CyCon K11 BIOS 3.05 Monitoring system

Operation and Maintenance Manual

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Content

Monitoring of clamping with controller K11 BIOS 3.05

1 Technical information

The K11 controller is a versatile microcontroller, which was designed especially for monitoring and safety functions of machine tools. It works at common voltage levels (24 V) and can be connected to any common 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.

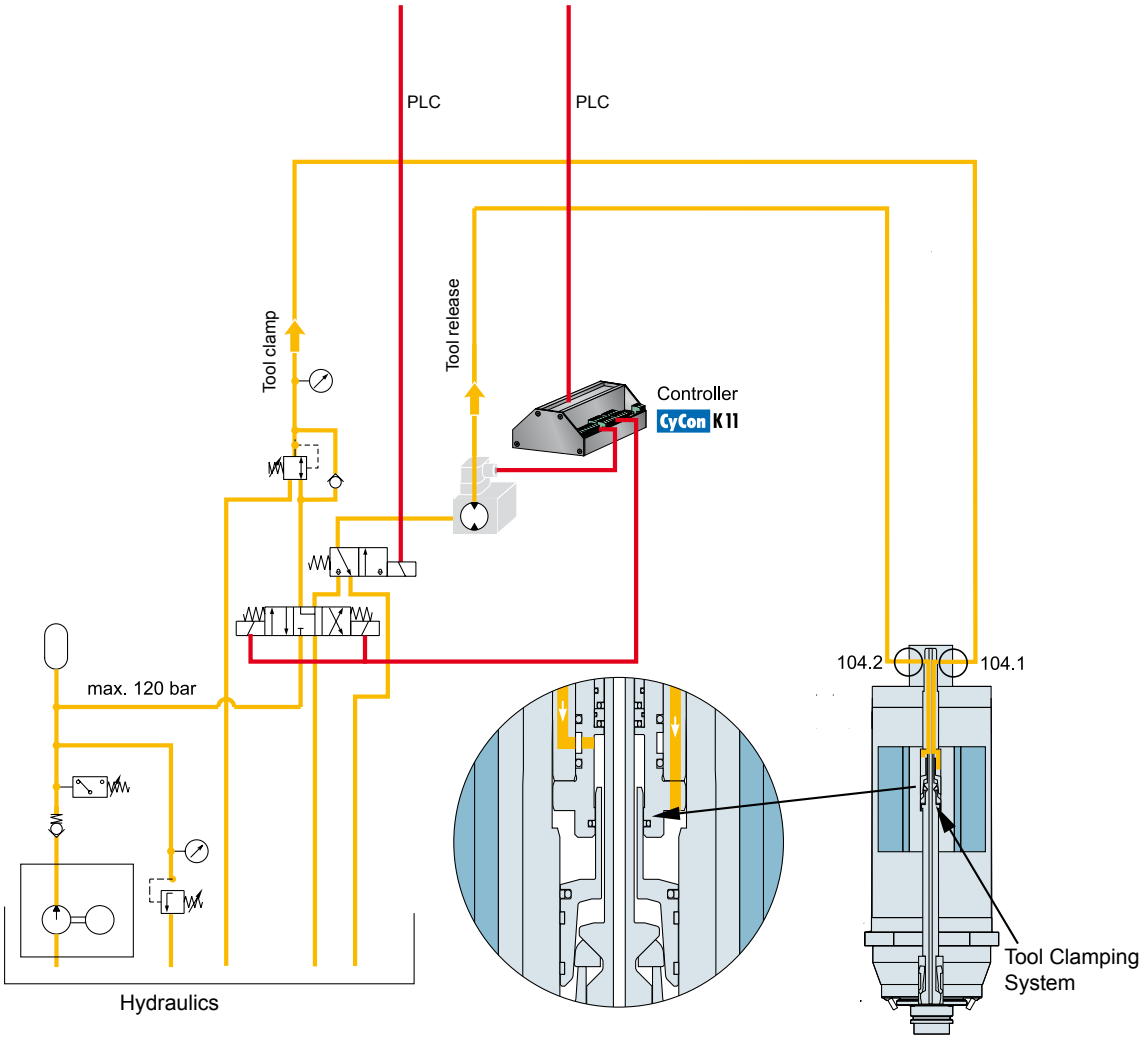
Apart from that the controller can be used for the following functions which are of inferior importance in conjunction with CyTec motor spindles:

- Tool face control (tool position)
- Monitoring of hydraulic system during operation
- Vibration sensing and control (Sensor V-Sens 10 required)
- monitoring of the analog values (3 channels)

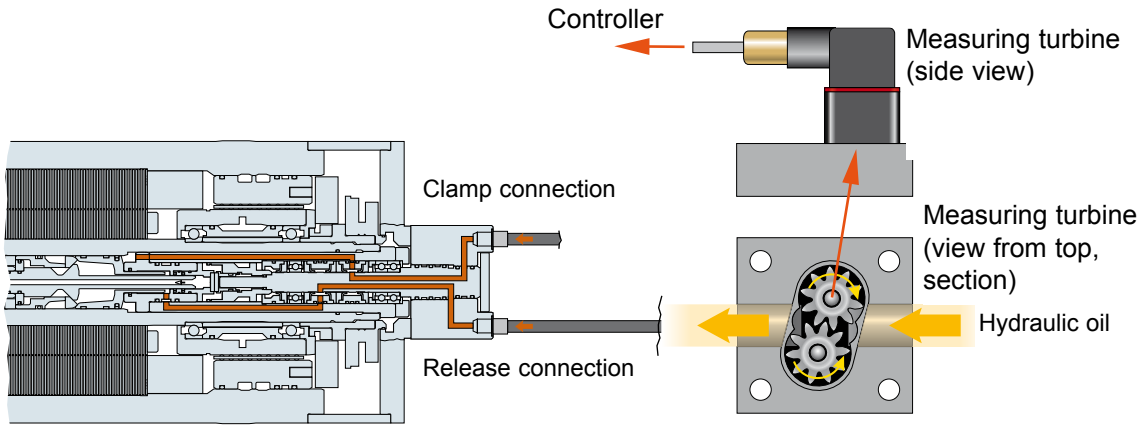
Communication between K11 and an external PLC is performed by digital I/O-signals only (8 bit).
The PLC selects a function by these digital input signals. The result is sent back by digital output signals.

All function parameters and limits of the K11-Controller are set via a windows program.

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.



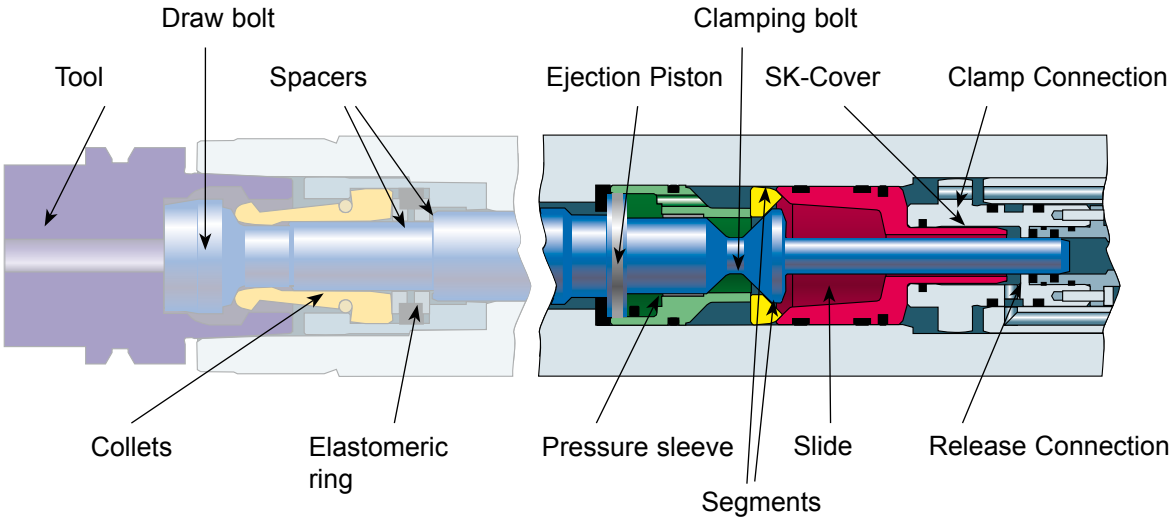
These rotations are detected by sensors and measured as frequency by the controller. This oil volume is always proportional to the clamping distance.
So not only the final position is monitored but also the entire effective range of the clamping circle.

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 PC with a 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.

The clamping system

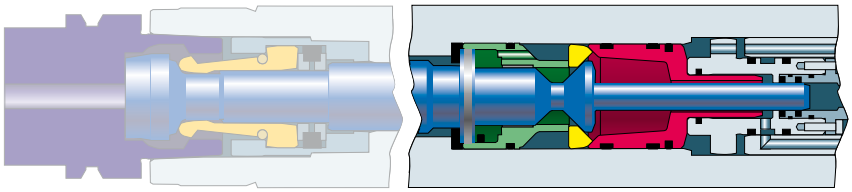


The collet kit is operated by the clamping cartridge. Its main components are: the centrally located tension bolt, the function segments which are placed concentric around it, and the slide enclosing these elements. In a hydro-mechanical system the slide is displaced directly by the pressurized hydraulic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

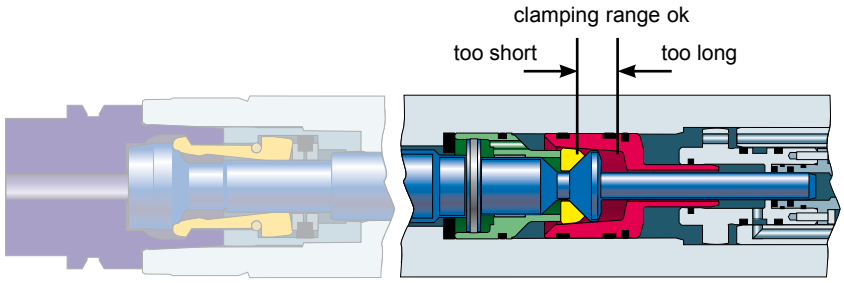
In the clamped position the positive lock is active. Clamping pressure can now be relieved as the clamping force is mechanically maintained by the self retention of the wedge system.

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

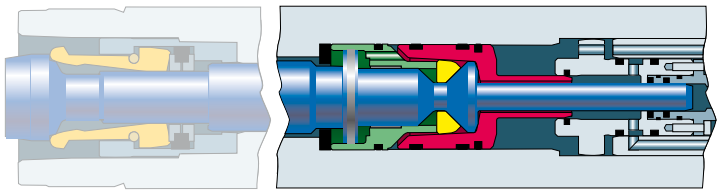
1. released position



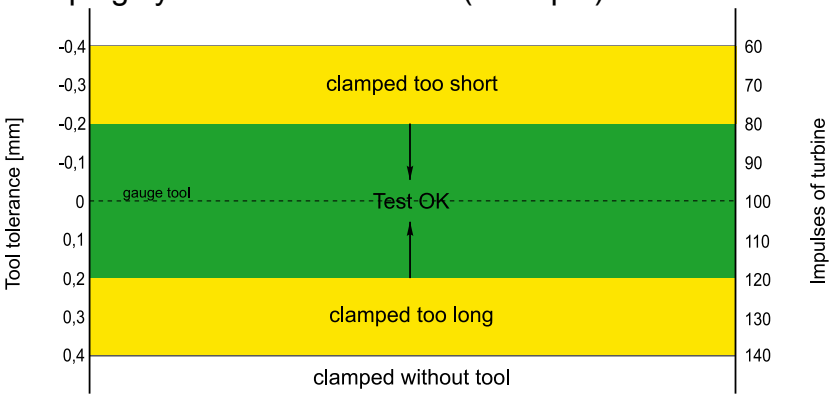
2. clamped position



3. totally clamped position without tool



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).

