Interface description

Real time and sync I/O interface of the CPX V4 Basic

TRUMPF

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Real time and sync I/O interface of the CPX V4 Basic

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Good to know

This interface description provides you with information regarding the real-time and Sync I/O interface of the CPX V4 Basic central processor.

This interface description contains the following information:

- location of the connectors for the digital inputs and outputs of the interfaces.
- technical data of the digital inputs and outputs.
- signals assigned to the interfaces.
- how to use the interfaces.
- How the digital inputs and outputs are configured in TruControl 1000.
- How the real-time interfaces are assigned to one or any desired number of fieldbus interfaces.
- available testing options.

Target group

This interface description is intended for system integrators and system administrators who are entrusted with integrating a laser device into a system environment.

Further documentation:

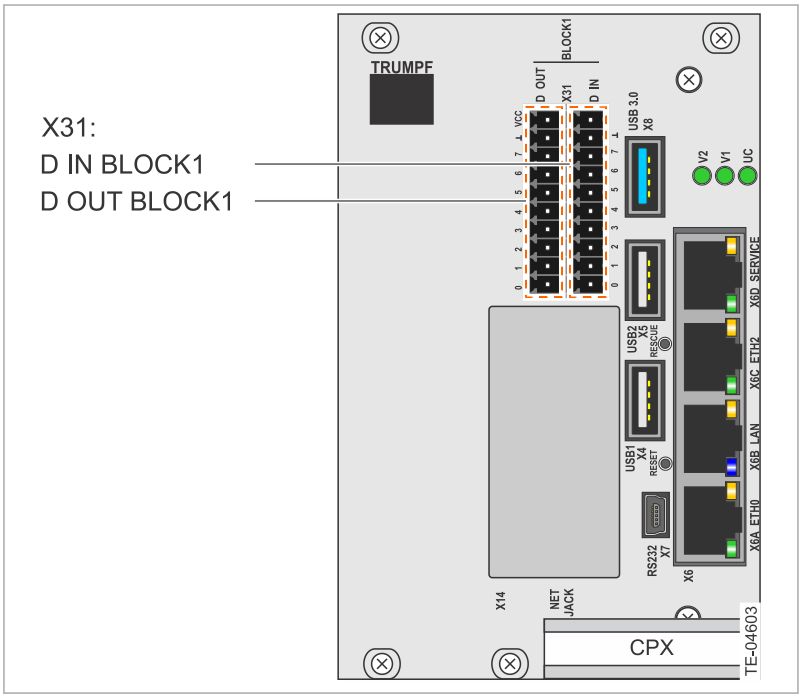
Document	Document no.
Software manual TruControl 1000	10-06-80-A1-CR
Technical information TruControl 1000 for changeover	21-A0-57-CP
Interface description Interfaces of the laser devices with CPX V4	18-23-03-A1-BA
Interface description Field bus interfaces for CPX – CPX V3 and CPX V4	18-22-91-A1-BA
Interface description TRUMPF Peripheral Bus	18-22-12-A1-BA

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1. Overview



Connection of the real-time and Sync I/O interface of the CPX V4 Basic Fig. TE-04603

The connection of the real-time and Sync I/O interface is located on the front plate of the central processor (CPX).

The digital inputs and outputs of the real-time and Sync I/O interface are each distributed to one input and one output channel of the X31 connector:

- Input channel: X31 D IN BLOCK1
- Output channel: X31 D OUT BLOCK1

The X31 connector can be optionally configured as:

- Real-time interface
- SYNC I/O interface

The interfaces are described in detail in the following sections.

1.1 Functions of the real-time interface

The real-time interface enables the following:

- triggering of individual laser pulses in realtime.
- starting laser program lines in real time.
- laser pulses or continuous wave laser power (cw) can be suppressed or enabled for a short time.

Note

The real-time interface can be selected only if no sync I/O interface of the CPX is configured.

1.2 Functions of the Sync I/O interface

The Sync I/O interface allows to synchronize the the laser program sequence with external sequences.

If the sync I/O interface is selected, 6 parallel inputs are available as query inputs and 6 parallel outputs as set outputs of the CPX. In laser programs, query inputs can be evaluated and set outputs can be set via the parameter "Function".

Note

The sync I/O interface can be selected only if no real-time interface of the CPX is configured.

1.3 Use of the digital inputs and outputs

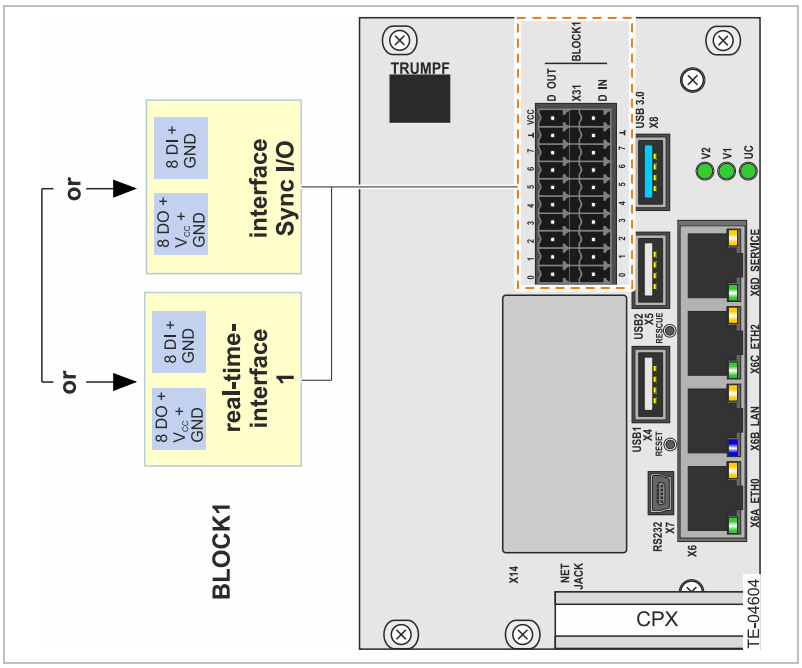


Fig. TE-04604

Real-time interface

The real-time interface can be assigned to a multi PLC interface via the dialog *>Setup >Multi PLC interface (MPI) >New... or Change...* in TruControl 1000 (see "Assigning Real-timeinterface to a multi PLC interface", pg. 18). The real-time interface can be assigned to several multi PLC interfaces.
The digital inputs and outputs are assigned to the real-time interface as follows:

- D IN BLOCK1 (4 inputs).
- D OUT BLOCK1 (5 outputs).

