

Cubase Articulate Map for Articulate Presets

Complete integration of the VSL into Cubase



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User manual

2nd Edition

Introduction

What are Cubase Expression Maps?

There was never a more convenient way to tap the full potential of the Vienna Symphonic Library in Cubase. The *Cubase Articulate Map* integrates Articulate Presets and allows you to select *all* articulations included in the Vienna Symphonic Library (VSL) via Cubase's *Expression Map* feature.

A Cubase Expression Map is a set of *Articulation Definitions*, that allow you to control the different articulations and individual versions included in an orchestral library within Cubase. An Articulation Definition includes up to four different identifiers—either score symbols or text specifications (in Cubase called “Articulations”)—that can be assigned to a note and that together determine the particular articulation version this note will play. They are divided up into four groups and at most one identifier from each group can be assigned. When you assign the appropriate identifiers to a note, Cubase automatically sends all required Midi events to select the articulation version in VI pro before the note is played. Score symbols and text specification in Cubase can be either *attributes* that affect only a single note or *directions* that affect all following notes until another one specified.

With over 100 identifiers (score symbols and text specifications) and over 2500 individual Articulation Definitions, the Articulate Map is very likely the most detailed Cubase Expression Map ever created! While recording it encodes the active articulation specified by its program change or dedicated key switches automatically in the Note Expression. It allows you to access *every* individual articulation version included in the VSL conveniently in Cubase—without the need for additional control events. And in addition it also allows you to continuously control the nuances of many articulations by additional continuous controllers via Articulate Presets's signature *3D-control*.

Setup

What you need to do to get started

There is only a single Cubase Expression Map for all Articulate Presets, which works with the standard version of Articulate Presets (where CC1 controls Velocity Xfade, but does not work with the “original” version using alternative controller assignments). There are two versions of the Expression Map, named *Articulate Map Program* and *Articulate Map Key* that only differ in the external MIDI controller assignments: using Program Change Messages respectively Key Switches.

To install the Expression Maps, simply copy them anywhere on your disk. Within Cubase select *Expression Map Setup...* from the *MIDI* menu. Press the *Load* button at the bottom of the left panel, locate the appropriate Expression Map in the file dialog and press the *Open* button. Finally, you have to assign the Expression Map for each instrument track in the Expression Map section of the *Inspector*. Now you can access the entire VSL conveniently from within Cubase. Enjoy!

Features of the Articulate Map

How to integrate the VSL into Cubase

Standardly Articulate Presets allow you to access all articulations included in the VSL via 128 program change messages, and all the different versions of an articulation by additional continuous controller events. The Cubase Articulate Map further simplifies the handling dramatically and allows you to access *all* articulations with *all* their different versions directly and conveniently in Cubase's various editors via standard musical symbols (like “-” for portato or “^” for marcato) and clear text (like “con sord.”, “slow” or “2s”)—yes, we really mean *everything* included in VSL full libraries! I.e. no additional Midi events besides the notes are required and you do not have to memorize program change numbers and controller assignments to access all sounds—including phrases realized via VI pro's Auto Playback and Pattern (APP) sequencer. The VSL is still unmatched when it comes to recorded dynamic transitions, phrases, They can strongly increase the realism, but for most users they likely sit unused on their disk since up to now they required a significant effort. With Articulate Presets and the Cubase Articulate Map, using them couldn't be simpler: E.g. you can conveniently select a recorded fast minor upwards run in G# by selecting the score symbol “↑”, representing an upwards run, and the three text identifiers “fast”, “min.” and “6/G#” from the list—or similarly the third version of a downward whole tone run realized within the APP sequencer by selecting “↓”, “whole” and “III”. As you can see the usage is completely self-explanatory. For convenience all implemented score symbols and text identifiers are shown in Fig. I in the appendix, where they are ordered according to their group. For completeness Table III provides the full list of possible identifier combinations to access all articulation versions included in the VSL.

Wherever possible, the Articulate Map adapts the conventions of the VSL factory map to make it easy for users that have used it before. I.e. the score symbols and text identifiers defined there are also available in the Articulate Map, but the Articulate Map introduces many more identifiers and gives you thereby far more control over the performance of your music. For instance, whereas the VSL factory Expression Map implements only a single portato or detache version “-” (which switches short and long detache based on the playing speed), the Articulate Presets version gives you full access to all three sampled portato versions (short, medium and long) included in the VSL.

Just as the VSL factory map, the Articulate Map defines both attributes and directions. Most identifiers are attributes that affect a particular note. However, identifiers that access performance interval or repetition patches, and therefore inherently involve several notes (and their transitions), are implemented via directions, that you have to specify before the corresponding group of notes. The same holds for special playing styles that typically affect a whole part, like muted (“con sord.”), as well as different vibrato versions. For a nice score image the new definitions avoid technical terms related to the sample library implementation and use “musical” descriptions, just like the definitions in the VSL factory map. In order to easily distinguish them, all directions have Italian names and all text attributes are given in English.

In the Cubase Articulate Map directions are available in groups 1, 3 and 4. There can be one active direction in each group at a time (e.g. both “legato”, “con sord.” and “senza vib.”). In Cubase

directions affect all following notes from the point on where a direction is given to the point where any other identifier—either direction or attribute—from the same group is specified. E.g. if you specify “molto vib.” (from group 4) and include a crescendo (which generally requires length specification from group 4), you will have to specify “molto vib.” again if you want it to continue.

As shown in Fig. 1, in the first group the available directions are “pizz.”, “col legno”, “legato”, “portamento” “marcato”, “spiccato” and “trill” (abbreviation for “trillare”, specifying the performance trill articulation—recorded trills are obtained by trill-symbols as note attributes). If you want to change from *any* of these playing styles to a sustained articulation (which does not require an identifier from group 1), choose the direction “non leg.”.

In the third group the directions are “con. sord.”, “sul ponticello”, “sul tastò”, as well as “var.”, “con sord. var.” and “sul pont. var.”, which will be explained in detail below. All these can be explicitly ended by “senza”, generalizing the “senza sord.” direction in the VSL factory Expression Map.

