# Mutelcor LoRaWAN Payload Document

**Version: 1.6.0**



NOTES:

- Currently only **version 2** is in use
- Endianness: **Big-endian**
- The type of payload is indicated by the OpCode
- The version 2 payload might be extended in the future with additional OpCode(s) and potential additional data (e.g. voting or sensor data)
- New payload versions could be introduced in the future, always starting with the version

- We always send the battery-voltage in every message
- Voltage with alkaline batteries is approx. **3.1 Volt for full batteries** and **2.4 Volt for empty**
- After power-up / reset we by default start joining and/or sending after 30 seconds (unless there is an upload before (e.g. on button pressed), then we join and send immediately)

# 1. LoRa Panic Button with Confirmation MTC-XX-PB01 / 02

The upload fields in the payload in order:

| Field | For OpCode | Encoding | Start position | Size | Remark |
|---|---|---|---|---|---|
| Version | All | uint8 | 0 | 1 | Always 2 |
| Voltage | All | uint16 | 1 | 2 | [V] in 0.01 V steps, i.e. 100 = 1.00 V |
| OpCode | All | uint8 | 3 | 1 | 0x00: Heartbeat, 0x01: Alarm |
| Alarm ID | Alarm | uint16 | 4 | 2 | Only included when alarm confirm is configured |

**Example** panic button payload (length):

- **Heartbeat** (4): 02 01 4A 00
- **Alarm** (4): 02 01 49 01
- **Alarm when alarm confirm is configured** (6): 02 01 48 01 12 34

**The alarm can be confirmed by the downlink command to port 1.**

**Downlink** fields in the payload in order:

| Field | Encoding | Start position | Size | Remark |
|---|---|---|---|---|
| Version | uint8 | 0 | 1 | Always 2 |
| OpCode | uint8 | 1 | 1 | 0x60: Alarm confirm |
| Alarm ID | uint16 | 2 | 2 | Should match Alarm ID from Alarm upload |

**Examples** alarm confirm downlink payload (length), send to port 1:

- **Alarm confirm** (4): 02 60 12 34

## 2. LoRa Alarm Unit MTC-XX-AU01 / 02 / 03 / 04

**Upload** fields in the payload in order:

| Field | For OpCode | Encoding | Start position | Size | Remark |
|---|---|---|---|---|---|
| Version | All | uint8 | 0 | 1 | Always 2 |
| Voltage | All | uint16 | 1 | 2 | [V] in 0.01 V steps, i.e. 100 = 1.00 V |
| OpCode | All | uint8 | 3 | 1 | 0x00: Heartbeat, 0x01: Button pressed, 0x50: Alert |
| Duration | Alert | uint8 | 4 | 1 | Remaining Alert Duration [1 minute] |
| Feedbacks | Alert | uint8 | 5 | 1 | Active Alert Feedbacks, Bit 0 = Feedback 1, Bit 1 = Feedback 2, Bit 2 = Feedback 3, Bit 3 = Feedback 4<br>Only included when Duration not 0 |

**Examples** alarm unit upload payload (length):

- **Heartbeat** (4): 02 01 4A 00
- **Button pressed** (4): 02 01 49 01
- **Alert status**, No Alert (5): 02 01 48 50 00
- **Alert status**, Feedback 4 for 5 more minutes (6): 02 01 47 50 05 08

NOTE: Alert status is returned on every Alert downlink (see below)

**The alarm unit can be controlled by downlink commands to port 1.**

**Downlink** fields in the payload in order:

| Field | Encoding | Start position | Size | Remark |
|---|---|---|---|---|
| Version | uint8 | 0 | 1 | Always 2 |
| OpCode | uint8 | 1 | 1 | 0x50: Alarm feedback |
| Duration | uint8 | 2 | 1 | Alert Duration [1 minute]<br>When omitted an Alert status uplink with the current alerts is sent |
| Feedbacks | uint8 | 3 | 1 | Alert feedbacks to start, Bit 0 = Feedback 1, Bit 1 = Feedback 2, Bit 2 = Feedback 3, Bit 3 = Feedback 4<br>Only include when Duration is more than 0 |

