# NUMSafe CTMP6900 Logic Terminal

## Operating manual

M00033EN-02

Edition 12.2017


www.num.com

num
CNC HighEnd Applications

# Summary

Page deliberately empty.

Page deliberately empty.

# Summary

Page deliberately empty.

# 1 Foreword

## 1.1 Notes on the manual

This description is only intended for the use of trained specialists in control and automation technology who are familiar with the applicable national standards. It is essential that the following notes and explanations are followed when installing and commissioning these components.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

### 1.1.1 Currentness

Please check whether you are using the current and valid version of this document. In case of doubt, please contact NUM Technical Support.

### 1.1.2 Product features

Only the product features specified in the current user documentation are valid. Further information given on catalogue, brochures, web-site etc. is not authoritative.

### 1.1.3 Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development. For that reason the documentation is not in every case checked for consistency with performance data, standards or other characteristics.

In the event that it contains technical or editorial errors, we retain the right to make alterations at any time and without warning.
No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

### 1.1.4 Trademarks

EtherCAT, Safety over EtherCAT® are registered trademarks of and licensed by Beckhoff Automation GmbH.

Other designations used in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owners.

### 1.1.5 Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents: EP1590927, EP1789857, DE102004044764, DE102007017835 with corresponding applications or registrations in various other countries.

### 1.1.6 Copyright



### 1.1.7 Delivery conditions

In addition, the general delivery conditions of the company NUM apply.

## 1.2 Safety instructions

### 1.2.1 Delivery state

All the components are supplied in particular hardware and software configurations appropriate for the application.

Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of NUM.

### 1.2.2 Operator's obligation to exercise diligence

The operator must ensure that:

- the NUMSafe products are only used as intended (see chapter Product description).
- the NUMSafe products are only operated in sound condition and in working order.
- the NUMSafe products are operated only by suitably qualified and authorized personnel.
- the personnel is instructed regularly about relevant occupational safety and environmental protection aspects, and is familiar with the operating manual and in particular the safety notes contained herein.
- the instruction manual is in good condition and complete, and always available for reference at the location where the NUMSafe products are used.
- none of the safety and warning notes attached to the NUMSafe products are removed, and all notes remain legible.

### 1.2.3 Description of safety symbols

The following safety symbols are used in this operating manual. They are intended to alert the reader to the associated safety instructions.

| Symbol | Meaning of the symbol |
|---|---|
|  DANGER | **Serious risk of injury!**<br><br>**Failure** to follow the safety instructions associated with this symbol directly endangers the life and health of persons. |
|  WARNING | **Risk of injury!**<br><br>**Failure** to follow the safety instructions associated with this symbol endangers the life and health of persons. |
|  CAUTION | **Personal injuries!**<br><br>**Failure** to follow the safety instructions associated with this symbol can lead to injuries to persons. |
|  Warning | **Damage to the environment or devices**<br><br>**Failure** to follow the instructions associated with this symbol can lead to damage to the environment or equipment. |
|  Note | **Tip or pointer**<br><br>This symbol indicates information that contributes to better understanding. |

## 1.3 Document revisions

| Code | Edition | Evolution Index | Meaning of the major documentation evolution points | See chapter |
|---|---|---|---|---|
| **M00033** | 05.2013 | 00 | First version of the manual. | - |
| | 11.2017 | 01 | - DIN EN ISO 13849-1:2015<br><br>- New Certificate | 2.2, 2.2.4, 3.1.1<br><br>5.2 |
| | 12.2017 | 02 | - Currentness.<br>- Product features.<br>- DIN mounting rail (EN 60715)<br>- DIN EN ISO 13849-1:2015, DIN EN ISO 13849-1:2015.<br>- System limits (Note).<br>- Power supply from SELV/PELV power supply unit (Warning).<br>- Technical data.<br>- Safety parameters.<br>- Environmental conditions.<br>- Example configuration.<br>- Fastening of mounting rails (Note).<br>- NUMSafe reaction times.<br>- NUMSafe address (Note).<br>- Diagnostic object:<br>- Index $FA80_{hex}$ Internal temperature values.<br>- Index $FA100_{hex}$ Device Status.<br>- Cycle time of the safety project:<br>- Index $1C32_{hex}$: Cycle Time Measuring.<br>- Decommissioning | 1.1.1<br>1.1.2<br>2.1<br>2.2.2<br>3.2<br>3.2<br>3.3<br>3.4<br>4.1<br>4.2.3.3<br>4.2.3.4<br>4.2.5<br>4.4.6<br>4.5.2<br><br><br>4.5.3<br><br>4.8 |

## 1.4 NUM Agencies

The list of NUM agencies is given on http://www.num.com

Page deliberately empty.

# Summary

Page deliberately empty.

# 2 System description

## 2.1 NUM EtherCAT Terminal

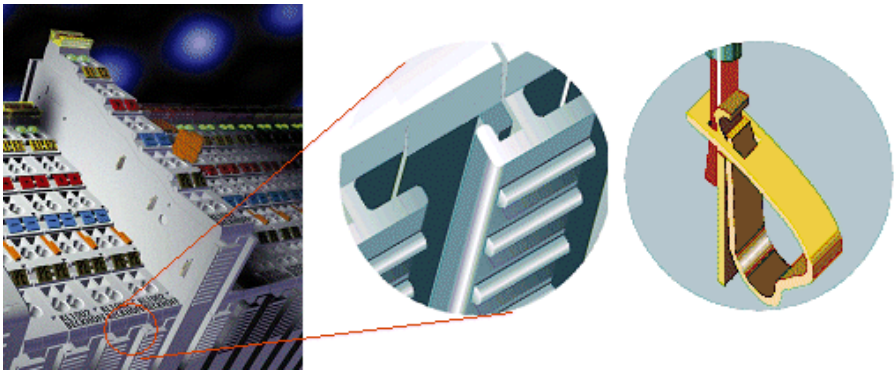
The NUM EtherCAT Terminal system is used for decentralized connection of sensors and actuators to a control system.

The NUM EtherCAT Terminal system components are mainly used in industrial automation.
In its minimum configuration, a bus station consists of a NUM EtherCAT Gateway or and NUM EtherCAT Terminals connected to it.

The NUM EtherCAT Gateway forms the communication interface to the higher-level controller, and the terminals are the interface to sensors and actuators. The whole bus station is clipped onto a 35mm DIN mounting rail (EN 60715).

The mechanical cross connection of the bus station is established via a slot and key system at the NUM EtherCAT Gateway and the NUM EtherCAT Terminals.

The sensors and actuators are connected with terminals via the screwless (spring-loaded) connection system.



