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Before you start assembling this set, in the form of a kit or ready-built and tested, we advise you to first read this manual in its entirety.

Partlist Main PCB

Semiconductors
IC1 74HCT04 (Hex Inverter)
IC3 ATtiny4313 (Pre-programmed GINO-Core IC)
IC2 78T05 (voltage regulator) 1A
IC4 74HCT139 (dual 4 to 1 address decoder IC)

Resistors
R1 220 ohm ¼ watt
R2 220 ohm ¼ watt
R3 10K ¼ watt
R4 470 ohm ¼ watt

Capacitors
C1 47uF/35v (Electrolytic or tantalum)
C2 100nF (ceramic or disc)
C3 100nF (ceramic or disc)
C4 33pF (ceramic or disc)
C5 33pF (ceramic or disc)
C6 10uF/16v (Electrolytic or tantalum)
C7 100nF (ceramic or disc)
C8 100nF (ceramic or disc)
C9 100nF (ceramic or disc)

Cristal
Q1 X-tal 8 Mhz

Diodes
B1 Brugcel/Bridge
LED1 Standard green led

Several parts
1 DIN 5 Pin Right Angle PCB Mount Socket
1 IC socket 14 pin for the 74HCT04
1 IC socket 16 pin for the 74HCT139
1 IC socket 20 pin for the ATtiny4313 processor
1 20 Pin IDC Male Header (for the 20-wire flatcable) for the GINO-BUS
1 Resetknop
1 DC-bus - pen 2,5mm
4 Parker 3 x 20 mm
4 Spacer / Afstandsbus
1 PCB GINO N10052018-1

Introduction

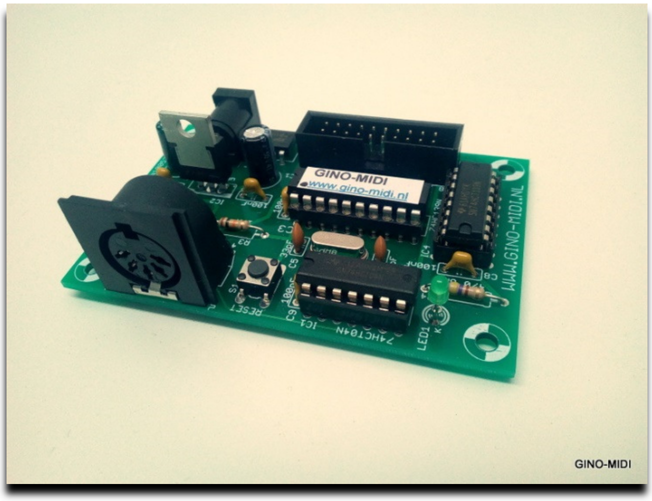
General

The Small-MIDI interface is designed to equip an organ console with a MIDI output. Via a MIDI output it is possible to control and play an expander or a personal computer. Certainly the latest application now offers many possibilities to make a real virtual organ on the personal computer possible.
On the Internet one can download applications with which one can build a virtual organ on the personal computer. Examples include jOrgan by Sven Meier and MyOrgan. Both freeware software. We also call Hauptwerk. This software is not free.
The configuration that the Small-MIDI Interface can handle consists of:

- two 5 octave keyboards and a large pedal and a register panel of up to 64 registers, or
- three 5 octave keys and a large pedal, or
- four 5 octave keys

The circuit

The heart of the Small-MIDI interface consists of the circuit around the microcontroller ATtiny4313. The microcontroller reads keystrokes, gets started and translates them to MIDI codes. The diagram about this microcontroller can be found further in this description. This diagram shows the power supply, the circuit around the microcontroller and the MIDI output.



The keyboards, pedal and the register panel are connected to this circuit by means of a flat cable, via the IDC male header SV1. We call this flatcable the GINO-Bus. The GINO-Bus connects all other components, such as decoders, with each other.

The crystal Q1 and the two capacitors C4 and C5 provide a constant clock signal of 8 MHz.

The reset circuit consists of R3 and the reset button. By pressing the reset button, a reset pulse is generated so that the program runs smoothly from the start and various initialization procedures are carried out. The reset button can also be used to enter the programming mode. More about this later in this manual.