Finally in the fourth group the directions are “int.” (abbreviation for “intervallo”, specifying more rarely use performance interval articulations that are not explicitly included in group 1), “rip.” (abbreviation for “ripetizione” specifying performance repetitions), “rip. cre.”, “rip. dim.”, “sul”, “molto vib.”, “con vib.”, “senza vib.”, “prog. vib.” (abbreviation for “progressivo vibrato”), “esp. vib.” (abbreviation for “espressivo vibrato”, giving access to the expressive vibrato (xVib) matrices, —the sampled espressivo, available for some strings, is accessed by the attribute “str.” instead). If you want to change from any of these playing styles to an articulation that does not require an identifier in group 4 (e.g. the standard staccato), choose the direction “std.” (abbreviation for “standard”) to end it.

Standardly an articulation instruction in the Articulate Map fixes the matrix position in VI pro to one of the sampled versions (labeled in the matrix) and sends the corresponding continuous controllers before each note. For instance standard sustained notes give you the upper/left cell in the matrix and additional vibrato or attack specifications the other sampled versions. This is done, since when you would switch from a specific articulation version, where the matrix controllers (Vertical and Horizontal) are used for articulation selection, to a matrix like sustained, where the Horizontal and Vertical Controllers are used for 3D control, you would otherwise end up at a random position in the 2D matrix space, which generally would not be desired. The way the Expression Map is designed everything works as expected and you do not need any other MIDI events besides the notes to conveniently access all sampled content.

3D control

In addition to the direct access of all sampled VSL sounds, discussed so far, the amazing 3D-control of Articulate Presets goes far beyond a few sampled versions and allows you for many articulations to continuously control the nuances of the performance by additional continuous controllers that e.g. dial the attack behavior or vibrato intensity. You can turn on 3D control by the directives “var.” (abbreviation for the Italian word “variabile”), “con sord. var.” or “sul pont. var.” in group 3—in the following referred to as “*var.-mode*”. In this case generally only the program change message is sent and you can specify the additional continuous controllers yourself to access every cell in the 2D matrix space and quasi-continuously crossfade the sampled versions—in combination with the (always active) Section controller—in a 3D sound space. Please see the *Articulate Presets Manual* for details. To do this you have to send the corresponding Horizontal and Vertical Controller

values before the respective note. Moreover, when you access a particular version of an articulation, where the matrix controllers are used for articulation selection, you will have to specify the appropriate controller values when you switch back to a matrix that offers 3D control. In many cases where one of the matrix controllers is used for articulation selection and the other one for continuous control (e.g. dynamics), there are in addition to a completely variable version also definitions where the selection of different versions (e.g. “2s”) still works as expected and the corresponding controller is sent automatically even in *var*-mode, but the other controller can be continuously controlled (e.g. to dial the vibrato).

The third group consists nearly exclusively of directives, that allow you to independently turn on/off *con sordino* (respectively *sul ponticello/tasto*) and 3D control, as shown in table 1. Thereby you can

Table 1: Directions in group 3

	(no direction)	senza	var.	con sord.	con sord. var.	sul ponticello	sul pon. var.	sul tasto
muted	—	—	—	x	x	—	—	—
altered bowing position	—	—	—	—	—	x	x	x
3D control	—	—	x	—	x	—	x	—

conveniently choose if you want to have 3D control available (*var*-mode), by simply specifying “*var*.” (or “*con sord. var*.” respectively “*sul pont. var*.”) at the beginning of the sequence, and it will work for all articulations and remain active until you manually turn it off by specifying “*senza*” (or “*con sord.*”, “*sul ponticello*”, “*sul tasto*”). The only exceptions are recorded runs and arpeggios as well as Harp glissandi, which require all four available identifiers. I.e. in the rare case that you use a specific version of a recorded run, arpeggio or Harp glissando, you will have to specify “*var*.” again afterwards to have 3D control available. (The same holds in principle for “*con sord.*”, ... , but since there are no recorded *con sordino* or *sul ponticello* runs and arpeggios this shouldn’t be a problem anyway.) Alternatively, there are also general (unspecified) articulation definitions of the recorded runs and arpeggios that do not end *var*-mode, but as discussed instead require you to choose the specific version of the run or arpeggio via the appropriate continuous controllers. Since *sul tasto* articulations are part of the corresponding *sul ponticello* matrices, which allow you to continuously control the bowing position, “*sul pont. var*.” also applies to *sul tasto*.

General attributes and directions

There are several specifiers that can be applied to various articulations. First there are the specifiers *molto vib.*, *con vib.* and *sensa vib* in group 4. which select the different sampled versions with strong, normal/light and no vibrato. These are available for sustained notes, selected portato articulations and in a few cases also for legato articulations. If the corresponding vibrato version is not available for the used instrument the available versions are used. In *var*-mode you can even continuously control the vibrato intensity with the Horizontal controller by blending the different versions, as long as non of these vibrato specifiers is active (remember that all directives in group 4

can be terminated by the directive *std.*). When one of the vibrato specifications is active the Horizontal controller is fixed, but in *var.*-mode you can still control the Vertical controller.

Similarly for most sustained string articulations (non-legato, tremolo, ...) you can select the fast attack version via the attribute “fast” from group 2. For the corresponding notes with the attribute “fast” the Vertical controller is fixed, but in *var.*-mode you can still control the Horizontal controller. Specifying both one of the vibrato directions and fast completely fixes the cell, even in *var.*-mode.

Finally, as in the VSL factory set, for most articulations an accent can be added as a note attribute, which uses the same samples but increases the velocity of the given note by 20% and imposes a minimum velocity of 40.

External MIDI control

The Cubase Articulate Map also allows you to select articulations via Midi messages from an external Midi controller. There are two different versions of the Cubase Articulate Map, since Cubase requires the user to choose between Key Switches and Program Changes Messages to select articulations from an external MIDI controller. External controller events generally select the “variable” (*var.*) version of the articulation definition that implements the flexible 3D control of Articulate Presets and allows you to shape the sound in detail via additional continuous controllers.

The *Articulate Map Program* Expression Map responds to the standard 128 program change messages implemented by Articulate Presets, which are listed in table III of the Articulate Presets Manual. You might have to set the *Remote Settings* parameter to *Program Change Messages* in the lower left of the *Expression Map Setup* window to activate them.

The alternative *Articulate Map Key* Expression Map implements key switches for the most important articulations. You might have to set the *Remote Settings* parameter to *Key Switches* in the lower left of the *Expression Map Setup* window to activate them. These key switches are on the lowest piano octave and follow the universal layout introduced by *Art Conductor* developed by *Babylon Waves*, as shown in table II. If you use *Art Conductor* Expression Maps you can thereby conveniently access all main VSL articulations with the same key switches as in all your other libraries. The universal key switches in *Art Conductor* range from C to A and this octave has been completed in the *Articulate Map Key* Expression Map, by adding further important articulations, namely Repetitions and Special Dynamics .

