SENSO8 LoRaWAN Sensor Data Payload Format Document

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1. Introduction

The SENSO8 LoRaWAN data payload format document describes the data payload format of downlink and uplink LoRaWAN data for the following SENSO8 LoRaWAN sensor models:

LRS20100	**Temperature and Humidity Sensor**
LRS20200	Temperature Sensor
LRS20310	Water Leakage Sensor
LRS20600-0000	Dry Contact Input Sensor
LRS20600-8000	Weight Sensor
LRS20LD0 LRS40LD0	ToF Distance Sensor
LRS20Uxx	Ultrasonic Distance Sensor

All these models are **Class A** LoRaWAN devices. For the sensors to operate properly, it is required to configure the sensor as a **Class A** device on the Network Server. For Class A LoRaWAN devices, downlink data are queued on Network Server until the next uplink data is received from the sensor.

2. Uplink Data

2.1. Data Reporting

The sensor sends a data uplink data report in the following cases:

- Periodic heartbeat
- Button press
- Measurement exceeds preset threshold
- Event triggered by a dry contact input state change
- Temperature change exceeds the delta for temperature sensor with delta mode enabled

2.1.1. LRS20100 Ambient Temperature and Humidity Sensor

Temperature and Humidity Reading (Port: 10)

Byte	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
				MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB
Field	0x01	EVT	BAT	TEMP		HUM		TOFF		HOFF	

Field	Measurement	Calculation
EVT	Event	Bitmask for the event. If the corresponding bit is '1', the data is of that type. 7 – Reserved 6 – Reserved 5 – Humidity Low 4 – Humidity High 3 – Temperature Low 2 – Temperature High 1 – Reserved 0 – Heartbeat/Button
BAT	Battery Capacity (%)	Battery = BAT, the reading can be used to determine the battery status, e.g., low battery
TEMP	Temperature (°C)	Temperature = TEMP/10 (TEMP is a 2's complement number)
HUM	Humidity (%)	Humidity = HUM/10
TOFF	RESERVED	
HOFF	RESERVED	

Example

Payload = 0x01045A01A7024400000000

EVT = 0x04 = 00000100b → Event = Temperature High

BAT = 0x5A = 90 → Battery Capacity = 90 %

TEMP = 0x01A7 = 423 → Temperature = 423/10 = 42.3 °C

HUM = 0x0244 = 580 → Humidity = 580/10 = 58 %

Payload = 0x011050FFC9036B00000000

EVT = 0x10 = 00010000b → Event = Humidity High

BAT = 0x50 = 80 → Battery Capacity = 80 %

TEMP = 0xFFC9 = -55 → Temperature = -55/10 = -5.5 °C

HUM = 0x036B = 875 → Humidity = 875/10 = 87.5 %

2.1.2. LRS20200 Temperature Sensor

Temperature Reading (Port: 10)

Byte	0	1	2	3	4	5	6	7	8
				MSB	LSB	MSB	LSB	MSB	LSB
Field	0x02	EVT	BAT	TEMP		TOFF		UPCNT	

Field	Measurement	Calculation
EVT	Event	Bitmask for the event. If the corresponding bit is '1', the data is of that type. 7 – Redundant Payload 6 – Reserved 5 – Reserved 4 – Reserved 3 – Temperature Low 2 – Temperature High 1 – Reserved 0 – Heartbeat/Button
BAT	Battery Capacity (%)	Battery = BAT, the reading can be used to determine the battery status, e.g., low battery
TEMP	Temperature (°C)	Temperature = TEMP/10 (TEMP is a 2's complement number)
TOFF	RESERVED	

Field	Measurement	Calculation
UPCNT	Uplink Count	Uplink count = UPCNT This count increases by one when there is new data. It will not increase when the uplink is redundant

Note: the sensor supports uplink redundancy when adaptive reporting mode is enabled. When adaptive reporting mode is enabled and uplink redundancy is larger than 0, there will be additional uplinks for each data. On the additional uplinks, the MSB (bit 7) of the event field will be set to indicate that it is a redundant payload. In addition, the UPCNT will not increase if the payload is redundant, i.e. if UPCNT is larger than the one received on last uplink, it is a new data sample.

The adaptive reporting mode is disabled by default. It can be enabled from the CONFIG port on the sensor.

Example

Payload = 0x02016400E600000010

EVT = 0x01 = 00000001b → Event = Heartbeat

BAT = 0x64 = 100 → Battery Capacity = 100 %

TEMP = 0x00E6 = 230 → Temperature = 230/10 = 23.0 °C

UPCNT = 0x0010 = 16 → Uplink Count = 16

Payload = 0x02085AFFC900000102

EVT = 0x08 = 00001000b → Event = Temperature Low

BAT = 0x5A = 90 → Battery Capacity = 90 %

TEMP = 0xFFC9 = -55 → Temperature = -55/10 = -5.5 °C

UPCNT = 0x0102 = 258 → Uplink Count = 258

This payload is a new payload, bit 7 of EVT is clear and UPCNT is larger than the previous one.

Payload = 0x02885AFFC900000102

EVT = 0x88 = 10001000b → Event = Temperature Low, Redundant Payload

BAT = 0x5A = 90 → Battery Capacity = 90 %

TEMP = 0xFFC9 = -55 → Temperature = -55/10 = -5.5 °C

UPCNT = 0x0102 = 258 → Uplink Count = 258

The second payload is a redundant payload, bit 7 of EVT is set and UPCNT is same as previous one.

