



# Excellence In Power Solutions

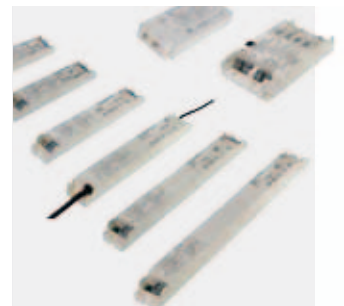
Power Supplies



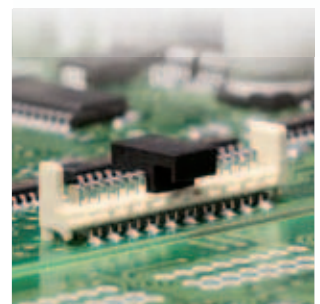
Chargers



LED Drivers



E<sup>2</sup>MS



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# Innovative, efficient and competitive LED drivers, power supplies and chargers

## Competent R&D and manufacturing services for electronic modules

## Sustainable value for our customers, employees, owners, suppliers and partners

### Global Player

FRIWO operates worldwide as leading manufacturer of LED drivers, battery chargers and power supplies. FRIWO is the best resource for value-added electronics development and manufacturing. With our products and services we serve demanding clients in segments like electric mobility, power tools, high quality consumer equipment, medical, industrial automation, LED lighting and renewable energy.

We consider it a permanent challenge to keep up with current and future technologies. Customized products for contactless energy transfer have already been designed and are available for transmissions of up to 30 Watts.

### Power Supplies / Chargers

Since FRIWO has developed the world's first power supply, the name has become a trademark. FRIWO stands for technical competence in standard and customized solutions, from concept to finished product. In 1971 FRIWO has laid the foundation for constant market success and sets landmarks for power supply and charging technology, in accordance with current safety standards and regulations.

### Standards, Regulations and Responsibility

The stringent criteria and requirements of the various standards, are, of course, respected by FRIWO, many products remain even far below threshold limits.

FRIWO cooperates with leading test and inspection institutes, and the sophisticated development of the products allows worldwide approvals and marketing. All units are thoroughly tested for reliability in our own accredited test centers and leave our factory as „zero defect products“. FRIWO power supply and charging platforms are approved in Europe, the USA and Canada without any review. Laws and regulations regarding environmental responsibility and conservation of natural resources are becoming increasingly important. Based on the EU directive all FRIWO units meet the Electrical and Electronic Equipment Act – WEEE.



### FRIWO Highlights

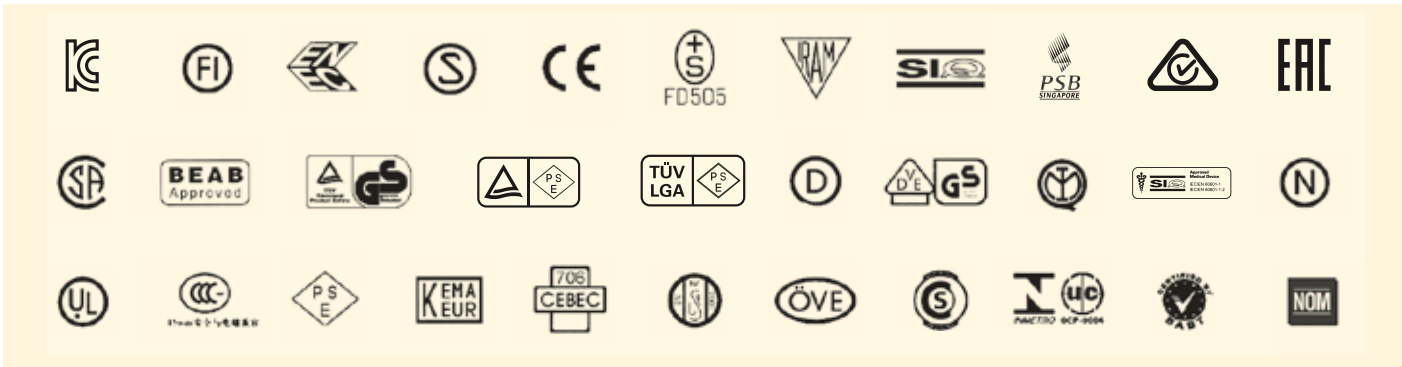
- Global manufacturing in Europe and Asia
- Local Engineering
- High Quality
- Reliability / Long life cycle
- Robust, compact design
- Short development cycles
- Customized solutions
- Rapid Prototyping
- Certified according to
  - ISO 9001:2008
  - DIN EN ISO 14001:2009
  - TS16949

### Safety and Compliance

- RoHS, WEEE and REACH conform
- Reliability
  - Long term stability
  - Drop tests
  - X-Ray
  - 100% inspection
- Medical safety standard 3rd Edition EN60601-1, ES60601
- Expert knowledge and close relationships with approval agencies (SIQ, VDE, UL,...)

### Mechanical / Electrical Design

- PCB layout
- Short development cycles
  - EMI laboratory
  - 3D Printer
  - Prototyping
- Proprietary IC
  - Low Standby
  - High efficiency (Valley detection)
  - Universal operation mode
  - Optimized IU curve for constant current and constant voltage
  - Know-how – protection / copy protection
- Potting
  - Protection against harsh environmental conditions
  - IP67
  - Robustness
  - Shock resistance
- Peak current concepts
- Direct access to FRIWO engineers
- Lowest leakage currents (no Y-capacitor)







Switchmode Power Supplies

# PP Series

All products conform to IEC 60950

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 ≤ 10 µA
- Low standby power ≤ 0.3 Watts
- Continuously short circuit proof

Technical data

|                          |                                                                                                                                                     |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Input voltage            | 100 to 240 V AC (± 10 %)                                                                                                                            |
| Input current            | 90 mA (PP 3)<br>150 mA (PP 6)<br>200 mA (PP 8)                                                                                                      |
| Frequency                | 50 to 60 Hz                                                                                                                                         |
| Efficiency               | 75 % typ. at full load                                                                                                                              |
| EMC                      | Conforms to EN 55011, 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 | ±2% (without consideration of the output lead)                                                                                                      |

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 according to following standards:<br>IEC/EN/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

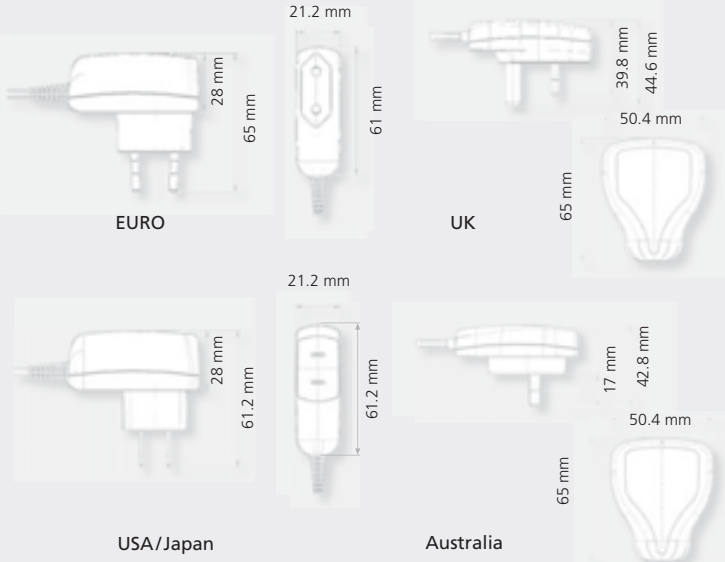
|                |                                                                                                                                 |
|----------------|---------------------------------------------------------------------------------------------------------------------------------|
| Weight approx. | 60 g (PP 3)<br>105 g (PP 6)<br>110 g (PP 8)                                                                                     |
| Plug connector | AC input:<br>FRIWO exchangeable mains plug system: EURO, UK, USA/Japan*<br>DC output:<br>Universal output plug system (page 34) |

\* Australia version available for OEM quantities

## PP 3 FW 7600



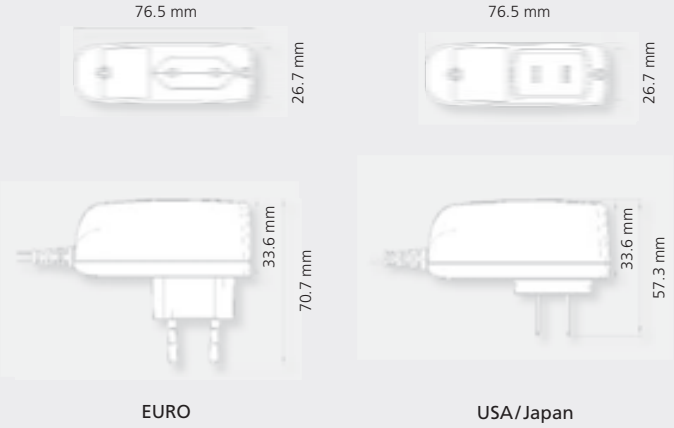
## 3 Watts



## PP 6 FW 7601



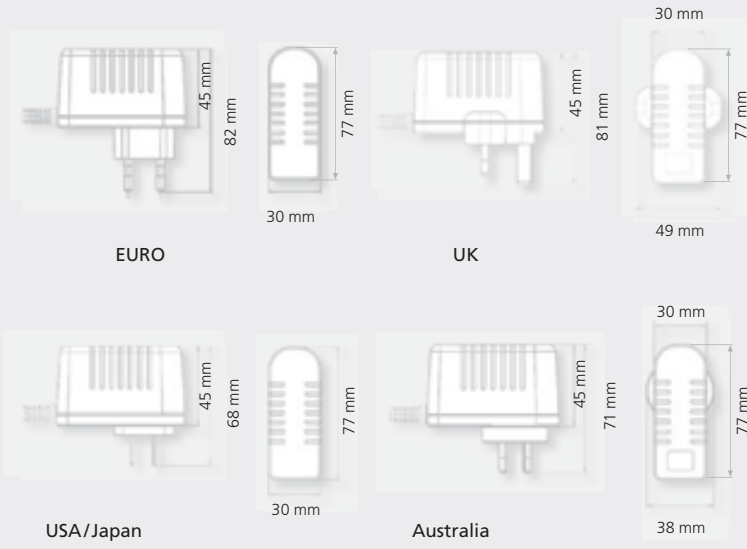
## 6 Watts



## PP 8 FW 7333S



## 8 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   |

| Output data |         | Ripple    | EURO      | USA/Japan |
|-------------|---------|-----------|-----------|-----------|
| Voltage     | Current | Voltage   | Order No. | Order No. |
| 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   |

| Output data |         | Ripple    | EURO      | USA/Japan | UK        |
|-------------|---------|-----------|-----------|-----------|-----------|
| Voltage     | Current | Voltage   | Order No. | Order No. | Order No. |
| 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

with exchangeable primary adapters

All products conform 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  $\leq 10 \mu\text{A}$  (GPP 6, GPP 10, GPP 18)
- Low standby power  $\leq 0.3 \text{ Watts}$
- Continuously short circuit proof

### Technical data

**Input voltage**  
**Input current**

100 to 240 V AC ( $\pm 10 \%$ )  
150 mA (GPP 6), 250 mA (GPP 10),  
400 mA (GPP 18), 600 mA (GPP 30)

**Frequency**  
**Efficiency**  
**EMC**

50 to 60 Hz  
80 % typ. at full load  
Conforms to  
EN 55011, 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**  $\pm 2\%$  (without consideration of the output lead)

### 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 according to  
following standards:  
IEC/EN/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

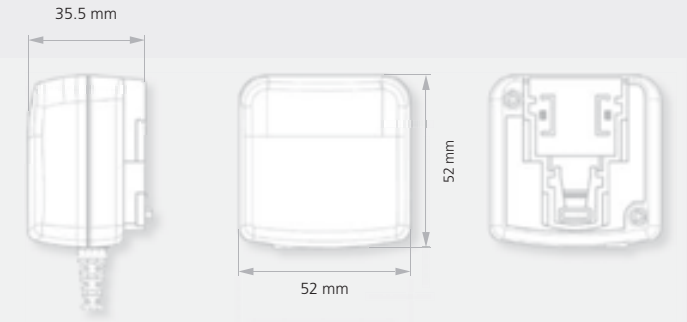
**Weight approx.** 80 g (GPP 6), 113 g (GPP 10), 170 g (GPP 18)  
200 g (GPP 30)  
**Plug connector** AC input:  
FRIWO exchangeable mains plug system:  
EURO, UK, USA/Japan, Australia, IEC  
DC output:  
Universal output plug system (page 34)

