

Datasheet micromax-f

Precise measurement of the power supply mainsfrequency



1 General description

The measurement device micromax-f determines the frequency of the supply voltage by the time between the zero crossings of the sine wave of the supply voltage. The timebase is calibrated at regular intervals with a temperature compensated crystal, whereby a high accuracy is achieved. The model -fgps can calibrate the timebase via the signal of the GPS satellites (Global Positioning System).

The measured values are averaged over a second and are then available for further processing or output. For this purpose the system has a web client to actively send the measurement data to a server (UDP and Modbus/TCP), and a web server to enable a query for the data and the device settings. The model -f485 has a built in Modbus/RTU server, which provides the data to a Modbus client.

Following models of the meter are available:

	Basic	GPS	RS485
Case and power supply for DIN rail mounting	-f	-fgps	-f485

A data export via different interfaces (e.g. via RS232, RS485, SPI, CAN, LIN) and a data logger function are optional available.

The model -fgps requires GPS reception in order to obtain the current time and to carry out time-synchronized measurement. It has an external, weatherproof Garmin GPS receiver, connected with a 5 m cable for flexible mounting.

2 Content of delivery

The delivery should include:

- Measurement device micromax-f / -fgps / -f485
- 6 V AC Power Supply (220-240 V)
- Network cable for ethernet
- Version -fgps: Garmin GPS receiver
- Infosheet (MAC-adress, serial number)

3 Technical data

Measurement device	
Case size	120 * 105 * 45 mm
(with DIN rail mounting)	120 * 117 * 45 mm
Weight	ca. 350 g
Operating temperature	-25 °C bis +85 °C
Storage temperature	-40 °C bis +85 °C
Case IP Code	IP30
GPS-receiver (only gps)	
Case size	61 * 61 * 19,5 mm
Weight	ca. 160 g
Cable Length	5 m
Operating temperature	-30 °C bis +80 °C
Storage temperature	-40 °C bis +90 °C
Case IP Code	IPX7 (waterproof IEC 60529)
Railmount power supply	
Case size	54 * 90 * 63 mm
Power supply	6 V AC
Operating current	< 450 mA
Operating power	< 4,5 VA
Measurement Specifications	
Range	45 Hz bis 65 Hz
Resolution	0.1 mHz
Accuracy (1 second period)	+/- 1 mHz
Accuracy (<250 ms period)	+/- 5 mHz

The following measured values are made available by the system:

- **Netzfrequenz (mainsfrequency):** At the end of every second calculated average of the measurements over the period of a second. The version -fgps provides calculation synchronous with the GPS time.
- **Netzfrequenz_100ms (150ms, 200ms, 1000ms):** Moving average of the measurements of the last 100 ms (150 ms, 200 ms, 1000 ms). The value is calculated after each single measurement and thus represents the most recent result. The 200 ms value is considering a time interval of 10 cycles (average of 10 cycles, performed with a moving window).
Moving average is not suitable for calculating minute values due to the timing of ethernet transport
- **Phasenwinkel (phase angle):** Angle of the current voltage vector relative to an imaginary machine which rotates at 50 Hz or 3000 revolutions per minute. The version -fgps provides calculation synchronous with the GPS time. The correct name for this measured angle is Phasor. In discrepancy from this, the word phase angle or phase is used alternatively in this document due to compatibility with older versions.

4 Meter with DIN rail mounting

The models micromax-f and micromax-fgps are equipped for DIN rail mounting. On the rail a width of at least 165 mm is required for the meter and the power supply.

- Power supply of the meter: The supplied cable (black/red, 2 m) is connected through the hollow plug with the meter. The other end of the cable is connected to terminals 6 and 7 of the power supply (6 V AC).
- For connection to 230 V mains voltage the terminals 1 and 4 are connected via a fuse to 230V.

