

*World Carillon Federation
Keyboard Committee*

Consensus on technical norms for a world standard carillon keyboard WCF Keyboard 2006

On the occasion of the 15th World Congress in Gdansk (Poland), the Committee of Delegates of the WCF accepted, on July 18, 2006, this final report by the Keyboard Committee.

These new norms were derived from the Keyboard 2000.

Attachments:

- 1) Technical description of WCF Keyboard 2006
- 2) Drawing of WCF Keyboard 2006
- 3) Comparative measurements of all hybrid keyboards of the last 20 years
- 4) History of the Keyboard 2000

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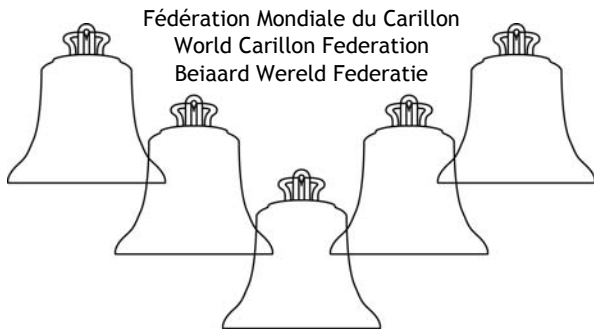
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Technical description of WCF Keyboard 2006

A. Measurements

center-to-center spacing of natural manual keys [A]	46 mm
projection length of natural manual keys, from face of key spreader [B]	181 mm
projection length of sharp manual keys, from face of key spreader [C]	108 mm
difference in length of natural and sharp manual keys [D]	73 mm
playing length of natural manual keys [E]	110 mm (including 20 mm transition from conical to square)
playing length of sharp manual keys [F]	110 mm (including 20 mm transition from conical to square)
manual key diameter, tapering from first number to second [G]	20 mm > 16 mm
cross section of manual key behind playing length [H]	25 mm
manual keyfall measured at face of key spreader [I]	min. 40 – max. 55 mm
height difference between natural and sharp manual keys [J]	97 mm
pedal/manual axis [K]	b^1 under d^3
front/back relation of manual keys to pedals (from tips of keys) [L]	plus 51 mm
distance from top of natural manual keys to top of natural pedals at rest [M]	801,5 mm at pedal/manual axis
center-to-center spacing of natural pedals [N]	85 mm
concavity of pedals [O]	see chart in keyboard drawing
radius of natural pedals to playing end [O]	$R = 5057$ mm
radius of sharp pedals to playing end [O]	$R = 4267$ mm
projection length of natural pedals, from face of key spreader [P]	232 mm, at b^1
projection length of sharp pedals, from face of key spreader [Q]	118 mm, at $a\#^1$
difference in length of natural and sharp pedals [R]	114 mm
playing length of natural pedals [S]	129 mm
playing length of sharp pedals [T]	110 mm
width of pedals [U]	30 mm
pedal keyfall measured at end of key [V]	to match manual keyfall
height difference between natural/sharp pedals [W]	76 mm
angle of manual keys/pedals from horizontal at rest [X]	2 degrees (variable)
total length of natural manual keys, pivot point to end [Y]	619 mm or as determined by designer
total length of pedals, pivot point to end [Z]	see chart in keyboard drawing
length from playing end of natural manual key to attachment point for vertical transmission wire [AA]	291 mm or as determined by designer

NOTE: Refer to "Drawing of the WCF Keyboard 2006" for a graphic depiction of these measurements

B. Comments

1. Comparison with North European and GCNA Standard

- Manual and pedal key centers

	<i>Standard WCF 2006</i>	<i>Standard N Euro 1983</i>	<i>Standard GCNA 1970/81</i>
Natural manual key centers	46 mm	46 mm	2" (50,8 mm)
Natural pedal centers	85 mm	85 mm	3,5" (88,9 mm)
Pedal/manual axis	b ¹ under d ³	c ¹ under c ²	b ¹ under d ³
Pedal radiation	Yes	No	Yes
Pedal concavity	Yes	No	2.875" (73 mm)

- Pedal radiation and concavity

The pedal spacing is 85 mm, same as N Euro. The radiation and concavity are similar to GCNA standard.

- Pedal/manual axis: b¹ under d³

The pedal/manual axis follows the GCNA standard. The center of the most-played manual part is right above the center of the pedal for a 5-octave instrument with a pedal compass of g⁰ - c⁵. It makes the keyboard as compact as possible, which is not the case for c¹ under c².