As shown in table II, due to the additional Continuous Controllers (CC) used by Articulate Presets (Vertical CC2 and Horizontal CC3)) the 1-octave *Art Conductor* layout gives you access to *all* main articulations—and due to 3D-control it even gives you control over the nuances of the performance! For instance, the *Long* articulation allows you for wind instruments to blend from sustained to long portato and eventually to (single-note) marcato by changing the Vertical Controller, whereas the Horizontal Controller dials the vibrato intensity from strong via light to no vibrato. Similarly, *Short* and *Staccato* give you access to all sampled short note versions. For the strings, the Legato articulation allows to blend from normal legato via slurred legato to a full-fledged portamento via the Vertical Controller. I.e. you actually have direct access to much more articulations than explicitly labeled in the articulation column (as shown in the Horizontal/Vertical columns). The first column of table II also shows the (program change) number of the corresponding Articulate Presets matrix.

Table II: Key Switches of the “Articulate Presets Key” Expression Map, following Art Conductor conventions

#	Key	Articulation	Availability	Vertical	Horizontal
1	C	Long	strings / winds	sustain normal ⇄ fast attack / sustain ⇄ long portato ⇄ marcato	vibrato intensity: strong ⇄ light ⇄ none
13	C#	Legato	strings / woodwinds ex BCL / HOs, TB, CTB / other winds	normal ⇄ slurred ⇄ portamento / normal ⇄ grace / normal ⇄ glissando / —	— (interval speed)
15	D	Marcato	all ex TU	attack behavior	— (interval speed)
12	D#	Tremolo	strings / harp / winds	tremolo normal ⇄ fast attack / bisbigliando / flutter tongue	tremolo intensity: tremolo ⇄ normal
17	E	Spiccato	strings S & VI-L / M, L ex VI	⇄ harsh / —	— (interval speed)
8	F	Staccato	violins L / all others	long ⇄ short	A/B: tight loose / —
5	F#	Short Tenuto	strings / winds	detache long ⇄ short / portato medium ⇄ short)	vibrato intensity
10	G	Pizzicato	strings M&L ex VC-M / VC-M / VI-S, VC-S / VA-S, DB-S	⇄ col legno ⇄ snap	⇄ slow / ⇄ vib. ⇄ slow / ⇄ secco / —
37	G#	Trill minor	strings S&M / L; woodwinds ex CBA; HOs, TU, CTU / TRs	—	—
37	A	Trill major	strings S&M / L; woodwinds ex CBA; HOs, TU, CTU / TRs	—	—
36	A#	Repetitions	all	legato ⇄ portato ⇄ staccato	— (repetition speed)
49	B	Dynamics	all	fortepiano ⇄ sforzato ⇄ sforzatissimo	vibrato intensity

The key switches standardly start with C-2 but you can easily change this by adjusting the *Root Note* parameter in the *Remote Settings* on the lower left of the Expression Map Setup window—e.g. to a higher octave, when using a small keyboard or low orchestral instruments. Moreover, if you want to add further key-switches or change them according to your preferences, owing to the fact that there is a single Articulate Map for all chromatic orchestral instruments, you can conveniently do this in the *Remote* column of the Expression Map Setup window,. E.g. since in Articulate Presets it is possible to access all recorded trills via additional controllers, you might want to change key switches G# and A in the Art Conductor layout to the general version of the recorded trills and the performance trill articulation instead. To do this remove G#-2 and A-2 from “Trill half tone” and “Trill whole tone” (at the beginning of the definitions color-coded in blue) and add G#-2 to “Trill+var” (the one with the trill-symbol further down the list) and A-2 to “Trill+var” (the one involving the text identifier *trill*, closer to the beginning of the list). The two key switches then give you access to the general matrices 37 and 18, see the Articulation Presets manual for details.

Important: Please keep a backup of the original files and create copies whenever you make changes.

Using the Articulate Map

All articulations right at your fingertips ...

General handling

You can view and specify the played articulation directly in Cubase's Editors (*Score, Key, In-Place*). The handling in the different Editors is similar and will be described for the Score Editor as an example, please see Cubase's manual for more details.

In the Score Editor Attributes can be assigned to a selected note in the *Articulations Inspector* on top of the Score window (you might have to activate the Articulation control in the Inspector by clicking on the small cog to the right). You can choose up to four attributes—one from each of the four groups. The different attributes are selected from a long list, which includes all entries included in the different groups (see Fig. 2 below) separated by thin lines. The Expression Map has been designed in an elaborate way to make sure that the list is ordered in a way that the important score symbols and text attributes are easily accessible on top of the list, and only rarely used special symbols (e.g. key specifications for recorded phrases) require you to scroll to the bottom of the list. The list shows both the identifiers and a full description. Therefore it gives you a clear overview in Cubase's editors and in particular in the score (see below) and at the same time enables a convenient articulation selection in pull-down menus.

Directions (and attributes) can be selected in the Expression Map pane under the *Symbols* tab to the left of the score. The directions appear in small quadratic tiles arranged in a large (non-scrollable) column. Once you selected a symbol just press on the position in the score, where you want to insert the direction. The direction then applies to all following notes until it is ended by an identifier in the same group as the direction. In the Symbols tab you can choose which types of symbols are shown by clicking on the small cog at the bottom of the symbols tab. This allows you to deactivate other symbol sets in case your screen is too small to display all direction symbols.

Whereas there are several VSL factory Expression Maps for the different instruments, there is by design only a single Articulate Presets Expression Map. This has the big advantage that you can move a sequence from any chromatic instrument to another one and, as far as this is possible, it will play back as expected. Within their limited set of supported articulations, the VSL factory Expression Maps are fool-proof, in the sense that they will automatically replace an articulation, if it is not available. The Articulate Presets Expression Map does the same wherever possible, but since it is completely universal and supports *all* articulations included in the VSL, there are inherently cases where this cannot work anymore, since an advanced articulation, e.g. a recorded phrase, is simply not available for a given instrument. In this case you will have to manually replace the special articulation to play back correctly—e.g. add the individual notes, to be played by one of the available articulations.