The midi signal arrives at the TXD output of the microcontroller and is connected to the 5 pole bus connection by IC1A and IC1B. IC4 is only used for half. This is an address decoder that determines which of the four ports (read keys, pedal and register panel) are read.

The power supply consists of a µA7805 with a few capacitors around it. This is a 5 volt voltage regulator that can deliver up to 1A. The supply voltage to be connected must not exceed 12 volts DC. You can use any home garden and kitchen adapter.

The program of the ATtiny4313 reads at very fast speed the position of the key contacts of the keyboards and the stops panel. This data is stored in the memory of the microcontroller and converted into MIDI data.

In the original design, we use a diode matrix for the keyboards and the stops panel. This diode matrix makes a distribution of the key contacts in groups of 8 keys.
So for a five octave keyboard you need 8 matrix parts of 8 keys. In total we can then read 64 keys. More than enough, because a five octave keyboard has a size of 61 keys.
Before a diode matrix can be read, we first have to set a decoder circuit between the ATtiny4313 and the diode matrix. This decoder is controlled by the ATtiny4313 and IC4A and gives 8 pulses per cycle. With each pulse, the microcontroller reads part of the diode matrix.

In order to minimize the wiring from the main PCB to the keyboards and the stops panel, the decoder circuits are accommodated at the keyboards and their matrix, and the main board and the decoder boards are connected to each other by the GINO-bus.

Assembly kit

Assembly of the PCB

This paragraph can be skipped in case you have purchased the built version.
Then read the paragraph **Midi-channels and port numbers**.

An important tip ....

Components such as resistors, capacitors, diodes, transistors, short cuts etc. have long connection wires. These components are bent to the right size and inserted into the PCB. Now it is wise to bend the connecting wires of these components after the insertion in the PCB along the PCB, preferably in line with the copper track. These connecting wires are then cut off as short as possible so that only the soldering island with the abbreviated connection wire remains.

Then you start soldering.

This method is recommended, because soldering is much easier, after all, the solder islands are more easily accessible, but last but not least, the flux that is released with the soldering now also flows over the entire solder island including the cut-off connection wire and is hermetically sealed. and any corrosion has no chance.

Assembly

First we will apply the resistors and the IC sockets. Pay attention to the marking of pin 1 at the IC socket. There is also room for a resistance network, that is RN1, but it is not used.
The bridge cell is mounted. Pay attention to the correct polarity.
Subsequently, the capacitors and electrolytic capacitors (elco's) come. Pay attention to the polarity at the elco's.
The LED also has a polarity. The short leg of an LED is the cathode. The "A" and "K" are indicated on the print.
Then the voltage regulator is mounted. Pay attention to the correct position, see also the pictures of this manual.
Then we assemble the connectors.
Namely: an entrance for the power adapter J1, the 5 pin connector for the MIDI-OUT, X1 and the connector for the GINO-Bus, SV1.
Finally, we mount the RESET button

The connectors

Power supply J1

For the power supply we use a 2.5 mm DC plug. You do not have to pay attention to the polarity here: the bridge rectifier ensures the correct polarity. Note the aforementioned height of the supply voltage.

IDC connector SV1

We use IDC connectors for the connection of the GINO-Bus. The male header is now mounted on the main board for this purpose. Pay close attention to the numbering of pin 1 indicated on the assembly diagram. This corresponds to a small triangle on the male header.
We use the 20-pole header for the GINO-Bus. The advantage of the IDC connectors is that they are sturdy and that the female part is always inserted in the male header in the correct way.

Current.

The circuit uses a current of 15 mA at 9 volts DC.
This is largely consumed by the microcontroller and the LED. The 74HCT139 consumes almost nothing, and is not measurable. If the decoder circuits with 74HCT138 with matrix for the keyboard and / or pedal and the register switch matrix is connected, the power consumption will not increase. This HCT type draw almost no power.

Testing.