Sync I/O interface

The Sync I/O interface can be selected via the *>Setup >Multi PLC interface (MPI)* dialog and by pressing the *Change properties* button if no real-time interface is configured.
The digital inputs and outputs are assigned to the sync-I/O interface as follows:

- D IN BLOCK1 (6 inputs).
- D OUT BLOCK1 (6 outputs).

Parallel I/O interface

If a parallel I/O interface is required together with a CPX V4 Basic central processor, then this can be implemented with TRUMPF Peripheral Bus, see interface description **TRUMPF Peripheral Bus**, Doc. no. 18-22-12-A1-BA01.

2. Technical Data

Connectors on front plate		
	X31	MCDN 1.5/10-G1-3.5 P26THR, 2x10-pole, pin Cable plug: FMCD 1.5/10-ST-3.5, 2x10-pole, socket, mat. no. 1764350
Digital inputs		
	Number	8
	Electrical isolation:	Between the inputs and the CPX
	Reference potential	A reference potential GND for the digital inputs
	Reverse polarity protection	Available
	Debouncing time	Programmable
	Low level	≤ +1.5 V
	High level	+8 V ... +35 V
	Input current	5 mA
	Maximum input frequency of the hardware	≥ 100 kHz (dependent on the levels of the input voltage)
	Input protection (ESD)	1 kV
	Insulation voltage	1 kV (between input and CPX)
Digital outputs		
	Number	8
	Electrical isolation:	Between the outputs and the CPX
	Power supply and reference potential	One input for external power supply VCC and one reference potential GND
	Overtemperature protection	Output drivers are switched off at > 150°C
	Maximum output frequency	68 kHz (depending on the ohmic load)
	Output current	max. 500 mA (sum of all output signals)
	Overcurrent protection	In case of overcurrent, the output driver limits the current to 800 mA
	External VCC power supply	+9.5 V ... +35 V
	Undervoltage protection	With VCC ≤ +8.5 V, the output drivers are switched off
	Insulation voltage	1 kV (between output and CPX)

Technical Data Tab. 2

2.1 Electromagnetic compatibility

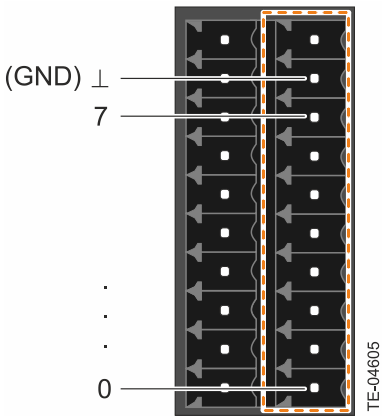
Cables for the real-time and sync I/O interface must be connected with the ground terminals at the laser device's cable entry system via the shielding braid.

This measure is necessary to ensure that the electromagnetic compatibility requirements (EMC) of the laser device are met.

3. Real-timeinterface

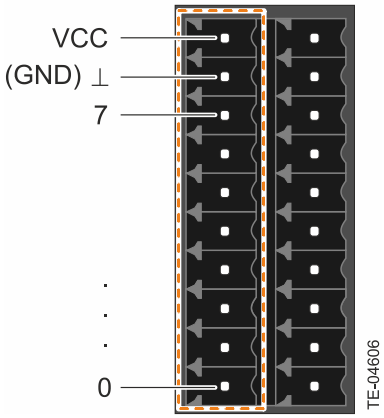
3.1 Pin assignment of the real-time interface

The real-time interface with 4 input and 5 output signals is assigned to the digital input and output channel 1 (D IN BLOCK1, D OUT BLOCK1).



Inputs of the channel D IN BLOCK1 (X31)		
Pin	**Signal name**	**Function**
0	BREAK	**Abort** the running of the laser programs.
1	PULSE_ INTERLOCK	**Suppressing** of laser pulses or continuous wave laser power (cw).
2	REALTIME_ START	**Real-time start** of laser pulses.
3	EXTERNAL_ FREQUENCY	**External frequency** to start laser pulses.
4 : 7	-	**Reserved**.
GND	GND	Reference voltage of the input channel.

Inputs of the real-time interface Tab. 3



Outputs of the channel D OUT BLOCK1 (X31)		
Pin	**Signal name**	**Function**
0	XEO1	Output for **pulse count**, specified via OPC.
1	PULSE_ COMPLETED	Output signal **Pulse end**.
2	PULSE_ DURATION	Output for **pulse duration**.
3	LASER_READY_ TO_PULSE	Output signal **Laser is ready to pulse**.
4	LASER_IS_ PULSING	Output signal **Laser is pulsing**.
5 : 7	-	**Reserved**.
GND	GND	Reference voltage of the output channel
VCC	VCC	External voltage supply of the output channel

Outputs of the real-time interface Tab. 4

3.2 Signal descriptions of the real-time interface

Input signals

The signal response of the input and output signals is dependent on the system parameters **RTI_LEVEL_SETTING** and **RTI_LEVEL_SETTING_1** (see "Configuring the real time interface", pg. 15).

