INDUSTRIAL LASER CLEANING

Technical documentation

Content:

Modbus TCP Protocol

Applicable machines:

QFC-200-300

Version: 1.1

Content

Purpose of the document

This document has the goal to clarify the communication protocol between the control unit of the P-Laser cleaning device and the customers controller.

The laser machines of P-Laser are often installed in production environments. The laser itself is made to work stand-alone as well as integrated with other machines. In order to let the master controller of the automated system communicate with the laser machine.

In this way, the master controller is able to read the critical information needed to monitor and control the other machines in the automation.

Connecting

The laser machine is foreseen with several connectors in the back of the control unit.

Specifications on the output ports can be found in the manual of the machine.

The Modbus communication uses the **Ethernet** connector. In this document we will name this connector the “Modbus port”.

The Modbus port can be wired to a switch or directly to the other controller.

Communication protocol

Modbus

The laser machine is permanently set up as a **Modbus SLAVE.** Therefore the external controller should act as a **Modbus MASTER**.

IP address

The Controller of the laser machine has the following IP address:

172.16.224.100

Port settings

The port should be set at following number:

502

Unit ID

1

Information Layout

The Modbus slave has 60 output WORDS and 32 Input words

The information from the OUTPUT WORDS contained in each byte is set up as the following:

```
WORD 0 :
      BIT 0.0    : Key switch
      BIT 0.1    : Pilz Safety Relay
      BIT 0.2    : Laser status 1 (1)
      BIT 0.3    : Laser status 2 (1)
      BIT 0.4    : Push-button Laser head
      BIT 0.5    : Laser status 3 (1)
      BIT 0.6    : Laser status 4 (1)
      BIT 0.7    : Reserved
WORD 1 :
      BIT 1.0    : Job BIT 1 input acknowledgement
      BIT 1.1    : Job BIT 2 input acknowledgement
      BIT 1.2    : Job BIT 3 input acknowledgement
      BIT 1.3    : Control BIT ON/OFF input acknowledgement

WORD 2 :
      BIT 2.0    : Reserved
      BIT 2.1    : Red signal Light (Emission enabled, danger)
      BIT 2.2    : LED Reset
      BIT 2.3    : Green signal light (Emission disabled, safe)
      BIT 2.4    : Fan
```

```
WORD 3 :
      BIT 3.0    : Manual Mode active
      BIT 3.0    : Robot  Mode active

WORD 5 : System on Time (2)

WORD 6 : Source active Time (2)

WORD 7 : Emission Time (2)

WORD 50 : Laser Temperature (3)

WORD 53 : Main Supply Voltage (4)

WORD 54 : Housekeeping Voltage (5)
```

The information from the INPUT WORDS contained in each byte is set up as the following:

```
WORD 0 :
      BIT 0.0    : Robot Mode activation (6)
      BIT 0.1    : Emission control
      BIT 0.2    : Job bit 1 control
      BIT 0.3    : Job bit 2 control
      BIT 0.4    : Job bit 3 control
```

(1) The laser alarms are communicated over a series of 4 Status bits. Each combination stands for a different situation. Which are listed in the next paragraph.

(2) The Times are expressed in hours.

(3) The laser temperature is an internal sensor value that needs to be divided by 10. (248/10=24.8°C)

(4) The Main Supply Voltage is the switched voltage to the laser. This value needs to be divided by 10. (239/10=23.9V)

(5) The housekeeping Voltage is a permanent voltage. This value needs to be divided by 10. (23.8/10=23.8V)

(6) This is needed to activate the robot mode for Modbus control activation.

Laser source alarm states:

BIT 1	BIT 2	BIT 3	BIT 4	Alarm description
0	0	0	0	**Source temperature out of range – source power cut off**
0	0	0	1	**Back reflection alarm**
0	0	1	0	**Laser is waiting for emission**
0	0	1	1	**System alarm**
0	1	0	0	**Reserved**
0	1	0	1	**Safety alarm**
0	1	1	0	**Laser is not ready for emission**
0	1	1	1	**Reserved**
1	0	0	0	**Critical alarm**
1	0	0	1	**Hot stop alarm**
1	0	1	0	**Main power is OFF**
1	0	1	1	**Emission ON**
1	1	0	0	**Reserved**
1	1	0	1	**Power supply alarm**