

RCI Can

Instruction manual

MICATRONIC

The RCI interface is a general interface for controlling and monitoring the SIGMA via the most common industrial busses. The RCI Interface can be configured to support various functions.

1. RCI handles conversion between the internal SIGMA CAN-protocol and the most common industrial busses.
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.



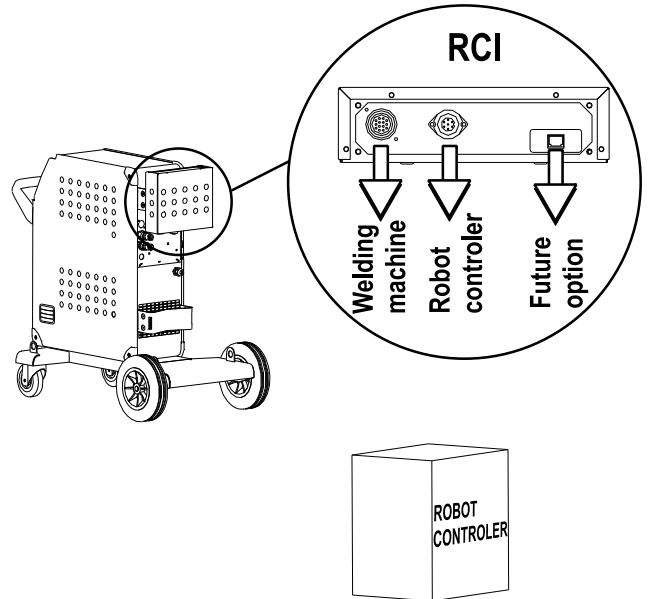
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Machine concept

The SIGMA robot interface is designed for automatised welding. The interface is designed for mounted behind SIGMA or at the customer's equipment.

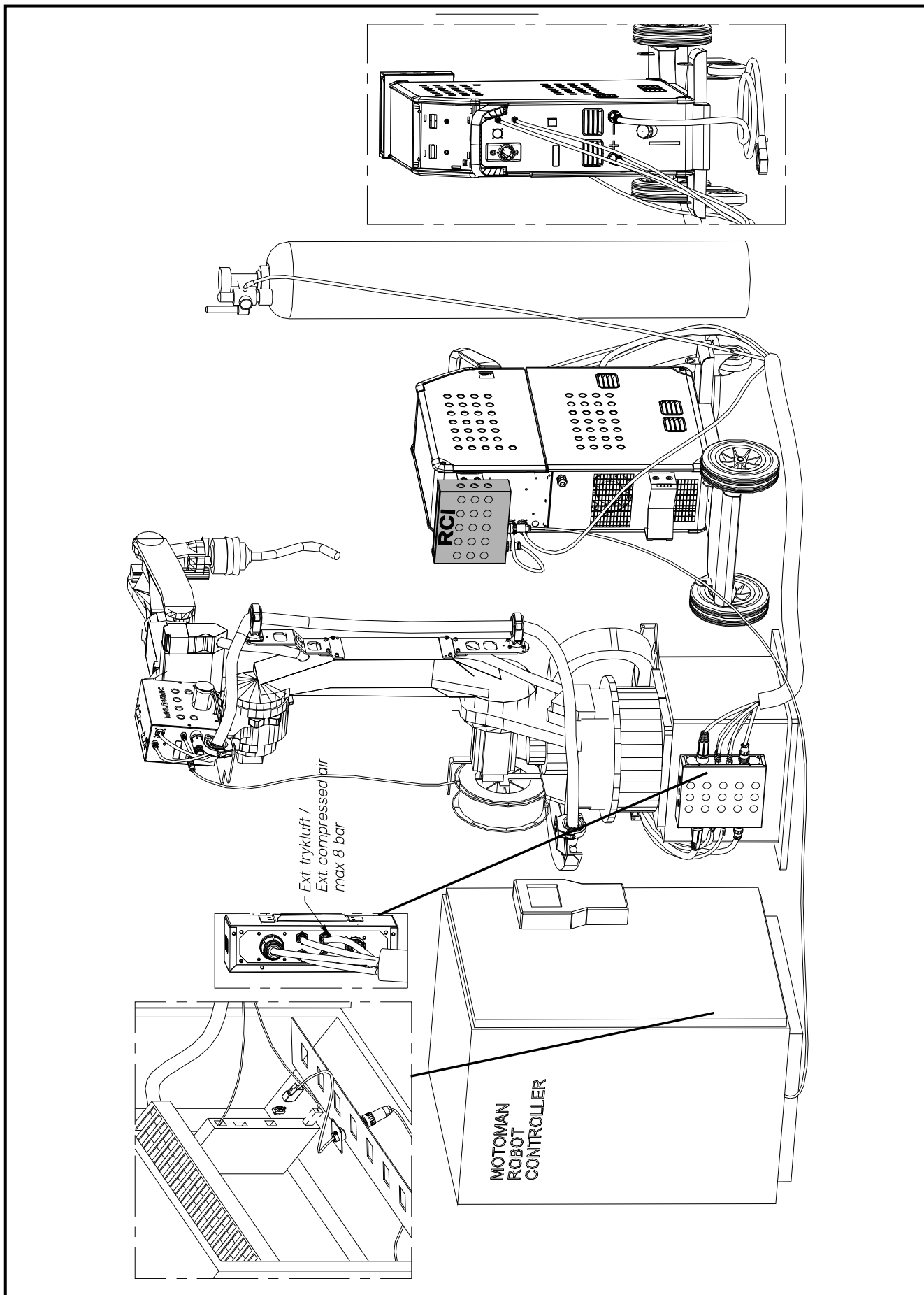
The robot interface is connected to the machine by means of a can-bus cable (order no.: 74340016). The power source shall already be fitted with an extra can-plug.