For primary adapters see page 34

## GPP 6 FW 7662



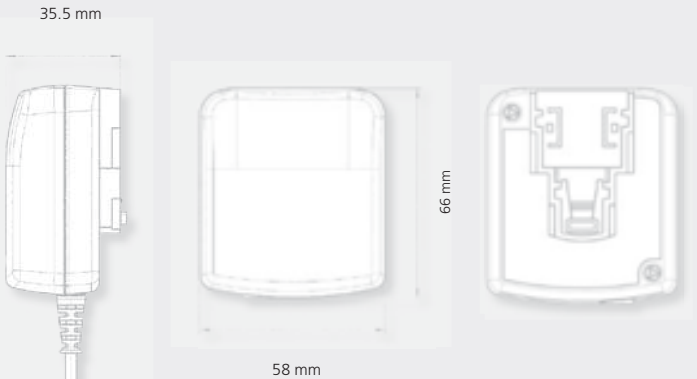
## 6 Watts



## GPP 10 FW 7660



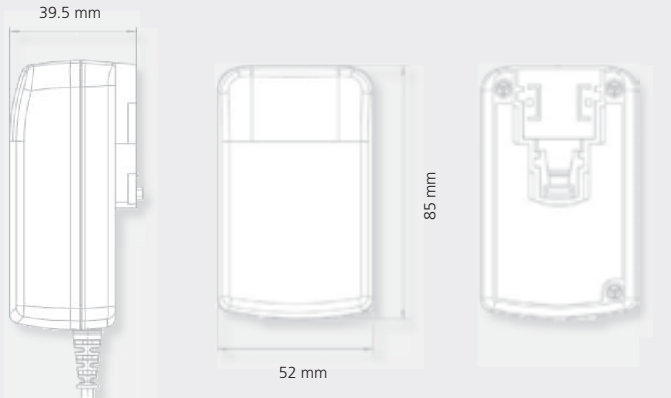
## 10 Watts



## GPP 18 FW 7556



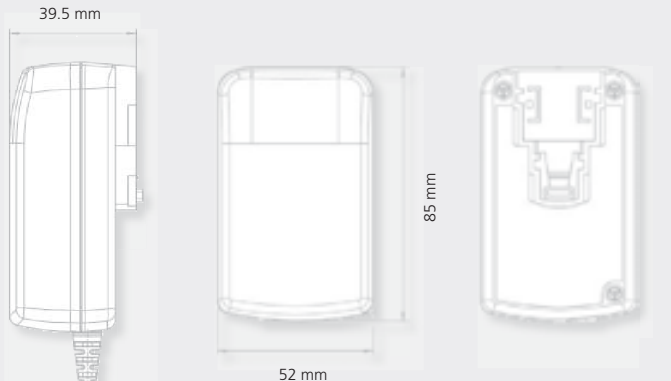
## 18 Watts



## GPP 30 FW 7540



## 30 Watts



| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 5 V         | 1100 mA | 200 mV pp      | 1891660   |
| 5.9 V       | 1000 mA | 200 mV pp      | 1891661   |
| 7.5 V       | 800 mA  | 200 mV pp      | 1891662   |
| 9 V         | 600 mA  | 200 mV pp      | 1891663   |
| 12 V        | 500 mA  | 200 mV pp      | 1891664   |
| 15 V        | 400 mA  | 200 mV pp      | 1891665   |
| 18 V        | 330 mA  | 200 mV pp      | 1891666   |
| 24 V        | 250 mA  | 200 mV pp      | 1891667   |

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 5 V         | 1600 mA | 75 mV pp       | 1827490   |
| 5.9 V       | 1400 mA | 75 mV pp       | 1827491   |
| 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   |

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 5 V         | 3000 mA | 75 mV pp       | 1828724   |
| 5.9 V       | 2500 mA | 75 mV pp       | 1828725   |
| 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   |

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 5 V         | 5000 mA | 50 mV pp       | 1893886   |
| 6 V         | 4200 mA | 60 mV pp       | 1893887   |
| 7.5 V       | 3600 mA | 75 mV pp       | 1893888   |
| 9 V         | 3000 mA | 90 mV pp       | 1893889   |
| 12 V        | 2500 mA | 120 mV pp      | 1893890   |
| 15 V        | 2000 mA | 150 mV pp      | 1893891   |
| 18 V        | 1650 mA | 180 mV pp      | 1893892   |
| 24 V        | 1250 mA | 240 mV pp      | 1893893   |
| 48 V        | 625 mA  | 240 mV pp      | 1893894   |



## Switchmode Power Supplies

# MPP Series

with exchangeable primary adapters

All products conform 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 standby power  $\leq 0.3$  Watts
- Continuously short circuit proof
- High efficiency

### Technical data

#### Input voltage

#### Input current

100 to 240 V AC ( $\pm 10\%$ )  
150 mA (MPP 6),  
400 mA (MPP 15),  
700 mA (MPP 30)

#### Frequency

#### Efficiency

#### EMC

50 to 60 Hz  
80 % typ. at full load, resp. 75 % (MPP 6)  
Conforms to  
EN 55011, 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

$\pm 2\%$  (without consideration of the output lead)

### 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 according to  
following standards:  
IEC/EN/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.

105 g (MPP 6), 160 g (MPP 15), 255 g (MPP 30)

#### Plug connector

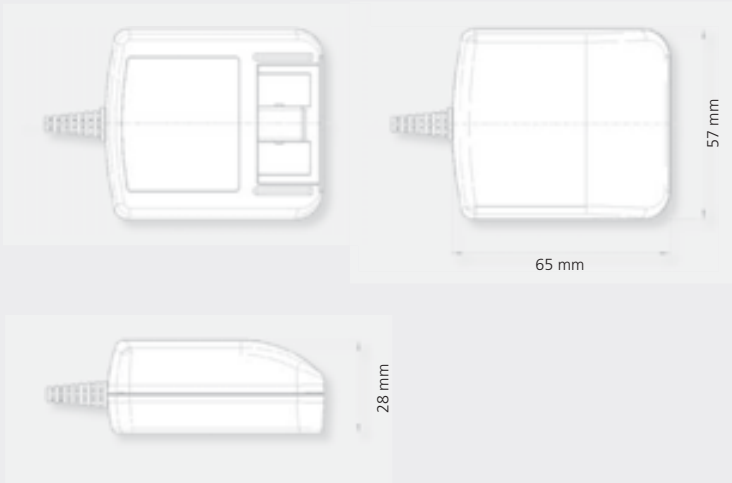
AC input:  
FRIWO exchangeable mains plug system:  
EURO, UK, USA/Japan, Australia, IEC  
DC output:  
Universal output plug system (page 34)

For primary adapters see page 34

## MPP 6 FW 7650



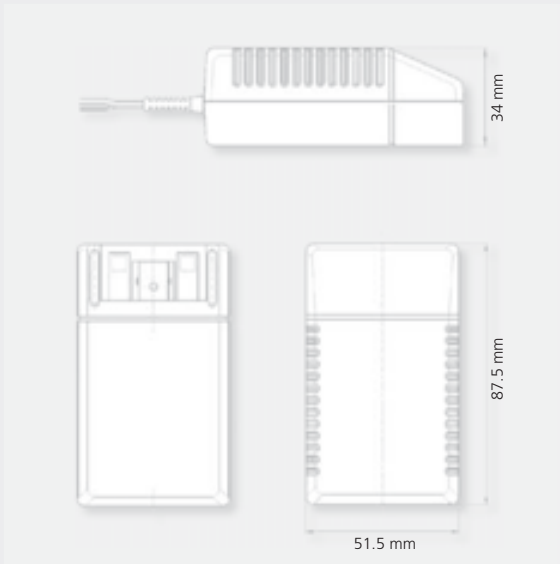
## 6 Watts



## MPP 15 FW 7520



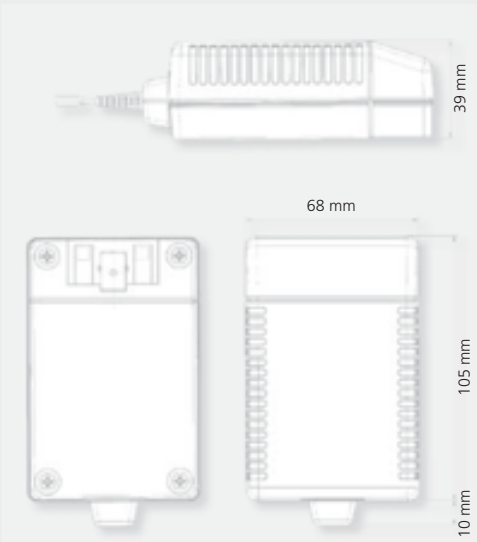
## 15 Watts



## MPP 30 FW 7530



## 30 Watts



| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 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   |

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 5 V         | 3000 mA | 75 mV pp       | 1894100   |
| 6 V         | 2500 mA | 75 mV pp       | 1894101   |
| 7.5 V       | 2000 mA | 75 mV pp       | 1894102   |
| 9 V         | 1800 mA | 90 mV pp       | 1894103   |
| 12 V        | 1300 mA | 120 mV pp      | 1894104   |
| 15 V        | 1000 mA | 150 mV pp      | 1894105   |
| 18 V        | 850 mA  | 180 mV pp      | 1894106   |
| 24 V        | 650 mA  | 240 mV pp      | 1894107   |
| 48 V        | 375 mA  | 100 mV pp      | 1894108   |

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 5 V         | 5000 mA | 50 mV pp       | 1894090   |
| 6 V         | 4200 mA | 60 mV pp       | 1894091   |
| 7.5 V       | 3600 mA | 75 mV pp       | 1894092   |
| 9 V         | 3000 mA | 90 mV pp       | 1894093   |
| 12 V        | 2500 mA | 120 mV pp      | 1894094   |
| 15 V        | 2000 mA | 150 mV pp      | 1894095   |
| 18 V        | 1650 mA | 180 mV pp      | 1894096   |
| 24 V        | 1250 mA | 240 mV pp      | 1894097   |





## Switchmode Power Supplies

# DT Series

All products conform to IEC 61558 and 60950

### Applications

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

### Characteristics

- Universal input 100 to 240 V AC
- Constant voltage, current limited
- Low standby power
  - ≤ 0.3 Watts (DT 12) resp.
  - ≤ 0.5 Watts (DT 60, DT 100, DT 150)
- Continuously short circuit proof
- High efficiency

### Technical data

**Input voltage**  
**Input current**  
**Frequency**  
**Efficiency**  
**EMC**  
**Output voltage tolerance**

100 to 240 V AC (± 10 %)  
300 mA (DT 12), 1500 mA (DT 100),  
1600 mA (DT 60), 2000 mA (DT 150)  
50 to 60 Hz  
up to 91 % typ. at full load  
Conforms to EN 55011,  
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  
±2% (without consideration of the output lead)

### Environmental specification

**Operating temperature**  
**Storage temperature**  
**Humidity**  
**Input transient susceptibility**

0 to 40° C at maximum load  
-10 to 70° C  
10 % to 95 % non condensing  
Complies with IEC 61000 requirements

### Safety specification

**Standards**

Fulfils class II, SELV according to following standards: IEC/EN/UL 60950, DT 100 and DT 150 fulfils class I.

### Reliability specification

**MTBF calculation**

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

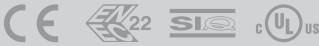
### Mechanical specification

**Weight approx.**  
**Plug connector**

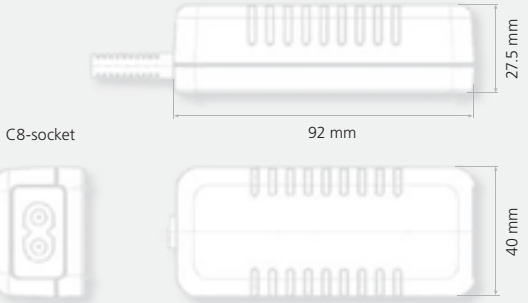
135 g (DT 12), 260 g (DT 60), 500 g (DT 100), 622 g (DT 150)  
AC input: 2-pole IEC 320, C8-socket (DT 12, DT 60) C14-socket (DT 100, DT 150) DC output (not DT 150): Universal output plug system (page 34)

For power cords see page 34

DT 12 FW 7402



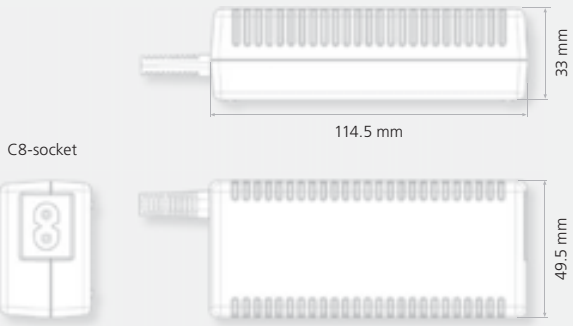
12 Watts



DT 60 DT 60



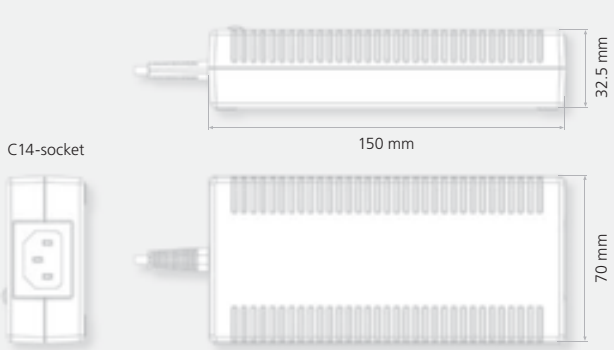
60 Watts



DT 100 DT 100



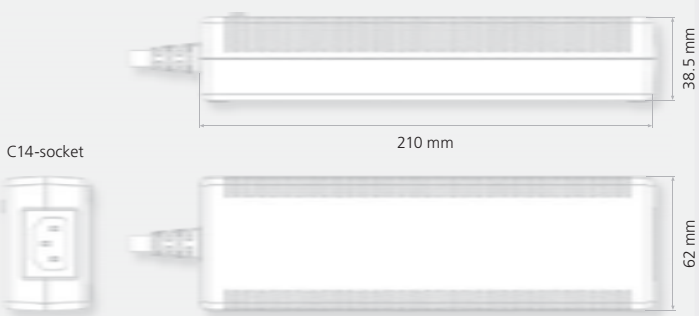
100 Watts



DT 150 DT 150



150 Watts



| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 5 V         | 2000 mA | 200 mV pp      | 1893922   |
| 5,9 V       | 1700 mA | 200 mV pp      | 1893923   |
| 7,5 V       | 1400 mA | 180 mV pp      | 1893924   |
| 9 V         | 1200 mA | 135 mV pp      | 1893925   |
| 12 V        | 1000 mA | 180 mV pp      | 1893926   |
| 15 V        | 800 mA  | 112 mV pp      | 1893927   |
| 18 V        | 660 mA  | 135 mV pp      | 1893928   |
| 24 V        | 500 mA  | 300 mV pp      | 1893929   |
| 48 V        | 250 mA  | 480 mV pp      | 1893930   |

| 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   |

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 24 V        | 4170 mA | 240 mV pp      | 1891551   |