BREAK

Functions	Cancel
Active signal	The running of program lines of a laser program with a fixed or continuous number of pulses is aborted if the "WRS (Wait Realtime Start)" function is entered in the program line.
Information	The delay time depends on the debouncing time set via the software (see "Configuring the real time interface", pg. 15). Jitter: < ±100 µs

Tab. 5

PULSE_INTERLOCK

Function	Pulse lock / POWER_GATE
Active signal	Laser pulses or continuous wave laser power (cw) will be suppressed if this input is active.
Information	There are 4 modes for the pulse lock. The system parameter **RTI_PULSE_INTERLOCK_MODUS** can be used in the >Setup >System setting >Real-time interface dialog to select the following modes: ■ 1: The pulse locking is deactivated, factory setting ■ 2: The pulse triggering is interrupted, a started pulse is still finished. ■ 3: The pulse triggering is interrupted, a started laser pulse is interrupted. ■ 4: **POWER_GATE**: The laser beam is suppressed. When mode 4 is selected, the system parameter **RTI_DEBOUNCE_TIME** <= 32 µs must be set.
	Delay time between the **POWER_GATE** signal and the switching on or off of the laser power: 50 µs - 600 µs. The actual value depends on the laser device type and on the the operating mode set.
	The signal response is dependent on the system parameters **RTI_LEVEL_SETTING** and **RTI_LEVEL_SETTING_1** (see "Configuring the real time interface", pg. 15).

Tab. 6

REALTIME_START

Function	Real-time start
Active signal	Starts laser pulses (single pulse, pulse train or continuous pulsing) when the function "WRS" (Wait Real-time Start) has been entered in the program lines of a laser program. "Continuous pulsing" started with the WRS function is ended by deactivating the REAL-TIME_START signal.
Information	The output signal "LASER_READY_TO_PULSE" must previously be active. The following can be set via software: ▪ Delay time for the start of the laser pulses (see "Configuring the real time interface", pg. 15). A delay time of 1 ms is set at the factory. ▪ Debouncing time of the input signals (see "Configuring the real time interface", pg. 15). A debouncing time of 32 µs is set at the factory. Jitter: < ±100 µs

Tab. 7

EXTERNAL_FREQUENCY

Function	External frequency
Active signal	Start of a laser pulse when "RT" is entered in the laser program as frequency value: ▪ with every positive signal edge. ▪ until the number of pulses specified in the laser program has been reached.
Feedback	The output signal **PULSE_COMPLETED** becomes active if no further pulse is triggered.
Information	The output signal **LASER_READY_TO_PULSE** must previously be active. The maximum permissible frequency can be determined in TruControl 1000 as follows: ▪ Define the laser parameters in manual operation. ▪ Raise the frequency until the value "Utilization 100 %" is reached. **Note:** The input signal **EXTERNAL_FREQUENCY cannot** be used to start a continuous wave laser power (CW). The following can be set via software: ▪ Delay time for the start of the laser pulses (see "Configuring the real time interface", pg. 15). A delay time of 1 ms is set at the factory. ▪ Debouncing time of the input signals (see "Configuring the real time interface", pg. 15). A debouncing time of 32 µs is set at the factory. Jitter: < ±100 µs

Tab. 8

Output signals

The signal response of the input and output signals is dependent on the system parameters **RTI_LEVEL_SETTING** and **RTI_LEVEL_SETTING_1** (see "Configuring the real time interface", pg. 15).

XEO1

Function	**Output for the pulse number specified via OPC**
Active signal	The output delivers a number of pulses that can be specified via OPC by means of the variable "WR_FGD_XEO1".
Requirement	An OPC server is installed.
Information	A maximum number of 255 pulses can be specified. The pulses are generated in the ratio 1:1 (pulse:pulse break). The pulse cycle is set to 40 ms at the factory. **Note:** This output signal can e.g. be used in order to identify an addressed laser device. The evaluation of the delivered pulses must be carried out by external devices (e.g. PLC).

Tab. 9

PULSE_COMPLETED

Function	**End of pulse**
Active signal	The output becomes: ■ active for a time set via software, if no further laser pulse is triggered. ■ early inactive when a new laser pulse is triggered.
Information	The time for an active output signal is set by means of the "RTI_MAXTIME_PULSE_COMPLETED" system parameter (see "Configuring the real time interface", pg. 15). "RTI_MAXTIME_PULSE_COMPLETED" = 100 ms is set at factory. This output can be used as feedback signal for the input signal "EXTERNAL_FREQUENCY".

Tab. 10

PULSE_DURATION

Function	Pulse duration
Active signal	During a pulse duration, the output is active in the time: ▪ from 50 µs to 500 µs before the laser pulse (depending on the settings and the type of the laser device). ▪ up to approx. 300 ms after the laser pulse.
Requirement	Output will become active during a pulse duration only if the real-time interface has been assigned to the currently active workstation (multi PLC interface).
Information	The output can be used as a trigger signal, e.g. for external measurement systems or for synchronization of an external camera. **Requirement:** Output will become active during a pulse duration only if the real-time interface has been assigned to the currently active workstation (multi PLC interface). The following documents contain a description of how a real-time interface is assigned to a multi PLC interface: ▪ Interface description **Field bus interfaces for CPX – CPX V3 and CPX V4**, document no. 18-22-91-A1-BA ▪ Interface description **TRUMPF Peripheral Bus**, document no. 18-22-12-A1-BA ▪ Software manual **TruControl 1000**, document no.: 10-06-80-A1-CR

Tab. 11

LASER_READY_TO_PULSE

Function	Laser is ready to pulse
Active signal	The output becomes active when the laser is ready to emit pulses.
Information	The signal becomes active for the first time 20 ... 30 ms after the start of a laser program. After the triggering of a laser pulse, the signal becomes inactive until the laser is again ready to emit laser pulses. The output can be used for synchronizing to the power limit of the laser device.

