



## MOSFET REDUNDANCY MODULE

- For 1+1 Redundancy with Automated Load Sharing
- Dual Input with Single Output
- Redundancy OK Signal Included which Reports the Loss of Redundancy
- 160% (32.5A) Peak Load Capability
- Reverse Input Polarity Protection
- Full Power Between -40°C and +70°C
- Width only 32mm
- Rugged Metal Housing
- Easy Wiring:  
Distribution Terminal for Negative Pole Included

## GENERAL DESCRIPTION

The YR20.246 is a redundancy module for building redundant power supply systems. It is equipped with two input channels and one output. The two inputs are decoupled by MOSFET technology.

The device is equipped with an automated load sharing feature, which can compensate a small voltage imbalance between the power supplies connected to the inputs in order to achieve an even current share. It also monitors the function of the redundancy circuitry and provides a signal in case of a failure or a high output current, which could prevent redundancy if one power supply fails. If this feature is not required the YR20.242 is available.

The redundancy utilizes MOSFETs instead of diodes for the decoupling of the two input channels. This reduces the heat generation and the voltage drop between input and output. The redundancy module does not require an additional auxiliary voltage.

Due to the low power losses, the unit is very slender and only requires 32mm width on the DIN-rail. Large connection terminals allow for a safe and fast installation. The large international approval package makes this unit suitable for nearly every application.

## ORDER NUMBERS

Redundancy Module	<b>YR20.246</b>	
Accessory	ZM11.SIDE	Side mount bracket

## SHORT-FORM DATA

Input voltage	DC 24-28V	±25%
Input voltage range	18-35Vdc	
Input current	2x 0-12A 2x 0-10A	ambient <+45°C ambient <+70°C
Output current	0-24A 0-20A max. 26A	ambient <+45°C ambient <+70°C in overload*) or short circuit mode
Input to output voltage drop	0.1-0.5V**) 0.2-0.5V**)	input: 2x5A input: 2x10A
Power losses	1.7W 2.6-4.7W**) 5.6-8.7W**)	at no load input: 2x5A input: 2x10A
Temperature range	-40°C to +70°C	operational
Dimensions	32x124x117mm	WxHxD
Weight	310g, 0.69lb	

\*) Currents at voltages below 6V

\*\*) Depending on load share function

## MARKINGS



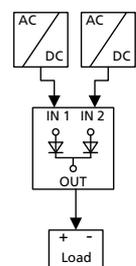
## INDEX

	Page		Page
1. Intended Use .....	3	16. Dielectric Strength.....	12
2. Installation Requirements.....	3	17. Approvals.....	13
3. Input and Output Characteristics .....	4	18. RoHS, REACH and Other Fulfilled Standards ..	13
4. Power Losses.....	5	19. Physical Dimensions and Weight .....	14
5. Lifetime Expectancy and MTBF.....	5	20. Accessories .....	15
6. Terminals and Wiring.....	6	20.1. ZM11.SIDE - Side Mounting Bracket.....	15
7. Functional Diagram.....	6	21. Application Notes.....	16
8. Front Side and User Elements.....	7	21.1. Using Only One Input Instead of Both	
9. "Redundancy OK" Relay Contact.....	8	Channels.....	16
10. "Load Share OK" Relay Contact.....	8	21.2. Recommendations for Redundancy.....	17
11. Automated Load Sharing.....	9	21.3. Inductive and Capacitive Loads.....	17
12. EMC.....	10	21.4. Sidewards Installation Clearances.....	17
13. Environment .....	11	21.5. 1+1 Redundancy up to 10A.....	18
14. Protection Features .....	12	21.6. Mounting Orientations .....	19
15. Safety Features.....	12		

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## TERMINOLOGY AND ABBREVIATIONS

<b>DC 24V</b>	A figure displayed with the AC or DC before the value represents a nominal voltage with standard tolerances (usually $\pm 15\%$ ) included. E.g.: DC 12V describes a 12V battery disregarding whether it is full (13.7V) or flat (10V)
<b>24Vdc</b>	A figure with the unit (Vdc) at the end is a momentary figure without any additional tolerances included.
<b>may</b>	A key word indicating flexibility of choice with no implied preference
<b>shall</b>	A key word indicating a mandatory requirement
<b>should</b>	A key word indicating flexibility of choice with a strongly preferred implementation
<b>1+1 Redundancy</b>	Use of two identical power supplies in parallel to provide continued operation following most failures in a single power supply. The two power supply outputs should be isolated from each other by utilizing diodes or other switching arrangements. E.g. two 10A power supplies are needed to achieve a 10A redundant system.



## 1. INTENDED USE

This redundancy module is designed for installation in an enclosure and is intended for the general use such as in industrial control, office, communication, and instrumentation equipment.

This redundancy module can be used with any type of power supply as long as the maximum output current ratings are not exceeded. It is suitable for power supplies with constant current overload behavior as well as any kind of "Hiccup" overload behavior.

Do not use this redundancy module in equipment, where malfunction may cause severe personal injury or threaten human life.

## 2. INSTALLATION REQUIREMENTS

This device may only be installed and put into operation by qualified personnel.

This device does not contain serviceable parts.

If damage or malfunction should occur during installation or operation, immediately turn power off and send unit to the factory for inspection.

To ensure a proper load share function ensure that the wiring between the two power supplies and the redundancy module is identical.

Mount the unit on a DIN-rail so that the input terminals are located on the bottom and the output terminals on the top of the unit. For other mounting orientations see de-rating requirements of chapter 21.6 in this document.

This device is designed for convection cooling and does not require an external fan. Do not obstruct airflow and do not cover the ventilation grid (e.g. cable conduits) by more than 30%!

Keep the following installation clearances:

40mm on top,

20mm on the bottom,

5mm on the left and right sides are recommended when the device is loaded permanently with more than 50% of the rated output current. Increase the side clearance to 15mm in case the adjacent device is a heat source (e.g. another power supply). See chapter 21.4 for other allowed clearances when used with the PULS DIMENSION series in a 1+1 redundant configuration.

Use only power supplies with a negligible output ripple voltage in the low frequency range between 50Hz and 10kHz when used in marine applications according to the GL regulations.

The input must be powered from a SELV source (according to IEC 60950-1), a PELV source (according to IEC 62477-1) or an Isolated Secondary Circuit (according to UL 508).

Do not ground or earth the positive output pole which could prevent redundancy in case of a ground failure. Ground the negative output pole when needed.

