



multiload

VoltMaster Intelligent Transformer

VMD series. IP20, IP66

A voltage-stabilised transformer for low-voltage light sources

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Product order codes

Single outlet

VMD300/12/SO
VMD400/12/SO
VMD400/24/SO
VMDE300/12/SO

Multi outlet

VMD300/12/MO
VMD400/12/MO
VMD400/24/MO
VMDE300/12/MO

For DSI or DALI digital:

Add suffix /DSI or /DALI
eg. VMD300/12/SO/DSI

Exterior version IP66

Add prefix EXT-
eg. EXT-VMD300/12/SO

For DSI or DALI digital:

Add suffix /DSI or /DALI
eg EXT-VMD300/12/SO/DSI

Installation

Before installation is undertaken it is imperative that the installation is designed and a wiring plan prepared with reference to the load wiring design options on pages 5–7.

The wiring plan should give VoltMaster positions, outlet numbers, cable lengths and sizes and voltage sensing point (see Sensing Connection on the following page).

Installation should be carried out by a suitably qualified person in accordance with good electrical practice and the appropriate national and local wiring regulations.

VoltMaster provides isolation to standards compatible with SELV (Safe Extra Low Voltage) lighting and is suitable for use with individual luminaires, tracks and high-wire systems.

Please note:

- 1 **Fitting cable clamps or conduit.** Remove appropriate knock-outs in the end plates before installation to enable the fitting of the cable clamps/glands or conduit. The cover must be earthed: check and, if necessary, reinstate the earthing connection before applying power. NB. Cables and clamps not provided.
- 2 **If installing in a cupboard** provide ventilation to avoid overheating. Do not mount unit on a vertical surface with the transformer below secondary outlets.

Exterior version only

Please also refer to additional instructions on page 4. These must be followed in conjunction with all other information supplied in this document.

Fault diagnosis

Please refer to page 8

Physical data

Weight: 9kg

Finish: stove enamel

Dimensions: see below

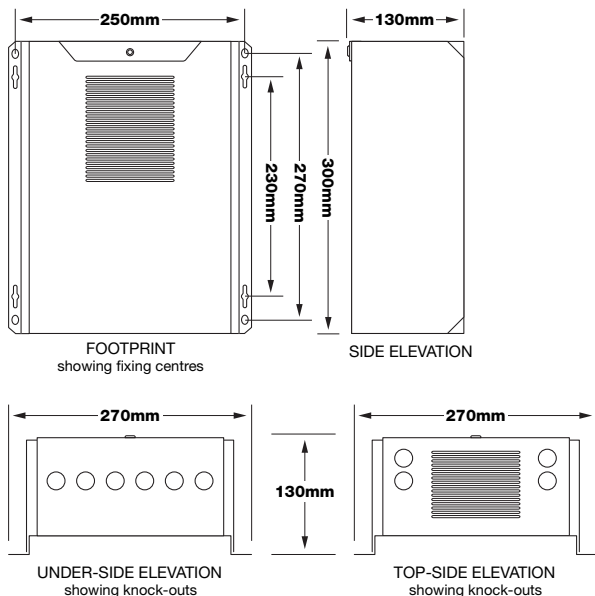


FIG 1. MULTI-OUTLET VOLTMASTER

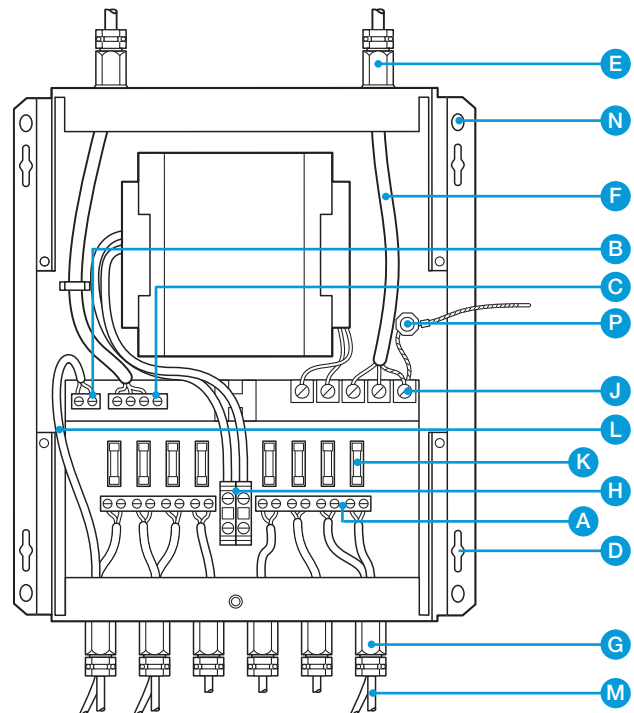
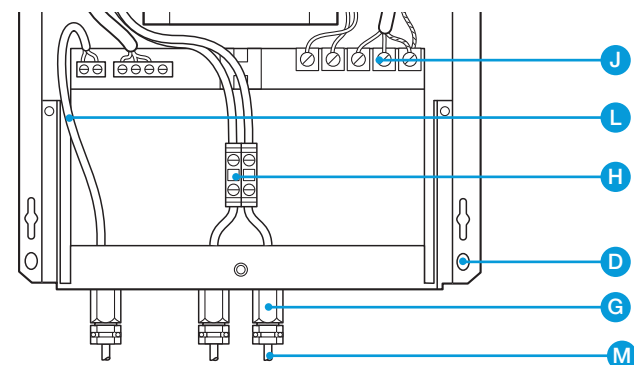


FIG 2. SINGLE-OUTLET VOLTMASTER



Key

- A **Secondary low voltage multi-outlet terminal pairs.** For one or more individual cables to single lamps. Maximum cable size 4mm²
- B **Sensing terminal pair.** If this terminal pair is not properly connected the unit will not give full brightness. See sensing connection (page 3)
- C **Dimming signal terminals**
- D **Fixing / mounting holes for secure fixing** – 4 in total.
- E **Cable clamps*** – 4 x 20mm knockouts provided
- F **Mains supply cable** – three core (live, neutral and earth)
See mains supply connection (page 3)
- G **Cable clamps*** – 12 x 20mm knockouts provided.
- H **Terminal pair for track or single outlet**
Use instead of individual multi-outlet terminal pairs (A)
Maximum cable size 10mm²
- J **Mains supply terminal block.** Mandatory earth must be connected
- K **Output fusing per individual multi-outlet terminal pair (A)**
See output fusing (page 3) for fuse function
- L **Sensing cable***
- M **Low voltage cables***
- N **Keyhole slots for initial fixing** – 4 in total
- P **Earth connection for cover**

* Not supplied with unit



Installation continued

Mains supply connection

VoltMaster must be connected to a clean unaltered mains supply and should **not** be connected to the output of mains dimmers.

Switch off mains electrical supply before commencing installation. Feed mains supply cable through cable clamp and connect wires into respective terminals in terminal block (Fig.1:J). VoltMaster must be earthed. To ensure the mains cable does not touch the transformer, avoid excessive cable inside VoltMaster.

