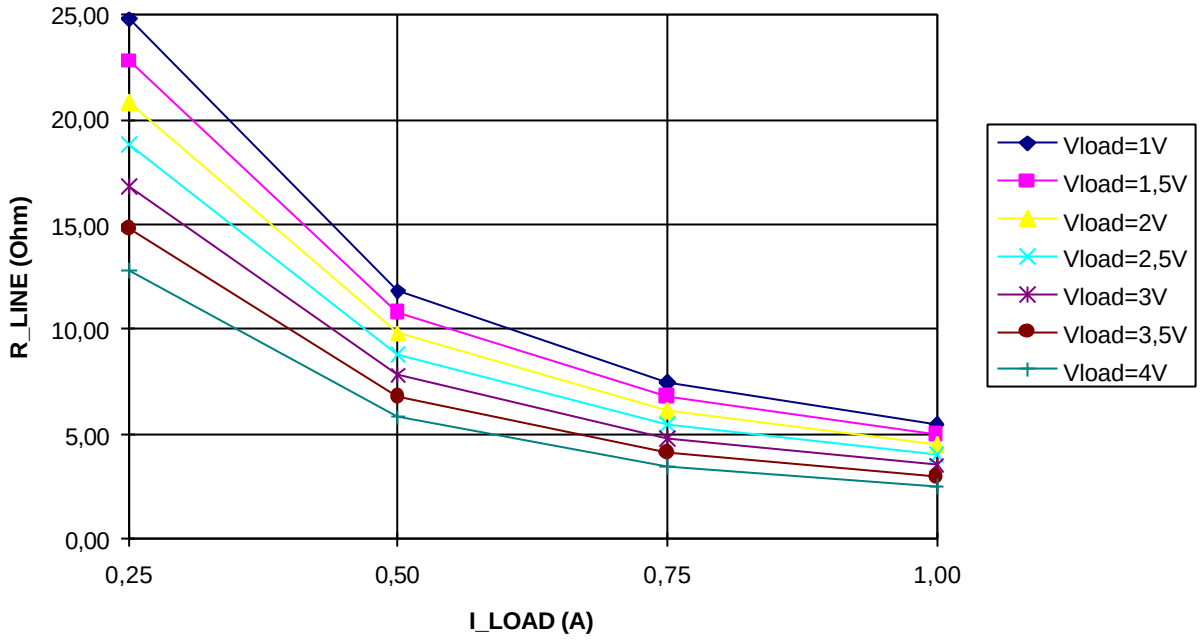
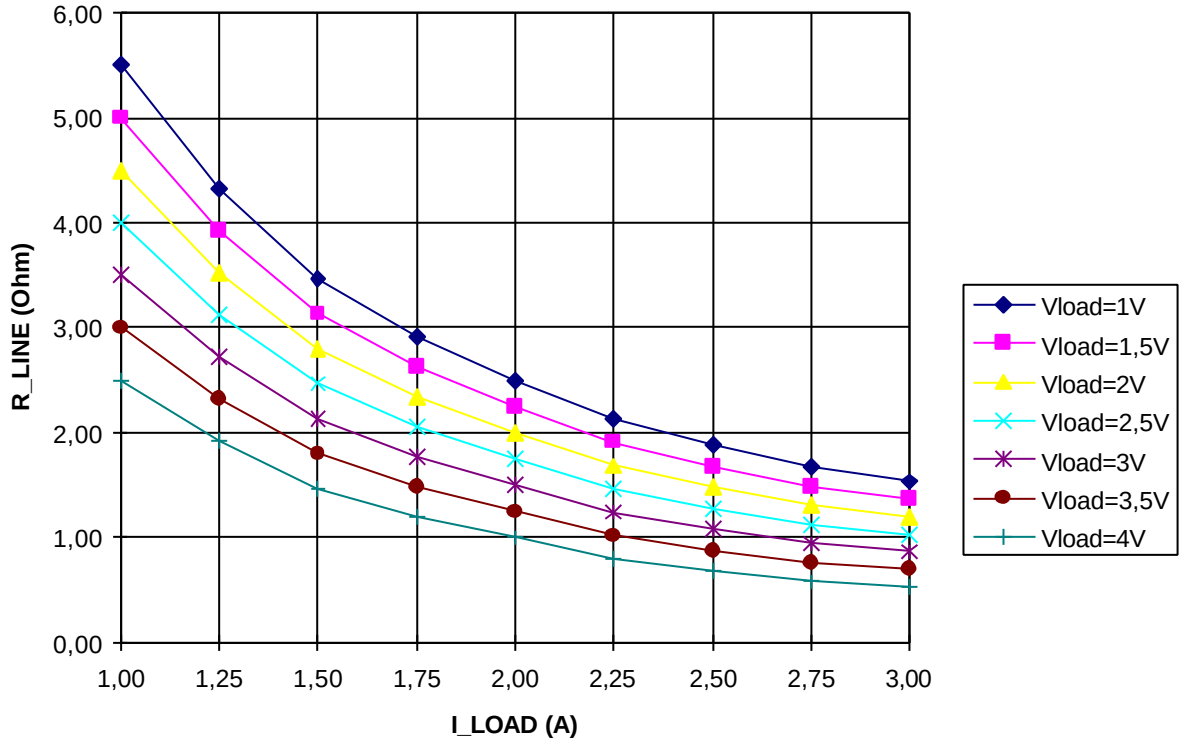


Fig. 2.20: Mod. A525 Channel Operating Parameters

In the following figures are shown the maximum Rline as a function of the load current, for different values of Vload. These diagrams allow to choose the appropriate impedance for the power cables.





This implies that the Rline value must be less than the value showed in the graphics in order to obtain the desired voltage value at the load to be supplied.

Provided that the Rline is chosen according to the previous diagrams, the power available for the load must be calculated from the following diagram. In particular, for 8 active channels (i.e. 8 completely powered channels) the power available for the load is limited to 60 W. This implies, e.g., that if the User wants to power up 8 loads at 3 V, no more than 2.5 A will be available to each load. For 6 active channels this power limit is 72 W.