**Examples** alarm unit downlink payload (length), send to port 1!:

- **Request Alert** status (2): 02 50
- **Stop current Alerts** (3): 02 50 00
- **Alert feedback 2** for 10 minutes (4): 02 50 0A 02
- **Alert feedback 3** for 10 minutes (4): 02 50 0A 04
- **Alert feedback 4** for 10 minutes (4): 02 50 0A 08
- **Extend current Alerts** for 10 minutes (3): 02 50 0A

## 3. LoRa Customer Feedback MTC-XX-CF01

The **upload** fields in the payload in order:

| Field | For OpCode | Encoding | Size | Remark |
|---|---|---|---|---|
| Version | All | uint8 | 1 | Always 2 |
| Voltage | All | uint16 | 2 | [V] in 0.01 V steps, i.e. 100 = 1.00 V |
| OpCode | All | uint8 | 1 | 0x00: Heartbeat, 0x02: Votes |
| # Buttons | Heartbeat, Votes | uint8 | 1 | Number of buttons |
| Button totals | Heartbeat, Votes | 3 * uint16 | 6 | Totals per button since start/reset/rollover |
| Button counts | Votes | 3 * uint8 | 3 | Counts per button since last votes uplink |

**Examples** of customer feedback device payload (length):

- **Heartbeat** (11): 02 01 45 00 03 03 E8 07 D0 0B B
  - button 1: total 1000,
  - button 2: total 2000,
  - button 3: total 3000
- **Votes** (14): 02 01 46 02 03 00 0A 00 14 00 1E 01 02 03
  - button 1: total 10, count 1
  - button 2: total 20, count 2
  - button 3: total 30, count 3

# 4. Smart CO2 LoRa Sensor MTC-XX-CO2-01 / 02 / 03 / 04

The **upload** fields in the payload in order:

| Field | Encoding | Start position | Size | Remark |
|---|---|---|---|---|
| Version | uint8 | 0 | 1 | Always 2 |
| Voltage | uint16 | 1 | 2 | [V] in 0.01 V steps, i.e. 100 = 1.00 V |
| OpCode | uint8 | 3 | 1 | 0x01: Alarm<br>0x03: Measurements<br>0x05: Thresholds |
| Measurements | uint8 | 4 | 1 | Bitmask of included measurements:<br>Bit 0 (LSB) = Temperature<br>Bit 1 = Relative Humidity<br>Bit 4 = $CO^2$ |
| Temperature | int16 | 5 | 2 | [°C] in 0.1°C steps, i.e. 378 = 37.8 °C<br>Only included when Temperature bit set in Measurements |
| Relative Humidity | uint8 | 7 | 1 | [%] Relative Humidity<br>Only included when Relative Humidity bit set in Measurements |
| CO2 | uint16 | 8 | 2 | [ppm] $CO^2$<br>Only included when $CO^2$ bit set in Measurements |
| Threshold Info | uint8 | 10 | 1 | Threshold info:<br>Bit 0-3: Trigger threshold 1-4<br>Bit 4-7: Stop threshold 1-4<br>Only included when OpCode 0x05 (Thresholds) |

**Examples** CO2 unit payload (length):

- **Alarm** (4): 02 01 49 01
- **Measurement** (10): 02 01 30 03 13 00 E5 38 05 1A
  - Temp: 22.9 °C, RH: 56%, CO2: 1306ppm
- **Threshold** (11): 02 01 30 05 13 00 E5 38 05 1A 01
  - Temp: 22.9°C, RH: 56%, $CO_2$: 1306 ppm, Trigger 1
- **Threshold** (11): 02 01 3B 05 13 00 E5 2A 03 D2 10
  - Temp: 22.9°C, RH: 42%, $CO_2$: 978 ppm, Stop 1
- **Threshold** (11): 02 01 3B 05 13 00 E5 2A 03 D2 30
  - Temp: 22.9°C, RH: 42%, $CO_2$: 978 ppm, Stop 1 and Stop 2

## 5. LoRa Manhole Sensor MTC-XX-MH01

The **upload** fields in the payload in order:

| Field | Encoding | Start position | Size | Remark |
|---|---|---|---|---|
| Version | uint8 | 0 | 1 | Always 2 |
| Voltage | uint16 | 1 | 2 | [V] in 0.01 V steps, i.e. 100 = 1.00 V |
| OpCode | uint8 | 3 | 1 | 0x06: Switch<br>0x07: Reminder |
| Switch state | uint8 | 4 | 1 | 0x00: Switch Off<br>0x01: Switch On |