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 24 V        | 6250 mA | 240 mV pp      | 1894781   |



# Switchmode Power Supplies

## Medical Series

**with exchangeable primary adapters**

## All products conform to IEC 60601-1

## Applications

- Blood analysers
- 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
- 2 x MOPP
- Continuously short circuit proof

## Technical data

**Input voltage**  
**Input current**

100 to 240 V AC ( $\pm 10\%$ )  
250 to 110 mA (GPP6)  
205 to 110 mA (GPP 10)  
400 to 200 mA (GPP 18)  
200 to 100 mA (GPP USB Medical)

### Frequency

80% typ. at full load

## Efficiency

Conforms to  
EN 55011, EN 55022/B, IEC 60601-1-2,  
FCC 47 Teil 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  
±2% (without consideration of the output lead)

## Environmental specification

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

## Safety specification

|                  |                                                                                                                                                 |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Standards</b> | Fulfils class II, SELV according to following standards:<br>ES 60601, IEC 60601-1, UL 2601, 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

|                       |                                                                                                                                                                                           |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Weight</b>         | 80 g (GPP 6), 113 g (GPP 10), 170 g (GPP 18),<br>60 g (GPP USB Medical)                                                                                                                   |
| <b>Plug connector</b> | AC input:<br>FRIWO exchangeable mains plug system:<br>EURO, UK, USA/Japan, Australia, IEC<br>DC output:<br>Universal output plug system (page 34)<br>USB socket: Type A (GPP USB Medical) |



| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 5 V         | 1100 mA | 200 mV pp      | 1891201   |
| 6 V         | 1000 mA | 200 mV pp      | 1891653   |
| 7.5 V       | 800 mA  | 200 mV pp      | 1891654   |
| 9 V         | 600 mA  | 200 mV pp      | 1891655   |
| 12 V        | 500 mA  | 200 mV pp      | 1891656   |
| 15 V        | 400 mA  | 200 mV pp      | 1891657   |
| 18 V        | 330 mA  | 200 mV pp      | 1891658   |
| 24 V        | 250 mA  | 200 mV pp      | 1891659   |

| 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   |

| 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   |
|             |         |                |           |

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 5 V         | 1500 mA | ≤ 50 mV pp     | 1895382   |





Switchmode Power Supplies

# Medical Series

with exchangeable primary adapters  
(MPP 15/30)

All products conform to IEC 60601-1

Applications

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

Characteristics

- Universal input 100 to 240 V AC
- Constant voltage, current limited
- Green LED indicator
- Low standby power
- Continuously short circuit proof
- Exchangeable primary adapters (MPP 15/30)
- 2 x MOPP
- Low leakage current ≤ 10 µA

Technical data

Input voltage  
Input current

100 to 240 V AC (± 10%)  
200 to 80 mA (PP 8)  
350 to 150 mA (MPP 15)  
700 to 350 mA (MPP 30)

Frequency  
Efficiency  
EMC

50 to 60 Hz  
80 % typ. at full load, PP 8 75%  
Conforms to  
EN 55011, EN 55022/B, IEC 60601-1-2  
FCC 47 Teil 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  
±2% (without consideration of the output lead)

Output voltage tolerance

Environmental specification

Operating temperature  
Storage temperature  
Humidity  
Input transient susceptibility

0 to 40° C at maximum load  
-40 to 70° C, PP 8 (-20 to 70° C)  
5 % to 95 % non condensing  
Complies with IEC 61000 requirements

Safety specification  
Standards

Fulfils class II, SELV according to following standards:  
ES 60601, IEC 60601-1, UL 2601, 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.  
Plug connector

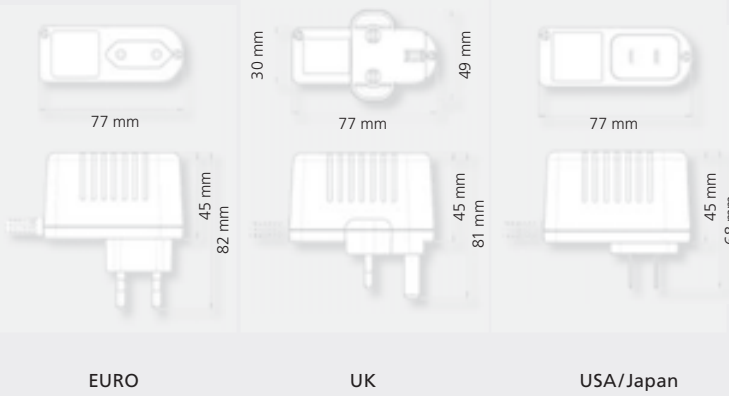
110 g (PP 8), 160 g (MPP 15), 255 g (MPP 30)  
AC input:  
FRIWO exchangeable mains plug system:  
EURO, UK, USA/Japan, Australia, IEC  
PP 8: EURO, UK, USA/Japan  
DC output:  
Universal output plug system (page 34)

For primary adapters see page 34

PP 8 FW 7333SM



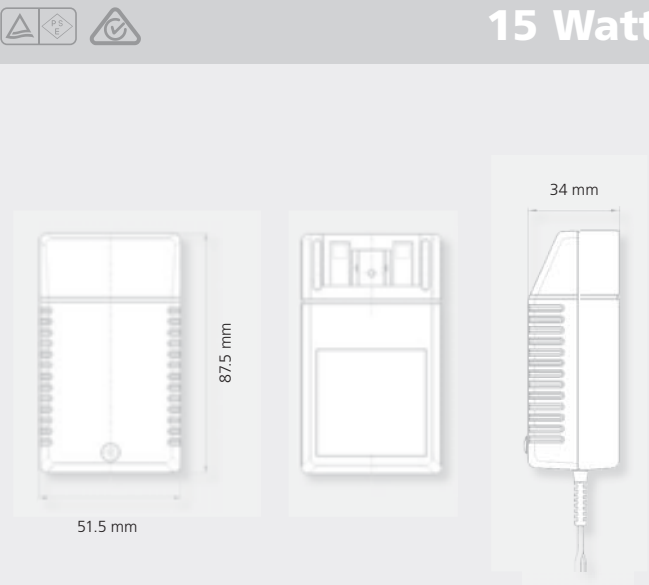
8 Watts



MPP 15 FW 7555SM



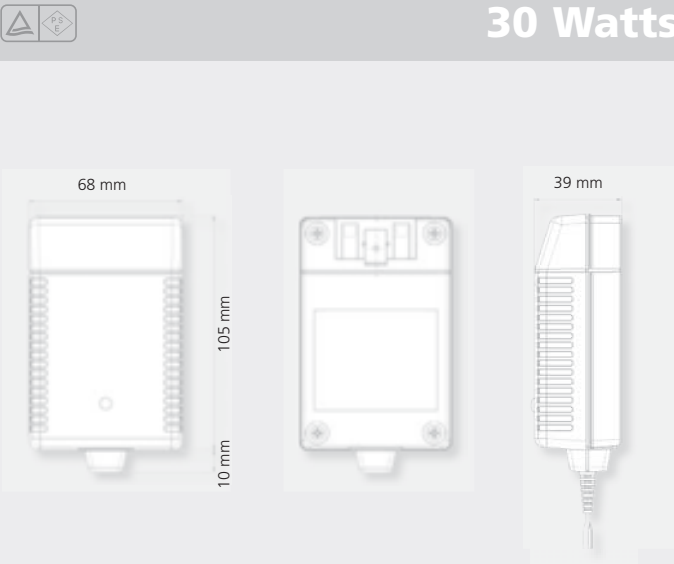
15 Watts



MPP 30 FW 7362M



30 Watts



| Output data |         | Ripple    | EURO      | USA/Japan | UK        |
|-------------|---------|-----------|-----------|-----------|-----------|
| Voltage     | Current | Voltage   | Order No. | Order No. | Order No. |
| 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   |

| 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   |

| 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

All products conform to IEC 60601-1

### Applications

- Blood analysers
- 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  $\leq 100 \mu\text{A}$ , DT 150  $\leq 100 \mu\text{A}$ )
- Continuously short circuit proof
- 2 x MOPP

### Technical data

**Input voltage**  
**Input current**

100 to 240 V AC ( $\pm 10\%$ )  
230 to 140 mA (DT 12)  
1.100 to 500 mA (DT 50)  
1.700 to 850 mA (DT 80)  
2.000 to 700 mA (DT 150)

**Frequency**  
**Efficiency**  
**EMC**

50 to 60 Hz  
90 % typ. at full load  
Conforms to  
EN 55011, EN 55022/B, IEC 60601-1-2  
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**

$\pm 2\%$  (without consideration of the output lead)

### 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 according to following standards:  
IEC 60601-1, UL 2601, ES 60601-1  
fulfils medical application class B/BF/CF  
(DT 12/ DT 50) and B/BF (DT 80, DT 150),  
class I DT 150

**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),  
350 g (DT 80), 622 g (DT 150)

**Plug connector**

AC input: 2-pole IEC 320,  
C8-socket (DT 12, DT 50, DT 80)  
C14-socket (DT 150)  
DC output (not DT 150):  
Universal output plug system (page 34)

For power cords see page 34

DT 12 FW 7401M

CE c US

Approved Medical Device  
IEC 60601-1  
EN 60601-1-2

C8 socket

12 Watts

DT 50 FW 7405M

CE c US

Approved Medical Device  
IEC 60601-1  
EN 60601-1-2

C8 socket

50 Watts

DT 80 FW 7488M

CE c US

Approved Medical Device  
IEC 60601-1  
EN 60601-1-2

C8 socket

80 Watts

DT 150 DT 150M

CE c US

Approved Medical Device  
IEC 60601-1  
EN 60601-1-2

C14 socket

150 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   |

| 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   |

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 12 V        | 5500 mA | 120 mV pp      | 1890865   |
| 15 V        | 5000 mA | 120 mV pp      | 1828339   |
| 24 V        | 3300 mA | 120 mV pp      | 1890981   |

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 24 V        | 6250 mA | 240 mV pp      | 1893142   |



## All products conform to IEC 60950

- Bluetooth
- Digital cameras
- Wireless communication accessories
- PDAs
- Household applications
- MP3 Players
- E-Books

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

**For primary adapters see page 34**

36 g (PP USB), 50 g (GPP USB),  
35 g (GUP), 25 g (PP Mini USB)  
AC input:  
FRIWO exchangeable mains plug system (GPP USB,  
GUP): EURO, UK, USA/Japan, Australia, IEC  
DC output:  
USB socket type A



| Output data |         | Ripple    | EURO                 | USA                  |
|-------------|---------|-----------|----------------------|----------------------|
| Voltage     | Current | Voltage   | Oder No.             | Order No.            |
| 5 V         | 1000 mA | 300 mV pp | 1894289              | 1894290              |
| 5 V         | 1000 mA | 300 mV pp | 1896014 <sup>1</sup> | 1896019 <sup>1</sup> |

<sup>1</sup> Color: white





Switchmode Power Supplies

# CPP Series

All products conform to IEC 60950;  
PP18 additional to IEC 60601-1

Applications

- Router
- E-Books
- Blood analysers
- Inhalers

Characteristics

- Universal input 100 to 240 V AC
- Constant voltage, current limited
- Continuously short circuit proof
- Low weight
- Low standby power  
≤ 0.3 Watts
- 2 x MOPP (PP18)

Technical data

|                                |                                                                                                                                                                                 |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input voltage                  | 100 to 240 V AC (±10%)                                                                                                                                                          |
| Input current                  | 300 mA (PP12), 550 mA (PP30),<br>400-180 mA (PP18)                                                                                                                              |
| Frequency                      | 50 to 60 Hz                                                                                                                                                                     |
| Efficiency                     | up to 78% typ. at full load                                                                                                                                                     |
| EMC                            | Conforms to EN55011, EN 55022/B, EN55024,<br>FCC41 part 15, EN61000-3-2, EN 61000-4-2,<br>EN61000-4-3, EN 61000-4-4, EN 61000-4-5, EN<br>61000-4-6, EN 61000-4-11, EN 60601-1-2 |
| Output voltage tolerance       | ±2% (without consideration of the output lead)                                                                                                                                  |
| 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 according to<br>following standards:<br>EN/IEC/UL 60950, EN/IEC 60601-1 (PP18) |
|-----------|-------------------------------------------------------------------------------------------------------|

Reliability specification

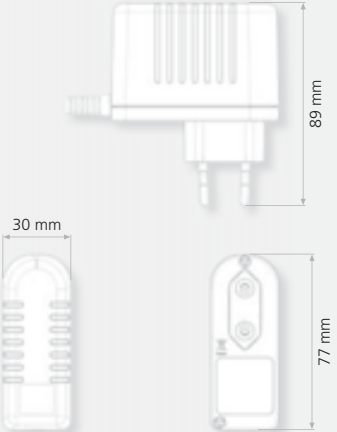
|                  |                                                                                                           |
|------------------|-----------------------------------------------------------------------------------------------------------|
| MTBF calculation | 200,000 hours at maximum load<br>and an ambient temperature of 25° C<br>(in accordance with MIL-HDBK-217) |
|------------------|-----------------------------------------------------------------------------------------------------------|

