Technical Data

**BBC**
sigma®-tronic b

Units for special application

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Command store R 423.3

Description
The command store R 423.3 comprises of a statically operating bistable trigger stage with series-connected logical functions as well as an AND-connection for the operating signal and an equivalent monitor.

The unit is used to generate drive signals for actuators.

To set the store, a 1-signal is required at input C only, or at inputs A and B together (setting with pre-requisite). Also a 1-signal must be placed at inputs D and E and an 0-signal at input F. With an 0-signal at input D or E, or 1-signal at input F, the store is cleared.

If the setting and clearing conditions are fulfilled simultaneously, the store goes into cleared position (dominant clearing). Without the input signal, the store goes to cleared position on switching on of the supply voltage (preferential position). For noise suppression the store operates with a delay.

Output Q is normally connected with the input of an appropriate output element. Thus, with a 1-signal at the store output and at input FG, the position-gate switches in. A feedback signal, which gives the switch status of the position gate, for example from auxiliary contact of a protective device or from a limit switch of a hydraulic cylinder, is operated on the feedback input RM. If the control signal at output Q and the feedback signal at input RM correspond, a 1-signal at the fault indicator output QS appears (operation without faults, otherwise an 0-signal fault indication). Thus if during the switchover time of a position gate the output QS is not 0, then the monitoring is delayed.

The LED indication shows the signal state on output Q.

An 0-signal at output QS indicates a fault and can be indicated by means of annunciator store R 464 and R 465.

Via input FG, the signal at output Q can be switched off (and, for example, reconnected in a defined state), if information is stored, without an error signal appearing at output QS.

Order code for module:
Order code for circuit system transparency:
Identifying colour:
Mechanical structure:
Weight:

<table>
<thead>
<tr>
<th>GH R423 0003 R1</th>
<th>GH R700 1901 R64</th>
</tr>
</thead>
<tbody>
<tr>
<td>black</td>
<td>single width</td>
</tr>
<tr>
<td>approx. 169 g</td>
<td></td>
</tr>
</tbody>
</table>

Technical data

| Current consumption, store reset | 15 mA |
| Store sat                       | 30 mA |
| Input, inputs A ... F, FG       | ↑ load |
| Input RM                        | 1 load |
| Fan out at output Q             | 100 loads |
| at output QS                    | 10 loads |
| Set delay of store              | approx. 8 ms |
| Reset delay of store            | approx. 2.5 ms |
| Switch on delay of output QS    | approx. 170 ms |
| Switch off delay of output QS   | approx. 500 ms |
Description
The store R 424 consists of six statically-operating bistable trigger stages with series-connected logical functions.

On the setting side, inputs A and B are brought out. With a set store, the outputs show a 1-signal, with a cleared store they show a 0-signal.

For setting a 1-signal must be applied at inputs A and B, and simultaneously at input C, and the internal preparation time of 100 ms must have expired.

To clear, a 1-signal must similarly be applied at reset input R.

If the setting and clearing conditions are fulfilled simultaneously, the store goes into the cleared position.

For suppression of fault signals, the store operates with a delay.

Order code for module: GH R424 0000 V0
Identifying colour: black
double width
approx. 170 g

Technical data
| Current consumption, store reset | 20 mA |
| Input | 40 mA |
| Fan out at Q | 1 load |
| Preparation time \( t_p \) | 10 loads |
| Set delay \( t_e \) | 100 ms |
| Reset delay \( t_a \) | typically |
| |

Description
The unit R 436 serves to economically provide short delay times without a high accuracy demand, e.g., for reduction of hydraulic thrusts through staggered switching of solenoid valves. The unit consists of three independent functions. The first and third functions delay at about 150 ms linking the terminals 1-2 and 8-9 for approx. 50 ms. The second terminal is adjustable with a built-in potentiometer from approx. 20 to 250 ms. The maximum input voltage is 31.2 V.

