

Power Supply Selection Guide 2000

DC-DC Converters
AC-DC Converters
Switching Regulators

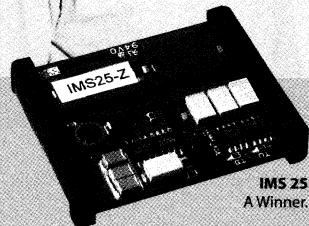
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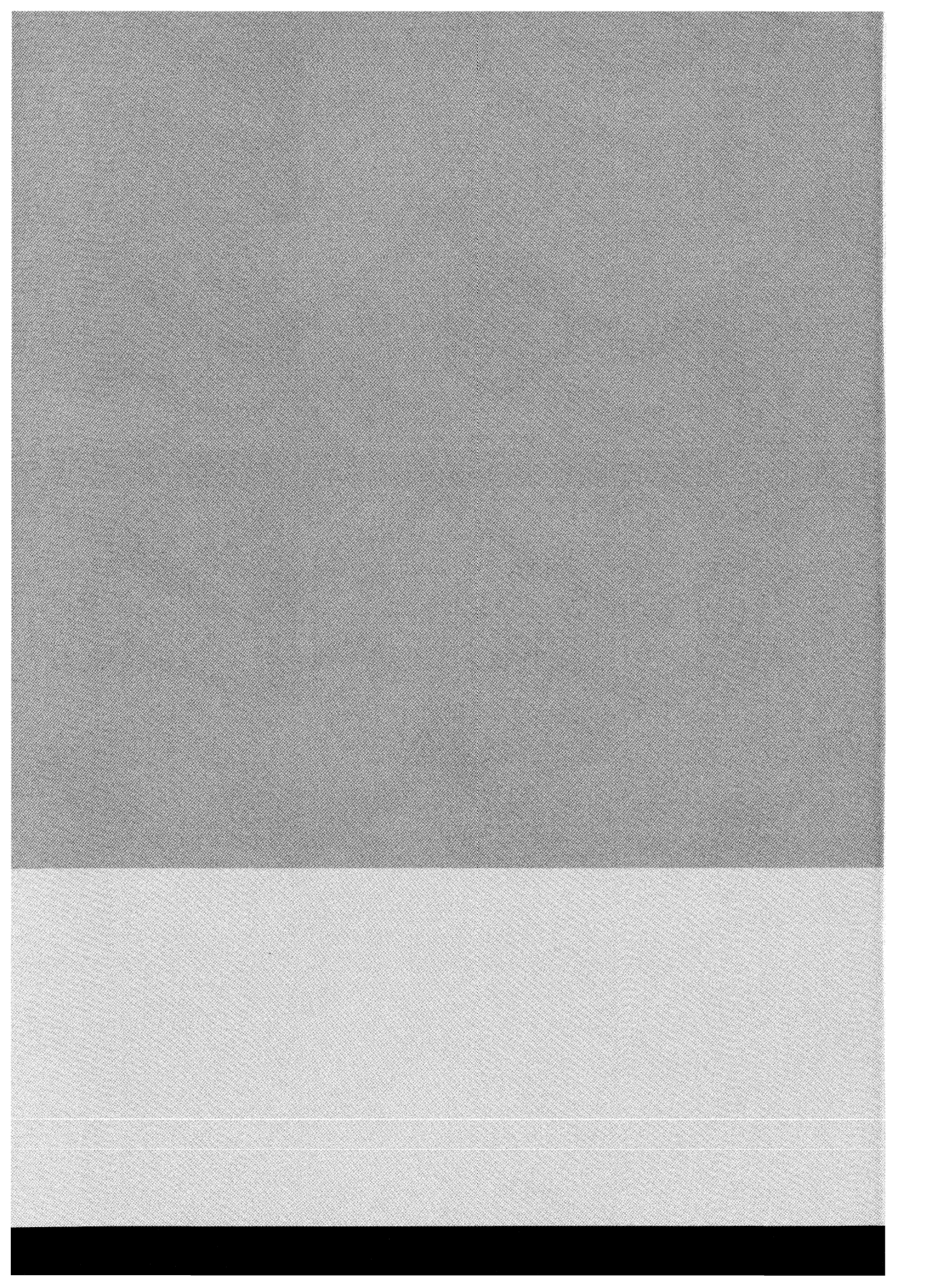
Chris Mayer
Product Manager
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Full datasheet information
on website and CD-ROM.



 **POWER-ONE®**

www.power-one.ch

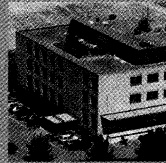


Your power-supply partner

Company



Power-One has been operating successfully for almost 30 years all over the world. Customers can rely on the complete and state-of-the-art product range from a global fast growing corporation that is dedicated to offering supreme and cost effective services as a true one-stop-shop. Its global presence at the major industrial centers

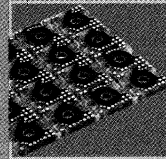


enables Power-One to learn from the leading industries in the world and adapt products, technologies and services to your benefit.

Technology

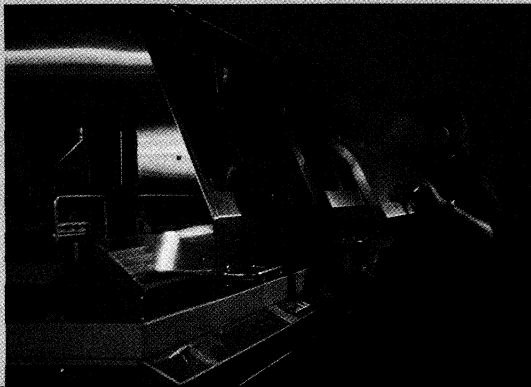


Latest technologies in design and manufacturing are applied to create solutions that meet the future needs of our customers. Experienced engineering teams guarantee the high quality of the products as well as the use of well controlled processes for high volume manufacturing. Whether your application needs central power

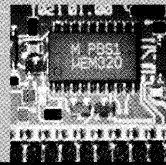


supplies or a complete solution of distributed power down to lowest output voltages – we offer you the choice.

Quality



The high standard of quality at Power-One is based on years of experience in a wide range of applications, the consequent adherence to strict design rules and the use of superior components and processes. The dedication of Power-One's employees to satisfy the customers needs, backed up by process oriented Quality Management

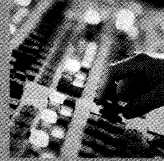


Systems ensure a continuous improvement system.

Applications



One of the most complete product ranges from 1 Watt to several kilowatt developed to fit demanding applications augmented by engineering services to customize to specific project needs makes Power-One the selected vendor to major industry leaders. We serve a broad customer base in telecom, datacom, industrial and infrastructure applications.



Sales



Power-One supports its customer base with a Europe wide direct sales network of technically skilled sales and application engineers to facilitate the design process. This network is backed up by customer support and contract management teams in major countries or areas as well as a properly staffed technical support and logistics organization at its European headquarters in Uster, Switzerland. A central stocking facility within the EU serves customers with standard products within 24-48 hours world wide.



www.power-one.ch

POWER-ONE, AC/DC POWER SUPPLIES, DC/DC CONVER...

Caribik, Mein Profil, Abmelden, Aktualisieren, Startseite, Web-Aus-Einst., Drucken, E-Mail

address http://www.power-one.ch/ Explorer

POWER-ONE

Products Company News Contacts Home

Welcome to Power-One

We are a major partner for our customers in the field of power supplies for infrastructure projects in telecoms, industry and transportation.

Products

- DC-DC Converters
- Isolated invertible
- Bridge
- Converter vclp
- Open-Shell
- AC-DC Converters
- Isolated invertible
- Converter vclp
- Open-Shell

Company

- About us
- USA Headquarters
- Press
- Jobs

News

- Company News
- Technology News
- Product News

Das Huber
Customer Service
Teamwork

Switching Regulators

This selection guide provides you with an overview of our current product range including the most important features of our power supplies. In our web page – www.power-one.ch – you will find the latest and most complete product information. The powerful PROBE product selector is a useful tool for fast and accurate product selection. Power-One regularly issues updated CDs with full product details and Update brochures to inform our customers about the latest product and company news.



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Data sheets

Detailed data sheets are available from either source:

- Internet: www.power-one.ch
- PowerOne CD-ROM
- Nearest sales office by fax or mail.

DC-DC Converters

Power [W]	Output [V DC]					No. of outputs	Input [V DC]					Series	Page
	3	5	15	24	36 48		3	10	20	60	80		

Board Mountable

1						1, 2						DSP	8
1...12						1, 2, 3						IMP	10
3						1, 2						IXP	14
3...15						1, 2, 3						IMR	16
4						1, 2						IMX 4	20
6						1, 2						IMO	24
6...12						1, 2						IAS, IAD	26
6...20						1, 2						DFA	28
6...30						1, 2, 3						DFC	30
7						1, 2						IMS 7	34
7						1, 2						IMX 7	38
10						1, 2						IWS, IWD	42
10						1, 2						IML	44
10...30						1, 2, 3						DGP	48
15						1						LES	50
15						3						HPT	52
15						1, 2						IMS 15	54
15						1, 2						IMX 15, IMY 15	58
20						1						IES	62
20...40						1, 3						OES, OET	64
25						1						IMS 25	66
25						1, 2						OBS, OBD	70
25						3						G	72
25...40						1, 2, 3						IMR 25, IMR 40	76
35						2, 3, 4						IMX 35	80

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DC-DC Converters

Power [W]	Output [V DC]						No. of outputs	Input [V DC]						Series	Page
	3	5	15	24	36	48		3	10	20	60	80	180		

Bricks

15...60	████████						1, 2		████████				HAS, HAD	84
25...150	██████████						1, 2		████████				HES, HED	88
30...150	████████						1, 2		████████				HBS, HBD	92
38...66	█						1		████████				QES	96
38...150	████████						1		████████				QBS	98
50...60		████████████████					1		████				QAS	100
85...100	██						2		██████				TQD	102
100...300	████						1		████				FES	104
100...300		████████████████					1		██████				VWS	106
113...225	████						1		██████				TES	110

Cassette Style

50		████████████████					1, 2, 3		██████				H	112
50		████████████████					1, 2, 3		████████████████				M	116
60...132		████████████████					1, 2		██████				Q	120
80...195		████████████████					1, 2, 3, 4		██████				P	124
100		████████████████					1, 2		████████████████				S	130
150		████████████████					1, 2		████████████████				K	134

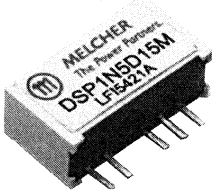
Open Frame

150		████					3, 4		████				MDU	138
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Data sheets

Detailed data sheets are available from either source:

- Internet: www.power-one.ch
- CD-ROM
- Nearest sales office by fax or mail.



Input voltage ranges 4.5...5.5 V DC
 1 or 2 outputs, 5 to 34 V DC
 700 V DC I/O electric strength test voltage

- Compact single in line package
- Four terminal operation
- 350 kHz fixed frequency operation

Selection chart

Output 1		Output 2		Input	Rated power	Type
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [mA]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [mA]	U_i [V DC]	$P_{o\ tot}$ [W]	
5	150	-	-	4.5...5.5	0.75	DSP 1 N5S5
7	140	-	-	4.5...5.5	1	DSP 1 N5S7
12	80	-	-	4.5...5.5	1	DSP 1 N5S12
14	70	-	-	4.5...5.5	1	DSP 1 N5S14
15	65	-	-	4.5...5.5	1	DSP 1 N5S15
17	60	-	-	4.5...5.5	1	DSP 1 N5S17
+5	75	-5	75	4.5...5.5	0.75	DSP 1 N5D5
+7	70	-7	70	4.5...5.5	1	DSP 1 N5D7
+12	40	-12	40	4.5...5.5	1	DSP 1 N5D12
+14	35	-14	35	4.5...5.5	1	DSP 1 N5D14
+15	33	-15	33	4.5...5.5	1	DSP 1 N5D15
+17	30	-17	30	4.5...5.5	1	DSP 1 N5D17

Input

Input voltage range	continuous range	4.5...5.5 V DC
---------------------	------------------	----------------

Output

Efficiency	$U_i\ nom, I_o\ nom$	typ. 73%
Output voltage ripple and noise	$U_i\ nom, I_o\ nom, 20\ MHz\ bandwidth, peak-peak$	typ. 70 mV _{pp}
Line regulation	input 1% change, single output	typ. 1.6%
	dual output	typ. 1%
Load regulation	no load, single output	typ. +30%
	load 20...75%, single output	typ. +8%
	load 75...100%, single output	typ. -5%
	load 20...75%, dual output	typ. 5%
Switching frequency		350 kHz

Control and protection

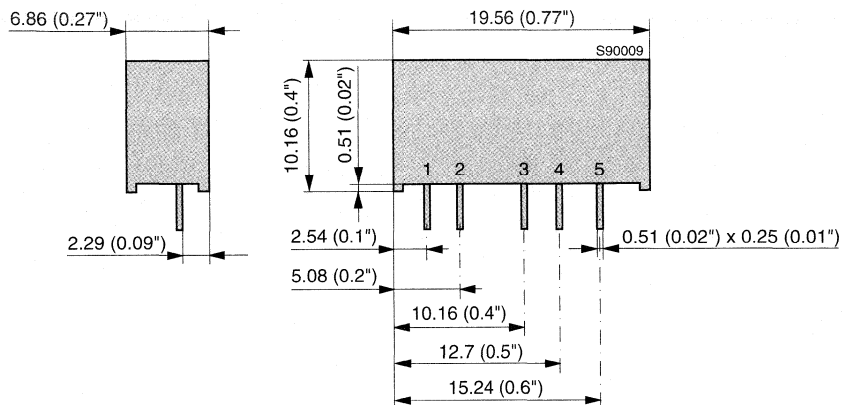
Output overload momentary short circuit only

Environmental

Operating temperature	case, with derating $>70^{\circ}\text{C}$	$-40\dots85^{\circ}\text{C}$
Storage temperature	non operational	$-55\dots105^{\circ}\text{C}$
MTBF	calculated	700'000 h

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	Single output units	Dual output units
1	V_{i+}	V_{i+}
2	V_{i-}	V_{i-}
3	V_{o-}	V_{o-}
4	V_{o+}	Common
5	-	V_{o+}



Input voltage range up to 72 V DC
 1, 2 or 3 outputs up to 30 V DC
 1500 V DC I/O electric strength test voltage

- Wide input range
- Short circuit protection
- Low cost

Selection chart

Output 1		Output 2		Output 3		Type	Type	Type	Opt.
U_o nom [V DC]	I_o nom [mA]	U_o nom [V DC]	I_o nom [mA]	U_o nom [V DC]	I_o nom [mA]	Input voltage 4.5...5.5 V DC	Input voltage 10...36 V DC	Input voltage 18...72 V DC	
3.3	1500	-	-	-	-	5 IMP 6-03-7	24 IMP 6-03-7	48 IMP 6-03-7	-
3.3	3000	-	-	-	-	-	24 IMP 12-03-7	48 IMP 12-03-7	-
5	200	-	-	-	-	5 IMP 1-05-7	-	-	S
5	500	-	-	-	-	-	24 IMP 3-05-7	48 IMP 3-05-7	S
5	1000	-	-	-	-	5 IMP 6-05-7	24 IMP 6-05-7	48 IMP 6-05-7	-
5	2400	-	-	-	-	-	24 IMP 12-05-7	48 IMP 12-05-7	-
12	84	-	-	-	-	5 IMP 1-12-7	-	-	S
12	250	-	-	-	-	-	24 IMP 3-12-7	48 IMP 3-12-7	S
15	500	-	-	-	-	5 IMP 6-12-7	24 IMP 6-12-7	48 IMP 6-12-7	-
15	1000	-	-	-	-	-	24 IMP 12-12-7	48 IMP 12-12-7	-
15	66	-	-	-	-	5 IMP 1-15-7	-	-	S
15	200	-	-	-	-	-	24 IMP 3-15-7	48 IMP 3-15-7	S
15	400	-	-	-	-	5 IMP 6-15-7	24 IMP 6-15-7	48 IMP 6-15-7	-
15	800	-	-	-	-	-	24 IMP 12-15-7	48 IMP 12-15-7	-
+5	100	-5	100	-	-	5 IMP 1-0505-7	-	-	S
+5	250	-5	250	-	-	-	24 IMP 3-0505-7	48 IMP 3-0505-7	S
+5	500	-5	500	-	-	5 IMP 6-0505-7	24 IMP 6-0505-7	48 IMP 6-0505-7	-
+5	1200	-5	1200	-	-	-	24 IMP 12-0505-7	48 IMP 12-0505-7	-
+12	42	-12	42	-	-	5 IMP 1-1212-7	-	-	S
+12	125	-12	125	-	-	-	24 IMP 3-1212-7	48 IMP 3-1212-7	S
12	125	12	125	-	-	-	24 IMP 3-12-12-7	48 IMP 3-12-12-7	-
+12	250	-12	250	-	-	5 IMP 6-1212-7	24 IMP 6-1212-7	48 IMP 6-1212-7	-
+12	500	-12	500	-	-	-	24 IMP 12-1212-7	48 IMP 12-1212-7	-
+15	33	-15	33	-	-	5 IMP 1-1515-7	-	-	S
15	100	15	100	-	-	-	24 IMP 3-15-15-7	48 IMP 3-15-15-7	-
+15	100	-15	100	-	-	-	24 IMP 3-1515-7	48 IMP 3-1515-7	S
+15	200	-15	200	-	-	5 IMP 6-1515-7	24 IMP 6-1515-7	48 IMP 6-1515-7	-
+15	400	-15	400	-	-	-	24 IMP 12-1515-7	48 IMP 12-1515-7	-
5	250	5	250	-	-	-	24 IMP 3-05-05-7	48 IMP 3-05-05-7	-
5	1500	+12	200	-12	200	-	24 IMP 12-051212-7	48 IMP 12-051212-7	-
5	1500	+15	160	-15	160	-	24 IMP 12-051515-7	48 IMP 12-051515-7	-

Input

Input voltage	continuous range, 5 V (IMP 1, IMP 6)	4.5...5.5 V DC
	continuous range, 24 V	10...36 V DC
	continuous range, 48 V	18...72 V DC
Reverse voltage protection	shunt diode	

Output

Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 2\% U_{o\text{ nom}}$
Minimum load	recommended	20% $I_{o\text{ nom}}$
Line regulation	$U_{i\text{ min}}...U_{i\text{ max}}, I_{o\text{ nom}}$	$\pm 1\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}, 0...100\% I_{o\text{ nom}}$, regulated outputs	2% $U_{o\text{ nom}}$
	tracking outputs	max. 6% $U_{o\text{ nom}}$
Output voltage switching noise	$U_{i\text{ nom}}, 20...100\% I_{o\text{ nom}}$, peak-peak, total	max. 3% $U_{o\text{ nom}}$
Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to 83%

Control and protection

Overload protection	$U_{i\text{ min}}$, full load	125% $P_{i\text{ nom}}$
No-load protection		
Remote shut down	positive logic (floating or high signal = on)	

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
Electromagnetic interference	conducted with external filter	class B

Environmental

Operating ambient temperature	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-25...71°C
Storage temperature	non operational	-40...100°C
Relative humidity	non condensing	95%
MTBF	MIL-HDBK-217F, N2	>3'700'000 h

Options

Industry standard pinout	IMP 1 and IMP 3	S
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Accessories

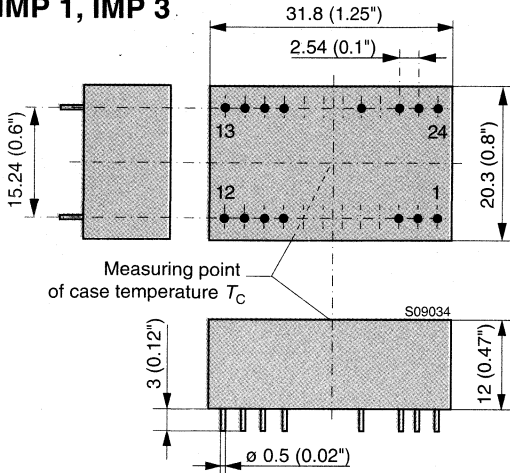
DIN and chassis mounting bracket		
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Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



IMP 1, IMP 3



Pin allocation IMP 1

Pin	Single output unit	Dual output unit
1	Vi+	Vi+
2	Vi+	Vi+
10	-	COM
11	-	COM
12	Vo-	-
13	Vo+	Vo-
15	-	Vo+
23	Vi-	Vi-
24	Vi-	Vi-

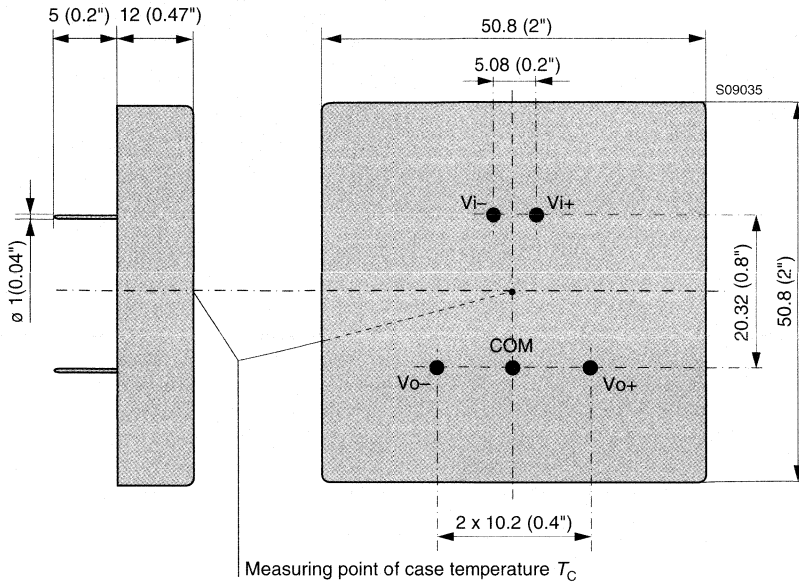
Industry standard pinout (option S)

Pin	Single output	Dual output
2	Vi-	Vi-
3	Vi-	Vi-
9	n.c.	COM
10	n.c.	n.c.
11	n.c.	Vo-
14	Vo+	Vo+
15	n.c.	n.c.
16	Vo-	COM
22	Vi+	Vi+
23	Vi+	Vi+

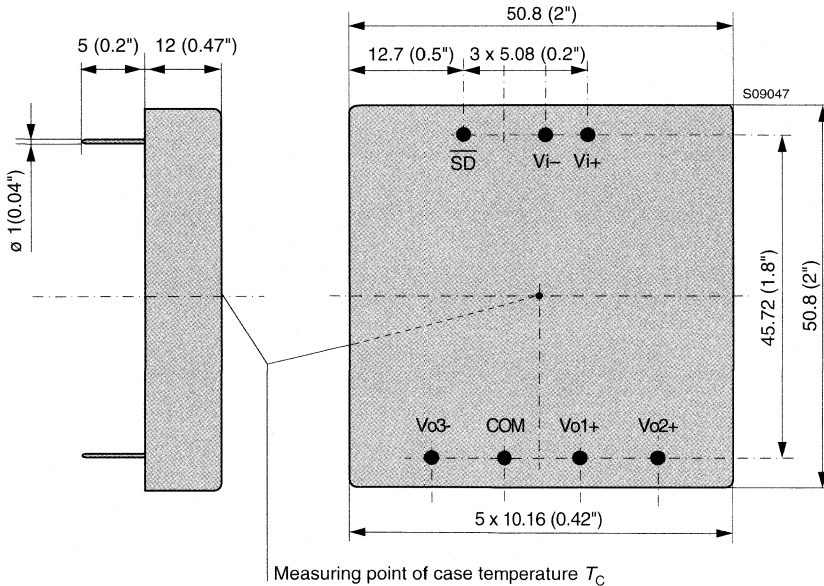
Alternative pinout IMP 3

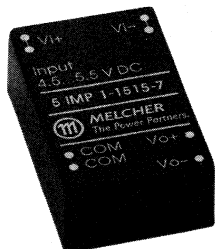
Pin	Single output	Dual output	Double output
1	Vi+	Vi+	Vi+
2	Vi+	Vi+	Vi+
9	-	-	Go1
10	-	COM	-
11	-	COM	-
12	Vo-	-	Vo1
13	Vo+	Vo-	Vo2
15	-	Vo+	-
16	-	-	Go2
20	SD	SD	SD
23	Vi-	Vi-	Vi-
24	Vi-	Vi-	Vi-

IMP 6, IMP 12 with single or dual output



IMP 12 with triple output





Input voltage range up to 72 V DC
1 or 2 outputs up to 30 V DC
3500 V DC I/O electric strength test voltage

- High input to output isolation
- Wide input range
- Short circuit protection

Selection chart

Output 1		Output 2		Input voltage	Rated power	Type	Option
$U_{o,nom}$ [V DC]	$I_{o,nom}$ [mA]	$U_{o,nom}$ [V DC]	$I_{o,nom}$ [mA]	U_i [V DC]	$T_A = 71^\circ\text{C}$ $P_{o,tot}$ [W]		
5	500	-	-	9...36	2.5	24 IXP 3-05-7	S
5	500	-	-	18...72	2.5	48 IXP 3-05-7	S
12	250	-	-	9...36	3	24 IXP 3-12-7	S
12	250	-	-	18...72	3	48 IXP 3-12-7	S
15	200	-	-	9...36	3	24 IXP 3-15-7	S
15	200	-	-	18...72	3	48 IXP 3-15-7	S
+5	250	-5	250	9...36	2.5	24 IXP 3-0505-7	S
+5	250	-5	250	18...72	2.5	48 IXP 3-0505-7	S
+12	125	-12	125	9...36	3	24 IXP 3-1212-7	S
+12	125	-12	125	18...72	3	48 IXP 3-1212-7	S
+15	100	-15	100	9...36	3	24 IXP 3-1515-7	S
+15	100	-15	100	18...72	3	48 IXP 3-1515-7	S
5	250	5	250	9...36	2.5	24 IXP 3-05-05-7	-
5	250	5	250	18...72	2.5	48 IXP 3-05-05-7	-
12	125	12	125	9...36	3	24 IXP 3-12-12-7	-
12	125	12	125	18...72	3	48 IXP 3-12-12-7	-
15	100	15	100	9...36	3	24 IXP 3-15-15-7	-
15	100	15	100	18...72	3	24 IXP 3-15-15-7	-

Input

Input voltage	continuous range, 24 V	9...36 V DC
	continuous range, 48 V	18...72 V DC
Reverse voltage protection	shunt diode	

Output

Output voltage setting accuracy	$U_{i,nom}, I_{o,nom}$	$\pm 2\% U_{o,nom}$
Minimum load	recommended	20% $I_{o,nom}$
Line regulation	$U_{i,min} \dots U_{i,max}, I_{o,nom}$	$\pm 1\% U_{o,nom}$
Load regulation	$U_{i,nom}, 0 \dots 100\% I_{o,nom}$, single output models	2% $U_{o,nom}$
	dual output models	max. 3% $U_{o,nom}$
Output voltage switching noise	$U_{i,nom}, 20 \dots 100\% I_{o,nom}$, peak-peak, total	max. 3% $U_{o,nom}$
Efficiency	$U_{i,nom}, I_{o,nom}$	up to 81%

Control and protection

Overload protection	$U_{I \min}$, full load	125% $P_{I \text{ nom}}$
No-load protection		
Remote Shut down	positive logic (floating or high signal = on)	

Safety and EMC

Electric strength test voltage	I/O	3500 V DC
Electromagnetic interference	conducted with external filter	class B

Environmental

Operating ambient temperature	$U_{I \text{ nom}}$, $I_{O \text{ nom}}$	-25...71 °C
Storage temperature	non operational	-40...100 °C
Relative humidity	non condensing	95%
MTBF	MIL-HDBK-217F, N2	>3'700'000 h

Options

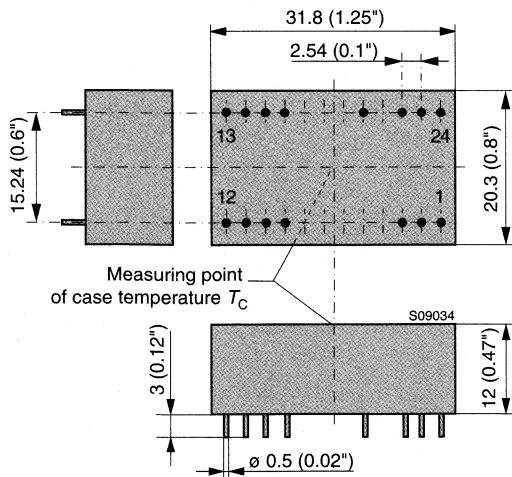
Industry standard pinout	S
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Accessories

DIN and chassis mounting bracket	
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Mechanical data

Tolerances $\pm 0.3 \text{ mm}$ (0.012") unless otherwise indicated.

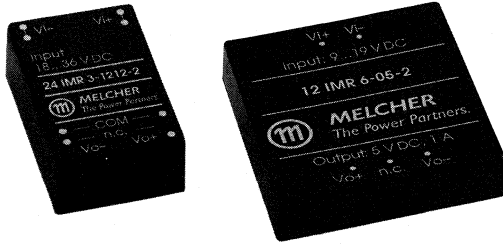


Industry standard

Pin	Single output	Dual output
2	Vi-	Vi-
3	Vi-	Vi-
9	n.c.	COM
10	n.c.	n.c.
11	n.c.	Vo-
14	Vo+	Vo+
15	n.c.	n.c.
16	Vo-	COM
22	Vi+	Vi+
23	Vi+	Vi+

Alternative pinout

Pin	Single output	Dual output	Double output
1	Vi+	Vi+	Vi+
2	Vi+	Vi+	Vi+
9	-	-	Go1
10	-	COM	-
11	-	COM	-
12	Vo-	-	Vo1
13	Vo+	Vo-	Vo2
15	-	Vo+	-
16	-	-	Go2
20	SD	SD	SD
23	Vi-	Vi-	Vi-
24	Vi-	Vi-	Vi-



Input voltage range up to 72 V DC
 1, 2 and 3 outputs up to 30 V DC
 500 V DC I/O electric strength test voltage

- Low cost
- Short circuit proof
- Efficiency up to 82%

Selection chart

Output 1		Output 2		Output 3		Type	Type	Type
U_o nom	I_o nom	U_o nom	I_o nom	U_o nom	I_o nom	Input voltage	Input voltage	Input voltage
[V DC]	[mA]	[V DC]	[mA]	[V DC]	[mA]	9...18 V DC	18...36 V DC	36...72 V DC
3.3	1500	-	-	-	-	12 IMR 6-03-2	24 IMR 6-03-2	48 IMR 6-03-2
3.3	3000	-	-	-	-	12 IMR 15-03-2	24 IMR 15-03-2	48 IMR 15-03-2
5	500	-	-	-	-	12 IMR 3-05-2	24 IMR 3-05-2	48 IMR 3-05-2
5	1000	-	-	-	-	12 IMR 6-05-2	24 IMR 6-05-2	48 IMR 6-05-2
5	3000	-	-	-	-	12 IMR 15-05-2	24 IMR 15-05-2	48 IMR 15-05-2
12	250	-	-	-	-	12 IMR 3-12-2	24 IMR 3-12-2	48 IMR 3-12-2
12	500	-	-	-	-	12 IMR 6-12-2	24 IMR 6-12-2	48 IMR 6-12-2
12	1250	-	-	-	-	12 IMR 15-12-2	24 IMR 15-12-2	48 IMR 15-12-2
15	200	-	-	-	-	12 IMR 3-15-2	24 IMR 3-15-2	48 IMR 3-15-2
15	400	-	-	-	-	12 IMR 6-15-2	24 IMR 6-15-2	48 IMR 6-15-2
15	1000	-	-	-	-	12 IMR 15-15-2	24 IMR 15-15-2	48 IMR 15-15-2
+5	250	-5	250	-	-	12 IMR 3-0505-2	24 IMR 3-0505-2	48 IMR 3-0505-2
+5	50	-5	50	-	-	12 IMR 6-0505-2	24 IMR 6-0505-2	48 IMR 6-0505-2
+12	125	-12	125	-	-	12 IMR 3-1212-2	24 IMR 3-1212-2	48 IMR 3-1212-2
+12	250	-12	250	-	-	12 IMR 6-1212-2	24 IMR 6-1212-2	48 IMR 6-1212-2
+12	625	-12	625	-	-	12 IMR 15-1212-2	24 IMR 15-1212-2	48 IMR 15-1212-2
+15	100	-15	100	-	-	12 IMR 3-1515-2	24 IMR 3-1515-2	48 IMR 3-1515-2
+15	200	-15	200	-	-	12 IMR 6-1515-2	24 IMR 6-1515-2	48 IMR 6-1515-2
+15	500	-15	500	-	-	12 IMR 15-1515-2	24 IMR 15-1515-2	48 IMR 15-1515-2
5	2000	+12	200	-12	200	12 IMR 15-051212-2	24 IMR 15-051212-2	48 IMR 15-051212-2
5	2000	+15	200	-15	200	12 IMR 15-051515-2	24 IMR 15-051515-2	48 IMR 15-051515-2

Input

Input voltage	continuous range, 12 V	9...18 V DC
	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	36...72 V DC
Protection	reverse input voltage, current limitation	

Output

Efficiency		up to 82%
Minimum load	recommended	20% $I_{o\ nom}$
Line regulation	$U_{i\ min}...U_{i\ max}, I_{o\ nom}$	$\pm 1\%$
Load regulation	$U_{i\ nom}, 0...100\% I_{o\ nom}$, single output models	2%
	dual output models (traching)	5%
	triple output models (traching)	6%
Ripple and noise	$U_{i\ nom}, (20...100\%) I_{o\ nom}$	2% $U_{o\ nom}$

Protection

Overload protection	$U_{i\ nom}$, full load	125% $P_{i\ nom}$
No-load protection		

Safety

I/O electric strength test	per EN 60950	500 V DC
Electromagnetic interference	conducted per EN 55022 with external filter	class B

Environmental

Operating temperature	$U_{i\ nom}, I_{o\ nom}$	-10...50°C
Storage temperature	non operational	-40...100°C
Relative humidity	non condensing	95%
MTBF	per MIL-HDBK-217F, N2	>3'000'000 h

Options

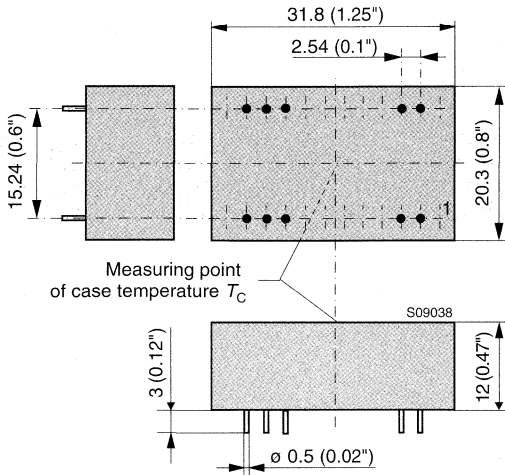
Extended temperature range	-25...71°C, ambient, operating, IMR 3, IMR 6	-7
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Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



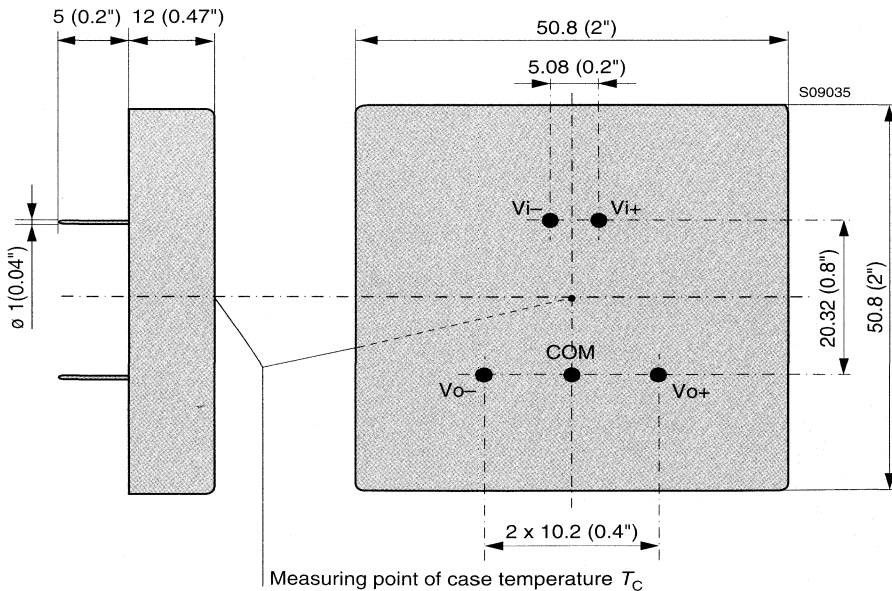
IMR 3



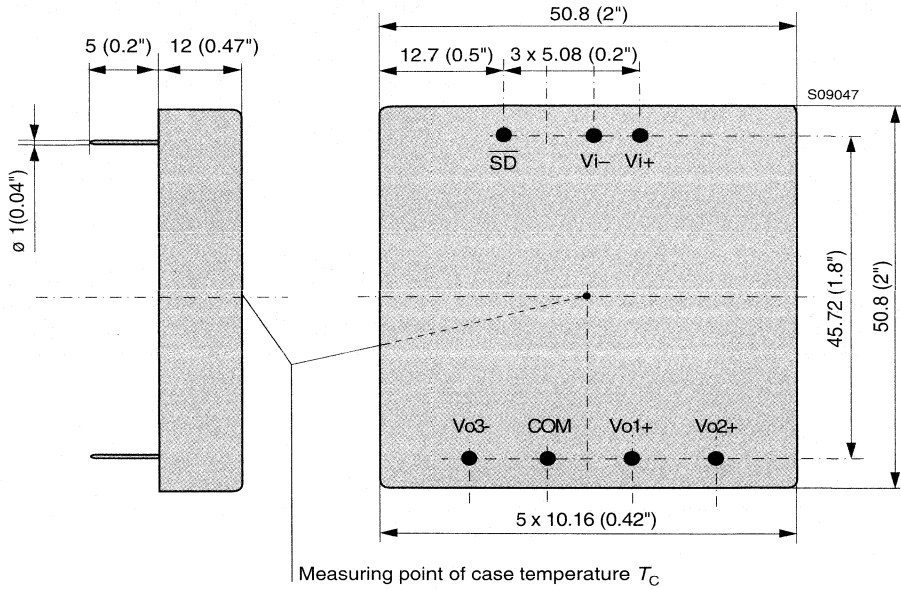
Pin allocation IMR 3

Pin	Single output unit	Dual output unit
2	Vi-	Vi-
3	Vi-	Vi-
9	n.c.	COM
11	n.c.	Vo-
14	Vo+	Vo+
16	Vo-	COM
22	Vi+	Vi+
23	Vi+	Vi+

IMR 6



IMR 15



Accessories

DIN and chassis mounting bracket.



Input voltage ranges up to 121 V DC
 1 or 2 outputs up to 48 V DC
 Up to 2000 V DC I/O electric strength test



- Short circuit protection
- DIL 24 Case with 8.5 mm profile

Selection chart

Output 1		Output 2		Input voltage	Type	Options (for availability consult sales point)
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [mA]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [mA]	U_i [V DC]		
3.3	800	-	-	4.7...16.8	5 IMX 4-03-9	-8, L, Z
3.3	900	-	-	8.4...36	20 IMX 4-03-9	-8, M, L, Z
3.3	900	-	-	16.8...75	40 IMX 4-03-9	-8, M, L, Z
3.3	900	-	-	40...121	70 IMX 4-03-9	-8, L, Z
5	700	-	-	4.7...16.8	5 IMX 4-05-9	-8, L, Z
5	700	-	-	8.4...36	20 IMX 4-05-9	-8, M, K, L, Z
5	700	-	-	16.8...75	40 IMX 4-05-9	-8, M, K, L, Z
5	700	-	-	40...121	70 IMX 4-05-9	-8, L, Z
12	340	-	-	4.7...16.8	5 IMX 4-12-9	-8, L, Z
12	340	-	-	8.4...36	20 IMX 4-12-9	-8, M, K, L, Z
12	340	-	-	16.8...75	40 IMX 4-12-9	-8, M, K, L, Z
12	340	-	-	40...121	70 IMX 4-12-9	-8, L, Z
15	280	-	-	4.7...16.8	5 IMX 4-15-9	-8, L, Z
15	280	-	-	8.4...36	20 IMX 4-15-9	-8, M, K, L, Z
15	280	-	-	16.8...75	40 IMX 4-15-9	-8, M, K, L, Z
15	280	-	-	40...121	70 IMX 4-15-9	-8, L, Z
+5	350	-5	350	8.4...36	20 IMX 4-0505-9	-8, M, K, L, Z
+5	350	-5	350	16.8...75	40 IMX 4-0505-9	-8, M, K, L, Z
+5	350	-5	350	40...121	70 IMX 4-0505-9	-8, L, Z
+12	170	-12	170	8.4...36	20 IMX 4-1212-9	-8, M, K, L, Z
+12	170	-12	170	16.8...75	40 IMX 4-1212-9	-8, M, K, L, Z
+15	140	-15	140	8.4...36	20 IMX 4-1515-9	-8, M, K, L, Z
+15	140	-15	140	16.8...75	40 IMX 4-1515-9	-8, M, K, L, Z
+24	80	-24	80	8.4...36	20 IMX 4-2424-9	-8, M, L, Z
+24	80	-24	80	16.8...75	40 IMX 4-2424-9	-8, M, L, Z

Input

Input voltage	5 IMX, continuous range, 5 V	4.7...16.8 V DC
	20 IMX, continuous range, 20 V	8.4...36 V DC
	40 IMX, continuous range, 40 V	18...75 V DC
	70 IMX, continuous range, 70 V	40...121 V DC

Output

Output voltage setting accuracy	$U_{i\text{ nom}}$, 50% $I_{o\text{ nom}}$	$\pm 1\%$ $U_{o\text{ nom}}$
Minimum load	recommended	10% $I_{o\text{ nom}}$
Line regulation	$U_{i\text{ min}}...U_{i\text{ max}}$, 50% $I_{o\text{ nom}}$	$\pm 1\%$ $U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}$, 10...100% $I_{o\text{ nom}}$, main output	$\pm 3\%$ $U_{o\text{ nom}}$
	tracking output	$\pm 3\%$ $U_{o\text{ nom}}$
Output voltage switching noise	$U_{i\text{ nom}}$, 10...100% $I_{o\text{ nom}}$, peak-peak, total	max. 2% $U_{o\text{ nom}}$
Efficiency	$U_{i\text{ nom}}$, $I_{o\text{ nom}}$	up to typ. 83%

Control and protection

Input protection	suppressor diode (except 5 IMX 4)
Overload protection	$U_{i\text{ min}}...U_{i\text{ max}}$, fully protected, hiccup mode
No-load protection	yes

Safety and EMC

Electric strength test voltage	I/O (5/20/40/70 IMX 4)	1/1.5/1.5/2 kV DC
Electromagnetic interference	conducted (5/20/40/70 IMX 4)	class B/B/B/A

Environmental

Operating ambient temperature	$U_{i\text{ nom}}$, $I_{o\text{ nom}}$	-40...71 °C
Storage temperature	non operational	-40...100 °C
Relative humidity	non condensing	93%
MTBF	Gf 40 °C (MIL-HDBK-217F-N2)	>349'000 h

Options

Extended temperature range	-40...85 °C, ambient, operating	-8
Alternative pinout		K
SMD version	with pins	M
SMD version	with adapter PCB	L
Open frame version		Z

Accessories

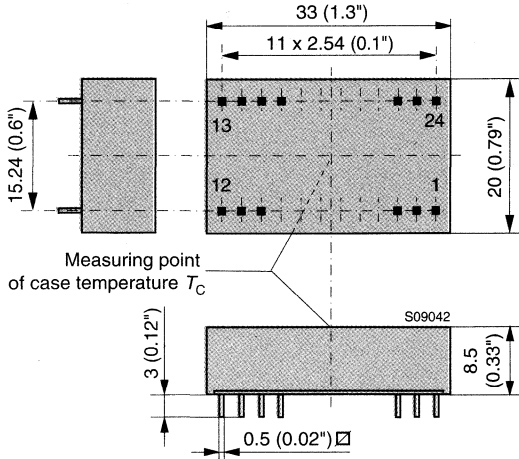
DIN and chassis mounting kit	
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Mechanical data

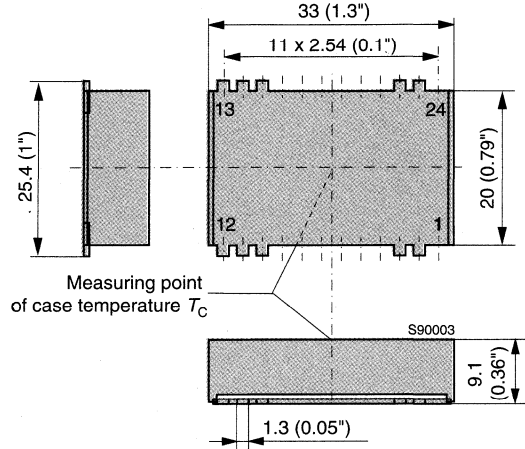
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



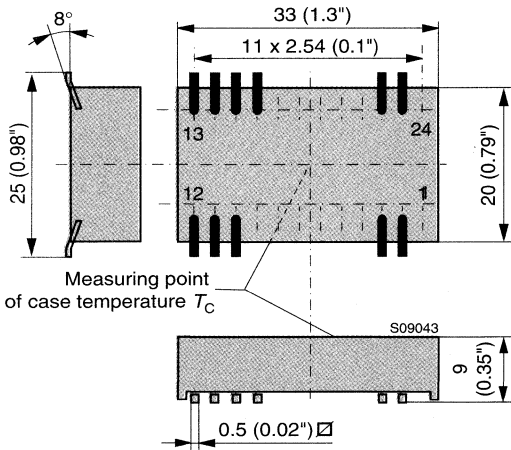
Standard and alternative pinout



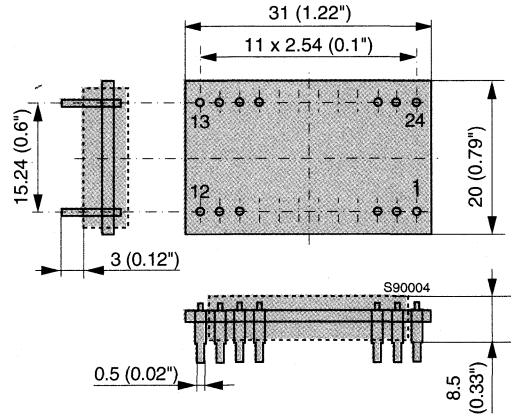
Option L



Option M



Option Z



Standard including option Z

Pin	Single output units	Dual output units
2	Vi-	Vi-
3	Vi-	Vi-
10	n.c.	-
11	-	Vo-
14	Vo+	Vo+
16	Vo-	Go
22	Vi+	Vi+
23	Vi+	Vi+

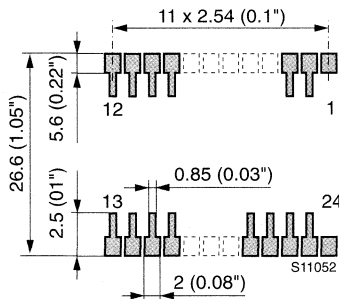
Option K including option Z

Pin	Single output units	Dual output units
1	Vi+	Vi+
2	n.c.	-
10	-	Go
11	-	Go
12	Vo-	-
13	Vo+	Vo-
15	-	Vo+
24	Vi-	Vi-

SMD pinout (option M and L)

Pin	Single output units	Dual output units
2	Vi-	Vi-
3	Vi-	Vi-
10	n.c.	Go
11	Vo-	Vo-
12	Vo-	Vo-
13	Vo+	Vo-
14	Vo+	Vo+
15	Vo+	Vo+
16	Vo-	Go
22	Vi+	Vi+
23	Vi+	Vi+

Solder lands for option M and L





Input voltage range up to 72 V DC
 1 or 2 outputs up to 30 V DC
 1500 V DC I/O electric strength test voltage

- Wide input range
- Short circuit protection
- Industry standard 2" x 1" foot print

Selection chart

Output 1		Output 2		Input voltage U_i [V DC]	Rated power $T_A = 71^\circ\text{C}$ $P_{o\text{ tot}}$ [W]	Type	Option
$U_{o\text{ nom}}$ [V DC]	$I_{o\text{ nom}}$ [mA]	$U_{o\text{ nom}}$ [V DC]	$I_{o\text{ nom}}$ [mA]				
3.3	1500	-	-	10...36	5	24 IMO 6-03-2	-7
3.3	1500	-	-	18...72	5	48 IMO 6-03-2	-7
5	1000	-	-	10...36	5	24 IMO 6-05-2	-7
5	1000	-	-	18...72	5	48 IMO 6-05-2	-7
12	500	-	-	10...36	6	24 IMO 6-12-2	-7
12	500	-	-	18...72	6	48 IMO 6-12-2	-7
15	400	-	-	10...36	6	24 IMO 6-15-2	-7
15	400	-	-	18...72	6	48 IMO 6-15-2	-7
+5	500	-5	500	10...36	5	24 IMO 6-0505-2	-7
+5	500	-5	500	18...72	5	48 IMO 6-0505-2	-7
+12	250	-12	250	10...36	6	24 IMO 6-1212-2	-7
+12	250	-12	250	18...72	6	48 IMO 6-1212-2	-7
+15	200	-15	200	10...36	6	24 IMO 6-1515-2	-7
+15	200	-15	200	18...72	6	48 IMO 6-1515-2	-7

Input

Input voltage	continuous range, 24 V	10...36 V DC
	continuous range, 48 V	18...72 V DC
Reverse voltage protection	shunt diode	

Output

Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 2\% U_{o\text{ nom}}$
Minimum load	not required	
Line regulation	$U_{i\text{ min}}...U_{i\text{ max}}, I_{o\text{ nom}}$	$\pm 1\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}, 0...100\% I_{o\text{ nom}}$, single output models	$2\% U_{o\text{ nom}}$
	dual output models	max. $5\% U_{o\text{ nom}}$
Ripple and noise	$U_{i\text{ nom}}, 0...100\% I_{o\text{ nom}}$, peak-peak, total	max. $3\% U_{o\text{ nom}}$
Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to 80%

Control and protection

Overload protection	$U_{i\text{ min}}$, full load	$150\% P_{i\text{ nom}}$
No-load protection		

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
Electromagnetic interference	conducted	class A
	conducted with external filter	class B

Environmental

Operating ambient temperature	$U_{I\text{ nom}}, I_{o\text{ nom}}$	-10...50°C
Storage temperature	non operational	-40...100°C
Relative humidity	non condensing	95%
MTBF	MIL-HDBK-217F, N2	>3'000'000 h

Options

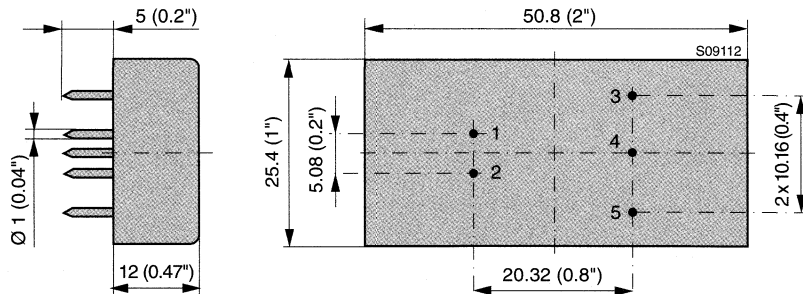
Extended temperature range	-25...71°C, ambient, operating	-7
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Accessories

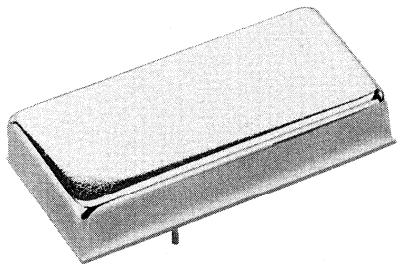
DIN and chassis mounting bracket

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.

**Pin allocation**

Pin	Single output	Dual output
1	Vi+	Vi+
2	Vi-	Vi-
3	Vo+	Vo+
4	no pin	COM
5	Vo-	Vo-



Input voltage range up to 75 V DC
 1 or 2 outputs up to 30 V DC
 1500 V DC I/O electric strength test voltage

- Operating case temperature up to 100°C
- Short circuit protection
- Efficiency up to 86%

Selection chart

Output 1		Output 2		Input	Rated power	Efficiency	Type
$U_{o,nom}$ [V DC]	$I_{o,nom}$ [mA]	$U_{o,nom}$ [V DC]	$I_{o,nom}$ [mA]	U_i [V DC]	$P_{o,tot}$ [W]	η_{typ} [%]	
3.3	2	-	-	18...36	6	75	IAS 006YE
3.3	2	-	-	34...75	6	75	IAS 0006ZE
5	2	-	-	18...36	10	80	IAS 010YG
5	2	-	-	34...75	10	81	IAS 010ZG
12	1	-	-	18...36	12	85	IAS 012YH
12	1	-	-	34...75	12	85	IAS 012ZH
15	0.8	-	-	18...36	12	86	IAS 015YJ
15	0.8	-	-	34...75	12	86	IAS 015ZJ
+5	1	-5	1	18...36	10	77	IAD 010YGG
+5	1	-5	1	34...75	10	78	IAD 010ZGG
+12	0.5	-12	0.5	18...36	12	82	IAD 012YHH
+12	0.5	-12	0.5	34...75	12	82	IAD 012ZHH
+15	0.4	-15	0.4	18...36	12	83	IAD 015YJJ
+15	0.4	-15	0.4	34...75	12	83	IAD 015ZJJ

Input

Input voltage	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	34...75 V DC
Reverse voltage protection	shunt diode	

Output

Output voltage setting accuracy	$U_{i,nom}, I_{o,nom}$	$\pm 1\% U_{o,nom}$
Minimum load	recommended	$10\% I_{o,nom}$
Line regulation	$U_{i,min} \dots U_{i,max}, I_{o,nom}$, single output models	typ $\pm 0.2\% U_{o,nom}$
	$U_{i,min} \dots U_{i,max}, I_{o,nom}$, dual output models	typ $\pm 0.5\% U_{o,nom}$
Load regulation	$U_{i,nom}, 1 \dots 100\% I_{o,nom}$, single output models	typ $0.5\% U_{o,nom}$
	dual output models	typ $1\% U_{o,nom}$
Output voltage switching noise	$U_{i,nom}, I_{o,nom}$, peak-peak, total	max $4\% U_{o,nom}$
Voltage trim range		$\pm 10\% U_{o,nom}$

Control and protection

Overload protection	shut down, hiccup, single output models	110...140% $I_{o\ nom}$
	shut down, hiccup, dual output models	110...150% $I_{o\ nom}$
Thermal shutdown		105...115°C
Remote shutdown	positive logic	

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
Safety	designed to meet UL, CSA and EN60950	
Electromagnetic interference	conducted	tbd

Environmental

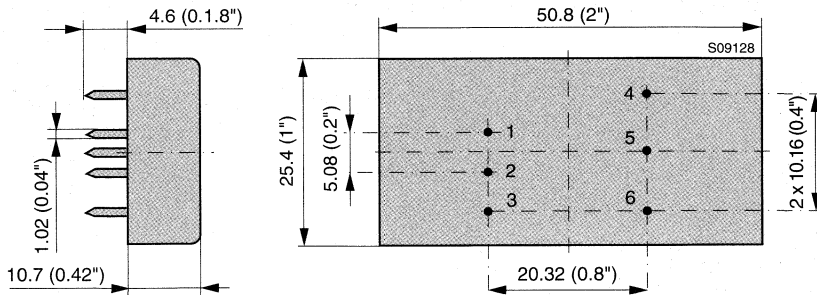
Operating case temperature T_C	$U_{i\ nom}$, $I_{o\ nom}$, single output models	-40...100°C
	$U_{i\ nom}$, $I_{o\ nom}$, dual output models	-40...85°C
Storage temperature	non operational	-40...110°C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332	2'100'000 h

Options

Trim input	-1
Shutdown	-2
Trim and shutdown	-3

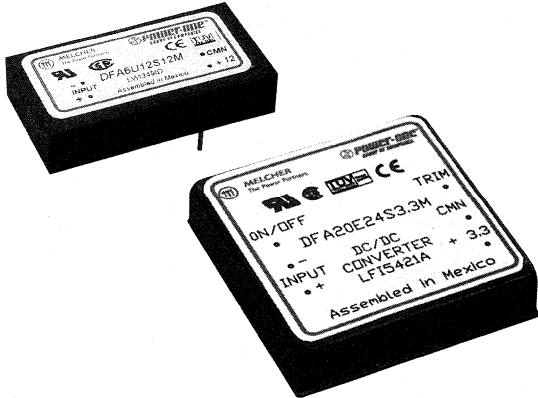
Mechanical data

Tolerances $\pm 0.3\text{ mm}$ (0.012") unless otherwise indicated.



Pin allocation

Pin	Single output unit	Dual output unit
1	V_{i+}	V_{i+}
2	V_{i-}	V_{i-}
3	no pin/Shutdown	no pin/Shutdown
4	V_{o+}	V_{o+}
5	no pin/Trim (option)	COM
6	V_{o-}	V_{o-}



Input voltage range up to 72 V DC
 1 or 2 outputs, 3.3 to 30 V DC
 1544 V DC I/O electric strength test voltage



- 85°C operation
- Overcurrent protection
- Efficiency to 85%
- Industry standard pinouts
- Remote ON/OFF and trim (DFA 20)

Selection chart

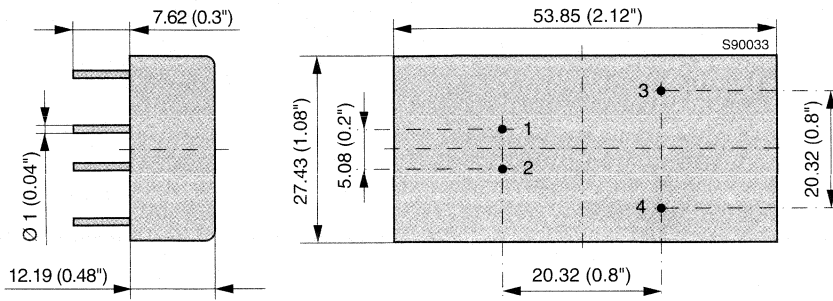
Output 1		Output 2		Input voltage	Rated power	Type
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	U_i [V DC]	$P_{o \text{ tot}}$ [W]	
3.3	4	-	-	9...18	13.2	DFA 20 E12S3.3
3.3	4	-	-	18...36	13.2	DFA 20 E24S3.3
3.3	4	-	-	36...72	13.2	DFA 20 E48S3.3
5	1	-	-	9...27	5	DFA 6 U12S5
5	1	-	-	20...60	5	DFA 6 U48S5
5	4	-	-	9...18	20	DFA 20 E12S5
5	4	-	-	18...36	20	DFA 20 E24S5
5	4	-	-	36...72	20	DFA 20 E48S5
12	0.5	-	-	9...27	6	DFA 6 U12S12
12	0.5	-	-	20...60	6	DFA 6 U48S12
12	1.7	-	-	9...18	20.4	DFA 20 E12S12
12	1.7	-	-	18...36	20.4	DFA 20 E24S12
12	1.7	-	-	36...72	20.4	DFA 20 E48S12
15	0.4	-	-	9...27	6	DFA 6 U12S15
15	0.4	-	-	20...60	6	DFA 6 U48S15
15	1.4	-	-	9...18	21	DFA 20 E12S15
15	1.4	-	-	18...36	21	DFA 20 E24S15
15	1.4	-	-	36...72	21	DFA 20 E48S15
+5	1.7	-5	1.7	9...18	17	DFA 20 E12D5
+5	1.7	-5	1.7	18...36	17	DFA 20 E24D5
+5	1.7	-5	1.7	36...72	17	DFA 20 E48D5
+12	0.85	-12	0.85	9...18	20.4	DFA 20 E12D12
+12	0.85	-12	0.85	18...36	20.4	DFA 20 E24D12
+12	0.85	-12	0.85	36...72	20.4	DFA 20 E48D12
+15	0.7	-15	0.7	9...18	21	DFA 20 E12D15
+15	0.7	-15	0.7	18...36	21	DFA 20 E24D15
+15	0.7	-15	0.7	36...72	21	DFA 20 E48D15

Mechanical data

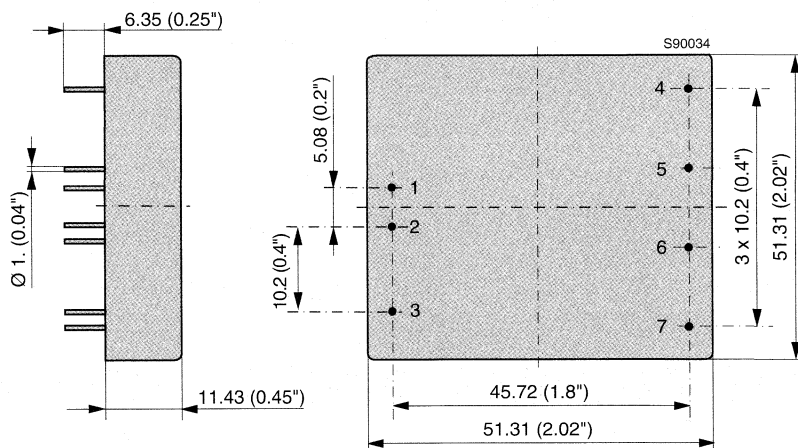
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



DFA 6



DFA 20

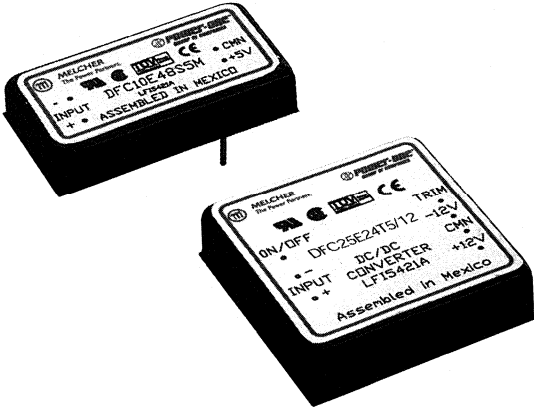


Pin allocation DFA 6

Pin	Single output units
1	Vi+
2	Vi-
3	Vo-
4	Vo+

Pin allocation DFA 20

Pin	Single output units	Dual output units
1	Vi+	Vi+
2	Vi-	Vi-
3	ON/OFF	ON/OFF
4	-	Vo+
5	Vo+	Common
6	Vo-	Vo-
7	Trim	Trim



Input voltage range up to 72 V DC
 1 to 3 outputs, 3.3 to 30 V DC
 1544 V DC I/O electric strength test voltage



- To 90°C case operation
- Overcurrent protection (except DFC 6)
- Efficiency to 83%
- Input and output filtering
- Industry standard package and pin-outs
- Remote ON/OFF and Trim DFC 15 and DFC 25

Selection chart

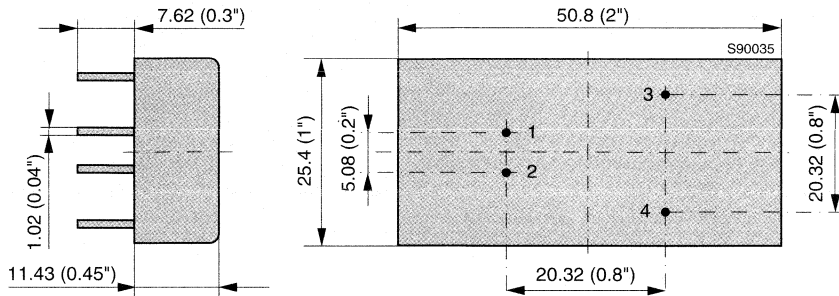
Output 1		Output 2		Output 3		Input U_i [V DC]	Rated power $P_{o\ tot}$ [W]	Type
$U_o\ nom$ [V DC]	$I_o\ nom$ [A]	$U_o\ nom$ [V DC]	$I_o\ nom$ [A]	$U_o\ nom$ [V DC]	$I_o\ nom$ [A]			
3.3	2	-	-	-	-	9...18	6.6	DFC 10 E12S3.3
3.3	2	-	-	-	-	18...36	6.6	DFC 10 E24S3.3
3.3	2	-	-	-	-	36...72	6.6	DFC 10 E48S3.3
3.3	7.5	-	-	-	-	9...18	24.7	DFC 25 E12S3.3
5	1.2	-	-	-	-	3.5...16	6	DFC 6 U5S5
5.2	1.2	-	-	-	-	3.5...16	6.2	DFC 6 U5S5.2
5	2	-	-	-	-	9...18	10	DFC 10 E12S5
5	2	-	-	-	-	18...36	10	DFC 10 E24S5
5	2	-	-	-	-	36...72	10	DFC 10 E48S5
5	3	-	-	-	-	20...60	15	DFC 15 U48S5
5	6	-	-	-	-	18...24	30	DFC 25 E24S5
5	6	-	-	-	-	36...72	30	DFC 25 E48S5
12	0.5	-	-	-	-	3.5...16	6	DFC 6 U5S12
12	0.9	-	-	-	-	9...18	10.8	DFC 10 E12S12
12	0.9	-	-	-	-	18...36	10.8	DFC 10 E24S12
12	0.9	-	-	-	-	36...72	10.8	DFC 10 E48S12
12	1.25	-	-	-	-	20...60	15	DFC 15 U48S12
15	0.4	-	-	-	-	3.5...16	6	DFC 6 U5S15
15	0.7	-	-	-	-	9...18	10.5	DFC 10 E12S15
15	0.7	-	-	-	-	18...36	10.5	DFC 10 E24S15
15	0.7	-	-	-	-	36...72	10.5	DFC 10 E48S15
15	1	-	-	-	-	20...60	15	DFC 15 U48S15
+5	0.85	-5	0.85	-	-	9...36	8.5	DFC 10 U24D5
+5	0.8	-5	0.8	-	-	18...72	8	DFC 10 U48D5
+12	0.4	-12	0.4	-	-	9...36	9.6	DFC 10 U24D12
+12	0.415	-12	0.415	-	-	18...72	10	DFC 10 U48D12
+12	0.625	-12	0.625	-	-	20...72	15	DFC 15 U48D12
+15	0.32	-15	0.32	-	-	9...36	9.6	DFC 10 U24D15
+15	0.33	-15	0.33	-	-	18...72	9.9	DFC 10 U48D15
+15	0.5	-15	0.5	-	-	20...72	15	DFC 15 U48D15
3.3	5	+12	1	-12	1	36...72	25	DFC 25 E48T3.3/12
5	5	+12	1	-12	1	18...36	25	DFC 25 E24T5/12
5	5	+12	1	-12	1	36...72	25	DFC 25 E48T5/12
5	5	+15	0.8	-15	0.8	18...36	25	DFC 25 E24T5/15

Mechanical data

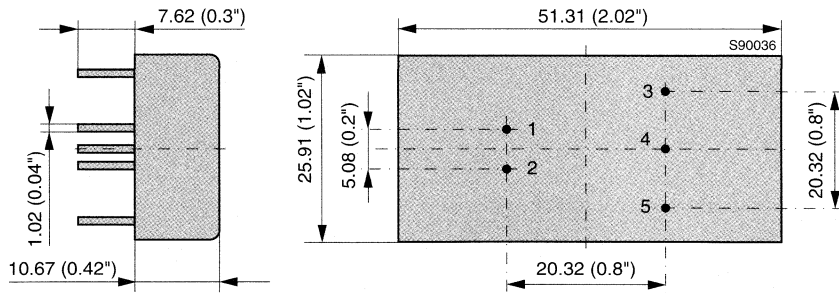
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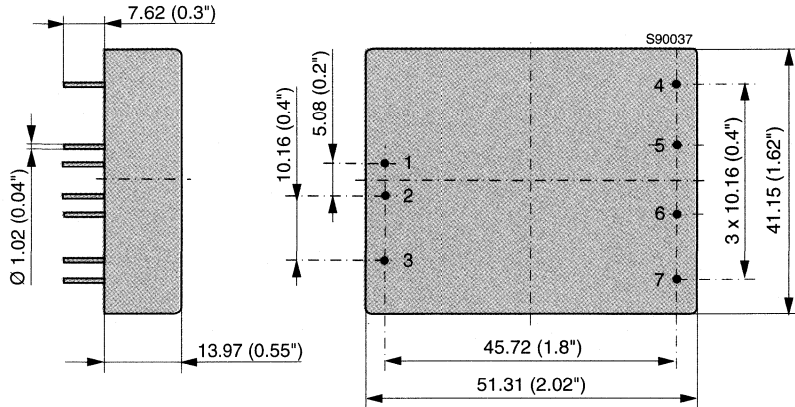
DFC 6



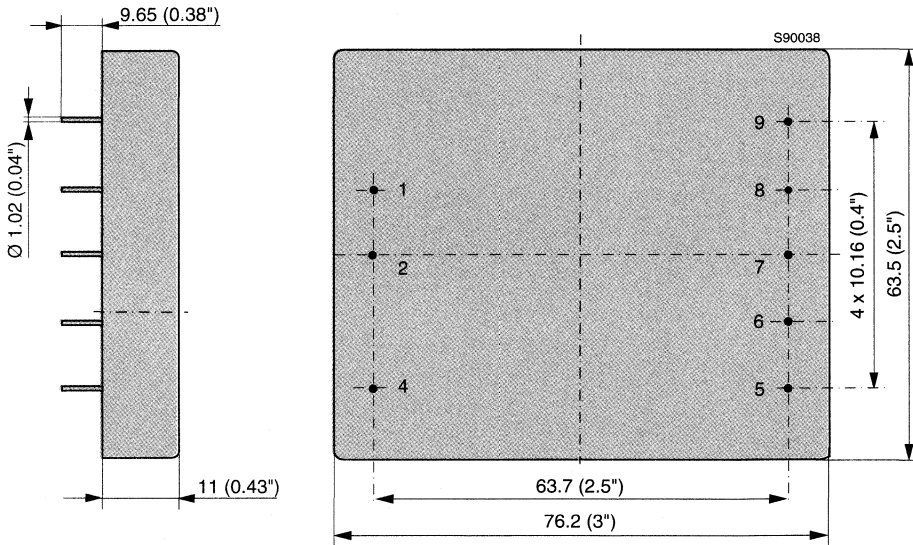
DFC 10



DFC 15



DFC 25



Pin allocation DFC 6

Pin	Single output units
1	Vi+
2	Vi-
3	Vo-
4	Vo+

Pin allocation DFC 10

Pin	Single output units	Dual output units
1	Vi+	Vi+
2	Vi-	Vi-
3	Vo+	Vo+
4	n.c.	Common
5	Vo-	Vo-

Pin allocation DFC 15

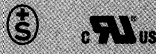
Pin	Single output units	Dual output units
1	Vi+	Vi+
2	Vi-	Vi-
3	ON/OFF	ON/OFF
4	n.c.	Vo+
5	Vo+	Common
6	Vo-	Vo-
7	Trim	Trim

Pin allocation DFC 25

Pin	Single output units	Triple output units
1	Vi-	Vi-
2	Vi+	Vi+
3	N/C	N/C
4	ON/OFF	ON/OFF
5	Trim	Trim
6	Vo+	+3.3 V or +5 V
7	Vo-	Common
8	N/C	+12 V or +15 V
9	N/C	-12 V or -15 V



Wide input voltage ranges up to 75 V DC
 1 or 2 outputs up to 48 V DC
 1500 V DC I/O electric strength test voltage



- Magnetic feedback for single output models
- Short circuit protection
- Industry standard 2" x 1" case with 10.5 mm profile

Selection chart

Output 1		Output 2		Input voltage	Type	Options
$U_{o, nom}$ [V DC]	$I_{o, nom}$ [mA]	$U_{o, nom}$ [V DC]	$I_{o, nom}$ [mA]	U_i [V DC]		(for availability consult sales point)
3.3	1200	-	-	14...36	24 IMS 7-03-9	M, C, L, Z
3.3	1200	-	-	36...75	48 IMS 7-03-9	M, C, L, Z
5.1	1200	-	-	14...36	24 IMS 7-05-9	M, C, L, Z
5.1	1200	-	-	36...75	48 IMS 7-05-9	M, C, L, Z
5	700	5	700	14...36	24 IMS 7-05-05-9	M, C, L, Z
5	700	5	700	36...75	48 IMS 7-05-05-9	M, C, L, Z
12	300	12	300	14...36	24 IMS 7-12-12-9	M, C, L, Z
12	300	12	300	36...75	48 IMS 7-12-12-9	M, C, L, Z
15	240	15	240	14...36	24 IMS 7-15-15-9	M, C, L, Z
15	240	15	240	36...75	48 IMS 7-15-15-9	M, C, L, Z
24	150	24	150	14...36	24 IMS 7-24-24-9	M, C, L, Z
24	150	24	150	36...75	48 IMS 7-24-24-9	M, C, L, Z

Input

Input voltage range	24 IMS 7	14...36 V DC
	48 IMS 7	36...75 V DC

Output

Output voltage setting accuracy	$U_{i \text{ nom}}$, 50% $I_{o \text{ nom}}$, single output models	$\pm 1\% U_{o \text{ nom}}$
	$U_{i \text{ nom}}$, 50% $I_{o \text{ nom}}$, double output, main/aux. output	$\pm 1.5\% U_{o \text{ nom}}$
Minimum load	recommended for double output models	10% $I_{o \text{ nom}}$
Line/load regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}$, 50% $I_{o \text{ nom}}$, single output models	$\pm 1\% U_{o \text{ nom}}$
Line regulation	$U_{i \text{ nom}}$, 50% $I_{o \text{ nom}}$, double output models, main output	$\pm 1\% U_{o \text{ nom}}$
Load regulation	$U_{i \text{ nom}}$, 10...100% $I_{o \text{ nom}}$, double output models	$\pm 3\% U_{o \text{ nom}}$
	tracking output	$\pm 3\% U_{o \text{ nom}}$
Output voltage switching noise	$U_{i \text{ nom}}$, 0...100% $I_{o \text{ nom}}$, peak-peak, total	max. 1.5% $U_{o \text{ nom}}$
Efficiency	$U_{i \text{ nom}}$, $I_{o \text{ nom}}$	up to 84%

Control and protection

Input protection	suppressor diode	
Overload protection	$U_{i \text{ min}} \dots U_{i \text{ max}}$, any load fully protected, hiccup mode	
No-load protection	yes	
Remote shut down	TTL-compatible inhibit input	disabled with 2.4 V
Trim input for U_o	yes	

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
Electromagnetic interference		class B

Environmental

Operating ambient temperature	$U_{i \text{ nom}}$, $I_{o \text{ nom}}$	-40...71°C
Storage temperature	non operational	-40...100°C
Relative humidity	non condensing	93%
MTBF	G_B 40°C, MIL-HDBK-217F, N2	1'650'000 h

Options

SMD version	with pins	M
SMD version	with PCB lid	L
Open frame version		Z
C-pinout		C

Accessories

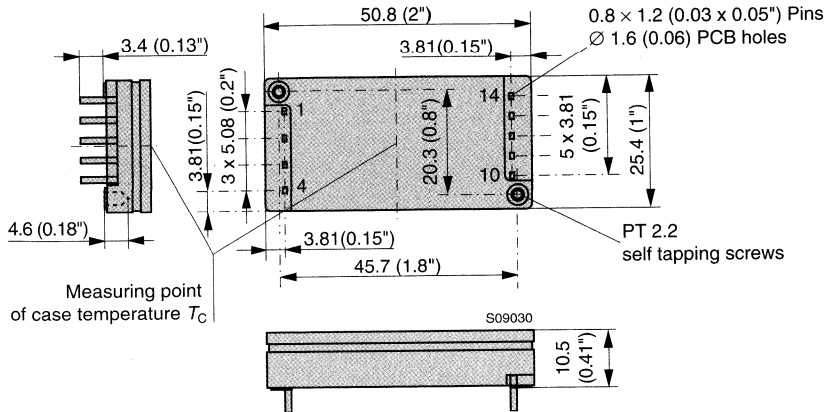
DIN and chassis mounting bracket		
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Mechanical data

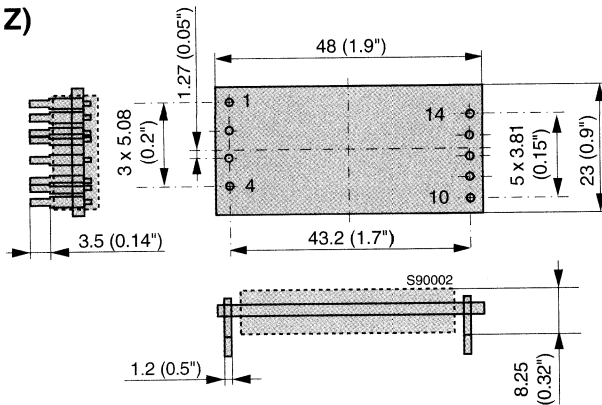
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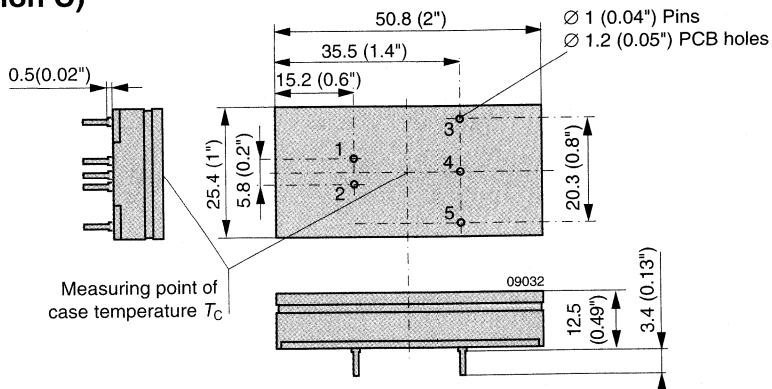
IMS 7



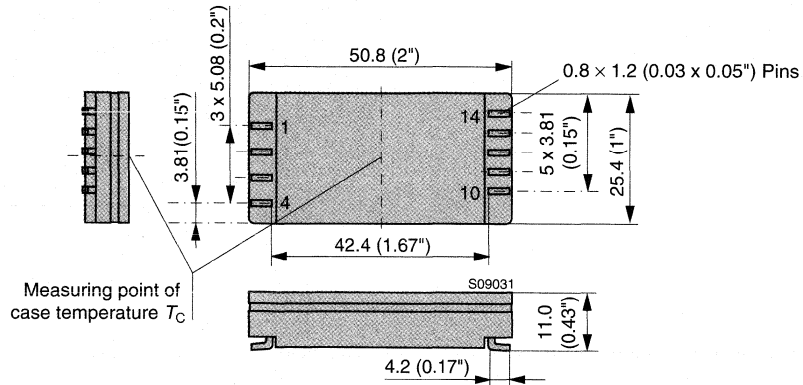
IMS 7 (option Z)



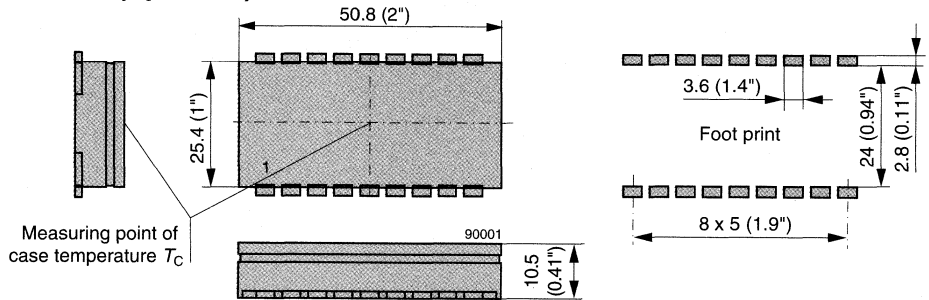
IMS 7 (option C)



IMS 7 SMD version (option M)



IMS 7 SMD version (option L)



Pin allocation IMS 7, option M and Z

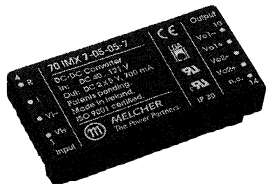
Pin	Single output	Dual output
1	Vi+	Vi+
2	Vi-	Vi-
3	i	i
4	n.c.	R (Trim)
10	Vo-	Vo1-
11	Vo+	Vo1+
12	Vo-	Vo2-
13	R	Vo2+
14	n.c.	n.c.

