



ESENSE--OEM PROTOCOL

ICD : COM PROTOCOL DESCRIPTION

ESENSE-3X-OEM Protocol

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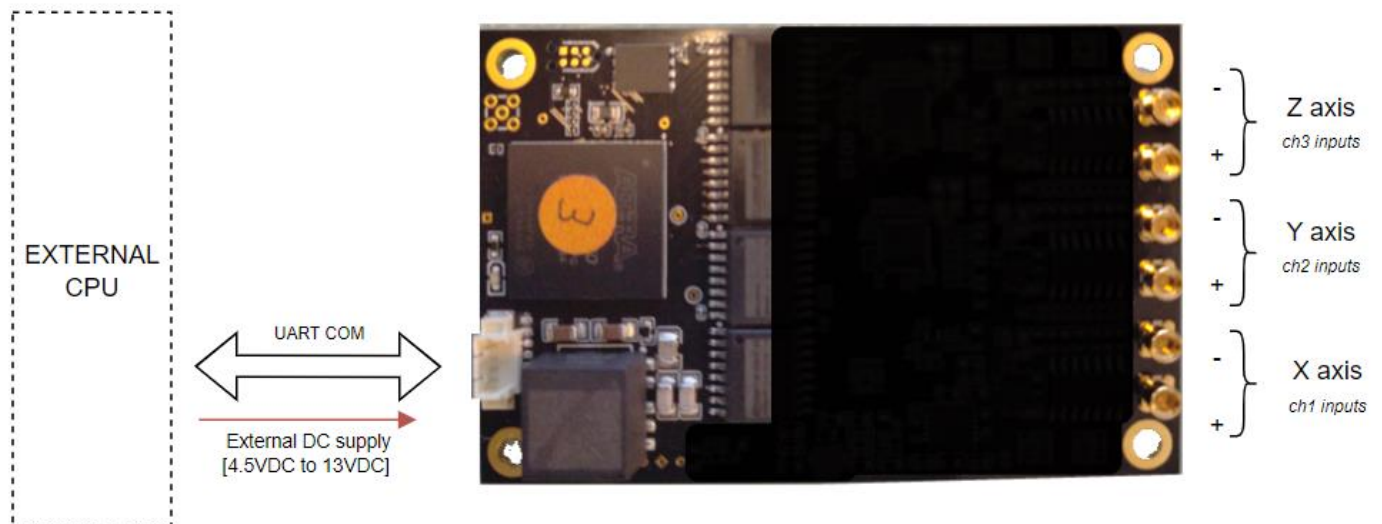
➤ **Object du document**

The purpose of this document is to describe ESENSE-OEM protocol in terms of its operation and the frames exchanged.

1 Implementation

1.1 System organization

1.1.1 Overview

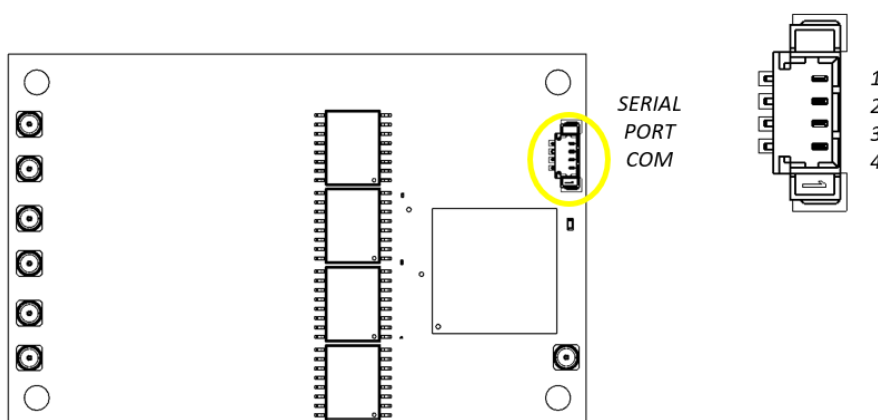


For the ESENSE-OEM in 2 axis version only channels 1 and 3 are available

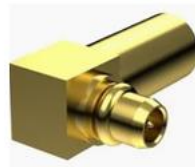
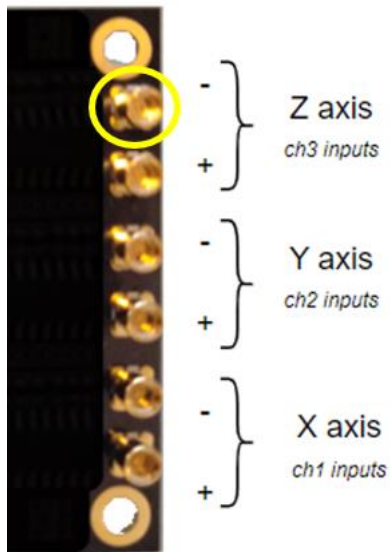
1.1.2 Supply voltage

The OEM ESENSE board is powered through the PicoBlade connector. The board supports a DC supply voltage ranging from 4.5 VDC to 13 VDC. Maximum power consumption (maximum configuration): 1.75 W (5 VDC, 350 mA), with the highest sampling rate, highest resolution, and all measurement axes enabled.