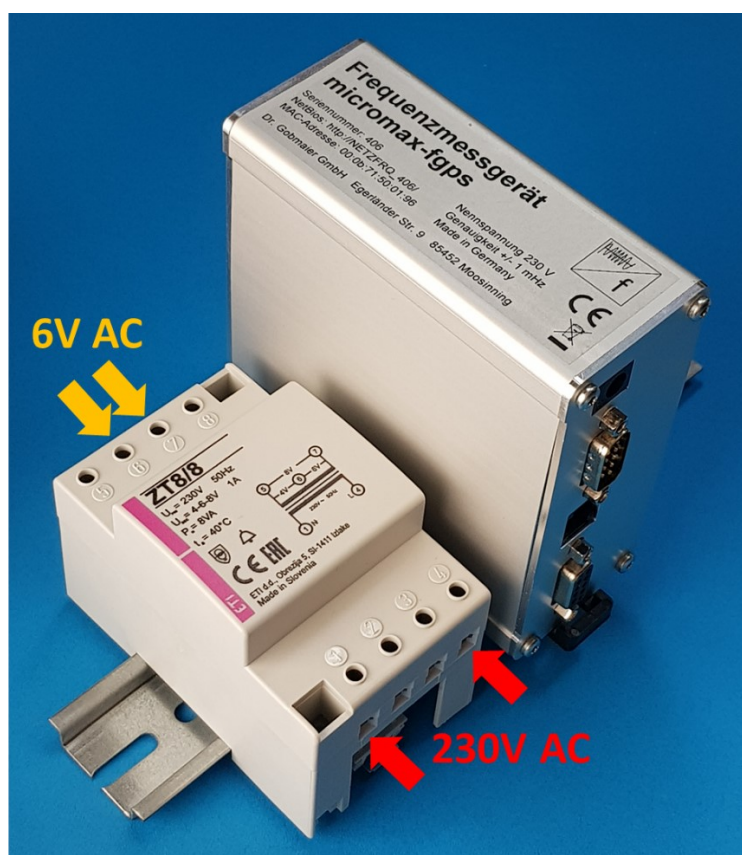


Figure 2: *Measuring device with DIN rail mounting, terminals marked*

5 Commissioning

- The device is connected to the grid (230 V) using the 6V AC power supply. This will start the measurement.
- Variant -fgps: The GPS receiver is set up next to a window (due to GPS reception) and connected to the measuring device.
- The network cable is connected to the network. The network must have a DHCP server that assigns an IP to the device. A working network connection is evident from the yellow LED on the Ethernet connector. Communication with the network is recognized by the illumination of the green LED on the Ethernet connector.
- The device communicates its host name to the network using NetBIOS. This allows a direct request in the browser (e.G. http://NETZFRQ_15/ for the device with the serial number 15).
- If the network does not support this service, then the device's IP address could be found with its MAC address (see supplied Infosheet). This can be done with the free tool “*Angry IP Scanner*“, or in the windows command prompt („cmd.exe“) with the command „arp -a“.
- Variant -fgps: The startup of the GPS-receiver may take up to 5 minutes (GPS cold start) if the receiver has been switched off for some days or if the location changed over wide distances. To get a good reception of the gps-signal, the receiver should be placed near a window.

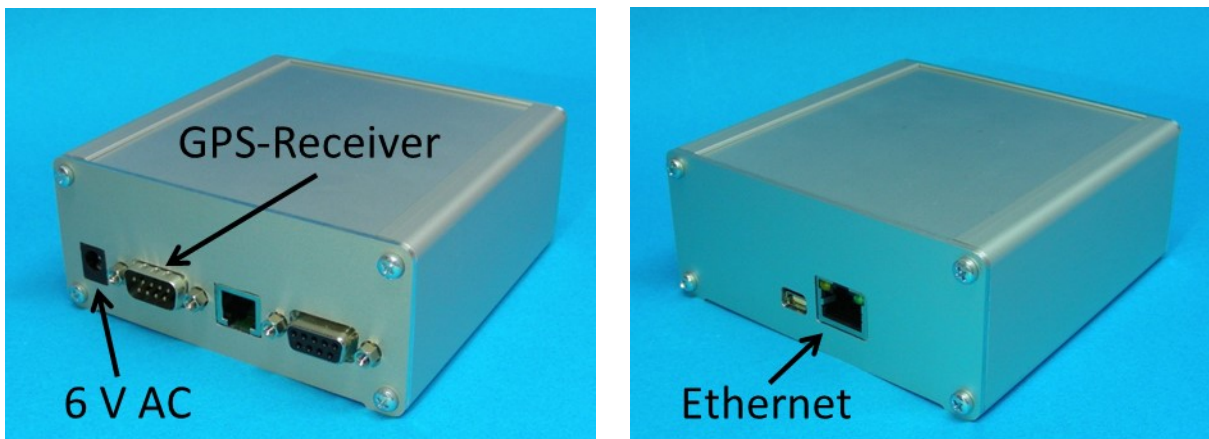


Figure 1: *Front side of the device with power supply and gps-receiver (only version -fgps) on the left, and back side with Ethernet on the right*

