

Robot Interface for SIGMA

Instruction manual

MICATRONIC

The Robot Interface is a general interface for controlling and monitoring the SIGMA by analog and digital signals. The Robot Interface can be configured to support various functions.

1. The Robot Interface communicates with the SIGMA via a CAN-interface and is connected on the rear side of the SIGMA via a cable, which can be up to 15 meters.
2. The Robot Interface is fully galvanic isolated from the SIGMA.

Connection of the Robot Interface to the robot controller and the welding machine should always be carried out with the mains supply disconnected on all units. Otherwise malfunction could occur.

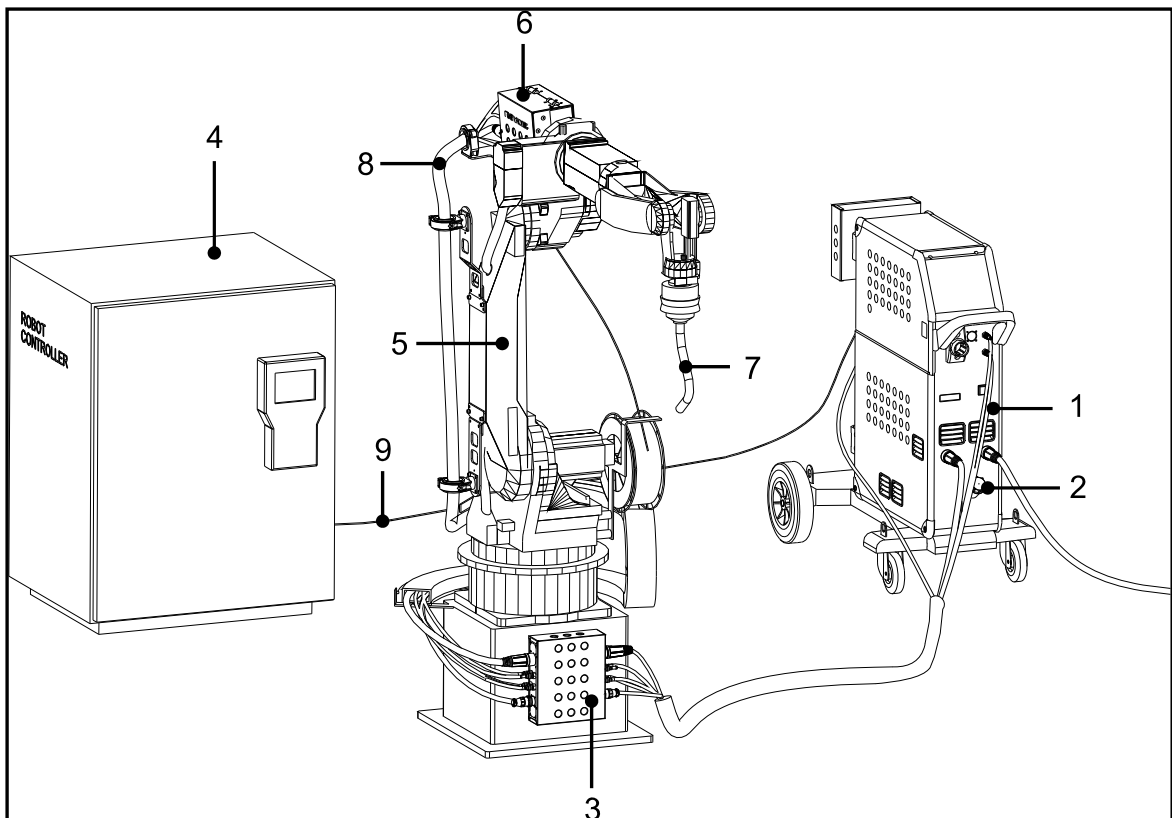
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Use of Sigma and robot interface (example)



1. Power source
2. Cooling unit
3. Robot interface
4. Robot controller
5. Robot
6. Motor
7. Welding torch
8. Intermediary cable
9. CANopen signal cable

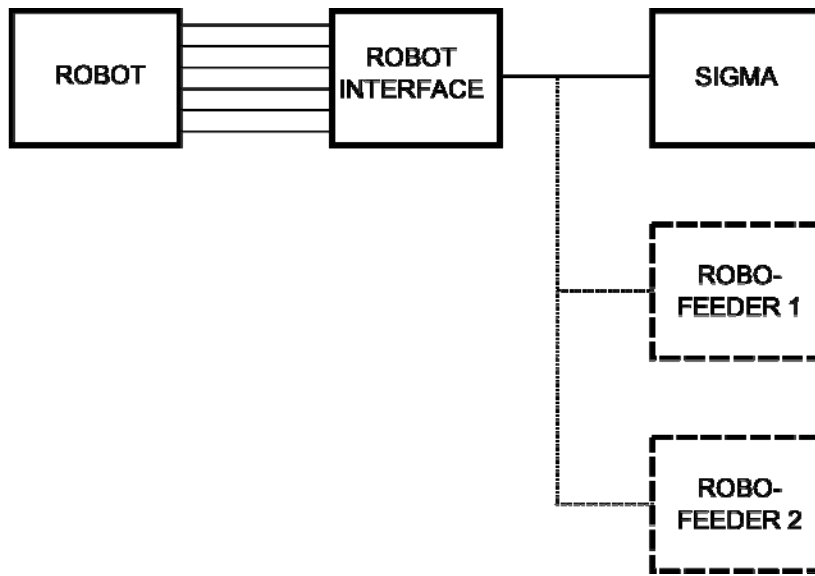
General Description

Robot Interface Concept

The robot interface is as a general I/O interface, which enables communication between a robot and the SIGMA welding machine. The robot is connected to the robot interface with a number of wires, each wire having a dedicated functionality. This cable shall be made by the certified electrician. It is recommended not to use cables longer than 1.5 m

The robot interface communicates with the SIGMA, and up to two external robofeeders, via a CAN-interface. The power source shall already be fitted with an extra can-plug.

When the robot uses the inputs, the robot interface translates it into CAN messages, and sends these messages to the SIGMA. If the SIGMA has any status updates for the robot, it sends a CAN message to the robot interface and the interface translates this message and signals to the robot on the dedicated wire.



Using the robot interface

Robot Interface I/O

The robot interface has four types of I/O; analogue output, analogue input, digital output and digital input.