The circuit can be tested without the use of a keyboard.
First we will see if the supply voltage is correct. Do not place ICs in the feet for this purpose.
For the supply voltage one can use an adapter that delivers a voltage of 8 to 12 volts DC. Note, the voltage of 12 volts must not be exceeded.
In an unloaded state the 12 volts soon becomes 15 volts, and because this circuit draws almost no current, this supply voltage will not be lowered by the load.
Connect the power supply and the green LED will come on. This is already a good sign ... the voltage regulator transmits the voltage.
Then measure the supply voltage on, for example, pin 20 of the IC socket of IC3. There must be 5 volts. If this is not the case, check the circuit again properly. Is IC2 well connected? These are sometimes those easy mistakes.
If the supply voltage is good, you can insert IC1, IC3 and IC4 into the feet. Note the direction of the ICs.
Then connect the MIDI out with the PC or with a MIDI instrument. Then switch on the voltage. Apparently nothing will happen yet, because we have not yet connected any decoders and diode matrices. However, the circuit already transmits a MIDI signal. Namely the codes for All-Notes-Off. More about that later.

We are now going to simulate a keyboard. Make a short-circuit between, for example, pin 17 and pin 6 of the IDC male SV1. You will now have to hear some response from your MIDI device. We simulate that we have now pressed the first key of each matrix. These are a lot of tones that we cannot distinguish with our hearing, but it is a way of noticing that the heart of the MIDI interface works. If you have a **MIDI monitor** program on the computer at your disposal, you can follow this. If you get no response, then it is important to go through the circuit again. You can also check if the first MIDI signal (All-Notes-Off) is being broadcast. For each of the 16 channels this code is sent and can be followed on a MIDI monitor. Below a link where you can download a MIDI monitor.

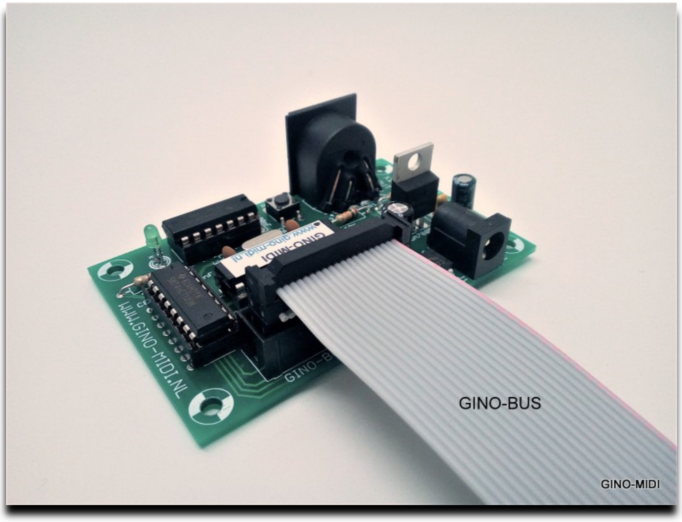
http://www.midiox.com

It is very convenient to have this kind of software on the PC. There are many applications on the Internet. Just go look for it.

End of description of assembly kit

Midi-channels and port numbers.

You can find a lot of data on the Internet about midi codes and all the details. We will not discuss this further in this manual. However, we will discuss the use of the MIDI channels.



As you probably know, MIDI can transmit data over 16 channels.
The Small-MIDI interface sends data over four MIDI channels. Namely channel 1, 2, 3 and 4. That is the factory setting.
The Small-MIDI interface has 4 port numbers that we can select with the blue jumpers on the decoder.
These are the gates numbered 1, 2, 3 and 4

Port 1 is used for MIDI channel 1, for example the main keyboard
Port 2 is used for MIDI channel 2, for example the second keyboard
Port 3 is used for MIDI channel 3, for example the pedal
Port 4 is used for MIDI channel 4, for example the stop switches, or a third keyboard
So ... port numbers are identical with the MIDI channel numbers.

Now situations can occur where it is desirable to use a different channel number for each port. This may be the case if you have already existing MIDI equipment and a certain channel number is already in use. To this end, a provision has been made for the Small-MIDI to change the channel numbers. See further under the heading Programming channel numbers.

Programming channel numbers

To be able to program the channel numbers, it is important that a keyboard or stop panel is connected to the Small-MIDI, and is also connected to a computer that runs a program like MIDI-OX, or Hauptwerk, etc., and with which tones could be are played.
We are going to use keys to program, and with the help of tones we can check whether programming has been successful or not.

