Description of the Payload

Wireless Sensor Node of the Series WILSEN.valve

WS-VAL-*-F406-B41-*-02

PEPPERL+FUCHS

LoRaWAN

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General Information on Operating WILSEN devices in a LoRaWAN Environment

Rejoin

A WILSEN device rejoins (= logs in to the LoRa network server [LNS] again) during operation "only if required." Corresponding detection mechanisms are active in the device to detect whether it is still connected to the LNS. If the device is not connected, the WILSEN rejoins the network automatically.

Unconfirmed/Confirmed Messages

By default, the WILSEN devices are set to "unconfirmed messaging". This type of transmission ensures the lowest possible load on the LoRa network. If your application requires a confirmed messaging, you can change the type of messaging in the WILSEN device to "confirmed". For details, refer to the WILSEN.valve manual.

Downlink / Remote Control via LoRa

The WILSEN devices are LoRa class A devices.
Besides the typical transmission of uplink messages, the device is able to accept and process downlink messages coming from the LNS. The commands supported by the device can be found in the separate documentation "WILSEN Downlink Description". You can download this from the product details page at www.pepperl-fuchs.com.

General Structure of a LoRaWAN Payload

The general structure of a LoRaWAN payload is as follows:

Commands of physical layer	Commands of MAC layer	Application payload	MIC of MAC layer	CRC of physical layer

Application data package 1	ADP2	ADP3	…	ADPn

Structure of the application payload data

Length	Universal Unique identifier (UUID)	Data
0x06	0x0201	0x41C567C9

Content of an application data package

The WILSEN.valve provides its data and information via three different payloads.

Payload 1

Payload 1 contains the sensor data (excluding GPS position data) and is typically used in all applications in which GPS position data is not required.
The transmission of payload 1 and its frequency are determined by the settings in the "LoRaWAN configuration submenu" of the WILSEN app (see the WILSEN.valve manual).

Payload length: 20 bytes

Structure of the application data payload:

ADP1	ADP2	ADP3	ADP4
Valve status	Detailed sensor status	Temperature in °C	Battery status

The table below provides details on the individual data packages:

Universally Unique Identifier UUID (16bit)	Data Package Description	Data Type	Data Length (Bytes)	Additional Information
0x0C02	valve_status	uint8	1	Valve position(s)
0x0C03	sensor_detail	uint16	2	Detailed status of the frontend sensors
0x0201	temp_celcius	float	4	Temperature in °C
0x5101	battery_vol	uint8	1	Battery status: value is provided in volts/10

Data packet „Valve_status“

The positions of the monitored valves are transmitted in the "Valve_status" data packet. The data byte is divided into the status information for valve 1 and valve 2 as follows:

Valve_Status = 0xBA

Here A stands for the status of valve 1 and B for the status of valve 2.

Fragments A and B can each have the following hexadecimal values and thus provide information about the respective valve position:

Value	Valve Position
0x0	Closed
0x1	Open
0x2	Undefined
0x3	Not connected
0x7	Not acquired

Note
For WILSEN.valve versions that can only monitor 1 valve, "0x3" (= not connected) is permanently transmitted as a value in fragment B, as these sensor inputs are not available on these devices.

Data packet „Sensor_detail“

The states of the individual sensors used to acquire the valve position are provided in the "Sensor_detail" data packet. The two data bytes are assigned to the individual sensors as follows:

Sensor_Detail = 0xDCBA

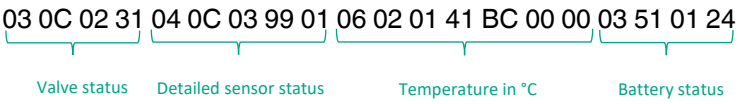
Fragment A contains the detailed information on sensor 1, B on sensor 2, C on sensor 3 and D on sensor 4. Sensors 1 and 2 are always assigned to valve 1, sensors 3 and 4 belong to valve 2.

Each fragment can have the following hexadecimal values and thus provides information about the status of the respective sensor:

Value	Sensor status
0x00	Low
0x1	High
0x7	Not acquired
0x8	Short circuit
0x9	Not connected
0xA	Impermissible operating state

Note
For WILSEN.valve versions that can only monitor 1 valve, "0x9" (= not connected) is permanently transmitted as a value in fragments C and D, as these sensor inputs are not available on these devices.

Below is an example of this payload:



Payload 2

Payload 2 contains the sensor data including GPS position data and is typically used in all applications in which GPS position data is required in addition to the sensor data. Payload 2 can be used in addition to or in place of payload 1.