The SIGMA uses the **2 analogue outputs** to send out measured current and voltage during welding, the robot can listen on these output.

The **2 analogue inputs** can be used by the robot to adjust the welding current/wire speed and the voltage trim of the SIGMA.

The **digital outputs** are used by the SIGMA to signal different status of the welding machine. This could be for instance pulse status on/off or machine status on/off.

The robot can use the **digital inputs** to set different states in the welding machine, like pulse on/off, inching on/off, start/stop welding, etc. Furthermore, some of the digital inputs can be used to select welding program or welding sequence. The interface is configured to choose either program or sequence.

Configuration of jumpers

The robot interface PCB is equipped with seven jumpers. These jumpers can be used to configure the interface and thereby get the functionality needed in the individual setup. The jumpers have the following functionality:

- Jumper 1: Digital input. The jumper decides whether active high or active low is used.
- Jumper 2: Safety function and supply to digital outputs. The jumper decides whether the digital outputs of the interface shall be supplied with 24 VDC from the robot or 20 VDC from the internal supply of the interface (see page 16). Use of the supply from the robot further increases safety during repair of breakdowns. If the robot is switched off, all output signals of the interface will disappear.
- Jumper 3: Digital output. The jumper decides whether active high or active low is used.
- Jumper 4: Program/Sequence choice. The jumper decides whether program or sequence function is used.
- Jumper 5: The jumper decides whether the robot controls the analogue input or if the current and voltage trim are adjusted on the welding machine.
- Jumper 6: Not in use.
- Jumper 7: Not in use.

	Position 1 & 2	Position 2 & 3
Jumper 1	Digital input Active low	Digital input Active High
Jumper 2	20 VDC from interface is used as supply for digital outputs	24 VDC from robot is used Used as supply for digital outputs
Jumper 3	Digital output Active High	Digital output Active Low
Jumper 4	Pins 7-10 are used to select sequence	Pins 4-10 are used to select program
Jumper 5	Robot control current/wire speed and trim/absolute voltage	Welding machine panel control current/wire speed and trim/absolute voltage

If the jumpers are moved while the interface is connected to power, the alterations will not be implemented until the power source has been restarted.

Selecting a wire feeder

A wire feeder is selected using digital input pins 2 & 3 (see page 8). Each pin enables a wire feeder. Only one wire feeder can be enabled at any given time. If both wire feeders are enabled, the internal feeder of the Sigma welding machine is activated. If no wire feeder is enabled, the internal wirefeeder of the Sigma power source is selected. The table belows shows the possible combinations.

	Robo Feeder 1 enable (Pin 3)	Robo Feeder 2 enable (Pin 2)	Selected feeder
Case 1	No	No	Internal feeder on Sigma machine
Case 2	Yes	No	Robo Feeder 1
Case 3	No	Yes	Robo Feeder 2
Case 4	Yes	Yes	Internal feeder on Sigma machine

Selecting a program

A welding program in the Sigma welding machine can be selected using the robot interface. For information on welding programs, see the manual/quickguide of the welding machine. The selection of a welding program depends on the correct jumper configuration. Jumper 4 must be placed in program mode.

The selection of a program is done using binary numbers. The binary number is pointing towards the placement of the desired program in the program list minus one and not the program number. MMA welding cannot be selected for safety reasons. If zero is selected, the program is set on the welding machine and not using the robot interface. The following table shows a few examples.

Pin 4 Bit 6	Pin 5 Bit 5	Pin 6 Bit 4	Pin 7 Bit 3	Pin 8 Bit 2	Pin 9 Bit 1	Pin 10 Bit 0	Program index	Resulting program in Sigma welding machine
Disable	Disable	Disable	Disable	Disable	Disable	Disable	0	Selected on machine
Disable	Disable	Disable	Disable	Disable	Disable	Enable	1	Manual CO2
Disable	Disable	Disable	Disable	Disable	Enable	Disable	2	Manual MixGas
.
Disable	Enable	Disable	Enable	Disable	Disable	Disable	40	P202
.
Enable	Enable	Enable	Enable	Enable	Enable	Disable	126	See machine quickguide
Enable	Enable	Enable	Enable	Enable	Enable	Enable	127	See machine quickguide

Selecting a sequence

A sequence inside a welding program can be selected using the robot interface. The selection of a sequence depends on the correct jumper setting. Jumper 4 must be placed in sequence mode. The selection of a sequence is done using binary numbers. If 0 is selected, sequence is disabled. Numbers higher than 9 are equal to 9. The following table shows how selection is done.

Pin 7 Bit 3	Pin 8 Bit 2	Pin 9 Bit 1	Pin 10 Bit 0	Selected sequence
Disable	Disable	Disable	Disable	None
Disable	Disable	Disable	Enable	1
Disable	Disable	Enable	Disable	2
Disable	Disable	Enable	Enable	3
Disable	Enable	Disable	Disable	4
Disable	Enable	Disable	Enable	5
Disable	Enable	Enable	Disable	6
Disable	Enable	Enable	Enable	7
Enable	Disable	Disable	Disable	8
Enable	Disable	Disable	Enable	9

Analogue I/O functions

Analogue input (2 channels)

- Both analogue channels shall be used.
- Synergic/manual mode is determined by program choice
- Alterations of parameters are not registered during slopedown

Input welding current/wire feed speed: Pin 25
Gnd: Pin 26

Input Trim/welding voltage: Pin 27
Gnd: Pin 28

Synergic mode

Welding current: 0 – 10 VDC ~ Range is determined by welding program
Trim value: 0 – 10 VDC ~ ± 9.9 Volt.
5 VDC ~ 0 in trim value

Manual mode

Wire feed speed: 0.21 – 10 VDC ~ 0.5 – 30 m/m
Welding voltage: 1.54 – 10 VDC ~ 10 – 65 VDC

Synergic or manual mode is decided by the selected program. See the Sigma user manual for more information on synergic and manual welding.

