

# CyCon K11-U Monitoring System

Operation and Maintenance Manual  
Edition 04.2015



**CyTec Zylindertechnik GmbH**  
Steffensrott 1 • D-52428 Jülich • Tel.: (+49) 2461/6808-0 • Fax: (+49) 2461/6808-758  
E-mail: [info@cytec.de](mailto:info@cytec.de) • <http://www.cytec.de>

# Inhalt

<b>1</b>	<b>Monitoring of clamping with controller K11-U</b>	<b>5</b>
1.1	Technical information	5
1.2	Function	6
1.3	The clamping system	8
1.4	Preparation for usage	10
1.4.1	Media connections/Adjustment of clamping system	10
1.4.2	Bleeding the clamping system	11
1.5	Different controller function under BIOS versions 3.05 and 5.04	15
1.6	Pin assignment Bios 3.05	17
1.7	Pin assignment Bios 5.04	20
1.8	Display and function buttons	23
<b>2</b>	<b>Safety advice</b>	<b>24</b>
<b>3</b>	<b>Installation of the software</b>	<b>26</b>
3.1	USB driver installation	27
4.1	Start of program	28
<b>4</b>	<b>Program overview</b>	<b>28</b>
4.2	Overview of software window	29
4.2.1	Register card 1 Parameter	30
4.2.2	Register card 2 Service	31
4.2.3	Register card 3 LOG data	32
4.2.4	Register card 4 Configuration	35
4.3	Minimal configuration for a new K11-U	36
<b>5</b>	<b>Arranging the monitoring system</b>	<b>37</b>
5.1	Clamp- and release control	37
5.2	Determination and setting of parameters	38
5.3	Adjustment of measuring times	43
5.4	Check for plausibility	45
<b>6</b>	<b>Communication with the control system</b>	<b>47</b>
6.1	Communication with the control system (BIOS 3.05)	47

6.2	Control sequence (BIOS 3.05) .....	49
6.3	Communication with the control system (Bios 5.04) .....	51
6.4	Control sequence (BIOS 5.04) .....	53
<b>7</b>	<b>Change of parameter set .....</b>	<b>55</b>
<b>8</b>	<b>Additional functions .....</b>	<b>59</b>
8.1	Data storage on USB-Stick.....	59
8.2	Diagnosis possibilities.....	60
8.3	Passwords .....	63
8.4	Change of passwords .....	64
8.5	Network adjustment .....	65
8.6	Execution of firmware update .....	67
8.7	Firmware Update via USB stick.....	70
8.8	Languages .....	72
9.2	Additional data .....	73
<b>9</b>	<b>Technical Data.....</b>	<b>73</b>
9.1	Electrical Data.....	73
9.3	Communication with the PC .....	74
9.4	Connections .....	75
9.5	USB stick compatibility .....	76
9.6	Required USB cable .....	76
<b>9.7</b>	<b>Wiring diagram BIOS 3.05.....</b>	<b>77</b>
<b>9.8</b>	<b>Wiring diagram BIOS 5.04.....</b>	<b>78</b>
<b>9.9</b>	<b>Measuring turbine.....</b>	<b>79</b>
<b>9.10</b>	<b>Declaration of compliance .....</b>	<b>80</b>
<b>10</b>	<b>Differences K11 -&gt; K11-U .....</b>	<b>81</b>
10.1	General .....	81
10.2	Inputs and outputs .....	82
<b>11</b>	<b>Electric noise reduction .....</b>	<b>85</b>
<b>12</b>	<b>Error messages.....</b>	<b>89</b>
12.1	General errors.....	89

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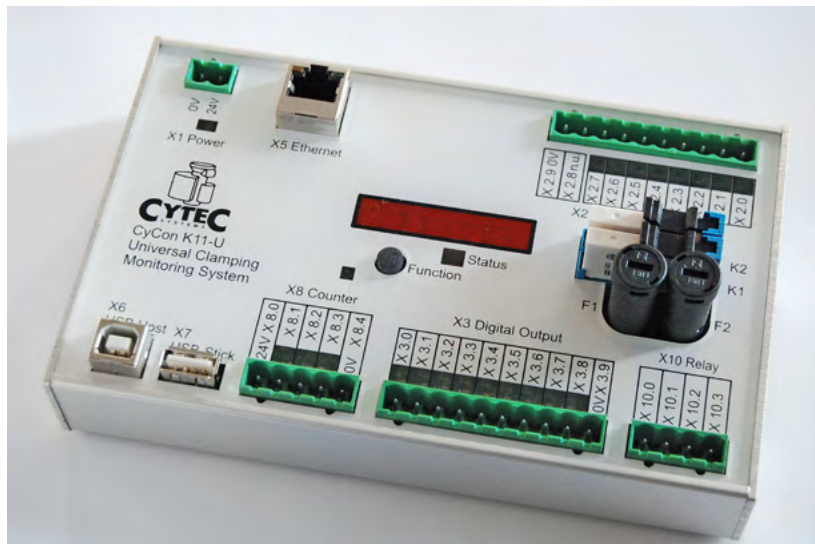
12.2	Advice .....	90
<b>13</b>	<b>Maintenance .....</b>	<b>92</b>
13.1	Battery exchange .....	92



# 1 Monitoring of clamping with controller K11-U

## 1.1 Technical information

The K11-U controller is a versatile microcontroller, which was specially designed for monitoring and safety functions of machine tools. It works at usual voltage levels (24 V) and can be connected to any usual control system (PLC) to communicate via parallel digital I/O.

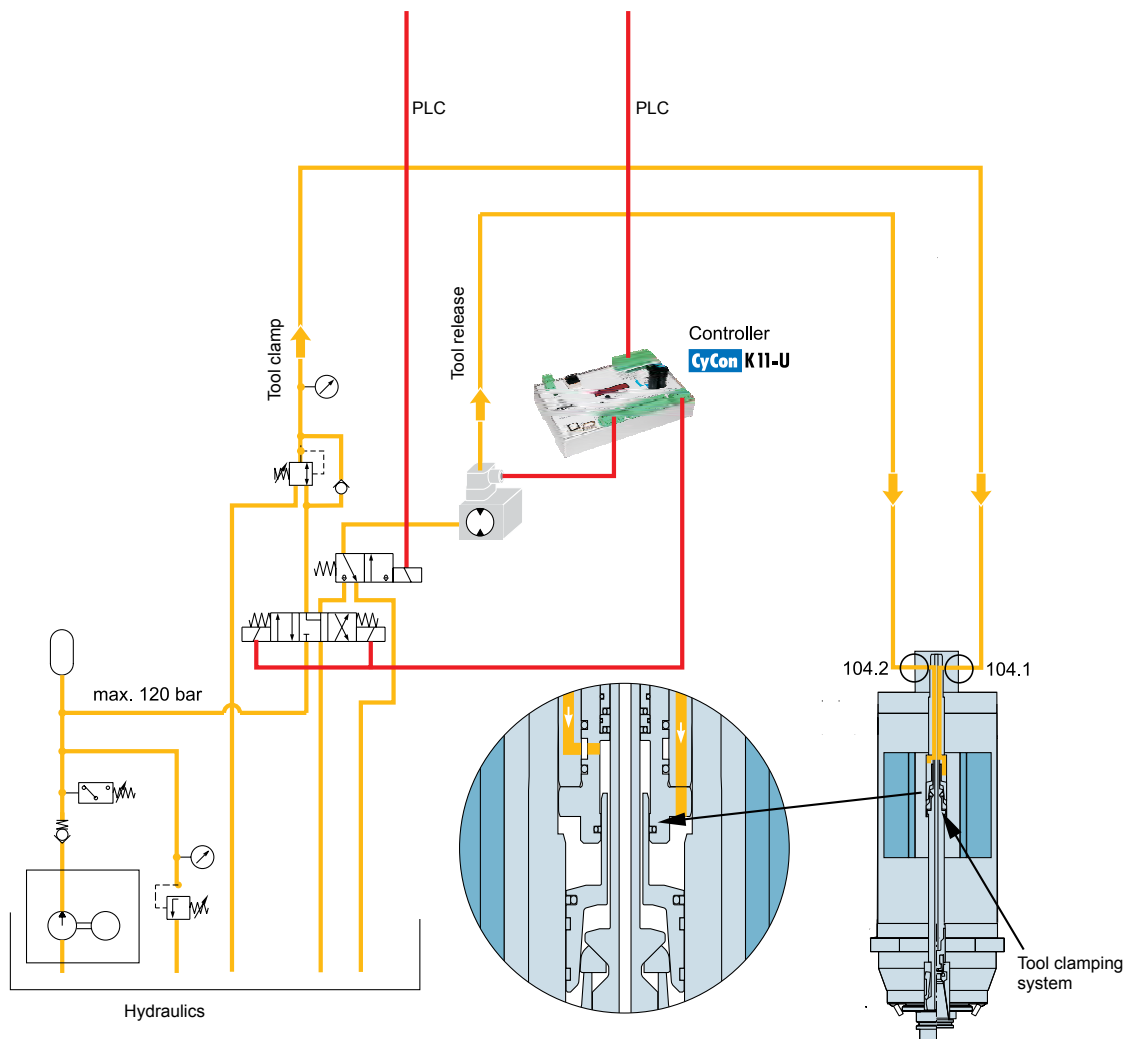


The K11-controller for monitoring of motor spindles is mostly used together with PLC's to monitor clamping and release functions in tool clamping systems or automatic head exchange systems.

The controller is used for applications where an oil flow within defined thresholds must be monitored.

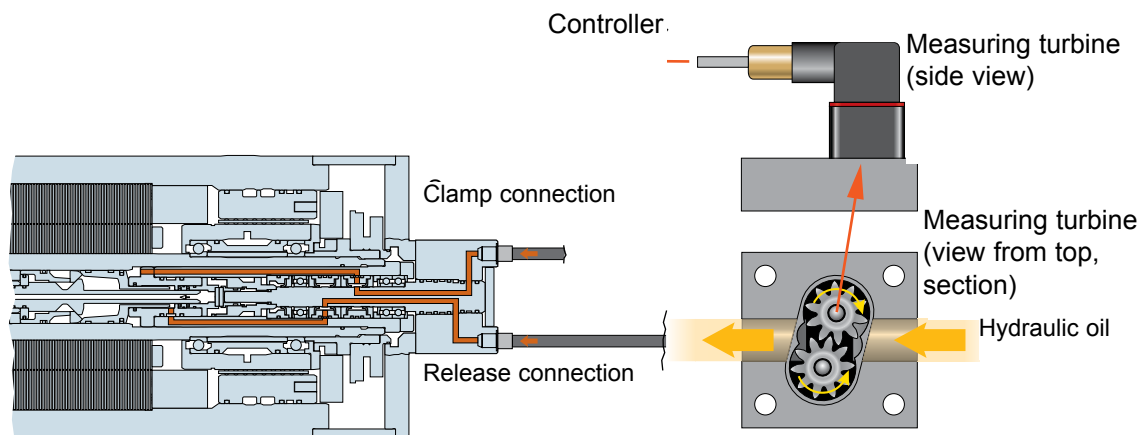
In this manual the commissioning and operation of the K11-U controller are explained on an example of a tool clamping system.

## 1.2 Function



For monitoring clamp and release of the tool, the hydraulic oil, which is conveyed to the clamping system, is measured volumetrically. The detection is carried out by a measuring turbine that is integrated in the release circuit. It is rotated by the through-passing hydraulic oil.





These turbine rotations are detected by sensors, and measured as frequency by the controller. This oil volume is always proportional to the clamping distance. So not only the final position is monitored but even the entire effective range of the clamping circle.

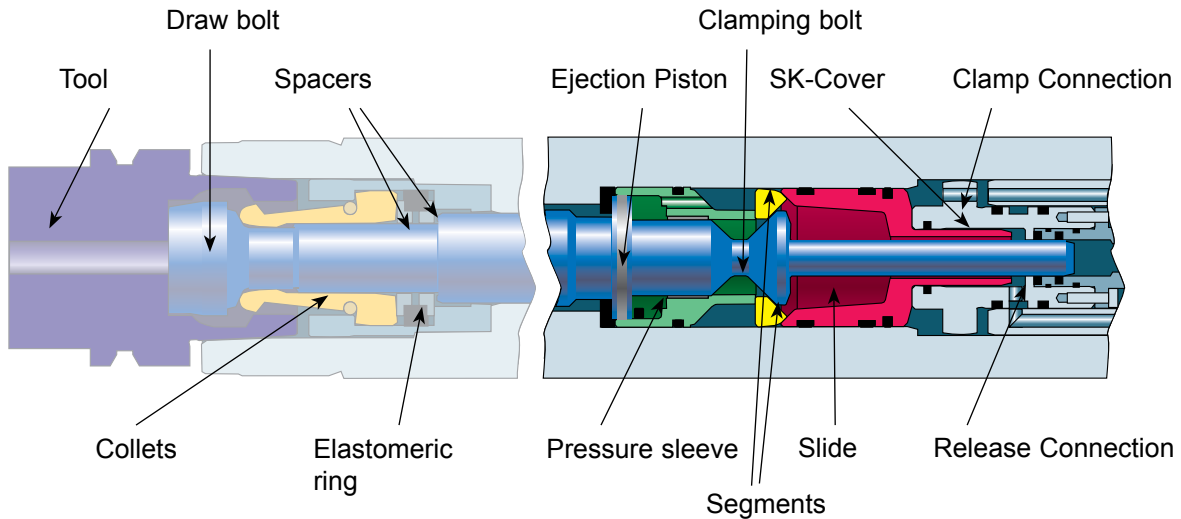
For this, the operator must define a dwell time before the check of the final condition is carried out. The number of counted pulses between start and stop (= oil volume) must be within the set window, otherwise the control system will switch off the motor spindle.

Differences in tool-length which are beyond the pre-set tolerances (DIN, ISO) are recognised.

The operator can apply the K11-operating program as graphical user interface that is installed on a usual PC with serial port to communicate with the controller.

The clamping sequence is divided in characteristic phases which each are indicated by a determined oil volume in the clamp and release line. According to this, the turbine sends a determined number of pulses for each phase, from which the position of the clamping slide can be recognised, depending on the tool size.

### 1.3 The clamping system

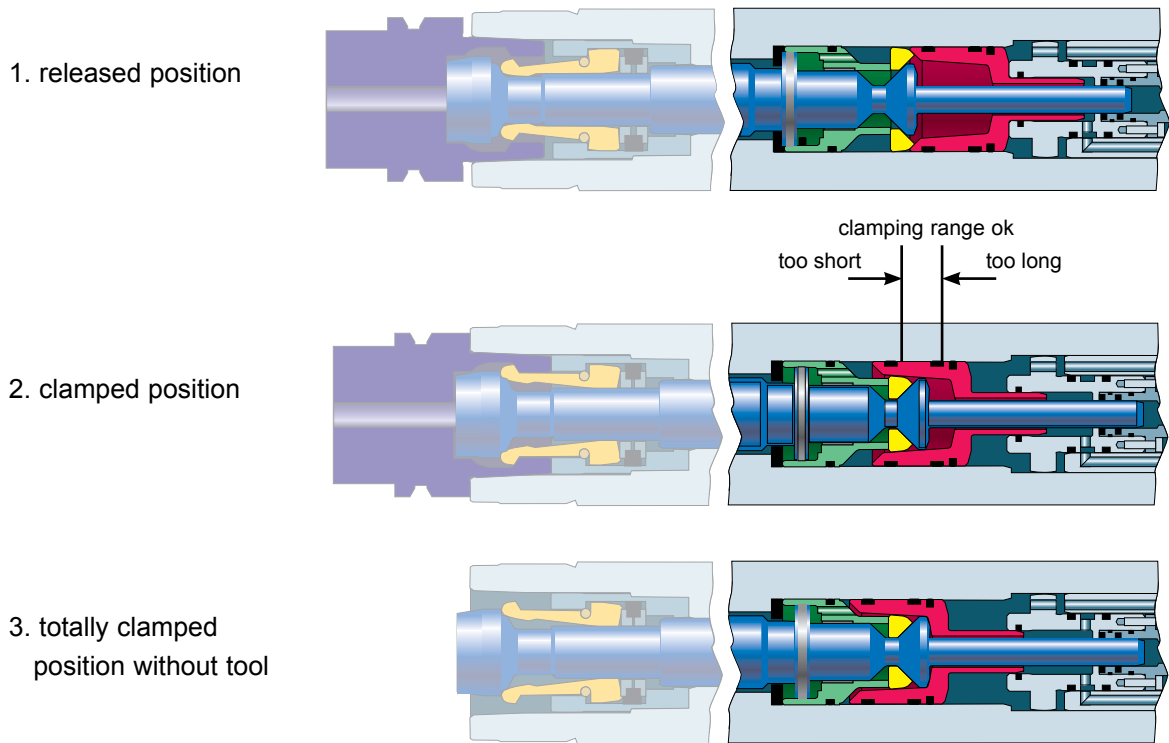


The collet kit is operated by the clamping cartridge. Its main components are: the centrally located tension bolt, the function segments which are placed concentric around it, and the slide enclosing these elements. In a hydro-mechanical system the slide is displaced directly by the pressurised hydraulic oil.

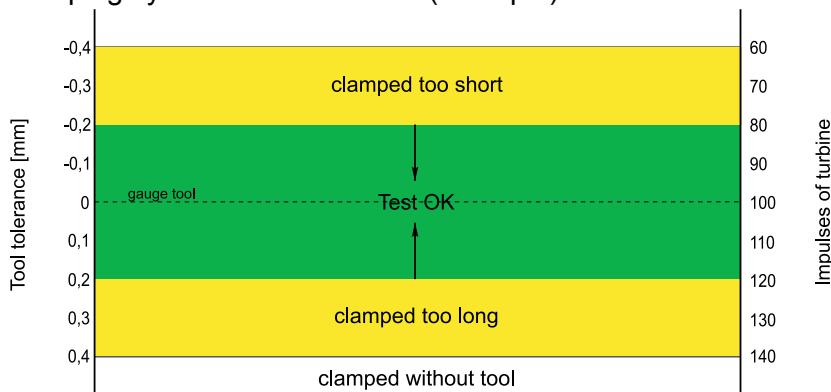
The clamping system acts with positive lock utilizing the force amplification of the wedge principle: the draw bolt grips the tool, pulls it inwards and clamps it.

In the clamped position the positive lock is active. Clamping pressure can now be relieved as the clamping force is mechanically maintained by the self retention of the wedge system.

The following example shows different positions of the clamping slide during the clamping sequence of a HSK-A63 clamping system:



The classification of the clamping phases can be displayed in a diagram for a clamping system Size HSK-A63 (example):



Typical for an HSK-63 tool is the ratio of approx. 10 pulses per 0,1 mm clamping stroke. The following values are entered into the register card CLAMP of the user program:

Clamp	short	80 (pulses)
	long	120 (pulses)
	without tool	140 (pulses).

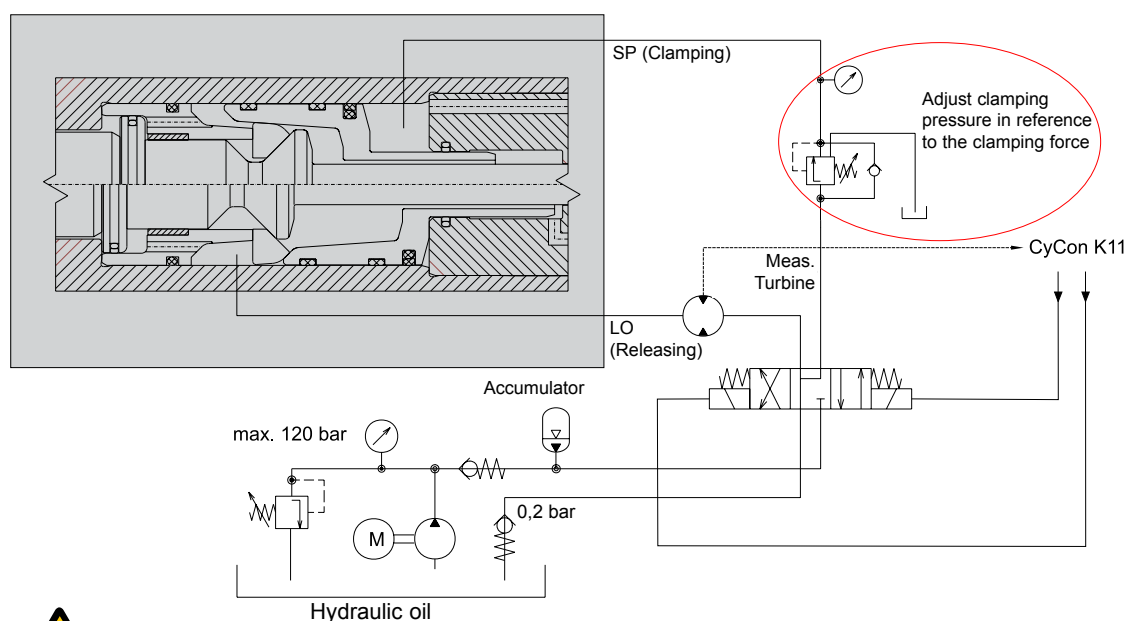
## 1.4 Preparation for usage

### 1.4.1 Media connections/Adjustment of clamping system

For proper function of the clamping system, the following must be checked:

- All media connections for function and pressure settings
- Clamp and release pressure for clamping system
- Function test - clamp and release
- correctly adjusted clamping force with clamping force meter (refer also to chap. 6 Assemblies: motor spindle)

Hydro-mechanical clamping system



#### Caution:

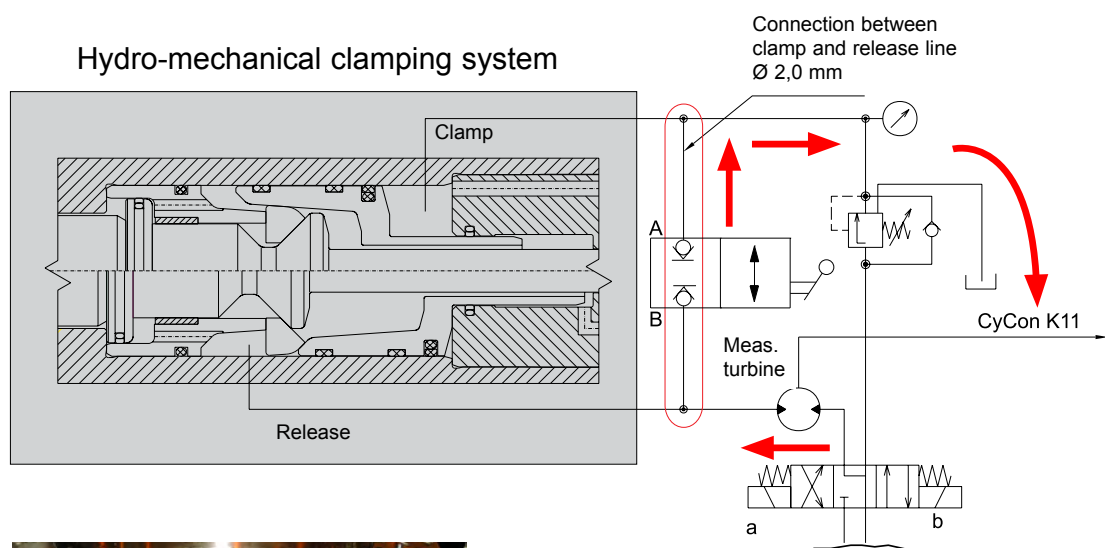
- **When the clamping system is released never push draw bolt into the spindle. This can destroy the tool clamping system. When the tool is ejected, release pressure should always be applied.**
- **The spindle may only be rotated with a tool or a tool dummy. It must never be rotated with the clamping system in the release position!**
- **Without tool in the spindle and the clamping system in the clamped position the maximum permissible speed is 100 rpm.**



- No pressure may be applied to the clamp and release port. This will lead to destruction of the ceramic seals in the rotary union.
- No pneumatic pressure may be applied to port “DA” as it would destroy the seals.
- Spindle may only be rotated with switched on cooling system for spindle and rotary union.

### 1.4.2 Bleeding the clamping system

When bleeding the clamping system, the releasing pressure of a released tool fitting is used to bleed the clamping system. A sealed connection between the clamping- and the releasing-cycle has to be built, which will be removed after bleeding the system.



Bleeding set with closed blocking tap, attached to the ports of the clamp and release line on the swivel housing of the milling head.



To guarantee a failsafe function of the tool clamping system no air bubbles must be trapped in the hydraulic lines. An invasion of smallest amounts of air cannot be avoided completely but they would disrupt the continuous transmission of pressure to the tool clamping and lead to failure.

So in the following the most important procedure steps are shown that are necessary to remove any trapped air out of the hydraulic system. For this a bleeding set (dump tap, tube, fittings) is required to short cut the clamp and release line.

It is assumed that the hydraulic power unit for the tool drawbar and for the axis clamping has previously been set up properly. It is assumed also that the operation personnel is qualified and is instructed about the function of the tool clamping system. Otherwise there is danger of severe function failure with damage to the machine or person.

### Procedure steps

- Step 1: Before attempting to bleed air from the hydraulic lines it is important to have allowed the oil in the hydraulic tank to have stood for a minimum of 3 hours. Failure to do this may mean that air bubbles could still be present in the oil that is going to be used for bleeding. This is especially true when new oil has been added to the hydraulic tank. Failure to observe this point could reduce the effectiveness of the whole set up procedure of the tool clamping system.
- Step 2: Put the spindle into a position where the both bleeding bores on the rear part of the spindle to expose the two bleed points on and to fit the connections of the bleeding set.
- The tool clamping system must be in clamped position to avoid pressure in the clamp line.**



Stems and fittings on bleeding points

- Step 3: Remove the two plugs of the bleeding ports on the swivel housing of the spindle and fit the bleeding set. Make sure the two steel stems have their copper washer to seal and do not over tighten.



Bleeding set with closed dump tap

- Step 4:



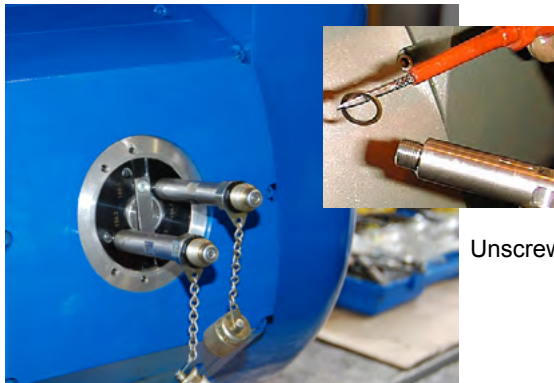
**Attention: Make sure that during fitting the bleeding set no clamp or unclamp cycles are operated.**

The dump tap of the bleeding set must be in closed position. Operate the clamping system several times for clamping and releasing. Check for any oil leaks in the range of bleeding set (dump tap, tube, fittings). Finish this step with the **clamping system in the clamped position** without tool.

Step 5: Bleed the clamp hydraulics by running through the following procedure 5 times (**initial position: clamped**):

- Release the clamping system.
- Open the bleed tap for 1 minute.
- Close the bleed tap.
- Clamp the system without tool.

Step 6: Remove the bleed tap assembly as swiftly as possible and replace the plugs. Some oil will be lost but this is unavoidable. Try to minimise this oil loss as much as possible by putting a finger over the ports as each stem is removed from the head. Also check that the copper washer is removed with the stem and not left in the port as shown  
The screw torque must be sufficient that the plugs are sealing tight.



