

Requirement Specification for Module stringtools

August 12, 2025

Contents

1	SEC-0001: Stream Definition	2
1.1	REQ-0019: Physical representation	2
1.2	REQ-0020: Time representation	2
1.3	REQ-0021: Fraction representation	2
2	SEC-0002: Human readable value representations	2
3	SEC-0003: Stream to Human readable String	2
3.1	REQ-0001: Hexadecimal Values	2
3.2	REQ-0002: Number of Bytes	2
3.3	REQ-0005: CRLF-Filter	2
4	SEC-0004: Stream Compression	3
4.1	REQ-0003: Compress	3
4.2	REQ-0004: Extract	3
5	SEC-0005: Carriagereturn Seperation Protocol (CSP)	3
5.1	REQ-0006: Frame creation	3
5.2	REQ-0007: Frame creation error	3
5.3	REQ-0008: Frame processing	3
5.4	REQ-0009: Frame processing - Input data type error	3
6	SEC-0006: Serial Transfer Protocol (STP)	4
6.1	REQ-0010: Frame creation	4
6.2	REQ-0015: Frame creation - Start pattern and end pattern inside a message	4
6.3	REQ-0011: Frame processing	4
6.4	REQ-0012: Frame processing - Input data type error	4
6.5	REQ-0013: Frame processing - Start pattern and end pattern inside a message	4
6.6	REQ-0014: Frame processing - Data before the start pattern	4
6.7	REQ-0016: Frame processing - Incorrect start patterns	4
6.8	REQ-0017: Frame processing - Incorrect end pattern	5
6.9	REQ-0018: Frame processing - After state corruption	5

1 SEC-0001: Stream Definition

1.1 REQ-0019: Physical representation

The library `stringtools` shall have a method `physical_repr`, transforming a float or integer value to a string with a 1 to 3 digit value followed by the physical prefix for the unit.

1.2 REQ-0020: Time representation

The library `stringtools` shall have a method `physical_repr`, transforming an integer value to a time string like HH:MM:SS.

1.3 REQ-0021: Fraction representation

The library `stringtools` shall have a method `frac_repr`, transforming a float or integer value to a fraction string with a limited denominator.

2 SEC-0002: Human readable value representations

3 SEC-0003: Stream to Human readable String

3.1 REQ-0001: Hexadecimal Values

A Stream shall be converted to a human readable String containing all bytes as hexadecimal values seperated by a Space.

<i>Reason</i>	Make non printable characters printable.
<i>Fitcriterion</i>	A stream shall be converted at least once and the hex values shall exist in the returnvalue in the correct order.

3.2 REQ-0002: Number of Bytes

The Length of a Stream surrounded by brakets shall be included in the human readable string.

<i>Reason</i>	Show the length of a Stream without counting the seperated values.
<i>Fitcriterion</i>	The described pattern including the decimal number of bytes is included in the string for at least one Stream.

3.3 REQ-0005: CRLF-Filter

The module `stringtools` shall have a method to replace carriage return and line feed to their escaped representation.

<i>Reason</i>	Replace these characters to make output printable (e.g. for logging a string based protocol).
<i>Fitcriterion</i>	Filter at least one string and check at least one CR and one LF representation.

4 SEC-0004: Stream Compression

4.1 REQ-0003: Compress

The module `stringtools` shall have a method compressing a Stream with `gzip`.

<i>Reason</i>	Speed up transfer with low transfer rate.
<i>Fitcriterion</i>	Compressed Stream is extractable and results in the original data.

4.2 REQ-0004: Extract

The module `stringtools` shall have a method extracting a Stream with `gzip`.

<i>Reason</i>	Speed up transfer with low transfer rate.
<i>Fitcriterion</i>	Extracted Stream is equal to the original compressed data.

5 SEC-0005: Carriagereturn Seperation Protocol (CSP)

5.1 REQ-0006: Frame creation

The CSP module shall support a method to create a Frame from a stream.

<i>Reason</i>	Simple message or frame generation for streams (e.g. Keyboard (user input), RFID-Reader, ...).
<i>Fitcriterion</i>	Creation of a testframe and checking the result.

5.2 REQ-0007: Frame creation error

The Frame creation Method shall raise `ValueError`, if a frame separation character is in the Source-String.

<i>Reason</i>	String including separation charcter will be splitted in pieces while processing after transport.
<i>Fitcriterion</i>	<code>ValueError</code> is raised for at least one String including the separation character.

5.3 REQ-0008: Frame processing

The CSP Module shall support a class including a method to process stream snippets of variable length. This Method shall return an empty list, if no frame has been detected, otherwise it shall return a list including detected frame(s).

<i>Reason</i>	Support message analysis of a stream with every size.
<i>Fitcriterion</i>	At least one frame given in at least two snippets is identified correctly.

5.4 REQ-0009: Frame processing - Input data type error

If the input data is not bytes for python3 or str for python 2, the process method shall raise `TypeError`.

<i>Reason</i>	Type restriction.
<i>Fitcriterion</i>	At least the following types return <code>TypeError</code> (list, int, str for python3, unicode for python 2).

6 SEC-0006: Serial Transfer Protocol (STP)

6.1 REQ-0010: Frame creation

A frame creation method shall create a frame out of given input data.

<i>Reason</i>	Message or Frame generation for streams (e.g. data transfer via bluetooth, ethernet, ...).
<i>Fitcriterion</i>	Creation of a testframe and checking the result.

6.2 REQ-0015: Frame creation - Start pattern and end pattern inside a message

The frame creation method shall support existence of the start or end pattern in the data to be framed.

<i>Reason</i>	Possibility to send any kind of data (including the patterns).
<i>Fitcriterion</i>	Creation of a testframe out of data including at least one start pattern and one end pattern and checking the result.

6.3 REQ-0011: Frame processing

The STP Module shall support a class including a method to process stream snippets of variable length. This Method shall return an empty list, if no frame has been detected, otherwise it shall return a list including detected frame(s).

<i>Reason</i>	Support message analysis of a stream with every size.
<i>Fitcriterion</i>	At least one frame given in at least two snippets is identified correctly.

6.4 REQ-0012: Frame processing - Input data type error

If the input data is not bytes for python3 or str for python 2, the process method shall raise `TypeError`.

<i>Reason</i>	Type restriction.
<i>Fitcriterion</i>	At least the following types return <code>TypeError</code> (list, int, str for python3, unicode for python 2).

6.5 REQ-0013: Frame processing - Start pattern and end pattern inside a message

6.6 REQ-0014: Frame processing - Data before the start pattern

Data before the start pattern shall be ignored. A warning shall be given to the logger.

<i>Reason</i>	Robustness against wrong or corrupted data.
---------------	---

6.7 REQ-0016: Frame processing - Incorrect start patterns

On receiving an incorrect start pattern, STP shall stay in `ESCAPE_1`, in case of data sync was received twice or back to state `IDLE` in all other faulty start patterns starting with data sync. A warning shall be given to the logger.

<i>Reason</i>	Robustness against wrong or corrupted data.
---------------	---

6.8 REQ-0017: Frame processing - Incorrect end pattern

On receiving an incorrect end pattern, STP shall change to state `STORE_DATA`, in case of a start pattern, to `ESCAPE_1`, in case of data sync was received twice or back to state `IDLE` in all other faulty end patterns starting with data sync. A warning shall be given to the logger.

Reason Robustness against wrong or corrupted data.

6.9 REQ-0018: Frame processing - After state corruption

The state of STP shall be set to `IDLE`, after an unknown state was recognised. The currently processed data shall be processed again. An error shall be given to the logger.

Reason Robustness against wrong or corrupted data.