*Slot and key system and screwless (spring-loaded) connection system*

In order to accommodate the wide range of different communication standards encountered in industrial automation, NUM offers NUM EtherCAT Gateways for a number of common bus systems (e.g. CTMG1100 for EtherCAT).

## 2.1.1 NUM EtherCAT Gateway

### Mechanical data

| Mechanical data | NUM EtherCAT Gateway |
|---|---|
| Material | Polycarbonate, polyamide (PA6.6). |
| Dimensions (W x H x D) | 44mm x 100mm x 68mm |
| Mounting | On 35mm mounting rail (EN 60715) with lock |
| Attachable by | Double slot and key connection |


*NUM EtherCAT Gateway*

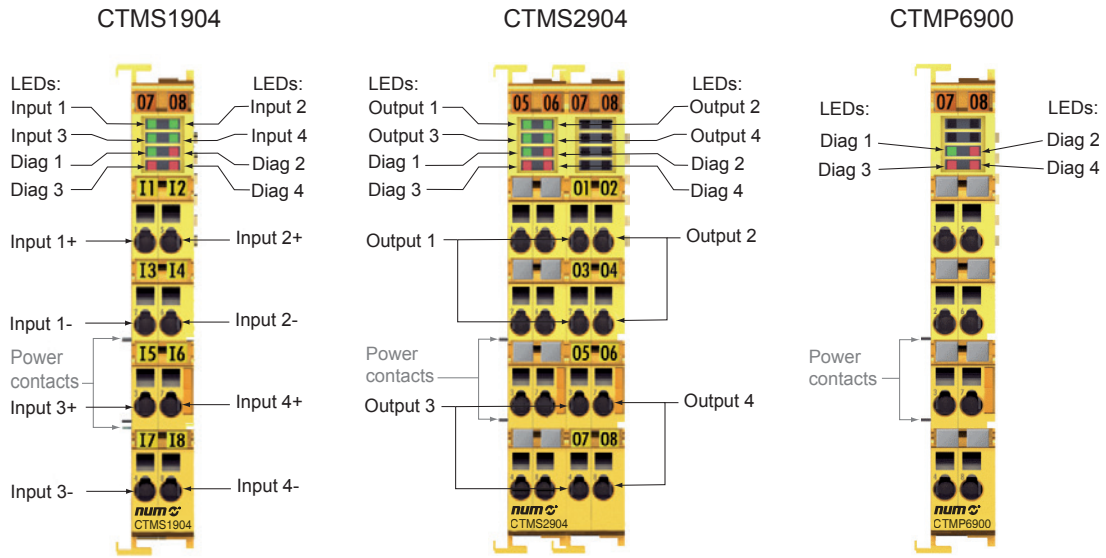
### Connection technology

| Connection technology | NUM EtherCAT Gateway |
|---|---|
| Wiring | spring-loaded system |
| Connection cross-section | 0.08 mm²... 2.5 mm², stranded wire, solid wire |
| Fieldbus connection | RJ45 |
| Power contacts | 3 spring contacts |
| Current load | 10A |
| Rated voltage | 24VDC |

## 2.1.2 NUMSafe Terminals

### Mechanical data

| Mechanical data | NUMSafe Terminals |
|---|---|
| Material | Polycarbonate, polyamide (PA6.6). |
| Dimensions (W x H x D) | 12mm x 100mm x 68mm or<br>24mm x 100mm x 68mm |
| Mounting | On 35mm mounting rail (EN 60715) with lock |
| Attachable by | Double slot and key connection |




*NUMSafe Terminals*

### Connection technology

| Connection technology | NUMSafe Terminals |
|---|---|
| Wiring | spring-loaded system |
| Connection cross-section | 0.08mm²... 2.5mm², stranded wire, solid wire |
| Fieldbus connection | E-bus |
| Power contacts | Up to 3 blade/spring contacts |
| Current load | 10A |
| Rated voltage | Depends on NUMSafe Terminal type |

### 2.1.3 E-bus

The E-bus is the data path within a terminal strip. The E-bus is led through from the NUM EtherCAT Gateway through all the terminals via six contacts on the terminals' side walls.

### 2.1.4 Power contacts

The operating voltage is passed on to following terminals via three power contacts. Terminal strip can be split into galvanically isolated groups by means of potential feed terminals as required.

The power feed terminals play no part in the control of the terminals, and can be inserted at any locations within the terminal strip.

## 2.2 NUMSafe

### 2.2.1 The I/O construction kit is extended safely

With the NUMSafe Terminals, NUM offers the option of simply expanding the proven EtherCAT Terminal system, and to transfer the complete cabling for the safety circuit into the already existing fieldbus cable.

Safe signals can be mixed with standard signals without restriction. This saves design effort, installation and material. Maintenance is simplified significantly through faster diagnosis and simple replacement of only a few components.

The new CTMxx9xx series EtherCAT terminals include three basic functionalities:
- digital inputs CTMS19xx,
- digital outputs CTMS29xx,
- Safe Logic Terminal CTMP6900.

For a large number of applications, all sensors and actuators can be wired on these EtherCAT terminals.

The required logical link of the inputs and the outputs is handled by the CTMP6900. For small to medium-sized configurations, the tasks of a fail-safe PLC can thus be handled within the EtherCAT terminal system.

### 2.2.2 Safety concept

**NUMSafe: Safety and I/O technology in one system**
- Extension of the familiar NUM I/Os system with NUMSafe EtherCAT Terminals
- Freely selectable mix of safe and standard signals
- Logical link of the I/Os in the CTMP6900 NUMSafe Logic Terminal
- Safety-relevant networking of machines via bus systems.

**NUMSafe protocol (Fail Safe over EtherCAT - FSoE)**
- Transfer of safety-relevant data via any media (“genuine black channel”)
- IEC 61508 SIL 3 compliant.

**Configuring instead of wiring:**
- Configuration of the NUMSafe system via “CODESYS Safety for EtherCAT Safety Module” programming system
- System Manager for editing and displaying all bus parameters
- Certified function blocks such as emergency stop, operation mode, etc.
- Simple handling
- Typical function blocks for machine safety.

**NUMSafe Logic Terminal CTMP6900**
- Link unit between NUMSafe input and output terminals
- Configuration of a simple, flexible, cost-effective, decentralized safety controller
- No safety requirements for higher-level control system
- NUMSafe Logic Terminal enables networks with up to 65535 NUMSafe devices
- NUMSafe Logic Terminal can establish up to 128 connections (NUMSafe connections).
- Several NUMSafe logic terminals are cascadable in a network
- Safety functions such as emergency stop, protective door etc. are already included
- Suitable for applications up to SIL 3 according to IEC 61508 and DIN EN ISO 13849-1:2015 (Cat 4, PL e).