**⚠ WARNING** Risk of electrical shock, fire, personal injury or death.

- Turn power off before working on the device. Protect against inadvertent re-powering.
- Make sure that the wiring is correct by following all local and national codes.
- Do not open, modify or repair the unit.
- Use caution to prevent any foreign objects from entering the housing.
- Do not use in wet locations or in areas where moisture or condensation can be expected.
- Do not touch during power-on, and immediately after power-off. Hot surfaces may cause burns.

## 3. INPUT AND OUTPUT CHARACTERISTICS

Number of inputs	-	2	
Number of outputs	-	1	
Input voltage	nom.	DC 24-28V ±25%	
Input voltage range	-	18-35Vdc	
Voltage drop, input to output	typ.	0.1-0.5V	at 2x5A, load share function dependent, see Fig. 3-1
	typ.	0.2-0.5V	at 2x10A, load share function dependent, see Fig. 3-1
	typ.	0.24-0.5V	at 2x12A, load share function dependent, see Fig. 3-1
Input current	nom.	2x 0-12A	continuous, ambient temperature < +45°C
	nom.	2x 0-10A	continuous, ambient temperature < +70°C
	nom.	2x 17A <sup>1)</sup>	for max. 5 seconds
	max.	2x 700A	for max. 1ms
Output current	nom.	24A	continuous, ambient temperature < +45°C
	nom.	20A	continuous, ambient temperature < +70°C
	nom.	32.5A	for max. 5 seconds
	max.	26A	in overload /short-circuit (voltage < 6V). Ensure that the sum of input currents does not exceed this value.
Reverse current	max.	1mA	at 24V, per input, -40°C to +70°C
Reverse voltage	max.	40Vdc	voltage applied to the output, continuously allowed
Output capacitance	typ.	320µF	

1) The average value (R.M.S. value) of the output current must not exceed the values of the continuous output current.

Fig. 3-1 Input to output voltage drop

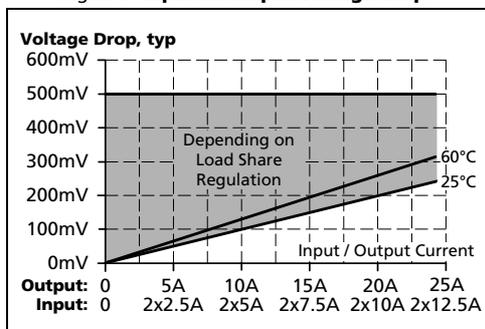
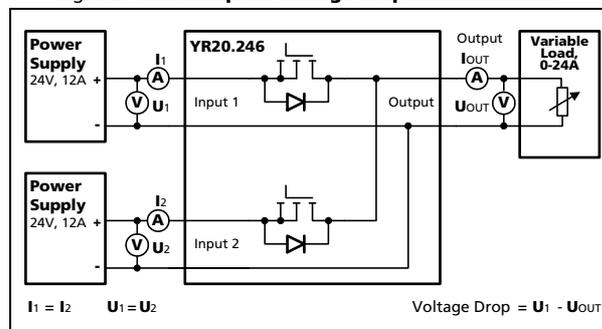


Fig. 3-2 Test setup for voltage drop measurements



## 4. POWER LOSSES

Power losses	typ.	2.6-4.7W	at 2x5A, 25°C ambient temperature
	typ.	5.6-8.7W	at 2x10A, 25°C ambient temperature
Standby power losses	typ.	1.7W	at no output current

Fig. 4-1 Power losses

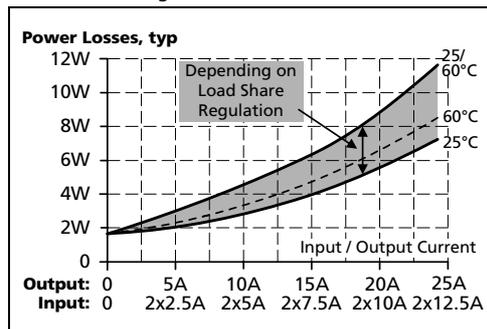
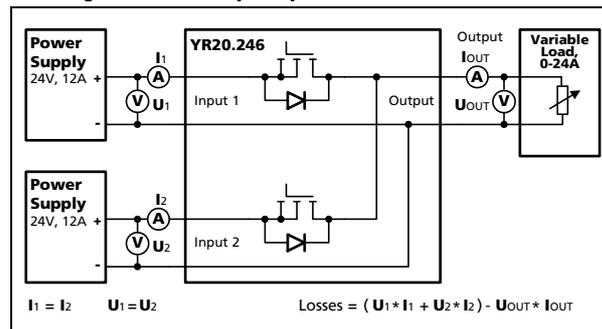


Fig. 4-2 Test setup for power loss measurements



## 5. LIFETIME EXPECTANCY AND MTBF

The redundancy module has two input channels which are completely independent from each other. Each control circuit, auxiliary voltage source, or other circuitry in the module are designed separately for each input. The dual input redundancy module can be considered as two single redundancy modules combined together in one housing. The only common point is the circuit trace that ties the two separate circuits together at the output.

The MTBF figures below are for the entire dual input module. If the MTBF number of only one path is needed, simply double the value from the table.

Input / output current conditions	Input: 2x5A Output: 10A	Input: 2x10A Output: 20A	
Lifetime expectancy <sup>*)</sup>	372 000h <sup>*)</sup> 1 053 000h <sup>*)</sup>	182 000h <sup>*)</sup> 516 000h <sup>*)</sup>	at 24V and 40°C at 24V and 25°C
MTBF <sup>**) SN 29500, IEC 61709</sup>	2 306 000h 3 913 000h	1 954 000h 3 359 000h	at 24V and 40°C at 24V and 25°C
MTBF <sup>**) MIL HDBK 217F</sup>	964 000h 1 379 000h 278 000h 381 000h	858 000h 1 226 000h 243 000h 330 000h	Ground Fixed GF40 (24V and 40°C) Ground Fixed GF25 (24V and 25°C) Ground Benign GB40 (24V and 40°C) Ground Benign GB25 (24V and 25°C)

<sup>\*)</sup> The **Lifetime expectancy** shown in the table indicates the minimum operating hours (service life) and is determined by the lifetime expectancy of the built-in electrolytic capacitors. Lifetime expectancy is specified in operational hours and is calculated according to the capacitor's manufacturer specification. The manufacturer of the electrolytic capacitors only guarantees a maximum life of up to 15 years (131 400h). Any number exceeding this value is a calculated theoretical lifetime which can be used to compare devices.