Mains fusing: VoltMaster is protected by a (F) HRC fuse. This is not a customer-replaceable fuse and should not blow in normal circumstances. Should this happen, contact Multiload.

Output connection

Total loading

The unit will control any load from 30W up to a total maximum equal to the unit rating: 300W for the VMD300/12 and VMDE300/12 and 400W for the VMD400/12 and VMD400/24.

Overall outlet to track, high wire or distribution box

Lamps up to the total max unit rating may be connected to the track, high wire or distribution box. Track is connected to the large terminal block (Fig.1:H, Fig 2:H) – which accepts up to 10mm² cable.

Standard multi-outlet to individual light fittings

Lamps are individually wired back to the individual multi-outlet terminal pairs (Fig.1:A). Each individual terminal pair will accept a single cable of up to 4mm². Thicker cable or multiple cables could be terminated into suitable pin or blade crimps or junction box to facilitate connection to the terminal pair.

The connection to individual terminal pairs on either side of the large green terminal should be balanced as equally as possible: in any case no more than 225W on any one side.

Cable connection

Feed the necessary cables to the luminaire(s) through the cable clamps if used. Securely connect cable(s) to appropriate terminal pairs (Fig.1:A/H). Tighten the cable clamps.

Output fusing

VoltMaster is supplied fitted with quick acting (ceramic) F10A fuses (max 75W per terminal pair) (Fig.1:K).

Fuse replacement

Accepts 11/4 ins x 1/4 ins size '0' or 20mm x 5mm fuses.

- 1 Ensure mains supply is switched off.
- 2 When removing fuse do not over-stress or deform clip contacts.
- 3 Ensure fuse caps and clip contacts are clean (avoid handling).
- 4 Locate fuse centrally in contacts before inserting.

Dimming connection

VoltMaster dims the brightness of the lamps according to the level of the 0-10V analogue signal. This reduced brightness is accurately stabilised against mains voltage and load variations even at lowest brightness levels.

Where dimming is not required, leaving the dimming terminals unconnected will deliver optimum maximum voltage to lamps.

Control by signalling system (0-10V or 1-10V)

The analogue signal is connected to the terminals (Fig.1:C)

C1=0V (negative) and

C4=signal (positive): maximum cable size 2.5mm².

In line with the industry standard, VoltMaster requires sink current capability from the control system. VoltMaster reverts to full brightness on signal disconnection.

Control by digital signalling (DSI or DALI)

The digital signal is connected to the input terminals on the DSI or DALI interface situated within the unit.

Manual control

VoltMaster can be controlled by any Multiload RPS3 rotary control module, which connects to terminals **C1 C2 C3** (Fig.1:C). Maximum cable size 2.5mm². Several VoltMasters may be connected to a single module.

Sensing connection

It is imperative that the sensing cable (Fig.1:L) is connected on installation. Failure to connect this cable will cause the unit to deliver a reduced fixed secondary voltage to the luminaires.

Connect cable (Fig.1:L) into voltage sensing terminals (B) and the other end to the voltage sensing point. The sensing cable carries 11.8V (23.6V) RMS and hardly any current.

For multi-outlet, we recommend the sensing cable should be a min of 1mm² (min 10A rating). The exact length is unimportant.

When the sensing cable is connected to a track, or similar, fed from the large terminals (Fig.1:H or Fig.2:H) we recommend sensing cables should be minimum 1.5mm². Thinner cable can be used if suitably protected at the voltage sensing point.

Short circuit protection

Single outlet to track, high-wire system or distribution box (Fig.2:H). If a short circuit occurs on the output circuit VoltMaster will shut down to almost zero voltage; monitor output circuit continuously; restart 10-15 seconds after the short has been corrected.

Each individual multi-outlet terminal pair (Fig1:A) is protected by a 10A (F) fuse. If a short circuit occurs on one of the outlets, either the fuse will blow immediately or VoltMaster will shut down for 10-15 secs and then restart. If shutting down the fuse will blow in the process which allows the remaining outlets to resume operation.

Overload protection

If unit is overloaded it will shut down for approx 15 secs, and then gradually ramp the lamps up towards the set brightness. If the overload persists this cycle will be repeated until the overload is removed. Normal operation will then be automatically resumed.



Additional instructions for exterior version

Siting

Care should be taken that the site for mounting VoltMaster is consistent with the IP rating of the product. Correct installation is vital to preserve the IP66 protection.

Cable entry

Holes should be positioned in the enclosure base for convenient cable entry, suitably spaced to avoid internal mouldings. Be aware that the orientation of the surface when installed may affect the IP rating required for the cable gland. Holes should be drilled with an arbor hole saw or similar to suit the specified gland.

IP rating

Integrated top and bottom moulded canopies give IP66 protection when vertically mounted. Electronic components have been conformally coated to provide a barrier against moisture ingress.

Mounting

Rubber washers and plastic screw caps are supplied for mounting onto an even surface from inside the enclosure.

To ensure IP66 protection these must be fitted correctly. If mounting onto an uneven surface use stand-off mounting brackets.

Plastic mounting brackets are available from Sarel in packs of four (order code 51299). If fixing onto a post, use post-mounting brackets. These are also available from Sarel in packs of two (order code 21427).

Mains supply connection

See page 3

Mains fusing

See page 3

Enclosure

Enclosure material: Recyclable glass-reinforced polyester (GRP); self-extinguishing thermoplastic. Resistant to corrosion, most chemical agents and UV rays

Insulation class: Double insulation enclosure (Class II)

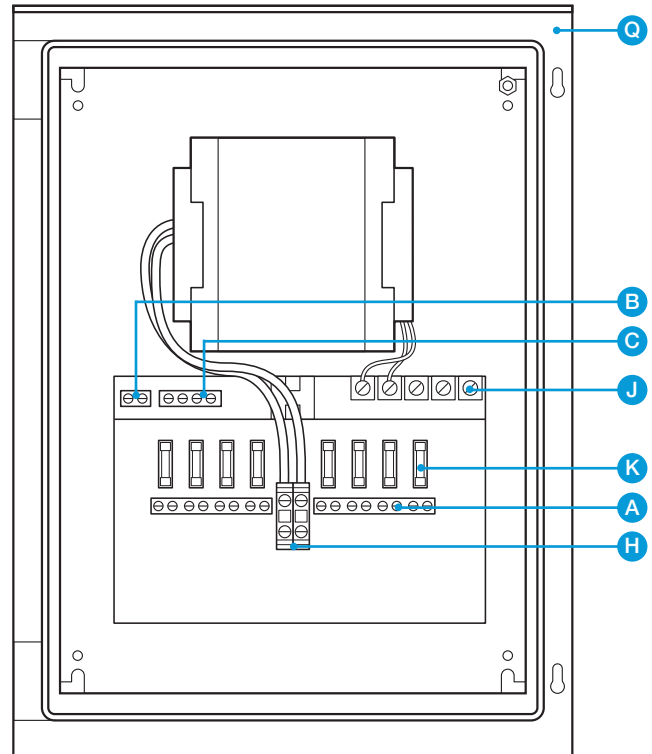
Durability: Resistance to impact 20 joules

Weight: 15kg

Finish: Smooth gloss finish RAL7032

Dimensions: H430mm; W330mm; D200mm

FIG 3. EXTERIOR VOLTMASTER



Key

- A Secondary low voltage multi-outlet terminal pairs.** For one or more individual cables to single lamps. Maximum cable size 4mm²
- B Sensing terminal pair.** If this terminal pair is not properly connected the unit will not give full brightness. See sensing connection, page 3
- H Terminal pair for track or single outlet.** Use instead of individual terminal pairs (A). Maximum cable size 10mm²
- J Mains supply terminal block.** Mandatory earth must be connected
- K Output fusing per individual multi-outlet terminal pair (A):** See output fusing, page 3, for fuse function
- C Dimming signal terminals**
- Q Enclosure**



Load wiring design – general

Load wiring design is applicable to both interior (IP20) and exterior (IP66) versions of VoltMaster.