1.1.3 Connectors interface



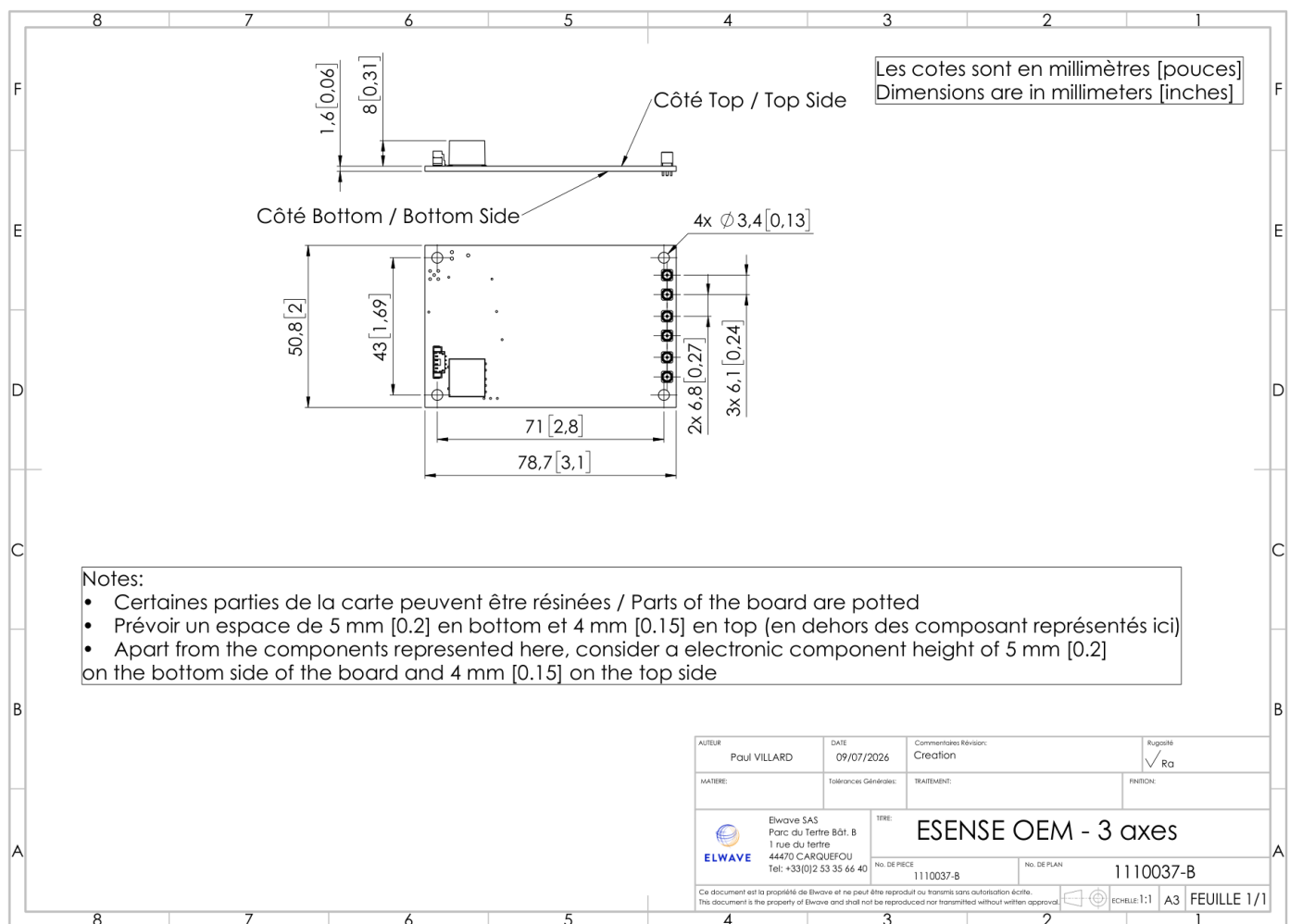
PORT COM ESENSE 3X-OEM	
Ref item :	53398-0471 Molex
Connector Matching	51021-0400 Molex
PIN number	Pin signification
1	GND
2	+VIN (4,5VDC-13,5 VDC)
3	SERIAL COM RXD TTL 3V3
4	SERIAL COM TXD TTL 3V3