SMD version (option L)

Pin	Single output	Dual output
1	Vo	Vo1
2	Go	Go
3	n.c.	Vo2
4	n.c.	n.c.
5	n.c.	n.c.
6	n.c.	n.c.
7	n.c.	n.c.
8	n.c.	n.c.
9	n.c.	Trim
10	n.c.	n.c.
11	i	i
12	no pin	no pin
13	no pin	no pin
14	n.c.	n.c.
15	n.c.	n.c.
16	n.c.	n.c.
17	Vi-	Vi-
18	Vi+	Vi+

C pinout (option C)

Pin	Single output	Dual output
1	Vi+	Vi+
2	Vi-	Vi-
3	Vo+	Vo+
4	no pin	Go
5	Vo-	Vo-



Wide input voltage ranges up to 150 V DC
 1 or 2 outputs up to 48 V DC
 1500...2500 V DC I/O electric strength test



- Magnetic feedback for single output models
- Short circuit protection
- Industry standard 2" x 1" case with 10.5 mm profile

Selection chart

Output 1		Output 2		Input voltage U_i [V DC]	Type	Options (for availability consult sales point)
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [mA]			
3.3	1.5	-	-	8.4...36	20 IMX 7-03-9	-8, D, M, C, L, Z
3.3	1.5	-	-	16.8...75	40 IMX 7-03-9	-8, D, M, C, L, Z
3.3	1.5	-	-	40...121	70 IMX 7-03-9	-8, D, M
3.3	1.5	-	-	60...150	110 IMX 7-03-9	-8, D, M
5.1	1.2	-	-	8.4...36	20 IMX 7-05-9	-8, D, M, C, L, Z
5.1	1.2	-	-	16.8...75	40 IMX 7-05-9	-8, D, M, C, L, Z
5.1	1.2	-	-	40...121	70 IMX 7-05-9	-8, D, M
5.1	1.2	-	-	60...150	110 IMX 7-05-9	-8, D, M
5	0.7	5	0.7	8.4...36	20 IMX 7-05-05-9	-8, M, C, L, Z
5	0.7	5	0.7	16.8...75	40 IMX 7-05-05-9	-8, M, C, L, Z
5	0.7	5	0.7	40...121	70 IMX 7-05-05-9	-8, M
5	0.7	5	0.7	60...150	110 IMX 7-05-05-9	-8, M
12	0.3	12	0.3	8.4...36	20 IMX 7-12-12-9	-8, M, C, L, Z
12	0.3	12	0.3	16.8...75	40 IMX 7-12-12-9	-8, M, C, L, Z
12	0.3	12	0.3	40...121	70 IMX 7-12-12-9	-8, M
12	0.3	12	0.3	60...150	110 IMX 7-12-12-9	-8, M
15	0.24	15	0.24	8.4...36	20 IMX 7-15-15-9	-8, M, C, L, Z
15	0.24	15	0.24	16.8...75	40 IMX 7-15-15-9	-8, M, C, L, Z
15	0.24	15	0.24	40...121	70 IMX 7-15-15-9	-8, M
15	0.24	15	0.24	60...150	110 IMX 7-15-15-9	-8, M
24	0.15	24	0.15	8.4...36	20 IMX 7-24-24-9	-8, M, C, L, Z
24	0.15	24	0.15	16.8...75	40 IMX 7-24-24-9	-8, M, C, L, Z
24	0.15	24	0.15	40...121	70 IMX 7-24-24-9	-8, M
24	0.15	24	0.15	60...150	110 IMX 7-24-24-9	-8, M

Input

Input voltage range	20 IMX 7	8.4...36 V DC
	40 IMX 7	16.8...75 V DC
	70 IMX 7	40...121 V DC
	110 IMX 7	60...150 V DC

Output

Output voltage setting accuracy	$U_{i \text{ nom}}$, 50% $I_{o \text{ nom}}$, single output models	$\pm 0.5\%$ $U_{o \text{ nom}}$
	$U_{i \text{ nom}}$, 50% $I_{o \text{ nom}}$, double outp., main/aux. outp.	$\pm 1\%$ / $\pm 1.2\%$ $U_{o \text{ nom}}$
Minimum load	recommended for double output models	10% $I_{o \text{ nom}}$
Line/load regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}$, 50% $I_{o \text{ nom}}$, single output models	$\pm 1\%$ $U_{o \text{ nom}}$
Line regulation	$U_{i \text{ nom}}$, 50% $I_{o \text{ nom}}$, double output models	$\pm 1\%$ $U_{o \text{ nom}}$
Load regulation	$U_{i \text{ nom}}$, 10...100% $I_{o \text{ nom}}$, double outp. models, main outp. tracking output	$\pm 3\%$ $U_{o \text{ nom}}$
Output voltage switching noise	$U_{i \text{ nom}}$, 0...100% $I_{o \text{ nom}}$, peak-peak, total	max. 1.5% $U_{o \text{ nom}}$
Efficiency	$U_{i \text{ nom}}$, $I_{o \text{ nom}}$	up to 84%

Control and protection

Input protection	suppressor diode	
Overload protection	$U_{i \text{ min}} \dots U_{i \text{ max}}$, fully protected, hiccup mode	
No-load protection		
Remote shut down	TTL-compatible inhibit input	disabled with 2.4 V
Trim input for U_o		

Safety and EMC

Electric strength test voltage	I/O (20/40/70/110 IMX7)	1500/1500/2000/2500 V DC
Electromagnetic interference	with external filter	class B

Environmental

Operating ambient temperature	$U_{i \text{ nom}}$, $I_{o \text{ nom}}$	-25...71 °C
Storage temperature	non operational	-40...100 °C
Relative humidity	non condensing	93%
MTBF	G_B 40°C, MIL-HDBK-217F, N2	1'650'000 h

Options

Output voltage monitor	only single output models	D
Extended temperature range	-40...85°C, ambient, operating	-8
SMD version	with pins	M
SMD version	with adapter PCB	L
Open version without housing		Z
C-pinout		C

Accessories

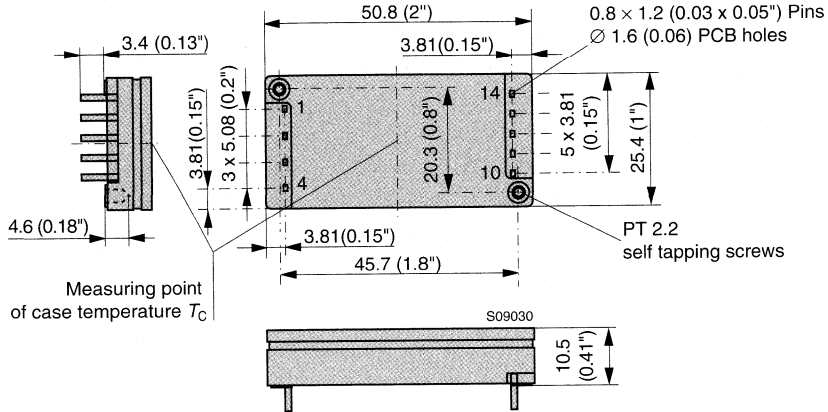
DIN and chassis mounting bracket	
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Mechanical data

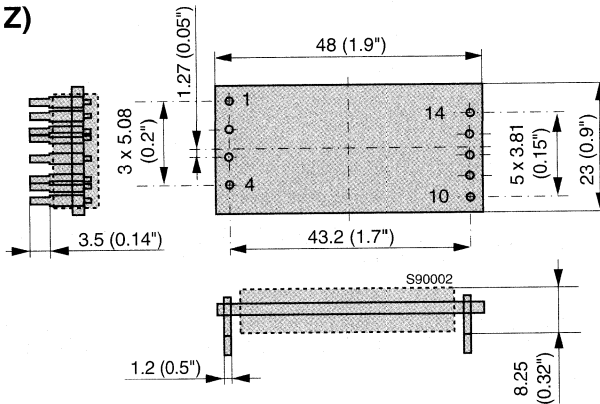
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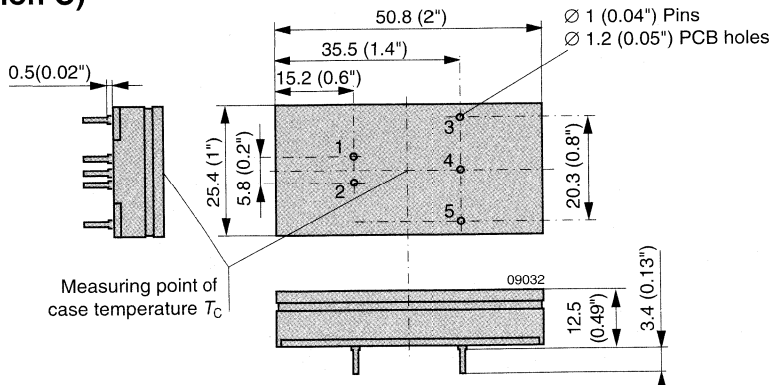
IMX 7



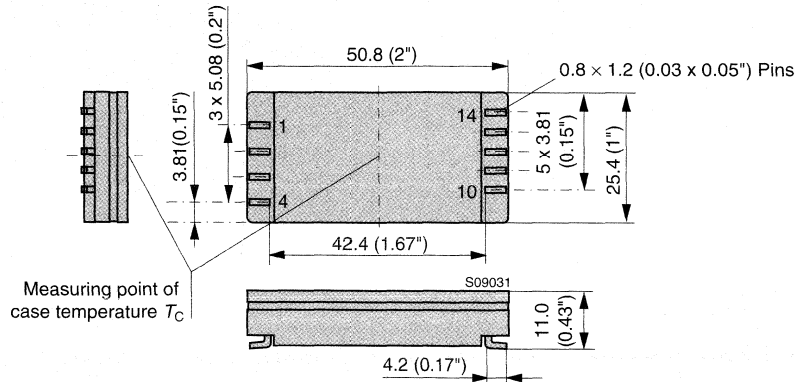
IMX 7 (option Z)



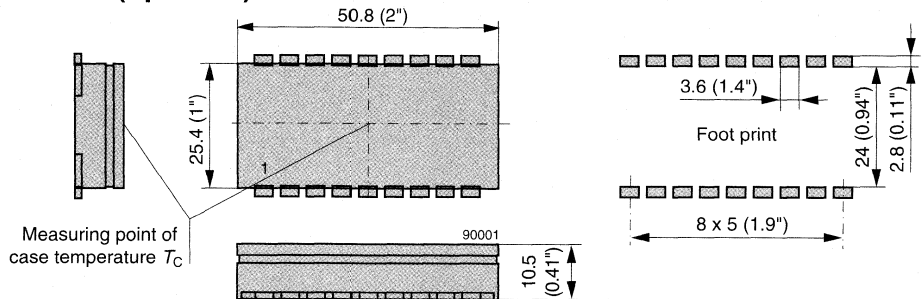
IMX 7 (option C)



IMX 7 SMD version (option M)



IMX 7 SMD version (option L)



Pin allocation IMX 7, option M and Z

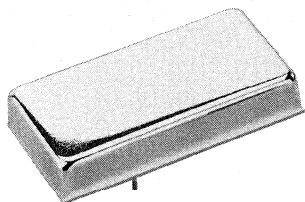
Pin	Single output	Dual output
1	Vi+	Vi+
2	Vi-	Vi-
3	i	i
4	n.c.	R (Trim)
10	Vo-	Vo1-
11	Vo+	Vo1+
12	Vo-	Vo2-
13	R	Vo2+
14	n.c.	n.c.

SMD version (option L)

Pin	Single output	Dual output
1	Vo	Vo1
2	Go	Go
3	n.c.	Vo2
4	n.c.	n.c.
5	n.c.	n.c.
6	n.c.	n.c.
7	n.c.	n.c.
8	n.c.	n.c.
9	n.c.	Trim
10	n.c.	n.c.
11	i	i
12	no pin	no pin
13	no pin	no pin
14	n.c.	n.c.
15	n.c.	n.c.
16	n.c.	n.c.
17	Vi-	Vi-
18	Vi+	Vi+

C pinout (option C)

Pin	Single output	Dual output
1	Vi+	Vi+
2	Vi-	Vi-
3	Vo+	Vo+
4	no pin	Go
5	Vo-	Vo-



Input voltage range up to 72 V DC
 1 or 2 output up to 48 V DC
 500 V DC I/O electric strength test voltage

- 5 V input
- Short circuit protection
- Input pi filter and six sided shielding

Selection chart

Output 1		Output 2		Input voltage	Rated power	Efficiency	Type
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	U_i [V DC]	$P_{o\ tot}$ [W]	η_{typ} [%]	
5	2	-	-	4.5...9	10	78	IWS 505
5	2	-	-	9...18	10	80	IWS 1205
12	1	-	-	4.5...9	12	80	IWS 512
12	1	-	-	9...18	12	82	IWS 1212
15	0.75	-	-	4.5...9	12	82	IWS 515
15	0.75	-	-	9...18	12	84	IWS 1215
24	0.5	-	-	4.5...9	12	83	IWS 524
24	0.5	-	-	9...18	12	85	IWS 1224
24	0.5	-	-	18...36	12	85	IWS 2424
24	0.5	-	-	36...72	12	85	IWS 4824
48	0.25	-	-	4.5...9	12	84	IWS 548
48	0.25	-	-	9...18	12	86	IWS 1248
48	0.25	-	-	18...36	12	86	IWS 2448
48	0.25	-	-	36...72	12	89	IWS 4848
+5	1	-5	1	4.65...5.5	5	82	IWD 505
+5	1	-5	1	10.9...13.2	5	80	IWD 1205
+12	0.5	-12	0.5	4.65...5.5	6	80	IWD 512
+12	0.5	-12	0.5	10.9...13.2	6	84	IWD 1212
+15	0.375	-15	0.375	4.65...5.5	6	82	IWD 515
+15	0.375	-15	0.375	10.9...13.2	6	82	IWD 1215

Input

Input voltage	5 V, continuous range, single output models	4.5...9 V DC
	5 V, continuous range, dual output models	4.65...5.5 V DC
	12 V, continuous range, single output models	9...18 V DC
	12 V, continuous range, dual output models	10.9...13.2 V DC
	24 V, continuous range, single output models only	18...36 V DC
	48 V, continuous range, single output models only	36...72 V DC

Output

Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 1\% U_{o\text{ nom}}$
Minimum load	recommended	$10\% I_{o\text{ nom}}$
Line regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, I_{o\text{ nom}}$	typ $\pm 0.5\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, I_{o\text{ nom}}$, dual output models	typ $\pm 1\% U_{o\text{ nom}}$
Output voltage switching noise	$U_{i\text{ nom}}, 1 \dots 100\% I_{o\text{ nom}}$	typ $\pm 1\% U_{o\text{ nom}}$
	$U_{i\text{ nom}}, I_{o\text{ nom}}$, peak-peak, total	max. $1\% U_{o\text{ nom}}$

Control and protection

Overload protection	Single output models, continuous current limit	$130\% I_{o\text{ max}}$
	Dual output models, hiccup, self recovery	$130\% I_{o\text{ max}}$

Safety and EMC

Electric strength test voltage	I/O	500 V DC
Electromagnetic interference	conducted	tbd

Environmental

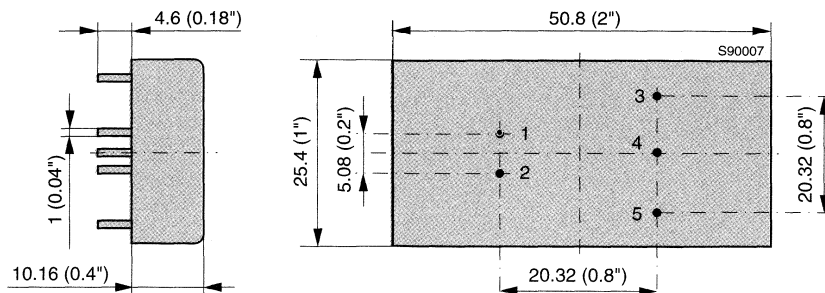
Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$-25 \dots 85^\circ\text{C}$
Storage temperature	non operational	$-40 \dots 125^\circ\text{C}$
Relative humidity	non condensing	95%

Options

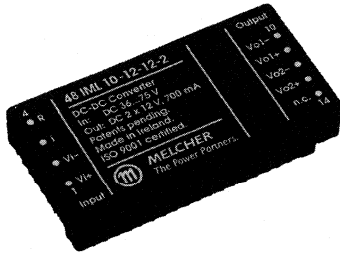
Extended temperature range	$-40 \dots 85^\circ\text{C}$, ambient, operating	I
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Mechanical data

Tolerances $\pm 0.3\text{ mm}$ (0.012") unless otherwise indicated.

**Pin allocation**

Pin	Single output units	Dual output units
1	V_{i+}	V_{i+}
2	V_{i-}	V_{i-}
3	V_{o+}	V_{o+}
4	no pin	Common
5	V_{o-}	V_{o-}



Wide input voltage ranges up to 75 V DC
 1 or 2 outputs up to 30 V DC
 1500 V DC I/O electric strength test voltage



- Magnetic feedback for single output models
- Short circuit protection
- Industry standard 2" x 1" case with 10.5 mm profile

Selection chart

Output 1		Output 2		Input voltage	Type	Options (for availability consult sales point)
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	U_i [V DC]		
3.3	1.9	-	-	8.4...16.8	12 IML 10-03-3	M, C, -0, L, Z
3.3	2	-	-	18...36	24 IML 10-03-3	M, C, -0, L, Z
3.3	2	-	-	36...75	48 IML 10-03-3	M, C, -0, L, Z
5	1.6	-	-	8.4...16.8	12 IML 10-05-3	M, C, -0, L, Z
5	1.9	-	-	18...36	24 IML 10-05-3	M, C, -0, L, Z
5	1.9	-	-	36...75	48 IML 10-05-3	M, C, -0, L, Z
12	0.7	-	-	8.4...16.8	12 IML 10-12-3C2	-0, L, Z
12	0.9	-	-	18...36	24 IML 10-12-3C2	-0, L, Z
12	0.9	-	-	36...75	48 IML 10-12-3C2	-0, L, Z
15	0.6	-	-	8.4...16.8	12 IML 10-15-3C2	-0, L, Z
15	0.7	-	-	18...36	24 IML 10-15-3C2	-0, L, Z
15	0.7	-	-	36...75	48 IML 10-15-3C2	-0, L, Z
5.1	1	3.3	1	36...75	48 IML 10-0503-3	M, C, -0, L, Z
12	0.7	12	0.7	8.4...16.8	12 IML 10-12-12-3	M, C, -0, L, Z
12	0.9	12	0.9	18...36	24 IML 10-12-12-3	M, C, -0, L, Z
12	0.9	12	0.9	36...75	48 IML 10-12-12-3	M, C, -0, L, Z
15	0.6	15	0.6	8.4...16.8	12 IML 10-15-15-3	M, C, -0, L, Z
15	0.7	15	0.7	18...36	24 IML 10-15-15-3	M, C, -0, L, Z
15	0.7	15	0.7	36...75	48 IML 10-15-15-3	M, C, -0, L, Z

Input

Input voltage range	12 IML 10	8.4...16.8 V DC
	24 IML 10	18...36 V DC
	48 IML 10	36...75 V DC

Output

Output voltage setting accuracy	$U_{i\text{ nom}}$, 50% $I_{o\text{ nom}}$, single output models	$\pm 1.5\% U_{o\text{ nom}}$
	$U_{i\text{ nom}}$, 50% $I_{o\text{ nom}}$, double outp., main/aux. outp.	$\pm 1.5\% / \pm 1.5\% U_{o\text{ nom}}$
Minimum load	recommended	10% $I_{o\text{ nom}}$
Line/load regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}$, 50% $I_{o\text{ nom}}$, single output models	$\pm 3\% U_{o\text{ nom}}$
Line regulation	$U_{i\text{ nom}}$, 50% $I_{o\text{ nom}}$, double output models, main output	$\pm 1\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}$, 10...100% $I_{o\text{ nom}}$, double outp. mod., main outp. tracking output	$\pm 3\% U_{o\text{ nom}}$ $\pm 3\% U_{o\text{ nom}}$
Output voltage switching noise	$U_{i\text{ nom}}$, 0...100% $I_{o\text{ nom}}$, peak-peak, total	max. 1.5% $U_{o\text{ nom}}$
Efficiency	$U_{i\text{ nom}}$, $I_{o\text{ nom}}$	up to 84%

Control and protection

Input protection		none
Overload protection	$U_{i\text{ min}} \dots U_{i\text{ max}}$, any load	fully protected, hiccup mode
No-load protection		yes

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
Electromagnetic interference		class A

Environmental

Operating ambient temperature	$U_{i\text{ nom}}$, $I_{o\text{ nom}}$	-25...60°C
Storage temperature	non operational	-40...100°C
Relative humidity	non condensing	93%

Options

Extended temperature range	-40...60°C, ambient, operating	-0
SMD version	with pins	M
SMD version	with adapter PCB	L
Open version without housing		Z
C-pinout		C

Accessories

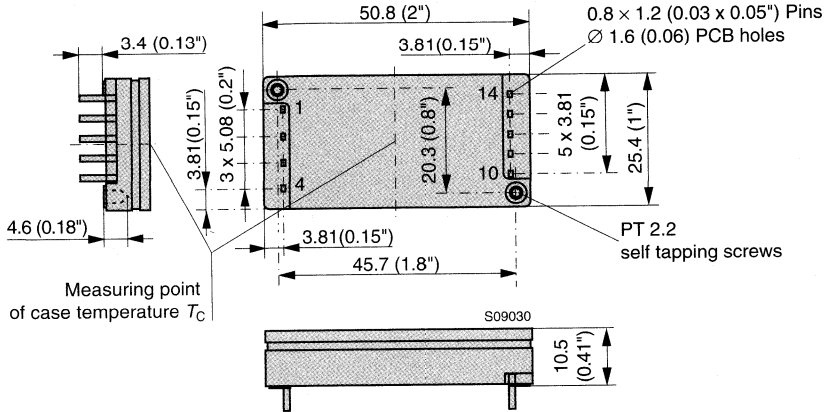
DIN and chassis mounting bracket	
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Mechanical data

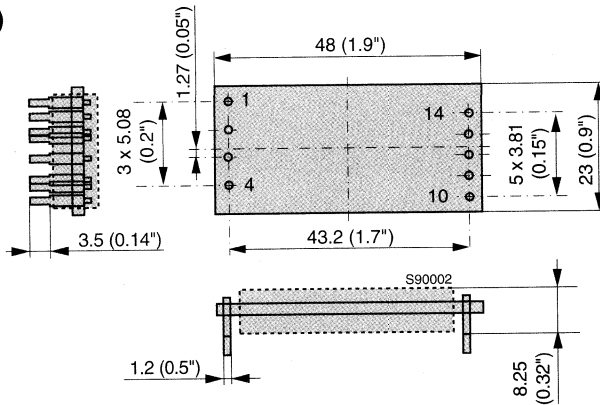
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



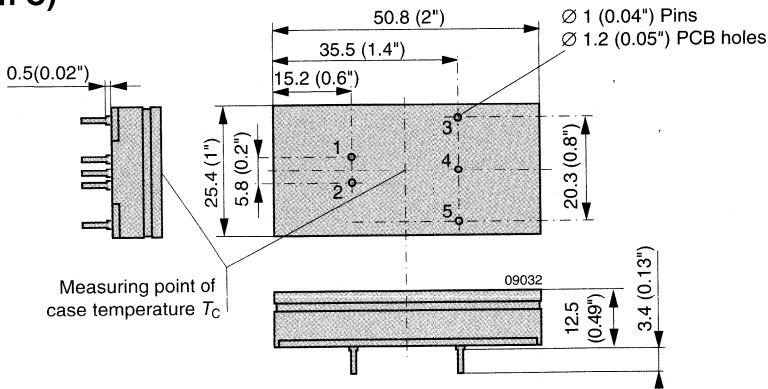
IML



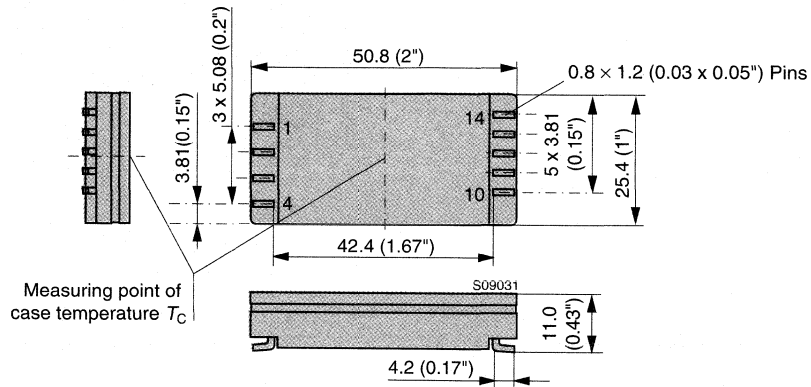
IML (option Z)



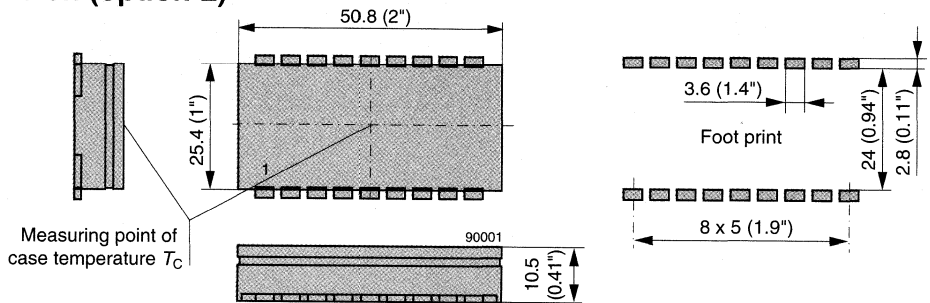
IML (option C)



IML SMD version (option M)



IML SMD version (option L)



Pin allocation IML, option M and Z

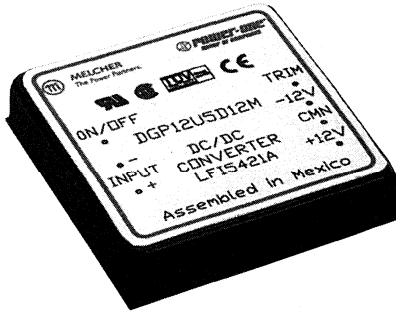
Pin	Single output	Dual output	Double output
1	Vi+	Vi+	Vi+
2	Vi-	Vi-	Vi-
3	n.c.	n.c.	n.c.
4	n.c.	n.c.	n.c.
10	Vo-	Go	Vo1-
11	Vo+	Vo1+	Vo1+
12	Vo-	Go	Vo2-
13	n.c.	Vo2+	Vo2+
14	n.c.	n.c.	n.c.

SMD version (option L)

Pin	Single output	Dual output
1	Vo	Vo1
2	Go	Go
3	n.c.	Vo2
4	n.c.	n.c.
5	n.c.	n.c.
6	n.c.	n.c.
7	n.c.	n.c.
8	n.c.	n.c.
9	n.c.	Trim
10	n.c.	n.c.
11	\overline{SD}	\overline{SD}
12	no pin	no pin
13	no pin	no pin
14	n.c.	n.c.
15	n.c.	n.c.
16	n.c.	n.c.
17	Vi-	Vi-
18	Vi+	Vi+

C pinout (option C)

Pin	Single output	Dual output
1	Vi+	Vi+
2	Vi-	Vi-
3	Vo+	Vo+
4	no pin	Go
5	Vo-	Vo-



Input voltage range up to 72 V DC
 1 to 3 outputs up to 30 V DC
 1544 V DC I/O electric strength test voltage



- 90°C case operation
- Overcurrent or short-circuit protection
- Efficiency to 86%
- Full input and output filtering (DGP 12)
- Remote ON/OFF and/or Trim

Selection chart

Output 1		Output 2		Output 3		Input	Rated power	Type
$U_o \text{ nom}$ [V DC]	$I_o \text{ nom}$ [A]	$U_o \text{ nom}$ [V DC]	$I_o \text{ nom}$ [A]	$U_o \text{ nom}$ [V DC]	$I_o \text{ nom}$ [A]	U_i [V DC]	$P_o \text{ tot}$ [W]	
5	2	-	-	-	-	3.5...16	10	DGP 12 U5S5
5	5	-	-	-	-	36...72	25	DGP 30 E48S5
12	1	-	-	-	-	3.5...16	12	DGP 12 U5S12
12	2.5	-	-	-	-	36...72	30	DGP 30 E48S12
15	0.8	-	-	-	-	3.5...16	12	DGP 12 U5S15
15	2	-	-	-	-	36...72	30	DGP 30 E48S15
+5	1	-5	1	-	-	3.5...16	10	DGP 12 U5D5
+12	0.5	-12	0.5	-	-	3.5...16	12	DGP 12 U5D12
+15	0.4	-15	0.4	-	-	3.5...16	12	DGP 12 U5D15
5	2.5	+12	0.31	-12	0.31	9...18	20	DGP 20 E12T5/12
5	2.5	+12	0.31	-12	0.31	18...36	20	DGP 20 E24T5/12
5	2.5	+12	0.31	-12	0.31	36...72	20	DGP 20 E48T5/12
5	2.5	+15	0.25	-15	0.25	9...18	20	DGP 20 E12T5/15
5	2.5	+15	0.25	-15	0.25	18...36	20	DGP 20 E24T5/15
5	2.5	+15	0.25	-15	0.25	36...72	20	DGP 20 E48T5/15

Pin allocation

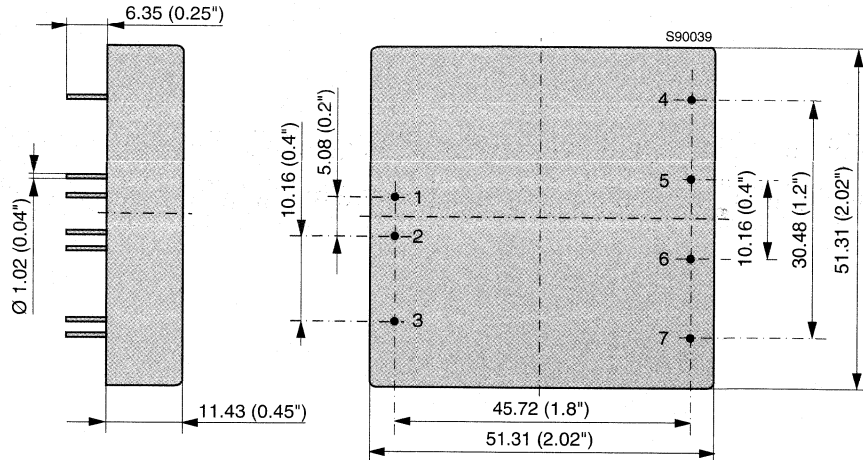
Pin	DGP 12 single	DGP 12 dual	DGP 20 triple	DGP 30 single
1	Vi+	Vi+	Vi+	Vi+
2	Vi-	Vi-	Vi-	Vi-
3	ON/OFF	ON/OFF	ON/OFF	ON/OFF
4	-	Vo+	+12/15 Vo	-
5	Vo+	Common	+5 Vo	Vo+
6	Vo-	Vo-	Common	Vo-
7	Trim	Trim	-12/15 Vo	Trim

Mechanical data

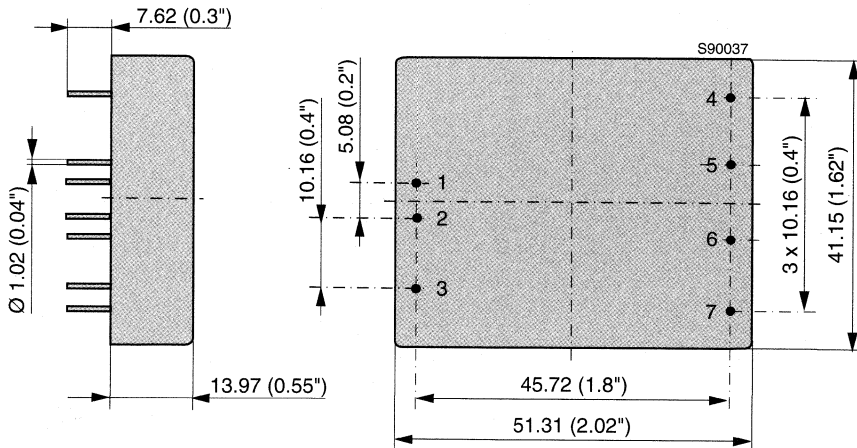
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.

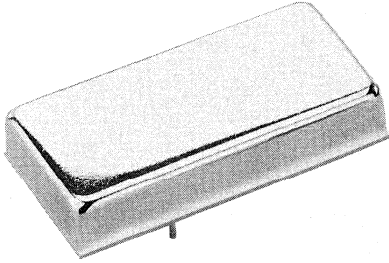


DGP 12, DGP 20



DGP 30





Input voltage range up to 75 V DC
 1 output up to 15 V DC
 1500 V DC I/O electric strength test voltage



- 100°C case operation
- Short circuit protection
- Six sided Shielding

Selection chart

Output 1		Input voltage	Rated power	Efficiency	Type
$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	U_i [V DC]	$P_{o,tot}$ [W]	η_{typ} [%]	
2.5	3	18...36	8	77	LES 008YD
2.5	3	36...75	8	77	LES 008ZD
3.3	3	18...36	10	81	LES 010YE
3.3	3	36...75	10	81	LES 010ZE
5	3	18...36	15	82	LES 015YG
5	3	36...75	15	84	LES 015ZG
12	1.25	18...36	15	86	LES 015YH
12	1.25	36...75	15	86	LES 015ZH
15	1	18...36	15	86	LES 015YJ
15	1	36...75	15	87	LES 015ZJ

Input

Input voltage	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	36...75 V DC

Output

Output voltage setting accuracy	$U_i, I_{o,nom}$	$\pm 1\% U_{o,nom}$
Minimum load	recommended	$10\% I_{o,nom}$
Line regulation	$U_i, I_{o,nom}$	typ. $\pm 0.2\% U_{o,nom}$
Load regulation	$U_i, I_{o,nom}$, single output models	typ. $0.5\% U_{o,nom}$
Output voltage switching noise	$U_i, I_{o,nom}$, peak-peak, total	max. $2\% U_{o,nom}$
Voltage trim range		$\pm 10\% U_{o,nom}$

Control and protection

Overload protection	shut down, hiccup	$110...150\% I_{o,nom}$, $200\% I_{o,max}$
Overvoltage protection	second control loop	$115...140\% U_{o,nom}$
Thermal shutdown		$105...115^\circ\text{C}$
Remote shutdown	positive/negative logic	

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
Electromagnetic interference	conducted	tbd

Environmental

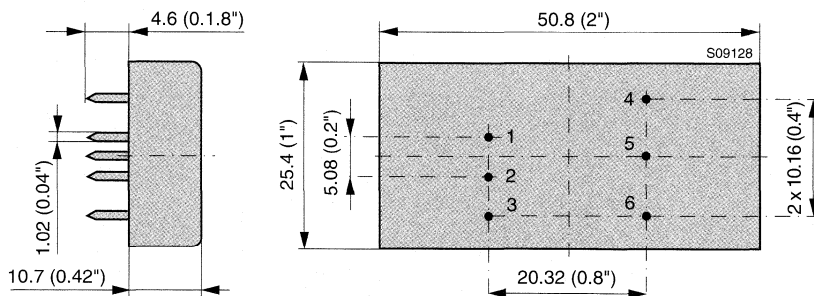
Operating case temperature T_C	$U_{i,nom}, I_{o,nom}$	-40...100°C
Storage temperature	non operational	-40...125°C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332	2'500'000 h

Options

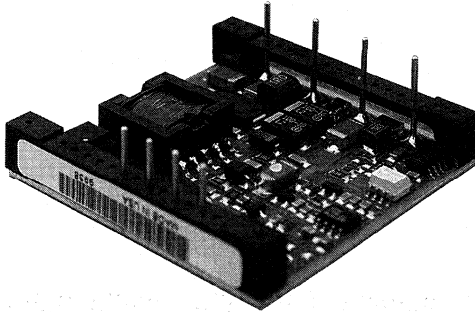
Trim input		1
Shutdown	positive logic	2
Trim and shutdown	positive logic	3
Shutdown	negative logic	2N
Trim and shutdown	negative logic	3N

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.

**Pin allocation**

Pin	Single output unit
1	Vi+
2	Vi-
3	Shutdown (option)
4	Vi+
5	Trim (option)
6	Vo-



Input voltage range up to 75 V DC
 3 outputs up to 15 V DC
 500 V DC I/O electric strength test voltage

- 100°C base plate operation
- shortcircuit and OVP protection
- Open frame 2" x 2" packaging

Selection chart

Output 1		Output 2		Output 3		Input	Rated power	Efficiency	Type
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	U_i [V DC]	$P_{o\ tot}$ [W]	η_{typ} [%]	
3.3	2.3	+12	0.31	-12	0.31	18...36	15	80	HPT 015YEHH-A
3.3	2.3	+12	0.31	-12	0.31	34...75	15	80	HPT 015ZEHH-AS1
3.3	2.3	+12	0.31	-12	0.31	20...60	15	80	HPT 015ZEHH-A
3.3	2.3	+15	0.25	-15	0.25	18...36	15	80	HPT 015YEJJ-A
3.3	2.3	+15	0.25	-15	0.25	34...75	15	80	HPT 015ZEJJ-AS1
3.3	2.3	+15	0.25	-15	0.25	20...60	15	80	HPT 015ZEJJ-A
5	1.5	+12	0.31	-12	0.31	18...36	15	83	HPT 015YGHH-A
5	1.5	+12	0.31	-12	0.31	34...75	15	83	HPT 015ZGHH-AS1
5	1.5	+12	0.31	-12	0.31	20...60	15	83	HPT 015ZGHH-A
5	1.5	+15	0.25	-15	0.25	18...36	15	83	HPT 015YGJJ-A
5	1.5	+15	0.25	-15	0.25	34...75	15	83	HPT 015ZGJJ-AS1
5	1.5	+15	0.25	-15	0.25	20...60	15	83	HPT 015ZGJJ-A

Input

Input voltage	continuous range, 24 V	10...30 V DC
	continuous range, 48 V	34...75 V DC
	continuous range, 48 V	20...60 V DC

Output

Output voltage setting accuracy	$U_i\ nom, I_o\ nom$	$\pm 1\% U_{o\ nom}$
Minimum load	recommended on all outputs	10% $I_o\ nom$
Line regulation	$U_i\ min...U_i\ max, I_o\ nom$	typ. $\pm 1\% U_{o\ nom}$
Load regulation	$U_i\ nom, 1...100\% I_o\ nom$	typ. $\pm 1\% U_{o\ nom}$
Output voltage switching noise	$U_i\ nom, I_o\ nom, peak-peak, total$	max. 1% $U_{o\ nom}$

Control and protection

Overload protection	shut down, hiccup, recovering	110...140% $I_o\ nom$
Overvoltage protection	second control loop	110...140% $U_{o\ nom}$
Thermal shutdown		105...115°C

Safety and EMC

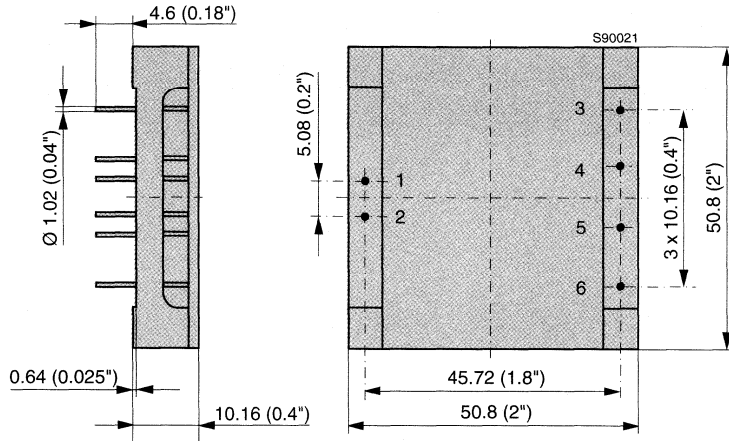
Electric strength test voltage	I/O	500 V DC
Electromagnetic interference	conducted	tbd

Environmental

Operating case temperature T_C	$U_{i\ nom}, I_{o\ nom}$	-40...100 °C
Storage temperature	non operational	-40...125 °C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332	2'500'000 h

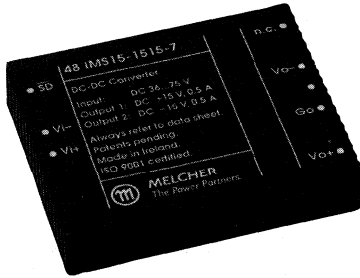
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	Triple output units
1	Vi+
2	Vi-
3	Vo+
4	Vo+
5	Vo-
6	Vo-



Wide input voltage ranges up to 75 V DC
 1 or 2 outputs up to 48 V DC
 1500 V DC I/O electric strength test voltage



- Magnetic feedback
- Short circuit protection
- Industry standard 2" x 1.6" case with 10.5 mm profile

Selection chart

Output 1		Output 2		Input voltage U_i [V DC]	Type	Options (for availability consult sales point)
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [mA]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [mA]			
5.1	2700	-	-	14...36	24 IMS 15-05-9R	i, C, L, Z
5.1	2700	-	-	36...75	48 IMS 15-05-9R	i, C, L, Z
+5.1	1600	+3.3	1600	14...36	24 IMS 15-0503-9R	i, C, L, Z
+5.1	1600	+3.3	1600	36...75	48 IMS 15-0503-9R	i, C, L, Z
5	1400	5	1400	14...36	24 IMS 15-05-05-9	K, i, C, L, Z
5	1400	5	1400	36...75	48 IMS 15-05-05-9	K, i, C, L, Z
12	700	12	700	14...36	24 IMS 15-12-12-9	K, i, C, L, Z
12	700	12	700	36...75	48 IMS 15-12-12-9	K, i, C, L, Z
15	560	15	560	14...36	24 IMS 15-15-15-9	K, i, C, L, Z
15	560	15	560	36...75	48 IMS 15-15-15-9	K, i, C, L, Z
24	350	24	350	14...36	24 IMS 15-24-24-9	i, C, L, Z
24	350	24	350	36...75	48 IMS 15-24-24-9	i, C, L, Z

Input

Input voltage range	24 IMS15	14...36 V DC
	48 IMS15	36...75 V DC

Output

Output voltage setting accuracy	$U_{i\text{ nom}}$, 50% $I_{o\text{ nom}}$, models with/without R	$\pm 1\%/\pm 1.5\%$ $U_{o\text{ nom}}$
Minimum load	recommended for double output models	10% $I_{o\text{ nom}}$
Line/load regulation	$U_{i\text{ min}}...U_{i\text{ max}}$, 50% $I_{o\text{ nom}}$, models R (magn. feedback)	$\pm 0.5\%$ $U_{o\text{ nom}}$
Line regulation	$U_{i\text{ min}}...U_{i\text{ max}}$, 50% $I_{o\text{ nom}}$, models without R	$\pm 1\%$ $U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}$, 10...100% $I_{o\text{ nom}}$, models without R	$\pm 3\%$ $U_{o\text{ nom}}$
	tracking output, models without R	$\pm 3\%$ $U_{o\text{ nom}}$
Output voltage switching noise	$U_{i\text{ nom}}$, 0...100% $I_{o\text{ nom}}$, peak-peak, total	max. 1...1.5% $U_{o\text{ nom}}$
Efficiency	$U_{i\text{ nom}}$, $I_{o\text{ nom}}$	up to typ 88%

Control and protection

Remote shut down	TTL-compatible input	disabled with 0.7 V
Trim input for U_o		80...105%
Input overvoltage protection	suppressor diode	
Input undervoltage lock-out		
Overload protection	$U_{i\text{ min}}...U_{i\text{ max}}$, fully protected, hiccup mode	
No-load protection	$U_{i\text{ min}}...U_{i\text{ max}}$	
Temperature protection		

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
Electromagnetic interference	conducted (with external filter)	class B
	radiated	class A

Environmental

Operating ambient temperature	$U_{i\text{ nom}}$, $I_{o\text{ nom}}$	-40...71°C
Storage temperature	non operational	-40...100°C
Relative humidity	non condensing	93%

Options

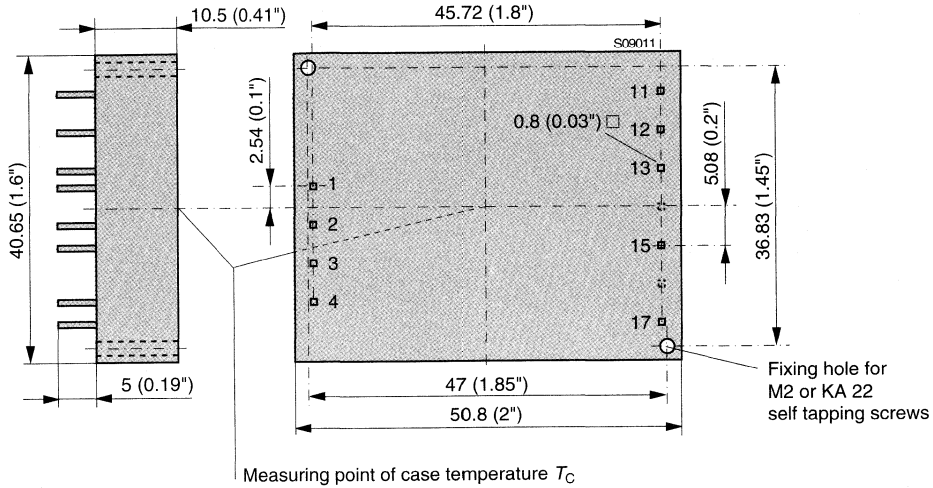
Magnetic feedback	standard for all single output and -0503-models	R
Inhibit input (reverse logic)	TTL-compatible, disabled with 2.4 V or open-circuit	i
Alternative pinout	connected outputs, for compatibility	K
C-pinout	connected outputs, no options possible	C
Open version	no housing, not lacquered	Z

Mechanical data

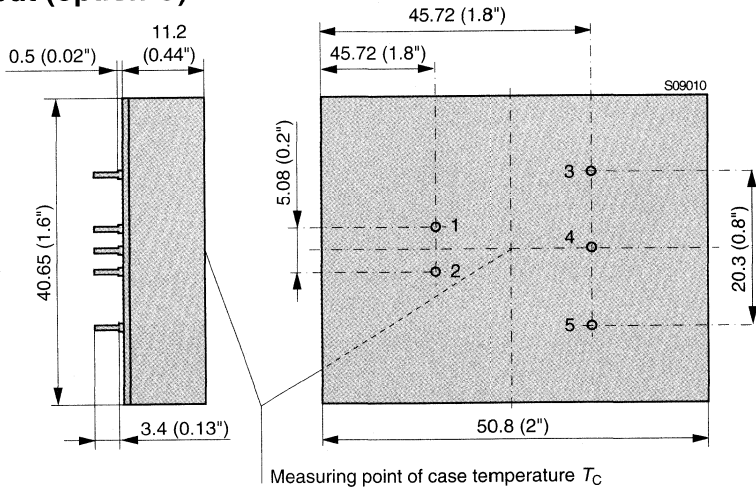
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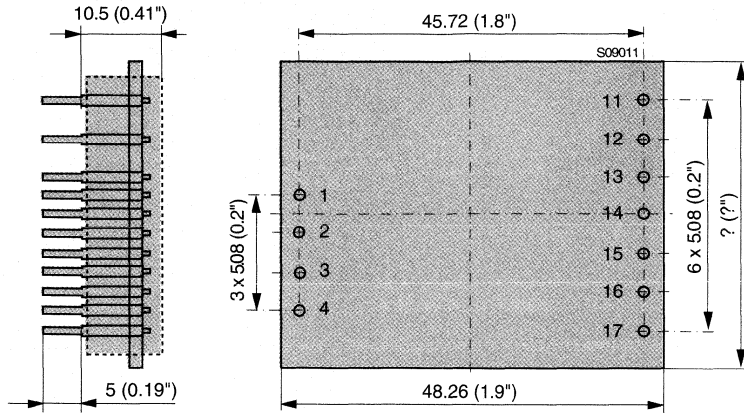
Standard and option K



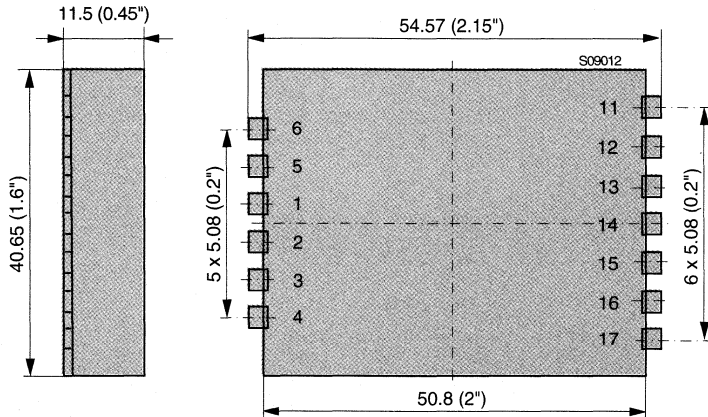
C pinout (option C)



Open frame version (option Z)

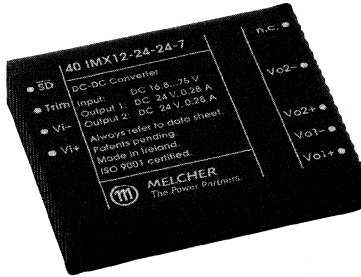


SMC version (option L)



Pin allocation

Pin	Standard		-0503-	Option K dual	Option C		Option L and Z	
	single	double			single	dual	single	double
1	Vi+	Vi+	Vi+	Vi+	Vi+	Vi+	Vi+	Vi+
2	Vi-	Vi-	Vi-	Vi-	Vi-	Vi-	Vi-	Vi-
3	-	Trim	n.c.	-	Vo+	Vo+	n.c.	Trim
4	\overline{SD}	\overline{SD}	\overline{SD}	\overline{SD}	-	Go	\overline{SD}	\overline{SD}
5	-	-	-	-	Vo-	Vo-	n.c.	n.c.
6	-	-	-	-	-	-	n.c.	n.c.
11	-	Vo1+	Vo2+	Vo+	-	-	-	Vo1-
12	-	Vo1-	Go	-	-	-	-	Vo2-
13	Vo+	Vo2+	Vo1+	Go	-	-	Vo+	Vo1+
15	Vo-	Vo2-	Go	Vo-	-	-	Vo-	Vo2-
17	R	n.c./R	R	n.c.	-	-	R	n.c.



Wide input voltage ranges up to 150 V DC
 1 or 2 outputs up to 48 V DC
 1500...4000 V DC I/O electric strength test



- Reinforced isolation for IMY-models
- Magnetic feedback
- Synchronous rectifier for 2.5, 3.3 and 5 V outputs
- Short circuit protection

Selection chart

Output 1		Output 2		Input voltage U_i [V DC]	Type	Options (for availability consult sales point)
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [mA]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [mA]			
2.5	4500	-	-	8.4...36	20 IMX 15-2.5-9RG	-8, i, L, C, Z
2.5	4500	-	-	16.8...75	40 IMX 15-2.5-9RG	-8, i, L, C, Z
3.3	4500	-	-	8.4...36	20 IMX 15-03-9RG	-8, i, L, C, Z
3.3	4500	-	-	16.8...75	40 IMX 15-03-9RG	-8, i, L, C, Z
3.3	4500	-	-	50...150	110 IMY 15-03-9RG	-8, i, L, C, Z
5	3500	-	-	8.4...36	20 IMX 15-05-9RG	-8, i, L, C, Z
5	3500	-	-	16.8...75	40 IMX 15-05-9RG	-8, i, L, C, Z
5	3500	-	-	50...150	110 IMY 15-05-9RG	-8, i, L, C, Z
5.1	2300	-	-	8.4...36	20 IMX 15-05-9R	-8, i, L, C, Z
5.1	2500	-	-	16.8...75	40 IMX 15-05-9R	-8, i, L, C, Z
5.1	2500	-	-	50...150	110 IMY 15-05-9R	-8, i, L, C, Z
+5.1	1350	+3.3	1350	8.4...36	20 IMX 15-0503-9R	-8, i, L, C, Z
+5.1	1500	+3.3	1500	16.8...75	40 IMX 15-0503-9R	-8, i, L, C, Z
+5.1	1500	+3.3	1500	50...150	110 IMY 15-0503-9R	-8, i, L, C, Z
5	1300	5	1300	8.4...36	20 IMX 15-05-05-9	-8, R, K, i, L, C, Z
5	1400	5	1400	16.8...75	40 IMX 15-05-05-9	-8, R, K, i, L, C, Z
5	1400	5	1400	50...150	110 IMY 15-05-05-9	-8, R, i, L, C, Z
12	650	12	650	8.4...36	20 IMX 15-12-12-9	-8, R, K, i, L, C, Z
12	700	12	700	16.8...75	40 IMX 15-12-12-9	-8, R, K, i, L, C, Z
12	700	12	700	50...150	110 IMY 15-12-12-9	-8, R, i, L, C, Z
15	500	15	500	8.4...36	20 IMX 15-15-15-9	-8, R, K, i, L, C, Z
15	560	15	560	16.8...75	40 IMX 15-15-15-9	-8, R, K, i, L, C, Z
15	560	15	560	50...150	110 IMY 15-15-15-9	-8, R, i, L, C, Z
24	320	24	320	8.4...36	20 IMX 15-24-24-9	-8, R, i, L, C, Z
24	350	24	350	16.8...75	40 IMX 15-24-24-9	-8, R, i, L, C, Z
24	350	24	350	50...150	110 IMY 15-24-24-9	-8, R, i, L, C, Z

Input

Input voltage range	20 IMX 15	8.4...36 V DC
	40 IMX 15	16.8...75 V DC
	110 IMY 15	50...150 V DC

Output

Output voltage setting accuracy	$U_{i\text{ nom}}, 50\% I_{o\text{ nom}}$	$\pm 1\% U_{o\text{ nom}}$
Minimum load	recommended for double output models	$10\% I_{o\text{ nom}}$
Line/load regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, 50\% I_{o\text{ nom}},$ models R (magn. feedback)	$\pm 0.5\% U_{o\text{ nom}}$
Line regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, 50\% I_{o\text{ nom}},$ models without R	$\pm 1\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}, 10 \dots 100\% I_{o\text{ nom}},$ models without R, main outp. tracking output, models without R	$\pm 3\% U_{o\text{ nom}}$ $\pm 3\% U_{o\text{ nom}}$
Output voltage switching noise	$U_{i\text{ nom}}, 0 \dots 100\% I_{o\text{ nom}},$ peak-peak, total	max. $1 \dots 2\% U_{o\text{ nom}}$
Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to typ 88%

Control and protection

Remote shut down	TTL-compatible input	disabled with $0.7 V$
Trim input for U_o		$80 \dots 105\%$
Input undervoltage lock-out		
Overload protection	$U_{i\text{ min}} \dots U_{i\text{ max}},$ fully protected, hiccup mode	
No-load protection	$U_{i\text{ min}} \dots U_{i\text{ max}}$	
Temperature protection		

Safety and EMC

Electric strength test voltage	I/O (20 and 40 IMX/110 IMY)	1500/4000 V DC
Type of insulation	I/O (20 and 40 IMX supplementary/110 IMY re-inforced)	
Electromagnetic interference	conducted (with external filter)	class B
	radiated	class A

Environmental

Operating ambient temperature	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$-40 \dots 71^\circ\text{C}$
Storage temperature	non operational	$-40 \dots 100^\circ\text{C}$
Relative humidity	non condensing	93%

Options

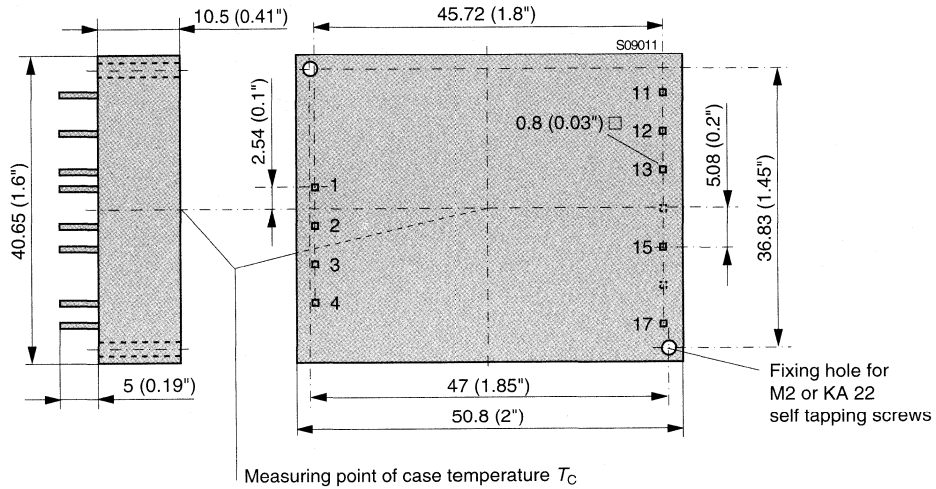
Extended temperature range	$-40 \dots 85^\circ\text{C}$ (derating above 71°C), ambient, operating	-8
Magnetic feedback	standard for all single output and -0503-models	R
Alternative pinout	connected outputs, for compatibility	K
Inhibit input (reverse logic)	TTL-compatible, disabled with $2.4 V$ or open-circuit	i
SMD version	with PCB lid	L
C-pinout	connected outputs, no options possible	C
Open version	no housing, not lacquered	Z

Mechanical data

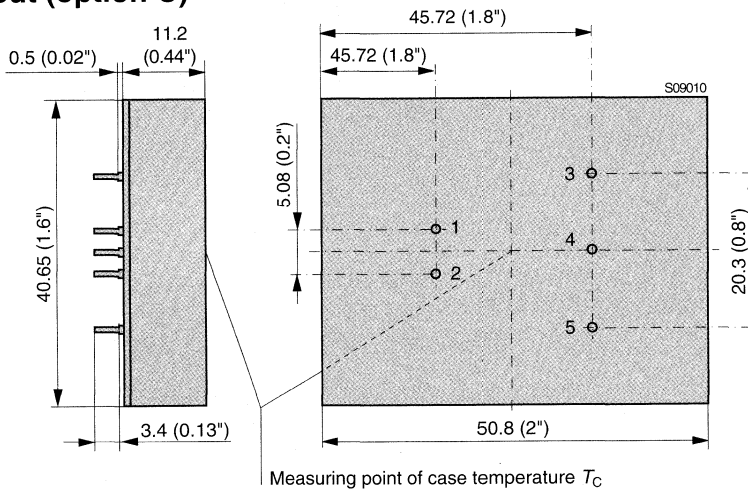
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



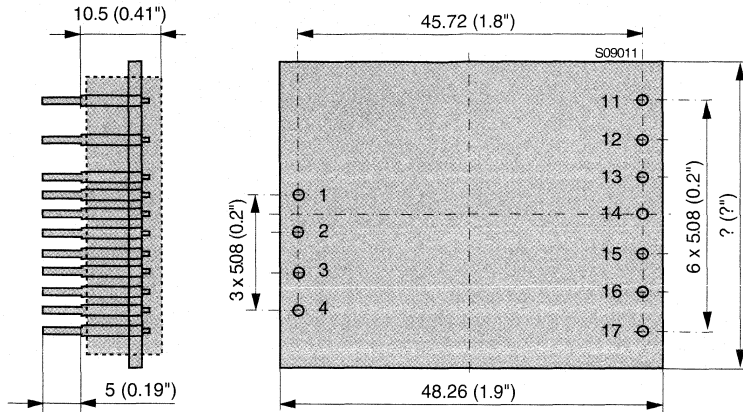
Standard and option K



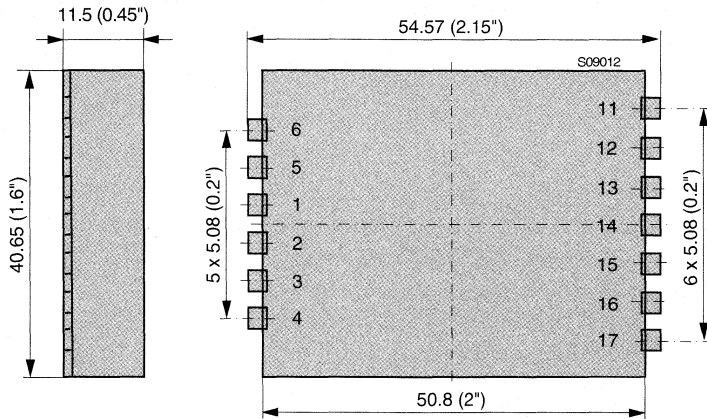
C pinout (option C)



Open frame version (option Z)

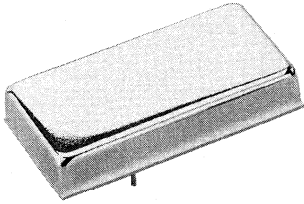


SMC version (option L)



Pin allocation

Pin	Standard		-0503-	Option K dual	Option C		Option L and Z	
	single	double			single	dual	single	double
1	Vi+	Vi+	Vi+	Vi+	Vi+	Vi+	Vi+	Vi+
2	Vi-	Vi-	Vi-	Vi-	Vi-	Vi-	Vi-	Vi-
3	-	Trim	n.c.	-	Vo+	Vo+	n.c.	Trim
4	SD	SD	SD	SD	-	Go	SD	SD
5	-	-	-	-	Vo-	Vo-	n.c.	n.c.
6	-	-	-	-	-	-	n.c.	n.c.
11	-	Vo1+	Vo2+	Vo+	-	-	-	Vo1-
12	-	Vo1-	Go	-	-	-	-	Vo2-
13	Vo+	Vo2+	Vo1+	Go	-	-	Vo+	Vo1+
15	Vo-	Vo2-	Go	Vo-	-	-	Vo-	Vo2-
17	R	n.c./R	R	n.c.	-	-	R	n.c.



Input voltage range up to 72 V DC
 3.3 V DC and 5 V DC output
 1500 V DC I/O electric strength test voltage



- 100°C case operation
- 88% efficiency at 5 V
- Open frame or encapsulated

Selection chart

Output		Input voltage	Rated power	Efficiency	Type
$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]	U_i [V DC]	$P_{o, tot}$ [W]	η_{typ} [%]	
3.3	4	18...36	14	83	IES 013YE-A
3.3	4	36...72	14	84	IES 013ZE-A
5	4	18...36	20	85	IES 020YG-A
5	4	36...72	20	88	IES 020ZG-A

Input

Input voltage	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	36...72 V DC
Input under voltage	lockout hysteresis 1 V nominal	<17 V, <34 V,
Input reverse voltage protection	shunt diode	

Output

Output voltage setting accuracy	$U_{i, nom}, I_{o, nom}$	$\pm 1\% U_{o, nom}$
Minimum load	recommended	10% $I_{o, nom}$
Line regulation	$U_{i, min} \dots U_{i, max}, I_{o, nom}$	typ. $\pm 0.2\% U_{o, nom}$
Load regulation	$U_{i, nom}, 1 \dots 100\% I_{o, nom}$	typ. 0.5% $U_{o, nom}$
Output voltage switching noise	$U_{i, nom}, I_{o, nom},$ peak-peak, total	max. 4% $U_{o, nom}$
Voltage trim range		$\pm 10\% U_{o, nom}$

Control and protection

Overload protection	shut down, hiccup	110...140% $I_{o, nom}$
Overvoltage protection	second control loop, self recovering	115...140% $U_{o, nom}$
Thermal shutdown		105...115°C
Remote shutdown	positive logic	

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
Electromagnetic interference	conducted	

Environmental

Operating case temperature T_C	$U_{I\ nom}, I_{o\ nom}$	-40...100°C
Storage temperature	non operational	-40...125°C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332	1'900'000 h

Options

Open frame	-A
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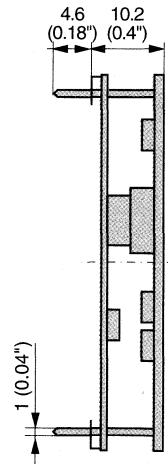
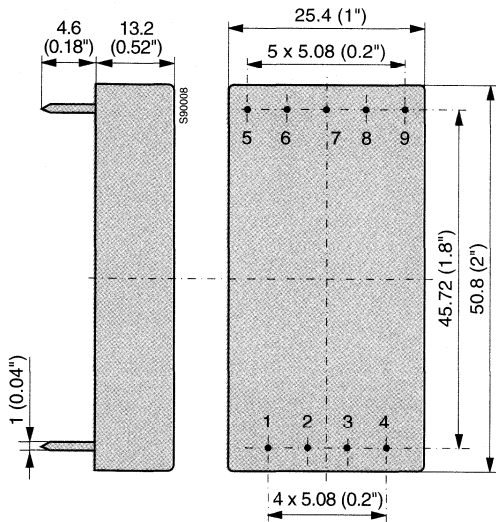
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



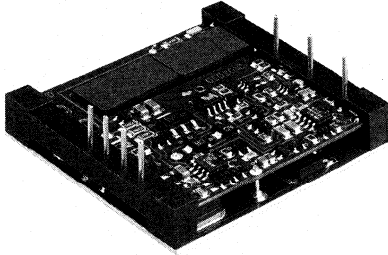
IES

Open frame (option -A)



Pin allocation

Pin	Single output unit
1	Vi+
2	Vi-
3	no pin
4	Shutdown (option)
5	Vo+
6	Vo-
7	Trim
8	no pin
9	no pin



Input voltage range up to 75 V DC
 1 or 3 outputs up to 15 V DC
 1500 V DC I/O electric strength test voltage



- 100°C base plate operation
- 5 V, 3.3 V, 2.5 V and 2.1 V outputs
- Open frame 2" x 2" packaging

Selection chart

Output 1		Output 2		Output 3		Input U_i [V DC]	Rated power $P_{o\ tot}$ [W]	Efficiency η_{typ} [%]	Type
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]				
2.1	10	-	-	-	-	36...72	21	81	OES 021ZC-A
2.5	10	-	-	-	-	36...72	25	82	OES 025ZD-A
3.3	10	-	-	-	-	36...72	33	85	OES 033ZE-A
5	8	-	-	-	-	36...72	40	89	OES 040ZG-A
3.3	3.5	+12	0.35	-12	0.35	18...36	20	85	OET 020YEHH-A
3.3	3.5	+12	0.35	-12	0.35	34...75	20	85	OET 020ZEHH-A
3.3	3.5	+15	0.28	-15	0.28	18...36	20	85	OET 020YEJJ-A
3.3	3.5	+15	0.28	-15	0.28	34...75	20	85	OET 020ZEJJ-A
5	3.5	+12	0.31	-12	0.31	18...36	25	86	OET 025YGGH-A
5	3.5	+12	0.31	-12	0.31	34...75	25	85	OET 025ZGGH-A
5	3.5	+15	0.25	-15	0.25	18...36	25	86	OET 025YGGJ-A
5	3.5	+15	0.25	-15	0.25	34...75	25	85	OET 025ZGGJ-A

Input

Input voltage	continuous range, 24 V, triple output models only	18...36 V DC
	continuous range, 48 V, single output models	36...72 V DC
	continuous range, 48 V, triple output models	34...75 V DC
Reverse voltage protection	shunt diode	

Output

Output voltage setting accuracy	$U_{i\ nom}, I_{o\ nom}$	$\pm 1\% U_{o\ nom}$
Minimum load	recommended on all outputs	$10\% I_{o\ nom}$
Line regulation	$U_{i\ min}...U_{i\ max}, I_{o\ nom}, 5\ V, 3.3\ V$ and triple output	typ. $\pm 0.2\% U_{o\ nom}$
	$U_{i\ min}...U_{i\ max}, I_{o\ nom}, 2.5\ V$ and 2.1 V	typ. $\pm 0.4\% U_{o\ nom}$
Load regulation	$U_{i\ nom}, 1...100\% I_{o\ nom}$	typ. $0.5\% U_{o\ nom}$
Output voltage switching noise	$U_{i\ nom}, I_{o\ nom},$ peak-peak, total	max. $6\% U_{o\ nom}$
Voltage trim range		$\pm 10\% U_{o\ nom}$

Control and protection

Overload protection	shut down, hiccup, self recovering	110...140% $I_{o\ nom}$
	triple output models	110...130% $I_{o\ nom}$, max. 200% $I_{o\ nom}$
Overvoltage protection	self recovering, single output models	120...140% $U_{o\ nom}$
	self recovering, triple output models	115...140% $U_{o\ nom}$
Thermal shutdown		105...115°C
Remote shutdown	positive logic, negative reference	

Safety and EMC

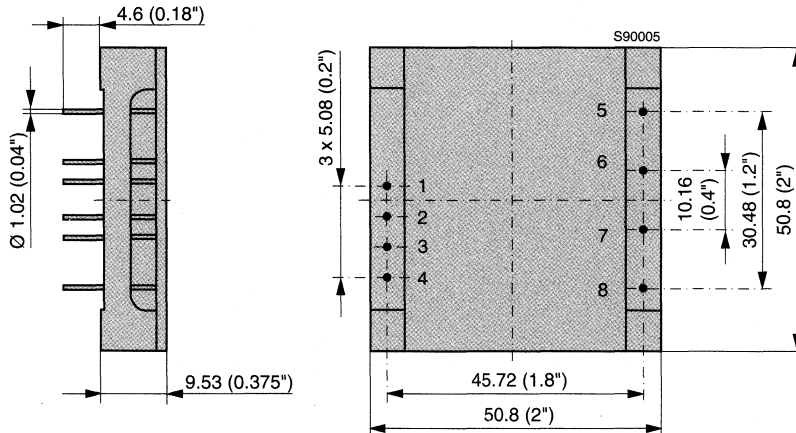
Electric strength test voltage	I/O	1500 V DC
Electromagnetic interference	conducted	tbd

Environmental

Operating case temperature T_C	$U_{i\ nom}$, $I_{o\ nom}$	-40...100°C
Storage temperature	non operational	-40...125°C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332	1'500'000 h

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.