Mechanical specification

|                |                                                                        |
|----------------|------------------------------------------------------------------------|
| Weight approx. | 120g (PP12), 125g (PP18), 150g (PP30)                                  |
| Plug connector | AC input: EURO<br>DC output:<br>Universal output plug system (page 34) |

PP 12 FW 7599

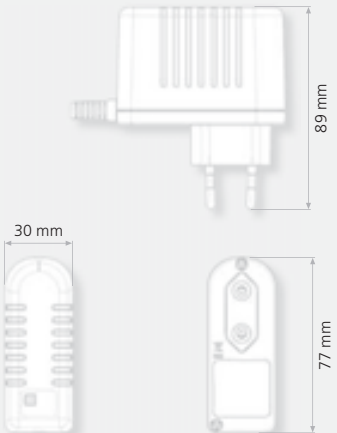




12 Watts

PP 18 FW 7598 M

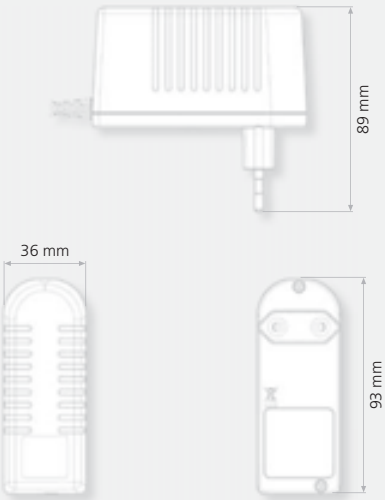




18 Watts

PP 30 FW 7583





30 Watts

| Output data |         |                | Euro      |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 12 V        | 1000 mA | 120 mV pp      | 1894626   |

| Output data |         |                | Euro      |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 12 V        | 1500 mA | 200 mV pp      | 1896903   |

| Output data |         |                | Euro      |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 12 V        | 2000 mA | 300 mV pp      | 1896904   |



## Switchmode Power Supplies

# In-wall Series

All products conform to  
IEC 61558, 60335

### Applications

- Safety technology
- Water taps
- Shutter control
- Door opener
- LED applications (UP 6)
- E-Books
- PDAs
- MP3-Players
- Tablets

### 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

|                                 |                                                                                                                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Input voltage</b>            | 100 to 240 V AC (± 10 %)                                                                                                                                                                                                         |
| <b>Input current</b>            | 150 mA (UP 6), 400 mA (UP 12, UP 18).<br>180 mA (UP USB)                                                                                                                                                                         |
| <b>Frequency</b>                | 50 to 60 Hz                                                                                                                                                                                                                      |
| <b>Efficiency</b>               | up to 80 % typ. at full load                                                                                                                                                                                                     |
| <b>EMC</b>                      | Conforms to EN 55011, 55014, EN 55022/B,<br>EN 55024, FCC 41 part 15, EN 61000-3-2,<br>EN 61000-4-2, EN 61000-4-3, EN 61000-4-4,<br>EN 61000-4-5, EN 61000-4-6, EN 61000-4-11,<br>±2% (without consideration of the output lead) |
| <b>Output voltage tolerance</b> |                                                                                                                                                                                                                                  |

### Environmental specification

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

### Safety specification

|                  |                                                                                  |
|------------------|----------------------------------------------------------------------------------|
| <b>Standards</b> | Fulfil class II, SELV according to<br>following standards:<br>EN 61558/IEC 61558 |
|------------------|----------------------------------------------------------------------------------|

### Reliability specification

|                         |                                                                                                           |
|-------------------------|-----------------------------------------------------------------------------------------------------------|
| <b>MTBF calculation</b> | 200,000 hours at maximum load<br>and an ambient temperature of 25° C<br>(in accordance with MIL-HDBK-217) |
|-------------------------|-----------------------------------------------------------------------------------------------------------|

### Mechanical specification

|                       |                                                                                                                                                                     |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Weight approx.</b> | 95 g (UP 6), 130 g (UP 12), 130 g (UP 18),<br>70 g (UP USB)                                                                                                         |
| <b>Plug connector</b> | AC input:<br>150 mm cable (UP 6, UP 12, UP 18)<br>Spring clip 2 x 2,5 mm² (UP USB)<br>DC output:<br>150 mm cable (UP 6, UP 12, UP 18)<br>USB-socket type A (UP USB) |

### Optional – upon request:

Customer-specific output voltages  
Customer-specific cable length

UP 6FW 7801

6 Watts

25 mm

51 mm

48 mm

UP 12FW 7802

12 Watts

35 mm

51 mm

48 mm

UP 18FW 7803

18 Watts

35 mm

51 mm

48 mm

UP USB153380

7 Watts

44 mm

48 mm

32 mm

43 mm

71 mm

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 4 V         | 1300 mA | 300 mV pp      | 1891505   |
| 5 V         | 1200 mA | 300 mV pp      | 1894388   |
| 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   |

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 12 V        | 1000 mA | 300 mV pp      | 1891767   |
| 24 V        | 500 mA  | 300 mV pp      | 1891768   |

| Output data |         |                | Worldwide |
|-------------|---------|----------------|-----------|
| Voltage     | Current | Ripple Voltage | Order No. |
| 12 V        | 1500 mA | 400 mV pp      | 1832688   |
| 24 V        | 750 mA  | 400 mV pp      | 1891685   |

| Output data                         |         |                | Worldwide |
|-------------------------------------|---------|----------------|-----------|
| Voltage                             | Current | Ripple Voltage | Order No. |
| 5 V                                 | 1400 mA | 300 mV pp      | 1891648   |
| Also available without support ring |         |                | 1894529   |



## Switchmode Power Supplies

# Open Frame

All products conform to 61558;  
OF 150 additional to 60601-1

### Applications

- Laboratory equipment
- Patient lifts
- Label printers
- Measuring equipment
- Laser
- Lighting
- Automation
- Climate chambers
- Electric tools
- Professional kitchen equipment

### Characteristics

- Universal input 100 to 240 V AC
- Constant voltage, current limited
- Low standby power
- High efficiency
- Continuously short circuit proof
- Leakage current  $\leq 100\text{ }\mu\text{A}$
- Small package
- Without active fan

### Technical data

**Input voltage**  
**Input current**

100 to 240 V AC ( $\pm 10\text{ }\%$ )  
1600 mA (OF 65), 2500 mA (OF 100),  
1800 mA (OF 150)

**Frequency**  
**Efficiency**  
**Standby Losses**  
**EMC**

50 to 60 Hz  
 $\geq 87\text{ }\%$  typ. at full load  
 $\leq 0.5\text{ Watts typ.}$   
Conforms to  
EN 55011, EN 55022/B, FCC47 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, EN 60601-1-2

**Output voltage tolerance**  
**Power factor**

$\pm 2\text{ }\%$   
 $\geq 0.9\text{ typ.}$

### Environmental specification

**Operating temperature**  
**Storage temperature**  
**Humidity**  
**Input transient susceptibility**

0 to  $70^{\circ}\text{ C}$   
 $-20\text{ to }+70^{\circ}\text{ C}$   
5 % to 95 % non condensing  
Complies with IEC 61000 requirements

### Safety specification

**Standards**

Fulfils class I, SELV according to  
following standards: IEC 60601, UL 2601,  
fulfils medical application class B/BF

### Reliability specification

**MTBF calculation**

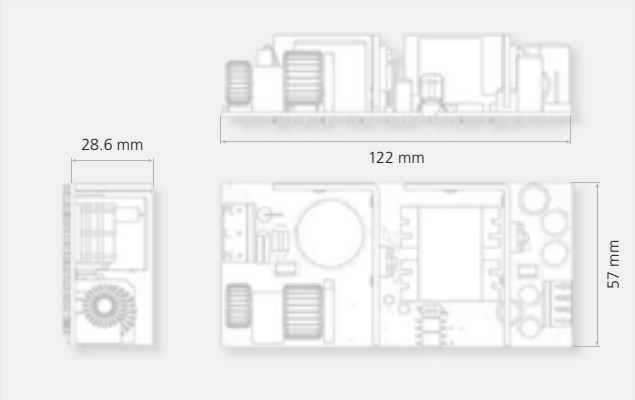
typ. 200,000 hours at maximum load  
and an ambient temperature of  $25^{\circ}\text{ C}$   
(in accordance with MIL-HDBK-217)

### Mechanical specification

**Weight approx.**  
**Plug connector**

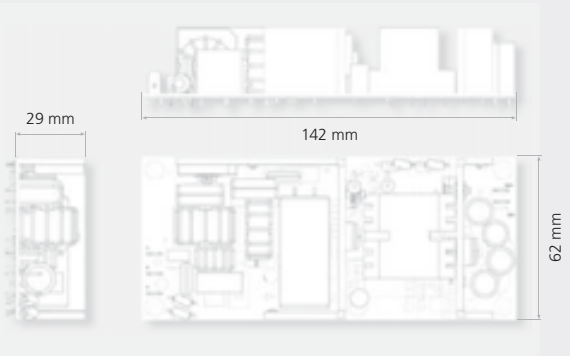
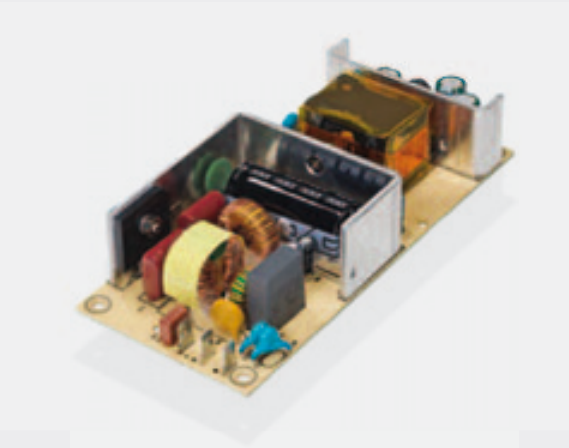
220 g (OF 65), 230 g (OF 100), 340 g (OF 150)  
Pin connector, flat-pin plug or screw terminal

## OF 65 OF65-2



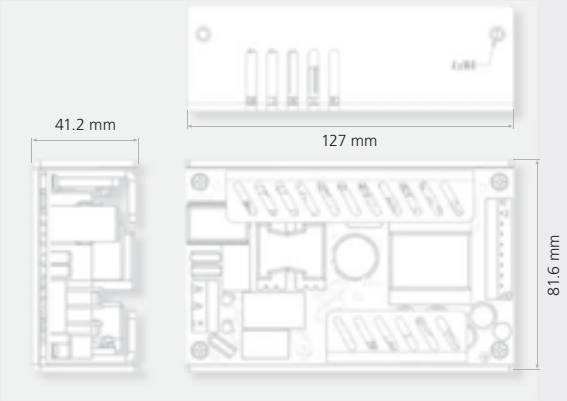
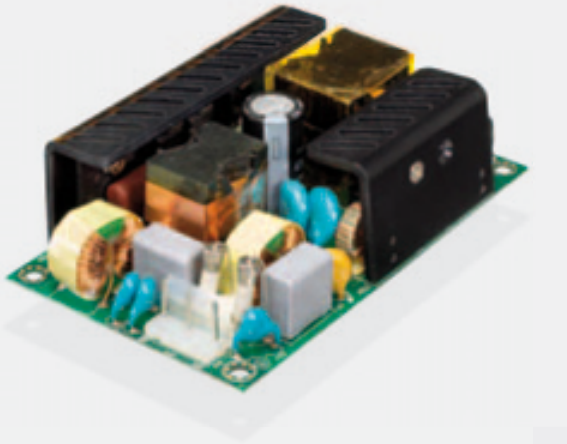
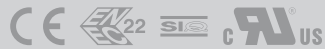
## 60 Watts

## OF 100 OF100



## 100 Watts

## OF 150 OF150



## 150 Watts

| Output data |         | Ripple Voltage          | Worldwide<br>Order No. |
|-------------|---------|-------------------------|------------------------|
| Voltage     | Current |                         |                        |
| 5 V         | 1000 mA | $\leq 75\text{ mV pp}$  | 1891628                |
| 12 V        | 5000 mA | $\leq 200\text{ mV pp}$ |                        |

| Output data |         | Ripple Voltage          | Worldwide<br>Order No. |
|-------------|---------|-------------------------|------------------------|
| Voltage     | Current |                         |                        |
| 12 V        | 7500 mA | $\leq 150\text{ mV pp}$ | 1893590                |

| Output data                      |          | Ripple Voltage          | Worldwide<br>Order No. |
|----------------------------------|----------|-------------------------|------------------------|
| Voltage                          | Current  |                         |                        |
| 12 V                             | 10500 mA | $\leq 240\text{ mV pp}$ | 1893143                |
| also available without U-bracket |          |                         | 1896246                |
| 24 V                             | 6250 mA  | $\leq 120\text{ mV pp}$ | 1893247                |
| also available without U-bracket |          |                         | 1891612                |
| 48 V                             | 3125 mA  | $\leq 480\text{ mV pp}$ | 1893703                |
| also available without U-bracket |          |                         | 1896248                |





Switchmode Power Supplies

# Open Frame

All products conform to 61558;  
OF 250 and OF 450 additional to 60601-1

Applications

- Laboratory equipment
- Patient lifts
- Label printers
- Measuring equipment
- Laser
- Lighting
- Automation
- Climate chambers
- Electric tools
- Professional kitchen equipment

Characteristics

- Universal input 100 to 240 V AC
- Constant voltage, current limited
- Low standby power
- High efficiency
- Continuously short circuit proof
- Leakage current ≤ 100 µA
- Small package
- Without active fan