The transmission of payload 2 and its frequency are determined by the settings in the "GPS configuration submenu" of the WILSEN app (see the WILSEN.valve manual).

ADP1	ADP2	ADP3	ADP4	ADP5	ADP6
Valve status	Detailed sensor status	Temperature in °C	Battery status	Geographic latitude	Geographic longitude

Payload length: 34 bytes

Structure of the application data packages:

Universally Unique Identifier UUID (16bit)	Data Package Description	Data Type	Data Length (Bytes)	Additional Information
0x0C02	valve_status	uint8	1	Valve position(s)
0x0C03	sensor_detail	uint16	2	Detailed status of the frontend sensors
0x0201	temp_celcius	float	4	Temperature in °C
0x5101	battery_vol	uint8	1	Battery status: value is provided in volts/10
0x5001	latitude	uint32	4	Geographic latitude: provided as a decimal value by calculating the degree of latitude/1000000
0x5002	longitude	uint32	4	Geographic longitude: provided as a decimal value by calculating the degree of longitude/1000000

Data packet „Valve_status“

The positions of the monitored valves are transmitted in the "Valve_status" data packet. The data byte is divided into the status information for valve 1 and valve 2 as follows:

Valve_Status = 0xBA

Here A stands for the status of valve 1 and B for the status of valve 2.

Fragments A and B can each have the following hexadecimal values and thus provide information about the respective valve position:

Value	Valve Position
0x0	Closed
0x1	Open
0x2	Undefined
0x3	Not connected
0x7	Not acquired

Note
For WILSEN.valve versions that can only monitor 1 valve, "0x3" (= not connected) is permanently transmitted as a value in fragment B, as these sensor inputs are not available on these devices.

Data packet „Sensor_detail“

The states of the individual sensors used to acquire the valve position are provided in the "Sensor_detail" data packet. The two data bytes are assigned to the individual sensors as follows:

Sensor_Detail = 0xDCBA

Fragment A contains the detailed information on sensor 1, B on sensor 2, C on sensor 3 and D on sensor 4. Sensors 1 and 2 are always assigned to valve 1, sensors 3 and 4 belong to valve 2.

Each fragment can have the following hexadecimal values and thus provides information about the status of the respective sensor:

Value	Sensor status
0x00	Low
0x1	High
0x7	Not acquired
0x8	Short circuit
0x9	Not connected
0xA	Impermissible operating state

Note
For WILSEN.valve versions that can only monitor 1 valve, "0x9" (= not connected) is permanently transmitted as a value in fragments C and D, as these sensor inputs are not available on these devices.

Below is an example of this payload:

03 0C 02 31 04 0C 03 99 01 06 02 01 41 BC 00 00 03 51 01 24 06 50 01 02 F1 C4 3C 06 50 02 00 7D 23 51

Note
If the device was unable to determine a valid GPS position, the following values are transmitted in the payload:

- Longitude: 0.000000
- Latitude: 0.000000

Payload 3

The sensor transmits payload 3 ("heartbeat") every 24 hours, regardless of payload 1 and payload 2. Payload 3 contains information about the sensor in the form of counter readings for the frequency of front-end sensor queries, the number of LoRa transmissions, the number of times the GPS position was determined, and the battery status.

The payload is structured is as follows:

ADP1	ADP2	ADP3	ADP4	ADP5
P+F serial number	Counter reading for LoRa transmissions	Counter reading for GPS position determination	Counter reading front-end sensor queries	Battery status

Payload length: 38 bytes

Structure of the application data packages:

Universally Unique Identifier UUID (16 bit)	Data Package Description	Data Type	Data Length (Bytes)	Additional Information
0x2A25	SerialNr	uint8(14)	14	P+F serial number, ASCII-coded
0x3101	lora_count	uint16	2	Counter reading for LoRa transmissions: number of LoRa transmissions
0x3102	gps_count	unit16	2	Counter reading for GPS position determination: number of times the GPS position was determined
0x3104	sensor_count	uint32	4	Counter reading front-end sensor queries: Number of status queries performed for the connected front-end sensors
0x5101	battery_vol	uint8	1	Battery status: value is provided in volts/10

Below is an example of this payload:

10 2A 25 34 38 30 30 30 30 30 30 36 33 39 39 39 39 04 31 01 00 9E 04 31 02 00 02 06 31 04 00 00 0D 2F 03 51 01 24

Note

This payload transmission cannot be modified. This payload is transmitted as a sign of life (=heartbeat) for the sensor even when the LoRa and GPS transmission intervals are switched off.