The robot interface is connected to the robot with a cable that is suitable for the used industrial bus.



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1. System overview



2. MOTOMAN

2.1 RCI CANopen

2.1.1 Mounting and configuration

RCI CANopen can be used with a MOTOMAN NX100 robot controller, mounted with XFB01/CANopen slave interface board.

RCI must be configured with a configuration file for MOTOMAN robot with article number xxxxxxxx.

XFB01/CANopen must be set to the following:

Baudrate : 250

Node address : 3

Please read MOTOMAN manual describing:

Motoman NX100 Controller

Fieldbus (XFB01)

Instruction Manual

Optional Anybus Interface Board

Partnumber 147380-2

before mounting and configuring the XFB01/CANopen.

RCI is connected to the XFB01/CANopen with a cable (article no.: 74340021)

Hereafter, there will be access to control of the welding machine settings and commands as described in table 1.

Detailed description of commands and settings can be seen in Appendix A

2.1.2 Parameters

Table 1: MOTOMAN RCI CANopen modes and commands

Robot Sends													Robot Receives																				
Index	Sub index	Ext. Output	OG#	Scale	MigaOpen		Index	Sub index	Ext. Input	IG#	Scale	Index	Sub index	Ext. Input	IG#	Scale																	
					Index	Sub											Index	Sub															
Bit mapped Sigma commands #0	10	0	TPDO 1	Byte 0	2101	01	(0x01)	30070	5	See detail sheet	10	2	RPDO 1	Byte 0	2103	01	(0x01)	20070	5	See detail sheet													
Bit mapped Sigma settings #0	10	1	Byte 1	Byte 1	2102	01	(0x01)	30080	6	See detail sheet	10	5	Byte 1	Byte 1	2106	01	(0x01)	20080	6	1-9													
Bit mapped robot status #0	10	3	Byte 2	Byte 2	2104	01	(0x01)	30090	7	See detail sheet	10	14	Byte 2	Byte 2	2110	01	(0x01)	20090	7	0-254													
Select sequence	10	4	Byte 3	Byte 3	2105	01	(0x01)	30100	8	1-9	10	13	Byte 3	Byte 3	210F	01	(0x01)	20100	8	See detail sheet													
Select Wirefeeder	10	12	Byte 4	Byte 4	210D	01	(0x01)	30110	9	0-254			Byte 4	Byte 4				20110	9														
			Byte 5	Byte 5				30120	10				Byte 5	Byte 5				20120	10														
			Byte 6	Byte 6				30130	11				Byte 6	Byte 6				20130	11														
			Byte 7	Byte 7				30140	12				Byte 7	Byte 7				20140	12														
Select welding process	10	6	TPDO 2	Byte 0	2107	01	(0x01)	30150	13	See chart for machine	10	11	RPDO 2	Byte 0	210C	01	(0x01)	20150	13	See chart for machine													
Set welding current	10	8	Byte 1	Byte 1	2109	01	(0x01)	30160	14		10	10	Byte 1	Byte 1	210B	01	(0x01)	20160	14														
			Byte 2	Byte 2				30170	15				Byte 2	Byte 2				20170	15	1/10 amps													
			Byte 3	Byte 3				30180	16				Byte 3	Byte 3				20180	16														
Set voltage trim	10	7	Byte 4	Byte 4	2108	01	(0x01)	30190	17	1/10 volts-9.9,+9.9	10	9	Byte 4	Byte 4	210A	01	(0x01)	20190	17	1/10 volts-9.9,+9.9													
			Byte 5	Byte 5				30200	18	(50%..100%..150%)			Byte 5	Byte 5				20200	18	(50%..100%..150%)													
Illegal area													Byte 6																				
Illegal area													Byte 7																				