Technical data

**Input voltage** 100 to 240 V AC (± 10 %)  
**Input current** 3500 mA (OF 250), 5500 mA (OF 450)  
**Frequency** 50 to 60 Hz  
**Efficiency** ≥ 87 % typ. at full load  
**Standby Losses** ≤ 0.5 Watts typ.  
**EMC** Conforms to  
EN 55011, EN 55022/B, FCC47 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, EN 60601-1-2

**Output voltage tolerance** ± 2 %  
**Power factor** ≥ 0.9 typ.

Environmental specification

**Operating temperature** 0 to 70° C  
**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 I, SELV according to  
following standards: IEC 60601, UL 2601,  
fulfils medical application class B/BF

Reliability specification

**MTBF calculation** typ. 200,000 hours at maximum load  
and an ambient temperature of 25° C  
(in accordance with MIL-HDBK-217)

Mechanical specification

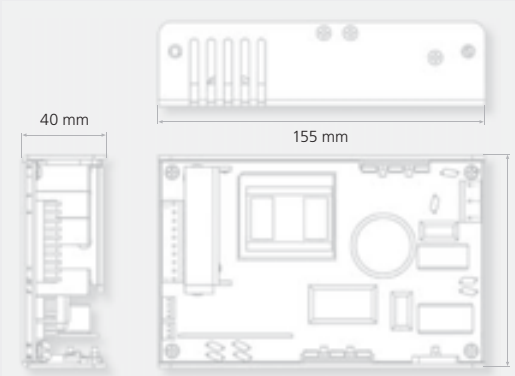
**Weight approx.** 600 g (OF 250), 1,250 g (OF 450)  
**Plug connector** Pin connector, flat-pin plug or screw terminal

OF 250 OF250     

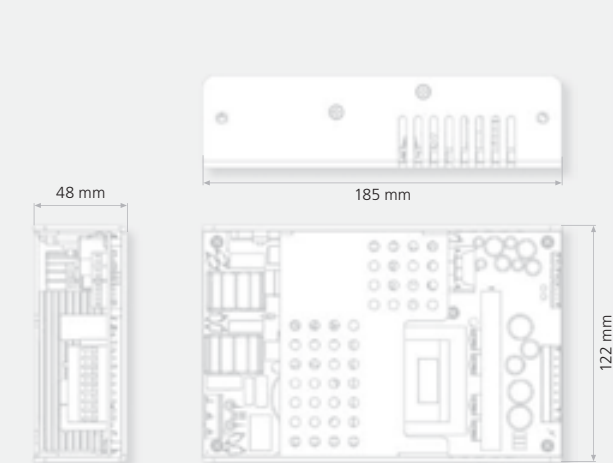


c  US

250 Watts



OF 450 OF450     



450 Watts

| Output data |          |                | Worldwide |
|-------------|----------|----------------|-----------|
| Voltage     | Current  | Ripple Voltage | Order No. |
| 5 V         | 500 mA   | 50 mV pp       | 1891705   |
| 24 V        | 10500 mA | 240 mV pp      |           |

| Output data |          |                | Worldwide |
|-------------|----------|----------------|-----------|
| Voltage     | Current  | Ripple Voltage | Order No. |
| 5 V         | 100 mA   | 100 mV pp      | 1893710   |
| 12 V        | 400 mA   | 100 mV pp      |           |
| 24 V        | 18750 mA | 240 mV pp      |           |

# Switchmode Chargers

**with exchangeable primary adapters  
(MPP 15 and GPP 18/36)**

**All products conform to IEC 60335  
and IEC 60601-1 (not FW 7574, 7290, 7219)**

## 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
- 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)
- 10KNTC, B = 3977 (GPP 18/36)
- Characteristics:  
 PP 8 = IU0U, MPP 15 = IOIU  
 GPP 18/36 = IU0

### Technical data

**Input voltage**  
**Input current**

100 to 240 V ( $\pm 10\%$ )  
 PP 8 (0,13 – 0,2 A), MPP 15 (0,25 – 0,3 A),  
 MPP 30 (0,4 – 0,5 A), GPP 18 (0,2 – 0,4 A)  
 GPP 36 (0,18 – 0,45 A)  
 50 to 60 Hz  
 75 % at full load  
 Conforms to  
 EN 55011, 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, EN 60601-1  
 $\pm 10\%$

**Frequency  
Efficiency  
EMC**

### Output current tolerance

|                                       |                                      |
|---------------------------------------|--------------------------------------|
| <b>Environmental specification</b>    |                                      |
| <b>Operating temperature</b>          | 0 to 40° C at maximum load           |
| <b>Storage temperature</b>            | -40 to 70° C                         |
| <b>Humidity</b>                       | 5 % to 95 % non condensing           |
| <b>Input transient susceptibility</b> | Complies with IEC 61000 requirements |

## Safety specification Standards

Fulfil class II, SELV according to following standards:  
IEC 60601-1, IEC 60335-2-29,  
UL 1310, UL 2601-1

### Reliability specification

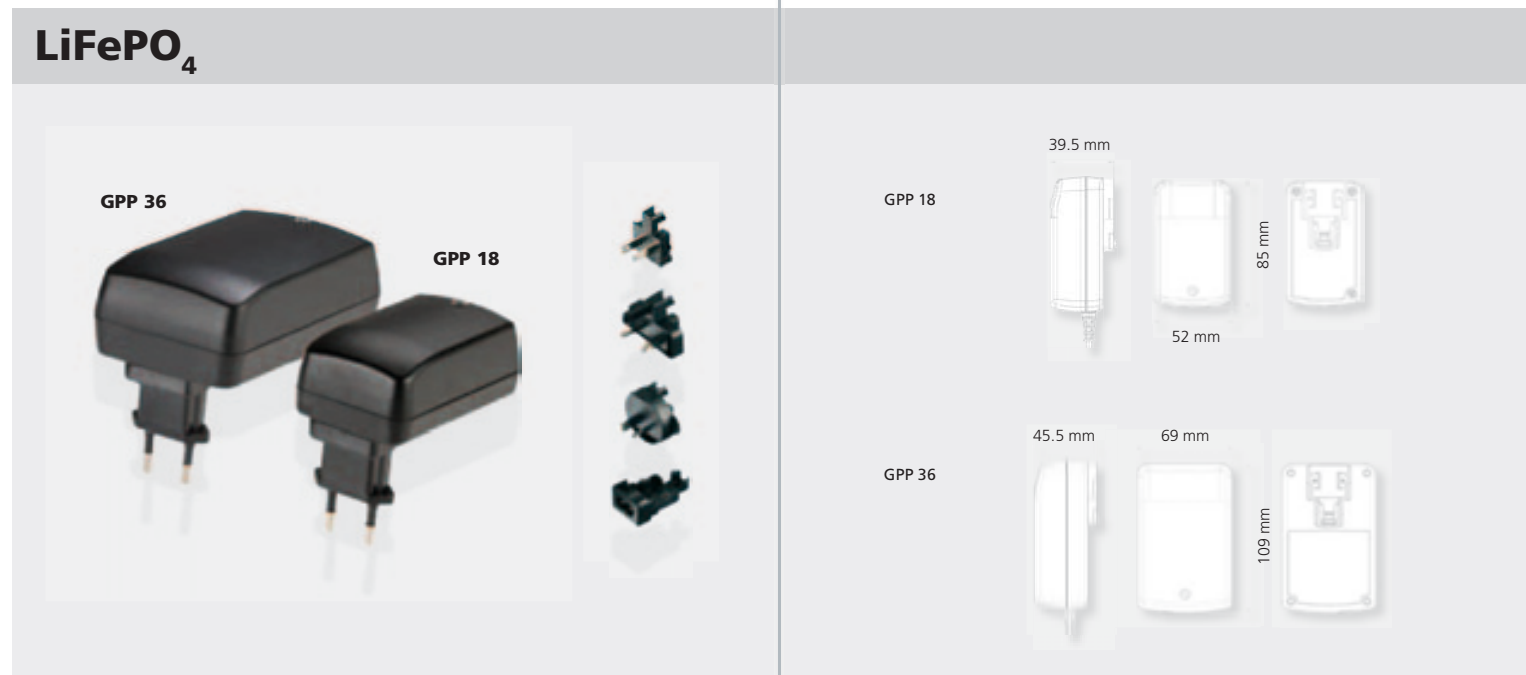
#### MTBF calculation

200,000 hours at maximum load  
and an ambient temperature of 25° C  
(in accordance with MIL-HDBK-217)

### Mechanical specification

|                       |                                                                                                                                                  |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Weight</b>         | PP 8 Li-Ion (125 g),<br>MPP 15 (140 g), MPP 30 (278 g),<br>GPP 18 (200 g), GPP 36 (320 g), GPP 36 75 (260 g)                                     |
| <b>Plug connector</b> | AC input:<br>MPP/GPP: FRIWO exchangeable mains plug<br>system, PP 8: Euro, USA/Japan, UK<br>DC output:<br>Universal output plug system (page 34) |

**For primary adapters see page 34**



| Product                       | FW Type            | Approvals                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PP 8<br>Li-Ion                | FW 7574            | CE                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| MPP 15<br>Li-Ion              | FW 7219            | CE   C                                                                                                                                                                              |
| GPP 18<br>Li-Ion              | FW 7290            | CE  C                                                                                                                                                                               |
| GPP 36<br>Li-Ion              | FW 7300            | CE  C                                                                                          |
| GPP 36<br>Li-Ion              | FW 7310<br>7 Cells | CE                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| GPP 18<br>LiFePO <sub>4</sub> | FW 7290            | CE   C                                                                                                                                                                              |
| GPP 36<br>LiFePO <sub>4</sub> | FW 7300            | CE   C    |

**Charge voltage can be adjusted for specific cell packs.  
Please observe battery specification.**

| Output data |           |       |             |         | EURO      | USA/Jap.  | UK        |
|-------------|-----------|-------|-------------|---------|-----------|-----------|-----------|
| Voltage     | Current   | Cells | Capacity    | Housing | Order No. | Order No. | Order No. |
| 4.1 V       | 1000 mA   | 1     | 0.8 – 10 Ah | PP 8    | 1890124   | 1891148   | 1891149   |
| 4.1 V       | 600 mA    | 1     | 0.8 – 10 Ah | PP 8    | 1828253   | 1891150   | 1891151   |
| 4.2 V       | 1000 mA   | 1     | 0.8 – 10 Ah | PP 8    | 1829906   | 1891161   | 1891162   |
| 4.2 V       | 600 mA    | 1     | 0.8 – 10 Ah | PP 8    | 1829804   | 1891159   | 1891160   |
| Worldwide   |           |       |             |         |           |           |           |
| 8.4 V       | 800 mA    | 2     | 0.8 – 5 Ah  | MPP 15  | 1826003   |           |           |
| 12.6 V      | 800 mA    | 3     | 0.8 – 5 Ah  | MPP 15  | 1826004   |           |           |
| 16.8 V      | 800 mA    | 4     | 0.8 – 5 Ah  | MPP 15  | 1826006   |           |           |
| with NTC    |           |       |             |         |           |           |           |
| 8.4 V       | 800 mA    | 2     | 0.8 – 5 Ah  | MPP 15  | 1826458   |           |           |
| 12.6 V      | 800 mA    | 3     | 0.8 – 5 Ah  | MPP 15  | 1826459   |           |           |
| 16.8 V      | 800 mA    | 4     | 0.8 – 5 Ah  | MPP 15  | 1826460   |           |           |
| 4.2 V       | 3000 mA*  | 1     | 20 Ah       | GPP 18  | 1832657   |           |           |
| 8.4 V       | 1500 mA*  | 2     | 20 Ah       | GPP 18  | 1832658   |           |           |
| 4.2 V       | 4000 mA** | 1     | 1.0 – 20 Ah | GPP 36  | 1834050   |           |           |
| 8.4 V       | 3500 mA** | 2     | 1.0 – 20 Ah | GPP 36  | 1834051   |           |           |
| 12.6 V      | 2500 mA** | 3     | 1.0 – 20 Ah | GPP 36  | 1834052   |           |           |
| 16.8 V      | 2000 mA** | 4     | 1.0 – 20 Ah | GPP 36  | 1834053   |           |           |
| 21.0 V      | 1600 mA** | 5     | 1.0 – 20 Ah | GPP 36  | 1834054   |           |           |
| 29.4 V      | 1350 mA** | 7     | 1.0 – 20 Ah | GPP 36  | 1893768   |           |           |

[illegible]



## Switchmode Chargers

# Chargers

with exchangeable primary adapters  
(MPP 15/30 and GPP 18/36)

All products conform to IEC 60335 and  
IEC 60601-1 (not FW 7304, 7219, 7290)

### 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
- 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 PP 8 Pb)
- 10KNTC, B = 3977
- Characteristics: Pb = IU0U

### Technical data

**Input voltage**  
**Input current**

100 to 240 V ( $\pm 10\%$ ),  
PP 8 (0.13 – 0.2 A),  
MPP 15 (0.25 – 0.3 A), MPP 30 (0.4 – 0.5 A),  
GPP 18 (0.2 – 0.4 A) GPP 36 (0.18 – 0.45 A)  
50 to 60 Hz  
75 % at full load  
Conforms to  
EN 55011, 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  
 $\pm 10\%$

**Frequency**  
**Efficiency**  
**EMC**

### Output current tolerance

### 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 according to following standards:  
IEC 60601-1 (NiCd/NiMH only MPP 15)  
IEC 60335-2-29, UL 1310, UL 2601-1 (only Li-Ion),  
VDE, CE label, CSA

### 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 approx.** PP 8 Li-Ion (125 g),  
MPP 15 (140 g), MPP 30 (278 g),  
GPP 18 (200 g) GPP 36 (320 g)  
**Plug connector** AC input:  
MPP/GPP: FRIWO exchangeable mains plug  
system, PP 8: Euro, USA/Japan, UK  
DC output:  
Universal output plug system (page 34)