<sup>\*\*)</sup> **MTBF** stands for **Mean Time Between Failure**, which is calculated according to statistical device failures, and indicates reliability of a device. It is the statistical representation of the likelihood of a unit to fail and does not necessarily represent the life of a product. The MTBF figure is a statistical representation of the likelihood of a device to fail. A MTBF figure of e.g. 1 000 000h means that statistically one unit will fail every 100 hours if 10 000 units are installed in the field. However, it can not be determined if the failed unit has been running for 50 000h or only for 100h.

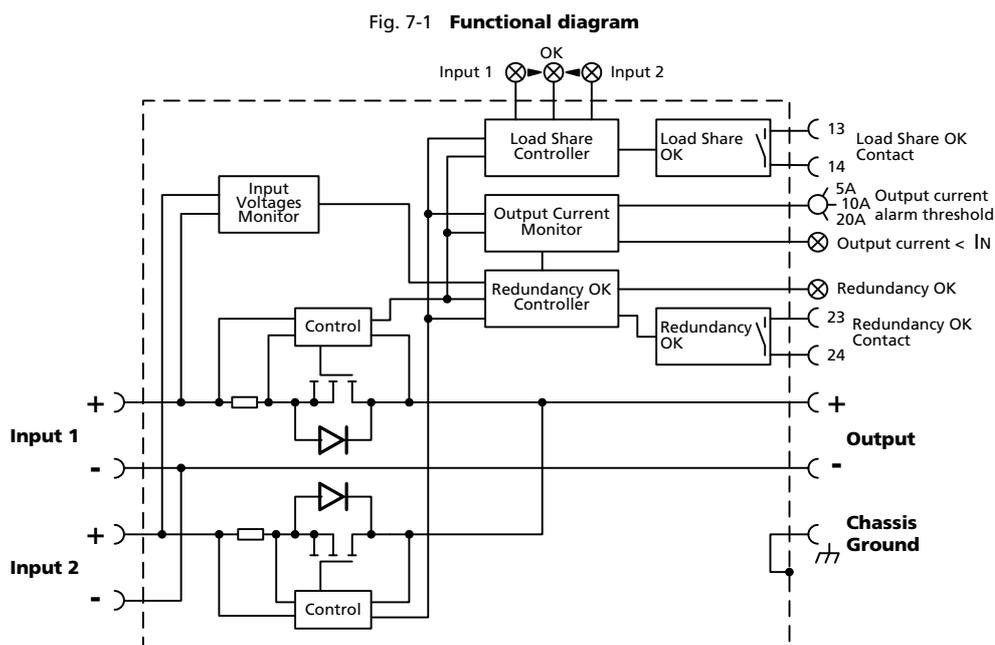
## 6. TERMINALS AND WIRING

Type	Input and Output	Signals
	Screw termination IP20 Finger safe construction. Suitable for field installation.	Push-in terminals
Solid wire	max. 6mm <sup>2</sup>	max. 1.5mm <sup>2</sup>
Stranded wire	max. 4mm <sup>2</sup>	max. 1.5mm <sup>2</sup>
American Wire Gauge	20-10 AWG	AWG 24-16
Max. wire diameter	2.8mm (including ferrule)	max. 1.6mm (including ferrules)
Wire stripping length	7mm / 0.28inch	7mm / 0.28inch
Screwdriver	3.5mm slotted or Pozidrive No 2	not required
Recommended tightening torque	0.8Nm, 7lb.in	not applicable

### Instructions:

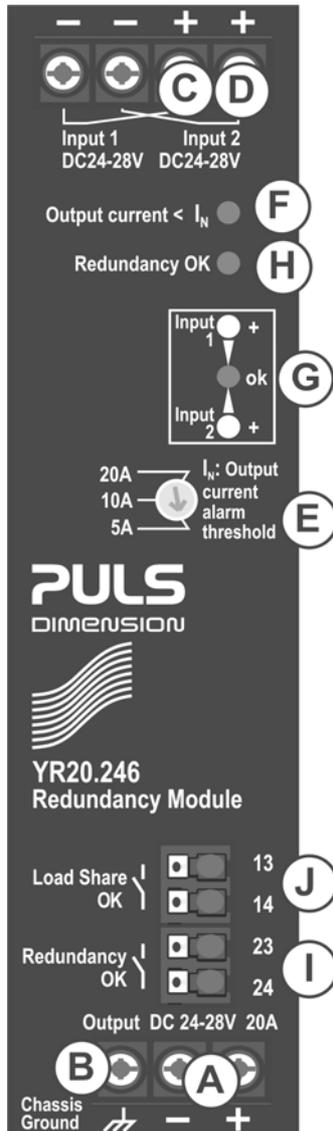
- Use appropriate copper cables that are designed for minimum operating temperatures of:
  - 60°C for ambient up to 45°C and
  - 75°C for ambient up to 60°C and
  - 90°C for ambient up to 70°C minimum.
- Follow national installation codes and installation regulations!
- Ensure that all strands of a stranded wire enter the terminal connection!
- Screws of unused terminal compartments should be securely tightened.
- Ferrules are allowed.

## 7. FUNCTIONAL DIAGRAM



### 8. FRONT SIDE AND USER ELEMENTS

Fig. 8-1 Front side



**A Output terminals** (screw terminals)

**B Chassis-Ground terminal**

Connection of the chassis is optional and not required since the unit fulfils the requirements according to protection class III.

**C Input terminals for input 1** (screw terminals)

**D Input terminals for input 2** (screw terminals)

**E Selector for output current warning threshold**

If the output current increases, e. g. due to additionally loads, and exceeds the nominal current of one power supply unit, redundancy is no longer guaranteed. To avoid the loss in redundancy, the output current is monitored and is reported through LEDs and relay contacts when exceeding the predefined value.

- Set the selector to 5A in combination with two 5A power supplies (1+1 red.)
- Set the selector to 10A in combination with two 10A power supplies (1+1 red.)
- Set the selector to 20A for n+1 redundant systems. With this setting, redundancy cannot be checked by the redundancy module any more. Exceeding the current by less than 2 seconds will be ignored.

**F Green LED "Output current < I<sub>N</sub>"**

The LED is on solid when the output current is smaller than the adjusted value of the output current alarm selector (E).

**G Load share LEDs**

The three LEDs indicate the status of the load sharing between the two power supplies. See chapter 11 for detailed description.

**H Green LED "Redundancy OK"**

The LED is on solid when no errors are detected.

