

PAYLOAD

EHKV Euris 3L telegram structure

Rev. 1.2

INNOTAS GMBH



15 April 2026

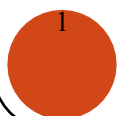
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1 Table of Contents

2	REVISION HISTORY	1
3	PRELIMINARY REMARKS	2
4	UPLOADED LOGS	2
4.1	MINUTES 1.....	2
4.2	MINUTES 2.....	3
4.3	MINUTES 4.....	4
4.4	MINUTES 5.....	5
4.5	MINUTES 6.....	6
4.6	MINUTES 9.....	7
4.7	MINUTES 11	8
4.8	NUMERICAL REPRESENTATION	10
4.9	ERROR AND STATUS BITS	10
4.10	TRANSMISSION INTERVALS	11
4.11	CLOCK TIME UPDATE VIA LORA	11
5	DOWNLOAD LOGS	11
5.1	SET DEVICE PIN	12
5.2	QUERY NUMBER OF BYTES SENT	12
5.3	CHANGE THE ANNUAL REFERENCE MONTH	12
5.4	CHANGE TRANSMISSION INTERVAL	12
5.5	PERFORM ONE-OFF REJOIN	13
5.6	RETRIEVING 12 MONTHLY VALUES	13
5.7	RETRIEVING 12 HALF-MONTHLY VALUES.....	13
5.8	RETRIEVING TELEGRAM 11.....	13
5.9	CHANGING KC/KQ VALUES	13
5.10	CHANGING THE CONFIRM MODE	14
5.11	CHANGE DISPLAY SETTINGS IN THE EHKV	14
5.12	OVERVIEW OF DOWNLOAD TELEGRAMS.....	14

2 Revision index

REVISION	DATE	CHANGE
1.0	14 January 2025	First edition based on the Euris 2 L version
1.1	12 June 2025	Additions and examples
1.2	15 April 2026	Swap display mode bit (VERB/ZS)



PAYLOAD

Telegram structure EHKV Euris 3L

3 Preliminary remarks

The EHKV EURIS 3L is a comprehensive revision which includes changes to key functions compared with the first version.

Among other things, a higher LoRa stack (1.0.4) has been implemented.

Existing telegrams have been modified, and new ones have been added. This applies to both upload and download telegrams.

It is therefore necessary to create a new device profile in the LoRa server when using the Innotas EHKV Euris 3L.

4 Upload protocols

Various transmission modes are available, which differ in terms of transmission frequency and the information transmitted:

The '2 days' transmission mode (protocol 1 every 2 days) is set as standard, unless the customer has specified a different setting.

The customer can change the transmission modes on the device via the optical head and IrDA interface or remotely via a download protocol.

The identifier for the log type currently being transmitted is encoded in the port number.

The log number is the same as the port number.

Protocol 1

Used for transmission modes '1 days', '2 days' and '4 days'

Protocol structure:

4-byte current counter reading as a 4-byte number in units.

4 bytes: Meter reading as at the annual reference date as a 4-byte number in units.

4 bytes: Meter reading at the end of the last month as a 4-byte number in units

1 byte: last month and year-end month, each as a half-byte value from 1 to 12

2 bytes: error and status code

Readings are taken once a year (annually) at the end of a month selected by the user (annual reference date) and additionally at the end of each month (monthly reference date).

At the end of the 'annual reference month' selected by the user, the two meter readings are identical.

Payload example: 0x0001e240000026940000007b5c207c

- ZS:123456, STYZS:9876, STMZS:123, Month_Last:5, Year_Month:12,
- Status 0x207c

4.2 Protocol 2

Protocol 2 is a special telegram for using the EHKV as a thermometer.

The room sensor is used as the temperature sensor. If a remote sensor is connected at the time of commissioning, this is used as the temperature sensor.

The temperature is recorded every 4 minutes. The telegram is sent hourly. This means that 15 temperature readings from the last hour are transmitted.

The temperature measurement range is 0°C to 110°C. If the temperature exceeds this range, only 110°C is recorded; if it falls below the range, 0°C is recorded.

