Haptic Library

Tactronik™ Evaluation kit

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1. Objective

The herein document describes haptic effects of the Haptic Library developed by Actronika and integrated in the Tactronik platform. Each effects is presented into more details including a brief effect description, parameters and presets explanation.
It completes the different commands available in the Tactronik system, as described in the Tactronik API documentation. The list of all the effect integrated in the library and more details about the parameters settings for each effects will be given below.
All the effects have the possibility to be bound to one of the actuator, or both of them.

2. Library Effects List

ID	Name of the effect	ID	Name of the effect
0x000	Original Force Click - Variation 1	0x141	Passive Click - Variation 1
0x001	Double Force Click	0x142	Passive Half Click - Variation 2
0x002	Rocket	0x143	Passive Click - Variation 2
0x003	Waveform	0x144	Passive Half Click - Variation 3
0x004	Heartbeat	0x145	Passive Click - Variation 3
0x005	Texture - Version 1	0x146	Passive Half Click - Variation 4
0x006	Scroll - Variation 1	0x147	Passive Click - Variation 4
0x007	Jerky Impulses - Variation 1	0x148	Passive Half Click - Variation 5
0x008	Jerky Impulses - Variation 2	0x149	Passive Click - Variation 5
0x100	Original Force Click - Variation 1	0x14a	Passive Half Click - Variation 6
0x101	Original Force Click - Variation 2	0x14b	Passive Click - Variation 6
0x102	Original Force Click - Variation 3	0x200	Scroll - Variation 1
0x103	Original Force Click - Variation 4	0x201	Scroll - Variation 2
0x110	Smooth Force Click - Variation 1	0x202	Scroll - Variation 3
0x111	Smooth Force Click - Variation 2	0x203	Scroll - Variation 4
0x112	Smooth Force Click - Variation 3	0x204	Scroll - Variation 5
0x120	Medium Force Click - Variation 1	0x205	Scroll - Variation 6
0x121	Medium Force Click - Variation 2	0x206	Scroll - Variation 7
0x122	Medium Force Click - Variation 3	0x207	Scroll - Variation 8
0x130	Sharp Force Click - Variation 1	0x208	Scroll - Variation 9
0x131	Sharp Force Click - Variation 2	0x300	Texture - Version 2
0x132	Sharp Force Click - Variation 3	0x400	Zoom - Smooth
0x140	Passive Half Click - Variation 1	0x401	Zoom - Medium

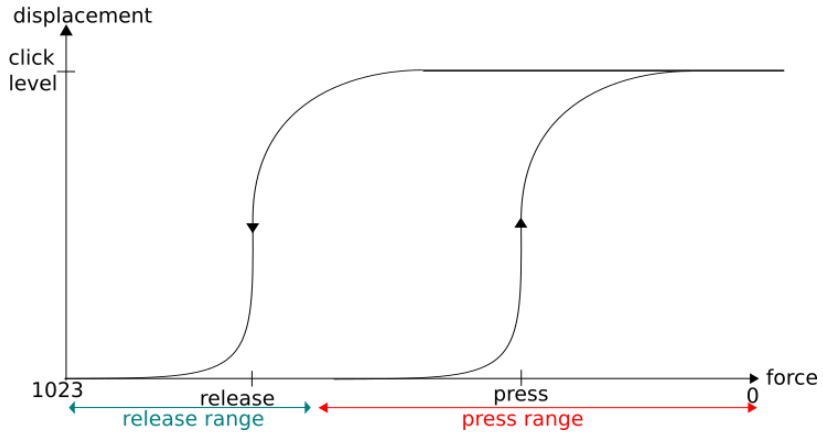
0x405	Rubber Band - Sharp		
0x500	Haptic Force - Variation 1		
0x501	Haptic Force - Variation 2		
0x502	Haptic Force - Variation 3		
0x503	Deceleration - Variation 1		
0x504	Deceleration - Variation 2		
0x505	Deceleration - Variation 3		

3. Original, Smooth, Medium & Sharp force click

3.1. Description of the effect

This is an effect simulating the sensation of a button click. It has been designed to recreate the haptic perception of a mechanical button. A force sensor has been used to trigger the click effect. Within this effect, many variations of the stimuli are proposed to adapt the haptic feedback to what the user desires.
The curve below presents how the effect reacts with the input sensor.

