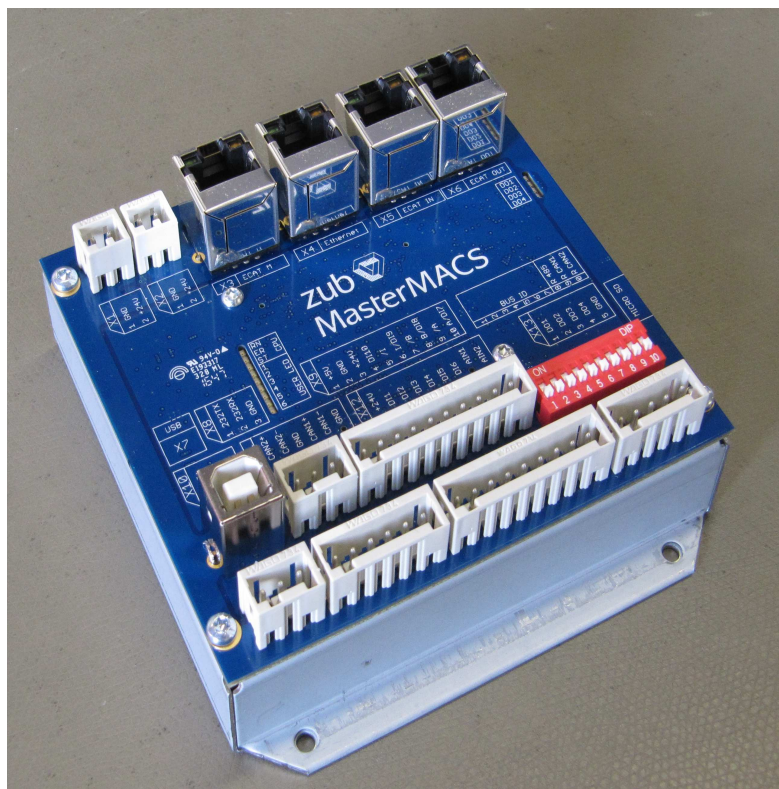# MasterMACS
Quick Hardware Reference:
Connectors & Wiring

Version 2.0

Document number:

-

Author:
Adrian Küng
ak@zub.ch
zub machine control AG

Date of Creation:
14 September 2016
Date of last Saving:
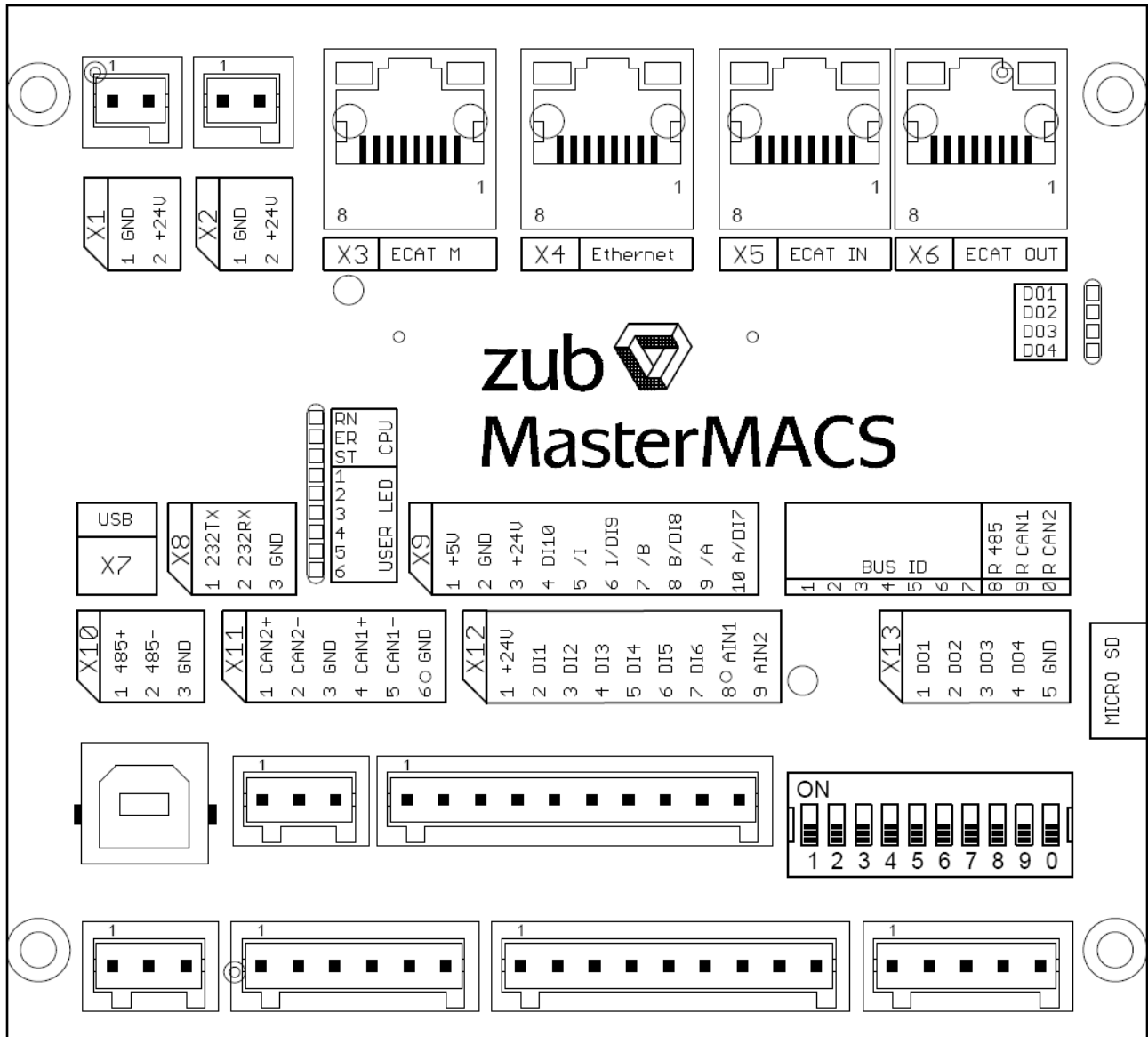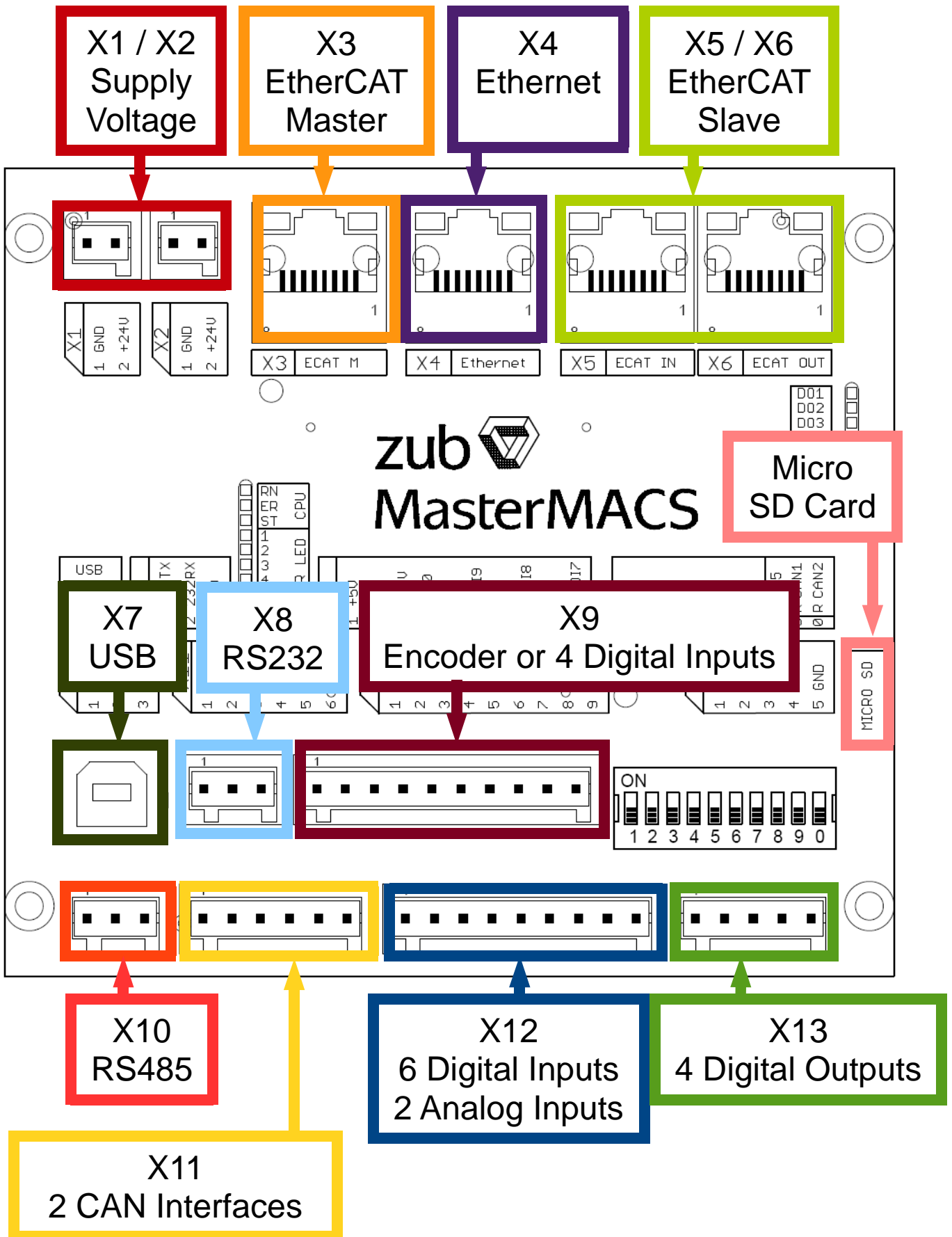16 February 2017
Total number of pages:
14