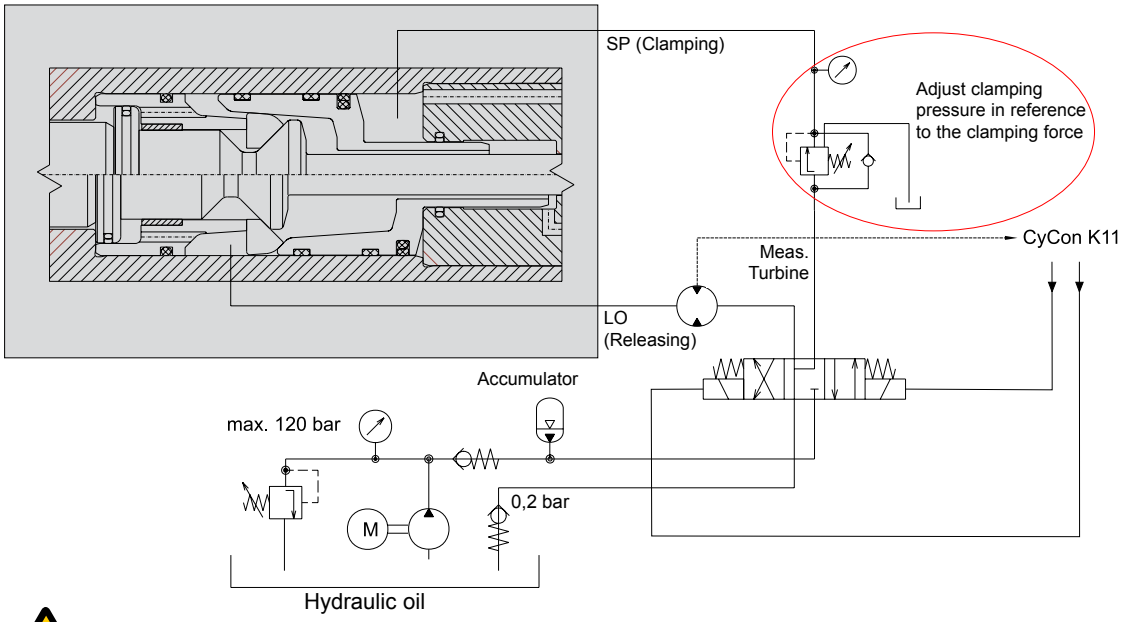
3 Prepare for usage

3.1 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



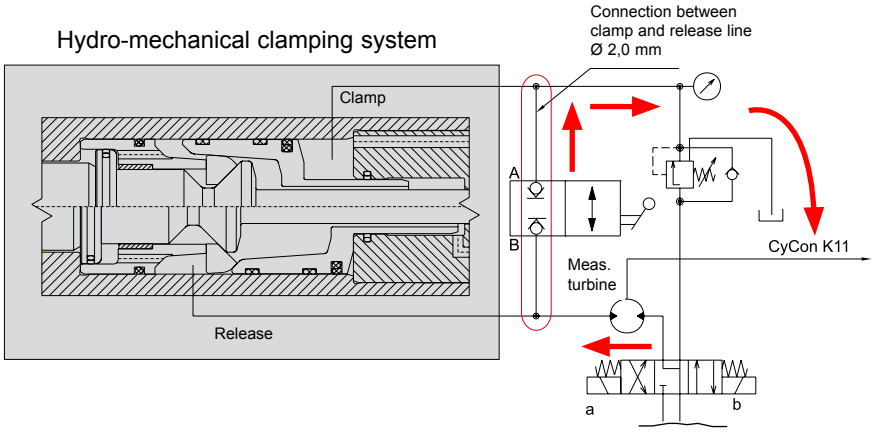
Caution:

- **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.**

3.2 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 clamper 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.

3.2.1 Procedure steps

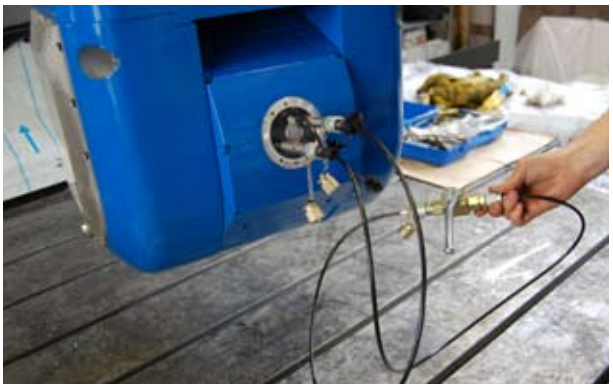
Step 1: Before attempting to bleed air from the hydraulic lines it is important to have allowed the oil in the hydraulic tank to have stood for a minimum of 3 hours. Failure to do this may mean that air bubbles could still be present in the oil that is going to be used for bleeding. This is especially 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 A-axis in a swivel position (+45 °) to expose the two bleed points on the rear part of A-axis swivel housing 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.

Swivelled A-axis with stems and fittings on bleeding points

Step 3: Remove the two plugs of the bleeding drills on the swivel housing of A-axis 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

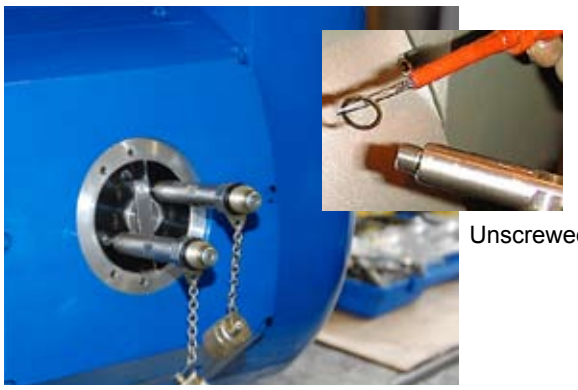
Step 4: **Attention: Make sure that during fitting the bleeding set no clamp or unclamp cycles are operated.**

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.

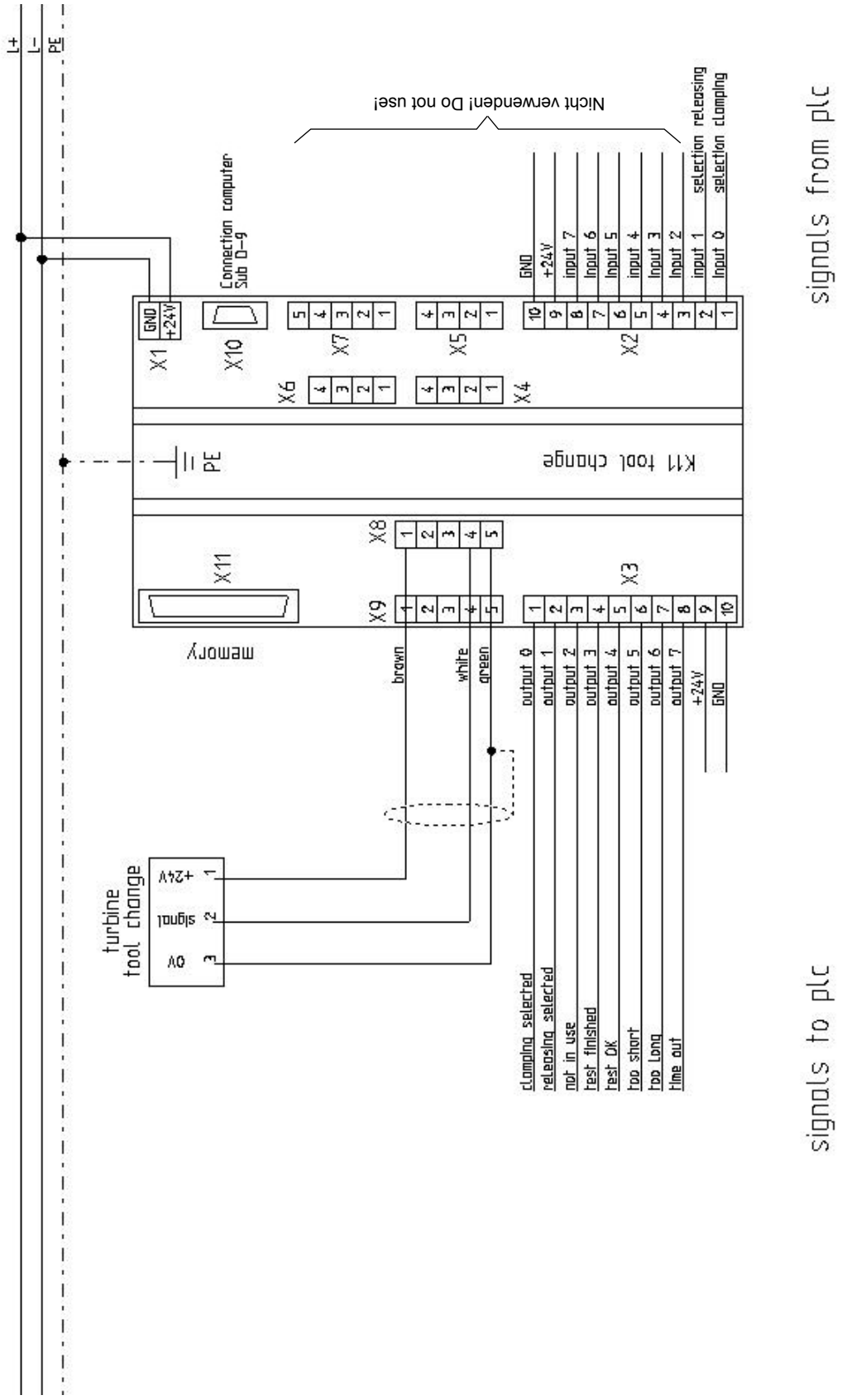
Step 6: Remove the bleed tap assembly as swiftly as possible and replace the plugs. Some oil will be lost but this is unavoidable. Try to minimise this oil loss as much as possible by putting a finger over the ports as each stem is removed from the head. Also check that the copper washer is removed with 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.

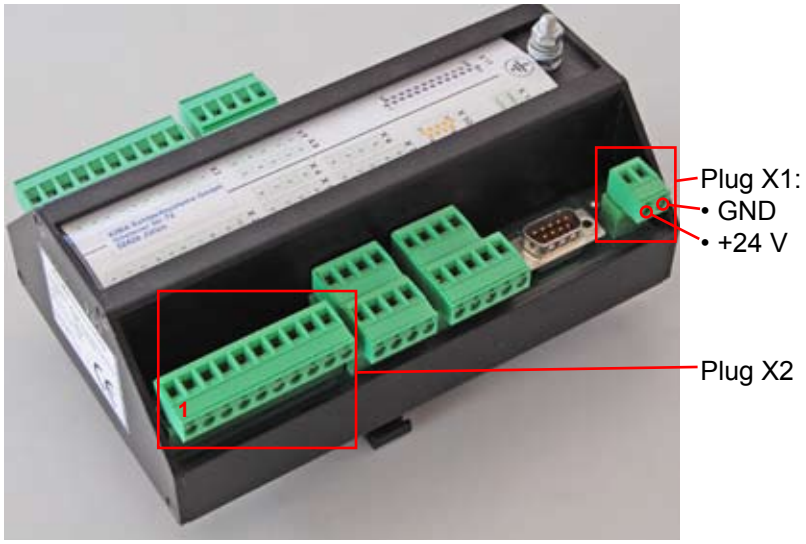
3.3 Pin layout



The monitoring functions of the K11 controller can be chosen via its digital inputs (input 0 up to input 7).