3.1.1. Press / Release Force



3.1.2. Press / Release Power

It is possible to configure the power of the sensation for the press and the release independently from the press/release force parameter which represents the simulated displacement of the button.

3.2. Configuration of the effect:

ID	Title	Description	Min	Max
0	Press Force	A simulated button displacement (switch travel) when pressing	0	1023
1	Release Force	A simulated button displacement (switch travel) when releasing	0	1023
2	Press Power	Amplitude of the sensation delivered when pressing	0	100
3	Release Power	Amplitude of the sensation delivered when releasing	0	100

3.3. Sensor and module

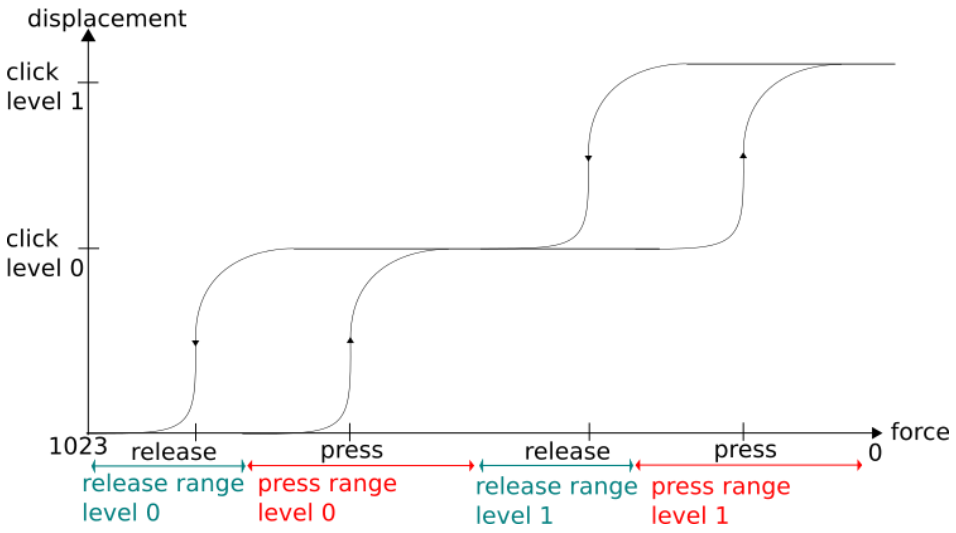
The click effect is controlled by the force applied to a force sensor (Sensor ID = 14). When using evaluation board, you shall use the force sensor module [User Manual, chapter. End modules]. When using an external sensor, you can use the API document to send the appropriate commands to update the sensor values.

4. Double Force Click

4.1. Description of the effect

Similarly to the Force Click, the Double Force Click simulates a click sensation with two levels of activation on a solid surface coupled to a force sensor.

4.1.1. Press / Release Force (1st and 2nd levels)



4.1.2. Press / Release Power (1st and 2nd levels)

It is possible to configure the power of the sensation for the press and the release independently from the press/release force parameter which represents the simulated displacement of the button.

4.2. Configuration of the effect

ID	Title	Description	Min	Max
0	Press Force 1st click	A simulated button displacement (switch travel) when pressing	0	1000
1	Release Force 1st click	A simulated button displacement (switch travel) when releasing	0	1000
2	Press Force 2nd click	A simulated button displacement (switch travel) when pressing	0	1000

3	Release Force 2nd click	A simulated button displacement (switch travel) when releasing	0	1000
4	Press Power 1st click	Amplitude of the sensation delivered when pressing the sensor	0	100
5	Release Power 1st click	Amplitude of the sensation delivered when releasing the sensor	0	100
6	Press Power 2nd click	Amplitude of the sensation delivered when pressing the sensor	0	100
7	Release Power 2nd click	Amplitude of the sensation delivered when releasing the sensor	0	100

4.3. Sensor and module

The click effect is controlled by the force applied to a force sensor module (Sensor ID = 14). When using evaluation board, you shall use the force sensor module [User Manual, chapter. End modules].
When using an external sensor, you can use the API document to send the appropriate commands to update the sensor values.

5. Passive Half Click

5.1. Description of the effect

This is a passive version of the click effect, with all the possible variations of the stimuli. It stimulates the actuator on a “Play Effect” command.
The *passive half click* effect only play the effect you can feel on a press.