Unscrewed stem with copper washer

Step 7: Now machine power can be re-established and the clamping system should be seen to release and clamp properly.

## 1.5 Different controller function under BIOS versions 3.05 and 5.04

The controller K11-U is compatible to the so far used controllers K11-3.05 and K11-5.04. The different kind of function can be adjusted using the PC software. So there is just one device for both BIOS versions.

Which version you use must be decided depending from the individual application.

The basic principle of the measurement and monitoring does not vary between the both versions. Only triggering and feedback are different.

As a result you have two different pin assignments.

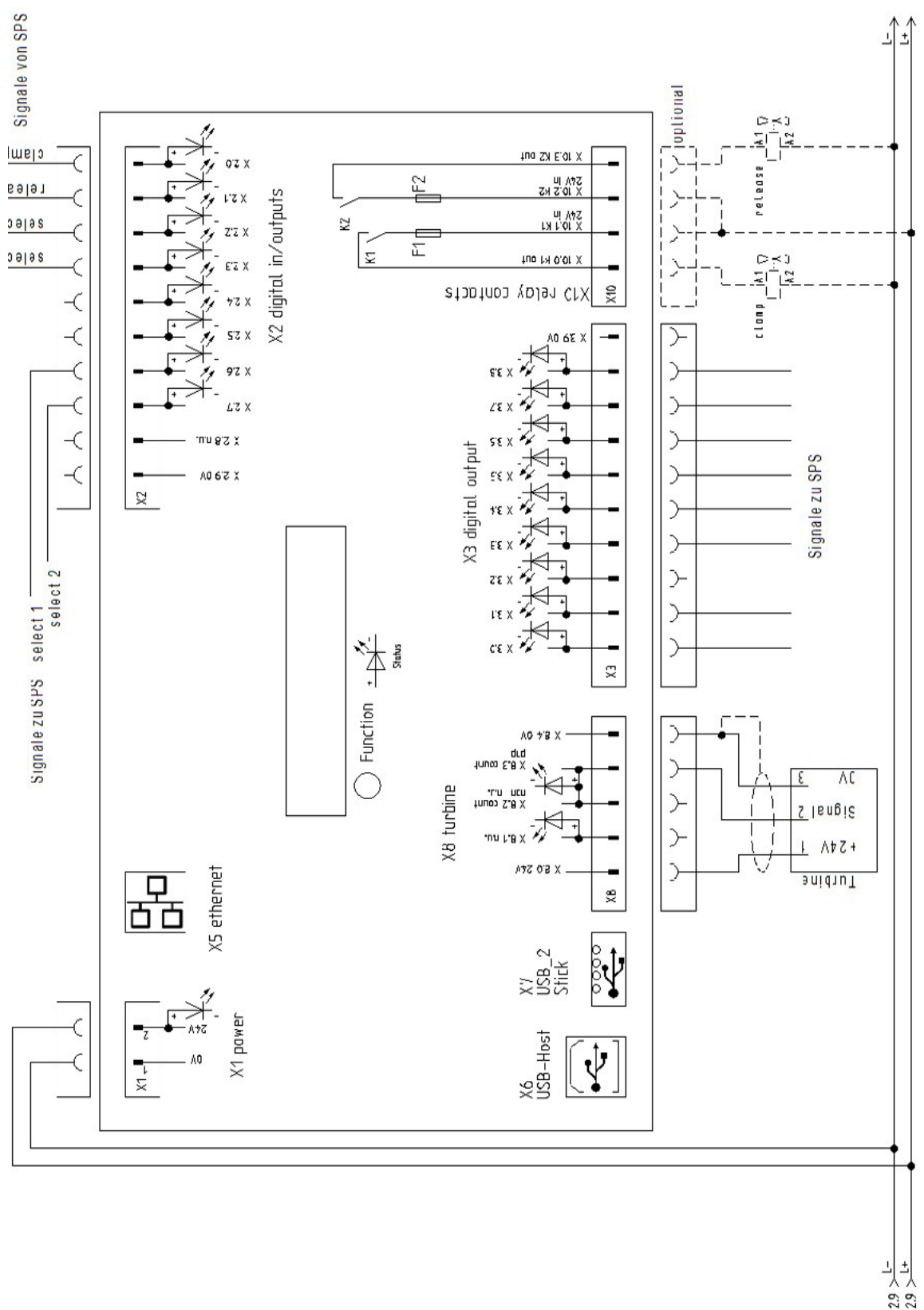
The differences of both versions are as follows:

Bios 3.05	Bios 5.04
Selection	Selection
Selection carried out by 2 inputs, one input each for Clamp and Release	Selection carried out by an input: Input High = Release Input Low = Clamp
Execution	Execution
<p>With setting the according input the measurement starts. If the input is set back before the controller recognises the measurement as finished regarding the preset parameters, the process is aborted and the error output is set.</p> <p>(Option: a valve which is connected directly with the controller, is opened with setting the input and closed with setting back the input.)</p> <p>For activation of the next procedure a new input must be set.</p> <p>A multiple clamp or release consecutively is possible, but is normally finished with an error signal (the clamping system is out of function, as a result too less pulses are counted). The plc is responsible for the adherence of the right process sequence.</p>	<p>With setting the according input the measurement starts. If the input is set back before the controller recognises the measurement as finished regarding the preset parameters, the process is continued anyway. A valve directly connected with the controller stays triggered, until the controller recognises the measurement as finished regarding the preset parameters and the input is not set back yet.</p> <p>After setting back the input and recognising the end of measurement, the clamping procedure is carried out automatically. This is executed in any case until the end of measurement is recognised. A valve directly connected with the controller stays triggered until the end of measurement and then is automatically closed.</p> <p>A multiple clamp or release consecutively is <b>not</b> possible.</p>

<b>Bios 3.05</b>	<b>Bios 5.04</b>
<b>Feedback</b>	<b>Feedback</b>
<p>The feedback to the plc consists of the outputs for the active process (clamp/release) and the outputs for the evaluation of the measuring process.</p> <p>Test finished test ok too short too long Clamped without tool (= test ok + too long) Error (time out)</p>	<p>For the feedback to the plc the following signals are used (outputs):</p> <p>Test finished Clamp ok Release ok Clamped without tool Error (time out)</p> <p>As an option the feedback signals for the active process can be evaluated.</p>

For detailed information about the functional process please refer to chapter „[Communication with the control](#)“

## 1.6 Pin assignment Bios 3.05



The monitoring functions of the K11 controller can be chosen via its digital input (input 0 and 1).

#### Designations on plug X2:

Input	Selection function	Logic level
E 0 X2.0	Clamp	HIGH (24 V)
E 1 X2.1	Release-	HIGH (24 V)
E 2 X2.2	Selection Parameter Set 1	HIGH (24 V)
E 3 X2.3	Selection Parameter Set 2	HIGH (24 V)
E 4 X2.4	-	
E 5 X2.5	-	
E 6 X2.6 Output	Parameter Set 1 active	HIGH (24 V)
E 7 X2.7 Output	Parameter Set 2 active	HIGH (24 V)
( X2.2 + E3 X2.3)	Selection Parameter Set 3	HIGH (24 V)
( X2.6 + E7 X2.7)	Parameter Set 3 active	HIGH (24 V)

The chosen function and the result of the selection are emitted via the digital outputs:

#### Designations on plug X3:

Output	Result for functions clamp and release	Logic level
A 0 X3.0	Clamp active	HIGH (24 V)
A1 X3.1	Release active	HIGH (24 V)
A 2 X3.2	-	
A 3 X3.3	Test finished	HIGH (24 V)
A 4 X3.4	Test ok	HIGH (24 V)
A 5 X3.5	too short	HIGH (24 V)
A 6 X3.6	too long	HIGH (24 V)
(X3.4 + X3.6)	Clamped without tool	HIGH (24 V)
A 7 X3.7	Error (Timeout)	HIGH (24 V)
A 8 X3.8	24V/Fuse ok	HIGH (24 V)



**Designations on plug X8:**

Input	Function	Logic level
1 X8.0	Voltage supply	+24 V
2 X8.1	-	-
3 X8.2	-	-
4 X8.3	Signal PNP	HIGH (24 V)
5 X8.4	GND	0 V

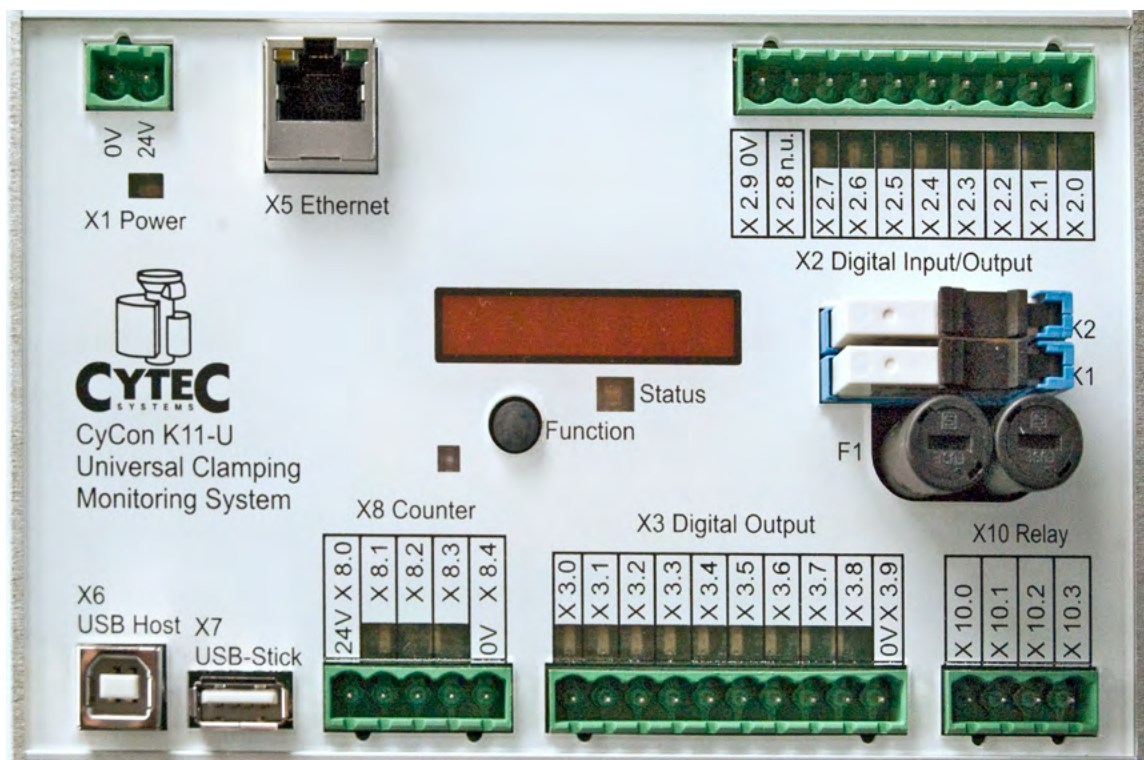
**Designations on plug X10:**

Output	Function	Logic level
1 X10.0	Relay Clamp	HIGH (24 V)
2 X10.1	Voltage supply	+24 V
3 X10.2	Voltage supply	+24 V
4 X10.3	Relay Release	HIGH (24 V)

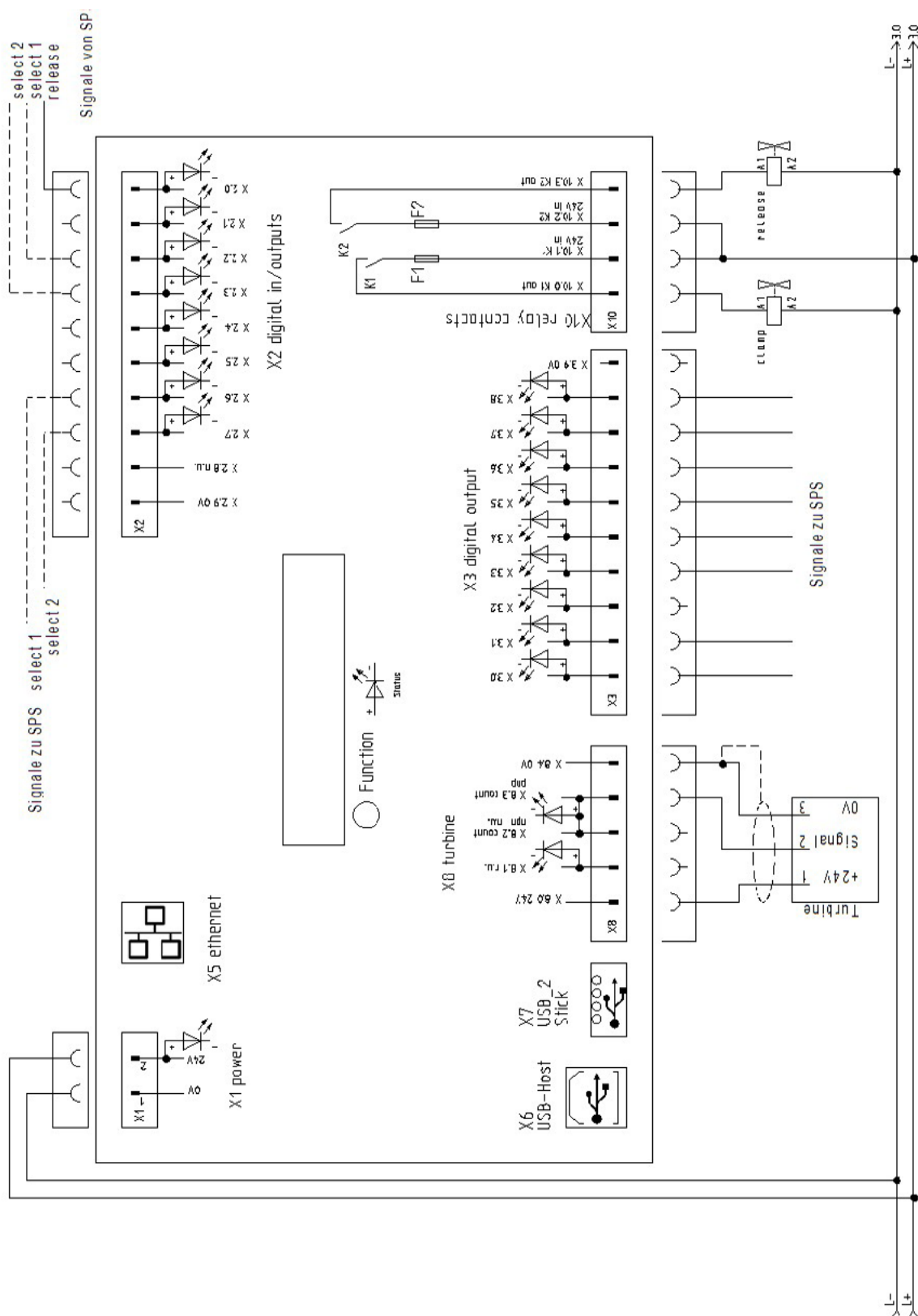


The turbine must be supplied with voltage by the K11-U plug X8. No plug must be energised as long the plug X1 (0 V) is not yet connected with the 0 V voltage source.

Attention: only one function at a time may be selected, i. e. only one input may be logically „HIGH“.



## 1.7 Pin assignment Bios 5.04



The monitoring functions of the K11 controller can be chosen via its digital input (input 0).

#### Designations on plug X2:

Input	Selection function	Logic level
E 0 X2.0	Clamp / Release	HIGH (24 V)
E 1 X2.1	-	HIGH (24 V)
E 2 X2.2	Selection Parameter Set 1	HIGH (24 V)
E 3 X2.3	Selection Parameter Set 2	HIGH (24 V)
E 4 X2.4	-	HIGH (24 V)
E 5 X2.5	-	HIGH (24 V)
E 6 X2.6 Output	Parameter Set 1 active	HIGH (24 V)
E 7 X2.7 Output	Parameter Set 2 active	HIGH (24 V)
E2( X2.2 + E3 X2.3)	Selection Parameter Set 3	HIGH (24 V)
E6( X2.6 + E7 X2.7)	Parameter Set 2 active	HIGH (24 V)

The chosen function and the result of the selection are emitted via the digital outputs:

#### Designations on plug X3:

Output	Result for functions clamp and release	Logic level
A 0 X3.0	Clamp active	HIGH (24 V)
A1 X3.1	Release active	HIGH (24 V)
A 2 X3.2	-	HIGH (24 V)
A 3 X3.3	Test finished	HIGH (24 V)
A 4 X3.4	clamped OK	HIGH (24 V)
A 5 X3.5	released OK	HIGH (24 V)
A 6 X3.6	Clamped without tool	HIGH (24 V)
A 7 X3.7	Error (Timeout)	HIGH (24 V)
A 8 X3.8	24V/Fuse ok	HIGH (24 V)

**Designations on plug X8:**

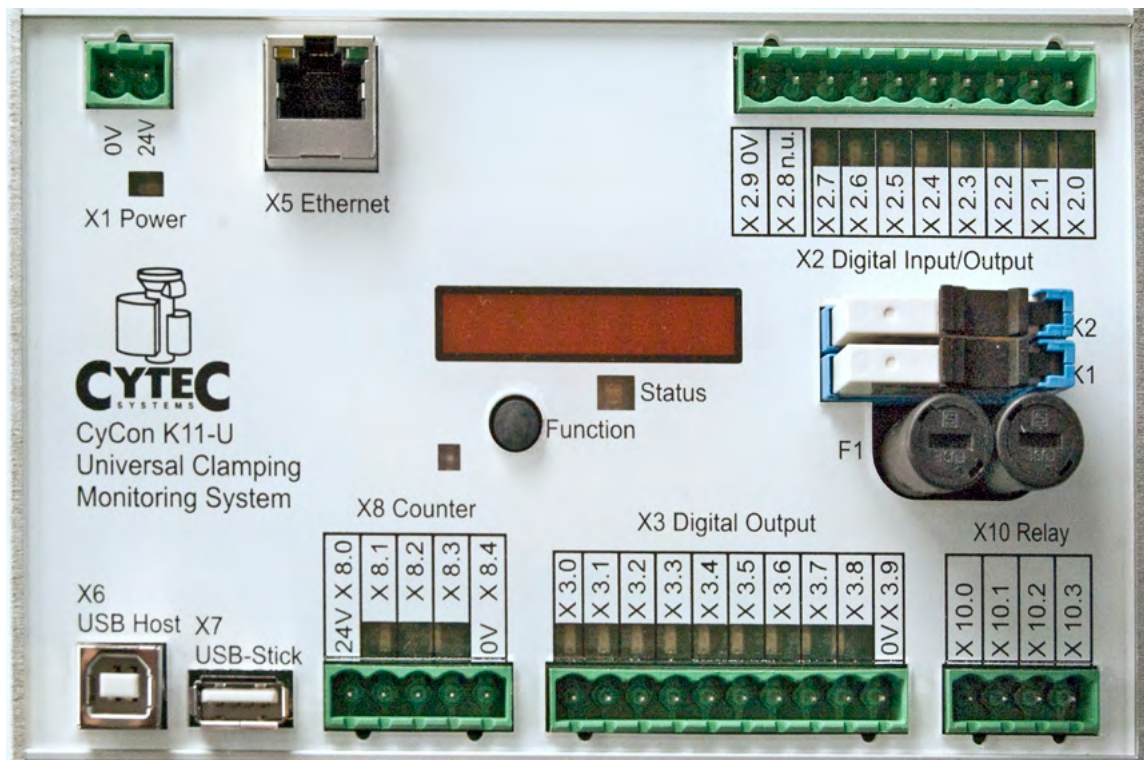
Input	Function	Logic level
1 X8.0	Voltage supply	+24 V
2 X8.1	-	-
3 X8.2	-	-
4 X8.3	Signal PNP	HIGH (24 V)
5 X8.4	GND	0 V

**Designations on plug X10:**

Output	Function	Logic level
1 X10.0	Relay Clamp	HIGH (24 V)
2 X10.1	Voltage supply	+24 V
3 X10.2	Voltage supply	+24 V
4 X10.3	Relay Release	HIGH (24 V)



The turbine must be supplied with voltage by the K11-U plug X8. No plug must be energised as long the plug X1 (0 V) is not yet connected with the 0 V voltage source.



## 1.8 Display and function buttons

In the controller display different information are indicated.

As long as no error messages are active, always the last event is shown, e. g. connection information or pulses of the last clamp and release cycle.

The status-LED glows green during correct operation.

In case of error messages the status LED blinks red.

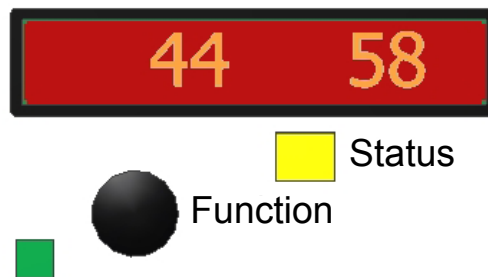
Error messages of the firmware superimpose the display of the last event.

Error messages which have no influence on the controller operation, can be indicated by pushing the function button.

If clamp and release pulses are shown, the left number indicates clamp pulses and the right one the release pulses.

On the LED's at the outputs X3.0 (clamp) and X3.1 (release) you can identify the last process.

With the function button you can scroll through the displays.



Shown are:

- active IP address
- adjustment for DHCP
- adjusted bios version
- firmware version of the controller
- pending error messages.

## 2 Safety advice

### General:

**The K11-Controller is a low voltage system (24 V DC) for monitoring of high speed spindles. Unqualified usage may lead to severe injuries or machine damage. The system is to be installed by qualified personel only!**

For the functions Clamp/Release:



**Attention:** While the spindle is rotating, never apply voltage to the input 2.0 or 2.1 ! The tool will be loosened from the spindle and hurled away uncontrollably! There is danger for personnel and material. The rotary union is pressurised during spindle rotations and it will be destroyed.



- **Clamp and release lines and the clamping system must be bled according to the manual.**
- The hydraulic lines must be kept full of oil. Most suitable is a non-return valve (0.2 bar) in the tank line of the hydraulic unit.
- The clamping pressure must be adjusted according to the clamping force. Therefore a pressure reduction valve must be integrated into the clamp line.
- It must be assured that there is no back pressure in the non pressurised hydraulic line (maybe caused by the pressure reduction valve, pressure reduction by draining off the volume flow into the tank line).
- The measuring turbine must be located in the release line and be attached as close as possible to the clamping system. If possible, the line between turbine and connection to the milling head should be hard-piped.
- The clamp/release valves should be attached as close as possible to the milling head (but in a position that they are accessible without effort).
- A bladder accumulator with approx. 0.75 to 1 liter content should be integrated in the pressure line (preferably on the clamp/release valve block).



**For BIOS 3.05**

- After each clamping process a release process must follow and vice versa. Never two same processes may be carried out, even if the machine was switched off in the meantime.
- The clamp and release valve must not be opened until the clamping/release process required by the PLC is confirmed by the K11 (signal to plug X3 pin 0 or 1). The clamp valve must be not closed until the K11 reports the signal "Measure finished" or "Timeout". The release valve must not be closed until "clamp" is required again.  
In the PLC no clamp and release times must be programmed, because that would cause malfunctions during tool changing processes. As well additional pressure switches in the hydraulic system can cause malfunctions of the control system.
- A security valve "release" must be provided in alignment with the valve "release". As soon as all safety conditions for tool release are fulfilled, this security valve must be switched directly by the PLC. Only after actuation of the security valve the selection "release" on K11 may be carried out.  
If required, CyTec can offer examples for the integration of the controller in Siemens PLC's.

The controller K11 must be adjusted correctly.

**For BIOS 5.04**

- A security valve "Release" must be provided in alignment with the valve "Release". As soon as all safety conditions for tool release are fulfilled, this security valve must be switched directly by the PLC. Only after actuation of the security valve the selection "Release" on K11 may be carried out. The actual release valve must be triggered by the relay "Release" on the relay circuit board on the K11. It must not be actuated until the K11 has confirmed the selection "Release" on plug X3 pin 1. The release and the security valve must not be closed until the K11 has finished the release process by deselection on plug X3 pin 1.
- The clamping valve must be actuated by the relay "Clamp" on the relay circuit board of the K11. It must not be triggered until the K11 has confirmed the selection "Clamp" on plug X3 pin 0. The clamp valve must not be closed until the K11 sends the signal "Measure finished" or "Timeout".
- The controller K11 must have priority concerning the collection of clamp and release times and the evaluation of data. In the higher-level PLC no clamp and release times must be programmed, because that would cause malfunctions during tool changing processes. As well additional pressure switches in the hydraulic system can cause malfunctions of the control system.

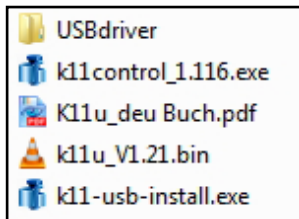
The controller K11 must be adjusted correctly.



### 3 Installation of the software

Before you start the software for the first time, install all USB drivers. See chapter „USB driver installation“.

The operation program is designed for installation under operating system Windows version XP up to version 7. The installation stick contains an installation directory \K11U-PC\_Software with all required data.



Content of program directory.

While running the program, further required data are generated:

- config.ini
- finder.exe
- k11\_capture.tcl
- k11-3.05.ini
- k11-5.04.ini
- Im3flash.exe

The software doesn't require any installation.

Copy the complete directory „K11-U-Software“ to a selected area on your hard disk.

**Please note that you need write permission in this directory during program operation.**

The software cannot be started from a write-protected medium, because data are generated in the program directory during operation.

Note:

No system data or registry entries are changed. For de-installation it is sufficient to delete the program directory.

When you connect the K11-U with the PC via network interface, you don't need driver installation and can skip the chapter „USB driver installation“.

The software can also be started from the USB stick. When you use this connection also the drivers must be installed.

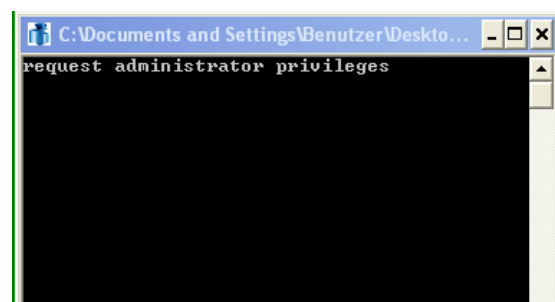
### 3.1 USB driver installation

Before you connect the K11-U Controller with the PC via USB interface the delivered USB drivers must be installed

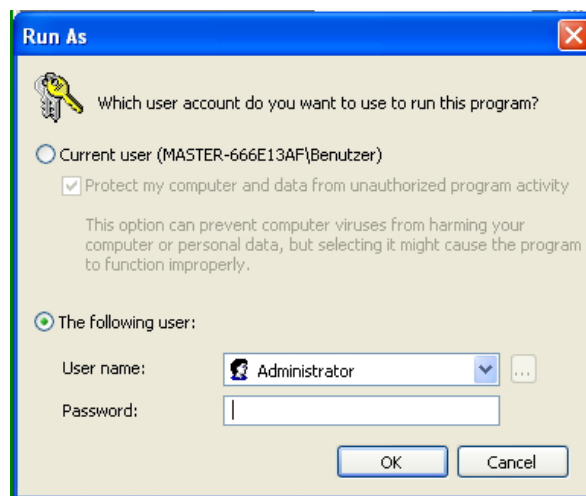
For driver installation you need administrator privileges.