**Examples** Manhole Sensor payload (length):

- Manhole opened (5): 02 01 49 06 01
- Manhole still open (5): 02 01 49 07 01
- Manhole closed (5): 02 01 49 06 00
- Manhole still closed (5): 02 01 49 07 00

NOTES:

- By default the Manhole sensor indicates “On” for manhole open and “Off” for manhole closed
- The Reminder is sent at regular intervals when there has been no switch change, it indicates the current switch state

## 6. LoRa Multi-Function Device MTC-XX-MF01

The **upload** fields in the payload in order:

| Field | Encoding | Start position | Size | Remark |
|---|---|---|---|---|
| Version | uint8 | 0 | 1 | Always 2 |
| Voltage | uint16 | 1 | 2 | [V] in 0.01 V steps, i.e. 100 = 1.00 V |
| OpCode | uint8 | 3 | 1 | 0x03: Measurements<br>0x05: Thresholds<br>0x06: Switch (only includes the Main Switch state) |
| Measurements | uint8 | 4 | 1 | Bitmask of included measurements:<br>Bit 7 (MSB) = More |
| Measurements 2 | uint8 | 5 | 1 | Bit 1 (LSB) = Digital Inputs<br>Only included when More bit set in Measurements |
| Digital Inputs | uint8 | 6 | 1 | Digital inputs:<br>Bit 0-3: Enabled Digital Inputs 1-4<br>Bit 4-7: Value Digital Inputs 1-4<br>Only included when Digital Inputs bit set in Measurements 2 |
| Threshold Info | uint8 | 7 | 1 | Threshold info:<br>Bit 0-3: Trigger threshold 1-4<br>Bit 4-7: Stop threshold 1-4<br>Only included when OpCode 0x05 (Thresholds) |
| Main Switch state | uint8 | 8 | 1 | 0x00: Switch Off<br>0x01: Switch On |

NOTES:

- The Multi-Function Device indicates “Off” for switch open and “On” for switch closed
- The main switch (MS) sends a message with Opcode (Switch) instantly every time it opens or closes
- The additional switches are connected to the digital inputs and only checked at regular intervals

**Examples** Multi-Function Device payload (length):

- **Main Switch closed** (5): 02 01 49 06 01
- **Main Switch opened** (5): 02 01 49 06 00
- **Additional Switch 1 closed** (9): 02 01 49 05 80 01 13 01 00
- **Additional Switch 2 opened** (9): 02 01 49 05 80 01 03 20 00
- **No change in any Switch** (8): 02 01 49 03 80 01 13 01

**Position 4** indicates the type of message: 03 = no switch change, 05 = additional switch change, 06 = main switch change

For 03 and 05 position 7 bit 4-7 indicates the current state of the additional switches, meaning below in yellow.

For 05 **position 8** bit 0-3 indicates the additional switches that just closed

For 05 **position 8** bit 4-7 indicates the additional switches that just opened

The 4 bits of the additional switches indicate (state between brackets):

- Value 0 (binary 0000): None (All switches open)
- Value 1 (binary 0001): Only Switch 1 (Switch 1 closed, Switch 2 open)
- Value 2 (binary 0010): Only Switch 2 (Switch 1 open, Switch 2 closed)
- Value 3 (binary 0011): Switch 1 and 2 (Switch 1 closed, Switch 2 closed)

The **last position** indicates the state of the main switch: Value 0: Open, Value 1: Closed

NOTE:

- The Measurement (03) is sent at regular intervals, it indicates the current state of all switches

