



Power

unlimited

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Design, production and sale of innovative and competitive power supplies – worldwide

Mission

That is our mission – and our obligation towards you. For more than 3 decades this maxim has been ruling our engineering, production and sale of power supplies.

Global Player

As a globally acting technology company with own R&D, production and sales departments, we are represented on all important international markets and - wherever you need us.

FRIWO is focused on platform and customer-specific power supplies and chargers, primarily for applications such as medical, IT & communication, domestic appliances and mobile tools as well as industrial applications.

Plug-in power supply

Ever since FRIWO engineered the world's first plug-in power supply, the brand has become very popular. FRIWO is synonymous with technical competence when it comes to standard or customized solutions, from conceptual design to finished product. Thus, in 1971, FRIWO has not only paved the way for today's market success but has also set new highlights for power supply and charging technology in accordance with current safety standards and regulations.

Standards, regulations and responsibility

It goes without saying that FRIWO meets the strict criteria and standards of medical technology, and even falls below threshold limits for some applications. FRIWO already meets legal requirements which have not yet become effective, for instance low power consumption in standby mode.

FRIWO networks with leading test and inspection centers; the technically sophisticated engineering of products safeguards the worldwide approval and sale.

All units are tested for operational safety in-house and leave our factories as „zero-fault-products“. FRIWO power supply and charger platforms are approved in Europe, USA, Canada, Japan, China and Australia without further review.

Laws and regulations for responsible treatment of the environment and available resources are becoming more and more important.

Based upon the EU regulations FRIWO meets the requirements of the „Electrical and Electronic Equipment Act“ - ElektroG.





Energy efficiency

FRIWO has been paying special attention to the design of energy efficient power supplies for a long time. Already prior to the global warming or power consumption discussions FRIWO assumed responsibility for the environment and is constantly involved in engineering non-polluting solutions.

These days, a variety of programs attend to the energy efficiency of electronic devices and define specific threshold limits for efficiency and no-load losses. FRIWO has committed itself to the fulfillment of these threshold limits and closely cooperates with the corresponding authorities.

One of the most familiar programs is ENERGY STAR. In 1992 the U.S. Environmental Protection Agency and the U.S. Department of Energy started this certification program. In accordance with an EU regulation ENERGY STAR was officially implemented in 2003. Today the ENERGY STAR program includes a variety of electronic devices which receive the ENERGY STAR label for threshold limit compliance - and further devices will follow. Although this program is voluntary, the ENERGY STAR certified partner FRIWO engineers and sells products which always comply with the latest state-of-the-art requirements.

In addition, the EuP regulation (Energy using Products) examines the entire life cycle of a product. This ecological design regulation does not only focus on an improved energy efficiency but also enhances an environmentally design. For this purpose the so-called „Integrated Product Policy“ (IPP) is to be implemented and destined to improve both the entire production chain and the recycling of the product. During the life cycle, energy and other

resources, necessary for the manufacture, are to be saved. This should avoid that improvements at a certain point of the life cycle generate negative effects at another. According to experts, the guideline is expected to become effective in 2009/2010 and will adopt the ENERGY STAR threshold limits.

For most of the global vendors it will become vital to comply with the corresponding applicable threshold limits. FRIWO's product portfolio is already expertly tuned to realize power supplies with high efficiency and low standby losses.



Top position in power supplies and chargers

Continuous enhancement of the sophisticated products, their innovative design and the technical expertise made FRIWO a reliable and experienced industrial partner worldwide. A highly qualified, flexible and motivated workforce ensures short engineering cycles.

The market and customer-oriented design of the individual product platforms, the flexible usage of global production capacities and the ideal sales organization result in FRIWO's successful positioning on the worldwide market for power supplies and chargers.

Switchmode Power Supplies

PP Series

Conforms to IEC 60950



PP 3

Applications

- Audio
- Bluetooth/WLAN
- Digital cameras
- Communication accessories
- Measurement and weighing technology
- MPEG Player
- Modems DSL, ADSL, VDSL
- PDA
- Safety technology

Characteristics

- Universal input 100 to 240 V AC
- Constant voltage, current limited
- Low leakage current $\leq 10 \mu\text{A}$
- Low standby power ≤ 0.3 Watts
- Continuously short circuit proof

Technical data

Input voltage

100 to 240 V AC ($\pm 10\%$)

Input current

approx. 90 mA (PP 3)

150 mA (PP 6)

200 mA (PP 8)

Frequency

50 to 60 Hz

Efficiency

75 % typ. at full load

EMC

Conforms to EN 55011, EN 55014, EN 55022/B, FCC 47 part 15, EN 61000-3-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-11

Output voltage tolerance

 $\pm 5\%$

Environmental specification

Operating temperature

0 to 40° C at maximum load

Storage temperature

-20 to 70° C

Humidity

5 % to 95 % non condensing

Input transient susceptibility

Complies with IEC 61000 requirements

Safety specification

Standards

Fulfils Class II SELV for the following applications: EN 60950/IEC 60950, VDE, CE label resp. UL 60950

Reliability specification

MTBF calculation

200.000 hours at maximum load and an ambient temperature of 25° C (in accordance with MIL-HDBK-217)

Mechanical specification

Weight approx.

60 g (PP 3)

105 g (PP 6)

110 g (PP 8)

Plug connector

AC input:

FRIWO exchangeable mains plug system: EURO, UK, USA/Japan*

DC output:

Universal output plug system

PP 6

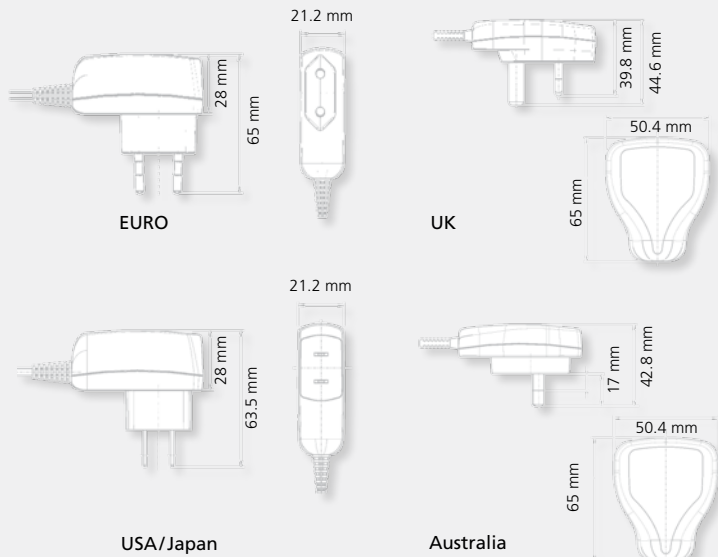


PP 8



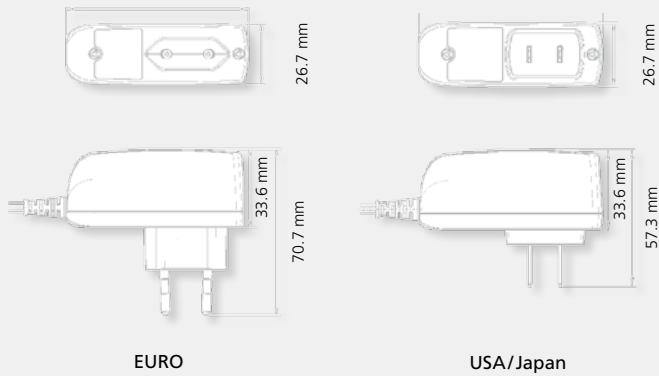
* Australia version available for OEM quantities

3 Watts



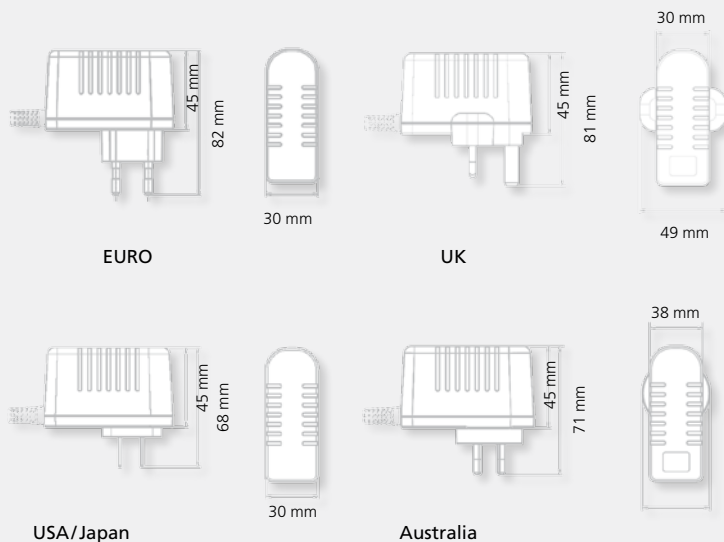
Output data		Ripple	EURO	USA/Japan	UK
Voltage	Current	Voltage	Order No.	Order No.	Order No.
5 V	650 mA	300 mV pp	1882750	1882760	1824460
6 V	550 mA	300 mV pp	1890574	1825734	1825733
7.5 V	450 mA	300 mV pp	1826282	1830703	1826268
9 V	360 mA	300 mV pp	1890562	1890576	1890575
12 V	270 mA	300 mV pp	1882753	1882763	1824461
15 V	220 mA	300 mV pp	1890714	1890716	1890715
24 V	135 mA	300 mV pp	1890717	1890718	1890719

6 Watts



Output data		Ripple	EURO	USA/Japan
Voltage	Current	Voltage	Order No.	Order No.
3 V	1300 mA	300 mV pp	1883765	1883767
5 V	1000 mA	200 mV pp	1882105	1814934
6 V	850 mA	180 mV pp	1882106	1814935
7.5 V	650 mA	150 mV pp	1882107	1814936
9 V	550 mA	150 mV pp	1882108	1814937
12 V	450 mA	150 mV pp	1882109	1814938
15 V	360 mA	150 mV pp	1882110	1814939
18 V	300 mA	150 mV pp	1882111	1814940
24 V	220 mA	150 mV pp	1882112	1814941

8 Watts



Output data		Ripple	EURO	USA/Japan	UK
Voltage	Current	Voltage	Order No.	Order No.	Order No.
3 V	1700 mA	300 mV pp	1829490	1829579	1829561
5 V	1300 mA	200 mV pp	1829491	1829580	1829562
6 V	1150 mA	180 mV pp	1829492	1829581	1829563
7.5 V	900 mA	150 mV pp	1829493	1829582	1829564
9 V	800 mA	150 mV pp	1829494	1829583	1829565
12 V	700 mA	150 mV pp	1829495	1829584	1829566
15 V	530 mA	150 mV pp	1829496	1829585	1829567
18 V	440 mA	150 mV pp	1829497	1829586	1829568
24 V	330 mA	150 mV pp	1829498	1829587	1829569

Switchmode Power Supplies

GPP Series

Conforms to IEC 60950

**Applications**

- Mobile applications
- Bluetooth
- Digital cameras
- Communication accessories
- Measurement and weighing technology
- Modems DSL, WLAN
- Elektronik cash systems
- Safety technology

Characteristics

- Universal input 100 to 240 V AC
- Constant voltage, current limited
- Exchangeable primary adapters
- Low leakage current $\leq 10 \mu\text{A}$
- Low standby power ≤ 0.3 Watts resp. ≤ 0.5 Watts (15, 18, 24 V)
- Continuously short circuit proof

Technical data

Input voltage	100 to 240 V AC ($\pm 10\%$)
Input current	250 mA (GPP 10), 400 mA (GPP 18)
Frequency	50 to 60 Hz
Efficiency	80 % typ. at full load
EMC	Conforms to EN 55011 EN 55014, EN 55022/B, FCC 47 part 15, EN 61000-3-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-11