For primary adapters see page 34

## NiCd/NiMH

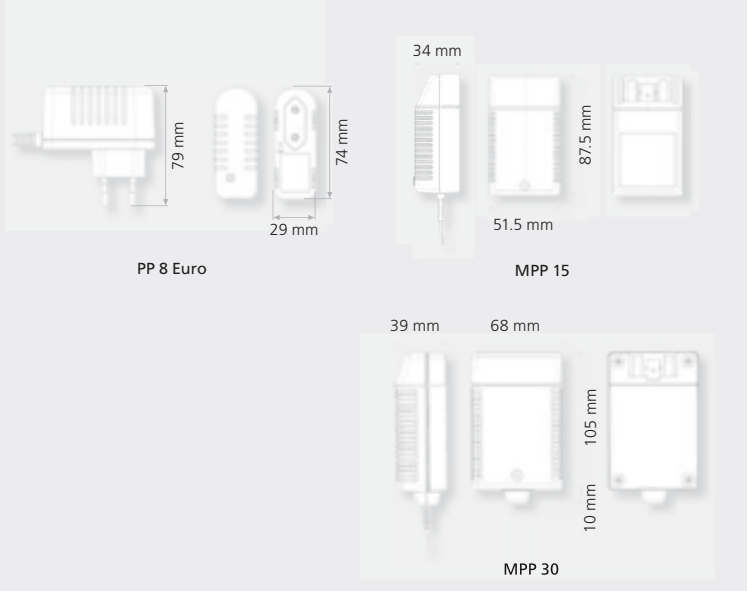
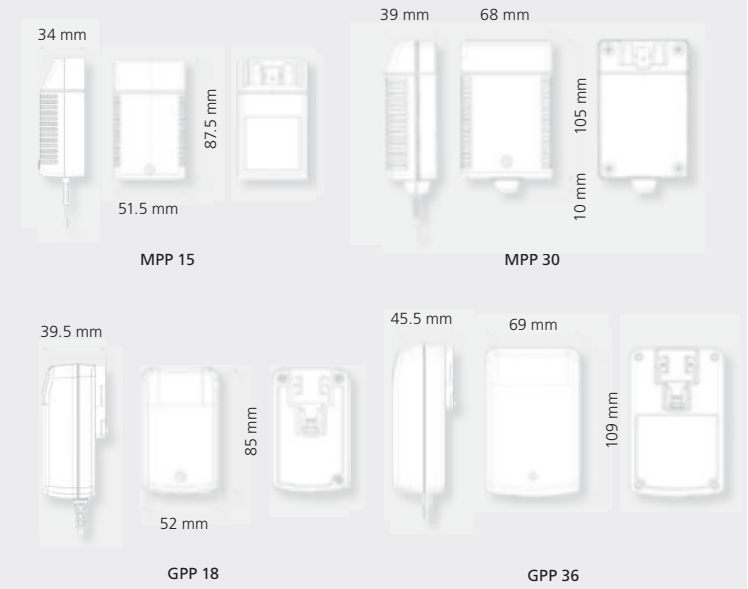


## Pb



| Product             | FW Type | Approvals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MPP 15<br>NiCd/NiMH | FW 7219 |                                                                                            |
| MPP 30<br>NiCd/NiMH | FW 7304 |                                                                                            |
| GPP 18<br>NiCd/NiMH | FW 7290 |                                                                                            |
| GPP 36<br>NiCd/NiMH | FW 7300 |       |

|                     |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PP 8<br>Lead Acid   | FW 7118 |                                                                                                                                                                                  |
| MPP 15<br>Lead Acid | FW 7218 |                                                                                             |
| MPP 30<br>Lead Acid | FW 7318 |        |



Charge voltage can be adjusted for specific cell packs.  
Please observe battery specification.

| Output data   |             | Switch-off criteria |         |    | Worldwide |
|---------------|-------------|---------------------|---------|----|-----------|
| Capacity      | Current     | Cells               | Housing | TI |           |
| 3.5 – 7.0 Ah  | 950 mA      | 10 – 20             | MPP 30  | ·  | ·         |
| 2.8 – 7.0 Ah  | 1000 mA     | 10 – 12             | MPP 30  | ·  | ·         |
| 2.5 – 4.5 Ah  | 1400 mA     | 8 – 12              | MPP 30  | ·  | ·         |
| 2.5 – 10.0 Ah | 2000 mA     | 5 – 6               | MPP 30  | ·  | ·         |
| 1.0 – 10.0 Ah | 800 mA      | 4 – 10              | MPP 15  | ·  | ·         |
| 1.0 – 10.0 Ah | 800 mA      | 4 – 10              | MPP 15  | ·  | ·         |
| 1.0 – 35.0 Ah | 1.5–3.0 A*  | 2 – 6               | GPP 18  | ·  | ·         |
| 1.0 – 35.0 Ah | 1.6–4.0 A** | 2 – 12              | GPP 36  | ·  | ·         |

Switch-off criteria: TI = time, TG = T. grad, -DU = -Delta-U

\* without NTC 1.5 A  
\*\* without NTC 1.6 A

| Output data |         | Switch-off criteria |               |         | Worldwide |
|-------------|---------|---------------------|---------------|---------|-----------|
| Voltage     | Current | Cells               | Capacity      | Housing |           |
| 6 V         | 900 mA  | 3                   | 2.4 – 16.0 Ah | PP 8 EU | 1890125   |
| 6 V         | 900 mA  | 3                   | 2.4 – 16.0 Ah | PP 8 UK | 1824106   |
| 6 V         | 900 mA  | 3                   | 2.4 – 16.0 Ah | PP 8 US | 1824107   |
| 6 V         | 1600 mA | 3                   | 4.8 – 32.0 Ah | MPP 15  | 1890126   |
| 6 V         | 3000 mA | 3                   | 9.0 – 60.0 Ah | MPP 30  | 1890129   |
| 12 V        | 500 mA  | 6                   | 1.5 – 10.0 Ah | PP 8 EU | 1824396   |
| 12 V        | 500 mA  | 6                   | 1.5 – 10.0 Ah | PP 8 US | 1825090   |
| 12 V        | 1000 mA | 6                   | 3.0 – 20.0 Ah | MPP 15  | 1890240   |
| 12 V        | 2000 mA | 6                   | 6.0 – 40.0 Ah | MPP 30  | 1890243   |
| 24 V        | 500 mA  | 12                  | 1.5 – 10.0 Ah | MPP 15  | 1890241   |
| 24 V        | 1000 mA | 12                  | 3.0 – 20.0 Ah | MPP 30  | 1890130   |
| 24 V        | 1500 mA | 12                  | 4.5 – 30.0 Ah | MPP 30  | 1890222   |





Accessories

Primary adapters

The MPP/GPP line is available with country-specific mains plugs. The products are therefore universally applicable. Not only do the plugs enhance mobility and reliability of the corresponding product, they even facilitate the management of the country versions of power supplies and chargers.

In countries with other mains plug types, the IEC adapter with the 2-pin IEC 320 C8 socket provides a standardized alternative.

Secondary adapters

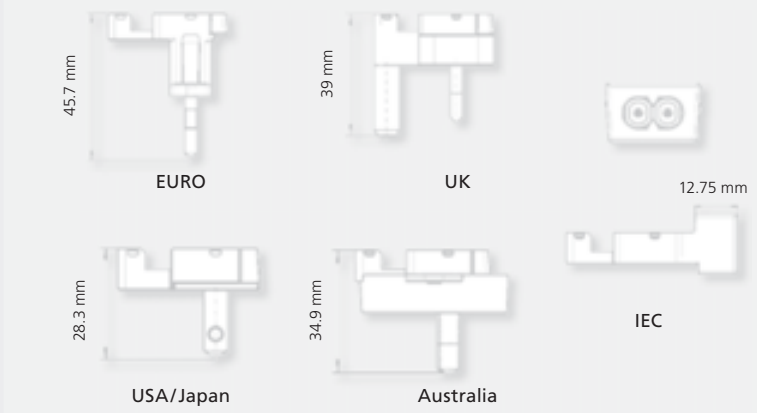
All standard units come with a round lead of 1.83 m length and our approved secondary adapter system. Depending on the required output voltage, the wire diameter is between 0.25 mm² (AWG30) and 1,31 mm² (AWG16). FRIWO also offers a broad range of secondary output plugs, including coaxial plugs (acc. to DIN 45323) and jack plugs (acc. to DIN 45318). Polarity is adjustable by reversing connector.

Customer-specific leads are also an option. If necessary, customer-specific flat or round leads can be fitted. Special versions as well as types and dimensions of low voltage plugs are available too.

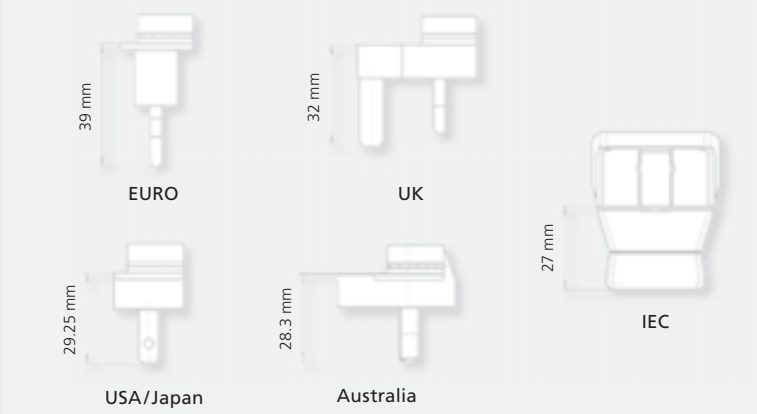
Power cords

Power cords with 2 contact IEC 320 C7 mains plug provide a specific solution for each country. All power cords are 2 m of length and can be used with our IEC 320 CB socket for the MPP/GPP and DT lines.

Primary adapters GPP system



Primary adapters MPP system

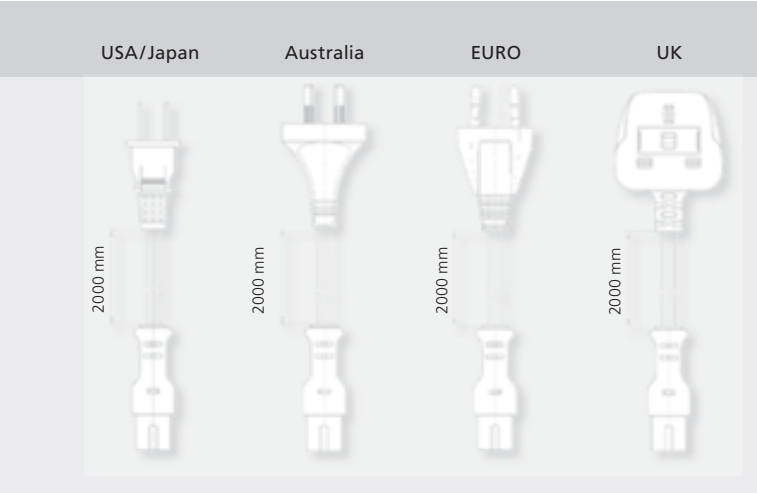


Secondary adapters



| Straight coaxial connectors |       |           |           | Angled coaxial connectors |       |           |           |
|-----------------------------|-------|-----------|-----------|---------------------------|-------|-----------|-----------|
| Ø out.                      | Ø in. | Length mm | Order No. | Ø out.                    | Ø in. | Length mm | Order No. |
| 3.5                         | 1.3   | 9.5       | 1807699   | 3.5                       | 1.3   | 9.5       | 1822478   |
| 4.0                         | 1.7   | 9.5       | 1822557   | 4.0                       | 1.7   | 9.5       | 1822558   |
| 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



| Primary adapter | GPP       |
|-----------------|-----------|
| Country         | Order No. |
| EURO            | 1827417   |
| UK              | 1827420   |
| USA/Japan       | 1827422   |
| Australia       | 1827425   |
| IEC             | 1827428   |
| Korea           | 1835619   |
| Argentina       | 1831610   |
| India           | 1831323   |
| China           | 1835620   |
| Brazil          | 1835621   |
| South Africa    | 1838236   |

| 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   |
| Brazil             | 1843164   |
| China              | 1840406   |

| Straight jack connectors |           |           | Connectors/Socket        |           |
|--------------------------|-----------|-----------|--------------------------|-----------|
| Ø out.                   | Length mm | Order No. | Desription               | Order No. |
| 2.5                      | 13        | 1807704   | Texas connector          |           |
| 3.5                      | 14        | 1807705   | Straight Texas connector | 1807706   |
|                          |           |           | Angled Texas connector   | 1822486   |
| Angled jack connectors   |           |           |                          |           |
| 2.5                      | 13        | 1822484   | Texas sockets 2-pin      |           |
| 3.5                      | 14        | 1822485   | Snap in type             | 1323938   |
|                          |           |           | PCB type                 | 1321609   |
|                          |           |           | Texas sockets 3-pin      |           |
|                          |           |           | Snap in type             | 1327259   |
|                          |           |           | PCB type                 | 1363506   |

| Power cords |           |
|-------------|-----------|
| Country     | Order No. |
| EURO        | 1812274   |
| UK          | 1812275   |
| USA/Japan   | 1812276   |
| Australia   | 1812277   |
| China       | 1843276   |