Payload = 0x02885AFFAB00000104

EVT = 0x88 = 10001000b → Event = Temperature Low, Redundant Payload

BAT = 0x5A = 90 → Battery Capacity = 90 %

TEMP = 0xFFAB = -85 → Temperature = -85/10 = -8.5 °C

UPCNT = 0x0103 = 259 → Uplink Count = 259

The third payload is a redundant payload but a new data sample, bit 7 of EVT is set but UPCNT is larger than the previous one.

2.1.3. LRS20310 Water Leakage Sensor

Water Leakage Reading (Port: 10)

Byte	0	1	2	3	4	5
					MSB	LSB
Field	0x05	EVT	BAT	LVL	TMOFF	

Field	Measurement	Calculation
EVT	Event	Bitmask for the event. If the corresponding bit is '1', the data is of that type. 7 – Reserved 6 – Reserved 5 – Reserved 4 – Reserved 3 – Cable Break Alert*note 2 – Water Leak Alert 1 – Reserved 0 – Heartbeat/Button
BAT	Battery Capacity (%)	Battery = BAT, the reading can be used to determine the battery status, e.g., low battery
LVL	Water Leakage Level (0-100)	Level = LVL
TMOFF	RESERVED	

*note Only apply to the cable with cable break detect feature

Example

Payload = 0x05045A150000

EVT = 0x04 = 00000100b → Water Leak Alert

BAT = 0x5A = 90 → Battery Capacity = 90 %

LVL = 0x15 = 21 → Leakage Level = 21

2.1.4. LRS20600-0000 Dry Contact Input Sensor

The dry contact input sensor supports 3 modes of operation. The data payload format for pulse meter counter mode is different from the two other modes. The description of DRY_IN_EN and P_CNTR_EN can be found in Dry Contact Input device settings.

Pulse meter counter mode can only be enabled with CONFIG PORT. It CANNOT be enabled with

downlink command.

	DRY_IN_EN	P_CNTR_EN	Description
Dry Contact Input Mode	1	0	Report instant state change
Counting Mode	0	0	Report state changes in a period
Pulse Meter Counter Mode	0	1	Report pulse meter counts

Dry Contact Input Reading (Port: 10)

State Change/Counting Mode

Byte	0	1	2	3	4	5
					MSB	LSB
Field	0x04	EVT	BAT	STS	EVT_CNT	

Pulse Meter Counter Mode

Byte	0	1	2	3	4	5	6	7	8	9	10
					MSB	LSB	MSB			LSB	
Field	0x04	EVT	BAT	STS	MTR_RD_DEC		MTR_RD_INT				RES

Field	Measurement	Calculation
EVT	Event	Bitmask for the event. If the corresponding bit is '1', the data is of that type. 7 – Reserved 6 – Reserved 5 – Reserved 4 – Reserved 3 – Reserved 2 – Reserved 1 – Reserved 0 – Heartbeat/Button

Field	Measurement	Calculation
BAT	Battery Capacity (%)	Battery = BAT, the reading can be used to determine the battery status, e.g., low battery
STS	Dry Contact Input Status	0 – Logic input “0” / Open 1 – Logic input “1” / Close
EVT_CNT	Total number of triggers since last heartbeat	Count = EVT_CNT
MTR_RD_DEC	Decimal part of meter reading	Meter reading = MTR_RD_INT + MTR_RD_DEC/(10^RES)
MTR_RD_INT	Integer part of meter reading	
RES	Resolution, no. of decimal places	

Example (State Change/Counting Mode)

Payload = 0x4015A010122

EVT = 0x01 = 00000001b → Heartbeat/Button

BAT = 0x5A = 90 → Battery Capacity = 00 %

STS = 0x01 = 1 → Logic input = "1” or Close

EVT_CNT = 0x0122 = 290 → Count = 290

Example (Pulse Meter Counter Mode)

Payload = 0x4015001001d0002030402

EVT = 0x01 = 00000001b → Heartbeat/Button

BAT = 0x50 = 80 → Battery Capacity = 80 %

STS = 0x01 = 1 → Logic input = "1” or Close

MTR_RD_DEC = 0x001d = 29

MTR_RD_INT = 0x00020304 = 131844

RES = 0x02

→ Meter Reading = 13184 + 29/(10^2) = 131844.29

2.1.5. LRS20LD0/LRS40LD0 ToF Distance Sensor

Distance Sensor Reading (Port: 10)

Byte	0	1	2	3	4	5
				MSB	LSB	
Field	0x0B	EVT	BAT	DIST		STS

Field	Measurement	Calculation
EVT	Event	Bitmask for the event. If the corresponding bit is '1', the data is of that type. 7 – Reserved 6 – Reserved 5 – Reserved 4 – Reserved 3 – Reserved 2 – Distance State Alert 1 – Reserved 0 – Heartbeat/Button
BAT	Battery Capacity (%)	Battery = BAT, the reading can be used to determine the battery status, e.g., low battery
DIST	Distance, in mm	Distance (cm) = DIST / 10
STS	Distance State	0 – distance ≥ threshold 1 – distance < threshold

Example

Payload = 0x0B045B079700

EVT = 0x04 = 00000100b → Distance State Alert

BAT = 0x5B → 91%

DIST = 0x0797/10 = 1943/10 → Distance = 194.3 cm

STS = 00 → distance ≥ threshold

2.1.6. LRS20Uxx Ultrasonic Distance Sensor

Distance Sensor Reading (Port: 10)