Order code for module: GH R436 0000 V0
Order code for circuit symbol transparency: GH R700 1901 R31
Order code for application: D NG 80764 D
Identifying colour: violet
single width
approx. 130 g

Technical data
| Current consumption, 0-signal at all outputs | 2 mA |
| 1-signal at all outputs | 10 mA |
| Input | 4 loads |
| Fan out | 10 loads |
| Switch off delay | 5 ms |
| Re-preparation time | 150 ms |
| Time limits: | |
| Function 1 and 3: without link 1-2 resp. 8-9 | 150 ms |
| with link 1-2 resp. 8-9 | 50 ms |
| Function 2: | adjustable |
| | 20 ... 250 ms |
Description

With the logic output unit R 451.3, signals from a control with interlocking conditions or manual signals, amongst others at the final output stage, can be connected. The unit is thus especially suitable for control of an output unit.

A 1-signal appears at output Q if signals are present on at least one of the inputs A to C, together with inputs F to H.

Apart from the signal logic described, the unit can also store signals. With a 1-signal at input D, a short 1-signal at each of the inputs A to C is stored, and in the case of a 1-signal at inputs F to H, a 1-signal at output Q is given. A 1-signal at blocking input E or an 0-signal at input D re-sets the store. Storing is therefore independent from the states of inputs F to H, which operate individually at the output.

Most important, because of the possibility of storing, and the corresponding danger of a fault through a voltage impulse on the input cables, output Q is delayed approx. 2 ms against inputs A to E.

Output Q carries the reversed signal as does output Q. It is used preferably for interlocking of the position gates.

Order code for module:
GH R451 0003 R1
GH R700 1901 R19
D GEF 31015 D
D GEF 40096 D
D GEF 40097 D

Order code for circuit symbol transparency:
green
Identifying colour:
single width
Mechanical structure:
approx. 130 g
Weight:

Technical data

Current consumption, 0-signal at output Q
1-signal at output Q
Input
Fan out at Q
at Q
The inputs A to C have a making delay of approx. 8.5 ms and breaking delay of approx. 2 ms.
Control units
R 452.4, R 452.5,
R 452.14, R 452.15

Description

With the control unit commands for position-gates are built up, which monitor and signal any faults which occur. The unit consists, principally, of a combination of control store R 423.3 and annunciator store R 465, with extended logic functions on the input side.

To set the store, a 1-signal at input C alone or at inputs A and B together (setting with pre-requisites) is necessary. Furthermore a 1-signal at input H and at least one of the inputs F or G as well as an 0-signal at input J, must be applied, and also 0-signal on input D or a 1-signal on input E, must be applied for setting to be achieved.

For clearing the store there are more possibilities, either clearing through a single signal or through a combination of signals: 1-signal at J, 0-signal at H, 0-signal at F and G, 1-signal at D and 0-signal at E. Apart from this, an internal clearing connection of the fault indicator unit will occur.

If the setting and clearing conditions are fulfilled simultaneously, the store goes in the clear position (overall clearance). Without an input signal the store, with switch-on of supply voltage, goes to the clear position (preferential position). For supression of disturbance the store operates with a delay.

Output Q is normally connected with the input of an appropriate output unit. Thus, with a 1-signal at the store output and at input FG, the appropriate position gate switches in. A feedback signal, which gives the switch status of the position-gate, e.g. from auxiliary contact of a protection device or from a limit switch of a hydraulic cylinder, is applied on feed back input RM. If the control signal at output Q and the feedback signal at input RM correspond, an 0-signal appears at fault output QS (operation without faults), as long as no 0-signal at signal input SM identifies a further fault.

If the signal at output Q and the feedback signal at RM do not correspond, or if there is a 0-signal at input SM, a 1-signal appears at QS (fault indication). Thereby if during the switchover time of a position-gate the output QS is not showing a 1-signal, the monitor is delayed.

At the same time as the 1-signal at QS, a short 1-signal shows at hooter output QH. This serves to set a central SIGMA-tronic store, which can switch on an audible warning element. Thus the outputs QH on the different units R 452, R 464 or R 455 can be connected in parallel. With a 1-signal at QH the internal store of the annunciator unit is also set. The command store is thereby cleared.

With a (fast) square-wave voltage at flasher input BL 1, a lamp connected to lamp output QL is operated in the sequence of voltage.

A 1-signal at input R clears the store of the annunciator unit. If the fault signal remains, the lamp at output QL operates in sequence with the flasher frequency connected to flasher input BL 2 (slow-flashing). Without the signal at the input, the lamp goes out. If a 1-signal is shown at output Q and if, within the delay time, there is no signal at input RM, then the fault indicator operates; the lamp flashes quickly. The command store is cleared by the fault indicator. Thus the signal at Q and RM correspond once again. With the shut-down of the annunciator unit, the fault signal also disappears.