Start program „k11-usb-install.exe“.

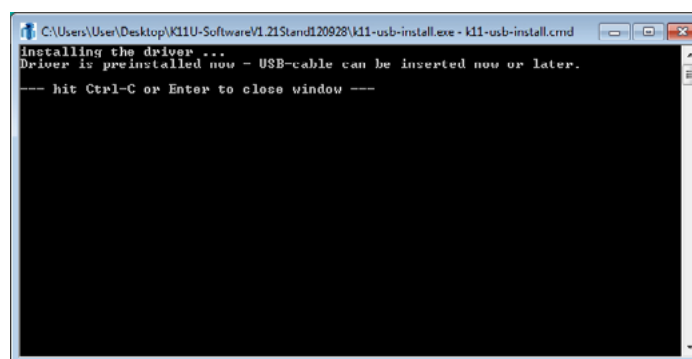
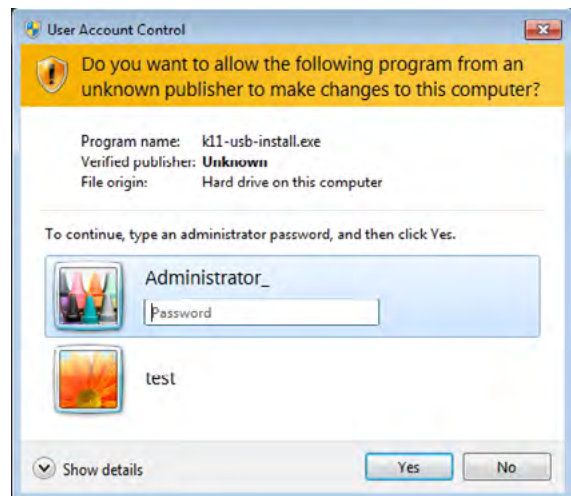
If you are not registered as administrator, a window appears on the screen where you can register as administrator.



Windows XP



Windows 7



Close the „command“ window.

## 4 Program overview

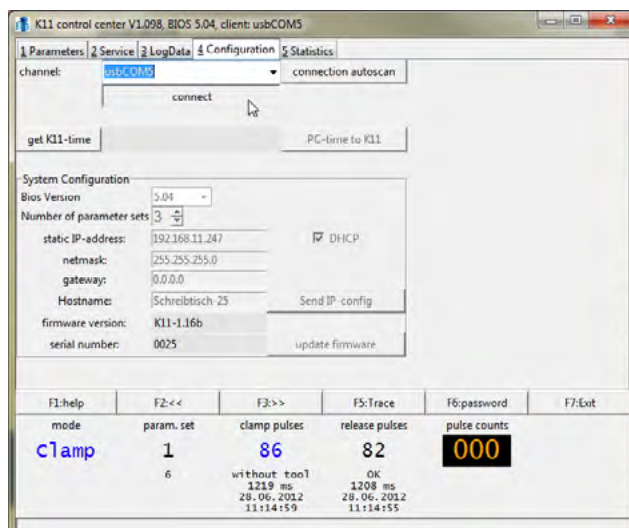
### 4.1 Start of program

Make sure that the controller is supplied with 24V= and that the source is switched on (the power-LED on X1 must glow).

The controller display shows the firmware version.

Connect the K11-U with the PC using the USB A/B cable. Use the plug X6 "USB-Host" of the controller.

The controller display shows: „USB --“.



Click „connection autoscan“.

Now the used USB interface is displayed.

Choose the desired interface and click „connect“

In the title bar of the program window now the used interface is shown, also the firmware version and the serial number of the K11-U.

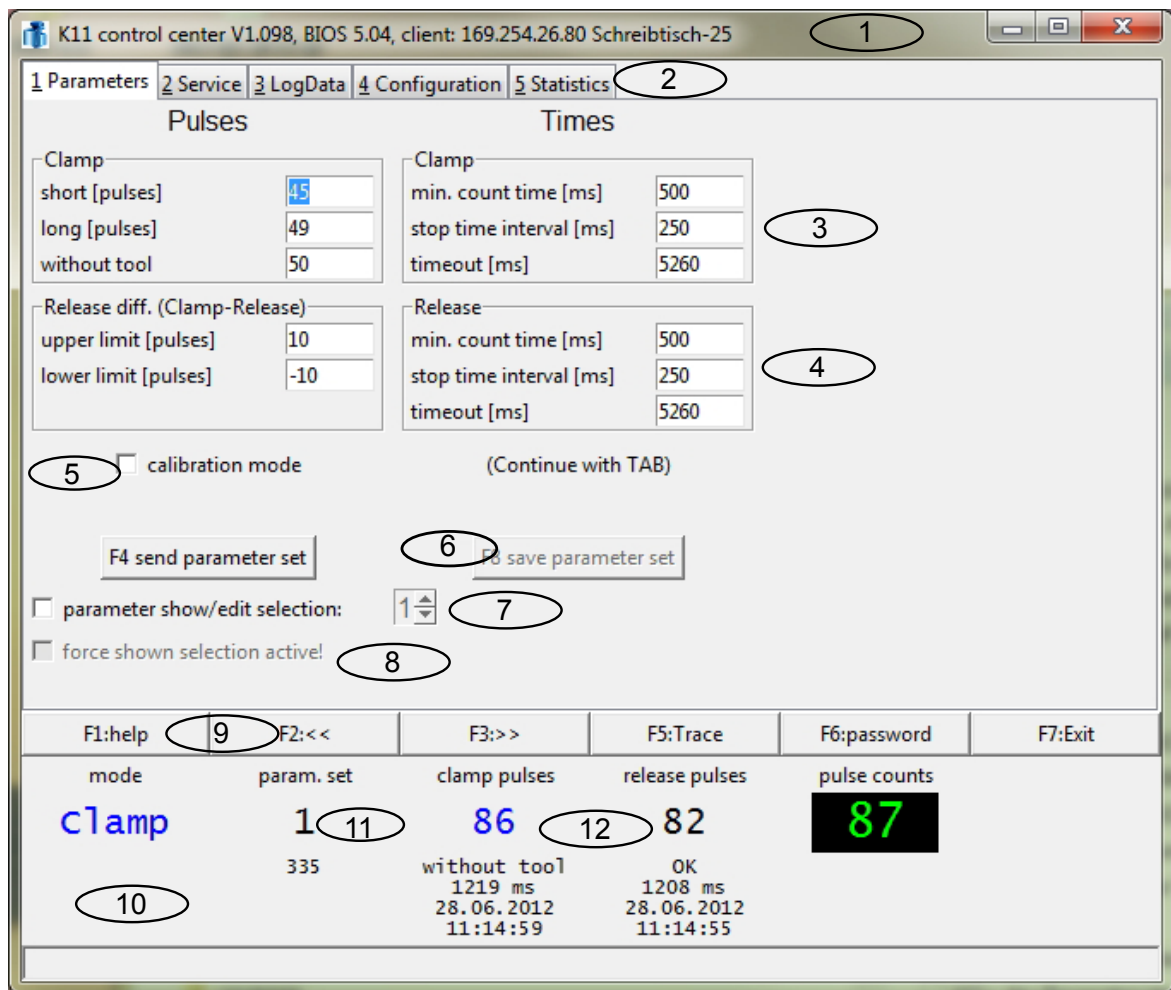
The controller display shows „USB <-->“.

Start the program with double clicking „k11control.exe“.

A program window opens with register card 4 „configuration“.

Now you can configure the K11-U, control and save measured values and signal sequences.

## 4.2 Overview of software window



Visible in all areas:

- 1: Headline with indication of the actual BIOS version and the used interface.
- 2: Register cards
- 9: Button bar, selection with mouse cursor.
  - F1:- Help.
  - F2: << Flip register cards direction left.
  - F3: >> Flip register cards direction right.
  - F5: Trace (activation of the online signal recording).
  - F6: After clicking this button a window opens to enter a password.
  - F7: Exit (closing the program).
- 10: Display of the active process or the last executed process.
- 11: Display of the active parameter set.
- 12: Display of the last measuring results (Number pulses / evaluation)

### 4.2.1 Register card 1 Parameter

- 3: Display and input of clamp parameters.
- 4: Display and input of release parameters.  
For changing the parameters a password is necessary. [Password level CUSTOMER](#)
- 5: Activation of the startup mode. (Pass word required. [Password level OEM](#))  
**In startup mode every process is returned with „OK“. The measured pulses are not monitored. The mode is only used to detect the required parameters and shows always the result „OK“ to avoid eventual security queries of the plc. .**
- 6: With clicking buttons „F4 send parameter set“ all parameters are sent to the controller.  
A plausibility check is executed and fault values are marked.  
The controller works with the sent parameters until the next „power off“.  
Starting with the next „power on“ the old parameters are used again.  
With clicking the button „F8 save parameter set“ the previously sent parameter set is saved in the controller permanently and will also be used after the next „power on“.
- 7: When „Show/edit chosen parameter set“ is activated, two further parameter sets can be shown and edited.
- 8: „Activate shown parameter set“ enables the service technician to overwrite the selection of parameter set of the plc temporarily, (password required, password level OEM).

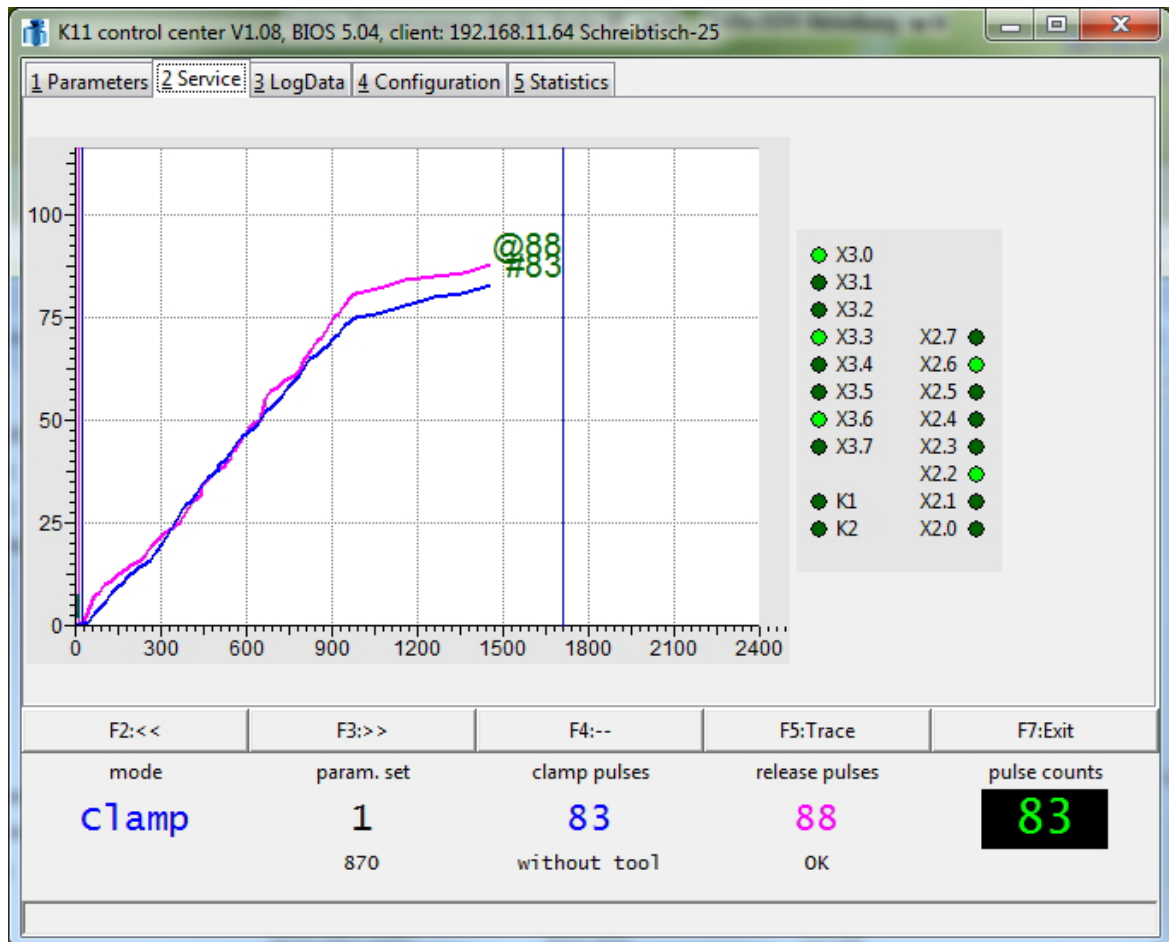
#### Admissible value range

Clamp short:	0 - 5000
Clamp long:	0 - 5000
Clamp without tool	0 - 10000

Release difference upper limit	+ -999
Release difference lower limit	+ -999

Minimal measure time	0 - 10000 [ms]
Stop interval time	10 - 10000 [ms]
Timeout	20 - 30000 [ms]

## 4.2.2 Register card 2 Service

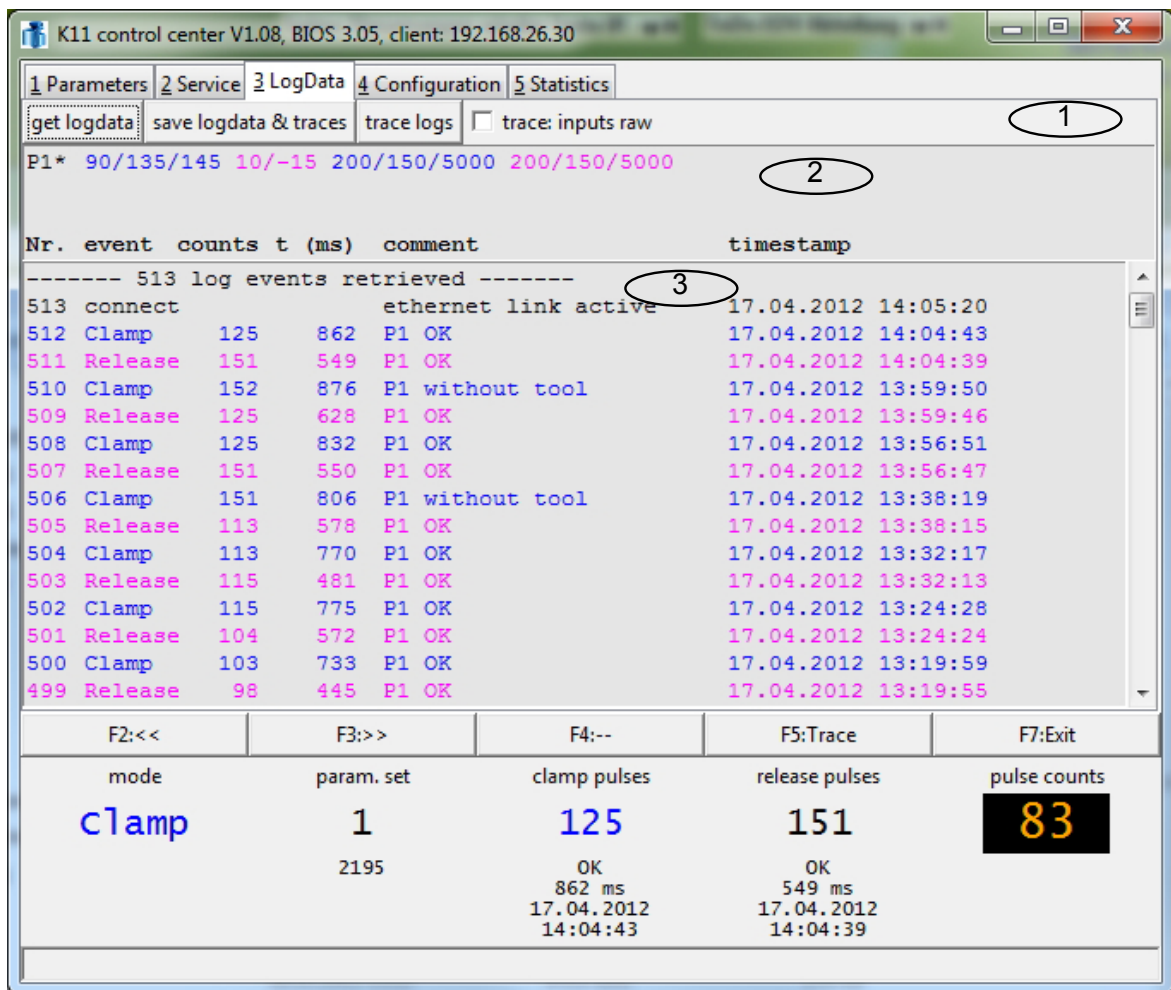


On register card „Service“ the pulses sent by the turbine are shown. The last clamp and release process each are shown with measuring result. Each „good“ valued result is marked with an @.

From this diagram conclusions can be drawn concerning oil flow and used hydraulics.

Aside the in- and outputs are shown. Active in-and outputs are marked with a green LED .

### 4.2.3 Register card 3 LOG data



The controller saves up to 500 measurements including configuring events such as parameter changings, clock time, switching on and off, internal errors etc.

Moreover for up to 16 events signal sequences (traces) are reported.

They are divided in 3 „OK“ measurements, 3 measurements „clamp without tool“ and approx. 10 measurements with errors.

- 1: After building a connection to K11-U you can get all saved data in the controller by clicking the button **get logdata**.



With clicking **save logdata & traces** all logdata and traces are saved. In the correspondant directory several data are stored that are necessary for offline display and evaluation:

Name	Gr...	Typ
000000FE._	1 KB	_-Datei
4F217C36._	1 KB	_-Datei
4F217C46._	1 KB	_-Datei
4F217C56._	1 KB	_-Datei
4F217C67._	1 KB	_-Datei
4F217C87._	1 KB	_-Datei
4F217C98._	1 KB	_-Datei
4F217CA8._	1 KB	_-Datei
4F217CC9._	1 KB	_-Datei
4F217CD5.^	1 KB	^-Datei
4F217CD9._	1 KB	_-Datei
4F217CFA._	1 KB	_-Datei
4F217D0A._	1 KB	_-Datei
4F217D2B.@	1 KB	@-Datei
4F217D27.@	1 KB	@-Datei
00000103.@	1 KB	@-Datei
Test-Log.csv	25 KB	Microsoft Excel-CSV-Datei
Test-Log.raw	14 KB	RAW-Datei

\*.\_, \*.^, \*.@ - trace data

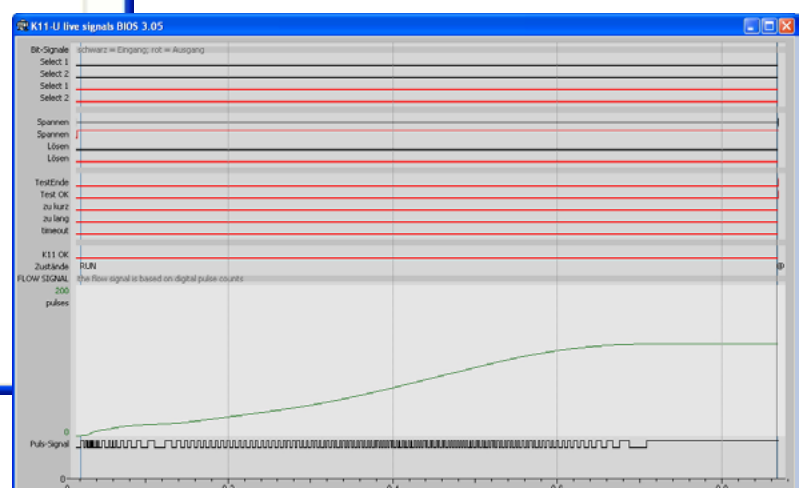
\*.csv - ASCII file with log-data

\*.raw - logdata readable by K11 software

With clicking **trace logs** another window opens, where you can select the reported signal sequences.

trace log		
26.01.2012 17:19:55	OK	
26.01.2012 17:19:51	OK	
26.01.2012 17:19:22	too short	
26.01.2012 17:19:06	too short	
26.01.2012 17:18:33	too short	
26.01.2012 17:18:29	too long	
26.01.2012 17:18:17	too short	
26.01.2012 17:17:44	too short	
26.01.2012 17:17:28	too short	
26.01.2012 17:17:11	too short	
26.01.2012 17:16:39	too short	
26.01.2012 17:16:22	too short	
26.01.2012 17:16:06	too short	
26.01.2012 17:15:50	too short	
01.01.1970 01:04:19	OK	
01.01.1970 01:04:14	too short	

With doubleclick the signal sequence of the event is shown.



2: Here the saved parameters for each parameter set is shown.

3: Display of logdata with event duration, evaluation and time mark.

Nr.	Ereignis	Pulse	t (ms)	Beschreibung	Zeitstempel
30	Lösen	12	1160	P1 zu kurz	14.02.2012 08:30:48
29	Spannen	12	1161	P1 zu kurz	14.02.2012 08:30:42
28	Spannen	4	211	P1 FEHLER	14.02.2012 08:30:37

Number of log entry

Event

Number of measured pulses

Duration of event

Active parameter set during measurement

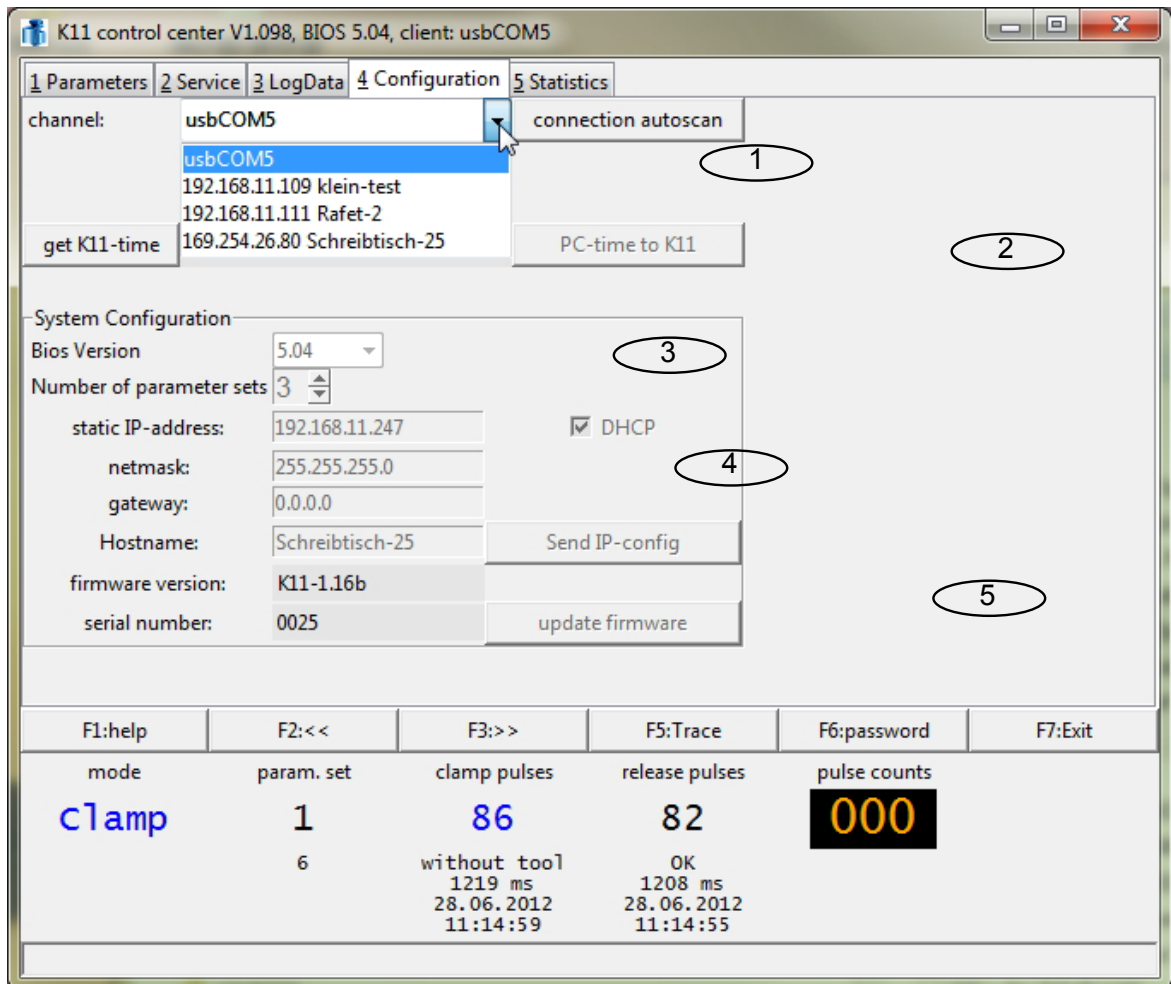
Result of evaluation

Date / time of event

## 4.2.4 Register card 4 Configuration

on register card „4 configuration“ the areas for connection setup, system configuration, network adjustment and firmware update.

Some areas can only be configured by entering a [password](#).



1: Button for connection autoscan. After clicking the button all local controllers are found and indicated in a drop down menu. After controller selection and clicking the button [connect](#) a connection with the controller is generated. Local connected controllers are:

- all controllers connected via USB
- all controllers connected via LAN cable directly to the PC.

Depending on the network adjustments, also all controllers are found, that are attached to the same subnet as the PC, on which the software is running. [See network](#)

- 2: Buttons for readout the internal controller clock and new setting the internal clock. For this the actual clock time of the PC is sent to the K11-U and saved (password required, password level CUSTOMER)
- 3: Dropdown menu for the adjustment of the desired BIOS version. With selecting the corresponding BIOS version a complete compatibility to the previous K11 controller series can be achieved.

The signal in- and outputs and the evaluation of the measurements vary between the different BIOS versions. (Password required, password level OEM)

After adjustment or changings of the BIOS version you must terminate the connection to the controller and disconnect it from voltage supply. When no cables are attached to the sockets X5 and X6 then after reconnection to the voltage supply the following is displayed: „Erase Log & cycle results .....“.
- 4: Configuration area for the network setup. See network.
- 5: Indication of the actual firmware and the serial number (MAC address), button for updating the firmware. (Password required, password level OEM)  
See „Firmware update“.

### 4.3 Minimal configuration for a new K11-U

When launching the initial operation of a new controller, the following adjustments must be carried out:

- Step 1: The BIOS version must be selected. The BIOS versions vary in triggering and result output. Therefore the desired BIOS version must be adjusted that the controller can carry out measurements and bring measure values to reasonable results.
- Step 2: The clock time must be set.
- Step 3: In case the controller should be triggered or adjusted, adjustments for the network configuration must be carried out.  
As standard the controller is defined as DHCP client.  
Required data for the network configuration are available from your system administrator.

## **5 Arranging the monitoring system**

For a successful initial commissioning, the personnel must have read and understood the complete manual of the K11 controller. The following instructions apply especially for the operation of motor spindles.

### **5.1 Clamp- and release control**

With clamp-/release control the hydraulic oil flow is detected by a measuring turbine. The revolutions of the turbine are captured by sensors (PNP- or NPN-type) and measured as frequency by the controller counting the pulse-sequence. For a correct clamp- and release procedure the following conditions must be fulfilled :

1. For a period of time determined by the user it must be waited until the check of the final condition takes place (Stop frequency).
2. Determining the stop frequency
3. The number of counted pulses between start and stop (=oil amount) must be within a pre-determined range.