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

Designations on plug X2:

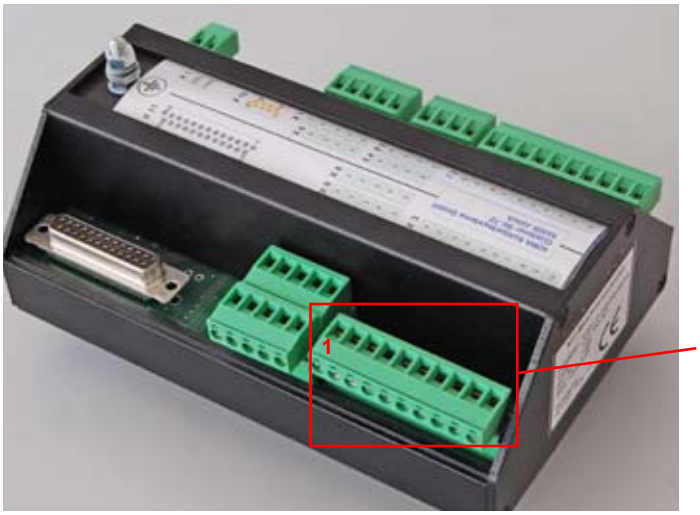


Input	Selection function	Logic level
I 0	CLAMP	HIGH (24 V)
I 1	RELEASE	HIGH (24 V)
I 2	(FLAT)	HIGH (24 V)
I 3	(VIBRATION)	HIGH (24 V)
I 4	Analog input 1	HIGH (24 V)
I 5	Analog input 2	HIGH (24 V)
I 6	Analog input 3	HIGH (24 V)
I 7	not used	-

If no function is selected, the controller goes into condition **IDLE** and displays the result of the last clamp/release process (if there has been one since the switching on).

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

Designations on plug X3:



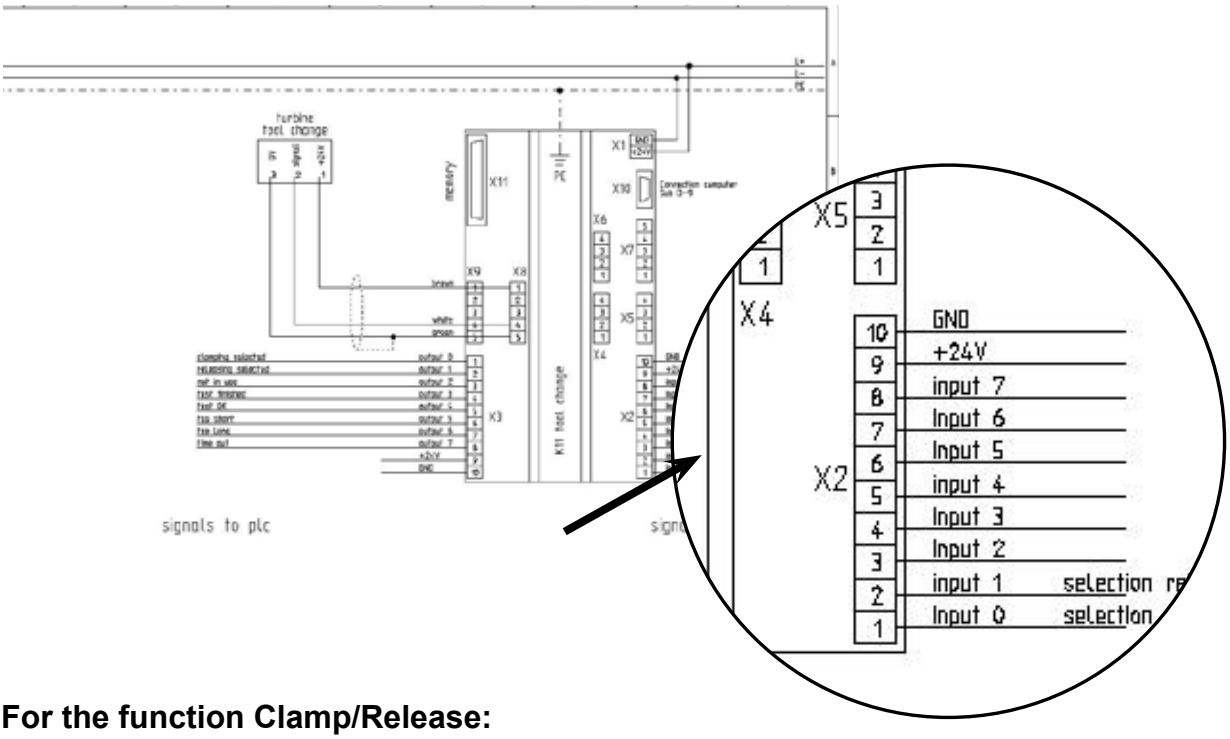
Output	Result for functions clamp and release	Logic level
O 0 O 1 O 2	selected function (binary coded) O2 O1 O0 0 0 0 = IDLE 0 0 1 = CLAMP 0 1 0 = RELEASE 0 1 1 = FLAT 1 0 0 = VIBRATION	HIGH (24 V)
O 3	Test finished	HIGH (24 V)
O 4	Test OK	HIGH (24 V)
O 5	too short (CLAMP/RELEASE)	HIGH (24 V)
O 6	too long (CLAMP/RELEASE) too high (VIBRATION)	HIGH (24 V)
O 7	Error (TIMEOUT)	HIGH (24 V)

3.4 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 injuries or machine damage.

The system is to be installed by qualified personel only!



For the function Clamp/Release:

Attention: While the spindle is rotating, never apply voltage to the input I0 on plug X2! The tool will be loosened from the spindle and hurled away uncontrollably! There is danger for personnel and material.

- Clamp and release lines and the clamping system must be vented according to the manual.

- The hydraulic lines must be secured against coasting. Recommended 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 pressurized hydaulic 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).
- 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.
- 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 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.

If required, CyTec can offer examples for the integration of the controller in Siemens PLC‘s.

The controller K11 must be adjusted correctly.

4 Operation

To parameterise the K11 – Controller exists a user program. With this program it is possible to parameterise the register cards / functions as well to see the measuring value.

4.1 Installation of the software

The operation program is designed for installation under operating system Windows up to version 7. The installation disk contains an installation directory \ CYTEC with the data file CytecxXXX.exe (the XXX stands for the version number, e.g. Cytec312.exe)

Copy **the directory \CYTEC** on the hard disk of the computer. The data file CytecXXX.exe is a self extracting file.

With a double click on this data file the following data files were extracted in the same directory:

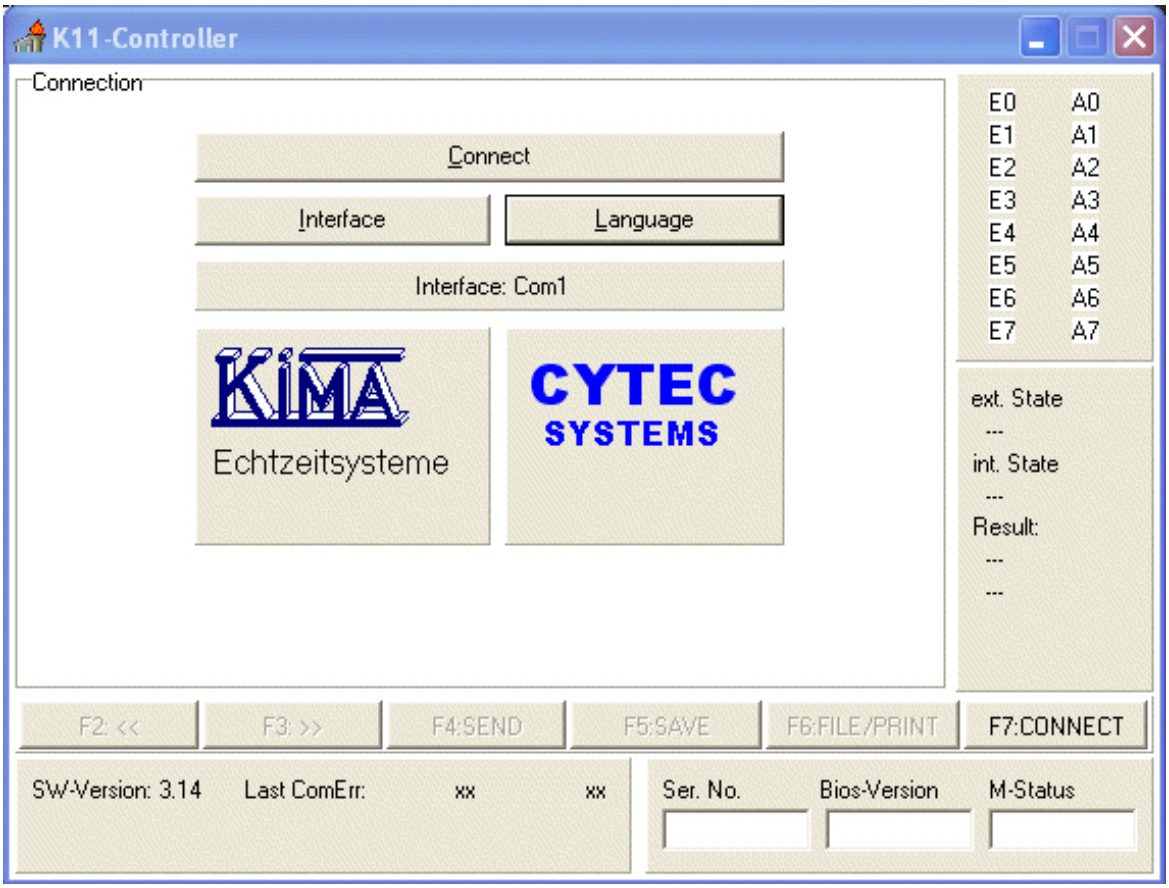
- Read_me.txt Informations to the installation
- Supercom a data file
- Supercom.dll a program library
- Cytec_03.exe the user program

To start the user program Cytec_03.exe the data files Supercom.dll and Supercom must exist in the same dictory as the user program!

Note:
No system files or registry entries were changed. For deinstallation delete the directory X:\cytec with the K11 program.

4.2 Start of program

Start program CYTEC_03.EXE in directory \CYTEC (double click).
The following screen is displayed:



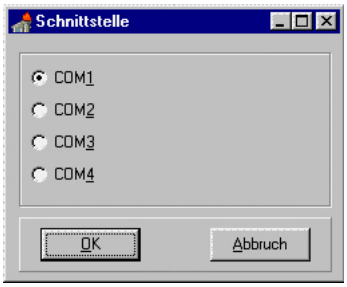
Up to now the program is not connected to the K11-Controller.

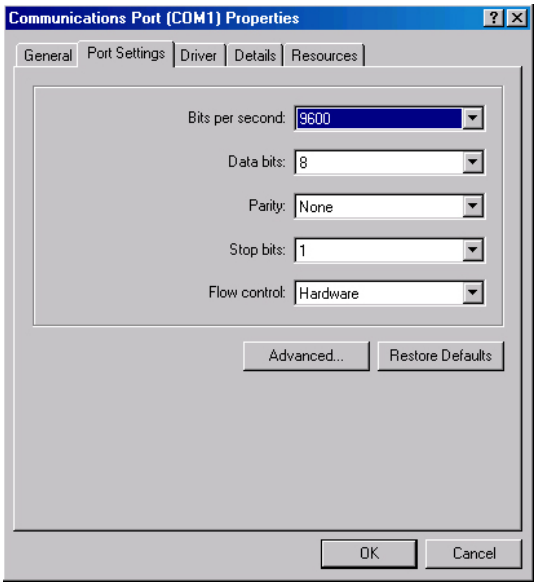
Only now connect the controller with the PC (with the shipped 0-modem-cable).
Adjust the desired interface (see next chapter).

4.3 Language choice/interface

By clicking of the button “Language“ the language of the program can be chosen. You can use either german or english.

Select a language and click **OK**. The chosen adjustment is stored.