Byte	0	1	2	3	4	5
				MSB	LSB	
Field	0x0C	EVT	BAT	DIST		STS

Field	Measurement	Calculation
EVT	Event	Bitmask for the event. If the corresponding bit is '1', the data is of that type. 7 – Reserved 6 – Reserved 5 – Reserved 4 – Reserved 3 – Distance ThresholdLo Alert 2 – Distance ThresholdHi Alert 1 – Reserved 0 – Heartbeat/Button
BAT	Battery Capacity (%)	Battery = BAT, the reading can be used to determine the battery status, e.g., low battery
DIST	Distance, in mm	Distance (cm) = DIST / 10
STS	Distance State	0 – distance ≥ ThresholdHi 1 – distance ≤ ThresholdLo

Example

Payload = 0x0C045B079700

EVT = 0x04 = 00000100b → Distance ThresholdHi Alert

BAT = 0x5B → 91%

DIST = 0x0797/10 = 1943/10 → Distance = 194.3 cm

STS = 00 → distance ≥ ThresholdHi

2.1.7. LRS20600-8000 Weight Sensor

Weight Sensor Reading (Port: 10)

Byte	0	1	2	3	4
				MSB	LSB
Field	0x0D	EVT	BAT	WEIGHT	

Field	Measurement	Calculation
EVT	Event	Bitmask for the event. If the corresponding bit is '1', the data is of that type. 7 – Reserved 6 – Reserved 5 – Reserved 4 – Reserved 3 – Reserved 2 – Weight Low Alert 1 – Reserved 0 – Heartbeat/Button
BAT	Battery Capacity (%)	Battery = BAT, the reading can be used to determine the battery status, e.g., low battery
WEIGHT	Weight (kg)	Weight = WEIGHT / 100 where WEIGHT has a resolution of 5.

Example

Payload = 0x0D045B001E

EVT = 0x04 = 00000100b → Weight Low Alert

BAT = 0x5B → 91 %

WEIGHT = 0x001E/100 = 30/100 → Weight = 0.30 kg

Note:

1. Weight Low Alert is kept unchanged when WEIGHT drops to 0 or less momentarily.
2. Weight Low Alert is set to 1 if WEIGHT is less than or equal to WeightLowTH but larger than 0.
3. Weight Low Alert is set to 0 if WEIGHT is more than (WeightLowTH + 15).

2.2. Device Configuration Reporting

The sensor uploads the device information and settings on receiving a downlink request.

2.2.1. All Models

Device Version (Port: 8)

Byte	0	1	2	3
	XX	YY	ZZZ	
Field	FWV			

Field	Description	Format
FWV	Firmware Version	XX.YY.ZZZ

Device Status (Port: 9)

Byte	0	1	2	3	4	5	6	7	8	9	10
	XX	YY	ZZZ		MSB	LSB		MSB			LSB
Field	FWV				BAT_L		BAT_P	UL_CNT			

Field	Description	Format
FWV	Firmware Version	XX.YY.ZZZ
BAT_L	Battery Level (mV)	Battery Level = BAT_L
BAT_P	Battery Percentage	Battery Percentage = BAT_P

Field	Description	Format
UL_CNT	Uplink count since last reboot	Uplink count = UL_CNT

The Device Status is sent automatically every 24 hours. Available on firmware version 1.06.000 or above.

2.2.2. LRS20100 Ambient Temperature and Humidity Sensor

Device Settings (Port: 12)

Byte	0	1	2	3	4
		MSB	LSB		
Field	0x01	ULT		MODE	DACK

Field	Description	Format
ULT	Data upload interval (minute)	Upload interval = ULT
MODE	RESERVED	
DACK	RESERVED	

Temperature/Humidity Threshold Settings (Port: 13)

Byte	0	1	2	3	4	5	6
		MSB	LSB	MSB	LSB		
Field	0x01	HTTH		LTTH		HHTH	LHTH

Field	Description
HTTH	High temperature threshold (°C)
LTTH	Low temperature threshold (°C)
HHTH	High humidity threshold (%)
LHTH	Low humidity threshold (%)

2.2.3. LRS20200 Temperature Sensor

Device Settings (Port: 12)

Byte	0	1	2	3	4
		MSB	LSB		

Byte	0	1	2	3	4
Field	0x02	ULT		MODE	DACK

Field	Description	Format
ULT	Data upload interval (minute)	Upload interval = ULT
MODE	RESERVED	
DACK	RESERVED	

Temperature Threshold Settings (Port: 13)

Byte	0	1	2	3	4
		MSB	LSB	MSB	LSB
Field	0x02	HTTH		LTTH	

Field	Description
HTTH	High temperature threshold (°C)
LTTH	Low temperature threshold (°C)

Adaptive Reporting Mode Settings (Port: 16)

Byte	0	1	2	3	4	5	6	7
		MSB	LSB	MSB	LSB	MSB	LSB	
Field	0x02	MST		T_DELTA		SAMPLING		RPT

Field	Description	Format
MST	Maximum Silent Time (minute)	Maximum Silent Time = MST
T_DELTA	Temperature Delta (°C) (change in temperature that will trigger an upload)	Temperature Delta = T_DELTA / 10
SAMPLING	Sampling Time (minute)	Sampling Time = SAMPLING
RPT	Uplink redundancy (0 –5) (number of additional uploads)	Redundancy = RPT

2.2.4. LRS20310 Water Leakage Sensor

Device Settings (Port: 12)