Output voltage tolerance + 5%, - 7 %

Environmental specification

Operating temperature	0 to 40° C at maximum load
Storage temperature	-40 to 70° C
Humidity	5 % to 95 % non condensing
Input transient susceptibility	Complies with IEC 61000 requirements

Safety specification

Standards	Fulfils Class II SELV for the following applications: EN 60950/IEC 60950, UL 60950, CSA 950 (cUL), VDE, CE label
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Reliability specification

MTBF calculation	200.000 hours at maximum load and an ambient temperature of 25° C (in accordance with MIL-HDBK-217)
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Mechanical specification

Weight approx.	113g (GPP10), 170g (GPP18)
Plug connector	AC input: FRIVO exchangeable mains plug system: EURO, UK, USA/Japan, Australia, IEC DC output: Universal output plug system

For primary adapters see page 26

GPP 10



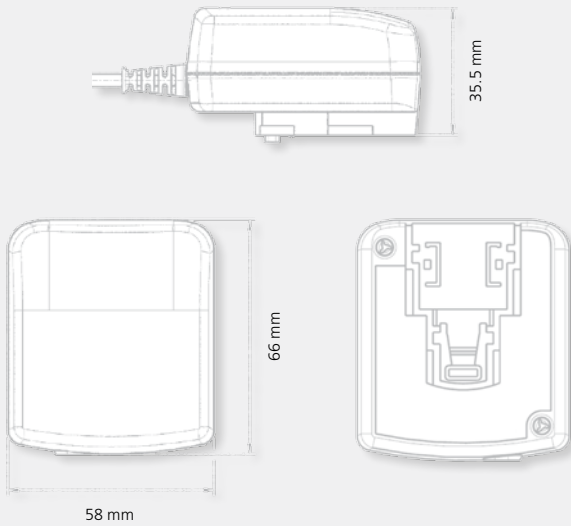
GPP 18



GPP 36

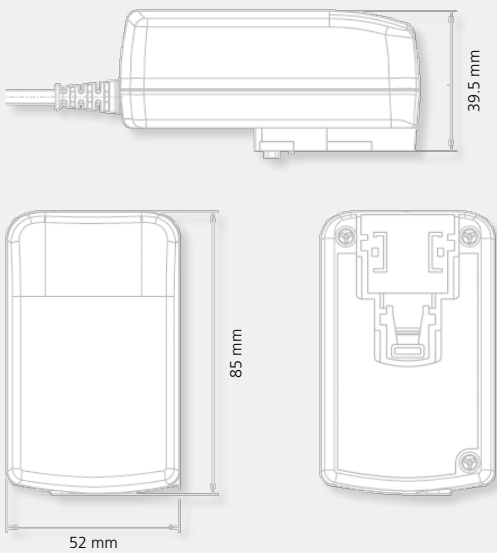


10 Watts



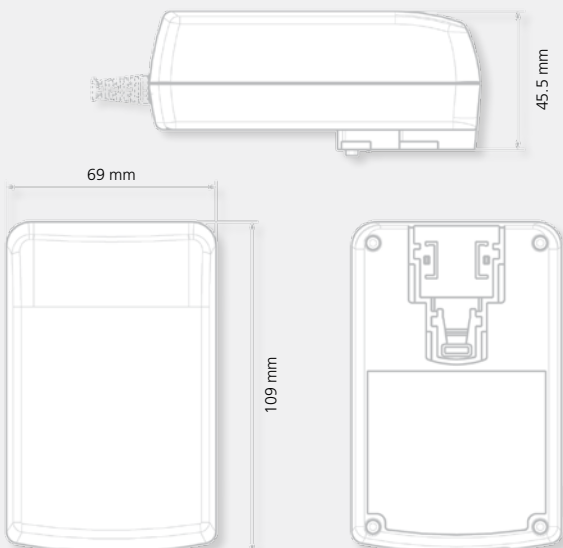
Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
5 V	1600 mA	75 mV pp	1827490
6 V	1400 mA	75 mV pp	1827491
7.5 V	1200 mA	75 mV pp	1827492
9 V	1000 mA	75 mV pp	1827493
12 V	800 mA	75 mV pp	1827494
15 V	700 mA	75 mV pp	1827495
18 V	560 mA	125 mV pp	1827496
24 V	420 mA	125 mV pp	1827497

18 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
5 V	3000 mA	75 mV pp	1828724
6 V	2500 mA	75 mV pp	1828725
7.5 V	2000 mA	75 mV pp	1828726
9 V	1800 mA	90 mV pp	1828727
12 V	1500 mA	100 mV pp	1828728
15 V	1200 mA	100 mV pp	1828729
18 V	1000 mA	180 mV pp	1828730
24 V	750 mA	180 mV pp	1828731

36 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
in preparation			

Switchmode Power Supplies

MPP Series

Conforms to IEC 60950



Applications

- Weighing technology
- WLAN modems
- Bluetooth
- Communication accessories
- Measurement technology
- LED applications
- Laser technology
- IT accessories
- Safety technology

Characteristics

- Universal input 100 to 240 V AC
- Constant voltage, current limited
- Exchangeable primary adapters
- Low leakage current $\leq 10 \mu\text{A}$
- Low standby power
 - ≤ 0.3 Watts (MPP6) resp.
 - ≤ 0.5 Watts (MPP15, MPP30)
- Continuously short circuit proof

Technical data

Input voltage
Input current

100 to 240 V AC ($\pm 10\%$)
150 mA (MPP6),
400 mA (MPP15),
700 mA (MPP30)

Frequency

50 to 60 Hz

Efficiency

80% typ. at full load, resp. 75% (MPP6)

EMC

Conforms to EN 55011
EN 55014, EN 55022/B,
FCC 47 part 15, EN 61000-3-2,
EN 61000-4-2, EN 61000-4-3,
EN 61000-4-4, EN 61000-4-5,
EN 61000-4-6, EN 61000-4-11

Output voltage tolerance

 $\pm 5\%$

Environmental specification

Operating temperature

0 to 40° C at maximum load

Storage temperature

-40 to 70° C

Humidity

5% to 95% non condensing

Input transient susceptibility

Complies with IEC 61000 requirements

Safety specification

Standards

Fulfils Class II SELV for the following applications: EN 60950/IEC 60950, UL 60950, CSA 950 (cUL), VDE, CE label

Reliability specification

MTBF calculation

200.000 hours at maximum load and an ambient temperature of 25° C (in accordance with MIL-HDBK-217)

Mechanical specification

Weight approx.

100g (MPP6), 160g (MPP15), 255g (MPP30)

Plug connector

AC input:
FRIVO exchangeable mains plug system:
EURO, UK, USA/Japan, Australia, IEC
DC output:
Universal output plug system

For primary adapters see page 26

MPP 6



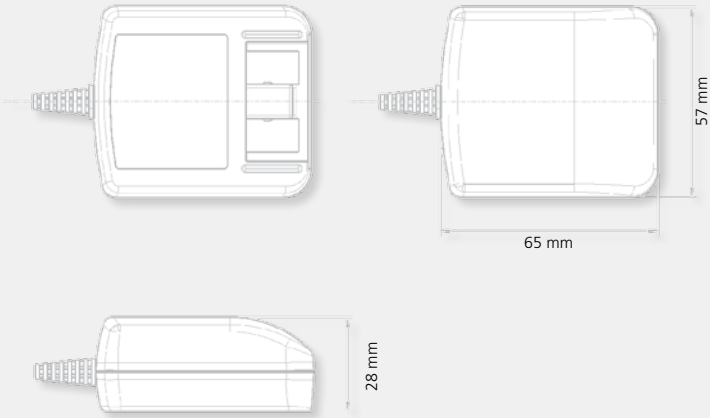
MPP 15



MPP 30

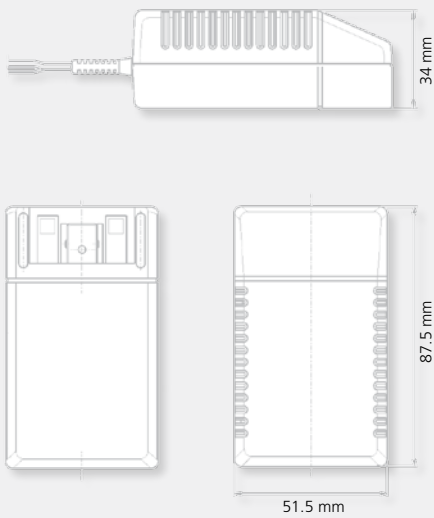


6 Watts



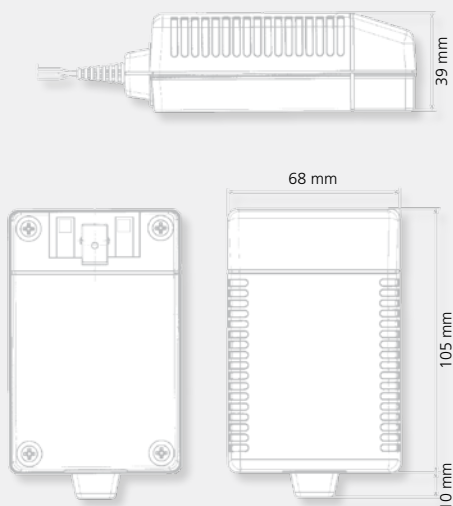
Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
3 V	1300 mA	300 mV pp	1883766
5 V	1000 mA	200 mV pp	1814926
6 V	850 mA	180 mV pp	1814927
7.5 V	650 mA	150 mV pp	1814928
9 V	550 mA	150 mV pp	1814929
12 V	450 mA	150 mV pp	1814930
15 V	360 mA	150 mV pp	1814931
18 V	300 mA	150 mV pp	1814932
24 V	220 mA	150 mV pp	1814933

15 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
3 V	2500 mA	45 mV pp	1812102
5 V	2400 mA	75 mV pp	1812037
6 V	2100 mA	75 mV pp	1812036
7.5 V	1700 mA	75 mV pp	1812038
9 V	1500 mA	90 mV pp	1811970
12 V	1250 mA	120 mV pp	1811971
15 V	1000 mA	150 mV pp	1812039
18 V	840 mA	180 mV pp	1812040
24 V	625 mA	240 mV pp	1812041

30 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
5 V	4000 mA	75 mV pp	1811463
6 V	3600 mA	80 mV pp	1811464
7.5 V	3300 mA	90 mV pp	1811465
9 V	3000 mA	90 mV pp	1811466
12 V	2500 mA	100 mV pp	1806413
15 V	2000 mA	100 mV pp	1811467
18 V	1660 mA	120 mV pp	1811483
24 V	1250 mA	80 mV pp	1811484

Switchmode Power Supplies

DT Series

Conforms to IEC 60950



Applications

- Audio
- Bluetooth/WLAN
- Digital cameras
- Communication accessories
- Measurement and weighing technology
- MPEG Player
- Modems DSL, ADSL, VDSL
- Safety technology
- Laboratory equipment

Characteristics

- Universal input 100 to 240 V AC
- Constant voltage, current limited
- Low leakage current
- Low standby power
 ≤ 0.5 Watts (DT 12, DT 60)
 ≤ 0.75 Watts (DT 50)
- Continuously short circuit proof

Technical data

Input voltage
Input current

100 to 200 V AC ($\pm 10\%$)
 300 mA (DT 12)
 1100 mA (DT 50)
 1600 mA (DT 60)

Frequency
Efficiency
EMC

50 to 60 Hz
 75% typ. at full load
 Conforms to EN 55014,
 EN 55022/B, FCC 47 part 15, EN 61000-3-2,
 EN 61000-4-2, EN 61000-4-3, EN 61000-4-4,
 EN 61000-4-5, EN 61000-4-6, EN 61000-4-11
 $\pm 5\%$

Output voltage tolerance

Environmental specification

Operating temperature 0 to 40° C at maximum load
Storage temperature -10 to 70° C
Humidity 10 % to 95 % non condensing
Input transient susceptibility Complies with IEC 61000 requirements

Safety specification

Standards Fulfils Class II SELV for the following applications: EN 60950/IEC 60950, UL 60950, CSA 950 (cUL), VDE, CE label

Reliability specification

MTBF calculation 200.000 hours at maximum load and an ambient temperature of 25° C (in accordance with MIL-HDBK-217)

Mechanical specification

Weight approx.