**If one of these conditions is not fulfilled, the clamping/releasing was not correct. The spindle must be switched off**

The minimum measuring time can be set to “0“ in most cases. Only with systems without continuous oil flow must this time be modified (e. g. 2 spindles connected to one hydraulic supply).



**A pre-adjustment of parameters or parameter specifications by the manufacturer are not possible, because all parameters must be adjusted to the on-site hydraulic system of the machine.**

## 5.2 Determination and setting of parameters

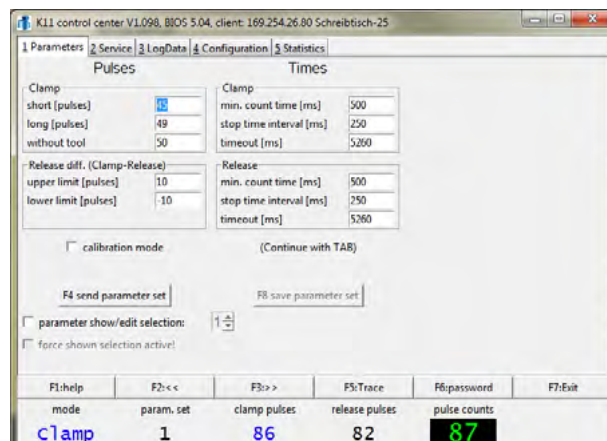
Following conditions must be fulfilled:

- The hydraulic supply must be in operational.
- Clamp and release pressure must be adjusted according to spindle manual.
- The hydraulic circuit and the clamping system must be bled.
- There must be the possibility to clamp and release manually.
- The controller must be **connected electrically**.
- The turbine must be mounted to the release line.
- The minimum configuration of the controller must have taken place.

### Procedural steps:

Step 1: Make sure that the controller is connected correctly and integrated to hydraulic system and the machine control.

Step 2: Connect controller and PC and start the user software as described in „program overview/ start of program“. The entries must be sent to the controller with „F4 send parameter set“ and saved permanently to the controller with „F8 save parameter set“



Step 3: Select register card "1 Parameter" and activate the startup mode. Enter for minimum measuring time 5000, for stop interval time 150 and for Timeout 10000.

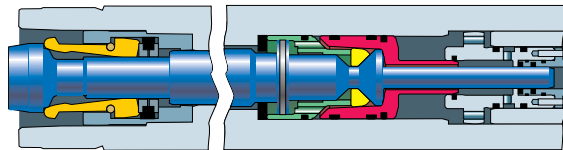


In startup mode every procedure is returned with „OK“. The measured pulses are not monitored. The mode serves only for determination of the required parameters gives always „OK“ as result to avoid possible safety inquiries of the plc.

**During detection of values no automatic tool changes may be executed!**

Step 4: Select register card „LogData“. Read the values indicated during the following procedure and chart them into a table.

Step 5: Operate the clamping system repeatedly without tool (at least 15 times). Note the displayed values for clamping [pulses] and release [pulses]. Subtract each release value from the previous clamp value.



Tool system clamped without tool

K11 control center V1.08, BIOS 3.05, client: 192.168.26.30

1 Parameters 2 Service 3 LogData 4 Configuration 5 Statistics

get logdata save logdata & traces trace logs ☐ trace: inputs raw

P1\* 90/135/145 10/-15 200/150/5000 200/150/5000

Nr.	event	counts	t (ms)	comment	timestamp
527	Clamp	108	808	P1 OK	17.04.2012 14:40:28
526	Release	116	484	P1 OK	17.04.2012 14:40:25
525	Clamp	116	791	P1 OK	17.04.2012 14:31:54
524	Release	102	453	P1 OK	17.04.2012 14:31:50
523	Clamp	102	799	P1 OK	17.04.2012 14:27:32
522	Release	95	436	P1 OK	17.04.2012 14:27:28
521	Clamp	91	731	P1 OK	17.04.2012 14:26:51
520	Release	115	487	P1 OK	17.04.2012 14:26:47
519	Clamp	113	755	P1 OK	17.04.2012 14:18:31
518	Release	100	454	P1 OK	17.04.2012 14:18:27
517	Clamp	99	704	P1 OK	17.04.2012 14:09:30
516	Release	151	547	P1 OK	17.04.2012 14:09:26
515	Clamp	151	875	P1 without tool	17.04.2012 14:08:15
514	Release	124	505	P1 OK	17.04.2012 14:08:12
----- 513 log events retrieved -----					
513	connect			ethernet link active	17.04.2012 14:05:20

F2:<< F3:>> F4:-- F5:Trace F7:Exit

mode param. set clamp pulses release pulses pulse counts

Table 1 (Example)

Nr.	Pulses clamp	Nr	Pulses release	Deviation
45	129	46	138	-9
47	128	48	134	-6
49	132	50	141	-9
:	:			:
:	:			:
:	:			:
:	:			:
55	134	56	140	-6

Ø 131

highest value

If the values vary significantly from one clamping cycle to the next (difference 10 pulses from clamp to clamp or release to release), probably there is still air in the hydraulic lines. The bleeding must be repeated.

- Step 6: Clamp a tool with a tool length within the normal range. This tool is designated as “zero“-tool. For this a clamping force measuring device can be used or a tool that was scanned on the measuring machine. Here too the clamp and release pulses should be counted 15 times and the average value should be calculated.

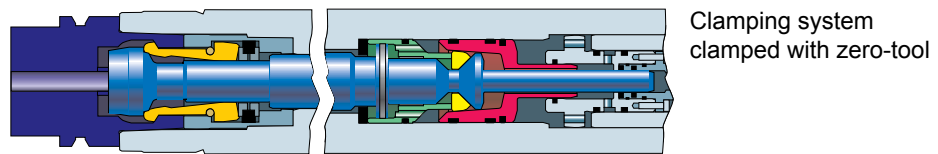


Table 2 (Example)

Nr.	Pulses clamp	Nr	Pulses release	Rel. difference
1	88	2	90	-2
3	91	4	97	-6
5	88	6	90	-2
7	89	8	91	-2
9	87	10	88	-1
:	:			:
:	:			:
:	:			:
15	89	16	93	-4

Ø 89

- Step 7: In released condition place three feeler gauges each 0,2 mm thick between tool and spindle nose. The clamping cone now is 0,2 mm too close to the spindle's planar surface. This tool is labeled “minus“ - tool. The drawbar movement will now be reduced compared with the clamped “zero“-tool.

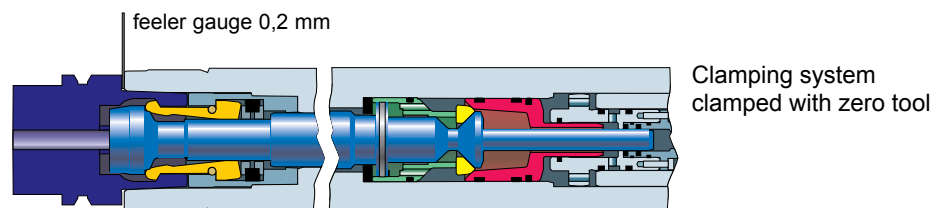




Table 3 (Example)

Nr.	Pulses clamp	Nr	Pulses release	Rel. difference
1	66	2	68	-2
3	70	4	76	-6
5	65	6	67	-2
7	68	8	70	-2
9	68	10	69	-1
:	:			:
:	:			:
:	:			:
15	66	16	70	-4

Ø 67

smallest value

Step 8: Select register card „Parameters“

Enter following values according to the measured and noted values from the 3 previous clamp cycles (Examples from tab. 1-3, values may vary):

### 1. Lower limit for “Clamp/short“:

It results from the lowest measured pulse-number from table 3 minus 5:

$$65 - 5 = \underline{60}$$

**2. Upper limit for “Clamp/long“:**

It results from the difference of the average measured values of “zero“- and “minus-tool“ (tab. 2 and 3), which is added to the value of the “zero“-tool plus 5:

$$89 - 67 = 22; 89 + 22 + 5 = \underline{116}$$

The min. difference between the **Upper limit for Clamp long** and **Limit for Clamp without tool** (see step 5) must be 10. If the difference is less than 10, you must calculate without the “plus 15“:

$$89 - 67 = 22; 89 + 22 = \underline{111}$$

**3. Limit for “Release difference pos.“:**

It results from the smallest indicated release difference from Tab. 3 plus 10:

$$-1 + 10 = \underline{9}$$

**4. Limit for “Release difference neg.“:**

It results from the biggest indicated release difference from Tab. 1 minus 10:

$$-9 - 10 = \underline{-19}$$

**5. Limit for “Clamp without tool“:**

It results from the average value from Tab. 1 minus 10:

$$131 - 10 = \underline{121}$$

If the signal “clamp without tool“ is not used, enter the value 999 into the register card.

Pulses	
<b>Clamp</b>	
short [pulses]	60
long [pulses]	111
clamp w/o tool	121
<b>Release diff. (Clamp-Release)</b>	
upper limit [pulses]	10
lower limit [pulses]	-20

After entering the values, the register card „Parameters“ looks like this (in our example).

Each modified entry must be sent to the controller with “F4 send parameter set” and saved permanently with „F8 save parameter set“.

The values to be entered must fulfil the following conditions:  
 clamp short < clamp long < clamp without tool.

#### Release Difference

Upper limit > lower limit (at which both limit values can be positive as well as negative).

### 5.3 Adjustment of measuring times

The precise calculation of the minimum measuring time is only necessary in case of time-critical clamping cycles. The higher the value for “stop time interval” is entered, the slower the turbine must turn before the signal “Test finished” is indicated.

As standard value a stop frequency of 150 is recommended.

“Minimum measuring time” is the time set to count all pulses, however, without considering the “stop time interval”. The signal “Test finished” is only read out after the minimum measuring time has elapsed and after the subsequent check whether the stop time interval was underrun.

For example, the following values are shown:

**Min. count time - 250ms / Stop interval - 150ms / Timeout - 5000ms.**

Procedural steps *(only for time-critical applications)*:

Step 9: Select register card „Times“ and enter the following values:

Clamp:	Minimum measuring time	= 0
	Stop time interval	= 150
	Timeout	= 5000

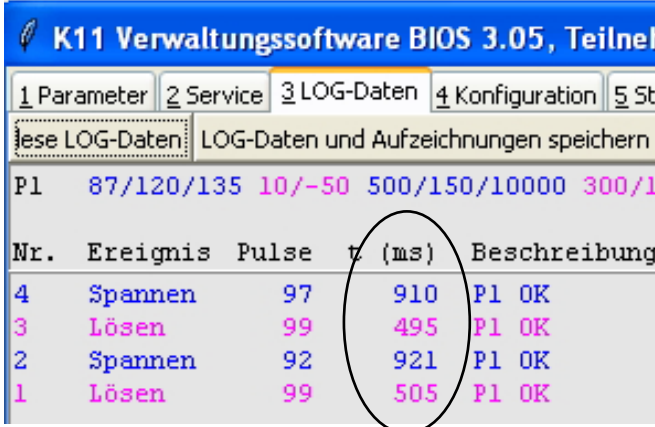
Release same as „Clamp“

Times	
<b>Clamp</b>	
min. count time [ms]	0
stop time interval [ms]	150
timeout [ms]	5000
<b>Release</b>	
min. count time [ms]	0
stop time interval [ms]	150
timeout [ms]	5000

After entering the values, the register card „Times“ looks like this (in our example).

Step 10: Select register card „3 Logdata“.

Step 11: Execute several clamp/release cycles (at least 15) without tool. Note the displayed times and subtract the adjusted stop time interval (150) from the longest time. Enter two-thirds of the result as minimum measuring time into register card „Times“.



Nr.	Ereignis	Pulse	t (ms)	Beschreibung
4	Spannen	97	910	P1 OK
3	Lösen	99	495	P1 OK
2	Spannen	92	921	P1 OK
1	Lösen	99	505	P1 OK

After the first clamping cycle, the register card „Service“ looks like this (in our example)

Table 4 (Example)

Nr.	Time [ms]
1	505
2	921
3	495
4	910
5	:
:	:
:	:
:	:
15	905

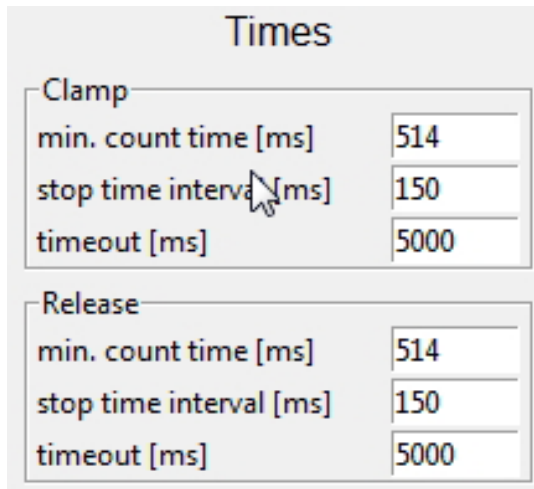
maximum value

Longest time = 921 ms

Stop interval = 150 ms

$$\frac{2 \times (921 \text{ ms} - 150 \text{ ms})}{3} = 514 \text{ ms}$$

**Min. count time to be entered = 514 ms.**



Times	
<b>Clamp</b>	
min. count time [ms]	514
stop time interval [ms]	150
timeout [ms]	5000
<b>Release</b>	
min. count time [ms]	514
stop time interval [ms]	150
timeout [ms]	5000

After entering the minimum measuring time, the register card „Times“ looks like this (in our example).

## 5.4 Check for plausibility

During entering of values into the parameter boxes a monitoring takes place in terms of compliance with the value ranges. Faulty values are marked red and must be changed.

Admissible value ranges:

clamp short:	0 - 5000
clamp long:	0 - 5000
clamp without tool	0 - 10000

Release difference upper limit	+999
Release difference lower limit	+999

Min. count time	0 - 10000 [ms]
Stop time interval	10 - 10000 [ms]
Timeout	20 - 30000 [ms]

By activating the button „F4 - send parameter set“ a plausibility check of the values is executed.

The following conditions are checked:

The values must be within their value range

clamp short < clamp long < clamp without tool

release difference upper limit > release difference lower limit

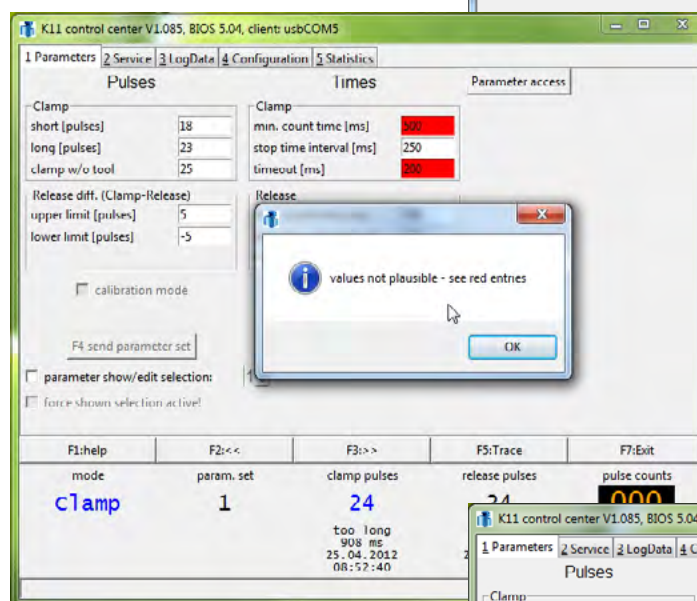
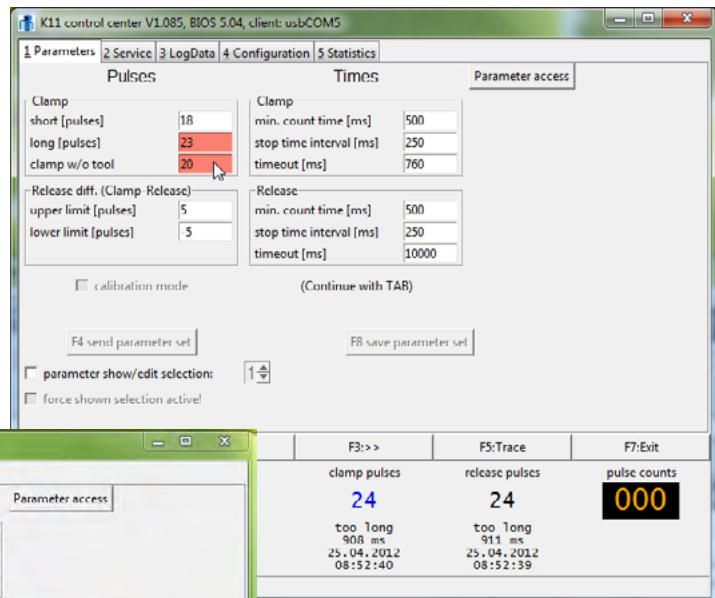
Timeout ≥ Min. count time + Stop time interval + 10 [ms]

Faulty values (pairs of values) are marked red and must be changed. When faulty values are detected, the parameters are not sent to the controller. A repeated sending is only possible after value change.

The value for Timeout is preset with a minimal possible. This value is marked yellow and should be checked.

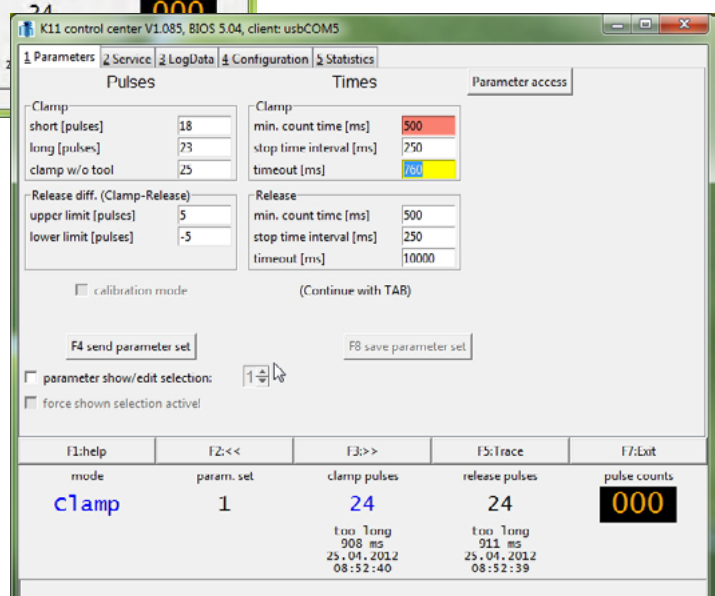
The permanent storage of parameters is only possible after successful sending.

Faulty values:  
here „clamp without tool“ is  
smaller than „clamp long“.



Faulty values:  
here „timeout“ is smaller than  
„Min. count time“.

Automatically changed value for  
„Timeout“.



## 6 Communication with the control system

### 6.1 Communication with the control system (BIOS 3.05)

By using clearance signals for “Test finished” and “Test OK” a defined flowchart, that is only depending on events and conditions, results from the interaction with external controls or automation devices. Time warps are not required and mostly lead to mismeasurements.

Evaluation of feedback signals:

#### „Test ok!“ (X3.4) **Techn. data / connections**

- **Clamping:** The spindle can be used with max. speed without restriction. Tool is clamped correctly.
- **Release:** The tool is released correctly and can be removed from the fitting. An automated change cycle can be continued.

#### “Clamped without tool!“ (X3.4 + X3.6)

- **Clamping:** The spindle was clamped without a tool and so the max. speed is restricted to 100 r.p.m.

#### „Clamped too short / too long!“ (X3.5 / X3.6)

- **Clamping:** The spindle must not rotate! Danger of loosened tool that could hurl away uncontrollably!
- **Releasing:** The tool is not released correctly and cannot be removed out of the tool interface. An automatic tool exchange cycle must be aborted.

#### „Timeout!“ (X3.7)

The error “timeout” can be caused by three different problems, which can be classified on the service display by the number of pulses:

**Case 1:** A triggering of the K11 over X2.0 or X2.1 takes place, but during the time set in “timeout” there are no pulses from the turbine. An error message will not occur until timeout is reached.

Service display for clamping and releasing mostly = Null.

**Conclusion: Check hydraulics and valves!**

**Case 2:** A triggering of the K11 over X2.0 or X2.1 takes place, but during the time set in “timeout” pulses are constantly sent from the turbine, the stop frequency does not stop the measurement procedure. “Test finished” is not displayed. An error message will not occur until Timeout is reached.

Service display for clamping and releasing mostly = very high values

**Conclusion: Check hydraulics and valves! Leakage possible!**

**Case 3:** A triggering of the K11 over X2.0 or X2.1 takes place, but is stopped before the K11 signals "Test finished". An error message occurs immediately after triggering is stopped.

**Conclusion:** The reason are often programmed time warps or defective relays.

## PLC signals to the controller K11-U

### For function clamp/release:

The input for manual or automatic clamping is **input X2.0** on **plug X2** of the K11-U-controller. The input can be triggered by the PLC or a switch 24 V.

The input for manual or automatic release is **input X2.1** on **plug X2** of the K11-U-controller. The input can be triggered by the PLC or a switch 24 V.

For clamping the tool, the signal must be +24V to input X2.0, holding as long as the K11-U confirms "Test finished" (X3.3) or "Timeout" (X3.7). The clamp-input must be blocked while the spindle is in rotation.

For releasing the tool, the signal must be +24V to input X2.1, holding as long as the clamping system is intended to be open. The release-input must be blocked while the spindle is in rotation.

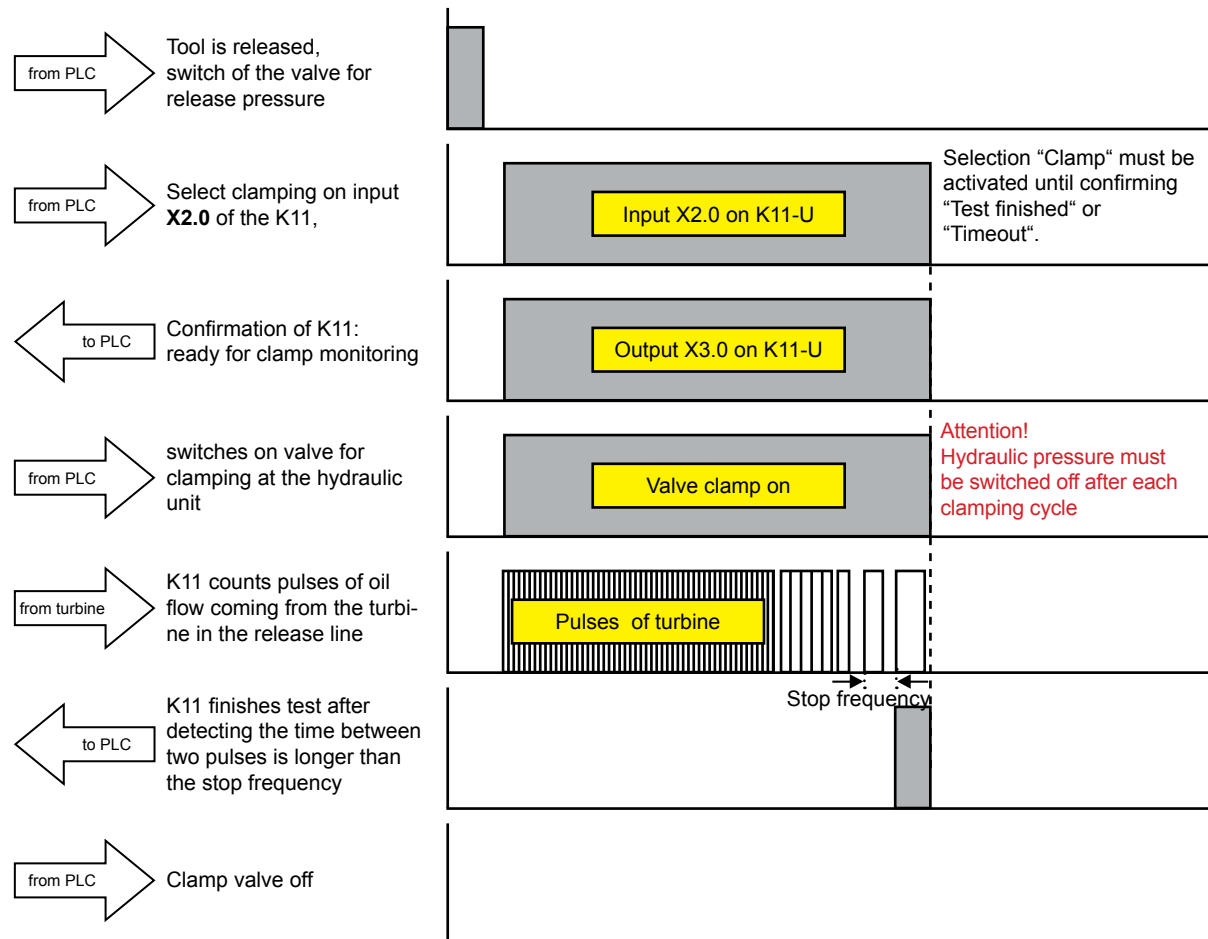
If **no function** is selected, the controller K11-U turns over to condition **IDLE** and shows the results of the last clamp/release process (when there has been any since the switching on).

The selected function and the result of the function selection are edited on the digital outputs.