**NUMSafe input (CTMS1904) and output terminal (CTMS2904)**
- All current safety sensors can be connected
- Operation with a NUMSafe Logic Terminal
- CTMS1904 with 4 fail-safe inputs for sensors (24VDC) with floating contacts
- CTMS2904 with four safe channels for actuators (24VDC, 0.5A per channel)
- conforming to IEC 61508:2010 SIL 3 and DIN EN ISO 13849-1:2015 (Cat 4, PL e) requirements.

### 2.2.3 CTMS1904, CTMS2904 – NUMSafe Terminals with 4 fail-safe inputs or outputs

The CTMS1904 and CTMS2904 EtherCAT terminals enable connection of common safety sensors and actuators. They are operated with the CTMP6900 NUMSafe Logic Terminal.

The NUMSafe Logic Terminal is the link unit between the NUMSafe input and output terminals.
It enables the configuration of a simple, flexible and cost-effective decentralized safety control system.

Therefore, there are no safety requirements for the higher-level controller!
The typical safety functions required for the automation of machines, such as emergency stop, protective door, two-hand etc., are already permanently programmed in the CTMP6900. The user configures the CTMP6900 terminal according to the safety requirements of his application.

### 2.2.4 CTMP6900 - NUMSafe Logic Terminal

The NUMSafe Logic Terminal is the link unit between the NUMSafe input and output terminals.

The CTMP6900 meets the requirements of IEC 61508:2010 SIL 3, EN 954 Cat. 4 and DIN EN ISO 13849-1:2015 (Cat 4, PL e).

### 2.2.5 The fail-safe principle (Fail Stop)

The basic rule for a safety system such as NUMSafe is that failure of a part, a system component or the overall system must never lead to a dangerous condition.

The safe state is always the switched off and wattless state.

Page deliberately empty.

Page deliberately empty.

# Summary

Page deliberately empty.

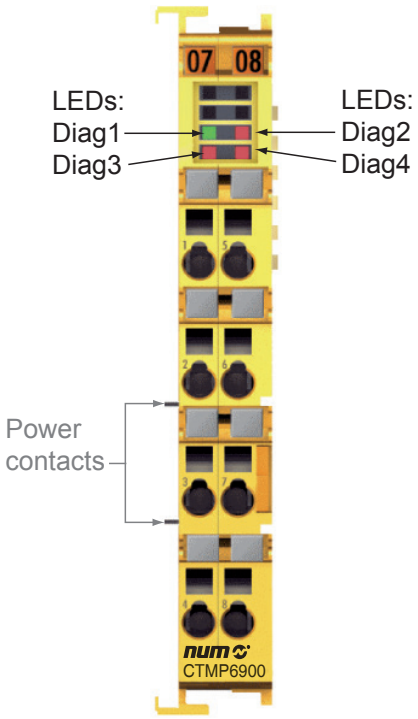
# 3 Product description

## 3.1 CTMP6900 - NUMSafe Logic Terminal

The NUMSafe Logic Terminal is the link unit between the NUMSafe input and output terminals.

The CTMP6900 meets the requirements of IEC 61508:2010 SIL 3, DIN EN ISO 13849-1:2015 (Cat 4, PL e), NRTL, UL508, UL1998 and UL991.

The NUMSafe terminal has the typical design of an EtherCAT terminal.




*CTMP6900 - NUMSafe Logic Terminal*

## 3.2 Intended use

| | |
|---|---|
|  WARNING | **Caution – Risk of injury!**<br><br>NUMSafe terminals may only be used for the purposes described below! |
|  WARNING | **System limits**<br><br>The TÜV SÜD certificate applies to the CTMP6900, the function blocks available in it, the documentation and the engineering tool.<br>The permitted engineering tool is “CODESYS Safety for EtherCAT SafetyModule”.<br>Any deviations from the procedures or tools, particularly externally generated xml files for NUMSafe import or externally generated automatic project creation procedures,are not covered by the certificate! |

The NUMSafe terminals expand the application range of NUM EtherCAT terminals system with functions that enable them to be used for machine safety applications.

The NUMSafe terminals are designed for machine safety functions and directly associated industrial automation tasks. They are therefore only approved for applications with a defined fail-safe state. This safe state is the wattless state. Fail-safety according to the relevant standards is required.

The NUMSafe terminals enable connection of:

- 24VDC sensors (CTMS1904) such as emergency stop push buttons, pull cord switches, position switches, two-hand switches, safety mats, light curtains, light barriers, laser scanners etc.
- 24VDC actuators (CTMS2904) such as contactors, protective door switches with tumbler, signal lamps, servo drives etc.

| | |
|---|---|
|  Note | **Test pulses**<br><br>When selecting actuators please ensure that the CTMS2904 test pulses do not lead to actuator switching or diagnostic message from the CTMS2904. |

The following modules were developed for these tasks:

- The CTMS1904 is an EtherCAT Terminal with 4 digital fail-safe inputs.
- The CTMS2904 is an EtherCAT Terminal with 4 digital fail-safe outputs.
- The CTMPL6900 is an EtherCAT Terminal with integrated NUMSafe logic.

These modules are suitable for operation with:

- NUM CTMGxxxx series EtherCAT Gateway.

| | |
|---|---|
|  WARNING | **Power supply from SELV/PELV power supply unit!**<br><br>The NUMSafe terminals components must be supplied with 24 VDC by an SELV/PELV power supply unit with an output voltage limit $U_{max}$ of 36 VDC. Failure to observe this can result in a loss of safety. |
|  CAUTION | **Follow the machinery directive!**<br><br>The NUMSafe terminals may only be used in machines according to the Machinery Directive. |
|  CAUTION | **Ensure traceability!**<br><br>The buyer has to ensure the traceability of the device via the serial number. |