Analogue output (2 channels)

- It is not necessary to use both channels
- Output cannot be used for documentation of the welding process as sampling happens with a low frequency

IW

Measured welding current: 0 – 10 VDC ~ 0 – 1000 Ampere
Output: Pin 31
Gnd: Pin 32

UW

Measured welding voltage: 0 – 10 VDC ~ 0 – 100 Volt
Output: Pin 33
Gnd: Pin 34

Digital I/O functions

Digital output

Arc Det

Arc detection

- 5 ms after establishing arc, the output is activated
- 100 ms after arc has gone out, the output is de-activated

Output: Pin 17
Gnd: Pin 32

Pulse status

Info to robot from power source that pulse has been selected in the welding program. It is presumed that:

- The program has pulse function
- The operation panel is fitted with the icon

Output: Pin 18
Gnd: Pin 32

DuoPlus

Info to robot from power source that DuoPlus has been selected in the welding program. It is presumed that:

- The program has DuoPlus function
- The operation panel is fitted with the icon

Output: Pin 19
Gnd: Pin 32

Machine status

Info to robot from power source that the power source is operational and there is no problem which needs repairing. If there is a problem:

- a LED on the operation panel will be lit
- display on the power source will show an error code. The error code is written in the power source's data log

Output: Pin 20
Gnd: Pin 32

Digital input

Alterations on digital entry points are not registered when the trigger is active

Exceptions:

- The robot reports error
- The + 24 VDC supply from the robot disappears

Trig

Welding start. Welding continues until signal disappears

Exceptions:

- The robot reports error
- The power source reports error
- Supply from robot is used for digital output. If the supply disappears, there is no output signal

Input: Pin 16
Gnd: Pin 32

Gas

Gas flushing. Airing of welding hose or pregas

- Can be overruled by the trigger signal

Input: Pin 15
Gnd: Pin 32

Inching

Runs wire out without welding current

- Inching speed is the same as wire feed speed
- Can be overruled by the trigger signal

Input: Pin 14
Gnd: Pin 32

Pulse

Activation of pulse function in a welding program. Presumes that the function is available on the operation panel. If the function is not activated from the robot interface, it is available on the operation panel of the power source. When activated from the robot interface, the function is blocked on the operation panel of the power source.

- An icon is lit on the operation panel of the power source
- The power source confirms activations by activating exit "pulse status"
- If the welding program does not contain a pulse function, the power source does not activate exit "Pulse status"

Input: Pin 13
Gnd: Pin 32

DuoPlus

Activation of DuoPlus function in a welding program. Presumes that the function is available on the operation panel. If the function is not activated from the robot interface, it is available on the operation panel of the power source. When activated from the robot interface, the function is blocked on the operation panel of the power source.

- An icon is lit on the operation panel on the power source
- The power source confirms activation by activating exit "DuoPlus status"

Input: Pin 12
Gnd: Pin 32

Stitching

Activation of stitching function

- An icon is lit on the operation panel on the power source
- The power source does not confirm the activation

Input: Pin 11
Gnd: Pin 32

Enable/Disable Robofeeder 1

When the robofeeder is activated, all control of wire and gas takes place from this feeder

- When the robofeeder is activated, an indicator lits on the front of the feeder

Input: Pin 3
Gnd: Pin 32

Enable/Disable Robofeeder 2

When the robofeeder is activated, all control of wire and gas takes place from this feeder

- When the robofeeder is activated, an indicator lits on the front of the feeder

Input: Pin 2
Gnd: Pin 32

Robot supply

+ 24 VDC supply from the robot. It is not a demand that it is used

- The supply is used for digital exits
- If the supply disappears, there will be no error report, but the digital exits are not shown:
 - Arc Det
 - Puls status
 - DuoPlus status
 - Machine status

Input: Pin 22

Gnd: Pin 34

Welding programs/sequence

- The robot interface can be set to control welding programs or sequence. The set-up is made with JP4
- The robot interface is fitted with 7 digital entry points; Bit 0 – Bit 6, that are used for selecting program/sequence number. Binary value is the function: Bit 0 = Lsb. Bit 6 = Msb
- All 7 entry points are used for program selection
- Selection of welding programs/sequences at the welding machine is not influenced if input for these is passive

Welding programs

127 programs can be selected binary.

- Notice: Programs that are set binary are only valid for the welding program package which is in the machine. If a new program package is loaded, there is no guarantee that the welding programs can be called with the same binary set-up.

Input: Pins 10, 9, 8, 7, 6, 5, 4

Gnd: Pin 34

Sequence

- 9 sequences can be selected binary
- The first 4 entry points are used for sequence selection

Input: Pins 10, 9, 8, 7

Gnd: Pin 34

Robot error E-07-01

Error signal from robot. This input must ALWAYS be connected.

- Stops welding immediately and puts the machine in standby when the connection is disconnected.
- The display on the power source shows E-07-01 for 5 secs. The error code is written in the datalog of the power source
- It is not possible to trigger the machine, if the robot reports error
- Wire can be inched
- Gas can be aired
- Digital input are active

Input: Pin 1

Gnd: Pin 32

Using the robot interface without robot

The robot interface can control the welding machine by using two potentiometers.

10 volt DC supply

10 VDC – 2 mA

The supply is galvanically separated from the robot interface

Connection

+ 10 VDC is connected to the top of the potmeter

Supply GND is connected to GND of the robot interface and bottom of the potmeter

Centre of the potmeter is connected to the analogue entry point of the robot interface

Error codes

In test and operation of Sigma robot interface errors may occur. All errors have a code which is shown in the display on the power source. The error code is also logged into the machine's error log. For more information on the error log consult the user manual for the Sigma welding machine

E07 01 Error report from robot or safety circuit. Input pin 1.

E07 02 No communication between robot interface and power source

E07 03 Selected robofeeder is not connected to the power source

Electrical Specifications

Analogue input (From robot)

Galvanically isolated and differential

Wire feed speed/welding current:

0 – 10 VDC ~ Min – Max welding current/ 0.5 – 30 m/m

Trim value/welding voltage:

0 – 10 VDC ~ Welding voltage \pm 9.9 Volt / 10 – 65 VDC

Info Analogue input

Common mode range:

\pm 20 VDC

Inlet impedance:

400K Ohm

Band width:

100 Hz

Pulse frequency:

Max. 10 Hz

Digital resolution:

10 Bit

Preciseness:

\pm 1 %

Analogue output (For the user)

Measured welding current:

0 – 10 VDC ~ 0 – 1000 Ampere

Measured welding voltage:

0 – 10 VDC ~ 0 – 100 Volt

Info Analogue output

Galvanically isolated

Welding current:

0 – 10 VDC ~ 0 – 1000 Ampere

Welding voltage:

0 – 10 VDC ~ 0 – 100.0 Volt

Load:

Max. 1 Ohm

Normal load:

Min. 2K Ohm

Digital resolution:

10 Bit

Sampling:

5 Hz

Preciseness:

\pm 1 %

Remark:

Output cannot be used for documentation of the welding process

Digital input (From robot)

7 binary entry points that can be used either for welding programs or sequences:

- 127 welding programs
- 9 sequences

Stitching:

High/Low

Duoplus:

High/Low

Pulse:

High/Low

Inching:

High/Low

Gas:

High/Low

Trigger:

High/Low

Robofeeder

Robofeeder 1:

High/Low

Robofeeder 2:

High/Low

Internal feeder in power source:

High/High – Low/Low

Robot error:

High/Low

Info Digital input

High:

10 – 26 VDC

Low:

0 – 3 VDC

Inlet impedance:

5K Ohm

Response time on trigger entry point:

10 ms

Response time on all other entry points:

50 ms

Digital output (For robot)

Arc Det:	High/Low
Pulse status:	High/Low
Duoplus status:	High/Low
Machine status:	High/Low

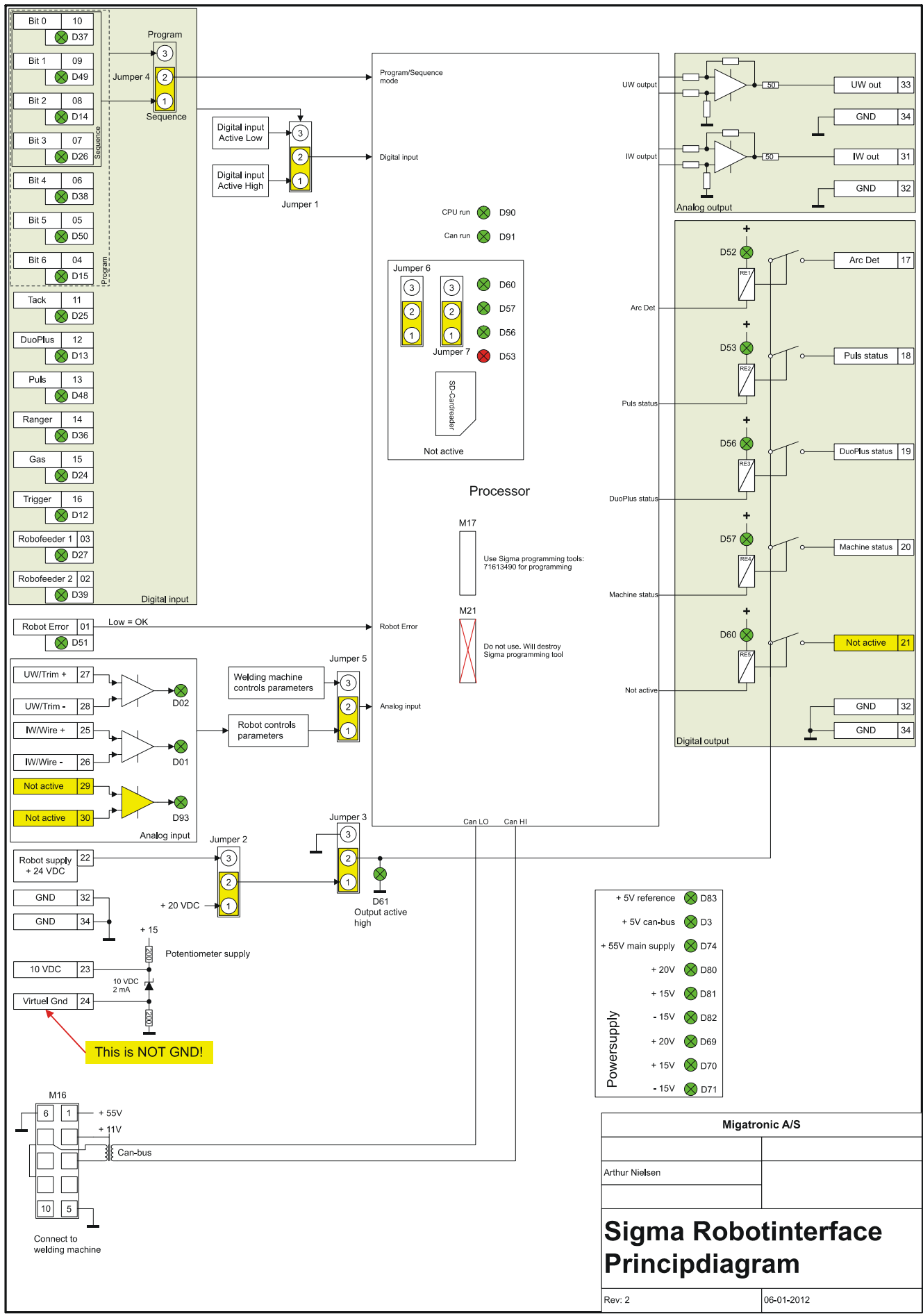
Info Digital output

High1:	+ 20 VDC from robot interface
High2:	External positive supply from robot
Low:	0 V
Max load:	50 mA
Response time:	5 ms