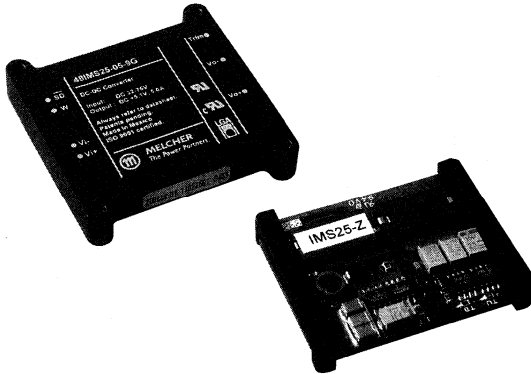


Pin allocation OES

Pin	Single output units
1	Vi+
2	Vi-
3	n.c.
4	Enable
5	Vo+
6	Vo-
7	Trim

Pin allocation OET

Pin	Triple output units
1	Vi+
2	Vi-
3	Case
4	Enable
5	Vo+ (aux)
6	Vo+ (main)
7	Common
8	Vo- (aux)



Wide input voltage ranges up to 75 V DC
 Single output up to 15 V DC
 1500 V DC I/O electric strength test voltage



- Magnetic feedback
- Synchronous rectifier for models with suffix G
- Short circuit protection
- 2.16" x 2.16" metal case with 10.5 mm profile

Selection chart

Output		Input voltage	Rated power	Type	Options
$U_{O \text{ nom}}$ [V DC]	$I_{O \text{ nom}}$ [A]	U_i [V DC]	$P_{O \text{ tot}}$ [W]		
2.5	6	14...36	15	24 IMS 25-2.5-9G	i, Z
2.5	6	32...75	15	48 IMS 25-2.5-9G	i, Z
3.3	6	14...36	19.8	24 IMS 25-03-9G	i, Z
3.3	6	32...75	19.8	48 IMS 25-03-9G	i, Z
5.1	5	14...36	25	24 IMS 25-05-9G	i, Z
5.1	5	32...75	25	48 IMS 25-05-9G	i, Z
12	2	14...36	24	24 IMS 25-12-9	i, Z
12	2	32...75	24	48 IMS 25-12-9	i, Z
15	1.6	14...36	24	24 IMS 25-15-9	i, Z
15	1.6	32...75	24	48 IMS 25-15-9	i, Z

Input

Input voltage range	24 IMS 25	14...36 V DC
	48 IMS 25	32...75 V DC

Output

Output voltage setting accuracy	$U_{i \text{ nom}}, 50\% I_{o \text{ nom}}$	$\pm 1\% U_{o \text{ nom}}$
Minimum load		not required
Line/load regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, 50\% I_{o \text{ nom}}$	$\pm 1\% U_{o \text{ nom}}$
Output voltage switching noise	$U_{i \text{ nom}}, 0 \dots 100\% I_{o \text{ nom}}, \text{ peak-peak, total}$	max. 1.5...2.5% $U_{o \text{ nom}}$
Efficiency	$U_{i \text{ nom}}, I_{o \text{ nom}}$	up to typ 91%

Control and protection

Remote shut down	TTL-compatible input	disabled with 0.7 V
Trim input for U_o		80...105%
Input undervoltage lock-out	programmable	
Input overvoltage protection	by suppressor diode	
Frequency synchronisation	switching frequency	approx. 270 kHz
Overload protection	$U_{i \text{ min}} \dots U_{i \text{ max}}$	current limitation to max. 130% $I_{o \text{ nom}}$
No-load protection	$U_{i \text{ min}} \dots U_{i \text{ max}}$	
Temperature protection	by thermistor	

Safety and EMC

Electric strength test voltage	I/O and I/Case	1500 V DC
Electromagnetic interference	conducted (with external filter)	class B
	radiated	class A

Environmental

Operating ambient temperature	$U_{i \text{ nom}}, I_{o \text{ nom}}$	-40...71°C
Storage temperature	non operational	-40...100°C
Relative humidity	non condensing	93%

Options

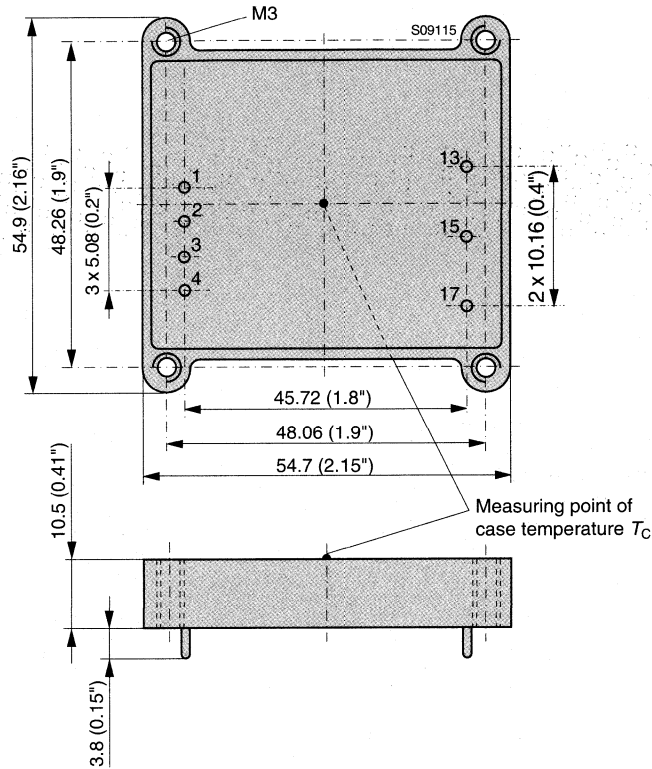
Inhibit input (reverse logic)	TTL-compatible, disabled with 2.4 V or open-circuit	i
Open frame version	no housing, not lacquered	Z

Mechanical data

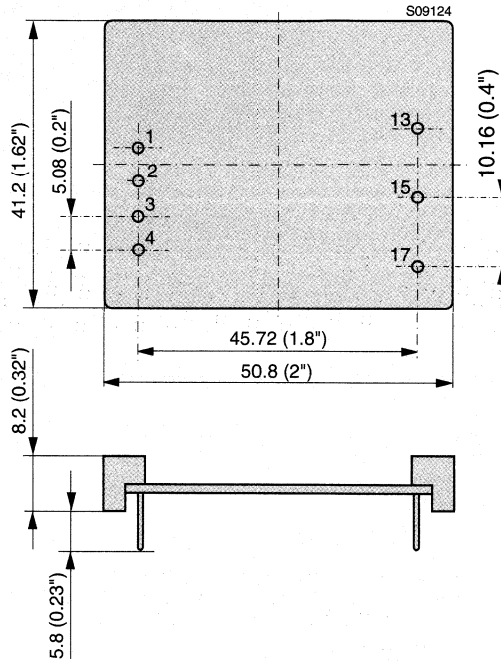
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



IMS 25

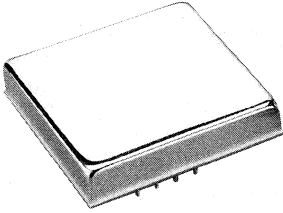


IMS 25 open frame (option Z)



Pin allocation

Pin	Single output unit	Option i
1	Vi+	Vi+
2	Vi-	Vi-
3	W	W
4	\overline{SD}	i
13	Vo+	Vo+
15	Vo-	Vo-
17	Trim	Trim



Input voltage range up to 75 V DC
 1 or 2 outputs up to 30 V DC
 1500 V DC I/O electric strength test voltage



- 100°C base plate operation
- Fixed frequency
- Six sided Shielding

Selection chart

Output 1		Output 2		Input voltage	Rated power	Efficiency	Type
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	U_i [V DC]	$P_{o \text{ tot}}$ [W]	η_{typ} [%]	
3.3	5	-	-	18...36	17	80	OBS 017YE
3.3	5	-	-	34...75	17	81	OBS 017ZE
5	5	-	-	18...36	25	84	OBS 025YG
5	5	-	-	34...75	25	83	OBS 025ZG
12	2.1	-	-	18...36	25.2	85	OBS 025YH
12	2.1	-	-	34...75	25.2	86	OBS 025ZH
15	1.7	-	-	18...36	25.5	87	OBS 025YJ
15	1.7	-	-	34...75	25.5	88	OBS 025ZJ
+5	2.5	-5	2.5	18...36	25	81	OBD 025YGG
+5	2.5	-5	2.5	34...75	25	80	OBD 025ZGG
+12	1	-12	1	18...36	24	86	OBD 025YHH
+12	1	-12	1	34...75	24	86	OBD 025ZHH
+15	0.85	-15	0.85	18...36	25.5	88	OBD 025YJJ
+15	0.85	-15	0.85	34...75	25.5	88	OBD 025ZJJ

Input

Input voltage	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	34...75 V DC
Reverse voltage protection	shunt diode	

Output

Output voltage setting accuracy	$U_{i \text{ nom}}, I_{o \text{ nom}}$	$\pm 1\% U_{o \text{ nom}}$
Minimum load	recommended	10% $I_{o \text{ nom}}$
Line regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, I_{o \text{ nom}}$	typ. $\pm 0.2\% U_{o \text{ nom}}$
Load regulation	$U_{i \text{ nom}}, 1 \dots 100\% I_{o \text{ nom}}$, single output models	typ. 0.5% $U_{o \text{ nom}}$
Output voltage switching noise	$U_{i \text{ nom}}, I_{o \text{ nom}}$, peak-peak, total	max. 4% $U_{o \text{ nom}}$
Voltage trim range		$\pm 10\% U_{o \text{ nom}}$

Control and protection

Overload protection	shut down, hiccup	110...140% $I_{o \text{ nom}}$
Overvoltage protection	hiccup (dual output models)	115...140% $U_{o \text{ nom}}$
	second control loop (single output models)	115...140% $U_{o \text{ nom}}$
Remote shutdown	positive logic, negative reference	

Safety and EMC

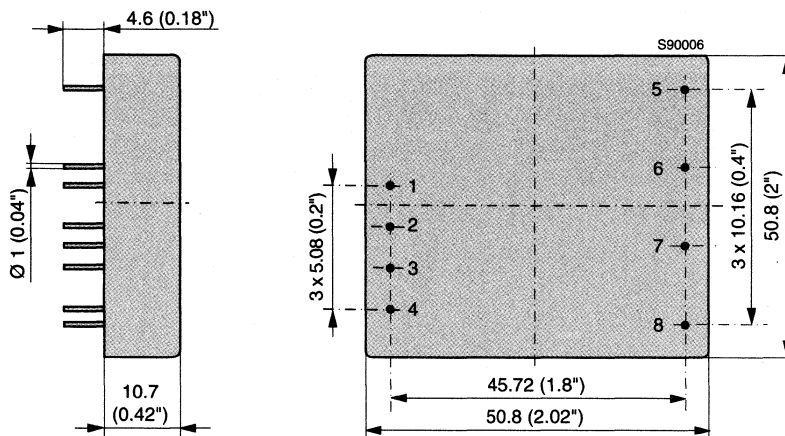
Electric strength test voltage	I/O	1500 V DC
Electromagnetic interference	conducted	tbd

Environmental

Operating case temperature T_C	$U_{i\ nom}, I_{o\ nom}$	-40...100 °C
Storage temperature	non operational	-40...125 °C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332	1'800'000 h

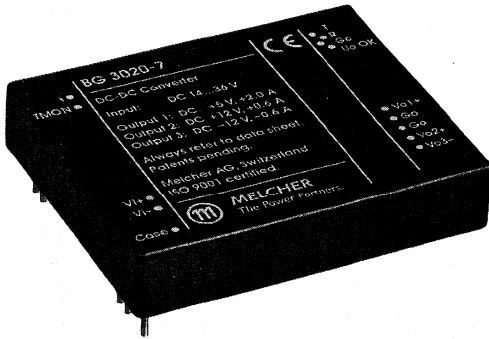
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	Single output units	Dual output units
1	Vi+	Vi+
2	Vi-	Vi-
3	n.c.	n.c.
4	Shutdown	Shutdown
5	no pin	Vo+
6	Vo+	Common
7	Vo-	Vo-
8	Trim	Trim



Input voltage ranges up to 75 V DC
 3 outputs 5...15 V DC
 1500 V DC I/O electric strength test voltage



- Flex power
- Serial 8-bit status communication port
- Adapted to MIL and avionics applications

Selection chart

Output 1		Output 2		Output 3		Input	Rated power	Efficiency	Type	Option
$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	U_i [V DC]	$P_{o,tot}$ [W]	η_{typ} [%]		
5.05	5	12.6	2	-12.6	2	14...36	25	87	BG 3020-7	-9, D, B
5.05	5	12.6	2	-12.6	2	36...75	25	87	CG 3020-7	-9, D, B
5.05	5	15.4	1.6	-15.4	1.6	14...36	25	87	BG 3040-7	-9, D, B
5.05	5	15.4	1.6	-15.4	1.6	36...75	25	87	CG 3040-7	-9, D, B

Input

Input voltage	BG	14...36 V DC
	CG	36...75 V DC
Reverse polarity protection	shunt diode	

Output

Output voltage setting accuracy	$U_{i \text{ nom}}, I_{o \text{ nom}}$	$\pm 1\% U_{o \text{ nom}}$
Minimum load	recommended for tracking outputs	10% $I_{o \text{ nom}}$
Line/load regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, 50\% I_{o \text{ nom}}$	$\pm 1\% U_{o \text{ nom}}$
Line regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, 50\% I_{o \text{ nom}}$ (tracking outputs)	$\pm 5\% U_{o \text{ nom}}$
Load regulation	$U_{i \text{ nom}}, 50 \dots 100\% I_{o \text{ nom}}$ (tracking outputs)	$\pm 10\% U_{o \text{ nom}}$
Output voltage switching noise	$U_{i \text{ nom}}, 100\% I_{o \text{ nom}}$, peak-peak, total	max. 1% $U_{o \text{ nom}}$
Efficiency	$U_{i \text{ nom}}, I_{o \text{ nom}}$	typ. 87%

Control and protection

Remote shut down	TTL-compatible input	disabled with $>2.4 \text{ V}$
Connection in parallel	current sharing	
Adjustable output voltage	R-input	60...110% $U_{o \text{ nom}}$
Output voltage OK signal	open collector	
Overload protection	continuous, each output	
Output overvoltage protection	second loop, self recovery	
No-load protection	$U_{i \text{ min}} \dots U_{i \text{ max}}$	
Temperature monitoring	thermistor, self recovery	$>110^\circ\text{C}$

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
Electromagnetic interference	conducted (with external filter)	class A
	radiated	class A

Environmental

Operating ambient temperature	$U_{i \text{ nom}}, I_{o \text{ nom}}$	$-25 \dots 71^\circ\text{C}$
Storage temperature	non operational	$-40 \dots 105^\circ\text{C}$
Relative humidity	non condensing	93%

Options

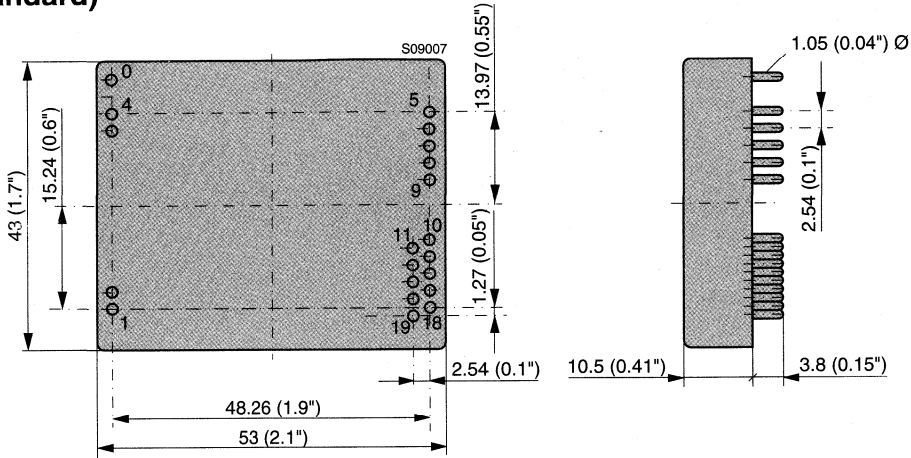
Extended temperature range	$-40 \dots 71^\circ\text{C}$, ambient, operating	-9
Output voltage monitor	serial 8 bit status communication interface	D
Case with fixing holes		B

Mechanical data

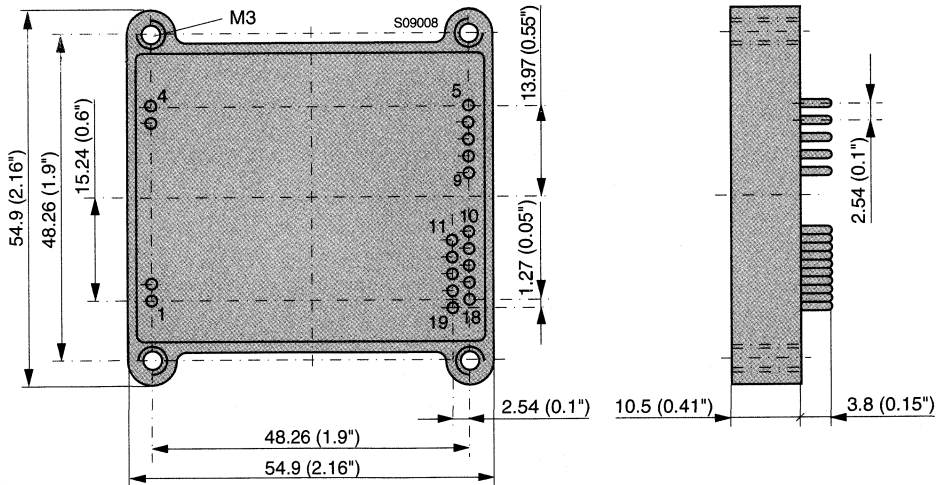
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



G (standard)

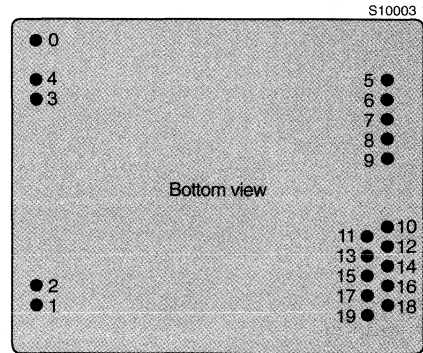


G (option B)



Pin allocation

Pin	Triple output units
1	i
2	TMON
3	Vi+
4	Vi-
5	Vo3-
6	Vo2+
7	Go
8	Go
9	Vo1+
10	/FAIL (Option D)
11	/SRQ (Option D)
12	/PDW (Option D)
13	/SDW (Option D)
14	/RST (Option D)
15	CT1 (Option D)
16	CT2 (Option D), U_o OK
17	Go
18	R
19	T
0	Case (not with option B)





Input voltage range up to 72 V DC
 1, 2 or 3 outputs up to 30 V DC
 1500 V DC I/O electric strength test voltage

- Low cost
- Short circuit protection
- Efficiency up to 82%

Selection chart

Output 1		Output 2		Output 3		Type	Type	Type
$U_{o,nom}$	$I_{o,nom}$	$U_{o,nom}$	$I_{o,nom}$	$U_{o,nom}$	$I_{o,nom}$	Input voltage	Input voltage	Input voltage
[V DC]	[A]	[V DC]	[A]	[V DC]	[A]	9...18 V DC	18...36 V DC	36...72 V DC
3.3	6.5	-	-	-	-	12 IMR 25-03-2	24 IMR 25-03-2	48 IMR 25-03-2
3.3	10	-	-	-	-	12 IMR 40-03-2	24 IMR 40-03-2	48 IMR 40-03-2
5	5	-	-	-	-	12 IMR 25-05-2	24 IMR 25-05-2	48 IMR 25-05-2
5	8	-	-	-	-	12 IMR 40-05-2	24 IMR 40-05-2	48 IMR 40-05-2
12	2.1	-	-	-	-	12 IMR 25-12-2	24 IMR 25-12-2	48 IMR 25-12-2
12	3.5	-	-	-	-	12 IMR 40-12-2	24 IMR 40-12-2	48 IMR 40-12-2
15	1.7	-	-	-	-	12 IMR 25-15-2	24 IMR 25-15-2	48 IMR 25-15-2
15	3	-	-	-	-	12 IMR 40-15-2	24 IMR 40-15-2	48 IMR 40-15-2
24	2	-	-	-	-	12 IMR 40-24-2	24 IMR 40-24-2	48 IMR 40-24-2
+5	4.7	-5	0.3	-	-	12 IMR 25-0505-2	24 IMR 25-0505-2	48 IMR 25-0505-2
+5	8	-5	0.5	-	-	12 IMR 40-0505-2	24 IMR 40-0505-2	48 IMR 40-0505-2
+12	1.8	-12	0.3	-	-	12 IMR 25-1212-2	24 IMR 25-1212-2	48 IMR 25-1212-2
+12	3	-12	0.5	-	-	12 IMR 40-1212-2	24 IMR 40-1212-2	48 IMR 40-1212-2
+15	1.4	-15	0.3	-	-	12 IMR 25-1515-2	24 IMR 25-1515-2	48 IMR 25-1515-2
+15	2	-15	0.5	-	-	12 IMR 40-1515-2	24 IMR 40-1515-2	48 IMR 40-1515-2
+5	4	+12	0.3	-12	0.3	12 IMR 25-051212-2	24 IMR 25-051212-2	48 IMR 25-051212-2
+5	6	+12	0.5	-12	0.5	12 IMR 40-051212-2	24 IMR 40-051212-2	48 IMR 40-051212-2
+5	3.5	+15	0.3	-15	0.3	12 IMR 25-051515-2	24 IMR 25-051515-2	48 IMR 25-051515-2
+5	6	+15	0.5	-15	0.5	12 IMR 40-051515-2	24 IMR 40-051515-2	48 IMR 40-051515-2
+5	12	-5	0.5	+12	0.5	-	24 IMR 40-050512-2	48 IMR 40-050512-2

Input

Input voltage	continuous range, 12 V	9...18 V DC
	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	36...72 V DC
Reverse voltage protection	shunt diode	

Output

Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 2\% U_{o\text{ nom}}$
Minimum load	recommended	$20\% I_{o\text{ nom}}$
Line regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, I_{o\text{ nom}}$	$\pm 1\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}, 0 \dots 100\% I_{o\text{ nom}}$, single output models	$\pm 2\% U_{o\text{ nom}}$
	dual and triple output models (tracking)	$5\% U_{o\text{ nom}}$
Output voltage switching noise	$U_{i\text{ nom}}, 20 \dots 100 I_{o\text{ nom}}$, peak-peak, total	max. $2\% U_{o\text{ nom}}$

Control and protection

Overload protection	$U_{i\text{ min}}$, full load	$125\% P_{i\text{ nom}}$
No-load protection		

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
Electromagnetic interference	conducted with external filter	class B

Environmental

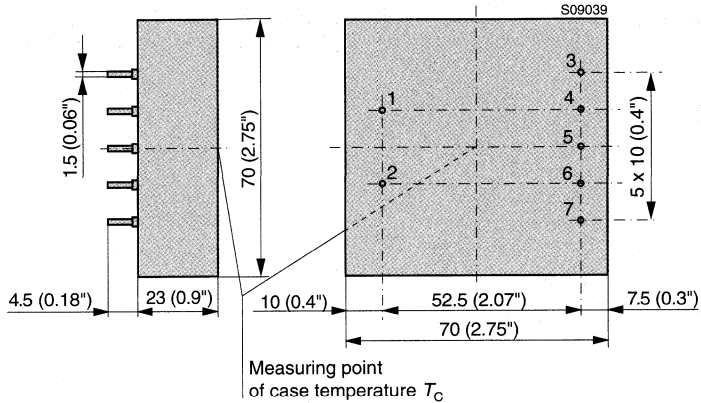
Operating ambient temperature	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$-10 \dots 50^\circ\text{C}$
Storage temperature	non operational	$-25 \dots 85^\circ\text{C}$
Relative humidity	non condensing	95%
MTBF	MIL-HDBK-217F, N2	2'000'000 h

Mechanical data

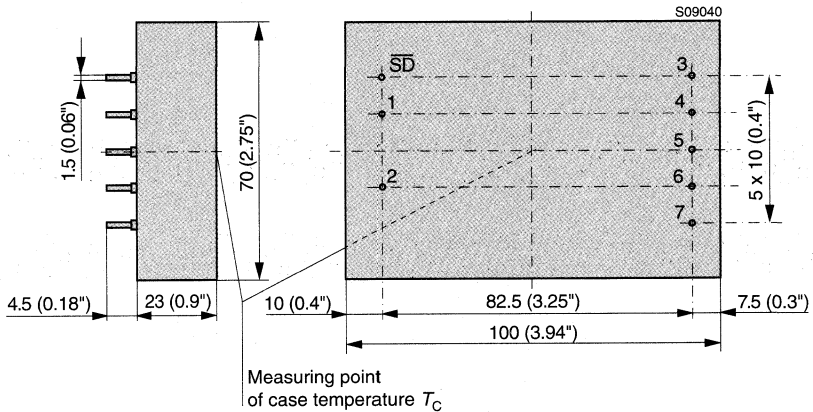
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



IMR 25 single and dual outputs units

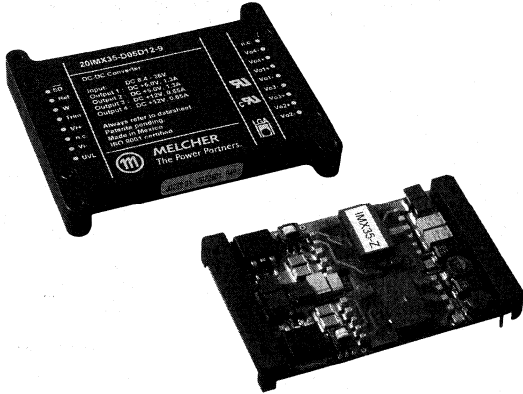


IMR 25 triple output units and IMR 40



Pin allocation

Pin	Single output	Dual output	Triple output
1	Vi+	Vi+	Vi+
2	Vi-	Vi-	Vi-
3	Vo+	Vo+	Vo1+
4	Vo+	Vo+	COM
5	Vo-	COM	Vo2+
6	Vo-	COM	COM
7	n.c.	Vo-	Vo3-



Wide input voltage ranges up to 75 V DC
 2...4 outputs up to 60 V DC
 1500 V DC I/O electric strength test voltage



- Magnetic feedback on selected models
- Synchronous rectifier on some models
- Input and output protection
- Industry standard 3" x 2.5" metal case with 10.5 mm profile

Selection chart

Output 1		Output 2		Output 3		Output 4		Input	Type	Options
$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	U_i [V DC]		
5	2.7	5	2.7	-	-	-	-	9...36	20 IMX 35-05-05-9	-8, Z, i
5	2.8	5	2.8	-	-	-	-	18...75	40 IMX 35-05-05-9	-8, Z, i
12	1.3	12	1.3	-	-	-	-	9...36	20 IMX 35-12-12-9	-8, Z, i
12	1.4	12	1.4	-	-	-	-	18...75	40 IMX 35-12-12-9	-8, Z, i
15	1.1	15	1.1	-	-	-	-	9...36	20 IMX 35-15-15-9	-8, Z, i
15	1.2	15	1.2	-	-	-	-	18...75	40 IMX 35-15-15-9	-8, Z, i
3.3	4.25	5	1.3	5	1.3	-	-	9...36	20 IMX 35-03D05-9	-8, Z, i
3.3	4.25	5	1.35	5	1.35	-	-	18...75	40 IMX 35-03D05-9	-8, Z, i
3.3	4.25	12	0.65	12	0.65	-	-	9...36	20 IMX 35-03D12-9	-8, Z, i
3.3	4.25	12	0.7	12	0.7	-	-	18...75	40 IMX 35-03D12-9	-8, Z, i
3.3	4.25	15	0.55	15	0.55	-	-	9...36	20 IMX 35-03D15-9	-8, Z, i
3.3	4.25	15	0.6	15	0.6	-	-	18...75	40 IMX 35-03D15-9	-8, Z, i
5.1	3.3	5	1.35	5	1.35	-	-	9...36	20 IMX 35-05D05-9	-8, Z, i
5.1	3.4	5	1.4	5	1.4	-	-	18...75	40 IMX 35-05D05-9	-8, Z, i
5.1	3.3	12	0.65	12	0.65	-	-	9...36	20 IMX 35-05D12-9	-8, Z, i
5.1	3.4	12	0.7	12	0.7	-	-	18...75	40 IMX 35-05D12-9	-8, Z, i
5.1	3.3	15	0.55	15	0.55	-	-	9...36	20 IMX 35-05D15-9	-8, Z, i
5.1	3.4	15	0.6	15	0.6	-	-	18...75	40 IMX 35-05D15-9	-8, Z, i
5	1.35	5	1.35	5	1.35	5	1.35	9...36	20 IMX 35 D05D05-9	-8, Z, i
5	1.4	5	1.4	5	1.4	5	1.4	18...75	40 IMX 35 D05D05-9	-8, Z, i
12	0.65	12	0.65	12	0.65	12	0.65	9...36	20 IMX 35 D12D12-9	-8, Z, i
12	0.7	12	0.7	12	0.7	12	0.7	18...75	40 IMX 35 D12D12-9	-8, Z, i
15	0.55	15	0.55	15	0.55	15	0.55	9...36	20 IMX 35 D15D15-9	-8, Z, i
15	0.6	15	0.6	15	0.6	15	0.6	18...75	40 IMX 35 D15D15-9	-8, Z, i

Input

Input voltage range	20 IMX 35	9...36 V DC
	40 IMX 35	18...75 V DC

Output

Output voltage setting accuracy	$U_{i \text{ nom}}, 50\% I_{o \text{ nom}}$	$\pm 1\% U_{o \text{ nom}}$
Minimum load	recommended for tracking outputs	$10\% I_{o \text{ nom}}$
Line/load regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, 50\% I_{o \text{ nom}},$ (outputs with magn. feedb.)	$\pm 0.5\% U_{o \text{ nom}}$
Line regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, 50\% I_{o \text{ nom}},$ (tracking outputs)	$\pm 1\% U_{o \text{ nom}}$
Load regulation	$U_{i \text{ nom}}, 10 \dots 100\% I_{o \text{ nom}},$ (tracking outputs)	$\pm 3\% U_{o \text{ nom}}$
Output voltage switching noise	$U_{i \text{ nom}}, 0 \dots 100\% I_{o \text{ nom}},$ peak-peak, total	max. $1 \dots 2\% U_{o \text{ nom}}$
Efficiency	$U_{i \text{ nom}}, I_{o \text{ nom}}$	up to typ 88%

Control and protection

Remote shut down	TTL-compatible input	disabled with 0.7 V
Input undervoltage lock-out	programmable	
Trim input for U_o		80...105%
Frequency synchronisation	twice the switching frequency	480...540 kHz
Reference output		5 V ± 0.1 V
Overload protection	$U_{i \text{ min}} \dots U_{i \text{ max}},$ hiccup mode	
No-load protection	$U_{i \text{ min}} \dots U_{i \text{ max}}$	
Temperature protection	by thermistor	

Safety and EMC

Electric strength test voltage	I/O, I/case	1500 V DC
Electromagnetic interference	conducted (with external filter)	class B radiated

class A

Environmental

Operating ambient temperature	$U_{i \text{ nom}}, I_{o \text{ nom}}$	$-40 \dots 71^\circ\text{C}$
Storage temperature	non operational	$-40 \dots 100^\circ\text{C}$
Relative humidity	non condensing	93%

Options

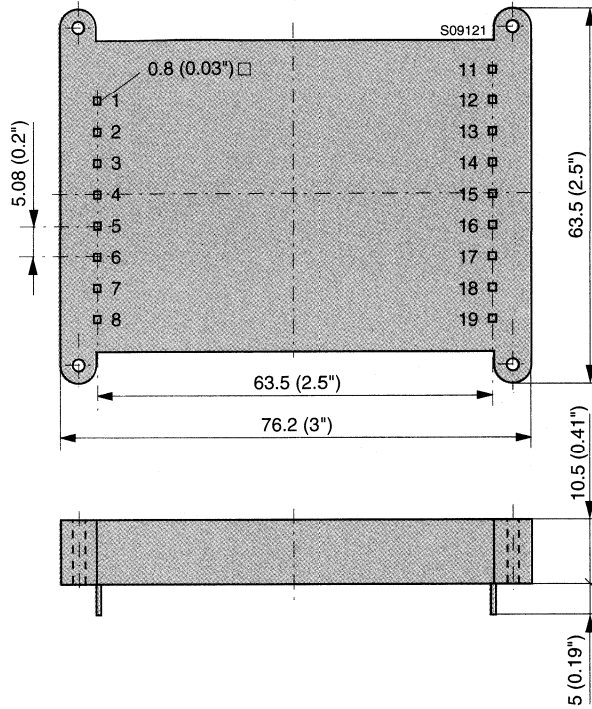
Extended temperature range	$-40 \dots 85^\circ\text{C}$ (derating above 71°C), ambient, operating	-8
Open version	no housing, not lacquered	Z
Inhibit input (reverse logic)	TTL-compatible, disabled with 2.4 V or open-circuit	i

Mechanical data

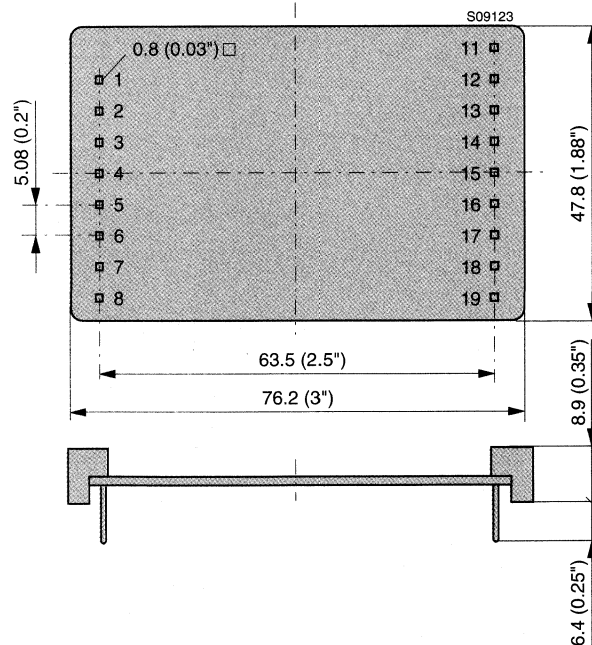
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



IMX 35

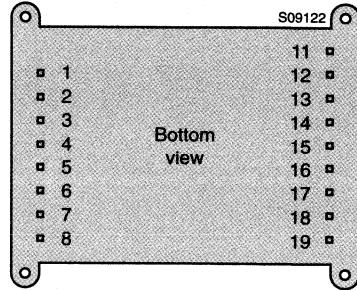


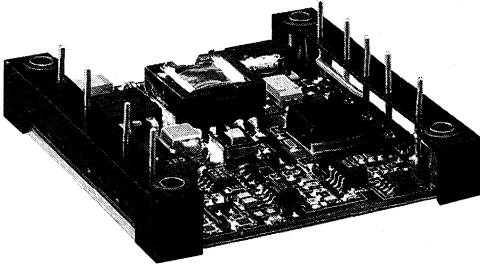
IMX 35 (option Z)



Pin allocation

Pin	Dual output	Triple output	Quadruple outp.
1	PUL	PUL	PUL
2	Vi-	Vi-	Vi-
3	n.c.	n.c.	n.c.
4	Vi+	Vi+	Vi+
5	Trim/n.c.	-	Trim
6	W	W	W
7	Ref	Ref	Ref
8	\overline{SD} or i	\overline{SD} or i	\overline{SD} or i
11	Vo2-	Vo3-	Vo3-
12	n.c.	Vo3+	Vo3+
13	Vo2+	Vo2+	Vo2+
14	n.c.	Vo2-	Vo2-
15	Vo1-	Vo1-	Vo1-
16	n.c.	n.c.	Vo1+
17	Vo1+	Vo1+	Vo4+
18	Trim1/n.c.	Trim1	Vo4-
19	n.c.	n.c.	n.c.





Input voltage ranges up to 75 V DC
 1 or 2 outputs up to 15 V DC
 1500 V DC I/O electric strength test voltage



- 100°C base plate operation
- Industry standard half-brick
- 5 and 3.3 V independent dual outputs

Selection chart

Output 1		Output 2		Input voltage	Rated power	Efficiency	Type
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	U_i [V DC]	$P_{o \text{ tot}}$ [W]	η_{typ} [%]	
2.5	6	-	-	18...36	15	77	HAS 015YD-A
2.5	6	-	-	34...75	15	78	HAS 015ZD-A
3.3	6	-	-	18...36	20	78	HAS 020YE-A
3.3	6	-	-	34...75	20	79	HAS 020ZE-A
5	6	-	-	18...36	30	82	HAS 030YG-A
5	6	-	-	34...75	30	84	HAS 030ZG-A
12	2.5	-	-	18...36	30	85	HAS 030YH-A
12	2.5	-	-	34...75	30	86	HAS 030ZH-A
12	5	-	-	18...36	60	85	HAS 060YH-A
12	5	-	-	36...75	60	85	HAS 060ZH-A
15	2	-	-	18...36	30	87	HAS 030YJ-A
15	2	-	-	34...75	30	87	HAS 030ZJ-A
15	4	-	-	18...36	60	86	HAS 060YJ-A
15	4	-	-	36...75	60	86	HAS 060ZJ-A
+5	6	+3.3	7.5	18...36	30	78	HAD 030YGE-A
+5	6	+3.3	7.5	34...75	30	80	HAD 030ZGE-A

Input

Input voltage	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	36...75 V DC
Reverse voltage protection	shunt diode	
Undervoltage lookout	24 V input, dual output models	17 V on, 15 V off
	48 V input, dual output models	33 V on, 30 V off

Output

Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 1\% U_{o\text{ nom}}$
Minimum load	recommended	10% $I_{o\text{ nom}}$
	5 V/3.3 V	300 mA/500 mA
Line regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, I_{o\text{ nom}}$, single output models	typ. $\pm 0.2\% U_{o\text{ nom}}$
	$U_{i\text{ min}} \dots U_{i\text{ max}}, I_{o\text{ nom}}$, dual output models	typ. $\pm 1\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}, 1 \dots 100\% I_{o\text{ nom}}$, single output models	typ. 0.2% $U_{o\text{ nom}}$
	$U_{i\text{ nom}}, 1 \dots 100\% I_{o\text{ nom}}$, dual output models	typ. 1% $U_{o\text{ nom}}$
Output voltage switching noise	$U_{i\text{ nom}}, I_{o\text{ nom}}$, peak-peak, total	max. 4% $U_{o\text{ nom}}$
Voltage trim range		$\pm 10\% U_{o\text{ nom}}$

Control and protection

Overload protection	shut down, continuous, single output models	110...140% $I_{o\text{ nom}}$
	shut down, hiccup, dual output models	110...140% $I_{o\text{ nom}}$
Overvoltage protection	hiccup, dual output models	115...140% $U_{o\text{ nom}}$
Thermal shutdown	dual output models	105...115°C
Remote shutdown	positive or negative logic, negative reference (single models)	
	positive logic, negative reference (dual models)	

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
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Environmental

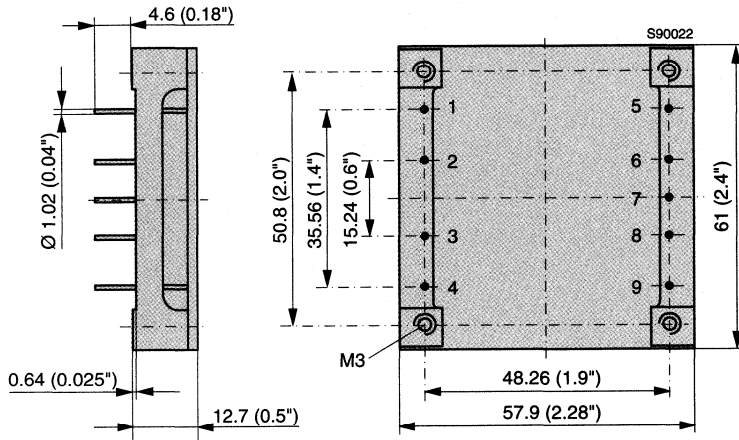
Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-40...100°C
Storage temperature	non operational	-40...125°C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332, single output version	2'500'000 h
	Bellcore TR-NWT-000332, dual output version	1'300'000 h

Options

Negative logic shutdown	single output models	N
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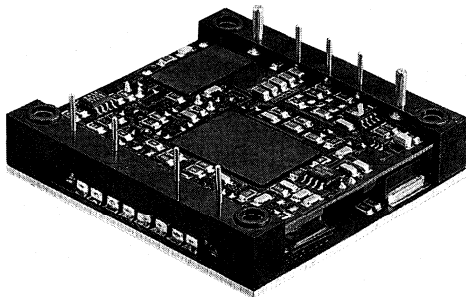
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	Single output units	Dual output units
1	Vi-	Vi-
2	Case	Case
3	On/Off	On/Off
4	Vi+	Vi+
5	Vo-	Vo-
6	Sense-	Sense-
7	Trim	Trim
8	Sense+	Sense+
9	Vo+	Vo+



Input voltage range up to 75 V DC
 1 or 2 outputs up to 30 V DC
 1500 V DC I/O electric strength test voltage



- 100°C base plate operation
- Industry standard half-brick
- High efficiency

Selection chart

Output 1		Output 2		Input voltage	Rated power	Efficiency	Type
$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	U_i [V DC]	$P_{o,tot}$ [W]	η_{typ} [%]	
2.1	30	-	-	36...72	63	80	HES 063ZC-A
2.5	10	-	-	36...72	25	88	HES 025ZD-A
2.5	15	-	-	36...72	37	87	HES 037ZD-A
2.5	20	-	-	36...72	50	86	HES 050ZD-A
2.5	30	-	-	36...72	75	83	HES 075ZD-A
3.3	10	-	-	36...72	33	87	HES 033ZE-A
3.3	15	-	-	36...72	50	89	HES 050ZE-A
3.3	20	-	-	36...72	66	88	HES 066ZE-A
3.3	30	-	-	36...72	100	85	HES 100ZE-A
5	10	-	-	36...72	50	88	HES 050ZG-A
5	15	-	-	36...72	75	88	HES 075ZG-A
5	20	-	-	36...72	100	88	HES 100ZG-A
5	30	-	-	36...72	150	89	HES 150ZG-A
+12	1.25	-12	1.25	18...36	30	85	HED 030YHH-A
+12	1.25	-12	1.25	36...75	30	85	HED 030ZHH-A
+15	1	-15	1	18...36	30	86	HED 030YJJ-A
+15	1	-15	1	36...75	30	88	HED 030ZJJ-A

Input

Input voltage	continuous range, 24 V	18...36 V DC
	continuous range, 48 V, single output models	36...72 V DC
	continuous range, 48 V, dual output models	36...75 V DC
Reverse voltage protection	shunt diode	
Undervoltage lockout	hysteresis, nominal 1 V, single output models	<34 V

Output

Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$, single output models	$\pm 1\% U_{o\text{ nom}}$
	$U_{i\text{ nom}}, I_{o\text{ nom}}$, dual output models, U_{o1}/U_{o2}	$\pm 1\%/\pm 2\% U_{o\text{ nom}}$
Minimum load	recommended	10% $I_{o\text{ nom}}$
Line regulation	$U_{i\text{ min}}...U_{i\text{ max}}, I_{o\text{ nom}}$, single output	typ. $\pm 0.2\% U_{o\text{ nom}}$
	$U_{i\text{ min}}...U_{i\text{ max}}, I_{o\text{ nom}}$, dual output, U_{o1}/U_{o2}	$\pm 1\%/\pm 2\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}, 1...100\% I_{o\text{ nom}}$, single output	typ. $\pm 0.2\% U_{o\text{ nom}}$
	$U_{i\text{ nom}}, 1...100\% I_{o\text{ nom}}$, dual output, U_{o1}/U_{o2}	$\pm 1\%/\pm 5\% U_{o\text{ nom}}$
Output voltage switching noise	$U_{i\text{ nom}}, I_{o\text{ nom}}$, peak-peak, total	max. 4% $U_{o\text{ nom}}$
Voltage trim range		$\pm 10\% U_{o\text{ nom}}$

Control and protection

Overload protection	shut down, hiccup, single output	110...130% $I_{o\text{ nom}}$
	shut down, continuous, dual output	110...140% $I_{o\text{ nom}}$
Overvoltage protection	hiccup, self recovering, single output	120...140% $U_{o\text{ nom}}$
	hiccup, self recovering, dual output	115...140% $U_{o\text{ nom}}$
Thermal shutdown		105...115°C
Remote shutdown	positive or negative logic, negative reference (single models)	
	positive logic, negative reference (dual models)	

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
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Environmental

Operating ambient temperature	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-40...100°C
Storage temperature	non operational	-40...125°C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332, single output models	1'800'000 h
	Bellcore TR-NWT-000332, dual output models	1'300'000 h

Options

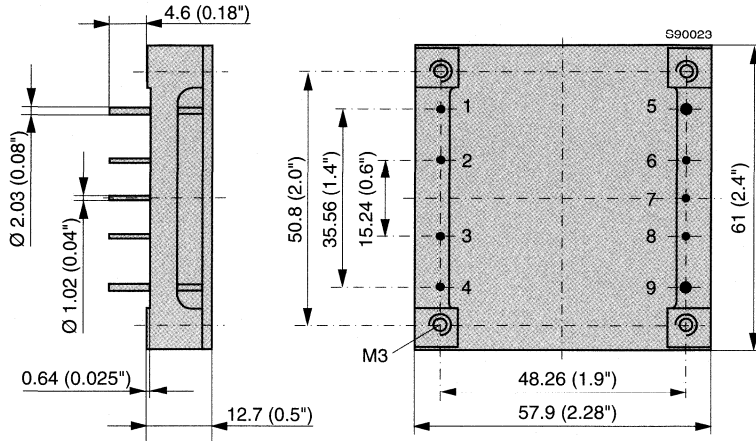
Negative logic shutdown	single output models	N
Water washable	no header	Y
Extended temperature range	-40...85°C, ambient, single output	I

Mechanical data

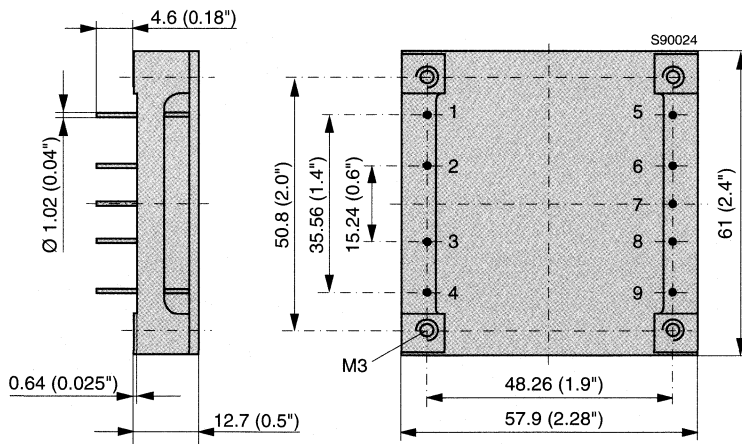
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



HES

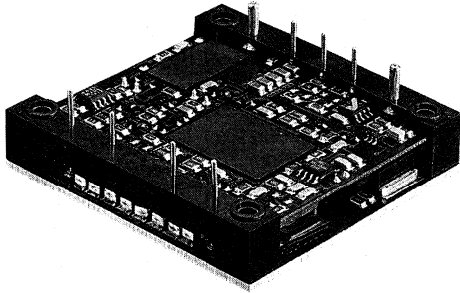


HED



Pin allocation

Pin	Single output units	Dual output units
1	Vi-	Vi-
2	Case	Case
3	Enable	On/Off
4	Vi+	Vi+
5	Vo-	No pin
6	Sense-	Vo2-
7	Trim	Common
8	Sense+	Vo1+
9	Vo+	Trim



Input voltage range up to 75 V DC
 1 or 2 outputs up to 15 V DC
 1500 V DC I/O electric strength test voltage



- 100°C base plate operation
- Industry standard half-brick
- High efficiency

Selection chart

Output 1		Output 2		Input voltage U_I [V DC]	Rated power $P_{o, tot}$ [W]	Efficiency η_{typ} [%]	Type
$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]	$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]				
3.3	10	-	-	18...36	33	80	HBS 033YE-A
3.3	10	-	-	34...75	33	80	HBS 033ZE-A
3.3	15	-	-	18...36	50	80	HBS 050YE-A
3.3	15	-	-	34...75	50	80	HBS 050ZE-A
3.3	20	-	-	18...36	66	80	HBS 066YE-A
3.3	20	-	-	34...75	66	80	HBS 066ZE-A
3.3	30	-	-	18...36	100	80	HBS 100YE-A
3.3	30	-	-	34...75	100	80	HBS 100ZE-A
5	10	-	-	18...36	50	83	HBS 050YG-A
5	10	-	-	34...75	50	84	HBS 050ZG-A
5	15	-	-	18...36	75	83	HBS 075YG-A
5	15	-	-	34...75	75	84	HBS 075ZG-A
5	20	-	-	18...36	100	83	HBS 100YG-A
5	20	-	-	34...75	100	84	HBS 100ZG-A
5	30	-	-	18...36	150	80	HBS 150YG-A
5	30	-	-	34...75	150	83	HBS 150ZG-A
12	4.2	-	-	18...36	50	85	HBS 050YH-A
12	4.2	-	-	34...75	50	86	HBS 050ZH-A
12	6.25	-	-	18...36	75	85	HBS 075YH-A
12	6.25	-	-	34...75	75	86	HBS 075ZH-A
12	8.3	-	-	18...36	100	85	HBS 100YH-A
12	8.3	-	-	34...75	100	86	HBS 100ZH-A
12	12.5	-	-	18...36	150	85	HBS 150YH-A
12	12.5	-	-	34...75	150	86	HBS 150ZH-A
15	3.3	-	-	18...36	50	88	HBS 050YJ-A
15	3.3	-	-	34...75	50	87	HBS 050ZJ-A
15	5	-	-	18...36	75	86	HBS 075YJ-A
15	5	-	-	34...75	75	87	HBS 075ZJ-A
15	6.7	-	-	18...36	100	86	HBS 100YJ-A
15	6.7	-	-	34...75	100	87	HBS 100ZJ-A
15	10	-	-	18...36	150	80	HBS 150YJ-A
15	10	-	-	34...75	150	84	HBS 150ZJ-A
+3.3	12	+2.5	15	18...36	77	75	HBD 040YED-A
+3.3	12	+2.5	15	34...75	77	75	HBD 040ZED-A
+5	8	+3.3	12	18...36	80	80	HBD 040YGE-A
+5	8	+3.3	12	34...75	80	80	HBD 040ZGE-A
+5	12	+3.3	15	18...36	110	78	HBD 060YGE-A
+5	12	+3.3	15	34...75	110	79	HBD 060ZGE-A

Input

Input voltage	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	34...75 V DC
Reverse voltage protection	shunt diode	

Output

Output voltage setting accuracy	$U_{i \text{ nom}}, I_{o \text{ nom}}$, single output models	$\pm 1\% U_{o \text{ nom}}$
Minimum load	recommended	$10\% I_{o \text{ nom}}$
Line regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, I_{o \text{ nom}}$, single output	typ. $\pm 0.2\% U_{o \text{ nom}}$
	$U_{i \text{ min}} \dots U_{i \text{ max}}, I_{o \text{ nom}}$, dual output, U_{o1}/U_{o2}	$\pm 0.2\% / \pm 1\% U_{o \text{ nom}}$
Load regulation	$U_{i \text{ nom}}, 1 \dots 100\% I_{o \text{ nom}}$, single output	$\pm 0.2\% U_{o \text{ nom}}$
	$U_{i \text{ nom}}, 1 \dots 100\% I_{o \text{ nom}}$, dual output, U_{o1}/U_{o2}	$\pm 0.5\% / \pm 1\% U_{o \text{ nom}}$
Output voltage switching noise	$U_{i \text{ nom}}, I_{o \text{ nom}}$, peak-peak, total	max. $4\% U_{o \text{ nom}}$
Voltage trim range		$\pm 10\% U_{o \text{ nom}}$

Control and protection

Overload protection	shut down, hiccup, single output	$110 \dots 140\% I_{o \text{ nom}}$
Overvoltage protection	hiccup, self recovering, single output	$115 \dots 140\% U_{o \text{ nom}}$
Thermal shutdown		$105 \dots 115^\circ\text{C}$
Remote shutdown	positive or negative logic, negative reference	

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
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Environmental

Operating case temperature T_C	$U_{i \text{ nom}}, I_{o \text{ nom}}$	$-40 \dots 100^\circ\text{C}$
Storage temperature	non operational	$-40 \dots 125^\circ\text{C}$
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332, single output version	2'100'000 h
	Bellcore TR-NWT-000332, dual output version	1'300'000 h

Options

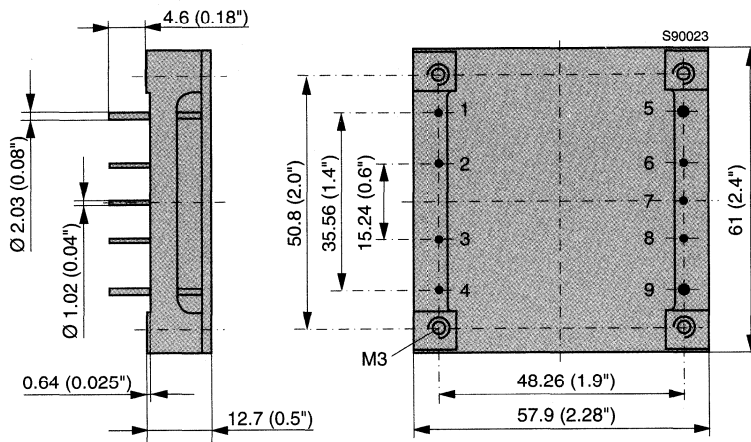
Negative logic shutdown		N
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Mechanical data

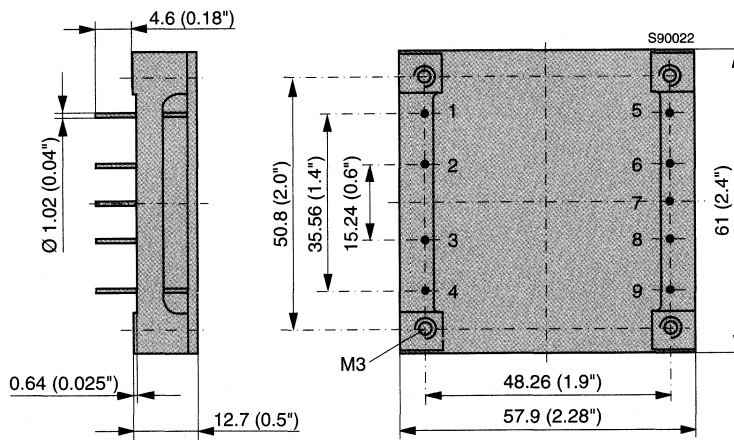
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



HBS



HBD



Pin allocation

Pin	Single output units	Dual output units
1	Vi-	Vi-
2	Case	Case
3	On/Off	On/Off
4	Vi+	Vi+
5	Vo-	Vo2+
6	Sense-	Vo2-
7	Trim	Trim2
8	Sense+	Vo1+
9	Vo+	Vo1-
10	-	Trim1



Input voltage range up to 75 V DC
 2.5 V DC and 3.3 V DC output
 1500 V DC I/O electric strength test voltage



- 100°C case operation
- 86% efficiency at 3.3 V
- Synchronous rectification

Selection chart

Output		Input voltage	Rated power	Efficiency	Type
$U_o \text{ nom}$ [V DC]	$I_o \text{ nom}$ [A]	U_i [V DC]	$P_o \text{ tot}$ [W]	$\eta \text{ typ}$ [%]	
2.5	15	18...36	38	80	QES 038YD-A
2.5	15	36...75	38	83	QES 038ZD-A
2.5	20	18...36	50	80	QES 050YD-A
2.5	20	36...75	50	83	QES 050ZD-A
3.3	15	18...36	50	85	QES 050YE-A
3.3	15	36...75	50	86	QES 050ZE-A
3.3	20	18...36	66	85	QES 066YE-A
3.3	20	36...75	66	86	QES 066ZE-A

Input

Input voltage	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	36...75 V DC
Reverse voltage protection	shunt diode	

Output

Output voltage setting accuracy	$U_i \text{ nom}, I_o \text{ nom}$	$\pm 1\% U_o \text{ nom}$
Minimum load	recommended	10% $I_o \text{ nom}$
Line regulation	$U_i \text{ min} \dots U_i \text{ max}, I_o \text{ nom}$	typ. $\pm 0.2\% U_o \text{ nom}$
Load regulation	$U_i \text{ nom}, 1 \dots 100\% I_o \text{ nom}$, single output models	typ. 0.5% $U_o \text{ nom}$
Output voltage switching noise	$U_i \text{ nom}, I_o \text{ nom}$, peak-peak, total	max. 4% $U_o \text{ nom}$
Voltage trim range		$\pm 10\% U_o \text{ nom}$
Switching frequency		300 kHz

Control and protection

Overload protection	shut down	110...140% $I_o \text{ nom}$ max. 200% $I_o \text{ nom}$
Overvoltage protection	latching	115...140% $U_o \text{ nom}$
Undervoltage protection	latching	70...90% $U_o \text{ nom}$
Thermal shutdown		105...115°C
Remote shutdown	positive or negative logic, negative reference	

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
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Environmental

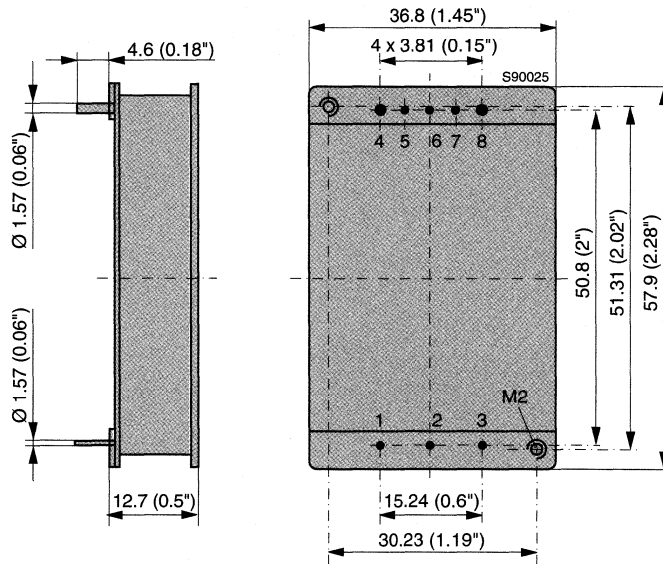
Operating case temperature T_C	$U_{i\ nom}, I_{o\ nom}$	-40...100°C
Storage temperature	non operational	-40...125°C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332	2'500'000 h

Options

Remote shutdown	negative logic	N
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Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	Single output units
1	Vi-
2	On/Off
3	Vi+
4	Vo-
5	Sense-
6	Trim
7	Sense+
8	Vo+



Input voltage range up to 75 V DC
 2.5 V...15 V DC output
 1500 V DC I/O electric strength test voltage



- 100°C case operation
- High power density
- Quarter-brick footprint

Selection chart

Output		Input voltage	Rated power	Efficiency	Type
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	U_i [V DC]	$P_{o\ tot}$ [W]	η_{typ} [%]	
2.5	15	18...36	38	76	QBS 038YD-A
2.5	15	36...75	38	77	QBS 038ZD-A
3.3	15	18...36	50	80	QBS 050YE-A
3.3	15	36...75	50	81	QBS 050ZE-A
5	15	18...36	75	84	QBS 075YG-A
5	15	36...75	75	83	QBS 075ZG-A
12	8.33	18...36	100	85	QBS 100YH-A
12	8.33	36...75	150	86	QBS 100ZH-A
12	10	36...75	120	84	QBS 120ZH-A
15	6.67	18...36	100	85	QBS 100YJ-A
15	6.67	36...75	100	86	QBS 100ZJ-A
15	10	36...75	150	84	QBS 150ZJ-A

Input

Input voltage	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	36...75 V DC

Output

Output voltage setting accuracy	$U_i\ nom, I_o\ nom$	$\pm 1\% U_{o\ nom}$
Minimum load	recommended	10% $I_o\ nom$
Line regulation	$U_i\ min...U_i\ max, I_o\ nom$	typ. $\pm 0.2\% U_{o\ nom}$
Load regulation	$U_i\ nom, 1...100\% I_o\ nom$	typ. 0.5% $U_{o\ nom}$
Output voltage switching noise	$U_i\ nom, I_o\ nom, peak-peak, total$	max. 4% $U_{o\ nom}$
Voltage trim range		$\pm 10\% U_{o\ nom}$
Switching frequency		400 kHz

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
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Control and protection

Overload protection	shut down	110...140% $I_{o\ nom}$ max. 200% $I_{o\ nom}$
Overvoltage protection	latching	115...140% $U_{o\ nom}$
Undervoltage protection	latching	70...90% $U_{o\ nom}$
Thermal shutdown		105...115°C
Remote shutdown	positive or negative logic, negative reference	

Environmental

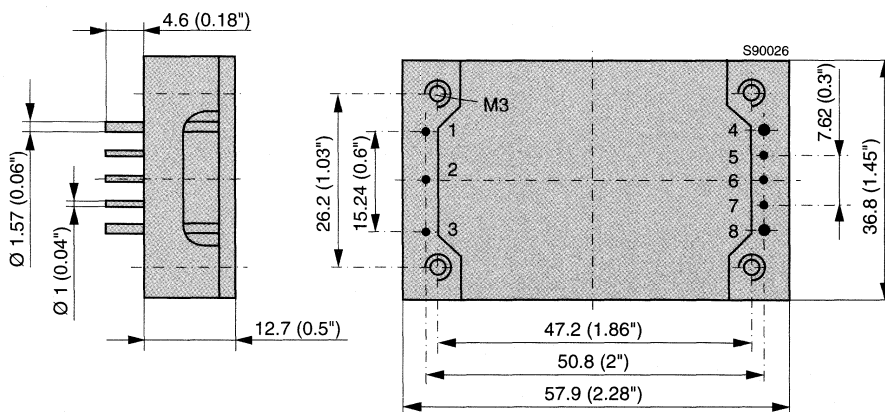
Operating case temperature T_C	$U_{I\ nom}, I_{o\ nom}$	-40...100°C
Storage temperature	non operational	-40...125°C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332	2'500'000 h

Options

Remote shutdown	negative logic	N
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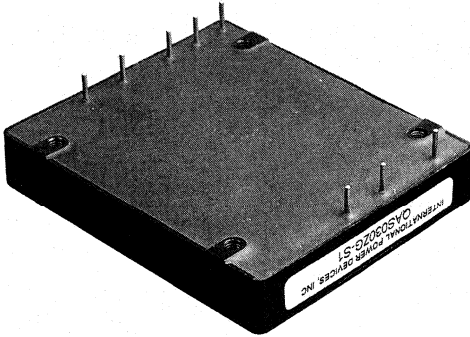
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	Single output units
1	V_{i-}
2	On/Off
3	V_{i+}
4	V_{o-}
5	Sense-
6	Trim
7	Sense+
8	V_{o+}



Input voltage range up to 72 V DC
 5...60 V DC output
 1500 V DC I/O electric strength test voltage

- 5-sided shielding
- Remote sense and voltage trim

Selection Chart

Output		Input voltage	Rated power	Efficiency	Type
$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]	U_i [V DC]	$P_{o, tot}$ [W]	η_{typ} [%]	
5	10	36...72	50	86	QAS 050ZG
57	1.1	36...72	60	87	QAS 060Z57
60	0.83	36...72	50	88	QAS 060Z60

Input

Input voltage	continuous range, 48V	36...72 V DC
Reverse voltage protection	shunt diode	

Output

Output voltage setting accuracy	$U_i, I_{o, nom}$	$\pm 1\% U_{o, nom}$
Minimum load	recommended	10% $I_{o, nom}$
Line regulation	$U_i, I_{o, nom}$	typ. $\pm 0.2\% U_{o, nom}$
Load regulation	$U_i, I_{o, nom}$, single output models	typ. 0.2% $U_{o, nom}$
Output voltage switching noise	$U_i, I_{o, nom}$, peak-peak, total, 5 V output	max. 100 mV
	$U_i, I_{o, nom}$, peak-peak, total, 57/60 V output	max. 200 mV
Voltage trim range		$\pm 10\% U_{o, nom}$
Switching frequency		300 kHz

Control and protection

Overload protection	shut down, hiccup	110...130% $I_{o, nom}$
Overvoltage protection	second control loop	120...140% $U_{o, nom}$
Remote shutdown	positive or negative logic	

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
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Environmental

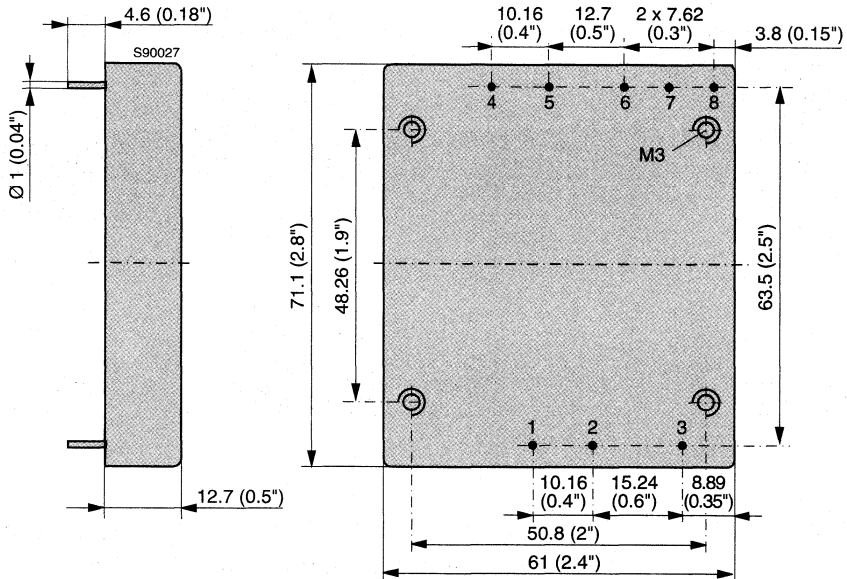
Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-25...85°C
Storage temperature	non operational	-40...125°C
Relative humidity	non condensing	95%

Options

Remote shutdown	negative logic	N
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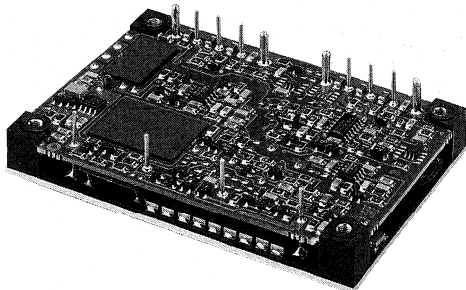
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	Single output units
1	Vi-
2	Vi+
3	Enable
4	Vo-
5	Vo+
6	Sense-
7	Trim
8	Sense+



Input voltage range up to 72 V DC
 3.3/2.5 V DC and 5/3.3 V DC output
 1500 V DC I/O electric strength test voltage



- 100°C case operation
- Flexible load sharing
- High efficient topology

Selection chart

Output 1		Output 2		Input voltage	Rated power	Efficiency	Type
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	U_i [V DC]	$P_{o\ tot}$ [W]	η_{typ} [%]	
3.3	25	2.5	25	36...72	85	82	TQD 085ZED-A
5	20	3.3	25	18...36	100	81	TQD 100YGE-A
5	20	3.3	25	36...72	100	83	TQD 100ZGE-A

Input

Input voltage	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	36...72 V DC
Reverse voltage protection	shunt diode	

Output

Output voltage setting accuracy	$U_{i\ nom}, I_{o\ nom}$	$\pm 1\% U_{o\ nom}$
Minimum load	recommended	10% $I_{o\ nom}$
Line regulation	$U_{i\ min} \dots U_{i\ max}, I_{o\ nom}, \text{output 1}$	typ. $\pm 0.2\% U_{o\ nom}$
Load regulation	$U_{i\ nom}, 1 \dots 100\% I_{o\ nom}, \text{output 1}$	typ. $0.3\% U_{o\ nom}$
Output voltage switching noise	$U_{i\ nom}, I_{o\ nom}, \text{peak-peak, total}$	max. $4\% U_{o\ nom}$
Voltage trim range		$\pm 10\% U_{o\ nom}$
Switching frequency		250 kHz

Control and protection

Overload protection		110...130% $I_{o\ nom}$
Overvoltage protection		115...140% $U_{o\ nom}$
Undervoltage protection		70...90% $U_{o\ nom}$
Thermal shutdown		105...115°C
Remote shutdown	positive or negative logic	

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
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Environmental

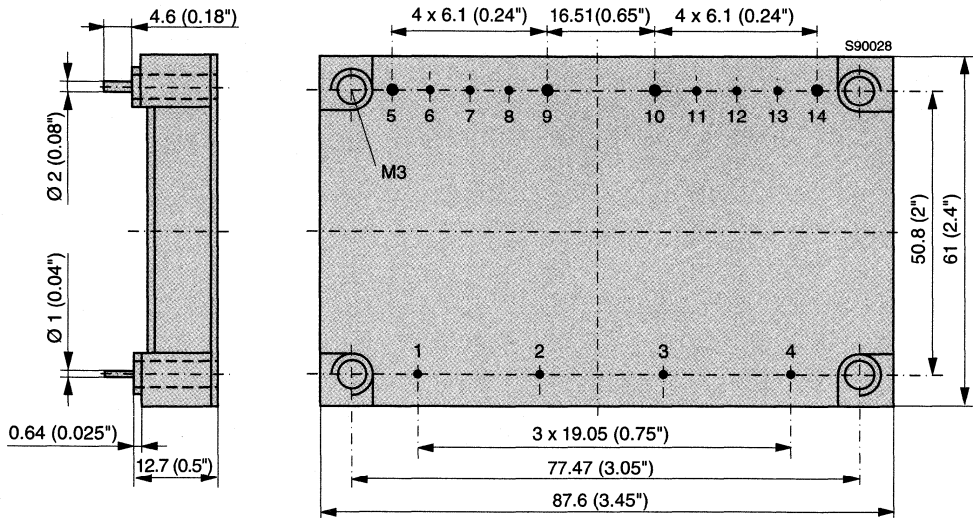
Operating case temperature T_C	$U_{i\ nom}, I_{o\ nom}$	-40...100°C
Storage temperature	non operational	-40...125°C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332	1'200'000 h

Options

Remote shutdown	negative logic	N
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Mechanical data

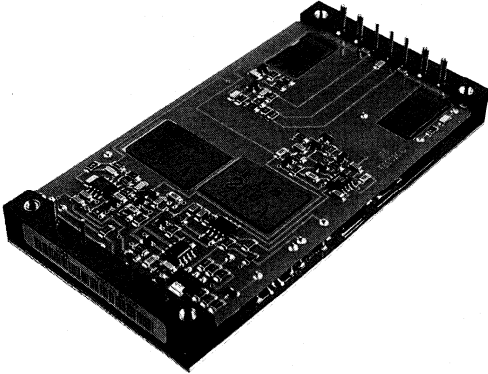
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	Double output units
1	Vi-
2	Enable
3	Case
4	Vi+
5	Vo1+
6	Sense1+
7	Trim1

Pin	Double output units
8	Sense1-
9	Vo1-
10	Vo2-
11	Sense2-
12	Trim2
13	Sense2+
14	Vo2+



Input voltage range up to 75 V DC
 2.5, 3.3 and 5 V DC
 1500 V DC I/O electric strength test voltage



- 100°C case operation
- 60 A full brick
- Very high efficiency, 89% at 5 V output
- Synchronous rectification

Selection chart

Output		Input voltage	Rated power	Efficiency	Type
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	U_i [V DC]	$P_{o\ tot}$ [W]	η_{typ} [%]	
2.5	40	36...75	100	85	FES 100ZD-A
2.5	60	36...75	150	83	FES 150ZD-A
3.3	40	36...75	132	87	FES 132ZE-A
3.3	60	36...75	200	85	FES 200ZE-A
5	40	36...75	200	87	FES 200ZG-A
5	60	36...75	300	86	FES 300ZG-A

Input

Input voltage	continuous range, 48 V	36...75 V DC
Undervoltage lock-out	turn on/turn off	34/32 V DC

Output

Output voltage setting accuracy	$U_{i\ nom}, I_{o\ nom}$	$\pm 1\% U_{o\ nom}$
Minimum load	recommended	$10\% I_{o\ nom}$
Line regulation	$U_{i\ min} \dots U_{i\ max}, I_{o\ nom}$	typ. $\pm 0.5\% U_{o\ nom}$
Load regulation	$U_{i\ nom}, 1 \dots 100\% I_{o\ nom}$	typ. $\pm 0.5\% U_{o\ nom}$
Output voltage switching noise	$U_{i\ nom}, I_{o\ nom}$, peak-peak, total	max. $5\% U_{o\ nom}$
Voltage trim range		$\pm 10\% U_{o\ nom}$
Switching frequency		200 or 300 kHz

Control and protection

Overload protection	hiccup	$120\% I_{o\ nom}$
Overvoltage protection	self recovering	$120 \dots 140\% U_{o\ nom}$
Thermal shutdown		$105 \dots 115^\circ\text{C}$
Remote shutdown	positive logic, negative reference	

Safety and EMC

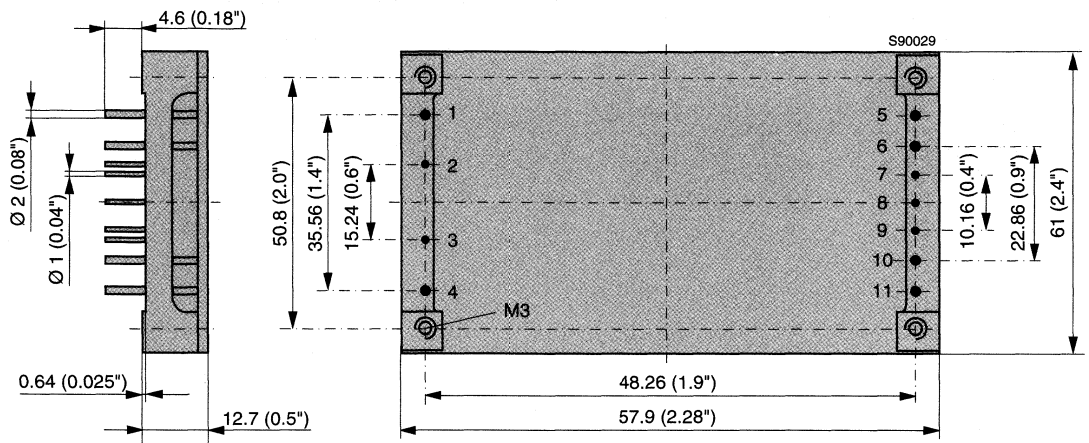
Electric strength test voltage	I/O	1500 V DC
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Environmental

Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-40...100°C
Storage temperature	non operational	-40...125°C
Relative humidity	non condensing	95%

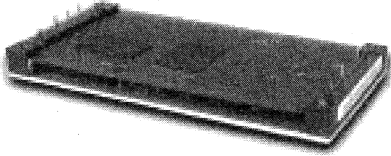
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	Single output units
1	Vi-
2	Case
3	Enable
4	Vi+
7	Vo-
8	Vo-
9	Sense-
10	Trim
11	Sense+
12	Vo+
13	Vo+



Input voltage range up to 72 V DC
 up to 48 V DC output
 1500 V DC I/O electric strength test voltage



- 100°C base plate operation
- Standard full brick
- VWB booster modules available

Selection chart

Output		Input voltage U_i [V DC]	Rated power $P_{o\ tot}$ [W]	Efficiency η_{typ} [%]	Type
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]				
5	20	18...36	100	82	VWS 100YG
5	20	36...72	100	84	VWS 100ZG
5	30	18...36	150	81	VWS 150YG-A
5	30	36...72	150	82	VWS 150ZG-A
12	8.3	18...36	100	84	VWS 100YH
12	8.3	36...72	100	89	VWS 100ZH
12	12.5	18...36	150	85	VWS 150YH-A
12	12.5	36...72	150	85	VWS 150ZH-A
12	20.8	18...36	250	81	VWS 250YH-A
12	25	36...72	300	84	VWS 300ZH-A
15	6.7	18...36	100	85	VWS 100YJ
15	6.7	36...72	100	89	VWS 100ZJ
15	10	18...36	150	88	VWS 100YJ-A
15	10	36...72	150	85	VWS 100ZJ-A
15	16.7	18...36	250	81	VWS 250YJ-A
15	20	36...72	300	84	VWS 300ZJ-A
24	4.2	18...36	100	87	VWS 100YK
24	4.2	36...72	100	88	VWS 100ZK
24	6.25	18...36	150	88	VWS 150YK-A
24	6.25	36...72	150	86	VWS 150ZK-A
24	10.4	18...36	250	82	VWS 250YK-A
24	12.5	36...72	300	85	VWS 300ZK-A
28	3.6	18...36	100	90	VWS 100YL
28	3.6	36...72	100	90	VWS 100ZL
28	8.9	18...36	250	82	VWS 250Y28-A
28	10.7	36...72	300	86	VWS 300Z28-A
48	2.1	18...36	100	90	VWS 100YM
48	2.1	36...72	100	90	VWS 100ZM
48	5.2	18...36	250	83	VWS 250Y48-A
48	6.25	36...72	300	87	VWS 300Z48-A

Input

Input voltage	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	36...72 V DC
Undervoltage lock-out	turn on/turn off	34/32 V DC
	turn on/turn off	17/15 V DC

Output

Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 1\% U_{o\text{ nom}}$
Minimum load	recommended	10% $I_{o\text{ nom}}$
Line regulation	$U_{i\text{ min}}...U_{i\text{ max}}, I_{o\text{ nom}}$	typ. $\pm 0.2\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}, 1...100\% I_{o\text{ nom}}, \text{VWS 300 models}$	typ. $\pm 0.2\% U_{o\text{ nom}}$
	$U_{i\text{ nom}}, 1...100\% I_{o\text{ nom}}, \text{VWS 100/150 models}$	typ. $\pm 0.5\% U_{o\text{ nom}}$
Output voltage switching noise	$U_{i\text{ nom}}, I_{o\text{ nom}}, \text{peak-peak, total}$	max. 8% $U_{o\text{ nom}}$
Voltage trim range		$\pm 10\% U_{o\text{ nom}}$
Switching frequency		300/500 kHz

Control and protection

Overload protection	shut down, hiccup	110...140% $I_{o\text{ nom}}$
Overvoltage protection	self recovering, VWS 100/300	120...140% $U_{o\text{ nom}}$
Thermal shutdown	VWS 100	90...100°C
	VWS 150/300	105...115°C
Remote shutdown	positive logic, negative reference	

Safety and EMC

Electric strength test voltage	I/O	1500 V DC
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Environmental

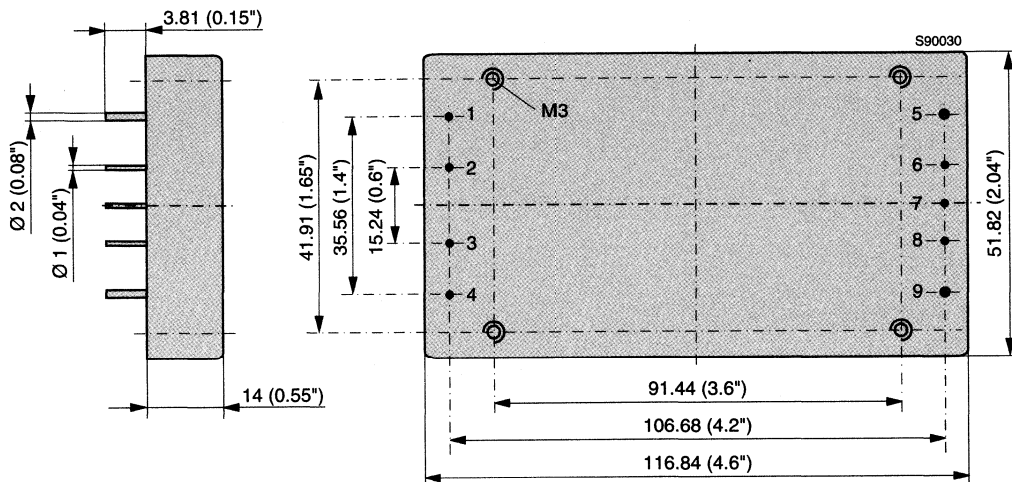
Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}, \text{VWS 100}$	-25...85°C
	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-40...100°C
	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-55...115°C
Storage temperature	non operational	-40...125°C
Relative humidity	non condensing	95%

Mechanical data

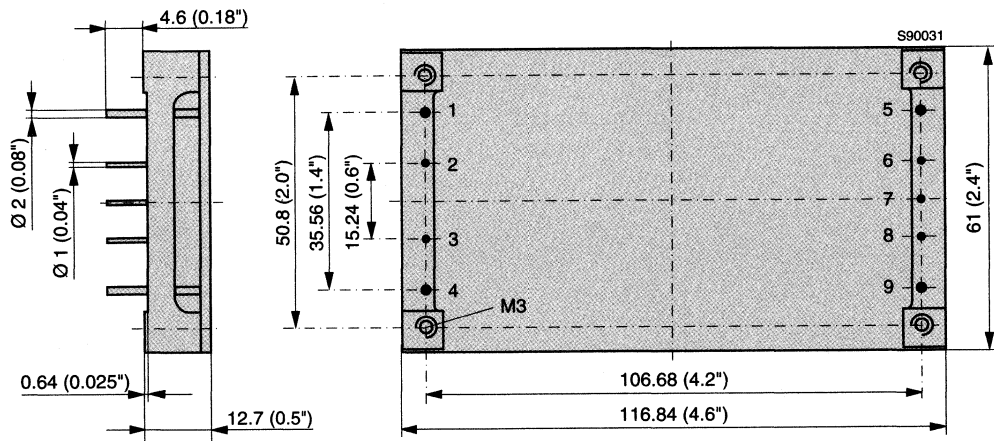
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



VWS 100

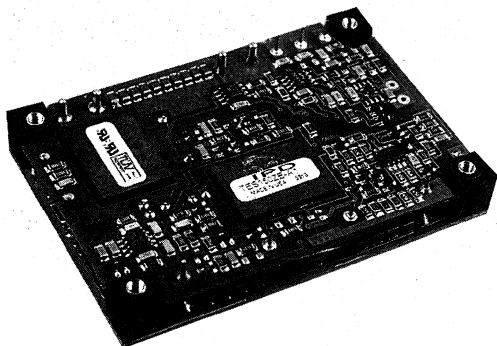


VWS 150, VWS 250, VWS 300



Pin allocation

Pin	Single output units
1	Vi-
2	Gate out
3	Gate in
4	Vi+
5	Vo-
6	Sense-
7	Trim
8	Sense+
9	Vo+



Input voltage range up to 72 V DC
 2.5, 3.3 and 5 V DC output
 1500 V DC I/O electric strength test voltage



- 100°C case operation
- 45 A three quarter brick
- Very high efficiency up to 88% at 5 V DC output

Selection chart

Output		Input voltage	Rated power	Efficiency	Type
$U_o \text{ nom}$ [V DC]	$I_o \text{ nom}$ [A]	U_i [V DC]	$P_o \text{ tot}$ [W]	η_{typ} [%]	
2.5	45	18...36	113	79	TES 113YD-A
2.5	45	36...72	113	80	TES 113ZD-A
3.3	45	18...36	150	82	TES 150YE-A
3.3	45	36...72	150	83	TES 150ZE-A
5	45	18...36	225	82	TES 225YG-A
5	45	36...72	225	82	TES 225ZG-A

Input

Input voltage	continuous range, 24 V	18...36 V DC
	continuous range, 48 V	36...72 V DC

Output

Output voltage setting accuracy	$U_i \text{ nom}, I_o \text{ nom}$	$\pm 1\% U_o \text{ nom}$
Minimum load	recommended	10% $I_o \text{ nom}$
Line regulation	$U_i \text{ min} \dots U_i \text{ max}, I_o \text{ nom}$	typ. $\pm 0.2\% U_o \text{ nom}$
Load regulation	$U_i \text{ nom}, 1 \dots 100\% I_o \text{ nom}$	typ. $\pm 0.5\% U_o \text{ nom}$
Output voltage switching noise	$U_i \text{ nom}, I_o \text{ nom}, \text{peak-peak, total}$	max. 4% $U_o \text{ nom}$
Voltage trim range		$\pm 10\% U_o \text{ nom}$
Switching frequency		200 or 300 kHz

Control and protection

Overload protection	latch	110...140% $I_o \text{ nom}$ max. 200% $I_o \text{ nom}$
Overvoltage protection	latch	115...140% $U_o \text{ nom}$
Undervoltage lockout	latch	70...90% $U_o \text{ nom}$
Thermal shutdown		105...115°C
Remote shutdown	positive logic, negative reference	

Safety and EMC

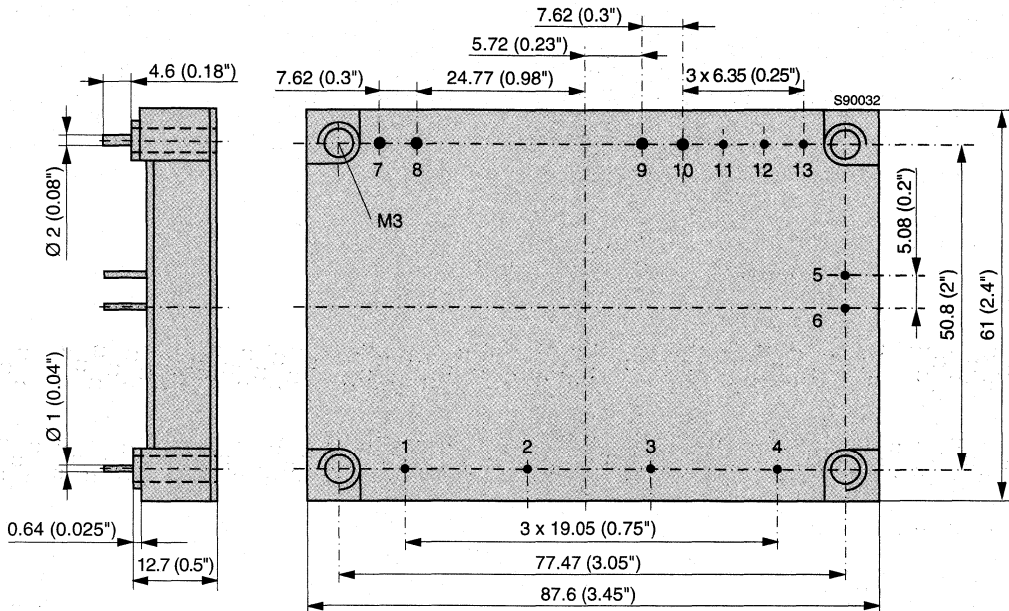
Electric strength test voltage	I/O	1500 V DC
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Environmental

Operating case temperature T_C	$U_{i\ nom}, I_{o\ nom}$	-40...100 °C
Storage temperature	non operational	-40...125 °C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332	1'000'000 h

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	Double output units
1	Vi-
2	Enable
3	Case
4	Vi+
5	cn2 (opt.)
6	cn1 (opt.)
7	Vo+

Pin	Double output units
8	Vo+
9	Vo-
10	Vo-
11	Sense-
12	Trim
13	Sense+



Wide input voltage ranges up to 60 V DC
 1, 2 or 3 outputs up to 48 V DC
 3 kV DC I/O electric strength test voltage



- Rugged electrical and mechanical design
- Output 1 regulated, outputs 2 and 3 tracking
- Operating ambient temperature range
 –25...71 °C with convection cooling

Selection chart

Output 1		Output 2		Output 3		Input voltage U_i [V DC]	Type	Options
U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]			
5.1	8	-	-	-	-	8...15	12H1001-2R	-7, D, V
5.1	8	-	-	-	-	14...30	24H1001-2R	-7, D, V
5.1	8	-	-	-	-	28...60	48H1001-2R	-7, D, V
12	4	-	-	-	-	8...15	12H1301-2R	-7, D
12	4	-	-	-	-	14...30	24H1301-2R	-7, D
12	4	-	-	-	-	28...60	48H1301-2R	-7, D
15	3.4	-	-	-	-	8...15	12H1501-2R	-7, D
15	3.4	-	-	-	-	14...30	24H1501-2R	-7, D
15	3.4	-	-	-	-	28...60	48H1501-2R	-7, D
24	2	-	-	-	-	8...15	12H1601-2R	-7, D
24	2	-	-	-	-	14...30	24H1601-2R	-7, D
24	2	-	-	-	-	28...60	48H1601-2R	-7, D
48	1	-	-	-	-	8...15	12H1901-2R	-7, D
48	1	-	-	-	-	14...30	24H1901-2R	-7, D
48	1	-	-	-	-	28...60	48H1901-2R	-7, D
12	2	12	2	-	-	8...15	12H2320-2	-7, D
12	2	12	2	-	-	14...30	24H2320-2	-7, D
12	2	12	2	-	-	28...60	48H2320-2	-7, D
15	1.7	15	1.7	-	-	8...15	12H2540-2	-7, D
15	1.7	15	1.7	-	-	14...30	24H2540-2	-7, D
15	1.7	15	1.7	-	-	28...60	48H2540-2	-7, D
5.1	5	12	0.7	12	0.7	8...15	12H3020-2	-7, D, V
5.1	5	12	0.7	12	0.7	14...30	24H3020-2	-7, D, V
5.1	5	12	0.7	12	0.7	28...60	48H3020-2	-7, D, V
5.1	5	15	0.6	15	0.6	8...15	12H3040-2	-7, D, V
5.1	5	15	0.6	15	0.6	14...30	24H3040-2	-7, D, V
5.1	5	15	0.6	15	0.6	28...60	48H3040-2	-7, D, V

Input

Input voltage	refer to selection chart
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Output

Efficiency	$U_{i \text{ nom}}, I_{o \text{ nom}}$	up to 86%
Output voltage 1 setting acc.	$U_{i \text{ nom}}, I_{o \text{ nom}}$	$\pm 2\% U_{o1 \text{ nom}}$
Output voltage 2, 3 setting acc.	$U_{i \text{ nom}}, I_{o \text{ nom}}$	$\pm 7.5\% U_{o2,3 \text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 200 mV _{pp}
Line regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, I_{o \text{ nom}}$	typ. $\pm 1\% U_{o \text{ nom}}$
Load regulation output 1	$U_{i \text{ nom}}, 0 \dots I_{o1 \text{ nom}}$	typ. 0.2% $U_{o1 \text{ nom}}$
Load regulation output 2, 3	10...100% $I_{o2,3 \text{ nom}}$	typ. 0.7 V
Output voltage 2, 3	$U_{i \text{ nom}}, I_{o1 \text{ nom}}, I_{o2,3} = 0$	max. 115% $U_{o2,3 \text{ nom}}$
Cross load regulation outp. 2, 3	0...100% $I_{o1 \text{ nom}}$	typ. 0.7 V
Minimum output current	not required	0 A
Current limitation main output	rectangular U/I characteristic	typ. 110% $I_{o \text{ nom}}$
Current limitation aux. output(s)	rectangular U/I characteristic	typ. 120% $I_{o \text{ nom}}$
Operation in parallel	by current limitation	
Hold-up time	$U_{i \text{ nom}}, I_{o \text{ nom}}$, with ext. diode in input line	up to 1 ms

Protection

Input reverse polarity	with external fuse	
Input undervoltage lockout		typ 80% $U_{i \text{ min}}$
Input overvoltage lockout		typ 110% $U_{i \text{ max}}$
Input transient protection	suppressor diode	
Output	no-load, overload g2d short circuit proof	
Output overvoltage	suppressor diode in each output	typ 150% $U_{o \text{ nom}}$
Overtemperature	switch-off with auto restart	T_c typ 100°C

Control

Output voltage adjustment	single output models	0...110% $U_{o1 \text{ nom}}$
Inhibit	TTL input, output(s) disabled if left open-circuit	
Status indication	LEDs: OK, inhibit	

Safety

Approvals	EN 60950, UL 1950, CSA C22.2 No. 950	
Class of equipment		class I
Protection degree	units without options	IP 40
Electric strength test voltage	I/case	2 kV AC
	I/O	4 kV AC
	O/case	1 kV AC
	O/O	0.2 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, contact discharge, level 2 (4 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level x (20 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, input, level 1 (0.5 kV)	criterion A
Surge	IEC/EN 61000-4-5, input, level 1 (0.5 kV)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, 12H, conducted	class A
	CISPR 22/EN 55022, 12H, radiated	class B
	CISPR 22/EN 55022, 24H, 48H, radiated and conducted	class B

Environmental

Operating ambient temperature	$U_{i\text{ nom}}, I_{o\text{ nom}}$, convection cooled	-10...50 °C
Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-10...80 °C
Storage temperature	non operational	-25...100 °C
Damp heat	IEC/EN 60068-2-3, 93%, 40 °C	21 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...150 Hz	0.15 mm/2 g _n
Shock	IEC/EN 60068-2-27, 11 ms	15 g _n
Bump	IEC/EN 60068-2-29, 16 ms	10 g _n
MTBF	MIL-HDBK-217E, G _B , 40 °C, single output types	384'000 h

Options

Extended temperature range	-25...71 °C, ambient, operating	-7
Input and/or output undervoltage monitoring, excludes option V		D1...D8
Input and/or output undervoltage monitoring (VME), excludes option D		V2, V3

Accessories

Front panels 19" (Schroff/Intermas)

Mating H11 connectors with screw, solder, fast-on or press-fit terminals

Connector retention facilities and code key system for connector coding

Flexible PCB for connecting the converter via an H11 connector, if mounted on a PCB

Chassis or wall mounting plates for frontal access

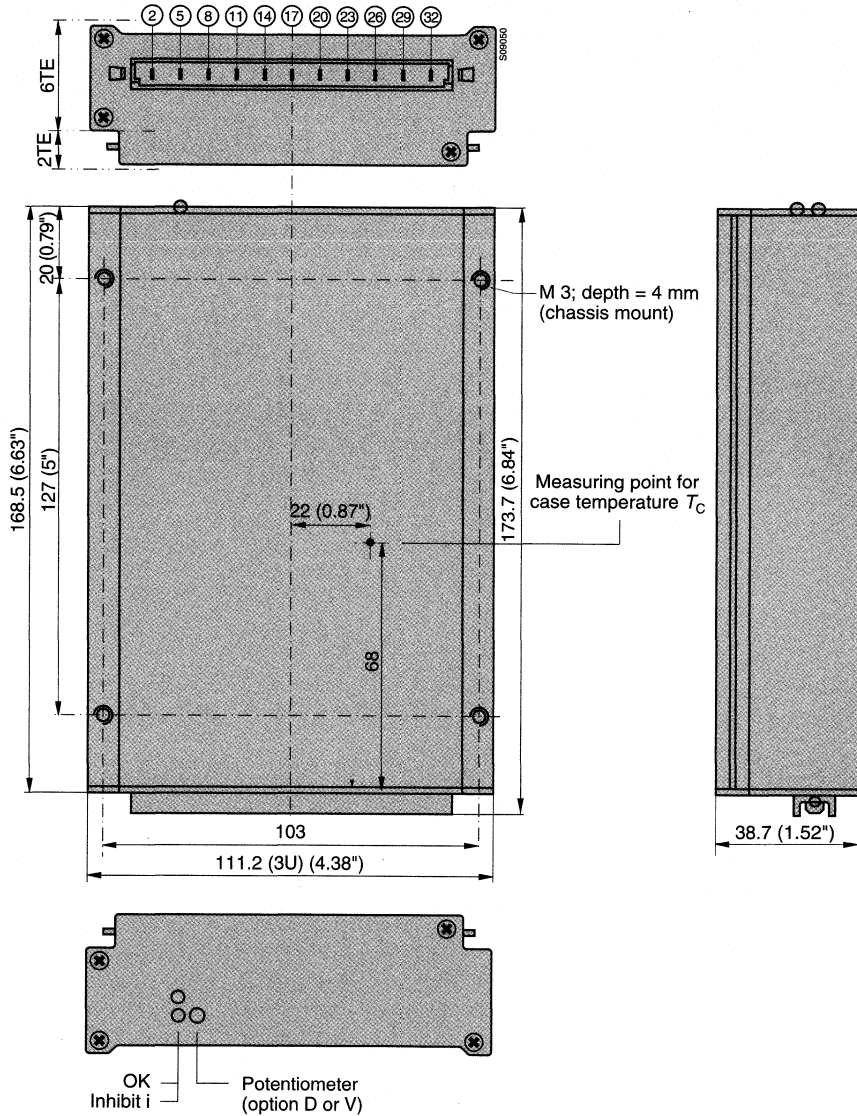
Universal mounting brackets for chassis or DIN-rail mounting

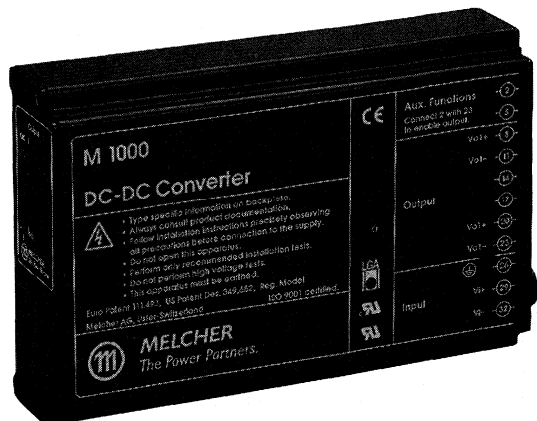
Pin allocation

Pin	Electrical Determination	H1000	H2000	H3000
2	Inhibit control input	i	i	i
5	Save Data or ACFAIL	D or V	D or V	D or V
8	Output voltage (positive)	Vo1+		Vo3+
11	Output voltage (negative)	Vo1-		Vo3-
14	Control input +	R		
17	Control input -	G		
14	Output voltage (positive)		Vo2+	Vo2+
17	Output voltage (negative)		Vo2-	Vo2-
20	Output voltage (positive)	Vo1+	Vo1+	Vo1+
23	Output voltage (negative)	Vo1-	Vo1-	Vo1-
26	Protective earthing	⊕	⊕	⊕
29	DC input voltage	Vi+	Vi+	Vi+
32	DC input voltage	Vi-	Vi-	Vi-

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.