## 3.3 Technical data

| Product name | CTMP6900 |
|---|---|
| Number of inputs | 0 |
| Number of outputs | 0 |
| Status display | 4 diagnostic LEDs |
| Minimum cycle time | Approx. 500µs |
| Error reaction time | ≤ watchdog times |
| Watchdog time | Min. 2ms, max. 60000ms |
| Input process image | Dynamic according to the NUMSafe configuration in “CODESYS Safety for EtherCAT Safety Module” programming system |
| Output process image | Dynamic according to the NUMSafe configuration in “CODESYS Safety for EtherCAT Safety Module” programming system |
| CTMP6900 supply voltage (PELV) | From NUM EtherCAT Gateway CTMG1100 |
| Current consumption from the E-bus | Approx. 188mA |
| Power dissipation of the terminal | Typically 1W |
| Dimensions (W x H x D) | 12mm x 100mm x 68mm |
| Weight | Approx. 50 g |
| Permissible ambient temperature (operation) up to SW 04 | 0°C to +55°C (see notes in section 4.2.3.2) |
| Permissible ambient temperature (operation) from SW 05 (week 02/2014) | -25°C to +55°C (see notes in section 4.2.3.2) |
| Permissible ambient temperature (transport/storage) | -40°C to +70°C |
| Permissible air humidity | 5% to 95%, non-condensing |
| Permissible air pressure (operation/storage/transport) | 750hPa to 1100hPa<br>(this corresponds to a height of approx. -690m to 2450m over sea level assuming an international standard atmosphere) |
| Climate class according to EN 60721-3-3 | 3K3<br>(the deviation from 3K3 is possible only with optimal environmental conditions and also applies only to thetechnical data which are specified differently in thisdocumentation) |
| Permissible level of contamination according to EN 60664-1 | Contamination level 2<br>(comply with the chapter Maintenance) |
| Impermissible operating conditions | NUMSafe terminals must not be used under the following operating conditions:<br>• under the influence of ionizing radiation<br>• in corrosive environments<br>• in an environment that leads to unacceptable soiling of the EtherCAT terminal. |
| Vibration / shock resistance | Conforms to EN 60068-2-6 / EN 60068-2-27 |
| EMC immunity/emission | Conforms to EN 61000-6-2 / EN 61000-6-4 |
| Shocks | 15 g with pulse duration 11 ms in all three axes |
| Protection class | IP20 |
| Permitted operating environment | Control cabinet or terminal box with minimum protection class IP54 according to IEC 60529 |
| Permissible installation position | See chapter 4.2.3.2<br>*Installation position and minimum distances* |
| Approvals | CE, cULus, ATEX, TÜV SÜD |

## 3.4 Safety parameters

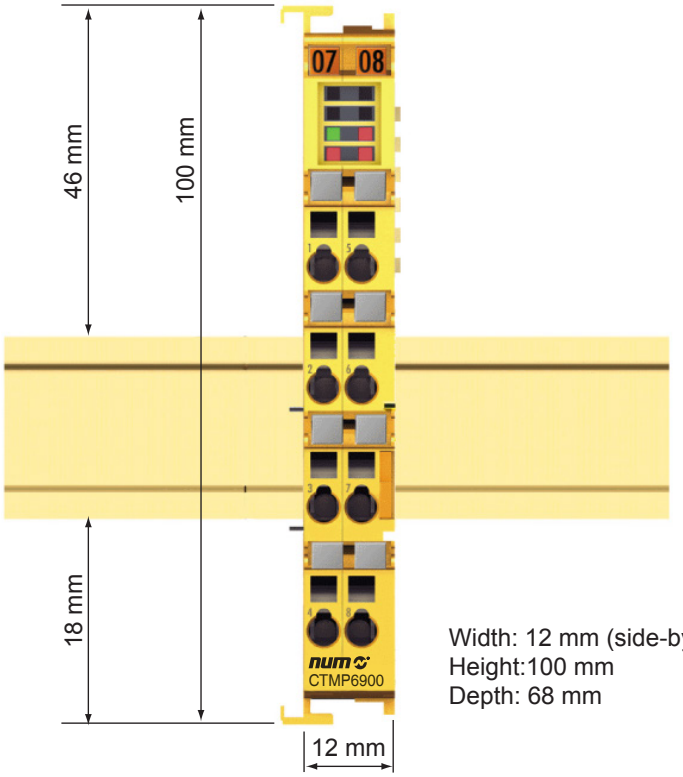
| Key figures | CTMP6900 |
|---|---|
| Lifetime [a] | 20 |
| Prooftest Interval [a] | not required [1] |
| $PFH_D$ | 1.03E-09 |
| %SIL3 | 1.03% |
| PFD | 8.23E-05 |
| %SIL3 | 8.23% |
| $MTTF_d$ | high |
| DC | high |
| Performance level | PL e |
| Category | 4 |
| HFT | 1 |
| Element classification [2] | Type B |

[1] Special proof tests are not required during the entire service life of the CTMP6900 EtherCAT terminal.
[2] Classification according to IEC 61508-2:2010.

The CTMP6900 EtherCAT Terminal can be used for safety-related applications within the meaning of IEC 61508:2010 up to SIL3 and EN ISO 13849-1 up to PL e (Cat4).

For the calculation or estimation of the MTTFd value from the PFHD value, further information can be found in the NUMSafe application guide or in ISO 13849-1:2015.

## 3.5 Dimensions




Width: 12 mm (side-by-side installation)
Height:100 mm
Depth: 68 mm

*Dimensions of the CTMP6900*

Page deliberately empty.

# Summary

# 4 Operation

## 4.1 Environmental conditions

Please ensure that the NUMSafe terminals are only transported, stored and operated under the specified conditions (see technical data)!

| | |
|---|---|
|  WARNING | **Risk of injury!**<br><br>The NUMSafe terminals must not be used under the following operating conditions:<br>• under the influence of ionizing radiation (that exceeds the level of the natural environ-mental radiation)<br>• in corrosive environments<br>• in an environment that leads to unacceptable soiling of the EtherCAT terminal. |
|  CAUTION | **Electromagnetic compatibility**<br><br>The NUMSafe components comply with the current standards on electromagnetic compatibility with regard to spurious radiation and immunity to interference in particular.<br>However, in cases where devices such as mobile phones, radio equipment, transmitters or high-frequency systems that exceed the interference emissions limits specified in the standards are operated near NUMSafe components, the function of the NUMSafe components may be impaired: |

## 4.2 Installation

### 4.2.1 Safety instructions

Before installing and commissioning the NUMSafe terminals please read the safety notes in the foreword of this documentation.