With a fault indication at SM, the fault signal remains switched on until the disappearance of the information signal. After operating the reset key (input R) the lamp flashes slowly.

A 1-signal at lamp-testing input LP results in the connected lamps lighting continuously. This input cannot only be used for testing of units and lamps, but also for signalling of non-fault instances, by a continuous light.

The outputs QL of more than one unit may not be switched in parallel.

The signal state of the output QL is shown by an LED fitted to the module.

The output QL has no series resistance and no fuse protection.

In the case of units R 452.4 and R 452.5 the signal lamp is connected by means of one terminal at output QL and the other at the positive terminal of the DC voltage. The voltage can be up to +6V—. Output QL may be loaded at 210 mA, so that SW-lamps of 65 V can be used.
Control units R 452

In the case of units R 452.14 and R 452.15 one terminal of the signal lamp is connected to output QL and the other terminal to the zero rail of the DC voltage. Only 24 V-lamps can be used with a maximum power of 10 W.

The output QL can also be used for driving other loads such as relays, auxiliary contactors, or solenoid valves with a maximum current consumption of 500 mA. A quenching diode is fitted in the unit for demagnetization of inductive loads; however there is no rapid demagnetization provided.

Order code for module R 452.4
Order code for module R 452.5
Order code for module R 452.14
Order code for module R 452.15
Order code for circuit symbol transparency for modules R 452.4 and R 452.6
GHR 452 0400 R1
GHR 452 0500 R1
GHR 452 1400 R1
GHR 452 1500 R1
GHR 700 1901
R27

Identifying colour: green
Mechanical structure: double width
Weight approx. 230 g

Technical data

<table>
<thead>
<tr>
<th>Current consumption</th>
<th>R 452.4</th>
<th>R 452.14</th>
</tr>
</thead>
<tbody>
<tr>
<td>all outputs 0-signal</td>
<td>34 mA</td>
<td>34 mA</td>
</tr>
<tr>
<td>with command buffer set when signalling</td>
<td>65 mA</td>
<td>65 mA</td>
</tr>
<tr>
<td>Input load per input</td>
<td>50 mA</td>
<td>50 mA</td>
</tr>
<tr>
<td>Fan out at output Q, QS</td>
<td>1 load</td>
<td>1 load</td>
</tr>
<tr>
<td>Fan out at output QH</td>
<td>3 loads</td>
<td>3 loads</td>
</tr>
<tr>
<td>100 loads</td>
<td>100 loads</td>
<td></td>
</tr>
<tr>
<td>Output capacity at output QL against positive voltage (max. 65 V—)</td>
<td>210 mA</td>
<td></td>
</tr>
<tr>
<td>Output capacity at output QL against zero rail (output voltage 24 V—)</td>
<td>420 mA</td>
<td></td>
</tr>
<tr>
<td>Delay time (typical value): Set command buffer</td>
<td>8 ms</td>
<td>8 ms</td>
</tr>
<tr>
<td>Reset command buffer</td>
<td>2.5 ms</td>
<td>2.5 ms</td>
</tr>
<tr>
<td>Delay time of comparator (signal delay if Q and RM are not equal)</td>
<td>500 ms</td>
<td>500 ms</td>
</tr>
<tr>
<td>R 452.4 and R 452.14</td>
<td>5 ms</td>
<td>5 ms</td>
</tr>
<tr>
<td>R 452.5 and R 452.15</td>
<td>30 ms</td>
<td>30 ms</td>
</tr>
<tr>
<td>Horn pulse width</td>
<td>30 ms</td>
<td>30 ms</td>
</tr>
</tbody>
</table>
Annunciator stores
R 465.3 and R 465.13

Description

The annunciator stores R 465.3 and R 465.13 can be installed with two flashing frequencies for status annunciation of transmitters and initiators, e.g. for so-called motor signalling and for new value annunciation of faults. For fault indication of drive controls they are mainly used together with control store R 423.3.

Signalling is accomplished on the closed circuit principle, i.e. 0-signal at the signalling input A or B operates a 1-signal at output QS. This can be used for various purposes within the control or for chronological recording.