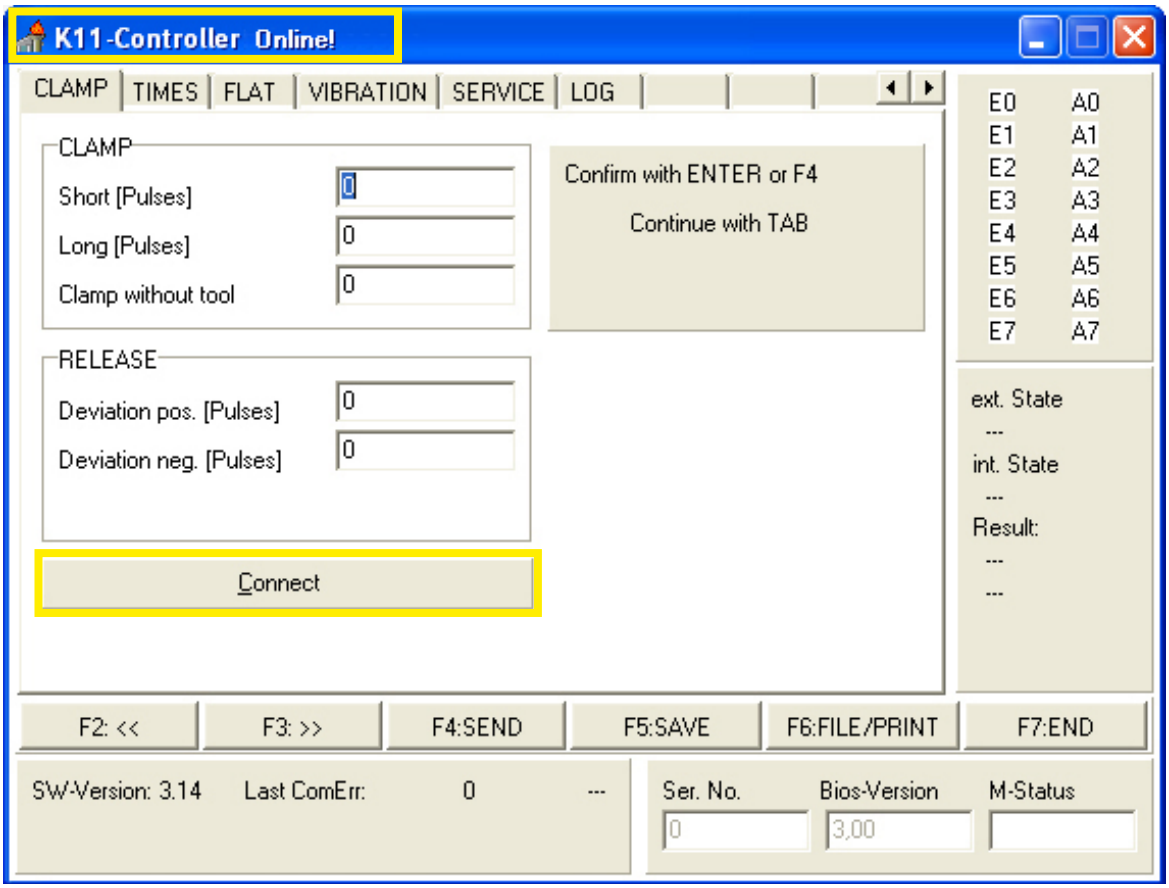


To set the interface click on the button Interface after the start of the user program (COM1 - COM4 are available).

Check the settings of the interface you want to use. Bring the setting to standard values (Button ”Restore Defaults”).

Choose the com-port your K11-Controller is connected to. Click on button OK and then the setting is saved.

To connect to the K11-Controller Click on button **Connect** or press the button **F7**.

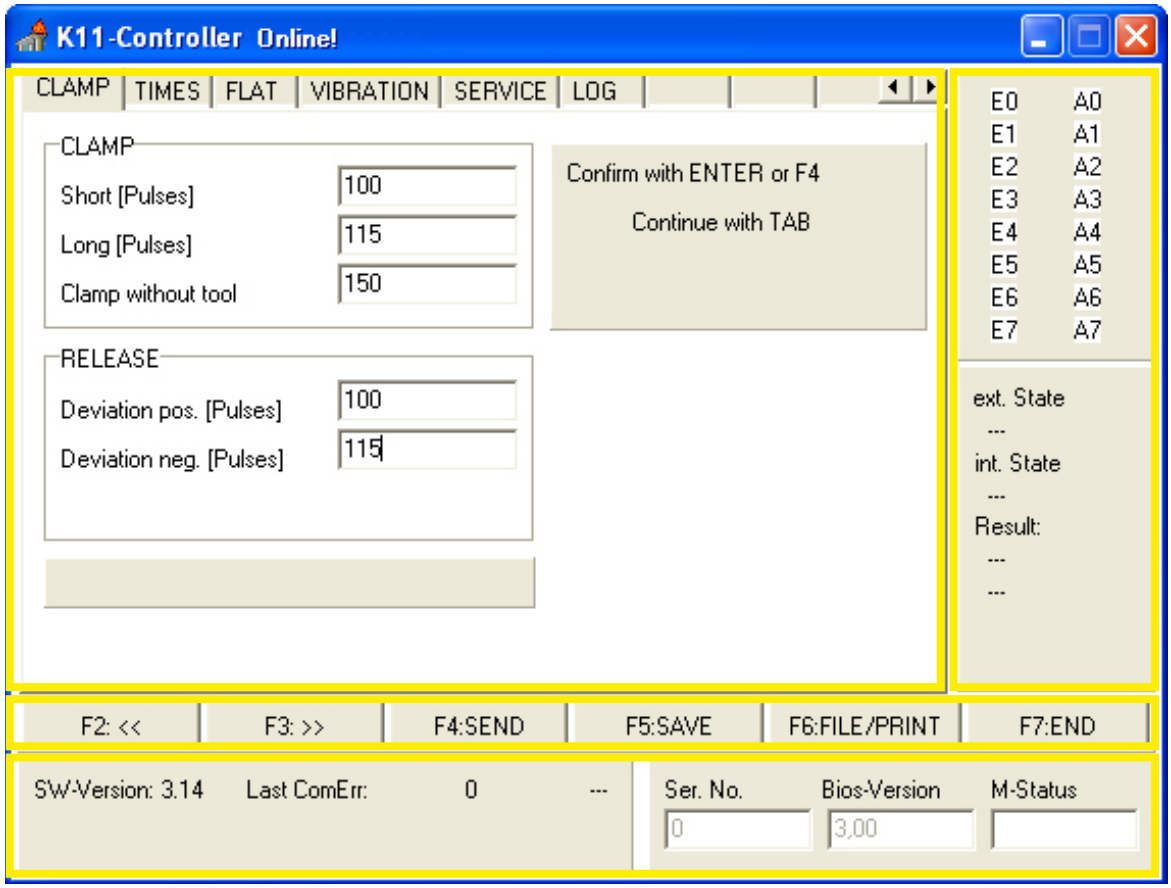


After succesful connection to K11-Controller, the programm changes to the register card CLAMP. A small window in the middle left of the screen first shows “connect“ and afterwards “read“. The caption of the user program shows K11-Controller Online!.

The Programm can now exchange information with the K11-Controller.

Serial number and software version of K11-Controller are displayed.

4.4 The program window



The program window shows four areas:

1. the status display on the bottom
2. the control panel with the function keys
3. the register cards on the left side
4. the display group on the right side

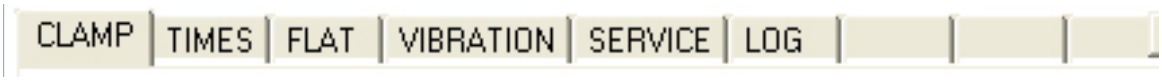
to 1) The status display:

shows the software version of the user program, the serial number, the software version and machine status of the K11 – Controller.

to 2) The control panel:

Button	**<<**	or **Button F2** :	Go to the next register card on the left site
Button	**>>**	or **Button F3** :	Go to the next register card on the right site
Button	**SEND**	or **Button F4** :	Transfer the parameter to the controller
Button	**SAVE**	or **Button F5** :	Save the parameter in the EEPROM
Button	**FILE/PRINT**	or **Button F6** :	Print of all parameter, measuring values and logfile
Button	**FINISH**	or **Button F7** :	Close the user programm and finish the connection to the K11 – Controller

to 3) With the register cards it is possible to change the parameter for

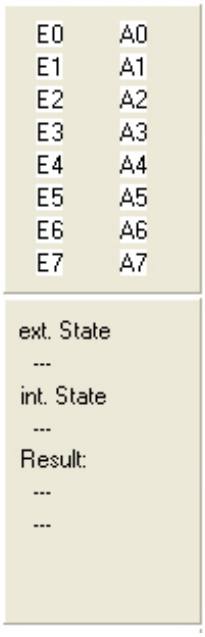


- CLAMP
- TIMES

(• FLAT)*
(• VIBRATION)*
(• Analog inputs 1-3)*

The with (*) designated register cards can be selected, but do not have any function in this BIOS version of the controller.

to 4) the display group

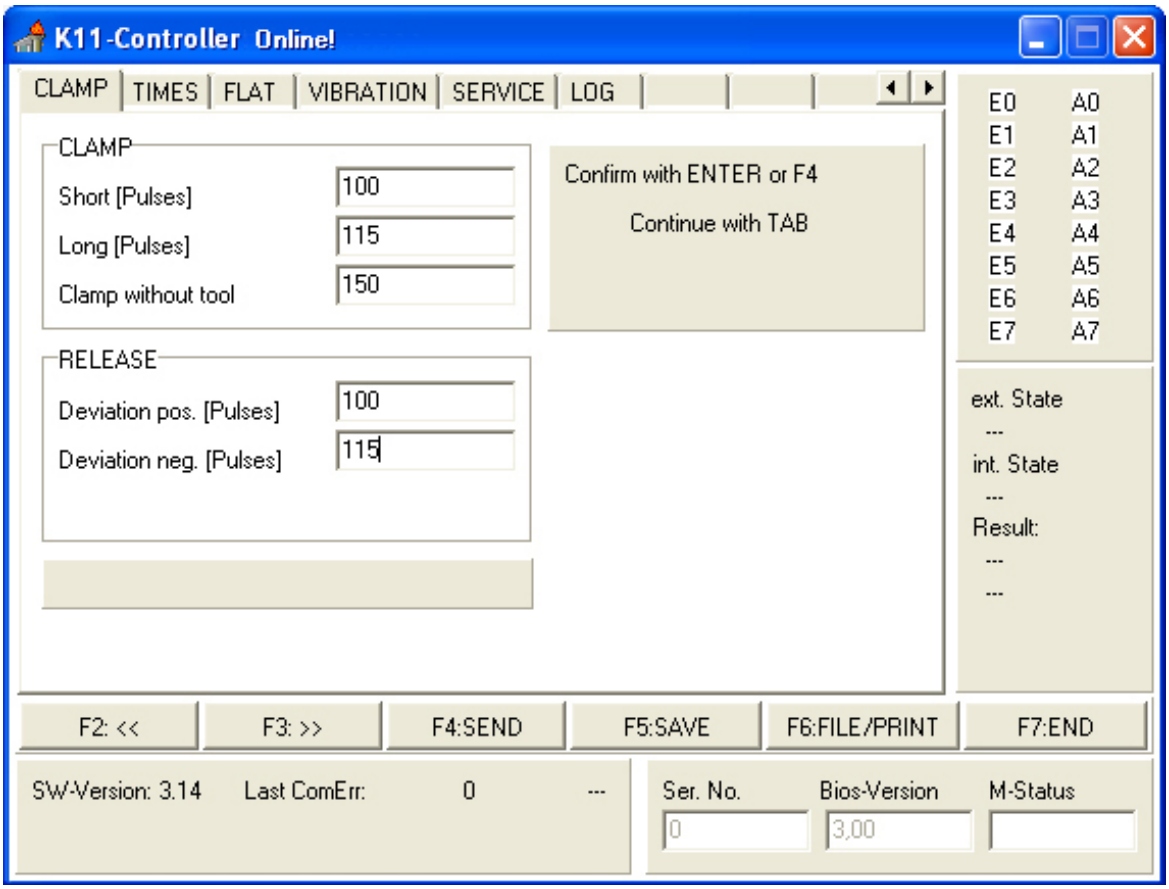


The display shows the actual status of

- **Input bits** (I0 – I7)
- **Output bits** (O0 – O7)
- **Status of measuring** (internal states)
- **Results**

4.5 Register card CLAMP

Starting with the version 2.11 of the K11 – BIOS, the card CLAMP looks like this:



Here the deviation of the release distance compared with the last clamp distance is entered. All boxes can be edited directly.