### 4.2.2 Transport / storage

Use the original packaging in which the components were delivered for transporting and storing the NUMSafe terminals.

| | |
|---|---|
|  CAUTION | **Note the specified environmental conditions**<br><br>Please ensure that the digital NUMSafe terminals are only transported and stored under the specified environmental conditions (see technical data). |

### 4.2.3 Mechanical installation

| | |
|---|---|
| DANGER | **Risk of injury!**<br><br>Bring the bus system into a safe, de-energized state before starting installation, disassembly or wiring of the devices! |

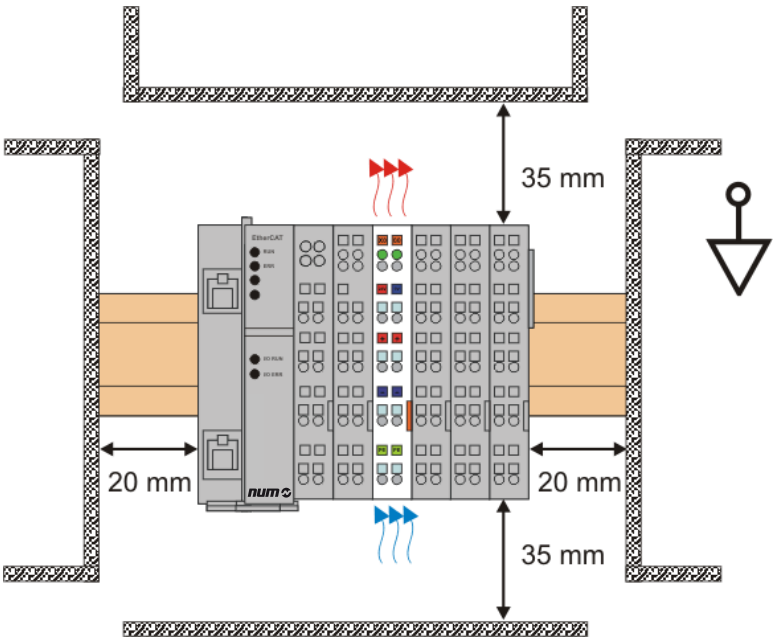
#### 4.2.3.1 Control cabinet / terminal box

The NUMSafe terminals must be installed in a control cabinet or terminal box with IP54 protection class according to IEC 60529 as a minimum.

#### 4.2.3.2 Installation position and minimum distances

For the prescribed installation position the mounting rail is installed horizontally and the mating surfaces of the CTMxxx terminals point toward the front (see illustration below).

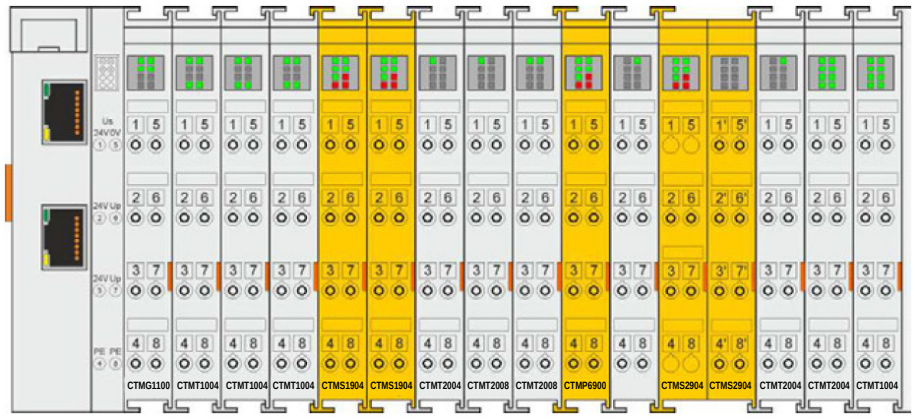
The terminals are ventilated from below, which enables optimum cooling of the electronics through convection. The direction indication “down” corresponds to the direction of positive acceleration due to gravity.




*Installation position and minimum distances*

In order to ensure optimum convection cooling, the distances to neighboring devices and to control cabinet walls must not be smaller than those shown in the diagram.

### 4.2.3.3 Example configuration




*Example configuration for temperature measurement*

The example configuration for the temperature measurement consists of an CTMT1100 EtherCAT coupler with connected terminals that match the typical distribution of digital and analog signal types at a machine.

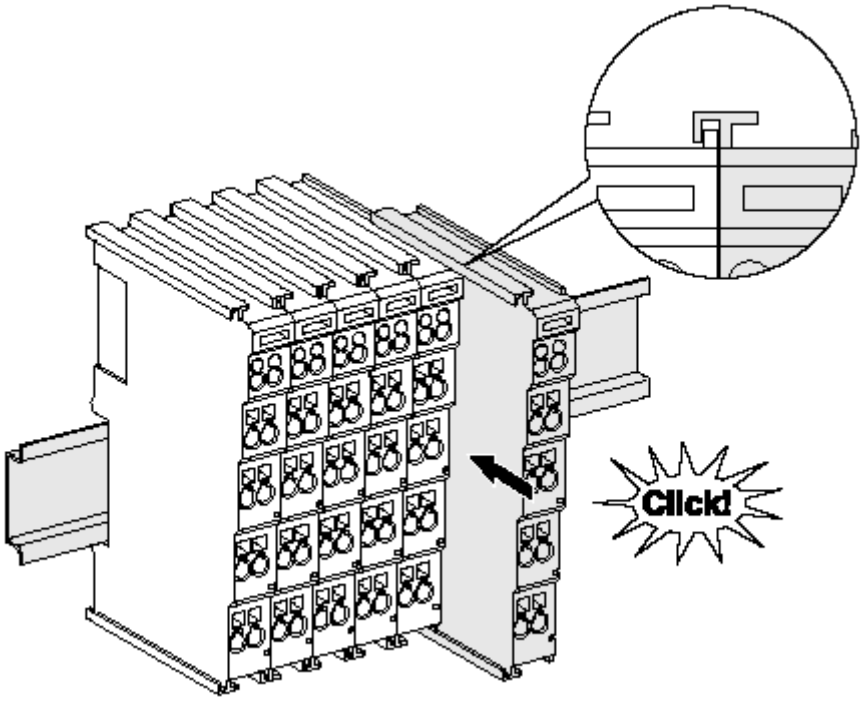
On theCTMP6900 a safety project is active, which reads safe inputs and enables all 4 safe outputs during themeasurement.

| | |
|---|---|
| **Note** | **External heat sources / radiant heat / impaired convection**<br><br>The maximum permissible ambient temperature of 55°C was checked with the above example configuration. Impaired convection, an unfavorable location near heat sources or an unfavorable configuration of the EtherCAT Terminals may result in overheating of the terminals.<br>The key parameter is always the maximum permitted internally measured temperature of 95°C, above which the NUMSafe terminals switch to safe state and report an error. The internal temperature can be read from the NUMSafe components via CoE (see chapter Diagnose). |

### 4.2.3.4 Installation on mounting rails

**Mounting**

The NUM EtherCAT Gateway and the NUM EtherCAT Terminals are attached to commercially available 35mm mounting rails (according to EN 60715) by applying slight pressure:



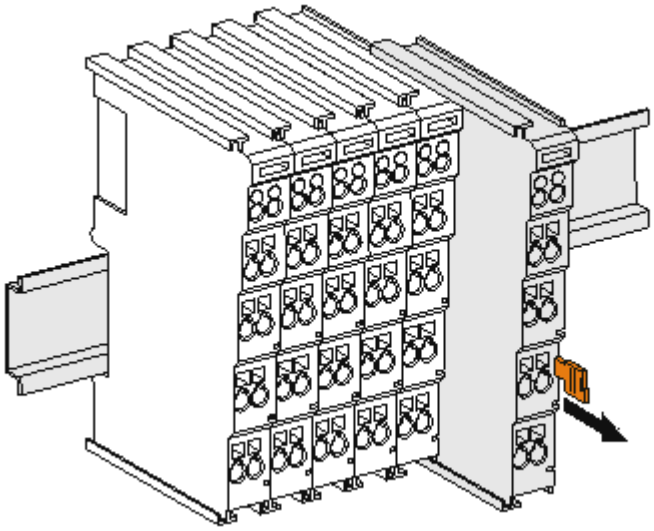

*Installation on the mounting rail*

1. First attach the EtherCAT Gateway to the mounting rail.

2. The EtherCAT Terminals are now attached on the right-hand side of the EtherCAT Gateway. Join the components with slot and key and push the terminals against the mounting rail, until the lock clicks onto the mounting rail.
   If the terminals are clipped onto the mounting rail first and then pushed together without slot and key, the connection will not be operational!
   When correctly assembled, no significant gap should be visible between the housings.

| | |
|---|---|
| **Note** | **Fastening of mounting rails**<br><br>The locking mechanism of the terminals and couplers protrudes into the profile of the mounting rail.<br>When installing the components, make sure that the locking mechanism doesn't come into conflict with the fixing bolts of the mounting rail.<br>For fastening mounting rails with a height of 7.5 mm under the terminals and couplers, use flat fastening components such as countersunk head screws or blind rivets. |

**Removal**



*Removal of mounting rails*

1. Carefully pull the orange-colored lugs approximately 1cm out of the disassembled terminal, until they protrude loosely. The lock with the mounting rail is now released for this terminal, and the terminal can be pulled from the mounting rail without excessive force.

2. Grasp the released terminal with thumb and index finger simultaneous at the upper and lower grooved housing surfaces and pull the terminal away from the mounting rail.

## 4.2.4 Electrical installation

### 4.2.4.1 Connections within a EtherCAT Terminal block

The electric connections between the EtherCAT Gateway and the EtherCAT Terminals are automatically realized by joining the components:

**Spring contacts (E-bus)**

- The six spring contacts of the E-bus deal with the transfer of the data and the supply of the EtherCAT Terminals electronics.

| | |
|---|---|
|  Note | **Observe the E-bus current**<br><br>Observe the maximum current that your EtherCAT Gateway can supply to the E-bus! Use the CTMT9410 Power supply terminal if the current consumption of your terminals exceeds the maximum current that your EtherCAT Gateway can feed to the E-bus supply. |

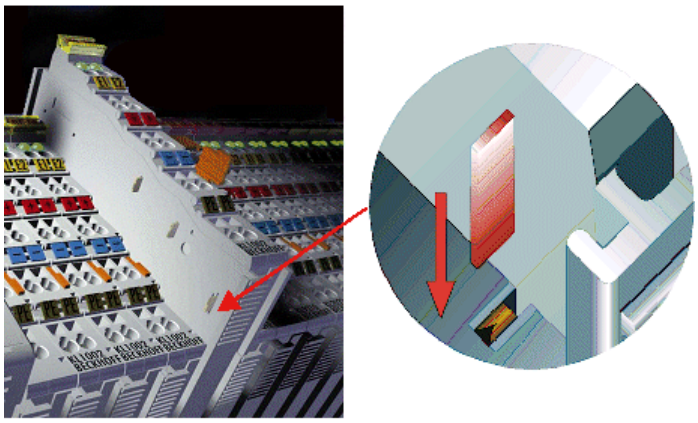
**Power contacts**

- The power contacts deal with the supply for the field electronics and thus represent a supply rail within the EtherCAT Terminal block.
  The power contacts are supplied via terminals on the EtherCAT Gateway.

| | |
|---|---|
|  Note | **Note the connection of the power contacts**<br><br>During the design of a EtherCAT Terminal block, the pin assignment of the individual EtherCAT Terminals must be taken account of, since some types (e.g. analog EtherCAT Terminals or digital 4-channel EtherCAT Terminals) do not or not fully loop through the power contacts.<br>Power Feed Terminals (CTMT91xx) interrupt the power contacts and thus represent the start of a new supply rail. |

**PE power contact**

The power contact labelled PE can be used as a protective earth. For safety reasons this contact mates first when plugging together, and can ground short-circuit currents of up to 125A.



*PE power contact*

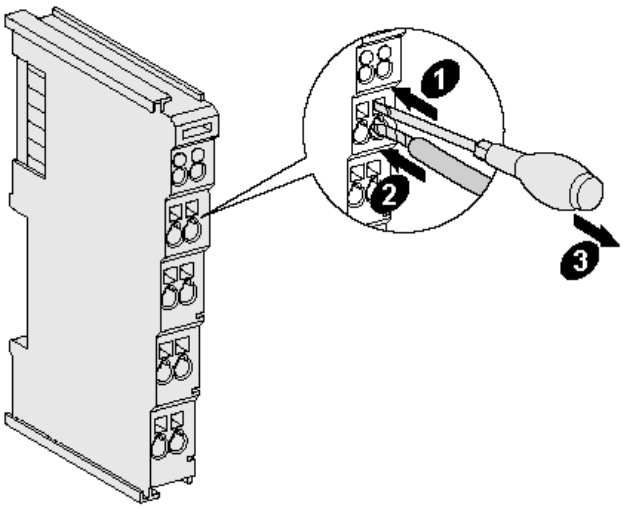
| | |
|---|---|
| CAUTION | **Insulation tests**<br><br>Note that, for reasons of electromagnetic compatibility, the PE contacts are capacitatively coupled to the mounting rail. This may lead to incorrect results during insulation testing or to damage on the terminal (e.g. disruptive discharge to the PE line during insulation testing of a consumer with a rated voltage of 230V).<br><br>For insulation testing, disconnect the PE supply line at the EtherCAT Gateway or the Power Feed Terminal! In order to decouple further feed points for testing, these Power Feed Terminals can be released and pulled at least 10mm from the group of terminals. |

| | |
|---|---|
| DANGER | **Serious risk of injury!**<br><br>The PE power contact must not be used for other potentials! |

### 4.2.4.2 Overvoltage protection

If protection against overvoltage is necessary in your plant, provide a surge filter for the voltage supply to the EtherCAT Terminal blocks and the NUMSafe terminals.

### 4.2.4.3 Wiring




*Connection of a cable to a terminal point*

Up to eight connections enable the connection of solid or finely stranded cables to the EtherCAT Terminals. The terminals are implemented in spring force technology.