Table 1a: MOTOMAN RCI CANopen modes and commands, details

Robot Sends										Robot Receives										
Index		Sub index		Ext. Output		OG#		OG#		Index		Sub index		Ext. Input		IN#		IG#		
TPDO 1	Byte 0	2000	01	(0x01)	30070	33		30071	34	2100	01	(0x01)	20070	33						
Bit mapped Sigma commands #0 (10.0)																				
	Trig (0=Not trigged, 1=Trigged)	1			30071	34		30072	35	1			20071	34						
	Wire Inch Forward (0=Stop, 1=Inch forward)	2			30072	35		30073	36	2			20072	35						
	Wire Inch Retract (0=Stop, 1=Inch Retract)	3			30073	36		30074	37	3			20073	36						
	Gas test (0=Close, 1=Open)	4			30074	37		30075	38	4			20074	37						
	Welding Simulation (0=Normal, 1=Simulate)	5			30075	38		30076	39	5			20075	38						
	Air Clean Valve (0=CLOSE, 1=OPEN)	6			30076	39		30077	40	6			20076	39						
		7			30077	40				7			20077	40						
Bit mapped Sigma settings #0 (10.1)																				
	Pulse mode select (0=Normal, 1=Puls)	1			30080	41		30081	42	0	2100	02	(0x02)	20080	41					
	DUO plus mode select (0=Normal, 1=DUOplus)	2			30082	43		30083	44	1			20081	42						
		3			30083	44		30084	45	2			20082	43						
		4			30084	45		30085	46	3			20083	44						
		5			30085	46		30086	47	4			20084	45						
		6			30086	47		30087	48	5			20085	46						
		7			30087	48				6			20086	47						
										7			20087	48						
Bit mapped robot status #0 (10.2)																				
	Robot status (0=Not ready, 1=Ready)	1			30090	49		30091	50	0	2100	03	(0x03)	20090	49					
	Enable Commands (0=Disabled, 1=Enabled)	2			30091	50		30092	51	1			20091	50						
	Enable Primary Settings (0=Disabled, 1=Enabled)	3			30092	51		30093	52	2			20092	51						
	Enable Secondary Settings (0=Disabled, 1=Enabled)	4			30093	52		30094	53	3			20093	52						
		5			30094	53		30095	54	4			20094	53						
		6			30095	54		30096	55	5			20095	54						
		7			30096	55		30097	56	6			20096	55						
										7			20097	56						
Bit mapped Sigma status #1 (10.13)																				
	Air Clean Valve Status (0=CLOSED, 1=OPEN)	1			30097	56				0	2100	04	(0x04)	20100	57					
		2								1			20100	57						
		3								2			20101	58						
		4								3			20102	59						
		5								4			20103	60						
		6								5			20104	61						
		7								6			20105	62						
										7			20106	63						
													20107	64						

2.1.3 Robot program examples

Examples:

Selecting a welding process.

The welding process is selected by writing a word size value to the relevant OG# in the communication area of the NX100.