A short 1-signal will appear at the hooter output OH, when the 1-signal begins to appear at QS. This signal will be sufficient to set a central SIGMA-tronic store, which can bring in an audible warning element. The outputs OH of various annunciator stores can be easily connected in parallel.

With the appearance of an information signal, the component-store is set. With this, output Q, which previously was in position 1, carries an 0-signal. With a (fast) square-wave voltage at flasher input BL1 (e.g. from a flasher unit R 435.3, output 2 Hz), the lamp connected to lamp output QL lights up in the sequence with the applied square-wave voltage.

A 1-signal at reset input R will clear the store. If the fault signal still persists at input A or B, the lamp at output QL is illuminated in the sequence of the flasher frequency connected to flasher input BL2 (e.g. from a flasher unit R 435.3, output 0.5 Hz). Without a fault signal at the inputs, the lamp is extinguished.

As long as an information signal persists, or when this is not reset, output Q carries an 0-signal. Only when the information signal has disappeared and is reset, does Q once again carry a 1-signal. Q can, for instance, be connected with clearing inputs D and E of the command store R 423.3.

A 1-signal at the lamp check input LP will cause constant illumination of the connected lamp. This input can also be used for testing of units and lamps.

The outputs QL of more than one unit may not be switched in parallel.

The signal state of the output QL is shown by an LED fitted to the module.

Output QL has no series resistance and no fuse protection.

In the case of unit R 465.3 the signal lamp is connected with one terminal at output QL and the other at the positive terminal of the DC voltage. This voltage can be up to +65 V. Output QL may be loaded at 210 mA, so that 5 W-lamps of 24 V or 13 W-lamps of 65 V can be used.

In the case of unit R 465.13, one terminal of the signal lamp is connected to output QL and the other terminal to the zero rail of the DC voltage. Only 24 V-lamps can be used with a maximum power of 10 W.

The output QL can also be used for driving other loads such as relays, auxiliary contactors, or solenoid valves with a maximum current consumption of 600 mA. A quenching diode is fitted in the unit for demagnetization of inductive loads; however, there is no rapid demagnetization provided.

Order code for module R 465.3:  GHR 465 0300 R1
Order code for module R 465.13:  GHR 465 1300 R1
Order code for circuit symbol transparency for module R 465.3:  GHR 700 1901 R26

Identifying colour:  brown
Mechanical structure:  single width
Weight:  approx. 150 g
Annunciator stores R 465.3 and R 465.13

Technical data

- Current consumption, closed circuit
  - open circuit
    - R 465.3: 25 mA
    - R 465.13: 25 mA
  - R 465.3: 42 mA
  - R 465.13: 42 mA

- Input load
  - 1 load
- Fan out at QH (up to 100 outputs switched in parallel)
  - 3 loads
  - 100 loads
- Fan out at QS and Q
  - 100 loads

- Output capacity at output QL
  - Output capacity at output QL against positive voltage (max. 65 V—)
    - 210 mA
    - 420 mA

- Output capacity at output QL against zero rail (output voltage 24 V—)
  - approx. 11 ms
  - approx. 3.5 ms

- Delay time of fault signal
  - approx. 11 ms
  - approx. 3.5 ms

- Delay time upon reset of fault signal
  - approx. 30 ms

- Horn pulse width
  - approx. 8 ms
  - approx. 2.5 ms

- Store set delay
  - approx. 24 ms
  - approx. 8 ms

- Store reset delay

- Deactivation delay, output Q
  - approx. 24 ms

- Reactivation delay, output Q
  - approx. 8 ms

- Delay times see diagram 1

- Signalling method see diagram 2
  (Delay times omitted)
Compact counter
5 decades, with preselection
R 483.1

Description
The 5-decade up/down counter R 483.1 counts the 0-1 counting pulses arriving at input Z. The respective counter reading is indicated by 7-segment displays.

The counting direction is selected at input VR; a 0 signal signifies down counting and a 1 signal signifies up counting. Various modes of operation can be programmed via inputs A3 to A6 and the two front pushbuttons in accordance with the following tables. In this case, in up counting mode, a pulse of approximately 150 ms is available at output Q1 for further processing in the control. In the event of coincidence with the preselected unit, in down counting modes Q1 is available as a presignal and Q2 as a zero signal for approximately 150 ms each, depending on the mode of operation. The potential-free changeover contacts Q1 and Q2 correspond to Q1 and Q2 switch for approximately 150 ms.
The transfer input operates dynamically.