Connect the cables as follows:

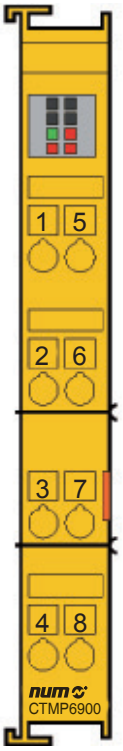
1. Open a spring-loaded terminal by slightly pushing with a screwdriver or a rod into the square opening above the terminal.

2. The wire can now be inserted into the round terminal opening without any force.

3. The terminal closes automatically when the pressure is released, holding the wire safely and permanently.

| | |
|---|---|
| Wire cross section | 0.08 ... 2.5mm$^2$ |
| Strip length | 8 ...9mm |

### 4.2.4.4 CTMP6900 pin assignment




*CTMP6900 pin assignment*

| Terminal point | Output | Signal |
|---|---|---|
| 1 | - | Not used, no function |
| 2 | | Not used, no function |
| 3 | - | Not used, no function |
| 4 | | Not used, no function |
| 5 | - | Not used, no function |
| 6 | | Not used, no function |
| 7 | - | Not used, no function |
| 8 | | Not used, no function |

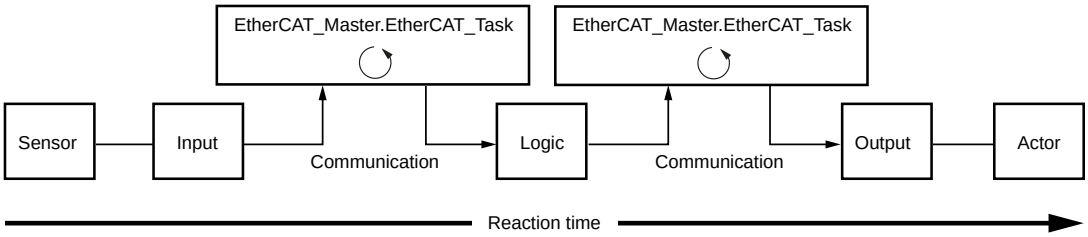
## 4.2.5 NUMSafe reaction times

NUMSafe form a modular safety system that exchanges safety-oriented data via the Safety-over-EtherCAT protocol.

This chapter is intended to help you determine the system's reaction time from the change of signal at the sensor to the reaction at the actuator.

### Typical reaction time

The typical reaction time is the time that is required to transmit information from the sensor to the actuator, if the overall system is working without error in normal operation.




*Typical reaction time*

| Definition | Description |
|---|---|
| **RTSensor** | Reaction time of the sensor until the signal is provided at the interface.<br>Typically supplied by the sensor manufacturer. |
| **RTInput** | Reaction time of the safe input, such as CTMS1904.<br>This time can be found in the technical data. In the case of the CTMS1904 it is 4 ms. |
| **RTComm** | Reaction time of the communication This is typically 3x the EtherCAT cycle time, because new data can only be sent in a new Safety-over-EtherCAT telegram.<br>These times depend directly on the higher-level standard controller (cycle time of the PLC/NC). |
| **RTLogic** | Reaction time of the logic terminal. This is the cycle time of the logic terminal and typically ranges from 500 µs to 10 ms for the CTMP6900, depending on the size of the safety project.The actual cycle time can be read from the terminal. |
| **RTOutput** | Reaction time of the output terminal.<br>This typically lies within the range of 2 to 3 ms. |
| **RTActor** | Reaction time of the actuator.<br>This information is typically supplied by the actuator manufacturer. |
| **WDComm** | Watchdog time of the communication. |

This results in the following equation for the typical reaction time:

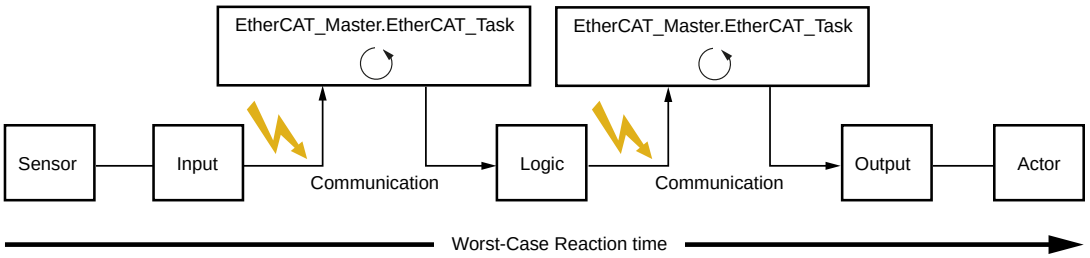
$$ReactionTime_{typ} = RT_{Sensor} + RT_{Input} + 3* RT_{Comm} + RT_{Logic} + 3* RT_{Comm} + RT_{output} + RT_{Actor}$$

with, for example

$$ReactionTime_{typ} = 5ms + 4ms + 3* 1ms + 10ms + 3* 1ms + 3ms + 20ms = 48ms$$

### Worst-case reaction time

The worst case reaction time is the maximum time required to switch off the actuator in the case of an error.




*Worst-case reaction time*

This assumes that a signal change occurs at the sensor and is transmitted to the input.

A communication error occurs at precisely the moment when the signal is to be transferred to the communication interface.This is detected by the logic following the watchdog time of the communication link.

This information should then be transferred to the output, but a further communication error occurs here. This error is detected at the output following the expiry of the watchdog time and leads to the switch-off.

This results in the following equation for the worst-case reaction:

$$ReactionTime_{max} = WD_{Comm} + WD_{Comm} + RT_{Actor}$$

with, for example

$$ReactionTime_{max} = 2* 15ms + 20ms = 50ms$$

### 4.2.6 Tested CTMS1904 devices

The following list contains devices that were tested the together with the CTMS1904 NUMSafe Terminal. The results only apply for the current device hardware version at the time of testing.

The tests were carried out in a laboratory environment. Modifications of these products cannot be considered here. If you are unsure please test the hardware together with the NUMSafe Terminal.

| Manufacturer | Type | Comment |
|---|---|---|
| SICK | C4000 | Safety light curtain |
| SICK | S3000 | Safety laser scanner |
| Wenglor | SG2-14ISO45C1 | Safety light grids |
| Leuze | lumiflex ROBUST 42/43/44 | Safety light barriers |
| Schmersal | BNS250-11ZG | Safety switch |
| ifm | GM701S | Inductive safety sensor |
| Keyence | SL-V (with PNP cable set) | Safety light curtain |

The tests were carried out as function tests only. The information provided in the respective manufacturer documentation remains valid.