**ANALOG INPUT SIGNAL
ESENSE 3X-OEM**

Ref item :	MMCX-J-P-H-ST-TH1 SAMTEC
Connector Matching	MMCX-P-C-H-RA-CA1 SAMTEC

1.1.4 Mechanical dimensions



1.1.5 SERIAL PORT COM

OSI Layer	Serial Interface
7 : Application	ESENSE-3X-OEM Protocol (ELWAVE Owner)
6 : Presentation	
5 : Session	
4 : Transport	Not used
3 : Network	Not used
2 : Data link	Serial
1 : Physique	Used

Serial Port Settings

- Baud rate : 921 600 Bd
- Donnée : 8 bits
- Parity : none
- Stop Bit : 1 bit
- Flow control : none

2 Message description

2.1 Protocol Message Overview

2.1.1 GENERAL_CH123

CMD	MSG	DESCRIPTION
\$G_APP01	GET_MODE_CH123	Request the current mode of channels CH1, CH2 and CH3, indicating whether they are in sampling or sleep mode.
\$S_APP01	SET_MODE_CH123	Configure the current mode of channels CH1, CH2 and CH3, indicating whether they are in sampling or sleep mode.
\$P_APP01	PARAM_MODE_CH123	Return the current mode of channels CH1, CH2 and CH3, indicating whether they are in sampling or sleep mode.
\$G_APP05	GET_SIGNAL_PROCESSING_STAGE	Request the filtering method applied to all output signals from CH1, CH2, and CH3.
\$S_APP05	SET_SIGNAL_PROCESSING_STAGE	Select the filtering method to apply all output signals from CH1, CH2, and CH3
\$P_APP05	PARAM_SIGNAL_PROCESSING_STAGE	Return the filtering method applied to all output signals from CH1, CH2, and CH3.
\$G_APP08	GET_GAIN_CH1	Requests the analog gain configuration applied to channel 1.
\$S_APP08	SET_GAIN_CH1	Configures the analog gain setting for Channel 1.
\$P_APP08	PARAM_GAIN_CH1	Returns the analog gain setting for Channel 1.
\$G_APP09	GET_GAIN_CH2	Requests the analog gain configuration applied to channel 2.
\$S_APP09	SET_GAIN_CH2	Configures the analog gain setting for Channel 2.
\$P_APP09	PARAM_GAIN_CH2	Returns the analog gain setting for Channel 2.
\$G_APP0A	GET_GAIN_CH3	Requests the analog gain configuration applied to channel 3.
\$S_APP0A	SET_GAIN_CH3	Configures the analog gain setting for Channel 3.
\$P_APP0A	PARAM_GAIN_CH3	Returns the analog gain setting for Channel 3.
\$STREAM_01	CONTINUOUS_STREAM_CH123	Message continuously transmitting the latest digitized values from Channels 1, 2, and 3, together with a timestamp and the saturation status.

2.2 Protocol message format :

2.2.1 Protocol standard message format : Frame structure

STX (1 byte)	LEN (2 bytes)	MSG ID (4 bytes)	PAYLOAD (0-65535 bytes)
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Index	Type	Content	Value	Description
0	uint8_t stx	Packet start marker	0xA5	Start of Text: protocol-specific value. Indicates the start of a new packet.
1 to 2	uint16_t len	Payload length	0-4080	Indicates the length of the packet payload.
4 to 7	uint32_t msgid	ID message	structure	The ID defines what the payload “means” and how to decode it correctly.
8	uint8_t payload [max 65535]	(0-65535) octets	buff[len]	Useful packet data, depends on msgid.

2.2.2 Protocol stream message format : Frame structure

STX (1 byte)	MSG ID (1 bytes)	PAYLOAD (0-65535 bytes)
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Index	Type	Content	Value	Description
0	uint8_t stx	Packet start marker	0xA9	Start of Text : protocol-specific value. Indicates the start of a new packet.
1	uint32_t msgid	ID message	structure	The ID defines what the payload “means” and how to decode it correctly.
2	uint8_t payload [max 65535]	(0-65535) octets	buff[len]	Useful packet data, depends on msgid.

2.3 Standard message Description

2.3.1 [\$G_APP01] Msg GET_MODE_CH123

Msg \$G_APP01	GET_MODE_CH123
Type	GET
Function	GENERAL_CH123
Description	Requests the current operational status (mode) of channels CH1, CH2, and CH3, indicating whether each channel is in active mode or sleep mode. Expected response: Msg \$P_APP01

STX	LEN		MSG_ID			
			TYPE	FUNC	OBJ	
	Byte 0	Byte 1			Byte 0	Byte 1
0xA5	0x00	0x00	0x01	0x02	0x01	0x00

Test : A5 00 00 01 02 01 00

2.3.2 [\$S_APP01] Msg SET_MODE_CH123

Msg \$S_APP01	SET_MODE_CH123
Type	SET
Function	GENERAL_CH123
Description	Configures the current operational status (mode) of channels CH1, CH2, and CH3 using a 1-byte field: Data[7..0]. - 0 : Sleep mode - 1 : Sampling mode In Sleep mode, the data streams are disabled. Expected response: Msg \$P_APP01