Byte	0	1	2	3	4	5	6
		MSB	LSB				
Field	0x05	ULT		MODE	RPT	RPI	DACK

Field	Description	Format
ULT	Data upload interval (minute)	Upload interval = ULT
MODE	RESERVED	
RPT	Number of additional uploads when alert is triggered (0 – 5)	Number of additional uploads = RPT
RPI	Time between additional uploads when alert is triggered (1 – 5min)	Time between additional uploads = RPI
DACK	RESERVED	

Water Leak Alert Threshold Settings (Port: 13)

Byte	0	1
Field	0x05	LVTH

Field	Description	Format
LVTH	Water leak alert threshold (0-100)	Threshold = LVTH

2.2.5. LRS20600-0000 Dry Contact Input Sensor

Device Settings (Port: 12)

Byte	0	1	2	3	4	5	6
		MSB	LSB		MSB	LSB	
Field	0x04	ULT		MODE	DEAF		DACK

Field	Description	Format
ULT	Data upload interval (minute)	Upload interval = ULT
MODE	Trigger mode	1 – NC input, falling edge trigger 2 – NO input, rising edge trigger 3 – NC input, rising/falling edge trigger 4 – NO input, rising/falling edge trigger

Field	Description	Format
DEAF	Trigger deaf time (s) – timeout for returning to inactive state	Trigger deaf time = DEAF
DACK	RESERVED	

Dry Contact Input Settings (Port: 13)

Byte	0	1
Field	0x04	EN

Field	Description	Format
DRY_IN_EN	Dry contact input enable/disable	0 – disable 1 – enable

Pulse Counter Mode Settings (Port: 16)

Byte	0	1	2	3	4	5	6	7	8	9
					MSB			LSB	MSB	LSB
Field	0x04	P_CNTR_EN	MAX_DIG	RES	INIT_MTR_RD_INT				INIT_MTR_RD_DEC	

Field	Description	Format
P_CNTR_EN	Pulse meter counter mode enable	0 – disable 1 – enable
MAX_DIG	No. of digits for integer part of the pulse meter reading	No. of digits = MAX_DIG
RES	No. of digits for decimal part of the pulse meter reading	No. of digits = RES
INIT_MTR_RD_INT	Initial value of the integer part of the pulse meter reading	Initial value = INIT_MTR_RD_INT
INIT_MTR_RD_DEC	Initial value of the decimal part of the pulse meter reading	Initial value = INIT_MTR_RD_DEC

2.2.6. LRS20LD0/LRS40LD0 ToF Distance Sensor

Device Settings (Port: 12)

Byte	0	1	2	3
		MSB	LSB	
Field	0x0B	ULT		DACK

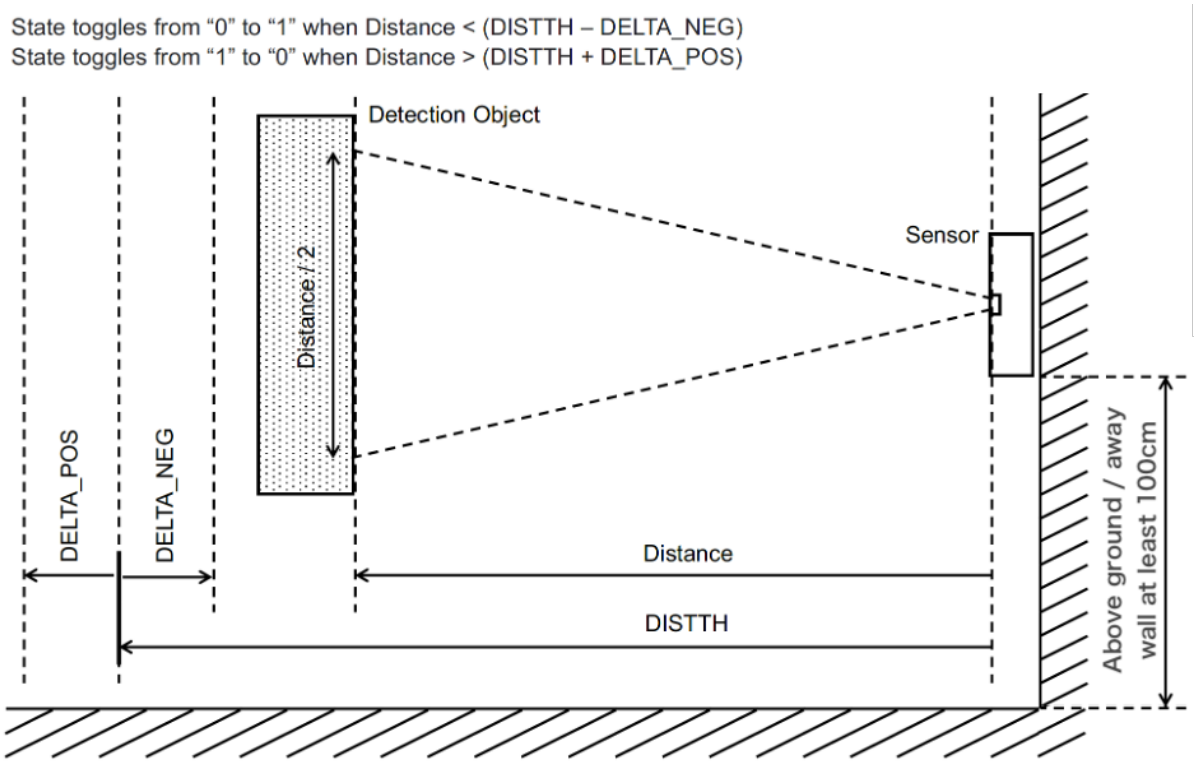
Field	Description	Format
ULT	Data upload interval (minute)	Upload interval = ULT
DACK	RESERVED	