6 Interfaces

The measurement device automatically connects to the network (Ethernet) through the built-in DHCP client. For the transfer of data multiple paths are provided:

- Retrieval of the data from the website of the embedded webserver
- Active transmission of measurement data to a server via UDP
- Retrieving a xml file from the embedded webserver
- Retrieval of the frequency trend (seconds values) from the embedded webserver
- Retrieving the moving average from the embedded webserver
- Modbus/TCP Server (slave), Modbus/RTU (optional)

Retrieval of the data from the website of the integrated webserver

The embedded webserver provides a web site on which the actual measurements are available, updated every second. On this site, the IP address for sending UDP data packets and the system time can be set.

Example: Calling `http://netzfrq_221/` returns the following website:

Dr. Gobmaier GmbH Egerländer Str. 9 85452 Moosinning Germany info@netzfrequenzmessung.de

Figure 3: *Summary page of the integrated webserver*

The menu item " FREQUENCY" leads to a simple representation of the frequency.

Figure 3: *Display of the current network frequency*

The time course of the frequency can be displayed for different periods (5 minutes to 24 hours).

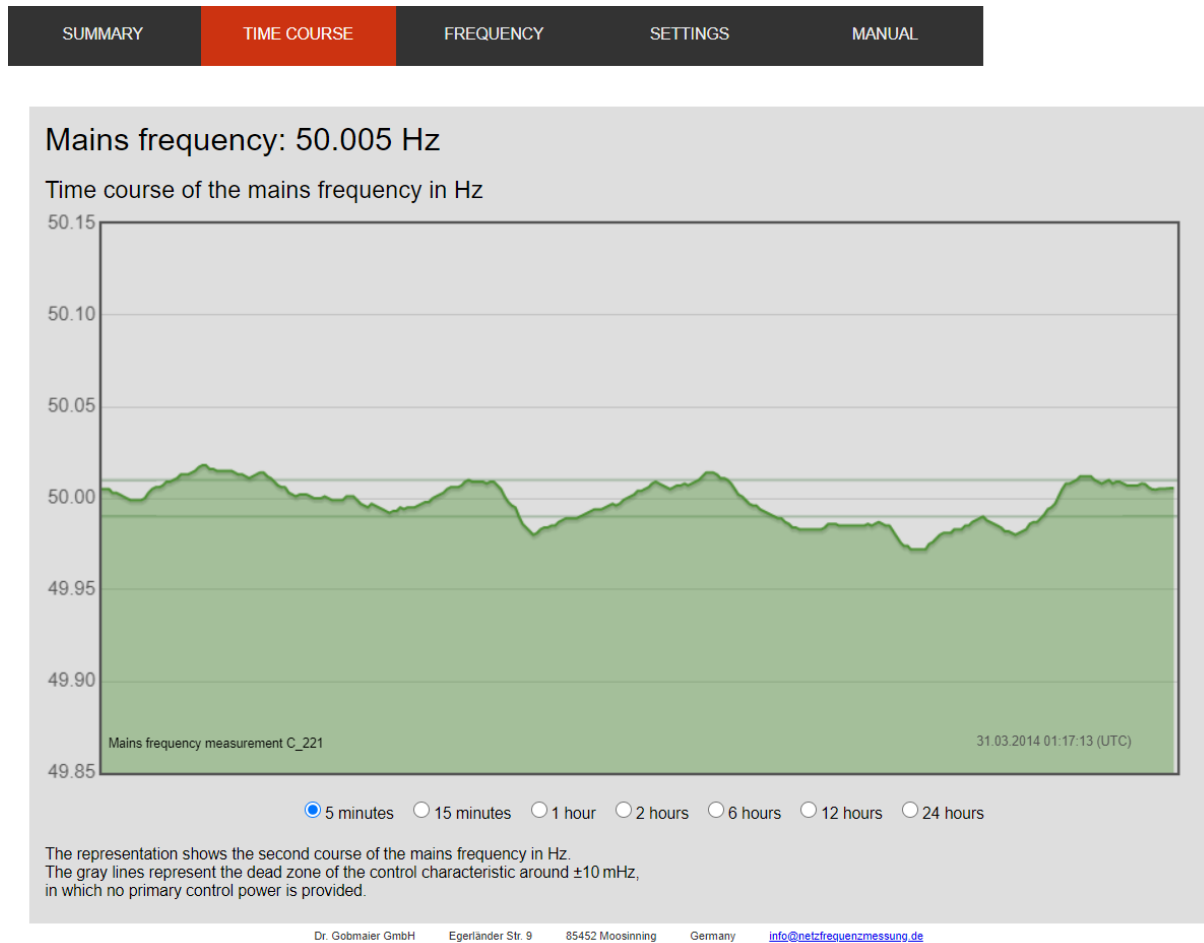


Figure 4: *Time course of the frequency*

Static IP address or dynamic IP address with DHCP

The meter has a DHCP client which gets automatically an IP address assigned in many networks (by a DHCP server). In this case, the field for the static IP address must contain the entry 0.0.0.0. Should the device get a static IP, then the address can be set in this input field. After pressing the button, „Set IP Measurement device“ the meter is restarted with the new IP.

Caution: If an incorrect IP is specified, the device may be unreachable from your network. Please contact the manufacturer for resetting.

SUMMARY	TIME COURSE	FREQUENCY	SETTINGS	MANUAL
---------	-------------	-----------	----------	--------

Mains frequency: 50.0106 Hz

System date: 31.03.2014 01:01:58
Real-time clock: ok Grid quality: ok
Data receiving indicator: ↑
Uptime from startup: 000 days, 00 h, 01 min, 58 s

Settings

Ethernet (IP address, subnet and udp)

Static IP address (DHCP on IP: 0.0.0.0)
0 . 0 . 0 . 0

Subnetmask (auto on 0.0.0.0)
255 . 255 . 255 . 0

Default Gateway (auto on 0.0.0.0)
0 . 0 . 0 . 0

Target IP address for UDP transmission on port 8000 (disabled on IP: 0.0.0.0)
0 . 0 . 0 . 0