135 g (DT 12)
 295 g (DT 50)
 260 g (DT 60)

Plug connector

AC input:
 2-pole IEC 320, C8-socket
 DC output:
 Universal output plug system

For power cords see page 26

DT 12



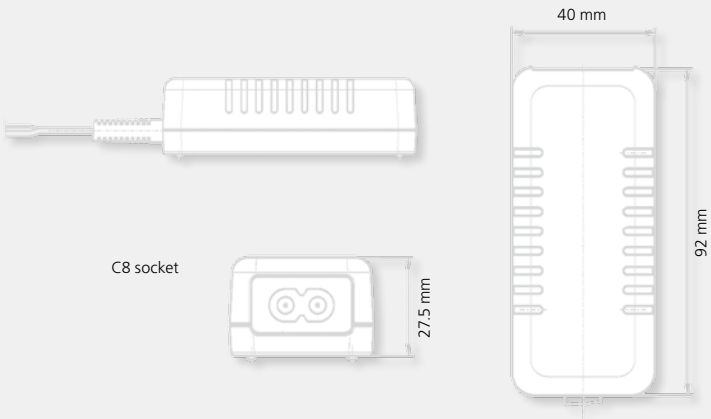
DT 50



DT 60

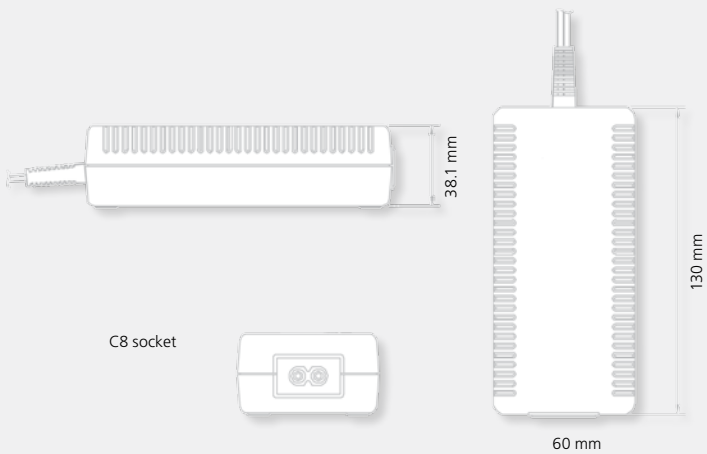


12 Watts



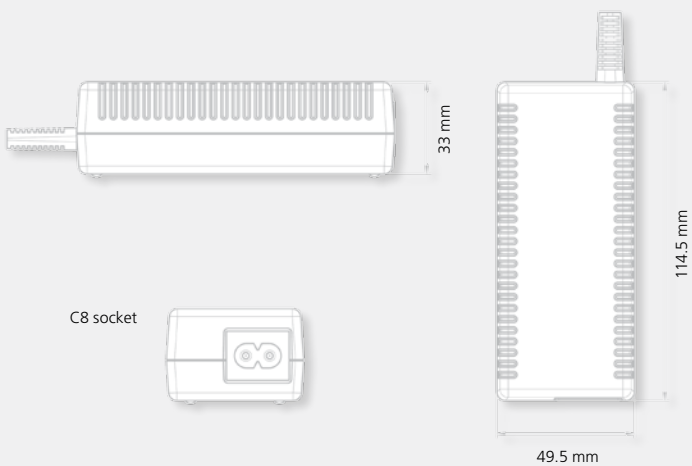
Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
5 V	2000 mA	120 mV pp	1890577
6 V	1700 mA	120 mV pp	1890578
7.5 V	1400 mA	115 mV pp	1890579
9 V	1200 mA	135 mV pp	1890581
12 V	1000 mA	180 mV pp	1890580
15 V	800 mA	112 mV pp	1890584
18 V	660 mA	135 mV pp	1890583
24 V	500 mA	300 mV pp	1890582
48 V	250 mA	480 mV pp	1812311

50 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
5 V	5000 mA	120 mV pp	1827398
12 V	3800 mA	120 mV pp	1827399
15 V	3000 mA	120 mV pp	1890946
24 V	2200 mA	120 mV pp	1827400

60 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
12 V	5000 mA	250 mV pp	1830993
15 V	4000 mA	250 mV pp	1830994
18 V	3300 mA	250 mV pp	1830995
24 V	2500 mA	250 mV pp	1831363

available 2009

Switchmode Power Supplies Medical Series

Conforms to IEC 60601-1



Applications

- Blood analyser
- Patient monitors
- Measuring equipment
- Laboratory equipment
- Inhalers
- Patient lifts

Characteristics

- Universal input 100 to 240 V AC
- Exchangeable primary adapters
- Constant voltage, current limited
- Green LED indicator
- Low leakage current $\leq 10 \mu\text{A}$
- Low standby power
 ≤ 0.3 Watts GPP 10/18 resp.
 ≤ 0.5 Watts MPP 15/30 and
GPP 10/18 (15, 18, 24 V)
- Continuously short circuit proof

Technical data

Input voltage
Input current

100 to 240 V AC ($\pm 10\%$)
250 mA (GPP 10), 400 mA, (GPP 18),
400 mA (MPP 15), 700 mA (MPP 30)

Frequency
Efficiency
EMC

50 to 60 Hz
80 % typ. at full load
Conforms to EN 55011
EN 55014, EN 55022/B,
FCC 47 part 15, EN 61000-3-2,
EN 61000-4-2, EN 61000-4-3,
EN 61000-4-4, EN 61000-4-5,
EN 61000-4-6, EN 61000-4-11
 $\pm 5\%$ (MPP 15/30) $+5\%$ -7% (GPP 10/18)

Output voltage tolerance

Environmental specification

Operating temperature
Storage temperature
Humidity
Input transient susceptibility

0 to 40° C at maximum load
-40 to 70° C
5 % to 95 % non condensing
Complies with IEC 61000 requirements

Safety specification

Standards

Fulfils Class II SELV for the following applications:
IEC 60601-1, UL 2601, VDE, CE label,
fulfils medical application class B/BF/CF

Reliability specification

MTBF calculation

200.000 hours at maximum load
and an ambient temperature of 25° C
(in accordance with MIL-HDBK-217)

Mechanical specification

Weight

approx. 113 g (GPP 10), 170 g (GPP 18),
160 g (MPP 15), 255 g (MPP 30),

Plug connector

AC input:
FRIVO exchangeable mains plug system:
EURO, UK, USA/Japan, Australia, IEC
DC output:
Universal output plug system

For primary adapters see page 26

GPP 10



GPP 18



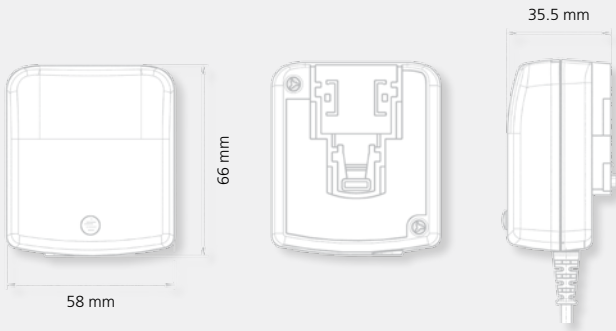
MPP 15



MPP 30

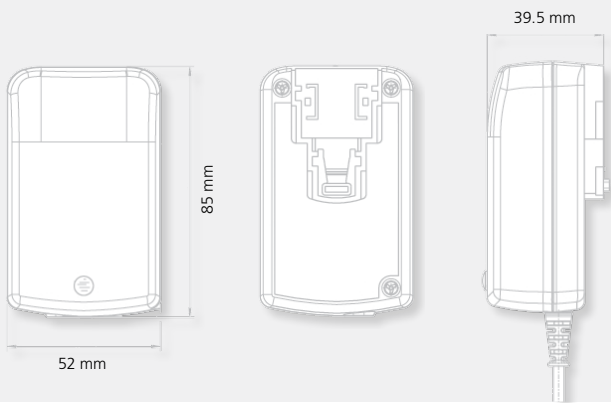


10 Watts



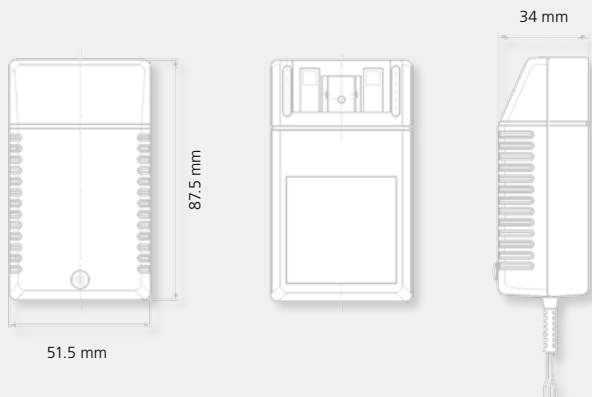
Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
5 V	1600 mA	75 mV pp	1950062
6 V	1400 mA	75 mV pp	1950064
7.5 V	1200 mA	75 mV pp	1950063
9 V	1000 mA	75 mV pp	1950068
12 V	800 mA	75 mV pp	1950082
15 V	700 mA	75 mV pp	1950067
18 V	560 mA	125 mV pp	1950066
24 V	420 mA	125 mV pp	1950065

18 Watts



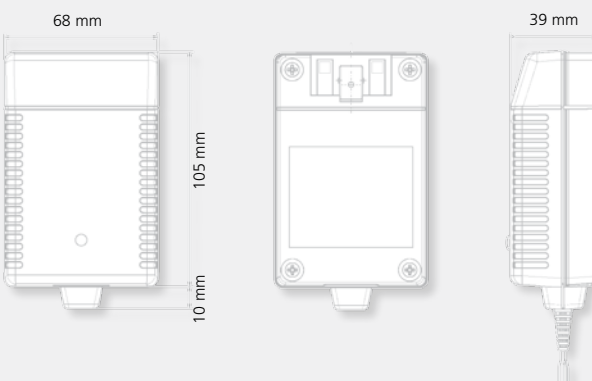
Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
5 V	3000 mA	75 mV pp	1890854
6 V	2500 mA	75 mV pp	1890920
7.5 V	2000 mA	75 mV pp	1890925
9 V	1800 mA	90 mV pp	1890924
12 V	1500 mA	100 mV pp	1890856
15 V	1200 mA	100 mV pp	1890923
18 V	1000 mA	180 mV pp	1890922
24 V	750 mA	180 mV pp	1890855

15 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
5 V	2400 mA	75 mV pp	1883256
6 V	2100 mA	75 mV pp	1883257
7.5 V	1700 mA	75 mV pp	1883258
9 V	1500 mA	90 mV pp	1883259
12 V	1250 mA	120 mV pp	1883260
15 V	1000 mA	150 mV pp	1883261
18 V	840 mA	180 mV pp	1883262
24 V	625 mA	240 mV pp	1883263