Distance Alert Threshold & Delta Settings (Port: 13)

Byte	0	1	2	3	4	5	6
		MSB	LSB	MSB	LSB	MSB	LSB
Field	0x0B	DISTTH		DELTA_NEG		DELTA_POS	

Field	Description	Format
DISTTH	Distance threshold, in mm	Distance threshold (cm) = DISTTH / 10
DELTA_NEG	Distance negative delta, in mm	Distance negative delta (cm) = DELTA_NEG / 10
DELTA_POS	Distance positive delta, in mm	Distance positive delta (cm) = DELTA_POS / 10

The following picture shows the usage of DISTTH, DELTA_NEG and DELTA_POS.



2.2.7. LRS20Uxx Ultrasonic Distance Sensor

Device Settings (Port: 12)

Byte	0	1	2	3
		MSB	LSB	
Field	0x0C	ULT		DACK

Field	Description	Format
ULT	Data upload interval (minute)	Upload interval = ULT
DACK	RESERVED	

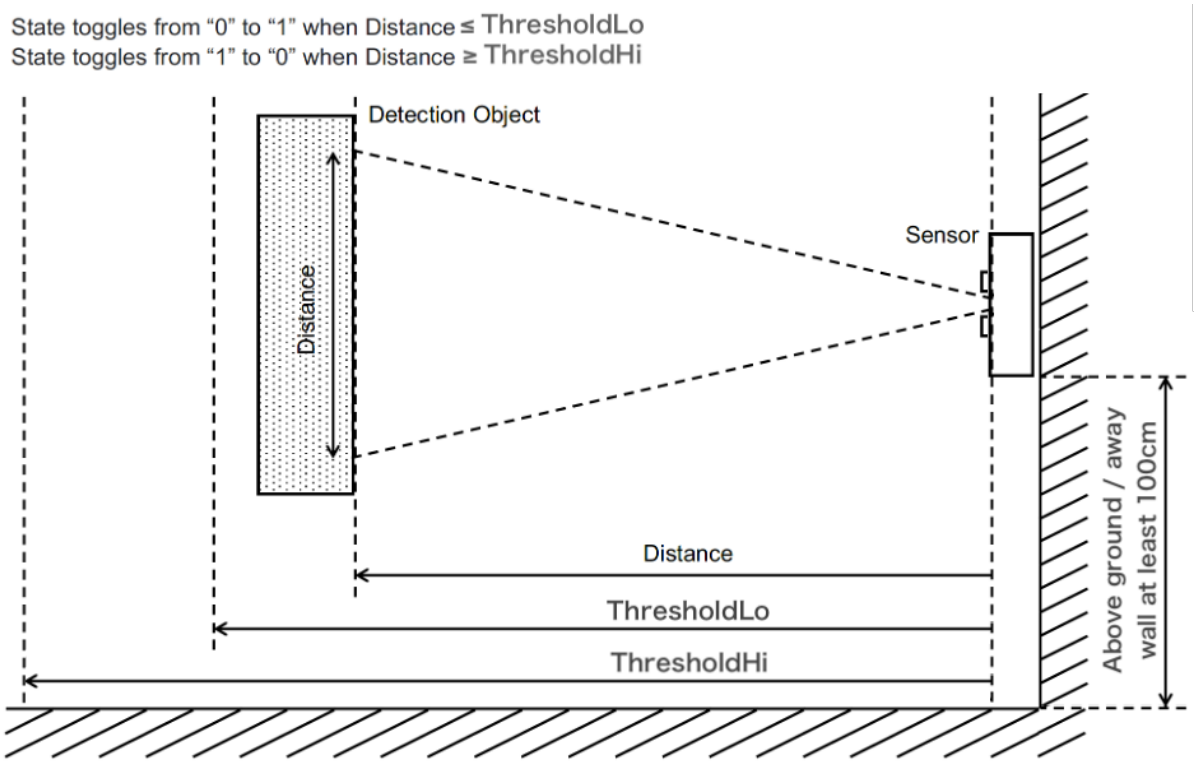
Distance Alert Threshold & Delta Settings (Port: 13)

Byte	0	1	2	3	4
		MSB	LSB	MSB	LSB
Field	0x0C	ThresholdHi		ThresholdLo	

Field	Description	Format
ThresholdHi	Distance high threshold, in mm	Distance high threshold (cm) = ThresholdHi / 10

Field	Description	Format
ThresholdLo	Distance low threshold, in mm	Distance low threshold (cm) = ThresholdLo / 10

The following picture shows the usage of ThresholdHi and ThresholdLo.



2.2.8. LRS20600-8000 Weight Sensor

Device Settings (Port: 12)

Byte	0	1	2	3
		MSB	LSB	
Field	0x0D	ULT		DACK

Field	Description	Format
ULT	Data upload interval (minute)	Upload interval = ULT
DACK	RESERVED	

Weight Alert Threshold Settings (Port: 13)

Byte	0	1	2
		MSB	LSB
Field	0x0D	WeightLowTH	

Field	Description	Format
WeightLowTH	Weight Low Threshold (kg)	Weight Low Threshold = WeightLowTH / 100 where WeightLowTH has a resolution of 5 and it is always positive.