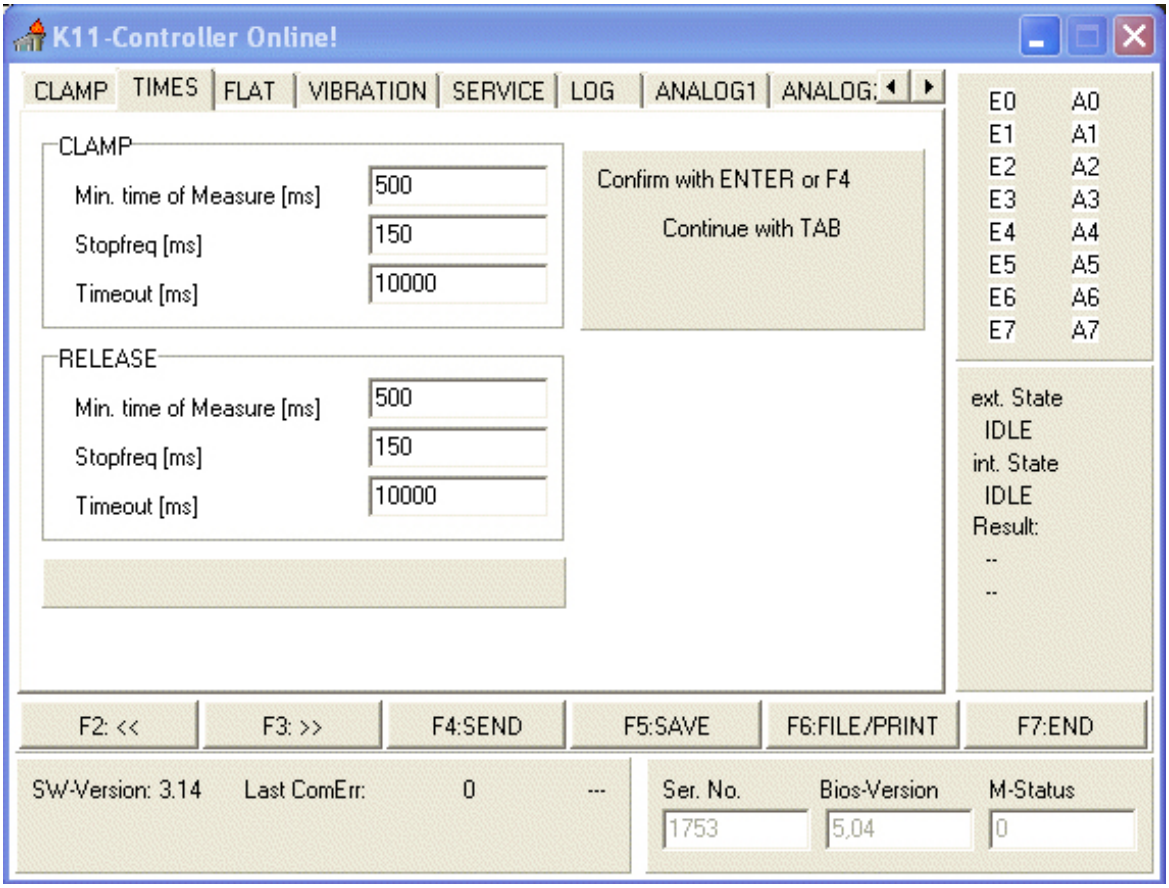
Use Enter-key or the button **SEND** or the **key F4** to commit). Integers only will be accepted (no comma or dot). Changed parameters are transfered immediately and checked for validity range. Out-of-range values are rejected. Accepted values are in use only after commiting the **Enter** or **F4-key**. Permanent saving can be performed with the box **SAVE** or the **key F5**.

Valid ranges:

- short (0...500)
- long (0... 3000)
- clamp without tool (0... 2000)
- deviation pos. pulses (-500...500)
- deviation neg. pulses (-500...500)

4.6 Register card TIMES

Set timing parameters for clamp and release. All fields can be edited (use **Enter-key** or the button **SEND** or the **key F4** to commit). Integers only will be accepted. Changed parameters are transfered immediately and checked for valid range. Out-of range values are rejected. Accepted values are in use only after commiting the **Enter** or **F4-Key**. Permanent saving can be performed with the box **SAVE** or the **key F5**.

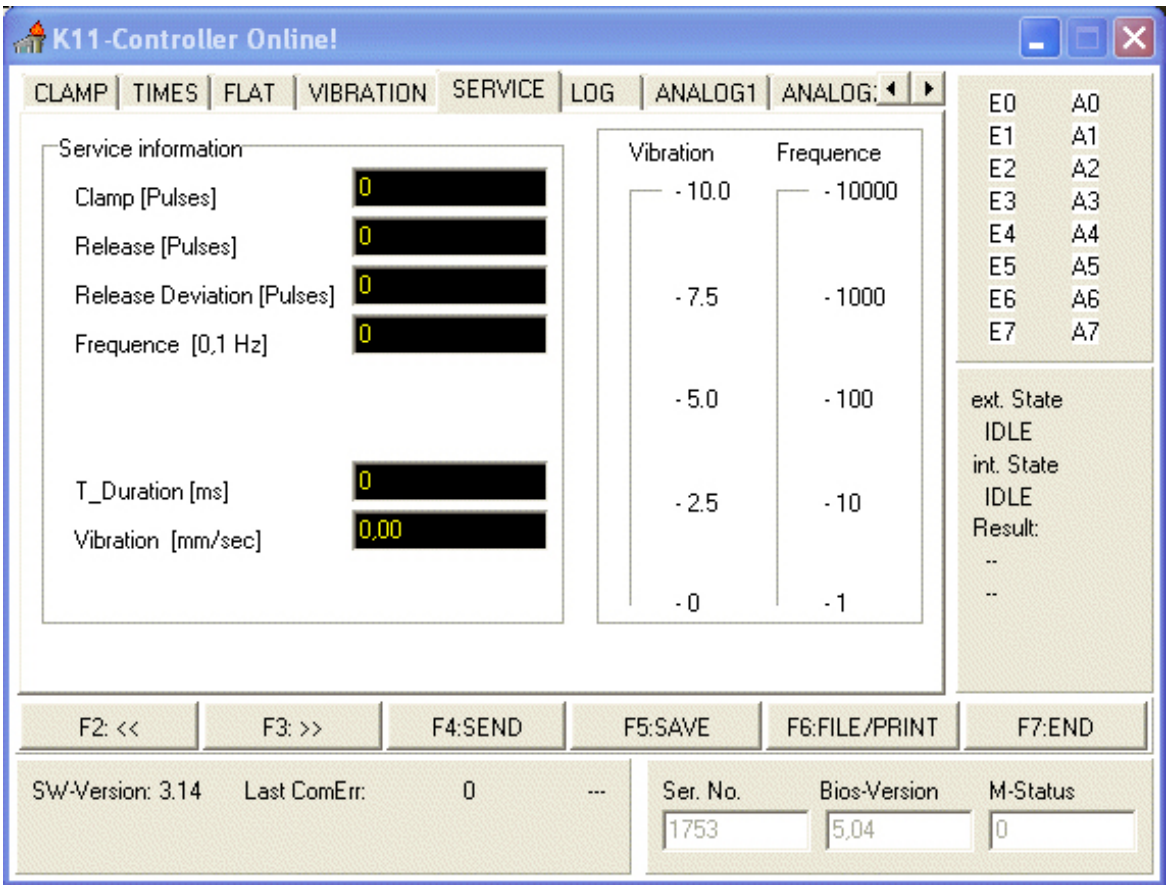


Valid ranges:

- Minimum time of measuring (0 ... 10000 ms)
- Stopfrequency (0 ... 10000 ms)
- Timeout (0 ... 10000 ms)

4.7 Register card SERVICE

No parameters can be edited here. Actual measured values of the cards **CLAMPING** and **TIMES** and frequencies or pulse counts (right bar; scale is logarithmic in 1/10 Hz) according to the actual function selected by the PLC are displayed.



Values displayed for:

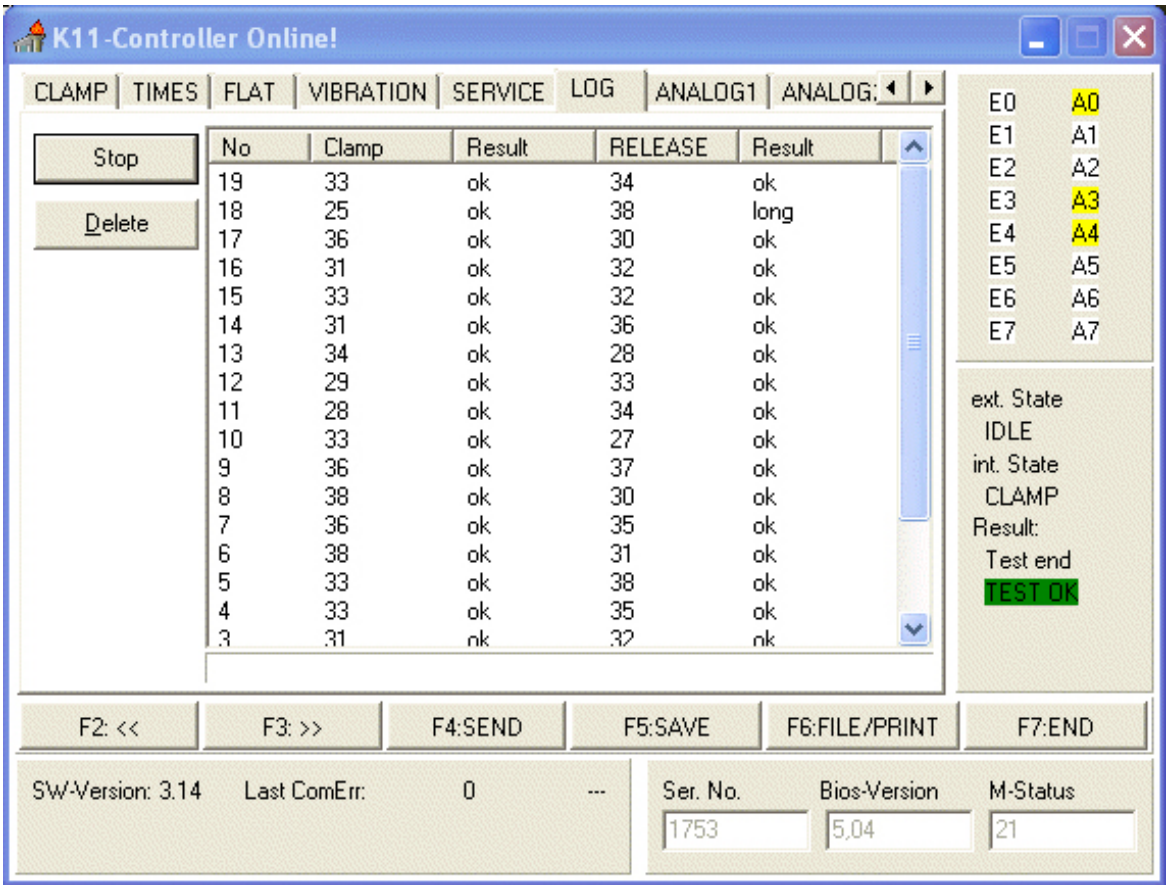
Clamp / Release

- Clamp (pulses)
- Release (pulses)
- Release deviation (pulses)
- actual frequency (frequency)
- Duration of measuring (T_Duration = 0, if Timeout was exceeded)
- Vibration

These values are useful hints to find parameters for all modes.