The relevant keyboard must be set to port 1 by means of the blue jumper on a connected decoder. So blue jumper on position 1.
To enter the programming mode, press the 8th key from the low end of the keyboard, ie the G, and then press the RESET button briefly.
You now hear briefly 4 tones in a row, indicating that we have entered the programming mode.
Then press one of the first 4 keys of the keyboard, ie, C, Cis, D or Dis. This action determines which channel numbers are assigned to the ports. Always in groups of 4 channels. The table below indicates what the result will be.

Key	MIDI channel numbers	Remark
C	1, 2, 3, 4	Default, factory setting
Cis	5, 6, 7, 8	
D	9, 10, 11, 12	
Dis	13, 14, 15, 16	

After pressing one of these keys, the programming mode will be closed and you will hear 4 consecutive tones again, but now in reverse order.

The setting of these channel numbers is stored in the memory of the microcontroller, even though the Small-MDII is switched off.

If you do not make a selection after entering the programming mode, the programming mode will be cancelled after 15 seconds. This is also confirmed by several tones in quick succession.
To restore the factory setting, press the 7th button and then the RESET button. As a check you will hear 4 short tones in quick succession.

Diode matrix

In the proposed diagram you can see that we start from a diode matrix to read out the keys and possibly stop switches.
A diode matrix is controlled by a decoder circuit. This decoder circuit, in turn, receives signals from the main PCB of the Small-MIDI to activate the correct matrix part.
The disadvantage of a diode matrix is that we have to arrange the key contacts in groups of 8 keys. The key contact rail cannot therefore consist of one piece, but must be divided into 8 short parts.
The advantage is that we only need a diode for each key and these diodes (= 1N4148) are quite cheap.

GINO-Bus

The GINO-Bus connects all decoder circuits to the main board. Below a specification of this bus.

Pen# of IDC connector	Name	Description
SV1-20	PORT 1	Signal keyboard/pedal/stops
SV1-18	PORT 2	Signal keyboard/pedal/stops
SV1-16	PORT 3	Signal keyboard/pedal/stops
SV1-14	PORT 4	Signal keyboard/pedal/stops
SV1-12	PORT 5	Only applicable for the Big-MIDI
SV1-10	PORT 6	Only applicable for the Big-MIDI
SV1-8	PORT 7	Only applicable for the Big-MIDI
SV1-6	A2	Adress 2 for decoders
SV1-4	A1	Adress 1 for decoders
SV1-2	A0	Adress 0 for decoders
SV1-1	GND	Massa/GND
SV1-3	D7	Data 7
SV1-5	D6	Data 6
SV1-7	D5	Data 5
SV1-9	D4	Data 4
SV1-11	D3	Data 3
SV1-13	D2	Data 2
SV1-15	D1	Data 1
SV1-17	D0	Data 0
SV1-19	+ 5 VOLT	Power suply + 5 volt