STX	LEN		MSG_ID				PAYLOAD
			TYPE	FUNC	OBJ		
	Byte 0	Byte 1			Byte 0	Byte 1	
0xA5	0x01	0x00	0x02	0x02	0x01	0x00	DATA [7..0]

Test : A5 01 00 02 02 01 00 01

2.3.3 [\$P_APP01] Msg PARAM_MODE_CH123

Msg \$P_APP01	PARAM_MODE_CH123
Type	PARAM_VALUE
Function	GENERAL_CH123
Description	Return the current operational status (mode) of channels CH1, CH2, and CH3 using a 1-byte field: Data[7..0]. - 0 : Sleep mode - 1 : Sampling mode In Sleep mode, the data streams are disabled. Expected response: None

STX	LEN		MSG_ID				PAYLOAD
			TYPE	FUNC	OBJ		
	Byte 0	Byte 1			Byte 0	Byte 1	Byte 0
0xA5	0x01	0x00	0x03	0x02	0x01	0x00	DATA [7..0]

Test : A5 01 00 03 02 01 00 01

2.3.4 [\$G_APP05] Msg GET_SIGNAL_PROCESSING_STAGE

Msg \$G_APP05	GET_SIGNAL_PROCESSING_STAGE
Type	GET
Function	GENERAL_CH123
Description	Request the filtering method applied to all output signals from CH1, CH2, and CH3. Expected response: Msg \$P_APP05

STX	LEN		MSG_ID			
			TYPE	FUNC	OBJ	
	Byte 0	Byte 1			Byte 0	Byte 1
0xA5	0x00	0x00	0x01	0x02	0x05	0x00

Test : A5 00 00 01 02 05 00

2.3.5 [\$S_APP08] Msg SET_SIGNAL_PROCESSING_STAGE

Msg \$S_APP08	SET_SIGNAL_PROCESSING_STAGE
Type	SET
Function	GENERAL_CH123
Description	Select the filtering method to apply all output signals from CH1, CH2, and CH3 : Data[7..0]: - 0 : Raw data (no filter) - 1 : Low-Pass Filter (DC–10 Hz) - 2 : Low-Pass Filter (DC–30 Hz) - 3 : High-Pass Filter (90–2000 Hz) Expected response: Msg \$P_APP08

STX	LEN		MSG_ID				PAYLOAD
			TYPE	FUNC	OBJ		
	Byte 0	Byte 1			Byte 0	Byte 1	Byte 0
0xA5	0x01	0x00	0x03	0x02	0x05	0x00	DATA [7..0]

Test : A5 01 00 03 02 05 00 01

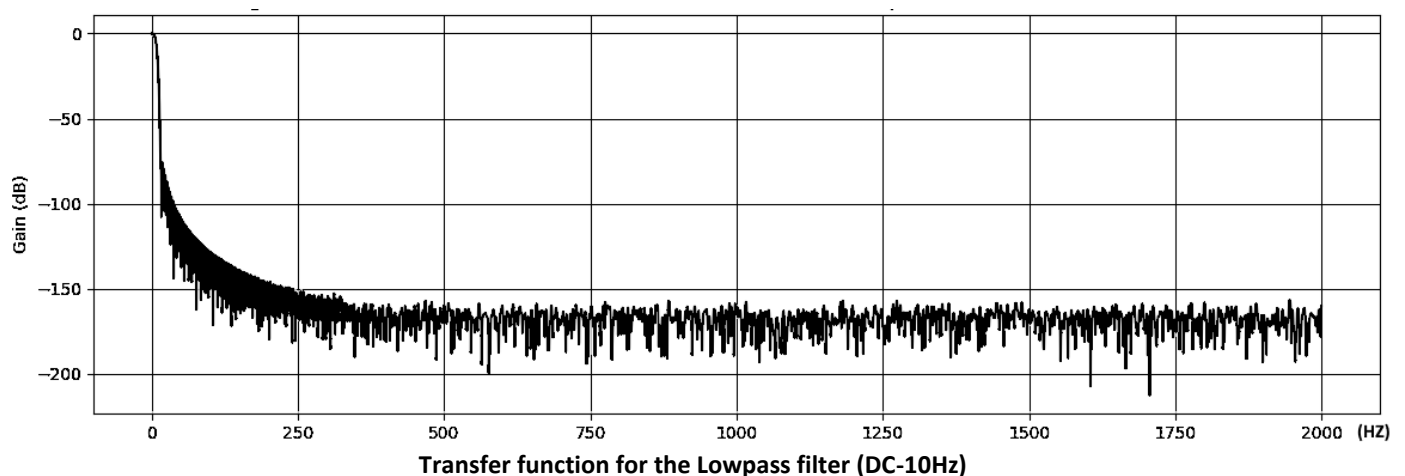
2.3.6 [\$P_APP08] Msg PARAM_SIGNAL_PROCESSING_STAGE