2. Center-to-center spacing of natural manual keys [A]

With a center-to-center distance of 46 mm, the negative space (i.e. the space available for a closed fist while depressing a key) should not be smaller than 76 mm (with a 16 mm key end).

3. Playing length of natural manual keys [E]

To avoid discomfort in open-position 'bridge' intervals, the playing length should be 110 mm. The transition from conical to square cross section should be done gradually. Sharp corners are to be avoided.

4. Manual keyfall [I]

40-55 mm is an adequate range for manual keyfall, assuming that other transmission component designs (i.e. clapper weights that are appropriate to the bells, multiple linkage attachment points provided on straight bar and crank or directional cranks, etc.) all fall into place. The manual keyfall should be measured at the key ends so that the keyfall for both naturals and sharps is the same. The 'ideal' setting for any particular instrument may be larger or smaller, depending on the transmission design. Therefore, it is necessary to have at least three multiple adjustable linkage attachment points provided on the crank arms. Adjustable means: user-friendly, without destroying any linkages in order to make a change.

5. Pedal/manual axis [K]

Working from a g⁰ - g⁵ (61-note, 5-octave) manual compass and g⁰ - c³ pedal compass (30 notes), keyboards - whether of 3 (ca. 37 bells), 4 (ca. 49 bells), or 5 octaves (ca. 61 bells) - should have the same lateral alignment of b¹ pedal under the d³ manual key. The concave, radiating pedalboard of 2 octaves (or 2½ if the pedal goes down to low g) should become standard.

Note that the Keyboard 2000 schematic follows b¹ pedal under d³ manual key and radiation centerline through the a# pedal (= same as GCNA). Thus, a 30-note pedal configuration starting at g⁰ would be perfectly symmetrical. The semitone spacings between pedals, both at the back (pivot) end and the front, are 48,5 mm (back spacing) and 42,5 (front spacing). The front spacing is the same as the European standard, and only 1,95 mm smaller than the GCNA. As for existing European carillons of 49 bells, starting from b-flat⁰, omitting b-natural⁰, traditionally the b-flat pedal comes into the space of the b-natural, but as a black key. If there is room, it is preferable to have the b-flat pedal in its standard position.

6. Distance between natural manual keys and natural pedals [M]

801,5 mm, from the top of the natural manual key to the top of the natural pedal, at the pedal/manual axis. The GCNA standard vertical distance of 30 11/16" (779,5 mm) allows enough legroom for average players. Richard Strauss has increased this amount slightly to 32 1/4" (794 mm) to allow for more legroom. Because of the reduced keyfall in the manual and in the pedal through leverage in pedal transmission, the total vertical distance from a manual sharp key in the up position to a central pedal in the down position is 35.5" (901 mm), less than the GCNA standard of 37.9" (962,7 mm) or the North European standard of 36.1" (916 mm). Therefore, both the shorter and taller player should find this new design more comfortable, since it provides more legroom for the taller player and involves less total vertical reach for the shorter player.

C. Further suggestions

1. Keypads

When rubber is used, this must be neoprene rubber. The hardness must be defined by the Rockwell scale, or the Durometer scale. When felt is used, this should be 6,35 mm (0.25") STEINWAY hard understring felt (also known as 'bellyman's felt'). A combination of rubber and felt might be used, too. Too-soft cushions will make fine adjustment impossible. The installer is entirely responsible for removing all pads and replacing with a harder, but noiseless, material if the carillonneur cannot adjust properly. There should be a guarantee period of at least five years on this item.

2. Ideal number of bells

As for new carillons, the starting point should always be an ambitious instrument with a $g^0 - g^5$ (61-note, 5-octave) manual compass and $g^0 - c^3$ pedal (30 notes), in concert pitch, which allows for a maximum of musical possibilities. In practice, space in towers is often limited and the decisions about the actual compass of the instrument and the pedal design must be agreed upon by the owner, the future player, and the builder. It is preferable to stay closer to concert pitch than having more bells with a higher transposition. For economic reasons, a-flat⁰ might be skipped.

3. Practice keyboard

A standard practice keyboard should have a range of five octaves ($g^0 - g^5$), so that carillonneurs who are asked to perform recitals on "grand carillons" will have those extra bass notes on their practice keyboards.