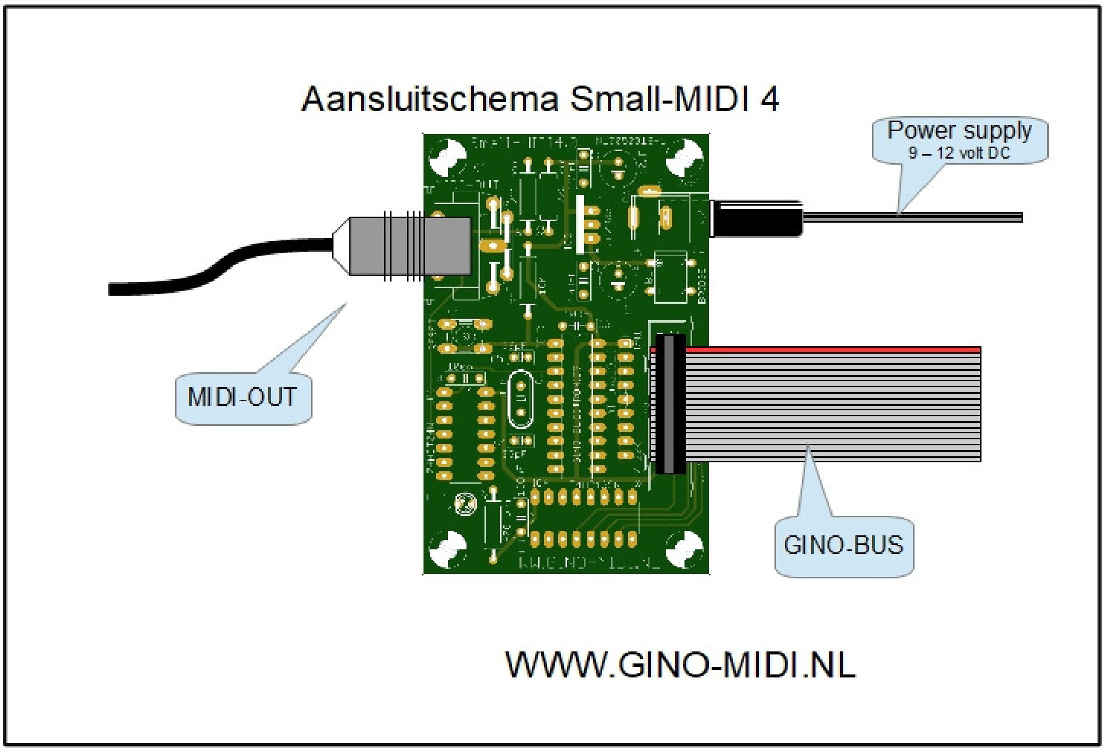
All-Notes-Off

Each time you start the Small-MIDI, the All-Notes-Off message is broadcast for each channel. This also happens when you press the Reset button.
The underlying idea is that it can prevent tones from sticking while playing. We have experienced this during testing, but that was in extreme circumstances. Especially bad contacts can be the cause of this.