5.2. Configuration of the effect

ID	Title	Description	Min	Max
0	Power	Amplitude of the sensation delivered	0	100

5.3. Sensor and module

No specific sensors or modules are needed for this effect, there’s no restriction on the module plugged to sense the effect.

6. Passive Click

6.1. Description of the effect

Similarly to the previous effect, this is a passive version of the click effect, with all the possible variations of the stimuli. It stimulates the actuator on a “Play Effect” command.
The *passive click* effect only play the successively, with a parametrable delay, the effects you can feel on an active click, the press and the release.

6.2. Configuration of the effect

ID	Title	Description	Min	Max
0	Effect 1 Power	Amplitude of the sensation delivered for the first effect	0	100
1	Effect 2 Power	Amplitude of the sensation delivered for the second effect	0	100
2	Blank delay (us)	Time between the two clicks	1000	10000

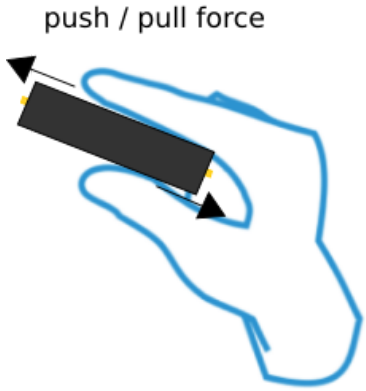
6.3. Sensor and module

No specific sensors or modules are needed for this effect, there’s no restriction on the module plugged to sense the effect.

7. Rocket

7.1. Description of the effect

The rocket effect shows an unusual coupling between a vibrotactile and force feedback. It generates a sensation of a push/pull force along the axis of the actuator. When changing the direction parameter you either feel a push or pull force.



7.2. Configuration of the effect

ID	Title	Description	Min	Max
0	Amplitude	Amplitude of the sensed force (%)	0	100
1	Direction	Direction of the sensed force created (0 : push / 1 : pull)	0	1

7.3. Sensor and module

It is recommended to try this effect holding the actuator in between the index finger and a thumb. No specific sensors or modules are needed for this effect, there's no restriction on the module plugged to sense the effect.

8. Waveform generator

8.1. Description of the effect

A simple waveform generator allowing to test basic signals such as a sinusoidal, triangle and square waves. Each of these signals has their frequency and amplitude configurable.

8.2. Configuration of the effect

ID	Title	Description	Min	Max
0	Duration	Period of the played signal (µs)	2000	50000
1	Amplitude	Amplitude of the sensed signal (%)	0	100
2	Waveform	Selection of the waveform (0 : Sinus, 1 : Square, 2 : Triangle)	0	2

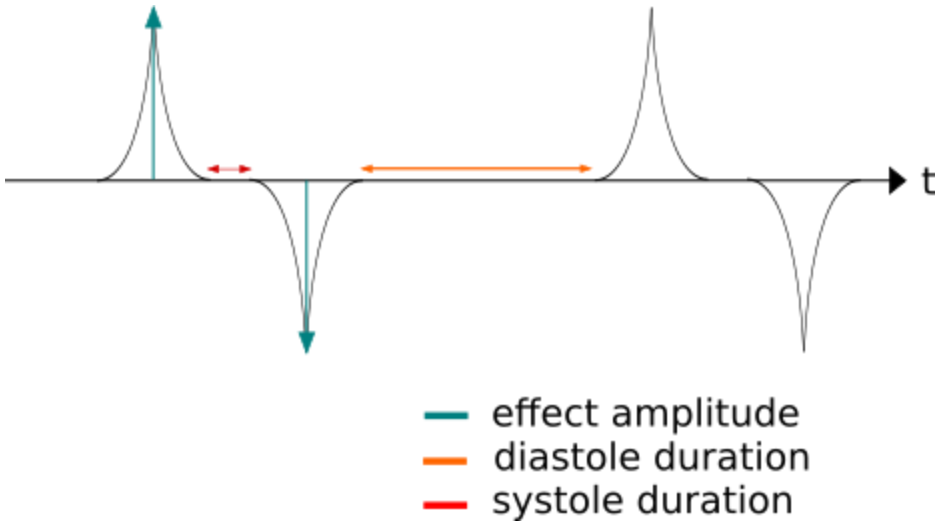
8.3. Sensor and module

No specific sensors or modules are needed for this effect, there's no restriction on the module plugged to sense the effect.