Most articulation identifier combinations in the Articulate Presets Expression Map, shown in Table III, are completely self-explanatory. Since the number of identifiers in Cubase are limited to 128, for some rare articulation, which are only available for selected instruments, substitute attributes had to

be chosen, though. E.g. clusters are specified by the attribute “chromatic” and the tune-in attack for the trumpet is obtained by the attribute “whole”—motivated by whole-tone music sounding out of tune to some listeners :-). In some cases there are two alternative ways to obtain the same articulation. For instance, the standard portato symbol “-“ yields a medium portato and the separate note lengths (long, medium and short) are either obtained by the additional attributes “fast”, “med.” and “slow”, or by separate symbols with a dot above (short) or below the bar (long). Similarly, pizzicato is implemented both through the direction “*pizz.*” and the note attribute “+”, whereas portamento is implemented both through the direction “*portamento*” and the attributes “/“ and “\”.

As discussed before the Articulate Presets Expression Maps effectively implements two alternative modes, see Table I. The normal mode gives you convenient access to all recorded sounds included in the VSL without requiring any other Midi events than the notes. The *var.*-mode, which is activated when you specify any directive that includes the abbreviation “*var.*” (i.e. *var.*, *con sord.* *var.* or *sul pont.* *var.*) allows you to access further nuances by additional continuous controllers via the unique 3D control of Articulate Presets. This gives you complete flexibility to shape the sound to the level of detail you want. E.g. you could standardly use the convenient normal mode and switch to *var.*-mode whenever you want to control a certain set of notes in detail.

In case of articulations with different sampled versions (e.g. runs), that are in Articulate Presets accessed by the matrix controllers (Vertical (CC2) and Horizontal (CC3)), *var.*-mode generally requires you to explicitly send the controller values to select the desired version (e.g. a major run in C) in addition to the notes. Therefore, it can be more convenient to select such special articulations, that do not offer 3D control anyway, in normal mode. For articulations, where one of the matrix controllers is used for articulation selection and the other for continuous control (like dynamics), there are often also dedicated articulation definitions included, that select the particular articulation version (e.g. a 3s diminuendo) automatically even in *var.*-mode, but still allow you to continuously control the continuous matrix controller (e.g. control the vibrato intensity via the Horizontal controller). In principle the A/B switch likewise has to be sent in *var.*-mode, but in many cases, where there are separate symbols for the two different versions (e.g. for up and downward runs), also the A/B controller is automatically sent.

Score Representation

In the score all articulations are automatically properly displayed using the attributes and directions in Fig. II in the appendix, as shown for several examples in Fig. I. This gives you automatically a clear, musical overview what is played by the corresponding note. To further improve the score, you can add any other symbols, not used in the Articulate Presets Expression Map, or hide any of the automatically used symbols from being displayed in order to improve the final (“printed”) score. For instance instead of the text direction *legato*, you might want to add explicit slurs between the notes. In this case you can hide the direction *legato* so that only the slurs are displayed in the score. The same holds for attributes, like the small dynamics, strength or length identifiers shown in Fig. I, in case you want to replace them in the final score by proper dynamics symbols.

For recorded and sequenced phrases special score symbols are used. Whereas most of them follow standard musical notation (trills, mordents, ...) for other recorded phrases (runs, arpeggios, ...), that are usually fully notated in the score (by the corresponding range of individual notes), the score symbols given in Fig. II in the appendix are introduced and are added to the base note. Examples

for runs, arpeggios and glissandi are shown in Fig. I. If you prefer to have these phrases fully notated in the score, you can simply add additional muted notes.

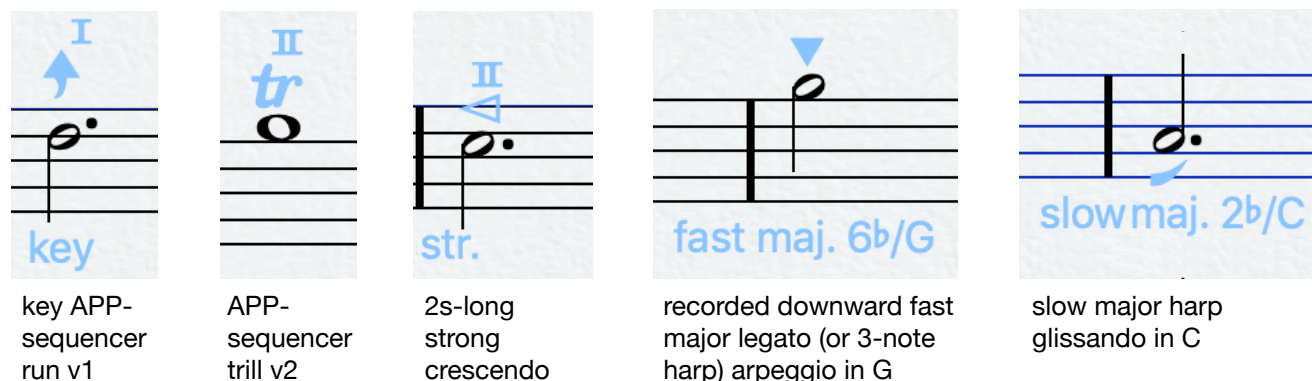


Figure I: Examples of the score representation of various phrases.

The Dorico Articulate Map

Steinberg also offers its own notation software, called Dorico, which largely expands on the notation capabilities of Cubase. There is a dedicated Articulate Map for Dorico, which is built from scratch to take into account all the advanced features of Dorico, to automatically play back your score, as well as the possibility to create custom Playing Techniques and Score Engravings. The Dorico Articulate Map can in particular automatically select the appropriate playing technique depending on the length of a given note. There are complete *Playback Templates* for all supported VSL full libraries, so that everything works automatically out of the box. In addition the Dorico Articulate Map, just like the Cubase Articulate Map, gives you full access to Articulate Preset's signature 3D control. This significantly raises the bar, as far as the realism of the playback is concerned, that can be achieved with notation software. Please check out the Dorico implementation (e.g. via the *free* Dorico SE), if you prefer a score-based approach but think that a realistic playback necessarily requires a DAW.

Appendix

All the details ... just in case

This appendix provides all details on the implementation of the Articulate Presets Expression Map. Figure II shows all implemented directions and attributes, ordered according to their group.