Errors:

- One or both input voltages are out of range (below 22V or above 30V).
- Output current is higher than the adjusted value of the output current threshold setting.
- Internal defect is detected

**I Relay contact "Redundancy OK"** (push-in terminals)

The relay contact is closed when no redundancy errors are detected. The relay contact is also synchronized with the "Redundancy OK" LED. See chapter 9 for contact ratings.

**J Relay contact "Load share OK"** (push-in terminals)

The relay contact is closed when the output voltage of the two power supplies are sufficiently adjusted. Deviations less than 2s will be ignored. See chapter 11 for detailed description. See chapter 10 for contact ratings.

## 9. "REDUNDANCY OK" RELAY CONTACT

This feature reports the loss of redundancy by opening the relay contact (pin 23 and 24).

Contact is closed	When no errors are detected	
Contact is open	When: - one or both input voltages are below 22Vdc or above 30Vdc. - the output current is higher than the adjusted value of the output current threshold setting. - an internal defect of the redundancy module is detected (decoupling measures and several internal test routines). Input voltage errors less than 2s will be ignored. Overcurrent errors (less than 150% of the adjusted value) less than 4s will be ignored. Overcurrent errors (above 150% of the adjusted value) less than 30ms will be ignored. Internal errors less than 10s will be ignored	
Contact ratings	max. 60Vdc 0.3A, 30Vdc 1A, 30Vac 0.5A min. 1mA at 5Vdc	resistive load minimum permissible load
Isolation voltage	See dielectric strength table in section 16.	

## 10. "LOAD SHARE OK" RELAY CONTACT

This feature monitors if the output voltages of the two power supplies connected to the input are sufficiently adjusted for an even current distribution. The relay contact (pin 13 and 14) is closed, when load sharing occurs.

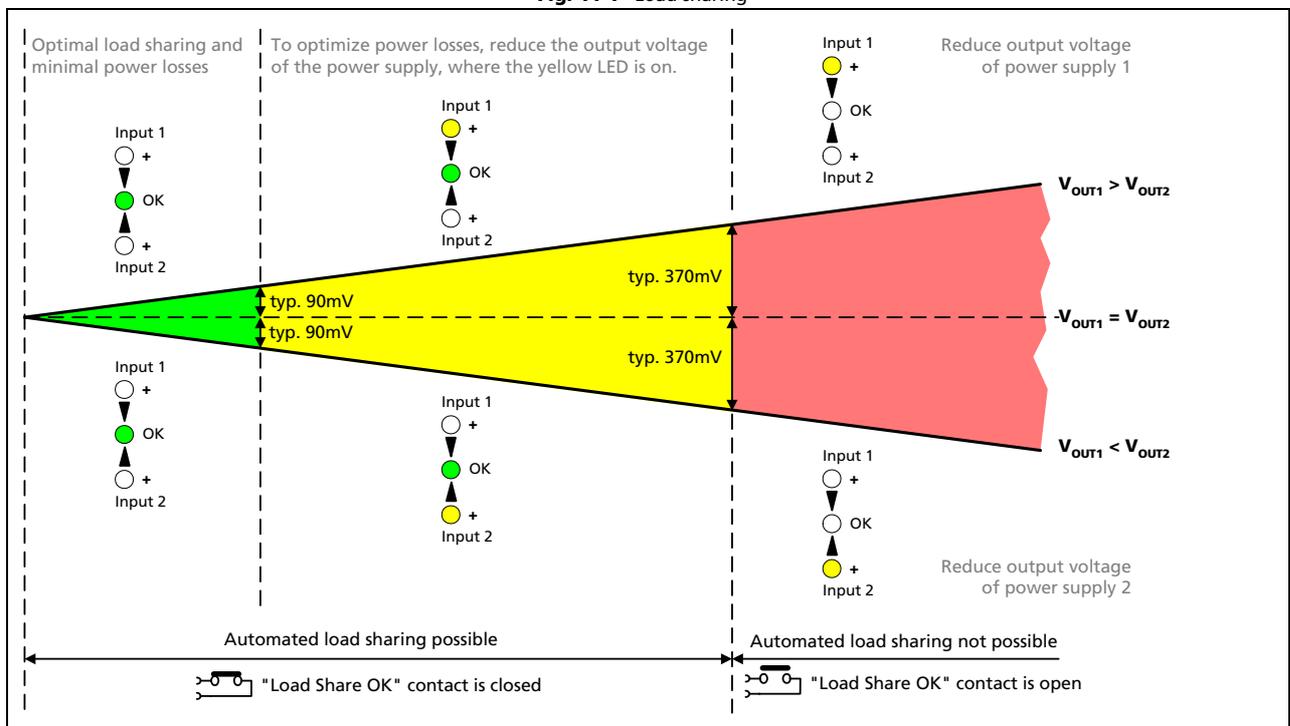
Contact is closed	When the adjustment of the output voltages are sufficient	
Contact is open	When an even load share does not occur and readjustment of the output voltages is recommended. Details see chapter 11.	
Contact ratings	max. 60Vdc 0.3A, 30Vdc 1A, 30Vac 0.5A min. 1mA at 5Vdc	resistive load minimum permissible load
Isolation voltage	See dielectric strength table in section 16.	

## 11. AUTOMATED LOAD SHARING

Drawing even current from both power supplies in a redundancy application can provide a longer service life of the redundant power supply system. An evenly shared current can avoid that one of the two units is getting much hotter than the other, which reduces the lifetime of the power supply system. The YR20.246 redundancy module is equipped with an automated load share feature, which can compensate a certain voltage unbalance between the two power supplies connected to the inputs.

However, to reduce the losses of the active circuit in the redundancy module, the individual output voltages shall be set as close as possible. The three LEDs on the front of the unit help to indicate if adjustment is necessary.

**Fig. 11-1** Load sharing



The active load share feature of the YR20.246 has a similar effect and benefit as the feature "Parallel Mode" (soft output characteristic), which is available on larger PULS power supplies.

## 12. EMC

The redundancy module is suitable for applications in industrial environment as well as in residential, commercial and light industry environment without any restrictions.