This can be done by writing to the high and low byte of the word like this:

$$\text{OG\#(14)} = \text{Trunc}(\text{"Desired Welding Process"} / 256)$$
$$\text{OG\#(13)} = \text{"Desired Welding Process"} - (\text{OG\#(14)} * 256)$$

Example:

"Desired Welding Process" = 712

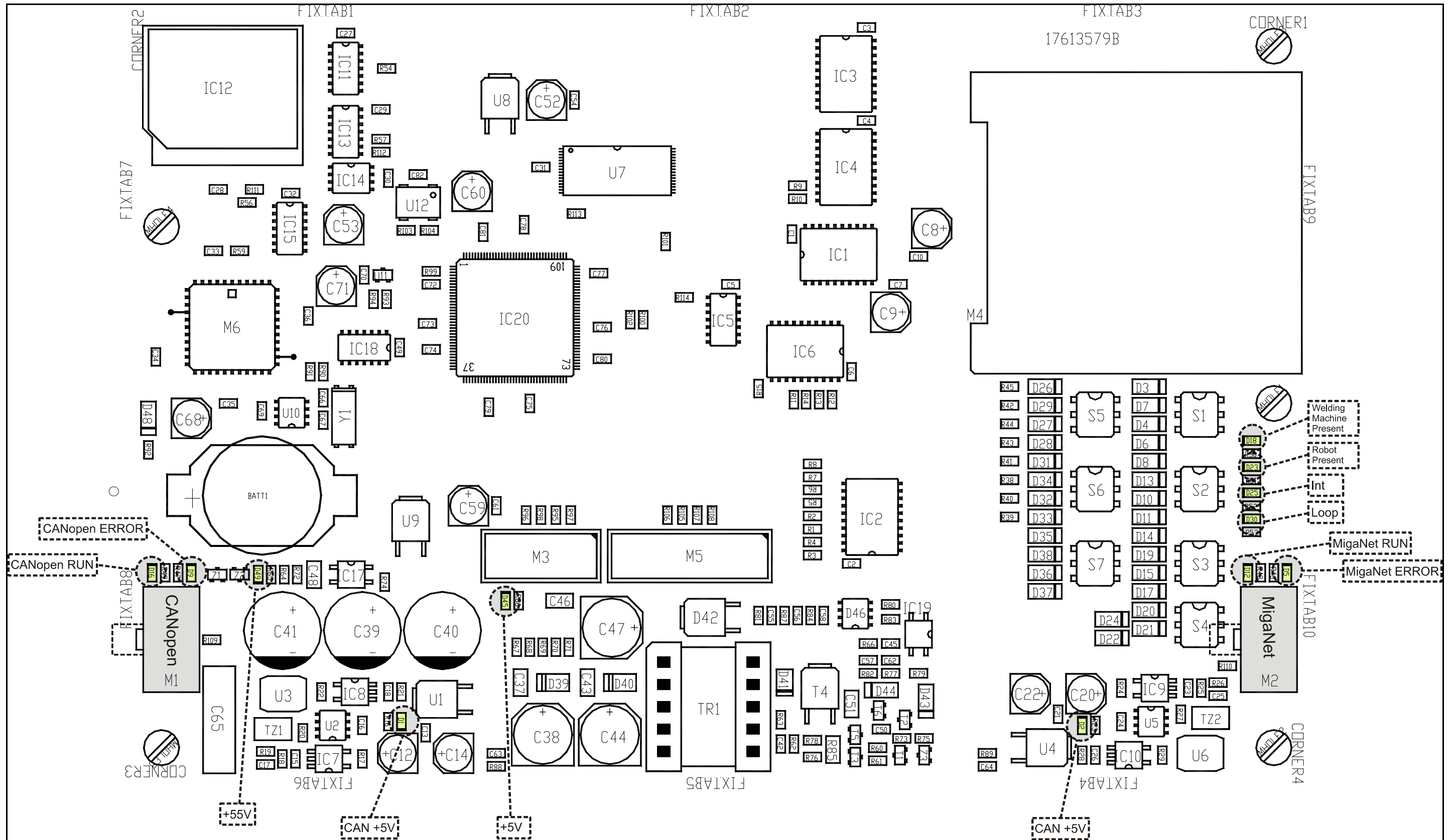
$$\text{OG\#(14)} = \text{Truncate}(712 / 256) = \text{Truncate}(2.781250) = \underline{2}$$
$$\text{OG\#(13)} = 712 - (2 * 256) = 712 - 512 = \underline{200}$$

To ensure that the value is actually transmitted it is recommended to first set the output groups to 0 and then to the desired welding process value.