Sensor wire and voltage sensing point

VoltMaster has a unique sensor wire which runs alongside the low voltage supply cable to the lamps. At the point where the end of this cable is attached (the voltage sensing point) voltage is maintained at 11.8V RMS (12V version) and 23.6V (24V version).

For correct operation the sensor wire MUST be connected.

Cable size and volt drop

The high current required by low voltage lamps causes significant volt drop down the low voltage supply cable. In other systems, large cable must be used to keep this volt drop low since it reduces as lamps blow, thereby overvolting the remaining lamps and causing cascade failure.

VoltMaster enables more cost-effective cable sizing. The volt drop may be substantially increased because VoltMaster automatically compensates for the drop, however many lamps are operating.

Maximum volt drop

VoltMaster caters for a **maximum volt drop** between VoltMaster and the **voltage sensing point** (usually at the nearest lamp or at the supply terminals of track, high-wire or distribution box).

Load wiring design must observe the following max cable volt drop:

VMD300/12	3V
VMDE300/12	7V
VMD400/12	3V
VMD400/24	6V

Tolerance volt drop

For ease of installation and without affecting visual quality, the stabilised voltage on the more distant lamps can deviate slightly from the 11.8V (23.6V) set at the voltage sensing point. The maximum deviation permitted (tolerance volt drop) is 0.4V (0.8V). All lamps will then receive between 11.4V (22.8V) and 11.8V (23.6V).

Maximum cable length and tolerance length

The two wiring configurations (on pages 6 and 7) show:

- Maximum individual cable length to the nearest single lamp holder with the additional tolerance length to the other holders (corresponding to the 0.4V tolerance drop)
- Maximum overall cable length to track (corresponding to volt drops given above)

For other configurations, and to reduce installation costs, VoltMaster allows mixed cabling. For the calculations, use the **general formula** (opposite).

General formula

volt drop = length x current x unit drop

where:

length is single distance along cable in metres

current is total current in cable found by summing individual lamp currents (Tables 1 and 2) for all lamps supplied by that cable

unit drop is volt drop per amp per metre for that cable (Table 3)

**TABLE 1
Lamp current 12V**

Lamp wattage	Lamp current
20W	1.67A
35W	2.92A
50W	4.17A
75W	6.25A
100W	8.34A

**TABLE 2
Lamp current 24V**

Lamp wattage	Lamp current
50W	2.08A
100W	4.16A
150W	6.24A

**TABLE 3
Unit volt drop per cable size**

Cable size	Unit drop V / A / M
1.0mm ²	0.042
1.5mm ²	0.028
2.5mm ²	0.017
4.0mm ²	0.011
6.0mm ²	0.0071
10.0mm ²	0.0042



Load wiring design – multi-outlet

TABLE 4
Maximum length and tolerance length to lamps

Cable size	50W max. length	tol. length	100W max. length	tol. length	150W max. length	tol. length
12V standard						
1.0mm ²	13.5	2.25	19.5	3.25	34.0	5.5
1.5mm ²	20.5	3.5	29.5	5.0	51.5	8.5
2.5mm ²	34.5	5.5	48.5	8.0	84.5	14.0
4.0mm ²	52.5	8.5	74.5	12.5	131.0	22.0
24V standard						
1.0mm ²	54.0	9.0	27.0	4.5	18.0	3.0
1.5mm ²	82.0	14.0	41.0	7.0	27.0	4.5
2.5mm ²	138.0	22.0	69.0	11.0	46.0	7.0
4.0mm ²	210.0	34.0	105.0	17.05	70.0	11.0
12V non-standard with extended cable runs						
1.0mm ²	31.0	2.25	45.0	3.25	79.0	5.5
1.5mm ²	47.0	3.5	68.0	5.0	120.0	8.5
2.5mm ²	80.0	5.5	113.0	8.0	197.0	14.0
4.0mm ²	121.0	8.5	173.0	12.5	305.0	22.0

For design assistance
contact Multiload +44 (0)20 7794 9152

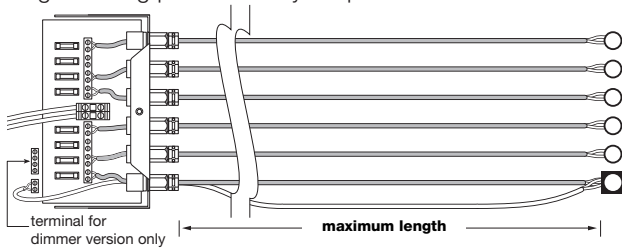
NB. All wiring configurations shown with six lamps only

Distribute loads as evenly as possible on each side of distribution outlet board

For wiring arrangements other than those specified here please check with manufacturer to ensure acceptable voltage to lamps under all conditions

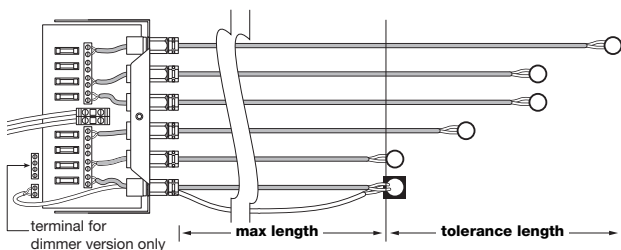
EXAMPLE 1
Multi-outlet installation using individual cables of equal diameter and the same length to lamps of equal wattage

Voltage sensing point is at any lamp



EXAMPLE 2
Multi-outlet installation using individual cables of equal diameter, but different lengths to lamps of equal wattage

Voltage sensing point is at nearest lamp

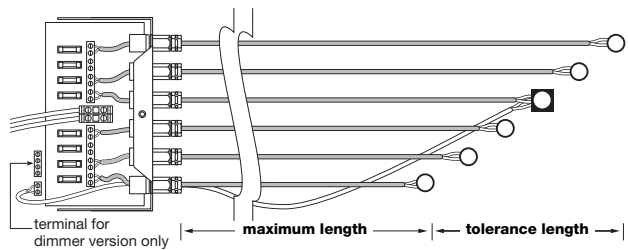


EXAMPLE 3
Multi-outlet installation using individual cables of different diameters to lamps of different wattages

When lamp distances or wattages are substantially unequal, cables of different diameters may be used:

- 1 For each lamp measure **cable length** required and using Tables 1 and 2, read off lamp **current** for the particular wattage
- 2 Using these values, and the **unit drops** from Table 3 for each available cable size, calculate **volt drop** using **general formula** (page 5)
- 3 Choose a cable size for each lamp such that all resulting volt drops are within 0.4V of each other, with the largest drop less than 7.4V
- 4 Designate the **voltage sensing point** at the lamp with the lowest drop, irrespective of distance or wattage

To cater for multi-outlet installations (individual wiring to each lamp) where distances are much greater than tolerance distances shown in Table 2, it may be necessary to snag cables or use different size cables.