<b>EMC Immunity</b>		According to generic standards: EN 61000-6-1 and EN 61000-6-2		
Electrostatic discharge	EN 61000-4-2	Contact discharge	8kV	Criterion A
		Air discharge	15kV	Criterion A
Electromagnetic RF field	EN 61000-4-3	80MHz-2.7GHz	10V/m	Criterion A
Fast transients (Burst)	EN 61000-4-4	Input lines	2kV	Criterion A
		Output lines	2kV	Criterion A
		Redundancy OK signal <sup>2)</sup>	2kV	Criterion A
		Load share OK signal <sup>2)</sup>	2kV	Criterion A
Surge voltage on input lines	EN 61000-4-5	+ → -	500V	Criterion A
		+/- → Chassis ground	1kV	Criterion A
Surge voltage on output lines	EN 61000-4-5	+ → -	500V	Criterion A
		+/- → Chassis ground	1kV	Criterion A
Surge voltage on signal lines	EN 61000-4-5	Load Share OK signal → PE	1kV	Criterion A
		Redundancy OK signal	1kV	Criterion A
Conducted disturbance	EN 61000-4-6	0.15-80MHz	20V	Criterion A
Power-frequency magnetic field <sup>1)</sup>	EN 61000-4-8	50Hz	30A/m	Criterion A

**Criteria:**

**A:** Redundancy module shows normal operation behavior within the defined limits.

**Notes:**

- 1) A test is not applicable according to EN 61000-6-2, since the device does not contain components susceptible to magnetic fields, e.g. hall elements, electrodynamic microphones, etc.
- 2) Tested with capacitive coupling clamp.

<b>EMC Emission</b>		According to generic standards: EN 61000-6-3 and EN 61000-6-4	
Conducted emission input lines	IEC/CISPR 16-1-2, IEC/CISPR 16-2-1	limits for DC power ports according EN 61000-6-3 fulfilled <sup>3) 4)</sup>	
Conducted emission output lines	IEC/CISPR 16-1-2, IEC/CISPR 16-2-1	limits for DC power ports according EN 61000-6-3 fulfilled <sup>3) 4)</sup>	
Radiated emission	EN 55011, EN 55022	Class B <sup>4)</sup>	

This device complies with FCC Part 15 rules.

Operation is subjected to following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**Notes:**

- 3) For information only, not mandatory for EN 61000-6-3.
- 4) Provided, that power sources connected on the inputs fulfill the requirements too.

### Switching frequency

The internal auxiliary supply is generated with a boost converter.  
The switching frequency varies from 140kHz to 500kHz depending on the input voltage.

## 13. ENVIRONMENT

Operational temperature *)	-40°C to +70°C (-40°F to 158°F)	
Storage temperature	-40 to +85°C (-40°F to 185°F)	for storage and transportation
Humidity **)	5 to 95% r.H.	IEC 60068-2-30
Vibration sinusoidal***)	2-17.8Hz: ±1.6mm; 17.8-500Hz: 2g 2 hours / axis	IEC 60068-2-6
Shock***)	30g 6ms, 20g 11ms 3 bumps / direction, 18 bumps in total	IEC 60068-2-27
Altitude	0 to 2000m (0 to 6 560ft) 2000 to 6000m (6 560 to 20 000ft)	without any restrictions reduce output power or ambient temperature, see Fig. 13-2
Altitude de-rating	1.25A/1000m or 5°C/1000m	> 2000m (6500ft), see Fig. 13-2
Over-voltage category	not applicable	The concept of the overvoltage category is used for equipment energized directly from the low voltage mains (IEC 60664-1 §4.3.3.2.1).
Degree of pollution	2	EN 62477-1, not conductive
LABS compatibility	The unit does not release any silicone or other LABS-critical substances and is suitable for use in paint shops.	

\*) Operational temperature is the same as the ambient temperature and is defined as the air temperature 2cm below the unit.

\*\*) Do not energize while condensation is present

\*\*\*) Tested in combination with DIN-Rails according to EN 60715 with a height of 15mm and a thickness of 1.3mm and standard mounting orientation.

Fig. 13-1 Output current vs. ambient temp.

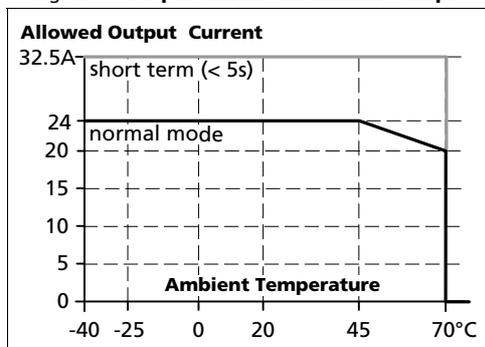
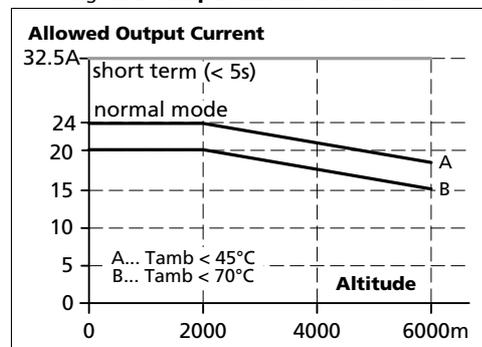


Fig. 13-2 Output current vs. altitude



## 14. PROTECTION FEATURES

Output over-current protection	not included	
Reverse input polarity protection	included	unit does not start when input voltage is reversed
Degree of protection	IP 20	EN/IEC 60529
Penetration protection	> 3.6mm	e.g. screws, small parts
Over-temperature protection	not included	
Input transient protection	included	see EMC section
Output transient protection	included	see EMC section
Internal input fuse	not included	

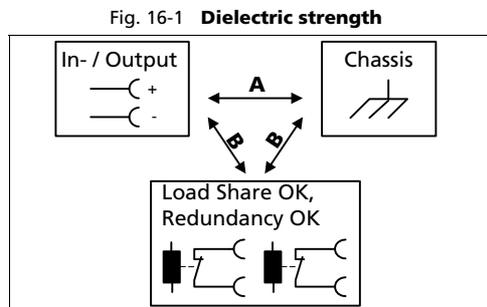
## 15. SAFETY FEATURES

Input / output separation	no galvanic separation	Mosfet between input and output
Safety level of output voltage	The output voltage is regarded to be SELV (EN 60950-1) or PELV (EN 60204-1, EN 62477-1, IEC 60364-4-41) if the input voltage fulfills the requirements for a SELV source or PELV source.	
Class of protection	III	PE (Protective Earth) or chassis connection not required
PE resistance	< 0.1Ohm	between housing and chassis-ground terminal

## 16. DIELECTRIC STRENGTH

The input and output voltages have the same reference, are floating and have no ohmic connection to ground. Type and factory tests are conducted by the manufacturer. Field tests may be conducted in the field using the appropriate test equipment which applies the voltage with a slow ramp (2s up and 2s down). Connect input/output and signal terminals together before conducting the test.