Wide input voltage from 8...373 V DC
 1, 2 or 3 isolated outputs up to 48 V DC
 4 kV AC I/O electric strength test voltage



- Rugged electrical and mechanical design
- Outputs individually controlled with excellent dynamic properties
- Operating ambient temperature range -40...71 °C

Selection chart

Output 1		Output 2		Output 3		Type	Type	Type	Options
U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	Input voltage 8...35 V DC	Input voltage 14...70 V DC	Input voltage 20...100 V DC	
5.1	8	-	-	-	-	AM 1001-7R	BM 1001-7R	FM 1001-7R	-9, P, D, V, A, H, F
12	4	-	-	-	-	AM 1301-7R	BM 1301-7R	FM 1301-7R	-9, P, D, A, H, F
15	3.4	-	-	-	-	AM 1501-7R	BM 1501-7R	FM 1501-7R	-9, P, D, A, H, F
24	2	-	-	-	-	AM 1601-7R	BM 1601-7R	FM 1601-7R	-9, P, D, A, H, F
48	1	-	-	-	-	AM 1901-7R	BM 1901-7R	FM 1901-7R	-9, P, D, A, H, F
12	2	12	2	-	-	AM 2320-7	BM 2320-7	FM 2320-7	-9, P, D, A, H, F
15	1.7	15	1.7	-	-	AM 2540-7	BM 2540-7	FM 2540-7	-9, P, D, A, H, F
5.1	5	12	0.7	12	0.7	AM 3020-7	BM 3020-7	FM 3020-7	-9, P, D, V, A, H, F
5.1	5	15	0.6	15	0.6	AM 3040-7	BM 3040-7	FM 3040-7	-9, P, D, V, A, H, F

Output 1		Output 2		Output 3		Type	Type	Type	Options
U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	Input voltage 28...140 V DC	Input voltage 44...220 V DC	Input voltage 88...373 V DC	
5.1	8	-	-	-	-	CM 1001-7R	DM 1001-7R	LM 1001-7R	-9, E, P, D, V, A, H, F
12	4	-	-	-	-	CM 1301-7R	DM 1301-7R	LM 1301-7R	-9, E, P, D, A, H, F
15	3.4	-	-	-	-	CM 1501-7R	DM 1501-7R	LM 1501-7R	-9, E, P, D, A, H, F
24	2	-	-	-	-	CM 1601-7R	DM 1601-7R	LM 1601-7R	-9, E, P, D, A, H, F
48	1	-	-	-	-	CM 1901-7R	DM 1901-7R	LM 1901-7R	-9, E, P, D, A, H, F
12	2	12	2	-	-	CM 2320-7	DM 2320-7	LM 2320-7	-9, E, P, D, A, H, F
15	1.7	15	1.7	-	-	CM 2540-7	DM 2540-7	LM 2540-7	-9, E, P, D, A, H, F
5.1	5	12	0.7	12	0.7	CM 3020-7	DM 3020-7	LM 3020-7	-9, E, P, D, V, A, H, F
5.1	5	15	0.6	15	0.6	CM 3040-7	DM 3040-7	LM 3040-7	-9, E, P, D, V, A, H, F

CM, DM and LM types available as CMZ, DMZ and LMZ class II equipment

Input

Input voltage	6 wide-input ranges (1:5)	refer to selection chart
Inrush current limitation	CM, DM, LM by thermistor	

Output

Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to 83%
Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 0.6\% U_{o\text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 50 mV _{pp}
Line regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, I_{o\text{ nom}}$, each output regulated	typ. $\pm 0.3\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}, 0 \dots I_{o\text{ nom}}$, each output regulated	typ. $0.15\% U_{o\text{ nom}}$
Minimum load	not required	0 A
Current limitation main output	rectangular U/I characteristic	typ. $110\% I_{o\text{ nom}}$
Current limitation aux. output(s)	rectangular U/I characteristic	typ. $120\% I_{o\text{ nom}}$
Operation in parallel	by current limitation, only main outputs	
Hold-up time	$U_{i\text{ nom}}, I_{o\text{ nom}}$, LM	typ. 100 ms
	$U_{i\text{ nom}}, I_{o\text{ nom}}$, A/B/C/D/FM with ext. diode in input line	up to 7 ms

Protection

Input reverse polarity	built-in fuse	
Input undervoltage lockout		typ. $80\% U_{i\text{ min}}$
Input overvoltage lockout		typ. $110\% U_{i\text{ max}}$
Input transient protection	varistor or suppressor diode	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. $150\% U_{o\text{ nom}}$
Overtemperature	switch-off with auto restart	T_C typ. 100°C

Control

Output voltage adjustment	single output types	$0 \dots 110\% U_{o\text{ nom}}$
Inhibit	TTL input, output(s) disabled if open circuit	
Status indication	LEDs: OK, inhibit, overload	

Safety

Approvals	EN 60950, UL 1950, CSA C22.2 No. 950	
Class of equipment	AM, BM, CM, DM, FM, LM	class I
	CMZ, DMZ, LMZ	class II
Protection degree	units without options	IP 40
Electric strength test voltage	class I, I/case	2 kV AC
	class I, I/O	4 kV AC
	class II, CMZ/DMZ/LMZ, I/O and I/case	4 kV AC
	O/case	1 kV AC
	O/O	0.2 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4 (8/15 kV)	criterion B
Electromagnetic field	IEC/EN 61000-4-3, level x (20 V/m)	criterion A/B
Electr. fast transients/bursts	IEC/EN 61000-4-4, input, level 3/4 (2/4 kV)	criterion A/B
Surge	IEC/EN 61000-4-5, input, level 3/4 (2/4 kV)	criterion A
Conducted disturbances	IEC/EN 61000-4-6, level 3 (10 V)	criterion B
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

Operating ambient temperature	$U_{i\text{ nom}}, I_{o\text{ nom}}$, convection cooled	-25...71 °C
Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-25...95 °C
Storage temperature	non operational	-40...100 °C
Damp heat	IEC/EN 60068-2-3, 93%, 40 °C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g_n
Shock	IEC/EN 60068-2-27, 6 ms	100 g_n
Bump	IEC/EN 60068-2-29, 6 ms	40 g_n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 $g_{n\text{ rms}}$
MTBF	MIL-HDBK-217E, G_B , 40 °C, single output types	320'000 h

Options

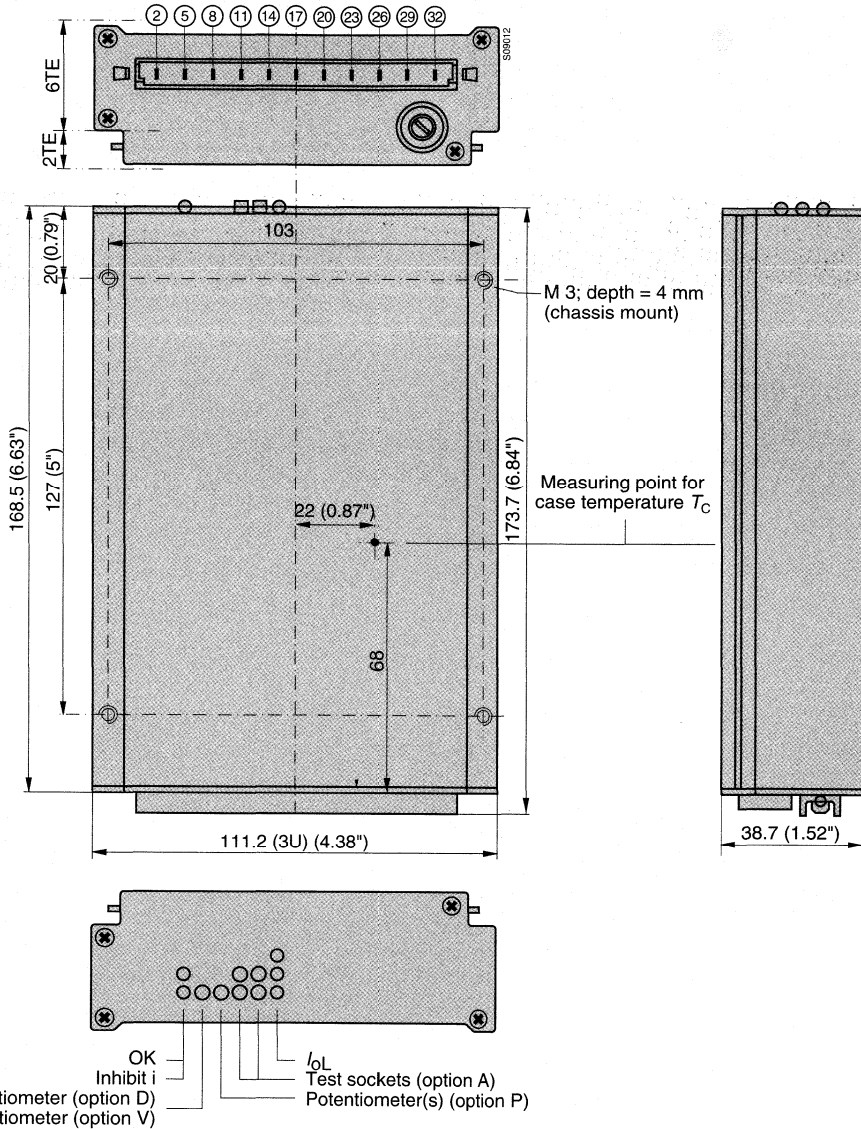
Extended temperature range	-40...71 °C, ambient, operating	-9
Electronic inrush current limitation		E
Output voltage adjustment	95...105% $U_{o\text{ nom}}$, excludes feature R and vice versa	P
Input and/or output undervoltage monitoring, excludes option V		D0...D9
Input and/or output undervoltage monitoring (VME), excludes option D		V0, V2, V3
Test sockets for check of output voltage		A
Enhanced electric strength test	2 kV AC	H
Fuse not user accessible		F

Pin allocation

Pin	Electrical determination	AM...LM 1000	CMZ...LMZ 1000	AM...LM 2000	CMZ...LMZ 2000	AM...LM 3000	CMZ...LMZ 3000
2	Inhibit control input	i	i	i	i	i	i
5	Safe data or ACFAIL	D or V	D or V	D or V	D or V	D or V	D or V
8	Output voltage (positive)	Vo1+	Vo1+			Vo3+	Vo3+
11	Output voltage (negative)	Vo1-	Vo1-			Vo3-	Vo3-
14	Control input +	R	R				
17	Control input -	G	G				
14	Output voltage (positive)			Vo2+	Vo2+	Vo2+	Vo2+
17	Output voltage (negative)			Vo2-	Vo2-	Vo2-	Vo2-
20	Output voltage (positive)	Vo1+	Vo1+	Vo1+	Vo1+	Vo1+	Vo1+
23	Output voltage (negative)	Vo1-	Vo1-	Vo1-	Vo1-	Vo1-	Vo1-
26	Protective earth	⊕		⊕		⊕	
29	DC input voltage	Vi+	Vi+	Vi+	Vi+	Vi+	Vi+
32	DC input voltage	Vi-	Vi-	Vi-	Vi-	Vi-	Vi-

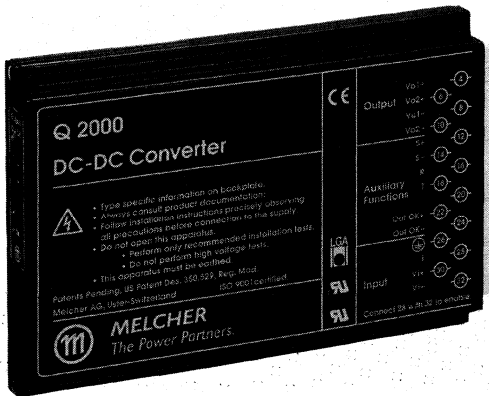
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

- Front panels 19" (Schroff/Intermas)
- Mating H11 connectors with screw, solder, fast-on or press-fit terminals
- Connector retention facilities and code key system for connector coding
- Flexible PCB for connecting the converter via an H11 connector, if mounted on a PCB
- Chassis or wall mounting plates for frontal access
- Universal mounting brackets for chassis or DIN-rail mounting



Input voltage ranges up to 168 V DC
 1 or 2 isolated outputs 3.3...48 V DC
 3 kV AC I/O electric strength test voltage



- Extremely slim case (4TE wide), fully enclosed
- Extremely low inrush current, hot swappable
- Operating ambient temperature range -40...71°C with convection cooling

Selection chart

Output 1			Output 2			Type	Type	Options
U_o nom [V DC]	I_o nom [A]	I_o max [A]	U_o nom [V DC]	I_o nom [A]	I_o max [A]	Input Voltage 16...36 V DC	Input Voltage 38...75 V DC	
5.1	16	16	-	-	-	24Q1001-2R	48Q1001-2R	P
12	8	8	-	-	-	24Q2320-2R	48Q2320-2R	P
15	6.6	6.6	-	-	-	24Q2540-2R	48Q2540-2R	P
24	4	4	-	-	-	24Q2320-2R	48Q2320-2R	P
24	4.4	4.4	-	-	-	24Q2660-2R	48Q2660-2R	P
30	3.3	3.3	-	-	-	24Q2540-2R	48Q2540-2R	P
48	2.2	2.2	-	-	-	24Q2660-2R	48Q2660-2R	P
5.1	7.5	7.5	5.1	7.5	7.5	24Q2001-2R	48Q2001-2R	P
12	4	4	12	4	4	24Q2320-2R	48Q2320-2R	P
15	3.3	3.3	15	3.3	3.3	24Q2540-2R	48Q2540-2R	P
24	2.2	2.2	24	2.2	2.2	24Q2660-2R	48Q2660-2R	P

Output 1			Output 2			Type	Type	Type	Options
U_o nom [V DC]	I_o nom [A]	I_o max [A]	U_o nom [V DC]	I_o nom [A]	I_o max [A]	Input Voltage 14.4...36 V DC	Input Voltage 21.6...54 V DC	Input Voltage 35...75 V DC	
3.3	18	22	-	-	-	BQ 1101-7	GQ 1101-7	CQ 1101-7	-9
5.1	16	20	-	-	-	BQ 1001-7R	GQ 1001-7R	CQ 1001-7R	-9, P
12	8	10	-	-	-	BQ 2320-7R	GQ 2320-7R	CQ 2320-7R	-9, P
15	6.6	8	-	-	-	BQ 2540-7R	GQ 2540-7R	CQ 2540-7R	-9, P
24	4.4	5.5	-	-	-	BQ 2660-7R	GQ 2660-7R	CQ 2660-7R	-9, P
24	4	5	-	-	-	BQ 2320-7R	GQ 2320-7R	CQ 2320-7R	-9, P
30	3.3	4	-	-	-	BQ 2540-7R	GQ 2540-7R	CQ 2540-7R	-9, P
48	2.2	2.75	-	-	-	BQ 2660-7R	GQ 2660-7R	CQ 2660-7R	-9, P
5.1	7.5	9.5	5.1	7.5	9.5	BQ 2001-7R	GQ 2001-7R	CQ 2001-7R	-9, P
12	4.4	5	12	4.4	5	BQ 2320-7R	GQ 2320-7R	CQ 2320-7R	-9, P
15	3.3	4	15	3.3	4	BQ 2540-7R	GQ 2540-7R	CQ 2540-7R	-9, P
24	2.2	2.75	24	2.2	2.75	BQ 2660-7R	GQ 2660-7R	CQ 2660-7R	-9, P

Output 1			Output 2			Type	Type	Options
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$I_{o\ max}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$I_{o\ max}$ [A]	Input Voltage 43...108 V DC	Input Voltage 65...168 V DC	
3.3	18	22	-	-	-	DQ 1101-7	EQ 1101-7	-9
5.1	16	20	-	-	-	DQ 1001-7R	EQ 1001-7R	-9, P
12	8	10	-	-	-	DQ 2320-7R	EQ 2320-7R	-9, P
15	6.6	8	-	-	-	DQ 2540-7R	EQ 2540-7R	-9, P
24	4.4	5.5	-	-	-	DQ 2660-7R	EQ 2660-7R	-9, P
24	4	5	-	-	-	DQ 2320-7R	EQ 2320-7R	-9, P
30	3.3	4	-	-	-	DQ 2540-7R	EQ 2540-7R	-9, P
48	2.2	2.75	-	-	-	DQ 2660-7R	EQ 2660-7R	-9, P
5.1	7.5	9.5	5.1	7.5	9.5	DQ 2001-7R	EQ 2001-7R	-9, P
12	4.4	5	12	4.4	5	DQ 2320-7R	EQ 2320-7R	-9, P
15	3.3	4	15	3.3	4	DQ 2540-7R	EQ 2540-7R	-9, P
24	2.2	2.75	24	2.2	2.75	DQ 2660-7R	EQ 2660-7R	-9, P

Input

Input voltage		refer to selection chart
Inrush current	ETS 300 132-2	typ. 40 A

Output

Efficiency	$U_{i\ nom}, I_{o\ nom}$	up to 88%
Output voltage setting accuracy	$U_{i\ nom}, I_{o\ nom}$	$\pm 0.6\% U_{o\ nom}$
Worst case output voltage 1	$U_{i\ min} \dots U_{i\ max}, 0 \dots I_{o1\ max}, T_C\ min \dots T_C\ max$	$\pm 1.8\% U_{o\ nom}$
Minimum output current 1, 2	in parallel configuration not required	0 A
Minimum output current 1, 2	in individual or series configuration	10% $I_{o1,2\ nom}$
Load regulation output 2	$I_{o1,2\ min} \dots I_{o1,2\ max}$	typ. $100\ m\Omega \cdot (I_{o1} - I_{o2})$
Output voltage switching noise	IEC/EN 61204, total, peak-peak	typ. $0.3\% U_{o\ nom}$
Common current limit. $I_{o1} + I_{o2}$	rectangular U/I characteristic	typ. $130\% (I_{o1\ max} + I_{o2\ max})$
Operation of units in parallel	by connecting the current sharing pins T	

Protection

Input reverse polarity	built-in fuse	
Input undervoltage lockout		typ. $90\% U_{i\ min}$
Input overvoltage lockout		typ. $110\% U_{i\ max}$
Input transient protection	varistor	
Output	no-load, overload and short-circuit proof	
Output overvoltage	second control loop	typ. $125\% U_{o\ nom}$
Overtemperature	switch-off with auto restart (-7 units)	T_C typ. 100°C

Control

Output voltage adjustment	with feature R	$60/80 \dots 110\% U_{o\ nom}$
Inhibit on input side	TTL input, output(s) disabled if left open circuit	
Status indication	LEDs: In OK (-7 units), Out OK (all)	
Output good signal (Out OK)	isolated open collector signal	

Safety

Approvals	EN 60950, UL 1950, CSA C22.2 No. 950	
Class of equipment		class I
Protection degree		IP 20/30
Electric strength test voltage	I/case, O/case, Out OK/case	1.5 kV AC
	I/O, Out OK/I, Out OK/O	3 kV AC
	O/O	300 V DC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4 (8/15 kV)	criterion B
Electromagnetic field	IEC/EN 61000-4-3, level 3 (10 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, output/input, level 3/4 (2/4 kV)	criterion B
Surge	IEC/EN 61000-4-5, input, level 2/3 (1/2 kV)	criterion B
Conducted disturbances	IEC/EN 61000-4-6, level 2/3 (3/10 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, 24/48/BQ/CQ/GQ, conducted	class B

Environmental –2 units

Operating ambient temperature	$U_{I\text{ nom}}, I_{o\text{ nom}}$, convection cooled	-10...50°C
Operating case temperature T_C	$U_{I\text{ nom}}, I_{o\text{ nom}}$	-10...80°C
Storage temperature	non operational	-25...100°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	21 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.15 mm/2 g_n
Shock	IEC/EN 60068-2-27, 6 ms	15 g_n
Bump	IEC/EN 60068-2-29, 6 ms	10 g_n
MTBF	MIL-HDBK-217F, G_B , 40°C, 24/48Q1000	588'000 h

Environmental –7 units

Operating ambient temperature	$U_{I\text{ nom}}, I_{o\text{ nom}}$, convection cooled	-25...71°C
	$U_{I\text{ nom}}, I_{o\text{ max}}$, convection cooled	-25...50°C
Operating case temperature T_C	$U_{I\text{ nom}}, I_{o\text{ nom}}$	-25...95°C
	$U_{I\text{ nom}}, I_{o\text{ max}}$	-25...85°C
Storage temperature	non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g_n
Shock	IEC/EN 60068-2-27, 11 ms	50 g_n
Bump	IEC/EN 60068-2-29, 11 ms	25 g_n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 $g_{n\text{ rms}}$
MTBF	MIL-HDBK-217F, notice 2, G_B , 40°C, BQ 2000	853'000 h

Options

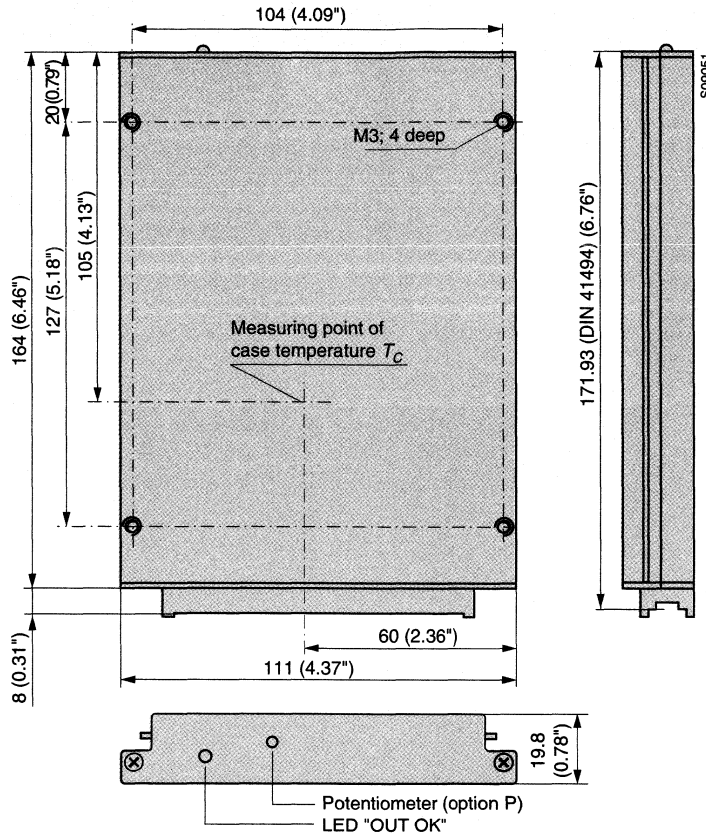
Extended temperature range	-40...71°C, ambient, operating, for -7 units	-9
Output voltage adjustment	±10% $U_{o\text{ nom}}$, excludes feature R and vice versa	P

Accessories

Front panels for 19" rack mounting in 3U or 6U configuration (Schroff/Intermas)	
Mating H15 connectors with screw, solder, fast-on or press-fit terminals	
Connector retention facilities and code key system for connector coding	
Additional external input or output filters	
Mechanical mounting supports for chassis, DIN-rail and PCB mounting	

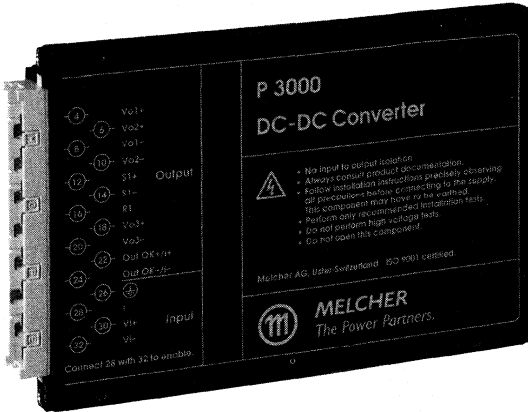
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	Electrical determination	Q 1000	Q 2000
4	Output voltage (positive)	Vo1+	Vo1+
6	Output voltage (positive)	Vo1+	Vo2+
8	Output voltage (negative)	Vo1-	Vo1-
10	Output voltage (negative)	Vo1-	Vo2-
12	Sense line (positive)	S+	S+
14	Sense line (negative)	S-	S-
16	Output voltage control input	R	R
18	Current sharing control input	T	T
20	Do not connect (internal Gnd.)	-	-
22	Output good signal (positive)	Out OK+	Out OK+
24	Output good signal (negative)	Out OK-	Out OK-
26	Protective earth	⊕	⊕
28	Inhibit control input	i	i
30	Input voltage (positive)	Vi+	Vi+
32	Input voltage (negative)	Vi-	Vi-



Input voltage up to 150 V DC
 1 to 4 isolated outputs 3.3...96 V DC
 3 kV AC I/O electric strength test voltage



Approvals pending



- Extremely slim case (4 TE), fully enclosed
- Extremely low inrush current, hot swappable
- Operating ambient temperature range -40...71°C with convection cooling

Selection chart

Output 1			Output 2			Output 3			Output 4			Type	Type
$U_{o,nom}$	$P_{o,nom}$	$P_{o,max}$	$U_{o,nom}$	$P_{o,nom}$	$P_{o,max}$	$U_{o,nom}$	$P_{o,nom}$	$P_{o,max}$	$U_{o,nom}$	$P_{o,nom}$	$P_{o,max}$	Input voltage	Input voltage
[V DC]	[W]	[W]	[V DC]	[W]	[W]	[V DC]	[W]	[W]	[V DC]	[W]	[W]	16...36 V DC	33.6...75 V DC
3.3	106	132	-	-	-	-	-	-	-	-	-	BP 1101-7R	CP 1101-7R
5.1	122	183	-	-	-	-	-	-	-	-	-	BP 1001-7R	CP 1001-7R
3.3	53	66	5.1	57	66	-	-	-	-	-	-	BP 2101-7R	CP 2101-7R
5.1	61	91	5.1	61	91	-	-	-	-	-	-	BP 2001-7R	CP 2001-7R
12	60	96	12	60	96	-	-	-	-	-	-	BP 2320-7R	CP 2320-7R
15	60	97.5	15	60	97.5	-	-	-	-	-	-	BP 2540-7R	CP 2540-7R
24	60	96	24	60	96	-	-	-	-	-	-	BP 2660-7R	CP 2660-7R
5.1	61	90	12	30	48	12	30	48	-	-	-	BP 3020-7R	CP 3020-7R
5.1	61	90	15	30	48	15	30	48	-	-	-	BP 3040-7R	CP 3040-7R
24	30	48	24	30	48	24	30	48	24	30	48	BP 4660-7R	CP 4660-7R

Output 1			Output 2			Output 3			Output 4			Type
$U_{o,nom}$	$P_{o,nom}$	$P_{o,max}$	$U_{o,nom}$	$P_{o,nom}$	$P_{o,max}$	$U_{o,nom}$	$P_{o,nom}$	$P_{o,max}$	$U_{o,nom}$	$P_{o,nom}$	$P_{o,max}$	Input voltage
[V DC]	[W]	[W]	[V DC]	[W]	[W]	[V DC]	[W]	[W]	[V DC]	[W]	[W]	66...150 V DC
3.3	106	132	-	-	-	-	-	-	-	-	-	EP 1101-7R
5.1	122	183	-	-	-	-	-	-	-	-	-	EP 1001-7R
3.3	53	66	5.1	53	66	-	-	-	-	-	-	EP 2101-7R
5.1	61	91	5.1	61	91	-	-	-	-	-	-	EP 2001-7R
12	60	96	12	60	96	-	-	-	-	-	-	EP 2320-7R
15	60	97.5	15	60	97.5	-	-	-	-	-	-	EP 2540-7R
24	60	96	24	60	96	-	-	-	-	-	-	EP 2660-7R
5.1	61	90	12	30	48	12	30	48	-	-	-	EP 3020-7R
5.1	61	90	15	30	48	15	30	48	-	-	-	EP 3040-7R
24	30	48	24	30	48	24	30	48	24	30	48	EP 4660-7R

Output 1			Output 2			Output 3			Output 4			Type
$U_{o,nom}$ [V DC]	$P_{o,nom}$ [W]	$P_{o,max}$ [W]	$U_{o,nom}$ [V DC]	$P_{o,nom}$ [W]	$P_{o,max}$ [W]	$U_{o,nom}$ [V DC]	$P_{o,nom}$ [W]	$P_{o,max}$ [W]	$U_{o,nom}$ [V DC]	$P_{o,nom}$ [W]	$P_{o,max}$ [W]	Input voltage 19.2...57.6 V DC
3.3	80	100	-	-	-	-	-	-	-	-	-	GP 1101-7R
5.1	92	120	-	-	-	-	-	-	-	-	-	GP 1001-7R
3.3	43	55	5.1	43	55	-	-	-	-	-	-	GP 2101-7R
5.1	46	60	5.1	46	60	-	-	-	-	-	-	GP 2001-7R
12	54	72	12	56	72	-	-	-	-	-	-	GP 2320-7R
15	50	68	15	50	68	-	-	-	-	-	-	GP 2540-7R
24	48	70	24	48	70	-	-	-	-	-	-	GP 2660-7R
5.1	46	60	12	24	33	12	24	33	-	-	-	GP 3020-7R
5.1	46	60	15	25	34	15	25	34	-	-	-	GP 3040-7R
24	24	35	24	24	35	24	24	35	24	24	35	GP 4660-7R

Input

Input voltage refer to selection chart

Output

Nominal output current $I_{o1,2,3,4,nom}$	$P_{o,nom}$ /Number of outputs/ $U_{o1,2,3,4,nom}$
Maximal output current $I_{o1,2,3,4,max}$	$P_{o,max}$ /Number of outputs/ $U_{o1,2,3,4,nom}$
Efficiency $U_{i,nom}, I_{o,nom}$	up to 92%
Voltage setting accuracy 1, 2 $U_{i,nom}, I_{o,nom}$	$\pm 0.6\% U_{o1,2,nom}$
Voltage setting accuracy 3, 4 $U_{i,nom}, I_{o,nom}$	$\pm 1.5\% U_{o3,4,nom}$
Worst case output voltage 1, 2 $U_{i,min}...U_{i,max}, 0...I_{o1,2,max}, T_C,min...T_C,max$	$\pm 1.6\% U_{o,nom}$
Minimum output current 1, 4	in parallel configuration not required 0 A
Minimum output current 2, 3	in individual or series configuration 5% $I_{o1,4,nom}$ 0 A
	in parallel configuration not required 5% $I_{o2,3,nom}$
Load regulation output 4	$I_{o1,4,min}...I_{o1,4,max}$ typ. 100 m $\Omega \cdot (I_{o1}...I_{o4})$
Load regulation output 3	$I_{o2,3,min}...I_{o2,3,max}$ typ. 100 m $\Omega \cdot (I_{o2}...I_{o3})$
Output voltage switching noise	IEC/EN 61204, total, peak-peak typ. 0.4% $U_{o,nom}$
Common power limitation	$(P_{o1} + P_{o4})$ rectangular U/I characteristic typ. 130% $P_{o,max}/2$ $(P_{o2} + P_{o3})$ rectangular U/I characteristic typ. 130% $P_{o,max}/2$

Protection

Input reverse polarity	built-in fuse
Input undervoltage lockout	typ. 90% $U_{i,min}$
Input overvoltage lockout	typ. 110% $U_{i,max}$
Input transient protection	varistor
Output	no-load, overload and short-circuit proof
Output overvoltage	varistor typ. 125% $U_{o,nom}$
Overtemperature	switch-off with auto restart T_C typ. 100°C

Control

Output voltage adjustment	output 1, 4	60/80...110% $U_{o\ nom}$
Inhibit on input side	TTL input, output(s) disabled if open circuit	
Status indication	LEDs: In OK, Out OK	
Output good signal (Out OK)	isolated open collector signal	

Safety

Approvals pending	EN 60950, UL 1950, CSA C22.2 No. 950	
Class of equipment		class I
Protection degree		IP 40
Electric strength test voltage	I/case, O/case, Out OK/case	1.5 kV AC
	I/O, Out OK/I, Out OK/O	3 kV AC
	O/O	500 V DC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4 (8/15 kV)	criterion B
Electromagnetic field	IEC/EN 61000-4-3, level 3 (10 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, output/input, level 3/4 (2/4 kV)	criterion B
Surge	IEC/EN 61000-4-5, input, level 2/3 (1/2 kV)	criterion B
Conducted disturbances	IEC/EN 61000-4-6, level 2/3 (3/10 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

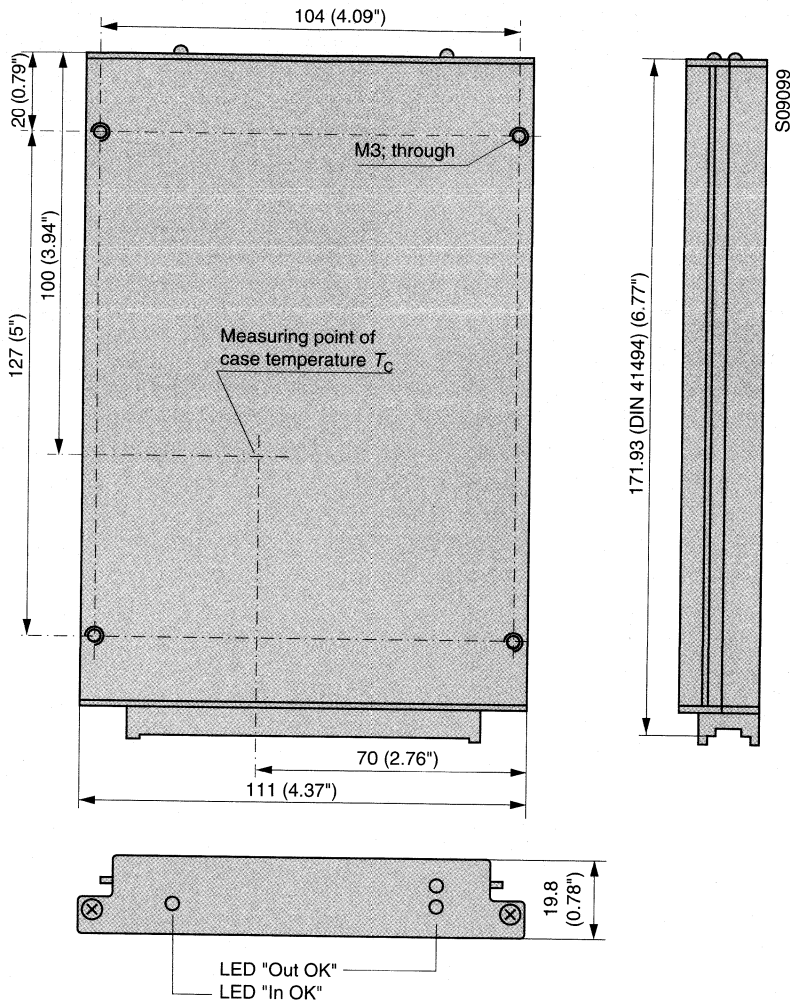
Operating ambient temperature	$U_{i\ nom}$, $P_{o\ nom}$, convection cooled	-25...71 °C
Operating case temperature T_C	$U_{i\ nom}$, $P_{o\ nom}/P_{o\ max}$	-25...95 °C
Storage temperature	non operational	-40...100 °C
Damp heat	IEC/EN 60068-2-3, 93%, 40 °C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g_n
Shock	IEC/EN 60068-2-27, 11 ms	50 g_n
Bump	IEC/EN 60068-2-29, 11 ms	25 g_n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 $g_{n\ rms}$

Options

Extended temperature range	-40...71 °C, ambient, operating	-9
Out OK output	excludes option i	D
VME compatible monitoring circuit, excludes option i and D		V
Current sharing		T
Inhibit on output side	excludes option D	i
Synchronisation		W

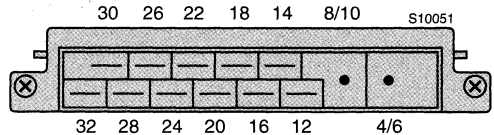
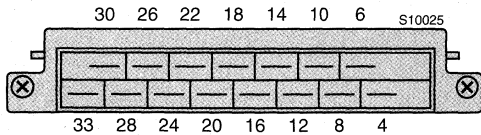
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	P 1000		P 2000		P 3000		P 4000	
4	Vo1+	Output 1	Vo1+	Output 1	Vo1+	Output 1	Vo1+	Output 1
6			Vo2+	Output 2	Vo2+	Output 2	Vo2+	Output 2
8	Vo1-	Output 1	Vo1-	Output 1	Vo1-	Output 1	Vo1-	Output 1
10			Vo2-	Output 2	Vo2-	Output 2	Vo2-	Output 2
12	S+	Sense	S1+	Sense 1	S1+	Sense 1	Vo4+	Output 4
14	S-	Sense	S1-	Sense 1	S1-	Sense 1	Vo4-	Output 4
16	R	Control of U_o	R1	Control of U_{o1}	R1	Control of U_{o1}	R1/4	Control of $U_{o1/4}$
					T1	Current sharing		
18	T	Current sharing	S2+	Sense 2	Vo3+	Output 3	Vo3+	Output 3
			T1	Current sharing				
20	n.c.	Not connected	S2-	Sense 2	Vo3+	Output 3	Vo3+	Output 3
	Pd in	Power down	Pd in	Power down				
22	Out OK+	Output good	Out OK+	Output good	Out OK+	Output good	Out OK+	Output good
	i+	Inhibit second.	i+	Inhibit second.	i+	Inhibit second.	i+	Inhibit second.
24	Out OK-	Output good	Out OK-	Output good	Out OK-	Output good	Out OK-	Output good
	i-	Inhibit second.	i-	Inhibit second.	i-	Inhibit second.	i-	Inhibit second.
	Rst	Reset	Rst	Reset				
26	⊕	Prot. ground	⊕	Prot. ground	⊕	Prot. ground	⊕	Prot. ground
28	i	Inhibit	i	Inhibit	i	Inhibit	i	Inhibit
	W	Synchronisat.	W	Synchronisat.	W	Synchronisat.	W	Synchronisat.
30	Vi+	Input	Vi+	Input	Vi+	Input	Vi+	Input
32	Vi-	Input	Vi-	Input	Vi-	Input	Vi-	Input



Accessories

Additional external heat sinks for operation above $P_{o\text{ nom}}$ or $T_{A\text{ max}}$

Front panels for 19" rack mounting in 3U or 6U configuration (Schroff/Intermas)

Mating H15 connectors with screw, solder, fast-on or press-fit terminals

Mechanical mounting supports for chassis, DIN-rail and PCB mounting



Wide input voltage ranges from 8...385 V DC
 1 or 2 isolated outputs up to 48 V DC
 4 kV AC I/O electric strength test voltage



- Rugged electrical and mechanical design
- Fully isolated outputs
- Operating ambient temperature range
 -40...71°C with convection cooling

Selection chart

Output 1		Output 2		Type	Type	Type	Options
U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	Input Voltage 8...35 V DC	Input Voltage 14...70 V DC	Input Voltage 20...100 V DC	
5.1	16	-	-	AS 1001-7R	BS 1001-7R	FS 1001-7R	-9, E, D, V, P, T, B1
12	8	-	-	AS 1301-7R	BS 1301-7R	FS 1301-7R	-9, E, D, P, T, B1
15	6.5	-	-	AS 1501-7R	BS 1501-7R	FS 1501-7R	-9, E, D, P, T, B1
24	4.2	-	-	AS 1601-7R	BS 1601-7R	FS 1601-7R	-9, E, D, P, T, B1
24	4	-	-	AS 2320-7R	BS 2320-7R	FS 2320-7R	-9, E, D, P, T, B1
30	3.2	-	-	AS 2540-7R	BS 2540-7R	FS 2540-7R	-9, E, D, P, T, B1
48	2	-	-	AS 2660-7R	BS 2660-7R	FS 2660-7R	-9, E, D, P, T, B1
12	4	12	4	AS 2320-7R	BS 2320-7R	FS 2320-7R	-9, E, D, P, T, B1
15	3.2	15	3.2	AS 2540-7R	BS 2540-7R	FS 2540-7R	-9, E, D, P, T, B1
24	2	24	2	AS 2660-7R	BS 2660-7R	FS 2660-7R	-9, E, D, P, T, B1

Output 1		Output 2		Type	Type	Type	Options
U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	Input Voltage 28...140 V DC	Input Voltage 44...220 V DC	Input Voltage 67...385 V DC	
5.1	16	-	-	CS 1001-7R	DS 1001-7R	ES 1001-7R	-9, E, D, V, P, T, B1
12	8	-	-	CS 1301-7R	DS 1301-7R	ES 1301-7R	-9, E, D, P, T, B1
15	6.5	-	-	CS 1501-7R	DS 1501-7R	ES 1501-7R	-9, E, D, P, T, B1
24	4.2	-	-	CS 1601-7R	DS 1601-7R	ES 1601-7R	-9, E, D, P, T, B1
24	4	-	-	CS 2320-7R	DS 2320-7R	ES 2320-7R	-9, E, D, P, T, B1
30	3.2	-	-	CS 2540-7R	DS 2540-7R	ES 2540-7R	-9, E, D, P, T, B1
48	2	-	-	CS 2660-7R	DS 2660-7R	ES 2660-7R	-9, E, D, P, T, B1
12	4	12	4	CS 2320-7R	DS 2320-7R	ES 2320-7R	-9, E, D, P, T, B1
15	3.2	15	3.2	CS 2540-7R	DS 2540-7R	ES 2540-7R	-9, E, D, P, T, B1
24	2	24	2	CS 2660-7R	DS 2660-7R	ES 2660-7R	-9, E, D, P, T, B1

Input

Input voltage	6 wide-input ranges (1:5)	refer to selection chart
Inrush current limitation	FS, CS, DS, ES by thermistor	

Output

Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to 86%
Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 0.6\% U_{o\text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 100 mV _{pp}
Line regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, I_{o\text{ nom}}$	typ. 0.3% $U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}, 10 \dots 100\% I_{o\text{ nom}}$, symmetrical output load	typ. 0.4% $U_{o\text{ nom}}$
Minimum load	not required	0 A
Current limitation	rectangular U/I characteristic	typ. 110% $I_{o\text{ nom}}$
Operation in parallel	by current limitation	
Hold-up time	$U_{i\text{ nom}}, I_{o\text{ nom}}$, CS/DS/ES/FS with ext. diode in input line	12...40 ms
	$U_{i\text{ nom}}, I_{o\text{ nom}}$, AS/BS with ext. diode in input line	typ. 1.8 ms

Control and protection

Input reverse polarity	built-in fuse not user accessible	
Input undervoltage lockout		typ. 80% $U_{i\text{ min}}$
Input overvoltage lockout		typ. 108% $U_{i\text{ max}}$
Input transient protection	varistor or suppressor diode	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. 130% $U_{o\text{ nom}}$
Overtemperature	switch-off with auto restart	T_C typ. 100°C
Output voltage adjustment		0...110% $U_{o\text{ nom}}$
Inhibit	TTL input, output(s) disabled if open circuit	
Status indication	LEDs: OK, inhibit, overload	

Safety

Approvals	EN 60950, UL 1950, CSA 22.2 No. 950	
Class of equipment		class I
Protection degree		IP 30
Electric strength test voltage	I/case	2 kV AC
	I/O	4 kV AC
	O/case	1 kV AC
	O/O	0.1 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4 (8/15 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level x (20 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 4 (2/4 kV)	criterion A
Surge	IEC/EN 61000-4-5, level 3 (2 kV)	criterion A
Conducted disturbances	IEC/EN 61000-4-6, level 3 (10 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

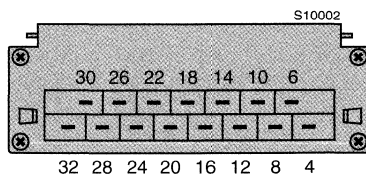
Operating ambient temperature	$U_{i\text{ nom}}, I_{o\text{ nom}}$, convection cooled	-25...71 °C
Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-25...95 °C
Storage temperature	non operational	-40...100 °C
Damp heat	IEC/EN 60068-2-3, 93 %, 40 °C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g_n
Shock	IEC/EN 60068-2-27, 6 ms	100 g_n
Bump	IEC/EN 60068-2-29, 6 ms	40 g_n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 g_n rms
MTBF	MIL-HDBK-217F, G_B , 40 °C	500'000 h

Options

Extended temperature range	-40...71 °C, ambient, operating	-9
Electronic inrush current limitation		E
Output voltage adjustment	40...110% $U_{o\text{ nom}}$, excludes feature R and vice versa	P
Input and/or output undervoltage monitoring, excludes option V		D0...D9
Input and/or output undervoltage monitoring (VME), excludes option D		V0, V2, V3
Current sharing		T
Cooling plate		B1

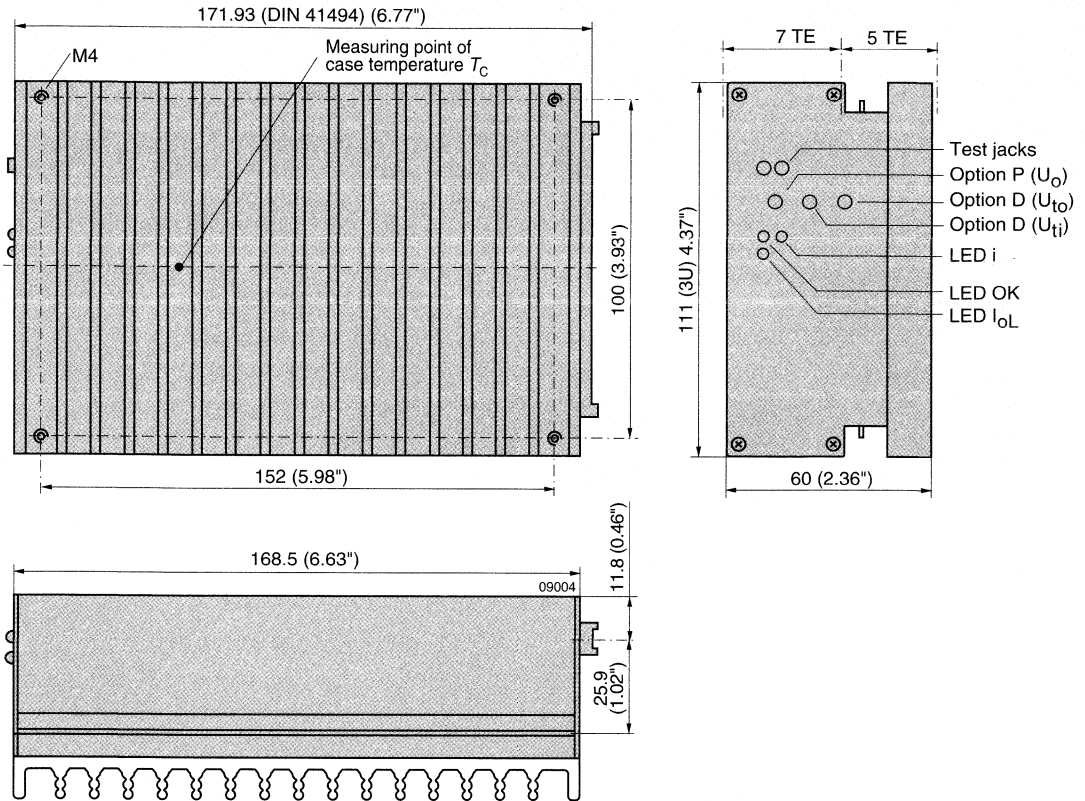
Pin allocation

Pin	AS...ES 1000		AS...ES 2000	
4	Vo1+	Output 1	Vo2+	Output 2
6	Vo1+		Vo2+	
8	Vo1-	Output 1	Vo2-	Output 2
10	Vo1-		Vo2-	
12	S+	Sense	Vo1+	Output 1
14	S-	Sense	Vo1-	
16	R	Control of U_{o1}	R	Control of U_{o1}
18	i	Inhibit	i	Inhibit
20	D	Save data	D	Save data
	V	ACFAIL		
22	T	Current sharing	T	Current sharing
24	⊕	Protective earth	⊕	Protective earth
26	Vi+	Input	Vi+	Input
28	Vi+		Vi+	
30	Vi-	Input	Vi-	Input
32	Vi-		Vi-	



Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

Front panels 19" (Schroff/Intermas)

Mating H15 connectors with screw, solder, fast-on or press-fit terminals

Connector retention facilities and code key system for connector coding

Chassis or wall mounting plates for frontal access

Universal mounting brackets for chassis or DIN-rail mounting



Input voltage ranges from 8...385 V DC
 for 2 outputs up to 48 V DC
 4 kV AC I/O electric strength test voltage



- Rugged electrical and mechanical design
- Fully isolated outputs
- Operating ambient temperature range
 -40...71 °C with convection cooling

Selection chart

Output 1		Output 2		Type	Options
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	Input voltage 8...35 V DC	
5.1	20	-	-	AK 1001-7R	-9, D, V, P, T, B1
12	10	-	-	AK 1301-7R	-9, D, P, T, B1
15	8	-	-	AK 1501-7R	-9, D, P, T, B1
24	5	-	-	AK 1601-7R	-9, D, P, T, B1
24	5	-	-	AK 2320-7R	-9, D, P, T, B1
30	4	-	-	AK 2540-7R	-9, D, P, T, B1
48	2.5	-	-	AK 2660-7R	-9, D, P, T, B1
12	5	12	5	AK 2320-7R	-9, D, P, T, B1
15	4	15	4	AK 2540-7R	-9, D, P, T, B1
24	2.5	24	2.5	AK 2660-7R	-9, D, P, T, B1

Output 1		Output 2		Type	Type	Options
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	Input voltage 14...70 V DC	Input voltage 20...100 V DC	
5.1	25	-	-	BK 1001-7R	FK 1001-7R	-9, D, V, P, T, B1
12	12	-	-	BK 1301-7R	FK 1301-7R	-9, D, P, T, B1
15	10	-	-	BK 1501-7R	FK 1501-7R	-9, D, P, T, B1
24	6	-	-	BK 1601-7R	FK 1601-7R	-9, D, P, T, B1
24	6	-	-	BK 2320-7R	FK 2320-7R	-9, D, P, T, B1
30	5	-	-	BK 2540-7R	FK 2540-7R	-9, D, P, T, B1
48	3	-	-	BK 2660-7R	FK 2660-7R	-9, D, P, T, B1
12	6	12	6	BK 2320-7R	FK 2320-7R	-9, D, P, T, B1
15	5	15	5	BK 2540-7R	FK 2540-7R	-9, D, P, T, B1
24	3	24	3	BK 2660-7R	FK 2660-7R	-9, D, P, T, B1

Output 1		Output 2		Type	Type	Type	Options
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	Input voltage 28...140 V DC	Input voltage 44...220 V DC	Input voltage 67...385 V DC	
5.1	25	-	-	CK 1001-7R	DK 1001-7R	-	-9, E, D, V, P, T, B1
12	12	-	-	CK 1301-7R	DK 1301-7R	EK 1301-7R	-9, E, D, P, T, B1
15	10	-	-	CK 1501-7R	DK 1501-7R	EK 1501-7R	-9, E, D, P, T, B1
24	6	-	-	CK 1601-7R	DK 1601-7R	EK 1601-7R	-9, E, D, P, T, B1
24	6	-	-	CK 2320-7R	DK 2320-7R	EK 2320-7R	-9, E, D, P, T, B1
30	5	-	-	CK 2540-7R	DK 2540-7R	EK 2540-7R	-9, E, D, P, T, B1
48	3	-	-	CK 2660-7R	DK 2660-7R	EK 2660-7R	-9, E, D, P, T, B1
12	6	12	6	CK 2320-7R	DK 2320-7R	EK 2320-7R	-9, E, D, P, T, B1
15	5	15	5	CK 2540-7R	DK 2540-7R	EK 2540-7R	-9, E, D, P, T, B1
24	3	24	3	CK 2660-7R	DK 2660-7R	EK 2660-7R	-9, E, D, P, T, B1

Input

Input voltage	6 wide-input ranges (1:5)	refer to selection chart
Inrush current limitation	CK, DK, EK by thermistor	

Output

Efficiency	$U_{i\ nom}, I_{o\ nom}$	up to 87%
Output voltage setting accuracy	$U_{i\ nom}, I_{o\ nom}$	$\pm 0.6\% U_{o\ nom}$
Output voltage switching noise	IEC/EN 61204, total	typ. 100 mV _{pp}
Line regulation	$U_{i\ min}...U_{i\ max}, I_{o\ nom}$	typ. $\pm 0.3\%$
Load regulation	$U_{i\ nom}, 10...100\% I_{o\ nom}$, symmetrical output load	typ. 0.4%
Minimum load	not required	0 A
Current limitation	rectangular U/I characteristic	typ. 110% $I_{o\ nom}$
Operation in parallel	by current limitation	
Hold-up time	$U_{i\ nom}, I_{o\ nom}$, C/D/E/FK with ext. diode in input line	4...30 ms
	$U_{i\ nom}, I_{o\ nom}$, A/BK with ext. diode in input line	typ. 1 ms

Control and protection

Input reverse polarity	built-in fuse, not user accessible	
Input undervoltage lockout		typ. 80% $U_{i\ min}$
Input overvoltage lockout		typ. 108% $U_{i\ max}$
Input transient protection	varistor or suppressor diode	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. 130% $U_{o\ nom}$
Overtemperature	switch-off with auto restart	T_C typ 100°C
Output voltage adjustment		0...110% $U_{o\ nom}$
Inhibit	TTL input, output(s) disabled if left open	
Status indication	LEDs: OK, inhibit, overload	

Safety

Approvals	EN 60950, UL 1950, CSA 22.2 No. 950	
Protection degree		IP 30
Class of equipment		class I
Electric strength test voltage	I/case	2 kV AC
	I/O	4 kV AC
	O/case	1 kV AC
	O/O	0.1 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4 (8/15 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level x (20 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 4 (2/4 kV)	criterion A
Surge	IEC/EN 61000-4-5, level 3 (2 kV)	criterion A
Conducted disturbances	IEC/EN 61000-4-6, level 3 (10 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

Operating ambient temperature	$U_{i\text{ nom}}, I_{o\text{ nom}}$, convection cooled	-25...71 °C
Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-25...95 °C
Storage temperature	non operational	-40...100 °C
Damp heat	IEC/EN 60068-2-3, 93%, 40 °C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g_n
Shock	IEC/EN 60068-2-27, 6 ms	100 g_n
Bump	IEC/EN 60068-2-29, 6 ms	40 g_n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 $g_{n\text{ rms}}$
MTBF	MIL-HDBK-217F, G_B , 40 °C	500'000 h

Options

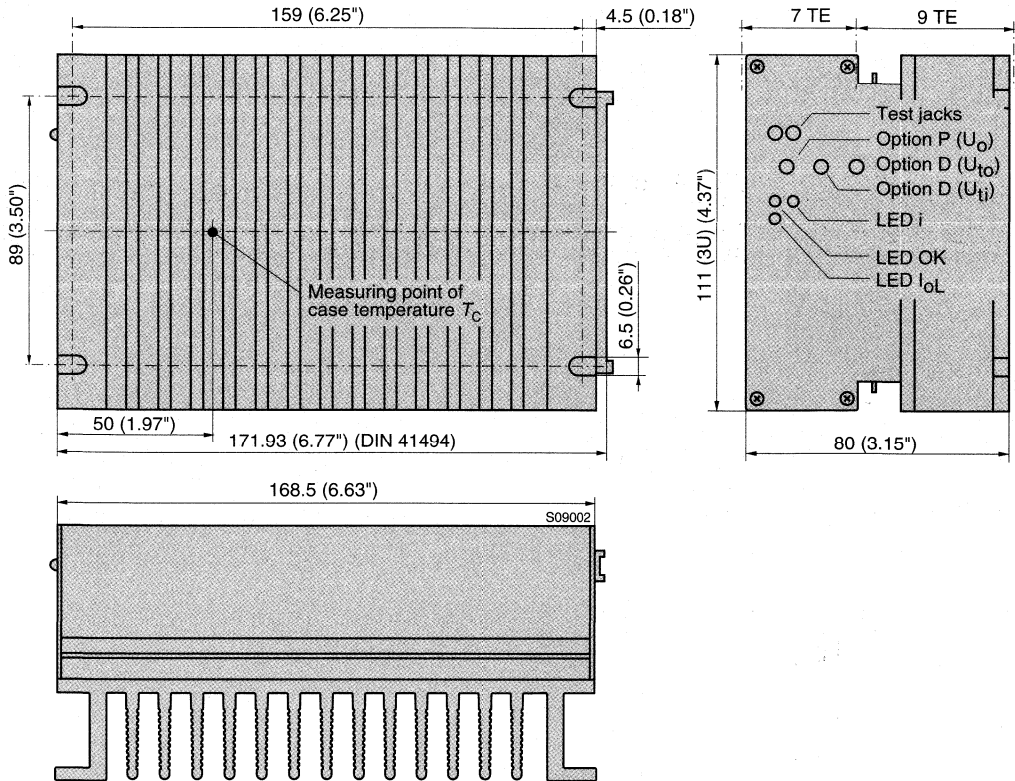
Extended temperature range	-40...71 °C, ambient, operating	-9
Electronic inrush current limitation		E
Output voltage adjustment	40...110% $U_{o\text{ nom}}$, excludes feature R and vice versa	P
Input and/or output undervoltage monitoring, excludes option V		D0...D9
Input and/or output undervoltage monitoring (VME), excludes option P		V0, V2, V3
Current sharing		T
Cooling plate		B1

Pin allocation

Pin	AK 1000, BK...EK 1001	AK 2000	BK...EK 1301/1501/1601	BK...EK 2000
4	Vo1+	Output 1	Vo2+	Output 2
6			Vo1+	
8	Vo1-	Output 1	Vo2-	Output 2
10			Vo1-	
12	S+	Sense	Vo1+	Output 1
14	S-	Sense	Vo1-	Output 1
16	R	Control of U_{o1}	R	Control of U_{o1}
18	i	Inhibit	i	Inhibit
20	D	Save data	D	Save data
	V	ACFAIL		
22	T	Current sharing	T	Current sharing
24	⊕	Protective earth	⊕	Protective earth
26	Vi+	Input	Vi+	Input
28			Vi+	
30	Vi-	Input	Vi-	Input
32			Vi-	

Mechanical data

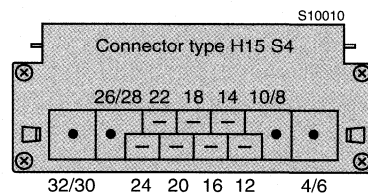
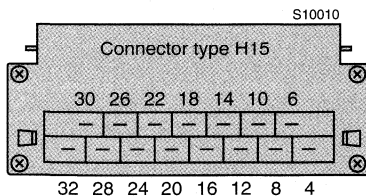
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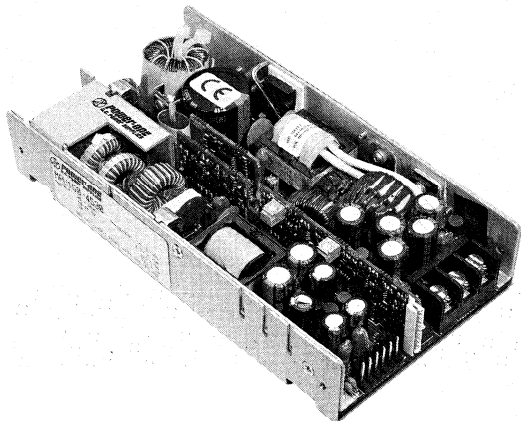


Accessories

- Front panels 19" (Schroff/Intermas)
- Mating H15/H15S4 connectors with screw, solder, fast-on or press-fit terminals
- Connector retention facilities and code key system for connector coding
- Chassis or wall mounting plates for frontal access
- Universal mounting brackets for chassis or DIN-rail mounting

Pin allocation





Input Voltage range 36...75 V DC
 3 or 4 Outputs 3.3...12 V DC
 1544 V DC I/O electric strength test voltage



- Dual main outputs provide 3.3 V and 5 V with remote sense and current share for mixed mode circuit applications
- Isolated outputs 3 and 4 can be used as positive or negative outputs
- Overtemperature, overload and overvoltage protection

Selection chart

Output 1		Output 2		Output 3		Output 4		Input Voltage U_i [V]	Rated Power $P_{o, tot}$ [W]	Type
$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]	$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]	$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]	$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]			
3.3	35	+5	20	+12	2	-	-	36...75	150	MDU 150-3300
+5	30	+3.3	15	12	3	12	3	36...75	150	MDU 150-4530
+5	30	+12	8	12	3	5	2	36...75	150	MDU 150-4000

Input

Input voltage	continuous range	36...75 V DC
Inrush current limitation	by thermistor, $U_i = 72$ V AC	<35 A
Protection	non-user serviceable internal input line fuse	

Output

Efficiency	48 V DC, $I_{o\ nom}$	typ. 75%
Minimum load	on V1 to maintain regulation on V2	4 A
Hold-up time	at full load	min. 20 ms
Ripple and noise	full load, 20 MHz bandwidth	max. 1%

Control and protection

Overvoltage protection	latch style	
Overload protection	overload and short circuit, automatic recovery	
Overtemperature protection	excessive internal temperature, automatic reset	
Output good	TTL compatible signal	
Input power fail warning	TTL compatible signal, warning time	min. 5 ms
Current share	up 6 units in parallel	max. 10%
Remote sense	available on V1 and V2	max. 250 mV
Inhibit	TTL compatible signal, inhibited at high (5 V) signal	

Safety

Approvals	UL 1950, CSA 22.2, EN 60950, CE to LVD	
I/O electric strength test	per EN 60950	min. 1544 V DC
Electromagnetic interference	conducted per EN 55022	class B
ESD susceptibility	EN 61000-4-2, level 4	min. 8 kV
Radiated susceptibility	EN 61000-4-3, level 3	min. 10 V/m
EFT/burst	EN 61000-4-4, level 3	min. ± 2 kV
Input transient protection	EN 61000-4-5, level 3	min. 2 kV

Environmental

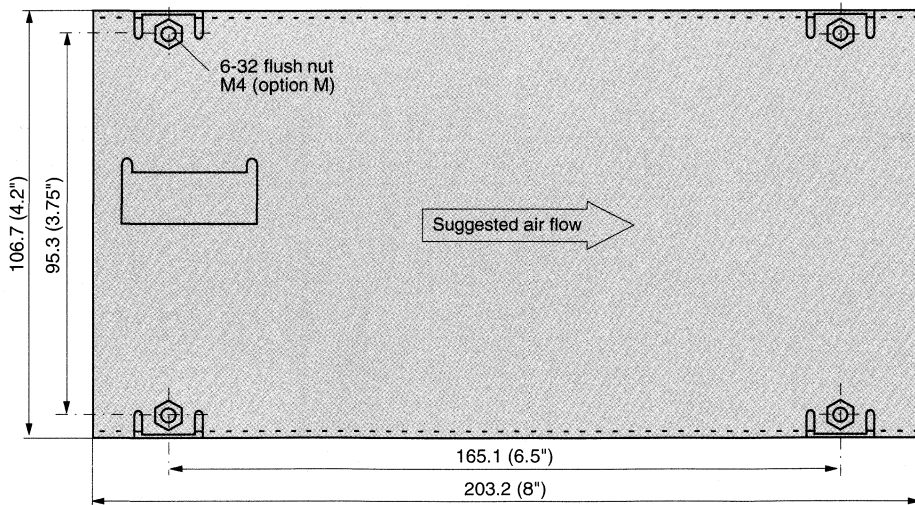
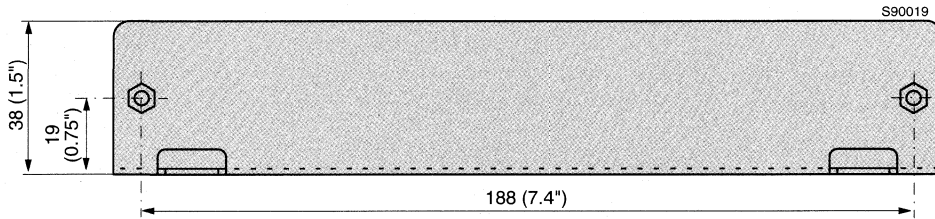
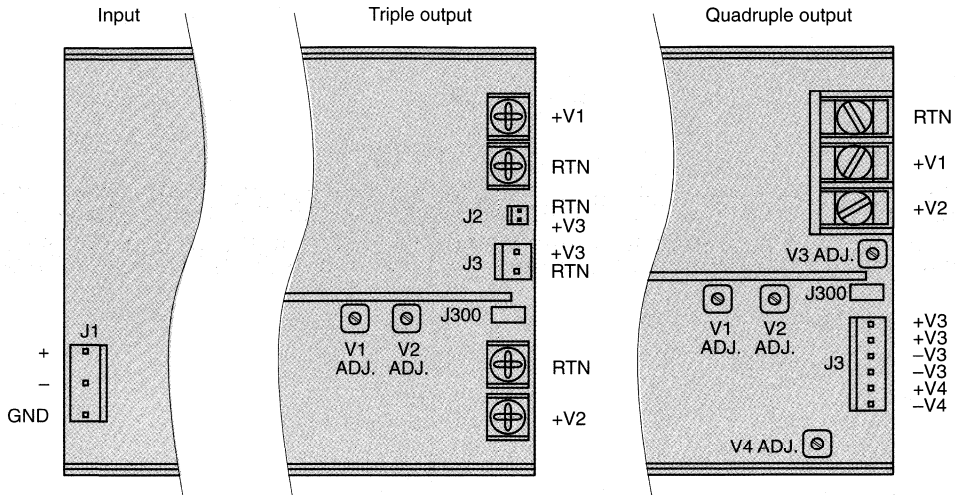
Operating temperature	100% load, convection cooled	0...50 °C
	linear derating above 50 °C, 2.5%/°C, 50% load	max. 70 °C
Storage temperature		-55...85 °C
Relative humidity	non-condensing	5...95%
Shock	peak acceleration	max. 20 g_n
Vibration	random vibration	max. 6 g_n

Options

Metric mounting inserts	M4	M
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Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation of the J300 connector

Pin	Electrical determination
1	Signal ground
2	Inhibit
3	Power fail warning
4	Output good V1
5	n.c.
6	Current share V2
7	+S V2
8	Current share V1
9	-S V1 and -S V2
10	+S V1

Molex connector information

Ref. design	Series	Housing	Pin series	Pins loose	Pins chain	Wire gauge
J1	41695	09-50-8051	6838	08-50-0189	08-50-0187	18-20 AWG
	41695	09-50-8051	2478	08-05-0106	08-50-0105	18-20 AWG
	2139	09-50-3051	2478	08-50-0106	08-50-0105	18-20 AWG
J2	5051-N	22-01-1022	2759	08-50-0114	08-50-0113	22-30 AWG
	5051-N	22-01-1022	2759	08-65-0805	08-65-0804	22-30 AWG
J3 triple output	41695	09-50-8021	6838	08-50-0189	08-50-0187	18-20 AWG
	41695	09-50-8021	2478	08-50-0106	08-50-0105	18-20 AWG
	2139	09-50-3021	2478	08-50-0106	08-50-0105	18-20 AWG
J3 quadruple output	41695	09-50-8061	6838	08-50-0189	08-50-0187	18-20 AWG
	41695	09-50-8061	2478	08-50-0106	08-50-0105	18-20 AWG
	2139	09-50-3061	2478	08-50-0106	08-50-0105	18-20 AWG
J300	5264-N	50-37-5103	5263	80-70-1040	80-70-1039	22-28 AWG

AC-DC Converters

Power [W]	Output [V DC]					No. of outputs	Input [V AC]					Series	Page
	3	5	15	24	36		48	85	110	132	170		

Board Mountable

10...25						1, 2						LHR, LGR	144
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Cassette Style

50						1, 2, 3						H	148
50						1, 2, 3						M	152
100						1, 2						S with PFC	156
100						1, 2						S	160
150						1, 2						K with PFC	164
150						1, 2						K	168
190...230						■ 1						PC	172
250						1, 2						KP	176
500						1						T	180
700						■ 1						B	184
1000...6000						1						FX	188
1440						■ 1						U	192

Modular Supplies

500...4000						1, 2, 3						High Power	196
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AC-DC Converters

Power [W]	Output [V DC]						No. of outputs	Input [V AC]					Series	Page
	3	5	15	24	36	48		85	110	132	170	230		

Open Frame

5...30							1						SWE 5...30	200
17...50							3						MWE	204
30...60							1, 2, 3, 4						MAP 30...55	208
50...75							1						SWE 50...75	212
80							2, 3						MPB	216
80...130							1, 4						MAP 80...130	218
110...140							1, 3, 4						MAP 110...140	222
150							3, 4						MPU	226
165...288							1, 4						PFC 250	230
360...500							1, 3, 4						PFC 375...500	234

DIN Rail Mountable

15...30							1						LOS/LOR 1000	238
30...50							1						LOR/LOK 4000	242
50							1						LOK 1000	246
125...250							1, 2						W	250
38...150							1						X	254

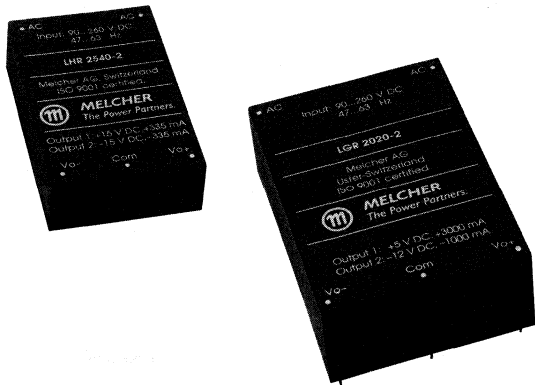
Linear Supplies

7...288							1, 2, 3, 4						Int. Line	258
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Data sheets

Detailed data sheets are available from either source:

- Internet: www.power-one.ch
- CD-ROM
- Nearest sales office by fax or mail.