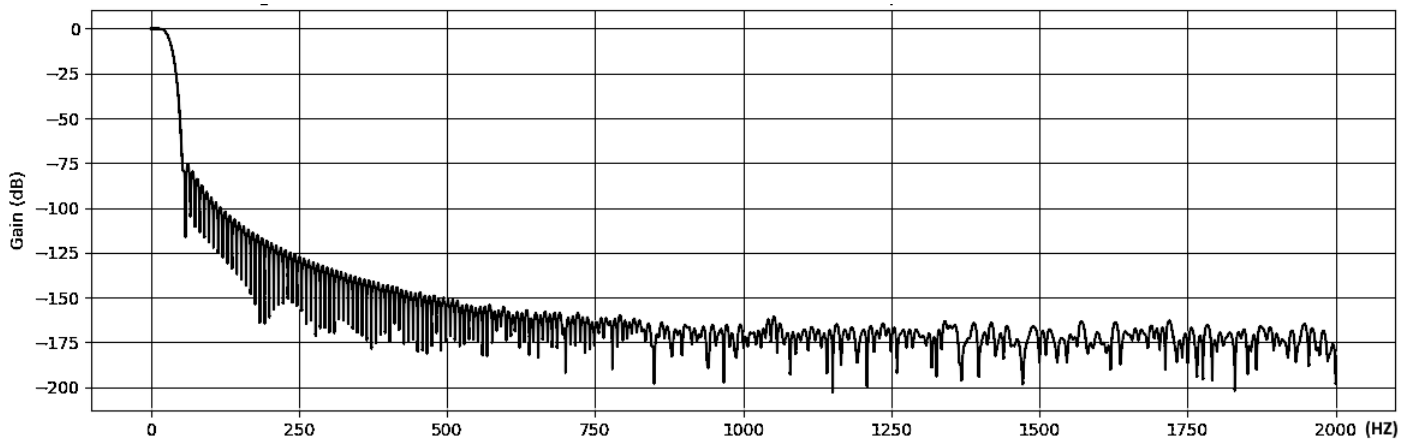
Msg \$P_APP08	PARAM_SIGNAL_PROCESSING_STAGE
Type	PARAM
Function	GENERAL_CH123
Description	Return the filtering method applied to all output signals from CH1, CH2, and CH3.: Data[7..0]: - 0 : Raw data (no filter) - 1 : Low-Pass Filter (DC–10 Hz) - 2 : Low-Pass Filter (DC–30 Hz) - 3 : High-Pass Filter (90–2000 Hz) Expected response: None

STX	LEN		MSG_ID				PAYLOAD
			TYPE	FUNC	OBJ		
	Byte 0	Byte 1			Byte 0	Byte 1	Byte 0
0xA5	0x01	0x00	0x03	0x02	0x05	0x00	DATA [7..0]

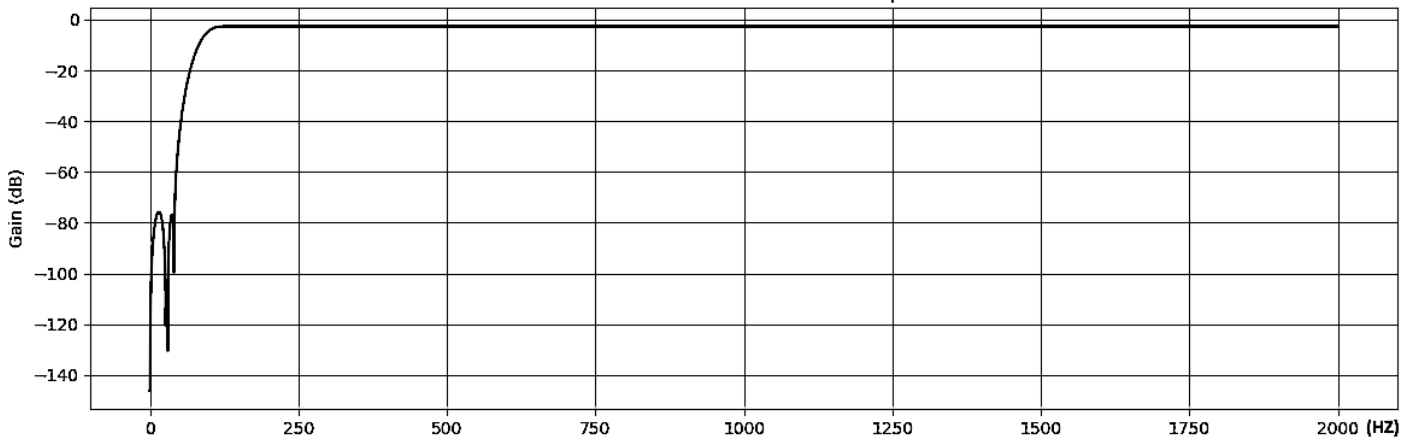
Test : A5 01 00 03 02 05 00 01

2.3.7 Transfer function on filter stage





Transfer function for the Lowpass filter (DC-30Hz)