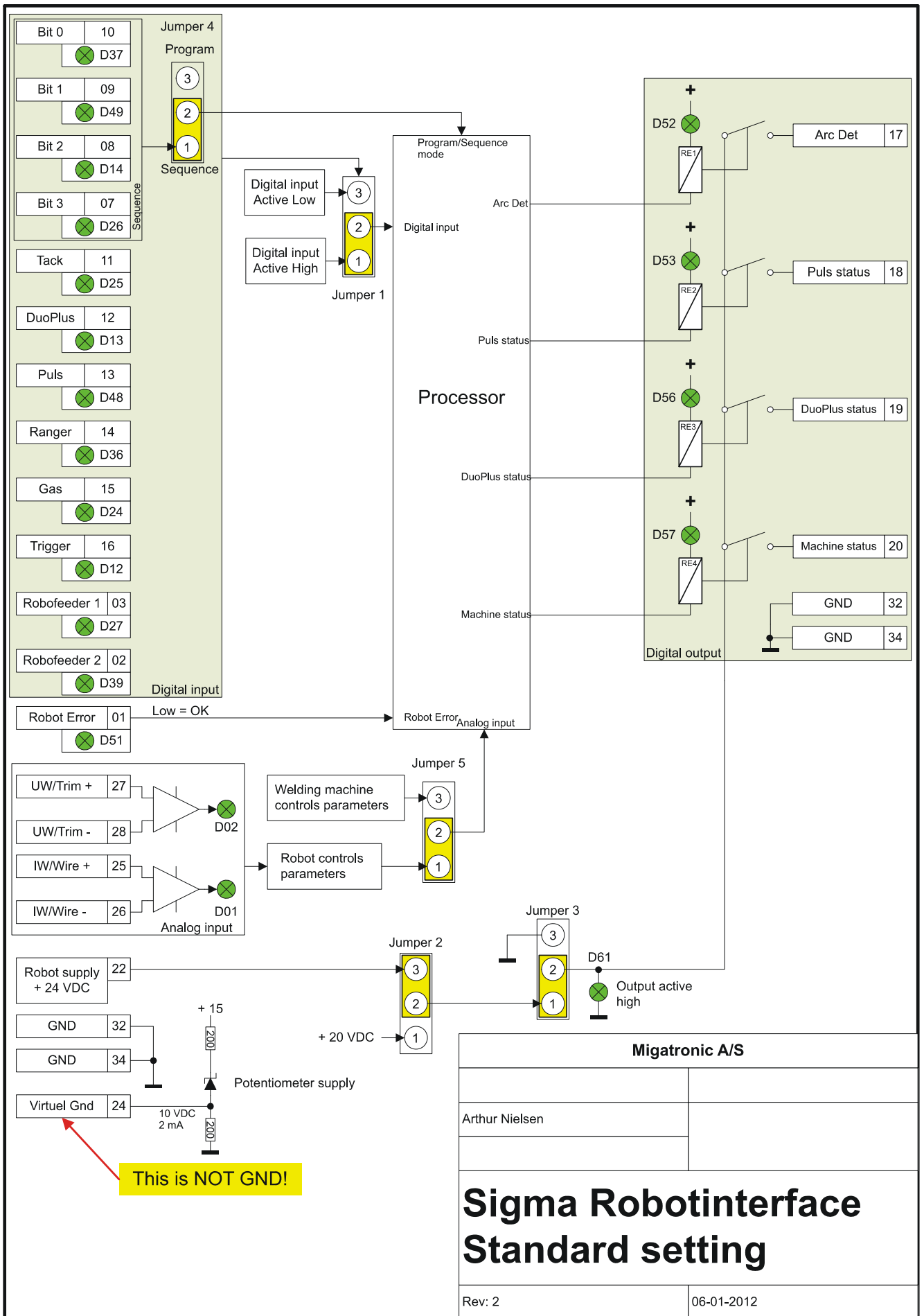
Power supply

10 VDC/2 mA:	Used for supply of a 10K Ohm remote control potmeter
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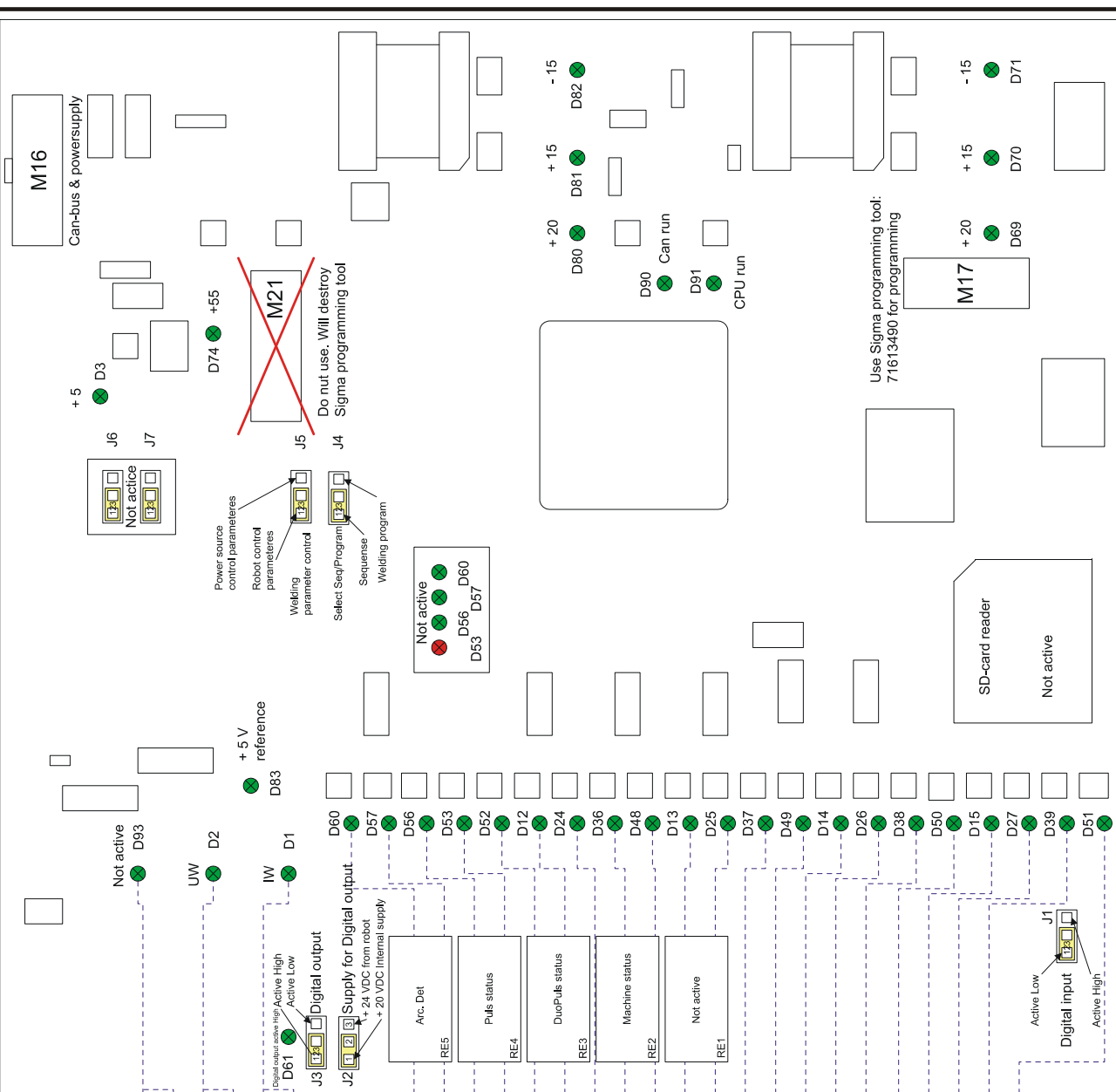
+ 24 VDC:	Supply from the robot. Used for supply of digital output
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Migatronik A/S	
Arthur Nielsen	
Sigma Robotinterface Principdiagram	
Rev: 2	06-01-2012