# 7. NFC RFID - LoRa Button MTC-XX-NFC01 / NFC02

The **upload** fields in the payload in order:

| Field | Encoding | Start position | Size | Remark |
|---|---|---|---|---|
| Version | uint8 | 0 | 1 | Always 2 |
| Voltage | uint16 | 1 | 2 | [V] in 0.01 V steps, i.e. 100 = 1.00 V |
| OpCode | uint8 | 3 | 1 | 0x00: Heartbeat<br>0x01: Alarm |
| Alarm Bitmask | uint8 | 4 | 1 | 0x01: Button 1 pressed<br>0x02: Button 2 pressed |
| Alarm ID | uint16 | 5 | 2 | Unique ID of the Alarm triggered |
| UID Type | uint8 | 7 | 1 | Type of RFID / NFC Tag:<br>0x00, 0x20: ISO/IEC14443-4A<br>0x01, 0x11: FeliCa 212 kbps<br>0x02, 0x12: FeliCa 424 kbps<br>0x03, 0x23: ISO/IEC14443-4B<br>0x04: Innovision Jewel/Topaz tag<br>0x10: Mifare (ISO/IEC14443-4A)<br>0x40: DEP passive 106 kbps<br>0x41: DEP passive 212 kbps<br>0x42: DEP passive 424 kbps<br>0x80: DEP active 106 kbps<br>0x81: DEP active 212 kbps<br>0x82: DEP active 424 kbps<br><br>0xFF: Error reading the Tag |
| UID | n * uint8 | 8 | n (1-10) | Included when UID Type NOT 0xFF<br><br>NFC RFID Tag Identifier. Size can be different dependent on the tag, starts at position 8 and goes until the end of the payload |
| UID Error | uint8 | 8 | 1 | Included when UID Type is 0xFF<br><br>Typical errors reading the tag:<br>0x20: Reader not found at startup<br>0x30: No tag/card found<br>0x40: Reader communication error<br>0x50: Tag/card read error (can be caused by low voltage)<br>0x60: Tag/card read error<br>0x70: Multiple tags/cards<br>0x90: Tag/card not supported<br>0xA0: Reading tag/card interrupted<br>0xB0: UID too long (max 10) |

| Field | Encoding | Start position | Size | Remark |
|---|---|---|---|---|
| | | | | 0xC0: Tag/card with random UID |

**Example** NFC RFID - LoRa Button payload (length):

- **Heartbeat** (4): 02 01 4A 00
- **Alarm with Reader Error, Button 1 pressed** (9) : 02 01 49 01 01 12 34 FF 30
- **Alarm, Button 2 pressed** (13): 02 01 49 01 02 12 34 10 12 34 56 78 90

**The alarm can be confirmed by the downlink command to port 1.**

**Downlink** fields in the payload in order:

| Field | Encoding | Start position | Size | Remark |
|---|---|---|---|---|
| Version | uint8 | 0 | 1 | Always 2 |
| OpCode | uint8 | 1 | 1 | 0x60: Alarm confirm |
| Alarm ID | uint16 | 2 | 2 | Should match Alarm ID from Alarm upload |

**Examples** alarm confirm downlink payload (length), send to port 1:

- **Alarm confirm** (4): 02 60 12 34

## 8. LoRa Service Call Button MTC-XX-SCB01

The **upload** fields in the payload in order:

| Field | Encoding | Start position | Size | Remark |
|---|---|---|---|---|
| Version | uint8 | 0 | 1 | Always 2 |
| Voltage | uint16 | 1 | 2 | [V] in 0.01 V steps, i.e. 100 = 1.00 V |
| OpCode | uint8 | 3 | 1 | 0x00: Heartbeat<br>0x01: Button(s) pressed |
| Buttons bitmask | uint8 | 4 | 1 | 0x01: Button 1 pressed<br>0x02: Button 2 pressed<br>0x04: Button 3 pressed |
| Alarm ID | uint16 | 5 | 2 | Unique ID of the Alarm triggered. Only when Alarm Confirmation is enabled in the Device Configuration |

**Example** panic button payload (length):

- **Heartbeat** (4): 02 01 4A 00
- **Alarm, Button 2 pressed** (4): 02 01 49 01 02
- **Alarm, Button 3 pressed, when alarm confirm is configured** (6): 02 01 48 01 04 12 34

**The alarm can be confirmed by the downlink command to port 1.**

**Downlink** fields in the payload in order:

| Field | Encoding | Start position | Size | Remark |
|---|---|---|---|---|
| Version | uint8 | 0 | 1 | Always 2 |
| OpCode | uint8 | 1 | 1 | 0x60: Alarm confirm |
| Alarm ID | uint16 | 2 | 2 | Should match Alarm ID from Alarm upload |