Load wiring design – single overall outlet

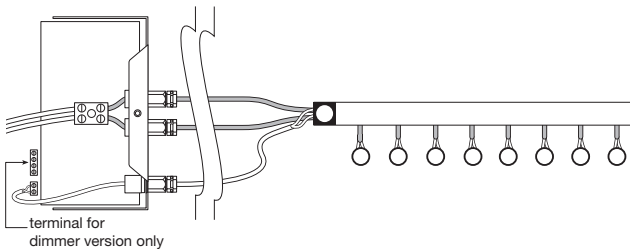
TABLE 5
Single overall outlet:
Maximum overall cable length to track or high wire

Cable size	Maximum length	
	300W load	400W load
12V standard		
4mm ²	10m	7.5m
6mm ²	16m	12m
10mm ²	28m	21m
24V standard		
4mm ²	40m	30m
6mm ²	64m	48m
10mm ²	112m	84m
12V non-standard with extended cable runs		
4mm ²	23m	
6mm ²	37m	
10mm ²	65m	

For design assistance contact Multiload
 mail@multiload.co.uk

EXAMPLE 4
Single overall cable to track or high-wire system

Voltage sensing point is at track or other supply terminals



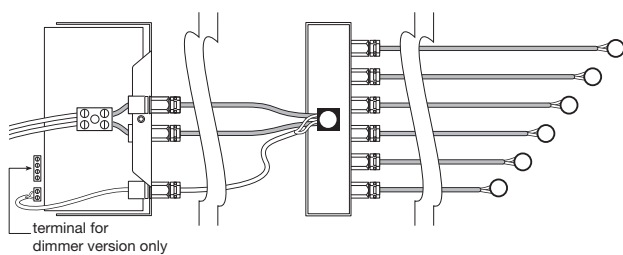
EXAMPLE 5
Overall outlet to distribution box with lamps close by

Overall cable length from VoltMaster to distribution box: up to maximum overall cable length (Table 5 above).

Individual cable lengths from distribution box to lamps: up to tolerance length for relevant lamp wattage and cable size (Table 4, page 6).

NB. For larger distances thicker cable may be used as necessary.

Voltage sensing point is at distribution box



EXAMPLE 6
Overall outlet to distribution box with distant lamps

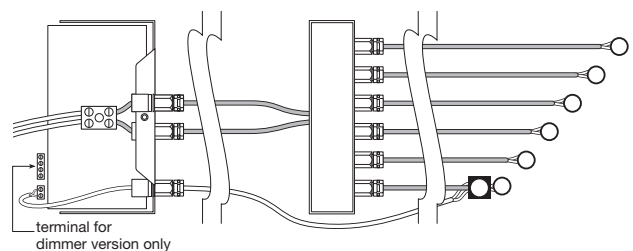
In many installations the full benefits of increased lamp distance and separation are achieved by using longer individual cables from the distribution box to the lamps.

In this case, volt drop to lamps is split between the single overall cable to the distribution box and individual cables to the lamps. The **total** volt drop to each lamp is **overall cable volt drop + individual cable volt drop**. These are calculated separately by using the **general formula** (page 5) based on the current carried by the relevant cable.

- 1 Individual cables with equal diameter and lamp wattage**
 Voltage sensing point at nearest lamp (total volt drop <7V), permitted extra length to other lamps within tolerance length
- 2 Individual cables with different diameters to cope with very different distances (or wattages).** Voltage sensing point is at lamp with lowest total volt drop and all other volt drops must be no more than 0.4V greater (0.8V / 24V). See example 3 (page 6) for a similar situation where the wiring is directly from VoltMaster without a junction box

To cater for multi-outlet installations (individual wiring to each lamp) where distances are much greater than tolerance distances shown in Table 4, it may be necessary to snag cables or use different size cables.

Voltage sensing point is at nearest lamp





Technical specification and fault diagnosis

Technical specification covers both interior (IP20) and exterior (IP66) versions of VoltMaster

Condition/feature	Requirement R / Capability C	Parameter	Value/units	Type/comment
Electrical supply (mains input)	R Regular sine wave Frequency	Voltage 48-62Hz	207-265V	Mandatory earth must be connected.
Mains supply termination	R L, N, $\underline{\underline{\text{PE}}}$	Cable size (Mandatory earth)	2x2.5mm ² acceptance	3-way terminal block 2 x 20mm knockout provided
Mains safety fusing	R Not customer-replaceable	Rating	5A	Fast ceramic 5 x 20mm
Ambient conditions	R Non-condensing IP rating: interior version IP rating: exterior version	Temperature	0-45°C IP20 IP66	For all interior and exterior versions
Output	C Isolated SELV-compatible	Nominal voltage Max. load (nominal) Min. load	12V 24V 300W 400W 30W	12V versions (interior and exterior) 24V versions (interior and exterior) 300W version only 400W version only Ensures correct operation
Voltage sensing	R 2-wire cable must be connected to track/lamp fitting Sensing cable terminal x 2	Min. cable size to track Min. cable size to fused fitting Cable size acceptance	1.5mm ² 1mm ² 2.5mm ²	If sensing cable not connected output freezes at approx half brightness Use load knockout
Dimming	R Dimming signal terminal	Cable size acceptance	2.5mm ²	Analogue signal: C1: 0V and C4: 0-10V C1, C2, C3 potentiometer connect
SoftStart	C increases output slowly from zero	Ramp up time to max	3 sec	100% effective
Overload protection	C Trips and reduces output quickly to zero	Trip threshold	110%	ie. trips when overloaded by approx 10% of rated full load
Short circuit protection	C Trips and reduces output quickly to zero	Response time	<50ms	100% effective
Recovery after protection trip	C Soft starts after approx. 10 second delay	Total time to recovery	15sec	If the fault persists, the output continually ramps up to a level which operates the trip again
Multi-outlet units only Output terminations. Total lamp wattage up to max load rating	C 8 x fused terminal pairs for individually wired lamp fittings	Cable size acceptance Max watts per terminal pair	4mm ² 75W 150W	12V versions 24V versions
Single-outlet units only Output terminations	C Large green Terminal pair for track	Cable size acceptance	10mm ²	Total lamp wattage up to maximum load rating
Multi-outlet units only Output terminations	One per fused terminal pair	As fitted	10A	Glass quick-acting 5 x 20mm

Fault diagnosis

Output showing approx 7V (14V) RMS (reduced brightness)

Check that sensing connection is made.