4.8 Register card LOG

The function logfile exists for the error diagnostic of clamp/relase – processes and as documentation of the settings of the controller. Every clamp/release – process is written in the logfile with its corresponding value. The last 100 clamp/release – processes are saved.



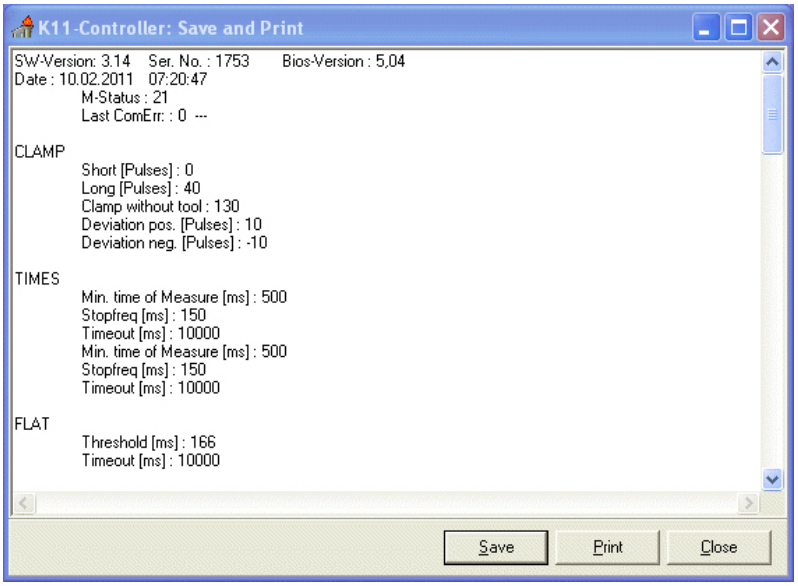
The button Read activates the logfile. As soon as a complete cycle (clamp and subsequent release) is finished, a new line with measuring data and results is displayed. With pushing the button **STOP** the reading ends, pushing the button **DELETE** deletes the screen.

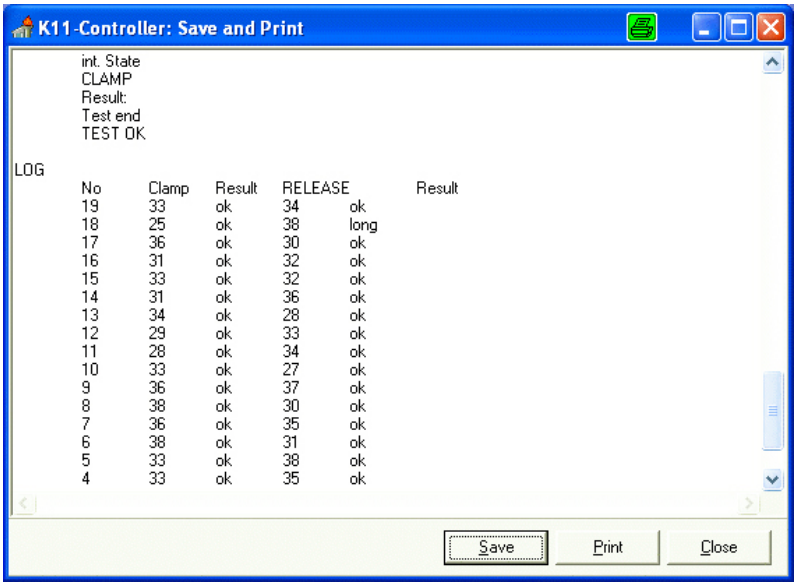
The button File/Print or the key F6 can save the logfile as file or print it.

Warning: Read should not stay activated in the normal use of the K11. In some cases errors of the measurement (Clamp / Release) can occur while reading the log.

4.9 Save and print LOG

The button FILE/PRINT is available with version 2.91. The machine and the parameters of the controller can be displayed, printed or saved into a datafile. The program itself suggests datanames containing series number, date and a continuing index. The logfiles were saved in the directory “Cytec\Log”. These log data can be used to document the parameters or to detect errors.





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. Underrunning 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).

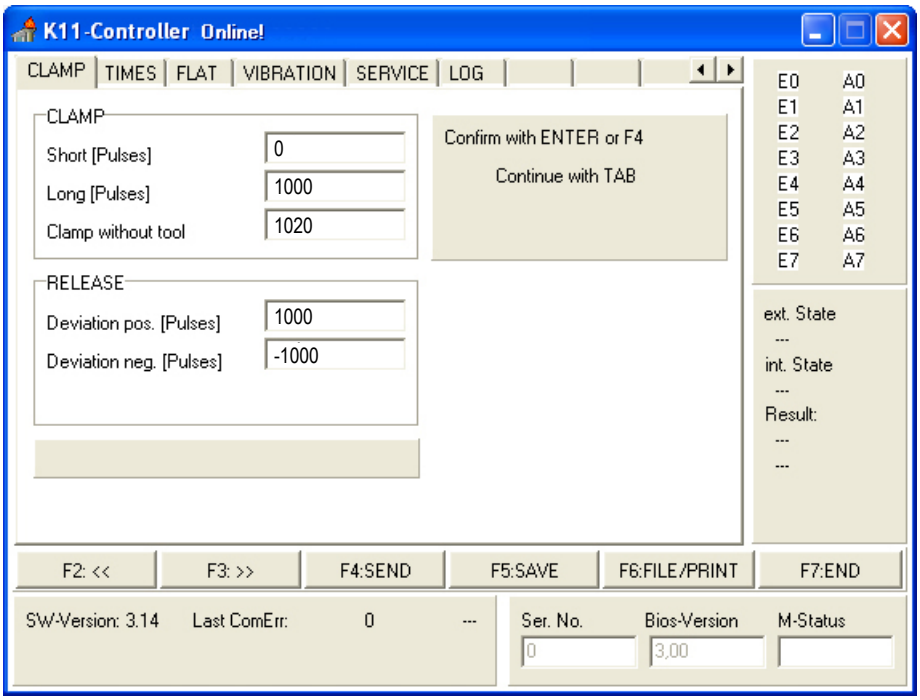
A pre-adjustment of parameters or parameter specifications by the manufacturer are not possible, because all parameters must be adjusted to the on-site hydraulic system of the machine.

5.2 Determination and setting of parameters

Procedural steps:

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

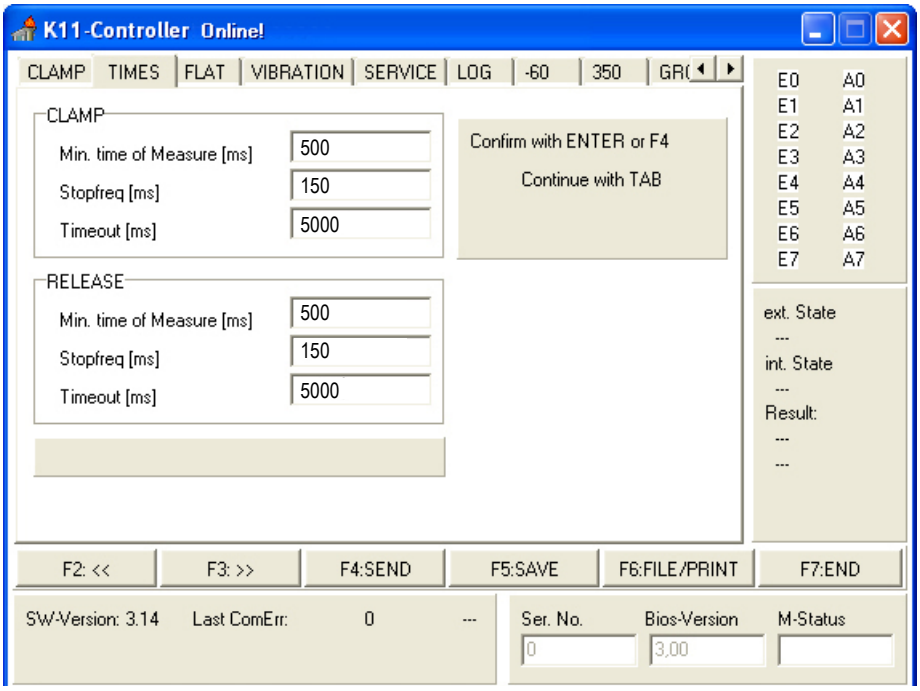
Step 2: Connect controller and PC and start the user software as described in chap. 4. Each input must be confirmed with **RETURN/ENTER** and each register card must be saved by double-clicking the **SAVE**-button.



Step 3: Select register card CLAMP and input the following values:

CLAMP: **short** **= 0**
long **= 1000**
CLAMP without tool **= 1020**

RELEASE: Deviation pos.: = 1000
Deviation neg.: = -1000



Step 4: Select register card TIMES and input the following values:

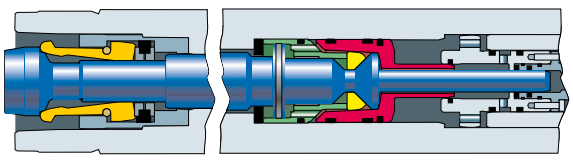
CLAMP:	Min. measuring time	**= 500**
	Stop frequency	**= 150**
	Timeout	**= 5000**

RELEASE: same as CLAMP

During the value collection no automatic tool changes must be executed!

Step 5: Select register card SERVICE. Read the values indicated during the following procedure and chart them into a table.

Step 6: Operate the clamping system repeatedly without tool (at least 15 times). Note the displayed values for clamping [pulses] and release deviation [pulses] and calculate the average value.



Clamping system clamped without tool

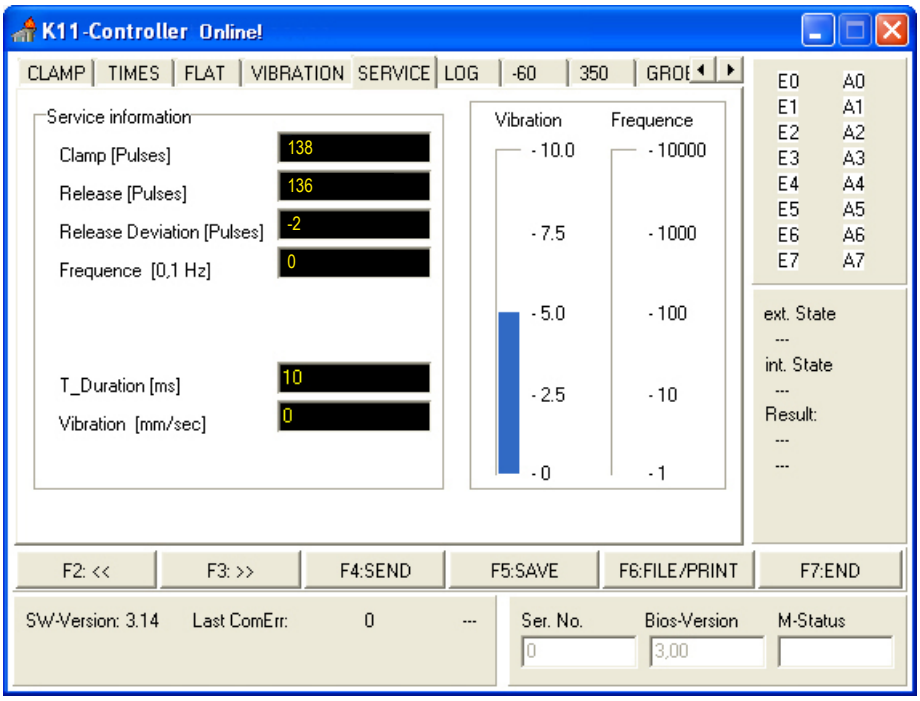


Table 1 (example)

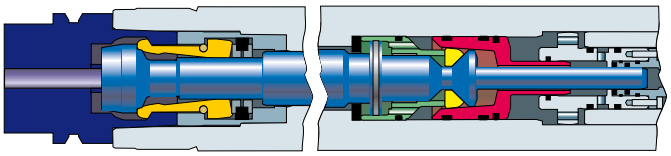
Nr.	Pulses clamp	Release deviation
1	138	-2
2	134	-8
3	140	-2
4	139	-6
5	140	-3
:	:	:
:	:	:
:	:	:
15	135	-4

maximum value

Ø 138

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

Step 7: 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.