When testing, set the cut-off current settings to the value in the table below.



		<b>A</b>	<b>B</b>
Type test	60s	500Vac	500Vac
Factory test	5s	500Vac	500Vac
Field test	5s	500Vac	500Vac
Cut-off current setting		> 2mA	> 2mA

## 17. APPROVALS

EC Declaration of Conformity		The CE mark indicates conformance with the - EMC directive and the - ATEX directive.
IEC 60950-1		CB Scheme, Information Technology Equipment
UL 508		Listed for use as Industrial Control Equipment; U.S.A. (UL 508) and Canada (C22.2 No. 107-1-01); E-File: E198865
UL 60950-1		Recognized for use as Information Technology Equipment, Level 5; U.S.A. (UL 60950-1) and Canada (C22.2 No. 60950); E-File: E137006
ANSI / ISA 12.12.01-2007 Class I Div 2, planned		LISTED for use in Hazardous Location Class I Div 2 T4 Groups A,B,C,D systems; U.S.A. (ANSI / ISA 12.12.01-2007) and Canada (C22.2 No. 213-M1987)
ATEX EN 60079-0, EN 60079-7	 II 3G Ex ec nC IIC T4 Gc	Suitable for use in Category 3 Zone 2 locations. Number of ATEX certificate: EPS 11 ATEX 1 312 X The redundancy module must be built-in in an IP54 enclosure.
IECEX IEC 60079-0, IEC 60079-7	 Ex ec nC IIC T4 Gc	Suitable for use in Category 3 Zone 2 locations. Number of IECEX certificate: IECEX EPS 12.0032X
Marine, planned		GL (Germanischer Lloyd) classified Environmental category: C, EMC1 Marine and offshore applications
EAC TR Registration		Registration for the Eurasian Customs Union market (Russia, Kazakhstan, Belarus)

## 18. ROHS, REACH AND OTHER FULFILLED STANDARDS

RoHS Directive		Directive 2011/65/EU of the European Parliament and the Council of June 8 <sup>th</sup> , 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
REACH Directive		Directive 1907/2006/EU of the European Parliament and the Council of June 1 <sup>st</sup> , 2007 regarding the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

### 19. PHYSICAL DIMENSIONS AND WEIGHT

Width	32mm 1.26"
Height	124mm 4.88"
Depth	117mm 4.61" The DIN-rail height must be added to the unit depth to calculate the total required installation depth.
Weight	310g / 0.69lb
DIN-Rail	Use 35mm DIN-rails according to EN 60715 or EN 50022 with a height of 7.5 or 15mm.
Housing material	Body: Aluminium alloy Cover: zinc-plated steel
Installation clearances	See chapter 2

Fig. 19-1 Front view

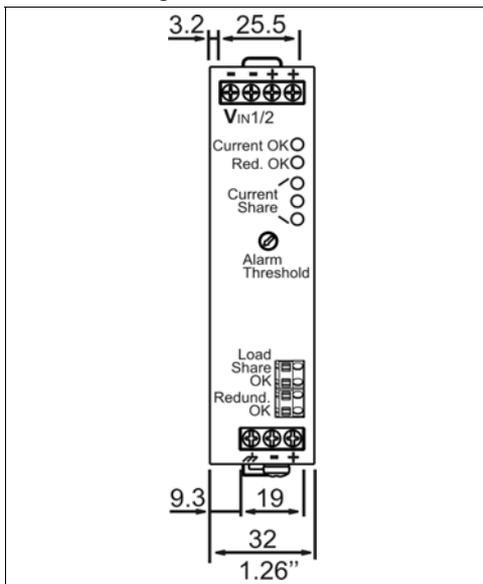
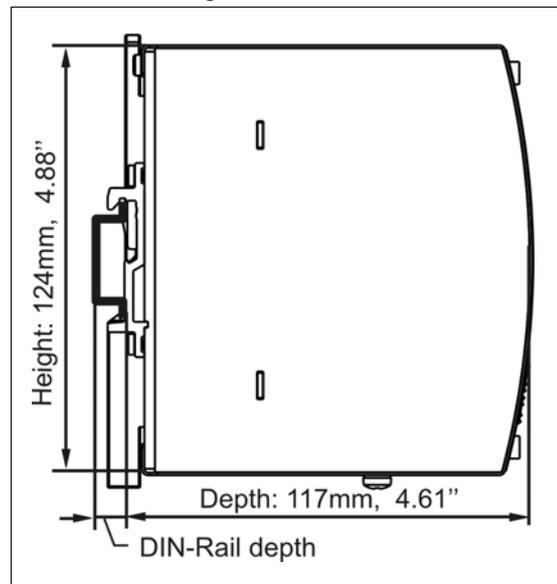


Fig. 19-2 Side view



## 20. ACCESSORIES

### 20.1. ZM11.SIDE - SIDE MOUNTING BRACKET

This bracket is used to mount the YR20.246 redundancy module sideways with or without utilizing a DIN-Rail.

The two aluminum brackets and the black plastic slider of the unit have to be detached, so that the steel brackets can be mounted.

For sideways DIN-rail mounting, the removed aluminum brackets and the black plastic slider need to be mounted on the steel bracket.

Fig. 20-1  
**Side mounting without DIN-rail brackets**

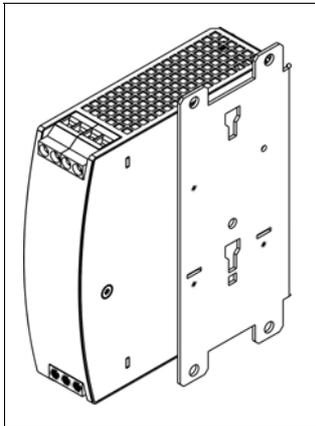


Fig. 20-2  
**Side mounting with DIN-rail brackets**

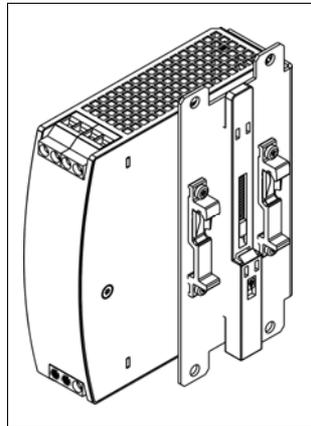
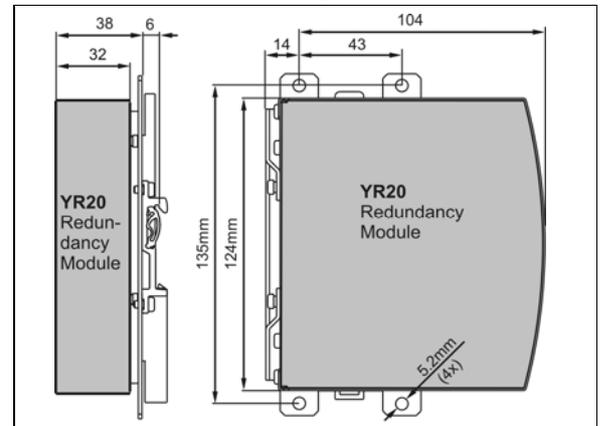