Lamps receiving more than 11.8V (23.6V) RMS

Check that sensing cable is connected to correct voltage sensing point.

Lamps appear off

Check mains supply to unit.

Check for output short circuit. Disconnect output connections in turn until lamps re-light.

Remove short circuit on relevant load before reconnection. Remove sensor cable to check for short circuits on sensor cable. If lamps do not light at all, contact Multiload.

Lamps at very dim level

Check dimming signal. Disconnect all connections to C1 C2 C3 C4 (Fig 1:C). If sensing cable is still connected then lamps should show full brightness. Reconnect correct dimming signal.

Lamps continually tripping off and slowly ramping up after approx 15 secs

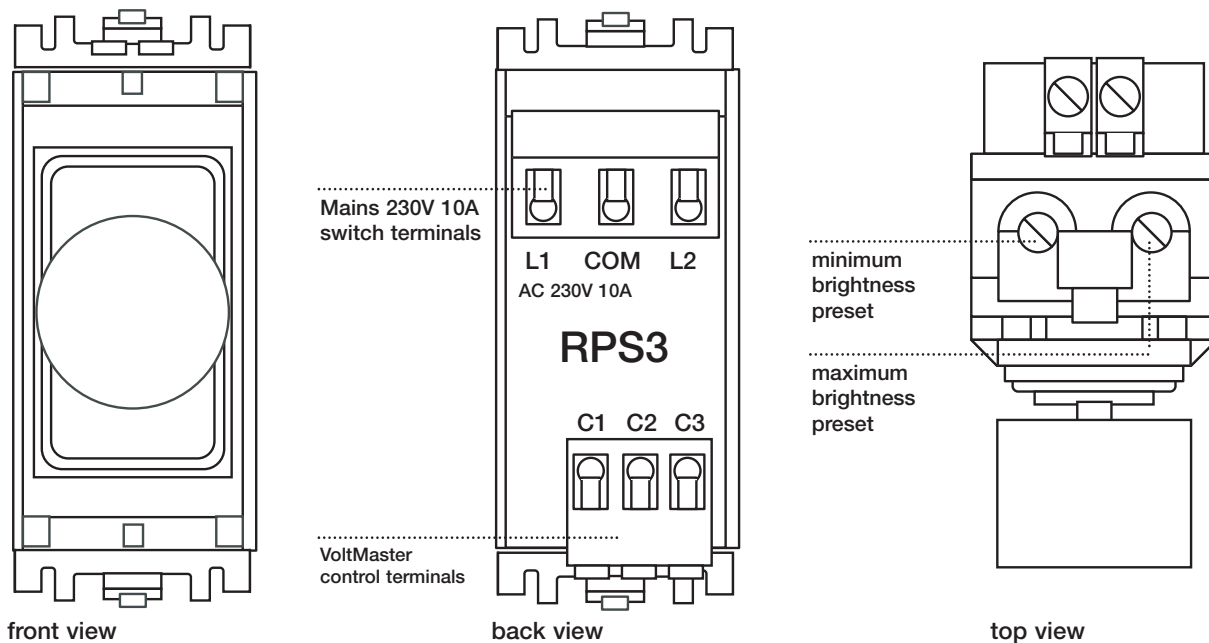
Check for overload, check lamp wattages and number of lamps connected.

Standards

VoltMaster conforms to the following standards for EMC: BSEN55103-1, BSEN55022 Class B, BSEN55103-2, BSEN61000-4-2, BSEN61000-4-3, BSEN61000-4-4, BSEN61000-4-5, BSEN61000-4-6, BSEN61000-4-11, following the provisions of EU EMC Directive/s 89-336-EEC and 92-31-EEC. The applicable safety standard is BSEN61558-2-6, following the Principal Elements of the Safety Objectives of the Low Voltage Directive 72-23-EEC.



VoltMaster rotary control RPS3



Modules can be supplied to fit wall plates and grid systems from UK wall-plate manufacturers. Contact Multiload on +44 (0)20 7794 9152 to ensure compatibility with specified plate type and finish. Shown above is module supplied for fitting into MKGridPlus.

Technical specification

Mains voltage

AC 230V +/- 10% (protect by 10A MCB)

Mains output

Switched mains output L1, COM, L2 – 3-wire terminal for change-over switching

Signal output

VoltMaster DC (signal will drive up to 20 VoltMasters)

Mains switching

10A (resistive). The number of VoltMasters that can be switched is 4 units – up to a total maximum of 10A. For higher loads a standard, suitably-rated lighting contactor may be incorporated into the circuit.

Dimensions

MK module: L:50mm W:25mm D:30mm
Knob Diam: 20mm H:13mm
Fixing: Bush M10 Shaft:6mm

Environmental specification

Temperature range

-10°C – +50°C

Maximum humidity

Less than 95% non-condensing

Installation and set up procedure

This should be wired in with reference to the wiring diagrams on pages 11 and 12

Terminals C1 (0V) C2 (+ve 0-10V) C3 (+VE)

Low voltage 3-wire DC analogue control by rotation of the control knob.

Mains switching multi-way

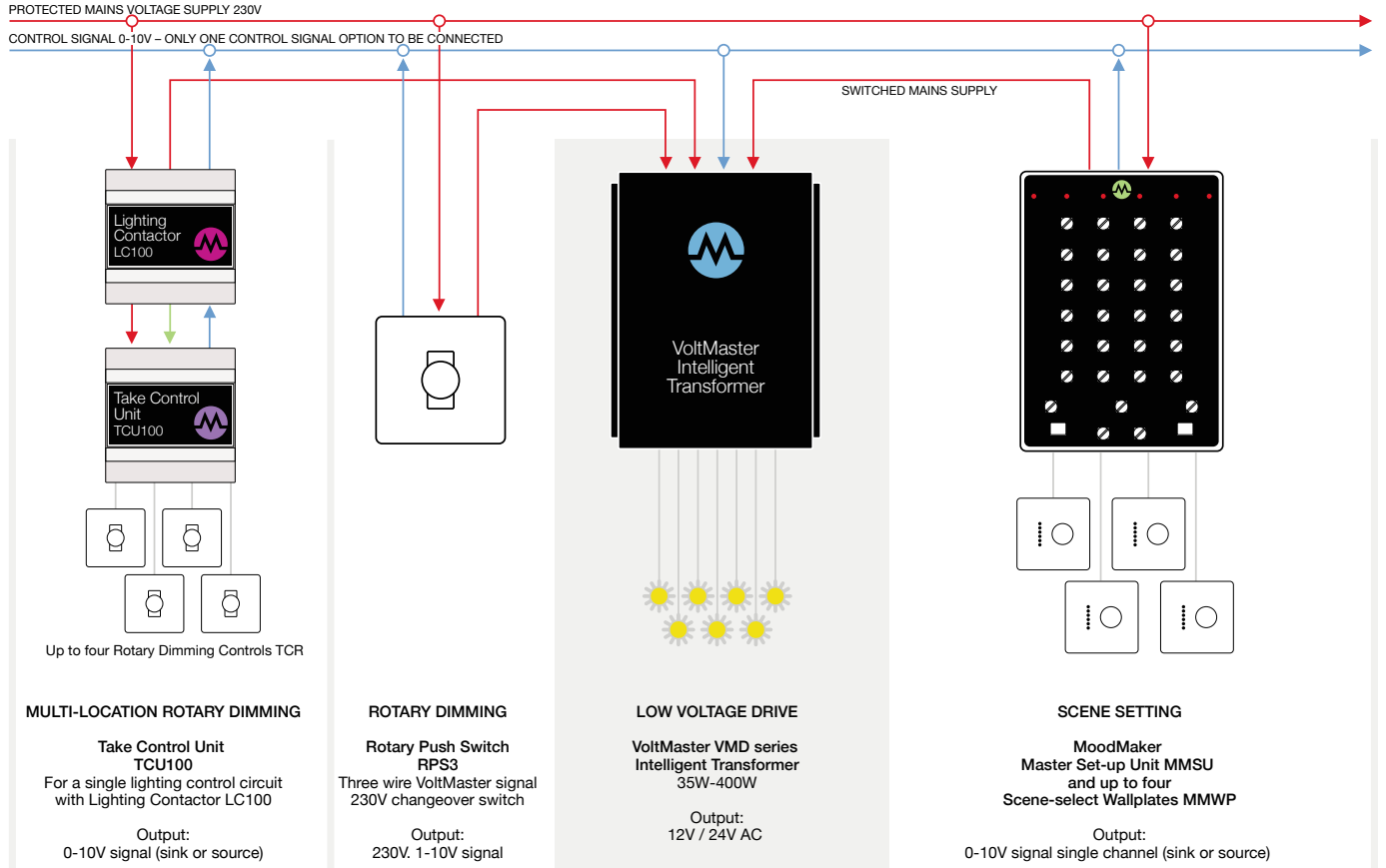
Provides 'on'/'off' switching of mains power (2-core mains cable + earth if required) or changeover switching (3-core mains cable + earth if required) for 2-way mains switching.