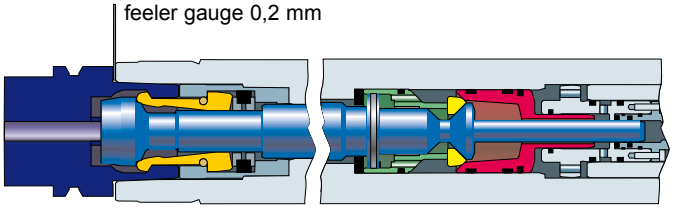
Clamping system clamped with zero-tool

Table 2 (example)

Nr.	pulses clamp	release deviation
1	88	-2
2	91	-6
3	88	-2
4	89	-2
5	87	-1
:	:	:
:	:	:
:	:	:
15	89	-4

Ø 89

Step 8: 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.

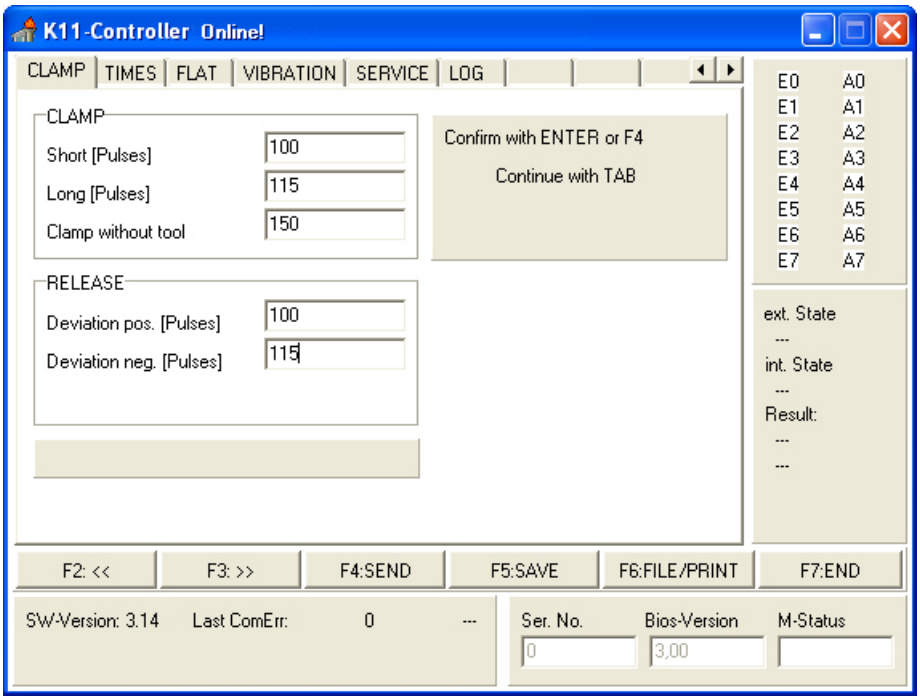


Clamping system clamped with zero tool

Table 3 (example)

Nr.	pulses clamp	release deviation	
1	66	-2	
2	70	-6	
3	66	-2	
4	68	-2	
5	68	-1	minimum value
:	:	:	
:	:	:	
:	:	:	
15	66	-4	
	Ø 67		

Step 9: Select register card CLAMP



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 = 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 = 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 = 111**

3. Limit for “Release/deviation pos.“:

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

-1 + 10 = 9

4. Limit for “Release/deviation neg.“:

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

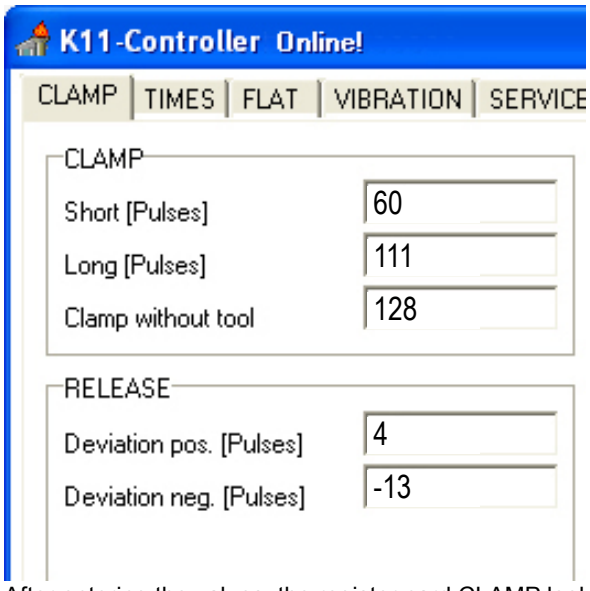
-8 - 10 = -18

5. Limit for “Clamp without tool“:

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

138 - 10 = 128

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



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

Each modified entry must be confirmed by pressing the Return/enter key and each register card must be saved by double clicking the “Save“-buttons.

5.3 Adjustment of minimum measuring time

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

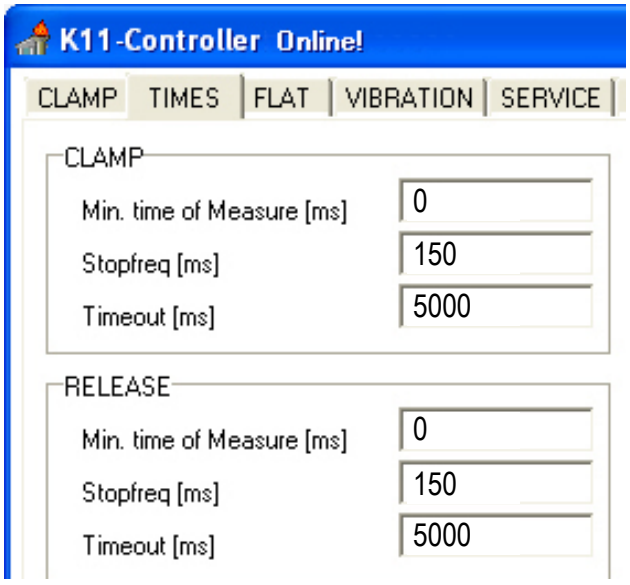
As standard value a stop frequency of 150 is recommended.
“Minimum measuring time“ is the time set to count all pulses, however, without considering the “Stop frequency“. The signal “Test finished“ is only read out after the minimum measuring time has elapsed and after the subsequent check whether the stop frequency was underrun.

Procedural steps:

Step 10: Select register card TIMES and enter the following values:

CLAMP:	Minimum measuring time	**= 0**
	Stop frequency	**= 150**
	Timeout	**= 5000**

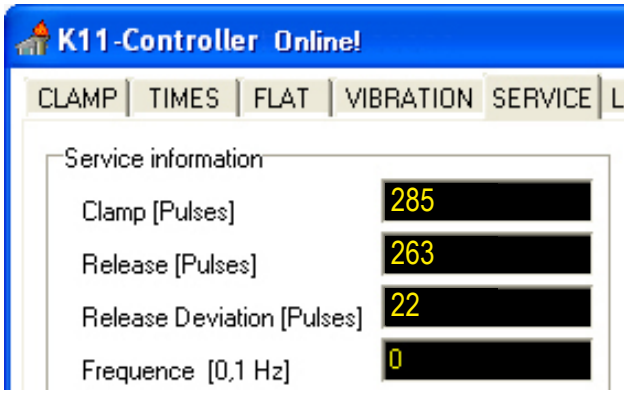
RELEASE same as CLAMP



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

Step 11: Select register card SERVICE.

Step 12: Execute several clamp/release cycles (at least 15) without tool. Note the displayed times and subtract the adjusted stop frequency (150) from the longest time. Enter two-thirds of the result as minimum measuring time into register card TIMES.



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

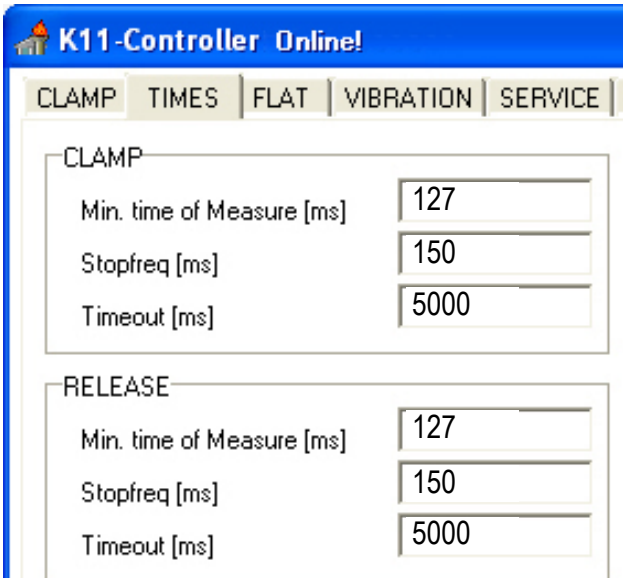
Table 4 (example)

Nr.	Times clamp	Times release	
1	285	263	
2	281	270	
3	283	267	
4	291	269	maximum value
5	282	264	
:	:	:	
:	:	:	
:	:	:	
15	286	286	

longest time = 291 ms
Stop frequency = 150 ms

$$\frac{2 \times (291\ \text{ms} - 150\ \text{ms})}{3} = 94\ \text{ms}$$

Minimum measuring time to be set = 94 ms.



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

6 Communication with the control system

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 contols or automation devices. Time warps are not required and mostly lead to mismeasurements.

6.1 Evaluation of feedback signals

“Test ok!“

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

“Clamped without tool!“

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

“Clamp too short/too long!“

- **Clamping:** The spindle must not rotate! Danger of losened 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!“ or “Error!“

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 I0 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 I0 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 I0 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.

6.2 PLC signals to the controller

For function clamp/release:

The input for manual or automatic clamping is **input I0** on **plug X2** of the K11-controller. The input can be triggered by the PLC or a switch 24 V.