30 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
5 V	4000 mA	75 mV pp	1883264
6 V	3600 mA	75 mV pp	1883265
7.5 V	3300 mA	75 mV pp	1883266
9 V	3000 mA	90 mV pp	1883267
12 V	2500 mA	100 mV pp	1883268
15 V	2000 mA	100 mV pp	1883269
18 V	1660 mA	120 mV pp	1883270
24 V	1250 mA	120 mV pp	1883271

Switchmode Power Supplies Medical Series

Conforms to IEC 60601-1



Applications

- Blood analyser
- Patient monitors
- Measuring equipment
- Laboratory equipment
- Inhalers
- Patient lifts

Characteristics

- Universal input 100 to 240 V AC
- Constant voltage, current limited
- Green LED indicator
- Leakage current $\leq 10 \mu\text{A}$ (DT 80 $\leq 100 \mu\text{A}$)
- Low standby power
 ≤ 0.3 Watts (PP 8) resp.
 ≤ 0.5 Watts (DT 12)
 ≤ 0.75 Watts (DT 50 and DT 80)
- Continuously short circuit proof

Technical data

Input voltage
Input current

100 to 240 V AC ($\pm 10\%$)
200 mA (PP 8), 300 mA (DT 12),
1100 mA (DT 50), 1500 mA (DT 80)

Frequency

50 to 60 Hz

Efficiency

80 % typ. at full load, PP 8 75%

EMC

Conforms to EN 55011
EN 55014, EN 55022/B,
FCC 47 part 15, EN 61000-3-2,
EN 61000-4-2, EN 61000-4-3,
EN 61000-4-4, EN 61000-4-5,
EN 61000-4-6, EN 61000-4-11
 $\pm 5\%$

Output voltage tolerance

Environmental specification

Operating temperature

0 to 40° C at maximum load

Storage temperature

-40 to 70° C, PP8 (-20 to 70° C)

Humidity

5 % to 95 % non condensing

Input transient susceptibility

Complies with IEC 61000 requirements

Safety specification

Standards

Fulfils Class II SELV for the following applications:
IEC 60601-1, UL 2601, VDE, CE label,
fulfils medical application class B/BF/CF

Reliability specification

MTBF calculation

200.000 hours at maximum load
and an ambient temperature of 25° C
(in accordance with MIL-HDBK-217)

Mechanical specification

Weight approx.

110 g (PP 8), 135 g (DT 12),
295 g (DT 50), 295 g (DT 80),

Plug connector

AC input:
2-pole IEC 320, C8-socket
PP 8: EURO, UK, USA/Japan
DC output:
Universal output plug system
resp. with stripped and tinned ends

For power cords see page 26

PP 8



DT 12



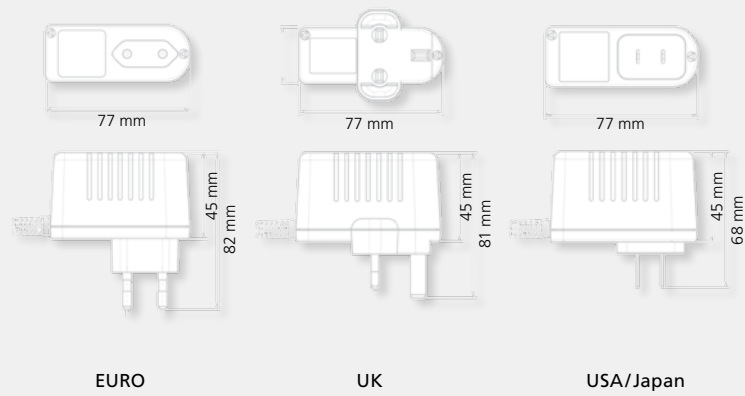
DT 50



DT 80

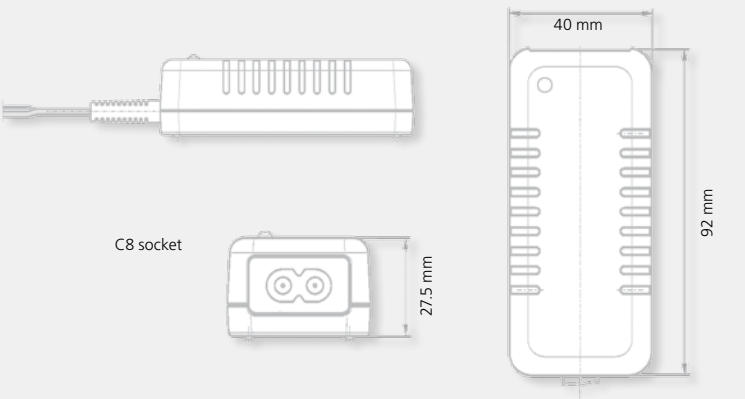


8 Watts



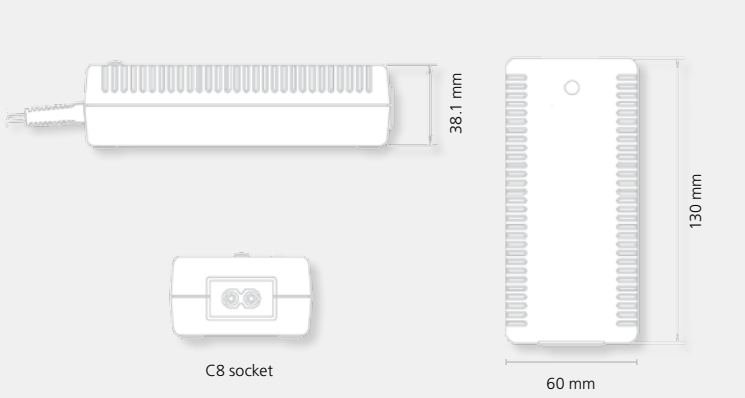
Output data		Ripple	EURO	USA/Japan	UK
Voltage	Current	Voltage	Order No.	Order No.	Order No.
3 V	1700 mA	300 mV pp	1829499	1829588	1829570
5 V	1300 mA	200 mV pp	1829500	1829589	1829571
6 V	1150 mA	180 mV pp	1829501	1829590	1829572
7.5 V	900 mA	150 mV pp	1829502	1829591	1829573
9 V	800 mA	150 mV pp	1829503	1829592	1829574
12 V	700 mA	150 mV pp	1829504	1829593	1829575
15 V	530 mA	150 mV pp	1829505	1829594	1829576
18 V	440 mA	150 mV pp	1829506	1829595	1829577
24 V	330 mA	150 mV pp	1829507	1829596	1829578

12 Watts



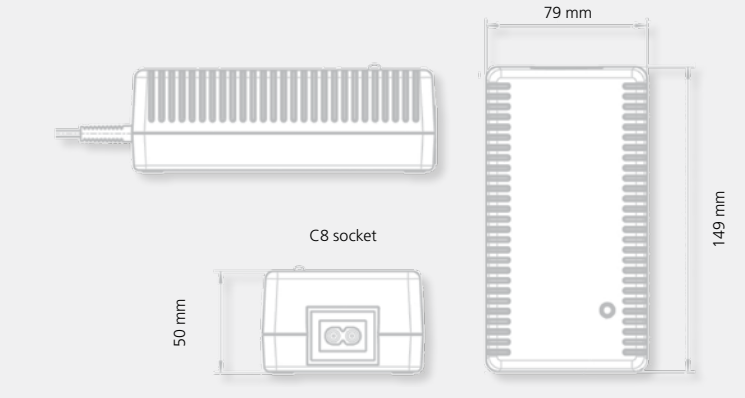
Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
5 V	2000 mA	120 mV pp	1826391
6 V	1700 mA	120 mV pp	1826392
7.5 V	1400 mA	115 mV pp	1826393
9 V	1200 mA	135 mV pp	1826394
12 V	1000 mA	180 mV pp	1826395
15 V	800 mA	112 mV pp	1826396
18 V	660 mA	135 mV pp	1826397
24 V	500 mA	300 mV pp	1826398

50 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
5 V	5000 mA	120 mV pp	1890649
12 V	3800 mA	120 mV pp	1890650
15 V	3000 mA	120 mV pp	1890839
24 V	2200 mA	120 mV pp	1825898

80 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
12 V	-	120 mV pp	1890865
15 V	-	120 mV pp	1828339
24 V	-	120 mV pp	1890981

available 2009

Switchmode Power Supplies

USB Series

Conforms to IEC 60950



Applications

- Bluetooth
- Digital cameras
- Wireless communication accessories
- PDA
- Household applications
- MP3 Player
- E-Book

Characteristics

- Universal input 100 to 240 V AC
- Constant voltage, current limited
- Exchangeable primary adapters (GPP USB)
- Low standby power ≤ 0.3 Watts
- Continuously short circuit proof
- Low weight
- Compact design

Technical data

Input voltage	100 to 240 V AC ($\pm 10\%$)
Input current	100mA (PP USB), 75mA (GPP USB)
Frequency	50 to 60 Hz
Efficiency	70 % typ. at full load
EMC	Conforms to EN 55011, 55014, EN 55022/B, EN 55024, FCC 41 part 15, EN 61000-3-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-11
Output voltage tolerance	$\pm 5\%$

Environmental specification

Operating temperature	0 to 45° C at maximum load
Storage temperature	-20 to 70° C
Humidity	5 % to 95 % non condensing
Input transient susceptibility	Complies with IEC 61000 requirements

Safety specification

Standards	Fulfils Class II SELV for the following applications: EN 60950/IEC 60950, UL 60950, VDE, CE label
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Reliability specification

MTBF calculation	200.000 hours at maximum load and an ambient temperature of 25° C (in accordance with MIL-HDBK-217)
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Mechanical specification

Weight approx.	34 g (PP USB), 50 g (GPP USB)
Plug connector	AC input: FRIVO exchangeable mains plug system: EURO, UK, USA/Japan, Australia, IEC DC output: USB socket type A

For primary adapters see page 26

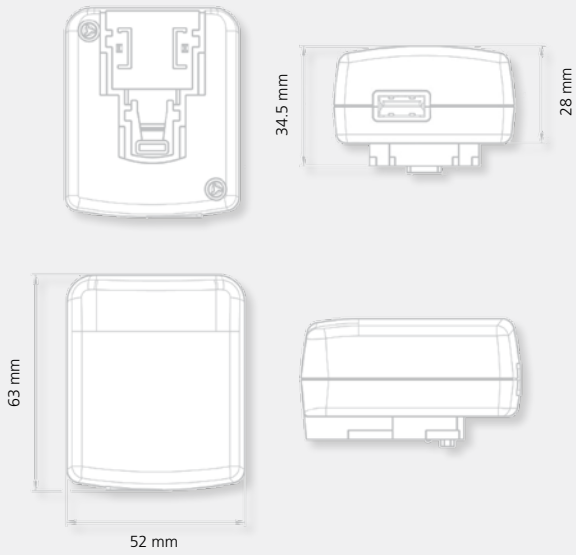
GPP USB



PP USB



2.5 Watts



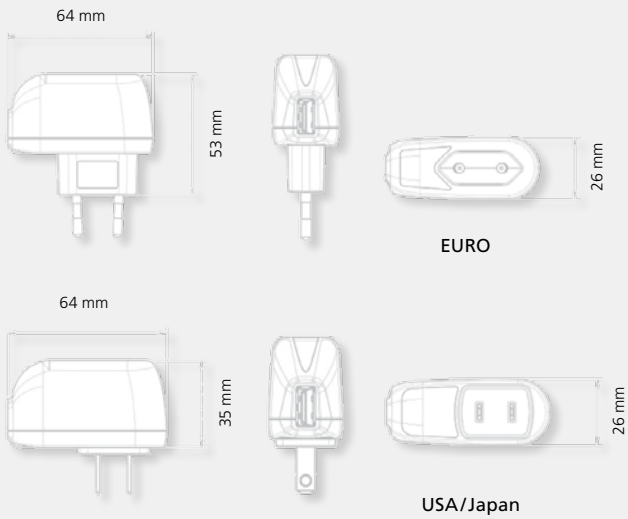
Output data

Voltage	Current	Ripple Voltage	Worldwide Order No.
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5 V	700 mA	200 mV pp	1891225
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available 2009