Setting minimum and maximum brightness

Presets set the dimming range covered by the rotary control. Set the minimum preset first: setting the maximum will not affect minimum setting.

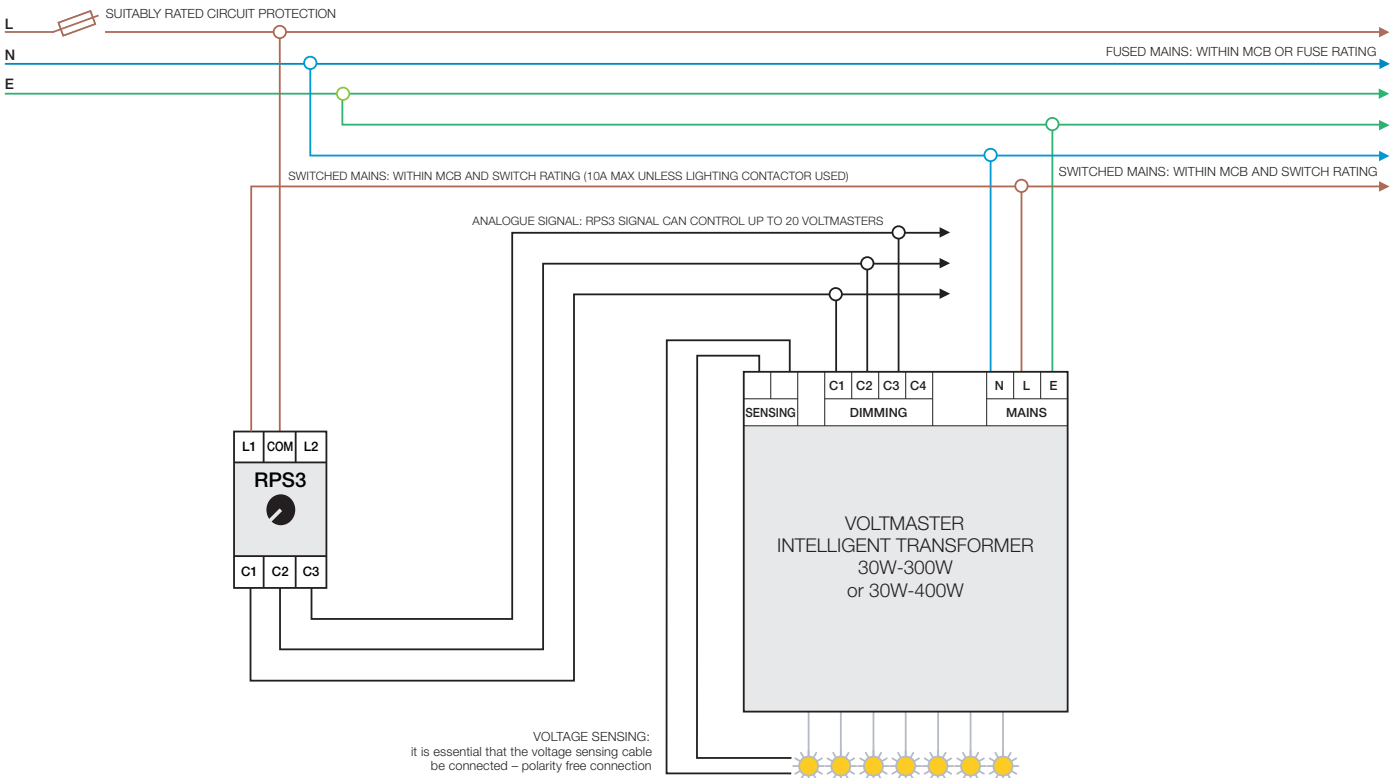


VoltMaster. Related product options



VoltMaster wired to RPS3 with mains switching

VoltMaster is shown with wiring from individual fused terminal pairs (A) to separate lamp holders with cables of same length. For wiring with cables of different lengths or single outlet versions see load wiring design, pages 5-7.