## 6.2 Control sequence (BIOS 3.05)

### Logic for “clamp tool”, starting position: tool interface released

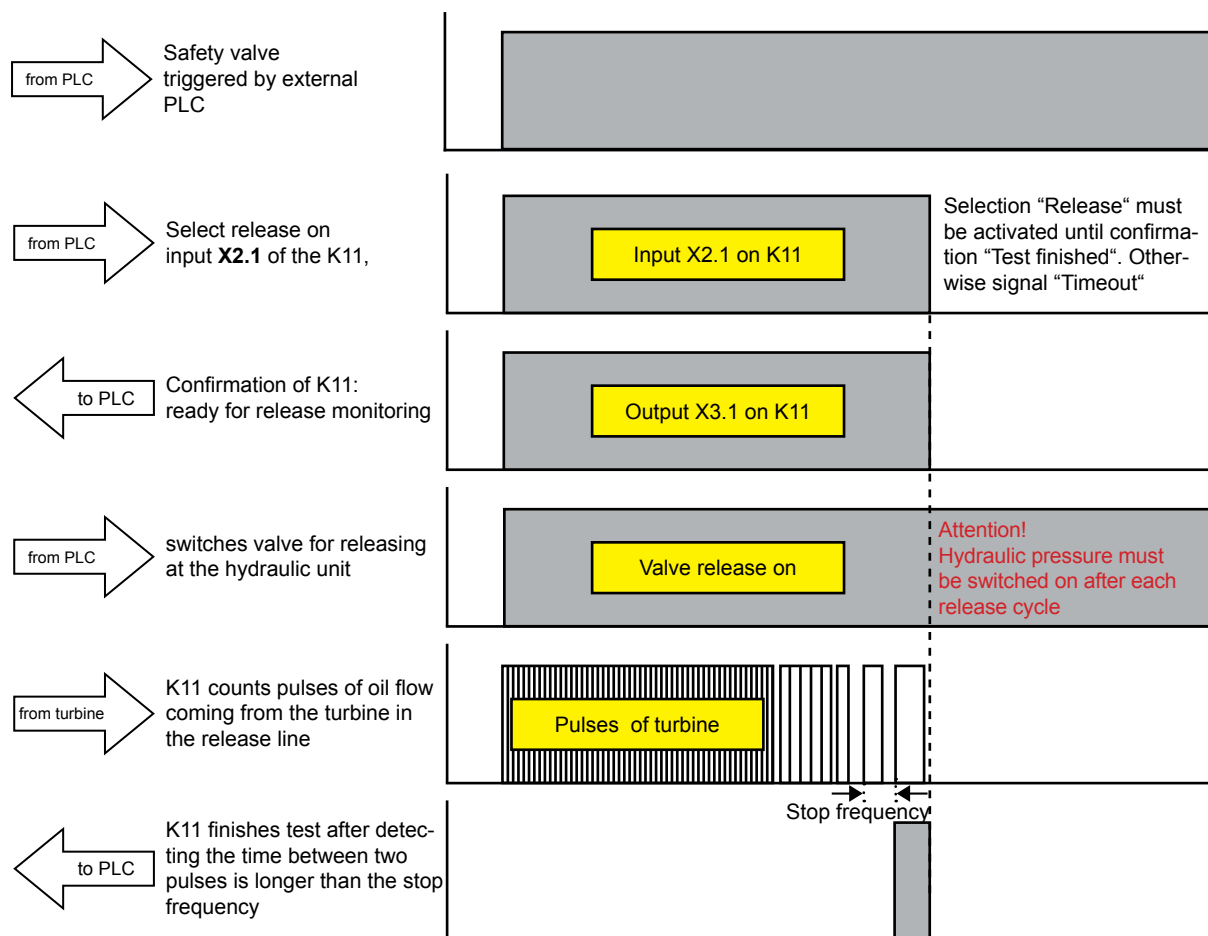


### Results of clamp-monitoring

	<b>O0</b> Clamp X3.0	<b>O1</b> Release X3.1	<b>O3</b> Test finished X3.3	<b>O4</b> TestOK X3.4	<b>O5</b> Clamped too short X3.5	<b>O6</b> Clamped too long X3.6	<b>O7</b> Timeout X3.7	<b>Result</b>	<b>Allowed spindle operation</b>
	X	-	X	X	-	-	-	Test OK	No speed limit
to PLC ←	X	-	X	X	-	X	-	Clamped without tool	Max. speed 100 rpm
	X	-	X	-	X	-	-	Clamped too short	Do not run spindle
	X	-	X	-	-	X	-	Clamped too long	Do not run spindle
	X	-	X	-	-	-	X	Timeout with clamping	Do not run spindle
	X	-	-	-	-	-	X	Stop of selection (I0) before test end	Do not run spindle

When selection (X2.0) is stopped also “Test end” (X3.3) is set to default.

## Logic for “release tool”, starting position: tool interface clamped



## Results for release-monitoring

	O0 Clamp X3.0	O1 Release X3.1	O3 Test finished X3.4	O4 TestOK X3.4	O5 Clamped too short X3.5	O6 Clamped too long X3.6	O7 Timeout X3.7	Result	Spindle condition
← to PLC	-	X	X	X	-	-	-	Test OK	Tool released
	-	X	X	-	X	-	-	Release too short	Tool not released
	-	X	X	-	-	X	-	Release too long	Tool released
	-	X	X	-	-	-	X	Timeout with Release	Tool not released
	-	X	-	-	-	-	X	Stop of selection (I1) before test end	Tool not released

When selection (X2.1) is stopped also “Test end” (X3.3) is set to default.

**Attention: Never set spindle into operation with released clamping system!**

## 6.3 Communication with the control system (Bios 5.04)

By using clearance signals for “Test finished” and “Test OK” a defined flowchart, that is only depending on events and conditions, results from the interaction with external controls or automation devices. Time warps are not required and mostly lead to mismeasurements.

### Evaluation of feedback signals:

#### “Clamped ok!” (X3.4) See „[Techn. data / connections](#)“

- **Clamping:** The spindle can be used with max. speed without restriction. Tool is clamped correctly.

#### “Released ok!” (X3.5)

- **Releasing:** The tool is released correctly and can be removed from the fitting. An automated change cycle can be continued.

#### “Clamped without tool!” (X3.6)

- **Clamping:** The spindle was clamped without a tool and so the max. speed is restricted to 100 r.p.m.

#### “Timeout!” or “Error!” (X3.7)

The error “timeout” can be caused by five different problems, which can be classified on the service display by the number of pulses:

**Case 1:** A triggering of the K11-U over X2.0 takes place, but during the time set in “timeout” there are no pulses from the turbine. An error message will not occur until timeout is reached.

Service display for clamping and releasing mostly = Null.

**Conclusion: Check hydraulics and valves!**

**Case 2:** A triggering of the K11-U over X2.0 takes place, but during the time set in “timeout” pulses are constantly sent from the turbine, the stop frequency does not stop the measurement procedure. “Test finished” is not displayed. An error message will not occur until timeout is reached.

Service display for clamping and releasing mostly = very high values

**Conclusion: Check hydraulics and valves! Leakage possible!**

**Case 3:** When “Clamp” is selected, too less or too many pulses are sent. The tool is not clamped properly and the spindle must not run.

**Case 4:** When “Release” is selected, too less or too many pulses are sent. The tool is not released properly and cannot be taken out of the interface. An automatic tool change cycle must be aborted.

**Case 5:** **General error:** In case of this error messages no measuring process is carried out until the error is removed. The detailed error message is shown in the display of the controller and in the PC software.

## PLC signals to the controller

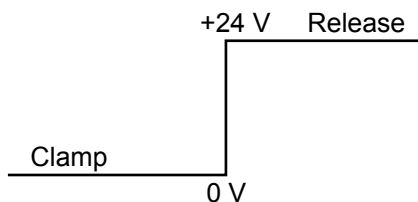
### For function clamp/release:

The input for manual or automatic clamping and release is **Input X2.0** of the K11-U controller. The input can be triggered by the PLC or a switch 24 V. See „**Techn. data / connections**“

For releasing the tool, the signal must be +24V, holding as long, as the tool system is intended to be open. This input must be blocked, when the spindle is running.



**Attention: Never switch on voltage to Input X2.0, when the spindle is running! The tool system will release the tool and it will hurl away uncontrollably. There is a danger to life and material!**

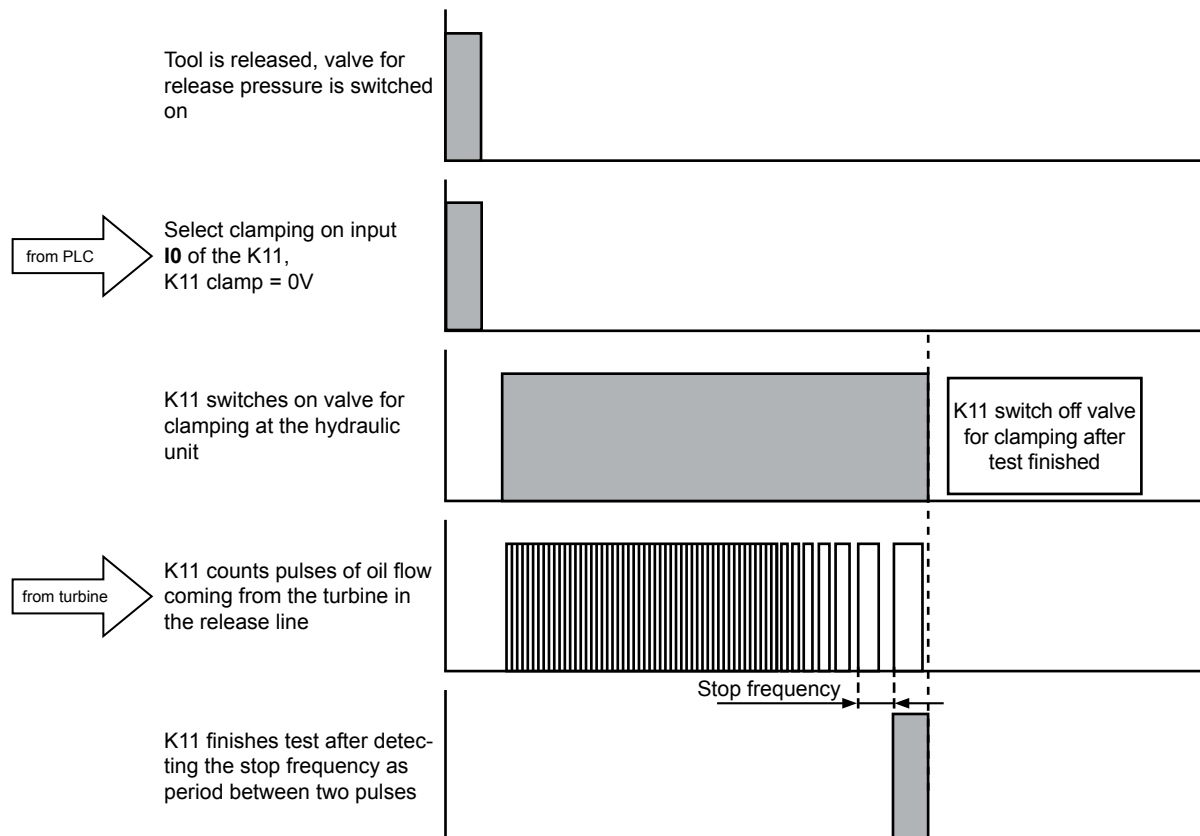


If the signal is set back to 0V, the tool system will clamp again. Even if only a short pulse (24 V) is applied to the input and interrupted immediately afterwards (0 V), the release cycle definitely will be finished completely, before it will be switched over to „clamp“.

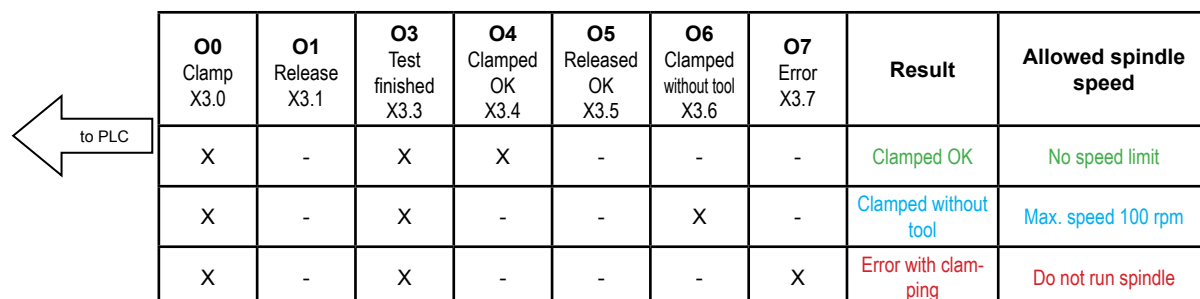
**Input X2.0:** When the tool system is released, the release line stays pressurised as long as the input X2.0 receives the clamp-signal again. After clamping, the pressure is switched off at the hydraulic line for clamping.

## 6.4 Control sequence (BIOS 5.04)

### Logic for “clamp tool”, starting position: tool interface released

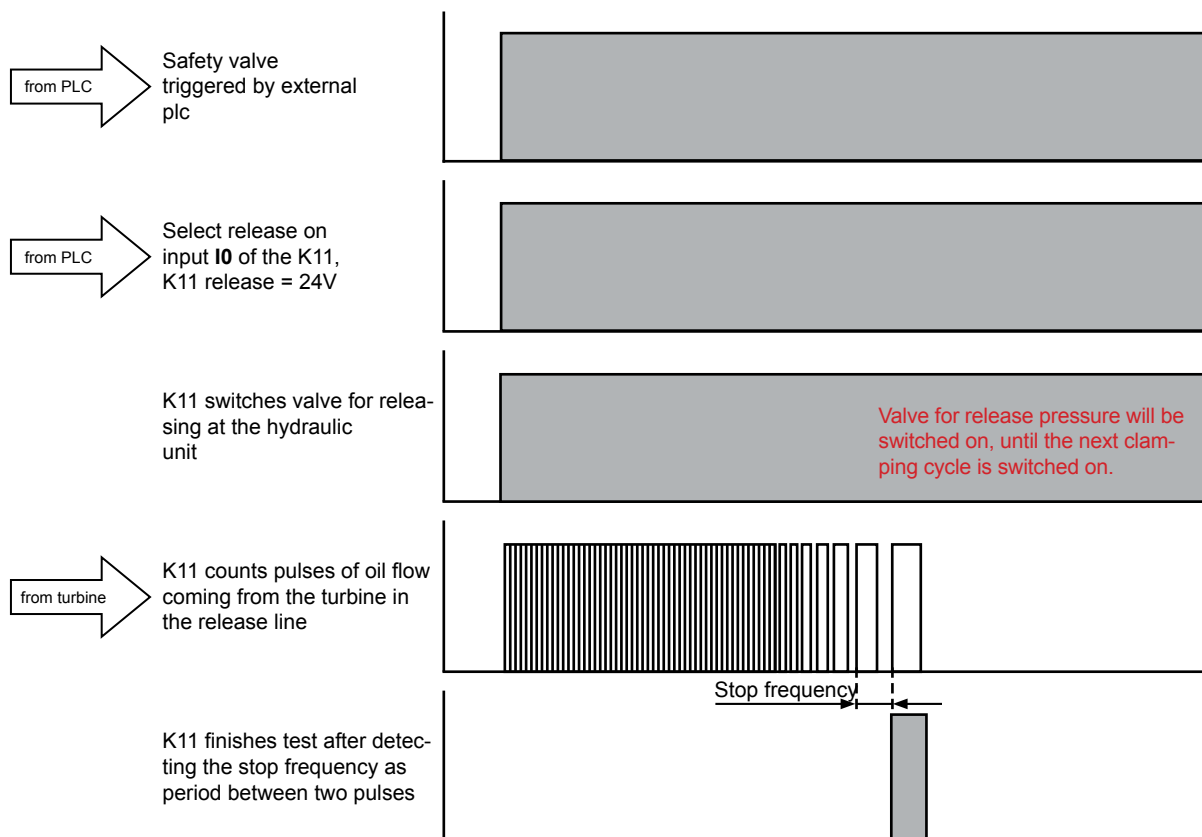


### Results of clamp-monitoring



O0 Clamp X3.0	O1 Release X3.1	O3 Test finished X3.3	O4 Clamped OK X3.4	O5 Released OK X3.5	O6 Clamped without tool X3.6	O7 Error X3.7	Result	Allowed spindle speed
X	-	X	X	-	-	-	Clamped OK	No speed limit
X	-	X	-	-	X	-	Clamped without tool	Max. speed 100 rpm
X	-	X	-	-	-	X	Error with clam- ping	Do not run spindle

## Logic for “release tool”, starting position: tool interface clamped



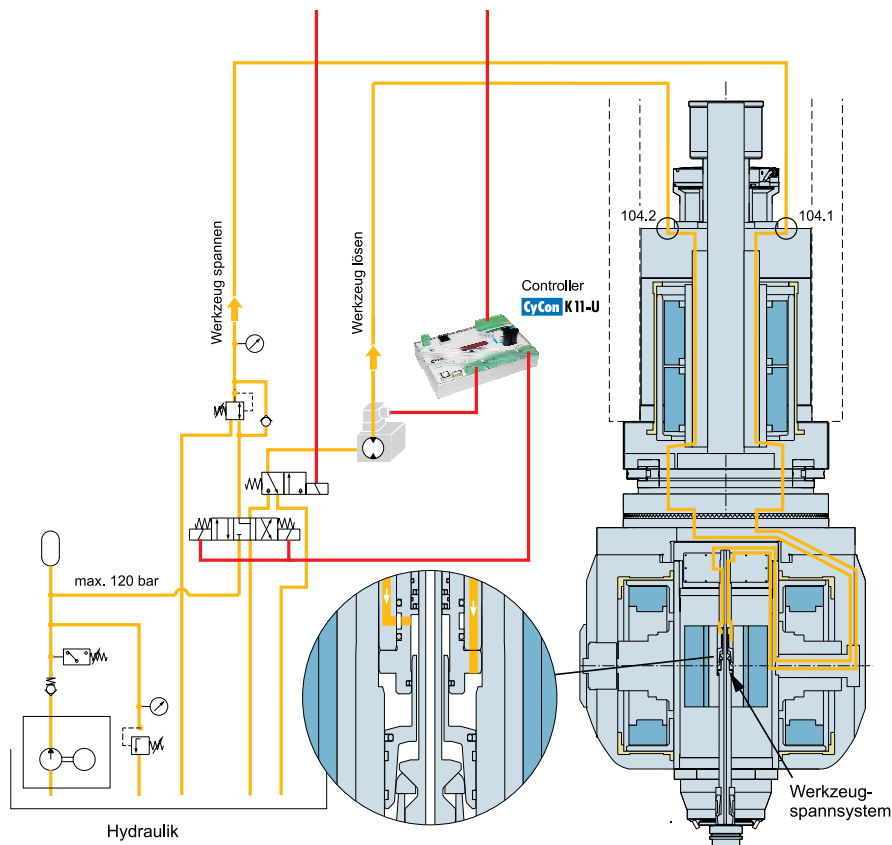
## Results for release-monitoring

	O0 Clamp X3.0	O1 Release X3.1	O3 Test finished X3.3	O4 Clamped ok X3.4	O5 Released ok X3.5	O6 Clamped without tool X3.6	O7 Error X3.7	Result	Spindle condition
← to PLC	-	X	X	-	X	-	-	Released OK	No spindle clearance
	-	X	X	-	-	-	X	Error with releasing	No spindle clearance

**Attention: Never set spindle into operation with released clamping system!**

## 7 Change of parameter set

In machines equipped with automatic spindle or milling head exchange for each changing process also the tool clamping system is always exchanged. This is always operated by the same clamp and release line and monitored by the same turbine. So it is necessary to store for each tool clamping system an own parameter set to the controller K11-U.





A change of a parameter set may only be executed for a complete tool clamping system because

Generally it is possible after a release process to request a change of parameter set. But it is not allowed because of mechanical matters to move a released clamping system without pending release pressure. So a change of parameter set is only reasonable after a clamping process.

You can build up to 3 parameter sets in the controller which can be activated by the plc via the inputs X2.2 and X2.3. A feedback of which parameter set is active is carried out via the outputs X2.6 and X2.7.

If only one parameter set is configured, these in- and outputs are without effect. If more than one parameter set is configured, the inputs are checked for their status and the corresponding parameter set is activated.

If more than one parameter set is configured and no signal is applied to the inputs X2.2 or X2.3, the output X3.7 is set to „error / timeout“ and a required clamp or release process will **not** be executed.

If 2 parameter sets are configured and parameter set 3 is selected (X2.2 + X2.3), the output X3.7 is set to „error / timeout“ and a required clamp or release process will **not** be executed.

A change of a parameter set is only executed during an „Idle“ - phase of the controller. That means when during a measurement a change of parameter set is requested, it will be executed directly after finishing of the active measurement (X3.3 Test finished or X3.7 time out). Also the feedback of the active parameter set does not change until „Test finished“ or „time out“ is displayed.

If during a measurement a voltage drop should occur and if after reset of the controller another parameter set is selected, the error output X3.7 is set. The aborted parameter set is resent to the outputs X2.6/X2.7. No measurement will be executed until the aborted parameter set is selected again.

If after a voltage drop a change of parameter set should be executed, at first the parameter set must be selected which was active during the voltage drop. Subsequently the parameter set can be changed.



If all preconditions for the change of parameter set are fulfilled, the last process of the requested parameter set is restored from the memory. The controller internally takes over the condition of the stored process and all outputs are set accordingly. The stored pulses are used for the calculation of the next process.

If a parameter set is selected for which no measure result exists yet, the number of pulses is assumed with 0 and used for further calculation.

Examples:

At first a clamp process was executed with active parameter set 2 (line 6). Then it was switched over to parameter set 3 (line 7) followed by a clamp and release process. Then it was switched over to parameter set 1 with following clamp and release.

The screenshot shows the 'LogData' tab of the K11 control center. The log lists events with their timestamps and comments. Several events are circled in red:

- Line 6: Clamp (72 pulses, 1206 ms) - P2 too short
- Line 7: Release (75 pulses, 1223 ms) - P2 too long
- Line 13: Change parameter set (P2)
- Line 14: Release (72 pulses, 1230 ms) - P2 OK

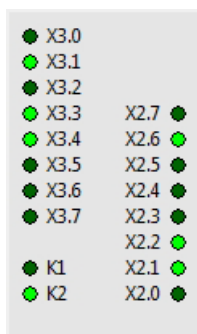
The summary table at the bottom shows the current state:

mode	param. set	clamp pulses	release pulses	pulse counts
clamp	3	72	66	72
	6	too short	too short	

File CRC is OK

In line 13 it was switched over again to parameter set 2 and the and the outputs are set according to the last result of parameter set 2. See line 6.

● X3.0	
● X3.1	
● X3.2	
● X3.3	● X2.7
● X3.4	● X2.6
● X3.5	● X2.5
● X3.6	● X2.4
● X3.7	● X2.3
	● X2.2
● K1	● X2.1
● K2	● X2.0



The following release (line 14) is cleared with the clamp value from line 6 and is evaluated according to the adjusted parameters. The outputs are set according to the evaluation.

(line 6) clamp 72 pulses minus (line 14) release 72 pulses = 0, in parameters P2 defined limits for release +2 / -2.

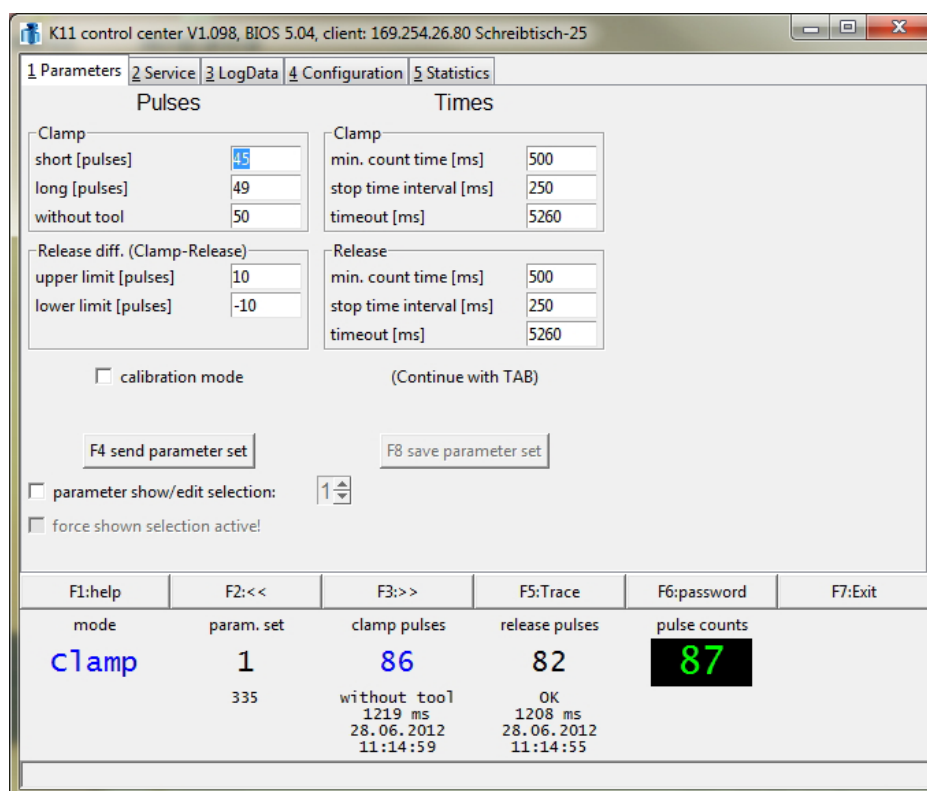
**Evaluation +2 > 0 > -2 = release ok.**

Each parameter set is adjusted as described in chapter „[Arranging the clamping monitoring](#)“.

Generally on register card 1 „parameters“ always the active parameter set is shown. With activation of „show/edit selected parameter set“ and the according selection box, you can display and edit another than the active parameter set (Password required, [password level CUSTOMER](#))

For the service technician and for startup there is the possibility to overwrite the external selection of the parameter set (signal to X2.2 and X2.3). For this activate at first „show/edit selected parameter set“, choose the desired parameter set and activate it with „activate indicated parameter set“.

(Password required, [password level OEM](#))



## 8 Additional functions

### 8.1 Data storage on USB-Stick

For quick data store purposes (parameters, logdata and traces) use the interface X7.

Preconditions are:

- 1.) On interface X6 no cable must be plugged.
- 2.) You need an USB 2.0 storage stick.
- 3.) The data system on the stick must be FAT or FAT32.
- 4.) The controller must be switched on and be in condition „idle“.

Insert the stick to plug socket X7 on the controller.

In the controller display appears: „**USBstick writing**“ and after a short time: „**Files copied. Remove Stick**“. In case of error the message appears „**stick problem, e. g. full**“ (see Error messages).

Remove the USB stick.

On the stick a directory is created: „K11-U“

The data in this directory can be read out by the PC software.

For this start the PC software. Do **not** build a connection to the controller K11 here.

Open register card „LogData“. Hit button „get logdata“.

The „file open“ dialogue (Windows) appears.

Open the new directory K11-U and mark the file „LOGFILE.RAW“.

Hit the „open“ button. The stored LOG entries are now shown.

The directory with content can be renamed and saved to any desired location.

The file „LOGFILE.RAW“ can be renamed, but extension „.RAW“ must be preserved.

All other data must not be changed. They must always remain in the same directory as the „.RAW“ file, with which they were generated by the controller.

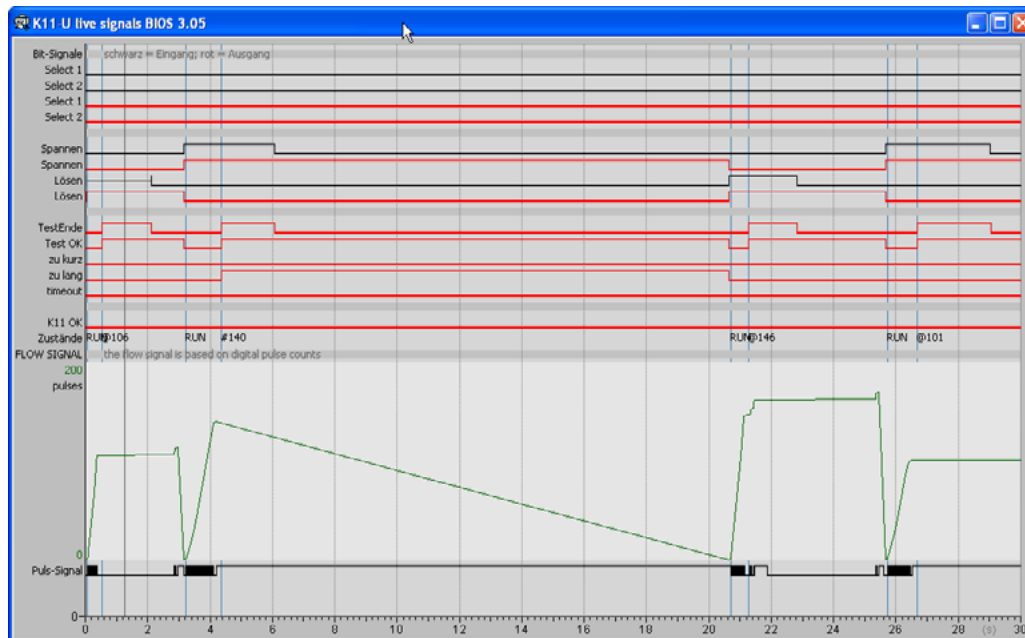
Name ▲	G...	Typ
4F2F76A2.#	5 KB	#-Datei
4F2F765F.^	5 KB	^-Datei
4F2F769C._	3 KB	_-Datei
4F2F7611.@	3 KB	@-Datei
4F2F7616.@	5 KB	@-Datei
4F2F7659._	3 KB	_-Datei
4F0572AB.E	2 KB	E-Datei
4F0572AD.^	4 KB	^-Datei
4F0572B2._	3 KB	_-Datei
4F0572FC.@	3 KB	@-Datei
LOGFILE.RAW	6 KB	RAW-Datei

**Attention!** If there is a directory K11-U on the stick from a former data storage, all contained data in this directory are overwritten. The old and new data set becomes defective. So the existing directory „K11-U“ on the stick must be renamed or deleted before further usage.