Transfer function for the High pass filter (90-2000Hz)

2.3.8 [\$G_APP08] Msg GET_GAIN_CH1

Msg \$G_APP08	GET_GAIN_CH1
Type	GET
Function	GENERAL_CH123
Description	Requests the analog gain setting for Channel 1. Expected response: Msg \$P_APP08

STX	LEN		MSG_ID			
			TYPE	FUNC	OBJ	
	Byte 0	Byte 1			Byte 0	Byte 1
0xA5	0x00	0x00	0x01	0x02	0x08	0x00

Test : A5 00 00 01 02 08 00

2.3.9 [\$S_APP08] Msg SET_GAIN_CH1

Msg \$S_APP08	SET_GAIN_CH1
Type	SET
Function	GENERAL_CH123
Description	Configures the analog gain setting for Channel 1 using a 1-byte field: Data[7..0]: - 3: ×200 - 2: ×2,000 - 1: ×20,000 - 0: ×200,000 Expected response: Msg \$P_APP08

STX	LEN		MSG_ID				PAYLOAD
			TYPE	FUNC	OBJ		
	Byte 0	Byte 1			Byte 0	Byte 1	
0xA5	0x01	0x00	0x02	0x02	0x08	0x00	DATA [7..0]

Test : A5 01 00 02 02 08 00 01

2.3.10 [\$P_APP08] Msg PARAM_GAIN_CH1

Msg \$P_APP08	PARAM_GAIN_CH1
Type	PARAM_VALUE
Function	GENERAL_CH123
Description	Return the analog gain setting for Channel 1 using a 1-byte field: Data[7..0]: - 3: ×200 - 2: ×2,000 - 1: ×20,000 - 0: ×200,000 Expected response: None

STX	LEN		MSG_ID				PAYLOAD
			TYPE	FUNC	OBJ		
	Byte 0	Byte 1			Byte 0	Byte 1	
0xA5	0x01	0x00	0x03	0x02	0x08	0x00	DATA [7..0]

Test : A5 01 00 03 02 08 00 01

2.3.11 [\$G_APP09] Msg GET_GAIN_CH2

Msg \$G_APP09	GET_GAIN_CH2
Type	GET
Function	GENERAL_CH123
Description	Requests the analog gain setting for Channel 2. Expected response: Msg \$P_APP09

STX	LEN		MSG_ID			
			TYPE	FUNC	OBJ	
	Byte 0	Byte 1			Byte 0	Byte 1
0xA5	0x00	0x00	0x01	0x02	0x09	0x00

Test : A5 00 00 01 02 09 00

2.3.12 [\$S_APP09] Msg SET_GAIN_CH2

Msg \$S_APP09	SET_GAIN_CH2
Type	SET
Function	GENERAL_CH123
Description	Configure la configuration du gain analogique appliqué à la voie n°2 sur 1 octet Data[7..0] : : - 3 : x 200 - 1 : x 2000 - 2 : x 20 000 - 3 : x 200 000 Réponse attendue : Msg \$P_APP09

STX	LEN		MSG_ID				PAYLOAD
			TYPE	FUNC	OBJ		
	Byte 0	Byte 1			Byte 0	Byte 1	Byte 0
0xA5	0x01	0x00	0x02	0x02	0x09	0x00	DATA [7..0]

Test : A5 01 00 02 02 09 00 01

2.3.13 [\$P_APP09] Msg PARAM_GAIN_CH2

Msg \$P_APP09	PARAM_GAIN_CH2
Type	PARAM_VALUE
Function	GENERAL_CH123
Description	Return the analog gain setting for Channel 2 using a 1-byte field: Data[7..0]: - 3: ×200 - 2: ×2,000 - 1: ×20,000 - 0: ×200,000 Expected response: None

STX	LEN		MSG_ID				PAYLOAD
			TYPE	FUNC	OBJ		
	Byte 0	Byte 1			Byte 0	Byte 1	
0xA5	0x01	0x00	0x03	0x02	0x09	0x00	DATA [7..0]

Test : A5 01 00 03 02 09 00 01

2.3.14 [\$G_APP0A] Msg GET_GAIN_CH3

Msg \$G_APP0A	GET_GAIN_CH3
Type	GET
Function	GENERAL_CH123
Description	Requests the analog gain setting for Channel 3. Expected response: Msg \$P_APP0A

STX	LEN		MSG_ID			
			TYPE	FUNC	OBJ	
	Byte 0	Byte 1			Byte 0	Byte 1
0xA5	0x00	0x00	0x01	0x02	0x0A	0x00