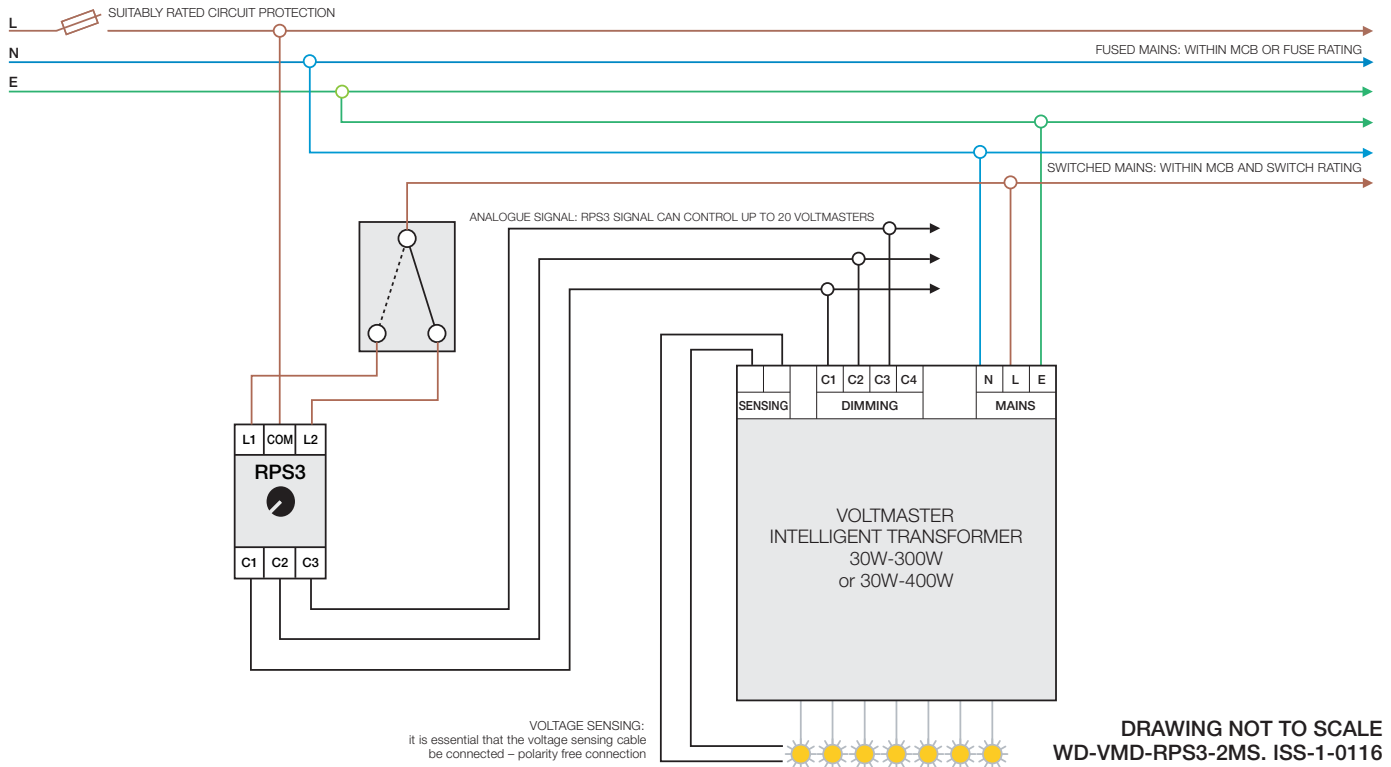


DRAWING NOT TO SCALE WD-VMD-RPS3-MS. ISS-1-0116



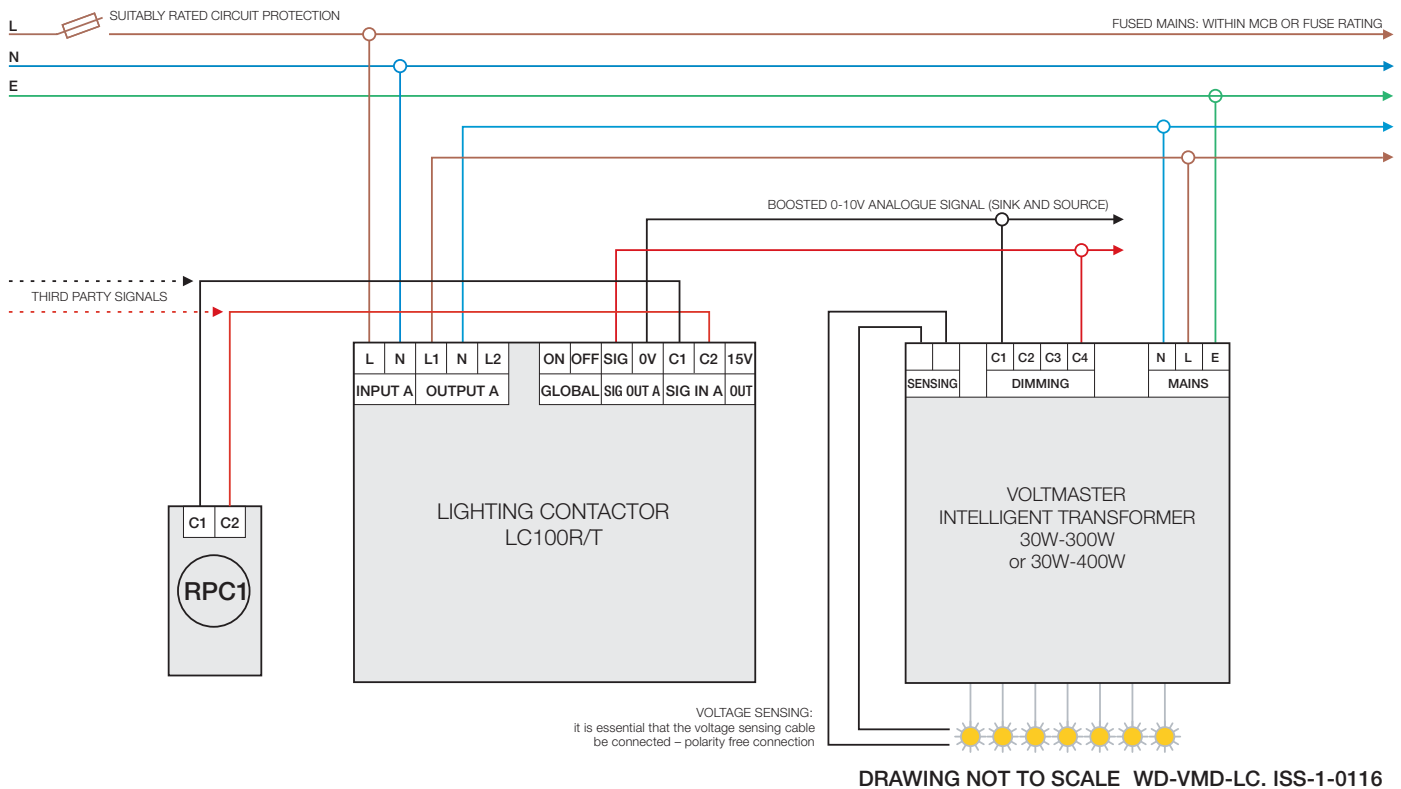
VoltMaster wired to RPS3 with 2-way mains switching

VoltMaster is shown with wiring from individual fused terminal pairs (A) to separate lamp holders with cables of same length. For wiring with cables of different lengths or single outlet versions see Load wiring design, pages 5-7.