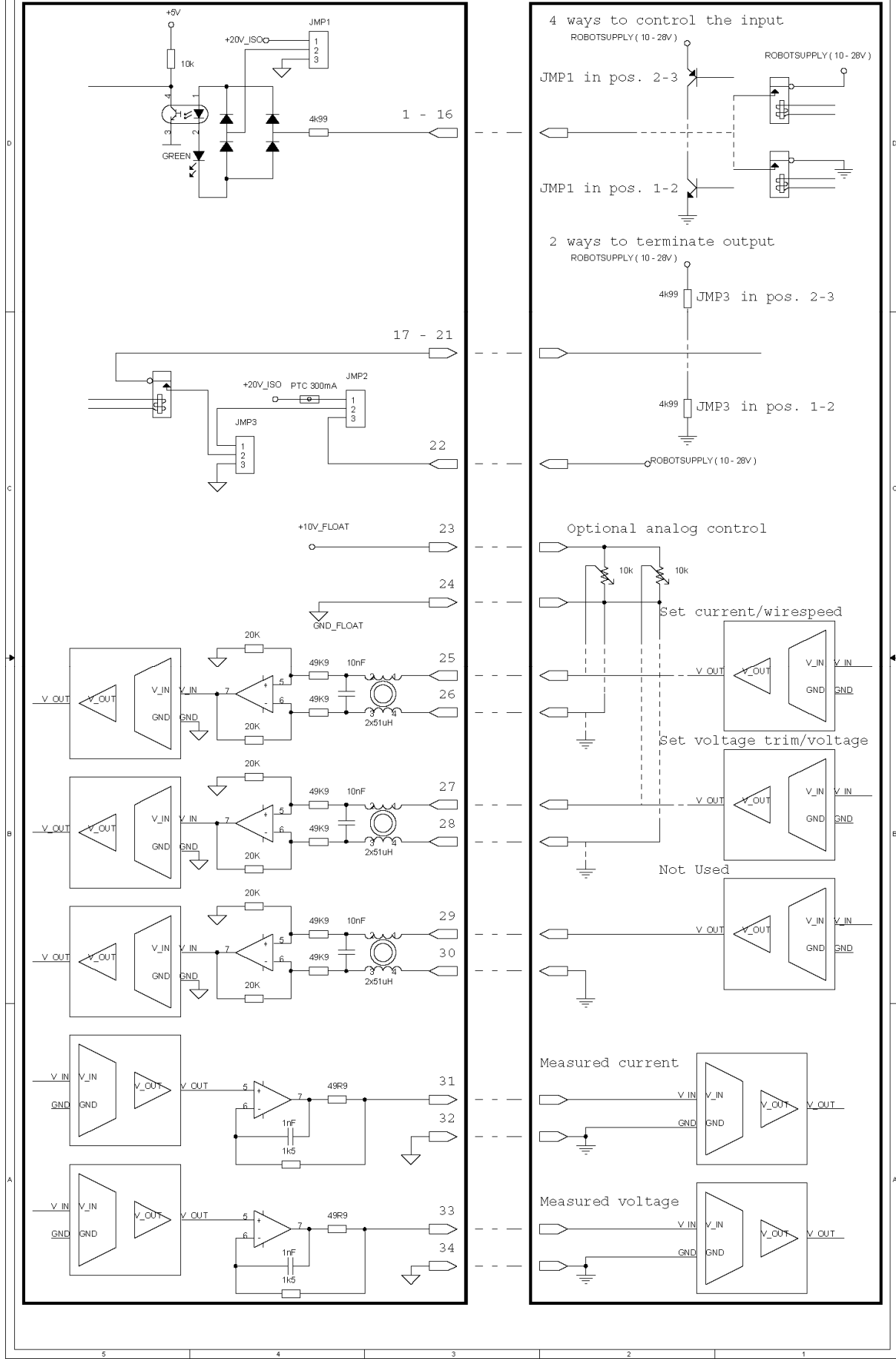
34	Gnd
33	Welding voltage readout +
32	Gnd
31	Welding amper readout +
30	Not active
29	Not active
28	Analog Input UW/Trim -
27	UW/Trim +
26	IW/Wire -
25	IW/Wire +
24	Potentiometer Virtual Gnd
23	supply 10 VDC - 2 mA
22	+ 24 VDC supply from robot
21	Not active
20	Digital Output Machine status
19	DuoPlus status
18	Puls status
17	Arc Det
16	Welding start
15	Gas test
14	Wire inching
13	Puls
12	DuoPuls
11	Stiching
10	Digital Input Program/Seq Bit 0
09	Program/Seq Bit 1
08	Program/Seq Bit 2
07	Program/Seq Bit 3
06	Program Bit 4
05	Program Bit 5
04	Program Bit 6
03	Robofeeder 1
02	Robofeeder 2
01	Robot error