The extensive Table III, extending over five pages, shows the full list of possible identifier combinations, ordered by the program numbers of the corresponding articulations in Articulate Presets. It uses the following conventions and abbreviations:

/ ... separates definitions for different instrument *id* ... identical identifier written out before in this cell
 ; ... in each group all identifiers at the same position—separated by semicolons—can be combined

Directions Group 1	Attributes Group 1	Attributes Group 2	Attributes Group 4
<div> <div>non le Non Legato</div> <div>pizz. Pizzicato</div> <div>col leg Col Legno</div> <div>legato Legato</div> <div>portan Portamento</div> <div>marca Marcato</div> <div>spicca Spiccato</div> <div>trill Trill</div> </div>	<div> <div>Long Portato</div> <div>Detache / Portato</div> <div>Short Detache / Portato</div> <div>Staccato</div> <div>Staccatissimo / Harsh</div> <div>Marcato</div> <div>Pizzicato</div> <div>Snap Pizz</div> <div>Slide</div> <div>Slide</div> <div>Tremolo / Fluttersongue</div> <div><i>fp</i> Fortepiano</div> <div><i>sfz</i> Sforzato</div> <div><i>sff</i> Sforzatisimo</div> <div>Crescendo</div> <div>Diminuendo</div> <div>Crescendo-Diminuendo</div> <div>Diminuendo-Crescendo</div> <div>Trill</div> <div>Trill half tone</div> <div>Trill whole tone</div> <div>Grace note</div> <div>Mordent up</div> <div>Mordent down</div> <div>Phrase</div> <div>Repetitions</div> <div>Fast Repetitions</div> <div>Run Up</div> <div>Run Down</div> <div>Arpeggio Sta/4 Up</div> <div>Arpeggio Sta/4 Down</div> <div>Arpeggio Leg/3 Up</div> <div>Arpeggio Leg/3 Down</div> <div>Glissando Up</div> <div>Glissando Down</div> <div>Upbeats 1 / Ricochet</div> <div>Upbeats 2 / Ricochet speed</div> <div>Upbeats 3 / Ricochet a3</div> </div>	<div> <div>lgt. Light</div> <div>str. Strong / Straight</div> <div>med. Medium</div> <div>slow Slow</div> <div>fast Fast</div> <div>dyn. Dynamic(s)</div> <div>key Key</div> <div>whole Whole</div> <div>chrom Chromatic</div> <div>cre. Crescendo</div> <div>dec. Diminuendo</div> <div>up Up</div> <div>down Down</div> <div>Harmonics Artificial</div> <div>Harmonics Natural</div> </div> <div>Attributes Group 3</div> <div> <div>maj. Major</div> <div>min. Minor</div> <div>chr. Chromatic</div> <div>w.t. Whole Tone</div> <div>dim. Diminished</div> <div>aug. Augmented</div> </div>	<div> <div>Accent</div> <div>Fall</div> <div>acc. Accelerando</div> <div>V1 / 1s</div> <div>V2 / 2s</div> <div>V3 / 3s</div> <div>V4 / 4s</div> <div>V5 / 5s</div> <div>V6 / 6s</div> <div>V7 / 1.5s</div> <div>V8 / 8s</div> <div>V9 / 9s</div> <div>V10 / 10s</div> <div>80bpm 80bpm</div> <div>90bpm 90bpm</div> <div>100bp 100bpm</div> <div>110bp 110bpm</div> <div>120bp 120bpm</div> <div>130bp 130bpm</div> <div>140bp 140bpm</div> <div>150bp 150bpm</div> <div>160bp 160bpm</div> <div>170bp 170bpm</div> <div>180bp 180bpm</div> <div>190bp 190bpm</div> <div>200bp 200bpm</div> <div>210bp 210bpm</div> <div>220bp 220bpm</div> <div>Minor 2. / C</div> <div>Major 2. / C#</div> <div>Minor 3. / D</div> <div>Major 3. / D#</div> <div>4. / E</div> <div>Minor 5. / F</div> <div>Major 5. / F#</div> <div>Minor 6. / G</div> <div>Major 6. / G#</div> <div>Minor 7. / A</div> <div>Major 7. / A#</div> <div>Octave / B</div> </div>
Directions Group 3			
<div> <div>senza Senza Sordino / Variabile</div> <div>con sc Con Sordino</div> <div>sul poi Sul Ponticello</div> <div>sul tas Sul Tasto</div> <div>var. Variabile</div> <div>con sc Con Sordino Variabile</div> <div>sul poi Sul Ponticello Variabile</div> </div>			
Directions Group 4			
<div> <div>std. Standard</div> <div>int. Interval</div> <div>rip. Repetition</div> <div>rip. crn Rep. Crescendo</div> <div>rip. dir Rep. Diminuendo</div> <div>prog. v Progressive Vibrato</div> <div>esp. vi Espressive Vibrato</div> <div>senza Senza Vibrato</div> <div>con vil Con Vibrato</div> <div>molto Molto Vibrato</div> <div>sul Sul</div> </div>			

Figure II: Directions and Attributes implemented in the Expression Map

Table III (Part 1): Cubase Articulation Definitions included in the Expression Map






