Below is an example:

```
/JOB
//NAME P712
//POS
///NPOS 0,0,0,0,0,0
//INST
///DATE 2009/03/02 12:35
///COMM SELECTS PROCES 712
///ATTR SC,RW
///GROUP1 RB1
NOP
DOUT OG#(13) 0
DOUT OG#(14) 0
TIMER T=0.20
DOUT OG#(13) 200
DOUT OG#(14) 2
TIMER T=0.20
END
```


3. Placement of component



4. Error indication

(LEDs)

Normal mode:

Loop	:	Fast flashes
Int	:	Slow flashes
Robot Present	:	Switched on
Welding machine present	:	Switched on
CANopen RUN	:	Switched on
CANopen ERROR	:	Switched off
MigaNet RUN	:	Switched off
MigaNet ERROR	:	Switched off

General system error:

CANopen RUN	:	Flashes
CANopen ERROR	:	Flashes
MigaNet RUN	:	Flashes
MigaNet ERROR	:	Flashes

CANopen error:

CANopen RUN	:	See CiA 303-3
CANopen ERROR	:	See CiA 303-3

Appendix A:

Parameters, detailed description

Behavior related parameters:

<i>Name:</i>	Robot Status
<i>Description:</i>	This parameter must be set to "ON" before the robot starts sending commands or settings to the welding machine.
<i>Restrictions:</i>	
<i>Unit:</i>	Binary
<i>Range:</i>	"OFF", "ON"

<i>Name:</i>	Enable Commands
<i>Description:</i>	This parameter must be set to "ON" before the welding machine accepts robot control of the commands: "Trig" "Wire Inch Forward" "Wire Inch Reverse" "Gas Test"
<i>Restrictions:</i>	
<i>Unit:</i>	Binary
<i>Range:</i>	"OFF", "ON"

<i>Name:</i>	Enable Primary Settings
<i>Description:</i>	This parameter must be set to "ON" before the welding machine accepts robot control of the settings: "Select Welding Process" "Select Sequence"
<i>Restrictions:</i>	
<i>Unit:</i>	Binary
<i>Range:</i>	"OFF", "ON"

<i>Name:</i>	Enable Secondary Settings
<i>Description:</i>	This parameter must be set to "ON" before the welding machine accepts robot control of the settings: "Set Welding Current" "Set Voltage Trim" "Pulse Mode Select" "DUO Plus Mode Select"
<i>Restrictions:</i>	
<i>Unit:</i>	Binary
<i>Range:</i>	"OFF", "ON"

<i>Name:</i>	Welding Simulation
<i>Description:</i>	This command instructs to only simulate welding when triggered. No Arc will occur, Gas valve will not open and Wire will not be fed.
<i>Restrictions:</i>	Not available on all machines. Do not issue while welding. Do not issue while Inching forward (Inch Forward)
<i>Unit:</i>	Binary
<i>Range:</i>	"OFF", "ON"

Settings:

<i>Name:</i>	Select Welding Process
<i>Description:</i>	Selects a welding process (welding program) on the welding machine. Please see the chart for the specific machine.
<i>Restrictions:</i>	A 200ms delay <u>must</u> be implemented after each Welding Process Selection. Alternatively a “wait IG#” may be used. Depends on welding packages installed in the welding machine. “Enable Primary Settings” must be set to “ON”
<i>Unit:</i>	Integer
<i>Range:</i>	1-999

<i>Name:</i>	Select Sequence
<i>Description:</i>	Selects a sequence on the welding machine.
<i>Restrictions:</i>	Depends on welding packages installed in the welding machine. A matching number of sequences must be configured on the welding machine. “Enable Primary Settings” must be set to “ON”
<i>Unit:</i>	Integer
<i>Range:</i>	1-9

<i>Name:</i>	Select Wirefeeder
<i>Description:</i>	Selects a Wirefeeder
<i>Restrictions:</i>	Welding machine will display an error if a non-existing is selected. Internal wirefeeder is #0, External wirefeeder # depends on configuration. “Enable Primary Settings” must be set to “ON”
<i>Unit:</i>	Integer
<i>Range:</i>	0-254

<i>Name:</i>	Pulse mode select
<i>Description:</i>	Selects pulse mode on welding machine.
<i>Restrictions:</i>	“Enable Secondary Settings” must be set to “ON”
<i>Unit:</i>	Binary
<i>Range:</i>	“OFF”, “ON”

<i>Name:</i>	DUO plus mode select
<i>Description:</i>	Selects DUO plus mode on welding machine.
<i>Restrictions:</i>	“Enable Secondary Settings” must be set to “ON”
<i>Unit:</i>	Binary
<i>Range:</i>	“OFF”, “ON”