Tab. 12

LASER_IS_PULSING

Function	Laser is pulsing
Active / inactive signal	For each program line, output becomes: ▪ active before the first laser pulse. ▪ inactive after the last laser pulse.
Information	Output can be used as a feedback signal for the inputs: ▪ EXTERNAL_FREQUENCY ▪ REALTIME_START.

Tab. 13

3.3 Using the realtime interface

⚠ WARNING

Laser light can be emitted without warning following a malfunction in the energy supply (power failure) and restoration of the energy flow.

Serious injuries or extensive property damage can result.

- Condition external controls so they do not automatically or randomly send signals to the laser control to activate the laser following failure and restoration of the energy flow.

Trigger individual laser pulses

Note

Continuous wave laser power (cw) cannot be started.

Individual laser pulses can be triggered externally via the EXTERNAL_FREQUENCY input signal of a real-time interface, when:

- a real-time interface is assigned.
- "Frequency of the real-time interface (RT)" is selected in the laser program as set value for the frequency.

A laser program can be created new or changed from the user level "40" via the dialog *>Programming >the laser program*.

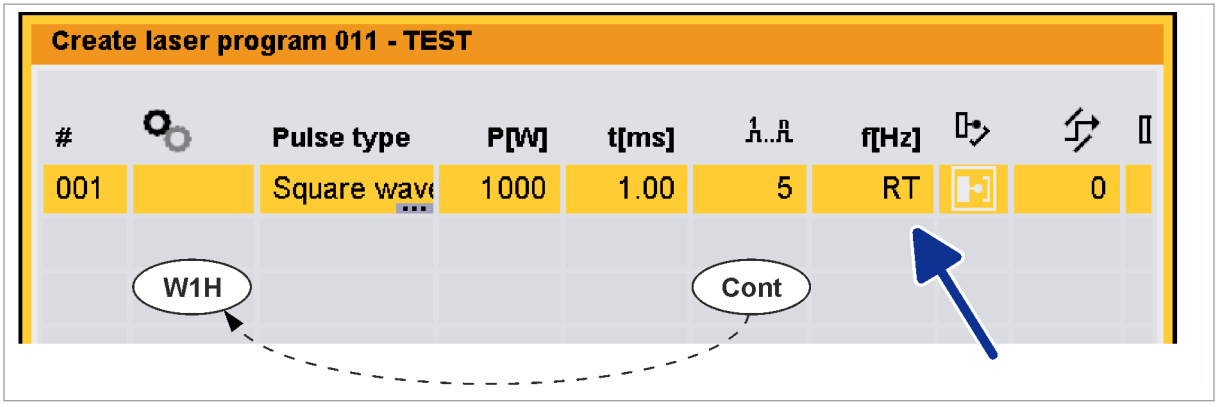


Fig. SR-00106

The laser program only moves on to the next program line when all laser pulses are triggered via the EXTERNAL_FREQUENCY input signal, which are entered in the "Pulse number" field in the program line.

If "Continuous" (Cont) is entered for the pulse number in the laser program, a wait function (W1H, W1L, W2H or W2L) should

be used in the program line if another program line follows. Without a wait function, the laser program will remain stuck in the program line. This condition can be ended by:

- Stopping the laser program.
- Activating the BREAK input signal on the real-time interface.

Note

When the EXTERNAL_FREQUENCY input signal is activated while the LASER_READY_TO_PULSE output signal is inactive, TruControl 1000 reports a malfunction. Work cannot be continued until after pressing the *Reset* button.

Starting program lines in real-time

The running of program lines can be triggered externally via the REALTIME_START input signal of a real-time interface when:

- a real-time interface is assigned.
- the function WRS is selected in the laser program.

A laser program can be created new or changed from the user level "40" via the dialog *>Programming >the laser program*.

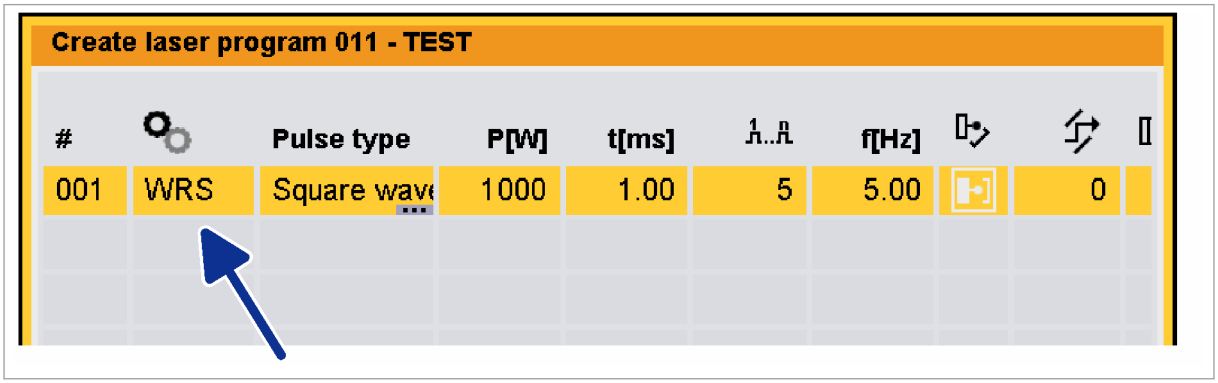


Fig. SR-00107

After activating the input signal REALTIME_START, the output of the laser pulses is started with the predefined frequency until the number of predefined laser pulses is reached.

If "Continuous" (Cont) is entered for the pulse number in the laser program, pulses are triggered until:

- the input signal REALTIME_START is set to inactive.

  or
- the BREAK input signal is activated.

  or
- the laser program is stopped.

Note

When the “REALTIME_START“ input signal is activated while the “LASER_READY_TO_PULSE” output signal is inactive, TruControl 1000 reports a monitoring. Work cannot be continued until after pressing the *Reset* button.