Input voltage range 85...265 V AC
 1 or 2 outputs up to 30 V DC
 4300 V DC I/O electric strength test voltage

LGA

- Class II equipment (double insulation)
- Short circuit protection
- Compact, low cost solution

Selection chart

Output 1		Output 2		Input voltage	Rated power	Type
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	U_i [V AC]	$T_A = 50^\circ\text{C}$ $P_{o \text{ tot}}$ [W]	
3.3	3	-	-	85...265	10	LHR 1101-2
3.3	7	-	-	85...265	23	LGR 1101-2
5	2	-	-	85...265	10	LHR 1001-2
5	5	-	-	85...265	25	LGR 1001-2
12	0.84	-	-	85...265	10	LHR 1301-2
12	2.1	-	-	85...265	25	LGR 1301-2
15	0.67	-	-	85...265	10	LHR 1501-2
15	1.7	-	-	85...265	25	LGR 1501-2
24	0.42	-	-	85...265	10	LHR 1601-2
24	1	-	-	85...265	24	LGR 1601-2
5	1	12	0.5	85...265	10	LHR 2020-2
5	2.5	12	1	85...265	24.5	LGR 2020-2
±12	±0.42	-	-	85...265	10	LHR 2320-2
±12	±1	-	-	85...265	25	LGR 2320-2
±15	±0.335	-	-	85...265	10	LHR 2540-2
±15	±0.8	-	-	85...265	25	LGR 2540-2

Input

Input voltage	continuous range	85...265 V AC
Input frequency		47...63 Hz
Inrush current limitation	by thermistor, $U_i = 230$ V AC	<40 A

Output

Efficiency	230 V AC, $I_{o\ nom}$	up to 86%
Output voltage switching noise	$U_{i\ nom}$, $I_{o\ nom}$, 20 MHz bandwidth, peak-peak	<1%
Line regulation	$U_{i\ min} \dots U_{i\ max}$, $I_{o\ nom}$	$\pm 1\%$
Load regulation	$U_{i\ nom}$, $0 \dots I_{o\ nom}$	$\pm 2\%$
Minimum load	single output models	0%
	dual output models recommended	20%
Hold-up time	110/230 V AC, $I_{o\ nom}$	>10 ms

Protection

Output overload	current limiting with foldback characteristic	
Short circuit		
No load		

Control

Trim	single output models only	$\pm 10\%$
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Safety and EMC

Safety marks	UL, ULc, CE	
Electric strength test voltage	I/O	3000 V AC
Electrostatic discharge	IEC/EN 61000-4-2, level 4 (15 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level 3 (10 V/m)	criterion A
Electr. fast transients/burst	IEC/EN 61000-4-4, level 3 (2 kV)	criterion A
Surge	IEC/EN 61000-4-5, level 3 (2 kV)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

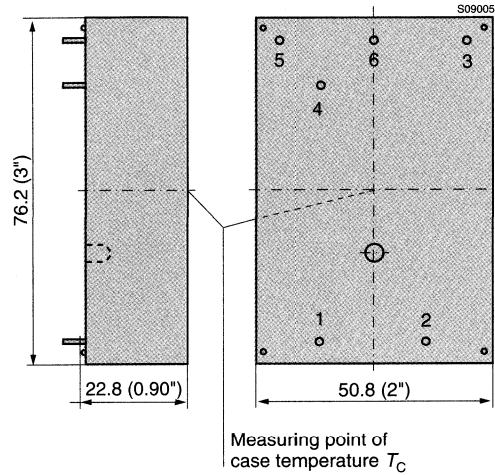
Ambient temperature	$U_{i\ nom}$, $I_{o\ nom}$, convection cooled	-10...50°C
Storage temperature	non operational	-40...100°C
Relative humidity	non condensing	5...95%
Shock	peak acceleration	20 g _n
Random vibration		2 g _{n rms}

Mechanical data

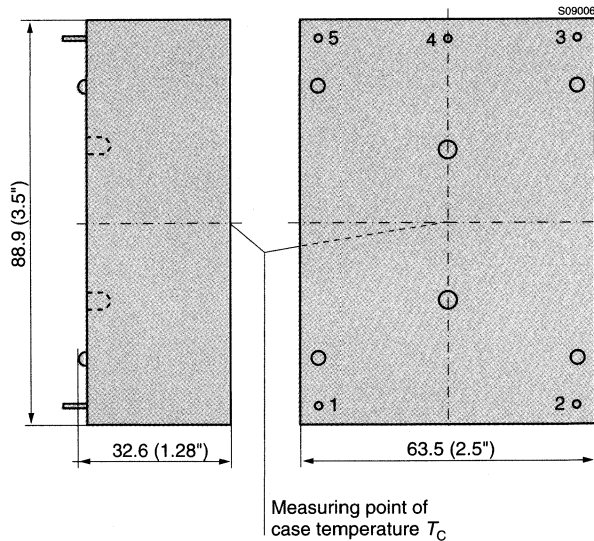
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



LHR



LGR



Pin allocation

Pin	Electrical determination	LHR		LGR		
		Single	Dual	Single	Dual +/-	Dual +/+
1	Input voltage	L	L	L	L	L
2	Input voltage	N	N	N	N	N
3	Output voltage (positive)	Vo+	Vo+	Vo+	Vo+	Vo1+
4	Output voltage (return potential)	-	-	Vo-	-	-
	Output voltage (common return)	-	-	-	Com	Com
	Control input Trim	-	-	-	-	-
5	Output voltage (negative or positive)	-	Vo-	-	Vo-	Vo2+
	Output voltage (return potential)	Vo-	-	-	-	-
	Control input	-	-	Trim	-	-
6	Output voltage	n.c.	Com	-	-	-



Input voltage range 85...255 V AC
 1, 2 or 3 isolated outputs up to 48 V DC
 3 kV AC I/O electric strength test voltage



- Rugged electrical and mechanical design
- Output 1 regulated, outputs 2 and 3 tracking
- Operating ambient temperature range -10...50°C with convection cooling

Selection chart

Output 1		Output 2		Output 3		Rated power $P_{o\ tot}$ [W]	Type Input voltage 85...255 V AC	Options
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]			
5.1	11	-	-	-	-	56	LH 1001-2R	D, V
12	6	-	-	-	-	72	LH 1301-2R	D
15	4.5	-	-	-	-	67	LH 1501-2R	D
24	3	-	-	-	-	72	LH 1601-2R	D
48	1.5	-	-	-	-	72	LH 1901-2R	D
12	2	12	2	-	-	48	LH 2320-2	D
15	1.7	15	1.7	-	-	51	LH 2540-2	D
5.1	5	12	0.7	12	0.7	42	LH 3020-2	D, V
5.1	5	15	0.6	15	0.6	43	LH 3040-2	D, V

Input

Input voltage	continuous range	85...255 V AC
Input frequency		47...63 Hz
Inrush current limitation	by thermistor	

Output

Efficiency	$U_i\ nom, I_o\ nom$	up to 83%
Output voltage 1 setting acc.	$U_i\ nom, I_o\ nom$	$\pm 2\% U_{o1\ nom}$
Output voltage 2, 3 setting acc.	$U_i\ nom, I_o\ nom$	$\pm 5\% U_{o2,3\ nom}$
Output voltage switching noise	IEC/EN 61204, total	typ. 200 mV _{pp}
Line regulation	$U_i\ min...U_i\ max, I_o\ nom$	typ. $\pm 1\% U_{o\ nom}$
Load regulation output 1	$U_i\ nom, 0...I_{o1\ nom}$	typ. 0.2% $U_{o1\ nom}$
Load regulation output 2, 3	10...100% $I_{o2,3\ nom}$	typ. 0.7 V
Output voltage 2, 3	$U_i\ nom, I_{o1\ nom}, I_{o2,3} = 0$	max. 115% $U_{o2,3\ nom}$
Cross load regulation outp. 2, 3	0...100% $I_{o1\ nom}$	typ. 0.7 V
Minimum output current	not required	0 A
Current limitation main output	rectangular U/I characteristic	typ. 110% $I_{o\ nom}$
Current limitation aux. output(s)	rectangular U/I characteristic	typ. 120% $I_{o\ nom}$
Operation in parallel	by current limitation	
Hold-up time	$U_i = 230\ V\ AC, I_o\ nom$	typ. 70 ms

Protection

Input undervoltage lockout		typ. 60 V AC
Input overvoltage lockout		typ. 280 V AC
Input transient protection	varistor	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. 150% $U_{o\ nom}$
Overtemperature	switch-off with auto restart	T_C typ. 100 °C

Control

Output voltage adjustment	single output types	0...110% $U_{o1\ nom}$
Inhibit	TTL input, output(s) disabled if left open-circuit	
Status indication	LEDs: OK, inhibit	

Safety

Approvals	EN 60950, UL 1950, CSA C22.2 No. 950	
Class of equipment		class I
Protection degree	units without options	IP 40
Electric strength test voltage	I/case	2 kV AC
	I/O	4 kV AC
	O/case	1 kV AC
	O/O	0.2 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, contact discharge, level 2 (4 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level x (20 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, input, level 1 (0.5 kV)	criterion A
Surge	IEC/EN 61000-4-5, input, level 1 (0.5 kV)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class A
	CISPR 22/EN 55022, radiated	class B

Environmental

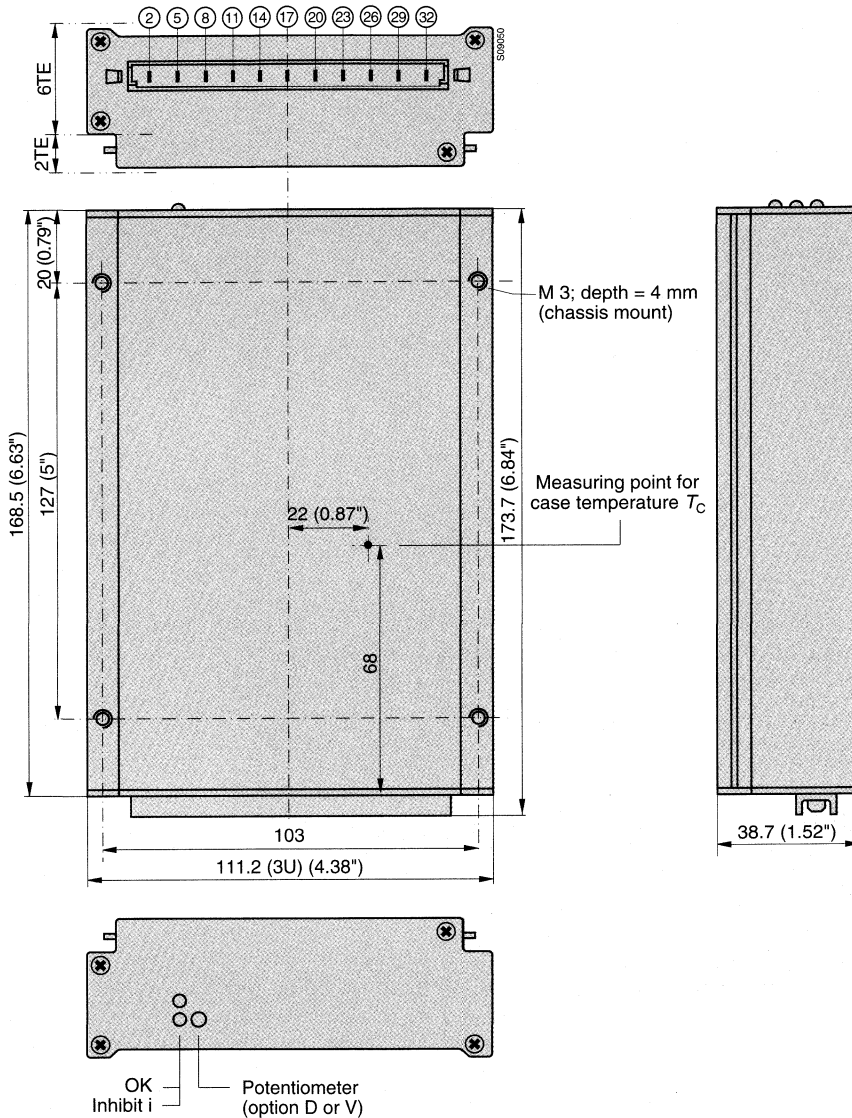
Operating ambient temperature	$U_{i\ nom}, I_{o\ nom}$, convection cooled	-10...50 °C
Operating case temperature T_C	$U_{i\ nom}, I_{o\ nom}$	-10...80 °C
Storage temperature	non operational	-25...100 °C
Damp heat	IEC/EN 60068-2-3, 93 %, 40 °C	21 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...150 Hz	0.15 mm/2 g_n
Shock	IEC/EN 60068-2-27, 6 ms	15 g_n
Bump	IEC/EN 60068-2-29, 16 ms	10 g_n
MTBF	MIL-HDBK-217E, G_B , 40 °C, single output types	384'000 h

Options

Input and/or output undervoltage monitoring, excludes option V	D1...D8
Input and/or output undervoltage monitoring (VME), excludes option D	V2, V3

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin	Electrical Determination	LH1000	LH2000	LH3000
2 5	Inhibit control input Safe Data or ACFAIL	i D or V	i D or V	i D or V
8 11	Output voltage (positive) Output voltage (negative)	Vo1+ Vo1-		Vo3+ Vo3-
14 17	Control input + Control input -	R G		
14 17	Output voltage (positive) Output voltage (negative)		Vo2+ Vo2-	Vo2+ Vo2-
20 23	Output voltage (positive) Output voltage (negative)	Vo1+ Vo1-	Vo1+ Vo1-	Vo1+ Vo1-
26	Protective earth	⊕	⊕	⊕
29 32	AC input voltage AC input voltage	N ~ P ~	N ~ P ~	N ~ P ~

Accessories

Front panels 19" (Schroff/Intermas)

Mating H11 connectors with screw, solder, fast-on or press-fit terminals

Connector retention facilities and code key system for connector coding

Flexible PCB for connecting the converter via an H11 connector, if mounted on a PCB

Chassis or wall mounting plates for frontal access

Universal mounting brackets for chassis or DIN-rail mounting



Input voltage range 85...264 V AC
 1, 2 or 3 isolated outputs up to 48 V DC
 3 kV AC I/O electric strength test voltage



- Rugged electrical and mechanical design
- Outputs individually controlled with excellent dynamic properties
- Operating ambient temperature range -40...71°C with convection cooling

Selection chart

Output 1		Output 2		Output 3		Input voltage U_i [V AC]	Type	Options
U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]			
5.1	8	-	-	-	-	85...264	LM 1001-7R	-9, E, P, D, V, A, H,
5.1	8	-	-	-	-	85...264	LMZ 1001-7R □	-9, E, P, D, V, A, H, F
12	4	-	-	-	-	85...264	LM 1301-7R	-9, E, P, D, A, H, F
12	4	-	-	-	-	85...264	LMZ 1301-7R □	-9, E, P, D, A, H, F
15	3.4	-	-	-	-	85...264	LM 1501-7R	-9, E, P, D, A, H, F
15	3.4	-	-	-	-	85...264	LMZ 1501-7R □	-9, E, P, D, A, H, F
24	2	-	-	-	-	85...264	LM 1601-7R	-9, E, P, D, A, H, F
24	2	-	-	-	-	85...264	LMZ 1601-7R □	-9, E, P, D, A, H, F
48	1	-	-	-	-	85...264	LM 1901-7R	-9, E, P, D, A, H, F
48	1	-	-	-	-	85...264	LMZ 1901-7R □	-9, E, P, D, A, H, F
12	2	12	2	-	-	85...264	LM 2320-7	-9, E, P, D, A, H, F
12	2	12	2	-	-	85...264	LMZ 2320-R □	-9, E, P, D, A, H, F
15	1.7	15	1.7	-	-	85...264	LM 2540-7	-9, E, P, D, A, H, F
15	1.7	15	1.7	-	-	85...264	LMZ 2540-R □	-9, E, P, D, A, H, F
5.1	5	12	0.7	12	0.7	85...264	LM 3020-7	-9, E, P, D, V, A, H, F
5.1	5	12	0.7	12	0.7	85...264	LMZ 3020-R □	-9, E, P, D, V, A, H, F
5.1	5	15	0.6	15	0.6	85...264	LM 3040-7	-9, E, P, D, V, A, H, F
5.1	5	15	0.6	15	0.6	85...264	LMZ 3040-R □	-9, E, P, D, V, A, H, F

Input

Input voltage	continuous range	85...264 V AC
Input frequency		47...65(440) Hz
Inrush current limitation	by thermistor	

Output

Efficiency	$U_{I\text{ nom}}, I_{O\text{ nom}}$	up to 81%
Output voltage setting accuracy	$U_{I\text{ nom}}, I_{O\text{ nom}}$	$\pm 0.6\% U_{O\text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 50 mV _{pp}
Line regulation	$U_{I\text{ min}} \dots U_{I\text{ max}}, I_{O\text{ nom}}$, each output regulated	typ. $\pm 0.2\% U_{O\text{ nom}}$
Load regulation	$U_{I\text{ nom}}, 0 \dots I_{O\text{ nom}}$, each output regulated	typ. 0.15% $U_{O\text{ nom}}$
Minimum load	not required	0 A
Current limitation main output	rectangular U/I characteristic	typ. 110% $I_{O\text{ nom}}$
Current limitation aux. output(s)	rectangular U/I characteristic	typ. 120% $I_{O\text{ nom}}$
Operation in parallel	by current limitation, only main outputs	
Hold-up time	$U_I = 230\text{ V AC}, I_{O\text{ nom}}$	typ. 90 ms

Protection

Input fuse	built-in	T 2.5 A, 250 V AC
Input undervoltage lockout		typ. 80% $U_{I\text{ min}}$
Input overvoltage lockout		typ. 110% $U_{I\text{ max}}$
Input transient protection	varistor or suppressor diode	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. 150% $U_{O\text{ nom}}$
Overtemperature	switch-off with auto restart	T_C typ. 100°C

Control

Output voltage adjustment	single output types	0...110% $U_{O1\text{ nom}}$
Inhibit	TTL input, output(s) disabled if open circuit	
Status indication	LEDs: OK, inhibit, overload	

Safety

Approvals	EN 60950, UL 1950, CSA C22.2 No. 950	
Class of equipment	LM	class I
	LMZ	class II
Protection degree	units without options	IP 40
Electric strength test voltage	class I, I/case	2 kV AC
	class I, I/O	4 kV AC
	class II (LMZ), I/O and I/case	4 kV AC
	O/case	1 kV AC
	O/O	0.2 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4 (8/15 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level x (20 V/m)	criterion A/B
Electr. fast transients/bursts	IEC/EN 61000-4-4, input, level 3/4 (2/4 kV)	criterion A/B
Surge	IEC/EN 61000-4-5, input, level 3/4 (2/4 kV)	criterion A
Conducted disturbances	IEC/EN 61000-4-6, level 3 (10 V)	criterion B
Electromagnetic emissions	CISPR 22/EN 55022, class I, conducted	class B

Environmental

Operating ambient temperature	$U_{i\ nom}, I_{o\ nom}$, convection cooled	-25...71°C
Operating case temperature T_C	$U_{i\ nom}, I_{o\ nom}$	-25...95°C
Storage temperature	non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g _n
Shock	IEC/EN 60068-2-27, 6 ms	100 g _n
Bump	IEC/EN 60068-2-29, 6 ms	40 g _n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 g _{n rms}
MTBF	MIL-HDBK-217E, G _B , 40°C, single output types	320'000 h

Options

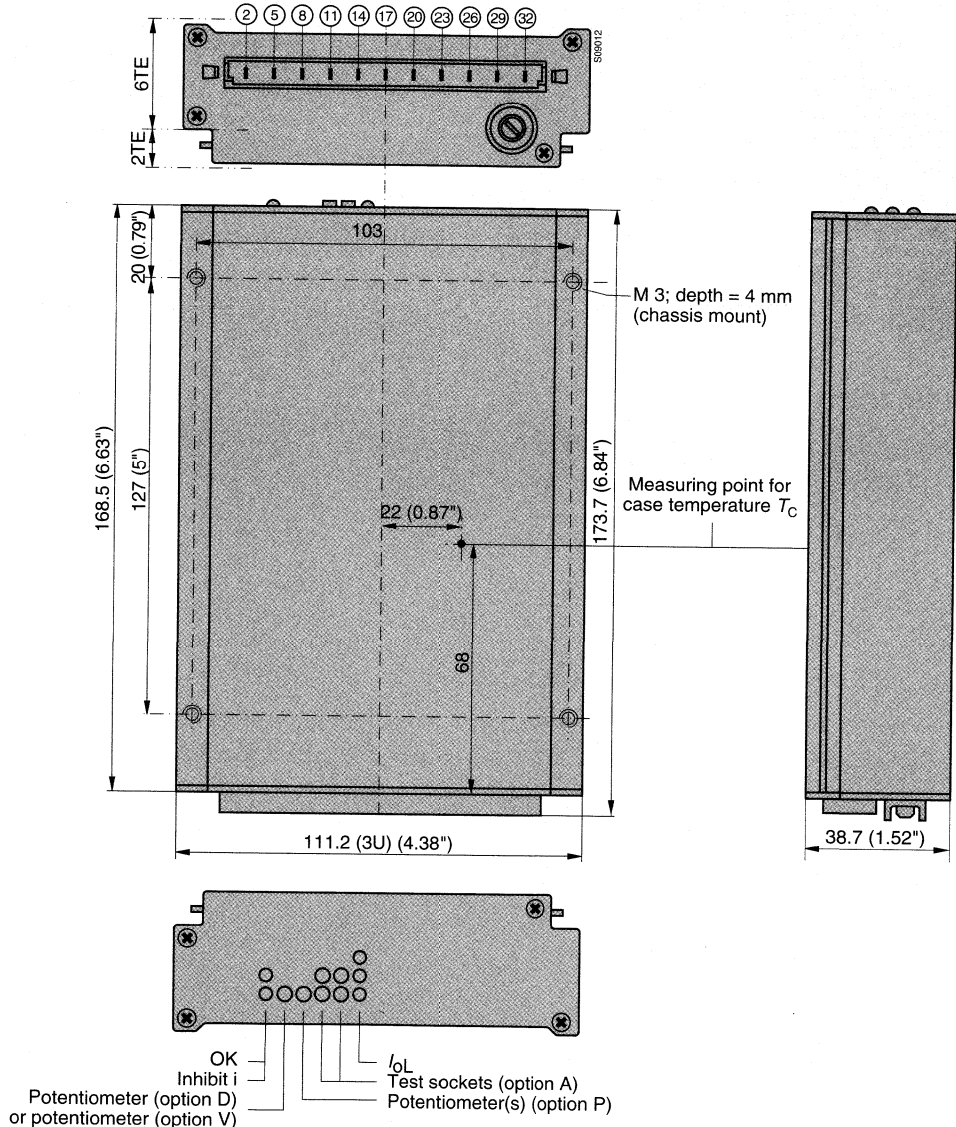
Extended temperature range	-40...71°C, ambient, operating	-9
Electronic inrush current limitation		E
Output voltage adjustment	95...105% $U_{o\ nom}$, excludes feature R and vice versa	P
Input and/or output undervoltage monitoring, excludes option V		D0...D9
Input and/or output undervoltage monitoring (VME), excludes option D		V1...V3
Test sockets for check of output voltage		A
Enhanced electric strength test 2 kV AC		H
Fuse not user accessible		F

Pin allocation

Pin	Electrical determination	LM 1000	LMZ 1000	LM 2000	LMZ 2000	LM 3000	LMZ 3000
2	Inhibit control input	i	i	i	i	i	i
5	Data safe or ACFAIL	D or V	D or V	D or V	D or V	D or V	D or V
8	Output voltage (positive)	Vo1+	Vo1+			Vo3+	Vo3+
11	Output voltage (negative)	Vo1-	Vo1-			Vo3-	Vo3-
14	Control input +	R	R				
17	Control input -	G	G				
14	Output voltage (positive)			Vo2+	Vo2+	Vo2+	Vo2+
17	Output voltage (negative)			Vo2-	Vo2-	Vo2-	Vo2-
20	Output voltage (positive)	Vo1+	Vo1+	Vo1+	Vo1+	Vo1+	Vo1+
23	Output voltage (negative)	Vo1-	Vo1-	Vo1-	Vo1-	Vo1-	Vo1-
26	Protective earth	⊕		⊕		⊕	
29	AC input voltage	N _~	N _~	N _~	N _~	N _~	N _~
32	AC input voltage	P _~	P _~	P _~	P _~	P _~	P _~

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

- Front panels 19" (Schroff/Intermas)
- Mating H11 connectors with screw, solder, fast-on or press-fit terminals
- Connector retention facilities and code key system for connector coding
- Flexible PCB for connecting the converter via an H11 connector, if mounted on a PCB
- Chassis or wall mounting plates for frontal access
- Universal mounting brackets for chassis or DIN-rail mounting



Input voltage range from 85...264 V AC
 1 or 2 isolated outputs up to 48 V DC
 4 kV AC I/O electric strength test voltage



- Rugged electrical and mechanical design
- Integrated Power factor correction
- Operating ambient temperature range
 -40...71 °C with convection cooling

Selection chart

Output 1		Output 2		Input voltage	Efficiency	Type	Options
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	U_i [V AC]	η_{min} [%]		
5.1	16	-	-	85...264	77	LS 4001-7R	-9, E, D, V, P, T, B1
12	8	-	-	85...264	81	LS 4301-7R	-9, E, D, P, T, B1
15	6.5	-	-	85...264	83	LS 4501-7R	-9, E, D, P, T, B1
24	4.2	-	-	85...264	83	LS 4601-7R	-9, E, D, P, T, B1
24	4	-	-	85...264	81	LS 5320-7R	-9, E, D, P, T, B1
30	3.2	-	-	85...264	81	LS 5540-7R	-9, E, D, P, T, B1
48	2	-	-	85...264	81	LS 5660-7R	-9, E, D, P, T, B1
12	4	12	4	85...264	81	LS 5320-7R	-9, E, D, P, T, B1
15	3.2	15	3.2	85...264	81	LS 5540-7R	-9, E, D, P, T, B1
24	2	24	2	85...264	81	LS 5660-7R	-9, E, D, P, T, B1

Input

Input voltage AC	wide input range	85...264 V AC
Input frequency		50/60 Hz
Power factor	per IEC/EN 61000-3-2	>95%
Inrush current limitation	by thermistor	

Output

Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to 83%
Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 0.6\% U_{o\text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 100 mV _{pp}
Line regulation	$U_{i\text{ min}}...U_{i\text{ max}}, I_{o\text{ nom}}$	typ. $\pm 0.1\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}, 10...100\% I_{o\text{ nom}}$, symmetrical output load	typ. 0.4% $U_{o\text{ nom}}$
Minimum load	not required	0 A
Current limitation	foldback U/I characteristic	typ. 110...100% $I_{o\text{ nom}}$
Operation in parallel	by current limitation	
Hold-up time	$U_{i\text{ nom}}, I_{o\text{ nom}}$	25 ms

Protection

Input fuse	not user accessible	4 AT
Input undervoltage lockout		typ. 80% $U_{i\text{ min}}$
Input overvoltage lockout		typ. 115% $U_{i\text{ max}}$
Input transient protection	varistor	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. 130% $U_{o\text{ nom}}$
Overtemperature	switch-off with auto restart	T_c typ. 100°C

Control

Output voltage adjustment		0...110% $U_{o\text{ nom}}$
Inhibit	TTL input, output(s) disabled if open circuit	
Status indication	LEDs: OK, inhibit, overload	

Safety

Approvals	EN 60950, UL 1950, CSA 22.2 No. 950	
Class of equipment		class I
Protection degree		IP 30
Electric strength test voltage	I/case	2 kV AC
	I/O	4 kV AC
	O/case	1 kV AC
	O/O	0.1 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4 (8/15 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level 3 (10 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 4 (2/4 kV)	criterion A
Surge	IEC/EN 61000-4-5, level 3 (2 kV)	criterion A
Conducted disturbances	IEC/EN 61000-4-6, level 3 (10 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022	class B

Environmental

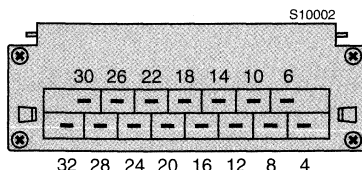
Operating ambient temperature	$U_{i\text{ nom}}, I_{o\text{ nom}}$, convection cooled	-25...71°C
Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-25...95°C
Storage temperature	non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g_n
Shock	IEC/EN 60068-2-27, 6 ms	100 g_n
Bump	IEC/EN 60068-2-29, 6 ms	40 g_n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 $g_{n\text{ rms}}$
MTBF	MIL-HDBK-217F, G_B , 40°C	514'000 h

Options

Extended temperature range	-40...71°C, ambient, operating	-9
Electronic inrush current limitation		E
Output voltage adjustment	40...110% $U_{o\text{ nom}}$, excludes feature R and vice versa	P
Input and/or output undervoltage monitoring, excludes option V		D0...D9
Input and/or output undervoltage monitoring (VME), excludes option D		V0, V2, V3
Current sharing		T
Cooling plate		B1

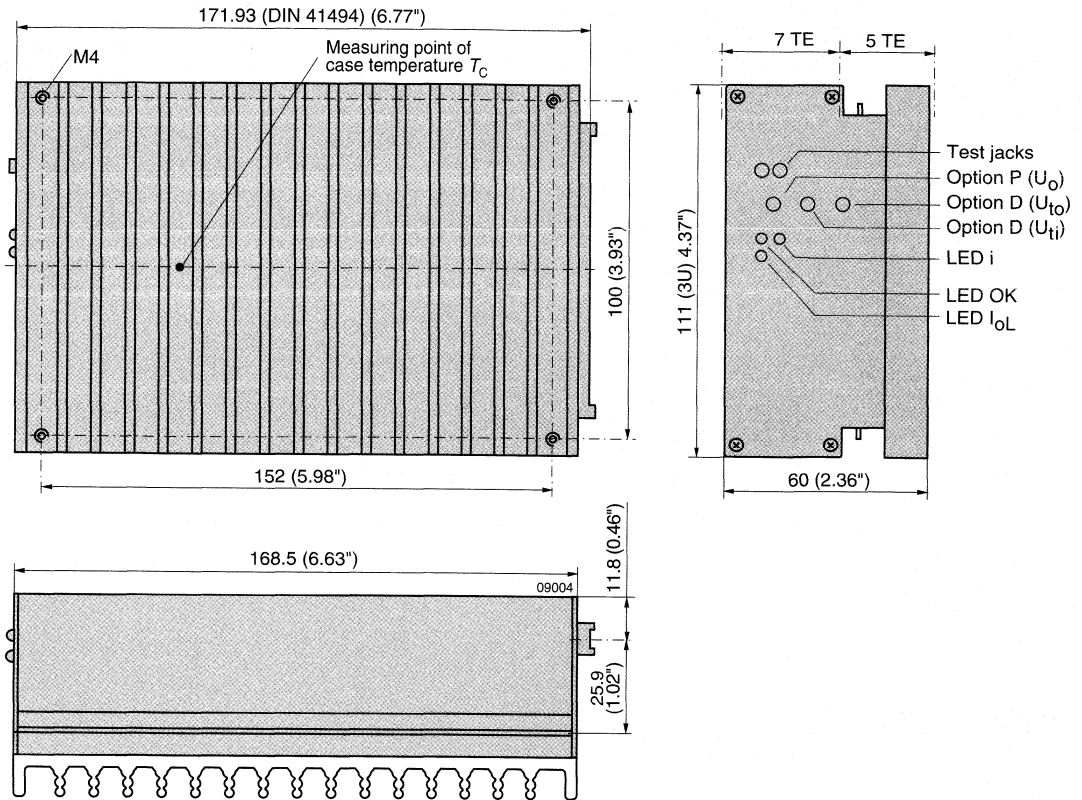
Pin allocation

Pin	LS 4000		LS 5000	
	Signal	Description	Signal	Description
4	Vo1+	Output 1	Vo2+	Output 2
6	Vo1+		Vo2+	
8	Vo1-	Output 1	Vo2-	Output 2
10	Vo1-		Vo2-	
12	S+	Sense	Vo1+	Output 1
14	S-		Vo1-	
16	R	Control of U_{o1}	R	Control of U_{o1}
18	i	Inhibit	i	Inhibit
20	D	Save data	D	Save data
	V	ACFAIL		
22	T	Current sharing	T	Current sharing
24	⊕	Protective earth	⊕	Protective earth
26	N~	Neutral	N~	Neutral
28	N~			
30	P~	Phase	P~	Phase
32	P~			



Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

Front panels 19" (Schroff/Intermas)

Mating H15 connectors with screw, solder, fast-on or press-fit terminals

Connector retention facilities and code key system for connector coding

Chassis or wall mounting plates for frontal access

Universal mounting brackets for chassis or DIN-rail mounting



Input voltage range from 85...264 V AC
 1 or 2 isolated outputs up to 48 V DC
 4 kV AC I/O electric strength test voltage



- Rugged electrical and mechanical design
- Wide input frequency range from 47...440 Hz
- Operating ambient temperature range -40...71°C with convection cooling

Selection chart

Output 1		Output 2		Input voltage	Type	Options
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	U_i [V AC]		
5.1	16	-	-	85...264	LS 1001-7R	-9, E, D, V, P, T, B1
12	8	-	-	85...264	LS 1301-7R	-9, E, D, P, T, B1
15	6.5	-	-	85...264	LS 1501-7R	-9, E, D, P, T, B1
24	4.2	-	-	85...264	LS 1601-7R	-9, E, D, P, T, B1
24	4	-	-	85...264	LS 2320-7R	-9, E, D, P, T, B1
30	3.2	-	-	85...264	LS 2540-7R	-9, E, D, P, T, B1
48	2	-	-	85...264	LS 2660-7R	-9, E, D, P, T, B1
12	4	12	4	85...264	LS 2320-7R	-9, E, D, P, T, B1
15	3.2	15	3.2	85...264	LS 2540-7R	-9, E, D, P, T, B1
24	2	24	2	85...264	LS 2660-7R	-9, E, D, P, T, B1

Input

Input voltage AC	wide input range	85...264 V AC
Input frequency		47...440 Hz
Input voltage DC		88...372 V DC
Inrush current limitation	by thermistor	

Output

Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to 85%
Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 0.6\% U_{o\text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 90 mV _{pp}
Line regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, I_{o\text{ nom}}$	typ. $\pm 0.3\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}, 10 \dots 100\% I_{o\text{ nom}}$, symmetrical output load	typ. $0.5\% U_{o\text{ nom}}$
Minimum load	not required	0 A
Current limitation	rectangular U/I characteristic	typ. $110\% I_{o\text{ nom}}$
Operation in parallel	by current limitation	
Hold-up time	$U_{i\text{ nom}}, I_{o\text{ nom}}$	80 ms

Control and protection

Input fuse	not user accessible	4 AT
Input undervoltage lockout		typ. $90\% U_{i\text{ min}}$
Input overvoltage lockout		typ. $109\% U_{i\text{ max}}$
Input transient protection	varistor	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. $130\% U_{o\text{ nom}}$
Overtemperature	switch-off with auto restart	T_C typ. 100°C
Output voltage adjustment		$0 \dots 110\% U_{o\text{ nom}}$
Inhibit	TTL input, output(s) disabled if open circuit	
Status indication	LEDs: OK, inhibit, overload	

Safety

Approvals	EN 60950, UL 1950, CSA 22.2 No. 950	
Class of equipment		class I
Protection degree		IP 30
Electric strength test voltage	I/case	2 kV AC
	I/O	4 kV AC
	O/case	1 kV AC
	O/O	0.1 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4 (8/15 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level x (20 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 4 (2/4 kV)	criterion A
Surge	IEC/EN 61000-4-5, level 3 (2 kV)	criterion A
Conducted disturbances	IEC/EN 61000-4-6, level 3 (10 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022	class B

Environmental

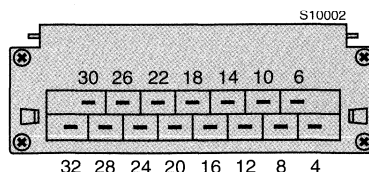
Operating ambient temperature	$U_{i\text{ nom}}, I_{o\text{ nom}}$, convection cooled	-25...71°C
Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-25...95°C
Storage temperature	non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g_n
Shock	IEC/EN 60068-2-27, 6 ms	100 g_n
Bump	IEC/EN 60068-2-29, 6 ms	40 g_n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 $g_{n\text{ rms}}$
MTBF	MIL-HDBK-217F, G_B , 40°C	500'000 h

Options

Extended temperature range	-40...71°C, ambient, operating	-9
Electronic inrush current limitation		E
Output voltage adjustment	40...110% $U_{o\text{ nom}}$, excludes feature R and vice versa	P
Input and/or output undervoltage monitoring, excludes option V		D0...D9
Input and/or output undervoltage monitoring (VME), excludes option D		V0, V2, V3
Current sharing		T
Cooling plate		B1

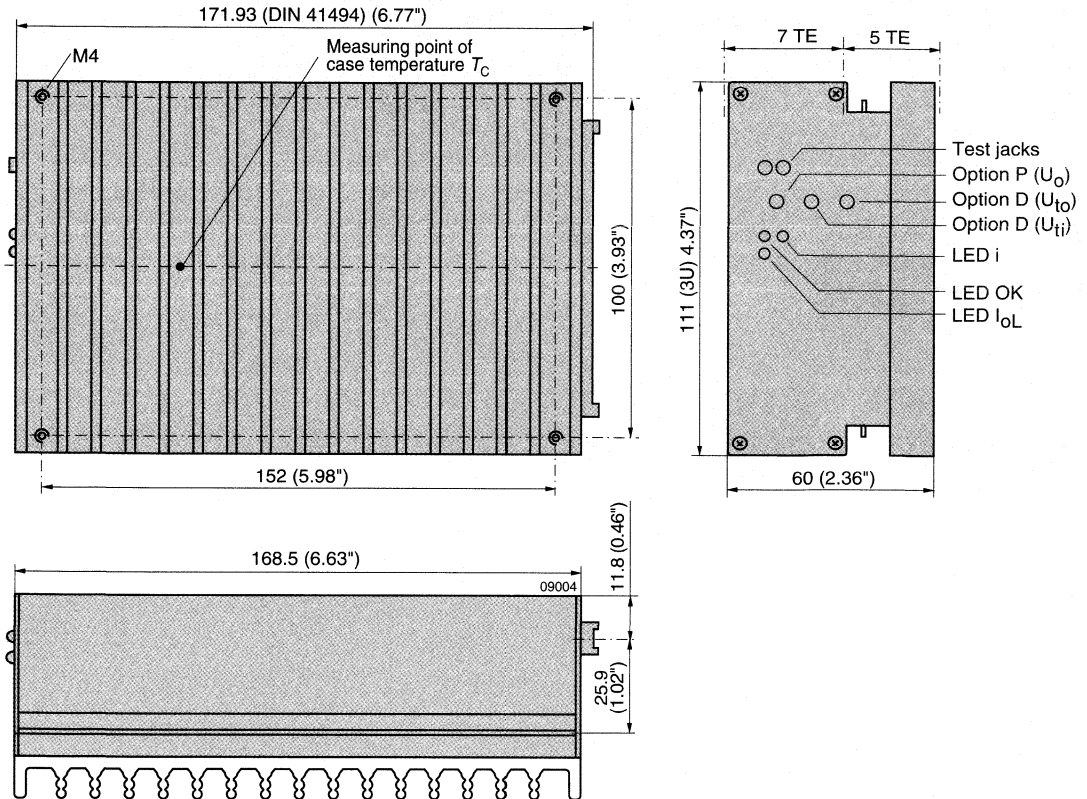
Pin allocation

Pin	LS 4000		LS 5000	
	LS 4000	LS 4000	LS 5000	LS 5000
4	Vo1+	Output 1	Vo2+	Output 2
6	Vo1+		Vo2+	
8	Vo1-	Output 1	Vo2-	Output 2
10	Vo1-		Vo2-	
12	S+	Sense	Vo1+	Output 1
14	S-	Sense	Vo1-	
16	R	Control of U_{o1}	R	Control of U_{o1}
18	i	Inhibit	i	Inhibit
20	D	Save data	D	Save data
	V	ACFAIL		
22	T	Current sharing	T	Current sharing
24	⊕	Protective earth	⊕	Protective earth
26	N~	Neutral	N~	Neutral
28	N~		N~	
30	P~	Phase	P~	Phase
32	P~		P~	



Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

Front panels 19" (Schroff/Intermas)

Mating H15 connectors with screw, solder, fast-on or press-fit terminals

Connector retention facilities and code key system for connector coding

Chassis or wall mounting plates for frontal access

Universal mounting brackets for chassis or DIN-rail mounting



Input voltage range from 85...255 V AC
 1 or 2 isolated outputs up to 48 V DC
 4 kV AC I/O electric strength test voltage

LGA C **UL** US CE

- Rugged electrical and mechanical design
- Integrated power factor correction
- Operating ambient temperature range -40...71 °C with convection cooling

Selection chart

Output 1		Output 2		Input voltage U_i [V AC]	Efficiency η_{min} [%]	Type	Options
$U_o \text{ nom}$ [V DC]	$I_o \text{ nom}$ [A]	$U_o \text{ nom}$ [V DC]	$I_o \text{ nom}$ [A]				
5.1	25	-	-	85...255	78	LK 4003-6R	-9, E, D, V, P, T, B1
12	12	-	-	85...255	85	LK 4301-7R	-9, E, D, P, T, B1
15	10	-	-	85...255	85	LK 4501-7R	-9, E, D, P, T, B1
24	6	-	-	85...255	86	LK 4601-7R	-9, E, D, P, T, B1
24	6	-	-	85...255	83	LK 5320-7R	-9, E, D, P, T, B1
30	5	-	-	85...255	83	LK 5540-7R	-9, E, D, P, T, B1
48	3	-	-	85...255	84	LK 5660-7R	-9, E, D, P, T, B1
12	6	12	6	85...255	83	LK 5320-7R	-9, E, D, P, T, B1
15	5	15	5	85...255	83	LK 5540-7R	-9, E, D, P, T, B1
24	3	24	3	85...255	84	LK 5660-7R	-9, E, D, P, T, B1

Input

Input voltage AC	wide input range	85...255 V AC
Input frequency		50/60 Hz
Power factor	per IEC/EN 61000-3-2	>95%
Inrush current limitation	by thermistor	

Output

Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to 86%
Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 0.6\% U_{o\text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 100 mV _{pp}
Line regulation	$U_{i\text{ min}}...U_{i\text{ max}}, I_{o\text{ nom}}$	typ. $\pm 0.1\%$
Load regulation	$U_{i\text{ nom}}, 0.1...I_{o\text{ nom}}$, symmetrical output load	typ. 0.4%
Minimum load	not required	0 A
Current limitation	rectangular U/I characteristic	typ. 110...100% $I_{o\text{ nom}}$
Operation in parallel	by current limitation	
Hold-up time	$U_{i\text{ nom}}, I_{o\text{ nom}}$	20 ms

Control and protection

Input fuse	not user accessible	4 AT
Input undervoltage lockout		typ. 80% $U_{i\text{ min}}$
Input overvoltage lockout		typ. 115% $U_{i\text{ max}}$
Input transient protection	varistor	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. 130% $U_{o\text{ nom}}$
Overtemperature	switch-off with auto restart	T_C typ. 100°C
Output voltage adjustment		0...110% $U_{o\text{ nom}}$
Inhibit	TTL input, output(s) disabled if open circuit	
Status indication	LEDs: OK, inhibit, overload	

Safety

Approvals	EN 60950, UL 1950, CSA 22.2 No. 950	
Class of equipment		class I
Protection degree		IP 30
Electric strength test voltage	I/case	2 kV AC
	I/O	4 kV AC
	O/case	1 kV AC
	O/O	0.1 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4 (8/15 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level 3 (10 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 4 (2/4 kV)	criterion A
Surge	IEC/EN 61000-4-5, level 3 (2 kV)	criterion A
Conducted disturbances	IEC/EN 61000-4-6, level 3 (10 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022	class B

Environmental

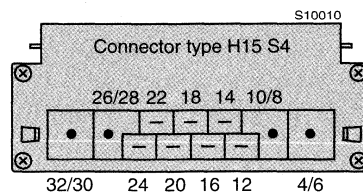
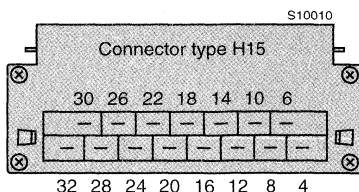
Operating ambient temperature	$U_{i\ nom}, I_{o\ nom}$, convection cooled	-25...71 °C
Operating case temperature T_C	$U_{i\ nom}, I_{o\ nom}$	-25...95 °C
Storage temperature	non operational	-40...100 °C
Damp heat	IEC/EN 60068-2-3, 93%, 40 °C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g_n
Shock	IEC/EN 60068-2-27, 6 ms	100 g_n
Bump	IEC/EN 60068-2-29, 6 ms	40 g_n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 $g_{n\ rms}$
MTBF	MIL-HDBK-217F, G_B , 40 °C	514'000 h

Options

Extended temperature range	-40...71 °C, ambient, operating	-9
Electronic inrush current limitation		E
Output voltage adjustment	40...100% $U_{o\ nom}$, excludes feature R and vice versa	P
Input and/or output undervoltage monitoring, excludes option V		D0...D9
Input and/or output undervoltage monitoring (VME), excludes option D		V0, V2, V3
Current sharing		T
Cooling plate		B1

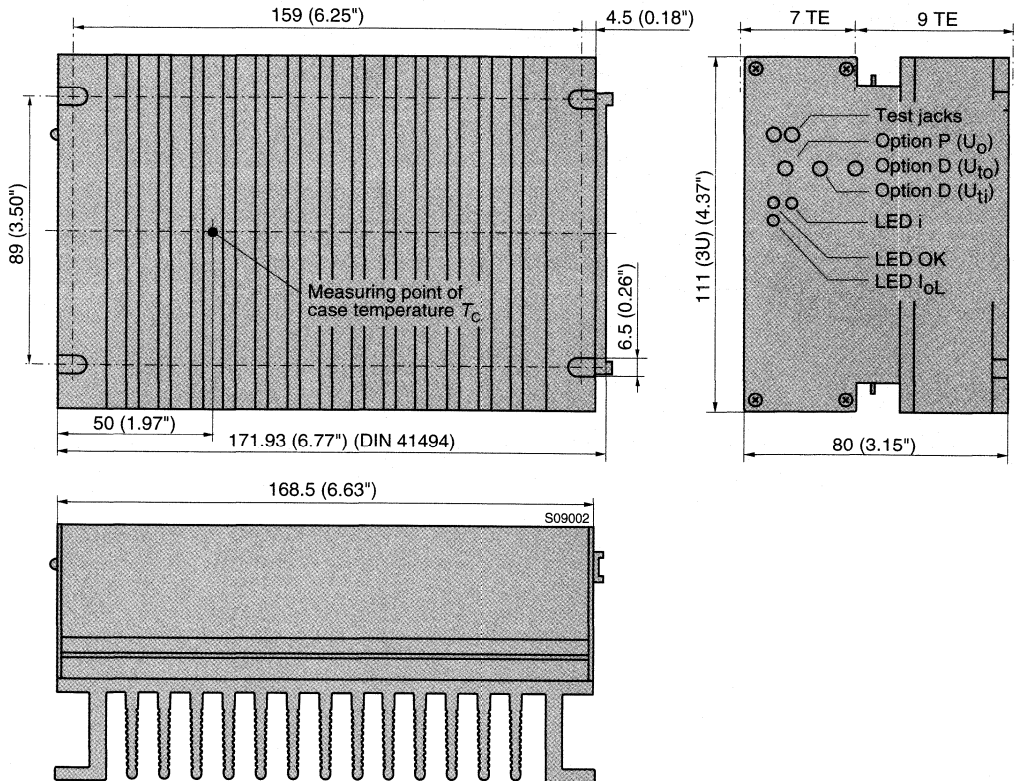
Pin allocation

Pin	LK 4003		LK 4301, LK 4501, LK 4601		LK 5000	
4	Vo1+	Output 1	Vo1+	Output 1	Vo2+	Output 2
6			Vo1+		Vo2+	
8	Vo1-	Output 1	Vo1-	Output 1	Vo2-	Output 2
10			Vo1-		Vo2-	
12	S+	Sense	S+	Sense	Vo1+	Output 1
14	S-	Sense	S-	Sense	Vo1-	Output 1
16	R	Control of U_{o1}	R	Control of U_{o1}	R	Control of U_{o1}
18	i	Inhibit	i	Inhibit	i	Inhibit
20	D	Save data	D	Save data	D	Save data
	V	ACFAIL				
22	T	Current sharing	T	Current sharing	T	Current sharing
24	⊕	Protective earth	⊕	Protective earth	⊕	Protective earth
26	N~	Input	N~	Input	N~	Input or Neutral
28			N~		N~	
30	P~	Input	P~	Input	P~	Input or Phase
32			P~		P~	



Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

- Front panels 19" (Schroff/Intermas)
- Mating H15/H15S4 connectors with screw, solder, fast-on or press-fit terminals
- Connector retention facilities and code key system for connector coding
- Chassis or wall mounting plates for frontal access
- Universal mounting brackets for chassis or DIN-rail mounting



Input voltage range from 85...255 V AC
 1 or 2 isolated outputs up to 48 V DC
 4 kV AC I/O electric strength test voltage



- Rugged electrical and mechanical design
- Wide input-frequency range from 47...440 Hz
- Operating ambient temperature range -40...71 °C with convection cooling

Selection chart

Output 1		Output 2		Input voltage	Efficiency	Type	Options
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	U_i [V AC]	η_{min} [%]		
5.1	25	-	-	85...255	79	LK 1001-7R	-9, E, D, V, P, T, B1
12	12	-	-	85...255	84	LK 1301-7R	-9, E, D, P, T, B1
15	10	-	-	85...255	84	LK 1501-7R	-9, E, D, P, T, B1
24	6	-	-	85...255	85	LK 1601-7R	-9, E, D, P, T, B1
24	6	-	-	85...255	81	LK 2320-7R	-9, E, D, P, T, B1
30	5	-	-	85...255	83	LK 2540-7R	-9, E, D, P, T, B1
48	3	-	-	85...255	83	LK 2660-7R	-9, E, D, P, T, B1
12	6	12	6	85...255	81	LK 2320-7R	-9, E, D, P, T, B1
15	5	15	5	85...255	83	LK 2540-7R	-9, E, D, P, T, B1
24	3	24	3	85...255	83	LK 2660-7R	-9, E, D, P, T, B1

Input

Input voltage AC	wide input range	85...255 V AC
Input frequency		47...440 Hz
Input voltage DC		88...372 V DC
Inrush current limitation	by thermistor	

Output

Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to 85%
Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 0.6\% U_{o\text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 90 mV _{pp}
Line regulation	$U_{i\text{ min}}...U_{i\text{ max}}, I_{o\text{ nom}}$	typ. $\pm 0.3\% U_{o\text{ nom}}$
Load regulation	$U_{i\text{ nom}}, 10...100\% I_{o\text{ nom}}$, symmetrical output load	typ. 0.5% $U_{o\text{ nom}}$
Minimum load	not required	0 A
Current limitation	rectangular U/I characteristic	typ. 110% $I_{o\text{ nom}}$
Operation in parallel	by current limitation	
Hold-up time	$U_{i\text{ nom}}, I_{o\text{ nom}}$	70 ms

Control and protection

Input fuse	not user accessible	4 AT
Input undervoltage lockout		typ. 90% $U_{i\text{ min}}$
Input overvoltage lockout		typ. 109% $U_{i\text{ max}}$
Input transient protection	varistor	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. 130% $U_{o\text{ nom}}$
Overtemperature	switch-off with auto restart	T_C typ. 100°C
Output voltage adjustment		0...110% $U_{o\text{ nom}}$
Inhibit	TTL input, output(s) disabled if open circuit	
Status indication	LEDs: OK, inhibit, overload	

Safety

Approvals	EN 60950, UL 1950, CSA 22.2 No. 950	
Class of equipment		class I
Protection degree		IP 30
Electric strength test voltage	I/case	2 kV AC
	I/O	4 kV AC
	O/case	1 kV AC
	O/O	0.1 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4 (8/15 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level x (20 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 4 (2/4 kV)	criterion A
Surge	IEC/EN 61000-4-5, level 3 (2 kV)	criterion A
Conducted disturbances	IEC/EN 61000-4-6, level 3 (10 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022	class B

Environmental

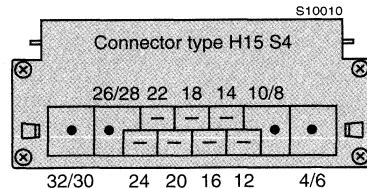
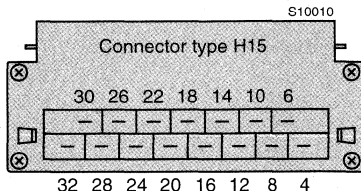
Operating ambient temperature	$U_{i\text{ nom}}, I_{o\text{ nom}}$, convection cooled	-25...71°C
Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-25...95°C
Storage temperature	non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g _n
Shock	IEC/EN 60068-2-27, 6 ms	100 g _n
Bump	IEC/EN 60068-2-29, 6 ms	40 g _n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 g _{n rms}
MTBF	MIL-HDBK-217F, G _B , 40°C	500'000 h

Options

Extended temperature range	-40...71°C, ambient, operating	-9
Electronic inrush current limitation		E
Output voltage adjustment	40...110% $U_{o\text{ nom}}$, excludes features R and vice versa	P
Input and/or output undervoltage monitoring, excludes option V		D0...D9
Input and/or output undervoltage monitoring (VME), excludes option D		V0, V2, V3
Current sharing		T
Cooling plate		B1

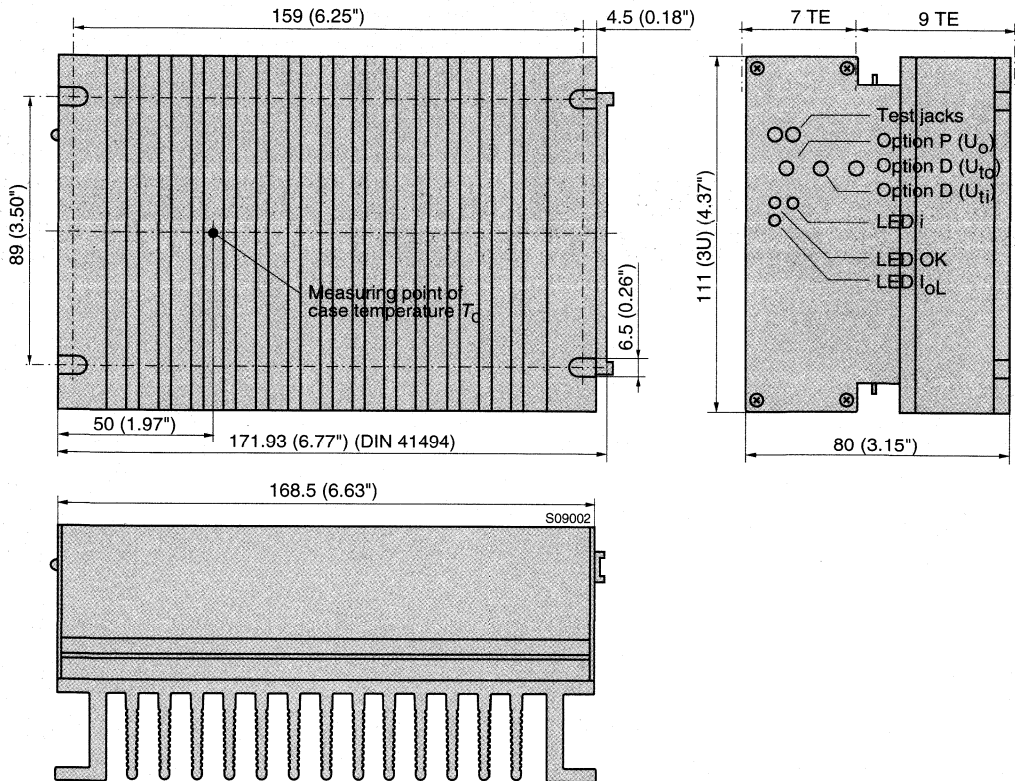
Pin allocation

Pin	LK 1001		LK 1301, LK 1501, LK 1601		LK 2000	
4	Vo1+	Output 1	Vo1+	Output 1	Vo2+	Output 2
6			Vo1+		Vo2+	
8	Vo1-	Output 1	Vo1-	Output 1	Vo2-	Output 2
10			Vo1-		Vo2-	
12	S+	Sense	S+	Sense	Vo1+	Output 1
14	S-	Sense	S-	Sense	Vo1-	Output 1
16	R	Control of U_{o1}	R	Control of U_{o1}	R	Control of U_{o1}
18	i	Inhibit	i	Inhibit	i	Inhibit
20	D	Save data	D	Save data	D	Save data
	V	ACFAIL				
22	T	Current sharing	T	Current sharing	T	Current sharing
24	⊕	Protective earth	⊕	Protective earth	⊕	Protective earth
26	N~	Input	N~	Input	N~	Input or Neutral
28			N~		N~	
30	P~	Input	P~	Input	P~	Input or Phase
32			P~		P~	



Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

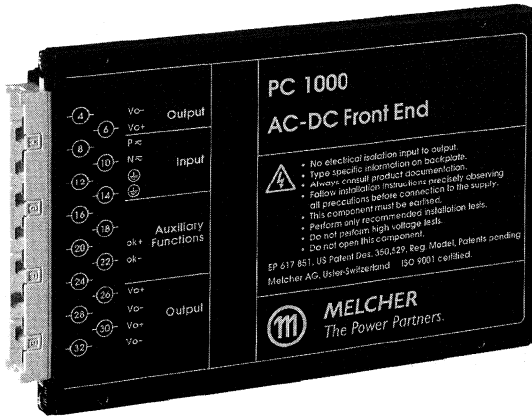
Front panels 19" (Schroff/Intermas)

Mating H15/H15S4 connectors with screw, solder, fast-on or press-fit terminals

Connector retention facilities and code key system for connector coding

Chassis or wall mounting plates for frontal access

Universal mounting brackets for chassis or DIN-rail mounting



Converter with single stage AC to DC conversion and PFC
 No electrical isolation input to output
 Input voltage range 85(95)...255 V AC

LGA CE

- Extremely slim case (4TE), fully enclosed
- Single outputs for 72 and 85 V DC loads
- Ideal to supply isolated P series DC-DC converters
- Operating ambient temperature range -40...71 °C with convection cooling

Selection chart

Output 1		Input voltage	Rated power	Efficiency	Type	Options
$U_o \text{ nom}$ [V DC]	$I_o \text{ nom}$ [A]	U_i [V AC]	$P_o \text{ max}$ [W]	η [%]		
72	2.7	85...255	190	94	LPC 1901-7D	-9
85	2.7	95...255	230	94	LPC 1902-7D	-9

Input

Input voltage	continuous range	85(95)...255 V AC
Input frequency		47...63 Hz
Inrush current	extremely low input capacitance of 1.25 µF	negligible

Output

Efficiency	$U_i \text{ nom}, I_o \text{ nom}$	94%
Output voltage setting accuracy	$U_i \text{ nom}, I_o \text{ nom}$	$\pm 2 \text{ V } U_o \text{ nom}$
Output voltage noise	IEC/EN 61204, low frequency	typ. 5 V _{pp}
	IEC/EN 61204, switching frequency	typ. 25 mV _{pp}
Line regulation	$U_i \text{ min} \dots U_i \text{ max}, I_o \text{ nom}$	typ. $\pm 1 \text{ V}$
Load regulation	$U_i \text{ nom}, 10 \dots 100\% I_o \text{ nom}$	typ. 250 mV
	$U_i \text{ nom}, 0 \dots 10\% I_o \text{ nom}$	typ. 700 mV
Minimum output current	not required	0 A
Power limitation	approx. 1 s, restart after 3 s	typ. 240 W
Current limitation	approx. 1 s, restart after 3 s	typ. 200% $I_o \text{ nom}$
Operation in parallel	by load regulation	up to 5 units
Hold-up time	$U_o = 72 \dots 66 \text{ V DC}, P_o = 190 \text{ W}$	typ. 4.3 ms
	$U_o = 85 \dots 40 \text{ V DC}, P_o = 230 \text{ W}$	typ. 24 ms

Protection

Input undervoltage lockout		typ. 68 V AC
Input overvoltage lockout		typ. 306 V AC
Input transient protection	two varistors	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. 150% $U_{o,nom}$
Overtemperature	switch-off with auto restart	T_C typ. 100°C

Control

Status indication	LED: OK	
Isolated open collector signal	In OK/Out OK	feature D

Safety

Approvals	EN 60950, UL 1950, CSA C22.2 No. 950	
Class of equipment		class I
Protection degree		IP 40
Electric strength test voltage	I/case and O/case	1.5 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, contact/air, level 2/3 (4/8 kV)	criterion B
Electromagnetic field	IEC/EN 61000-4-3, level 2 (3 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 3 (2 kV)	criterion B
Surge	IEC/EN 61000-4-5, input, level 2/3 (1/2 kV)	criterion B
Conducted disturbances	IEC/EN 61000-4-6, level 2 (3 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B
	CISPR 14/EN 55014, radiated	below limit

Environmental

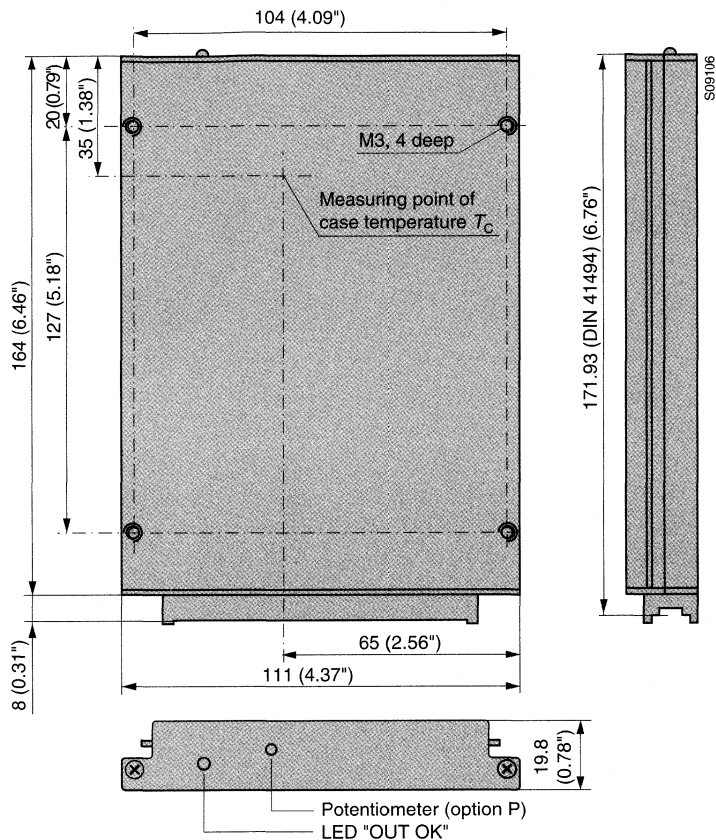
Operating ambient temperature	$U_{i,nom}$, $I_{o,nom}$, convection cooled	-25...71°C
Operating case temperature T_C	$U_{i,nom}$, $I_{o,nom}$	-25...95°C
Storage temperature	non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...150 Hz	0.35 mm/5 g_n
Shock	IEC/EN 60068-2-27, 11 ms	50 g_n
Bump	IEC/EN 60068-2-29, 11 ms	25 g_n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 g_n rms
MTBF	MIL-HDBK-217E, G_B , 40°C, notice 2	763'000 h

Options

Extended temperature range	-40...71°C, ambient, operating	-9
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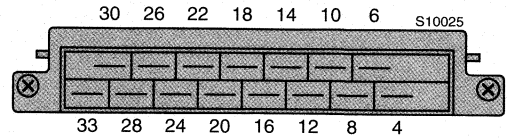
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Pin allocation

Pin no.	Electrical determination	
4	Output voltage negative	Vo-
6	Output voltage positive	Vo+
8	Phase	P~
10	Neutral	N~
12	Protective earth	⊕
14	Protective earth	⊕
16	-	n.c.
18	-	n.c.
20	Output good	Out OK+
22	Output good	Out OK-
24	-	n.c.
26	Output voltage positive	Vo+
28	Output voltage negative	Vo-
30	Output voltage positive	Vo+
32	Output voltage negative	Vo-



Accessories

Front panels 19" (Schroff/Intermas)

Mating H11 connectors with screw, solder, fast-on or press-fit terminals

Connector retention facilities and code key system for connector coding

Flexible PCB for connecting the converter via an H11 connector, if mounted on a PCB

Chassis or wall mounting plates for frontal access

Universal mounting brackets for chassis or DIN-rail mounting



Input voltage from 187...255 V AC
 1 or 2 isolated outputs up to 56.5 V DC
 4 kV AC I/O electric strength test voltage



- Rugged electrical and mechanical design
- Integrated power factor correction
- No derating over ambient temperature range
- Special battery charging features

Selection chart

Output 1		Output 2		Input voltage	Rated power	Type	Options
$U_o \text{ nom}$ [V DC]	$I_o \text{ nom}$ [A]	$U_o \text{ nom}$ [V DC]	$I_o \text{ nom}$ [A]	U_i [V AC]	$P_o \text{ tot}$ [W]		
24	9.6	-	-	187...255	230	LKP 5662-7R	E, D, P, T, B1
24	10.4	-	-	187...255	250	LKP 5660-6R	E, D, P, T, B1
24	11.6	-	-	187...255	278	LKP 5661-5R	E, D, P, T, B1
25.25...28.25	8	-	-	187...255	226	LKP 5742-7R	E, D, P, T, B1
25.25...28.25	9	-	-	187...255	254	LKP 5740-6R	E, D, P, T, B1
25.25...28.25	10	-	-	187...255	282	LKP 5741-5R	E, D, P, T, B1
48	4.8	-	-	187...255	230	LKP 5662-7R	E, D, P, T, B1
48	5.2	-	-	187...255	250	LKP 5660-6R	E, D, P, T, B1
48	5.8	-	-	187...255	278	LKP 5661-5R	E, D, P, T, B1
50.5...56.5	4	-	-	187...255	226	LKP 5742-7R	E, D, P, T, B1
50.5...56.5	4.5	-	-	187...255	254	LKP 5740-6R	E, D, P, T, B1
50.5...56.5	5	-	-	187...255	282	LKP 5741-5R	E, D, P, T, B1
24	4.8	24	4.8	187...255	230	LKP 5662-7R	E, D, P, T, B1
24	5.2	24	5.2	187...255	250	LKP 5660-6R	E, D, P, T, B1
24	5.8	24	5.8	187...255	278	LKP 5661-5R	E, D, P, T, B1

Input

Input voltage AC		187...255 V AC
Input frequency		50/60 Hz
Power factor	per IEC/EN 61000-3-2	>95%
Inrush current limitation	by thermistor	

Output

Efficiency	$U_{i \text{ nom}}, I_{o \text{ nom}}$	up to 86%
Output voltage setting accuracy	$U_{i \text{ nom}}, I_{o \text{ nom}}$	$\pm 0.6\% U_{o \text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. $0.6\% U_{o \text{ nom}}$
Line regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, I_{o \text{ nom}}$	typ. $\pm 0.1\% U_{o \text{ nom}}$
Load regulation	$U_{i \text{ nom}}, 0.1 \dots I_{o \text{ nom}}$, symmetrical output load	typ. 0.4%
Minimum load	not required	0 A
Current limitation	foldback U/I characteristic	typ. 110...100% $I_{o \text{ nom}}$
Operation in parallel	by current limitation	
Hold-up time	$U_{i \text{ nom}}, I_{o \text{ nom}}$	9 ms

Control and protection

Input fuse	not user accessible	4 AT
Input undervoltage lockout		typ. 80% $U_{i \text{ min}}$
Input overvoltage lockout		typ. 115% $U_{i \text{ max}}$
Input transient protection	varistor	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. 130% $U_{o \text{ nom}}$
Overtemperature	switch-off with auto restart	T_C typ. 100°C
Output voltage adjustment		0...110% $U_{o \text{ nom}}$
Inhibit	TTL input, output(s) disabled if open circuit	
Status indication	LEDs: OK, inhibit, overload	

Safety

Approvals	EN 60950, UL 1950, CSA 22.2 No. 950	
Class of equipment		class I
Protection degree		IP 30
Electric strength test voltage	I/case	2 kV AC
	I/O	4 kV AC
	O/case	1 kV AC
	O/O	0.1 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4 (8/15 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level 3 (10 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 4 (2/4 kV)	criterion A
Surge	IEC/EN 61000-4-5, level 3 (2 kV)	criterion B
Conducted disturbances	IEC/EN 61000-4-6, level 3 (10 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022	class B

Environmental

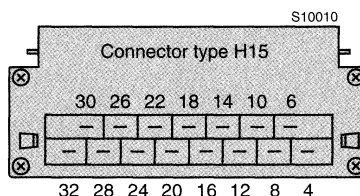
Operating ambient temperature	$U_{i\,nom}, I_{o\,nom}$, convection cooled, -5	-25...50°C
	$U_{i\,nom}, I_{o\,nom}$, convection cooled, -6	-25...60°C
	$U_{i\,nom}, I_{o\,nom}$, convection cooled, -7	-25...71°C
Operating case temperature T_C	$U_{i\,nom}, I_{o\,nom}$	-25...90°C
Storage temperature	non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g_n
Shock	IEC/EN 60068-2-27, 6 ms	100 g_n
Bump	IEC/EN 60068-2-29, 6 ms	40 g_n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 $g_{n\,rms}$
MTBF	MIL-HDBK-217F, G_B , 40°C	514'000 h

Options

Electronic inrush current limitation		E
Output voltage adjustment	40...110% $U_{o\,nom}$, excludes feature R and vice versa	P
Input and/or output undervoltage monitoring		D0...D9
Current sharing		T
Cooling plate		B1

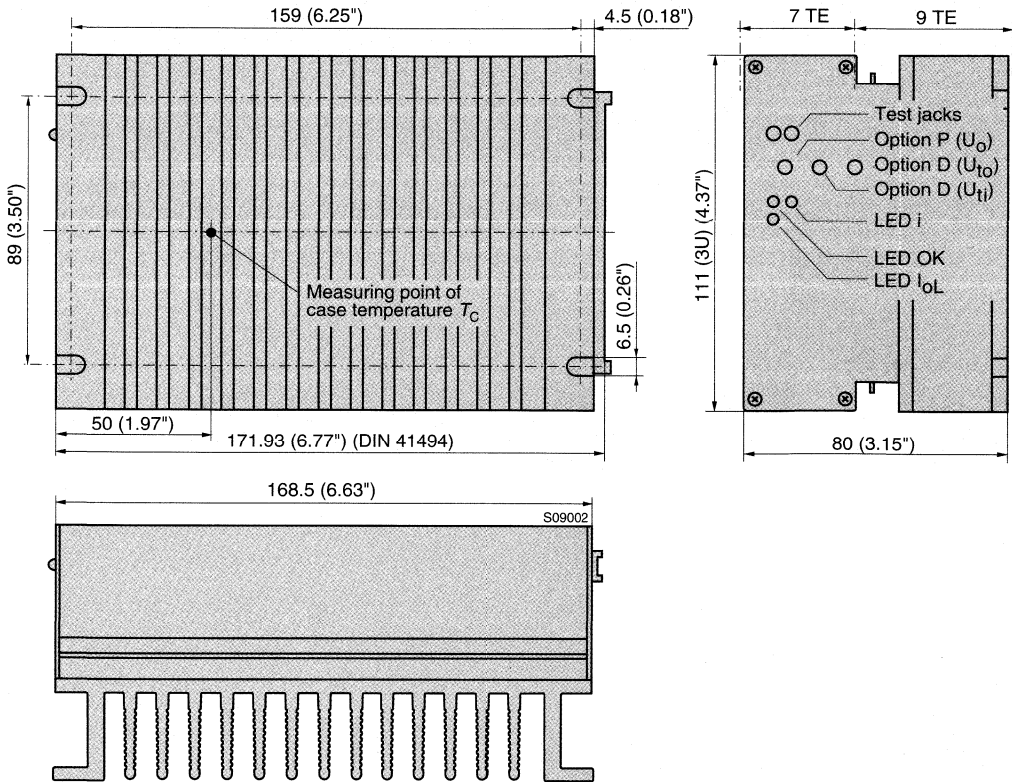
Pin allocation

Pin	LKP 5000	
4	Vo2+	Output 2
6	Vo2+	Output 2
8	Vo2-	Output 2
10	Vo2-	Output 2
12	Vo1+	Output 1
14	Vo1-	Output 1
16	R	Control of U_{o1}
18	i	Inhibit
20	D	Save data
22	T	Current sharing
24	⊕	Protective earth
26	N~	Neutral
28	N~	Neutral
30	P~	Phase
32	P~	Phase



Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

- Front panels 19" (Schroff/Intermas)
- Mating H15 connectors with screw, solder, fast-on or press-fit terminals
- Connector retention facilities and code key system for connector coding
- Chassis or wall mounting plates for frontal access
- Universal mounting brackets for chassis or DIN-rail mounting
- Temperature sensor for battery charger



Universal input range 70...255V AC with PFC
 Single outputs up to 56.5 V DC
 4 kV AC I/O electric strength test voltage



- Rugged electrical and mechanical design, hot swappable
- Battery chargers for 24, 36 and 48 V lead acid batteries with remote temperature control
- Operating ambient temperature range $-25...71^{\circ}\text{C}$ with convection cooling

Selection chart

Output Voltage at $0.5 \times I_o \text{ nom}$ [V DC]	Temperature coefficient of output [mV/K]	Output current $I_o \text{ nom}$ [A]	Input voltage U_i [V AC]	Type	Options
24.25 24.25	-5 -5	16 16	70...140 85...255	UT 1201-7 LT 1201-7	B1 B1
25.25...28.25 25.25...28.25	-3 -3	14.5 14.5	70...140 85...255	UT 1240-7Z LT 1240-7Z	B1, D B1, D
37.9...42.4	-3	11	85...255	LT 1840-7Z	B1, D
48 48	-5 -5	11 11	70...140 85...255	UT 1702-7 LT 1702-7	B1 B1
50.5...56.5 50.5...56.5	-3 -3	10.2 10.2	70...140 85...255	UT 1740-7Z LT 1740-7Z	B1, D B1, D
54.5 54.5	-5 -5	10 10	70...140 85...255	UT 1701-7 LT 1701-7	B1 B1

Input

Input voltage AC		refer to selection chart
Input frequency		47/63 Hz
Power factor	active PFC	>0.96
Inrush current	virtually no inrush current	

Output

Efficiency	$U_{i \text{ nom}}, I_{o \text{ nom}}$	up to 93%
Output voltage setting accuracy	$U_{i \text{ nom}}, 50\% I_{o \text{ nom}}$	$\pm 0.25 \text{ V}$
Output voltage noise (total)	IEC/EN 61204, including a sinusoidal output ripple at twice the line frequency	$1.1 \text{ V}_{\text{pp}}$
Line regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, I_{o \text{ nom}}$	typ. 1.6%
Load regulation	$U_{i \text{ nom}}, 1 \dots 100\% I_{o \text{ nom}}$	typ. 2.5%
Minimum load	not required	
Current limitation	constant power, constant current characteristic	typ. 145% $I_{o \text{ nom}}$
Operation in parallel	enabled by droop current share	
Hold-up time	$I_{o \text{ nom}}$, output voltage decrease to 85% $U_{o \text{ nom}}$	16 ms

Protection

Input fuse	built-in, UT/LT	10 A slow blow/6.3 A fast
Reverse polarity	bridge rectifier	
Input undervoltage lockout		typ. 90% $U_{i \text{ min}}$
Input overvoltage lockout		typ. 104% $U_{i \text{ max}}$
Input transient	varistor	
Output	no-load, overload and short circuit proof	
Output overvoltage	second control loop	30/60 V SELV
Overtemperature	switch-off with auto restart	T_C typ. 100°C

Control

Output voltage adjustment	U_{Cr} input for remote control	93...104% $U_{o \text{ nom}}$
Inhibit	output enabled if inhibit left open	
Output undervoltage monitoring	threshold level externally adjustable	
Status monitoring	system good (Sys OK, U_o OK, no int. or external fault)	
Status indication	LEDs: Sys OK, U_o OK and Error	

Safety

Approvals	EN 60950, UL 1950, CSA 22.2 No. 950	
Electric strength test voltage	class I, I/case	2 kV AC
	class I, I/O	4 kV AC
	class I, O/case	1 kV AC
Degree of protection		IP 30

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4, contact/air	8/15 kV, criterion A
Electromagnetic field	IEC/EN 61000-4-3, level 3	10 V/m, criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 4, capacitive/direct	2/4 kV, criterion A
Surge	IEC/EN 61000-4-5, level 3	2 kV, criterion A
Conducted disturbances	IEC/EN 61000-4-6, level 3	10 V _{rms} , criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

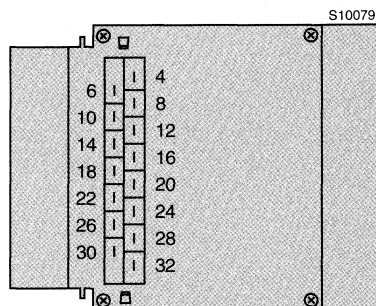
Operating ambient temperature	$U_{I\text{ nom}}, I_{O\text{ nom}}$, convection cooled	-25...71 °C
Operating case temperature T_C	$U_{I\text{ nom}}, I_{O\text{ nom}}$	-25...95 °C
Storage temperature	non operational	-40...100 °C
Damp heat	IEC/EN 60068-2-3, 93%, 40 °C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 2...28/28...2000 Hz	1.5 mm/5 g _n
Shock	IEC/EN 60068-2-27, 6 ms	100 g _n
Random vibration	IEC/EN 60068-2-64, 20...500 Hz	4.9 g _{n rms}
MTBF	MIL-HDBK-217E, G _B , 40 °C	198'000 h

Options

Remote bus voltage monitoring	D
Battery cell voltage selector switch	Z
Mounting plate for chassis mounting	B1

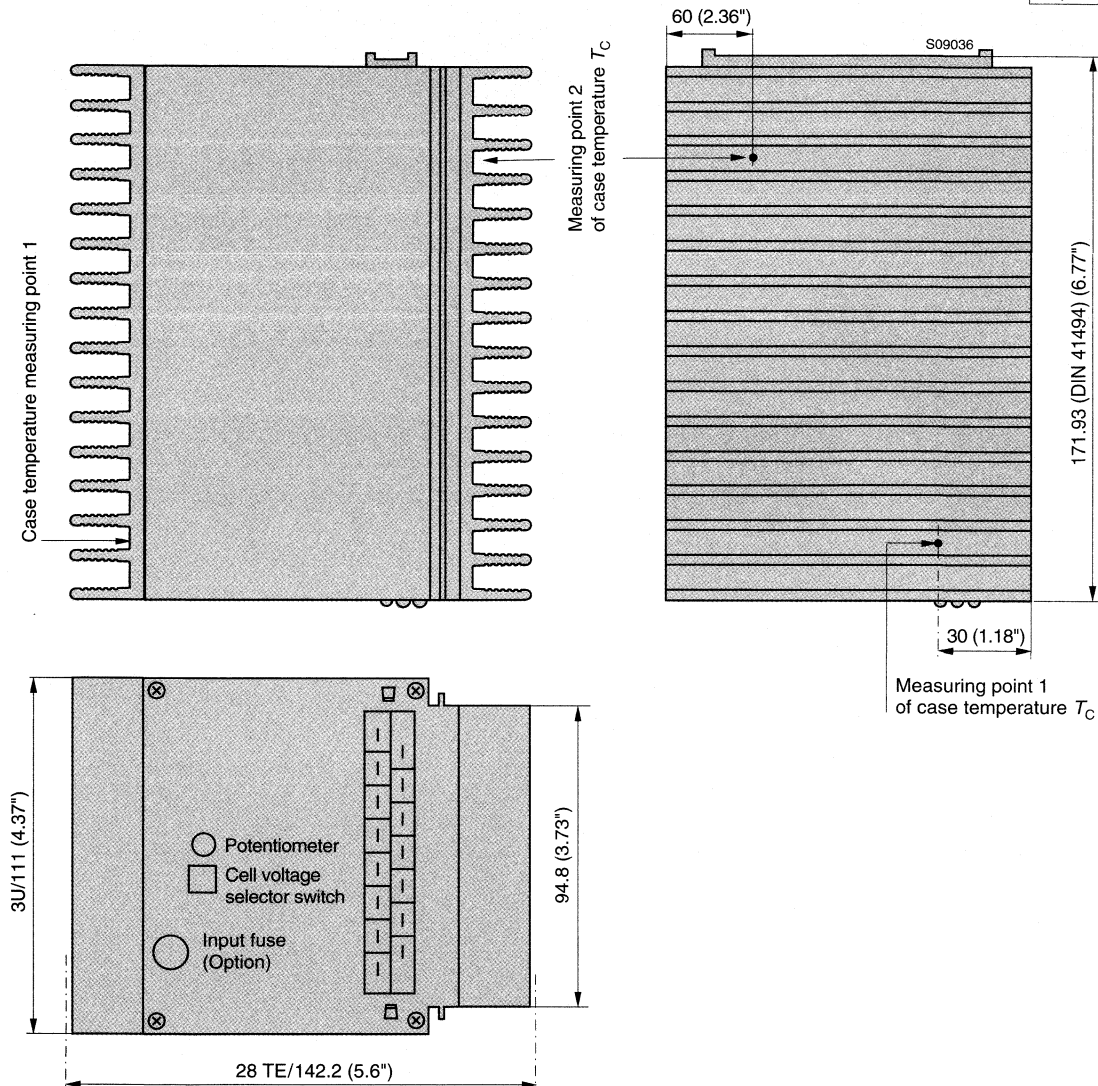
Pin allocation

Pin	Electrical determination	Design.
4	Phase	P~
6	Neutral	N~
8	Protective earth	⊕
10	Protective earth	⊕
12	Output voltage positive	Vo+
14	Output voltage positive	Vo+
16	Hot plug-in contact, positive	HC+
18	Hot plug-in contact, negative	HC-
20	Output voltage negative	Vo-
22	Output voltage negative	Vo-
24	System good signal input	Sys In
26	System good signal output	Sys Out
28	Inhibit input or remote control input	i/U _{Cr}
30	Power down signal	D
32	Power down signal threshold of U _o	D set



Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

Front panels 19" (Schroff)

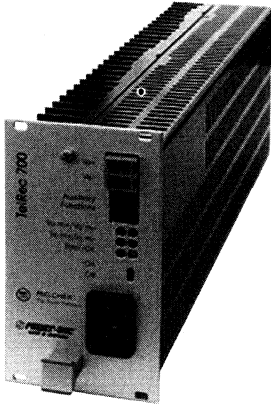
Mating H15 connectors with screw, solder, fast-on or press-fit terminals

Connector retention facilities and code key system for connector coding

Back planes for system integration

19" racks for system integration

Temperature sensors for battery charging



Input range 150...264 V AC with PFC
 48 V battery charger
 3 kV AC I/O electric strength test voltage



Approvals pending



- U/P/I output characteristic
- High power density 300 W/dm³
- Overtemperature, overload and overvoltage protection

Selection chart

Output 1		Input voltage	Rated power	Efficiency	Type
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	U_i [V AC]	$P_{o \text{ tot}}$ [W]	η_{typ} [%]	
53.5	12.6	150...264	680	90	LB 1740-6R