UDP transmission period and content
 Second values, repeated each 500 ms
 Second and 100 ms mean values, repeated each 100 ms

Device ID in UDP message (1 to 65534):
C_ 221

Modbus/TCP and Modbus/RTU

Operating mode and speed (with RS485 Parity even, 1 Stopbit):
 Aus
 TCP (Ethernet)

Modbus Unit identifier (1 to 247):
1

Modbus/TCP Port (Standard Port 502):
(first port for multiple connections)
502

date and time

date (dd.mm.jj)
31 . 03 . 14

time (hh:mm:ss)
01 . 01 . 07

Pin for settings

Pin (4 digits number)
Pin repetition

Language

deutsch english

Information:

Measurement device: C_221
Serial number: 221
Software: 02.42b
Build Date: Oct 7 2020 14:26:09

Figure 4: *Settings of the device -f*

SUMMARY	TIME COURSE	FREQUENCY	SETTINGS	MANUAL
---------	-------------	-----------	----------	--------

Mains frequency: 50.0163 Hz

System date: 09.10.2020 14:02:50
 Real-time clock: ok Grid quality: ok GPS: ok
 Data receiving indicator: ↓
 Uptime from startup: 000 days, 04 h, 30 min, 06 s

Settings

Ethernet (IP address, subnet and udp)

Static IP address (DHCP on IP: 0.0.0.0)

Subnetmask (auto on 0.0.0.0)

Default Gateway (auto on 0.0.0.0)

Target IP address for UDP transmission on port 8000 (disabled on IP: 0.0.0.0)

UDP transmission period and content
 Second values, repeated each 500 ms
 Second and 100 ms mean values, repeated each 100 ms

Device ID in UDP message (1 to 65534):
 C_

Modbus/TCP and Modbus/RTU

Operating mode and speed (with RS485 Parity even, 1 Stopbit):
 Aus
 TCP (Ethernet)

Modbus Unit identifier (1 to 247):

Modbus/TCP Port (Standard Port 502):
 (first port for multiple connections)

Phase angle (only versions with GPS receiver)

Measured phase for phasor:

Standard L1 (0°) L2 (+120°) L3 (+240°)
 Inverted L1 (+180°) L2 (+300°) L3 (+ 60°)

Pin for settings

Pin (4 digits number)
 Pin repetition

Language

deutsch english

GPS (only versions with GPS receiver)

GPS Status: Valid position (A)
 GPS : Non-differential GPS fix
 Number of satellites visible/used: 11/8
 Coordinates: N 48.2756, E 11.8486, Height: 478.0 m

Information:

Measurement device: C_221
 Serial number: 221
 Software: 02.42b
 Build Date: Oct 7 2020 14:26:09

Figure 5: *Settings of the device with gps (-fgps)*

Active transmission of measurement data to a server via UDP

The integrated UDP client sends UDP packets to a pre-programmed IP address on port 8000. The ip-adress can be set on the integrated web server. For UDP the device needs a dynamic IP via DHCP.