Fig. 20-3  
**Mounting Dimensions Side mounting bracket**



## 21. APPLICATION NOTES

### 21.1. USING ONLY ONE INPUT INSTEAD OF BOTH CHANNELS

Using only one input instead of both is allowed up to a nominal input current of 12A (at max. +45°C ambient temperature) or 10A (at max. +70°C ambient temperature).

The load share feature is disabled in cases one input voltage is not present or the level of the input voltage is below a certain value. The MOSFET will be on in such cases.

However, it is always recommended to connect both input path in parallel for reduced power losses and voltage drop. When this is not possible, the following values can be expected:

Voltage drop, input to output	typ.	0.15V	at 1x10A, 25°C, see Fig. 21-1
Power losses	typ.	2.6W	at 1x10A, 25°C, see Fig. 21-3
Standby power losses	typ.	1.1W	

Fig. 21-1 Input to output voltage drop when only one input is used

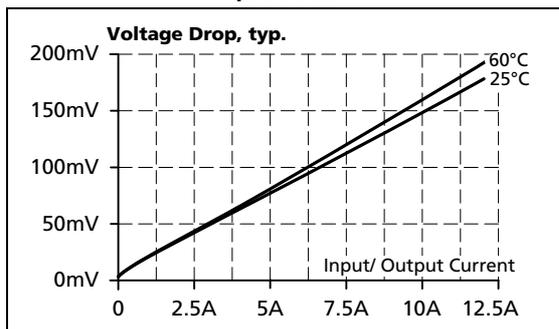


Fig. 21-2 Test setup for voltage drop measurements

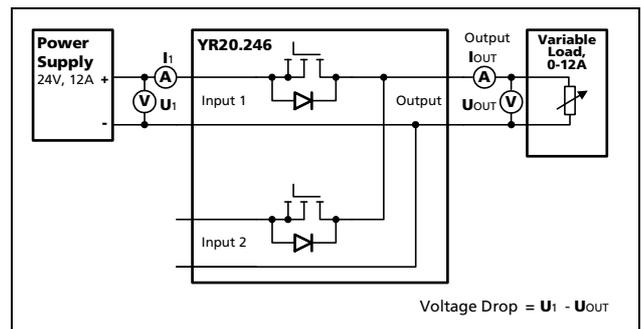


Fig. 21-3 Power losses when only one input is used

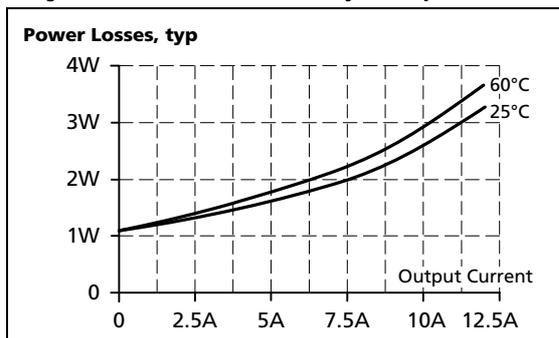
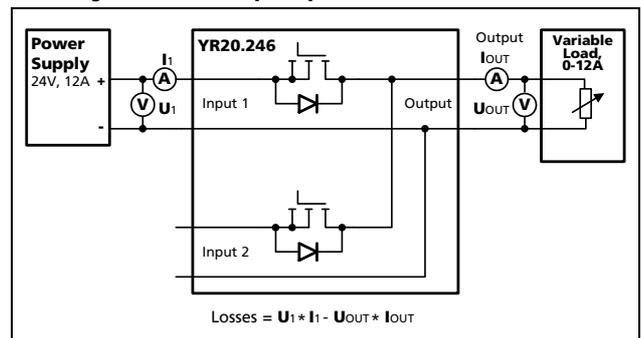


Fig. 21-4 Test setup for power loss measurements



## 21.2. RECOMMENDATIONS FOR REDUNDANCY

Recommendations for the configuration of redundant power systems:

- Use separate input fuses for each power supply.
- Use three-phase power supplies to gain functional safety if one phase fails.
- When single-phase power supplies are utilized connect them to different phases or mains circuits if possible.
- Set the power supply in "Parallel-Use" mode if this feature is available
- It is desirable to set the output voltages of all power supplies to the same value.

## 21.3. INDUCTIVE AND CAPACITIVE LOADS

The unit is designed to supply any kind of loads, including unlimited capacitive and inductive loads.

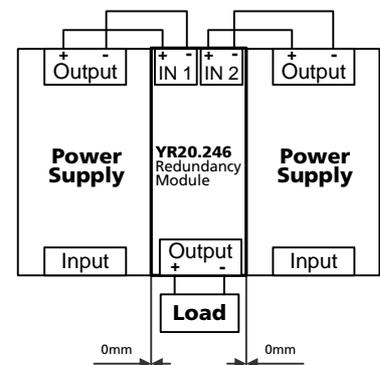
## 21.4. SIDEWARDS INSTALLATION CLEARANCES

The minimum clearance recommendations are defined in chapter 2.

Normally, the following installation clearance are recommended: 40mm on top, 20mm on the bottom, 5mm on the left and right sides when the device is loaded permanently with more than 50% of the rated power. Increase this clearance to 15mm in case the adjacent device is a heat source (e.g. another power supply).

