IoT sensor HarvyLR

User manual and technical data of the
LoRaWAN sensors HarvyLR-36 and HarvyLR-360

Version 2.2

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sense ı check ı act

Contents

1   Introduction

Please read the following information carefully.

Keep the manual or pass it on to other users of the product. Visit our website www.dezem.de with the respective website belonging to the product. There you may find further information about the product.

This product complies with the legal, national and European requirements. All company names and product designations contained herein are trademarks of their respective owners. All rights reserved.

2   Safety instructions

The device complies with electrical protection class III.

- To maintain the protection class III, only external sensors/power sources which also comply with SELV (safety extra-low voltage) requirements – protection class III – may be connected to the device.
- Avoid shocks or impacts.
- If the housing or cable is damaged, please contact deZem GmbH and do not install the affected device.
- Do not connect deZem clamp-on current transformers to uninsulated or damaged cables.
- The product must be installed professionally and in accordance with the specified installation guidelines.
- Installation may only be carried out by appropriately qualified personnel.
- For safety and approval reasons, unauthorised conversion and/or modification of the product is not permitted.
- Maintenance, adjustment or repair work may only be carried out by a specialist or a specialist workshop that is familiar with the associated dangers and the relevant regulations.
- Do not expose the product to extreme temperatures, direct sunlight or strong vibrations. Protect the product from dust and dirt.

3   Product description

3.1   Product designation

Type	HarvyLR-36	HarvyLR-360
Shunt value	1 Ohm (+/- 1 %)	0.091 Ohm (+/- 2 %) - 1 Ohm und 0.1 Ohm in parallel
Max. input	25 mA AC 36 mA DC	250 mA AC 360 mA DC

* when using these transformer types protection class II is valid

In the following, the general short designation "HarvyLR" refers to both product variants.

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3.2   Intended use

HarvyLR is used for wireless acquisition of AC and DC currents via LoRaWAN and it is self-powered, i.e. it does not require an external power supply or battery. It is particularly suitable for the acquisition of RMS currents using the deZem clamp-on current transformers as well as industrial 4–20 mA output signals. The intelligent event filter integrated in the sensor provides metering t series (inrush currents, etc.) accurate to the second at a defined maximum rate.

Any application other than described above, as well as modifications to the product, are considered improper use and may impair the protective effect.

4 Functional Description

The HarvyLR records AC and DC currents via LoRaWAN. The intelligent event filter integrated in the sensor provides metering series (inrush currents, etc.) accurate to the second at a defined maximum rate. Even a signal current (AC or DC) of only 0.15 mA on average is sufficient to record and send metered values every 10 minutes on average. Even higher data rates are possible with larger input currents.

Optionally, the HarvyLR can be integrated into the deZem DataSuite, see chapter 5.3. There, its metered value histories are immediately available online for further purposes.

Metering interval

Isec (avg-long)	Metering interval
<= 30 mA **OR** Vsys > FastSampleLevel	1 sec.
>= 20 mA	3 sec.
>= 10 mA	5 sec.
>= 5 mA	10 sec.
>= 2 mA	20 sec.
Else	30 sec.

LoRaWAN Payload encoding (Port 1)