Mode Second values repeated each 500 ms: The second values of the mains frequency and the phasor of the last second change are sent with the time stamp. As UDP packets can be lost on the network they are repeated each 500 ms.

Example: Setting the field „IP-Adresse für den UDP-Versand“ will result in sending UDP packets to the IP each second (frequency 50.0273 Hz, Date/Time 14.05.2014 08:46:04, device number C_15):

```
f=50.0273&n=C_15 &z=14.05.2014 08:46:04
```

Mode Second and 100 ms mean values repeated each 100 ms: In addition to the data just described, the moving 100 ms mean value, the last measured phasor and the internal millisecond time are transmitted. The packets are sent every 100 ms.

Example: Packet at the millisecond 600 with moving 100 ms average of 50.0128 mHz and a phasor of 221.6°:

```
f=50.0273&n=C_15 &z=14.01.2020 08:46:04 ...
&p=062.9 &d=009&zx=0600&fx=50.0128&px=221.6
```

Retrieving the xml file from the embedded webserver

Each second a xml file with the current measurement data is generated. This file can be downloaded with a server that calls via http cyclically the file "frequenz.xml".

Example: Access the <http://192.168.4.14/frequenz.xml> to get a xml-file with the content:

```
<response>
  <frequenz>50.0273</frequenz>
  <phase>163</phase>
  <datumzeit_utc>14.05.2014 08:46:04</datumzeit_utc>
  <controller>C_15</controller>
</response>
```

Retrieval of the frequency trend (second values) from the embedded webserver

The meter provides an xml file (frequenz_export.xml) which includes an adjustable number of measurements. With the parameter „d“ up to 3,600 second values can be queried. The last value is the current measured value. To simplify further processing, the values are transferred in mHz and separated by semicolons.

Example: Access http://netzfrq_15/frequenz_export.xml?d=5 to get a xml file with the measured values of the last 5 seconds:

```
<result>
  <data>50019;50019;50020;50020;50020;</data>
</result>
```

Retrieving the moving average from the embedded webserver

The measurement device continuously calculates a moving average over the last 100 ms, 150 ms, 200 ms and 1000 ms. These values can be retrieved via the file "frequenz_ms.xml". The frequency measurement <frequenz> is synchronized to the second change, the moving averages shows the current average of the last measurements (e.g. <frequenz_100ms> shows the average of the last 100 ms period).

The phase angle <phase> indicates the phasor at the last second change, the value <phasen20ms> indicates the phasor of the last zero crossing.

Example: Access http://192.168.4.14/frequenz_ms.xml to get a xml-file with the content:

```
<response>
  <frequenz>49.9667</frequenz>
  <phase>163</phase>
  <frequenz1000ms>49.9664</frequenz1000ms>
  <frequenz100ms>49.9643</frequenz100ms>
  <frequenz150ms>49.9646</frequenz150ms>
  <frequenz200ms>49.9646</frequenz150ms>
  <phase20ms>159</phase20ms>
  <datumzeit_utc>31.03.2014 00:08:07</datumzeit_utc>
  <zeit_ms>560</zeit_ms>
  <controller>C_15</controller>
</response>
```

Modbus/TCP Server (slave)

The device has a built in Modbus/TCP Server (slave). On request of a Modbus Client (master) the server answers with the requested register. The Modbus/TCP Server can handle 12 connections to clients.

The system has no multi-port capability. This means that with Modbus/TCP only one connection per port is possible at the same time. In order to be able to query the measurement data with several master devices, the ports from 502 and higher must be used for Modbus/TCP (e.g. first device uses port 502, second device uses port 503, third port 504, ...).

The data transmission via Modbus/TCP can be activated by setting a unit identifier. A unit identifier of 0 disables the server. The server supports only holding registers (function-code 3 respectively starting with the address 0x40000). The contents of the registers are shown in the following table.