**Examples** alarm confirm downlink payload (length), send to port 1:

- **Alarm confirm** (4): 02 60 12 34

# 9. LoRa Particulate Matter Sensor MTC-XX-PM01

The **upload** fields in the payload in order:

| Field | Encoding | Start position | Size | Remark |
|---|---|---|---|---|
| Version | uint8 | 0 | 1 | Always 2 |
| Voltage | uint16 | 1 | 2 | [V] in 0.01 V steps, i.e. 100 = 1.00 V |
| OpCode | uint8 | 3 | 1 | 0x03: Measurements |
| Measurements | uint8 | 4 | 1 | 0x80: Measurements 2 present |
| Measurements 2 | uint8 | 5 | 1 | 0x02: Particulate Matter |
| PM1.0 | uint16 | 6 | 2 | [µg/m³] PM1.0 |
| PM2.5 | uint16 | 8 | 2 | [µg/m³] PM2.5 |
| PM10 | uint16 | 10 | 2 | [µg/m³] PM10 |

**Examples** PM unit payload (length):

- **Measurement** (12): 02 01 30 03 80 02 00 07 00 0A 00 0B
  - PM1.0: 7 µg/m³, PM2.5: 10 µg/m³, PM10: 11µg/m³

- **Measurement** (12): 02 01 30 03 80 02 00 A0 00 B2 01 A1
  - PM1.0: 160µg/m³, PM2.5: 178 µg/m³, PM10: 417µg/m³

## Complete payload description

# Uplink

The **upload** fields in the payload in order:

| Field | Encoding | For OpCode | Size | Remark |
|---|---|---|---|---|
| Version | uint8 | All | 1 | Always 2 |
| Voltage | uint16 | All | 2 | [V] in 0.01 V steps, i.e. 100 = 1.00 V |
| OpCode | uint8 | All | 1 | 0x00: Heartbeat<br>0x01: Alarm<br>0x02: Votes<br>0x03: Measurements<br>0x05: Thresholds<br>0x06: Switch<br>0x07: Reminder<br>0x50: Alert<br>0x70: Info<br>0x71: Show<br>0x72: Update<br>0x80: SCD30 |
| Alarm buttons | uint8 | Alarm | 1 | Bit per button for multi button, bit set if button pressed (LSB = button 1, MSB = button 8)<br><br>Only included for units with more than 1 button or when the UID reader is enabled for the button |
| Alarm ID | uint16 | Alarm | 2 | Only included when feedback on (non) confirm is configured or when device with UID reader enabled |
| UID Type | uint8 | Alarm | 1 | Type of RFID / NFC Tag:<br>0x00, 0x20: ISO/IEC14443-4A<br>0x01, 0x11: FeliCa 212 kbps<br>0x02, 0x12: FeliCa 424 kbps<br>0x03, 0x23: ISO/IEC14443-4B<br>0x04: Innovision Jewel/Topaz tag<br>0x10: Mifare (ISO/IEC14443-4A)<br>0x40: DEP passive 106 kbps<br>0x41: DEP passive 212 kbps<br>0x42: DEP passive 424 kbps<br>0x80: DEP active 106 kbps<br>0x81: DEP active 212 kbps<br>0x82: DEP active 424 kbps |