# LED Drivers

## Standard Range

All products comply with  
EN61347-1 and EN61347-2-13

### Applications

- Lighting

### Characteristics

- Voltage and current regulation within single design
- Compact design: 21 x 30 mm (LT 10 – LT 60), 24 x 30 mm (LT 100)
- Active PFC ≥ LT 40
- Continuously short circuit proof
- Overload protection
- Overtemperature protection
- Fastening by screws, rivets, cable straps or clips...
- LED dimmable with DALI, 1-10V or Push-Dim via connectable DIMMbox
- IP rating: IP20, IP67 (LT-UP, LT 40 WP)

### Technical data

#### Input voltage

100 to 120 V AC  
220 to 240 V AC

#### Input current

150 mA (LT 10 UP), 200 mA (LT 20 UP),  
90 mA (LT 10), 200 mA (LT 20), 180 mA (LT 40)

#### Frequency

50 to 60 Hz

#### Efficiency

up to 91% typ. at full load

#### EMC

Conforms to

EN 55012, EN 61000-3-2, EN 62384, EN 61547

#### Output voltage tolerance

± 2%

#### Environmental specification

##### Operating temperature

-20 to +45°C at maximum load

##### Storage temperature

-40 to +70°C

##### Humidity

5% to 90% non condensing

##### Input transient susceptibility

Complies with IEC 61000 requirements

#### Safety specification

##### Standards

Fulfils class II, SELV according to  
following standards:

EN/IEC 61437-1, EN/IEC 61347-2-13

#### Reliability specification

##### MTBF calculation

typ. 200,000 hours at maximum load  
and an ambient temperature of 25° C  
(in accordance with MIL-HDBK-217)

#### Mechanical specification

##### Weight approx.

90 g (LT 10 UP), 125 g (LT 20 UP), 50 g (LT 10),  
82 g (LT 20), 106 g (LT 40)

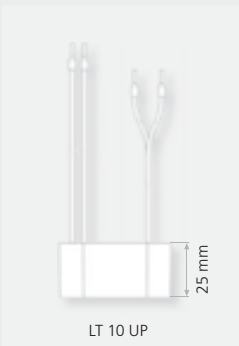
##### Plug connector

connecting bracket 0.5..1.5 mm²

## LT UP FW7804



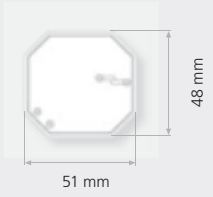
## 10 / 20 Watts



LT 10 UP



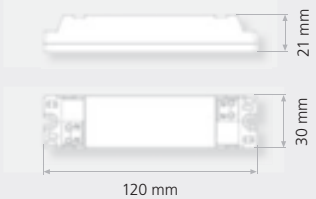
LT 20 UP



## LT 10 LT 10



## 10 Watts



## LT 20 LT 20



## 20 Watts



## LT 40 LT 40



## 40 Watts



## LT Accessories



### LT SQ Cap

Order No. 1840704  
for LT 40 SQ, LT 60 SQ

### LT Cap

Order No. 1839772  
for LT 10, LT 20, LT 40, LT 60,  
LT 100 and DIMMbox

### LT Cap slim

Order No. 1844170  
for LT 10, LT 20, LT 40, LT 60,  
LT 100 and DIMMbox

| Model                       | Order No. | Output voltage* | Output current* |
|-----------------------------|-----------|-----------------|-----------------|
| LT10-12 UP <sup>1</sup>     | 1896539   | 8–12 VDC        | 0–1000 mA       |
| LT10-24 UP <sup>1</sup>     | 1896408   | 8–24 VDC        | 0–500 mA        |
| LT10-36 UP <sup>1</sup>     | 1895582   | 8–37 VDC        | 0–350 mA        |
| LT10-36/300 UP <sup>1</sup> | 1897066   | 8–37 VDC        | 0–300 mA        |
| LT20-24 UP <sup>1</sup>     | 1896409   | 12–24 VDC       | 0–850 mA        |
| LT20-31 UP <sup>1</sup>     | 1895583   | 15–31 VDC       | 0–700 mA        |
| LT20-36/600 UP <sup>1</sup> | 1897067   | 15–37 VDC       | 0–600 mA        |

<sup>1</sup> without DIMMbox connection

| Model                    | Order No. | Output voltage* | Output current* |
|--------------------------|-----------|-----------------|-----------------|
| LT10-12 <sup>1</sup>     | 1895611   | 1–12 VDC        | 3–700 mA        |
| LT10-16 <sup>1</sup>     | 1895089   | 1–16 VDC        | 3–700 mA        |
| LT10-24 <sup>1</sup>     | 1896009   | 1–24 VDC        | 3–550 mA        |
| LT10-32 <sup>1</sup>     | 1895008   | 2–32 VDC        | 3–350 mA        |
| LT10-32 DB               | 1895541   | 8–32 VDC        | 3–350 mA        |
| LT10-36/300 <sup>1</sup> | 1897064   | 8–37 VDC        | 0–300 mA        |

<sup>1</sup> without DIMMbox connection

| Model             | Order No. | Output voltage* | Output current* |
|-------------------|-----------|-----------------|-----------------|
| LT20-24           | 1894910   | 15–24 VDC       | 0–833 mA        |
| LT20-28           | 1894611   | 5–28 VDC        | 350–700 mA      |
| LT20-28/700 1-10V | 1897012   | 5–28 VDC        | 350–700 mA      |
| LT20-36/600       | 1897065   | 15–37 VDC       | 0–600 mA        |
| LT20-40           | 1895718   | 15–40 VDC       | 0–450 mA        |
| LT20-40           | 1894612   | 10–40 VDC       | 200–500 mA      |
| LT20-40/500 1-10V | 1897014   | 10–40 VDC       | 200–500 mA      |
| LT20-48           | 1895720   | 15–48 VDC       | 0–200 mA        |
| LT20-48           | 1894613   | 15–48 VDC       | 100–350 mA      |
| LT20-48           | 1895013   | 15–48 VDC       | 0–417 mA        |
| LT20-48/350 1-10V | 1897015   | 15–48 VDC       | 100–350 mA      |

| Model              | Order No. | Output voltage* | Output current* |
|--------------------|-----------|-----------------|-----------------|
| LT40-24            | 1894614   | 10–24 VDC       | 700–1.400 mA    |
| LT40-24            | 1894973   | 10–24 VDC       | 700–1.460 mA    |
| LT40-24/1400 1-10V | 1897016   | 10–24 VDC       | 700–1400 mA     |
| LT40-27            | 1895641   | 17–27 VDC       | 0–1.150 mA      |
| LT40-36            | 1894615   | 15–36 VDC       | 500–1.050 mA    |
| LT40-36/900        | 1897068   | 15–37 VDC       | 0–900 mA        |
| LT40-36/1050 1-10V | 1897017   | 15–36 VDC       | 500–1050 mA     |
| LT40-48            | 1894616   | 22–48 VDC       | 350–700 mA      |
| LT40-48 1–10 V     | 1896700   | 22–47 VDC       | 0–700 mA        |

\* Standard units will be delivered with highest voltage and current output.

# LED Drivers

## Standard Range

All products comply with  
EN61347-1 and EN61347-2-13

### Applications

- Lighting

### Characteristics

- Voltage and current regulation within single design
- Compact design: 21 x 30 mm (LT 10 – LT 60), 24 x 30 mm (LT 100)
- Active PFC ≥ LT 40
- Continuously short circuit proof
- Overload protection
- Overtemperature protection
- Fastening by screws, rivets, cable straps or clips...
- LED dimmable with DALI, 1-10V or Push-Dim via connectable DIMMbox
- IP rating: IP20, IP67 (LT-UP, LT 40 WP)

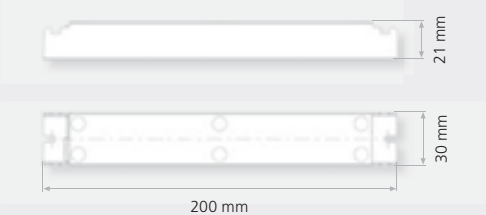
### Technical data

|                                |                                                                                                                |
|--------------------------------|----------------------------------------------------------------------------------------------------------------|
| Input voltage                  | 100 to 120 V AC<br>220 to 240 V AC                                                                             |
| Input current                  | 180 mA (LT 40 WP), 300 mA (LT 60),<br>450 mA (LT 60 SQ), 700 mA (LT 60 SQ US)                                  |
| Frequency                      | 50 to 60 Hz                                                                                                    |
| Efficiency                     | up to 91% typ. at full load                                                                                    |
| EMC                            | Conforms to<br>EN 55012, EN 61000-3-2, EN 62384, EN 61547                                                      |
| Output voltage tolerance       | ± 2%                                                                                                           |
| Environmental specification    |                                                                                                                |
| Operating temperature          | -20 to +45°C at maximum load                                                                                   |
| Storage temperature            | -40 to +70°C                                                                                                   |
| Humidity                       | 5% to 90% non condensing                                                                                       |
| Input transient susceptibility | Complies with IEC 61000 requirements                                                                           |
| Safety specification           |                                                                                                                |
| Standards                      | Fulfils class II, SELV according to<br>following standards:<br>EN/IEC 61437-1, EN/IEC 61347-2-13               |
| Reliability specification      |                                                                                                                |
| MTBF calculation               | typ. 200,000 hours at maximum load<br>and an ambient temperature of 25° C<br>(in accordance with MIL-HDBK-217) |
| Mechanical specification       |                                                                                                                |
| Weight approx.                 | 200 g (LT 40 WP), 130 g (LT 60),<br>150 g (LT 60 SQ), 160 g (LT 60 SQ US)                                      |
| Plug connector                 | connecting bracket 0.5..1.5 mm²                                                                                |

LT 40 WP LT 40 WP

CE

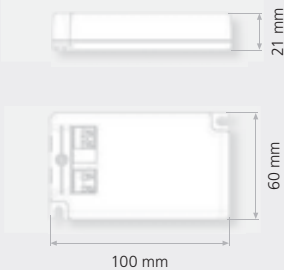
40 Watts



LT 40 SQ LT 40 SQ

CE

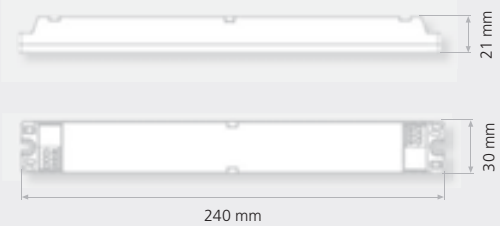
40 Watts



LT 60 LT 60

CE ENEC S10

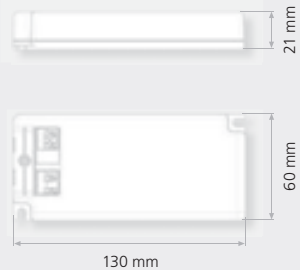
60 Watts



LT 60 SQ LT 60 SQ

CE ENEC S10

60 Watts



| Model                                   | Order No. | Output voltage* | Output current* |
|-----------------------------------------|-----------|-----------------|-----------------|
| LT40-24 WP <sup>1</sup>                 | 1894660   | 10–24 VDC       | 700–1.400 mA    |
| LT40-36 WP <sup>1</sup>                 | 1894661   | 15–36 VDC       | 500–1.050 mA    |
| LT40-48 WP <sup>1</sup>                 | 1894662   | 22–48 VDC       | 350–700 mA      |
| <sup>1</sup> without DIMMbox connection |           |                 |                 |

| Model      | Order No. | Output voltage* | Output current* |
|------------|-----------|-----------------|-----------------|
| LT40-24 SQ | 1895925   | 10–24 VDC       | 700–1.400 mA    |
| LT40-36 SQ | 1896077   | 15–36 VDC       | 500–1.050 mA    |
| LT40-48 SQ | 1896078   | 22–48 VDC       | 350–700 mA      |

| Model                                                      | Order No. | Output voltage* | Output current* |
|------------------------------------------------------------|-----------|-----------------|-----------------|
| LT60-24                                                    | 1894681   | 15–24 VDC       | 0–2500 mA       |
| LT60-36                                                    | 1895136   | 22–36 VDC       | 0–1600 mA       |
| LT60-36                                                    | 1897069   | 22–37 VDC       | 0–1200 mA       |
| LT60-36                                                    | 1897071   | 22–37 VDC       | 0–1500 mA       |
| LT60-48                                                    | 1895106   | 30–48 VDC       | 0–1200 mA       |
| LT60-24 1-10 V WR <sup>1</sup>                             | 1895553   | 24 VDC          | 0–2500 mA       |
| LT60-85 1-10 V                                             | 1896459   | 40–85 VDC       | 0–700 mA        |
| LT60-170 1-10 V                                            | 1896458   | 100–170 VDC     | 0–350 mA        |
| <sup>1</sup> wide range input 100-240 V AC, LT 100 housing |           |                 |                 |

| Model         | Order No. | Output voltage* | Output current* |
|---------------|-----------|-----------------|-----------------|
| LT60-24 SQ    | 1895735   | 15–24 VDC       | 0–2500 mA       |
| LT60-36 SQ    | 1895373   | 22–36 VDC       | 0–1600 mA       |
| LT60-36 SQ    | 1897070   | 22–37 VDC       | 0–1200 mA       |
| LT60-36 SQ    | 1897072   | 22–37 VDC       | 0–1500 mA       |
| LT60-36 SQ US | 1897073   | 22–37 VDC       | 0–1200 mA       |
| LT60-36 SQ US | 1897074   | 22–37 VDC       | 0–1500 mA       |
| LT60-48 SQ    | 1895950   | 30–48 VDC       | 0–1200 mA       |

LT Accessories



LT SQ Cap

Order No. 1840704

for LT 40 SQ, LT 60 SQ

LT Cap

Order No. 1839772

for LT 10, LT 20, LT 40, LT 60,  
LT 100 and DIMMbox

LT Cap slim

Order No. 1844170

for LT 10, LT 20, LT 40, LT 60,  
LT 100 and DIMMbox

\* Standard units will be delivered with highest voltage and current output.