Address	Data	Format
0x00 01	Measured value of the mains frequency (second value)	unsigned int 16 bit
0x00 02	State of the device	unsigned int 16 bit
0x00 03	Day	unsigned int 16 bit
0x00 04	Month	unsigned int 16 bit
0x00 05	Year	unsigned int 16 bit
0x00 06	Hour (UTC)	unsigned int 16 bit
0x00 07	Minute	unsigned int 16 bit
0x00 08	Second	unsigned int 16 bit
0x00 09	ProgrammNo.	unsigned int 16 bit
0x00 0A	VersionsNo.	unsigned int 16 bit
0x00 0B	Phasor of last second change	unsigned int 16 bit
0x00 0C	spare	unsigned int 16 bit
0x00 0D	Millisecond cpu time	unsigned int 16 bit
0x00 0E	Mains frequency (floating mean value over 1000 ms)	unsigned int 16 bit
0x00 0F	Mains frequency (floating mean value over 200 ms)	unsigned int 16 bit
0x00 10	Mains frequency (floating mean value over 150 ms)	unsigned int 16 bit
0x00 11	Mains frequency (floating mean value over 100 ms)	unsigned int 16 bit
0x00 12	spare	unsigned int 16 bit
0x00 13	Phasor of last measurement	unsigned int 16 bit

Table 1: Registers of Modbus (TCP & RTU)

In Modbus/RTU (optional) data is transmitted via RS485 using the standard MODBUS-2W (RS232 is available as an option). RS485 is a serial transmission using two differentially driven lines (A/B), which allows multiple subscribers, and is robust against interference.

Parameter: 19,200 bps, even parity, 1 stop bit

The interface speed can also be reduced to 9,200 bps in the settings. The connector is a female 9-pol. D-Sub. It has the following pinout: Pin 1 → GND, Pin 5 → B, Pin 9 → A

7 Information

- Indoor use only
- Use only the supplied accessories (e.g. power supply, GPS receiver)
- Do not use the meter on mains with higher voltage or frequencies as specified
- Do not use the device if it appears damaged, incomplete or not properly closed
- Only use the factory supplied power adapter
- Repairs and checks must be performed by accredited experts.
- If there is doubt about the proper function of the device, the frequency-value of the integrated web interface can be compared with the value shown under www.netzfrequenzmessung.de. For a detailed review the values of a 10-minute period can be logged and sent to the manufacturer, so we can compare it to its reference measurement.
- The accuracy can decrease with time due to aging of electronic components. Therefore, it is recommended that the unit is checked every four years. For this the submission of a recorded 10-minute period to the manufacturer is sufficient to possibly identify deviations.

 The CE mark confirms the compliance with European Directives, notably the Low Voltage Directive and the EMC Directive.



The crossed out dustbin means that the product must be supplied in the European Union in accordance with the WEEE Directive 2012/19/EG a separate e-waste recycling. The product may not be treated as household waste.

8 Contact

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EG-Konformitätserklärung



Allgemein

Hiermit erklären wir, dass die nachstehend bezeichnete Maschine in Ihrer Konzeption und Bauart sowie der von uns in Verkehr gebrachten Ausführung der grundlegenden Sicherheits- und Gesundheitsanforderungen der EG-Richtlinie 2006/42/EG entspricht. Bei einer mit uns nicht abgestimmten Änderung des Messgerätes verliert die Erklärung ihre Gültigkeit.

Hersteller/Bevollmächtigter:

micma GmbH
Glonner Straße 19
85667 Oberpfarrmern
Tel: 08093 / 905940

Beschreibung der Maschine:

Funktion: Messgerät für Netzfrequenzmessung micromax-f
Typ/Model: Netzfrequenzmessung
Seriennummer:
Baujahr: 2016

Es wird die Übereinstimmung mit weiteren, ebenfalls für das Produkt geltenden Richtlinien/Bestimmungen erklärt:

Niederspannungsrichtlinie 2014/35/EU

den Bestimmungen der oben gekennzeichneten Richtlinien – einschließlich deren zum Zeitpunkt der Erklärung geltenden Änderungen – entspricht.

Angaben zur Person des Unterzeichners:

Siegfried Zeller, Geschäftsführer

Oberpfarrmern, den 14.03.2016

Unterschrift:

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