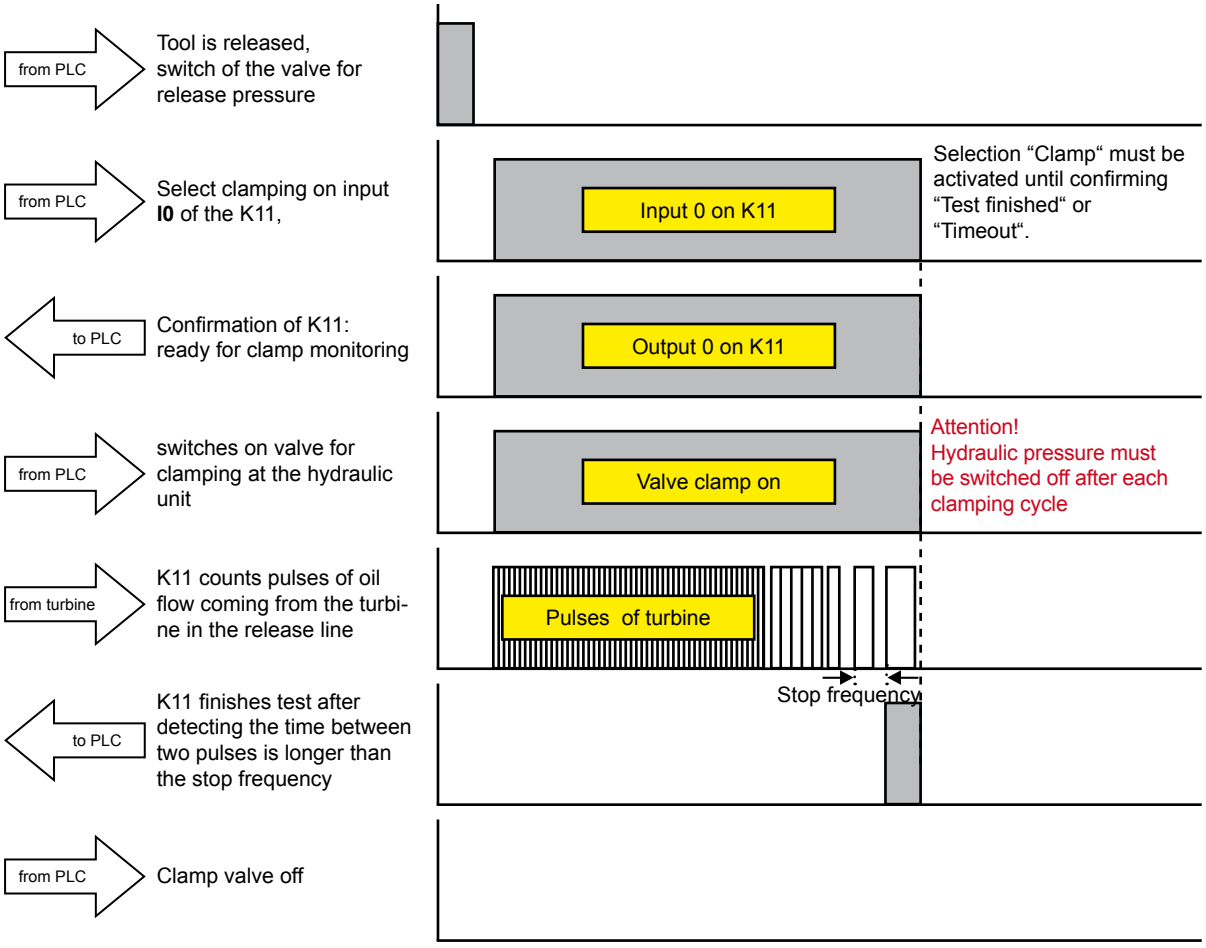
The input for manual or automatic release is **input I1** on **plug X2** of the K11-controller. The input can be triggered by the PLC or a switch 24 V.

For clamping the tool, the signal must be +24V to **input I0**, holding as long as the K11 confirms “Test finished“ (O3) or “Timeout“ (O7). The clamp-input must be blocked while the spindle is in rotation.

For releasing the tool, the signal must be +24V to **input I1**, holding as long as the clamping system is intended to be open. The release-input must be blocked while the spindle is in rotation.

6.3 Control sequence (BIOS 3.05)

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



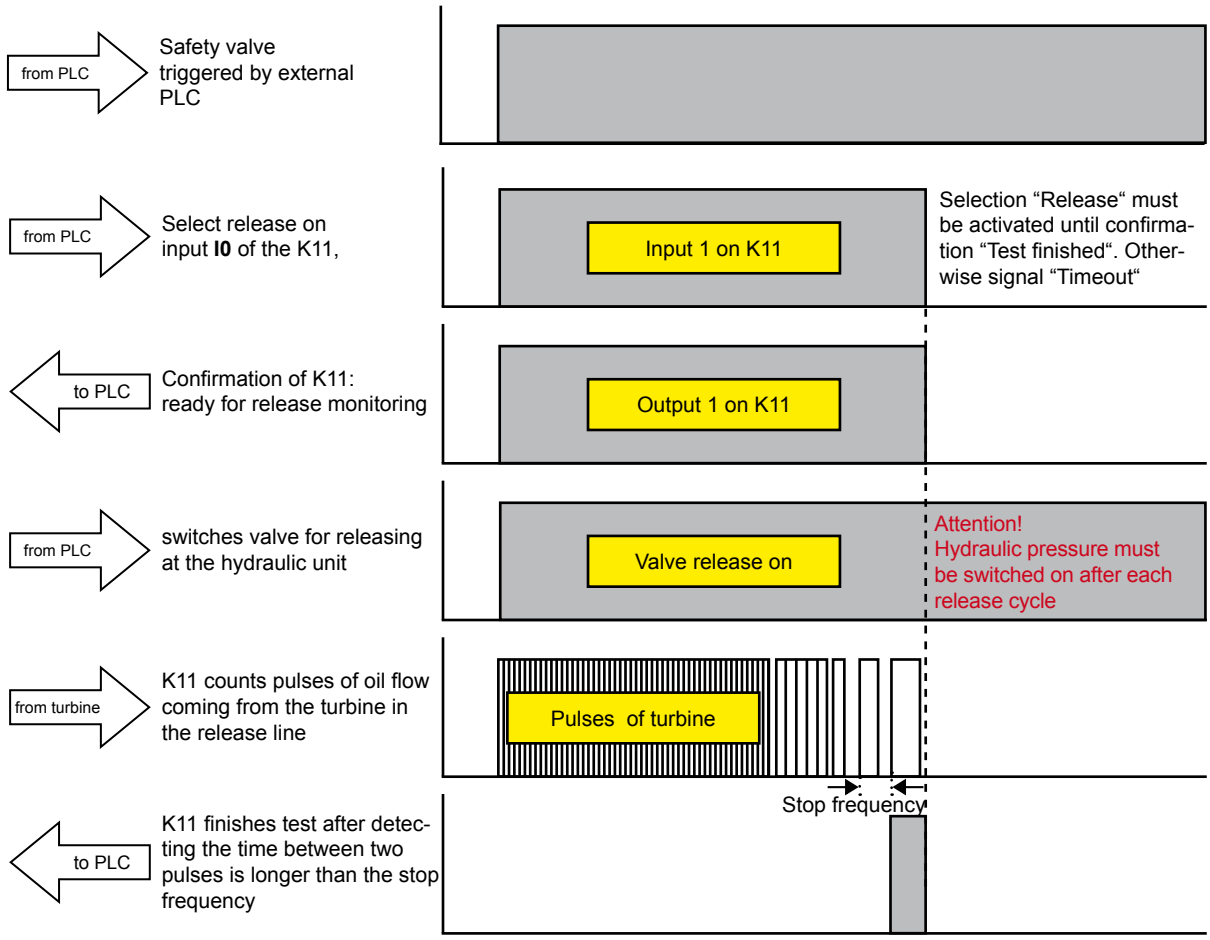
Results of clamp-monitoring

to PLC

O0 Clamp	O1 Release	O2 Flat	O3 Test finished	O4 TestOK	O5 Clamped too short	O6 Clamped too long	O7 Timeout	Result	Allowed spindle operation
X	-	-	X	X	-	-	-	Test OK	No speed limit
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) befor test end	Do not run spindle

When selection (I0) is stopped also “Test end“ (I3) is set to default.

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



Results for release-monitoring

to PLC

O0 Clamp	O1 Release	O2 Flat	O3 Test finished	O4 TestOK	O5 Clamped too short	O6 Clamped too long	O7 Timeout	Result	Spindle condition
-	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) befor test end	Tool not released

When selection (I1) is stopped also “Test end“ (I3) is set to default.

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

7 Technical data

Controller

- CPU: Motorola 68HC11 Microprocessor
- Memory: 512 Byte EEPROM (internal for Parameters)
  32 KB EPROM
  32 KB RAM
- I/O: 8 Digital-In 24 V (15 - 30 V)
  8 Digital-Out 24 V (je 20 mA; short circuit protected)
  4 Analog-In (0 - 5V or 0 -10V or 0 - 20mA or 4 - 20mA)
  2 Counters 24 V max. 500 Hz for NPN- and PNP-Initiators
  1 serial port RS 232
  1 spare port
- Connectors: Phoenix-Connectors Typ MSTB for
  - Inputs
  - Outputs
  - Counter
  - Power supply

  Serial port: SubD 9 pol
  Spare port: SubD 25 pol.
- Power supply: 24 V DC +/- 20%, ca. 1 A A
- Extension options:

  K11-memory module: Can be used to save the last state of Clamp or Release permanently (even after loss of power). It is connected to the X11-connector
- Power supply for external sensors or devices:

  24 V DC and 5 V DC; by internal power supply of K11. **Total current is max. 500 mA, which must not be exceeded.**
  If there are foreign sensors, which need other voltages, connect power supplies to the K11-controller.

Measuring turbine

- Characteristics: - Flow metering with volumetric principle
  - suitable for viscose liquid self-lubricating, non-abrasive media
- Measure principle: 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 biassed Hall sensor with one pulse per tooth. The sensor sends signals proportionally to the flow-through ratio.
- Measuring range: VHZ 10 = 0,1 - 6l/min
- Accuracy: ± 3% of measured value (in reference to 20 mm^3/s)
- Reproducebility: ± 0,3 %
- Max. pressure: 200 bar
- Media temperature: -25 up to 85°C
- Current consumption: 20 mA without load
- Output: PNP, Frequency output 200 mA max.
- Connection: Plug DIN 43650-A
  short-circuit proof
  reverse polarity protected
- Material:

Housing	Al anodised
Gear and axis	Stainless steel 1.4462
Bearing	IGLIDUR X
Seal	Viton

- Protection class: IP 65
- Weight: 0,50 kg

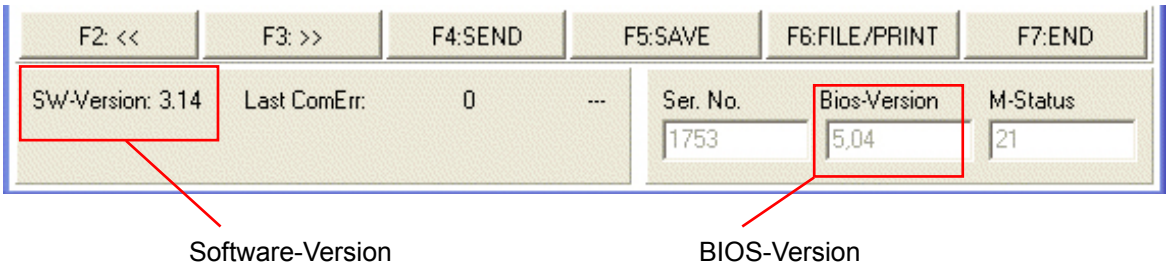
8 Ordering advice

Because of technical development and functional extensions of our controllers and software in the meantime several versions exist.

In case of a required spare part, please give us accordant information about your special software or BIOS-version.

Otherwise we ship the update version.

Please read the designations of your controller on the screen display:



Deliverable versions:

Controller:

- BIOS version 3.05: **ID-Nr. 156-024**
- BIOS version 5.04: **ID-Nr. 156-038**
  related relay circuit board: **ID-Nr. 156-040**

Software (for all Windows-operation systems up to version 7):

- 2.96 (for all BIOS versions up to 2.11): **ID-Nr. 156-005**
- 3.16 (Attention: for all installed version from 3.14 up to 3.16, on the screen the version “3.14” is displayed; for all BIOS versions > 2.11): **ID-Nr. 156-031**