Example of a laser program

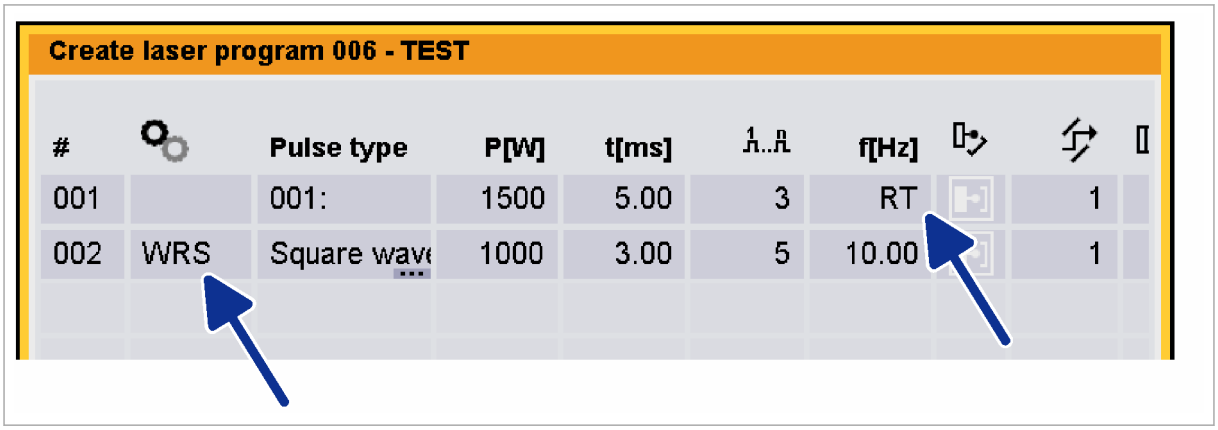


Fig. SR-00109

The laser program shown above consists of 2 program lines:

- In program line 1, three laser pulses are triggered individually via the input signal EXTERNAL_FREQUENCY of the real-time interface. For frequency, the set value selected is "RT" (frequency of the real-time interface).
- In program line 2, the output of 5 rectangular pulses is started via the input signal REALTIME_START. For function, WRS (Wait Realtime Start) is selected.

Timing diagram for real-time interface

The timing diagram shows the start and running of the laser program number 20 (see "Example of a laser program", pg. 13).



Fig. SR-00108

3.4 Configuring the real time interface

User level ≥ 50		
	1.	Select main activity *Set-up*.
	2.	Select "System settings".
	3.	Select "Real time interface".
	4.	Select parameter. The selected parameter is highlighted in yellow.
	5.	Select *Edit*. The *Edit parameters* dialog is displayed.
	6.	Select a value.
	7.	Select *Apply*.

Tab. 14

The following table list the settings possible for the real-time interface.

Variable	Functions	Default	Values
RTI_DEBOUNCE_TIME	**Setting the debouncing time of the inputs.** The debouncing time can be set in 8 defined levels. If the **RTI_PULSE_INTERLOCK_MODUS** is = 4, a value of <= 32 µs must be set here.	8 µs	30 ns, 8 µs, 32 µs, 128 µs, 500 µs, 2 ms, 8 ms, 32 ms
RTI_DELAY_TIME	**Adjusting the delay time for the pulse trigger.** Laser pulses started via the input signals REAL-TIME_START and EXTERNAL_FREQUENCY are triggered delayed by the adjusted time.	0.0 ms	0.0 ms ... 100.0 ms Increment: 0.1 ms
RTI_EXTERNAL_ FREQUENCY_NO_ READY_TO_PULSE	**Monitoring the input signal EXTERNAL_FREQUENCY outside of the active output signal LaserReadyToPulse.** 0 = No monitoring message. 1 = monitoring message.	1	0, 1
RTI_EXTERNAL_ FREQUENCY_WITHOUT_ FG_IS_ON	**Monitoring the input signal EXTERNAL_FREQUENCY for trigger pulses outside of the active output signal PROG_ACTIVE.** 0 = No monitoring message 1 = monitoring message	0	0, 1

Variable	Functions	Default	Values
RTI_LEVEL_SETTING	**Set the signal response of the real-time interface.** The signal response that has been set applies for the input signals of real-time interface 1 when the system parameter RTI_LEVEL_SETTING_1 = 0 or when the system parameter RTI_LEVEL_SETTING_1 is not available. 0 = All signals are low-active. 1 = All signals are high-active.	1	0, 1
RTI_LEVEL_SETTING_1	**Set the signal response of real-time interface 1.** The signal response that has been set applies for the input signals of real-time interface 1 when the system parameter RTI_LEVEL_SETTING_1 ≥ 1. 0 = Parameter RTI_LEVEL_SETTING is used for the real-time interface 1. 1 = All signals are high-active. 2 = All signals are low-active. 3 = Only the PULSE_INTERLOCK signal is low-active, all other signals are high-active.	0	0, 1
RTI_MAXTIME_PULSE_COMPLETED	**Setting the time for the active output signal PULSE_COMPLETED.** If the set pulses are triggered, the output signal PULSE_COMPLETED for the defined time will be activated.	100 ms	1 ms ... 500 ms Increment: 1 ms
RTI_PLCVIEW_ACTIVE	**Recording the real-time signals with PLCView activated.** If RTI_PLCVIEW_ACTIVE = 1, the real-time signals are recorded with PLCView. If RTI_PLCVIEW_ACTIVE = 0, the recording of the real-time signals with PLCView is deactivated. Exception: If RTI_PLCVIEW_ACTIVE = 0 and RTI_PULSE_INTERLOCK_MODUS = 4, the POWER_GATE signals are recorded.	0	0, 1
RTI_PULSE_INTERLOCK_MODE	**Setting the mode for the pulse locking.** 1 = The pulse locking is deactivated. 2 = The pulse triggering is interrupted, a started laser pulse is still finished. 3 = The pulse triggering is interrupted, a started laser pulse is interrupted. 4 = POWER_GATE: The laser beam is suppressed if the signal PULSE_INTERLOCK is active. 5 = POWER_GATE via field bus: The laser beam is suppressed if the signal is active on bit 14.2 (bit 2, input word 14). Available for CW lasers only.	1	1 ... 4