2.5 Watts



Output data

Voltage	Current	Ripple Voltage	EURO Order No.	USA/Japan Order No.	UK Order No.
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5 V	700 mA	200 mV pp	1832642	1832641	1832643
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available 2009

Switchmode Power Supplies

UP Series

Conforms to IEC 61558, 60950, 60335



Applications

- Safety technology
- Water taps
- Shutter control
- Door opener
- LED applications

Characteristics

- Universal input 100 to 240 V AC
- Constant voltage, current limited
- Low standby power ≤ 0.3 Watts
- High output power
- Continuously short circuit proof
- Compact design
- IP 64 protection class

Technical data

Input voltage	100 to 240 V AC ($\pm 10\%$)
Input current	150 mA (UP 6)
Frequency	50 to 60 Hz
Efficiency	75 % typ. at full load
EMC	Conforms to EN 55011, 55014, EN 55022/B, EN 55024, FCC 41 part 15, EN 61000-3-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-11, $\pm 5\%$
Output voltage tolerance	$\pm 5\%$

Environmental specification

Operating temperature	0 to 40° C at maximum load
Storage temperature	-20 to 70° C
Humidity	5 % to 95 % non condensing
Input transient susceptibility	Complies with IEC 61000 requirements

Safety specification

Standards	Fulfils Class II SELV for the following applications: EN 60950/IEC 60950, UL 60950, VDE, CE label
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Reliability specification

MTBF calculation	200.000 hours at maximum load and an ambient temperature of 25° C (in accordance with MIL-HDBK-217)
-------------------------	---

Mechanical specification

Weight approx.	95 g (UP 6), 95 g (UP 12), 130 g (UP18)
Plug connector	AC input: 150 mm cable DC output: 150 mm cable

Optional – upon request: customer specific output voltages
customer specific cable length

UP 6



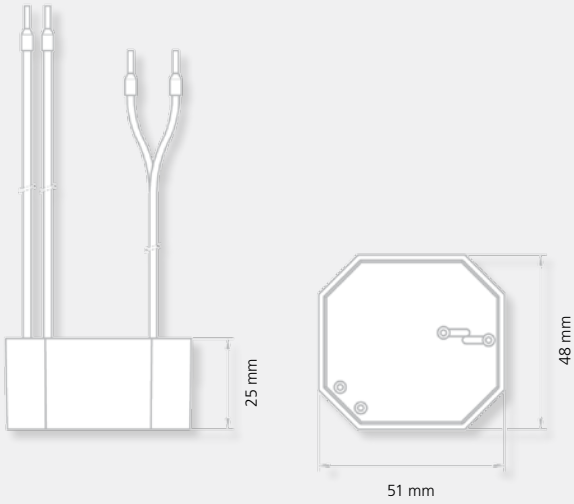
UP 12



UP 18



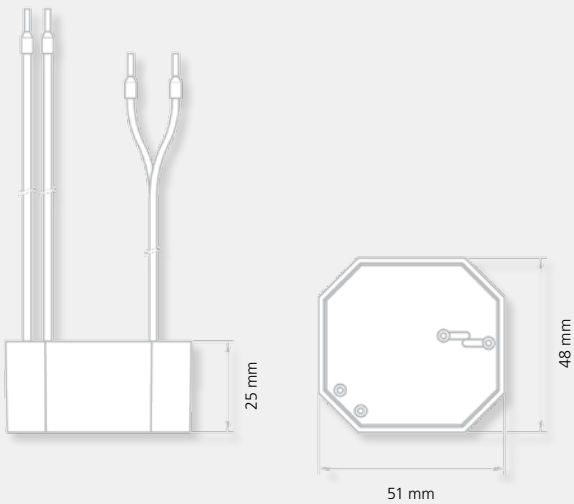
6 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
4 V	1300 mA	300 mV pp	1891505
6 V	1000 mA	300 mV pp	1891506
9 V	660 mA	300 mV pp	1891507
12 V	500 mA	300 mV pp	1891508
15 V	400 mA	300 mV pp	1891509
18 V	330 mA	300 mV pp	1891510
24 V	250 mA	300 mV pp	1891511

available 2009

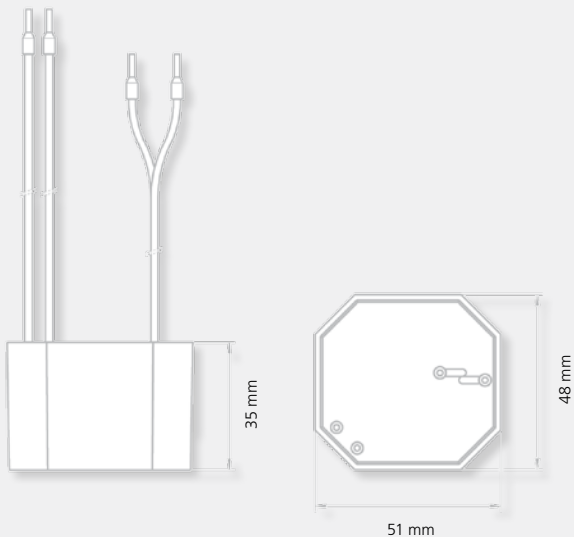
12 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
12 V	1000 mA		
24 V	500 mA		

available 2009

18 Watts



Output data			Worldwide
Voltage	Current	Ripple Voltage	Order No.
12 V	1500 mA		1832688
24 V	750 mA		1891685

available 2009

Switchmode Chargers

Chargers

Conform to IEC 60335 and IEC 60601-1



Applications

- Medical applications
- Electrical vehicles
- Stair lifts/patient lifts
- Mobile lighting
- Cleaning machines
- Professional photographic technology
- Mobile measuring technology
- Starter batteries
- Diving lamps

Characteristics

- Universal input 100-240 V AC (DTC 60 only 230 V)
- Constant voltage, current limited
- Exchangeable primary adapters (MPP and GPP system)
- Low leakage current
- Low standby power
- LED charge indication
- Continuously short circuit proof
- Reverse polarity protection (not MPP 15 Li-Ion and PP 8 Lead Acid)

Technical data

Input voltage (AC)
Input current

100 to 240V ($\pm 10\%$), (DTC 60 230V)
PP 8 (0.13-0.2A), MPP 15 (0.25-0.3A), DTC 60 (0.45A), MPP 30 (0.4-0.5A), GPP 36 (0.18-0.45A)

Frequency
Efficiency

50 to 60 Hz
75 % at full load, resp.
80 % (NiCd/NiMH and GPP 36)

EMC

Conforms to EN 55011
EN 55014, EN 55022/B, FCC 47 part 15,
EN 61000-3-2, EN 61000-4-2, EN 61000-4-3,
EN 61000-4-4, EN 61000-4-5, EN 61000-4-6,
EN 61000-4-11

Output current
tolerance (NiCd/NiMH)

$\pm 10\%$

Environmental specification

Operating temperature

0 to 40° C at maximum load

Storage temperature

-40 to 70° C resp. -25 to 70° C (DTC 60)

Humidity

5 % to 95 % non condensing

Input transient susceptibility

Complies with IEC 61000 requirements

Safety specification

Standards

Fulfils Class II SELV for the following applications:
IEC 60601-1 (NiCd/NiMH only MPP 15)
UL 60601-1 (only Lead Acid),
IEC 60335-2-29, UL 1310 (only NiCd/NiMH),
UL 2601-1 (only Li-Ion),
VDE, CE label, CSA (only Li-Ion)

Reliability specification

MTBF calculation

200.000 hours resp. 100.000 hours (NiCd/NiMH) at maximum load and an ambient temperature of 25° C (in accordance with MIL-HDBK-217)

Mechanical specification

Weight

PP 8 (approx. 80g), PP 8 Li-Ion (approx. 125 g),
MPP 15 (approx. 140 g), MPP 30 (approx. 278 g),
DTC 60 (approx. 450 g), GPP 36 (approx. 320 g)

Plug connector

AC input:
(MPP/GPP) FRIWO exchangeable mains plug system, PP 8 (Euro, USA/Japan, UK) DTC 60 (C8-socket)
DC output:
Universal output plug system (partially with stripped and tinned ends)

For primary adapters see page 26

Li-Ion



NiCd/NiMH



Lead Acid



Output data						Worldwide	EURO	USA/Japan	UK
Voltage	Current	No. of cells	Capacity*	Characteristics	Housing	Order No.	Order No.	Order No.	Order No.
4.1 V	1000 mA*	1	0.8 – 10 Ah	IU0U	PP 8		1890124	1891148	1891149
4.1 V	600 mA*	1	0.8 – 10 Ah	IU0U	PP 8		1828253	1891150	1891151
4.2 V	1000 mA*	1	0.8 – 10 Ah	IU0U	PP 8		1829906	1891161	1891162
4.2 V	600 mA*	1	0.8 – 10 Ah	IU0U	PP 8		1829804	1891159	1891160
8.4 V	800 mA	2	0.8 – 10 Ah	IOIU	MPP 15	1826003			
12.6 V	800 mA	3	0.8 – 10 Ah	IOIU	MPP 15	1826004			
16.8 V	800 mA	4	0.8 – 10 Ah	IOIU	MPP 15	1826006			
with NTC									
8.4 V	800 mA	2	0.8 – 10 Ah	IOIU	MPP 15	1826458			
12.6 V	800 mA	3	0.8 – 10 Ah	IOIU	MPP 15	1826459			
16.8 V	800 mA	4	0.8 – 10 Ah	IOIU	MPP 15	1826460			
4.2 V	4000 mA	1	20 Ah	IU0	GPP 36	1830714			
8.4 V	3500 mA	2	20 Ah	IU0	GPP 36	1830720			
12.6 V	2500 mA	3	20 Ah	IU0	GPP 36	1830721			
16.8 V	1600 mA	4	20 Ah	IU0	GPP 36	1830722			
21.0 V	1400 mA	5	20 Ah	IU0	GPP 36	1830723			

Output data				Switch-off criteria			Worldwide	EURO	UK
Capacity	Current	No. of cells	Housing	Time	T. grad	-delta-U	Order No.	Order No.	Order No.
1.0 – 20.0 Ah	2600 mA	4 – 12	DTC 60	.	.	.		1890704	1890704
1.0 – 20.0 Ah	1800 mA	10 – 20	DTC 60	.	.	.		1890132	1890132
3.5 – 7.0 Ah	950 mA	10 – 20	MPP 30	.	.	.	1811894		
2.8 – 7.0 Ah	1000 mA	10 – 12	MPP 30	.	.	.	1812609		
2.5 – 4.5 Ah	1400 mA	8 – 12	MPP 30	.	.	.	1880408		
2.5 – 10.0 Ah	2000 mA	5 – 6	MPP 30	.	.	.	1818681		
1.0 – 10.0 Ah	800 mA	4 – 10	MPP 15	.	.	.	1826002		
1.0 – 10.0 Ah	800 mA	4 – 10	MPP 15	.	.	.	1890127		
0.8 – 1.6 Ah	550 mA	5 – 8	PP 8	.	.	.		1824466	1824468
2.0 – 35.0 Ah*	1.6–4.0 A**	2 – 12	GPP 36	.	.	.	1890131		