#	Articulation Version	Group 1	Group 2	Group 3	Group 4
1	sustained; sustained fast attack	—, <i>non leg.</i>	—; fast	—, <i>senza, var.</i>	—,  , <i>std., senza vib., con vib., molto vib.</i>
2	progressive vibrato	—, <i>non leg.</i>	—	—, <i>senza, var.</i>	<i>prog. vib.</i>
3	long portato	 ; 	—; slow	—, <i>senza, var.</i>	—,  , <i>std., senza vib., con vib., molto vib.</i>
4	expres. vibrato (xVib)	—, <i>non leg.</i>	—	—, <i>senza, var.</i>	<i>esp. vib.</i>
5	long detache / medium portato		—; med.	—, <i>senza, var.</i>	—,  , <i>std., senza vib., con vib., molto vib.</i>
6	short detache /portato	 ; 	—; fast	—, <i>senza, var.</i>	—,  , <i>std., senza vib., con vib., molto vib.</i>
7	marcato / tune		— / whole	—, <i>senza, var.</i>	—,  , <i>std., senza vib., con vib., molto vib. / —</i>
8	staccato		—	—, <i>senza, var.</i>	—,  , <i>std.</i>
9	short staccato		—	—, <i>senza, var.</i>	—,  , <i>std.</i>
10	pizzicato; col legno; snap pizzicato	 or —; <i>col legno;</i> 	—, slow and <i>pizz.</i> ; —, slow; —	—, <i>senza, var.</i>	—,  , <i>std.</i>
11	xfade velocity (xVel); espressivo	—, <i>non leg.</i>	dyn.; str.	—, <i>senza, var.</i>	—,  , <i>std.</i>
12	tremolo / fluttertongue; tremolo fast attack		—; fast	—, <i>senza, var.</i>	—,  , <i>std.</i>
13	legato; legato slur; portamento	<i>legato;</i> <i>legato;</i>  ,portamento, 	—	—, <i>senza, var.</i>	—,  , <i>std., senza vib., con vib., molto vib.; int.; —,</i>  , <i>std.</i>
14	legato progressive	<i>legato</i>	<i>prog. vib.</i>	—, <i>senza, var.</i>	<i>prog. vib.</i>
15	interval marcato	<i>marcato</i>	—	—, <i>senza, var.</i>	—,  , <i>std.</i>
16	legato exp. vib. (xVib)	<i>legato</i>	<i>esp. vib.</i>	—, <i>senza, var.</i>	<i>esp. vib.</i>
17	spiccato; interval harsh	<i>spiccato;</i> 	—	—, <i>senza, var.</i>	—,  , <i>std.; int.</i>
18	perform. trill; + speed	<i>trill.</i>	—	—, <i>senza, var.</i>	—,  , <i>std.; int.</i>
19	interval detache / sfz	 / <i>sfz</i>	—	—	<i>int.</i>
20	grace / zigané / tune	 /  ,  / <i>leg.</i>	— / — / whole	—, <i>senza, var.</i>	<i>int. / int. / —, std.;</i> 
21	glissando	 or 	—	—, <i>senza, var.</i>	<i>int.</i>
22	legato sul / sustained	<i>legato</i>	—	—, <i>senza, var.</i>	<i>sul</i>
23	interval tremolo		—	—, <i>senza, var.</i>	<i>int.</i>
24	interval universal	<i>legato</i>	—	—, <i>senza, var.</i>	<i>int.</i>

Table III (Part 2): Cubase Articulation Definitions included in the Expression Map












































#	Articulation Version	Group 1	Group 2	Group 3	Group 4
25	repetition legato	<i>legato</i>	—, slow, med., fast	—, <i>senza</i> ; <i>var.</i>	<i>rip.</i> , <i>rip. cre.</i> , <i>rip. dec.</i> ; <i>rip.</i>
26	rep. bow vibrato		—, slow, fast	—, <i>senza</i> ; <i>var.</i>	<i>rip.</i> , <i>rip. cre.</i> , <i>rip. dec.</i> ; <i>rip.</i>
27	repetition portato		—, slow, med., fast	—, <i>senza</i> ; <i>var.</i>	<i>rip.</i> , <i>rip. cre.</i> , <i>rip. dec.</i> ; <i>rip.</i>
28	repetition pizzicato		—, slow, fast	—, <i>senza</i> ; <i>var.</i>	<i>rip.</i> , <i>rip. cre.</i> , <i>rip. dec.</i> ; <i>rip.</i>
29	repetition staccato		—, slow, fast	—, <i>senza</i> ; <i>var.</i>	<i>rip.</i> , <i>rip. cre.</i> , <i>rip. dec.</i> ; <i>rip.</i>
30	repetition spiccato	<i>spiccato</i>	—	—, <i>senza</i> ; <i>var.</i>	<i>rip.</i> , <i>rip. cre.</i> , <i>rip. dec.</i> ; <i>rip.</i>
31	repetition harsh		—	—, <i>senza</i> ; <i>var.</i>	<i>rip.</i> , <i>rip. cre.</i> , <i>rip. dec.</i> ; <i>rip.</i>
32	repetition upbeats 1		—, slow, fast	—, <i>senza</i> ; <i>var.</i>	<i>rip.</i> , <i>rip. cre.</i> , <i>rip. dec.</i> ; <i>rip.</i>
33	repetition harmonics	—, <i>non leg.</i>		—, <i>senza</i> , <i>var.</i>	<i>rip.</i>
35	repetition upbeats 2		—, slow, fast	—, <i>senza</i> ; <i>var.</i>	<i>rip.</i> , <i>rip. cre.</i> , <i>rip. dec.</i> ; <i>rip.</i>
35	rep. sul ponticello	—, <i>non leg.</i>	—	—, <i>senza</i> ; <i>var.</i>	<i>rip.</i> , <i>rip. cre.</i> , <i>rip. dec.</i> ; <i>rip.</i>
36	repetition universal	—	—	—, <i>senza</i> , <i>var.</i>	<i>rip.</i>
37	trills	 ;  ^{HT} ,  ^{WT}	—	—, <i>senza</i> , <i>var.</i>	2b/C, 2/C#, 3B/D, 3/D#; —,  , <i>std.</i>
38	trills accelerando	 ^{HT} ,  ^{WT}	—	—, <i>senza</i> , <i>var.</i>	acc.
39	grace notes		up, down	—, <i>senza</i> ; <i>var.</i>	intervals & scales: 2b/C, 2/C#, 3b/D, 3/D#, 4/E, 5b/F, 5/F#, 6b/G, 6/G#, 7b/A, 7/A#, 8/B; —
40	mordents (legato)	 , 	—	—, <i>senza</i> ; <i>var.</i>	I, II, III, IV, V, VI; —
41	fast repetitions		—	—, <i>senza</i> ; <i>var.</i>	repetition tempos (bpm): 140 - 220; —
42	runs legato	 , 	—	runs: maj.; min.; chr.; w.t.; <i>var.</i>	scales: intervals & scales; <i>id</i> ; —; —; —
43	runs legato fast & spiccato / furioso	 ; 	fast / up; down	runs / —	scales / —
44	gliss. / fast (S.S.) / falls	 ; 	— / up; down / —	—, <i>senza</i> , <i>var.</i>	intervals & scales / — / 
45	glissando fast / harmonics. / falls fast muted arpeggio (A.S.)	 ,  / — /  ;  .	 ,  / fast up; down	—, <i>senza</i> , <i>var.</i> / <i>id</i> / <i>id</i> / <i>con sord.</i> , + <i>var.</i>	intervals & scales / — /  / —
46	arpeggios staccato / sequencer	 ,  /  ; 	—	arps: maj.; min.; dim.; aug.; <i>var.</i> / —, <i>senza</i> , <i>var.</i>	scales / I - X; I, II
47	arpeggios stac. fast / muted sequencer	 ; 	fast / —	arps / <i>con sord.</i> , + <i>var.</i>	scales / I - X; I, II, —
48	upbeats / ricochet / arpeggio (A.S.)	 ;  ;  /  , 	— / fast; —, down; — / up; down	—, <i>senza</i> , <i>var.</i> /	upbeat tempos (bpm) 80 - 160, 180, 200, 220 / 150 - 190, 210; acc.; — / —