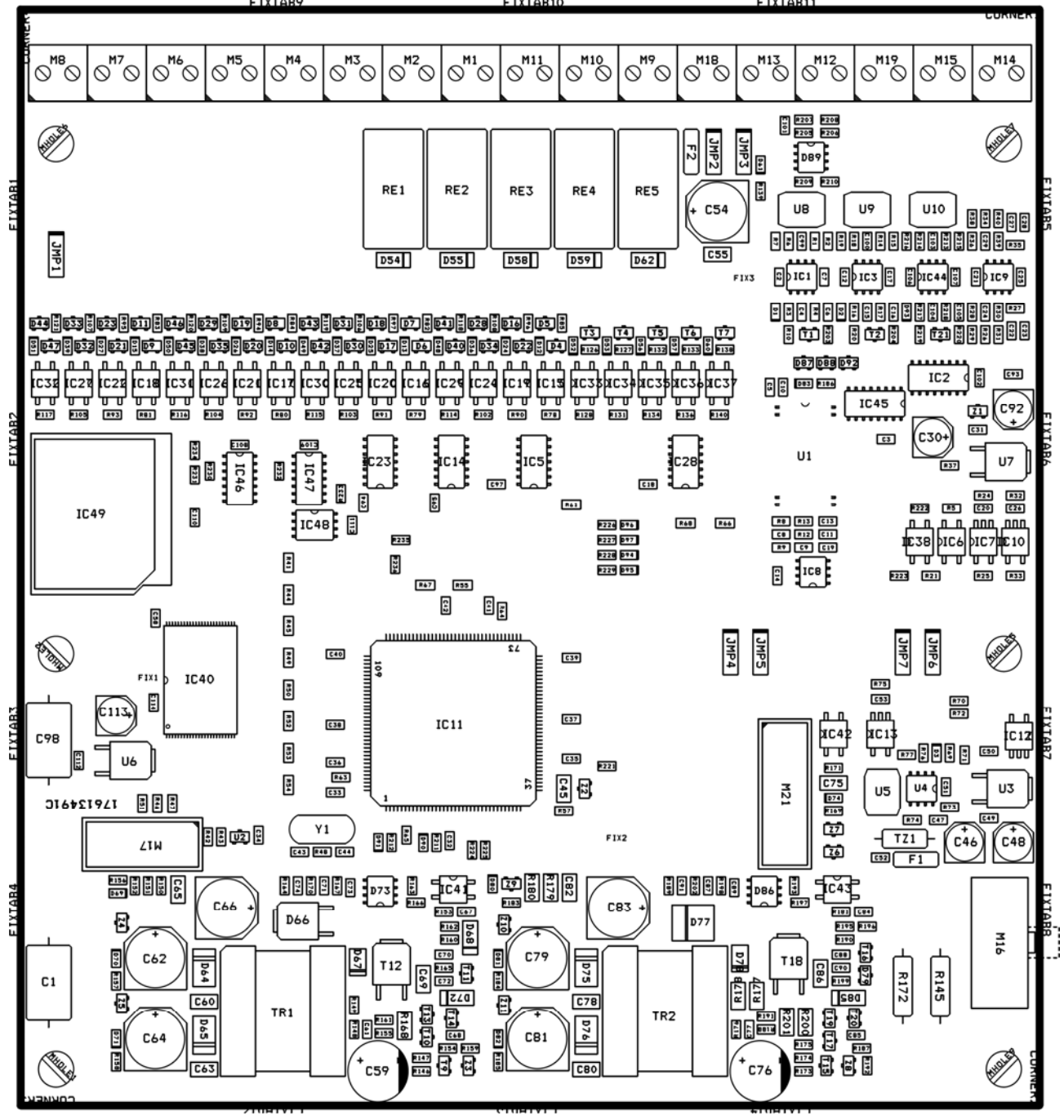


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<h1>Sigma Robotinterface Layout</h1>	
Rev: 1	10-01-2012

EQUIVALENT CIRCUITS FOR ROBOT CONTROLLER INTERFACE

ROBOT CONTROLLER



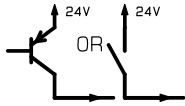


FANUC – SIGMA

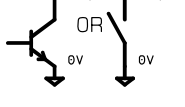
External Error Robot -
Short Circuit to 0V or 24V
depending of JMP1,
when not used from controller

Multifeeder Choice 1, Choice 2
Short Circuit to 0V or 24V,
to make Multifeeder active,
or activate from controller.
If no Multifeeder = Not Connected

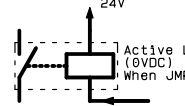
Active High (24VDC)
When JMP3=2&3



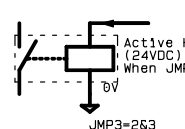
Active Low (0VDC)
When JMP1=1&2



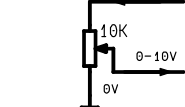
Connect to interface relays
OR
optocoupler inputs



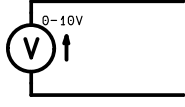
OR JMP3=1&2



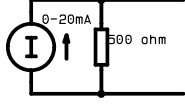
Use with 10Kohm potentiometer
For analog control