Weight Downlink Taring Results (Port: 14)

Byte	0	1	2	3	4	5
			MSB	LSB	MSB	LSB
Field	0x0D	T_State	WeightBefore		WeightAfter	

Field	Description	Format
T_State	Taring State	T_State = 0 if Downlink Taring has not been performed. T_State = 1 if Downlink Taring has been performed successfully. T_State = 2 if Downlink Taring has not been successful.
WeightBefore	Weight Before Taring (kg)	Weight Before Taring = WeightBefore / 100 For T_State = 1, WeightBefore = WEIGHT (before taring). For T_State = 0 or 2, WeightBefore = 0.
WeightAfter	Weight After Taring (kg)	Weight After Taring = WeightAfter / 100 For T_State = 1, WeightAfter = WEIGHT (after taring). For T_State = 0 or 2, WeightAfter = 0.

Note:

WeightAfter is always supposed to be 0 no matter taring has been performed successfully or not.

3. Downlink Data

The downlink data is used for updating the sensor settings online. The format of the downlink

commands is described in Downlink Data Format. After issuing a downlink configuration request command, the device will acknowledge with a response/acknowledgment command described in Device Configuration Reporting.

3.1. Downlink Data Format

3.1.1. All Models

Device Version Request (Port: 20)

Byte	0
Field	0x00

Response command: Device Version (Port: 8)

3.1.2. LRS20100 Ambient Temperature and Humidity Sensor

Device Settings Request (Port: 21)

Byte	0	1
Field	0x01	0x00

Response command: Device Settings (Port: 12)

Temperature/Humidity Threshold Settings Request (Port: 21)

Byte	0	1
Field	0x01	0x01

Response command: Temperature/Humidity Threshold Settings (Port: 13)

Device Settings Configuration (Port: 22)

Byte	0	1	2	3	4
			MSB	LSB	
Field	0x01	MODE	ULT		DACK

Field	Description	Format	Default
MODE	RESERVED	0x00	-
ULT	Data upload interval (minute)	Upload interval = ULT	10

Field	Description	Format	Default
DACK	RESERVED	Default Value = 1	1

Acknowledgement command: Device Settings (Port: 12)

Temperature/Humidity Threshold Configuration (Port: 23)

Byte	0	1	2	3	4	5	6
		MSB	LSB	MSB	LSB		
Field	0x01	HTTH		LTTH		HHTH	LHTH

Field	Description	Default
HTTH	High temperature threshold (°C)	30
LTTH	Low temperature threshold (°C)	18
HHTH	High humidity threshold (%)	70
LHTH	Low humidity threshold (%)	40

Acknowledgement command: Temperature/Humidity Threshold Settings (Port: 13)

3.1.3. LRS20200 Temperature Sensor

Device Settings Request (Port: 21)

Byte	0	1
Field	0x02	0x00

Response command: Device Settings (Port: 12)

Temperature Threshold Settings Request (Port: 21)

Byte	0	1
Field	0x02	0x01

Response command: Temperature Threshold Settings (Port: 13)

Adaptive Reporting Mode Settings Request (Port: 21)

Byte	0	1
Field	0x02	0x03

Response command: Adaptive Reporting Mode Settings (Port: 16)

Device Settings Configuration (Port: 22)

Byte	0	1	2	3	4
			MSB	LSB	
Field	0x02	MODE	ULT		DACK

Field	Description	Format	Default
MODE	RESERVED	0x00	-
ULT	Data upload interval (minute)	Upload interval = ULT	10
DACK	RESERVED	Default Value = 1	1

Acknowledgement command: Device Settings (Port: 12)

Temperature Threshold Configuration (Port: 23)

Byte	0	1	2	3	4
		MSB	LSB	MSB	LSB
Field	0x02	HTTH		LTTH	

Field	Description	Default
HTTH	High temperature threshold (°C)	30
LTTH	Low temperature threshold (°C)	18

Acknowledgement command: Temperature Threshold Settings (Port: 13)

- +*

Adaptive Reporting Mode Configuration (Port: 26)

Byte	0	1	2	3	4	5	6	7
		MSB	LSB	MSB	LSB	MSB	LSB	
Field	0x02	MST		T_DELTA		SAMPLING		RPT

Field	Description	Format	Default
MST	Maximum Silent Time (minute)	Maximum Silent Time = MST	60
T_DELTA	Temperature Delta (°C)	Temperature Delta = DELTA_T / 10	0

Field	Description	Format	Default
SAMPLING	Sampling Time (minute)	Sampling Time = SAMPLING	5
RPT	Uplink Redundancy (0 – 5)	Redundancy = RPT	0

Acknowledgement command: Adaptive Reporting Mode Settings (Port: 16)

3.1.4. LRS20310 Water Leakage Sensor

Device Settings Request (Port: 21)

Byte	0	1
Field	0x05	0x00

Response command: Device Settings (Port: 12)

Threshold Settings Request (Port: 21)

Byte	0	1
Field	0x05	0x01

Response command: Water Leak Alert Threshold Settings (Port: 13)

Device Settings Configuration (Port: 22)

Byte	0	1	2	3	4	5	6
			MSB	LSB			
Field	0x05	MODE	ULT		RPT	RPI	DACK

Field	Description	Format	Default
MODE	RESERVED	0x00	-
ULT	Data upload interval (minute)	Upload interval = ULT	60
RPT	Number of additional uploads when alert is triggered (0-5)	Number of additional uploads = RPT	3
RPI	Time between additional uploads when alert is triggered (minute) (1-5)	Time between additional uploads = RPI	1
DACK	RESERVED	Default Value = 1	1