Table of contents

1 MasterMACS – A quick glance

1.1 MasterMACS – Topview

1.2 MasterMACS – Connector Overview

2 Power Supply

2.1 X1 / X2: Power Supply
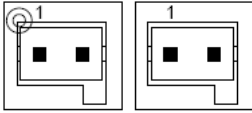
Print circuit board terminal: WAGO 734-132, male, 2pin, RM3.5
Suitable wire connector: WAGO 734-102, female, 2pin, RM3.5

Pin	Name	Type	Meaning	Remark
1	GND	GND	GND of the power supply	
2	+24V	Power Input	Supply voltage for powering the MACS	+24V DC, +/-25%, 200mA (I/O's disabled)

List 2.1-1: Pin configuration connector X1 / X2

Remarks:
- X1 and X2 are internally linked. Therefore it is possible to link the power supply to just one of the connectors and use the other connector again as a power output for the next MACS or other 24V low-power devices. (Do NOT use one of the connectors as an power output for high-power devices like servo amplifiers!)

Please refer to the MasterMACS data sheet for more information about the required power supply.

3 Bus and Communication Ports

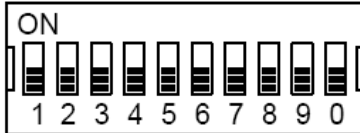## 3.1 DIP switches for RS485, CAN and Ethernet configuration

The DIP switches are in use to configure the CAN ID and bus termination, as well as the Ethernet IP address setting, if required.