9. Heartbeat

9.1. Description of the effect

The heartbeat effect reproduces the sensation of a heartbeat. Within this effect, the systoles and diastole durations, as well as the amplitude of the effect, can be configured by the user.



9.2. Configuration of the effect

ID	Title	Description	Min	Max
0	Amplitude	Amplitude of the effect.	0	100
1	Systoles delay	Delay (us) between two successives beats	300000	2000000
2	Diastole delay	Delay (us) representing the diastole.	70000	250000

9.3. Sensor and module

No specific sensors or modules are needed for this effect, there's no restriction on the module plugged to sense the effect.

10. Generic Texture

10.1. Description of the effect

The generic texture effect modifies your haptic perception of a surface. It has been designed to be integrated on tactile surfaces such as a trackpad or a tactile screen to modify a default texture sensation. It is driven by the movement of one or several fingers and it is configured to work in only one direction. There are two effects generating a texture effect.

10.2. First texture effect (ID 0x005) :

10.2.1. Configuration of the effect

ID	Title	Description	Min	Max
0	Effect Power	Amplitude of the sensation delivered to the user while sliding on the surface	0	100
1	Number of fingers triggering the effect	Minimal number of fingers triggering the effect	1	3
2	Resolution	Span of the cues triggering the effect	1	500

10.2.2. Sensor and module

This effect is bound to the horizontal position of the finger on the surface (Sensor ID = 3). On the evaluation kit, this effect works with the trackpad.
When using an external sensor, you can use the API document to send the appropriate commands to update the sensor values.

8.2. Second texture effect (ID 0x300) :

10.2.3. Configuration of the effect

ID	Title	Description	Min	Max
0	Minimum Effect Power	Minimum amplitude of the sensation delivered to the user while sliding on the surface	0	100
1	Maximum Effect Power	Maximum amplitude of the sensation delivered to the user while sliding on the surface	0	100
2	Minimum Resolution	Minimum time space between two texture pulses(µs)	10	32767
3	Maximum Resolution	Maximum time space between two texture pulses (µs)	10	32767
4	Speed threshold	Minimum speed of the finger at which the effect will be active (pixel/s)	2	100

10.2.4. Sensor and module

This effect is bound to the position (x, y) of the finger on the surface (X ID = 2, Y ID = 3). On the evaluation kit, this effect works with the trackpad.
When using an external sensor, you can use the API document to send the appropriate commands to update the sensor values.

11. Scroll

11.1. Description of the effect

The scroll effect simulates a traditional mouse wheel scroll on a flat surface. It has been designed to be integrated on tactile surfaces such as trackpad or tactile screen and reproduce a scroll sensation. It is driven with the movement of one or several fingers, depending on the configuration, and will produce some impulses according to a vertical shifting of the fingers on the surface.
Within this effect, many variations of the stimuli are proposed.

11.2. Configuration of the effect

ID	Title	Description	Min	Max
0	Effect Power	Amplitude of the sensation delivered to the user while scrolling	0	100
1	Number of fingers triggering the effect	Exact number of fingers triggering the effect	1	3
2	Resolution	Span of the cues triggering the effect	1	500

11.3. Sensor and module

This effect is bound to the vertical position of the finger on the surface (Sensor ID = 3). On the evaluation kit, this effect works with the trackpad.
When using an external sensor, you can use the API document to send the appropriate commands to update the sensor values.

12. Zoom Gesture

12.1. Description of the effect

This effect generates impulses more or less spaced following the usual zoom gesture that can be done on tactile surfaces. The more distant the fingers are, the more spaced the impulses are.This effect is used with two fingers and depends on the variation between these two.
3 variations of the integrated stimuli are proposed within this effect.

12.2. Configuration of the effect

ID	Title	Description	Min	Max
0	Effect Power	Amplitude of the maximum sensation delivered to the user while zooming	0	100
1	Grain	Resolution of the grain sensed while zooming	100	100000
2	Distance	Maximum value taken by the distance between two fingers	1	2000

12.3. Sensor and module

This effect is bound to the position (x, y) of two fingers on a surface (X1 ID = 2, Y1 ID = 3, X2 ID = 5, Y2 ID = 6). On the evaluation kit, this effect works with the trackpad.
When using an external sensor, you can use the API document to send the appropriate commands to update the sensor values.