| | | | | |
|---|---|---|---|---|
| | | | | 0xFF: Error reading the Tag<br><br>Only included when UID reader enabled for button |
| UID | n * uint8 | Alarm | n (1-10) | NFC RFID Tag Identifier. Size can be different dependent on the tag, starts at position 8 and goes until the end of the payload<br><br>Only included when UID reader enabled for button and UID Type <> 0xFF |
| UID Error | uint8 | Alarm | 1 | Typical errors reading the tag:<br>0x20: Reader not found at startup<br>0x30: No tag/card found<br>0x40: Reader communication error<br>0x60: Tag/card read error<br>0x70: Multiple tags/cards<br>0x90: Tag/card not supported<br>0xA0: Reading tag/card interrupted<br>0xB0: UID too long (max 10)<br>0xC0: Tag/card with random UID<br><br>Only included when UID reader enabled for button and UID Type = 0xFF |
| #Buttons | uint8 | Heartbeat & Votes | 1 | Number of buttons |
| Button totals | #Buttons * uint16 | Heartbeat & Votes | 2 * #Buttons | Totals per button since start/reset/rollover |
| Button counts | #Buttons * uint8 | Heartbeat & Votes | #Buttons | Counts per button since last votes uplink |
| Measurements | uint8 | Measurements & Thresholds | 1 | Bitmask of included measurements:<br>Bit 0 (LSB) = Temperature<br>Bit 1 = Relative Humidity<br>Bit 2 = Pressure<br>Bit 3 = Light<br>Bit 4 = $CO^2$<br>Bit 5 = TVOC<br>Bit 6 = Distance<br>Bit 7 (MSB) = More |
| Temperature | int16 | Measurements & Thresholds | 2 | [°C] in 0.1°C steps, i.e. 378 = 37.8 °C<br>Only included when Temp bit set in Measurements |
| Relative Humidity | uint8 | Measurements & Thresholds | 1 | [%] Relative Humidity<br>Only included when Relative Humidity bit set in Measurements |

| | | | | |
|---|---|---|---|---|
| Pressure | uint16 | Measurements & Thresholds | 2 | [Pa] in 10 Pa steps, i.e. 10345 = 103450 Pa (1034.5 hPa)<br>Only included when Pressure bit set in Measurements |
| Light | uint16 | Measurements & Thresholds | 2 | [lx] Illuminance<br>Only included when Light bit set in Measurements |
| $CO^2$ | uint16 | Measurements & Thresholds | 2 | [ppm] $CO^2$<br>Only included when $CO^2$ bit set in Measurements |
| Distance | uint16 | Measurements & Thresholds | 2 | [mm] Distance (0-5000)<br>Only included when Distance bit set in Measurements |
| Measurements 2 | uint8 | Measurements & Thresholds | 1 | Bit 0 (LSB) = Digital Inputs<br>Bit 1 = Particulate Matter<br>Only included when More bit set in Measurements |
| Digital Inputs | uint8 | Measurements & Thresholds | 1 | Digital inputs:<br>Bit 0-3: Enabled Digital Inputs 1-4<br>Bit 4-7: Value Digital Inputs 1-4<br>Only included when Digital Inputs bit set in Measurements 2 |
| Particulate Matter | 3*uint16 | Measurements & Thresholds | 6 | 1st unint16 = PM1.0 [µg/$m^3$]<br>2nd uint16 = PM2.5 [µg/$m^3$]<br>3rd uint16 = PM10 [µg/$m^3$] |
| Threshold Info | uint8 | Thresholds | 1 | Threshold info:<br>Bit 0-3: Trigger threshold 1-4<br>Bit 4-7: Stop threshold 1-4 |
| Switch state | uint8 | Switch & Reminder | 1 | Only for units with a 2 state switch (e.g. Manhole sensor)<br>0x00: Switch Off<br>0x01: Switch On |
| Alert Duration | uint8 | Alert | 1 | Remaining Alert duration in steps of 1 minute<br>e.g:<br>0: No Alert<br>1: 1 minute<br>5: 5 minutes<br>60: 1 hour<br>240: 4 hours |
| Alert Feedbacks | uint8 | Alert | 1 | Active Alert Feedbacks<br>Bit 0-3: Feedback 1-4<br>Only included when Alert Duration > 0 |
| Firmware Info | ASCII | Info | Variable | Until the end of the payload |
| Config CRC | uint16 | Show & Update | 2 | CRC of the Config |
| Config Position | uint8 | Show | 1 | |