If the EHKV's room sensor is used for measurement, the temperature at the EHKV must be between 0°C and 70°C only, as higher temperatures can damage the battery and must be avoided.

If the remote sensor is used, temperatures between -0°C and 110°C may be present at the remote sensor and measured; however, the 0°C–70°C range still applies to the EHKV, which must be taken into account when selecting the installation location.

Protocol structure:

4-byte timestamp (internal time in the EHKV at the time of the last temperature measurement)

1 byte: temperature measured within the last 4 minutes (value 1 = latest temperature measurement) 1

byte: temperature measured 4–8 minutes ago (value 2 = penultimate temperature measurement)

1 byte: temperature measured 8–12 minutes ago (value 3)

...

1 byte: temperature measured 56–60 minutes ago (value 15)

2 bytes: error and status code

The error and status code has been adapted to the thermometer function, and the following bits are set to 0:

- RF traffic overflow

-Tampering

-Display in the EHKV as meter reading/consumption

Due to the frequent telegrams, the thermometer's battery life is limited and will range between 4 and 8 years, depending on operating conditions

The display shows the last measured temperature in a cyclical pattern (display on for 2 seconds – off for 2 seconds).

Timestamp format:

4 bytes (32 bits) Order: Bit 31 ... Bit 0 (msb first)

Bit 31 ... Bit 26 6 bits for the year minus 2000 (range 0 to 63 = years 2000 to 2063)

Bit 25 ... Bit 22 4-bit month

Bit 21 ... Bit 17 5-bit day

Bit 16 ... Bit 12 5-bit hour

Bit 11 ... Bit 6 6-bit minute

Bit 5 ... Bit 0 6-bit seconds

Payload example: 0x6598d14b161516171616141616161718191817207c

- 12 June 2025 13:05:11 Time of last measurement
- 22°C Temperature at 12 June 2025 13:05:11
- 21°C Temperature at 12 June 2025 13:01:11
- 22°C Temperature at 12 June 2025 12:57:11
- 23°C Temperature at 12 June 2025 12:53:11
- 22,22,20,22,22,22,23,24,25,24,23 etc
- 0x7207c Status



4.3 Protocol 4

Used for the 'history' transmission interval

Protocol structure:

4 bytes: Current meter reading as a 4-byte number in units.

4-byte meter reading as at the annual reference date as a 4-byte number in units.

4 bytes: Meter reading at the end of the last month as a 4-byte number in units

1 byte: last month and year-end month, each as a half-byte value from 1 to 12

4 bytes: timestamp (internal time in the EHKV at the time the measurement values were recorded) 1 byte: average temperature of the last full hour (-1h)

1-byte average temperature for the penultimate full hour (-2h)

...

1 byte average temperature for the full hour (-24h)

2 bytes: error and status code

Please note: the internal clock is used to determine the time, which may differ from the server time. To calculate the average temperature, the mean value is taken from 15 measurements within an hour. The radiator sensor and uncorrected temperature readings are used.

Please note that the cyclical recording of temperature readings in privately occupied dwellings by the landlord may contravene data protection regulations and is therefore prohibited. Please familiarise yourself with the applicable regulations in your country.

Payload example:

0x0001e240000026940000007b5c6599000011101010101112141618191a1a1b1b1b1b1a191715131211207c

- ZS:123456, STYZS:9876, STMZS:123, Month_Last:5, Year_Month:12,
- 12 June 2025 16:00:00 Time of last internal measurement
- DST1h:17 15:00:00–16:00:00 Average temperature
- DST 2h:16 14:00:00–15:00:00 Average temperature
- DST 3h:16 13:00:00–14:00:00 Average temperature
- DST4h:16 etc.