Acknowledgement command: Device Settings (Port: 12)

Water Leak Alert Threshold Configuration (Port: 23)

Byte	0	1
Field	0x05	LVTH

Field	Description	Default
LVTH	Water leak alert threshold (15-100)	15

Acknowledgement command: Water Leak Alert Threshold Settings (Port: 13)

3.1.5. LRS20600-0000 Dry Contact Input Sensor

Device Settings Request (Port: 21)

Byte	0	1
Field	0x04	0x00

Response command: Device Settings (Port: 12)

Dry Contact Input Settings Request (Port: 21)

Byte	0	1
Field	0x04	0x01

Response command: Dry Contact Input Settings (Port: 13)

Pulse Meter Counter Settings Request (Port: 21)

Byte	0	1
Field	0x04	0x03

Response command: Dry Contact Input Settings (Port: 13)

Device Settings Configuration (Port: 22)

Byte	0	1	2	3	4	5	6
			MSB	LSB	MSB	LSB	
Field	0x04	MODE	ULT		DEAF		DACK

Field	Description	Format	Default
MODE	Trigger mode	1 – NC input, falling edge trigger 2 – NO input, rising edge trigger 3 – NC input, rising/falling edge trigger 4 – NO input, rising/falling edge trigger	3
ULT	Data upload interval (minute)	Upload interval = ULT	60
DEAF	Trigger deaf time (s) – timeout for returning to inactive state	Trigger deaf time = DEAF	2
DACK	RESERVED	Default Value = 1	1

Acknowledgement command: Device Settings (Port: 12)

Dry Contact Input Configuration (Port: 23)

Byte	0	1
Field	0x04	EN

Field	Description	Format	Default
DRY_IN_EN	Dry contact input enable/disable	0 – disable 1 – enable	1

Acknowledgement command: Dry Contact Input Settings (Port: 13)

Pulse Meter Counter Settings Configuration (Port: 26)

Byte	0	1	2	3	4	5	6	7	8
				MSB			LSB	MSB	LSB
Field	0x04	MAX_DIG	RES	INIT_MTR_RD_INT				INIT_MTR_RD_DEC	

Field	Description	Format	Default
MAX_DIG	No. of digits for integer part of the pulse meter reading	No. of digits = MAX_DIG	6
RES	No. of digits for decimal part of the pulse meter reading	No. of digits = RES	3

Field	Description	Format	Default
INIT_MTR_RD_INT	Initial value of the integer part of the pulse meter reading	Initial value = INIT_MTR_RD_INT	0
INIT_MTR_RD_DEC	Initial value of the decimal part of the pulse meter reading	Initial value = INIT_MTR_RD_DEC	0

Acknowledgement command: Dry Contact Input Settings (Port: 16)

Important Note:

- When Pulse Meter Counter Mode is enabled, DRY_IN_EN will be disabled and DEAF will be set to 0. DO NOT change these settings for proper operation of the sensor.

3.1.6. LRS20LD0/LRS40LD0 ToF Distance Sensor

Device Settings Request (Port: 21)

Byte	0	1
Field	0x0B	0x00

Response command: Device Settings (Port: 12)

Threshold & Delta Settings Request (Port: 21)

Byte	0	1
Field	0x0B	0x01

Response command: Distance Alert Threshold & Delta Settings (Port: 13)

Device Settings Configuration (Port: 22)

Byte	0	1	2	3
		MSB	LSB	
Field	0x0B	ULT		DACK

Field	Description	Format	Default
ULT	Data upload interval (minute)	Upload interval = ULT	15
DACK	RESERVED	Default Value = 1	1

Acknowledgement command: Device Settings (Port: 12)

Occupancy Alert Threshold Configuration (Port: 23)

Byte	0	1	2	3	4	5	6
		MSB	LSB	MSB	LSB	MSB	LSB
Field	0x0B	DISTTH		DELTA_NEG		DELTA_POS	

Field	Description	Format	Default
DISTTH	Distance threshold, in mm	Distance threshold (cm) = DISTTH / 10	100
DELTA_NEG	Distance negative delta, in mm	Distance negative delta (cm) = DELTA_NEG / 10	10
DELTA_POS	Distance positive delta, in mm	Distance positive delta (cm) = DELTA_POS / 10	0

Acknowledgement command: Distance Alert Threshold & Delta Settings (Port: 13)

Note:

DELTA_NEG and DELTA_POS are hysteresis for state transitions. See Distance Sensor device settings.

When transiting from state 0 to 1, the distance has to be less than (DISTTH – DELTA_NEG).

When transiting from state 1 to 0, the distance has to be more than (DISTTH + DELTA_POS).

The distance threshold and hysteresis must meet the following conditions:

- (DISTTH – DELTA_NEG) ≥ 40, and
- (DISTTH + DELTA_POS) ≤ 4000

These limits are field values in mm (4 cm to 400 cm).