Configuration of RS485 and CAN bus:
- The DIP switches 1 - 7 define the RS485 and the CAN node ID of the MasterMACS,
- The DIP switches 8 is in use to activate / deactivate the bus termination of RS485 bus (-> connector X10).
- The DIP switches 9 and 10 are in use to activate / deactivate the bus termination of CAN bus 1 and 2 (-> connector X11).

Find more information about the CAN bus connectors and the pin assignment in chapter 3.4 "X10: RS485" and 3.8 "X11: 2 x CAN".

Configuration of Ethernet IP address:
- The default IP address is 172.16.1.xx, where xx corresponds to the setting of the DIP switches 1 - 7. This means, that the last two hex digits of the IP address equal the CAN node ID.
- The global parameters "IPADDRESSMODE" (par.no. 20) and "IPSUBNET" (par.no. 21) can be used to set up the IP address by software without evaluation of the DIP switches. This gives full flexibility to configure the IP address independent of the CAN node ID configuration by the DIP switches.

  Meaning of the parameter "IPADDRESSMODE":
 0:   The IP address is set to IPSUBNET + DIP Switch (default)
  -1:   DHCP mode
  1 – 255: The IP address is set to IPSUBNET + n

  The current active IP address can be readout by SDO 0x2209 / 14.

Find more information about the Ethernet connector in chapter 3.5 "X4: Ethernet".

Please refer to the APOSS manuals to find more information about related the configuration parameter settings.
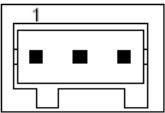
3.2 X7: USB
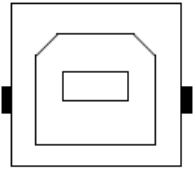
Remarks:
- The MasterMACS is a USB slave device. The MasterMACS can be connected directly (or by a USB hub) to a PC.
- The MasterMACS can not handle other USB slave devices, like cameras, scanners, or bar code readers by its own.

3.3 X8: RS232

Print circuit board terminal: WAGO 734-132, male, 3pin, RM3.5
Suitable wire connector: WAGO 734-102, female, 3pin, RM3.5

Pin	Name	Type	Meaning	Remark
1	232TX	Data	RS232 Transmit line	
2	232RX	Data	RS232 Receive line	
3	GND	GND	GND	Signal GND

List 3.3-1: Pin configuration connector X8

Remarks:
- The RS232 interface can be used to command the MasterMACS (as a slave of a PC or any other microcontroller) or to handle devices like bar code scanners directly by the MasterMACS application program.
- The functionality of the RS232 interface is compatible with the RS232 interface of former product lines, like MACS5, MACS3, MACS2 or MOCON.

3.4 X10: RS485

Print circuit board terminal: WAGO 734-133, male, 3pin, RM3.5
Suitable wire connector: WAGO 734-103, female, 3pin, RM3.5
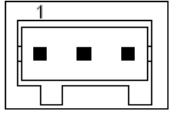
Pin	Name	Type	Meaning	Remark
1	485+	Data	RS485 High signal line	
2	485-	Data	RS485 Low signal line	
3	GND	GND	GND	Signal GND

List 3.4-1: Pin configuration connector X10

3.5 X4: Ethernet
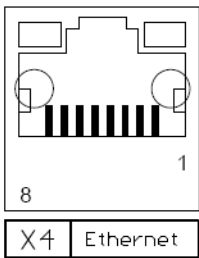
Remarks:
- The MasterMACS is an Ethernet slave device. The MasterMACS can be connected directly (or by a Ethernet hub) to a PC.
- The MasteMACS can not handle other Ethernet slave devices, like cameras or printers by its own.

Please find more information about Ethernet IP address configuration in chapter
3.1 "DIP switches for RS485, CAN and Ethernet configuration".