STATUS: 0x207c

○	OPT_RADIO:	"ON"
○	OPT_2F:	false
○	ERROR_MESS:	false
○	ERROR_RFTRAFFIC:	false
○	ERROR_SABOT:	false
○	ERROR_BATTLOW:	false
○	ERROR_RF:	false
○	OPT_ADR:	"ON"
○	ERROR_RESET:	true
○	INTERVAL:	"4DAY"
○	ERROR_CS:	false
○	OPT_LINK:	"ON"
○	OPT_ANZ:	"ZS"
○	INSTALL:	"2min"

4.4 Report 5

Record 5 contains the last 12 consumption values at the end of the month since the annual reference date as a 2-byte number

Protocol structure:

1 byte for the month of the first value, a number from 1 (January) to 12 (December) e.g. 11 for November

1 byte: year of the first value minus 2000 i.e. 24 for the year 2024

2 bytes: cumulative consumption since the last annual reference date recorded at the end of November
2 bytes: cumulative consumption since the last annual reference date recorded at the end of October

...

2 bytes of cumulative consumption since the last annual cut-off date. Recorded at the end of December of the previous year
Protocol 5 is only sent upon request by the server.

Note: If, for example, the annual reference date is the end of August and the telegram is retrieved in January, the monthly value for September is equal to the consumption in September, the monthly value for October is the cumulative consumption for September and October, and the monthly value for November is the cumulative consumption for September, October and November, and so on.

The monthly value for August is the sum of consumption figures for the months from September to August since the previous year's annual reference date (which is identical to the consumption in the previous year), and the monthly value for July is the sum of consumption figures for the months from September to July since the previous year's annual reference date

Example payload:

0x0519007b009b00a700b100d300f000e600dc008c0062002b000c

- Month: 5
- YEAR: 2025
- ZSM:
 - 0: 123
 - 1: 155
 - 2: 167
 - 3: 177
 - 4: 211
 - 5: 240
 - 6: 230
 - 7: 220
 - 8: 140
 - 9: 98
 - 10: 43
 - 11: 12

4.5 Log 6

Record 6 contains the last 12 consumption readings taken in the middle of the month (recorded at 24:00 on the 15th of the month) since the annual reference date, as a 2-byte number

Protocol structure:

1 byte: month of the first value, a number from 1 (January) to 12 (December) e.g. 11 for November

1 byte: year of the first value minus 2000 i.e. 24 for the year 2024

2 bytes: cumulative consumption since the last annual reference date recorded in mid-November
2 bytes of accumulated consumption since the last annual reference date recorded in mid-October

...

2 bytes of cumulative consumption since the last annual reference date. Recorded in mid-December of the previous year Protocol 6 is only sent upon request by the server.

The comments from Protocol 5 apply here mutatis mutandis.

Example payload:

0x0519007b009b00a700b100d300f000e600dc008c0062002b000c

- Month: 5
- YEAR: 2025
- ZSHM:
 - 0: 123
 - 1: 155
 - 2: 167
 - 3: 177
 - 4: 211
 - 5: 240
 - 6: 230
 - 7: 220
 - 8: 140
 - 9: 98
 - 10: 43
 - 11: 12

4.6 Log 9

Protocol 9 contains the total number of bytes transmitted to date, broken down by spreading factor.

Protocol structure:

4 bytes: Number of bytes transmitted in SF7

4 bytes: Number of bytes transmitted in SF8

4 bytes: Number of bytes transmitted in SF9

4 bytes: Number of bytes transmitted in

SF10 4 bytes: Number of bytes transmitted

in SF11 4 bytes: Number of bytes

transmitted in SF12 (Number of bytes with
LSB first!)

2 bytes Number of JOIN attempts

2 bytes: Controller VDD in mV

Protocol 9 is only sent upon request by the server. Example payload:

```
0x17010000000000000000000000000000000000c10000000050b5f
```

- | | |
|----------------|------|
| • SF7: | 279 |
| • SF8: | 0 |
| • SF9: | 0 |
| • SF10: | 0 |
| • SF11: | 0 |
| • SF12: | 193 |
| • VDD_mV: | 2911 |
| • JOINCOUNTER: | 5 |

4.7 Protocol 11

Protocol 11 is sent as an installation telegram following initial activation and thereafter only upon request by the server.