VoltMaster wired to Lighting Contactor LC100 with RPC

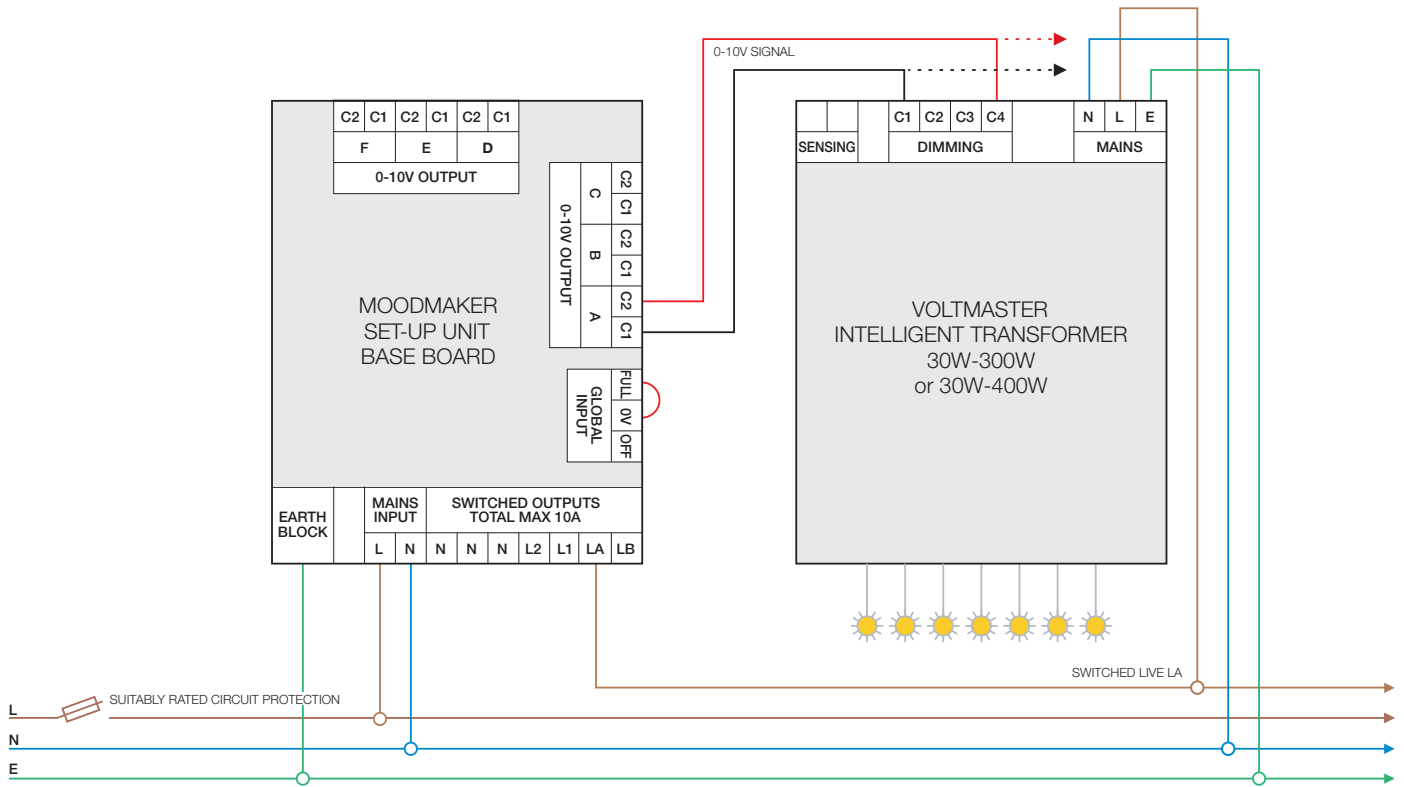
VoltMaster is shown with wiring from individual fused terminal pairs (A) to separate lamp holders with cables of same length. For wiring with cables of different lengths or single outlet versions see Load wiring design, pages 5-7.





VoltMaster wired to MoodMaker

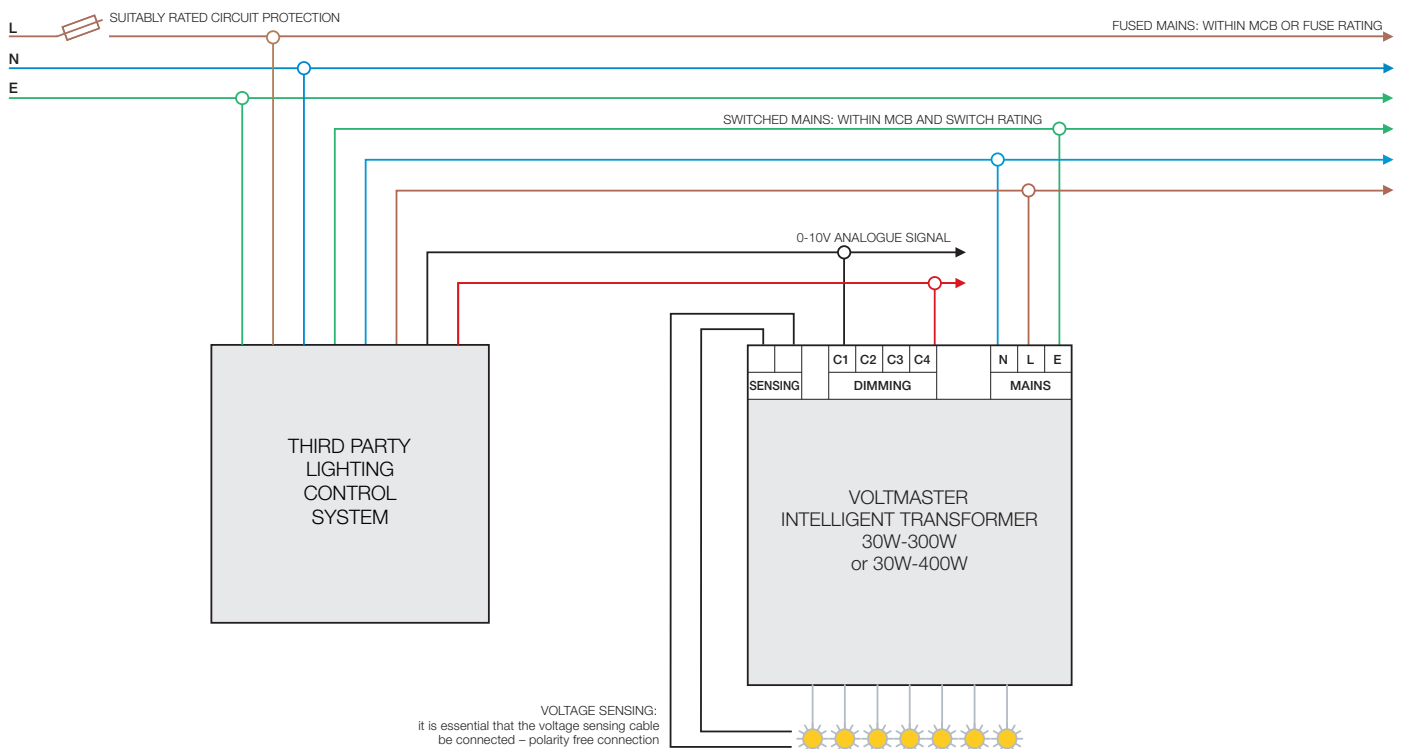
VoltMaster is shown with wiring from individual fused terminal pairs (A) to separate lamp holders with cables of same length. For wiring with cables of different lengths or single outlet versions see Load wiring design, pages 5–7.



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VoltMaster wired to by third party lighting control system

VoltMaster is shown with wiring from individual fused terminal pairs (A) to separate lamp holders with cables of same length. For wiring with cables of different lengths or single outlet versions see Load wiring design, pages 5–7.



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