Variable	Functions	Default	Values
RTI_REALTIME_START_ WITHOUT_WRS_LINE	**Monitoring the input signal REALTIME_START for trigger pulses without programmed WRS function in the laser program line.** 0 = No monitoring message 1 = monitoring message	0	0, 1
RTI_REALTIME_START_ WITHOUT_FG_IS_ON	**Monitoring the input signal REALTIME_START for trigger pulses outside of the active output signal PROG_ACTIVE.** 0 = No monitoring message 1 = monitoring message	0	0, 1

Tab. 15

Assigning Real-timeinterface to a multi PLC interface

Note

Real-time interfaces can be assigned to a multi PLC interface only if no sync I/O interface is configured.

The real-time interfaces can be assigned to several multi PLC interfaces.

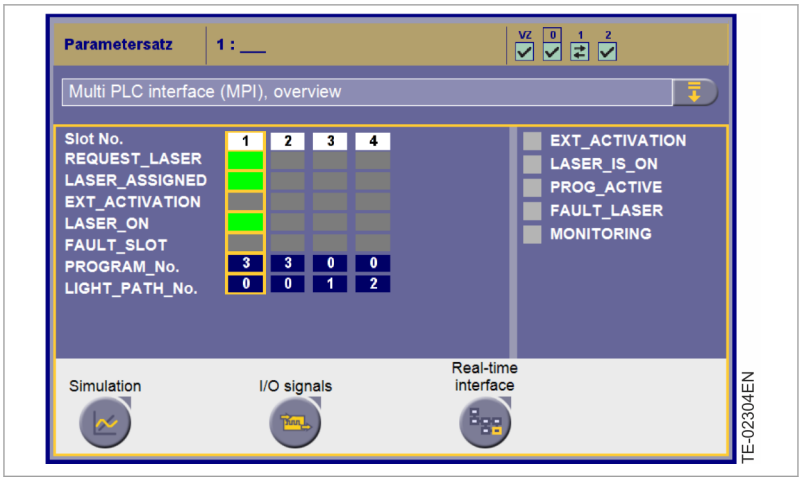
Assign a real-time interface to a multi PLC interface:

User level ≥ 50		
	1.	Select main activity *Set-up*.
	2.	Select "Multi PLC interface (MPI)".
	3.	Select the desired slot. The selected slot is highlighted in yellow.
	4.	Select *Change*. The *PLC interface editor* dialog is displayed.
	5.	Select real-time interface parameter. The parameter is highlighted in yellow.
	6.	Select *Change properties*.
	7.	Select real-time interface number.
	8.	Select *Close*.
	9.	Select Close. The dialog for applying the changes is displayed.
	10.	Select Save. The real-time interface is assigned to the multi PLC interface.

Tab. 16

3.5 Testing options

Multi-PLC interface (MPI), overview



Multi PLC Interface (MPI), overview dialog Fig. TE-02304

Open the dialog **Multi PLC Interface (MPI), overview**:

User level ≥ 0		
	1.	Select the main activity *Production*.
	2.	Select *Multi PLC interface (MPI), overview*. The *Multi PLC interface (MPI), overview* dialog is displayed. The statuses of important signals, the pulse energy, the average laser power and the utilization of the laser device are displayed for each assigned machining station (slot).

Tab. 17

When selecting a slot, buttons are displayed in the context bar which enable activation of further functions. Depending on the configuration the following buttons are available:

- Simulation
- I/O signals.
- Real-time interface
- Manual focusing optics (option).

Further information can be found in the **TruControl 1000** software manual, doc. no. 10-06-80-A1-CR.

Real-time interface status information

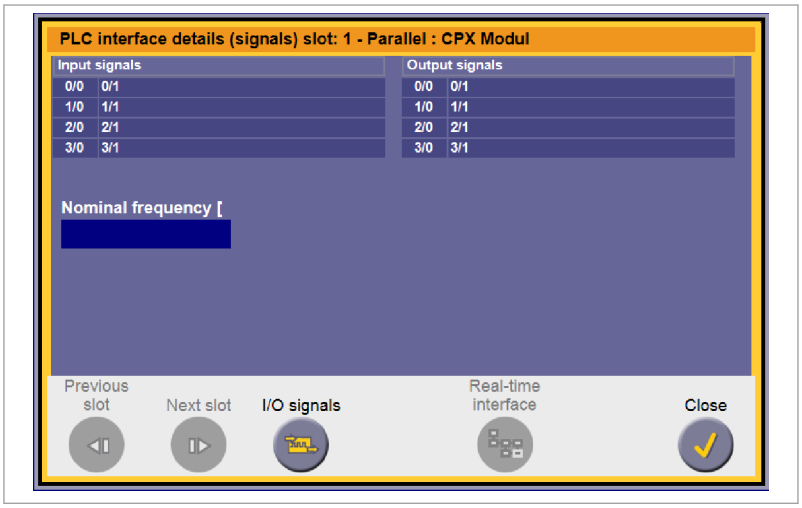


Fig. TE-02411

User level ≥ 0		
	1.	Select the main activity *Production*.
	2.	Select *Multi PLC interface (MPI), overview*.
	3.	Select the desired slot.
	4.	Select Real time interface.