Protocol structure:

4 bytes: Current meter reading as a 4-byte number in units. 1

byte: Hardware version

1 byte software version 4

bytes BCD device

number

1 byte chip temperature in °C

2 bytes: Controller VDD in mV 2

bytes: K1

2 bytes K2

2 bytes KQ in watts

1 byte battery capacity in %

1 byte: number of days until forced rejoin (cyclical force rejoin); 0 means disabled

2-byte option switch

2 bytes error and status code

Force Rejoin causes the modules to start at **random** times during the day after x days. This ensures that the telegrams following a Force Rejoin are spread throughout the day. To avoid excessive data traffic, Force Rejoin is limited to values of ≥ 10 days. The setting '0' disables Force Rejoin completely.

Unlike the initial join process, no installation telegrams are sent after Force Rejoin

Bits	Description Option switches (flags)
15+14	Confirm mode: b00 = Disable, b01 = ALL, b10 = every 2 telegrams, b11 = every 5 telegrams
13	1= OTAA, 0= ABP
12	1= ADR on, 0= ADR off
11	1= LINKCHECK on, 0= LINKCHECK off
10	1= RTC AUTO SYNC on, 0= RTC AUTO SYNC off
9	1= Unit scale, 0= Product scale
8	Reserve
7–5	Transmission interval, b000=Thermometer; b001=History, b010=1 Day, b011=2 Days, b100=4 Days, b101=Option 1, b110=OPTION 2, b111=OPTION 3
4-0	Reserve

Example payload:

0x0001e240410600000000190b61060209c403e8ff0afe80207c

- ZS:123456
 - HW_VERSION: "41"
 - SW_VERSION: "06"
 - GRNo: "00000000"
 - ChipTemp: 25
 - VDD_mV: 2913
 - K1: 1538
 - K2: 2500
 - KQ: 1000
 - Batt: 255
 - ForceReJoin: 10
- - ADR: true
 - OTAA: true
 - LINKCHECK: true
 - INTERVAL: "4DAY"
 - RTC_AUTO: true
 - CONFIRM: "5TEL"
 - ESCALA: true
 - RES2: false

Status:

- ERROR_RFTRAFFIC: false
- OPT_ANZ: "ZS"
- OPT_RADIO: "ON"
- ERROR_SABOT: false
- ERROR_BATTLOW: false
- OPT_2F: false
- INTERVAL: "4DAY"
- ERROR_CS: false
- INSTALL: "2min"
- OPT_LINK: "ON"
- OPT_ADR: "ON"
- ERROR_MESS: false
- ERROR_RF: false
- ERROR_RESET: true



4.8 Numeric representation

Value	Display
Current meter reading	Hex, MSB first, e.g. 0000 012C = 300 units
Meter reading as at the reference date	Hex, MSB first, e.g. 0001 5C40 = 89154 units
Month of the annual reference date	Hex, e.g. 0x01 = January; 0x0C = December
Last month and annual reference month	Hex, e.g. 0x3C = March/December
Kc values	Hex, /1000, e.g. 0x0602 = 1.538
KQ values	Hex, in watts, e.g. 0x03E8 = 1000 W
Number of bytes sent	Hex, LSB first , e.g. 2A01 0000 = 298 bytes
Number of JOIN attempts	Hex, two bytes, e.g. 00 04 = 4 join attempts
Device number	Hex 4-byte BCD, LSB first, e.g. 08000000 = "00000008"

4.9 Error and status bits

Byte	Bit No.	Meaning/Function
MSB	7	RF traffic overflow
MSB	6	2-sensor/remote sensor
MSB	5	Reset error
MSB	4	HF error
MSB	3	CS error
MSB	2	Battery low
MSB	1	Sabotage
MSB	0	Measurement error
LSB	7	Display in the EHKV as consumption / meter reading
LSB	6	Radio on/off
LSB	5	Link Check on/off
LSB	4	ADR off/on
LSB	3	Transmission interval according to bits 0+1+2 (0) Transmission interval 2 minutes (1)
LSB	2	Transmission interval, b000=thermometer; b001=Option 4, b010=1 Day, b011=2 days, b100=4 days, b101=Option 1, b110=OPTION 2, b111=OPTION 3
LSB	1	
LSB	0	

RF traffic overflow is a status bit that is set if the number of 320 transmission bytes was exceeded on the previous day. The spreading factor is not taken into account here, even though the warning should be regarded as more critical in the case of large spreading factors.