| | | | | |
|---|---|---|---|---|
| Config Length | uint8 | Show | 1 | |
| Config Content | length * uint8 | Show | Config length | Config content for position with length<br>Load in Mutelcor LoRaButton configurator web page to see the config |
| Update Result | uint8 | Update | 1 | 0x00: Success<br>0x01: Incomplete (length exceeds payload)<br>0x02: Failed (not writable or position error)<br>0x03: No length field<br>0x04: Failed (max. heartbeat/measurement interval increase more than double) |
| Update Success Count | uint8 | Update | 1 | Number of successful updates<br>In case of an error this is the number of successful updates preceding the one causing the error<br>Only included since version 1.4.2 |
| SCD30 Result | uint8 | SCD30 | 1 | 0x00: Success<br>0x01: Start Timeout<br>0x02: Address Timeout<br>0x03: Data Timeout<br>0x07: Stop Timeout<br>0x20: Address NACK<br>0x30: Data NACK<br>0x38: Arbitration lost<br>0xF1: Recalibration pending<br>0xF2: Recalibration canceled<br>0xF3: Recalibration missing argument<br>0xF5: No Auto Calibration on batteries<br>0xFF: Invalid command/argument length<br>Any other value is also an I2C error<br>Success only indicates successful transmission on the I2C bus, not whether the SCD30 accepted the command |

## Downlink

NOTE: **Downlink** should always be sent to port 1

The fields in the payload in order:

| Field | Encoding | For OpCode | Size | Remark |
|---|---|---|---|---|
| Version | uint8 | All | 1 | Always 2 |
| OpCode | uint8 | All | 1 | 0x50: Alert<br>0x60: Alarm Confirm<br>0x70: Info<br>0x71: Show<br>0x72: Update<br>0x80: SCD30<br>0x90: Reset<br>0x91: Rejoin |
| Alert Duration | uint8 | Alert | 1 | Alert duration in steps of 1 minute e.g:<br>0: Stop Alert<br>1: 1 minute<br>5: 5 minutes<br>60: 1 hour<br>240: 4 hours<br>When omitted an Alert status uplink with the current Alerts is sent |
| Alert Feedbacks | uint8 | Alert | 1 | Alert feedback to start<br>Bit 0-3: Feedback 1-4<br><br>When omitted the Feedback Time stops or extends the current Feedback<br><br>When omitted the Alert Duration stops or extends the current Alert feedback, either way an Alert status uplink will be sent with the new/updated Alert |
| Alarm ID | uint16 | Alarm Confirm | 2 | Should match the Alarm ID of the Alarm that is confirmed |
| Config Position | uint8 | Show & Update | 1 | Since version 1.4.2 update can contain multiple sets of Config Position, Config Length and Config Update fields concatenated |
| Config Length | uint8 | Show & Update | 1 | Since version 1.4.2 update can contain multiple sets of Config Position, Config Length and Config Update fields concatenated |
| Config Content | length * uint8 | Update | Config length | Config content for position with length<br>Use the Mutelcor LoRaButton configurator web page to create the config update |

| | | | | |
|---|---|---|---|---|
| | | | | Since version 1.4.2 update can contain multiple sets of Config Position, Config Length and Config Update fields concatenated |
| SCD30 Command | uint16 | SCD30 | 2 | SCD30 Command |
| SCD30 Argument | uint16 | SCD30 | 2 | SCD30 Argument<br>Optional, only when SCD30 Command has an argument |

**Examples** of downlinks (length):

- Info (2): 02 70
- Reset (2): 02 90

To show the complete configuration send the following 5 downlinks to port 1:

- Part 1 (4): 02 71 00 13
- Part 2 (4): 02 71 23 28
- Part 3 (4): 02 71 4B 28
- Part 4 (4): 02 71 73 28
- Part 5 (4): 02 71 9B 28

The uplink show responses can be loaded in the Mutelcor LoRaButton configurator web page to see the config

To create configuration update downlinks use the Mutelcor LoRaButton configurator web page

SCD30 commands (length):

- SCD30 Soft Reset (2): 02 80 D3 04

SCD30 change calibration (length):

NOTES:

- You need a very good $CO^2$ reference to change the calibration, these commands are irreversible!
    - SCD30 Set Forced Recalibration value **400 ppm** (6): 02 80 52 04 01 90
    - SCD30 Set Forced Recalibration value **800 ppm** (6): 02 80 52 04 03 20
    - SCD30 Set Forced Recalibration value **1000 ppm** (6): 02 80 52 04 03 E8
    - SCD30 Set Forced Recalibration value **2000 ppm** (6): 02 80 52 04 07 D0
    - SCD30 Set Forced Recalibration value **x ppm** (6): 02 80 52 04 XX XX (XX XX ppm value in HEX notation, minimum 400, maximum 2000)