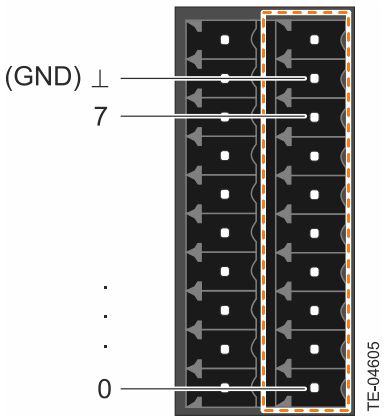
Tab. 18

The status of the real-time interface can be displayed with every user level via the *>Production >Multi PLC interface (MPI), overview* dialog for every allocated Multi-PLC interface. Select the desired Multi-PLC interface in the *>Multi PLC Interface (MPI), overview* dialog and then *>Real-time interface*.

4. Sync I/O interface

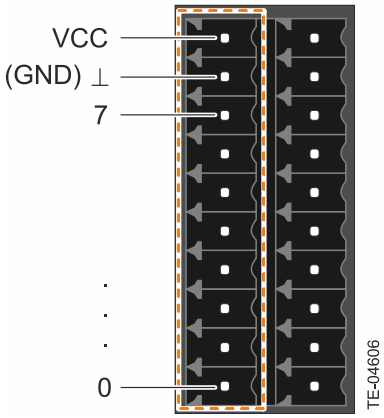
4.1 Pin assignment of the Sync I/O interface

The sync I/O interface with 6 query inputs and 6 setting output is assigned to digital input and output channel 1 (D IN BLOCK1, D OUT BLOCK1).



Inputs of the channel D IN BLOCK1 (X31)		
Pin	**Signal name**	**Function**
0	INQUIRY_INPUT_A	**Inquiry inputs A ... F**
1	INQUIRY_INPUT_B	
2	INQUIRY_INPUT_C	
3	INQUIRY_INPUT_D	
4	INQUIRY_INPUT_E	
5	INQUIRY_INPUT_F	
6	-	**Reserved**.
7	-	
GND	GND	Reference voltage of the input channel.

Inputs of the Sync I/O interface Tab. 19



Outputs of the channel D OUT BLOCK1 (X31)		
Pin	**Signal name**	**Function**
0	SET_OUTPUT_A	**Set outputs A ... F**
1	SET_OUTPUT_B	
2	SET_OUTPUT_C	
3	SET_OUTPUT_D	
4	SET_OUTPUT_E	
5	SET_OUTPUT_F	
6	-	**Reserved**.
7	-	
GND	GND	Reference voltage of the output channel.
VCC	VCC	External voltage supply of the output channel.

Outputs of the Sync I/O interface Tab. 20

4.2 Signal descriptions of the Sync-I/O interface

Input signals

INQUIRY_INPUT_A ... _F

Function	**Inquiry inputs A ... F**
Active signal	The 6 input signals "INQUIRY_INPUT_A ... INQUIRY_INPUT_F" can be used to synchronize the running of a laser program with external sequences.
Information	If a line of the laser program contains a inquiry instruction (WxH or WxL), this line is not executed until the respective inquiry input acquires the required status "high" or "low". x = A ... F
Example	Command **WAH**: The laser program is continued as soon as the inquiry input A acquires the status "high".

Tab. 21

Output signals

SET_OUTPUT_A ... _F

Function	**Set outputs A ... F**
Active signal	The 6 output signals "SET_OUTPUT_A ... SET_OUTPUT_F" can be used to synchronize external processes with the running of the laser program.
Information	The states of the output signals in laser programs can be set to the output level "high" or "low" by means of commands (SxH or SxL). If an output signal is set to the "high" level by the laser program, this output level remains active until: ▪ a laser program is started again. ▪ a cancelled laser program is reset with the "Reset" button. ▪ the output level is set to "low" by means of a command SxL in the laser program. x = A ... F **Note:** The output signals "SET_OUTPUT_A ... SET_OUTPUT_F" can also be used to monitor the running of a laser program.
Example	The **SAH** command in the laser program sets the output signal "SET_OUTPUT_A" to the output level "high". The **SAL** command in the laser program sets the output signal "SET_OUTPUT_A" to the output level "low".

Tab. 22

4.3 Using the Sync I/O interface

Inquiry inputs and set outputs of the sync I/O interface can be used in laser programs if the sync I/O interface is selected.

The input signals of the 6 inquiry inputs of the CPX can be used to synchronize the running of a laser program to external sequences.

With the output signals of the 6 set outputs of the CPX, external sequences can be synchronized with the laser program sequence.

The column "Function" of a program can be used to define:

- which inquiry input is used and which signal level must be applied for the program line to be run.
- which set output is used and at what signal level the set output is set when the program line is run.

Example of a laser program

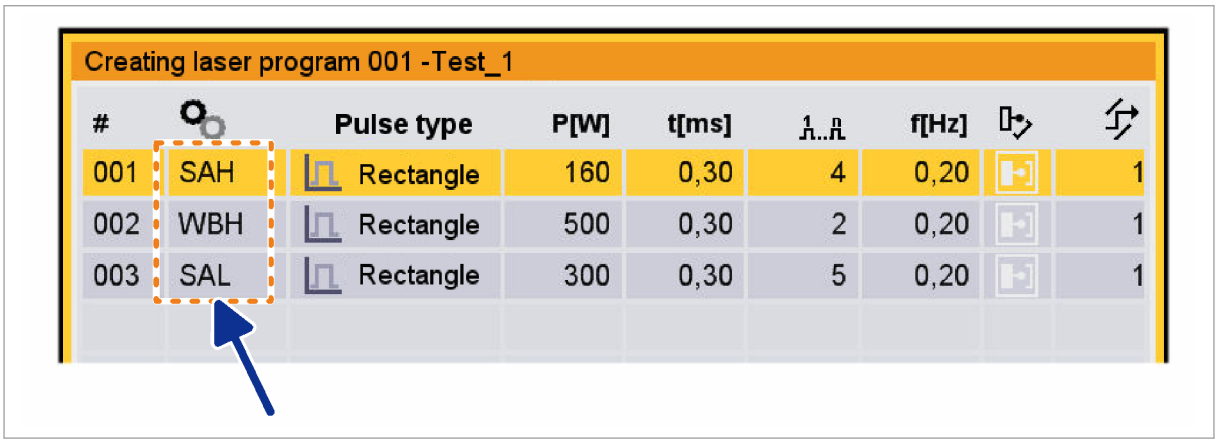


Fig. SR-00704

The laser program shown above consists of 3 program lines:

- **Program line 1:** After the program start, the set output A is set to the signal level "high" according to the function "SAH" and the program line is run.
- **Program line 2:** The program line is only run if a high level is applied at inquiry input B according to the function "WBH".
- **Program line 3:** The set output A is set to the signal level "low" according to the "SAL" function and the program line is run.