Output data						
Voltage	Current	No. of cells	Capacity	Characteristics	Housing	Order No.
6 V	900 mA	3	2.4 – 16.0 Ah	IU0U	PP 8 EU	1890125
6 V	900 mA	3	2.4 – 16.0 Ah	IU0U	PP 8 UK	1824106
6 V	900 mA	3	2.4 – 16.0 Ah	IU0U	PP 8 US	1824107
6 V	1600 mA	3	4.8 – 32.0 Ah	IU0U	MPP 15	1890126
6 V	3000 mA	3	9.0 – 60.0 Ah	IU0U	MPP 30	1890129
12 V	500 mA	6	1.5 – 10.0 Ah	IU0U	PP 8 EU	1824396
12 V	500 mA	6	1.5 – 10.0 Ah	IU0U	PP 8 US	1825090
12 V	1000 mA	6	3.0 – 20.0 Ah	IU0U	MPP 15	1890240
12 V	2000 mA	6	6.0 – 40.0 Ah	IU0U	MPP 30	1890243
24 V	500 mA	12	1.5 – 10.0 Ah	IU0U	MPP 15	1890241
24 V	1000 mA	12	3.0 – 20.0 Ah	IU0U	MPP 30	1890130
24 V	1500 mA	12	4.5 – 30.0 Ah	IU0U	MPP 30	1890222

* please observe accu specification
** without NTC 1.6 A

Switchmode Power Supplies

SP Series

Conforms to IEC 60950



Applications

- Communication accessories
- Modems, DSL, VDSL
- Safety technology

Characteristics

- Input 100 or 240 V AC
- Constant voltage, current limited
- Low standby power
- High efficiency
- Continuously short circuit proof
- Light weight, compact size

Technical data

Input voltage

100 or 240 V AC ($\pm 10\%$)

Input current

80 mA to 300 mA

Frequency

50 and 60 Hz

Efficiency

75 % typ. at full load

EMC

Conforms to EN 55011, 55014, EN 55022/B, EN 55024, FCC 41 part 15, EN 61000-3-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-11

Output voltage tolerance

$\pm 5\%$

Environmental specification

Operating temperature

0 to 40° C at maximum load

Storage temperature

-20 to 70° C

Humidity

5 % to 95 % non condensing

Input transient susceptibility

Complies with IEC 61000 requirements

Safety specification

Standards

Fulfils Class II SELV for the following applications: EN 60950/IEC 60950, UL 60950, VDE, CE label

Reliability specification

MTBF calculation

200.000 hours at maximum load and an ambient temperature of 25° C (in accordance with MIL-HDBK-217)

SP 7



SP 12



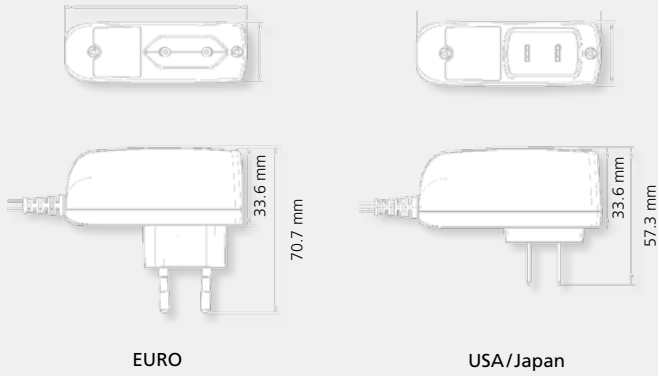
SP 18



SP 24

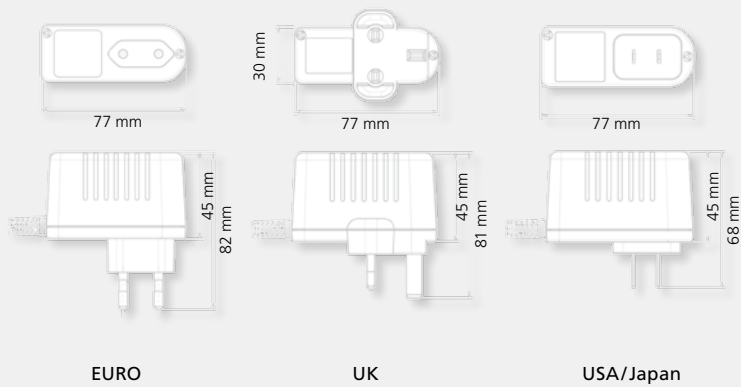


6 Watts



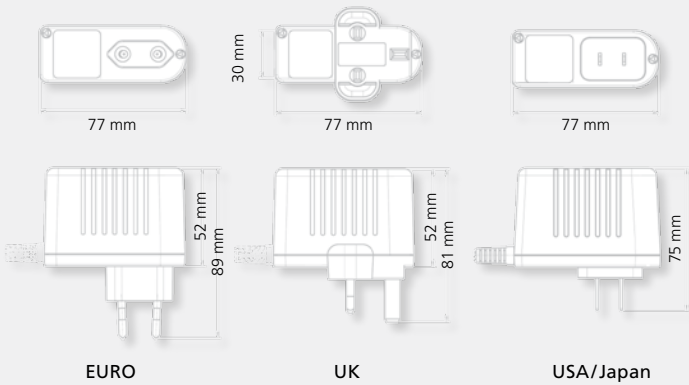
Output data		EURO	USA/Japan	UK
Voltage	Current			
5 V	1000 mA	•	•	
7.5 V	900 mA	•		
6 V	1000 mA	•		
12 V	400 mA	•		•

12 Watts



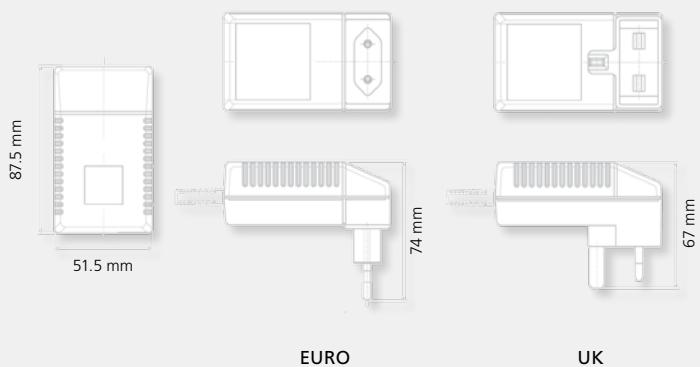
Output data		EURO	USA/Japan	UK
Voltage	Current			
5 V	2000 mA	•	•	•
6 V	1500 mA	•	•	
12 V	600 mA	•		•
12 V	1000 mA		•	
24 V	350 mA	•		
40 V	350 mA	•		

18 Watts



Output data		EURO	USA/Japan	UK
Voltage	Current			
8 V	2000 mA		•	
9 V	2000 mA	•		•
12 V	1400 mA	•		
15 V	1200 mA	•		

24 Watts



Output data		EURO	USA/Japan	UK
Voltage	Current			
12 V	2000 mA	•	•	•
15 V	1500 mA	•		•
24 V	1000 mA	•		

Accessories

Primary adapters

The GPP/MPP-series can be variably equipped with the mains plugs as shown. Your applications and products can be sold and used worldwide due to the set of all country mains plugs which can be inserted with the unit.

Mobility and dependability with respect to the use of the product are increased in this way and provide a constant level of functionality and availability – wherever you are in the world. Beyond that, these plug modules help reducing the logistic complexity, avoiding the need to plan and stock mains adapters and chargers in various mains plug configurations.

In countries with mains plugs which are not covered by EURO, UK, USA/Japan and Australia mains plug types, the IEC adapter with the 2-pin IEC 320 C8 socket provides a standardized alternative.

Secondary adapter

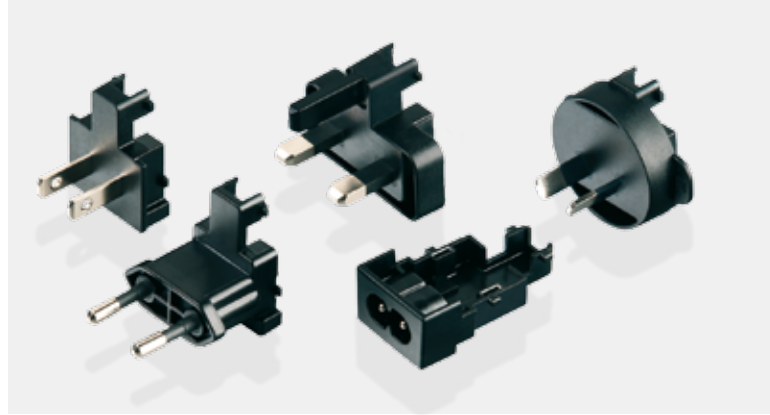
In addition to the standardized low voltage plug-in connections such as coaxial (in accordance with DIN 45323) and jack connectors (in accordance with DIN 45318), FRIWO also provides customized connecting cables. The wire diameter which is generally used in our units ranges from 0.25 mm² to 1.5 mm². Both flat and round cables can be used.

The low-voltage plugs shown only represent a selection of the comprehensive range. Customized designs, special versions and types with other dimensions can be obtained upon request.

Power cords

Mains power cords with the 2 contact IEC 320 C 7 mains plug provide the specific solution for each country. All power cords are 2 metres long. These power cords are suitable for use with our IEC 320 C8 socket for FRIWO's MPP/GPP and DT lines.

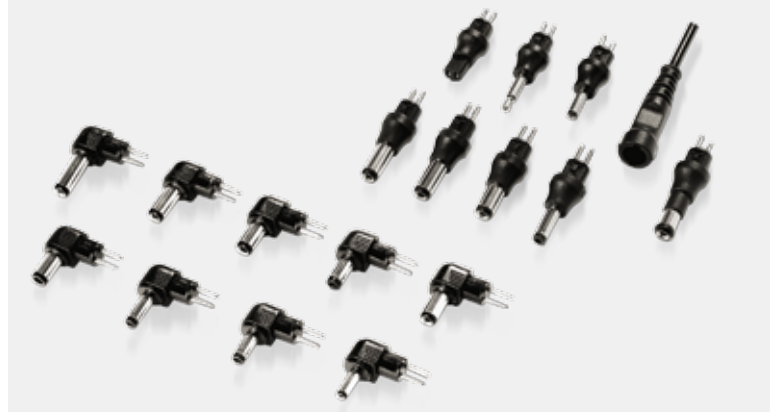
Primary adapters GPP system



Primary adapters MPP system

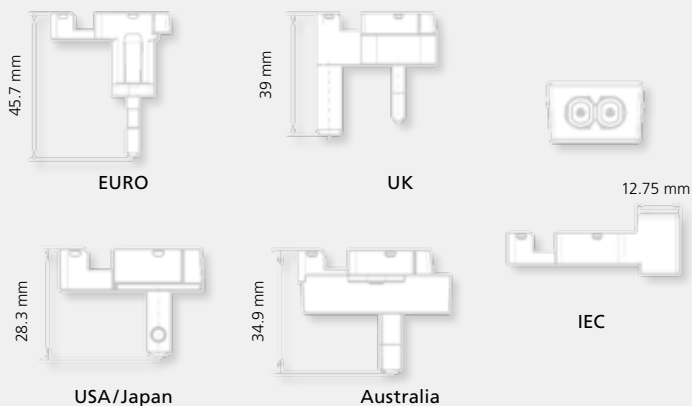


Secondary adapter plug system

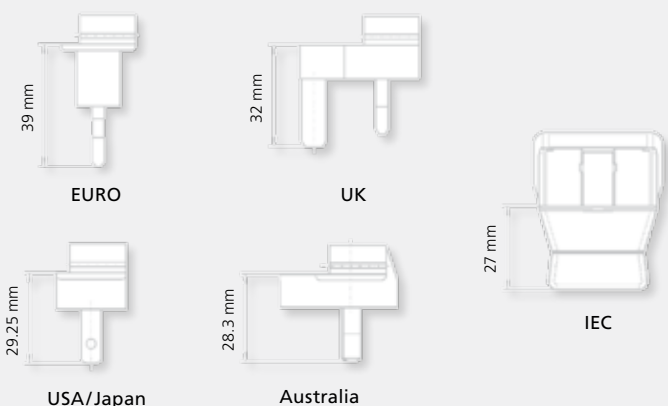


Power cords



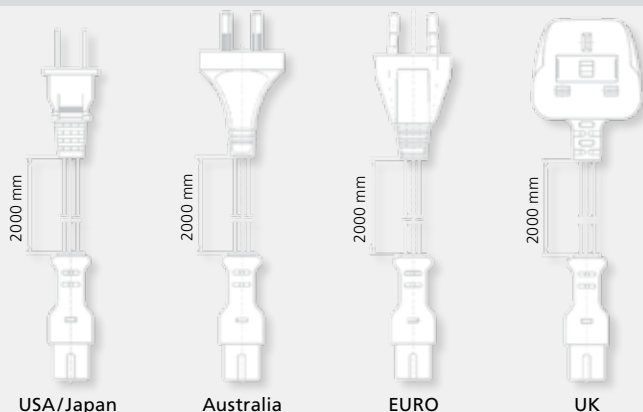


Primary adapter	GPP	
Country	Order No.	
EURO	1827417	
UK	1827420	
USA/Japan	1827422	
Australia	1827425	
IEC	1827428	
Korea	1830162	without picture
Argentina	1831610	- -
India	1831323	- -
China	1830164	- -
Brasil	1830859	- -