## 8.2 Diagnosis possibilities

When you have build a connection with the controller you can start with „F5:Trace“ a live monitoring of all input and output signals and the signals from the turbine.

A graphic window opens where the signals in chronological sequence are shown.



Which input and output signals are shown is depending from the used BIOS version. Here the display for **BIOS 3.05**.

The input signals on K11-U are displayed in black, output signals in red.

Select 1(black)	X2.2	Selection Parameter set 1
Select 2(black)	X2.3	Selection Parameter set 2
Select 1(red)	X2.6	Parameter set 1 active
Select 2(red)	X2.7	Parameter set 2 active
Clamp	X2.0	Selection Clamp
Clamp	X3.0	Clamp active
Clamp relay	X10.0	Clamp relay active
Release	X2.1	Selection Release
Release	X3.1	Release active
Release relay	X10.3	Release relay active
Test finished	X3.3	Measurement finished
Test ok	X3.4	Measurement successful
too short	X3.5	too less pulses measured
too long	X3.6	too much pulses measured
timeout	X3.7	Measurement not finished until Timeout is reached.
Signal of pulses		Display of pulses from the turbine

With Bios 5.04 the following signals are indicated:

Select 1(black)	X2.2	Selection Parameter set 1
Select 2(black)	X2.3	Selection Parameter set 2
Select 1(red)	X2.6	Parameter set 1 active
Select 2(red)	X2.7	Parameter set 2 active
Release	X2.0	Selection Release
Clamp	X3.0	Clamp active
Clamp relay	X10.0	Clamp relay active
Release	X3.1	Release active
Release relay	X10.3	Release relay active
Test finished	X3.3	Measurement finished
Clamp ok	X3.4	Clamp successful
Release OK	X3.5	Release successful
without tool	X3.6	Clamped without tool
Timeout	X3.7	Measurement not finished until Timeout is reached.
Signal of pulses		Display of pulses from the turbine

By means of this graph chronological sequences during tool exchange can be monitored. It can be examined whether selections were executed correctly by the plc. By means of the pulse progress problems in the hydraulic system can be determined.

### Operation of „Live Trace“:

Stop/continue recording with „Return“.

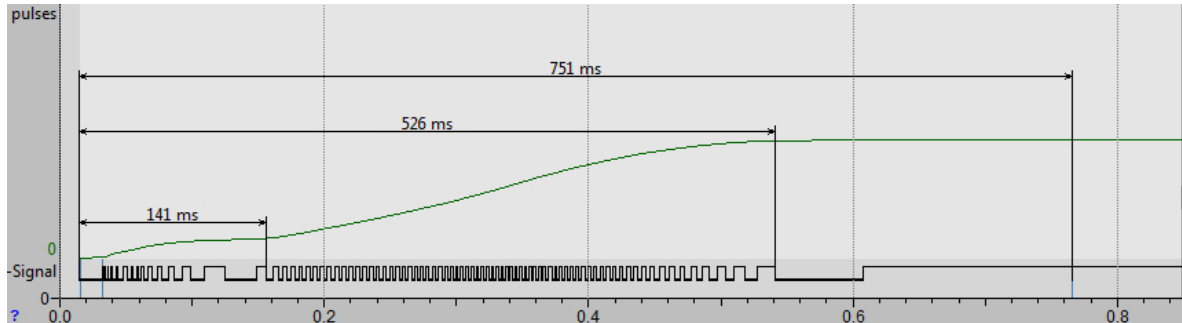
For zoom use the mouse wheel or the buttons Page up / Page down.

Set a mark with „space“.

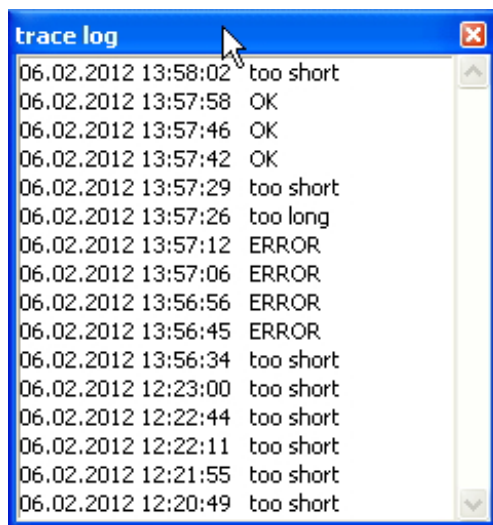
Clear a window and restart recording with „Pos 1“ button.

In case of enlarged presentation you can shift the signal sequence on the time line by clicking and holding the left mouse button or with cursor buttons „left/right“.

You can gauge times by clicking in the graph in the desired start position with the left mouse button and track with pressed mouse button to the desired end position.



On register card „LogData“ with clicking the button „trace Logs“ a window opens where all stored reports (traces) of the controller are displayed. With double click an entry this entry is opened and displayed in a graphic window. The handling is similar to the live graphic window.



Double click on an entry opens it in a graphic window.

If you work offline all stored traces are shown in the directory. See „Data storage on a USB-Stick“.

## 8.3 Passwords

Some functions and configuration facilities are protected by passwords to prevent unintended changes by unauthorised people.

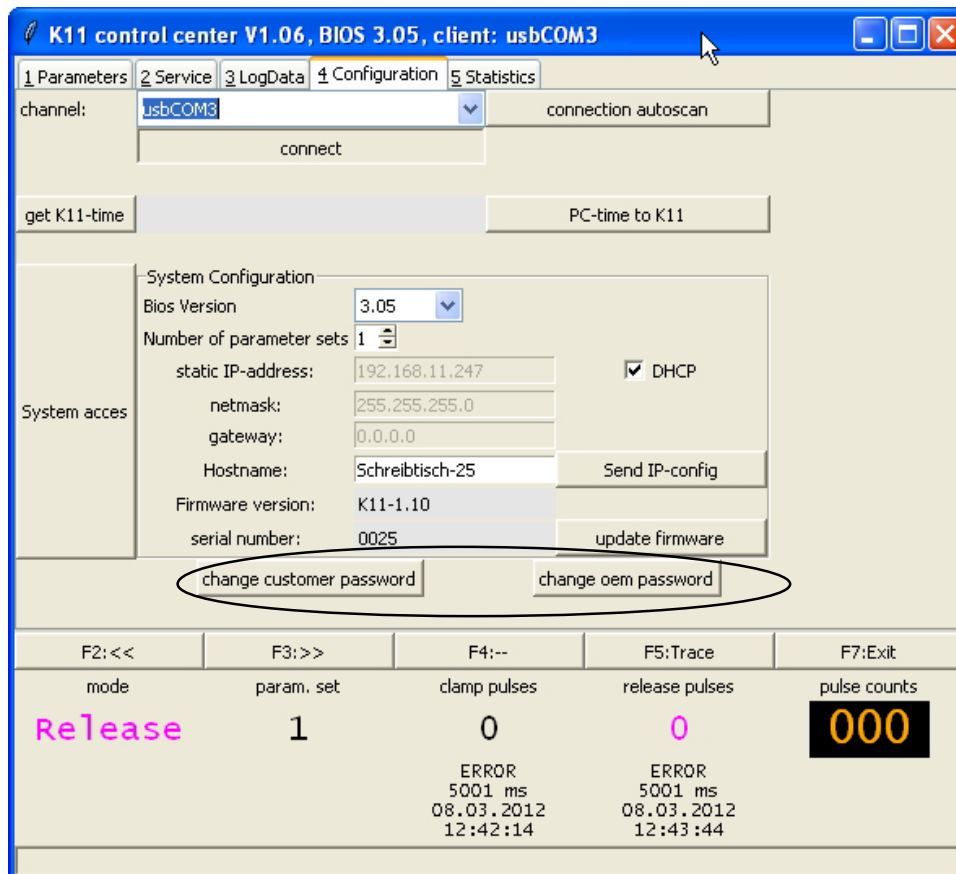
Structure of the access protection:

- 1.) Without password:  
View, read out and save all parameters.  
Read out and save log data.  
Save data on USB stick.
- 2.) Password level „CUSTOMER“ (default: cytec):  
Change of all data of the parameter sets.  
Set date and time.  
Change network adjustments.
- 3.) Password level „OEM“ (default: cytecoem)  
Change of customer password.  
Change of OEM password.  
Activation of the „calibration mode“.  
„Force“ parameter sets  
Change number of usable parameter sets.  
Change of BIOS version.  
Execution of a firmware update.

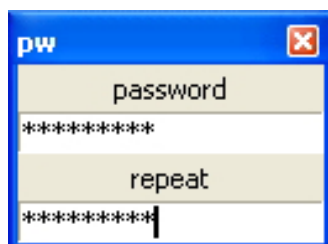
Passwords can be changed by clicking the button F6 „Password“.

## 8.4 Change of passwords

By entering the „OEM“ password (default : cytecoem) on register card „configuration“ two buttons become visible to change the passwords.



After clicking one of the buttons the particular password can be determined new..



Enter the desired password in both entry boxes.  
Confirm the entry with return.

Changed passwords can always be changed after entry of the actually determined „OEM“ password.

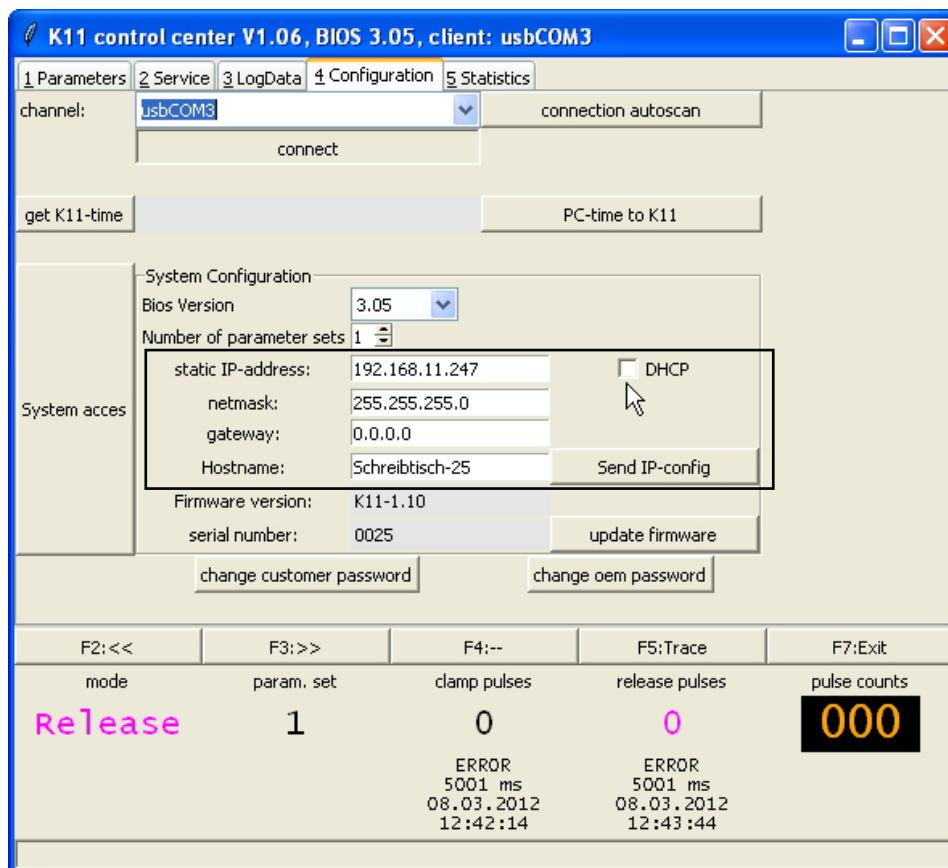


**Should the „OEM“ password be lost, the passwords can only be reset by Cytec. For this the controller must be sent back.**



## 8.5 Network adjustment

The controller can be accessed over the network. The functions are the same as for the USB access. To be able to use the network you have to make specific adjustments. After entering the customer or OEM password the adjustment boxes on register card „configuration“ are visible.



To run the controller in a network with DHCP- and DNS-server activate the option „DHCP“. You can assign a hostname to find the controller easier in the net. The hostname then is displayed in the channel select list in the title line of the program.

Deactivate the DHCP function to assign a permanent IP address to the controller. Afterwards you must enter a valid configuration. Information about a valid configuration is available from your network administrator. A hostname can be entered as an option.

After entry of all required adjustments send them with clicking the button „send IP configuration“

An eventually existing network connection is terminated, and the controller tries to establish a communication with new adjustments.

If after a short time the display of the controller does not show an IP address according to the adjustments, the controller should be cut off from the electric supply for about 30 seconds. Restart the controller without network connection. Then plug the network cable.

## 8.6 Execution of firmware update

Firmware updates can be carried out to improve the stability of the system and enhance the functional range.

The input of older firmware versions is possible the same way

**Depending on the version of the new firmware the LOG data and traces are deleted during the update process! You are requested to save the LOG data (see register card 3 / LOG data).**

You need the following data which must be located in the program directory:

- **k11control.exe** (contains „finder.exe“ and Im3flash.exe) and
- **k11uVxxxx.bin** (the desired firmware file).

These data are available under

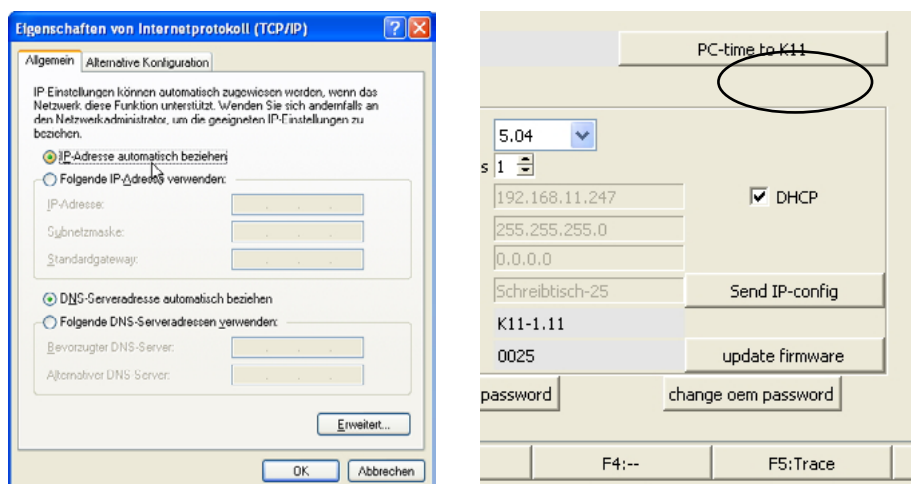
[http://www.cytec.de/germany/download/cytec\\_download.htm](http://www.cytec.de/germany/download/cytec_download.htm)

The original data are on the delivered USB stick.

A firmware update is only possible via an existing TCP/IP connection (plug X5).

Regard the following restrictions:

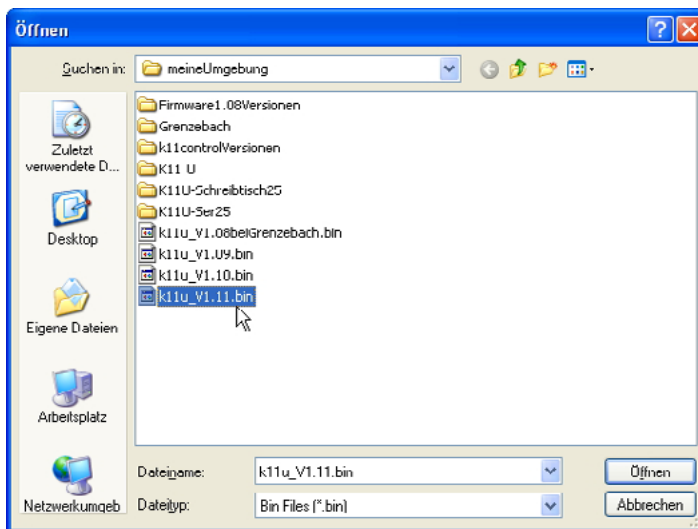
- The IP addresses of the controller and of the PC must be allocated in the same subnet.
- The controller must be adjusted to DHCP.



- The PC must be adjusted to DHCP or have a permanent IP address which is allocated to the same subnet as the IP address of the controller which was assigned via DHCP.
- In case of a peer to peer connection controller and PC must be adjusted to DHCP.

All changes are carried out on register card „4 Configuration“.

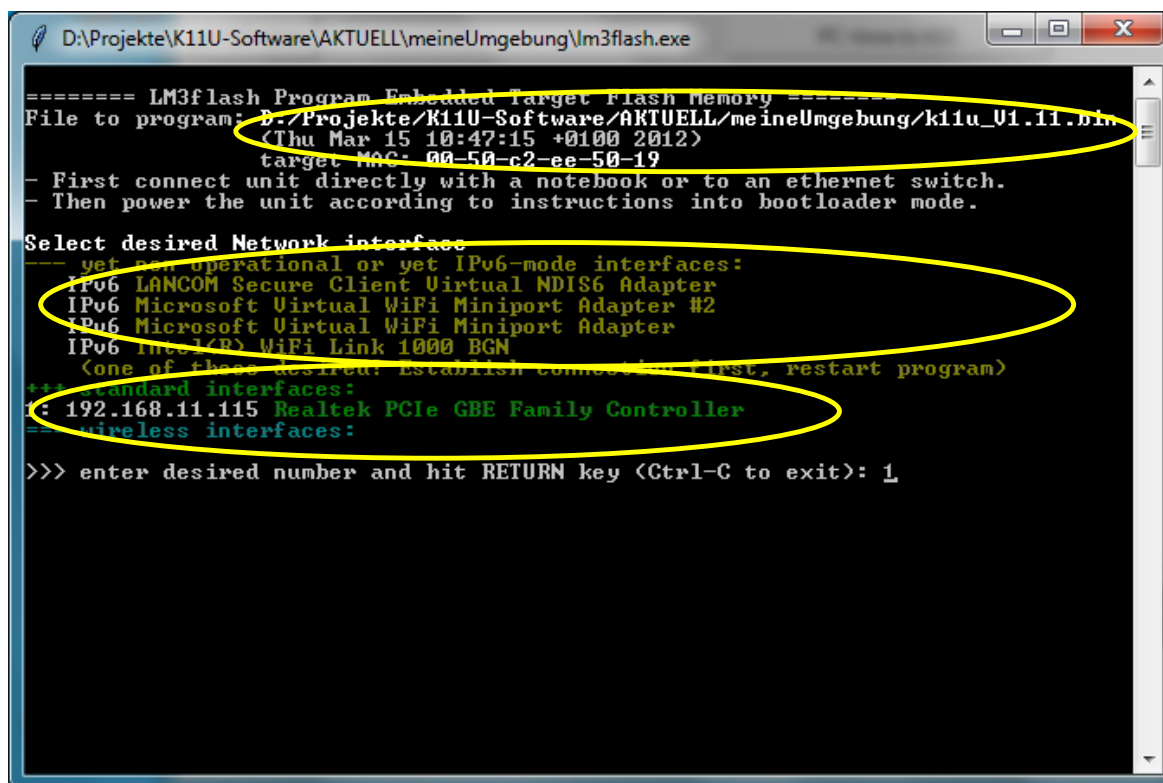
- Hit button F6 „password“. Enter the „OEM“ password.
- Execute all required network adjustments.
- Restart the controller, if necessary.
- Hit button „update firmware“.



Select the desired firmware file.

A window opens with the following information:

- *File to program* - selected firmware file.
- *target MAC* - MAC address of selected controller.



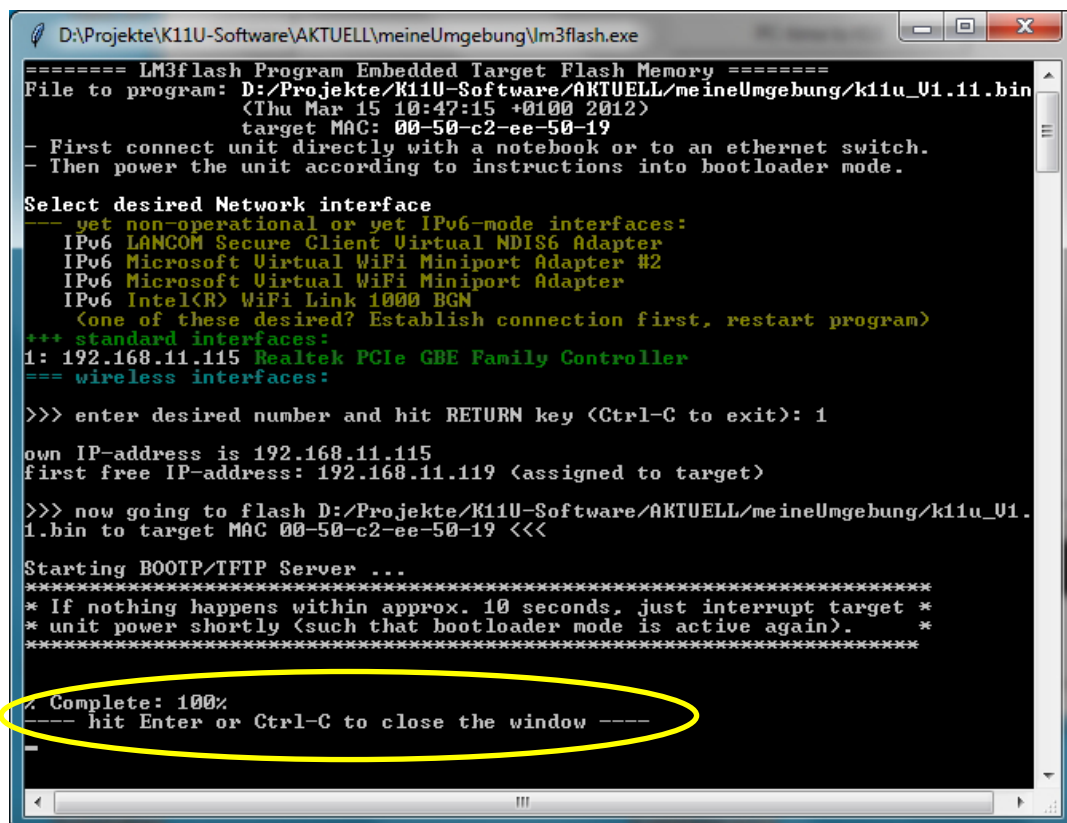
- *non-operational interfaces* - existing but inactive network adapters.
- *standard interfaces* - existing and active network adapters.

If several network adapters are indicated, select the one which connects the PC with the controller (enter the number of the adaptor).

In case of an active connection no adaptor selection is shown.

After input of the adaptor number and confirmation with „return“ the actual update process is started.

After execution of the process the window „% Complete: 100%“ is displayed.  
Close the window.



```

D:\Projekte\K11U-Software\AKTUELL\meineUmgebung\lm3flash.exe
===== LM3flash Program Embedded Target Flash Memory =====
File to program: D:/Projekte/K11U-Software/AKTUELL/meineUmgebung/k11u_U1.11.bin
<Thu Mar 15 10:47:15 +0100 2012>
target MAC: 00-50-c2-ee-50-19
- First connect unit directly with a notebook or to an ethernet switch.
- Then power the unit according to instructions into bootloader mode.

Select desired Network interface
--- yet non-operational or yet IPv6-mode interfaces:
IPv6 LANCOM Secure Client Virtual NDIS6 Adapter
IPv6 Microsoft Virtual WiFi Miniport Adapter #2
IPv6 Microsoft Virtual WiFi Miniport Adapter
IPv6 Intel(R) WiFi Link 1000 BGN
<one of these desired? Establish connection first, restart program>
+++ standard interfaces:
1: 192.168.11.115 Realtek PCIe GBE Family Controller
=== wireless interfaces:

>>> enter desired number and hit RETURN key <Ctrl-C to exit>: 1

own IP-address is 192.168.11.115
first free IP-address: 192.168.11.119 <assigned to target>

>>> now going to flash D:/Projekte/K11U-Software/AKTUELL/meineUmgebung/k11u_U1.11.bin to target MAC 00-50-c2-ee-50-19 <<<

Starting BOOTP/TFTP Server ...
*****
* If nothing happens within approx. 10 seconds, just interrupt target *
* unit power shortly (such that bootloader mode is active again). *
*****

% Complete: 100%
----- hit Enter or Ctrl-C to close the window -----

```

The controller restarts.

Build a new connection to the controller and check its internal clock time. Adjust it if necessary ([see register card configuration](#)).

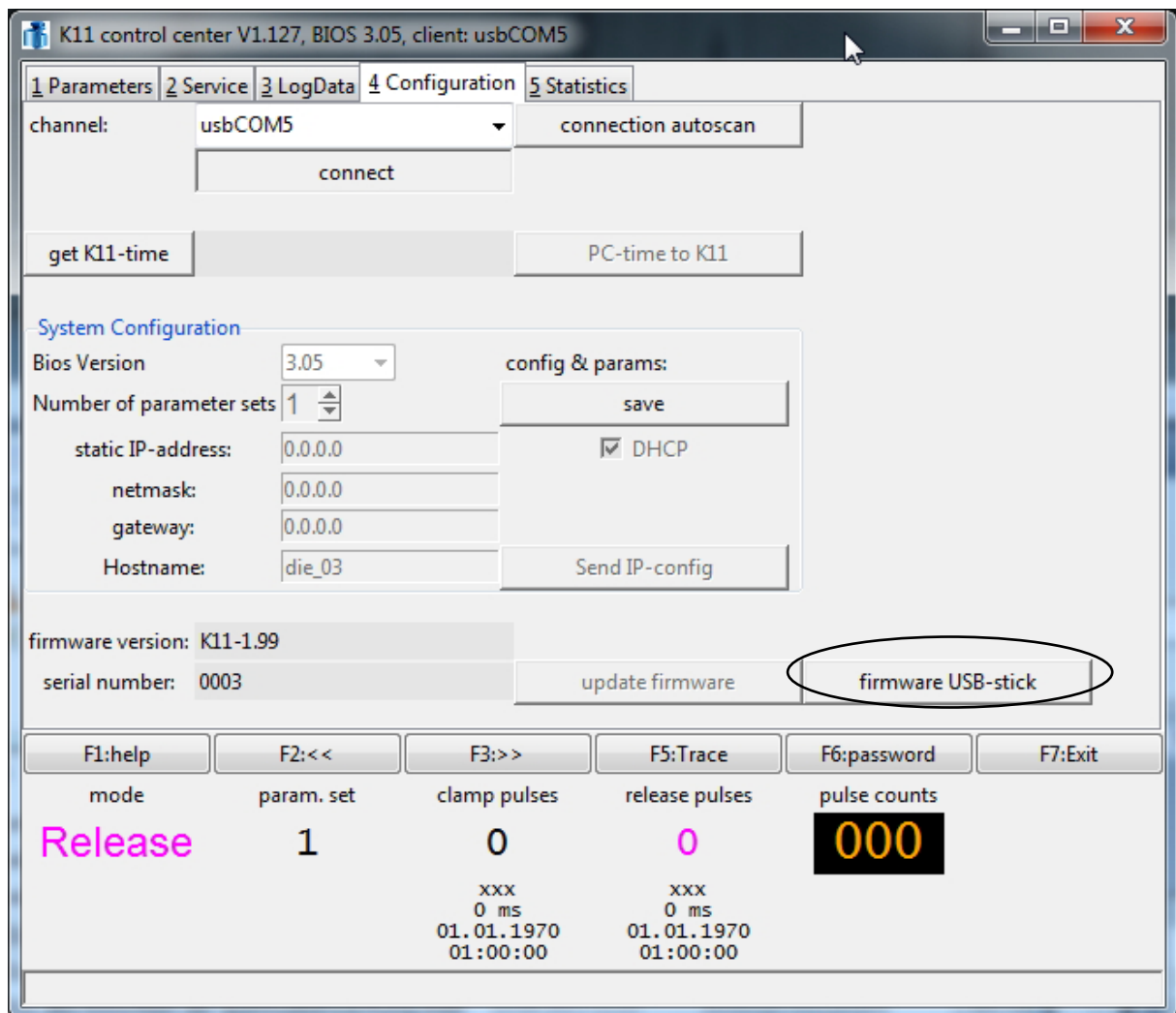
Parameter settings remain preserved during the update and do not have to be input again.