3.6   X3: EtherCAT Master
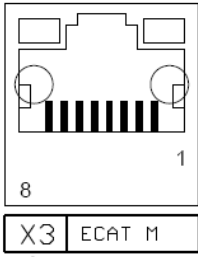
Remarks:
- The EtherCAT Master functionality can be used to command EtherCAT drives and I/O modules only. There will be no system manager tool (like for PLCs) available to configure the slave device and its PDO mapping. The configuration and PDO mapping has to be part of MasterMACS application program code.

Please find more information about Ethernet IP address configuration in chapter 3.1 "DIP switches for CAN and Ethernet configuration".

3.7   X5 / X6: EtherCAT Slave

The EtherCAT bus from the PLC (= master) has to be daisy chained to X5 (= EtherCAT In) and X6 (= EtherCAT Out).
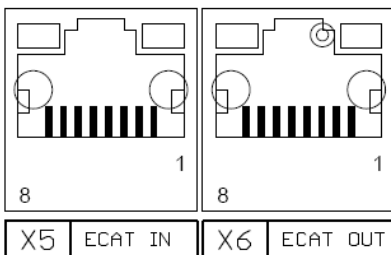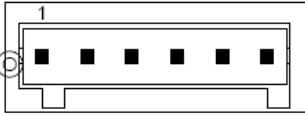
3.8 X11: 2 x CAN

Print circuit board terminal: WAGO 734-136, male, 6pin, RM3.5
Suitable wire connector: WAGO 734-106, female, 6pin, RM3.5

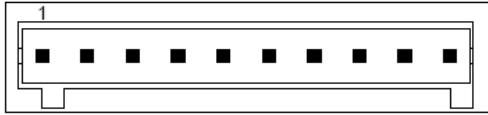| Pin	Name	Type	Meaning	Remark
1	CAN2+	Data	CAN High signal line	
2	CAN2-	Data	CAN Low signal line	
3	GND	GND	GND	Signal GND
1	CAN1+	Data	CAN High signal line	
2	CAN1-	Data	CAN Low signal line	
3	GND	GND	GND	Signal GND

List 3.8-1: Pin configuration connector X11

Remarks:
- The CAN node ID has to be configured by the DIP switches 1 – 7.
- The DIP switch 9 -10 activates / deactivates the bus termination of the CAN bus.

Please find more information about CAN node ID configuration 3.1 "DIP switches for RS485, CAN and Ethernet configuration".

4 Encoder Input

4.1 X9: Incremental Encoder (RS422)

Print circuit board terminal: WAGO 734-140, male, 10pin, RM3.5
Suitable wire connector: WAGO 734-110, female, 10pin, RM3.5

The following wiring information is valid for incremental encoder signals only:

Pin	Name	Type	Meaning	Remark
1	+5V	Power Output	+5V supply for the encoder	+5V, max. 200mA Do NOT link to another +5V supply! e.g. if a servo drive powers the encoder
2	GND	GND	GND	Signal GND
3	+24V	Power Output	+24V supply for the encoder	+24V, max. 200mA Do NOT link to another 24V supply. This is the same power line like provided to the MasterMACS by the connectors X1 and X2.
4	DI10	Input	Digital sensor signal input	Low: <2V / High: >4V, max. 35 V, max. 1 kHz
5	/I	Input	Inverted Index signal	+5V Encoder signal level only!
6	I / DI9	Input	Encoder channel Index / Digital sensor signal input	+5V Encoder signal level only! Low: <2V / High: >4V, max. 35 V, max. 1 kHz
7	/B	Input	Inverted B signal	+5V Encoder signal level only!
8	B / DI8	Input	Encoder channel B / Digital sensor signal input	+5V Encoder signal level only! Low: <2V / High: >4V, max. 35 V, max. 1 kHz
9	/A	Input	Inverted A signal	+5V Encoder signal level only!
10	A / DI7	Input	Encoder channel A / Digital sensor signal input	+5V Encoder signal level only! Low: <2V / High: >4V, max. 35 V, max. 1 kHz

*List 4.1-1: Pin configuration connector X9*

Remarks:
- Due to much better EMC immunity it is strongly recommended to use only encoders with inverted signals, so called differential types (RS422).
- If the encoder is linked to the MasterMACS and a servo amplifier, make sure that the encoder supply voltage (+5V) is just provided by one of the units. Do NOT link the +5V of the MasterMACS to the +5V provided by another device.
- If the encoder signals are provided by a servo amplifier (e.g. by an internal resolver to encoder conversion of the servo drive), the +5V supply must NOT be connected!
- Optionally the encoder inputs can provide four additional digital inputs.