4.4 Selecting the Sync I/O interface

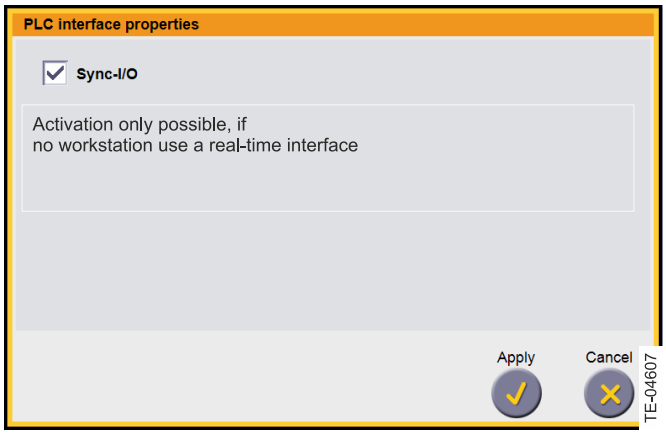


Fig. TE-04607

Note

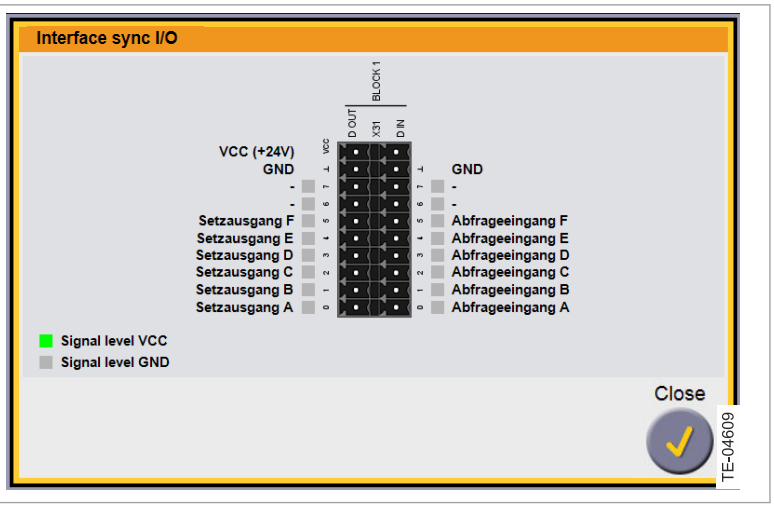
The sync I/O interface can be selected only if no multi PLC interface (workstation) is using the real-time interface.

User level ≥ 50		
	1.	Select main activity *Set-up*.
	2.	Select *MPI PLC interface*.
	3.	Select *Change properties*.
	4.	Enable the Sync I/O option.
	5.	*Select Apply*.

Tab. 23

4.5 Testing options

Diagnosis Sync I/O interface



Diagnostics Sync-I/O, CPX V4 Fig. TE-04609

User level ≥ 0		
	1.	Select the main activity *Diagnostics*.
	2.	Select *TruControl laser control* (CPX).
	3.	Select connector of input and output channel 1 (X31) The overview showing the set outputs and query inputs of the Sync I/O interface is displayed.

Tab. 24

5. Terms and abbreviations

CPX
Central **P**rocessor E**x**tendable,
German: Erweiterbarer Zentralrechner

The CPX is the central board in the new generation laser control. Both the TruControl 1000 operating software and central processor software of the plug-in control unit run in the operating system Linux on the CPX.

D IN BLOCK
Digital **IN**put **BLOCK**,
German: Digitaler Eingangskanal

Input channel with 8 digital inputs.

D OUT BLOCK
Digital **OUT**put **BLOCK**,
German: Digitaler Ausgangskanal

Output channel with 8 digital outputs.

high-active
- If a high-level voltage is present at the input or output, then the bit value of the signal is "1".
- If a low-level voltage is present at the input or output, then the bit value of the signal is "0".

The required voltage values for high and low levels are described in the **Technical Data** section (see "Technical Data", pg. 5).

I/O
Input / **O**utput,
German: Ein-/Ausgangs-Schnittstelle

I/O interface for external control of the laser device via digital input and output signals

low-active
- If a high-level voltage is present at the input or output, then the bit value of the signal is "0".
- If a low-level voltage is present at the input or output, then the bit value of the signal is "1".

The required voltage values for high and low levels are described in the **Technical Data** section (see "Technical Data", pg. 5).

Multi-PLC interface (MPI)
Multi-**P**LC-**I**nterface

The Multi-PLC interface is a system component of the TRUMPF LaserNetwork (TLN). It is a software interface of the laser control system which allows different (max. 32) control units of machining station to request the laser power.

The control units are connected to the laser device via fieldbus, OPC or parallel I/O interfaces.

PLC
Programmable **L**ogical **C**ontroller
.

PLCView >*PlcView* is a secondary activity in the main activity >*Diagnosis*.

In the sub-operation >*PlcView*, the input and output data of the 32 possible connections of the laser device to the external controls (multi PLC interfaces) are displayed and recorded.

WRS **W**ait **R**ealtime **S**tart

The function **WRS** is used to trigger laser pulses in a laser program by means of the signal **REALTIME_START**.