13. Rubber Band

13.1. Description of the effect

Similarly to the zoom effects, we generates impulses while following a usual zoom gesture. The difference is that the more the fingers are spaced, the more the impulses are close, giving the feeling of stretching a rubber band. This effect is used with two fingers and depends on the variation between these two. 3 variations of the integrated stimuli are proposed within this effect.

13.2. Configuration of the effect

ID	Title	Description	Min	Max
0	Effect Power	Amplitude of the maximum sensation delivered to the user while zooming	0	100
1	Grain	Resolution of the grain sensed while zooming	100	100000
2	Distance	Maximum value taken by the distance between two fingers	1	2000

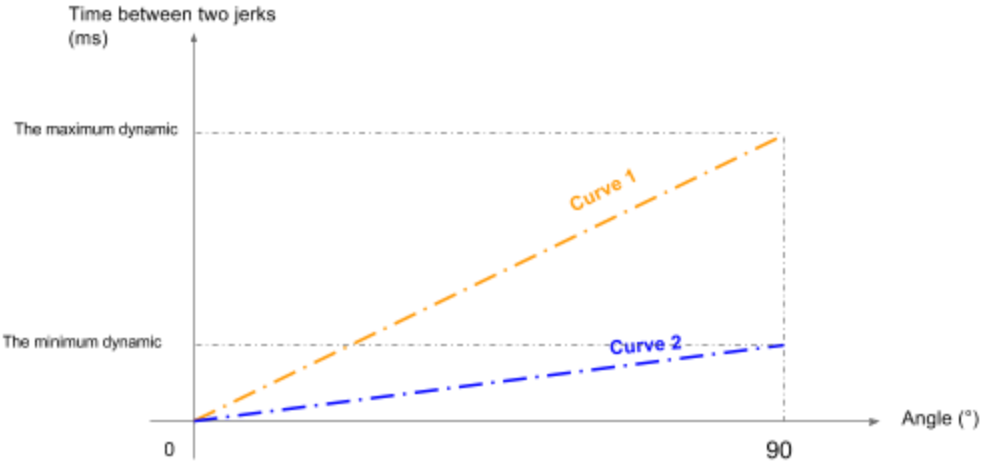
13.3. Sensor and module

This effect is bound to the position (x, y) of two fingers on a surface (X1 ID = 2, Y1 ID = 3, X2 ID = 5, Y2 ID = 6). On the evaluation kit, this effect works with the trackpad.
When using an external sensor, you can use the API document to send the appropriate commands to update the sensor values.

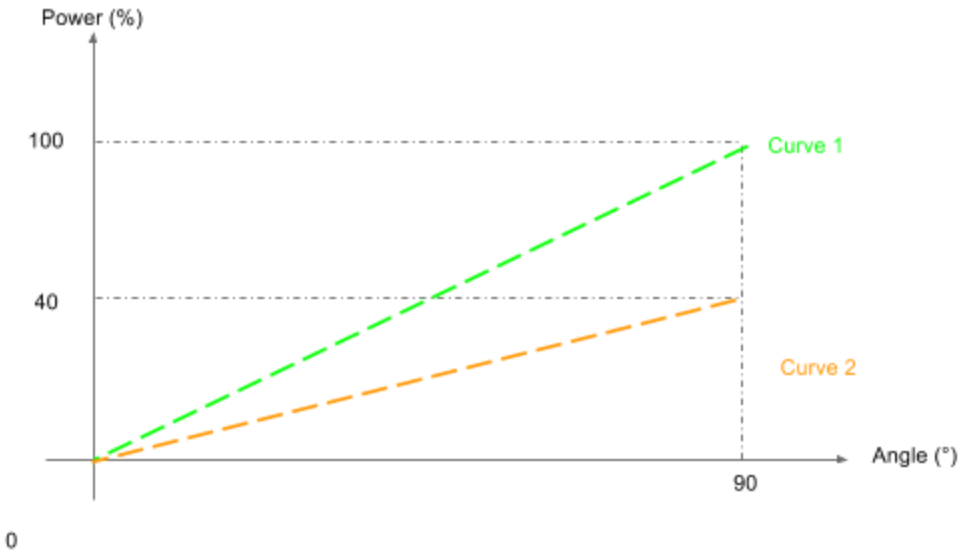
14. Jerky Impulses

14.1. Description of the effect

The Jerky Impulses effect generates a series of impulses that varies in time. It has been design to be modulated according to a variation of speed, and be integrated in the system such as drones controllers or model cars. This effect is sensitive to the Y-axis of an accelerometer.
The effect dynamics depends on the delay variation between two jerks which replies on linearly on the Y-axis accelerometer value.