Table III (Part 3): Cubase Articulation Definitions included in the Expression Map

#	Articulation Version	Group 1	Group 2	Group 3	Group 4
49	fortepiano		—	—, senza, var.	—, , std., senza vib., ...
50	trills dynamics	; ;	cre., dec.	—, senza, var.	2b/C, 2/C#, 3B/D, 3/D#, —, std.; —, std.; —, std.
51	sforzato		—	—, senza, var.	—, , std., senza vib., ...
52	trills accelerando dyn.	,	cre., dec.	—, senza, var.	—, std.
53	sforzatissimo		—	—, senza, var.	—, , std., senza vib., ...
54	crescendo-dim.	pfp	—	—, senza, var.; var.	1(I)-6(VI), 8(VIII)-10(X)s; —
55	diminuendo-cre.	fpf	—	—, senza, var.; var.	4(IV), 5(V), 6(VI), 8(VIII)s; —
56	strong dynamics	,	str.	—, senza, var.; var.	1(I), 1.5(VII), 2(II)-6(VI)s; —
57	fast repetition dyn.		cre., dec.	—, senza; var.	repetition tempos; —
58	medium dynamics	,	med.	—, senza, var.; var.	1(I), 1.5(VII), 2(II)-6(VI)s; —
59	tremolo dynamics		cre., dec.	—, senza; var.	—, std.
60	light dynamics	,	lgt.	—, senza, var.; var.	1(I), 1.5(VII), 2(II)-6(VI)s; —
61	sul ponticello sus.; + fast a. / pres de la t. sul tasto sus.; + f. a. / muted xVel sus.	—, non leg.	—; fast / — / —; fast / dyn.	sul ponticello, +var. / sul ponticello, +var. / sul tasto / con sord., +var.	—, std.
62	sul pont. detache / sul tasto detache / muted long portato / sul pont. dynamics	or , .	— / — / — or slow / —	sul ponticello, +var. / sul tasto / con sord., +var. sul ponticello; +var. /	—, std. / —, std. / —, , std. 1.5(VII), 4(IV)s; —, std. /
63	sul pont. staccato / sul tasto staccato / t.-ram sta. & low FX / sustain fall release / muted dyn. med. vib. / chords / 4-note arp. straight	. non leg., — , ,	— / — / str. / — / med. / str. / str.	sul ponticello, +var. / sul tasto / — / —, senza, var. / con sord. / +var. / —, senza, var. / arps	—, std. / —, std. / —, std. / / molto vib. / —, std. / scales
64	sul ponticello sfz / sul tasto sfz mordents staccato / muted fluttert. cre. / 3-note arp. straight	; , ,	sul pont. / sul tasto / up; down / cre. / str.	sul ponticello, +var. / sul tasto / — / con sord. / arps	—, std. / —, std. / I, II, III, IV, V, VI / — / scales
65	sul pont. trem.; + f. a. / sul tasto trem.; + f. a. / arpeggio legato / 3-note arp. slow / muted fast rep. dyn.	 , 	—; fast / —; fast / — / — / cre., dec.	sul ponticello, +var. / sul tasto / arps / arps / con sord.; +var.	— / — / scales / scales / repetition tempos; —, std.
66	snap pizzicato / arpeggio legato fast / 3-note arp. fast / muted upbeat	, , ,	— / fast / fast / —	—, senza, var. / arps / arps / con sord.; +var.	—, , std. / scales / scales / upbeat tempos; —, std.

Table III (Part 4): Cubase Articulation Definitions included in the Expression Map






































































































#	Articulation Version	Group 1	Group 2	Group 3	Group 4
67	sus. vibrato down / muted trills dyn. / 4. trill & lip trill / muted upbeats B / harp glissandi slow /	—, <i>non leg.</i>     ,  ,   , 	down / cre., dec. / — / up / slow	—, <i>senza, var.</i> / — / — / <i>con sord., +var.</i> / harp keys: maj.; min.; w. t.; aug.; maj.; min.; dim.	—, <i>std.</i> / —, <i>std.</i> / 4/E / upbeat tempos / harp scales: scales; scales; 2b/C, 2/C#, I, II, III; scales; scales; 2b/C, 2/C#, 3b/D
68	mut. art. harm. sus. / flautando / cluster sus. & duop. / legato + fall release / sustained blared / harp glissandi med.	—, <i>non leg.</i> / —, <i>non leg.</i> / —, <i>non leg.</i> / <i>legato</i> /  ,  , 	 / lgt. / chromatic / — / str. / med.	<i>con sord., +var.</i> / —, <i>senza, var.</i> / —, <i>senza, var.</i> / —, <i>senza, var.</i> / —, <i>senza, var.</i> / harp keys	—, <i>std.</i> / —, <i>std.</i> / —, <i>std.</i> /  / —, <i>std.</i> / harp scales
69	mut. art. harm. stac. / cluster staccato / random pizzicato / marcato + fall rel. / portato blared / harp glissandi fast	 /  +  <i>marcato</i> /  ,  , 	 / chromatic / chromatic / — / str. / fast	<i>con sord., +var.</i> / —, <i>senza, var.</i> / —, <i>senza, var.</i> / —, <i>senza, var.</i> / — / harp keys	—, <i>std.</i> / —, <i>std.</i> / —, <i>std.</i> /  / —, <i>std.</i> / harp scales
70	art. har. sus. & flag. / cluster sfz & duo. B / sus. marcato + fall r.	—, <i>non leg.</i> /  / 	 / chromatic / —	—, <i>senza, var.</i> / —, <i>senza, var.</i> / —, <i>senza, var.</i>	—, <i>std.</i> / —, <i>std.</i> / 
71	art. harmonics stac. / fast rep. triplets / tune-in sus. + fall rel. / cluster dynamics	 /  —, <i>non leg.</i> /  , 	 / fast / whole / chromatic	—, <i>senza, var.</i> / —; <i>var.</i> / —, <i>senza, var.</i> / —, <i>senza, var.</i> /	—, <i>std.</i> / 130 - 180bpm; —, <i>std.</i> /  / 1.5(VII), 4(IV)s; —, <i>std.</i> /
72	nat. harmonics sus. / stac. rep. triplets / rip & FX, + fall rel / cluster repetitions	—, <i>non leg.</i> /  / —, <i>non leg.</i> / —, <i>non leg.</i>	 / med. / up / chromatic	—, <i>senza, var.</i> / — / — / —	—, <i>std.</i> / <i>rip.</i> / —,  / <i>rip., rip. cre., rip. dec.</i>
73	muted sustained; muted sus. fast attack	—, <i>non leg.</i>	—; fast	<i>con sord., +var.</i>	—,  , <i>std., senza vib.,</i> <i>con vib., molto vib.</i>
74	muted prog. vibrato	—, <i>non leg.</i>	—	<i>con sord., +var.</i>	<i>prog. vib.</i>
75	muted special dyn.	 ,  , 	—	<i>con sord., +var.</i>	—,  , <i>std.</i>
76	muted exp. vib. (xVib)	—, <i>non leg.</i>	—	<i>con sord., +var.</i>	<i>esp. vib.</i>
77	muted l. det. / m. por.		—, med.	<i>con sord., +var.</i>	—,  , <i>std.</i>
78	muted short det. / por.	 or 	— and fast	<i>con sord., +var.</i>	—,  , <i>std.</i>
79	muted cresc.-dim.	pfp	—	<i>con sord.; +var.</i>	1(I) - 6(VI), 8(VIII) - 10(X) s; —
80	muted staccato		—	<i>con sord., +var.</i>	—,  , <i>std.</i>
81	muted strong dyn.	 , 	str.	<i>con sord.; +var.</i>	1(I), 1.5(VII), 2(II) - 6(VI) s; —
82	muted pizzicato	 or <i>pizz.</i>	—	<i>con sord., +var.</i>	—,  , <i>std.</i>
83	muted medium dyn.	 , 	med.	<i>con sord.; +var.</i>	1(I), 1.5(VII), 2(II) - 6(VI) s; —
84	muted tremolo; + f. a.		—; fast	<i>con sord., +var.</i>	—,  , <i>std.</i>