3.1.7. LRS20Uxx Ultrasonic Distance Sensor

Device Settings Request (Port: 21)

Byte	0	1
Field	0x0C	0x00

Response command: Device Settings (Port: 12)

Threshold & Delta Settings Request (Port: 21)

Byte	0	1
Field	0x0C	0x01

Response command: Distance Alert Threshold & Delta Settings (Port: 13)

Device Settings Configuration (Port: 22)

Byte	0	1	2	3
		MSB	LSB	
Field	0x0C	ULT		DACK

Field	Description	Format	Default
ULT	Data upload interval (minute)	Upload interval = ULT	15
DACK	RESERVED	Default Value = 1	1

Acknowledgement command: Device Settings (Port: 12)

Occupancy Alert Threshold Configuration (Port: 23)

Byte	0	1	2	3	4
		MSB	LSB	MSB	LSB
Field	0x0C	ThresholdHi		ThresholdLo	

Field	Description	Format	Default
ThresholdHi	Distance high threshold, in mm	Distance high threshold (cm) = ThresholdHi/10	200
ThresholdLo	Distance low threshold, in mm	Distance low threshold (cm) = ThresholdLo/10	150

Acknowledgement command: Distance Alert Threshold & Delta Settings (Port: 13)

Note:

When transiting from state 0 to 1, the distance has to be less than or equal to ThresholdLo.

When transiting from state 1 to 0, the distance has to be more than or equal to ThresholdHi.

ThresholdHi and ThresholdLo must meet the following conditions:

- ThresholdHi ≤ 4500;
- ThresholdHi ≥ ThresholdLo; and
- ThresholdLo ≥ 30.

These limits are field values in mm (3 cm to 450 cm).

3.1.8. LRS20600-8000 Weight Sensor

Device Settings Request (Port: 21)

Byte	0	1
Field	0x0D	0x00

Response command: Device Settings (Port: 12)

Weight Alert Threshold Settings Request (Port: 21)

Byte	0	1
Field	0x0D	0x01

Response command: Weight Alert Threshold Settings (Port: 13)

Weight Downlink Taring Results Request (Port: 21)

Byte	0	1
Field	0x0D	0x02

Response command: Weight Downlink Taring Results (Port: 14)

Device Settings Configuration (Port: 22)

Byte	0	1	2	3
		MSB	LSB	
Field	0x0D	ULT		DACK

Field	Description	Format	Default
ULT	Data upload interval (minute)	Upload interval = ULT	15
DACK	RESERVED	Default Value = 1	1

Acknowledgement command: Device Settings (Port: 12)

- +*

Weight Alert Threshold Configuration (Port: 23)

Byte	0	1	2
		MSB	LSB
Field	0x0D	WeightLowTH	

Field	Description	Format	Default
WeightLowTH	Weight Low Threshold (kg) (0.05 - 5)	Weight Low Threshold = WeightLowTH / 100	35

Acknowledgement command: Weight Alert Threshold Settings (Port: 13)

Note:

1. The step of WeightLowTH is 5. It accepts input like 35, 40, 45, etc. Other input will be rounded down to the nearest multiple of 5.
2. Weight Low Alert is kept unchanged when WEIGHT drops to 0 or less momentarily.
3. Weight Low Alert is set to 1 if WEIGHT is less than or equal to WeightLowTH but larger than 0.
4. Weight Low Alert is set to 0 if WEIGHT is more than (WeightLowTH + 15).

Weight Downlink Taring Configuration (Port: 24)

Byte	0	1
Field	0x0D	0x00

Acknowledgement command: Weight Downlink Taring Results (Port: 14)

4. Revision History

Revision	*Description*	*Date*
1.0	• Initial Release.	15 Dec 2020

Revision	*Description*	*Date*
1.01	• Added water leak alert clear in EVT (Water Leak Reading). • Added data payload format for dry contact input sensor. • Corrected formula for calculating temperature for LRS20100 and Battery Voltage for all sensors. • Added additional uploads settings for water leak sensor.	15 Mar 2021
1.02	• Added examples for decoding payload. • Added default values of sensor settings.	28 Mar 2021
1.03	• Remove water leak alert clear in EVT (Water Leak Reading). • Remove dry contact input alert in EVT (Dry Contact Input) • Updated several default parameters setting.	27 May 2021
1.10	• Change the BAT from voltage to percentage (Only apply to firmware version (FMV) 01.00.000 or later)	4 Jun 2021
1.11	• Remove battery low bit from EVT field under Port 10	10 Dec 2021
1.12	• Add cable break alert bit from EVT field under Port 10 (Water Leak Reading)	17 Mar 2022
1.13	• Added table of content	17 Jun 2022
1.14	• Added payload for Distance Sensor	11 Oct 2022
1.15	• Added LoRaWAN class description.	31 Mar 2023
1.20	• Added the information for LRS20UD0 (Ultrasonic Distance Sensor).	3 May 2023
1.21	• Added the information for LRS20200 (Temperature Sensor). • Update data payload examples.	15 June 2023
1.22	• Updated the supported part number for ultrasonic sensor. • Updated the unit for distances.	7 Dec 2023
1.23	• Added negative reading examples for temperature sensor.	9 Jan 2024
1.24	• Corrected the calculation/unit of the distance and its threshold.	25 April 2024

Revision	*Description*	*Date*
1.25	• Added Weight Scale Sensor (LRS20800). • Added Temperature Delta Mode for LRS20200.	8 Oct 2024
1.26	• Added uplink count for LRS20200. • Added device status for all models.	10 Mar 2025
1.27	• Added pulse meter counter support for LRS20600-0000. • Change the model number of Dry Contact Input Sensor to LRS20600-0000 and Weight Sensor model number to LRS20600-8000. • Changed LRS20200 temperature delta mode to adaptive reporting mode.	11 Jun 2025
1.28	• Added support for LRS40LD0.	22 Oct 2025
1.29	• Spelling corrections in Section 3.2.3 LRS20200 Temperature Sensor	17 July 2026
2.0	First release on docs.senso8.com	Oct 2026