In the tables, "1" signifies the input with + Ud.

Table 1: Up counting mode

<table>
<thead>
<tr>
<th>Mode</th>
<th>Signal at A3</th>
<th>Link A5-A6</th>
<th>Link A4-A7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Beginning of counting: set preselection</td>
<td>1</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>1.2 Beginning of counting: zero, coincidence signal appears when the set preselection is reached and the counter continues to count.</td>
<td>1</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>1.3 Beginning of counting: zero, coincidence signal appears when the set preselection is reached and the counter continues to count as from zero (repeat mode).</td>
<td>1</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

In modes 1.2 and 1.3, the counter automatically returns to zero when the mains power is activated or when pushbutton S is depressed or when a 0-1 pulse is applied to the transfer input (A4). In mode 1.1, the counter automatically changes to the preselected value. If the preselection is to be changed during operation, pushbutton V must be depressed in order to transfer the modified preselection to the counter. If the counter is to additionally begin counting when it reaches zero, pushbutton S must also be depressed.

Table 2: Down counting mode

<table>
<thead>
<tr>
<th>Mode</th>
<th>Signal at A3</th>
<th>Link A5-A6</th>
<th>Link A4-A9</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Beginning of counting: zero</td>
<td>0</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>2.2 Beginning of counting: set preselection, coincidence signal appears when zero is reached and the counter continues counting.</td>
<td>0</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>2.3 Beginning of counting: set preselection, coincidence signal appears when zero is reached and the counter then changes to the set preselection and continues counting (repeat mode).</td>
<td>0</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

In modes 2.2 and 2.3, the counter is set to the preselected number when the mains power is activated, when the pushbutton S is depressed or when a 0-1 pulse appears at the transfer input (A4). In mode 2.1, the counter returns to zero position. If the preselection is to be changed during operation, the pushbutton S must be depressed in order to transfer the modified preselection to the counter. In mode 2.3, the counter automatically changes to the new preselection when the number is reached.
Compact counter R 483.1

A special feature of the counter R 483.1 is the operating mode: down counting to zero with any set pre-switch-off point (e.g., if it is necessary to switch over from fast to slow speed). For this purpose, first of all the pre-switch-off point is set on the up counter and then the pushbutton V is depressed. The number is then set at which the counter is to start and pushbutton S is depressed. Both numbers are now stored in the counter. The memory contents are lost when the voltage is switched off. The wiring is as described for both mode 2.2 or 2.3. The only difference is that, when the pre-switch-off point is reached, output Q1 has a 1 signal for approximately 150 ms. The changeover contact Q1m switches over for this time and then returns to its initial position. If changes are necessary, first of all the pre-switch-off point and the start of counting must be set. Modes of operation are possible which permit both up and down counting. The counter must be wired in accordance with the tables above. The external counting frequency can be increased in accordance with Table 3 to 100 kHz by means of external wiring (on the rear) with a resistor. In the mode of operation “repeat mode”, the maximum counting frequency is 500 Hz without counting losses.

Table 3: Maximum counting frequencies

<table>
<thead>
<tr>
<th>Pulse time</th>
<th>Max. counting frequency</th>
<th>Resistor R1</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 ms</td>
<td>100 Hz</td>
<td>omitted</td>
</tr>
<tr>
<td>2,5 ms</td>
<td>200 Hz</td>
<td>2,7 MΩ</td>
</tr>
<tr>
<td>1 ms</td>
<td>500 Hz</td>
<td>560 kΩ</td>
</tr>
<tr>
<td>0,5 ms</td>
<td>1 kHz</td>
<td>220 kΩ</td>
</tr>
<tr>
<td>0,25 ms</td>
<td>2 kHz</td>
<td>100 kΩ</td>
</tr>
<tr>
<td>100 µs</td>
<td>5 kHz</td>
<td>39 kΩ</td>
</tr>
<tr>
<td>50 µs</td>
<td>10 kHz</td>
<td>18 kΩ</td>
</tr>
<tr>
<td>5 µs</td>
<td>100 kHz</td>
<td>1,2 kΩ</td>
</tr>
</tbody>
</table>

Use resistors with connecting wires having a diameter of 0.6 mm. These are placed into the provided sockets in accordance with the connection diagram without soldering.