Input

Input voltage	150...264 V AC
	with full output power
	187...264 V AC
Input frequency	47...63 Hz
Inrush current limitation	ETSI 300 132-1, at 230 V AC
	<35 A
Input harmonics	IEC/EN 61000-3-2
	class D
Power factor	$U_{i \text{ nom}}, I_{o \text{ nom}}$
	>0.98
Efficiency	$U_{i \text{ nom}}, I_{o \text{ nom}}$
	>90%

Output

Nominal output voltage	$U_{i \text{ nom}}, 50\% I_{o \text{ nom}}, T_C = 25^\circ\text{C}$	53.5 ±0.1 V
Nominal output power	power limitation	680 W
Current limitation	U/P/I characteristic	15.5 A
Static line and load regulation	$U_{i \text{ min}}...U_{i \text{ max}}, U_{i \text{ nom}}, 5...100\% I_{o \text{ nom}}$	typ. ±300 mV
Output voltage ripple and noise	$U_{i \text{ nom}}, I_{o \text{ nom}}, 20 \text{ MHz bandwidth}$	<120 mV _{pp}
Psophometric ripple	A-filter acc. CCITT	<2 mV _{rms}
Minimum load	not required	0 A
Auxiliary supply		11.5 ±1 V, 50 mA

Protection

Input fuses	not user accessible (fuses in both lines)	6.3 AT
Input transient protection	varistor	
Output	no-load, overload and short circuit proof	
Overtemperature	automatic output power derating	$T_C = 90^\circ\text{C}$

Control

Output voltage adjustment	by remote control, $U_{cr} = 0...10\text{ V}$	44...59.0 V DC
ON/OFF switch		
Shut-down input	TTL compatible signal	
Status monitoring	input OK output, module OK output	
Output voltage monitor	$U_{UoM} = 0...10\text{ V}$ for $U_o = 0...60\text{ V}$	
Output current monitor	$I_{IoM} = 0...10\text{ V}$ for $I_o = 0...20\text{ A}$	
Current share	up to 6 units in parallel	$\pm 50\text{ W}$
Status indication	LEDs: OK, error	

Safety and EMC

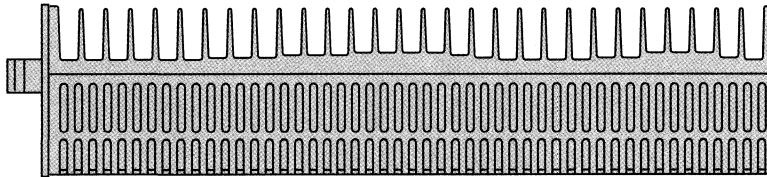
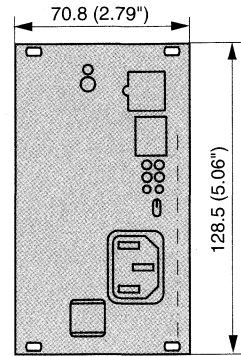
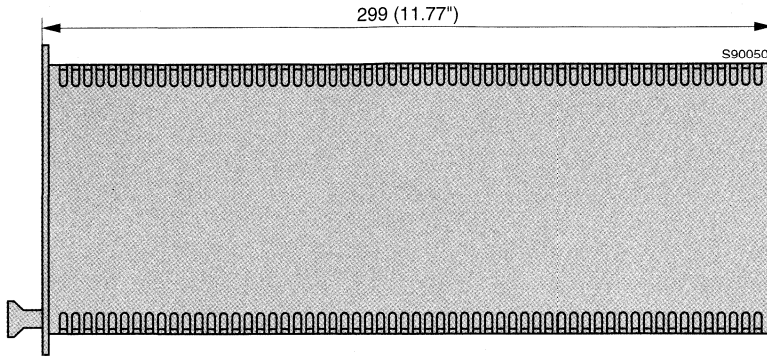
Approvals in progress	EN 60950, UL 1950, CSA 22.2 No. 950	
Protection degree		IP 20
Electric strength test voltage	class I, I/case	1.5 kV AC
	class I, I/O	3 kV AC
	class I, O/case	1 kV AC
Electrostatic discharge	IEC/EN 61000-4-2, level 3	4/8 kV, criterion B
Electromagnetic field	IEC/EN 61000-4-3, level 2	3 V/m, criterion A
Electr. fast transients/burst	IEC/EN 61000-4-4, level 4	4 kV, criterion B
Surge	IEC/EN 61000-4-5, level 4	4 kV, criterion B
Electromagnetic emissions	CISPR 22/EN 55022, conducted and radiated	class B

Environmental specifications

Operating temperature	$U_{I\text{ nom}}, I_{O\text{ nom}}$, cooling by forced air flow 1 m/s	$-25...60^\circ\text{C}$
Storage temperature	non operational	$-40...90^\circ\text{C}$
Relative humidity	non condensing	93%
Shock	IEC/EN 60068-2-27, 11 ms	15 g_n
Bump	IEC/EN 60068-2-29, 6 ms	10 g_n
Sinusoidal vibration	IEC/EN 60068-2-6, 8.2...58.1/58.1...500 Hz	1 $g_n/2\text{ }g_n$
Random vibration	IEC/EN 60068-2-64, 10...200/200...2000 Hz	0.01/0.003 g^2/Hz

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



AMP 558065 Western connector

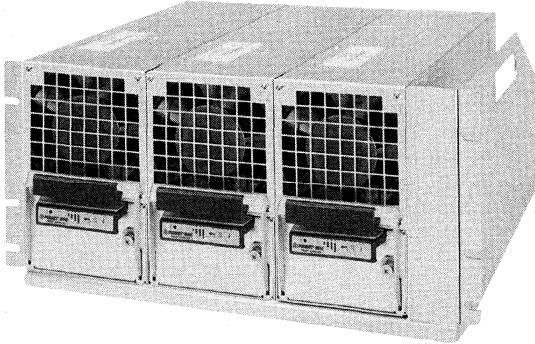
Pin	Destination	Description
1	U_{aux}	Auxiliary voltage (12 V, 50 mA)
2	G	Reference ground
3	SD	Shut down input
4	D	Module OK
5	AC OK	AC input OK
6	U_{cr}	Remote control input
7	U_{oM}	Output voltage monitor
8	I_{oM}	Output current monitor
9	T or Uh	Current sharing or Aux.
10	n.c.	Open circuit

Phoenix Power-Combicon connector

Pin	Designation
1	Vi+
2	Vi-

Accessories

Temperature sensor for battery charging



Input voltage range 85...528 V AC
Output 24 or 48 V DC



- Excellent for Distributed Power Architecture (DPA) applications
- Current share and monitoring, status indicator signals and LED's
- 3U and 5U heights for ease of rack mounting

Selection chart

Output		Input voltage U_i [V AC]	Input phases	Type	
$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]			Chassis mountable	Hot pluggable
24	33.6	85...264	1	FXC 1000-24	FXP 1000-24
24	200	180...264/342...528	3	FXC 6000-24	FXP 6000-24
48	21	85...264	1	FXC 1000-48	FXP 1000-48
48	125	180...264/342...528	3	FXC 6000-48	FXP 6000-48

Input

Input voltage	FXC/FXP 1000	85...264 V AC, 1 phase
	FXC/FXP 6000	180...264/342...528 V AC, 3 phase
Input frequency	47...63 Hz	
Power factor	IEC/EN 61000-3-2 (FXC/FXP 1000) >0.98	

Output

Efficiency	full load, nominal line input, 24 V DC out	nom. 86%
	48 V DC out	nom. 89%
Output voltage ripple and noise	peak to peak, 20 MHz bandwidth	max. 1%
Line regulation		max. 0.15%
Load regulation	with remote sense connected	max. 0.2%
	with remote sense not connected	max. 0.75%
	with droop current sharing	max. $\pm 2.2\%$
Minimum load	none required	
Hold-up time	>23 ms	
Auxiliary power	isolated 12 V DC source FXC/FXP 1000	100 mA
	FXC/FXP 6000	500 mA

Protection

Output overload	straight line overcurrent and short circuit	
Output overvoltage	latch style	
Overtemperature	advance warning before shutdown	100 ms

Interface and control

Input power fail warning	TTL compatible signal, warning time	5 ms
Remote sense	max. voltage compensation	1 V
Current share	3 rd wire accuracy, as % of full load	2.5%
	max. number of units in parallel	30
Output good	TTL compatible signal	
Inhibit	logic high enables	
Current monitor	analog output accuracy	2.5%
Power supply present signal		
Output interlock signal		

Safety and EMC

Agency approvals	UL 1950; CSA 22.2 No. 234/950; EN 60950 (TUV); CE	
Electrostatic discharge	IEC/EN 61000-4-2, level 4	8 kV
Radiated susceptibility	IEC/EN 61000-4-3, level 3	10 V/m
Electr. fast transients/burst	IEC/EN 61000-4-4, level 4	±4kV
Input surge	IEC/EN 61000-4-5, level 4	2 kV/4 kV
Voltage sag immunity	SEMI F47-0999, no output voltage interruption	
Electromagnetic emissions	CISPR 22/EN 55022, conducted FXC/FXP 1000	level B
	CISPR 22/EN 55022, conducted FXC/FXP 6000	level A

Environmental

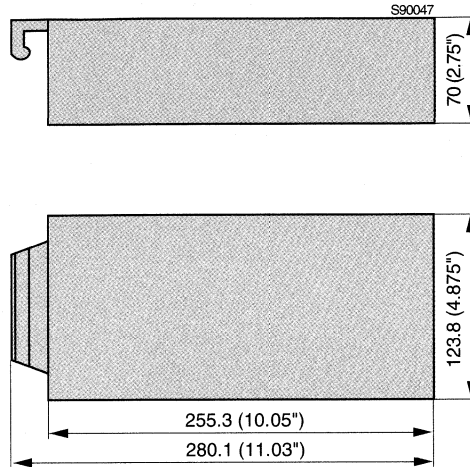
Operating temperature	at 100% load	0...50°C
	at 60% load	0...70°C
Storage temperature	non-operational	-40...85°C
Relative humidity	non-condensing	max. 95%
Shock	peak acceleration	20 g _n
Vibration	swept sine, 5 Hz to 2 kHz, 3 axes	1 g _{n, pk}

Mechanical data

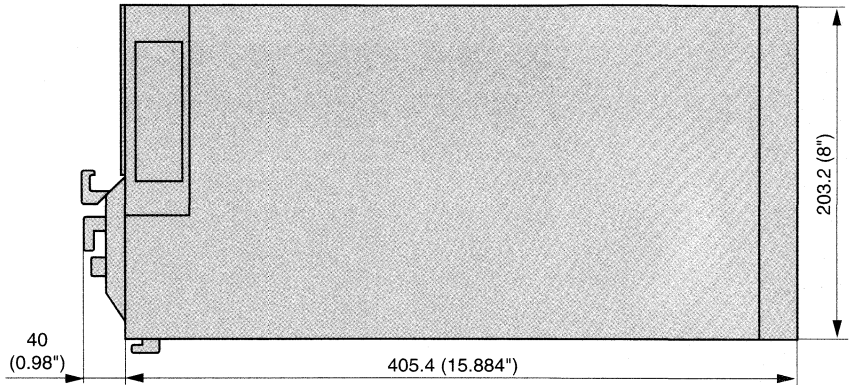
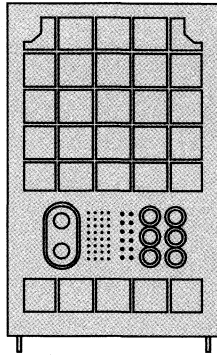
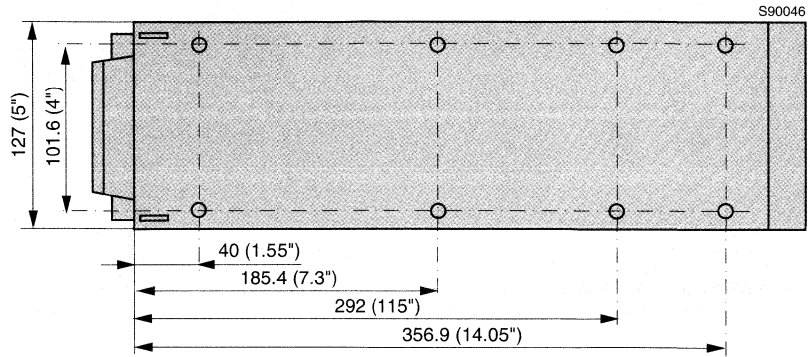
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



FXC/FXP 1000



FXC/FXP 6000





Input range 187...255 V AC with PFC
 48 V battery charger, temperature controlled
 3 kV AC I/O electric strength test voltage



- Very high efficiency up to 93.5%, compact design
- Hot swap capability, accessible from the front side
- Operating ambient temperature range $-25...50^{\circ}\text{C}$ with convection cooling

Selection chart

Output Voltage at $0.5 \times I_{o \text{ nom}}$ [V DC]	Temperature coefficient of output [mV/K]	Output current $I_{o \text{ nom}}$ [A]	Input voltage U_i [V AC]	Type	Options
50.3...58	-3	26.5	187...255	LU 1740-5IMZ2	V, Z, G, F

Input

Input voltage AC		187...255 V AC
Input frequency		47...63 Hz
Power factor	active PFC	up to 0.99
Inrush current	virtually no inrush current	

Output

Nominal output voltage		54.5 V
Nominal output power		1440 W
Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to 93.5%
Output voltage setting accuracy	$U_{i\text{ nom}}, 50\% I_{o\text{ nom}}$	± 0.25 V
Output voltage noise (total)	IEC/EN 61204, including a sinusoidal output ripple at twice the line frequency	1.3 V _{pp}
Line regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, I_{o\text{ nom}}$	typ. ± 0.2 V
Load regulation	$U_{i\text{ nom}}, 1 \dots 100\% I_{o\text{ nom}}$	typ. 0.8 V
Minimum load	not required	
Current limitation	constant power, constant current characteristic	40 A
Operation in parallel	enabled by droop current share	
Hold-up time	$I_{o\text{ nom}}$, output voltage decrease to 85% $U_{o\text{ nom}}$	18 ms

Protection

Input fuse	not user accessible	12.5 A, slow blow
Reverse polarity	bridge rectifier	
Input undervoltage lockout		typ. 178 V AC
Input overvoltage lockout		typ. 270 V AC
Input transient	varistor	
Output	no-load, overload and short circuit proof	
Output overvoltage	second control loop	SELV, <60 V
Overtemperature	switch-off with auto restart	T_C typ. 100°C

Control

Output voltage adjustment	U_{cr} input for remote control	50.3...58.0 V
Cell voltage selector switch Z2	accessible from the front	2.18...2.32 V/cell
Inhibit switch	accessible from the front	
Inhibit input	remote control, output enabled if inhibit pin left open	
Output undervoltage monitoring	threshold externally adjustable	
Output current/voltage mirror	available via D-Sub connector	40 A \triangleq 10 V/60 V \triangleq 10 V
Status monitoring	system good (Sys OK, Uo OK, no int. or external fault)	
Status indication	LEDs: Sys Good, Uo OK and Error	

Safety

Approvals	EN 60950, UL 1950, CSA 22.2 No. 950	
Protection degree		IP 30
Electric strength test voltage	class I, I/case	2 kV AC
	class I, I/O	4 kV AC
	class I, O/case	1 kV AC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4, contact/air (8/15 kV)	criterion B
Electromagnetic field	IEC/EN 61000-4-3, level 3 (10 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 4, capacitive/direct (2/4 kV)	criterion A
Surge	IEC/EN 61000-4-5, level 3 (2 kV)	criterion B
Conducted disturbances	IEC/EN 61000-4-6, level 3 (10 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

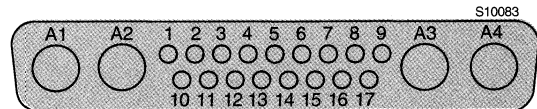
Operating ambient temperature	$U_{i\text{ nom}}, I_{o\text{ nom}}$, convection cooled	-25...50°C
Operating case temperature T_C	$U_{i\text{ nom}}, I_{o\text{ nom}}$	-25...90°C
Storage temperature	non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	56 days
Vibration, sinusoidal	IEC/EN 60068-2-6, 8.2...58 / 58...500 Hz	1g _r /2 g _n
Shock	IEC/EN 60068-2-27, 11 ms	15 g _n
Bump	IEC/EN 60068-2-29, 6 ms	10 g _n
Random vibration	IEC/EN 60068-2-64, 10...200/200...2000 Hz	2.7 g _{r rms}

Options

AC-fail signal		V
Zell voltage selector switch	2.23...2.37 V/cell	Z
Electrical isolated output signals		G
Fuse in both input lines		F

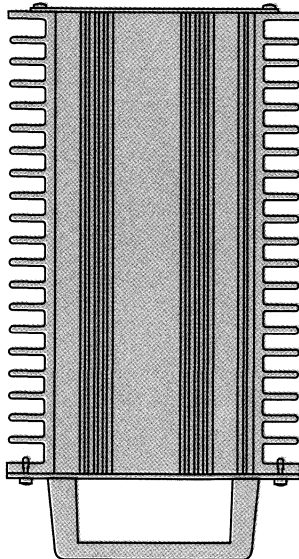
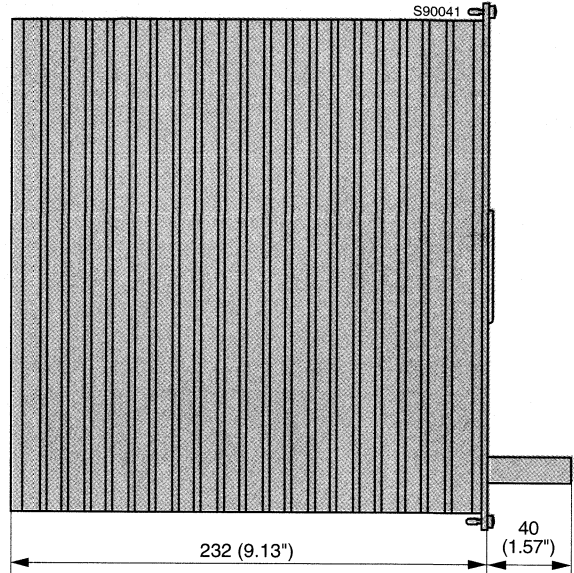
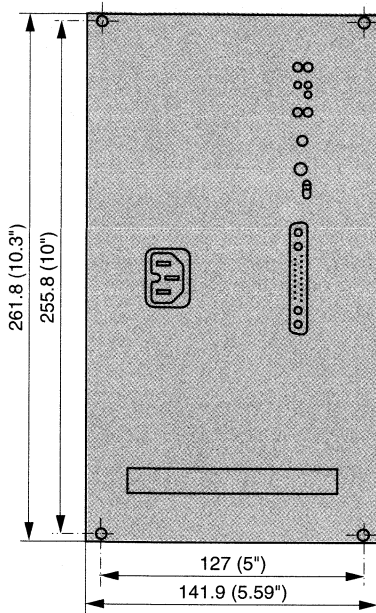
Pin allocation of the D-Subconnector

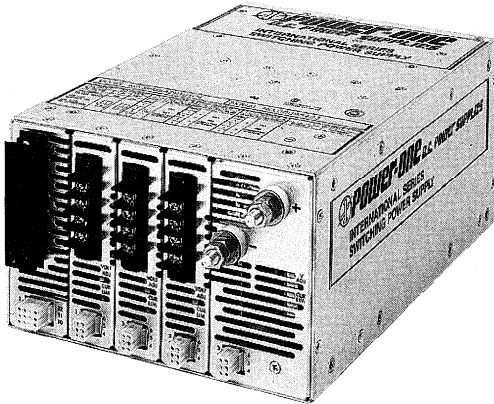
Pin	Electrical determination	Design.
A1	Output voltage positive (power)	Vo+
A2	Hot plug-in contact positive	HC+
1	Output voltage positive (signal)	Vo+
2	Inhibit input	i
3	Power down input signal of U_o	D set
4	Reserve	n.c.
5	System good signal output neg.	Sys Out-
6	Power down signal output neg.	D-
7	AC-fail output negative	AC fail-
8	Output voltage mirror	Vo_m+
9	Output voltage negative (signal)	Vo-
10	Output current mirror	Io_m+
11	System good input signal	Sys In
12	Remopte control input	Ucr
13	System good signal output pos.	Sys Out +
14	Power down signal output pos.	D+
15	AC-fail output positive	AC fail+
16	Reserve	-
17	Output voltage negative (signal)	Vo-
A3	Hot plug-in contact negative	HC-
A4	Output voltage negative (power)	Vo-



Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.





Input voltage 85...264 V AC, 1 or 3 phase
 1...21 outputs, 1.0 to 48 V DC
 4300 VDC I/O electric strength test voltage



- Modular construction, over 10 million possible configurations
- Ruggedized AC input section exceeds EN 61000-4 standards
- High reliability, demonstrated MTBF of greater than 5 million hours for DC output modules

Chassis selection chart

Max. no. of outputs	No. of module slots	Input voltage U_i [V AC]	U_i range selection	Rated power $P_{o\ tot}$ [W]	0.98 PFC meets EN 60555	Type metric mount.	Type SAE mount.	Case size L x W x H [mm]
9	3	85...159 160...264	wide range	1000 1350	yes	SMF 3	SPF 3	127 x 140 x 318
9	3	85...159 160...264	wide range	1500 2000	yes	HMF 3	HPF 3	127 x 140 x 318
15	5	85...159 160...264	wide range	1500 2000	yes	HMF 5	HPF 5	127 x 203 x 280
6	2	90...132 175...264	manual	500 500	no	SMM 2	SPM 2	127 x 76 x 280
9	3	90...132 175...264	manual	1000 1000	no	SMM 3	SPM 3	127 x 140 x 280
15	5	90...132 175...264	manual	1500 1500	no	SMM 5	SPM 5	127 x 203 x 280
15	5	180...264	-	2000	no	HMM 5	HPM 5	127 x 203 x 280
21	7	180...264	-	2500	no	HMM 7	HPM 7	127 x 280 x 330
15	5	180...264	three ph.	4000	no	RMM 5	RPM 5	127 x 203 x 381

Design your own power supply

Using the innovative PROBE feature on our website: www.power-one.ch or www.power-one.com, one can input the required output voltages and currents and have a unit automatically configured to meet these requirements complete with a front panel drawing.

Input

Input voltage	see chassis selection chart
Input frequency	47...63 Hz
Power factor	IEC/EN 61000-3-2 >0.95

Output

Efficiency	full load, nominal line input	typ. 75%
Output voltage ripple and noise	see module table for individual specifications	
Line regulation		max. <0.1%
Load regulation	with remote sense 5 V output	typ. <10 mV
	with remote sense >5 V output	typ. <30 mV
Minimum load	on dual output modules only	1 A
Hold-up time		>23 ms

Protection

Output overload	overload and short circuit	
Output overvoltage	latch style	
Overtemperature	advance warning before shutdown	10 ms

Interface and control

Input power fail warning	TTL compatible signal, warning time	5ms
Remote sense	max. voltage compensation	0.5 V
Current share	for individual modules	<1% rated load
Output good	TTL compatible signal on individual modules	
Inhibit	both global and for individual modules	

Safety and EMC

Agency approvals	UL 1950; CSA 22.2 No. 234/950; EN 60950 (TUV); CE	
Electric strength test voltage	I/O per EN60950	4300 V DC
Electrostatic discharge	IEC/EN 61000-4-2, level 4	15 kV/8 kV
Radiated susceptibility	IEC/EN 61000-4-3, level 3	10 V/m
Electr. fast transients/burst	IEC/EN 61000-4-4, level 4	±2kV
Input surge	IEC/EN 61000-4-5, level 4	2 kV/4 kV
Electromagnetic emissions	CISPR 22/EN 55022, conducted	level A

Environmental

Operating temperature		0...50°C
	linear derating on modules above 50°C, 2.5%/°C	50...70°C
Storage temperature	non-operational	-40...85°C
Relative humidity	non-condensing,	max. 95%
Shock	peak acceleration	20 g _n
Vibration	random vibration, 10 Hz to 2 kHz, 3 axes	6 g _{n rms}

Options

System inhibit logic	A, B, C
Single width slot blank	K
Double width slot blank	L
Input power fail warning	M, N, P
Module paralleling options	Y
Allows further options not covered by standard options	

Output modules

Output 1		Output 2		Output 3		Module	Slots used	Noise & ripple	
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]			typ. [mV]	max. [mV]
1.0	320	-	-	-	-	ER	2	30	100
1.5/1.8	35	-	-	-	-	T1 (Note K)	1	30	50
1.5/1.8	60	-	-	-	-	T6 (Note K)	1	30	50
1.5/1.8	250	-	-	-	-	T4 (Note K)	2	30	50
2	80	-	-	-	-	F8	1	25	40
2/2.2	35	-	-	-	-	F1 (Note J)	1	20	50
2/2.2	60	-	-	-	-	AG (Note B, J)	1	30	50
2/2.2	60	-	-	-	-	F6 (Note J)	1	30	50
2/2.2	150	-	-	-	-	F2 (Note J)	2	30	50
2/2.2	180	-	-	-	-	CS (Note J)	2	30	50
2/2.2	250	-	-	-	-	F4 (Note J)	2	30	50
2/2.2	320	-	-	-	-	F7 (Note J)	2	30	100
2/2.2	375	-	-	-	-	QF (Note B, I)	2	30	50
2.3	35	-	-	-	-	BJ	1	30	50
3.3	35	-	-	-	-	H1	1	30	50
3.3	60	-	-	-	-	H6	1	30	50
3.3	80	-	-	-	-	H8	1	40	50
3.3	90	-	-	-	-	DA	1	30	50
3.3	150	-	-	-	-	H2	2	30	40
3.3	250	-	-	-	-	H4	2	30	40
3.3	320	-	-	-	-	H7	2	50	100
5	35	-	-	-	-	A1	1	35	50
5	60	-	-	-	-	A6	1	15	50
5	80	-	-	-	-	A8	1	15	50
5	90	-	-	-	-	DT	1	15	50
5	150	-	-	-	-	A2	2	30	50
5	220/250	-	-	-	-	A4	2	30	50
5	320	-	-	-	-	A7	2	30	100
5	375	-	-	-	-	QA	2	30	50
6	35	-	-	-	-	AU	1	65	90
6	100	-	-	-	-	CT	1	40	60
6	120	-	-	-	-	BY	2	40	60
6	250	-	-	-	-	CU	2	40	100
8	65	-	-	-	-	AJ	2	53	80
10	20	-	-	-	-	AW	1	66	100
10	40	-	-	-	-	BE	1	40	60
10	50	-	-	-	-	CV	1	66	100
10	65	-	-	-	-	AQ	2	66	100
10	160	-	-	-	-	CW	2	100	200
12	20	-	-	-	-	B1	1	80	120
12	40	-	-	-	-	B6	1	40	60
12	65	-	-	-	-	B2	2	80	120
12	80	-	-	-	-	BC	2	80	120
12	135	-	-	-	-	DE	2	120	240
15	16	-	-	-	-	AF (Note C)	1	15	35
15	16	-	-	-	-	C1	1	100	150
15	32	-	-	-	-	C6	1	30	60
15	50	-	-	-	-	C5	1	100	150
15	52	-	-	-	-	C2	2	100	150
24	10	-	-	-	-	D1	1	160	240
24	15	-	-	-	-	D6	1	80	120
24	29	-	-	-	-	D8	1	60	100

Output 1		Output 2		Output 3		Module	Slots used	Noise & ripple	
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]			typ. [mV]	max. [mV]
24	32	-	-	-	-	D2	2	160	240
24	33	-	-	-	-	D5	1	60	100
28	8.6	-	-	-	-	E1	1	200	280
28	26	-	-	-	-	E8	1	70	100
28	2	-	-	-	-	E2	2	150	280
28	29	-	-	-	-	E5	1	70	100
36	20	-	-	-	-	J8	1	100	200
36	21	-	-	-	-	J2	2	100	200
36	23	-	-	-	-	J5	1	100	200
48	5	-	-	-	-	G1	1	400	480
48	12.5	-	-	-	-	G4 (Note C)	1	40	60
48	16	-	-	-	-	G2	2	135	200
48	16	-	-	-	-	G8	1	60	100
48	19	-	-	-	-	G6	1	60	100
1.0...1.8	320	-	-	-	-	ER	2	30	100
1.5...2.8	375	-	-	-	-	QF (Note B)	2	50	50
1.9...3	150	-	-	-	-	AB	2	50	50
14...24	10	-	-	-	-	W1	1	80	120
14...24	32	-	-	-	-	BS	2	135	200
12	10	12	4	-	-	M4 (Note D)	1	120	240
+12	10	-12	10	-	-	B4 (Note E)	1	120	240
+15	8	-15	8	-	-	C4 (Note E)	1	150	300
+20	5	-20	5	-	-	BQ (Note E)	1	80	100
+24	5	-24	5	-	-	D4 (Note E)	1	80	120
								max. [mV]	
5	10	1.5	10	12	10	CA (Note D)	1	100/100/120	
5	10	2.2	10	12	10	W6 (Note D)	1	100/100/120	
5	10	12	10	12	10	M6 (Note D)	1	50/120/120	
5	10	12	10	24	5	U6 (Note D)	1	50/120/240	
5	10	15	8	12	10	EC (Note D)	1	50/150/120	
5	10	15	8	15	8	V6 (Note D)	1	50/150/150	
5	10	24	5	24	5	R6 (Note D)	1	50/240/240	
5.2	15	12	8	12	8	BA (Note D)	1	100/180/180	
5.2	5	12	16	12	7	AE (Note D)	1	60/160/120	
12	10	12	10	12	10	N6 (Note D)	1	120/120/120	
24	5	12	10	12	10	P6 (Note D)	1	240/120/120	

Note B is designed to accommodate output cable losses of up to one volt.

Note C Module is designed for use in applications demanding low noise and ripple. Consult factory for further specifications.

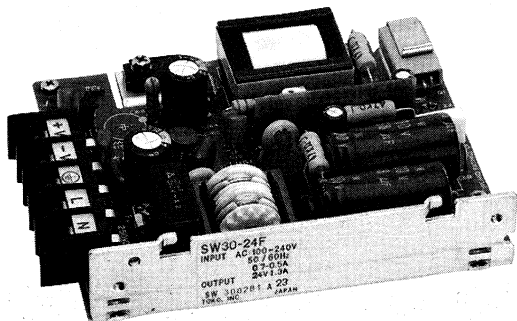
Note D All triple output modules, as well as the M4 dual output module, have floating outputs. Like voltages may be shared within the same module. All triple output adjustments and interface signals are for output 1. Consult factory for more information.

Note E The dedicated negative (-) output is quasiregulated. Both outputs require a small minimum load to perform to specification. Consult factory for more information.

Note I Module output is wide range adjustable from 1.5 to 2.8 V, factory preset to 2.0 V.

Note J Module output is factory set to 2.0 V. Output voltage will adjust +10% to 2.2 V.

Note K Modules do not adjust -10% below 1.5V or +10% above 1.8V. Consult factory.



Input voltage range 85...264 V AC
 1 output up to 24 V DC
 4300 V DC I/O electric strength test voltage



- Ultra thin and compact
- Universal input range
- High reliability

Selection chart

Output		Input voltage	Rated power	Type	Configuration
$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]	U_i [V AC]	$P_{o, tot}$ [W]		
5	1	85...264	5	SWE 05-05 ..	FC
5	2	85...264	10	SWE 10-05 ..	F, FC
5	3	85...264	15	SWE 15-05 ..	C, F, FC
5	6	85...264	30	SWE 30-05 ..	C, F, FC
12	0.42	85...264	5	SWE 05-12 ..	FC
12	0.83	85...264	10	SWE 10-12 ..	F, FC
12	1.3	85...264	15	SWE 15-12 ..	C, F, FC
12	2.5	85...264	30	SWE 30-12 ..	C, F, FC
15	0.67	85...264	10	SWE 10-15 ..	F, FC
15	1	85...264	15	SWE 15-15 ..	C, F, FC
15	2	85...264	30	SWE 30-15 ..	C, F, FC
24	0.42	85...264	10	SWE 10-24 ..	F, FC
24	0.63	85...264	15	SWE 15-24 ..	C, F, FC
24	1.33	85...264	30	SWE 30-24 ..	C, F, FC

Input

Input voltage	continuous range	85...264 V AC
Input frequency		47...63 Hz
Inrush current limitation	by thermistor, $U_i = 200$ V AC, SWE 05, SWE 10, SWE 15	<60 A
	by thermistor, $U_i = 200$ V AC, SWE 30	<90 A

Output

Efficiency	230 V AC, $I_{o\ nom}$	typ. 75%
Output voltage switching noise	$U_{i\ nom}$, $I_{o\ nom}$, 20 MHz bandwidth, peak-peak	<2%
Line regulation	$U_{i\ min...}U_{i\ max}$, $I_{o\ nom}$	$\pm 1\%$
Load regulation	$U_{i\ nom}$, 0... $I_{o\ nom}$	$\pm 2\%$
Minimum load	single output models	0%
Hold-up time	110/230 V AC, $I_{o\ nom}$	>15 ms

Protection

Output overload	continuous current, automatic reset	105% $I_{o\ nom}$
Overvoltage	SWE 30 only	130...140% $U_{o\ nom}$

Control

Voltage trim range		$\pm 10\%$
Output OK		LED

Safety and EMC

Safety marks	UL/CSA or NRTL/C, TÜV or LGA, CE	
Electric strength test voltage	I/O	3000 V AC
Electrostatic discharge	IEC/EN 61000-4-2	6 kV, criterion A
Electromagnetic field	IEC/EN 61000-4-3	10 V/m, criterion A
Electr. fast transients/burst	IEC/EN 61000-4-4	2 kV, criterion A
Surge	IEC/EN 61000-4-5	2 kV, criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

Ambient temperature	$U_{i\ nom}$, $I_{o\ nom}$, with derating	0...60 °C
Storage temperature	non operational	-20...75 °C
Relative humidity	non condensing	30...85%
Shock	peak acceleration	20 g_n
Random vibration		2 g_n rms

Options

Cover	SWE 15, SWE 30	C
Open frame with terminal strip	SWE 10, SWE 15, SWE 30	F
Open frame with connectors	SWE 05, SWE 10, SWE 15, SWE 30	FC
PCB without frame, connectors	SWE 05, SWE 10, SWE 15, SWE 30	P

Accessories

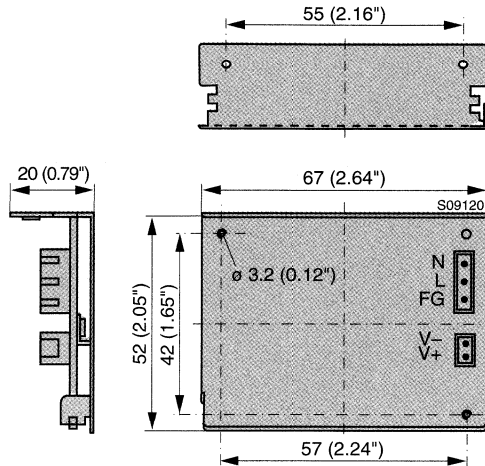
Cable Kit		
Connector Kit		

Mechanical data

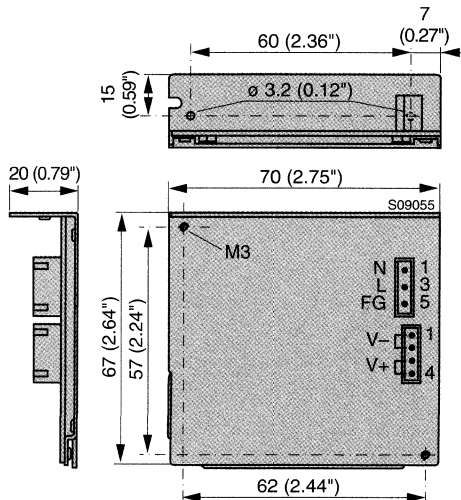
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



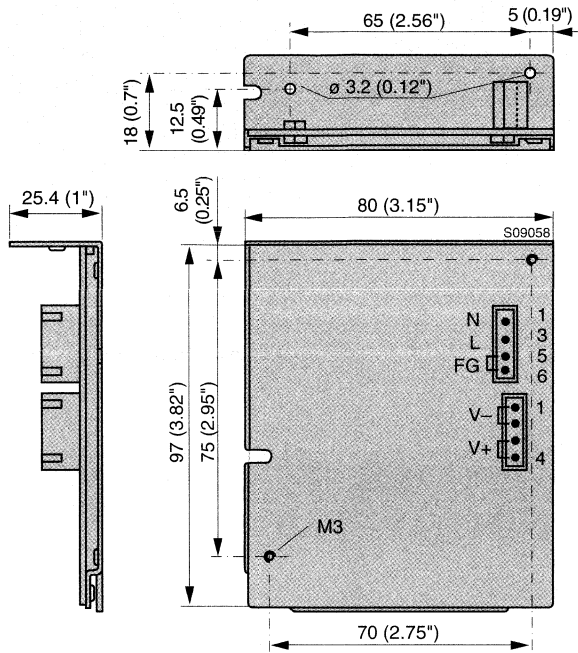
SWE 05



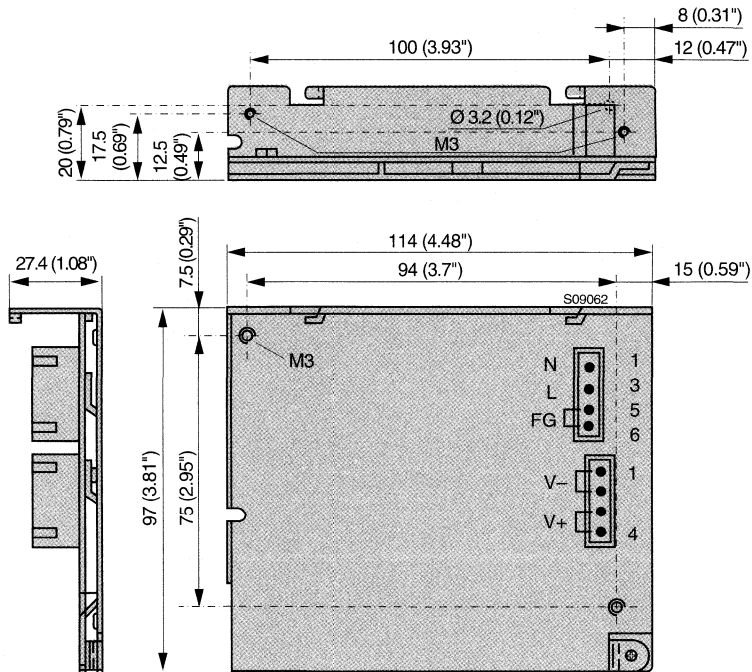
SWE 10

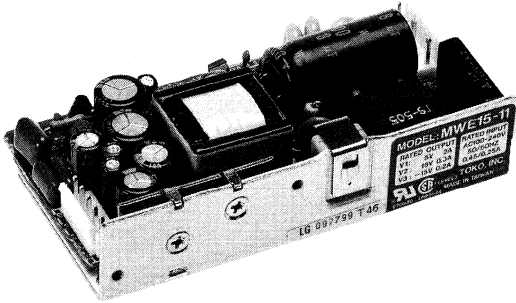


SWE 15



SWE 30





Input voltage range 85...264 V AC
 3 outputs 5/±12 V DC and 5/±15 V DC
 4300 V DC I/O electric strength test voltage



NRTL/C



- Ultra thin and compact
- Universal input range
- Flex power topology

Selection chart

Output 1		Output 2		Output 3		Input voltage	Rated power	Type
$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]	$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]	$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]	U_i [V AC]	$P_{o, tot}$ [W]	
5	8	12	1.5	5	1	85...264	50	MWE 50-21
5	3	12	0.5	12	0.5	85...264	15	MWE 15-01
5	5	12	1.2	12	0.5	85...264	30	MWE 30-01
5	8	12	1.5	12	1	85...264	50	MWE 50-01
5	3	15	0.5	15	0.5	85...264	15	MWE 15-11
5	5	15	1.2	15	0.5	85...264	30	MWE 30-11
5	8	15	1.5	15	1	85...264	50	MWE 50-11

Input

Input voltage	continuous range	85...264 V AC
Input frequency		47...63 Hz
Inrush current limitation	by thermistor, $U_i = 200$ V AC	<60 A

Output

Efficiency	230 V AC, $I_{o\ nom}$	typ. 65%
Output voltage switching noise	$U_{i\ nom}$, $I_{o\ nom}$, 20 MHz bandwidth, peak-peak	<2%
Line regulation	$U_{i\ min}$... $U_{i\ max}$, $I_{o\ nom}$, output 1	±2%
	$U_{i\ min}$... $U_{i\ max}$, $I_{o\ nom}$, output 2 and 3	±0.5%
Load regulation	$U_{i\ nom}$, 0... $I_{o\ nom}$, output 1	±2%
	$U_{i\ nom}$, 0... $I_{o\ nom}$, output 2	±1%
	$U_{i\ nom}$, 0... $I_{o\ nom}$, output 3	±0.5%
Minimum load	output 1	20% $I_{o\ max}$
Hold-up time	110/230 V AC, $I_{o\ nom}$	>20 ms

Protection

Output overload	continuous current, automatic reset	105% $I_{o\ nom}$
Overvoltage	MWE 50, output 1 only, manual reset	max. 140% $U_{o\ nom}$

Safety and EMC

Safety marks	NRTL/C, LGA, CE	
Electric strength test voltage	I/O	3000 V AC
Electrostatic discharge	IEC/EN 61000-4-2	6 kV, criterion A
Electromagnetic field	IEC/EN 61000-4-3	10 V/m, criterion A
Electr. fast transients/burst	IEC/EN 61000-4-4	2 kV, criterion A
Surge	IEC/EN 61000-4-5	2 kV, criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

Ambient temperature	$U_{i\ nom}$, $I_{o\ nom}$, with derating	0...60°C
Storage temperature	non operational	-20...75°C
Relative humidity	non condensing	30...85%
Shock	peak acceleration	20 g_n
Random vibration		2 $g_{n\ rms}$

Accessories

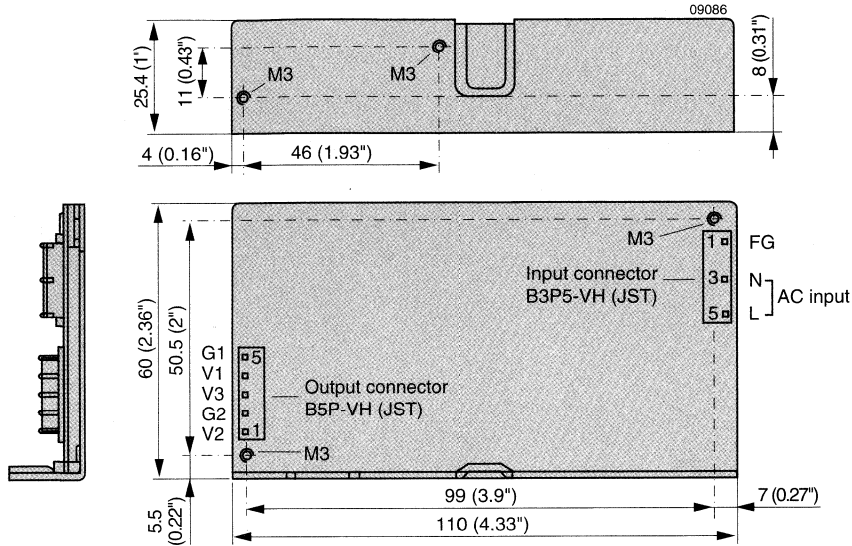
Cable kit	
Connector kit	

Mechanical data

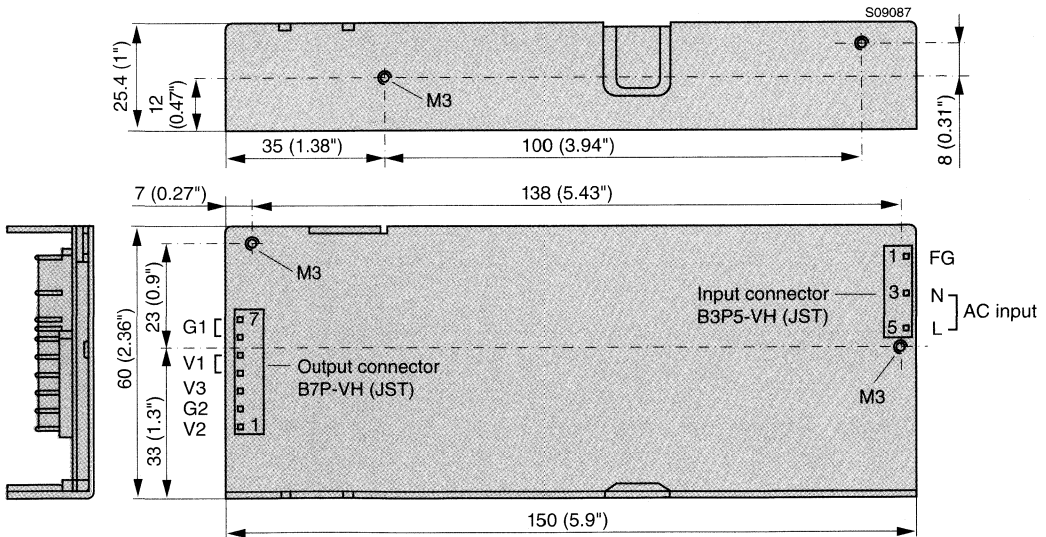
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



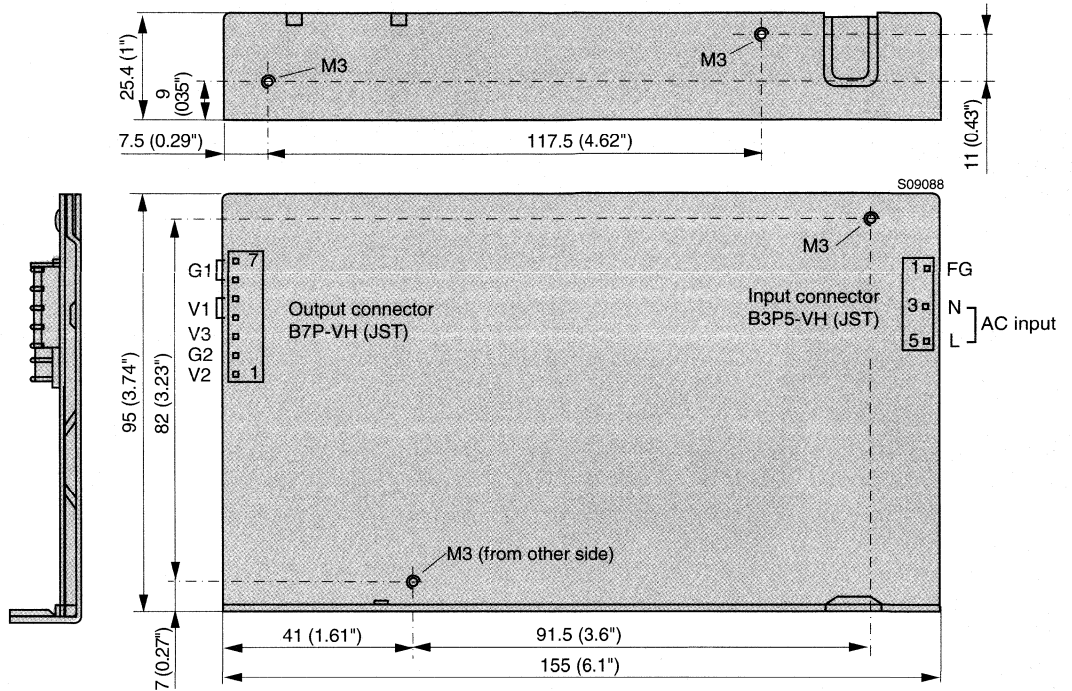
MWE 15

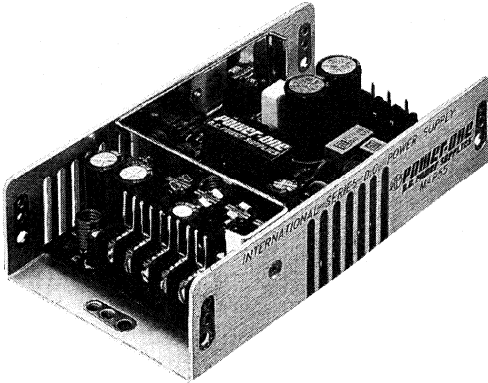


MWE 30



MWE 50





Input voltage range 90...264 V AC
 1, 3 or 4 outputs, 5 to 24 V DC
 2600 V DC I/O electric strength test voltage



- EN55022 conducted and radiated limits
- Overload and overvoltage protection
- EMC compliance to EN61000-4-2/3/4

Selection chart

Output 1		Output 2		Output 3		Output 4		Input voltage	Rated power	Type
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	U_i [V AC]	$P_{o \text{ tot}}$ [W]	
5	6	-	-	-	-	-	-	90...264	30	MAP 30-1005
5	8	-	-	-	-	-	-	90...264	40	MAP 40-1005
5	11	-	-	-	-	-	-	85...264	55	MAP 42-1005
12	4.6	-	-	-	-	-	-	85...264	55	MAP 42-1012
12	5.0	-	-	-	-	-	-	90...264	60	MAP 55-1012
15	3.0	-	-	-	-	-	-	85...264	55	MAP 42-1012
15	4.0	-	-	-	-	-	-	90...264	60	MAP 55-1012
24	2.3	-	-	-	-	-	-	85...264	55	MAP 42-1024
24	2.5	-	-	-	-	-	-	90...264	60	MAP 55-1024
+5	3	+12	1	-12	0.3	-	-	90...264	40	MAP 40-3100
+5	3	+12	2	-5	0.3	-	-	90...264	40	MAP 40-3105
+5	3	+12	2	-12	0.3	-	-	90...264	40	MAP 40-3000
+5	3	+15	1.5	-15	0.2	-	-	90...264	40	MAP 40-3003
+5	3	+24	1	-12	0.3	-	-	90...264	40	MAP 40-3101
+5	5	+12	1	-5	0.3	-	-	90...264	40	MAP 40-3500
+5	6	+12	3	-5	0.5	+12	0.5	90...264	55	MAP 55-4000
+5	6	+12	3	-12	0.5	+12	0.5	90...264	55	MAP 55-4002
+5	6	+15	2.5	-5	0.5	-15	0.5	90...264	55	MAP 55-4003
+5	6	+24	1.5	-12	0.5	+12	0.5	90...264	55	MAP 55-4001
+5	6	+24	1.5	-15	0.5	+15	0.5	90...264	55	MAP 55-4004

Input

Input voltage	continuous range	90...264 V AC
Input frequency		47...63 Hz
Inrush current	limited by thermistor, $U_i = 264$ V AC, 1 cycle, 25°C	<38 A

Output

Efficiency	115 V AC, $I_{o\ nom}$	typ. 73%
Output voltage ripple and noise	$U_i\ nom$, $I_{o\ nom}$, 20 MHz bandwidth, peak-peak	<1%
Voltage regulation	line and Load combined	typ. <2%
Minimum load	on MAP 40 and MAP55, maximum	0.5 A
Hold-up time	115 V AC, $I_{o\ nom}$	>15 ms

Protection

Input fuse	non-user serviceable internal AC input line fuse
Output overload	overload and short circuit, automatic recovery
Output overvoltage	latch style

Control

Remote sense	MAP 30 and MAP 42, voltage compensation	250 mV
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Safety

Agency approvals	UL 1950; CSA 22.2 No. 234/950; EN 60950 (TÜV); CE to LVD	
Electric strength test voltage	I/O per EN 60950	2600 V DC

EMC

Surge	IEC/EN 61000-4-5, level 3	2 kV, criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted most radiated and conducted minimum	class B class A

Environmental

Operating temperature	MAP 30/42, 30/40 W convection	
	40/55 W with 100 LFM forced air	0...50°C
	MAP 40/55, convection	0...50°C
	linear derating above 50°C, 2.5%/°C	50...70°C
Storage temperature	non-operational	-40...85°C
Relative humidity	non-condensing	5...95%
Shock	peak acceleration	20 g_n
Vibration, random	10 Hz to 2 kHz, 3 axes	6 $g_{n\ rms}$

Options

Cover	MAP 40-1005 (derate to 40 W)	C
	MAP 55 only (derate multiple to 45 W, single to 50 W)	

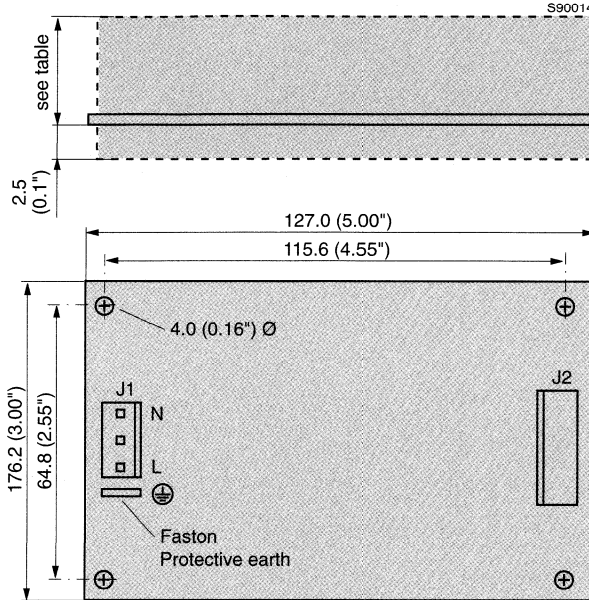
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



MAP 30, MAP 40, MAP 42

MAP 40-1005 uses MAP 55 chassis



J1 and J2 mates with Molex (series 2139 or series 41695) 4 mm (0.156") center crimp terminal housing or equivalent.

Terminal allocation J2

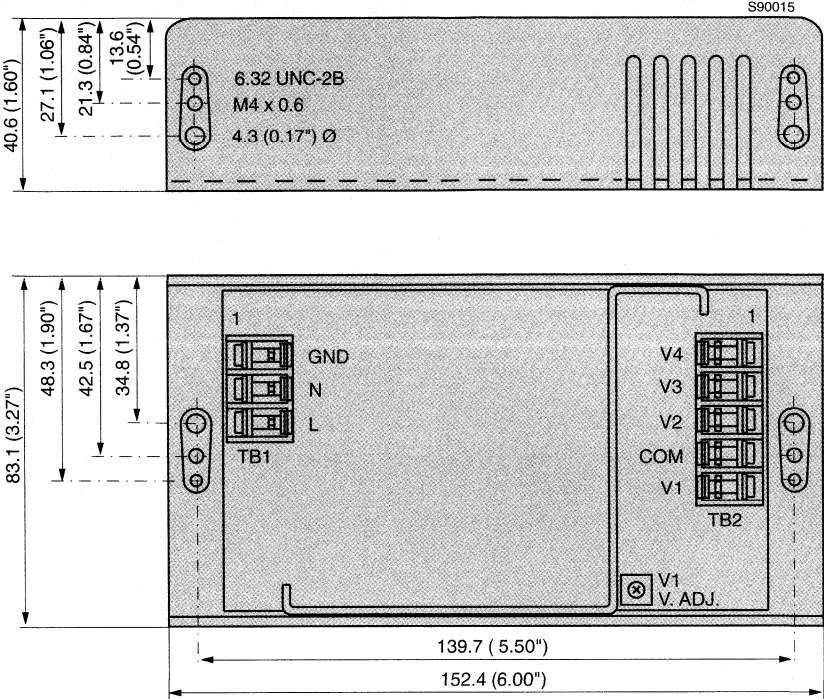
Pin	MAP 30	MAP 40	MAP 42
1	- Sense	V3	- Sense
2	+ Sense	GND	+ Sense
3	GND	GND	GND
4	GND	V1	GND
5	V1	V1	V1
6	V1	V2	V1
7	n.c.	-	-

Height

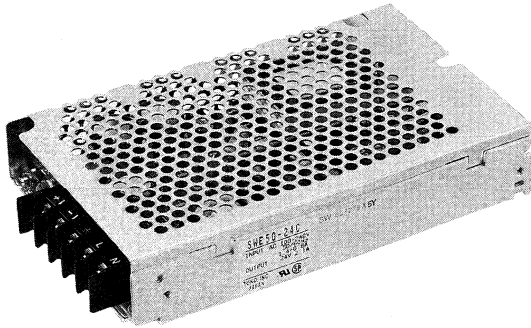
Single output models	
Model	Height
MAP 30-1005	29.5 mm (1.16")
MAP 42-1005	31.8 mm (1.25")
MAP 42-1012	31.8 mm (1.25")
MAP 42-1024	31.8 mm (1.25")

Multiple output models	
Model	Height
MAP 40-3000	29.5 mm (1.16")
MAP 40-3003	29.5 mm (1.16")
MAP 40-3100	31.8 mm (1.25")
MAP 40-3101	31.8 mm (1.25")
MAP 40-3105	31.8 mm (1.25")
MAP 40-3500	40.6 mm (1.6")

MAP 40-1005, MAP 55



Input and output connections: 6-32 screw wire clamps on 7.9 mm (0.312") centers, 1.1 mm (0.045") square pins on 3.4 mm (0.156") centers, mates with Molex series 2139, 6442 or 41695.



Input voltage range 85...264 V AC
 1 output up to 48 V DC
 4300 V DC I/O electric strength test voltage



- Ultra thin and compact
- Universal input range
- High reliability

Selection chart

Output		Input voltage	Rated power	Type	Configuration
$U_o \text{ nom}$ [V DC]	$I_o \text{ nom}$ [A]	U_i [V AC]	$P_o \text{ tot}$ [W]		
5	10	85...264	50	SWE 50-05 ..	C, F, FC
12	4.2	85...264	54	SWE 50-12 ..	C, F, FC
12	6.3	85...264	75	SWE 75-12 ..	C, F, FC
15	3.4	85...264	51	SWE 50-15 ..	C, F, FC
15	5	85...264	75	SWE 75-15 ..	C, F, FC
24	2.1	85...264	50	SWE 50-24 ..	C, F, FC
24	3.1	85...264	77	SWE 75-24 ..	C, F, FC
48	1.6	85...264	77	SWE 75-48 ..	C, F, FC

Input

Input voltage	continuous range	85...264 V AC
Input frequency		47...63 Hz
Input current	110/230 V AC, $I_o \text{ nom}$ SWE 50	typ. 1.2/0.7 A
	110/230 V AC, $I_o \text{ nom}$ SWE 75	typ. 1.3/0.65 A
Inrush current limitation	by thermistor, $U_i = 200$ V AC	<90 A
Power factor correction	$U_i \text{ nom}$, $I_o \text{ nom}$, 230 V AC, SWE 75	0.8

Output

Efficiency	230 V AC, $I_o \text{ nom}$	typ. 75%
Output voltage switching noise	$U_i \text{ nom}$, $I_o \text{ nom}$, 20 MHz bandwidth, peak-peak	<2%
Line regulation	$U_i \text{ min} \dots U_i \text{ max}$, $I_o \text{ nom}$	±1%
Load regulation	$U_i \text{ nom}$, 0... $I_o \text{ nom}$	±2%
Minimum load	single output models	0%
Hold-up time	110/230 V AC, $I_o \text{ nom}$	>15 ms

Protection

Output overload	continuous current, automatic reset	105% $I_{o\ nom}$
Overvoltage		130...140% $U_{o\ nom}$

Control

Voltage trim range		$\pm 10\%$
Output OK		LED

Safety and EMC

Safety marks	NRTL/C, LGA, CE	
Electric strength test voltage	I/O	3000 V AC
Electrostatic discharge	IEC/EN 61000-4-2	6 kV, criterion A
Electromagnetic field	IEC/EN 61000-4-3	10 V/m, criterion A
Electr. fast transients/burst	IEC/EN 61000-4-4	2 kV, criterion A
Surge	IEC/EN 61000-4-5	2 kV, criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted, SWE 50	class B
	CISPR 22/EN 55022, conducted, SWE 75	class A

Environmental

Ambient temperature	$U_{i\ nom}, I_{o\ nom}$, with derating	0...60°C
Storage temperature	non operational	-20...75°C
Relative humidity	non condensing	30...85%
Shock	peak acceleration	20 g_n
Random vibration		2 $g_{n\ rms}$

Options

Covered with terminal strips	C
Open frame with terminal strip	F
Open frame with connectors	FC

Accessories

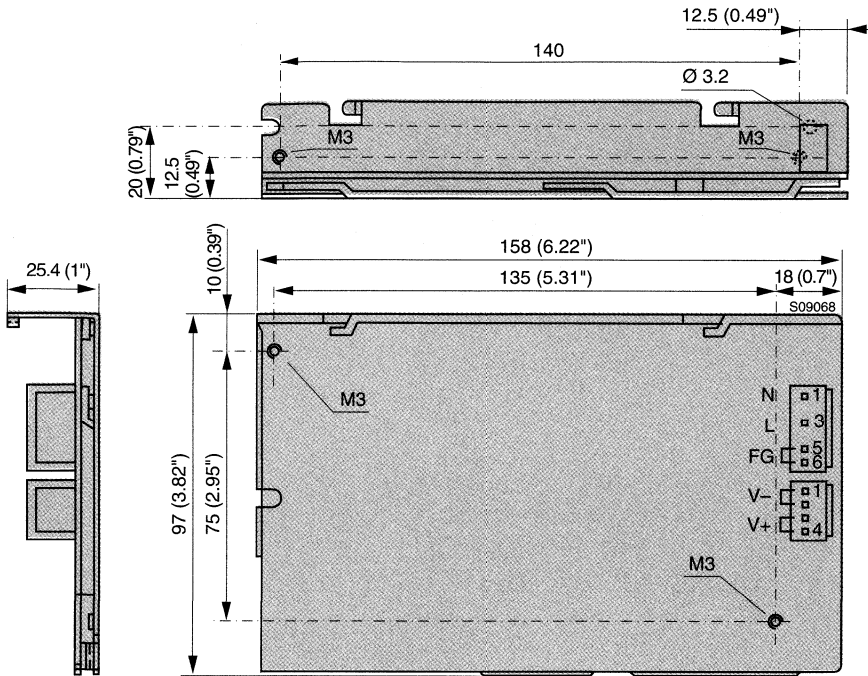
Cable Kit	
Connector Kit	

Mechanical data

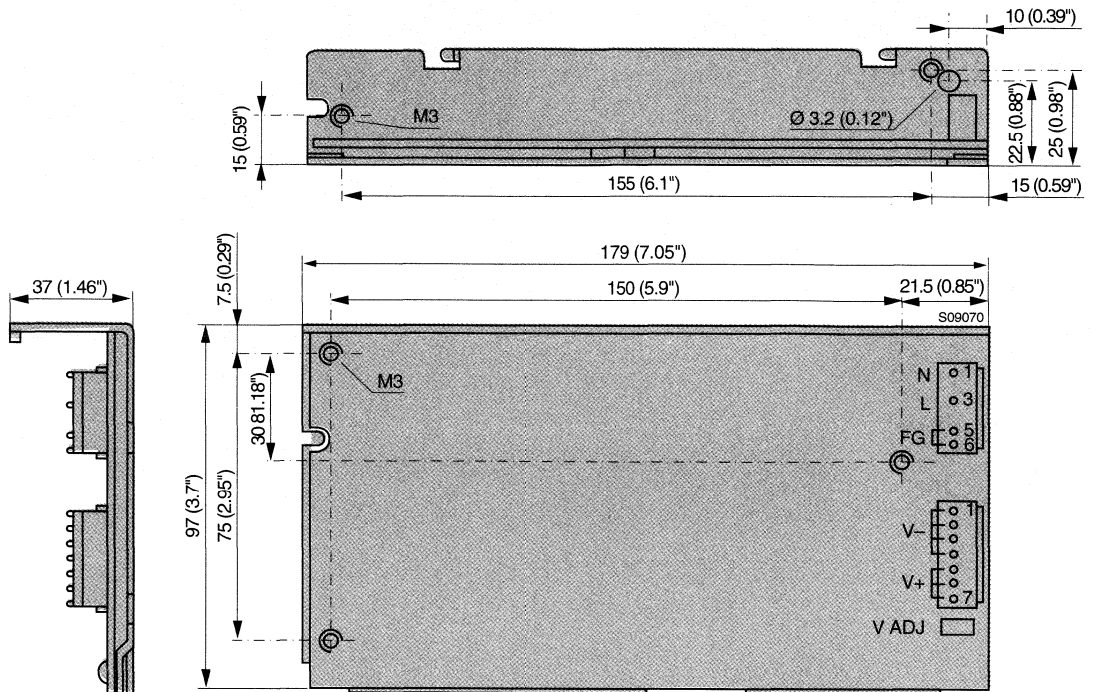
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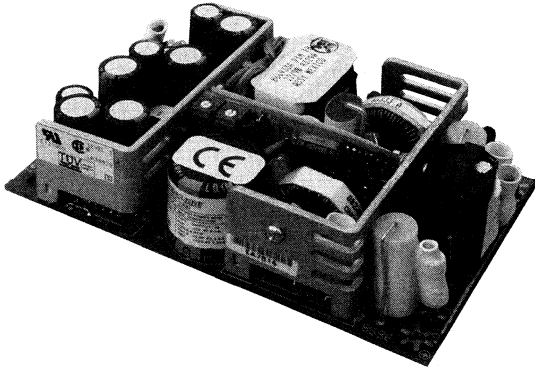


SWE 50



SWE 75





Input voltage range 85...264 V AC
 2 or 3 outputs, 3.3 to 12 V DC
 2600 V DC I/O electric strength test voltage



- High current on 3.3 V and 5 V outputs for mixed mode circuit applications
- Overload and overvoltage protection
- Power factor correction: meets EN 61000-3-2
- Low profile for 1U system chassis applications

Selection chart

Output 1		Output 2		Output 3		Input voltage U_i [V AC]	Rated power $T_A = 60^\circ\text{C}$ $P_{o\ tot}$ [W]	Type
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]			
+5	15	+12	1	-	-	85...264	87	MPB 80-2000
+5	8.5	+12	3	-12	0.7	85...264	87	MPB 80-3000
+3.3	8.5	+5	5	+12	0.65	85...264	61	MPB 80-3300

Input

Input voltage	continuous range	85...264 V AC
Input frequency		47...63 Hz
Inrush current	limited by thermistor, $U_i = 230$ V AC, 1 cycle, 25 °C	<32 A
Power factor	IEC/EN 61000-3-2	

Output

Efficiency	230 V AC, $I_{o\ nom}$	typ. 73%
Output voltage ripple and noise	$U_{i\ nom}$, $I_{o\ nom}$, 20 MHz bandwidth, peak-peak	<1%
Voltage regulation	line and load combined	typ. <4%
Minimum load	on V1 to maintain regulation on V2/V3	1.5 A
Hold-up time	110 V AC, $I_{o\ nom}$	>16 ms

Protection

Input fuse	non-user serviceable internal AC input line fuse
Output overload	overload and short circuit, automatic recovery
Output overvoltage	latch style

Safety

Agency approvals	UL 1950; CSA 22.2 No. 234/950; EN 60950 (TUV); CE to LVD
Electric strength test voltage	I/O per EN 60950 2600 V DC

EMC

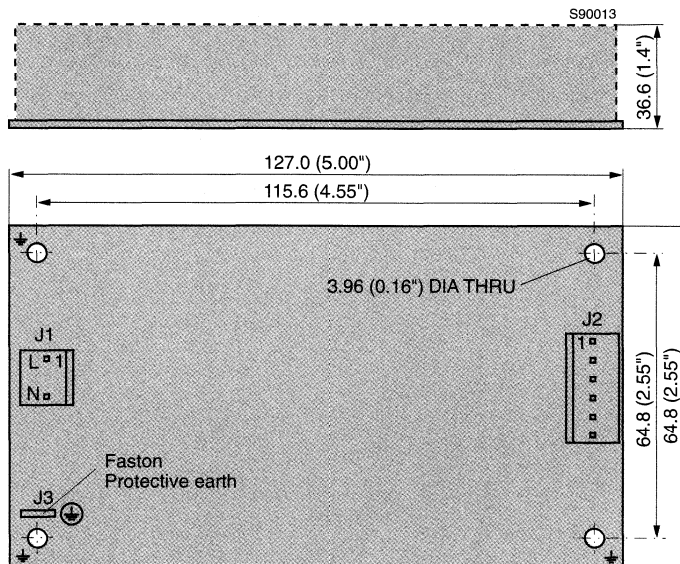
Surge	IEC/EN 61000-4-5, class 3	2 kV, criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

Operating temperature	convection to 63 W, 300 LFM forced air for full load	0...50°C
	linear derating above 50°C, 2.5%/°C	50...70°C
Storage temperature	non-operational	-40...85°C
Relative humidity	non-condensing	5...95%
Shock	peak acceleration	20 g _n
Vibration, random	10 Hz to 2k Hz, 3 axes	6 g _{n rms}

Mechanical data

Tolerances ±0.3 mm (0.012") unless otherwise indicated.

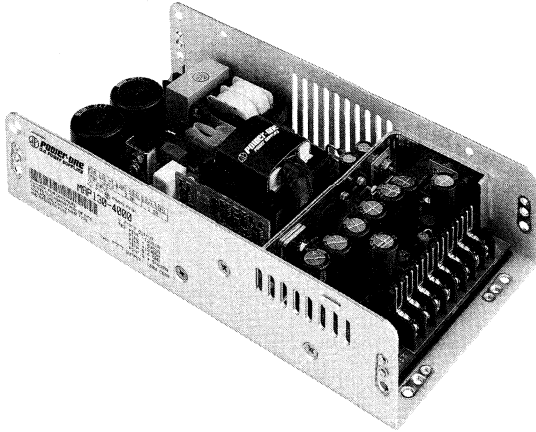


Terminal allocation J2

Pin	MPB 80-2000	MPB 80-3000	MPB 80-3300
1	V1	V2	V2
2	V1	V1	RTN
3	V1	V1	RTN
4	RTN	RTN	RTN
5	RTN	RTN	V1
6	RTN	V3	V1
7	V2	-	V3

J1: Molex 26-60-4030 or equivalent header mates with Molex housing 09-50-3031 or equivalent and pins 08-50-0106 (18-20 AWG) or 08-50-0108 (22-26 AWG) or equivalent.

J2: Molex 26-60-4060 or equivalent header mates with Molex housing 09-50-3061 or equivalent and pins 08-50-0106 (18-20 AWG) or 08-50-0108 (22-26 AWG) or equivalent.



Input voltage range 90...264 V AC
 1 or 4 outputs 5...24 V DC
 2600 V DC I/O electric strength test voltage



- EN 55002 conducted and radiated limits
- Overtemperature and overload protection
- EMC compliance to EN61000-4-2/3/4

Selection chart

Output 1		Output 2		Output 3		Output 4		Input voltage	Rated power	Type
$U_{o \text{ nom}}$	$I_{o \text{ nom}}$	$U_{o \text{ nom}}$	$I_{o \text{ nom}}$	$U_{o \text{ nom}}$	$I_{o \text{ nom}}$	$U_{o \text{ nom}}$	$I_{o \text{ nom}}$	U_i [V AC]	$P_{o \text{ tot}}$ [W]	
[V DC]	[A]	[V DC]	[A]	[V DC]	[A]	[V DC]	[A]			
5	16	-	-	-	-	-	-	90...264	80	MAP 80-1005
5	26	-	-	-	-	-	-	90...264	130	MAP 130-1005
12	7.5	-	-	-	-	-	-	90...264	90	MAP 80-1012
12	12	-	-	-	-	-	-	90...264	144	MAP 130-1012
15	6	-	-	-	-	-	-	90...264	90	MAP 80-1012
15	10	-	-	-	-	-	-	90...264	150	MAP 130-1012
24	3.8	-	-	-	-	-	-	90...264	90	MAP 80-1024
24	6.2	-	-	-	-	-	-	90...264	150	MAP 130-1024
+5	14	+12	4	-5	1	-12	1	90...264	80	MAP 80-4000
+5	14	+12	4	-5	1	+12	3	90...264	80	MAP 80-4010
+5	14	+12	4	-12	1	-5	3	90...264	80	MAP 80-4020
+5	14	+12	4	-12	1	+12	1	90...264	80	MAP 80-4002
+5	14	+15	3.5	-5	1	-15	1	90...264	80	MAP 80-4003
+5	14	+24	2	-12	1	+12	1	90...264	80	MAP 80-4001
+5	14	+24	2	-15	1	+15	1	90...264	80	MAP 80-4004
+5	20	+12	5	-5	1	-12	1	90...264	130	MAP 130-4000
+5	20	+12	5	-5	1	-12	3	90...264	130	MAP 130-4010
+5	20	+12	5	-12	1	-5	3	90...264	130	MAP 130-4020
+5	20	+12	5	-12	1	+12	1	90...264	130	MAP 130-4002
+5	20	+15	4	-5	1	-15	1	90...264	130	MAP 130-4003
+5	20	+24	3.5	-12	1	+12	1	90...264	130	MAP 130-4001
+5	20	+24	3.5	-15	1	+15	1	90...264	130	MAP 130-4004

Input

Input voltage	auto-ranging, continuous ranges	90...135 V AC 175...264 V AC
Input frequency		47...63 Hz
Inrush current	limited by thermistor, $U_i = 264$ V AC, 1 cycle, 25°C	<38 A

Output

Efficiency	115 V AC, $I_{o\ nom}$	typ. 75%
Output voltage ripple and noise	$U_{i\ nom}$, $I_{o\ nom}$, 20 MHz bandwidth, peak-peak	<1%
Voltage regulation	line and load combined	typ. <1%
Minimum load	on MAP 80	max. 1 A
	on MAP130	max. 3 A
Hold-up time	115 V AC, $I_{o\ nom}$	>20 ms

Protection

Input Fuse	non-user serviceable internal AC input line fuse
Output overload	overload and short circuit, automatic recovery
Output overvoltage	latch style
Overtemperature	on MAP130 only

Control

Input power fail warning	TTL compatible signal, warning time	4 ms
Remote sense	MAP130 only, voltage compensation	250 mV

Safety

Agency approvals	UL 1950; CSA 22.2 No. 234/950; EN 60950 (TÜV); CE to LVD
Electric strength test voltage	I/O per EN 60950 2600 V DC

EMC

Electrostatic discharge	MAP130 IEC/EN 61000-4-2, level 4	8 kV, criterion A
Radiated susceptibility	MAP130 IEC/EN 61000-4-3, level 3	10 V/m, criterion A
Electr. fast transients/burst	MAP130 IEC/EN 61000-4-4, level 3	±2 kV, criterion A
Input surge	IEC/EN 61000-4-5, level 3	2 kV, criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted and radiated	class B

Environmental

Operating temperature	convection cooled	0...50°C
	linear derating above 50°C, 2.5 %/°C	50...70°C
Storage temperature	non-operational	-40...85°C
Relative humidity	non-condensing	5...95%
Shock	peak acceleration	20 g_n
Vibration, random	10 Hz to 2 kHz, 3 axes	6 g_n rms

Options

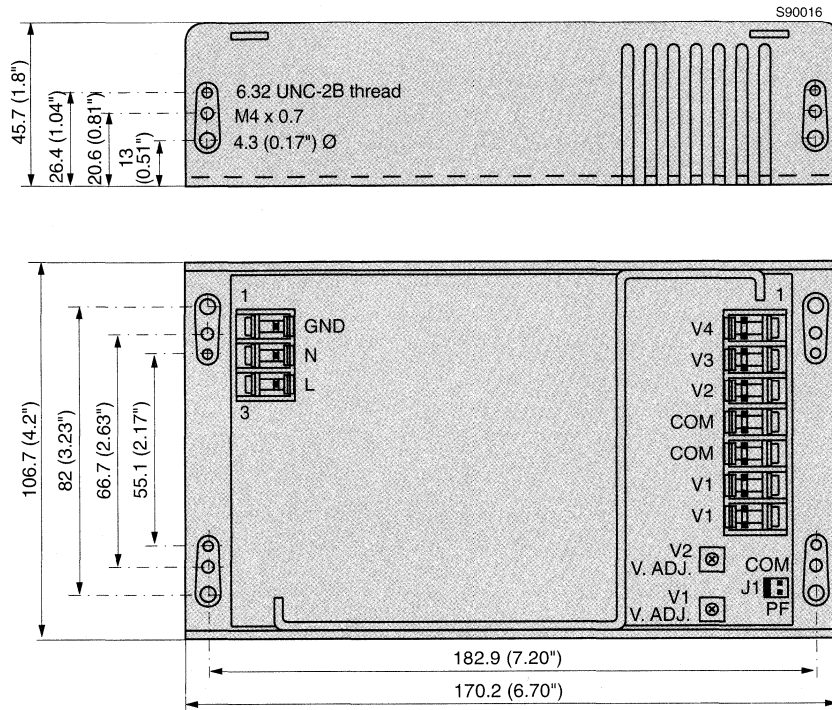
Cover	MAP 80 derate to 65 W, MAP 130 to 120 W	C
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Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



MAP 80

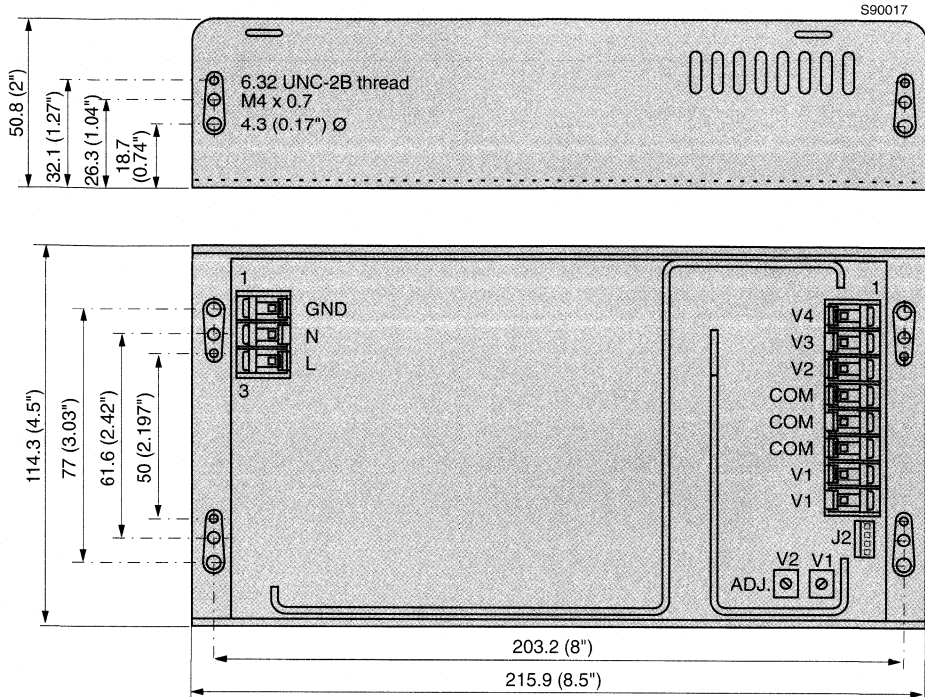


AC input: Mates with 5 circuit Molex connector.

DC output: Mates with 14 circuit Molex connector.

J1: 0.9 mm (0.035") square pins on 2.5 mm (0.1") centers, mates with Molex series 2695 and 6471.

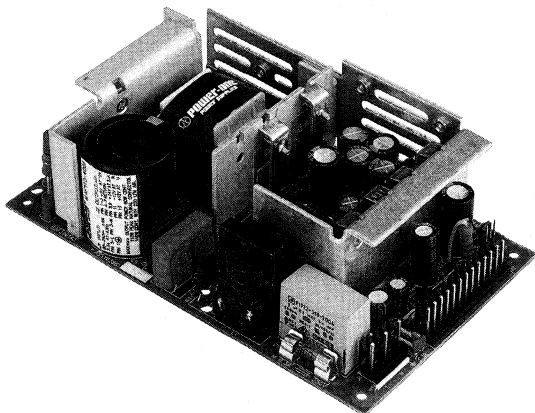
MAP 130



Terminal allocation J2

Pin	MAP 130
1	n.c.
2	+Sense, V1
3	-Sense, V1
4	Power fail warning

AC input: Mates with 5 circuit Molex connector.
DC output: Mates with 16 circuit Molex connector.
J2: 0.89 mm (0.035") square pins on 2.54 mm (0.1") centers, mates with Molex series 2695 and 6471.