It is automatically reset if the total for a full day falls below this number.

This alerts the operator to the fact that there is a problem in the interaction between the server and the EHKV. A one-off or very rare occurrence of RF traffic overflow is not critical. This happens, for example, when a device is commissioned and sends installation telegrams. If it occurs frequently, e.g. several times

a month or on several consecutive days, the cause should be investigated to avoid reducing battery life. As a rule, a setting on the server will be the critical factor.

A two-byte counter is implemented in the module, which counts the days with RF traffic overflow.

4.10 *Transmission intervals*

The following transmission intervals are available:

every day	Use of Protocol 1
every 2 days	Use of Protocol 1
every 4 days	Use of Protocol 1
every day	History, use of Protocol 4
every 2 minutes	Installation telegrams (Protocol 11 only after initial commissioning for 20 telegrams)
every hour	Protocol 2 (only when using the EHKV as a thermometer; battery life is limited)

After the device starts up (Join), 20 telegrams are sent with a cycle time of 2 minutes for commissioning (the cycle time may be slightly longer if the duty cycle is exceeded due to large spread factors). The cycles start at the 'Join' time; they do not run synchronously with the top of the hour! The first telegram (cycle 0) is sent once the connection has been successfully established (Join). When evaluating consumption values, the possible time deviation between the internal time and the server time must be taken into account.

The current cycle time can be reset to 2 minutes via the optical interface for a further 20 installation telegrams. Please note: repeated use of the 2-minute mode shortens the battery life!

You can switch between the individual standard intervals via download logs.

Updating the time via LoRa

The EHKV can request the current time from the LoRa server and adjust its internal clock accordingly.

To do this, the request is generated on the 17th of each month or after a successful join, and sent to the server with the next regular telegram. The server transmits the current time immediately following the telegram.

5 Download logs

Immediately after receiving a telegram, the server can send data or commands to the device. The download logs must be sent on port 2.

Please note that frequent use of download protocols (e.g. daily retrieval of optional telegrams) places an additional strain on the battery and reduces the operating time of the devices.

If a download log does not request a response log, an installation telegram is sent as a response following successful receipt by the EHKV, serving as an acknowledgement for the user.

Example:	Set device PIN	The EHKV sends an installation telegram in response
	Retrieving monthly values	The EHKV sends monthly values but no installation telegram



5.1 Set device PIN

The command for setting the device PIN is 0x56 PIN0 PIN1

e.g. 0x56 0x12 0x34 sets the device PIN to 1234.

The factory-set PIN is 0000 and is ignored by the device during communication. Only decimal numbers are accepted.

5.2 Querying the number of bytes sent

The command 0x57 instructs the device to send the transmitted byte statistics (protocol 9).

5.3 Changing the annual reference month

The annual reference date value (meter reading on the reference date) is recorded once a year at the end of a pre-selected month. The factory default is set to December.

The command 0x58 followed by the month (0x01 = January...0x0C = December) sets a different reference month.

If the reference month is changed retrospectively, the last reference value will continue to be transmitted and will be reset on the new reference date.

Changing the reference month means that the consumption reading is accumulated over more or fewer than 12 months and is only reset thereafter. We therefore recommend avoiding changing the reference month retrospectively.