Order code for module: GH R483 0100 R1
Mechanical structure: standard housing for front panel installation 50 x 50 x 140 mm, necessary front panel cut out: 50.5 x 50.5 mm
Dimensions of the front panel (W x H): 60 x 75 mm
Spacing between attachment holes (M4): 63 mm
Housing colour: black
Weight: approx. 350 g

Technical data
Permissible supply voltage 24 V DC ± 30%
Current consumption, all segments driven 140 mA
Counter reading 00000 80 mA
Maximum input voltage 50 V
Input load at A2, A3, A4, per input 1 load
Fan-out at Q1 and Q2, per output 10 loads
Relay contacts (changeover contacts), switching voltage maximum 250 V AC,
maximum 50 V DC
maximum 4 A
at 12 to 50 V DC: 100 W ohmic load
500 Hz, otherwise in accordance with
Table 3
Reactivation pause ≥ 5 s
Permissible ambient temperature ± 25 to + 70 °C

Accessories
Order code for flexible front panel cover (for enclosure type IP 55): GH R700 8203 P1
Weight: approx. 100 g
Shift register with LED
136 bits serial
R 491.14

Description
The shift register R 491.14 can take on and store up to 136 bits in serial mode.

The information pending at input A (0 or 1 signal) is transferred to the register (1st position) by a 0-1 edge at the clock input T.

This information is shifted in the register by one respective memory location with each subsequent 0-1 edge. If more than 136 information items are stored, the information first stored is then lost.

A static 1 signal pending at input A is stored several times in the case of several clock pulses. A 1 signal at input R deletes the register contents.

The available 10 outputs Q1 to Q10 can be linked to each memory location by means of internal programming (solder links) in accordance with the table below. In this case, the outputs Q1 to Q10 routed to the soldering posts a 1 to a 10 are linked to one soldering leg of a corresponding register IC (A1 to A17). For example, a connection from soldering post a1 (≤ output Q1) to soldering lug No. 10 of IC A9 signifies that the 68th register position (soldering lug No. 10 on IC A9) is connected to output Q1.

The signal state of each output is indicated by a red LED.

Order code for module:
Identifying colour:
Mechanical structure:
Weight:

Technical data
Current consumption, all outputs 0 signal
Input load, per input
Fan out, per output
Delay times:
(typical values) per input
Duration of internal forced deletion
after connection of the supply voltage
Maximum shift frequency

| Assignment of the required register position to the corresponding IC connection: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soldering lug No. | IC module No. | IC A1 | IC A2 | IC A3 | IC A4 | IC A5 | IC A6 | IC A7 | IC A8 | IC A9 | IC A10 | IC A11 | IC A12 | IC A13 | IC A14 | IC A15 | IC A16 | IC A17 |
| 5 | 1 | 9 | 17 | 25 | 33 | 41 | 49 | 57 | 65 | 73 | 81 | 89 | 97 | 105 | 113 | 121 | 129 |
| 4 | 2 | 10 | 18 | 26 | 34 | 42 | 50 | 58 | 66 | 74 | 82 | 90 | 98 | 106 | 114 | 122 | 130 |
| 3 | 3 | 11 | 19 | 27 | 35 | 43 | 51 | 59 | 67 | 75 | 83 | 91 | 99 | 107 | 115 | 123 | 131 |
| 10 | 4 | 12 | 20 | 28 | 36 | 44 | 52 | 60 | 68 | 76 | 84 | 92 | 100 | 108 | 116 | 124 | 132 |
| 13 | 5 | 13 | 21 | 29 | 37 | 45 | 53 | 61 | 69 | 77 | 85 | 93 | 101 | 109 | 117 | 125 | 133 |
| 12 | 6 | 14 | 22 | 30 | 38 | 46 | 54 | 62 | 70 | 78 | 86 | 94 | 102 | 110 | 118 | 126 | 134 |
| 11 | 7 | 15 | 23 | 31 | 39 | 47 | 55 | 63 | 71 | 79 | 87 | 95 | 103 | 111 | 119 | 127 | 135 |
| 2 | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 | 104 | 112 | 120 | 128 | 136 |