The clearance between the power supplies and the redundancy module can be reduced to zero under the following conditions:

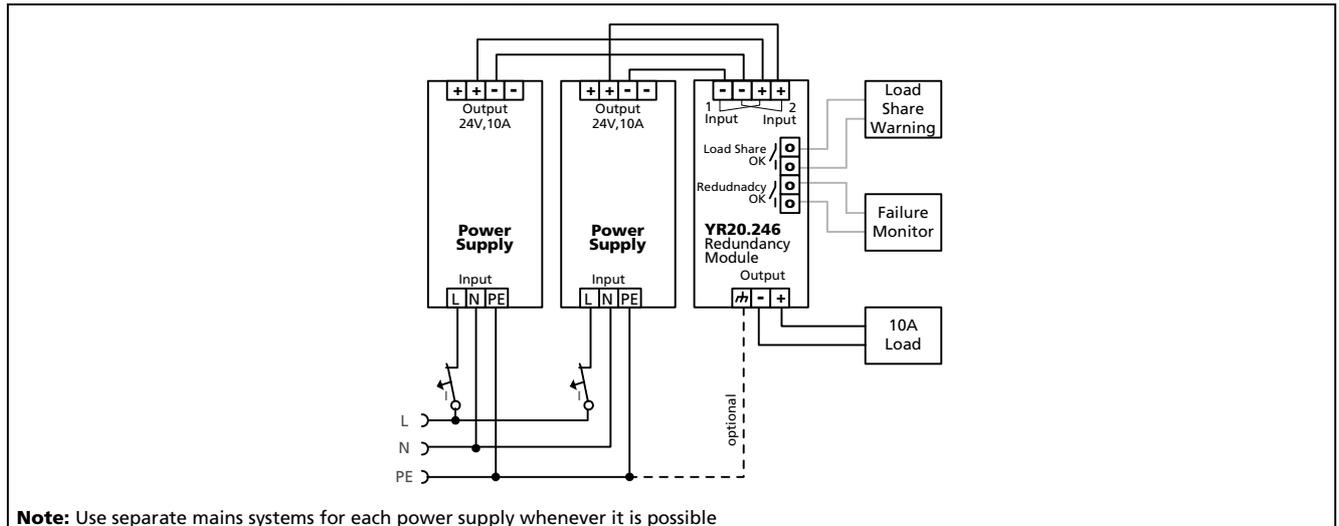
- 1+1 redundancy application with maximum 12A output current.
- The power supplies are from the PULS DIMENSION series.
- The redundancy module is placed between the two power supplies.
- The output voltage is set to the same level on both power supplies.



## 21.5. 1+1 REDUNDANCY UP TO 10A

1+1 Redundancy up to 10A requires two 10A power supplies and one YR20.246 redundancy module.

Fig. 21-5 **Wiring diagram, 1+1 Redundancy, 10A output current**



## 21.6. MOUNTING ORIENTATIONS

Mounting orientations other than input terminals on the bottom and output on the top require a reduction in continuous output power or a limitation in the maximum allowed ambient temperature. The amount of reduction influences the lifetime expectancy of the power supply. Therefore, two different derating curves for continuous operation can be found below:

**Curve A1** Recommended output current.

**Curve A2** Max allowed output current (results in approximately half the lifetime expectancy of A1).

Fig. 21-6  
**Mounting Orientation A**  
(Standard orientation)

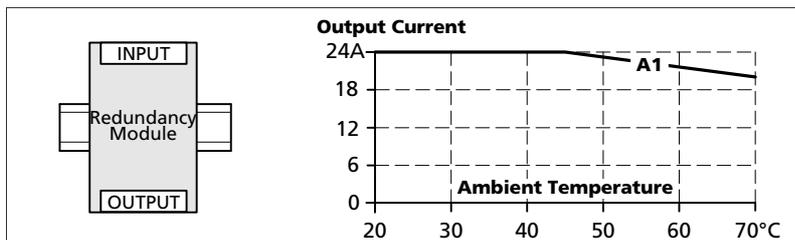


Fig. 21-7  
**Mounting Orientation B**  
(Upside down)

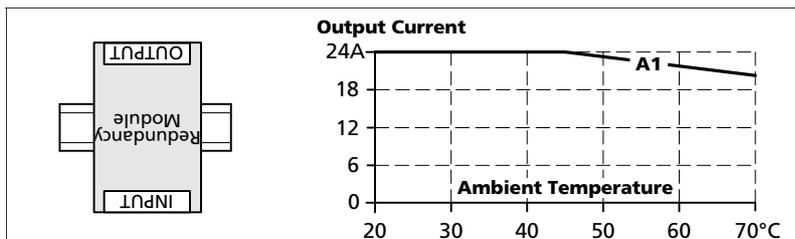


Fig. 21-8  
**Mounting Orientation C**  
(Table-top mounting)

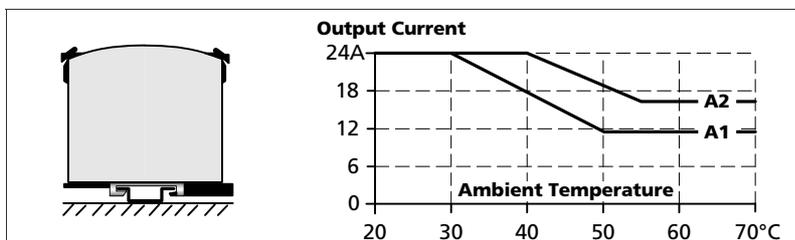


Fig. 21-9  
**Mounting Orientation D**  
(Horizontal cw)

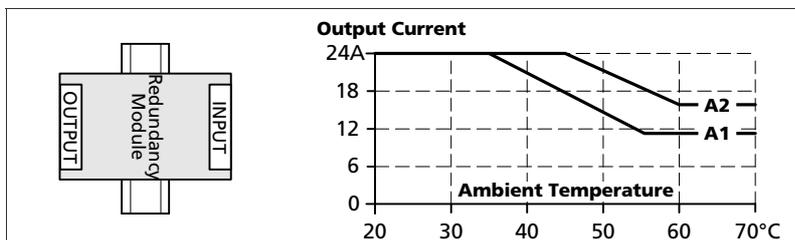
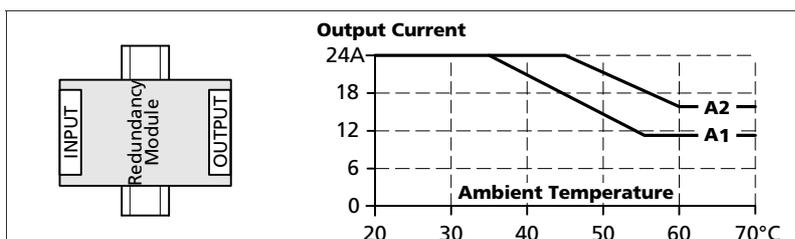


Fig. 21-10  
**Mounting Orientation E**  
(Horizontal ccw)



Jul. 2017 / Rev. 1.4 DS-YR20.246-EN All parameters are typical values specified at 24V, 20A output current, 25°C ambient and after a 5 minutes run-in time unless otherwise noted.