Test : A5 00 00 01 02 0A 00

2.3.15 [\$S_APP0A] Msg SET_GAIN_CH3

Msg \$S_APP0A	SET_GAIN_CH3
Type	SET
Function	GENERAL_CH123
Description	Configure la configuration du gain analogique appliqué à la voie n°3 sur 1 octet Data[7..0] : : - 0 : x 200 - 1 : x 2000 - 2 : x 20 000 - 3 : x 200 000 Réponse attendue : Msg \$P_APP0A

STX	LEN		MSG_ID				PAYLOAD
			TYPE	FUNC	OBJ		
	Byte 0	Byte 1			Byte 0	Byte 1	
0xA5	0x01	0x00	0x02	0x02	0x0A	0x00	DATA [7..0]

Test : A5 01 00 02 02 0A 00 01

2.3.16 [\$P_APP0A] Msg PARAM_GAIN_CH3

Msg \$P_APP0A	PARAM_GAIN_CH3
Type	PARAM_VALUE
Function	GENERAL_CH123
Description	Return the analog gain setting for Channel 3 using a 1-byte field: Data[7..0]: - 3: ×200 - 2: ×2,000 - 1: ×20,000 - 0: ×200,000 Expected response: None

STX	LEN		MSG_ID				PAYLOAD
			TYPE	FUNC	OBJ		
	Byte 0	Byte 1			Byte 0	Byte 1	
0xA5	0x01	0x00	0x03	0x02	0x0A	0x00	DATA [7..0]

Test : A5 01 00 03 02 0A 00 01

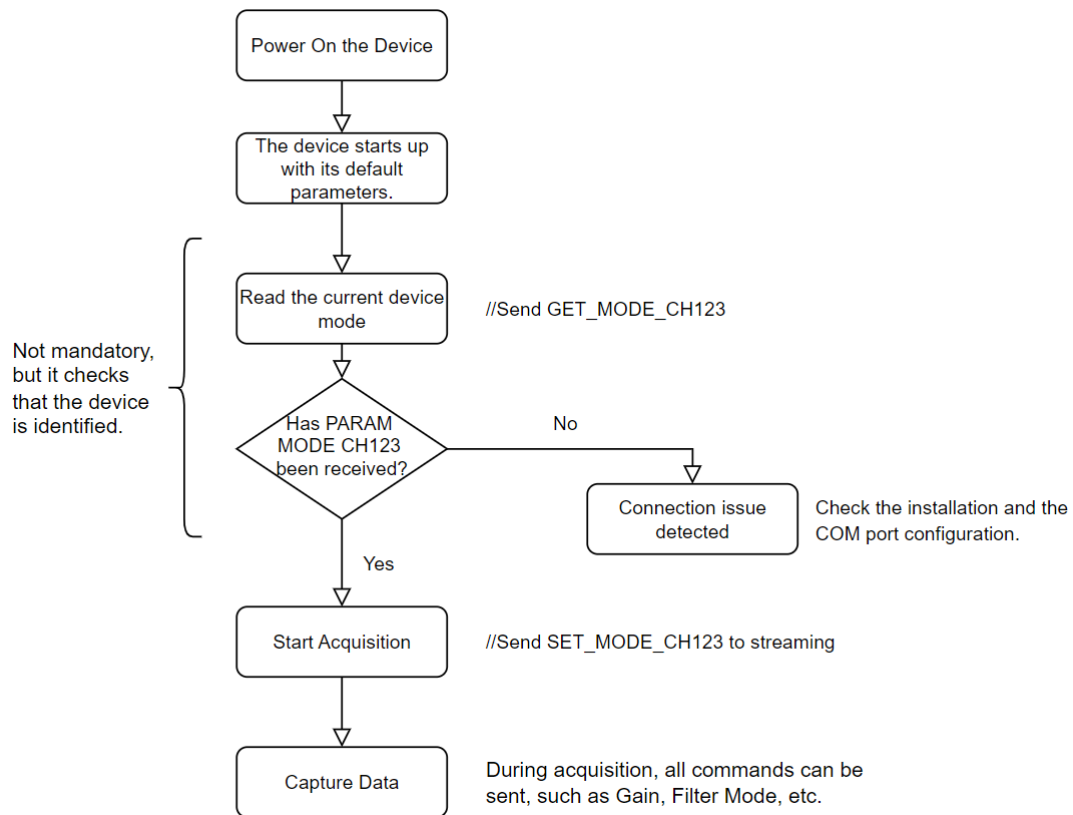
2.3.17 [\$STREAM_01] Msg CONTINUOUS_STREAM_CH123