Primary adapter	MPP	
Country	Order No.	
EURO	1717707	
UK	1717618	
USA/Japan	1717715	
Australia MPP 15	1800496	
Australia MPP 6/30	1804237	
IEC	1809281	
Korea	1832029	without picture

Straight coaxial connectors				Straight jack connectors			Angled coaxial connectors				Angled jack connectors		
Ø outer	Ø inner	length mm	Order No.	Ø outer	length mm	Order No.	Ø outer	Ø inner	length mm	Order No.	Ø outer	length mm	Order No.
3.5	1.3	9.5	1807699	2.5	13	1807704	3.5	1.3	9.5	1822478	2.5	13	1822484
4.0	1.7	9.5	1822557	3.5	14	1807705	4.0	1.7	9.5	1822558	3.5	14	1822485
4.0	1.7	11.0	1811994				4.0	1.7	11.0	1822482			
4.8	1.7	9.5	1822559				4.8	1.7	9.5	1822560			
5.5	2.1	9.5	1807700				5.5	2.1	9.5	1822479			
5.5	2.1	11.5	1807701				5.5	2.1	11.5	1822480			
5.5	2.1	14.0	1807697				5.5	2.1	14.0	1822476			
5.5	2.5	9.5	1807698				5.5	2.5	9.5	1822477			
5.5	2.5	11.5	1807702				5.5	2.5	11.5	1822481			
5.5	3.3	9.5	1822561				5.5	3.3	9.5	1822562			
DIN 45323			1807703				DIN 45323			1822483			



Power Cords	
Country	Order No.
EURO	1812274
UK	1812275
USA/Japan	1812276
Australia	1812277

Open Frame

Applications

- Safety technology
- Medical equipment
- Automation technology
- Measurement technology
- Communication technology

Characteristics

- Universal input voltage
- Several output voltages
- High efficiency
- Low standby losses
- Customized PCB contours

Open frame units

FRIWO's long-term experience and constantly growing know-how in engineering of chargers and power supplies makes us your ideal partner for customized power supplies.

Your specific requirements, wishes and applications are centered in our creative and innovate engineering. Technical application-specific solutions are always subject to existing and future legal requirements in regard to efficiency and no-load losses. To protect the environment and for better utilization of resources our engineering is focused on energy-efficient units.

All types of our wide line of products can be supplied as open frame models or can be adapted to your housing dimensions. We are also at your service for approvals like VDE-GS and UL.

Technical data

Input voltage

100 to 240 V AC or single range $\pm 10\%$

Frequency

50 to 60 Hz

Efficiency

> 80 % typ. at full load

EMC

Conforms to EN 55011, EN 55014, EN 55022/B, FCC 47 part 15, EN 61000-3-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-11

Environmental specification

Operating temperature

0 to 110° C at maximum load

Storage temperature

-10 to 70° C

Humidity

5 % to 95 % non condensing

Input transient susceptibility

Complies with IEC 61000 requirements

Safety specification

Standards

Fulfills Class II SELV for the following applications: EN 60950/IEC 60950, VDE, CE label resp. UL 60950

Reliability specification

MTBF calculation

200.000 hours at maximum load levels and an ambient temperature of 25° C (in accordance with MIL-HDBK-217)



EMS

FRIWO – Service provider for electronic modules and devices

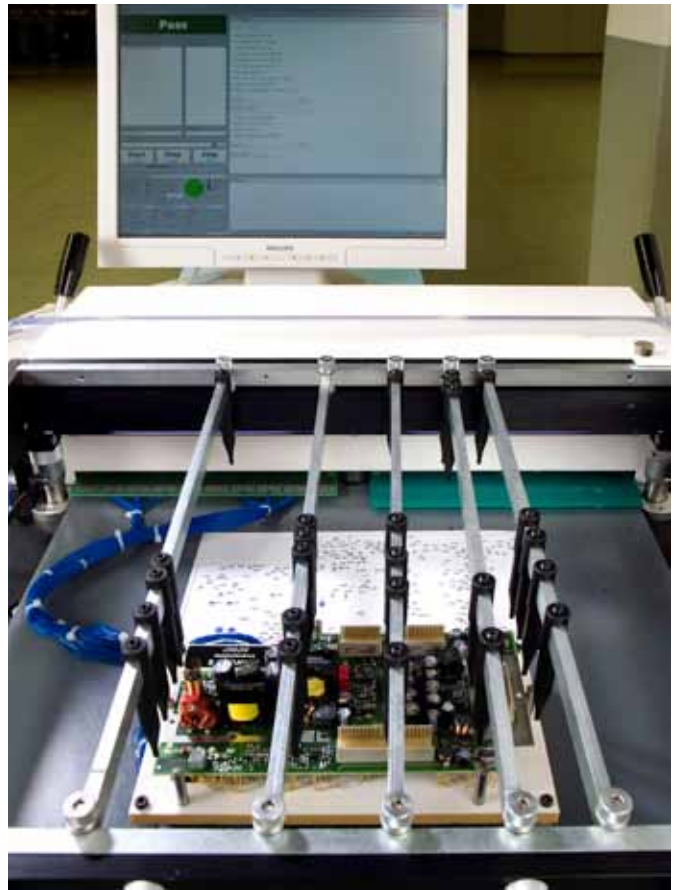


In addition to the standard program for power supplies and chargers or OEM-specific products FRIWO offers you EMS. You turn in your technical documents like B/Ms and specifications – we do the rest and supply you from one source – naturally after close coordination. Our EMS team is highly experienced and stays in close contact with you: from the production of entire devices

or systems via testing and packing until shipment. The experts of our strategic and operative purchasing department tend to the worldwide purchase of the required electronic and mechanic components. Process security is safeguarded by automatic inspection systems. Voltage and current are adjusted by active laser trimming.



EMS

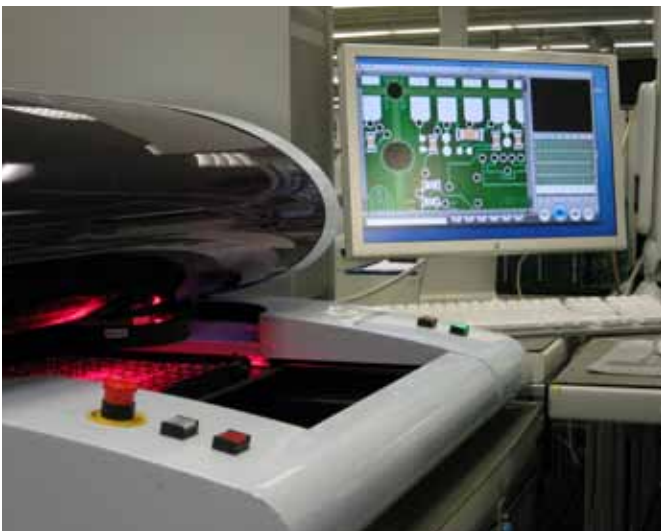


The quality department is significantly involved and monitors each and every production step.

The inspection of the manufactured devices plays an important role and belongs to FRIWO's core competences. It includes the crucial final inspection of manufactured devices with, for example, in-circuit and functional testing equipment. FRIWO is certified in accordance with DIN EN ISO 9001-2000 and DIN EN ISO 14001:2005.

Should an automatic production turn out to be impracticable because of product size or weight, FRIWO will switch to manual manufacture unhesitatingly. We are also flexible when it comes to quantity. Also practiced is lead-free soldering to comply with RoHS „Restriction of the use Of certain Hazardous Substances in electrical and electronic equipment“ (EG regulation 2002/95/EG and its corresponding national adaptations to prohibit the use of certain substances for production and processing of electric and electronic devices and modules).

This service yields important synergies for you which will considerably influence your product success. In earlier times outsourcing was just a way to save costs, today further advantages surface: you can focus on your core competences. You have access to additional production capacities and can avoid bottlenecks or capacity excesses. Furthermore FRIWO offers the latest technical equipment and state-of-the-art production standards which help to reduce your entrepreneurial risk. You do not even have to invest in new technologies, thus also minimizing your risk and capital lockup and increasing your solvency. We have experienced lasting business relationships because our partners know that they can rely on us.



Service Portfolio	
PCB assembly	THT SMT
Joining/connecting	Glueing Soldering (reflow, wave, nitrogen, lead-free)
Inspections	Automatic-Optical-Inspection In-circuit test Functional test Special tests (e.g. boundary scan) Safety tests
Protective Coating	
Potting technology	
Assembly	Tightening technology Ultrasonics
Prototype manufacturing	
Handling of complete subassemblies (outsourcing/insourcing)	
Testing equipment development and construction	
Material management (worldwide)	
Certifications	DIN EN ISO 9001: 2000, DIN EN ISO 14001: 2005

Technical Equipment	
SMT assembly 110000 – 120000 components/h	2 Siemens X 3 2 Siemens HF 3 3 Assembleon Topaz 2 Assembleon Emerald with LCS Feeder 1 MPM printers 5 Ekra printers 5 Dispenser Gemini 2
THT assembly 40000 to 45000 components/h	1 Universal 8 XT Triple Scan 1 Universal VCD/Sequencer 8
Reflow soldering	6 SMT QPM (nitrogen) 1 HERAEUS VC 36
Wave soldering	2 SEHO nitrogen plants (lead-free) 1 SEHO air plant
Inspections	5 AOI systems Mitutoyo BHN 506 3D coordinate measuring machine 10 in-circuit/combitesters (Reinhardt KMFT 470) 3 in-circuit/combitesters (SPEA 100 AP) 1 in-circuit/combitesters (SPEA 3030) 1 laser trimmer (general scanning) 1 boundary scan system (Jtag) PC functional testing technology 2 high-voltage and leakage current tester (Sefelec)
Potting/Varnishing	1 Scheugenpflug vacuum potting system 1 Scheugenpflug potting system 1 PCB varnishing unit



Glossary

Type of accu	Lead Acid	Ni-Cd	Ni-MH	Li-Ion	
				cobalt	manganese
Cell voltage	2.0 V	1.2 V	1.2 V	3.6 resp. 3.7 V	
Energy density [Wh/kg]	30–50	45–80	60–120	110–190	110–120
Self-discharge ratio per month	5%	20%	30%	8%	
Overload tolerance	high	moderate	low	very low	
Charging cycles	200–400	1500	300–500	300–500	
Charging method	U= const.	I= const.	I= const.	300–500	
Charging characteristic	IU0U, IU1a	I0I	I0I	IUa	
	Phase 1: constant current	Charging criteria: -dV, dT/dt, dU/dt, T _{max}		Phase 1: constant current	
	Phase 2: constant voltage	Identification and control via microcontroller		Phase 2: constant voltage	
	Phase 3: trickle charge				

Ambient temperature

Temperature of inactive air which surrounds the power supply. It is usually measured approx. 10 mm apart from the running power supply.