Name	Type	Bytes	Description	Example	Value range
Version	uint8[3]	0–2	Firmware version	1, 5, 1 v1.5.1	
Shunt Value	uint8	3	Value of shunt resistance on hw 1/10 Ohm	10 1 Ohm 1 0.1 Ohm	
Amplifier Gain	uint8	4	Gain, typical 100x		
Vsys (current)	uint16	5–6	System voltage or charge of 0.47 F supercaps; system voltage in 1/10 mV	29470 29 47 mV 2.947V	<= 3600 mV
Vsys (min)	uint16	7–8	Minimum system voltage since last LoRaWAN uplink package; system voltage in 1/10 mV		
Vsys (max)	uint16	9–10	Maximum system voltage since last LoRaWAN uplink package; system voltage in 1/10 mV		
Vamp (rms)	uint16	11–12	Output voltage (RMS value) of amplifier (x100 Gain) in 1/10 mV	35991 3.5991 V	
Isec (current)	uint16	13–14	RMS current (calculated from shunt value and Vamp); Secondary current CT in 1/100 mA	3101 31.01 mA 12034 120.34 mA	0...36 mA (1 Ohm) 0...360 mA (0.1 Ohm)
Isec (avg-long)	uint16	15–16	Moving Average Filter since Power Up above Isec (current); calculation (exponent=4): Filtered Value = (15 * oldValue + newValue) / 16; secondary current CT in 1/100 mA		"
Isec (avg-short)	uint16	17–18	Average value filter with Reset at last LoRaWAN upload (max. 600 values); secondary current CT in 1/100 mA		"

Name	Type	Bytes	Description	Example	Value range
Isec (min)	uint16	19–20	Minimum secondary current since last LoRaWAN uplink package; secondary current CT in 1/100 mA		"
Isec (max)	uint16	21–22	Maximum secondary current since last LoRaWAN uplink package; secondary current CT in 1/100 mA		"
Meas. Counter	uint16	23–24	Number of measurements since last LoRaWAN upload	0x000f 15 Measurements since last uplink	x (uint32)
Last upload	uint16	25–26	Seconds since last upload/duration of creating average value; Time in seconds since last uplink		x seconds
Temp	int16	27–28	Temperature in 1/10 °C; nRF52832 temp sensor +-5°C accuracy;		
Power Loss?	uin8	29	1 = Power Loss detected 0 = No Power loss detected; when Isec < 0.75 mA		

5   Installation

5.1   First time charging of HarvyLR

Prerequisite: HarvyLR is set up on a LoRaWAN server (e.g. deZem IoT platform, i.e. deZem.io).

1.   For initial charging, we recommend connecting the HarvyLR to the computer via the optional USB adapter cable. As soon as values are transmitted from the sensor to the LoRaWAN server, the HarvyLR is sufficiently charged. The charging time is max. 6 min. when using the USB adapter cable.
2.   Disconnect the HarvyLR from the computer and remove the USB adapter cable.

Alternatively, the sensor can also be connected directly without charging beforehand, as described in the next section. In this case, approx. 2 mAh are required for charging. Depending on the primary current, it may take a different amount of time until the HarvyLR transmits values for the first time.

5.2   Connecting the sensor

1.   Connect the HarvyLR to the appropriate deZem clamp-on current transformer for an RMS current measurement or to the adapter cable (for 4–20 mA signals). The sensor housing can be operated freely suspended or fixed with cable ties.

HINT

For the 4-20 mA signal there is no need to pay attention to the polarity.

WARNING

NEVER connect a clamp-on current transformer to a conductor unless it is connected to the HarvyLR or other terminal device. Otherwise, high voltages may build up at the transformer output. It is imperative that additional insulation is fitted between the conductor and the clamp-on current transformer in order to comply with the above-mentioned SELV requirements (cf. chapter 2, Safety instructions) of sensors/current sources connected externally to the device.

5.3   Configuration in deZemAd

Type of current transf.	Max. primary current [in A]		Min. primary current [in A]	Nominal secondary current [in mA]	Current ratio	Max. wire-Ø [in mm]	Max. wire cross-sect. [in mm²]	Scale factor deZemAd
	HarvyLR-360	HarvyLR-36	deZem clamp-on current transformers					
T80	80	50	0,8	40	2000	5,6	25	2
T80/26,6	80	75	1	26,7	3000	5,6	25	3
T150/40	150	94	1	40	3750	8	50	3,75
T300	300	30	0,9	250	1200	13,8	150	1,2
T300/40	300	188	1,6	40	7500	13,8	150	7,5
T500	500	50	0,8	250	2000	19,5	300	2
T500/40	500	312	2,8	40	1250	19,5	300	12,5
			4 –20 mA analog signals					0,001

6   Disposal

In Germany and for products delivered directly from Germany: All devices must be disposed of in an orderly manner. Due to the applicable regulations, the electrical and electronic devices of deZem GmbH may not be disposed of via the public collection points for electrical devices. The complete electronic devices of deZem GmbH must be returned to us for disposal. The prepaid delivery must be sent to the following address:

deZem GmbH, Wilmersdorfer Str. 60, 10627 Berlin.