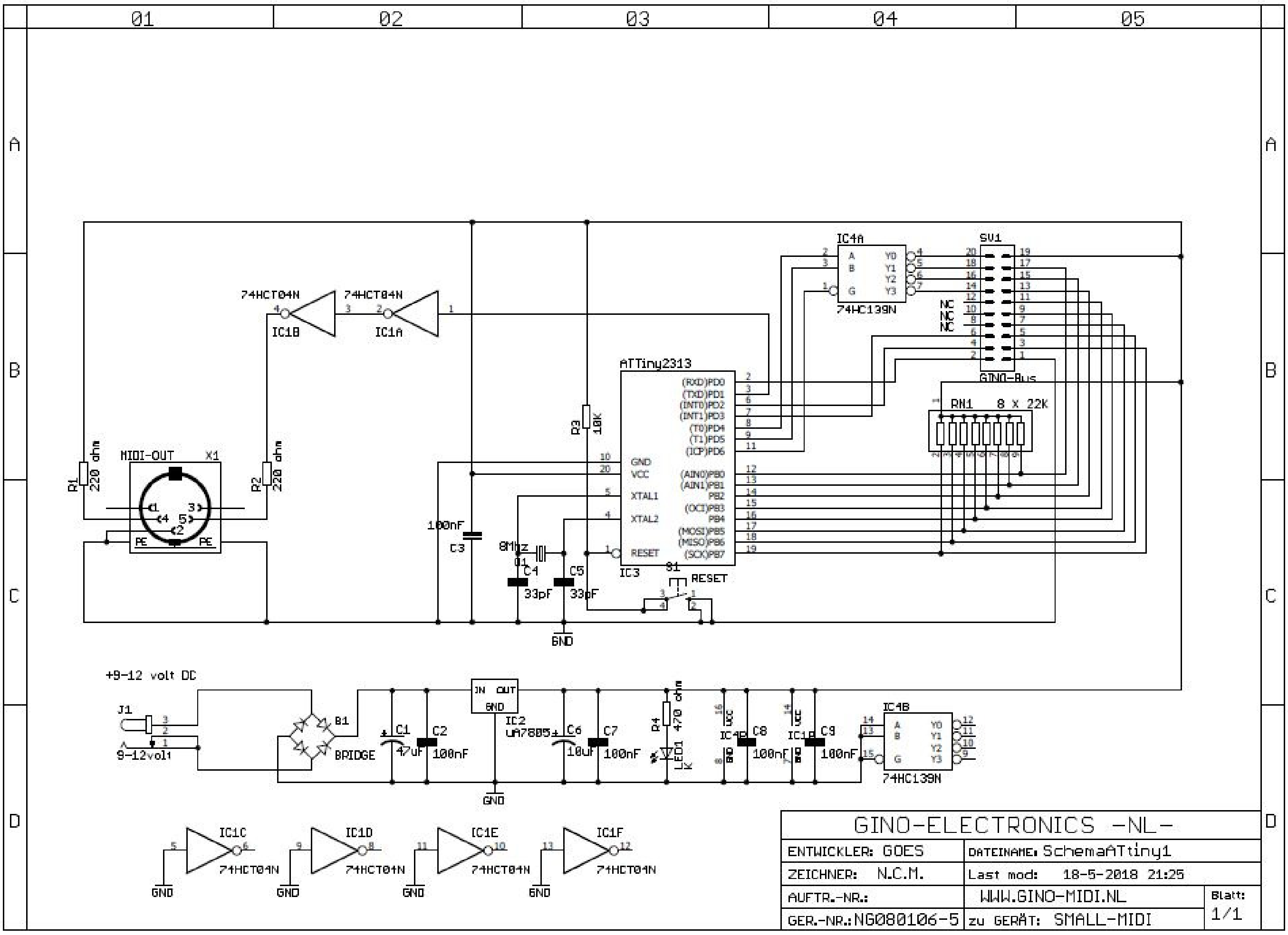
And last but not least

We have tried to cover as many things as possible in this manual. If you have any comments, please let us know. This way other users can also benefit from this.
Good luck with the construction of the **Small-MIDI**.