Input voltage range 85...264 V AC
 1, 3 or 4 outputs 5...24 V DC
 2600 V DC I/O electric strength test voltage



- EN 55002 conducted and radiated limits
- Overtemperature and overload protection
- EMC compliance to EN 61000-4-2/3/4

Selection chart

Output 1		Output 2		Output 3		Output 4		Input voltage	Rated power	Type
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	U_i [V AC]	$P_{o \text{ tot}}$ [W]	
5	22	-	-	-	-	-	-	85...264	110	MAP 110-1005
12	10	-	-	-	-	-	-	85...264	120	MAP 110-1012
15	8	-	-	-	-	-	-	85...264	120	MAP 110-1012
15	10	-	-	-	-	-	-	85...264	150	MAP 140-1012
24	5	-	-	-	-	-	-	85...264	120	MAP 110-1024
24	6.3	-	-	-	-	-	-	85...264	150	MAP 140-1024
48	3.1	-	-	-	-	-	-	85...264	120	MAP 140-1048
+5	20	+12	4	-12	1	-	-	85...264	140	MAP 140-3000P
+3.3	15	+5	8	-12	1	+12	1	85...264	110	MAP 110-4300
+5	12	+12	5	-5	1	-12	3	85...264	110	MAP 110-4010
+5	12	+12	5	-12	1	+5	1	85...264	110	MAP 110-4000
+5	12	+12	5	-12	1	+12	1	85...264	110	MAP 110-4002
+5	12	+12	5	-12	1	+24	1	85...264	110	MAP 110-4011
+5	12	+12	5	-15	1	+15	1	85...264	110	MAP 110-4015
+5	12	+15	5	-15	1	-5	1	85...264	110	MAP 110-4003
+5	12	+24	3	-12	1	+12	1	85...264	110	MAP 110-4001
+5	12	+24	3	-15	1	+15	1	85...264	110	MAP 110-4004
+12	9	+24	4.5	-12	1	+5	2.5	85...264	110	MAP 110-4200

Input

Input voltage	auto-ranging, continuous ranges	85...264 V
Input frequency		47...63 Hz
Inrush current	limited by thermistor, $U_i = 264$ V AC, 1 cycle, 25 °C	<41 A

Output

Efficiency	230 V AC, $I_{o\ nom}$	typ. 75%
Output voltage ripple and noise	$U_{i\ nom}$, $I_{o\ nom}$, 20 MHz bandwidth, peak-peak	<1%
Voltage regulation	line and load combined	typ. <1%
Minimum load	on MAP110, on multiple only	1 A
	on MAP140, on multiple only	2 A
Hold-up time	115 V AC, $I_{o\ nom}$	>20 ms

Protection

Input fuse	non-user serviceable internal AC input line fuse
Output overload	overload and short circuit, automatic recovery
Output overvoltage	latch style
Overtemperature	option, automatic recovery

Control

Input power fail warning	optional TTL compatible signal.	
	minimum warning time	2.3 ms
Remote sense	voltage compensation	250 mV

Safety

Agency approvals	UL 1950; CSA 22.2 No. 234/950; EN 60950 (TUV); CE to LVD
Electric strength test voltage	I/O per EN 60950 2600 V DC

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4	8 kV, criterion A
Radiated susceptibility	IEC/EN 61000-4-3, level 3	10 V/m, criterion A
Electr. fast transients/burst	IEC/EN 61000-4-4, level 3	± 2 kV, criterion A
Input surge	IEC/EN 61000-4-5, level 3	2 kV, criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B
	CISPR 22/EN 55022, radiated	class A

Environmental

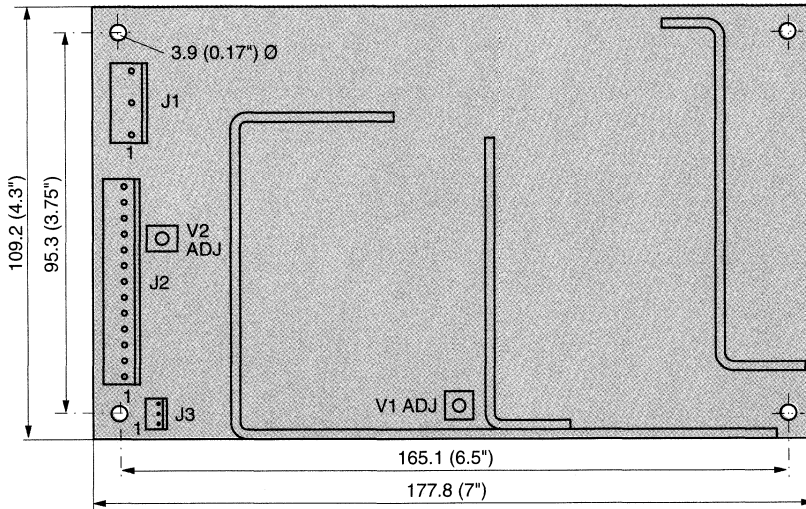
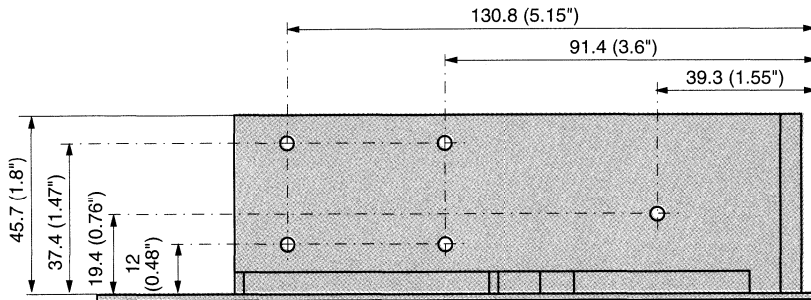
Operating temperature	with 200 LFM forced air cooled	0...50 °C
	derate multiples with convection to	80 W
	linear derating above 50 °C, 2.5%/°C	50...70 °C
Storage temperature	non-operational	-40...85 °C
Relative humidity	non-condensing	5...95%
Shock	peak acceleration	20 g _n
Vibration, random	10 Hz to 2 kHz, 3 axes	6 g _{n rms}

Options

L-bracket	L
Cover (includes L-bracket)	C
Power-fail signal	P
Overtemperature protection: thermal shutdown	T

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Input terminal allocation J1

Pin	J1
1	GND
3	N
5	L

Output terminal allocation J3

Pin	J3
1	+Sense
2	-Sense
3	n.c.

Output terminal allocation J2

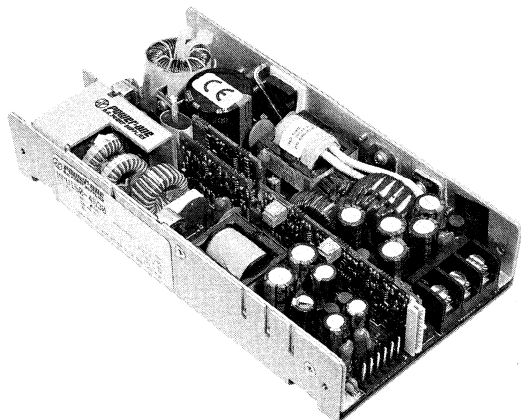
Pin	J2
1	V1
2	V1
3	V1
4	RTN
5	RTN
6	RTN
7	RTN
8	V2
9	V2
10	P.F.
11	V3
12	n.c.
13	V4

When the V4 output is a positive (+) output, pin 12 on J2 is connected to RTN.

When the V4 output is a negative (-) output, pin 12 on J2 is connected to V4.

Molex connector information

Ref. design	Series	Molex P/N	Spacing	Pins square
J1	41671	26-48-1055	3.96 (0.156")	1.14 (0.045")
	41791	26-60-4050	3.96 (0.156")	1.14 (0.045")
J2	41671	26-48-1035	3.96 (0.156")	1.14 (0.045")
	41791	26-60-4130	3.96 (0.156")	1.14 (0.045")
J3	6373	22-23-2031	2.45 (01")	0.64 (00.25")



Input voltage range 85...264 V AC
 3 or 4 outputs, 3.3 to 12 V DC
 2600 V DC I/O electric strength test voltage



- Power factor correction: meets EN 61000-3-2
- Dual main outputs provide 3.3 V and 5 V with remote sense and current share for mixed mode circuit applications
- DC Input versions available (see MDU150 in DC-DC section)

Selection chart

Output 1		Output 2		Output 3		Output 4		Input voltage	Rated power	Type
U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	U_i [V AC]	$P_{o\ tot}$ [W]	
+3.3	35	+5	20	+12	2	-	-	85...264	150	MPU 150-3300
+2.5	30	+3.3	15	12	4	5	2	85...264	150	MPU 150-4230
+3.3	30	+5	15	12	3	12	3	85...264	150	MPU 150-4350
+5	30	+3.3	15	12	3	12	3	85...264	150	MPU 150-4530
+5	30	+12	8	12	3	5	2	85...264	150	MPU 150-4000

Input

Input voltage	Continuous range	85...264 V AC
Input frequency		47...63 Hz
Inrush current limitation	by thermistor, $U_i = 230$ V AC, 1 cycle, 25°C	<35 A
Power factor	IEC/EN 61000-3-2	>0.95
Protection	non-user serviceable internal AC input line fuse	

Output

Efficiency	110 V AC, $I_{o\ nom}$	typ. 75%
Output voltage ripple and noise	$U_i\ nom$, $I_{o\ nom}$, 20 MHz bandwidth, peak-peak	<1.5%
Voltage regulation	line and load combined	typ. <1%
Minimum load	on V1 to maintain regulation on other outputs	4 A
Hold-up time	110 V AC, $I_{o\ nom}$	>17.5 ms

Protection

Output overload	overload and short circuit, automatic recovery
Output overvoltage	latch style
Overtemperature	shutdown due to excessive internal temperature, automatic reset

Interface and control

Input power fail warning	TTL compatible signal, warning time	5 ms
Remote sense	available on V1 and V2, max. voltage compensation	500 mV
Current share	up to 6 units in parallel, V1 and V2 share within	<10% rated load
Output good	TTL compatible signal	
Inhibit	TTL input, output(s) inhibited by high (5 V) signal	

Safety and EMC

Agency approvals	UL 1950; CSA 22.2 No. 234/950; EN 60950 (TÜV); CE to LVD	
Electric strength test voltage	I/O per EN 60950	2600 V DC
Electrostatic discharge	IEC/EN 61000-4-2, level 4	8 kV, criterion A
Radiated susceptibility	IEC/EN 61000-4-3, level 3	10 V/m, criterion A
Electr. fast transients/burst	IEC/EN 61000-4-4, level 3	±2 kV, criterion A
Input surge	IEC/EN 61000-4-5, level 3	2 kV, criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

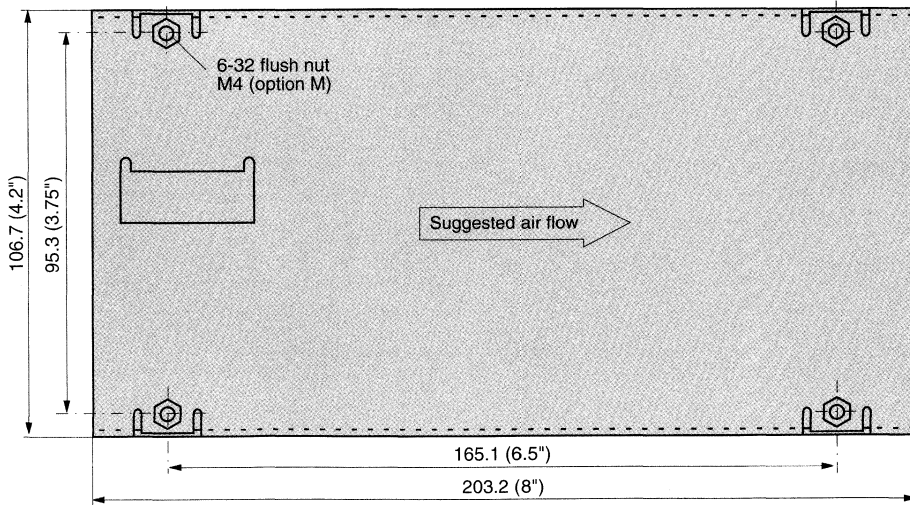
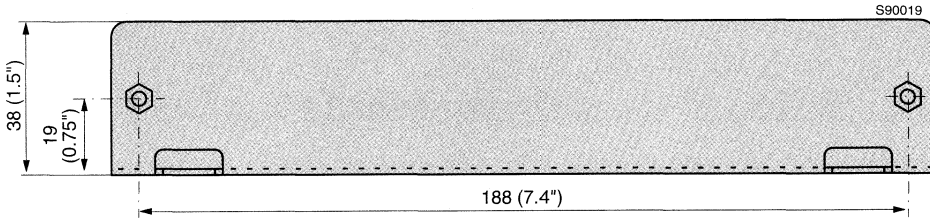
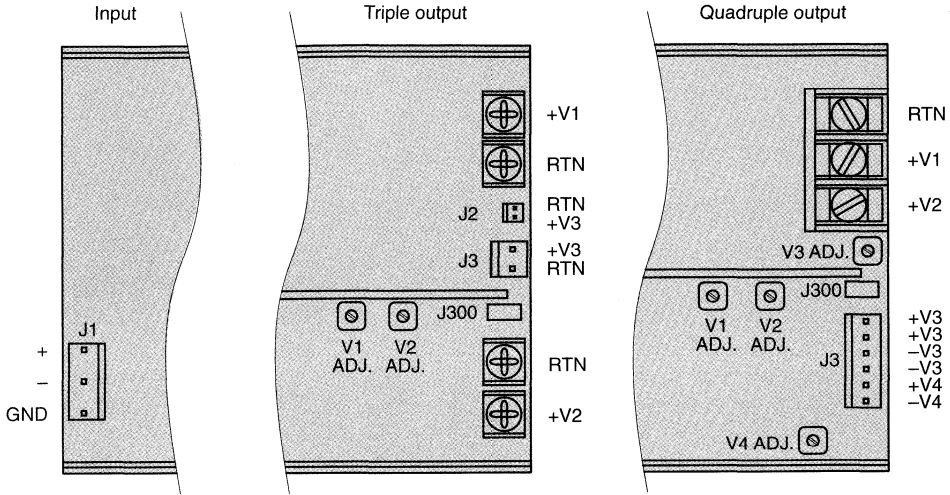
Operating temperature	300 LFM forced air cooling	0...50°C
	linear derating above 50°C, 2.5%/°C	50...70°C
Storage temperature	non-operational	-55...85°C
Relative humidity	non-condensing	5...95%
Shock	peak acceleration	20 g _n
Vibration	random vibration, 10 Hz to 2 kHz, 3 axes	6 g _{n rms}

Options

Metric mounting inserts	M4	M
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Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.

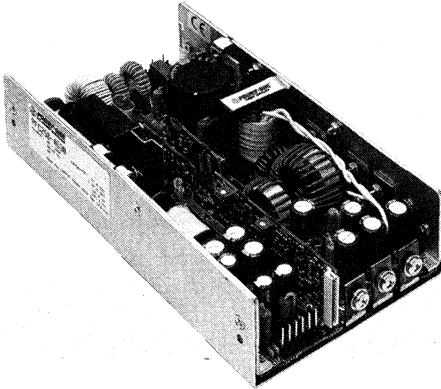


Pin allocation of the J300 connector

Pin	Electrical determination
1	Signal ground
2	Inhibit
3	Power fail warning
4	Output good V1
5	n.c.
6	Current share V2
7	+S V2
8	Current share V1
9	-S V1 and -S V2
10	+S V1

Molex connector information

Ref. design	Series	Housing	Pin series	Pins loose	Pins chain	Wire gauge
J1	41695	09-50-8051	6838	08-50-0189	08-50-0187	18-20 AWG
	41695	09-50-8051	2478	08-05-0106	08-50-0105	18-20 AWG
	2139	09-50-3051	2478	08-50-0106	08-50-0105	18-20 AWG
J2	5051-N	22-01-1022	2759	08-50-0114	08-50-0113	22-30 AWG
	5051-N	22-01-1022	2759	08-65-0805	08-65-0804	22-30 AWG
J3 tripple output	41695	09-50-8021	6838	08-50-0189	08-50-0187	18-20 AWG
	41695	09-50-8021	2478	08-50-0106	08-50-0105	18-20 AWG
	2139	09-50-3021	2478	08-50-0106	08-50-0105	18-20 AWG
J3 quadruple output	41695	09-50-8061	6838	08-50-0189	08-50-0187	18-20 AWG
	41695	09-50-8061	2478	08-50-0106	08-50-0105	18-20 AWG
	2139	09-50-3061	2478	08-50-0106	08-50-0105	18-20 AWG
J300	5264-N	50-37-5103	5263	80-70-1040	80-70-1039	22-28 AWG



Input voltage range 85...264 V AC
 1 and 4 outputs up to 48 V DC
 2600 V DC I/O electric strength test voltage



- Power factor correction meets EN 61000-3-2
- Dual main outputs provide 3.3 V and 5 V with remote sense and current share for mixed mode circuit applications
- Isolated output 3 and 4 can be used as positive or negative outputs

Selection chart

Output 1		Output 2		Output 3		Output 4		Input voltage	Rated power	Type
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	U_i [V AC]	$P_{o \text{ tot}}$ [W]	
3.3	50	-	-	-	-	-	-	85...264	165	PFC 250-1003
5	50	-	-	-	-	-	-	85...264	250	PFC 250-1005
12	23	-	-	-	-	-	-	85...264	276	PFC 250-1012
15	18.3	-	-	-	-	-	-	85...264	275	PFC 250-1015
24	10.5	-	-	-	-	-	-	85...264	252	PFC 250-1024
48	6	-	-	-	-	-	-	85...264	288	PFC 250-1048
+3.3	40	+5	20	12	6	5	3	85...264	250	PFC 250-4350
+5	40	+3.3	20	12	6	12	3	85...264	250	PFC 250-4530
+5	40	+12	10	12	6	5	3	85...264	250	PFC 250-4000
+5	40	+12	10	12	6	12	3	85...264	250	PFC 250-4001
+5	40	+12	10	15	6	15	3	85...264	250	PFC 250-4004

Input

Input voltage	continuous range	85...264 V AC
Input frequency		47...63 Hz
Inrush current limitation	by thermistor, $U_i = 230$ V AC, 1 cycle, 25°C	<35 A
Power factor	IEC/EN 61000-3-2	>0.95
Protection	non-user serviceable internal AC input line fuse	

Output

Efficiency	110 V AC, $I_{o\ nom}$	typ. 75%
Output voltage ripple and noise	$U_{i\ nom}$, $I_{o\ nom}$, 20 MHz bandwidth, peak-peak	<1%
Voltage regulation	line and Load combined	typ. <1%
Minimum load	single output models	N/A
	multiple output models to maintain regulation	4 A
Hold-up time	110 V AC, $I_{o\ nom}$	>20 ms

Protection

Output overload	overload and short circuit, automatic recovery
Output overvoltage	latch style
Overtemperature	shutdown due to excessive internal temperature, automatic reset

Interface and control

Input power fail warning	TTL compatible signal, warning time	5 ms
Remote sense	available on V1 and V2. max. voltage compensation	500 mV
Current share	up to 6 units in parallel, V1 and V2 share within	<10% rated load
Output good	TTL compatible signal	
Inhibit	TTL input, output(s) inhibited by high (5 V) signal	

Safety and EMC

Agency approvals	UL 1950; CSA 22.2 No. 234/950; EN 60950 (TÜV); CE to LVD	
Electric strength test voltage	I/O per EN60950	2600 V DC
Electrostatic discharge	IEC/EN 61000-4-2, level 4	8 kV, criterion A
Radiated susceptibility	IEC/EN 61000-4-3, level 3	10 V/m, criterion A
Electr. fast transients/burst	IEC/EN 61000-4-4, level 4	4 kV, criterion A
Input surge	IEC/EN 61000-4-5, level 3	2 kV, criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

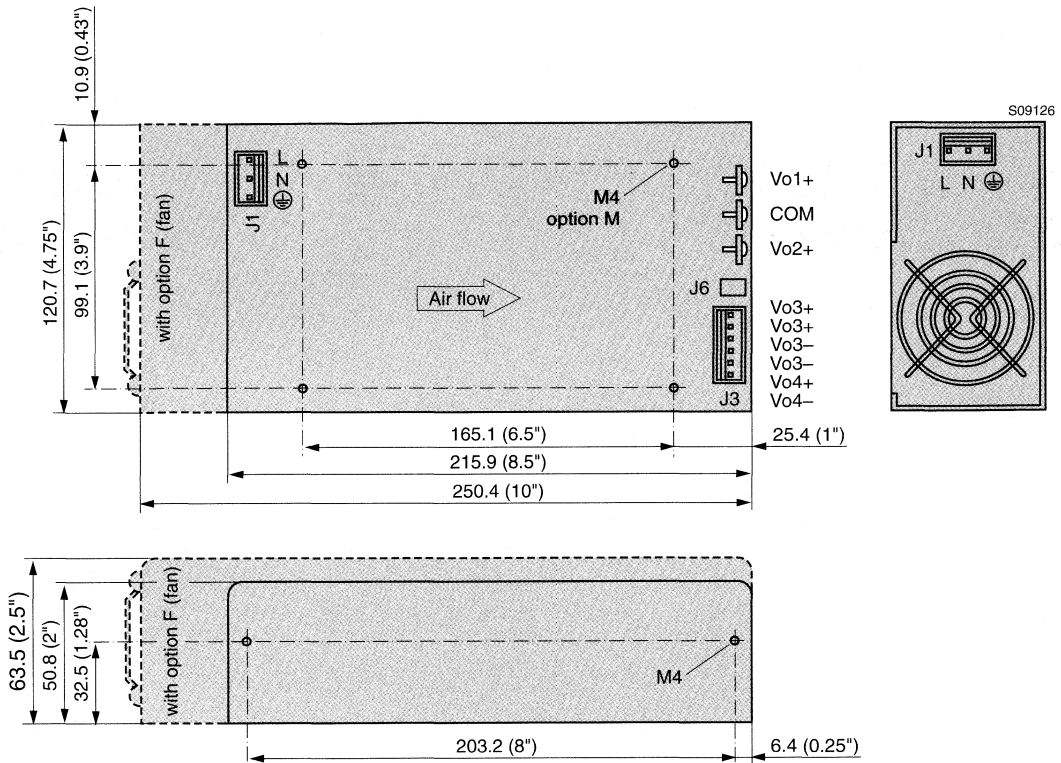
Operating temperature	300 LFM forced air cooling without fan option	0...50°C
	linear derating above 50°C, 2.5%/°C	50...70°C
Storage temperature	non-operational	-55...85°C
Relative humidity	non-condensing	5...95%
Shock	peak acceleration	20 g _n
Vibration	random vibration, 10 Hz to 2k Hz, 3 axes	6 g _{n rms}

Options

Metric mounting inserts	M4	M
Integral fan		F

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.

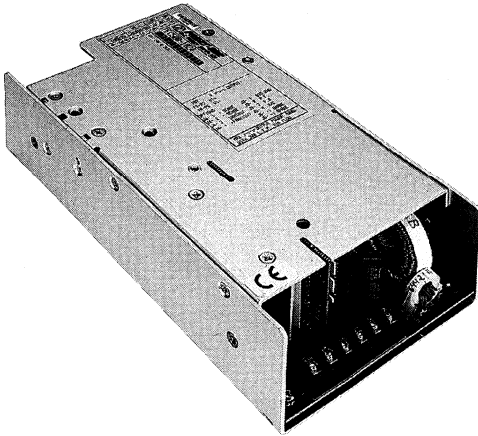


Connectors

Connector	Molex series	Housing	Pin series	Pins loose	Pins chain	Wire gauge
J1	41695	90-50-8051	6838	08-50-0189	08-50-0187	18-20 AWG
	41695	09-50-8051	2478	08-50-0106	08-50-0105	18-20 AWG
	2139	09-50-3051	2478	08-50-0106	08-50-0105	18-20 AWG
J3	41695	09-50-8061	6838	08-50-0189	08-50-0187	18-20 AWG
	41695	09-50-8061	2478	08-50-0106	08-50-0105	18-20 AWG
	2139	09-50-3061	2478	08-50-0106	08-50-0105	18-20 AWG
J6	5268-NA	5264-N	5263	08-70-1040		

Pin allocation of the J6 connector

Pin	Electrical determination
1	Signal ground
2	Inhibit
3	Power fail warning
4	Output good Vo1
5	n.c.
6	Current share Vo2
7	+S Vo2
8	Current share Vo1
9	-S Vo1 and -S Vo2
10	+S Vo1
11	+5 V, 100 mA (option F only)



Input voltage range 85...264 V AC
 1 and 4 outputs up to 48 V DC
 2600 V DC I/O electric strength test voltage



- Power factor correction meets EN 61000-3-2
- Main output with remote sense and current share
- Isolated outputs 3 and 4 can be used as positive or negative polarity

Selection chart

Output 1		Output 2		Output 3		Output 3		Input voltage	Rated power	Type
U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	U_i [V AC]	$P_{o\ tot}$ [W]	
12	30	-	-	-	-	-	-	85...264	360	PFC 375-1012
15	25	-	-	-	-	-	-	85...264	360	PFC 375-1015
24	15	-	-	-	-	-	-	85...264	360	PFC 375-1024
24	21	-	-	-	-	-	-	85...264	504	PFC 500-1024
28	13.4	-	-	-	-	-	-	85...264	375	PFC 375-1028
28	17.9	-	-	-	-	-	-	85...264	501	PFC 500-1028
48	7.8	-	-	-	-	-	-	85...264	375	PFC 375-1048
48	10.4	-	-	-	-	-	-	85...264	499	PFC 500-1048
+5	40	+12	10	5	6	-	-	85...264	375	PFC 375-3002
+5	40	+12	10	24	3	-	-	85...264	375	PFC 375-3004
+5	40	+12	10	48	3	-	-	85...264	375	PFC 375-4005
+5	40	+15	10	15	6	-	-	85...264	375	PFC 375-3001
+5	40	+12	10	12	6	5	3	85...264	375	PFC 375-4000
+5	40	+12	10	12	6	12	3	85...264	375	PFC 375-4001
+5	40	+12	10	12	6	24	3	85...264	375	PFC 375-4002
+5	40	+12	10	15	4	15	4	85...264	375	PFC 375-4004
+5	40	+12	10	24	3	24	3	85...264	375	PFC 375-4005
+5	50	+12	10	12	6	5.2	3	85...264	375	PFC 375-4500
+24	10	+5	10	12	4	12	4	85...264	375	PFC 375-4200
+24	10	+5	10	15	4	15	4	85...264	375	PFC 375-4201

Input

Input voltage	continuous range	85...264 V AC
Input frequency		47...63 Hz
Inrush current limitation	by thermistor, $U_i = 220$ V AC, 1 cycle, 25°C	<65 A
Power factor	IEC/EN 61000-3-2	>0.98
Protection	non-user serviceable internal AC input line fuse	

Output

Efficiency	110 V AC, $I_{o\ nom}$	typ. 75%
Output voltage ripple and noise	$U_{i\ nom}$, $I_{o\ nom}$, 20 MHz bandwidth, peak-peak	<1%
Voltage regulation	line and load combined	typ. <1%
Minimum load	single output models, PFC 500 only	<1.2 A
	multiple output models to maintain regulation 5 V main	3.5 A
	24 V main	1 A
Hold-up time	110 V AC, $I_{o\ nom}$	>20 ms
Output power	multiple output units, continuous	375 W
	peak	450 W

Protection

Output overload	overload and short circuit, automatic recovery
Output overvoltage	latch style
Overtemperature	shutdown due to excessive internal temperature, automatic reset

Interface and control

Input power fail warning	TTL compatible signal, warning time	PFC 375	5 ms
		PFC 500	4 ms
Remote sense	available on V1, max. voltage compensation		250 mV
Current share	up to 6 units in parallel. V1 shares within		<10% rated load
Output good	TTL compatible signal		
Inhibit	TTL input, output(s) inhibited by low (ground) signal		
Fan voltage	170 mA for user if fan option is not selected		12 V

Safety and EMC

Agency approvals	UL 1950; CSA 22.2 No. 234/950; EN 60950; CE to LVD and EMC		
Electric strength test voltage	I/O per EN 60950		2600 V AC
Electrostatic discharge	IEC/EN 61000-4-2, level 4		8 kV, criterion A
Radiated susceptibility	IEC/EN 61000-4-3, level 3		10 V/m, criterion A
Electr. fast transients/burst	IEC/EN 61000-4-4, level 4		4 kV, criterion A
Input surge	IEC/EN 61000-4-5, level 3		2 kV, criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted		class B

Environmental

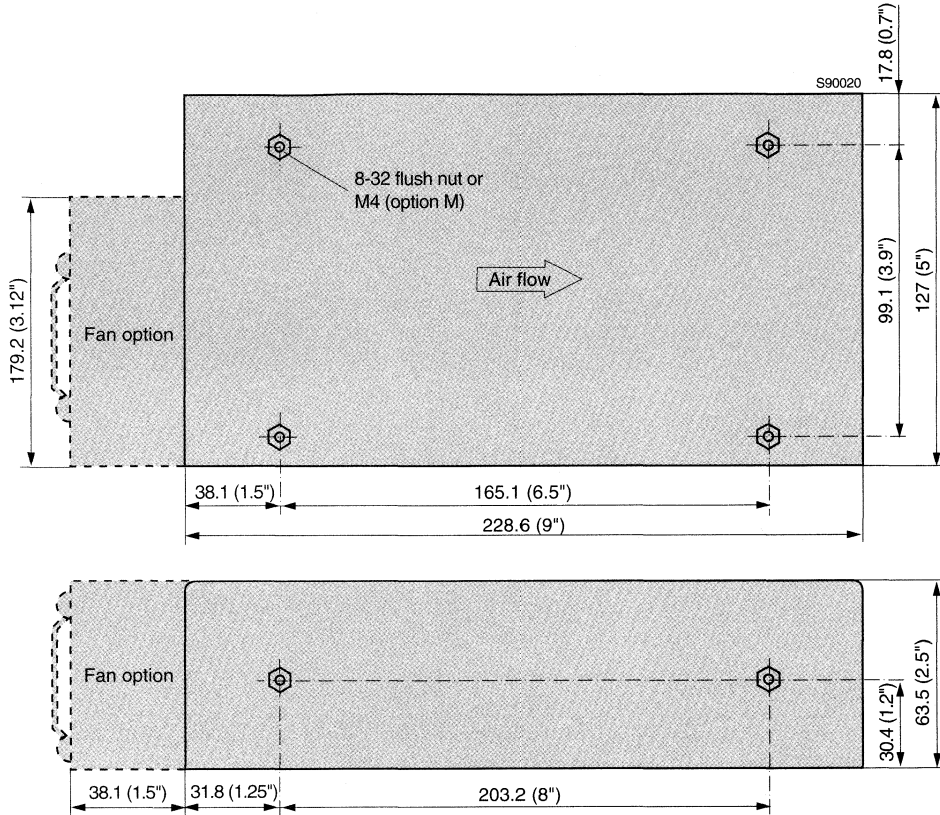
Operating temperature	300 LFM forced air cooling without fan option	0...50°C
	linear derating above 50°C, 2.5%/°C	50...70°C
Storage temperature	non-operational	-55...85°C
Relative humidity	non-condensing	5...95%
Shock	peak acceleration	20 g _n
Vibration	random vibration, 10 Hz to 2k Hz, 3 axes	6 g _{n rms}

Options

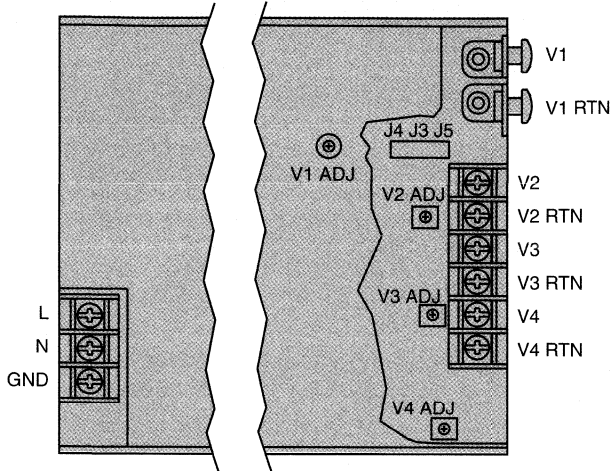
Metric mounting inserts	M4	M
Integral fan		F
Isolation diodes PFC 500 only		D

Mechanical data

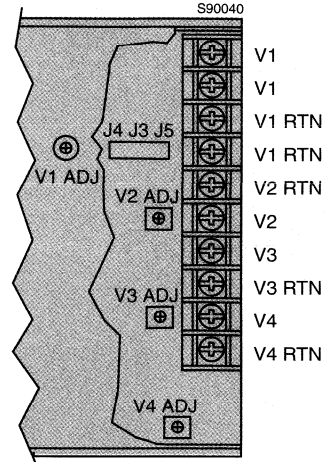
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



PFC 375
bus bar
for +5 V main output



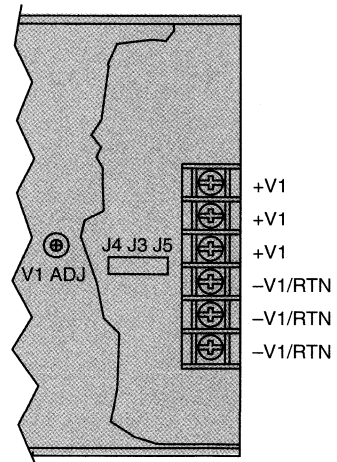
PFC 375
terminal block
main output
for PFC 375-4200
-4201, single output



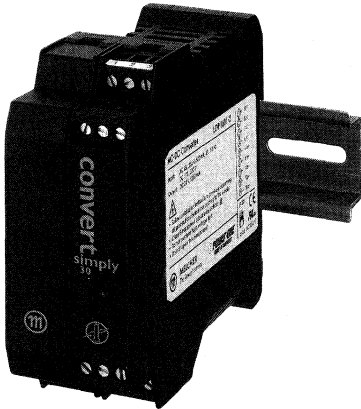
Terminal allocation

Pin	J4	J3	J5
1	+Sense	SIG GND	+Sense
2	-Sense	PF	n.c.
3	Inhibit	PWR GOOD	-
4	+FAN	n.c.	-

PFC 500



LOS, LOR 1000 Series 15 and 30 Watt AC-DC Converters



Universal input range 85...265 V AC
 Single output 24 V DC
 3 kV AC I/O electric strength test voltage



- High efficiency up to 86%
- Class II equipment (double insulation)
- Operating ambient temperature range
 – 10...50°C with convection cooling

Selection chart

Output 1		Input voltage	Rated power	Type
$U_{o \text{ nom}}$ [V DC]	$I_{o \text{ nom}}$ [A]	$T_A = 50^\circ\text{C}$ U_i [V AC]	$P_{o \text{ tot}}$ [W]	
24	0.63	85...265	15	LOS 1601-2
24	1.25	85...265	30	LOK 1601-2

Input

Input voltage	world wide mains, single phase	85...264 V AC
	battery powered	110...330 V DC
Input frequency		47...63 Hz
Inrush current	LOS/LOR	25/30 A

Output

Efficiency	$U_{i \text{ nom}}, I_{o \text{ nom}}$	up to 84%
Output voltage setting accuracy	$U_{i \text{ nom}}, I_{o \text{ nom}}$	$\pm 2\% U_{o \text{ nom}}$
Output voltage ripple & noise	$U_{i \text{ nom}}, I_{o \text{ nom}}$	typ. 100 mV _{pp}
Line regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, I_{o \text{ nom}}$	$\pm 1\%$
Load regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, I_o = (0.5 \dots 1) I_{o \text{ nom}}$	$\pm 2\%$
Minimum load	not required	
Current limitation	hiccup mode	typ. 105% $I_{o \text{ nom}}$
Operation in series	add reverse polarity diodes to the outputs	
Hold-up time	115/230V	15/80 ms

Protection

Input fuse	not user accessible	2 A, slow blow
Input transient protection	voltage depending resistor (VDR)	
Output	no-load, overload and short circuit proof	

Control

Status indication	LED output OK	
Output voltage adjustment	trim-input	90...110% $U_{o\ nom}$

Safety

Approvals	EN 60950, UL 1950, CSA22.2 No. 950	
Electric strength test voltage	class II, I/	kV AC
	class II, I/O	3 kV AC
	class II, O/	kV AC
Pollution degree		2
Degree of protection		IP 20

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4	8kV, criterion B
Electromagnetic field	IEC/EN 61000-4-3, level 2	3 V/m, criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 3	2 kV, criterion B
Surge	IEC/EN 61000-4-5, level 3	2 kV, criterion A
Conducted disturbances	IEC/EN 61000-4-6, level 2	3 V, criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

Operating ambient temperature	$U_{i\ nom}$, $I_{o\ nom}$, convection cooled	-10...50°C
Operating case temperature T_C	$U_{i\ nom}$, $I_{o\ nom}$	-10...80°C
Storage temperature	non operational	-40...85°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	21 days
Shock and vibration	unit wall mounted with brackets	
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.15 mm/2 g_n
Shock	IEC/EN 60068-2-27, 11 ms	15 g_n
Bump	IEC/EN 60068-2-29, 11 ms	10 g

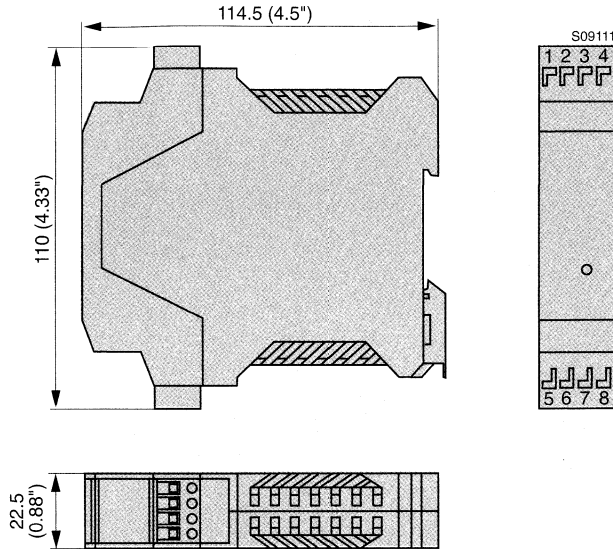
LOS, LOR 1000 Series 15 and 30 Watt AC-DC Converters

Mechanical data

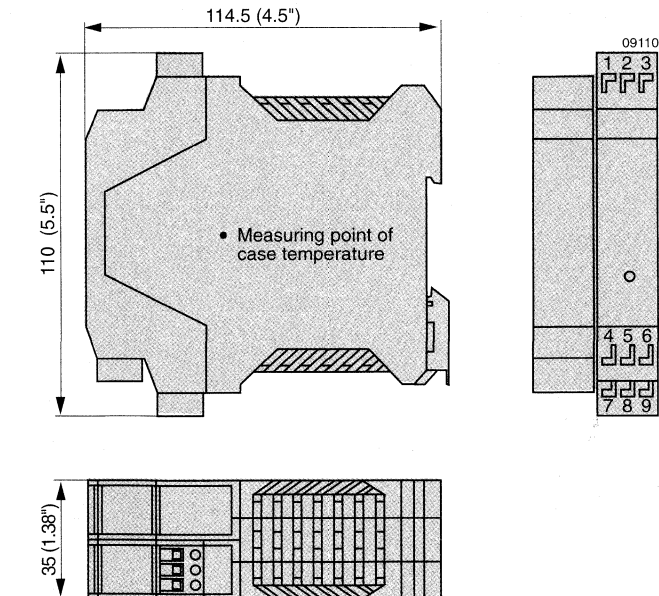
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



LOS



LOR



Pin allocation

Pin	Determination	LOS	LOR
1	Input voltage	N \approx	L \approx
2	Input voltage	N \approx	-
3	Input voltage	L \approx	N \approx
4	Input voltage	L \approx	-
	Output voltage	-	Vo+
5	Output voltage	Vo+	Vo-
6	Output voltage	Vo+	-
	Control input	-	Trim
7	Output voltage	Vo-	Vo+
8	Output voltage	Vo-	Vo-
9	Control input	Trim	-

LOR, LOK 4000 Series 30 and 50 Watt AC-DC Converters



Universal input range 85...264 V AC
 Single output 12, 24 or 48 V DC
 3 kV AC I/O electric strength test voltage



- Extremely compact design
- Battery charger versions
- Operating ambient temperature range
 -10...50 °C with convection cooling

Selection chart

Output 1		Input voltage U_i [V AC]	Rated power $T_A = 50^\circ\text{C}$ $P_{o\ tot}$ [W]	Type	Options
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]				
12	4	85...264	48	LOK 4301-2R	F, K, L, D
13.6	3.6	85...264	49	LOK 4140-2RL	F, K, D
24	1.25	85...264	30	LOR 4601-2	F, K
24	2	85...264	48	LOK 4601-2R	F, K, L, D
27.25	1.8	85...264	49	LOK 4240-2RL	F, K, D
48	1	85...264	48	LOK 4901-2R	F, K, L, D
54.5	0.9	85...264	49	LOK 4740-2RL	F, K, D

Input

Input voltage	world wide mains, single phase	85...264 V AC
	battery powered	88...372 V DC
Input frequency		47...63 Hz
Inrush current	limited by NTC 16 Ω	

Output

Efficiency	$U_{i\ nom}, I_{o\ nom}$	up to 86%
Output voltage setting accuracy	$U_{i\ nom}, I_{o\ nom}$	$\pm 1.5\% U_{o\ nom}$
Output voltage ripple & noise	$U_{i\ nom}, I_{o\ nom}$	$< 1\% U_{o\ nom}$
Load regulation	$U_{i\ min} \dots U_{i\ max}, I_o = 10 \dots 100\% \text{ of } I_{o\ nom}$	$\pm 1\%$
Minimum load	not required	
Current limitation	12/24/48 V types, hiccup mode	short-time overload capability
	battery chargers, rectangular U/I characteristic	max. 130% $I_{o\ nom}$
Operation in series	add reverse polarity diodes to the outputs	
Operation in parallel	with battery charger versions possible	
Hold-up time	115/230 V	14/90 ms

Protection

Input fuse	not user accessible	1.6 A, slow blow
Input transient protection	voltage depending resistor (VDR)	
Output	no-load, overload and short circuit proof	

Control

Status indication	LED output O.K.	
Output voltage adjustment	R input	90...110% $U_{o,nom}$

Safety

Approvals	EN 60950, UL 1950, CSA22.2 No. 950, UL 508 listed	in progress
Electric strength test voltage	input/protective earth	1.5 kV AC
	input/output	3 kV AC
	output/protective earth	1 kV AC
Pollution degree		2
Degree of protection		IP 20

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 2 (8 kV)	criterion B
Electromagnetic field	IEC/EN 61000-4-3, level 2 (3 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 3 (2 kV)	criterion B
Surge	IEC/EN 61000-4-5, level 3, line to prot. earth (2 kV)	criterion B
	IEC/EN 61000-4-5, level 2, line to line (1 kV)	criterion B
Conducted disturbances	IEC/EN 61000-4-6, level 2 (3 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

Operating ambient temperature	$U_{i,nom}$, $I_{o,nom}$, convection cooled	-10...50°C
Operating case temperature T_C	$U_{i,nom}$, $I_{o,nom}$	-10...80°C
Storage temperature	non operational	-40...85°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	21 days
Shock and vibration	unit wall mounted with brackets	
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.15 mm/2 g_n
Shock	IEC/EN 60068-2-27	11 ms/15 g_n
Bump	IEC/EN 60068-2-29	11 ms/10 g_n

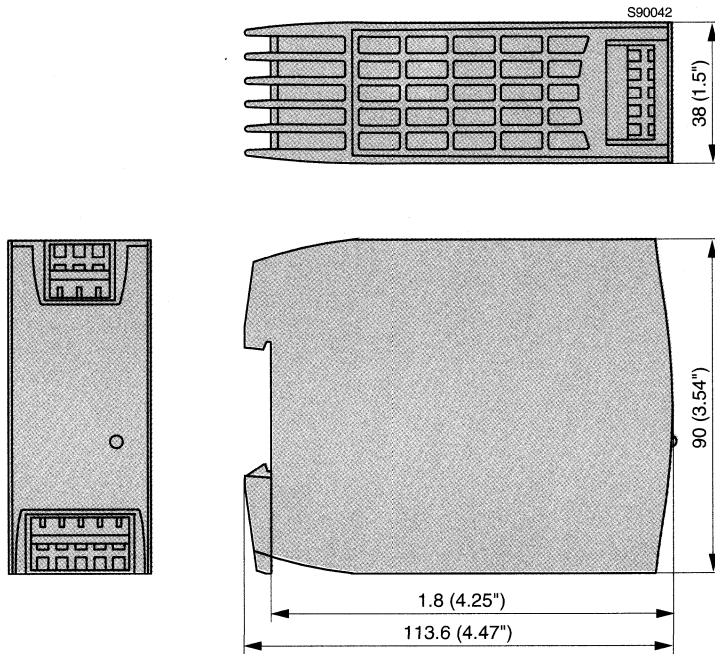
Options

Output undervoltage monitoring, only together with option L	D
Built-in second fuse in the neutral	F
System connectors with screw terminals	K
Rectangular current limitation	L

LOR, LOK 4000 Series 30 and 50 Watt AC-DC Converters

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.

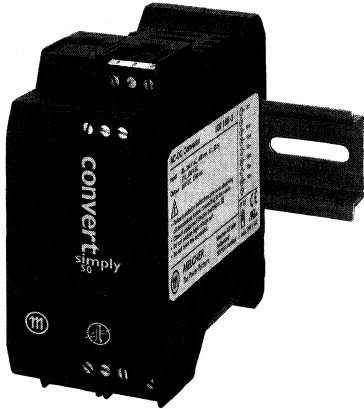


Terminal allocation

Terminal	Determination	LOR	LOK
1	Input	L	L
2	Protective earth	⊖	⊖
3	Input	N	N
4	Output (positive)/D	Vo+	Vo+/D
5	Output (positive)	Vo+	Vo+
6	Output (negative)	Vo-	Vo-
7	Output (negative)	Vo-	Vo-
8	n.c./R input	n.c.	R

Accessories

Protective covers over input and output terminals



Universal input range 85...264 V AC
 Single output 12 or 24 V DC
 3 kV AC I/O electric strength test voltage



- Extremely compact design
- Battery charger versions
- Operating ambient temperature range
 -10...50°C with convection cooling

Selection chart

Output 1		Input voltage U_i [V AC]	Rated power $T_A = 50^\circ\text{C}$ $P_{o\ tot}$ [W]	Type
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]			
12	4	85...264	48	LOK 1301-2
13.6	3.6	85...264	49	LOK 1140-2R
24	2	85...264	49	LOK 1601-2
27.25	1.8	85...264	49	LOK 1240-2R

Input

Input voltage	world wide mains, single phase	85...264 V AC
	battery powered	90...315 V DC
Input frequency		47...63 Hz
Inrush current	limited by NTC 16 W	

Output

Efficiency	$U_i\ nom, I_o\ nom$	up to 86%
Output voltage setting accuracy	$U_i\ nom, I_o\ nom$	$\pm 1.5\% U_o\ nom$
Output voltage ripple & noise	$U_i\ nom, I_o\ nom$	$< 1\% U_o\ nom$
Load regulation	$U_i\ min...U_i\ max, I_o = 10...100\%$ of $I_o\ nom$	$\pm 1\%$
Minimum load	not required	
Current limitation	12/24 V types, hiccup mode	short-time overload capability
	battery chargers, rectangular U/I characteristic	max. 130% $I_o\ nom$
Operation in series	add reverse polarity diodes to the outputs	
Operation in parallel	with battery charger versions possible	
Hold-up time	115/230 V	14/90 ms

Protection

Input fuse	not user accessible	1.6 A, slow blow
Input transient protection	transient suppressor	
Output	no-load, overload and short circuit proof	

Control

Status indication	LED output O.K.	
Output voltage adjustment	R input	90...110% $U_{o\ nom}$

Safety

Approvals	EN 60950, UL 1950, CSA22.2 No. 950	
Electric strength test voltage	input/protective earth	1.5 kV AC
	input/output	3 kV AC
	output/protective earth	1 kV AC
Pollution degree		2
Degree of protection		IP 20

EMC

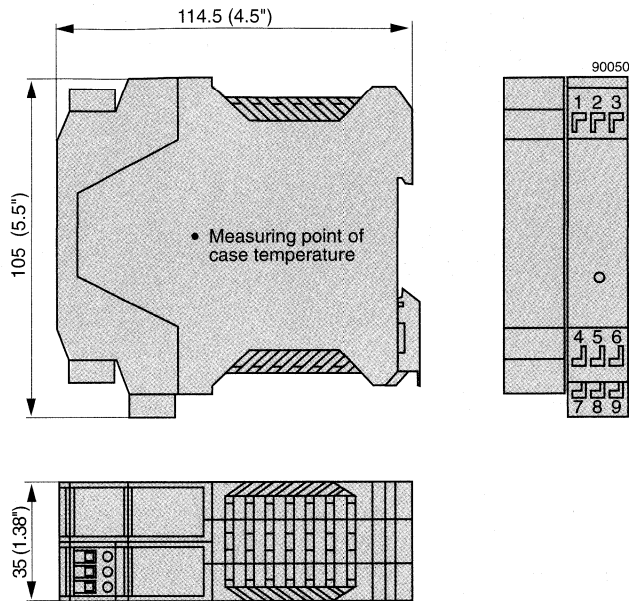
Electrostatic discharge	IEC/EN 61000-4-2, level 4 (8 kV)	criterion B
Electromagnetic field	IEC/EN 61000-4-3, level 2 (3 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 3 (2 kV)	criterion B
Surge	IEC/EN 61000-4-5, level 3, line to prot. earth (2 kV)	criterion B
	IEC/EN 61000-4-5, level 2, line to line (1 kV)	criterion B
Conducted disturbances	IEC/EN 61000-4-6, level 2 (3 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

Operating ambient temperature	$U_{i\ nom}, I_{o\ nom}$, convection cooled	-10...50°C
Operating case temperature T_C	$U_{i\ nom}, I_{o\ nom}$	-10...80°C
Storage temperature	non operational	-40...85°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	21 days
Shock and vibration	unit wall mounted with brackets	
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.15 mm/2 g_n
Shock	IEC/EN 60068-2-27	11 ms/15 g_n
Bump	IEC/EN 60068-2-29	11 ms/10 g_n

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Terminal allocation

Terminal	Determination	LOK
1	Input	L
2	Protective earth	⊕
3	Input	N
4	Output (positive)	Vo+
5	n.c./D-output	n.c./D
6	Output (positive)	Vo+
7	Output (negative)	Vo-
8	R input	R
9	Output (negative)	Vo-



Input range 85...264 V AC with PFC
 1 or 2 isolated, regulated outputs up to 96 V
 3 kV AC I/O electric strength test voltage



- Electrically and mechanically rugged DIN-rail front end
- Outputs individually controlled with 150% output peak power
- Operating ambient temperature range -40...60°C with convection cooling

Selection chart

Output 1		Output 2		Input voltage	Rated power	Type	Options
U_o nom [V DC]	I_o nom [A]	U_o nom [V DC]	I_o nom [A]	U_i [V AC]	$T_A = 60^\circ\text{C}$ $P_{o\ tot}$ [W]		
24.7	5	-	-	85...264	125	LWR-1601-6	S, D, R, F, K, M
24.7	10	-	-	85...264	250	LWN-1601-6	S, D, R, F, K, M
49.4	2.6	-	-	85...264	130	LWR 1801-6	S, D, R, F, K, M
49.4	5	-	-	85...264	250	LWN-1801-6	S, D, R, F, K, M
24.7	5	24.7	5	85...264	250	LWN-2660-6	S, D, R, F, K, M
49.4	2.5	49.4	2.5	85...264	250	LWN 2880-6	S, D, R, F, K, M

Input

Input voltage	world wide mains, single phase	85...264 V AC
	derating information see data sheet	90...350 V DC
Input frequency		16 2/3...440 Hz
Power factor	active PFC	up to 0.99
Inrush current	virtually no inrush current	

Output

Efficiency	U_i nom, I_o nom	up to 89%
Output voltage setting accuracy	U_i nom, I_o nom	$\pm 1.3\% U_o$ nom
Output voltage noise	IEC/EN 61204	typ. 50 mV
Output voltage ripple	sinusoidal output ripple at twice the line frequency	1.2 V _{pp}
Line and cross regulation	U_i min... U_i max	typ. 50 mV
Load regulation	0...100% I_o nom, U_i nom	-1.6% U_o nom
Minimum load	not required	
Current limitation	rectangular U/I characteristic	101...112% I_o nom
Short term peak power	1 s, electronically controlled	150% I_o nom
Operation in parallel	enabled by droop current share	
Hold-up time	I_o nom, U_o decreases to 80% of U_o nom	typ. 15 ms

Control

Status indication	LED output(s) OK
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Protection

Input fuse	not user accessible 6.3 A, slow blow	
Input reverse polarity	bridge rectifier	
Input undervoltage lockout		typ. 80% $U_{i \min}$
Input overvoltage lockout		typ. 105% $U_{i \max}$
Input transient protection	voltage depending resistor (VDR)	
Output(s)	no-load, overload and short circuit proof	
Output overvoltage	second control loop, each output, 24 V/48 V	30/60 V SELV
Overtemperature	reduced output power if thermally overloaded	

Safety

Approvals	EN 60950, UL 1950, CSA22.2 No. 950, UL 508 listed	
Electric strength test voltage	class I, I/case	2 kV AC
	class I, I/O	3 kV AC
	class I, O/case	1 kV AC
	class I, O/O	0.35 kV AC
Pollution degree	AC-in / DC-in	3/2
Degree of protection		IP 20

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4, contact/air (8/15 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level 3 (10 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 4, capacitive/direct (4/2 kV)	criterion A
Surge	IEC/EN 61000-4-5, level 3, in and out, line to line (2 kV)	criterion B
	level >3, input, line to case (3.5 kV)	criterion B
	level 2, output, line to case (1 kV)	criterion A
Conducted disturbances	IEC/EN 61000-4-6, level 3 (10 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class A

Environmental

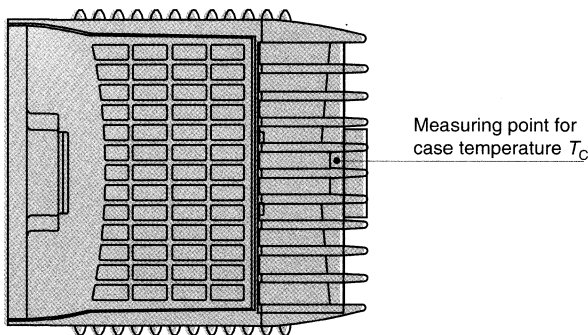
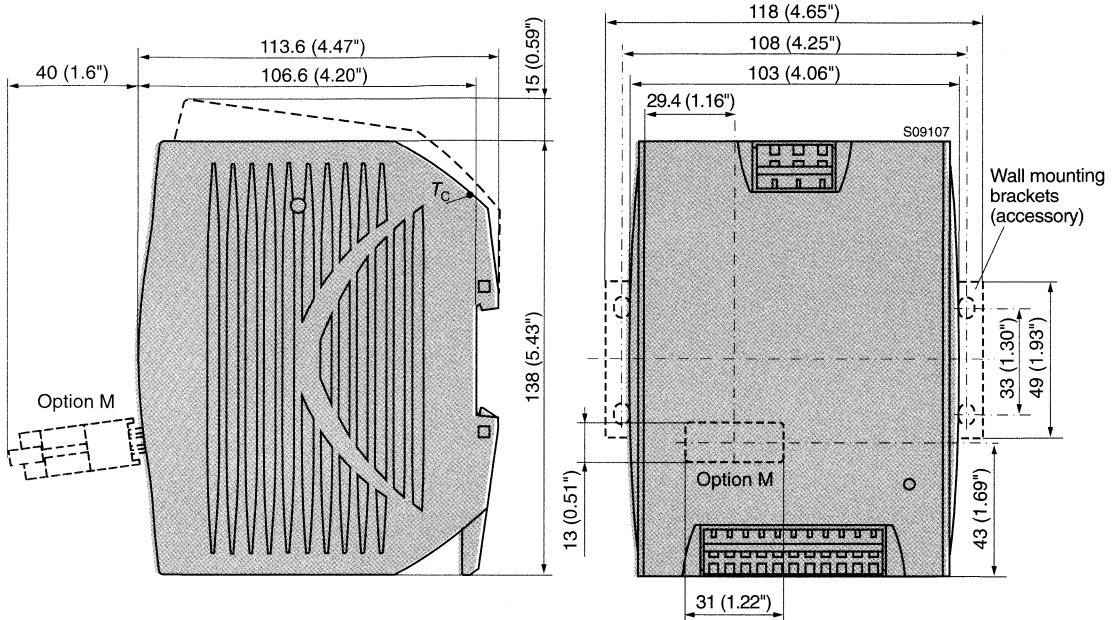
Operating ambient temperature	$U_{i \text{ nom}}, I_{o \text{ nom}}$, convection cooled	-40...60°C
Operating case temperature T_C	$U_{i \text{ nom}}, I_{o \text{ nom}}$	-40...87°C
Storage temperature	non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	56 days
Shock and vibration	unit wall mounted with brackets	
Shock	IEC/EN 60068-2-27, 11 ms	50 g _n
Bump	IEC/EN 60068-2-29, 11 ms	25 g _n
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g _n
Vibration, random	IEC/EN 60068-2-64, 20...500 Hz	0.05 g ² /Hz
MTBF	MIL-HDBK-217E, G _B , 40°C	>600'000 h

Options

Input and output undervoltage monitoring		D1...D5
Output voltage adjustment	7 V...110% of $U_{o \text{ nom}}$	R
Remote on/off		S
Multi option choice (D1...D5, R, S) via Sub-D connector		M1...M2
Built-in second input fuse in the neutral		F
System connectors with screw terminals		K

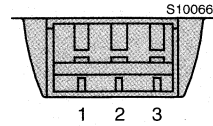
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



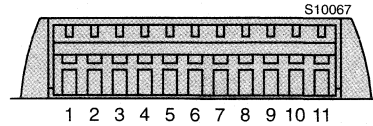
Terminal allocation input side

Pin	Des.	Determination
1	⊕	Protective earth
2	N \approx	Input neutral
3	P \approx	Input phase



Terminal allocation output side

Pin	Des.	Single output	Double output
1	⊕	Earth to load	Earth to load
2	+	Output pos.	Output 1 pos.
3	+	Output pos.	Output 1 pos.
4	-	Output neg.	Output 1 neg.
5	-	Output neg.	Output 1 neg.
6	+	Output pos.	Output 2 pos.
7	+	Output pos.	Output 2 pos.
8	-	Output neg.	Output 2 neg.
9	-	Output neg.	Output 2 neg.
10	Aux.	Options	Options
11	⊕	Earth to load	Earth to load



Accessories

- Mounting brackets for vertical chassis/wall mounting
- Fixing brackets for enhanced vibrations on DIN-rail
- Protective covers over input and output terminals



Input range 85...264 V AC with PFC
 1 or 2 isolated, regulated outputs up to 96 V
 3 kV AC I/O electric strength test voltage



- Electrically and mechanically rugged DIN-rail front end
- Outputs individually controlled with 150% output peak power
- Operating ambient temperature range -40...60°C with convection cooling

Selection chart

Output 1		Output 2		Input voltage	Rated power	Type	Options
$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	U_i [V AC]	$T_A = 60^\circ\text{C}$ $P_{o,tot}$ [W]		
24.7	20.3	-	-	85...264	500	LXN-1601-6	S, D, R, F, K, M
49.4	10.15	-	-	85...264	500	LXN-1801-6	S, D, R, F, K, M
24.7	10.15	24.7	10.15	85...264	500	LXN-2660-6	S, D, R, F, K, M
49.4	5.1	49.4	5.1	85...264	500	LXN-2880-6	S, D, R, F, K, M

Input

Input voltage	world wide mains, single phase	85...264 V AC
	derating information see data sheet	90...350 V DC
Input frequency	wide frequency range	16 2/3...440 Hz
Power factor	active PFC	up to 0.99
Inrush current	virtually no inrush current	

Output

Efficiency	$U_{i,nom}, I_{o,nom}$	up to 89%
Output voltage setting accuracy	$U_{i,nom}, I_{o,nom}$	$\pm 1.3\% U_{o,nom}$
Output voltage noise	IEC/EN 61204	typ. 50 mV
Output voltage ripple	sinusoidal output ripple at twice the line frequency	1.2 V _{pp}
Line and cross regulation	$U_{i,min}...U_{i,max}$	typ. 50 mV
Load regulation	0...100% $I_{o,nom}, U_{i,nom}$	-1.6% $U_{o,nom}$
Minimum load	not required	
Current limitation	rectangular U/I characteristic	101...112% $I_{o,nom}$
Short term peak power	1 s, electronically controlled	150% $I_{o,nom}$
Operation in parallel	enabled by droop current share	
Hold-up time	$I_{o,nom}, U_o$ decreases to 80% of $U_{o,nom}$	typ. 15 ms

Control

Status indication	LED output(s) OK
-------------------	------------------

Protection

Input reverse polarity	bridge rectifier	
Input fuse	not user accessible	12.5 A, slow blow
Input undervoltage lockout		typ. 80% $U_{i \min}$
Input overvoltage lockout		typ. 105% $U_{i \max}$
Input transient	voltage depending resistor (VDR)	
Output(s)	no-load, overload and short circuit proof	
Output overvoltage	second control loop, each output, 24/48 V	30/60 V SELV
Overtemperature	reduced output power if thermally overloaded	

Safety

Approvals in progress	EN 60950, UL 1950, CSA22.2 No. 950, UL 508 listed	
Electric strength test voltage	class I, I/case	2 kV AC
	class I, I/O	3 kV AC
	class I, O/case	1 kV AC
	class I, O/O	0.35 kV AC
Pollution degree	AC-in / DC-in	3/2
Degree of protection		IP 20

EMC

Electrostatic discharge	IEC/EN 61000-4-2, level 4, contact/air (8/15 kV)	criterion A
Electromagnetic field	IEC/EN 61000-4-3, level 3 (10 V/m)	criterion A
Electr. fast transients/bursts	IEC/EN 61000-4-4, level 4, capacitive/direct (4/2 kV)	criterion A
Surge	IEC/EN 61000-4-5, level 3, in and out, line to line (2 kV)	criterion B
	level >3, input, line to case (3.5 kV)	criterion B
	level 2, output, line to case (1 kV)	criterion A
Conducted disturbances	IEC/EN 61000-4-6, level 3 (10 V)	criterion A
Electromagnetic emissions	CISPR 22/EN 55022, conducted	class B

Environmental

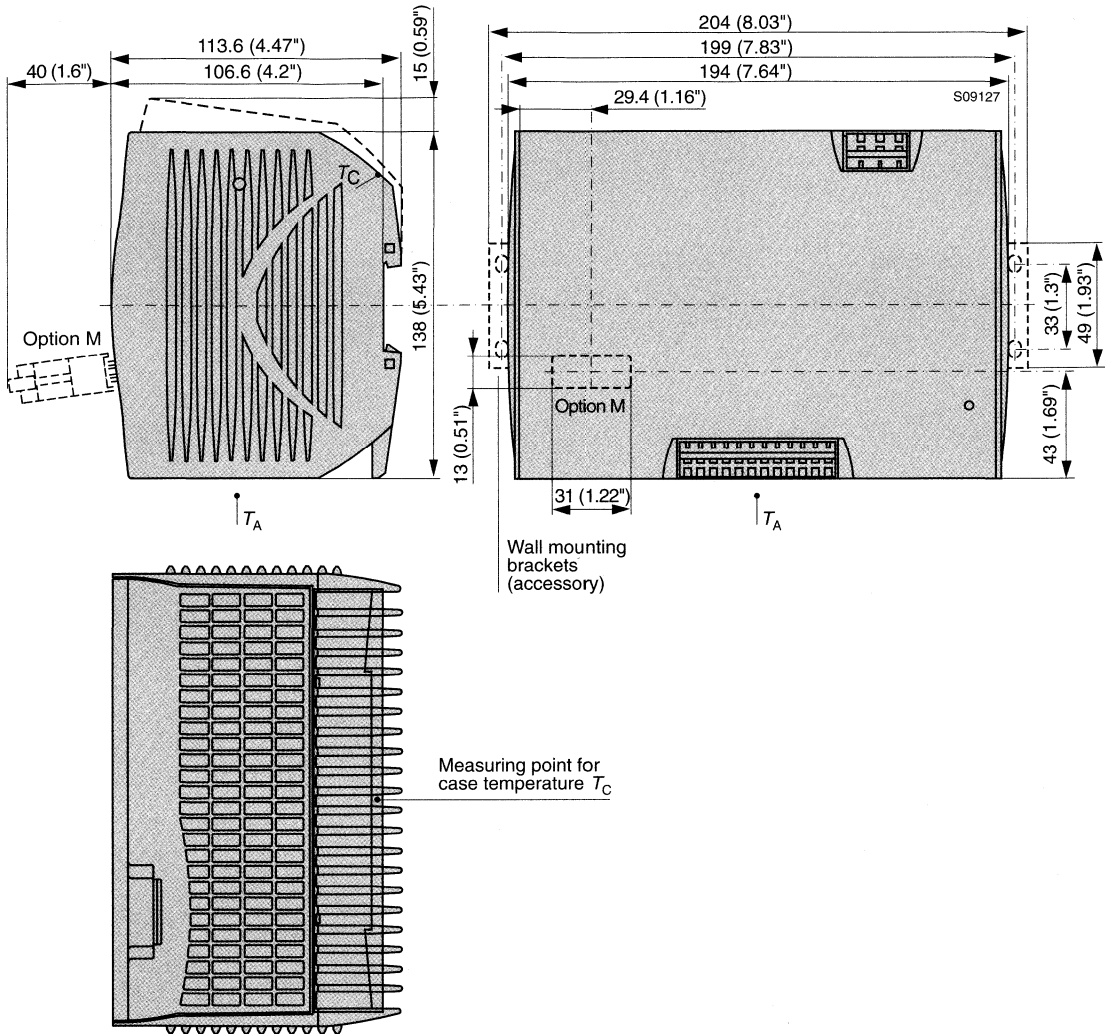
Operating ambient temperature	$U_{i \text{ nom}}, I_{o \text{ nom}}$, convection cooled	-40...60°C
Operating case temperature T_C	$U_{i \text{ nom}}, I_{o \text{ nom}}$	-40...87°C
Storage temperature	non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3, 93%, 40°C	56 days
Shock and vibration	unit wall mounted with brackets	
Shock	IEC/EN 60068-2-27, 11 ms	50 g _n
Bump	IEC/EN 60068-2-29, 11 ms	25 g _n
Vibration, sinusoidal	IEC/EN 60068-2-6, 10...60/60...2000 Hz	0.35 mm/5 g _n
Vibration, random	IEC/EN 60068-2-64, 20...500 Hz	0.05 g ² /Hz
MTBF	MIL-HDBK-217E, G _B , 40°C	400'000 h

Options

Input and output undervoltage monitoring		D1...D5
Output voltage adjustment	7 V...110% of $U_{o \text{ nom}}$	R
Remote on/off		S
Multi option choice	(D1...D5, R, S) via Sub-D connector	M1...M2
Built-in second input fuse in the neutral		F
System connectors with screw terminals		K, K2

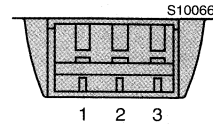
Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



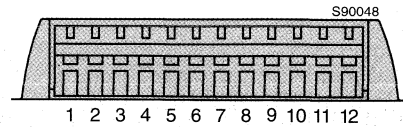
Terminal allocation input side

Pin	Des.	Determination
1	⊕	Protective earth
2	N~	Input neutral
3	P~	Input phase



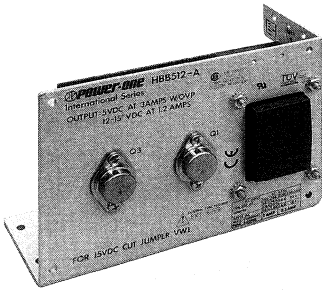
Terminal allocation output side

Pin	Des.	Single output	Double output
1	⊕	Earth to load	Earth to load
2	+	Output pos.	Output 1 pos.
3	+	Output pos.	Output 1 pos.
4	-	Output neg.	Output 1 neg.
5	-	Output neg.	Output 1 neg.
6	+	Output pos.	Output 2 pos.
7	+	Output pos.	Output 2 pos.
8	-	Output neg.	Output 2 neg.
9	-	Output neg.	Output 2 neg.
10	Aux1	Options	Options
11	Aux2	Options	Options
12	⊕	Earth to load	Earth to load



Accessories

- Mounting brackets for vertical chassis/wall mounting
- Fixing brackets for enhanced vibrations on DIN-rail
- Protective covers over input and output terminals



Nominal input voltages: 100...240 V AC
 1 or 4 outputs, 5 to 250 V DC
 3750 V AC I/O electric strength test voltage



- EN 55022 conducted and radiated limits
- Overload and overvoltage protection
- Jumper selectable inputs for worldwide operation

Single output models

Output 1		Type	Case size	Features
U_o nom [V DC]	I_o nom [A]	U_i 100...240 V AC	L x W x H [mm]	
5	1.5	HA 5-1.5/OVP-A	123.7 x 101.6 x 53.3	A
5	3	HB 5-3/OVP-A	123.7 x 101.6 x 53.3	A, E
5	6	HC 5-6/OVP-A	142.7 x 123.7 x 75	A, E
5	9	HN 5-9/OVP-A	177.8 x 123.7 x 83.2	A, E
5	12	HD 5-12/OVP-A	228.6 x 123.7 x 83.2	A, E
5	18	HE 5-18/OVP-A	355.6 x 123.7 x 89.7	A, E
5	25	F 5-25/OVP-A	425.5 x 124 x 127	A, E, F
5	35	G 5-35/OVP-A	425.5 x 124 x 127	A, E, F
5	50	CP 197-A	425.5 x 124 x 127	A, E, F
12	0.9	HA 15-0.9-A	123.7 x 101.6 x 53.3	B
12	1.7	HB 12-1.7-A	123.7 x 101.6 x 53.3	E
12	3.4	HC 12-3.4-A	142.7 x 123.7 x 75	E
12	5.1	HN 12-5.1-A	177.8 x 123.7 x 83.2	E
12	6.8	HD 12-6.8-A	228.6 x 123.7 x 83.2	E
12	10.2	HE 12-10.2-A	355.6 x 123.7 x 89.7	E
12	16	F 15-15-A	425.5 x 124 x 127	B, E, F
15	0.9	HA 15-0.9-A	123.7 x 101.6 x 53.3	B
15	1.5	HB 15-1.5-A	123.7 x 101.6 x 53.3	E
15	3	HC 15-3-A	142.7 x 123.7 x 75	E
15	4.5	HN 15-4.5-A	177.8 x 123.7 x 83.2	E
15	6	HD 15-6-A	228.6 x 123.7 x 83.2	E
15	9	HE 15-9-A	355.6 x 123.7 x 89.7	E
15	15	F 15-15-A	425.5 x 124 x 127	B, E, F
24	0.5	HA 24-0.5-A	123.7 x 101.6 x 53.3	B
24	1.2	HB 24-1.2-A	123.7 x 101.6 x 53.3	E
24	2.4	HC 24-2.4-A	142.7 x 123.7 x 75	E
24	3.6	HN 24-3.6-A	177.8 x 123.7 x 83.2	E
24	4.8	HD 24-4.8-A	228.6 x 123.7 x 83.2	E
24	7.2	HE 24-7.2-A	355.6 x 123.7 x 89.7	E
24	10	F 24-12-A	425.5 x 124 x 127	B, E, F
28	0.5	HA 24-0.5-A	123.7 x 101.6 x 53.3	B
28	1	HB 28-1-A	123.7 x 101.6 x 53.3	E
28	2	HC 28-2-A	142.7 x 123.7 x 75	E
28	3	HN 28-3-A	177.8 x 123.7 x 83.2	E
28	4	HD 28-4-A	228.6 x 123.7 x 83.2	E
28	6	HE 28-6-A	355.6 x 123.7 x 89.7	E
28	12	F 24-12-A	425.5 x 124 x 127	B, E, F
48	0.5	HB 48-0.5-A	123.7 x 101.6 x 53.3	-
48	1	HC 48-1-A	142.7 x 123.7 x 75	-
48	3	HD 48-3-A	228.6 x 123.7 x 83.2	E
48	4	HE 48-4-A	355.6 x 123.7 x 89.7	E
120	0.2	HB 120-0.2-A	123.7 x 101.6 x 53.3	-
175...210	0.12	HB 200.0.12-A	123.7 x 101.6 x 53.3	-
250	0.1	HB 250-0.1-A	123.7 x 101.6 x 53.3	-

Dual output models

Output 1		Output 2		Type	Case size	Features
$U_{o,nom}$ [V]	$I_{o,nom}$ [mA]	$U_{o,nom}$ [V]	$I_{o,nom}$ [mA]	U_i 100...240 V AC	L x W x H [mm]	
+5	1.5	-5	1.5	HAA 5-1.5/OVP-A	165.1 x 101.6 x 53.3	A
+5	3	-5	3	HBB 5-3/OVP-A	177.8 x 124 x 74.9	A
5	6	-5	6	HCC 5-6/OVP-A	238.3 x 123.7 x 83.2	A, D, E
5	2	12	0.5	HAA 512-A	165.1 x 101.6 x 53.3	A, D, E
5	3	12	1.25	HBB 512-A	177.8 x 124 x 74.9	A, D, E
5	6	12	2.5	HCC 512-A	238.3 x 123.7 x 83.2	A, D, E
5	2	15	0.5	HAA 512-A	165.1 x 101.6 x 53.3	A, D, E
5	3	15	1.25	HBB 512-A	177.8 x 124 x 74.9	A, D, E
5	6	15	2.5	HCC 512-A	238.3 x 123.7 x 83.2	A, D, E
+12	1	-5	0.4	HAA 15-0.8-A	165.1 x 101.6 x 53.3	E
+12	1.7	-5	0.7	HBB 15-1.5-A	177.8 x 124 x 74.9	E
+12	0.4	-12	0.4	HAD 12-0.4-A	123.7 x 101.6 x 53.3	-
+12	1	-12	1	HAA 15-0.8-A	165.1 x 101.6 x 53.3	E
+12	1.7	-12	1.7	HBB 15-1.5-A	177.8 x 124 x 74.9	E
+12	3.4	-12	3.4	HCC 15-3-A	238.3 x 123.7 x 83.2	E
+12	5	-12	5	HDD 15-5-A	355.6 x 123.7 x 89.7	E
+12	1	-15	0.8	HAA 15-0.8-A	165.1 x 101.6 x 53.3	E
+12	1.7	-15	1.5	HBB 15-1.5-A	177.8 x 124 x 74.9	E
+12	3.4	-15	3	HCC 15-3-A	238.3 x 123.7 x 83.2	E
+12	5	-15	5	HDD 15-5-A	355.6 x 123.7 x 89.7	E
+15	0.8	-5	0.4	HAA 15-0.8-A	165.1 x 101.6 x 53.3	E
+15	1.5	-5	0.7	HBB 15-1.5-A	177.8 x 124 x 74.9	E
+15	0.8	-12	1	HAA 15-0.8-A	165.1 x 101.6 x 53.3	E
+15	1.5	-12	1.7	HBB 15-1.5-A	177.8 x 124 x 74.9	E
+15	3	-12	3.4	HCC 15-3-A	238.3 x 123.7 x 83.2	E
+15	5	-12	5	HDD 15-5-A	355.6 x 123.7 x 89.7	E
+15	0.4	-15	0.4	HAD 15-0.4-A	123.7 x 101.6 x 53.3	-
+15	0.8	-15	0.8	HAA 15-0.8-A	165.1 x 101.6 x 53.3	E
+15	1.5	-15	1.5	HBB 15-1.5-A	177.8 x 124 x 74.9	E
+15	3	-15	3	HCC 15-3-A	238.3 x 123.7 x 83.2	E
+15	5	-15	5	HDD 15-5-A	355.6 x 123.7 x 89.7	E
+18	0.4	-18	0.4	HAA 24-0.6-A	165.1 x 101.6 x 53.3	-
+18	0.9	-18	0.9	HBB 24-1.2-A	177.8 x 124 x 74.9	-
+18	1.8	-18	1.8	HCC 24-2.4-A	238.3 x 123.7 x 83.2	E
+18	0.4	-20	0.4	HAA 24-0.6-A	165.1 x 101.6 x 53.3	-
+18	0.9	-20	0.9	HBB 24-1.2-A	177.8 x 124 x 74.9	-
+18	1.8	-20	1.8	HCC 24-2.4-A	238.3 x 123.7 x 83.2	E
+18	0.4	-24	0.6	HAA 24-0.6-A	165.1 x 101.6 x 53.3	-
+18	0.9	-24	1.2	HBB 24-1.2-A	177.8 x 124 x 74.9	-
+18	1.8	-24	2.4	HCC 24-2.4-A	238.3 x 123.7 x 83.2	E
+20	0.4	-18	0.4	HAA 24-0.6-A	165.1 x 101.6 x 53.3	-
+20	0.9	-18	0.9	HBB 24-1.2-A	177.8 x 124 x 74.9	-
+20	1.8	-18	1.8	HCC 24-2.4-A	238.3 x 123.7 x 83.2	E
+20	0.4	-20	0.4	HAA 24-0.6-A	165.1 x 101.6 x 53.3	-
+20	0.9	-20	0.9	HBB 24-1.2-A	177.8 x 124 x 74.9	-
+20	1.8	-20	1.8	HCC 24-2.4-A	238.3 x 123.7 x 83.2	E
+20	0.4	-24	0.6	HAA 24-0.6-A	165.1 x 101.6 x 53.3	-
+20	0.9	-24	1.2	HBB 24-1.2-A	177.8 x 124 x 74.9	-
+20	1.8	-24	2.4	HCC 24-2.4-A	238.3 x 123.7 x 83.2	E
+24	0.6	-18	0.4	HAA 24-0.6-A	165.1 x 101.6 x 53.3	-
+24	1.2	-18	0.9	HBB 24-1.2-A	177.8 x 124 x 74.9	-
+24	2.4	-18	1.8	HCC 24-2.4-A	238.3 x 123.7 x 83.2	E
+24	0.6	-20	0.4	HAA 24-0.6-A	165.1 x 101.6 x 53.3	-
+24	1.2	-20	0.9	HBB 24-1.2-A	177.8 x 124 x 74.9	-
+24	2.4	-20	1.8	HCC 24-2.4-A	238.3 x 123.7 x 83.2	E
+24	0.6	-24	0.6	HAA 24-0.6-A	165.1 x 101.6 x 53.3	-
+24	1.2	-24	1.2	HBB 24-1.2-A	177.8 x 124 x 74.9	-
+24	2.4	-24	2.4	HCC 24-2.4-A	238.3 x 123.7 x 83.2	E

Triple output models

Output 1		Output 2		Output 3		Type	Case size	Features
$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	$U_{o\ nom}$ [V DC]	$I_{o\ nom}$ [A]	Input voltage 100...240 V AC	L x W x H [mm]	
5	2	+12	0.4	-5	0.4	HTAA-16W-A	165.1 x 101.6 x 53.3	A, D
5	3	+12	1	-5	0.4	HBAA-40W-A	260.3 x 101.6 x 74.9	A, D, E
+5	6	+12	1	-5	0.4	HCAA-60W-A	228.6 x 123.7 x 83.2	A, E
5	6	+12	1.7	-5	0.7	HCBB-75W-A	279.4 x 123.7 x 90.2	A, D, E
5	8	+12	1.7	-5	0.7	CP 131-A	279.4 x 123.7 x 81.3	A, D, E
5	12	+12	1.5	-5	0.7	HDBB-105W-A	361.9 x 123.7 x 85.7	A, D, E
5	2	+12	0.4	-12	0.4	HTAA-16W-A	165.1 x 101.6 x 53.3	A, D
5	3	+12	1	-12	1	HBAA-40W-A	260.3 x 101.6 x 74.9	A, D, E
+5	6	+12	1	-12	1	HCAA-60W-A	228.6 x 123.7 x 83.2	A, E
5	6	+12	1.7	-12	1.7	HCBB-75W-A	279.4 x 123.7 x 90.2	A, D, E
5	8	+12	1.7	-12	1.7	CP 131-A	279.4 x 123.7 x 81.3	A, D, E
5	12	+12	1.5	-12	1.7	HDBB-105W-A	361.9 x 123.7 x 85.7	A, D, E
5	12	+12	3.4	-12	3.4	HDCC-150W-A	381 x 123.9 x 115.6	A, D, E
5	2	+12	0.4	-15	0.4	HTAA-16W-A	165.1 x 101.6 x 53.3	A, D
5	3	+12	1	-15	0.8	HBAA-40W-A	260.3 x 101.6 x 74.9	A, D, E
+5	6	+12	1	-15	1	HCAA-60W-A	228.6 x 123.7 x 83.2	A, E
5	6	+12	1.7	-15	1.5	HCBB-75W-A	279.4 x 123.7 x 90.2	A, D, E
5	8	+12	1.7	-15	1.5	CP 131-A	279.4 x 123.7 x 81.3	A, D, E
5	12	+12	1.5	-15	1.5	HDBB-105W-A	361.9 x 123.7 x 85.7	A, D, E
5	12	+12	3.4	-15	3	HDCC-150W-A	381 x 123.9 x 115.6	A, D, E
5	2	+15	0.4	-5	0.4	HTAA-16W-A	165.1 x 101.6 x 53.3	A, D
5	3	+15	0.8	-5	0.4	HBAA-40W-A	260.3 x 101.6 x 74.9	A, D, E
+5	6	+15	1	-5	0.4	HCAA-60W-A	228.6 x 123.7 x 83.2	A, E
5	6	+15	1.5	-5	0.7	HCBB-75W-A	279.4 x 123.7 x 90.2	A, D, E
5	8	+15	1.5	-5	0.7	CP 131-A	279.4 x 123.7 x 81.3	A, D, E
5	12	+15	1.5	-5	0.7	HDBB-105W-A	361.9 x 123.7 x 85.7	A, D, E
5	2	+15	0.4	-12	0.4	HTAA-16W-A	165.1 x 101.6 x 53.3	A, D
5	3	+15	0.8	-12	1	HBAA-40W-A	260.3 x 101.6 x 74.9	A, D, E
+5	6	+15	1	-12	1	HCAA-60W-A	228.6 x 123.7 x 83.2	A, E
5	6	+15	1.5	-12	1.7	HCBB-75W-A	279.4 x 123.7 x 90.2	A, D, E
5	8	+15	1.5	-12	1.7	CP 131-A	279.4 x 123.7 x 81.3	A, D, E
5	12	+15	1.5	-12	1.7	HDBB-105W-A	361.9 x 123.7 x 85.7	A, D, E
5	12	+15	3	-12	3.4	HDCC-150W-A	381 x 123.9 x 115.6	A, D, E
5	2	+15	0.4	-15	0.4	HTAA-16W-A	165.1 x 101.6 x 53.3	A, D
5	3	+15	0.8	-15	0.8	HBAA-40W-A	260.3 x 101.6 x 74.9	A, D, E
+5	6	+15	1	-15	1	HCAA-60W-A	228.6 x 123.7 x 83.2	A, E
5	6	+15	1.5	-15	1.5	HCBB-75W-A	279.4 x 123.7 x 90.2	A, D, E
5	8	+15	1.5	-15	1.5	CP 131-A	279.4 x 123.7 x 81.3	A, D, E
5	12	+15	1.5	-15	1.5	HDBB-105W-A	361.9 x 123.7 x 85.7	A, D, E
5	12	+15	3	-15	3	HDCC-150W-A	381 x 123.9 x 115.6	A, D, E

High peak models

Output 1		Output 2		Output 3		Output 4		Type	Case size	Features
$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	Input voltage 100...240 V AC	L x W x H [mm]	
+5	2	+12	4	-	-	-	-	CP 323-A	177.8 x 123.7 x 83.2	A, G
+5	6	+12	2.5	-	-	-	-	CP 510-A	209.5 x 123.7 x 83.2	A
+5	1	-5	0.5	24	1.5	-	-	CP 205-A	260.3 x 101.6 x 74.9	A, D
+5	3	-5	0.6	24	5	-	-	CP 162-A	279.4 x 123.7 x 81.3	A, D, E
+5	6	-5	1.2	24	3.5	-	-	CP 379-A	279.4 x 123.7 x 81.3	A, D, E, H, I
+5	6	+12	5	5	0.25	-	-	CP 498-A	279.4 x 123.7 x 81.3	A, D, E, H
+5	6	+12	5	12	0.5	-	-	CP 498-A	279.4 x 123.7 x 81.3	A, D, E, H
+5	6	-12	1.2	24	3.5	-	-	CP 379-A	279.4 x 123.7 x 81.3	A, D, E, H, I
+5	6	+12	1	-5	0.5	+24	2.4	CP 503-A	279.4 x 123.7 x 81.3	A, I
+5	6	+12	1	-12	1	+24	2.4	CP 503-A	279.4 x 123.7 x 81.3	A, I

Features

- A Overvoltage protection, set at 6.2 V \pm 0.4 V
- B Adjustable outputs:
 12/15 V: F 15-15-A, HA 15-0.9-A
 24/48 V: F 24-12-A, HA 24-0.5-A
- D Isolated outputs, can be referenced as positive (+) or negative (-)
- E Remote sense provided
- F With output inhibit and parallel operation master/slave capability
- G Inhibit
- H Adjustable 3 terminal regulator
- I Can be made into an isolated output by removing jumper

Switching Regulators

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Switching Regulators

Current [A]	Output [V DC]						No. of outputs	Input [V DC]					Series	Page
	1	5	15	24	36	48		5	10	20	60	80		

Board Mountable

3.5	■						1	■					DSN	264
4...6	■						1	■					SIP, SIE	266

Cassis Mountable

1...6	■						1	■					PSA, PSR	268
3...8	■						1	■					PSB	272
6...12	■						1	■					PSC	276

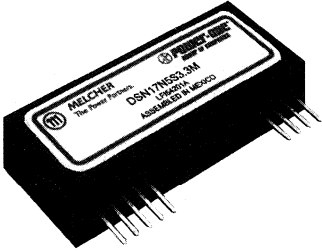
Cassette Style

6...12	■						1	■					PSL	280
9...25	■						1	■					PSS, PSK	284

Data sheets

Detailed data sheets are available from either source:

- Internet: www.power-one.ch
- CD-ROM
- Nearest sales office by fax or mail.