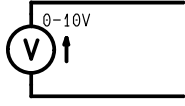
Analog output 0-10V



Analog output 0-20mA



Analog input 0-10V



24VDC Do not connect
FOR OUTPUTS If JMP2=2&3

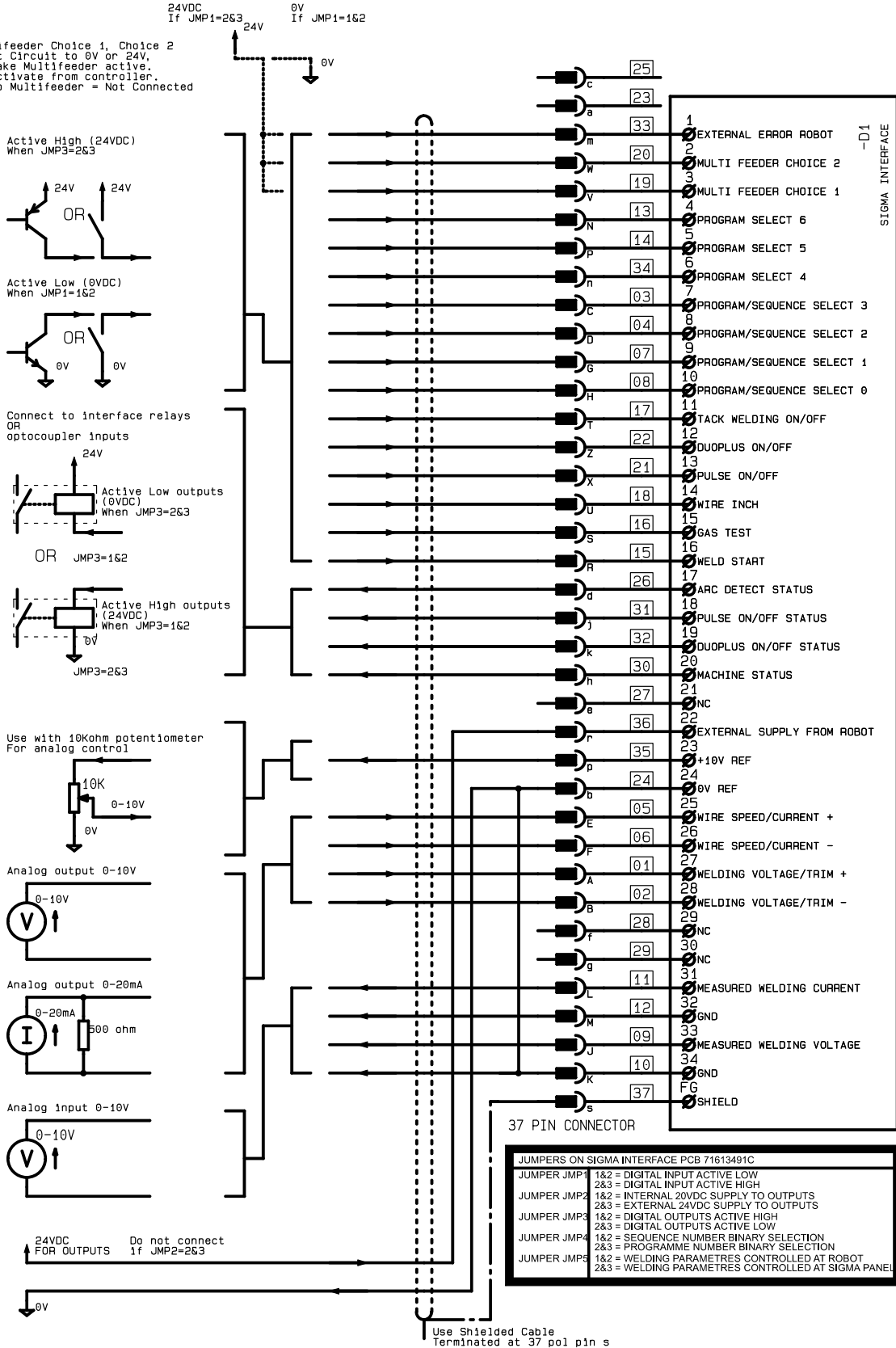
0V

24VDC If JMP1=2&3
0V If JMP1=1&2

Interface PLC / Robot - MIGATRONIC SIGMA

Connection between FANUC CRW1 / Sigma 400/500 robot interface

Filename: K31/Projekt/EI/Std/Rob/Sig/Interface/SIGMA_Migatronik



JUMPERS ON SIGMA INTERFACE PCB 71613491C

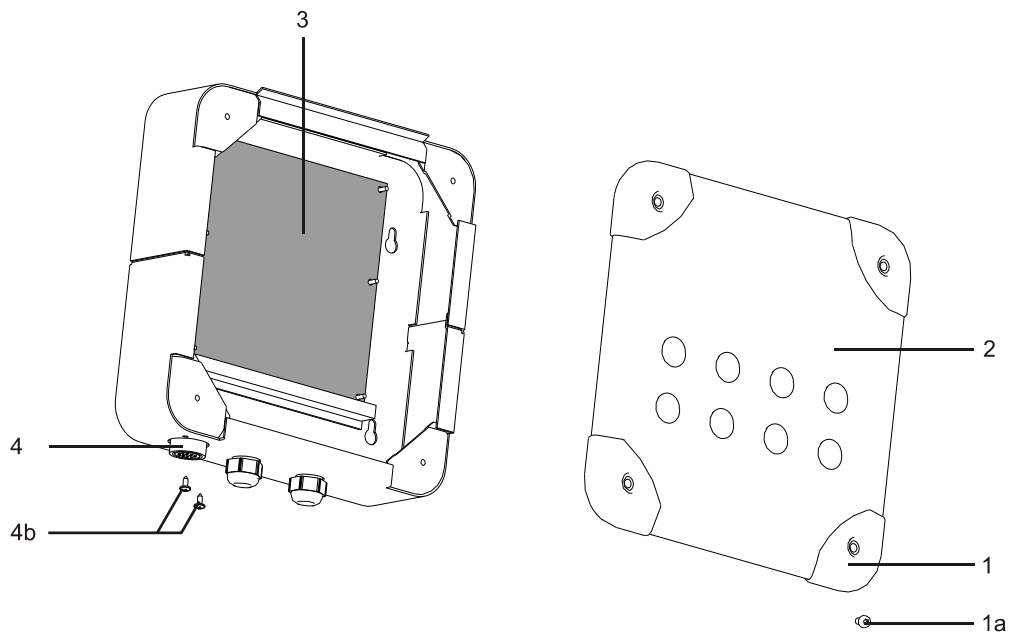
JUMPER JMP1	1&2 = DIGITAL INPUT ACTIVE LOW 2&3 = DIGITAL INPUT ACTIVE HIGH
JUMPER JMP2	1&2 = INTERNAL 20VDC SUPPLY TO OUTPUTS 2&3 = EXTERNAL 24VDC SUPPLY TO OUTPUTS
JUMPER JMP3	1&2 = DIGITAL OUTPUTS ACTIVE HIGH 2&3 = DIGITAL OUTPUTS ACTIVE LOW
JUMPER JMP4	1&2 = SEQUENCE NUMBER BINARY SELECTION 2&3 = PROGRAMME NUMBER BINARY SELECTION
JUMPER JMP5	1&2 = WELDING PARAMETRES CONTROLLED AT ROBOT 2&3 = WELDING PARAMETRES CONTROLLED AT SIGMA PANEL

Use Shielded Cable
Terminated at 37 pol pin s



Reservedelsliste
Spare parts list
Ersatzteilliste
Liste des pièces de rechange

ROBOT INTERFACE



Pos.	No.	Varebetegnelse Warenbezeichnung	Description of goods Désignation des pièces
1	45050316	Hjørne til skærm Ecke	Corner Angle plastique
1a	40840510	Skrue M5x10mm Schraube M5x10mm	Screw M5x10mm Vis M5x10mm
1b	41319023	Skærmclips M5 for gevind reparation Schirmclips M5	Panel clip M5 Attache
2	61113824	Sideskærm Seitenschirm	Side panel Plaque latérale
3	71613491	Print Platine	PCB Carte de circuits imprimé
4	74471227	Ledningssæt CAN-filter Leitungsbündel	Wire harness Ensemble de filerie
4a	17200038	Multistik 14-pol Vielfachstecker 14-polig	Multiplug 14-pole Prise multibroche 14-pôle
4b	40810418	Skrue 15,9x3,5 Schraube 15,9x3,5	Screw 15.9x3.5 Vis 15,9x3,5
	74340015	Kabel for Robot Interface Kabel für Robot Interface	Cable for Robot Interface Câble pour Robot Interface

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