Msg \$STREAM_01	CONTINUOUS_STREAM_CH123
Type	STREAM
Function	GENERAL_CH123
Description	Continuously transmitted whenever new samples are available. The message contains the latest digitized values for Channels 1, 2, and 3, together with a timestamp (referenced from system startup or from the last setTime command). Signal Status (1-byte bit field): indicates which channels are saturated. - Bit0 : Channel 1 status (1 = saturated, 0 = not saturated) - Bit1 : Channel 2 status (1 = saturated, 0 = not saturated) - Bit2 : Channel 3 status (1 = saturated, 0 = not saturated) The timestamp is a 4-byte unsigned value expressed in microseconds (μs). Channel Measurements - Channel 1: 4-byte signed integer - Channel 2: 4-byte signed integer - Channel 3: 4-byte signed integer When using ELWAVE electro, the voltage difference U_x (in volts) for each channel is calculated using the formula below. $U_x = \frac{CHx}{(12\ 025\ 908\ 429 * GainChx)}$ The payload format is 21 bytes: Data[151..0] : - Data[7..0] : (bit field) channels status - Data[39..8] : u32 Times in us - Data[71..40] : s32 Data chanal-1 - Data[103..72] : s32 Data chanal-2 - Data[135..104] : s32 Data chanal-3 - Data[151..136] : CRC16 Expected response: None

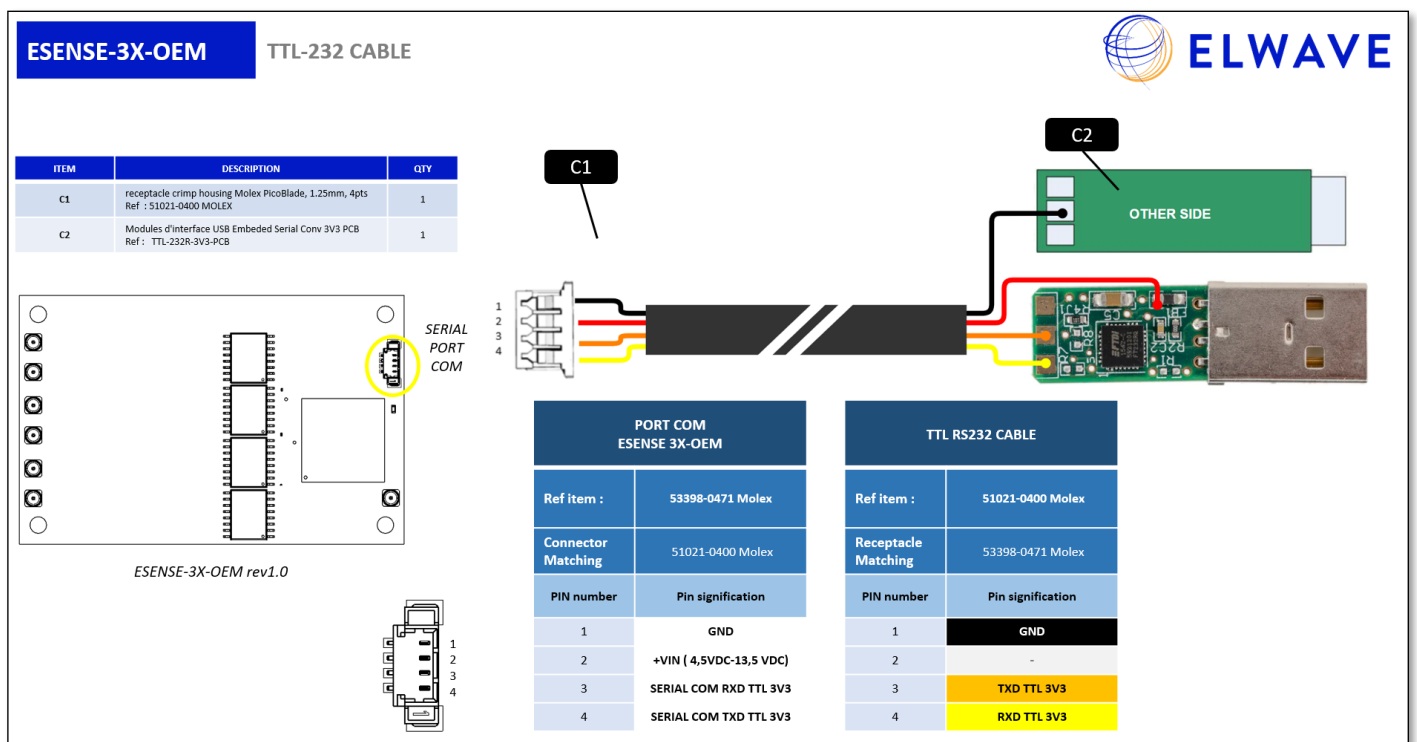
STX	OBJ	PAYLOAD					
		Byte 0	Byte 1	...	Byte 18	Byte 19	Byte 20
0xA9	0x01	DATA [7..0]	DATA [15..8]	...	DATA [135..128]	DATA [143..136]	DATA [151..144]

Payload					
Channel Status	Time (us)	Data CH-1	Data CH-2	Data CH-3	CRC16

3 Application information



4 CABLE WIRING



END OF DOCUMENT