<i>Name:</i>	Set Welding Current
<i>Description:</i>	Sets the welding current on the welding machine.
<i>Restrictions:</i>	Depends on welding packages installed in the welding machine. “Enable Secondary Settings” must be set to “ON”
<i>Unit:</i>	1/10 of amperes.
<i>Range:</i>	1-9999 (0.1 – 999.9 ampere)

<i>Name:</i>	Set Voltage Trim
<i>Description:</i>	Sets the trim voltage on the welding machine.
<i>Restrictions:</i>	Depends on welding packages installed in the welding machine. "Enable Secondary Settings" must be set to "ON"
<i>Unit:</i>	1/10 of volts.
<i>Range:</i>	50%..150% (equals -9.9..+9.9 volt)

Commands:

<i>Name:</i>	Trig
<i>Description:</i>	This command instructs the welding machine to start or stop welding assuming that the welding machine has been configured correctly.
<i>Restrictions:</i>	"Enable Commands" must be set to "ON"
<i>Unit:</i>	Binary
<i>Range:</i>	"OFF", "ON"

<i>Name:</i>	Wire Inch Forward
<i>Description:</i>	This command instructs the welding machine to activate the wire drive motor and inch forward.
<i>Restrictions:</i>	Do not issue while welding. Do not issue while Retracting (Inch Retract). "Enable Commands" must be set to "ON"
<i>Unit:</i>	Binary
<i>Range:</i>	"OFF", "ON"

<i>Name:</i>	Wire Inch Retract
<i>Description:</i>	This command instructs the welding machine to activate the wire drive motor and retract the wire.
<i>Restrictions:</i>	Not possible on all wirefeeders. Do not issue while welding. Do not issue while Inching forward (Inch Forward) "Enable Commands" must be set to "ON"
<i>Unit:</i>	Binary
<i>Range:</i>	"OFF", "ON"

<i>Name:</i>	Gas Test
<i>Description:</i>	This command instructs the welding machine to open the gas valve.
<i>Restrictions:</i>	Do not issue while welding. Do not issue while Inching forward (Inch Forward). "Enable Commands" must be set to "ON"
<i>Unit:</i>	Binary
<i>Range:</i>	"OFF", "ON"

Status:

<i>Name:</i>	Actual Welding Process
<i>Description:</i>	Reflects the current welding process (welding program) on the welding machine. Please see the chart for the specific machine.
<i>Restrictions:</i>	Depends on welding packages installed in the welding machine.
<i>Unit:</i>	Integer
<i>Range:</i>	1-999

<i>Name:</i>	Actual Sequence
<i>Description:</i>	Reflects the current sequence on the welding machine.
<i>Restrictions:</i>	
<i>Unit:</i>	Integer
<i>Range:</i>	1-9

<i>Name:</i>	Actual Welding Current
<i>Description:</i>	Reflects the actual welding current while welding.
<i>Restrictions:</i>	
<i>Unit:</i>	1/10 of amperes.
<i>Range:</i>	1-9999 (0.1 – 999.9 ampere)

<i>Name:</i>	Actual Voltage
<i>Description:</i>	Reflects the actual welding voltage while welding
<i>Restrictions:</i>	
<i>Unit:</i>	1/10 of volts.
<i>Range:</i>	

<i>Name:</i>	Communication status
<i>Description:</i>	Reflects the status of the bus communication between the robot controller and the welding machine.
<i>Restrictions:</i>	
<i>Unit:</i>	Binary
<i>Range:</i>	“Not Ready”, “Ready”

<i>Name:</i>	Power Source status
<i>Description:</i>	Reflects the status of the welding machine. When the welding machine is ready to weld the status will be "Ready". In case of errors the status will be set to "Not Ready"
<i>Restrictions:</i>	
<i>Unit:</i>	Binary
<i>Range:</i>	"Not Ready", "Ready"

<i>Name:</i>	Arc status
<i>Description:</i>	Reflects the status of the arc.
<i>Restrictions:</i>	
<i>Unit:</i>	Binary
<i>Range:</i>	"OFF", "ON"

<i>Name:</i>	Gas status
<i>Description:</i>	Reflects the status of the gas valve.
<i>Restrictions:</i>	
<i>Unit:</i>	Binary
<i>Range:</i>	"Closed", "Open"