## 8.7 Firmware Update via USB stick

From firmware version 2.00 on you have the possibility to execute a firmware update using a USB stick.

For this the files „k11u.bin“ and „k11u.key“ must be located in the root directory.

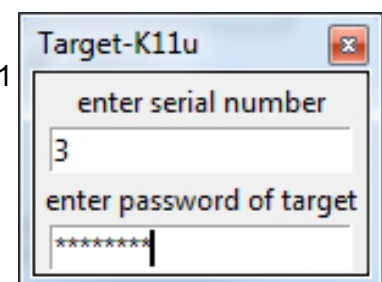
Start the PC software to generate these files and open the register card „configuration“.



Push the button „firmware USB stick“.

The window „Target-K11u“ pops up.

Enter here the serial number or the K11 which should be updated and also the OEM password assigned for the K11. If the serial number or the password do not match with the K11 data, the update procedure will fail with an error message.

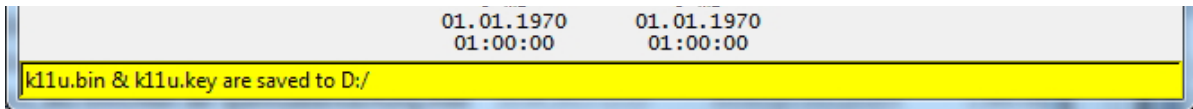


Confirm your entry with „Enter“.

The open file dialogue appears from which you can select the desired firmware file.

**Attention!** In case of a selected firmware < version 2.00 the update procedure will fail with an error message.

After confirming the selection a window for the selection of the target data volume opens. Choose here the storage location for the both update files and confirm it with „OK“. The storage process is confirmed in the status line.



These generated files can be copied to a stick or sent to your customer via email.

For the actual update process, both files must be located in the root directory of the USB stick.

During the update process, the interfaces X5 and X6 must be idle.

Insert the stick to socket X7.

On the screen the message „New Firmware. OK. Hit.....“ is displayed.

You can abort the process by simply pulling off the stick.

Push the function switch on the K11.

Depending on the firmware version, an automatic saving of the LOG data to the stick is executed.

The message „Firmware update.....“ is displayed.

At the end of the procedure the K11 executes a reset and the message „Update ok.

Remove Stick“ appears. Remove the USB stick. The update process is finished.

If the process is interrupted eventually caused by any occurrence, you can restart it simply by turning off and on.

Before the K11 executes the update it checks all files. If anything is not ok, the K11 refuses the process with an error message.

For detailed information refer to chapter „[Error messages](#)“

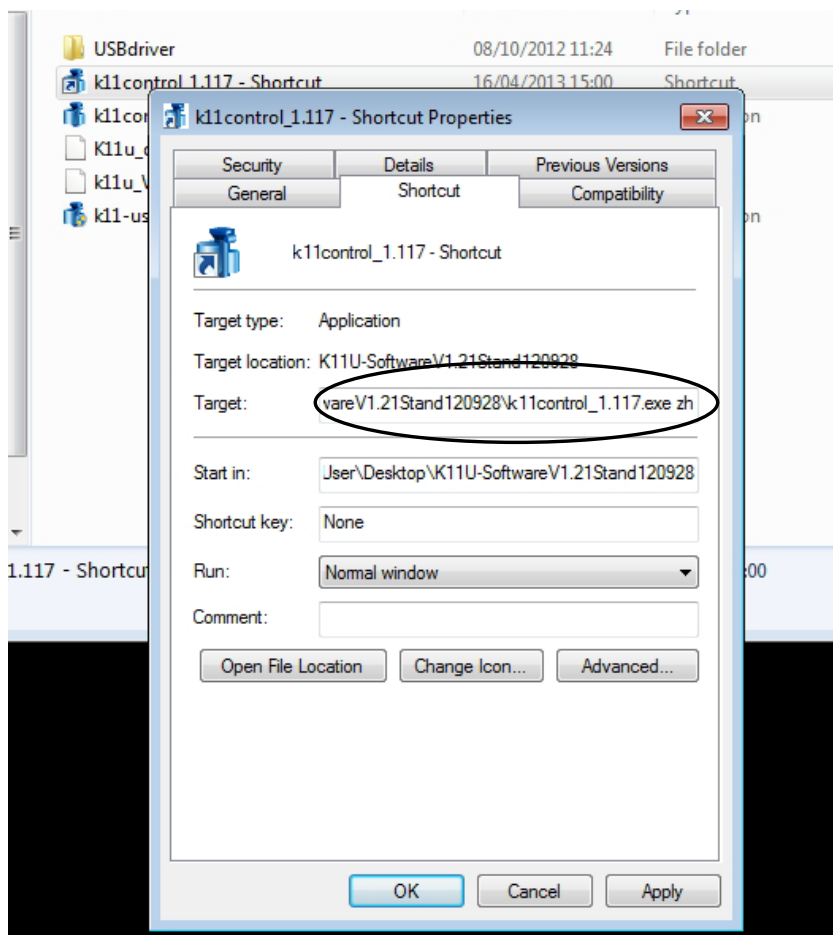
## 8.8 Languages

The language of the software user interface adjusts automatically according to the installed operation system. If the OS language is not determined in the software, automatically the english language version is installed.

For changing the language the software „K11control“ must be started with the following parameter. This is easy done by creating a shortcut to the software and enter the parameter there.

Currently the following languages are available:

Chinese        -> zh  
German        -> de  
English       -> en  
French         -> fr



Enter here after the last quotation mark a space followed by the language parameter. Click „resume“ and confirm with „OK“.



## 9 Technical Data

### 9.1 Electrical Data

Range of supply voltage	15-30 V
- max. supply voltage	35 V
Energy consumption (Text in display, 5 LED's on terminal glowing)	130 mA with 15 V supply voltage 100 mA with 24 V supply voltage
Safety device for internal voltage supply	reverse voltage protection, self resetting fuse 0,2 A
Digital outputs	10 (4 are bidirectional)
- current per output	0,6 A (short circuit proof)
- voltage limitation for inductive pulses	Supply+1 V and -20 V (last value causes reduction of inductive pulses)
- total current limitation	1 A with self resetting fuse
Digital inputs	10 (4 of them are bidirectional)
- Threshold for logic „1“	approx. 13 V
- Current drain per input	8 mA with 24 V
Pulse input	2, PNP, one also with NPN-connector
- Threshold for logic „1“	approx. 13 V
- Max. count frequency	3 kHz
Relay	2
- max. current load	6 A, up to 250V AC or 30 V DC
- max. protection value of cutout	5 A (independent from speed)

### 9.2 Additional data

Microcontroller	32-Bit ARM-Cortex-M3 family by Texas Instruments (LM3S9B90)
Display	LED-Text display, service life > 10 years
Interfaces	USB, USB stick, Ethernet
<b>Up to serial number 200:</b> Backup-battery (real time clock)	Lithium CR2032, exchangeable
- Service life (not in operation)	> 10 years
- Service life (in operation, without supply)	9 months
- autom. battery seal in case of insourcing	90 days (programmable), from Firmware 2.02 on: 60 days
<b>From serial number 201:</b>	Battery VL2330, not exchangeable

Data	3 V, 50mAh
- Service life (not in operation)	> 10 years
- autom. battery seal in case of insourcing	60 days
Log memory	EEPROM 64 KB, 1 billion of write accesses
Plug	Grid 5.08, screw connection
Dimensions of the component in the housing	168 x 105 x 32 mm (with relay 55 mm high)
Fixture	Cap rail mounting

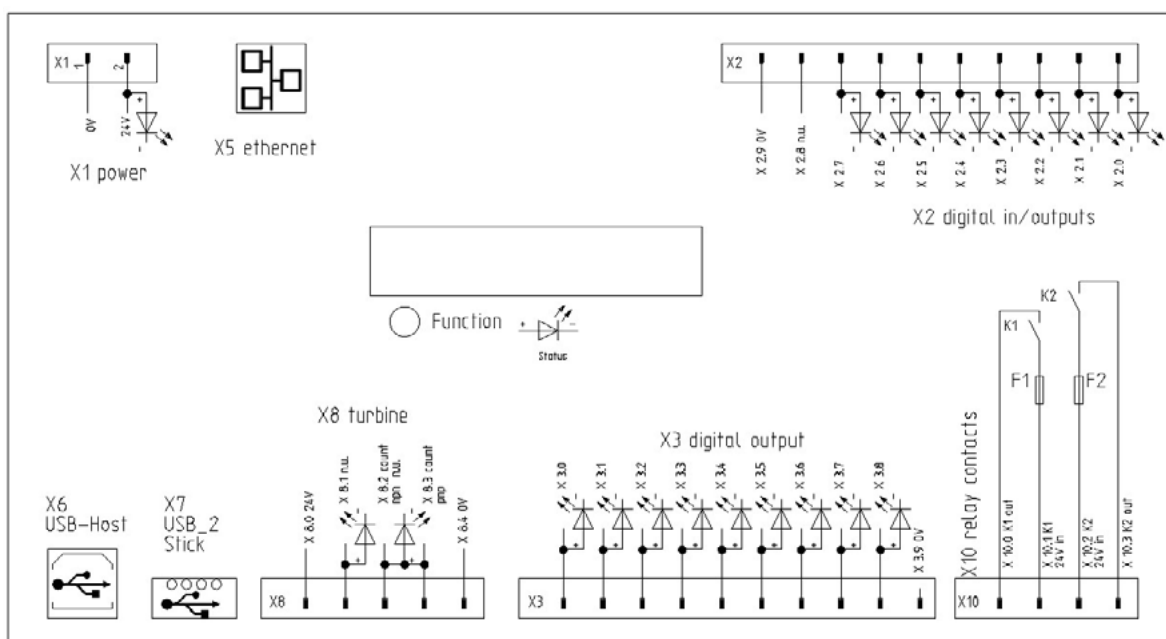
### 9.3 Communication with the PC

USB according specification 2.0

Ethernet

Protocol	Port	Note
TCP/IP v.4	16808	used by K11-U
Telnet	UDP 23	only for connection autoscanner

## 9.4 Connections



### X1 Power connection

X1.1	0V
X1.2	24V

### X2 digital input / output

	BIOS 3.05	BIOS 5.04	
X2.0	Clamp	Released	in
X2.1	Released	not used	in
X2.2	Selection Parameter set 1		in
X2.3	Selection Parameter set 2		in
X2.2 + X2.3	Selection Parameter set 3		in
X2.4	not used		
X2.5	not used		
X2.6	Parameter set 1 activ		out
X2.7	Parameter set 2 activ		out
X2.6 + X2.7	Parameter set 3 activ		out
X2.8	not used		
X2.9	0V		

### X3 digital output

	BIOS3.05	BIOS5.04
X3.0	Clamp active	
X3.1	Released active	
X3.2	not used	
X3.3	Test finished	
X3.4	Test ok	clamped ok
X3.5	too short	released ok
X3.6	too long	without tool
X3.4 + X3.6	ohne Wz.	---
X3.7	TimeOut	

X3.8	24V/Fuse ok
X3.9	0V

X8.2	counter npn not used
X8.3	counter pnp
X8.4	0V Sensor

**X8 Counter**

X8.0	24V Sensor
X8.1	not used

**X10 Relay**

X10.0	K1 out (valve clamp)
X10.1	24V in (for K1)

X10.0	K1 out (clamp valve)
X10.1	24V in (for K1)
X10.2	24V in (for K2)
X10.3	K2 out (release valve)

**Communication with PC**

X5	ethernet	RJ45
X6	USB Host	USB-B
X7	USB-Stick	USB-A

**9.5 USB stick compatibility:**

speed - USB 2.0 and lower.

USB Mass - Storage file system FAT or FAT32.

Current consumption < 0,5 A (otherwise a separate current supply is necessary)

The manufacturer CyTec cannot guarantee that all USB sticks available on the market work together with the K11-U

**9.6 Required USB cable:**

cable with A/B m/m connectors

max. lenght 5 meters

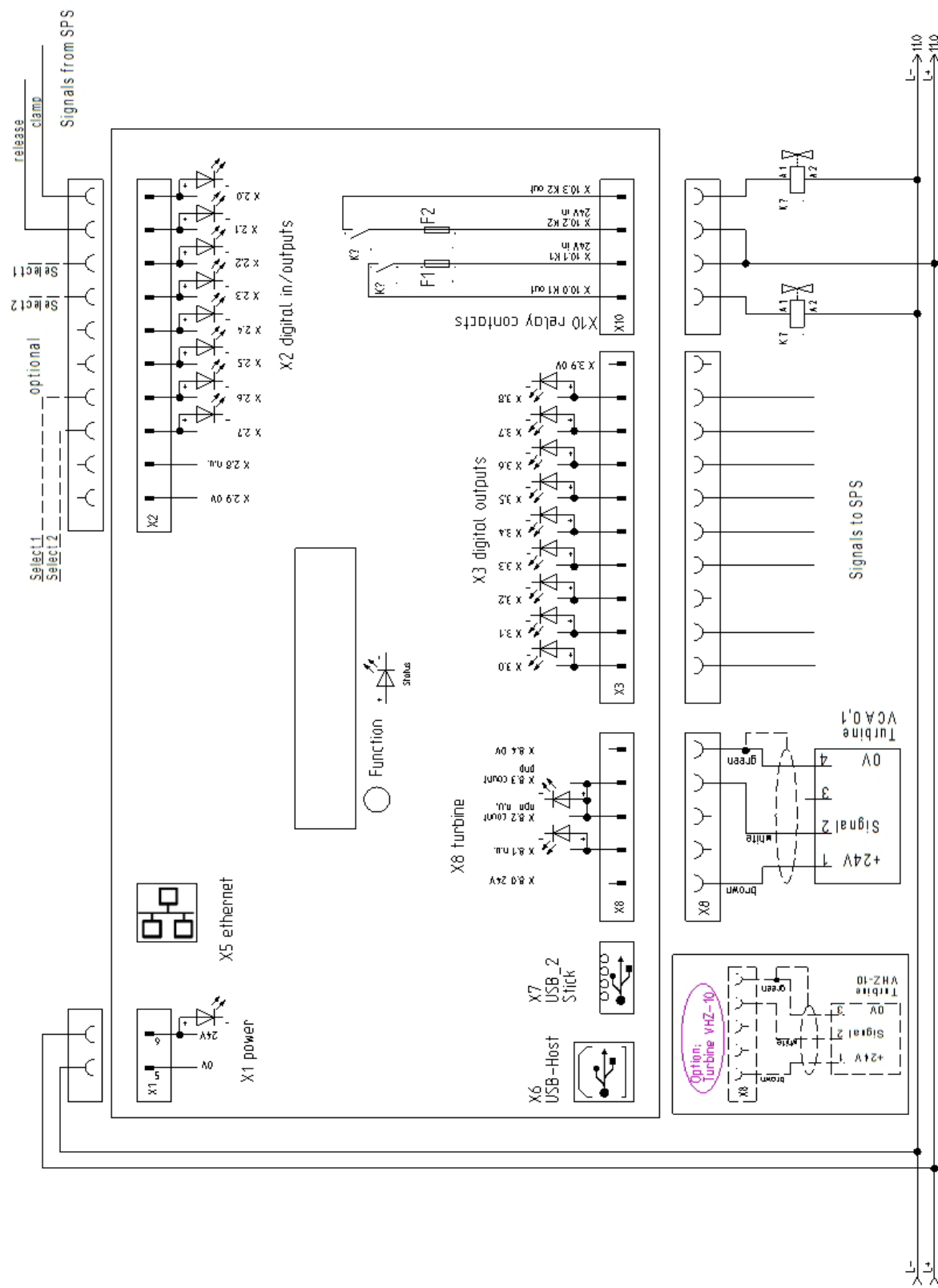
cable must designed for USB 2.0 specification (twisted pair, shielded .....)



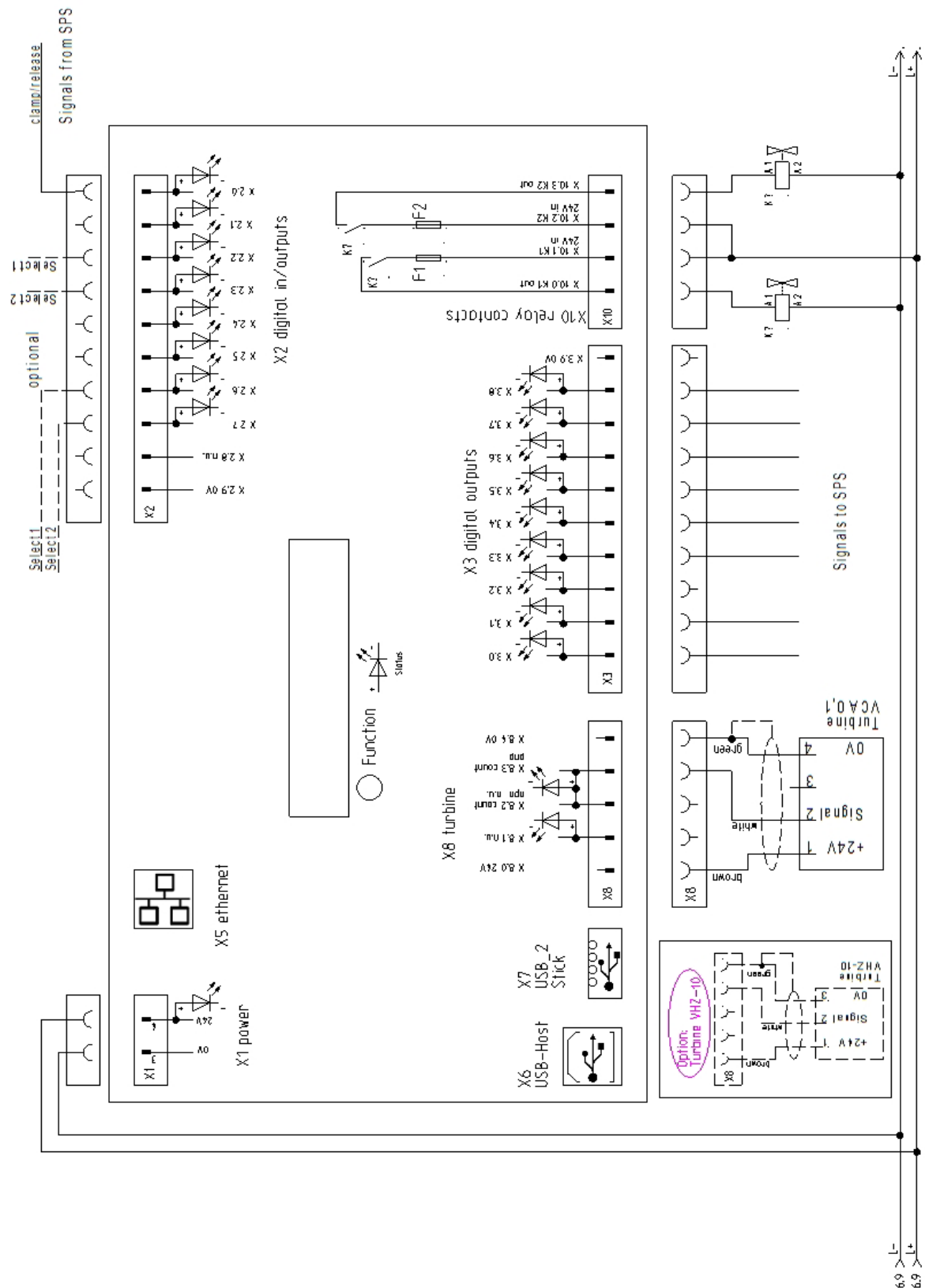
Power supply for the turbine must come from connector X8 of the K11-U unit.

It's not allowed to give power on one of the connectors before 0V - connector X1 is connected to the power supply.

## 9.7 Wiring diagram BIOS 3.05



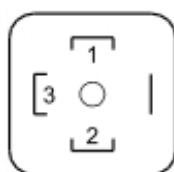
## 9.8 Wiring diagram BIOS 5.04



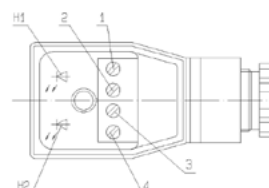
## 9.9 Measuring turbine



Typ	VHZ-10	VC 0,1
<b>Characteristics:</b>	Flow metering with volumetric principle; suitable for viscous liquid self-lubricating, non-abrasive media	
<b>Measure principle:</b>	A pair of geared wheels is set into rotation by hydraulic flow rate. The volume between the geared wheels transports an exact amount, which is detected by a biased Hall sensor with one pulse per tooth. The sensor sends signals proportionally to the flow-through ratio.	
<b>Measuring range:</b>	VHZ 10 = 0,1 - 6l/min	VC 0,1 = 0,04 – 8l/min
<b>Accuracy:</b>	± 3% of measured value (in reference to 20 mm <sup>3</sup> /s)	± 3% of measured value
<b>Pulses/L</b>	5.000	10.000
<b>Max. pressure:</b>	200 bar	350 bar
<b>Media temperature:</b>	-25 up to 85°C	-40 up to 80°C
<b>Current consumption:</b>	20 mA without load	37 mA max.
<b>Output:</b>	PNP, Frequency output 100 mA max., frequency 500 Hz with Qmax	PNP, Frequency output 12,5 mA max., frequency 1333 Hz with Qmax
<b>Connection:</b>	Plug DIN 43650-A / ISO 4400, short-circuit proof, reverse polarity protected	Device socket (Hirschmann); Integrated preamplifier
<b>Media connection:</b>	G3/8"	G3/8"
<b>Material:</b>	Housing: Al anodised, Gear and axis: Stainless steel 1.4462, Bearing: IGLIDUR X, Seal: FKM	Housing: ductile iron GJS-400; Gears: steel; Seal: FKM
<b>Protection class:</b>	IP 65	IP 65
<b>Weight:</b>	0,50 kg	0,67 kg



1 +(10-30 V DC)  
2 Output  
3 0 V



1 U<sub>B</sub>  
2 Channel 1  
3 Channel 2 **n.a.**  
4 0 Volt  
H1 Transmitter Channel 1  
H2 Transmitter Channel 2 **n.a.**

## 9.10 Declaration of compliance

Spannsysteme • Motorspindeln • Zylinder • CNC-Fräsköpfe



CyTec Zylindertechnik GmbH • Steffensrott 1 • D-52428 Jülich

CyTec Zylindertechnik GmbH  
Steffensrott 1 • D-52428 Jülich  
Telefon: +49 (0) 24 61 / 68 08 - 0  
Telefax: +49 (0) 24 61 / 68 08 25  
E-mail: [info@cytec.de](mailto:info@cytec.de)  
Internet: [www.cytec.de](http://www.cytec.de)

**Bezeichnung: CyCon K11-U**

Geschäftsführung: Klaus-Dieter Klement  
Georg Conzelmann  
Stephan Weuthen  
Handelsregister: HRB 3592  
USt-Id-Nr.: DE 122 612 542  
Steuernummer: 15 294 03881

Verkaufsbüro Süd:  
Carl-Zeiss-Str. 7 • D-72124 Pliezhausen  
Telefon: +49 (0) 71 27 / 81 18 80  
Telefax: +49 (0) 71 27 / 81 18 85  
E-mail: [cytectrade@cytec-de.com](mailto:cytectrade@cytec-de.com)

### Einbauerklärung für eine unvollständige Maschine

im Sinne der EG-Maschinenrichtlinie 2006/42/EG Anhang II Teil 1 Abschnitt B

Hiermit erklären wir, dass die Bauart von:

Hydrauliküberwachungssystem **CyCon K11-U**

eine unvollständige Maschine im Sinne der Maschinenrichtlinie ist. Das Produkt ist ausschließlich zum Einbau in eine Maschine oder unvollständige Maschine vorgesehen und entspricht daher noch nicht allen Anforderungen der Maschinenrichtlinie.

Folgende Grundlegende Sicherheits- und Gesundheitsschutzanforderungen nach Anhang I der o.a. Richtlinie sind angewandt und eingehalten: Artikel 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4 und 1.5.1


Die speziellen technischen Unterlagen nach Anhang VII B wurden erstellt und dem Kunden übergeben. Die Unterlagen werden auf begründetes Verlangen an die einzelstaatlichen Stellen übermittelt. Die Übermittlung erfolgt postalisch in Papierform oder auf elektronischem Datenträger.

Das oben genannte Produkt erfüllt die Anforderungen der folgenden einschlägigen Richtlinie:  
Maschinenrichtlinie: EG-Richtlinie 2006/42/EG, in ihrer jeweils aktuellen Änderungsfassung  
Niederspannungsrichtlinie: EG-Richtlinie 2006/95/EG, in ihrer jeweils aktuellen Änderungsfassung  
EMV-Richtlinie: EG-Richtlinie 2004/108/EG, in ihrer jeweils aktuellen Änderungsfassung

**Angewandte harmonisierte Normen, insbesondere:**  
EN ISO 12100-1, EN ISO 12100-2, EN 60204-1

Die Inbetriebnahme ist solange untersagt, bis festgestellt wurde, dass – soweit zutreffend – die Maschine, in die die o.a. Maschine eingebaut werden soll, den Bestimmungen der Maschinenrichtlinie 2006/42/EG entspricht.

Name des Dokumentationsbevollmächtigten: Stefan Klein (Adresse des Hersteller)  
Jülich den: 27.09.2012

  
Stephan Weuthen Geschäftsführer



## **10 Differences K11 -> K11-U**

### **10.1 General**

The controller K11-U is developed as a replacement for the controllers K11-BIOS 3.05 and K11-BIOS 5.04. In existing equipments the previous controller can be exchanged easily and without big effort.

The procedures of measuring the volume flow and parameterisation of limit and monitoring values has not changed.