The slope of the delay variation curve is a parameter varying from 1 to 8. The curve 1 corresponds to a slope of 8 (maximal dynamic), the second curve corresponds to a slope of 1 (minimal dynamic).
The power of the impulses depends linearly on the sensor values.



The slope of the power variation curve is a parameter varying from 200 to 800. When the slope is 200, the power is maximal : 100 % (Curve 1). The power is minimal when slope is 800 : 40% (Curve 2).

When the angle value increases, the power of jerks and delay variation increase until reaching the maximum value at 90°.

14.2. Configuration of the effect

ID	Title	Description	Min	Max
0	Amplitude	Defines the maximum variation of the amplitude	800	200
1	Dynamics	Defines the variation of the delay between jerks	1	8

Important: as can be seen in the table above, the minimum of the power is obtained when the parameter ID 0 is equal to 800, and the maximum when this last is equal to 200.

14.3. Sensor and module

The click effect depends of an Y-axis of an accelerometer position (sensor ID 9). When using evaluation board, you shall use the accelerometer module.
When using an external sensor, you can use the API document to send the appropriate commands to update the sensor values.

15. Haptic Force

15.1. Description of the effect

The haptic force effect generates successive impulsives whose space between it depends on the force applied. The more the force is high, the more the impulses are close.

15.2. Configuration of the effect

ID	Title	Description	Min	Max
0	Maximum amplitude	Maximum amplitude for the minimum force threshold.	35	100
1	Minimum Force threshold for amplitude	Threshold from which the modulation of the amplitude for the effect is active.	40	740
2	Maximum Force threshold for amplitude	Threshold defining when the minimum amplitude is sensed.	760	1020
3	Minimum Delay	Minimum delay between impulses for the maximum force threshold.	1000	25000
4	Maximum Delay	Maximum delay between impulses for the minimum force threshold.	20000	32000
5	Minimum force threshold for delay	Threshold from which the modulation of the delay for the effect is active.	0	470
6	Maximum force threshold for delay	Threshold defining when the minimum delay between the impulses is sensed.	760	1020

15.3. Sensor and module

The Haptic Force effect is controlled by the force applied to a force sensor (Sensor ID = 14). When using evaluation board, you shall use the force sensor module [User Manual, chapter. End modules]. When using an external sensor, you can use the API document to send the appropriate commands to update the sensor values.

16. Deceleration

16.1. Description of the effect

Similarly to the Haptic Force effect, the Deceleration effect generates successive impulses whose space between it depend on the force applied. But conversely to the Haptic Force effect, the more the force applied is high, the more the impulses are far.

16.2. Configuration of the effect

ID	Title	Description	Min	Max
0	Maximum amplitude	Maximum amplitude for the maximum force threshold.	35	100
1	Minimum Force threshold for amplitude	Threshold from which the modulation of the amplitude for the effect is active.	40	740
2	Maximum Force threshold for amplitude	Threshold defining when the maximum amplitude is sensed.	760	1020
3	Minimum Delay	Minimum delay between impulses for the minimum force threshold.	1000	25000
4	Maximum Delay	Maximum delay between impulses for the maximum force threshold.	20000	32000
5	Minimum force threshold for delay	Threshold from which the modulation of the delay for the effect is active.	0	470
6	Maximum force threshold for delay	Threshold defining when the maximum delay between the impulses is sensed.	760	1020

16.3. Sensor and module

The Haptic Force effect is controlled by the force applied to a force sensor (Sensor ID = 14). When using evaluation board, you shall use the force sensor module [User Manual, chapter. End modules]. When using an external sensor, you can use the API document to send the appropriate commands to update the sensor values.

17. Revision History

Date	Ver.	Ref.	Description	Author	Checked by	Approved by
26/06/2017	1.0	TAEKHL0001	Document creation	Aurélien Zanelli	Jeremy Cheynet	Rafal Pijewski
19/01/2018	2.0	TAEKHL0002	Update & integrate effects	Thomas Begeot		