<i>Name:</i>	Trig status
<i>Description:</i>	Reflects the trig status of the welding machine.
<i>Restrictions:</i>	
<i>Unit:</i>	Binary
<i>Range:</i>	"Not trigged", "Trigged"

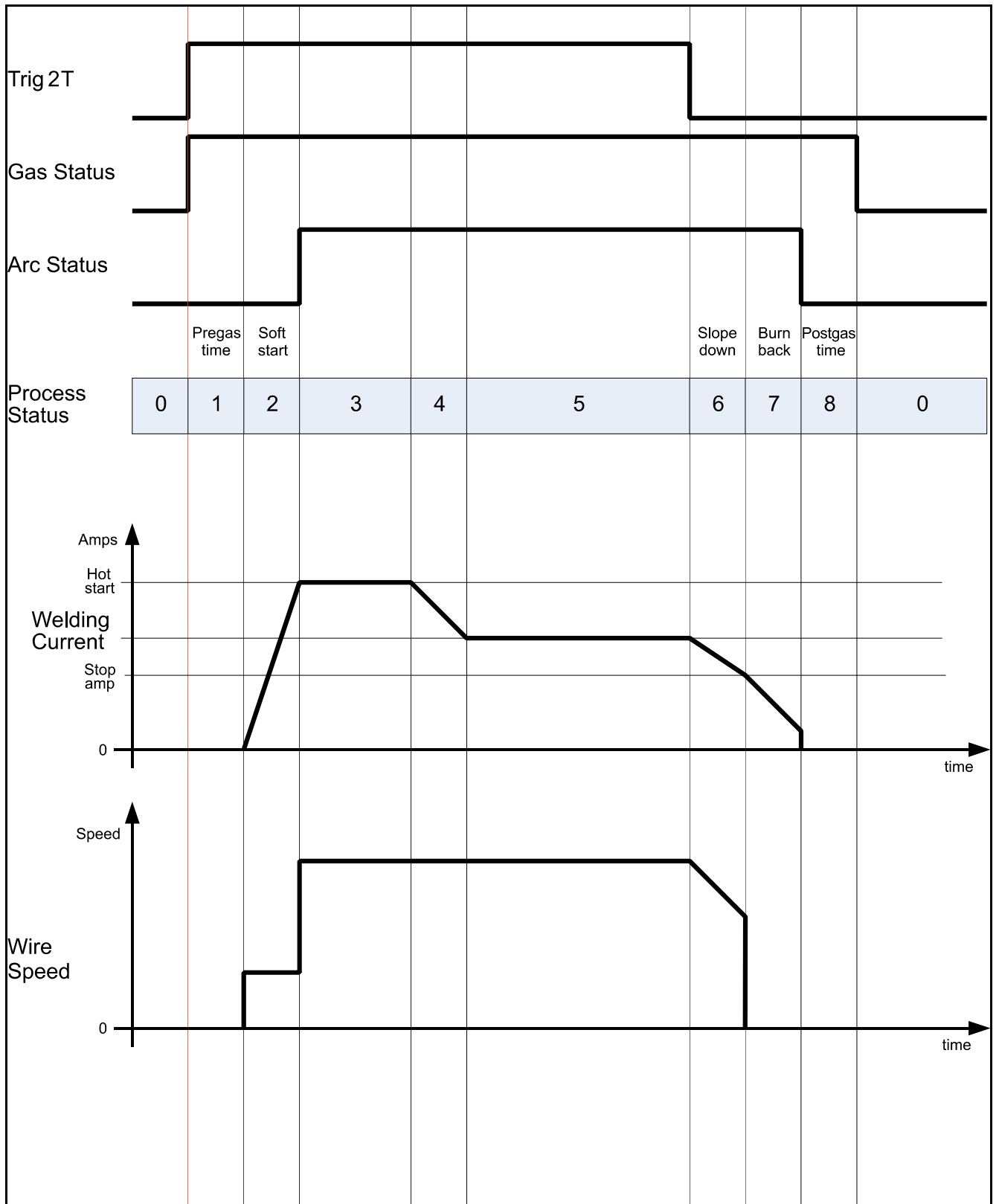
<i>Name:</i>	Pulse mode status
<i>Description:</i>	Reflects the pulse mode status on th welding machine.
<i>Restrictions:</i>	
<i>Unit:</i>	Binary
<i>Range:</i>	"Puls disabled", "Puls enabled"