#### **Following functions are not available any more:**

- Control of tool face contact
- Vibration monitoring
- Analog inputs for foreign sensors

#### **Following functions are new:**

- Display of measured values directly on the controller.
- Display of active in- and outputs directly on the controller.  
So in most cases a connection of controller and PC is not necessary any more.
- Permanent storage of the last 500 processes incl. configuring procedures
- Permanent storage of several „OK-“ and „error-“ processes incl. turbine signals in graphic presentation
- Integrated signal-analyser for simplified error analysis in case of hydraulic or communication problems with the plc.
- Stored processes and adjustments can be copied directly to a USB stick for archival storage or further processing.
- Protection possibilities of the adjustments with different password levels.  
The passwords are arbitrary.
- Communication with a PC via USB.
- Communication with a PC via Ethernet. So you have the possibility for remote maintainance.
- Up to 3 parameter sets can be configured and activated. So in plants with milling head or spindle exchange several controllers are not necessary.
- Update ability
- Self resetting fuse
- Reverse voltage protection of the in- and outputs
- Possibility to adjust the BIOS version. Disregarding the BIOS version only one controller is necessary
- Integrated relays incl. fuses for triggering the clamp and release valve.  
Is optional for BIOS version 3.05, using BIOS version 5.04 no additional plate is necessary.

## 10.2 Inputs and outputs

Shown are only different pin assignments.

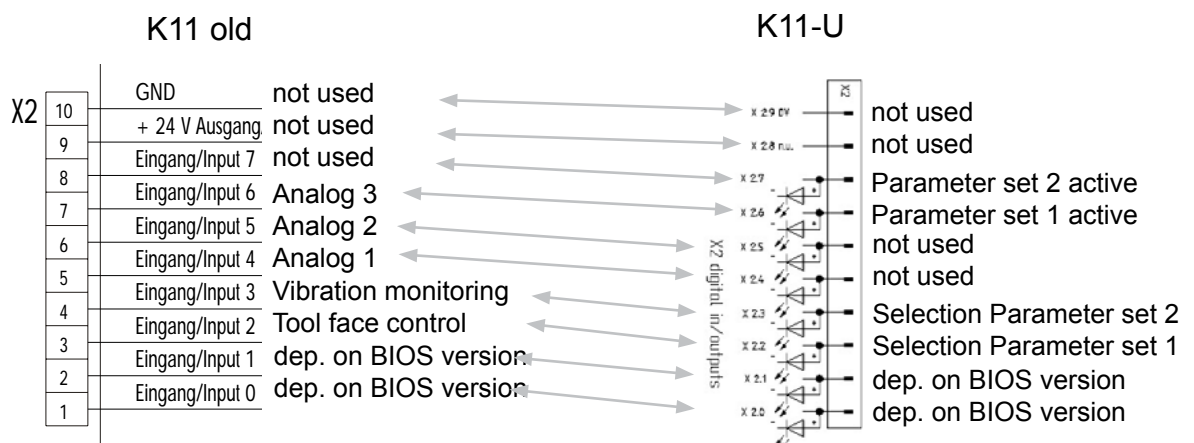
The following prescriptions refer only to an exchange of an old K11 with an new K11-U.  
If the plc is accommodated to the new functions, of course all functions of the K11-U are available.

### Both BIOS versions plug X2

K11 alt Plug X2	K11-U Plug X2
X2.3 Tool face control E3	X2.2 Selection Parameter set 1
X2.4 Vibration monitoring E4	X2.3 Selection Parameter set 2
X2.5 Analog 1 E5	X2.4 reserved
X2.6 Analog 2 E6	X2.5 reserved
X2.7 Analog 3 E7	X2.6 Output Parameter set 1 active
X2.8 not used E8	X2.7 Output Parameter set 2 active
X2.9 Output 24V	X2.8 not used



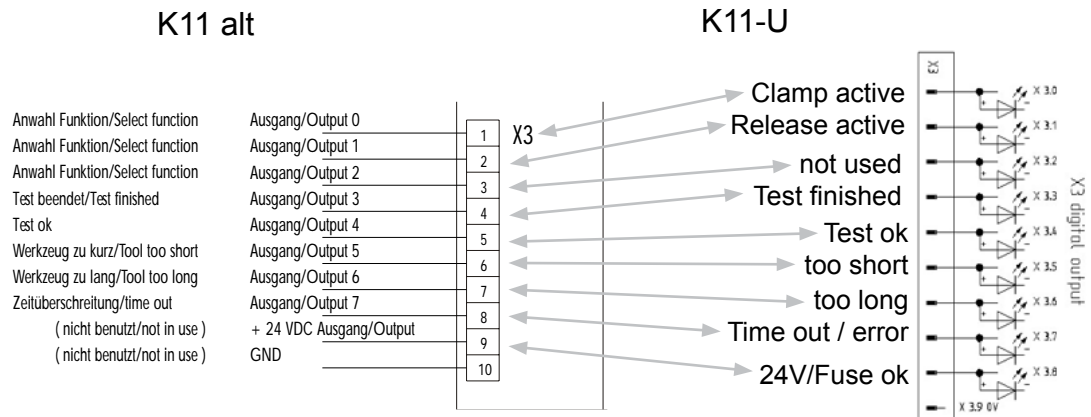
Note: nothing may be connected to the contacts X2.2 to X2.8.



### K11 old BIOS 3.05 Plug X3 → K11-U BIOS 3.05 Plug X3

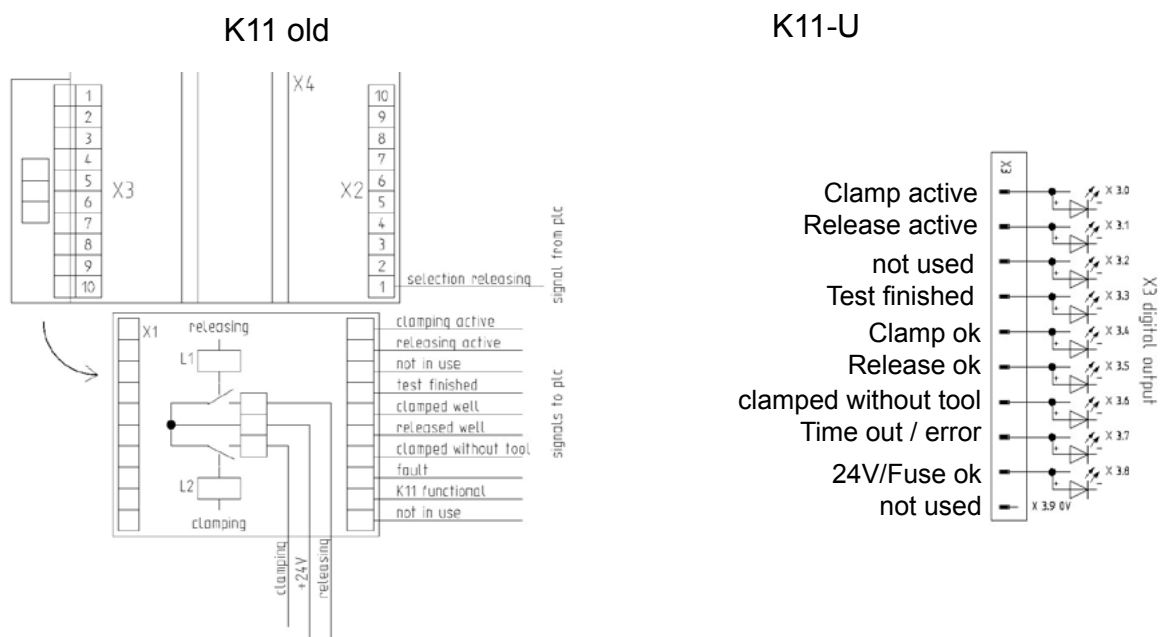
K11 old Plug X3	K11-U Plug X3
X3.3 Vibration monitoring A3	X3.2 not used
X3.9 +24VDC	X3.8 24V/Fuse OK

The feedbacks for tool face control, vibration monitoring and analog 1/2/3 are eliminated.



### K11 old BIOS 5.04 Plug X3 → K11-U BIOS 5.04 Plug X3

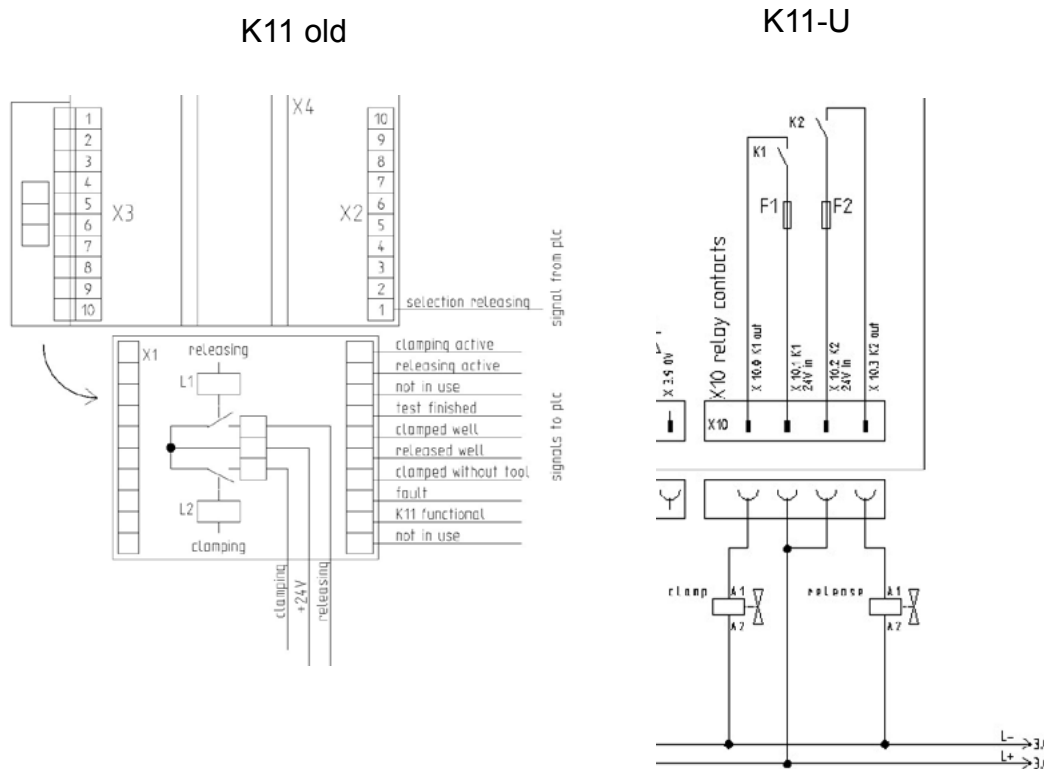
K11 alt Plug X3	K11-U Plug X3
X3.3 Vibration monitoring A3	X3.2 not used
X3.9 +24VDC	X3.8 24V/Fuse ok



**K11 old BIOS 5.04 additional plate relay → K11-U BIOS 5.04 Plug X10**

<b>K11 old</b> Plug X12	<b>K11-U</b> Plug X10
X12.1 Output relay release	X10.0 Output relay clamp
X12.2 +24V for relay	X10.2 +24V für relay clamp
	X10.3 +24V für relay release
X12.3 Output relay clamp	X10.4 Output relay release

X10.2 and X10.3 can be bridged to use still a supply line for these relays.



## 11 Electric noise reduction

Caused by the ever faster switching transistor elements in the drive modules ( $dU/dt$ ) an increased inductive or capacitive coupling of interference pulses occurs into low voltage signals such as e.g. rotary encoders, temperature sensors etc.

When the plc does not switch off the system/machine directly, interferences can cause clamp errors during the measurement for clamping monitoring, i. e. more pulses are counted than delivered by the turbine.

Here must be distinguished between cause and effect: based on a high switching voltage of the motors (cause) derives an interference of the measuring signal (effect).

To comply with the EMC Directive 2004/108/EC of the European Parliament, adequate measures for the safe dissipation of disturbances and to prevent signal interference should be taken. These are available in the following 10 EMC - rules summarised:

- Rule 1:** All metallic parts must be superficially and highly conductive connected with each other (paint on surfaces must be removed). If necessary, contact rings must be used. The cabinet doors are connected with the cabinet via ground straps which should be as short as possible.
- Rule 2:** Signal cables and power cables must be routed separately from each other, sections of coupled cables must be avoided.
- Rule 3:** Signal lines should be conducted on one side into the electrical cabinet, separated from the power lines.
- Rule 4:** Unshielded cables of the same circuit must be twisted pair, unused wires of a cable must be connected to a safe potential (in cabinet).
- Rule 5:** Contactors, relays and solenoid valves must be interconnected with EMV combinations, e.g. RC elements, varistors or diodes.
- Rule 6:** Shields of digital cables must be connected on both sides to the case (ground). The contact to other shield connections must be avoided.
- Rule 7:** The shields of analog signals may be connected only on one side (in the cabinet). The unilateral connection prevents from capacitive couplings of low-frequency noise.
- Rule 8:** Mains filters must be integrated into the power supply, taking care to ensure that this line filters are tuned to the application (converter to motor). Line filters must be choosed which are suitable for use with torque motors. The line filter must be connected to the control cabinet housing superficially.

**Rule 9:** Power lines must be shielded and if possible the shield should be connected on one side on the shield sheet in the electric cabinet. Only shielded multi-conductor cable may be used. Shielded single cores are not allowed due to de high shielding capacity.

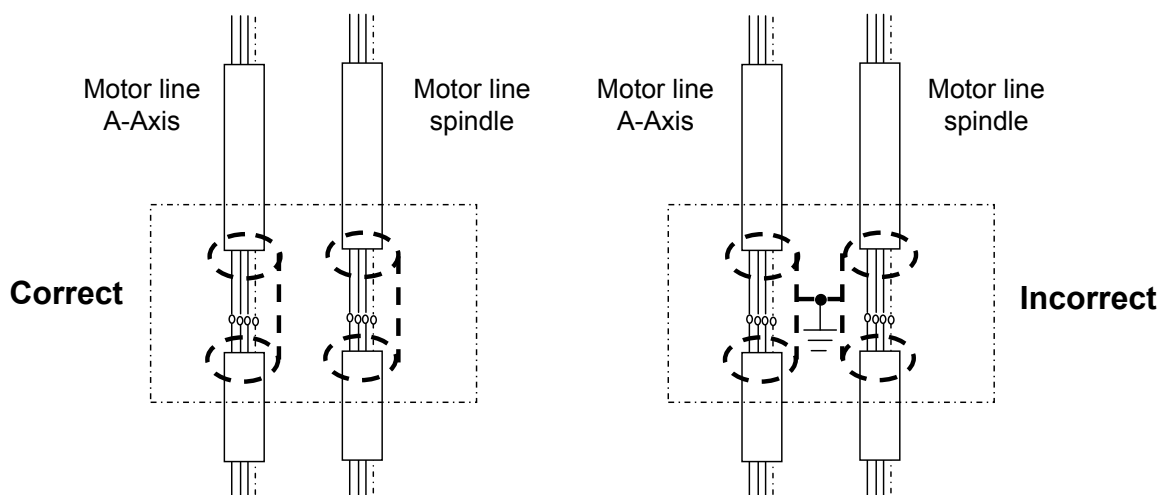
**Rule 10:** The shield point should be located in the cabinet near the grounding point but separated from it. A proper, direct and short connection to the grounding point is required. The grounding concept of the complete power supply system must be regarded. An appropriate grounding to building parts and power supply is essential (short distances and hall grounding).

The concept to prevent these interferences is to use a continuous shielding to avoid the radiation and to prevent interference.

Especially the power lines must be protected by a shield to ensure that interference current can drain. It is important that there is no contact between the various shield lines. Otherwise parallel streams are generated, by which e. g. interference frequencies drain through the encoder.

So it should be avoided that the signal transmission lines do receive electrical interference from adjacent motor lines, e. g. these lines should not run parallel.

The shields of each power - and data lines are connected to set up potential rails in the cabinet. Here also care must be taken for spatial separation as well as its proximity to the central grounding point.



Non-connected shields for motor lines automatically cause coupling into the sensor lines and disturbances in the function sequence. A proper conductivity of the shield terminals is required.

A general grounding - and shield concept for machinery does not exist, because it must be classified according to the disturbances:

- The shield of data lines should be applied to both line terminals (mostly capacitive coupling).
- The shield of power lines should be applied to only one terminal (central grounding, inductive coupling)



**Caution:**

**Disturbances on the signal lines can cause an undefined condition of the machine and crash the machine control. There is threat to life and physical condition!**

Disturbances can also be caused by problems with the grounding of the machine and rear coupling on the input voltage.

It must be regarded that

- the cabinet, the machine and the machine shop are connected to the same potential line.
- due to long lines, the grounding resistance is not too high. Caused by too high ground resistance the leakage current cannot drain.
- in case of series connection of galvanic separation devices, i. e. pre- transformers or generators, no current fluctuations are generated. A weak transformer causes increased vibration in the supply voltage of the machine.
- no interferences caused by other machines are coupled into the cabinet.
- a compensated supply net is available and that caused by switching off of single or several machines no net peaks are generated in the machine shop („hard“ net). Here a load inspection of the voltage supply must be carried out.

Measurements of the loop and grounding resistance must be carried out according to DIN IEC 60364 (VDE100).

Experiences have shown that it is the best with regarding the rules to conduct the shield of the turbine line as shown in the [wiring plan](#).



## 12 Error messages

### 12.1 General errors

General errors are errors that are not directly related to clamp and release cycles. These errors are shown in the display of the controller.

After successful connection, these messages are displayed in the message bar on the lower edge of the program window.

#### **NVRAMerr errors:**

indicates a permanent hardware error. Exchange the whole assembly group.

#### **CRC errors / no existing CRC (no more measurements executed):**

After switching on the controller at first a self diagnosis of the firmware is carried out. If this is not successful the display indicates „crc-error“ and the status LED shines red.

**Trouble shooting:** copy the firmware again as described in chapter „[Firmware Update](#)“

#### **select? (no more measurements executed):**

This error only appears when more than one parameter set is configured.

It indicates that no parameter set is chosen, or that in this situation invalid parameter set is chosen from the external plc.

**Trouble shooting:** Select a valid parameter set. See „[Change of parameter set](#)“.

#### **Time ?:**

The internal clock of the K11 is not adjusted. Clamp and release events are not saved with the actual date and time. The internal clock must be set via the PC program. See „[register card 4 configuration](#)“.

#### **Low Batt!:**

The battery for the internal clock is empty and must be replaced.

See „[battery exchange](#)“.

From serial number 201: Battery defective, exchange the complete assembly.

#### **Stick problem e. g. full:**

The USB stick cannot be written. Cause: the stick has no sufficient memory space; the write protection is active; wrong data format, file system format must be FAT or FAT32.

#### **Error during firmware update via USB stick:**

If an error occurs during file examination, the message „Error“ followed by a binary number is indicated. Possible errors are displayed as hexadecimal number of which the first digit indicates an error in file „K11u.bin“ and the second digit an error in file „K11u.key“.

Errors in file k11u.bin		
1	CRC error	File is damaged and must be generated once again.
2	Firmware < V 2.00	A too old firmware version is selected. For an update via USB stick a firmware >= V 2.00 must be chosen.
4	File not readable	File was damaged during transmission and must be generated new.
8	File not existent	The required firmware file does not exist.

Errors in file k11u.key		
1	CRC error	File is damaged and must be generated once again.
2	Wrong serial number	The entered serial number is different from the serial number of the K11.
4	Password level too low or invalid	The entered password is different from the password of the K11.

## 12.2 Advice

Errors which are not indicated by a message:

### 24V supply / internal fuses

The controller is protected by resettable fuses against short circuit.

In case of triggered fuse or in case of missing current supply on plug X1 the output X3.8 is reset.

**Trouble shooting:** Switch on the current supply.

If the fuse is triggered remove all plugs from the controller.

Clear the short circuit. After approx. 1 min. the fuses are reset. All plugs can be inserted again. The controller is ready for use again.

### Wiring error:

Problem 1: extremely varying measuring values, e.g.: Clamp 150, 1865, .....

Reason: 24V+ and turbine signal are interchanged.

**Trouble shooting:** [Check turbine wiring](#).

Problem 2: only clamp or release values are counted.

Reason: 0V and turbine signal are interchanged.

**Trouble shooting:** [Check turbine wiring](#).

### A valve connected with plug X10 does not switch.

Check if 24V+ is connected to plug X10.1 and X10.2.

Check if the LEDs on plug X3.0 and X3.1 are glowing while voltage is connected to plug X2.0 and. X2.1 (*for Bios version 3.05 the outputs X3.0 and*

*X3.1 are active as long as plug X2.0 or X2.1 is energised.  
For Bios version 5.04 the outputs are active according to the adjusted parameters).*

Switch off the controller.

Remove the plugs X2, X3 and X10.

Remove the fuses F1 and F2 from their sockets and check them for function (connection passage). Exchange the damaged fuse with a usual one (safety cord) 5x20mm, 250V, T-2A (max. 5A).

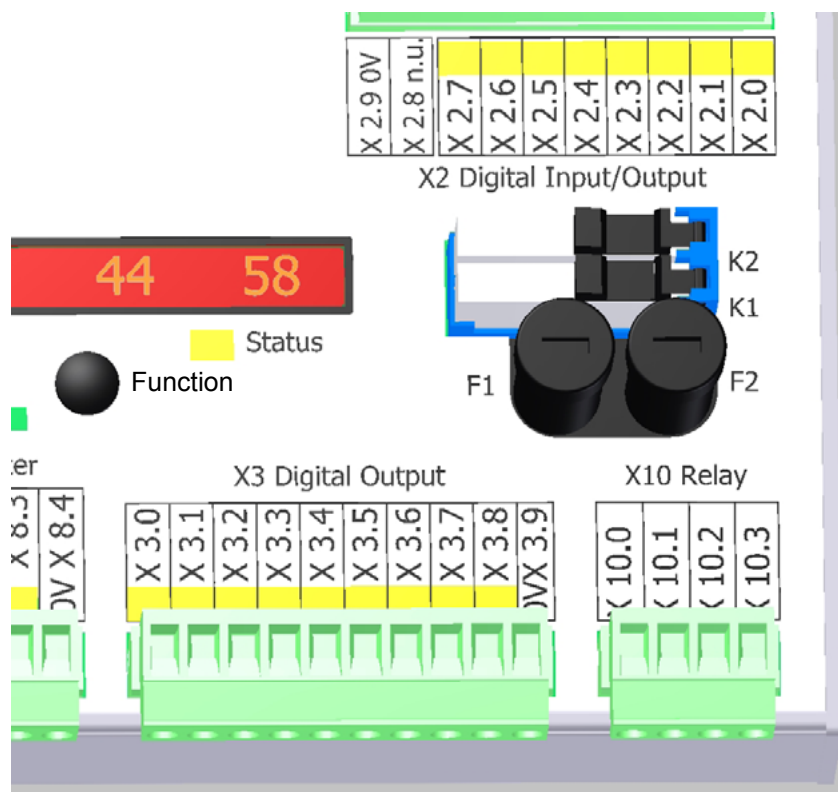
Insert the plugs X2 and X3 again. Switch on the controller again.

Activate clamp and release and check connection passage of the plugs X10.0 and 10.1 or rather X10.2 and 10.3.

If you cannot detect connection passage while X3.0 and/or X3.1 is active, exchange the relay K1 and K2 with new ones. Type: Finder 34.51.7.024.4.0000 / 24VDC / 6A / 250VAC or 30VDC

If you detect connection passage, check the wiring to the valve and from valve to control cabinet.

Insert plug X10 again and check the function of the valve.



See [Wiring plan](#)

## 13 Maintenance

### 13.1 Battery exchange

If the K11 is not energised periodically, the internal clock is supplied with voltage by a battery. If it is empty the K11 loses its time adjustment and displays after reswitching the date 01.Jan.1970. So the events are not synchronised with actual date and time in the LOG file.

If during the measurement a voltage drop occurs, this event is not saved and after resetting the last event could be displayed incorrectly.

For battery exchange switch off the machine.

Remove all cable connections to the K11.

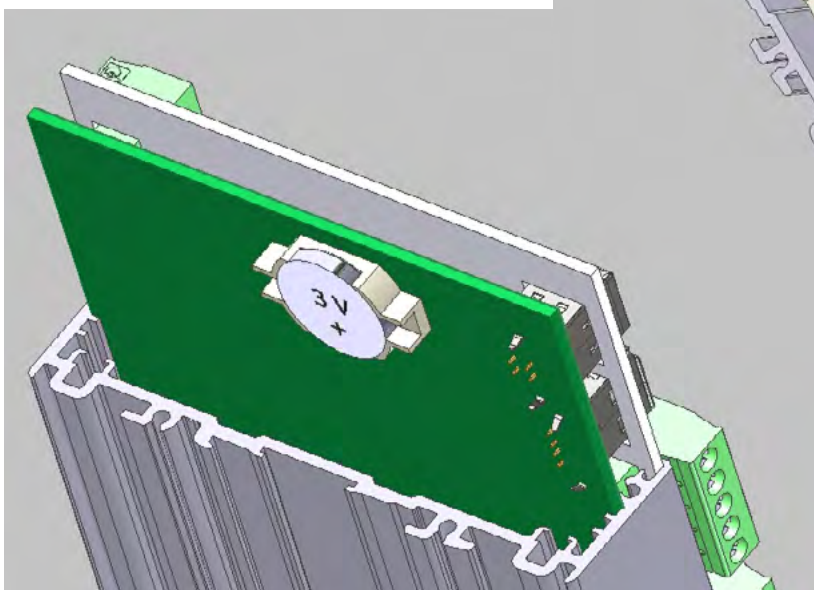
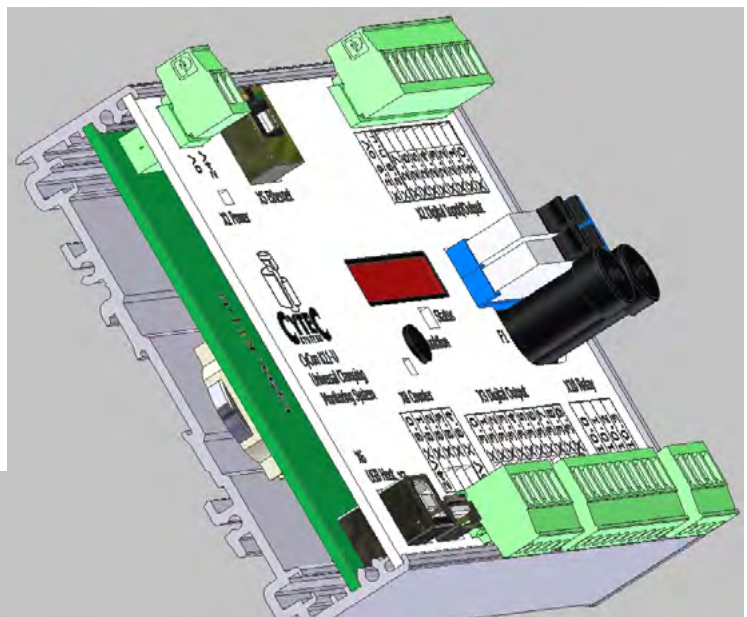
Remove the controller from the cap rail.

Screw off the left lateral plate and carefully draw off a bit the card and front cover.

Remove carefully the empty battery and substitute it with a new one.

Push in the card and front cover and mount the lateral plate again.

Mount the controller to the cap rail again. Remount all cable connections.



Switch on the machine.  
Set the internal clock as described under [Register card 4 configuration](#).

**Required is a Lithium battery  
Type CR2032.**