In countries of the European Union outside Germany: Information on the correct disposal can be obtained from your dealer or the responsible sales department.

7   Technical Data

Type	HarvyLR-36	HarvyLR-360
Housing dimensions	HxWxD: 22x69x49 mm	
Weight	50 g	
Power supply	Self-powered, Input voltage max. 3 V	
Input current	0–25 mA AC 0–36 mA DC	0–250 mA AC 0–360 mA DC
Connection	1x JST-socket, suitable for deZem clamp-on current transformers	
IoT protocol	LoRaWAN v1.03, Class A Device, EU863-870 Mhz	
Permissible ambient conditions	Temperature: 0–55 °C Humidity: 30–60 % Protection type: IP20	
Permissible transport conditions	Temperature: -10–55 °C Humidity: 20–70 %	

HarvyLR Default parameter

Name	Typ	Bytes
ShuntVal	1000	Shunt resistance in [mOhm] When set to 100, actually 91 is used!
TxMinInterval	900	Min. LoRaWAN upload interval in [s]
LoRaLevel	3100	Min. voltage level for regular LoRaWAN uploads in [mV]
ColdStartEndLevel	2700	Min. voltage level for the end of initial cold start in [mV]. As soon as once Vsys > ColdStartEndLevel, the sensor starts measuring
ExpFilterExponent	4	Exponential filter exponent (2^x), Default: 4 -> 16
IsecBrownout	500	Isec value in [µA], that considered a "brownout" and sent via confirmable uplink
FastSampleLevel	3500	System voltage in [mV], when above sample every second
FilterAbs	180	Absolute Vamp difference in [mV], to trigger uplink
FilterRel	85	Required relative change of Isys in [%] to trigger instant upload. Value [1..100] e.g. => +/- 15 %
LogUart	false	Set to „true" to print more detailed logs on UART (needs more power). Even with „false", some logs are generated

LoRaWAN Frequencies

Direction	Frequency	Bandwidth	Modulation	Duty Cycle	Transmission power
RX + TX	868.1 MHz	+/- 0.0625 MHz	LoRa	≤ 1%	≤ 14 dBm
RX + TX	868.3 MHz	+/- 0.0625 MHz	LoRa	≤ 1%	≤ 14 dBm
RX + TX	868.3 MHz	+/- 0.0625 MHz	LoRa	≤ 1%	≤ 14 dBm
RX + TX	868.3 MHz	+/- 0.125 MHz	LoRa	≤ 1%	≤ 14 dBm
RX + TX	868.5 MHz	+/- 0.0625 MHz	LoRa	≤ 1%	≤ 14 dBm
RX + TX	867.1 MHz	+/- 0.0625 MHz	LoRa	≤ 1%	≤ 14 dBm
RX + TX	867.5 MHz	+/- 0.0625 MHz	LoRa	≤ 1%	≤ 14 dBm
RX + TX	867.7 MHz	+/- 0.0625 MHz	LoRa	≤ 1%	≤ 14 dBm
RX + TX	867.9 MHz	+/- 0.0625 MHz	LoRa	≤ 1%	≤ 14 dBm

RX: receive mode, TX: transmit mode

8 Support

Do you have any further questions about set-up and operation? Our deZem team will be happy to answer them.

Give us a call: +49 30 3180 0730 or write us an email to support@dezem.de.