<i>Name:</i>	DUO plus mode status
<i>Description:</i>	Reflects the pulse mode status on th welding machine.
<i>Restrictions:</i>	
<i>Unit:</i>	Binary
<i>Range:</i>	"DUO plus disabled", "DUO plus enabled"

<i>Name:</i>	Toggle Bit
<i>Description:</i>	Toggles its value with a 2 second interval or when a transmission of the status byte is made.
<i>Restrictions:</i>	
<i>Unit:</i>	Binary
<i>Range:</i>	"0", "1"

Appendix B

Welding Process Signals



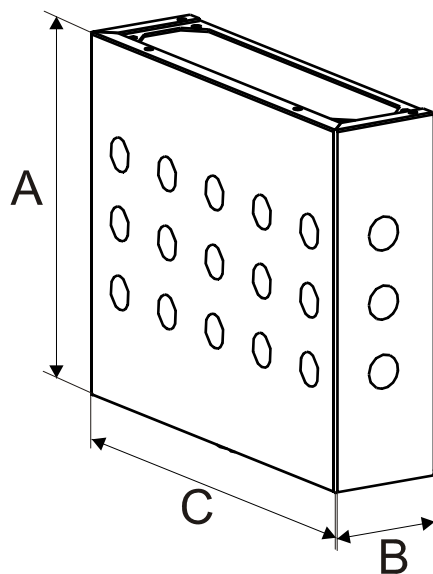
Specifications

Mechanical:

Cabinet size (AxBxC) : 223,5x73x263,5 mm
Protection class : IP21

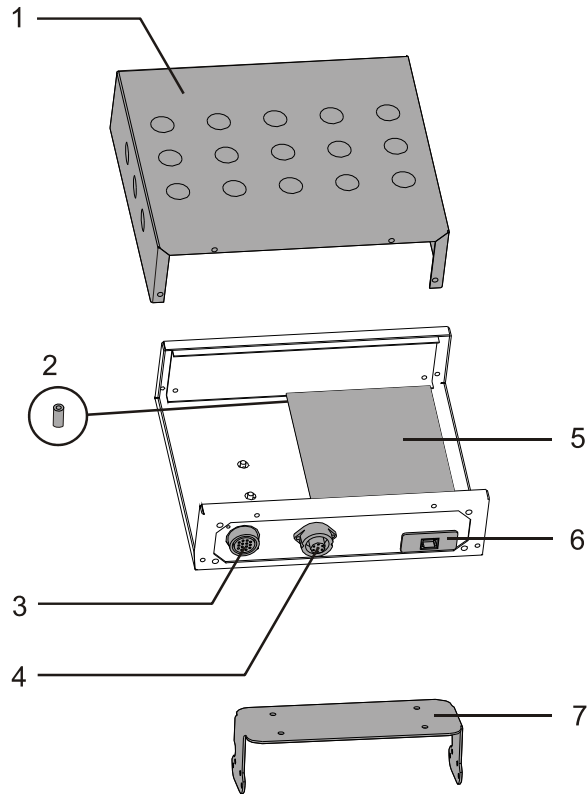
Electrical:

Power supply : 55VDC from welding machine



Reservedelsliste
Spare parts list
Ersatzteilliste
Liste des pièces de rechange

RCI



Pos.	No.	Varebetegnelse Warenbezeichnung	Description of goods Désignation des pièces
1	24433696	Låg Deckel	Cover Couvercle
2	26150039	Afstandsør Abstandsstück	Spacer
3	71613481	Print m/stik Platine mit Vielfachstecker	PCB with multiplug Carte de circuits imprimé avec multibroche
3a	17200038	Multistik 14-pol Vielfachstecker 14-polig	Multiplug 14-pole Prise multibroche 14-pôle
4	74471364	Ledningssæt Leitungsbündel	Wire harness Ensemble de filerie
5	71613579	Print, CANOpen CPU Platine, CANOpen CPU	PCB , CANOpen CPU Carte de circuits imprimé, CANOpen CPU
6	45050372	Blindprop Blindstöpfel	Blind plug Bouchon de couverture
7	24611790	Monteringsbeslag Befestigungsbeslag	Mounting fittings Console de montage

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