Input voltage range 4.5...15.5 V DC
Single output of 3.3 or 5 V DC

- Compact single in line package
- High power density and efficiency to 88%
- Remote ON/OFF

Selection chart

Output		Input voltage	Rated power	Efficiency	Type
$U_{o, nom}$ [V DC]	$I_{o, nom}$ [A]	U_i [V DC]	$P_{o, tot}$ [W]	η_{typ} [%]	
3.3	3.5	4.5...6	11.5	86	DSN 17 N5S3.3
5	3.5	6.5...15.5	17.5	88	DSN 17 N12S5

Input

Input voltage	DSN 17 N5S3.3	4.5...6 V DC
	DSN 17 N12S5	6.5...15.5 V DC

Output

Efficiency	$U_{i, nom}, I_{o, nom}$	typ. 87%
Output voltage ripple and noise	$U_{i, nom}, I_{o, nom}, 20$ MHz bandwidth, peak-peak	typ. 50 mV _{pp}
Regulation	input line minimum to maximum	max. 1%
	load 25...100%	max. 2.5%

Protection

Output overload	continuous current limit
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Interface and control

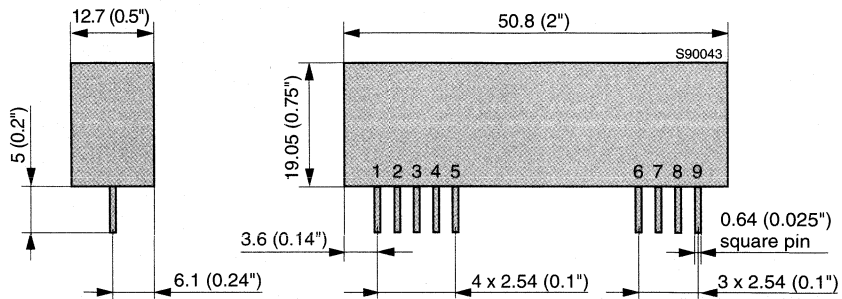
ON/OFF	TTL compatible, open or logic high	Off
	logic low	On

Safety and EMC

Agency approvals	UL 1950; CSA 22.2 No. 234/950; EN 60950 (TÜV); CE to LVD
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Environmental

Operating temperature	case	-40...85°C
Storage temperature	non operational	-55...105°C

Mechanical dataTolerances ± 0.3 mm (0.012") unless otherwise indicated.**Pin allocation**

Pin	Single output unit
1	ON/OFF
2	Vi+
3	Vi+
4	Vi-
5	Vi-
6	Vo-
7	Vo-
8	Vo+
9	Vo+



Input voltage range up to 5.5 V DC
 Single output of 1.2...5 V DC
 No input to output isolation



- High efficiency topology
- Vertical and horizontal mounting
- Open frame, water washable

Selection chart

Output		Input voltage U_i [V DC]	Rated power $P_{o,tot}$ [W]	Efficiency η_{typ} [%]	Type	Type
U_o, nom [V DC]	I_o, nom [A]					
1.2	6	4.5...5.5	7	70	SIP 501.2E	SIE 501.2
1.5	6	4.5...5.5	9	75	SIP 501.5E	SIE 501.5
1.8	6	4.5...5.5	11	77	SIP 501.8E	SIE 501.8
2.1	6	4.5...5.5	13	81	SIP 502.1E	SIE 502.1
2.5	6	4.5...5.5	15	83	SIP 502.5E	SIE 502.5
3.3	6	4.5...5.5	20	87	SIP 503.3E	SIE 503.3
5	4	3...4	20	90	SIP 305	

Input

Input voltage	continuous range, 3.3 V	3...4 V DC
	continuous range, 5 V	4.5...5.5 V DC

Output

Output voltage setting accuracy	$U_{i, nom}, I_{o, nom}$	$\pm 1\% U_{o, nom}$
Minimum load	recommended	10% $I_{o, nom}$
Line regulation	$U_{i, min}...U_{i, max}, I_{o, nom}$, SIE models	typ. $\pm 1\% U_{o, nom}$
	$U_{i, min}...U_{i, max}, I_{o, nom}$, SIP models	typ. $\pm 0.5\% U_{o, nom}$
Load regulation	$U_{i, nom}, 1...100\% I_{o, nom}$	typ. $\pm 1\% U_{o, nom}$
Output voltage switching noise	$U_{i, nom}, I_{o, nom}$, DC-200 MHz, peak-peak, total, SIE	50 mV
	$U_{i, nom}, I_{o, nom}$, DC-200 MHz, peak-peak, total, SIP	100 mV

Control and protection

Overload protection	hiccup, threshold range, SIE models	150% $I_{o, nom}$
Shortcircuit	latching, SIE models	
Remote shutdown	negative logic, SIE models	
Remote sense	headroom, SIE model	0.25 V
Power good signal	SIE model	-16...-10, +10...+16% $V_{setpoint}$

Safety and EMC

Electromagnetic interference	conducted	tbd
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Environmental

Operating ambient temperature	$U_{i\ nom}, I_{o\ nom}$	0...55°C
Minimum required airflow		200 LFM
Storage temperature	non operational	-25...120°C
Relative humidity	non condensing	95%
MTBF	Bellcore TR-NWT-000332	7'100'000 h

Options

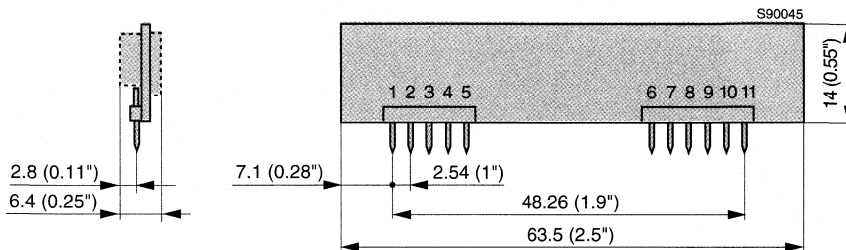
Right angle pins	SIP and SIE	R
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Mechanical data

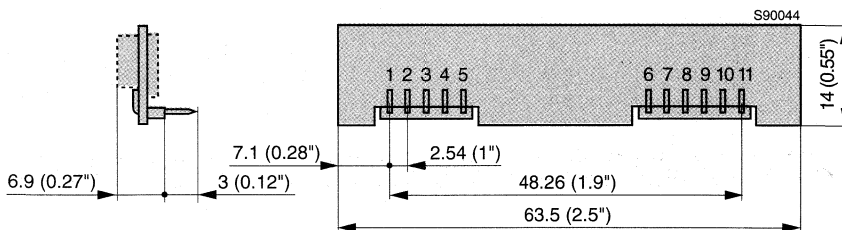
Tolerances $\pm 0.3\text{ mm}$ (0.012") unless otherwise indicated.



Standard

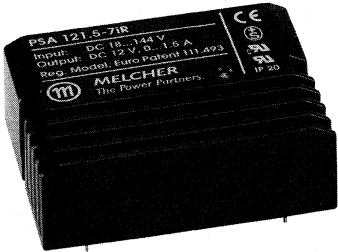


Option R



Pin allocation

Pin	SIP models	SIE models
1	+Vout	+Vout
2	+Vout	+Vout
3	+Vout	sense
4	-Vout	+Vout
5	-Vout	ground
6	-Vin	ground
7	-Vin	+Vin
8	+Vin	+Vin
9	+Vin	Power OK
10	+Vin	trim
11	+Vin	enable



Input voltage up to 144 V DC
 Single output of 3.3...48 V DC
 No input to output isolation



- Efficiency up to 95%
- Low input-output differential voltage
- No derating over temperature
- Board or chassis mountable

Selection chart

Output		Input voltage	Rated power	Efficiency	Type	Options
$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	U_i [V DC]	$P_{o,tot}$ [W]	η_{typ} [%]		
3.3	6	5...35	19.8	80	PSA 3E6-2	iRY-Package
5	2	8...80	10	74	PSR 52-7	Y
5	3	8...80	15	79	PSR 53-7	-9, i, P, R, Y
5	4	7...40	20	83	PSR 54-7	-9, i, P, R, Y
5	5	7...35	25	83	PSA 55-7	-9, i, P, R, Y
5.1	2	8...40	10.2	75	PSA 5A2-2	iRY-Package
5.1	5	7...35	25.5	83	PSA 5A5-2	iRY-Package
12	1.5	18...144	18	87	PSA 121.5-7iR	-9, P, Y
12	2.5	15...80	30	87	PSR 122.5-7	-9, i, P, R, Y
12	3	15...40	36	89	PSA 123-2	iRY-Package
15	1.5	22...144	22.5	89	PSA 151.5-7iR	-9, P, Y
15	2.5	19...80	37.5	89	PSR 152.5-7	-9, i, P, R, Y
15	3	19...40	45	90	PSA 153-2	iRY-Package
24	1.5	31...144	36	93	PSA 241.5-7iR	-9, P, Y
24	2	29...80	48	92	PSR 242-7	-9, i, P, R, Y
24	2.5	29...60	60	93	PSA 242.5-2	iRY-Package
36	1.2	44...144	43.2	95	PSA 361-7iR	-9, P, Y
36	2	42...80	72	94	PSR 362-7	-9, i, P, R, Y
48	1	58...144	48	95	PSA 481-7iR	-9, P, Y

Input

Input voltage	refer to selection chart
No load input current	50 mA

Output

Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to 95%
Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 0.6\% U_{o\text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 0.3%
Line regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, I_{o\text{ nom}}$	typ. $\pm 0.3\%$
Load regulation	$U_{i\text{ nom}}, 0 \dots I_{o\text{ nom}}$	typ. 0.3%
Minimum load	not required	0 A
Current limitation	rectangular U/I characteristic	typ. 110% $I_{o\text{ nom}}$
Operation in parallel	by current limitation	

Protection

Input reverse polarity	with external fuse	
Input undervoltage lockout		typ. 80% $U_{i\text{ min}}$
Input transient protection	suppressor diode	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode	typ. 150% $U_{o\text{ nom}}$

Safety

Approvals	EN 60950, UL 1950, CSA C22.2 No. 950	
Protection degree		IP 20/40
Electric strength test voltage	I/case and O/case	500/750/1500 V DC

EMC

Electrostatic discharge	IEC/EN 61000-4-2
Electromagnetic field	IEC/EN 61000-4-3
Electr. fast transients/bursts	IEC/EN 61000-4-4
Surge	IEC/EN 61000-4-5
Conducted disturbances	IEC/EN 61000-4-6
Electromagnetic emissions	CISPR 22/EN 55022

Environmental

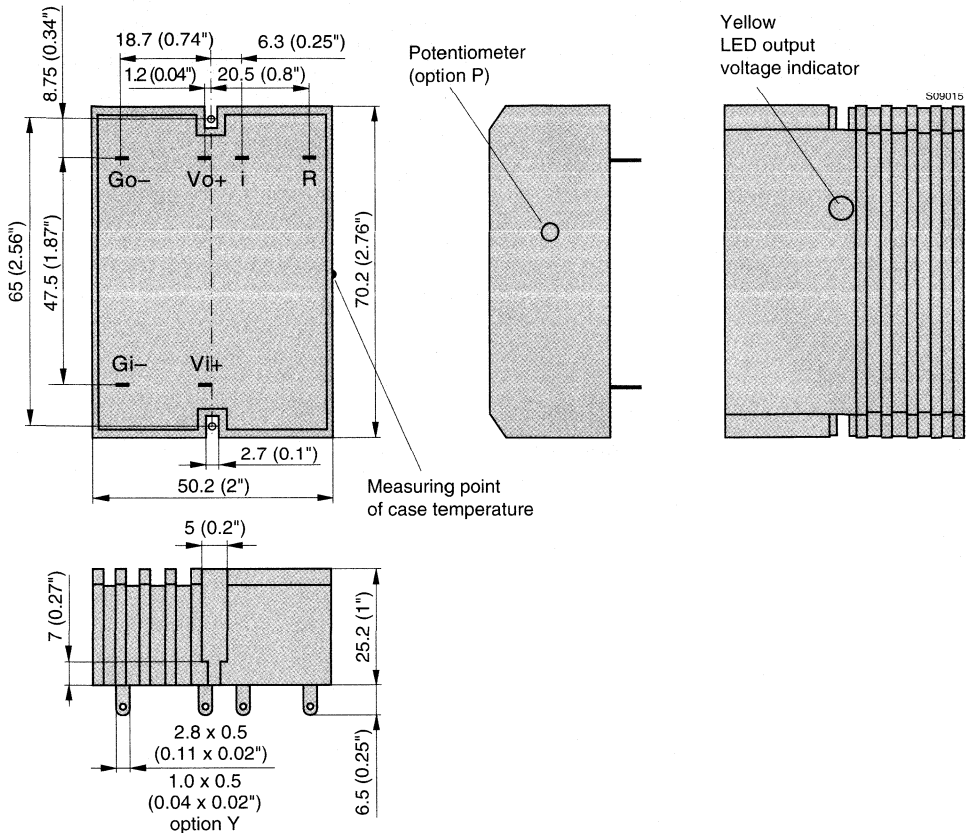
Operating ambient temperature	-2, $U_{i\text{ nom}}$, $I_{o\text{ nom}}$, convection cooled	-10...50°C
Operating case temperature T_C	-2, $U_{i\text{ nom}}$, $I_{o\text{ nom}}$	-10...80°C
Storage temperature	-2, non operational	-25...100°C
Operating ambient temperature	-7, $U_{i\text{ nom}}$, $I_{o\text{ nom}}$, convection cooled	-25...71°C
Operating case temperature T_C	-7, $U_{i\text{ nom}}$, $I_{o\text{ nom}}$	-25...95°C
Storage temperature	-7, non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3	
Vibration, sinusoidal	IEC/EN 60068-2-6	
Shock	IEC/EN 60068-2-27	
Bump	IEC/EN 60068-2-29	
Random vibration	IEC/EN 60068-2-64	
MTBF	MIL-HDBK-217	

Options

Extended temperature range	-40...71°C, ambient, operating	-9
Inhibit, TTL input, output(s) enabled if left open		i
Output voltage adjustment	0...108% $U_{o\text{ nom}}$	R
Output voltage adjustment	±8% $U_{o\text{ nom}}$	P
Small soldering pins 0.5 x 1.0 mm		Y

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

- Isolation pads for easy and safe PCB mounting
- Filters and ring core chokes for ripple and interference reduction
- Adapter kit for DIN-rail and chassis mounting



Input voltage up to 144 V DC
 Single output of 5.1...48 V DC
 No input to output isolation



- Efficiency up to 96%
- Low input-output differential voltage
- No derating over temperature

Selection chart

Output		Input voltage	Rated power	Efficiency	Type	Options
$U_{o, \text{nom}}$ [V DC]	$I_{o, \text{nom}}$ [A]	U_i [V DC]	$P_{o, \text{tot}}$ [W]	η_{typ} [%]		
5.1	4...5	15...144	25.5	80	PSB 5A4-7iR	-9, L, P, C
5.1	6	8...80	30.6	81	PSB 5A6-7iR	-9, L, P, C
5.1	7	7...40	35.7	84	PSB 5A7-7iR	-9, L, P, C
5.1	8	7...40	40.8	81	PSB 5A8-2	iR-Package
12	3...4	18...144	48	89	PSB 123-7iR	-9, L, P, C
12	5	15...80	60	90	PSB 125-7iR	-9, L, P, C
12	6	15...40	72	90	PSB 126-2	iR-Package
15	3...4	22...144	60	90	PSB 153-7iR	-9, L, P, C
15	5	19...80	75	92	PSB 155-7iR	-9, L, P, C
15	6	15...40	90	92	PSB 156-2	iR-Package
24	3...4	31...144	96	94	PSB 243-7iR	-9, L, P, C
24	5	29...80	120	95	PSB 245-7iR	-9, L, P, C
24	6	29...60	144	95	PSB 246-2	iR-Package
36	3...4	44...144	144	90	PSB 153-7iR	-9, L, P, C
36	5	42...80	180	92	PSB 155-7iR	-9, L, P, C
48	3...4	58...144	192	96	PSB 483-7iR	-9, L, P, C

Input

Input voltage	refer to selection chart
No load input current	≤50 mA

Output

Efficiency	$U_{i \text{ nom}}, I_{o \text{ nom}}$	up to 96%
Output voltage setting accuracy	$U_{i \text{ nom}}, I_{o \text{ nom}}$	±0.6% $U_{o \text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 0.3%
Line regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, I_{o \text{ nom}}$	typ. ±0.3%
Load regulation	$U_{i \text{ nom}}, 0 \dots I_{o \text{ nom}}$	typ. 0.25%
Minimum load	not required	0 A
Current limitation	rectangular U/I characteristic	typ. 110% $I_{o \text{ nom}}$
Operation in parallel	by current limitation	

Protection

Input reverse polarity	with external fuse (built-in fuse with option C installed)
Input undervoltage lockout	typ. 80% $U_{i \text{ min}}$
Input transient protection	suppressor diode
Output	no-load, overload and short circuit proof
Output overvoltage	suppressor diode in each output typ. 150% $U_{o \text{ nom}}$

Safety

Approvals	EN 60950, UL 1950, CSA C22.2 No. 950
Protection degree	IP 20
Electric strength test voltage	I/case and O/case 500/750/1500 V DC

EMC

Electrostatic discharge	IEC/EN 61000-4-2
Electromagnetic field	IEC/EN 61000-4-3
Electr. fast transients/bursts	IEC/EN 61000-4-4
Surge	IEC/EN 61000-4-5
Conducted disturbances	IEC/EN 61000-4-6
Electromagnetic emissions	CISPR 22/EN 55022

Environmental

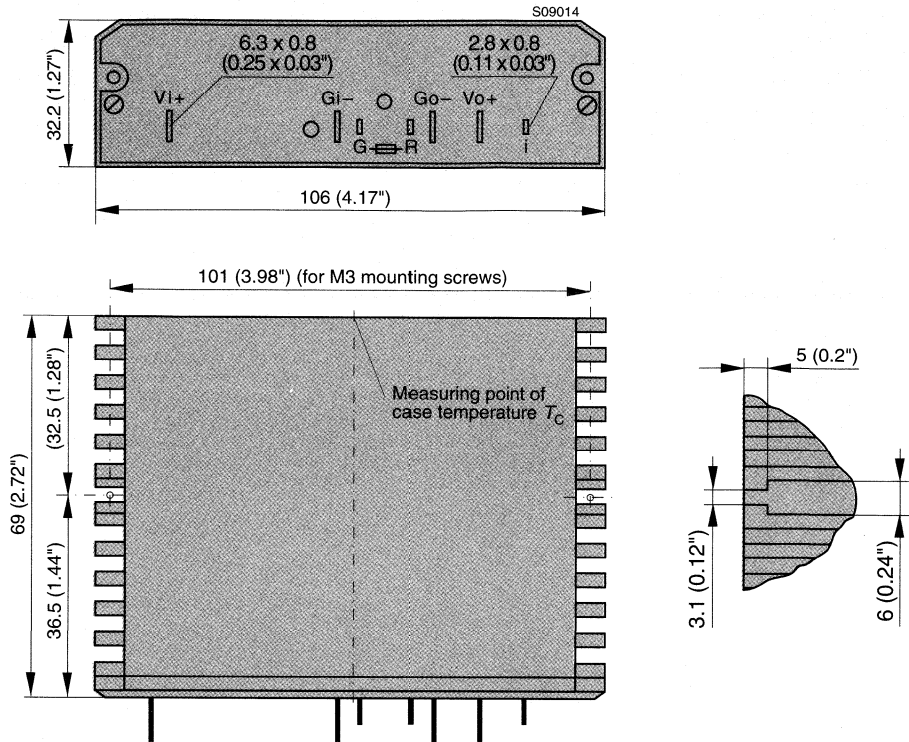
Operating ambient temperature	-2, $U_{i\text{ nom}}$, $I_{o\text{ nom}}$, convection cooled	-10...50°C
Operating case temperature T_C	-2, $U_{i\text{ nom}}$, $I_{o\text{ nom}}$	-10...80°C
Storage temperature	-2, non operational	-25...100°C
Operating ambient temperature	-7, $U_{i\text{ nom}}$, $I_{o\text{ nom}}$, convection cooled	-25...71°C
Operating case temperature T_C	-7, $U_{i\text{ nom}}$, $I_{o\text{ nom}}$	-25...95°C
Storage temperature	-7, non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3	
Vibration, sinusoidal	IEC/EN 60068-2-6	
Shock	IEC/EN 60068-2-27	
Bump	IEC/EN 60068-2-29	
Random vibration	IEC/EN 60068-2-64	
MTBF	MIL-HDBK-217	

Options

Extended temperature range	-40...71°C, ambient, operating	-9
Inhibit, TTL input, output(s) enabled if left open		i
Output voltage adjustment	0...108% $U_{o\text{ nom}}$	R
Additional internal input filter		L
Output voltage adjustment	±8% $U_{o\text{ nom}}$	P
Thyristor crowbar on output		C

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

- Isolation pads for easy and safe PCB mounting
- Ring core chokes for ripple and interference reduction



Input voltage up to 144 V DC
 Single output of 3.3...36 V DC
 No input to output isolation



- Efficiency up to 96%
- Low input-output differential voltage
- No derating over temperature

Selection chart

Output		Input voltage	Rated power	Efficiency	Type	Options
U_o nom [V DC]	I_o nom [A]	U_i [V DC]	$P_{o\ tot}$ [W]	η_{typ} [%]		
3.3	12	8...40	39.6	77	PSC 3E122	iR-Package
5.1	10	8...80	51	79	PSC 5A10-7iR	-9, L, P, C, D
5.1	11	8...40	56.1	79	PSC 5A11-2	iR-Package
5.1	12	7...40	61.2	83	PSC 5A12-7iR	-9, L, P, C, D
12	6	18...144	72	89	PSC 126-7iR	-9, L, P, C, D
12	8	15...80	96	90	PSC 128-7iR	-9, L, P, C, D
12	9	15...40	108	90	PSC 129-2	iR-Package
15	6	22...144	90	90	PSC 156-7iR	-9, L, P, C, D
15	8	19...80	120	91	PSC 158-7iR	-9, L, P, C, D
15	9	19...40	135	91	PSC 159-2	iR-Package
24	6	31...144	144	94	PSC 246-7iR	-9, L, P, C, D
24	8	29...80	192	94	PSC 248-7iR	-9, L, P, C, D
24	9	29...60	216	94	PSC 249-2	iR-Package
36	6	44...144	216	95	PSC 366-7iR	-9, L, P, C, D
36	8	42...80	288	96	PSC 368-7iR	-9, L, P, C, D

Input

Input voltage	refer to selection chart
No load input current	50 mA

Output

Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to 96%
Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 0.6\% U_{o\text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 0.4%
Line regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, I_{o\text{ nom}}$	typ. $\pm 0.3\%$
Load regulation	$U_{i\text{ nom}}, 0 \dots I_{o\text{ nom}}$	typ. 0.3%
Minimum load	not required	0 A
Current limitation	rectangular U/I characteristic	typ. 110% $I_{o\text{ nom}}$
Operation in parallel	by current limitation	

Protection

Input reverse polarity	with external fuse (built-in fuse with option C installed)	
Input undervoltage lockout		typ. 80% $U_{i\text{ min}}$
Input transient protection	suppressor diode	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. 150% $U_{o\text{ nom}}$

Safety

Approvals	EN 60950, UL 1950, CSA C22.2 No. 950	
Protection degree		IP 20
Electric strength test voltage	I/case and O/case	500/750/1500 V DC

EMC

Electrostatic discharge	IEC/EN 61000-4-2
Electromagnetic field	IEC/EN 61000-4-3
Electr. fast transients/bursts	IEC/EN 61000-4-4
Surge	IEC/EN 61000-4-5
Conducted disturbances	IEC/EN 61000-4-6
Electromagnetic emissions	CISPR 22/EN 55022

Environmental

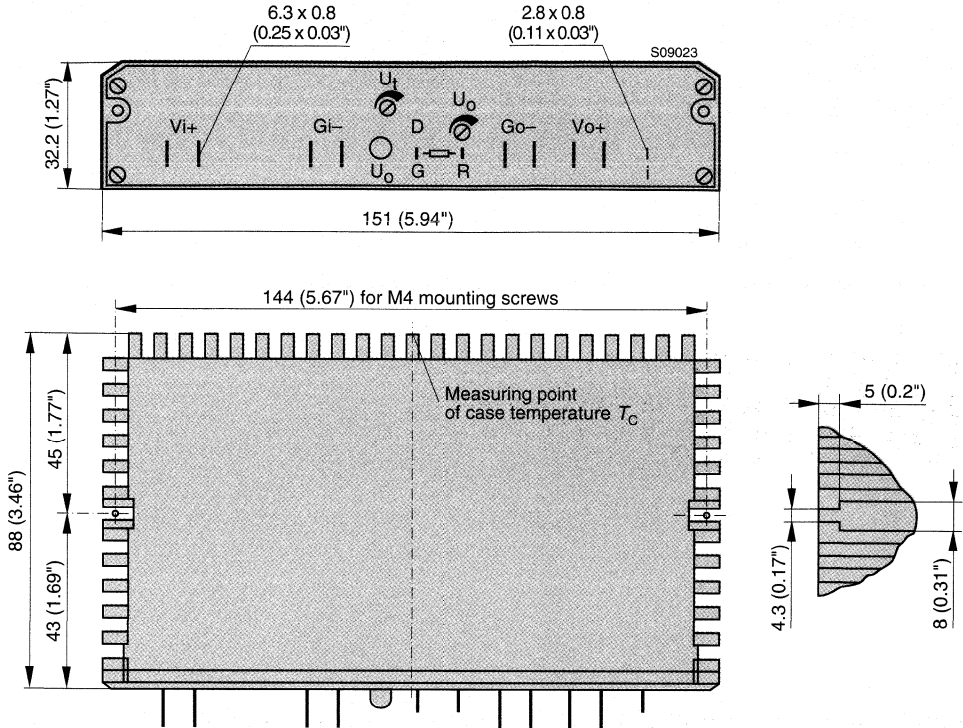
Operating ambient temperature	-2, $U_{i\text{ nom}}$, $I_{o\text{ nom}}$, convection cooled	-10...50°C
Operating case temperature T_C	-2, $U_{i\text{ nom}}$, $I_{o\text{ nom}}$	-10...80°C
Storage temperature	-2, non operational	-25...100°C
Operating ambient temperature	-7, $U_{i\text{ nom}}$, $I_{o\text{ nom}}$, convection cooled	-25...71°C
Operating case temperature T_C	-7, $U_{i\text{ nom}}$, $I_{o\text{ nom}}$	-25...95°C
Storage temperature	-7, non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3	
Vibration, sinusoidal	IEC/EN 60068-2-6	
Shock	IEC/EN 60068-2-27	
Bump	IEC/EN 60068-2-29	
Random vibration	IEC/EN 60068-2-64	
MTBF	MIL-HDBK-217	

Options

Extended temperature range	-40...71°C, ambient, operating	-9
Inhibit, TTL input, output(s) enabled if left open		i
Output voltage adjustment	0...108% $U_{o\text{ nom}}$	R
Additional internal input filter		L
Output voltage adjustment	$\pm 8\%$ $U_{o\text{ nom}}$	P
Thyristor crowbar on output		C
Input or output undervoltage monitoring		D/D1

Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

- Isolation pads for easy and safe PCB mounting
- Ring core chokes for ripple and interference reduction



Input voltage up to 144 V DC
 Single output of 5.1...48 V DC
 No input to output isolation



UL US



- Efficiency up to 97%
- Low input-output differential voltage
- No derating over temperature

Selection chart

Output		Input voltage	Rated power	Efficiency	Type	Options
$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	U_i [V DC]	$P_{o,tot}$ [W]	η_{typ} [%]		
5.1	10	8...80	51	79	PSL 5A10-7R	-9, L, i, P, C, D, A
5.1	11	8...40	56.1	79	PSL 5A11-2R	
5.1	12	7...40	61.2	83	PSL 5A12-7R	-9, L, i, P, C, D, A
12	6	18...144	72	89	PSL 126-7R	-9, L, i, P, C, D, A
12	8	15...80	96	90	PSL 128-7R	-9, L, i, P, C, D, A
12	9	15...40	108	90	PSL 129-2R	
15	6	22...144	90	90	PSL 156-7R	-9, L, i, P, C, D, A
15	8	19...80	120	91	PSL 158-7R	-9, L, i, P, C, D, A
15	9	19...40	135	91	PSL 159-2R	
24	6	31...144	144	94	PSL 246-7R	-9, L, i, P, C, D, A
24	8	29...80	192	94	PSL 248-7R	-9, L, i, P, C, D, A
24	9	29...60	216	94	PSL 249-2R	
36	6	44...144	216	96	PSL 366-7R	-9, L, i, P, C, D, A
36	8	42...80	288	96	PSL 368-7R	-9, L, i, P, C, D, A
48	6	58...144	288	97	PSL 486-7R	-9, L, i, P, C, D, A

Input

Input voltage	refer to selection chart
No load input current	50 mA

Output

Efficiency	$U_{i \text{ nom}}, I_{o \text{ nom}}$	up to 97%
Output voltage setting accuracy	$U_{i \text{ nom}}, I_{o \text{ nom}}$	$\pm 0.6\% U_{o \text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 0.4%
Line regulation	$U_{i \text{ min}} \dots U_{i \text{ max}}, I_{o \text{ nom}}$	typ. $\pm 0.3\%$
Load regulation	$U_{i \text{ nom}}, 0 \dots I_{o \text{ nom}}$	typ. 0.3%
Minimum load	not required	0 A
Current limitation	rectangular U/I characteristic	typ. 110% $I_{o \text{ nom}}$
Operation in parallel	by current limitation	

Protection

Input reverse polarity	with external fuse (built-in fuse with option C installed)
Input undervoltage lockout	typ. 80% $U_{i \text{ min}}$
Input transient protection	suppressor diode
Output	no-load, overload and short circuit proof
Output overvoltage	suppressor diode in each output typ. 150% $U_{o \text{ nom}}$

Safety

Approvals	EN 60950, UL 1950, CSA C22.2 No. 950
Protection degree	IP 20
Electric strength test voltage	I/case and O/case 500/750/1500 V DC

EMC

Electrostatic discharge	IEC/EN 61000-4-2
Electromagnetic field	IEC/EN 61000-4-3
Electr. fast transients/bursts	IEC/EN 61000-4-4
Surge	IEC/EN 61000-4-5
Conducted disturbances	IEC/EN 61000-4-6
Electromagnetic emissions	CISPR 22/EN 55022

Environmental

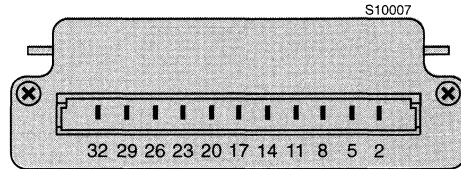
Operating ambient temperature	-2, $U_{i \text{ nom}}, I_{o \text{ nom}}$, convection cooled	-10...50 °C
Operating case temperature T_C	-2, $U_{i \text{ nom}}, I_{o \text{ nom}}$	-10...80 °C
Storage temperature	-2, non operational	-25...100 °C
Operating ambient temperature	-7, $U_{i \text{ nom}}, I_{o \text{ nom}}$, convection cooled	-25...71 °C
Operating case temperature T_C	-7, $U_{i \text{ nom}}, I_{o \text{ nom}}$	-25...95 °C
Storage temperature	-7, non operational	-40...100 °C
Damp heat	IEC/EN 60068-2-3	
Vibration, sinusoidal	IEC/EN 60068-2-6	
Shock	IEC/EN 60068-2-27	
Bump	IEC/EN 60068-2-29	
Random vibration	IEC/EN 60068-2-64	
MTBF	MIL-HDBK-217	

Options

Extended temperature range	-40...71 °C, ambient, operating	-9
Inhibit, TTL input, output(s) enabled if left open		i
Output voltage adjustment	0...108% $U_{o,nom}$	R
Additional internal input filter		L
Output voltage adjustment	$\pm 8\%$ $U_{o,nom}$	P
Thyristor crowbar on output		C
Input or output undervoltage monitoring		D/D1
Test sockets for check of output voltage		A

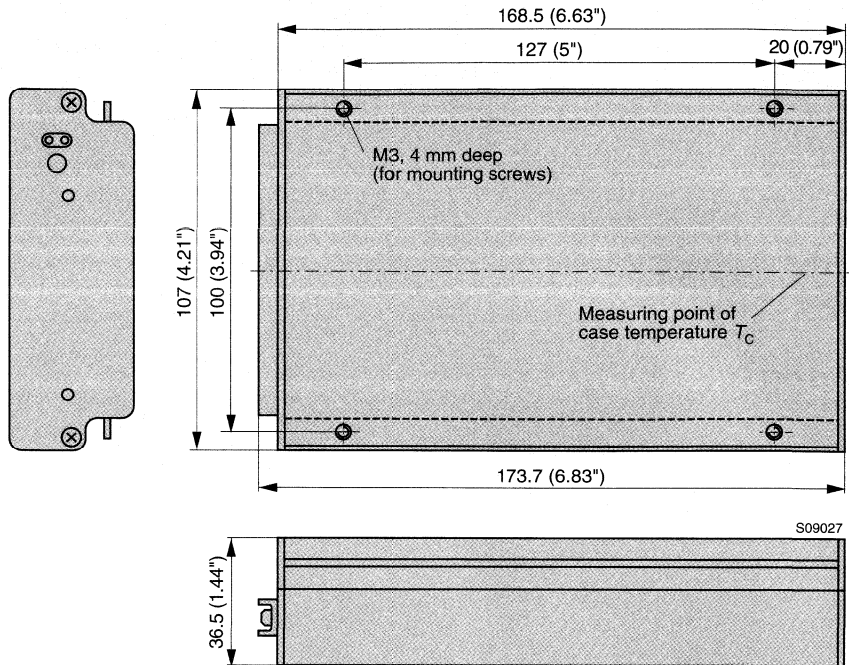
Pin allocation

Pin	Electrical determination	Design.
2	R-input (or inhibit input)	R (i)
5	Undervoltage monitor (Option D)	D
8	Output voltage (negative)	Go-
11	Output voltage (negative)	Go-
14	Output voltage (positive)	Vo+
17	Output voltage (positive)	Vo+
20	Input voltage (negative)	Gi-
23	Input voltage (negative)	Gi-
26	Input voltage (positive)	Vi+
29	Input voltage (positive)	Vi+
32	Protective ground (leading pin)	\oplus



Mechanical data

Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



Accessories

Isolation pads for easy and safe PCB mounting

Ring core chokes for ripple and interference reduction



Input voltage up to 144 V DC
Single output of 3.3...48 V DC
No input to output isolation



- Efficiency up to 97%
- Low input-output differential voltage
- No derating over temperature

Selection chart

Output		Input voltage	Rated power	Efficiency	Type	Options
$U_{o,nom}$ [V DC]	$I_{o,nom}$ [A]	U_i [V DC]	$P_{o,tot}$ [W]	η_{typ} [%]		
3.3	25	8...40	82.5	82	PSK 3E25-7	-9, E, P, B, B1
5.1	12	8...80	61.2	79	PSS 5A12-7	-9, E, P, C, B, B1
5.1	14	8...40	71.4	83	PSS 5A14-2	B, B1
5.1	16	8...80	81.6	79	PSK 5A16-7	-9, E, P, C, B, B1
5.1	18	8...40	91.8	82	PSK 5A18-2	B, B1
5.1	20	8...80	102	79	PSK 5A20-7	-9, E, P, C, B, B1
5.1	25	8...40	127.5	82	PSK 5A25-7	-9, E, P, C, B, B1
12 (15)	9	18...144	108 (135)	91	PSS 129-7	-9, E, P, C, B, B1
12 (15)	12	15...80	144 (180)	91	PSS 1212-7	-9, E, P, C, B, B1
12 (15)	12	18...144	144 (180)	91	PSK 1212-7	-9, E, P, C, B, B1
12 (15)	14	16...40	168 (210)	90	PSS 1214-2	B, B1
12 (15)	16	15...80	192 (240)	90	PSK 1216-7	-9, E, P, C, B, B1
12 (15)	18	16...40	216 (270)	90	PSK 1218-2	B, B1
12 (15)	20	15...80	240 (300)	90	PSK 1220-7	-9, E, P, C, B, B1
24	9	31...144	216	94	PSS 249-7	-9, E, P, C, B, B1
24	12	29...80	288	94	PSS 2412-7	-9, E, P, C, B, B1
24	12	31...144	288	94	PSK 2412-7	-9, E, P, C, B, B1
24	14	29...60	336	94	PSS 2414-2	B, B1
24	16	29...80	384	94	PSK 2416-7	-9, E, P, C, B, B1
24	18	29...60	432	94	PSK 2418-2	B, B1
24	20	29...80	480	94	PSK 2420-7	-9, E, P, C, B, B1
36	9	44...144	324	96	PSS 369-7	-9, E, P, C, B, B1
36	12	42...80	432	96	PSS 3612-7	-9, E, P, C, B, B1
36	12	44...144	432	96	PSK 3612-7	-9, E, P, C, B, B1
36	16	42...80	576	95	PSK 3616-7	-9, E, P, C, B, B1
36	20	42...80	720	95	PSK 3620-7	-9, E, P, C, B, B1
48	9	58...144	432	97	PSS 489-7	-9, E, P, C, B, B1
48	12	58...144	576	97	PSK 4812-7	-9, E, P, C, B, B1

Input

Input voltage	refer to selection chart
No load input current	50 mA

Output

Efficiency	$U_{i\text{ nom}}, I_{o\text{ nom}}$	up to 97%
Output voltage setting accuracy	$U_{i\text{ nom}}, I_{o\text{ nom}}$	$\pm 0.6\% U_{o\text{ nom}}$
Output voltage switching noise	IEC/EN 61204, total	typ. 0.2%
Line regulation	$U_{i\text{ min}} \dots U_{i\text{ max}}, I_{o\text{ nom}}$	typ. $\pm 0.2\%$
Load regulation	$U_{i\text{ nom}}, 0 \dots I_{o\text{ nom}}$	typ. 0.15%
Minimum load	not required	0 A
Current limitation	rectangular U/I characteristic	typ. 110% $I_{o\text{ nom}}$
Operation in parallel	current sharing feature (CS)	
Hold-up time	$U_{i\text{ nom}}, I_{o\text{ nom}}$, with ext. diode in input line, PSS	up to 7 ms

Protection

Input reverse polarity	built-in fuse	
Input undervoltage lockout		typ. 80% $U_{i\text{ min}}$
Input transient protection	suppressor diode	
Output	no-load, overload and short circuit proof	
Output overvoltage	suppressor diode in each output	typ. 150% $U_{o\text{ nom}}$
Overtemperature	switch-off with auto restart	T_C typ. 100°C

Control

Inhibit	TTL input, output enabled if left open	
R control	output voltage adjustment, PSS	0...108% $U_{o\text{ nom}}$
Output voltage indication	LED	
Sense lines	compensation of voltage drop across the load lines, PSS	
Test sockets	test sockets for check of output voltage	

Safety

Approvals	EN 60950, UL 1950, CSA C22.2 No. 950	
Protection degree	units without options	IP 20/30
Electric strength test voltage	I/case and O/case	500/750/1500 V DC

EMC

Electrostatic discharge	IEC/EN 61000-4-2	
Electromagnetic field	IEC/EN 61000-4-3	
Electr. fast transients/bursts	IEC/EN 61000-4-4	
Surge	IEC/EN 61000-4-5	
Conducted disturbances	IEC/EN 61000-4-6	
Electromagnetic emissions	CISPR 22/EN 55022	

Environmental

Operating ambient temperature	-2, $U_{i\text{ nom}}, I_{o\text{ nom}}$, convection cooled	-10...50°C
Operating case temperature T_C	-2, $U_{i\text{ nom}}, I_{o\text{ nom}}$	-10...80°C
Storage temperature	-2, non operational	-25...100°C
Operating ambient temperature	-7, $U_{i\text{ nom}}, I_{o\text{ nom}}$, convection cooled	-25...71°C
Operating case temperature T_C	-7, $U_{i\text{ nom}}, I_{o\text{ nom}}$	-25...95°C
Storage temperature	-7, non operational	-40...100°C
Damp heat	IEC/EN 60068-2-3	
Vibration, sinusoidal	IEC/EN 60068-2-6	
Shock	IEC/EN 60068-2-27	
Bump	IEC/EN 60068-2-29	
Random vibration	IEC/EN 60068-2-64	
MTBF	MIL-HDBK-217	

Options

Large and small cooling plate instead of standard heatsink		B/B1
Extended temperature range	-40...71°C, ambient, operating	-9
Electronic inrush current limitation		E
Output voltage adjustment	$\pm 8\% U_{o\text{ nom}}$, excludes feature R and vice versa	P
Thyristor crowbar on output		C

Accessories

Front panels 19" (Schroff/Intermas), 12 und 16 TE
Mating H15 or H15 S4 connectors with screw, solder, fast-on or press-fit terminals
Connector retention facilities
Adapter kit for DIN-rail

Pin allocation

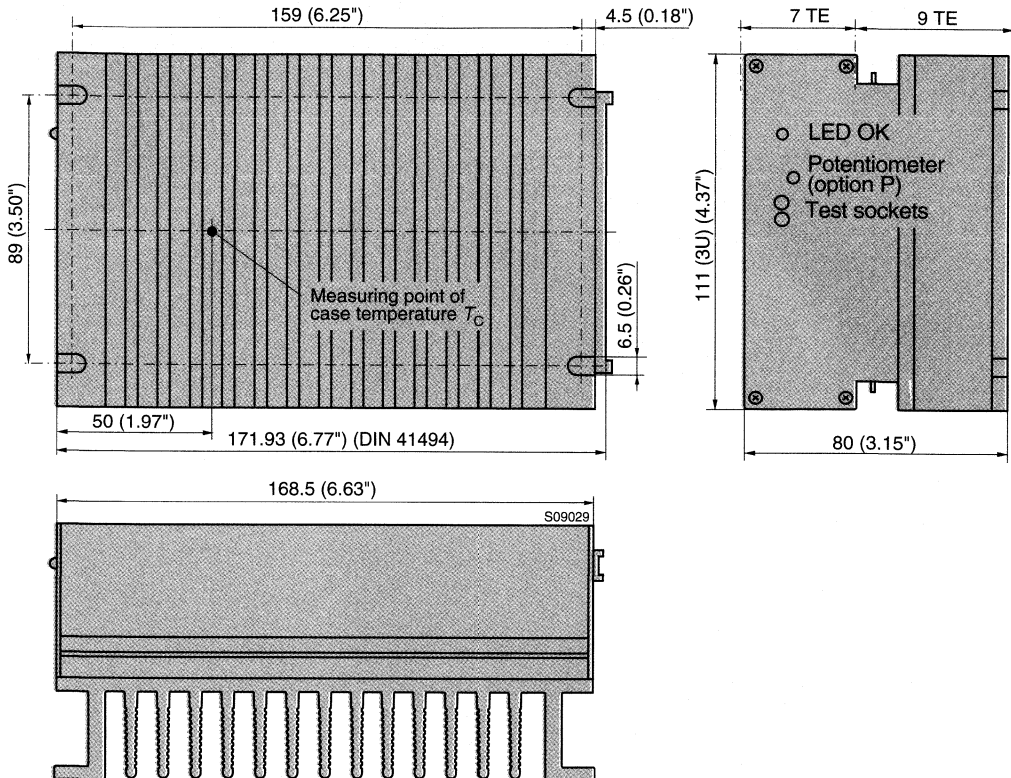
Electrical Determination	Type H15		Type H15 S4	
	Pin No.	Ident.	Pin No.	Ident.
Output voltage (positive)	4	Vo+	4/6	Vo+
Output voltage (positive)	6	Vo+		
Output voltage (negative)	8	Go-	8/10	Go-
Output voltage (negative)	10	Go-		
Crowbar trigger input (option C)	12	C	12	C
Inhibit input	14	i	14	i
R-input (output voltage programming) ¹	16	R	16	R
Sense line (negative)	18	S-	18	S-
Sense line (positive)	20	S+	20	S+
Current sharing control input	22	CS	22	CS
Protective ground (leading pin)	24	⊕	24	⊕
Input voltage (negative)	26	Gi-	26/28	Gi-
Input voltage (negative)	28	Gi-		
Input voltage (positive)	30	Vi+	30/32	Vi+
Input voltage (positive)	32	Vi+		

Mechanical data

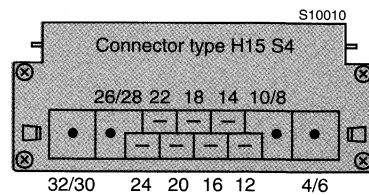
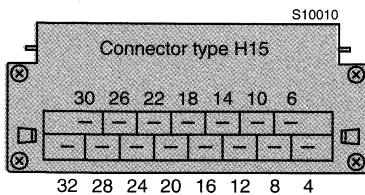
Tolerances ± 0.3 mm (0.012") unless otherwise indicated.



PSK

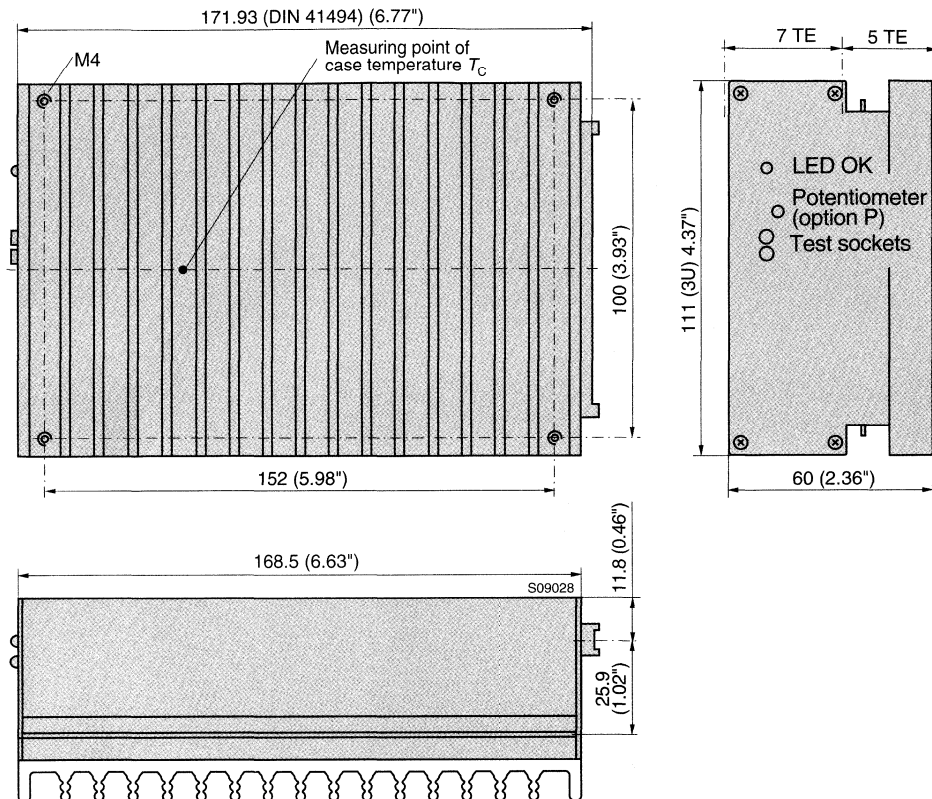


Pin allocation



H15 S4 connectors for 20 and 25 A types

PSS



Information

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Data sheets

Detailed data sheets are available from either source:

- Internet: www.power-one.ch
- CD-ROM
- Nearest sales office by fax or mail.

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Glossary

Ambient temperature

The temperature of the environment surrounding a power supply.

Bandwidth

Based on the assumption that a power supply can be modeled as an amplifier, the bandwidth is that frequency at which the voltage gain has fallen off by 3 dB. Bandwidth is an important determinant of transient response and output impedance.

Bleed resistor

A resistor usually connected across a filter circuit to discharge capacitors when the unit is turned off.

Breakdown voltage

See: *Isolation*.

Bridge

- 1 Rectifier circuit incorporating four diodes (full-bridge) or two diodes (half-bridge).
- 2 Converter or chopper section of switching power supplies incorporating four transistors (full-bridge) or two transistors (half-bridge).

Brownout

Condition during peak usage periods when electric utilities reduce their nominal line voltage by 10% to 15%.

Brownout protection

The ability of a power supply to continue operating within specification through the duration of a brownout.

Burn in

The period directly following the very first turn-on of a given power supply. It is characterized by a relatively high and declining failure rate.

Bus

- 1 The system of conductors (wire, cable, copper bars, etc.) used to transport power from the power supply to the load.
- 2 A communications structure used to control various instruments and subsystems (e.g., IEEE-488 bus).

CB-report

Document necessary for the mutual recognition of approvals between different national test normes.

CEE (International Commission on Rules for the Approval of Electrical Equipment)

A regional, European safety agency in which the United States participates only as an observer.

Chopper

See: *Inverter*.

Common-mode noise

That component of noise common to the input and return or output and return lines with respect to an electrically fixed point, usually chassis ground.

Constant current

A power supply that regulates current level regardless of changes in load resistance.

Constant current limiting circuit

Current-limiting circuit that holds output current at some maximum value whenever an overload of any magnitude is experienced.

Constant voltage

A power supply that regulates voltage level regardless of changes in load resistance.

Convection

The transfer of thermal energy in a gas or liquid by currents resulting from unequal temperatures.

Converter

- 1 A device that delivers DC power when energized by a DC source.
- 2 Sections of a switching power supply that perform the actual power conversion and final rectification.

Cooling

Removal of heat, which, in a power supply, is generated by transformation, rectification, regulation, and filtering. It can be accomplished using radiation, convection, forced air, or liquid means.

Cross regulation

In a multiple-output power supply, the load variation of one output can cause a voltage change in other outputs. This voltage change divided by its nominal value is the cross regulation.

Crowbar

A type of overvoltage protection in which an SCR is placed directly across the output terminals of a power supply.

CSA (Canadian Standards Association)

An independent Canadian organization testing for public safety, similar to the function of Underwriters' Laboratories in the United States.

Current limiting circuit

A circuit designed to prevent overload of a constant-voltage power supply. It can take the form of constant, foldback or cycle-by-cycle current limiting.

Cycle-by-cycle current limiting circuit

Current-limiting circuit that immediately reduces output current to some minimum level whenever an overload of any magnitude is experienced.

Derating

A reduction of some operating parameter to compensate for a change in one or more other parameters. In power supplies, the output power rating is generally reduced at elevated temperatures.

Dielectric withstand voltage

See: *Isolation*.

Differential mode noise

That component of noise measured with respect to output or input to its return; it does not include common-mode noise.

Drift

See: *Stability*.

Dynamic load

A load that rapidly changes from one level to another. To be properly specified, both the total change and the rate of change must be stated.

Efficiency

The ratio of output power to input power. It is generally measured at full-load and nominal line conditions. In multiple-output switching power supplies, efficiency can be a function of total output power and its division among the outputs.

Electric strength test voltage

Ability of a power supply to withstand a high voltage potential placed either from the input terminals to ground, from any of the output terminals to ground, or between any pair of input and output terminals. This specification is important for safety reasons and is partially dependent on the mechanical design of the power supply.

EMC (electromagnetic compatibility)

Any electromagnetic effect: Emissions from elements within apparatus (motors, converters, choppers), disturbance of elements and measures for improving the functionality.

EMI (electromagnetic interference)

Also called radio-frequency interference (RFI), EMI is unwanted high-frequency energy caused by the switching transistors, output rectifiers, and zener diodes in switching power supplies. EMI can be conducted through the input or output lines or radiated through space.

ESR (equivalent series resistor)

The amount of resistance in series with an ideal (lossless) capacitor, which reduces the performance of a real capacitor. In general, the lower the ESR, the higher the quality of the capacitor and the more effective it is as a filtering device. ESR is a prime determinant of ripple in switching power supplies.

Faraday shield

An electrostatic shield wound on a transformer, designed to reduce interwinding capacitance. The result is less common-mode noise at the output of the power supply.

FCC (Federal Communications Commission)

United States federal regulating body whose new EMI limits affect the design and production of digital electronics systems and their related subassemblies, such as power supplies.

Ferroresonance

A principle used in a simple open-loop (non-feedback) voltage stabilizing power supply.

Filter

A frequency-sensitive network that attenuates unwanted noise and ripple components of a rectified output.

Flyback converter

Switching power supply configuration using a single transistor and a flyback diode.

Foldback current limiting circuit

Current-limiting circuit that gradually decreases the output current under overload conditions until some minimum current level is reached under a direct short circuit.

Forward converter

Switching power supply configuration using a transistor.

Frequency changer

Power-conversion equipment that transforms AC electric power from one frequency to another without affecting its other characteristics.

Glossary

Full-bridge converter

Four-transistor switching power supply configuration used to handle high power levels.

Full-wave rectifier

Rectifier circuit that rectifies both halves of an AC wave.

Ground loop

A feedback problem caused by two or more circuits sharing a common electrical line, usually a common ground line. Voltage gradients in this line caused by one circuit may be capacitively, inductively, or resistively coupled into the other circuits via the common line. With power supplies, this problem can be reduced using single-point grounding.

Half-bridge converters

Two-transistor switching power supply configuration used in medium-power applications.

Half-wave rectifier

Single-diode rectifier circuit that rectifies only one-half the input AC wave.

Harmonic distortion

AC current outputs with multiple harmonic frequencies to AC line frequency provoked by the switching devices in a power supply.

Head room

In a linear regulator, the head room is the difference between the secondary voltage supplied by the power transformer at nominal input voltage and the regulated output voltage. Head room is necessary to ensure proper regulation under full load and low input voltage operation.

Heat sink

Device used to conduct away and disperse the heat generated by electronic components.

Hi-pot (high potential voltage)

See: *Isolation test voltage*.

Holdup time

The total time any output will remain within its regulation band after the input line voltage has been turned off. Typically measured at full load and nominal line conditions.

Hybrid supplies

A power supply that combines two or more different regulation techniques, such as ferroresonant and linears or switching and linear.

IEC (International Electrotechnical Commission)

An international safety agency. Its headquarters are in Geneva, Switzerland.

Inhibit

The ability to electrically turn off the output of a power supply from a remote location.

Input surge current

See: *Inrush current*.

Input voltage range

The range of source voltages for which the power supply meets its specifications.

Inrush current

A high surge of input current that occurs in switchers and occasionally in linears upon initial turn on, caused by charging of the input capacitors.

Instantaneous current limiting circuit

See: *Cycle-by-cycle current limiting circuit*.

Insulation

Material used to isolate a device by preventing or reducing the transmission of electricity.

Interaction

Total static regulation of a power supply when line and load changes occur simultaneously.

Inverter

- 1 A device that delivers AC power when energized from a source of DC power. Inverters may be frequency, amplitude, or pulse-width modulated to vary output-voltage.
- 2 The chopper section of a switching power supply.

Isolation

The degree of electrical separation between two points. It can be expressed in terms of voltage (breakdown), current (galvanic), or resistance and/or capacitance (impedance). In power supplies it is important to maximize the input to output isolation.

See also: *Electric strength test voltage*

Leakage current

Current flowing between the output buses and chassis ground due to imperfections in electronic components and designs. It must be tightly controlled to satisfy safety regulations such as UL and VDE.

LGA (Landesgewerbeamt Bayern, Bavarian Trade Institute)

A private German organisation testing for public safety and EMC, is a notified body to the EU, similar to VDE.

Line frequency regulation

The variation of an output voltage caused by a change in line input frequency, with all other factors held constant. This effect is negligible in switching and linear power supplies, but it is a critical specification of ferroresonant power supplies.

Line regulation

The variation of an output voltage due to a change in the input voltage, with all other factors held constant. Line regulation is expressed as the maximum percentage change in output voltage as the input voltage is varied over its specified range.

Linear regulator

A common voltage stabilization technique in which the control device (usually a transistor) is placed in series or parallel with the power source to regulate the voltage across the load. The term "linear" is used because the voltage drop across the control device is varied continuously to dissipate unused power.

Load

For voltage regulated power supplies, the load is the output current.

Load regulation

Variation of the output voltage due to a change in the output's load within a specified range with all other factors held constant. It is expressed as a percentage of the nominal DC output voltage.

Logic enable

The ability to turn a power supply on and off with a TTL signal. A logic low generally turns the supply off; a logic high turns it on.

See also: *Logic inhibit* .

Logic high

A TTL voltage of higher than 2.3 V with a maximum of up to 50 V. Also known as "logic 1".

Logic inhibit

The ability to turn a power supply off and on with TTL signals. A logic low generally allows the power supply to operate. A logic high turns off the power supply.

See also: *Logic enable* and *Logic low*.

Logic low

A TTL voltage lower than 0.8 V. Also known as a "logic 0".

Margining

The ability to adjust (generally with a switch) the output manually, usually to within +5% of nominal. This capability is used in system testing.

Master

The unit in a master-slave system of interconnection that exercises control over the outputs of one or more slave units. Such a system is a common technique used to ensure load sharing of parallel operating power supplies. Redundancy is not achieved in this configurations.

Modular

A physically descriptive term used to describe a power supply made up of a number of separate subsections, such as an input module, power module, or filter module. Modular construction tends to lower the MTBF.

MTBF (mean time between failures)

A measure of reliability. The reliability interval calculated in accordance with the procedures of MIL-HDBK 217.

MTTR (mean time to repair)

The average time required to repair a power supply. It is a result of both electrical and mechanical design factors.

Multiple output supply

A power supply that delivers two or more different output voltages.

Noise

Noise is the aperiodic, random component of undesired deviations in output voltage. Usually specified in combination with ripple.

See: *PARD* and also: *Ripple* .

Nominal output voltage

The intended, ideal voltage of any given output.

Glossary

Off-line switcher

A circuit configuration commonly used in PWM switchers in which the input rectifier and filter section sit directly across the AC input line.

Open-frame construction

A construction technique common to OEM power supplies where the supply is not provided with an enclosure. It can be either a simple printed circuit board or a circuit board mounted on a metal chassis without a cover.

Operating temperature

The range of temperatures within which a power supply will perform within specified limits.

Opto-isolator

Device that provides electrical isolation and a signal path by making an electrical to optical to electrical signal transformation from its input to output terminals. This is accomplished with a light-emitting diode in close proximity to a phototransistor. Opto-isolators are used in the feedback loop to maintain electrical isolation between the input and output of the power supply. Ageing may distort the demanded feed-back response.

Output impedance

The value of a fictional resistor in series with an ideal voltage source that would give the same magnitude of AC voltage across the supply terminals as observed for a particular magnitude and frequency of alternating current.

Overcurrent protection

See: *Current limiting circuit*.

Overshoot

The amount by which an output exceeds its final value in response to a rapid change in load or input voltage, measured as a percentage of the nominal. It is an important value at turn-on and following a step change in load or line voltage.

OVP (overvoltage protection)

A protection mechanism for the load circuitry that does not allow the output voltage to exceed a preset level. In most cases, the output voltage is reduced to a low value, and the input power must be recycled to restore the power supply output. Often protection is provided by a suppressor diode across the output, engaging overcurrent limiting.

Parallel operation

The ability of power supplies to be connected so that the current from corresponding outputs can be combined into a single load.

PARD

Acronym for "periodic and random deviation" and used as the specification term for ripple and noise. Ripple is the unwanted portion of the output harmonically (periodically) related in frequency to the input line and to any internally generated switching frequency. Noise is the unwanted, aperiodic output deviation.

Pass element

The active circuit element, typically a transistor, that forms the output power stage of a linear power supply.

Peak charging

A rise in voltage across a capacitor caused by the charging of the capacitor to the peak rather than rms value of the input voltage. This generally occurs when a capacitor has a high discharge resistance across it and large ripple and noise or spikes on its input line. In a switcher, this parameter affects minimum load conditions (discharge resistance) on each output required to maintain regulation.

Peak transient output current

The maximum peak current that can be delivered to a load during transient load conditions, such as electric motor starts.

Phase controlled modulation

A circuit used in switching regulators where the operating frequency is held constant (typically 50 or 60 Hz line frequency) and the phase angle at which the control elements are turned on is varied, controlling both line and load changes with minimal dissipation.

Pin fins

Type of heat sink that uses pins in place of conventional extruded fins.

Post regulator

Usually a linear regulator used on the output of a switching or ferro power supply to improve overall (load) regulation.

Power factor

The ratio of actual power used in a circuit to the apparent power. Power factor is the measure of the fraction of current in phase with the voltage and contributing to average power.

Power fail detect

A circuit that senses the DC voltage across the input capacitors of a switching power supply. Should the AC input line fail, it senses an abnormally low DC level across the capacitors and provides an isolated TTL output signal warning of imminent loss of output power.

Power supply

The common term for electronic devices that provide DC output voltages when powered by an AC primary source.

Pre-regulator

A regulator circuit that provides a line-regulated output, which is then processed by a second regulator, the post-regulator, which provides load regulation.

Programming

The capability of controlling the voltage of each output.

Push-pull converter

Used in switching power supplies where the main switching circuit uses two transistors operating in push-pull. The main advantage is simplicity of design.

PWM (Pulse width modulation)

A circuit used in switching regulated power supplies where the switching frequency is held constant and the width of the power pulse is varied, controlling both line and load changes with minimal dissipation.

Rated pulse power

The maximum power that may be delivered by the power supply on a pulse basis. The rated pulse power usually averages out to the maximum continuous output power.

Recovery time

The time required by a transient overshoot or undershoot in a stabilized output quantity to decay to within specified limits.

Redundance

The ability to connect power supplies in parallel so that if one fails the other will provide continuous power to the load. This mode is used in systems when power supply failure cannot be tolerated.

Reference

A known stable voltage to which the output voltage is compared for the purpose of stabilizing the output voltage.

Regulator

The part of a power supply that controls the output voltage. In most cases, the regulator acts to stabilize the output voltage at a preset value.

Remote on-off

See: *Inhibit*.

Remote sensing

A method of moving the point of regulation from the output terminals to the load. Compensates voltage drops in the power distribution bus, but negative impact on dynamic load behavior must be tolerated.

Response time

The amount of time (ms) it takes for an output to react to a dynamic load change and to settle to within some tolerance band following a load change.

Return

An arbitrary name for the common terminal for all the outputs. It carries the return current of all the outputs.

Reverse voltage protection

The ability of a power supply to withstand reverse voltage at the input terminals when hooked up in the reverse polarity.

RFI (Radio frequency interference)

See: *EMI*.

Ripple

The periodic AC noise component of the power supply output voltage.

See: *PARD*.

Schottky diode

A device that exhibits a low forward voltage drop (e.g. 0.6 V) and a fast recovery time. This type of diode is especially useful at high current, low voltage (typically 5 V DC), where low losses and high switching speed are important.

Glossary

Secondary breakdown

Most common failure in the power transistors of switchers; it is caused by the coincidence of high voltage and current levels when the transistors are turned off. Its effects are irreversible, almost instantaneous, and fatal. It can be controlled through proper circuit design.

Semi-regulated output

A secondary output on a multiple-output power supply that receives line regulation only.

Sense Lines

S+ and S- lines, complementary to the Vo+ and Vo- lines, allowing the compensation of voltage drops due to line resistance.

Sequencing

Controlling the time delay and order of output voltage appearance and drop-out upon power supply turn on and turn off.

Series regulator

A linear regulator in which the active control element (transistor) is connected in series with the load.

Short-circuit protection

See: *Current limiting circuit.*

Shunt regulator

A linear power supply in which the active control element (transistor) is in parallel with the load.

Slave

The unit in a master-slave paralleling scheme that is controlled by the master unit.

See: *Master.*

Snubber

A network containing a resistor, capacitor, and sometimes diode used in switching power supplies to trap high-energy transients and to protect sensitive components.

Soft start

Input surge-current limiting in a switching power supply where the switching drive is slowly ramped up.

Stability

The change in output voltage that occurs at constant load, AC input, and temperature after a given period of time following warm-up. This effect is related, in part, to internal temperature and ageing effects.

Standby current

The input current drawn by any power supply under minimum load conditions.

Static load

A load that remains constant over a given time period. It is usually specified as a percentage of full load.

Stefan-Boltzmann law

A law of thermodynamics that describes the rate of emission of radiant energy from the surface of a body.

Step change

An abrupt and sustained change in one of the influence or control quantities (e.g. load current).

Stress-ageing

The process of subjecting a completed power supply to a variety of stresses to force the occurrence of all burn-in failures.

Switching frequency

The rate at which the source voltage is switched in a switching regulator or chopped in a DC to DC converter.

Switching regulator

A high-efficiency non-isolated DC to DC converter consisting of inductors and capacitors to store energy and switching elements (typically transistors or SCRs), which open and close as necessary to regulate voltage across a load. The switching duty cycle is generally controlled by a feedback loop to stabilize the output voltage.

Temperature coefficient

The average percentage of change in output voltage per degree change in temperature with load and input voltage held constant.

Thermal protection

Protection via a thermally actuated switch that interrupts the operation of a power supply if the internal temperature exceeds a predetermined value.

Thermal regulation

See: *Temperature coefficient.*

Thermistor

A device with relatively high electrical resistance when cold and almost no resistance when at operating temperature. Thermistors are sometimes used to limit inrush current in off-line switchers .

Transformer

A magnetic device that converts AC voltages to AC voltages at any level. An ideal transformer is a lossless device in which no energy is stored and that requires no magnetic current.

Transient

A temporary and brief change in a given parameter. Typically associated with input voltage or output loading parameters.

Transient response time

The amount of time taken for an output to settle to within some tolerance band, normally following a stated change in load.

UL (Underwriters' Laboratories)

An independent, non-profit organization testing for public safety in the United States. UL recognition is required for equipment used in some applications.

Undershoot

The amount by which an output falls below its final value in response to a rapid load change.

UPS (Uninterruptible power supply)

A device designed to supply power in the event of temporary or permanent loss of AC line power. Often these supplies will operate with either an AC line input or DC (battery) back-up input.

VDE (Verband Deutscher Elektrotechniker)

A German organization testing for public safety; similar to UL in the United States.

Warm up drift

The change in output voltage that occurs during warm-up from turn on of a cold supply until about 30 minutes after turn on. Warm-up drift is measured at constant load, input line, and ambient temperature and is primarily due to internal components reaching thermal equilibrium.

Warm up time

The time needed, after turn on, for the power supply to reach thermal equilibrium with a constant load. Usually estimated to be about 30 minutes.

Standards Overview

Melcher refer data to international standards for assuring world-wide common understanding. IEC and CISPR standards will therefore be applied in the first instance. For practical reasons other standards will be used for proper product specification, whereby EN (European Standards), UL and MIL standards are applied.

Important note: The IEC publication numbers have changed as of 1997. All new IEC publications and parts, as well as editions and revisions will be issued with a designation in the 60000 series. It is necessary to add 60'000 to the existing base number. Renumbering has taken place, but publications printed before 1997 still carry the old series of numbers. However the new numbers will appear in all bibliographic references. Therefore we have amended all IEC references to the new system in the Melcher Data Book 98.

EMC standards

Generic EMC standards

Previous no.	Present no.	Title (present; partially abbreviated) and remarks
EN 50081-1	EN 50081-1	Generic emission standard – Residential, commercial and light industry
EN 50081-2	EN 50081-2	Generic emission standard – Industrial environment
EN 50082-1	EN 50082-1 (Will be replaced by IEC/EN 61000-6-1.)	Generic immunity standard – Residential, commercial and light industry
EN 50082-2	EN 50082-2 (Will be replaced by IEC/EN 61000-6-2.)	Generic immunity standard – Industrial environment
–	CISPR/IEC 61000-6-3	Generic standards – Emission standard for residential, commercial and light industrial environments
–	IEC 61000-6-4	Generic standards – Emission standard for industrial environments

Basic electromagnetic immunity test standards

Previous no.	Present no.	Title (present; partially abbreviated) and remarks
IEC 801-2	IEC/EN 61000-4-2	Electrostatic discharge immunity test
IEC 801-3 ENV 50140	IEC/EN 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity test
ENV 50204	ENV 50204 (Will be replaced by the new edition of IEC/EN 61000-4-3.)	Radiated electromagnetic field from digital radio telephones – Immunity test
IEC 801-4 (1988)	IEC/EN 61000-4-4	Electrical fast transient/burst immunity test
IEC 801-5 (draft) ENV 50142	IEC/EN 61000-4-5	Surge immunity test
IEC 801-6 (draft) ENV 50141	IEC/EN 61000-4-6	Immunity to conducted disturbances, induced by radiofrequency fields
IEC/EN 61000-4-8	IEC/EN 61000-4-8	Power frequency magnetic field immunity test
IEC/EN 61000-4-9	IEC/EN 61000-4-9	Pulse magnetic field immunity test
IEC/EN 61000-4-10	IEC/EN 61000-4-10	Damped oscillatory magnetic field immunity test
IEC/EN 61000-4-11	IEC/EN 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests
IEC/EN 61000-4-12	IEC/EN 61000-4-12	Oscillatory waves immunity test
–	CISPR 24	Information technology equipment – Immunity characteristics – Limits and methods of measurement

Basic electromagnetic emission measurement standards

Previous no.	Present no.	Title (present; partially abbreviated) and remarks
IEC 555-2 EN 60555-2	IEC/EN 61000-3-2	Limits for harmonic current emissions (equipment input current 16 A per phase)
IEC 555-3 EN 60555-3	IEC/EN 61000-3-3	Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current 16 A
CISPR 11/EN 55011	CISPR 11/EN 55011	Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement
CISPR 14/EN 55014	CISPR 14/EN 55014	Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electrical apparatus
CISPR 22/EN 55022	CISPR 22/EN 55022	Limits and methods of measurement of radio disturbance characteristics of information technology (IT) equipment

Safety publications

Basic safety publications

Previous no.	Present no.	Title (present; partially abbreviated) and remarks
IEC 664-1	IEC 60664-1	Insulation coordination for equipment within low-voltage systems – Principles, requirements and tests

Group safety publications

Previous no.	Present no.	Title (present; partially abbreviated) and remarks
IEC 65 EN 60065	IEC/EN 60065	Safety requirements for mains operated electronic and related apparatus for household and similar general use (Radio, TV, HiFi)
IEC 335-1 EN 60335-1	IEC/EN 60335-1	Safety of household and similar electrical appliances General requirements
IEC 601-1	IEC/EN 60601-1 ≈ UL 2601	Medical electrical equipment – General requirements for safety
IEC 601-1-1	IEC/EN 60601-1-1 ≈ UL 2601-1	Medical electrical equipment – General requirements for safety – Collateral standard: Safety requirements for medical electrical systems
IEC 601-1-2	IEC/EN 60601-1-2	Medical electrical equipment – General requirements for safety – Collateral standard: Electromagnetic compatibility - Requirements and tests
IEC 950	IEC/EN 60950 ≈ UL 1950 = CAN/CSA C22.2 No. 950	Safety of information technology equipment
IEC 1010-1 EN 61010-1	IEC/EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use – General requirements
EN 41003	EN 41003	Particular safety requirements for equipment to be connected to telecommunication networks
–	IEC 61558-1	Safety of power transformers, power supply units and similar – General requirements and tests
–	EN 50178	Electronic equipment for use in power installations

Standards Overview

Product family standards

Railway applications standards

Previous no.	Present no.	Title (present; partially abbreviated) and remarks
IEC 571-1	IEC 60571-1	Electronic equipment used on rail vehicles – General requirements and tests for electronic equipment
EN 50155	EN 50155	Electronic equipment used on rolling stock
RIA 12	RIA 12	General specification for protection of traction & rolling stock electronic equipment from transients & surges in DC control systems

Product standards

Power supply standards

Previous no.	Present no.	Title (present; partially abbreviated) and remarks
IEC 478-1	IEC 60478-1	Stabilised power supplies, d.c. output – Terms and definitions
IEC 478-2	IEC 60478-2	Stabilised power supplies, d.c. output – Rating and performance
IEC 478-3	IEC 60478-3 (Will be replaced by IEC 61204-3.)	Stabilised power supplies, d.c. output – Reference levels and measurement of conducted electro-magnetic interference
IEC 478-4	IEC 60478-4	Stabilised power supplies, d.c. output – Tests other than radio-frequency interference
IEC 478-5	IEC 60478-5	Stabilised power supplies, d.c. output – Measurement of the magnetic component of the reactive near field
IEC 1204	IEC/EN 61204	Low-voltage power supply devices, d.c. output Performance characteristics and safety requirements
UL 1012	UL 1012	Power units other than class 2

Relays standards

Previous no.	Present no.	Title (present; partially abbreviated) and remarks
IEC 255-4, App. E4 DIN 57435, part 303 VDE 0435, part 303	DIN VDE 0435, part 303	IEC 255-4 has been withdrawn. This standard, DIN 57435 and VDE 0435 are no longer referenced in the Melcher data sheets. IEC/EN 61000-4-4 and IEC/EN 61000-4-5 serve as replacement for Melcher needs.
IEC 255-4, App. E5 DIN 57435, part 303 VDE 0435, part 303	IEC 60255-22-1 DIN VDE 0435, part 303	Electrical relays – Electrical disturbance tests for measuring relays and protection equipment – 1 MHz burst disturbance tests. IEC 255-4 has been withdrawn. This standard, DIN 57435 and VDE 0435 are no longer referenced in the Melcher data sheets.

Standards Overview

Environmental testing standards

Previous no.	Present no.	Title (present; partially abbreviated) and remarks
IEC 68-2-3 DIN 40046, part 5	IEC/DIN IEC 60068-2-3	Test Ca: Damp heat, steady state
IEC 68-2-6 DIN 40046, part 8	IEC/EN/DIN EN 60068-2-6	Test Fc: Vibration (sinusoidal)
IEC 68-2-27 DIN 40046, part 7	IEC/EN/DIN EN 60068-2-27	Test Ea and guidance: Shock
IEC 68-2-29 DIN 40046, part 26	IEC/EN/DIN EN 60068-2-29	Test Eb and guidance: Bump
IEC 68-2-35 DIN 40046, part 23	IEC 60068-2-35 DIN 40046, part 23	Test Fda: Random vibration wide band – Reproducibility high
IEC 68-2-52 DIN 40046, part 105	IEC/EN/DIN IEC 60068-2-52	Test Kb: Salt mist, cyclic (sodium, chloride solution)
IEC 68-2-56	IEC/DIN IEC 60068-2-56	Test Cb: Damp heat, steady state, primarily for equipment
IEC 68-2-64	IEC/EN/DIN EN 60068-2-64	Test Fh: Vibration, broad-band random (digital control) and guidance

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