Class B

Protection against electric shock with special consideration of the leakage currents.

Class BF

Like B, but considering the so-called „F-parts“ which sometimes may get in contact with a patient and which are isolated from other parts.

Class CF

Class with the highest protection among all classes.

Current limited

Electronic overload protection which limits the max. output to a preset value.

Efficiency ratio

The efficiency ratio concerns the ratio between output and input and is always smaller than 1. To reduce the power loss under the given load prerequisites, the maximum efficiency ratio is aspired. For a power supply it is measured at full load and at nominal input. The difference between input and output is transposed into heat, hence each increase of the efficiency ratio means less thermal stress on the components and therefore a life cycle increase. Even a minor improvement of the efficiency ratio can have a dramatic impact on the life cycle.

EMC

“Electromagnetic Compatibility” is the ability of a device, equipment, or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment. Power supplies should at least comply with two minimum technical standards of the EMC standards: 1. standard for transient emissions (grid-bound interferences emitted by the power supply) and 2. standard for interference resistance (external interferences). These standards comprise a multitude of substandards which stipulate thresholds for particular subareas (for example particular types of interferences). FRIWO power supplies meet these standards even tighter than required since we believe that we should make the most of EMC to guarantee a trouble-free service.

Leakage current

Current which discharges via a protective earth conductor against ground during service by passing the capacitances and the insulating resistor of the working circuit.

Life cycle

Life cycle of a power supply. After the expiration of life cycles power supplies tend to break down because of worn components.

MTBF (meantime between failures)

MTBF stands for Mean Time Between Failures (average time between two power supply breakdowns). The MBTF specifies the statistic average time during which a power supply is likely to break down because of production or material problems before it is worn out.

Standards	Office /IT	Medical	Tools, chargers, toys, household appliances	EMC	Surge	Burst
EU	EN60950-1	EN60601-1	EN60335-1	EN61000/EN55014	EN61000-4-4	EN61000-4-5
USA	UL60950-1	UL60601-1	UL 1310/E60335/UL 697	FCC 47 part 15/EN61000	EN61000-4-4	EN61000-4-5
Canada	C22.2 No. 60950-1	C22.2 No. 60601.1-M90	C22.2 No.223-M91 C22.2 No.173-M1983 (Toys)	FCC 47 part 15/EN61000	EN61000-4-4	EN61000-4-5
China	GB4943	GB9706.1	GB4706	GB4343.1	GB/T17626.4	GB/T17626.5

NTC

A temperature-sensitive resistor with negative coefficient which constantly reduces the resistance value at increasing heat. It is therefore also called thermal resistor. In addition to its temperature monitoring function it also limits the switch-on current of power supplies.

Operating temperature

The range of temperature which can neither be exceeded nor fallen below during operation.

Overvoltage resistance

A circuitry within the power supplies monitors the output. If a preset threshold value is exceeded, the power supply will be turned off.

Short circuit proof

Short circuit proof means that a temporary short circuit of some seconds can be absorbed without any damages.

Single range

Power supplies with limited input voltage for usage in the corresponding countries.

SMT

SMT (surface-mounting technology) means a special surface-mounting technology during which surface-mountable components (components without wire bondings) are directly soldered onto a PCB.

Standby losses

Power consumption of a power supply during idle service.

Storage temperature

Ambient temperature in which a switchmode unit may be stored (not operated) without being damaged.

Sustained short circuit proof

A short circuit might occur without damaging the output. As soon as the problem is solved, the output will return to normal service.

THT

Stands for "through-hole technology" and concerns the transfix montage. Components to be used for this mode of montage have wire bondings ("through-hole components") and are inserted by vias into the PCB. Afterwards the components are soldered in a special THT soldering process.

Voltage regulated

A servo loop within the power supply ensures a stable output voltage, independent of all other factors (e.g. temperature).

Wide range

Wide range power supplies can be operated at different rated voltages without having to be readjusted (manually or automatically) by a switch.

FRIWO worldwide

Europe Germany

FRIWO Gerätebau GmbH

P.O. Box 1164
 Von-Liebig-Strasse 11
 D-48346 Ostbevern
 Tel.: +49 25 32 81 - 0
 Fax: +49 25 32 81 - 112
 sales@friwo.de
 www.friwo.de

Asia China

FRIWO Power Solutions

Technology (Shenzhen) Co., Ltd.
 3rd Xin An Industrial Zone
 Hangchen Industrial Zone
 XiXiang, Bao An District
 Shenzhen
 Postal Code: 518104
 China
 Tel.: +86 755 33 25 88 88
 Fax: +86 755 33 26 02 84
 sales.asia@friwo.com.cn
 www.friwo.com

FRIWO Shanghai

Room 601, Building1,
 No. 335 Xian Xia Road,
 Shanghai
 Postal Code: 200051
 China
 Tel.: +86 21 62 35 01 21
 Fax: +86 21 62 35 02 89
 sales.asia@friwo.com.cn
 www.friwo.com

Asia Japan

FRIWO Japan branch

Masuni Dai-ichi Building, 6F
 4-6, Shinyokohama, 2-chome, Kohoku-ku,
 Yokohama-shi, Kanagawa 222-0033
 Japan
 Tel.: +81 45 470 - 02 06
 Fax: +81 45 470 - 02 07
 friwojp@friwojp.com
 www.friwo.com

Distributors North America

USA

PEI-Genesis

2180 Hornig Road
 Philadelphia, PA 19116
 Tel.: + 888-887-9017 USA/Kanada
 Tel.: + 215-673-0400 außerhalb von
 USA/Kanada
 Fax: + 215-638-8360
 phsales@peigenesis.com
 www.peigenesis.com

Components Center

11208 Young River
 Fountain Valley, CA 92708
 Tel.: +800 598 - 04 33
 Fax: +714 557 - 73 90
 e-sales@componentscenter.com
 www.componentscenter.com

Dalis Electronics

3645 East Atlanta Avenue
 Phoenix, AZ 85040
 Tel.: +800 888 - 14 08
 Fax: +602 275 - 05 78
 e-sales@componentscenter.com
 www.componentscenter.com

Future Electronics

237 Hymus Blvd.
 Pointe-Claire, Quebec H9R 50
 Tel.: +514 694 - 77 10
 Fax: +514 695 - 37 07
 eService@futureelectronics.com
 www.futureelectronics.com

Components Center

3351 Edward Avenue
 Santa Clara, CA 95054
 Tel.: +800 776 - 08 10
 Fax: +408 988 - 69 31
 e-sales@componentscenter.com
 www.componentscenter.com

Vale Distribution

2 Linda Lane, Suite B
 Vincentown, NJ 08088
 Tel.: +800 606 - 82 53
 Fax: +609 859 - 87 59
 alan@valedistro.com
 www.valedistro.com

Distributors Europe

Austria

Kellner Netcom GmbH
Siemensstrasse 28
D-70825 Korntal-Münchingen
Tel.: +49 71 50 94 30 943
Fax: +49 71 50 94 30 944
friwo@kellner.de
www.kellner.de

Belgium

Alcom electronics NV/SA
Singel 3
B-2550 Kontich
Tel.: +32 3-458 30 33
Fax: +32 3-458 31 26
info@alcom.be
www.alcom.eu

Finland

Oy Flinkenberg Ab
PL 69 (Mikkilänkallio 3)
FI-02771 Espoo, Finland
Tel.: +358 9 859 911
Fax: +358 9 8599 1306
electronics@flinkenberg.fi

France

Microel Division de CATS
19 avenue de Norvège
F-91958 Courtabœuf cedex
Tel.: +33 169 07 08 24
Fax: +33 169 07 17 23
friwo.cats@fr.oleane.com
www.microel.fr

Solutec Division de CATS
19 avenue de Norvège
F-91958 Courtabœuf cedex
Tel.: +33 169 59 21 50
Fax: +33 169 59 21 51
friwo.cats@fr.oleane.com
www.solutec-france.fr

Germany

Hubert Schroeter KG
Saseler Bogen 1
D-22393 Hamburg
Tel.: +49 40 60 00 06 - 0
Fax: +49 40 60 00 06 - 30
info@schroeter-kg.de
www.schroeter-kg.de

Kellner Netcom GmbH
Siemensstrasse 28
D-70825 Korntal-Münchingen
Tel.: +49 71 50 94 30 943
Fax: +49 71 50 94 30 944
friwo@kellner-netcom.de
www.kellner-netcom.de

Great Britain

Haredata Electronics
14 Crown House
Hornbeam Square North,
Hornbeam Park
GB-Harrogate, HG2 8PB
Tel.: +44 14 23 85 31 80
Fax: +44 14 23 85 31 99
sales@haredata.co.uk
www.haredata.co.uk

Ireland

Eltech Ltd.
Rubicon Centre
CIT Campus
Bishopstown
IRL-Cork
Tel.: +353 21 420 90 24
Fax: +353 21 420 90 91
eltech@iol.ie
www.friwo.com

Israel

Tamuz Electronics Ltd.
3 Hayozma St. Industrial Zone
Kfar-Saba 44422 Israel
P.O Box 7124, Kfar-Saba 44641 Israel
Tel.: +972 9 76 33 000
Fax: +972 9 76 33 011
info@tamuz-ele.co.il
www.tamuz-ele.co.il

Italy

ELSAP SPA
Viale Famagosta, 61
I-20142 Milano
Tel.: +39 02 89 12 52 72
Fax: +39 02 89 12 53 04
fbenedetti@elsap.it
www.elsap.it

Netherlands

Alcom electronics bv
Rivium 1e straat 52
NL-2909 LE Capelle a/d IJssel
Tel.: +31 10-288 25 00
Fax: +31 10-288 25 25
info@alcom.nl
www.alcom.eu

Poland

Elhurt Spółka z o.o.
ul. Galaktyczna 35A
PL-80-299 Gdańsk
Tel.: +48 58 554 0800
Fax: +48 58 554 0807
elhurt@elhurt.com.pl
www.elhurt.com.pl

Russia

ELTECH SPb
10/6 Dvinskaya str.
RU-198035 Saint-Petersburg
Tel.: +7 812 635-50-60
Fax: +7 812 635-50-70
irina.ld@eltech.spb.ru
www.eltech.spb.ru

Scandinavia

Awilco Electronic ApS
Yderholmvej 64
DK-4623 Lille Skensved
Tel.: Denmark: +45 56 56 55 00
Tel.: Norway: +47 91 68 62 60
Fax: +45 56 56 55 05
mail@awilco.dk
www.awilco.dk

Spain/Portugal

Matrix Electrónica, S.L.
C/Alejandro Sanchez, 109
28019 Madrid - Spain
Tel.: +34 915602737
Fax: +34 91562865
matrix@matrix.es
www.matrix.es

Switzerland

NOVITRONIC AG
Thurgauerstrasse 74
CH-8050 Zürich
Tel.: +41 44 306 91 73
Fax: +41 44 306 91 03
energietechnik@novitronic.ch
www.novitronic.com