# LED Drivers

## Standard Range

All products comply with  
EN61347-1 and EN61347-2-13

### Applications

- Lighting

### Characteristics

- Voltage and current regulation within single design
- Compact design: 21 x 30 mm (LT 10 – LT 60), 24 x 30 mm (LT 100)
- Active PFC ≥ LT 40
- Continuously short circuit proof
- Overload protection
- Overtemperature protection
- Fastening by screws, rivets, cable straps or clips...
- LED dimmable with DALI, 1-10V or Push-Dim via connectable DIMMbox
- IP rating: IP20, IP67 (LT-UP, LT 40 WP)

### Technical data

#### Input voltage

100 to 120 V AC  
220 to 240 V AC

#### Input current

325 to 300 mA (LT 60 DPA), 480 mA (LT 100),  
0 to 5A (DIMMbox)

#### Frequency

50 to 60 Hz

#### Efficiency

up to 91% typ. at full load

#### EMC

Conforms to  
EN 55012, EN 61000-3-2, EN 62384, EN 61547

#### Output voltage tolerance

± 2%

#### Environmental specification

##### Operating temperature

-20 to +45°C at maximum load

##### Storage temperature

-40 to +70°C

##### Humidity

5% to 90% non condensing

##### Input transient susceptibility

Complies with IEC 61000 requirements

#### Safety specification

##### Standards

Fulfils class II, SELV according to  
following standards:  
EN/IEC 61437-1, EN/IEC 61347-2-13

#### Reliability specification

##### MTBF calculation

typ. 200,000 hours at maximum load  
and an ambient temperature of 25° C  
(in accordance with MIL-HDBK-217)

#### Mechanical specification

##### Weight approx.

200 g (LT 40 WP), 130 g (LT 60),  
150 g (LT 60 SQ), 160 g (LT 60 SQ US)

##### Plug connector

connecting bracket 0.5..1.5 mm²

## LT Accessories



### LT SQ Cap

**Order No. 1840704**  
for LT 40 SQ, LT 60 SQ

### LT Cap

**Order No. 1839772**  
for LT 10, LT 20, LT 40, LT 60,  
LT 100 and DIMMbox

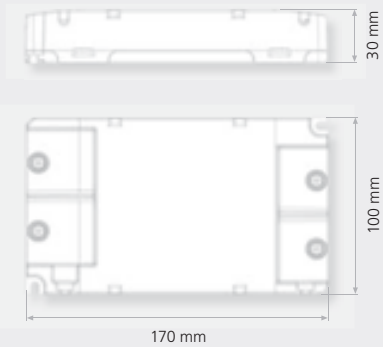
### LT Cap slim

**Order No. 1844170**  
for LT 10, LT 20, LT 40, LT 60,  
LT 100 and DIMMbox

## LT 60 DPA LT 60 DPA



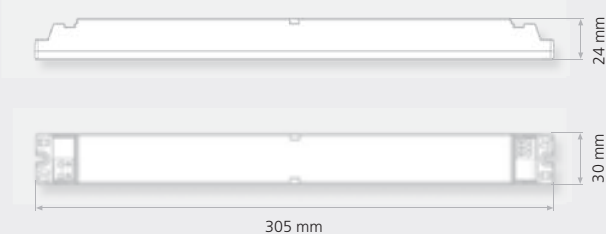
60 Watts



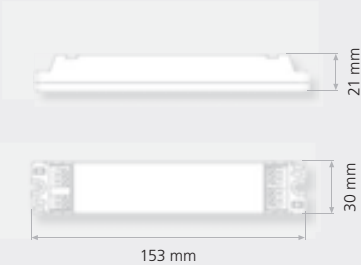
## LT 100 LT 100



100 Watts



## DIMMbox DIMMbox



| Model                                                                   | Order No. | Output voltage* | Output current* |
|-------------------------------------------------------------------------|-----------|-----------------|-----------------|
| LT60 DPA                                                                | 1895499   | 18–42 VDC       | 350–1.400 mA    |
| Output current adjustable by customer<br>incl. DALI, Push-Dim and 1-10V |           |                 |                 |

| Model           | Order No. | Output voltage* | Output current* |
|-----------------|-----------|-----------------|-----------------|
| LT100-24        | 1894680   | 15–24 VDC       | 0–4.200 mA      |
| LT100-36        | 1896218   | 22–36 VDC       | 0–2.800 mA      |
| LT100-48        | 1896207   | 30–48 VDC       | 0–2.100 mA      |
| LT100-285 1-10V | 1896460   | 190–285 VDC     | 0–350 mA        |
| LT100-142 1-10V | 1896461   | 100–142 VDC     | 0–700 mA        |

| Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Order No. | Output voltage* | Output current* |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------|-----------------|
| DIMMbox                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1894848   | 15–50 VDC       | 5.000 mA        |
| DIMMbox 1-10 OFF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1896084   | 15–50 VDC       | 5.000 mA        |
| DIMMbox CV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1897004   | 15–50 VDC       | 5.000 mA        |
| <b>Functional description</b><br>The DIMMbox and the connected LED(s) are powered by the power supply/<br>LED driver at the input of the DIMMbox.<br>The dimming function is achieved by pulse width modulation control<br>(PWM) at the LED minus output. Switching frequency is around 600Hz.<br>DIMMbox: control range 10 – 100 %<br>DIMMbox 1-10 OFF: control range 10 – 100 %, at an interface voltage between 1 – 10 V/< 0,7 V = off<br>DIMMbox CV: control range 1 – 100 %, at an interface voltage between 1 – 10 V |           |                 |                 |

| Model                                                                                                                                                                                                                                                                                                                                 | Order No. | Output voltage* | Output current* |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------|-----------------|
| LS12/100 DPA                                                                                                                                                                                                                                                                                                                          | 1895885   | 13±1 VDC        | 100 mA          |
| <b>Functional description</b><br>The light control is a converter for light control signals. An extended 1 – 10<br>V interface serves as output. For input DALI, PUSH-DIM, a PWM signal or a<br>1 – 10 V dimmer can be chosen.<br>The output is synchronized with the FRIWO LED drivers and their integra-<br>ted 1 – 10 V interface. |           |                 |                 |

## LS 12 – Light Control LS 12



\* Standard units will be delivered with highest voltage and current output.

# E<sup>2</sup>MS

## Excellence in Engineering & Electronic Manufacturing Services



FRIWO is your competent partner for the implementation and development of visions and ideas up to series production of your electronic systems. From PCB assembly, production of entire units and worldwide shipping – with E<sup>2</sup>MS FRIWO offers a service platform that allows you to focus on your core business and competencies.

We support you throughout the entire value chain: from engineering and prototyping through purchasing and manufacturing and ultimately approval assistance.

FRIWO's lead and competence factory Ostbevern, certified in accordance with DIN EN ISO 9001 and TS 16949, handles the initial production of products by means of modern manufacturing processes (auto assembly, AOI, selective soldering, X-ray, etc...).



Short distances between R&D and production allow innovative production techniques and streamlined processes, which can also be pursued and implemented after a subsequent shift to our global manufacturing locations. This leads to short lead times and consistently high quality, enabling us to support you in accelerating the market introduction of your products.

In case of unplanned or unexpected market developments we are able to respond flexibly with our fast-line production.

Through constant follow-up and continuous improvement of process technology in all areas of manufacturing, we ensure high quality at optimized costs and maximize your business success in the market.



### Quality in good hands:

| Manufacturing                                                                                                                                                                                | Engineering                                                                                                                                 | Systems & Processes                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Contract manufacturing of electronic systems and PCBs in form of sheer servicing.                                                                                                            | Setup of concept and specification                                                                                                          | Definition and capture of requirements                                                    |
| <b>Services</b>                                                                                                                                                                              | Setup of requirement specification                                                                                                          | Acceptance of system engineering services                                                 |
| <ul style="list-style-type: none"> <li>Global purchasing of PCBs and components</li> <li>Design and implementation of testing concepts</li> <li>Logistics and global distribution</li> </ul> | Acceptance of defined R&D services                                                                                                          |                                                                                           |
| <b>2nd Source</b>                                                                                                                                                                            | Project management                                                                                                                          | Design, specification and implementation of production processes for projects and systems |
| <ul style="list-style-type: none"> <li>Manufacturing of excess demands</li> <li>Quota management</li> <li>Avoidance of dependencies</li> </ul>                                               | General entrepreneurship, exploration and coordination of external engineering partners for special requirements, i.e. explosion protection |                                                                                           |
|                                                                                                                                                                                              | EMC level optimization and harmonization                                                                                                    |                                                                                           |
|                                                                                                                                                                                              | Support for certification and approval                                                                                                      |                                                                                           |



## FRIWO E<sup>2</sup>MS

Short routes, same time zone,  
same language – quick response  
= quality in good hands

**E2MS@friwo.de**



# Glossary

| Battery type                   | Lead Acid                    | NiCd                                                      | NiMH       | Li-Ion<br>cobalt      manganese                 | LiFePO <sub>4</sub>                             |
|--------------------------------|------------------------------|-----------------------------------------------------------|------------|-------------------------------------------------|-------------------------------------------------|
| Cell voltage                   | 2.0 V                        | 1.2 V                                                     | 1.2 V      | 3.6 resp. 3.7 V                                 | 3.3 V                                           |
| Energy density [Wh/kg]         | 30–50                        | 45–80                                                     | 60–120     | 110–190      110–120                            | 90–130                                          |
| Self-discharge ratio per month | 5 %                          | 20 %                                                      | 30 %       | 2–5 %                                           | 2–5 %                                           |
| Overload tolerance             | high                         | moderate                                                  | low        | very low                                        | very low                                        |
| Charging cycles                | 200–400                      | 1500                                                      | 300–500    | 300–500                                         | 1000–2000                                       |
| Charging method                | U = const.                   | I = const.                                                | I = const. | 300–500                                         | U = const.                                      |
| Charging characteristic        | IU0U, IU1a                   | IOI                                                       | IOI        | IUa                                             | IUa                                             |
|                                | Phase 1:<br>constant current | Charging criteria:<br>-dV, dT/dt, dU/dt, T <sub>max</sub> |            | Phase 1:<br>constant current                    | Phase 1:<br>constant current                    |
|                                | Phase 2:<br>constant voltage | Identification and control<br>via microcontroller         |            | Phase 2:<br>constant voltage<br>± 1 % tolerance | Phase 2:<br>constant voltage<br>± 1 % tolerance |
|                                | Phase 3:<br>trickle charge   |                                                           |            |                                                 |                                                 |

## Abbreviations

|                   |                                                   |
|-------------------|---------------------------------------------------|
| CPP               | = Customized Power Plug                           |
| DT                | = Desktop                                         |
| E <sup>2</sup> MS | = Engineering & Electronic Manufacturing Services |
| GPP               | = Global Power Plug                               |
| LED               | = Light Emitting Diode                            |
| LT                | = LED Driver                                      |
| MPP               | = Multi Power Plug                                |
| OF                | = Open frame                                      |
| PP                | = Power Plug                                      |
| SMT               | = Surface Mount Technology                        |
| UP                | = In-wall                                         |
| USB               | = Universal Serial Bus                            |

## Cell chemistries

|                     |                          |
|---------------------|--------------------------|
| Li-Ion              | = Lithium Ion            |
| LiFePO <sub>4</sub> | = Lithium Iron Phosphate |
| NiCd                | = Nickel Cadmium         |
| NiMH                | = Nickel Metal Hydride   |
| Pb                  | = Lead Acid              |

## 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 in due consideration of the leakage current.

## Class BF

Like B, but taking into account the so-called „F parts“ which may accidentally come into contact with the patient and which are isolated from other parts.

## Class CF

Class with the highest protection.

## Current limited

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

## Efficiency

Efficiency is calculated as the ratio of output to input power 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.

| Standards | Office/IT         | Medical               | Tools, chargers, toys,<br>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<br>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 |

## EMC

The ability of electrical equipment to function satisfactorily in its electromagnetic environment without negative interferences. Power supplies should meet at least two generic standards for EMC:

1. standard for transient emissions (grid-bound interferences emitted by the power supply) and
2. standard for interference immunity (protection against external interferences)

These generic standards comprise a multitude of sub-standards that define threshold values for subdomains (for example certain types of interferences). FRIWO power supplies meet these standards to a higher degree than required to make the most of EMC, and to safeguard a trouble-free service.

## Life-cycle

Life-cycle of a power supply. After the end of life power supplies are likely to break down because of worn components.

## NTC

A temperature-sensitive resistor with negative coefficient which reduces the resistance as temperature increases. It is therefore also called thermistor. It serves not only the temperature monitoring but also limits the inrush current of power supplies.

## Operating temperature

Temperature of still air surrounding the device. It is usually measured approx. 10 mm next to the operated device.

## 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 can be absorbed without damage.

## Single range

Power supplies with single input voltage for the use in the respective countries.

## SMT

SMT is a surface mount technology which allows surface mountable components with solderable pads (without wire connectors) to be soldered directly onto a PCB.

## Standby losses

Power consumption of a power supply during idle service.

## Storage temperature

Temperature range in which a device 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“. Wired components are connected to the PCB by vias and connected by a special THT soldering process.

## Voltage controlled

A control loop in the power supply stabilizes the output voltage, independent of all factors (e.g. temperature).

## Wide range

Power supplies with wide range input can be operated at different nominal voltages without having to be adjusted (manually or automatically).





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