Please refer to the APOSS manual to learn more about the configuration of related parameters.

5 Digital Inputs & Outputs

5.1 X12: Digital Inputs
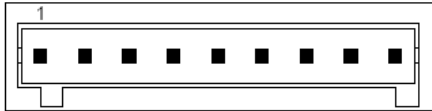
Print circuit board terminal: WAGO 734-139, male, 9pin, RM3.5
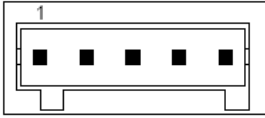Suitable wire connector: WAGO 734-109, female, 9pin, RM3.5

Pin	Name	Type	Meaning	Remark
1	+24V	Power Output	+24V for sensors	Do NOT link to another 24V supply. This is the same power line like provided to the MasterMACS by the connectors X1 and X2.
2 - 7	DI1-6	Input	Digital sensor signal input	Low: <4,6 V / High: >18 V, max. 45 V, max. 1 kHz All types of sensors with 24V signal level can be linked to the digital inputs.
8 - 9	AI1-2	Input	Analog sensor signal input	0-10V, 10Bit, max. 1kHz

List 5.1-1: Pin configuration connector X12

Remarks:
- The functionality and usage of each input is defined by the application program or a global parameter configuration (see -> I_REFSWITCH, I_POSLIMITSW, I_NEGLIMITSW). Therefore it is possible to use any input for any functionality.
- Application specific functionality can be part of the application code and called up by an interrupt handler for example.
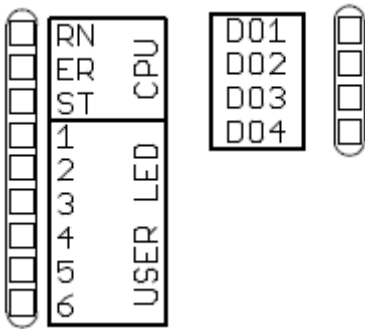
5.2 X13: Digital Outputs

Print circuit board terminal: WAGO 734-135, male, 5pin, RM3.5
Suitable wire connector: WAGO 734-105, female, 5pin, RM3.5

Pin	Name	Type	Meaning	Remark
1 - 4	DO1-4	Signal Output	Digital Output	24V DC output signals, max. 100mA each
5	GND	GND	Signal GND	

List 5.2-1: Pin configuration connector X13

6 Status LED

9 LEDs returns a feedback about input, output, software and hardware states.

LED	Colour	Meaning	Remark
CPU RN	green	Device is running	Active, if internal 3V3 supply is powered up.
CPU ST	yellow	Motor control status	Active, if an application is running.
CPU ER	red	Error occurred	Active, if the application detects an error.
1 - 6	yellow	USER LED 's	Depends on the application. Per default active, if the input is high.
DO1 - DO4	yellow	Status of digital outputs	Active, if 24V is delivered to the output.

List 6-1: Status LED

7 Further information

Please refer to the MasterMACS data sheet, technical manuals, and the online documentation of the APOSS integrated development enviroment for more detailed information.

If you have any questions or you want to discuss your application and the best way to solve your requirements, please feel free to contact us:

zub machine control AG
Buzibachstrasse 31
6023 Rothenburg
SWITZERLAND

Tel.: +41 - (0)41 - 541 50 40
Fax: +41 - (0)41 - 541 50 49

e-mail: info@zub.ch
Website: www.zub.ch