Table III (Part 5): Cubase Articulation Definitions included in the Expression Map

#	Articulation Version	Group 1	Group 2	Group 3	Group 4
85	muted legato; +slur; portamento	<i>legato; id;</i> <i>portamento</i> , 	—	<i>con sord., +var.</i>	—,  , <i>std., senza vib.,</i> <i>con vib., molto vib.; int.;</i> —,  , <i>std.</i>
86	muted legato prog.	<i>legato</i>	—	<i>con sord., +var.</i>	<i>prog. vib.</i>
87	muted marcato	<i>marcato</i>	—	<i>con sord., +var.</i>	—,  , <i>std.</i>
88	muted legato xVib	<i>legato</i>	—	<i>con sord., +var.</i>	<i>esp. vib.</i>
89	muted spiccato	<i>spiccato</i>	—	<i>con sord., +var.</i>	—,  , <i>std.</i>
90	muted perf. trill	<i>trill.</i>	—	<i>con sord., +var.</i>	—,  , <i>std.</i>
91	muted trills	 ^{HT} ,  ^{WT}	—	<i>con sord., +var.</i>	—,  , <i>std.</i>
92	muted rep. legato	<i>legato</i>	—	<i>con sord.; +var.</i>	<i>rip., rip.cre., rip.dec.; rip.</i>
93	muted fast repetitions		—	<i>con sord., +var.</i>	repetition tempos; —
94	muted rep. portato		—	<i>con sord.; +var.</i>	<i>rip., rip.cre., rip.dec.; rip.</i>
95	muted rep spiccato	<i>spiccato</i>	—	<i>con sord.; +var.</i>	<i>rip., rip.cre., rip.dec.; rip.</i>
96	muted rep. staccato		—	<i>con sord.; +var.</i>	<i>rip., rip.cre., rip.dec.; rip.</i>
97	seq. repetitions	 ;  ; 	—	—, <i>senza; id; var.</i>	I - X; I, II; —, <i>std.</i>
98	muted seq. repetitions	 ;  ; 	—	<i>con sord.; id; +var.</i>	I - X; I, II; —, <i>std.</i>
99	seq. rep. dynamics	 ;  ; 	dyn.	—, <i>senza; id; var.</i>	I - VIII; I - IV; —, <i>std.</i>
100	muted seq. rep. dyn.	 ;  ; 	dyn.	<i>con sord.; id; +var.</i>	I - VIII; I - IV; —, <i>std.</i>
101	seq. trills	 ;  ;  ; 	—; —; —; slow	—, <i>senza; id;; var.</i>	I - IV; VII - X; VII - X; —, <i>std.</i>
102	seq. runs key	 , 	key	—, <i>senza; var.</i>	I - VI; —, <i>std.</i>
103	muted seq. runs key	 , 	key	<i>con sord.; +var.</i>	I - VI; —, <i>std.</i>
104	seq. runs whole	 , 	whole	—, <i>senza; var.</i>	I - VI; —, <i>std.</i>
105	muted seq. runs whole	 , 	whole	<i>con sord.; +var.</i>	I - VI; —, <i>std.</i>
106	seq. runs chromatic	 , 	chromatic	—, <i>senza; var.</i>	I - VI; —, <i>std.</i>
107	muted seq. runs chr.	 , 	chromatic	<i>con sord.; +var.</i>	I - VI; —, <i>std.</i>
108	muted seq. trills	 ;  ;  ; 	—; —; —; slow	<i>con sord.; id;; +var.</i>	I - IV; VII - X; VII - X; —, <i>std.</i>
109-113	see 1, 3, 10 and 11	—	—	—	—
114/115	rep. individual. dyn. / muted rep. ind. dyn.	<i>legato;</i>  ,  , <i>spiccato,</i> 	slow, fast; —, —, —, —	—, <i>senza; var. /</i> <i>con sord.; +var.</i>	I - IX; —, <i>std.</i>
116	legato ind. speeds	<i>legato</i>	slow, med., fast	—	—, <i>std.</i>
117	muted leg. ind. speeds	<i>legato</i>	slow, fast	<i>con sord.</i>	—, <i>std.</i>
118/119	marc. ind. sp. / +muted	<i>marcato</i>	slow, fast	— / <i>con sord.</i>	—, <i>std.</i>
120	spiccato ind. speeds	<i>spiccato</i>	slow, med., fast	—	—, <i>std.</i>
121-128	custom matrix 1-8	—, <i>non leg.</i>	—	<i>var.</i>	I - VIII