Changing the transmission interval

To change the transmission interval/transmission telegram, send command 0x59, followed by the value of the first 3 bits from the table:

5.4

Command byte	Meaning/Function
Bit 0	Transmission interval, b000=Thermometer, b001=History, b010=1 Day, b011=2 days, b100=4 days, b101=Option 1, b110=Option 2, b111=Option 3
Bit 1	
Bit 2	
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	

e.g.: a telegram for all four days = 0x5904h



5.5 Perform a one-off ReJoin

When this command (0x60) is issued, the device will leave the network and initiate a one-off rejoin process. This command can be useful when the network configuration changes (e.g. when moving to a new server). The command expects a 1-byte parameter specifying the number of hours after which the rejoin process begins. The valid range is [0..255]h.

If set to zero, the rejoin is triggered immediately upon receipt of the response telegram.

This one-off ReJoin is unrelated to the ForceReJoin parameter, which triggers a cyclical ReJoin every x days and forms part of the configuration.

No installation telegrams are sent after the one-off ReJoin.

Immediately after the one-off ReJoin, a regular telegram is sent in accordance with the setting. Subsequent telegrams are sent in accordance with the set cycle time.

Example: (The setting is to send a standard telegram every 2 days)

The download command 0x600C '→' – ReJoin 12 hours after receipt of the log – is made available on the server

EHKV sends a regular telegram at the cycle time

It receives the command via the return channel.

EHKV sends an installation telegram as an acknowledgement. EHKV performs a ReJoin after 12 hours

Immediately afterwards, EHKV sends a standard telegram. EHKV sends further standard telegrams every 2 days.

5.6 Retrieving 12 months' worth of data

Command 0x62 triggers a one-off transmission of Protocol 5 (last 12 monthly values).

5.7 Retrieving 12 half-monthly values

Command 0x68 triggers a one-off transmission of Protocol 6 (last 12 half-monthly values).

5.8 Retrieving telegram 11

Telegram 11 is sent 20 times as an installation telegram following the initial join process and contains information on the device's configuration. If a single installation telegram is to be resent at a later date, command 0x63 is used.

Changing KC/KQ values

KC/KQ values can be changed via radio.

This may be useful if the EHKV is to be operated in product scale, but the radiator has yet to be specified. The switch from unit scale to product scale can only be made once via LoRa. If the device is already in product scale, the command is ignored.

The command is 0x64 followed by K1 (2 bytes), K2 (2 bytes) and KQ (2 bytes).

Example: 0x64 0602 09C4 03E8 K1= 1.538 K2= 2.5 KQ= 1000

If the KC/KQ values are changed, the EHKV internally recalculates the meter reading to the new values on a one-off basis. It is recommended that tenants be informed of such a change to explain any 'jumps' in the display reading.

5.10 Changing Confirm Mode

To change the Confirm Mode (i.e. for every how many telegrams a confirmation is requested), send the command 0x66, followed by the value of the first 2 bits from the table:

Command byte	Meaning/Function
Bit 0	b00=Disable, b01=all, b10=every 2 telegrams, b11=all 5 telegrams
Bit 1	
Bit 2	
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	

e.g.: 0x66 02h Confirm both 2 telegrams

5.11 Changing the display on the EHKV

The display can show either the absolute meter reading or the consumption since the last annual reference date. This command allows you to switch between the two displays. This applies to both the values and their labels.

Command 0x67 00h→ Display as meter reading

Command 0x67 01h→ Display as consumption since the reference date

Overview of download telegrams

5.12

Command	Parameter	Meaning/Function	Acknowledgement*
0x56	2 bytes	Set device pin (0000 – 9999)	yes
0x57	None	Query number of bytes sent	no
0x58	1 byte	Change annual reference date	yes
0x59	1 byte	Change transmission telegram/transmission interval	yes
0x60	1 byte	Execute a one-off ReJoin in x hours	yes
0x62	without	Retrieve log 5 with 12 monthly values	no
0x63	without	Retrieval of a single installation telegram	no
0x64	3 × 2 bytes	Change Kc and Kq values	yes
0x66	1 byte	Change Confirm Mode	yes
0x67	1 byte	Change display (consumption/meter reading)	yes
0x68	None	Retrieve log 6 with 12 half-monthly values	no

*Commands marked with 'no' do not generate an additional installation telegram as an acknowledgement, as they send a (different) response telegram anyway.