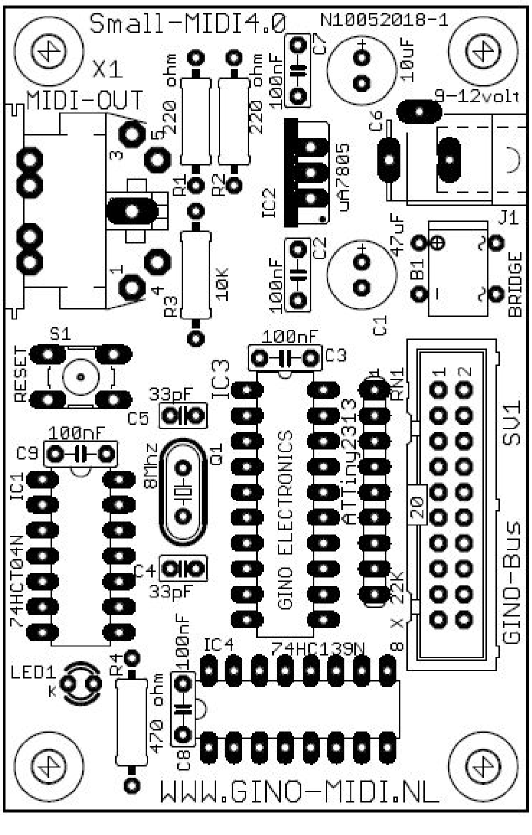
Connecting scheme



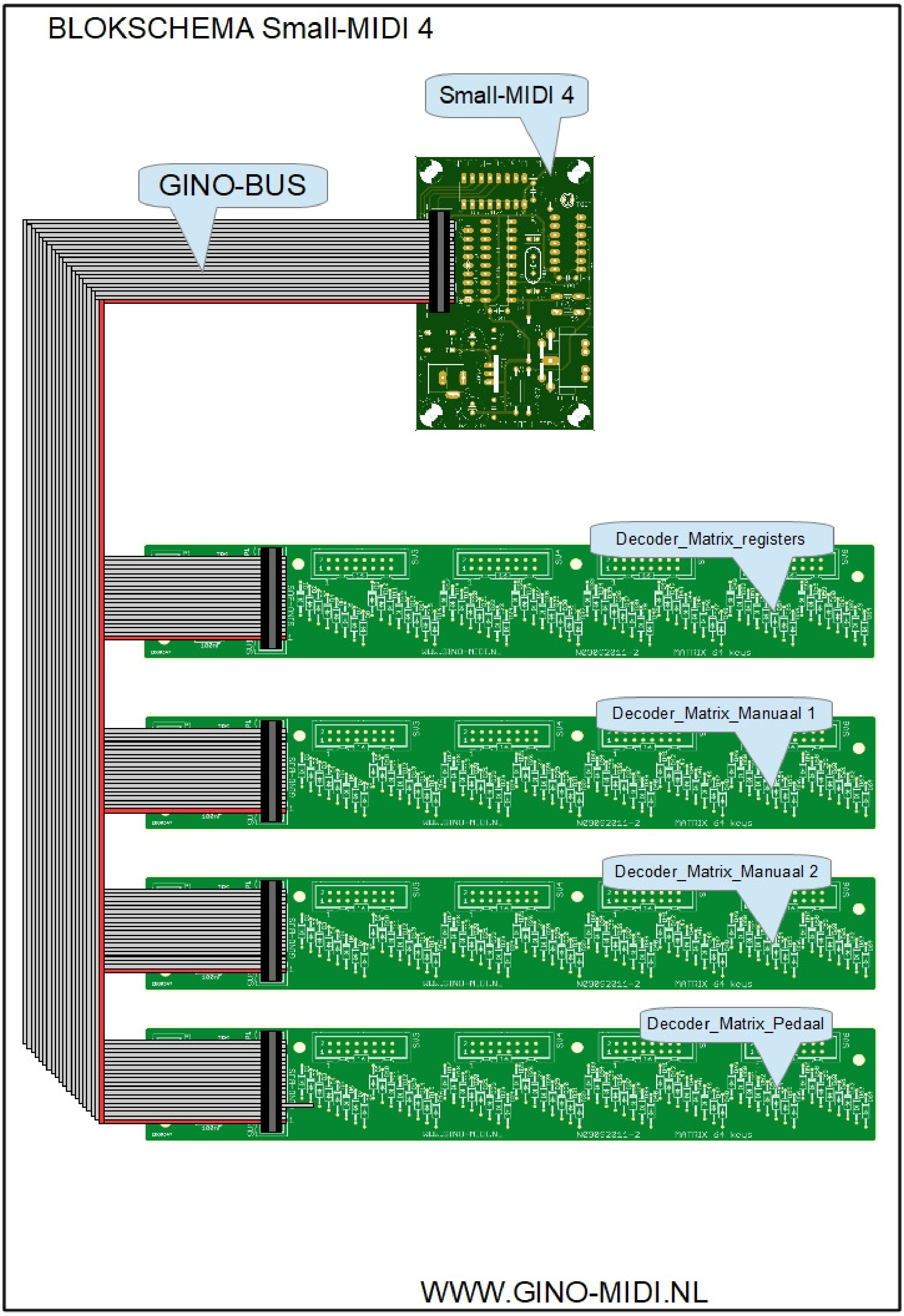
Electronic scheme



Mounting scheme



Block scheme



MIDI Messages

Midi Messages Small-MIDI 4 Default instelling

Midi Channel 1	Jumper positie 1			**Manual or Pedal**	**Schakelaar / switch #**
Note On	90	24	7F	C Groot	1
Note Off	80	24	7F	C Groot	1
Note On	90	25	7F	Cis Groot	2
Note Off	80	25	7F	Cis Groot	2
	|	|	|	|	|
Note On	90	60	7F	c4	61
Note Off	80	60	7F	c4	61

Midi Channel 2	Jumper positie 2			**Manual or Pedal**	**Schakelaar / switch #**
Note On	91	24	7F	C Groot	1
Note Off	81	24	7F	C Groot	1
Note On	91	25	7F	Cis Groot	2
Note Off	81	25	7F	Cis Groot	2
	|	|	|	|	|
Note On	91	60	7F	c4	61
Note Off	81	60	7F	c4	61

Midi Channel 3	Jumper positie 3			**Manual or Pedal**	**Schakelaar / switch #**
Note On	92	24	7F	C Groot	1
Note Off	82	24	7F	C Groot	1
Note On	92	25	7F	Cis Groot	2
Note Off	82	25	7F	Cis Groot	2
	|	|	|	|	|
Note On	92	60	7F	c4	61
Note Off	82	60	7F	c4	61

Midi Channel 4	Jumper positie 4			**Manual or Pedal**	**Schakelaar / switch #**
Note On	93	24	7F	C Groot	1
Note Off	83	24	7F	C Groot	1
Note On	93	25	7F	Cis Groot	2
Note Off	83	25	7F	Cis Groot	2
	|	|	|	|	|
Note On	93	60	7F	c4	61
Note Off	83	60	7F	c4	61