### 4.2.7 Tested CTMS2904 devices

The following list contains devices that were tested the together with the CTMS2904 NUMSafe Terminal. The results only apply for the current device hardware version at the time of testing.

The tests were carried out in a laboratory environment. Modifications of these products cannot be considered here. If you are unsure please test the hardware together with the NUMSafe Terminal.

| Manufacturer | Type | Comment |
|---|---|---|
| Siemens | SIRIUS series<br>S00 3RT1016-1BB42 | Contactor |
| Telemecanique | LP1K09 | Contactor |

The tests were carried out as function tests only. The information provided in the respective manufacturer documentation remains valid.

| | |
|---|---|
|  <br>**Note** | **Recommended protective circuits**<br><br>We recommend R/C or diode-based protective circuits for these devices.<br>Varistor-based protective circuits should not be used. |

## 4.3 Operation in potentially explosive atmospheres (ATEX)

### 4.3.1 Special conditions

WARNING

**Observe the special conditions for the intended use of NUM fieldbus components in potentially explosive areas (directive 94/9/EU)!**

- The certified components are to be installed in a suitable housing that guarantees a protection class of at least IP54 in accordance with EN60529! The environmental conditions during use are thereby to be taken into account!
- If the temperatures during rated operation are higher than 70°C at the feed-in points of cables, lines or pipes, or higher than 80°C at the wire branching points, then cables must be selected whose temperature data correspond to the actual measured temperature values!
- Observe the permissible ambient temperature range of 0 to 55 °C when using NUM fieldbus components in potentially explosive atmospheres!
- Measures must be taken to protect against the rated operating voltage being exceeded by more than 40% due to short-term interference voltages!
- The individual terminals may only be unplugged or removed from the EtherCAT terminal system if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- The connections of the certified components may only be connected or disconnected if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- Address selectors and ID switches may only be adjusted if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!

The fundamental health and safety requirements are fulfilled by compliance with the following standards:

- **EN 60079-0: 2006**
- **EN 60079-15: 2005**

### 4.3.2 Identification

NUM fieldbus components that are certified for use in potentially explosive atmospheres bear one of the following markings:

II 3 G Ex nA II T4 KEMA 10ATEX0075 X Ta: 0 - 55°C

or

II 3 G Ex nA nC IIC T4 KEMA 10ATEX0075 X Ta: 0 - 55°C

### 4.3.3 Date code and serial number

The NUMSafe terminals bear a date code, which is composed as follows:

Date code: CW YY SW HW

| Legend | | Example: Date code 29 10 02 01 |
|---|---|---|
| CW: | Calendar week of manufacture | Calendar week: 29 |
| YY: | Year of manufacture | Year: 2010 |
| SW: | Software version | Software version: 02 |
| HW: | Hardware version | Hardware version: 01 |

In addition the NUMSafe terminals bear a unique serial number.

## 4.4 Configuration of CTMP6900 with “CODESYS Safety for EtherCAT Safety Module”

| | |
|---|---|
|  CAUTION | **Do not change the register values!**<br><br>Do not change any of the CoE objects in the NUMSafe terminals.<br>Any modifications (e.g. via “CODESYS Safety for EtherCAT Safety Module”) of the CoE objects would permanently set the terminals to the Fail-Stop state. |

### 4.4.1 Configuration requirements

The following system requirements apply to smaller “CODESYS Safety for EtherCAT Safety Module” projects with a maximum of 100 blocks, a maximum of 10 visualisations and a maximum of 8 fieldbus devices:

- 1 GB RAM
- 1 GHz Pentium
- 1 GB free hard disc space
- Screen resolution 1024 x 768.

The “CODESYS Safety for EtherCAT Safety Module” programming system is approved only for the following operating systems:

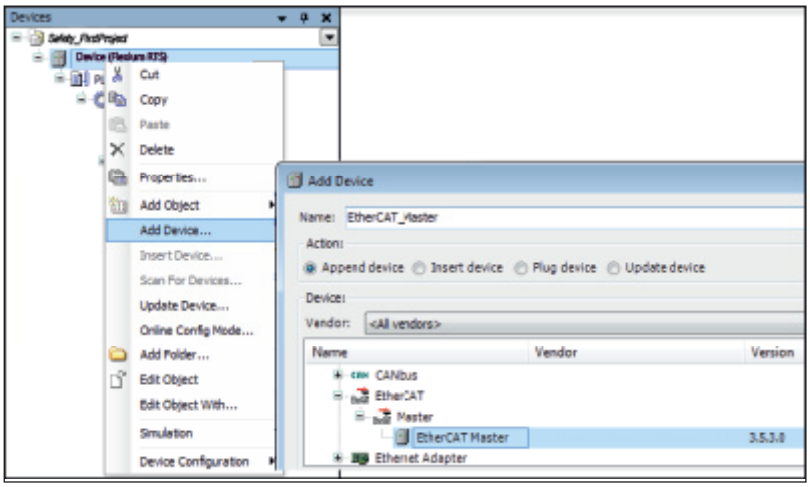
- Windows 7 (32/64 bit).

### 4.4.2 NUM EtherCAT Gateway

See NUM EtherCAT terminals CTMG and CTMT Operating manual M00032.

### 4.4.3 Adding an EtherCAT Master to the device tree

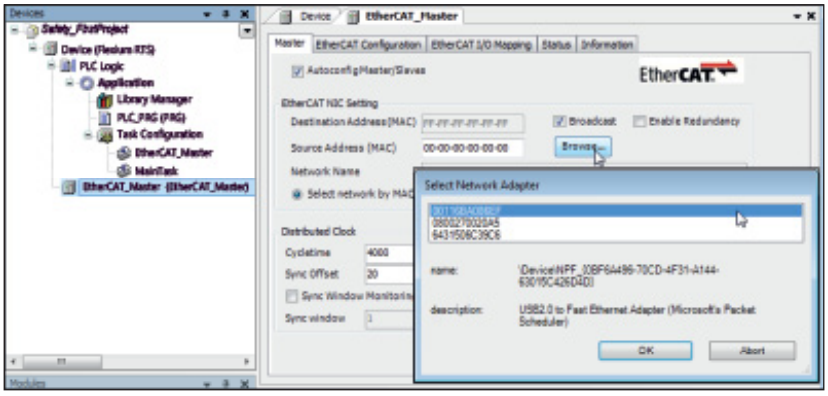
A right-click on the controller opens the context menu, from which the *“Add device...”* command is selected. The “EtherCAT Master” device is then selected in the following dialog.




*Inserting an EtherCAT Master*

### 4.4.4 Adapting the EtherCAT Master settings

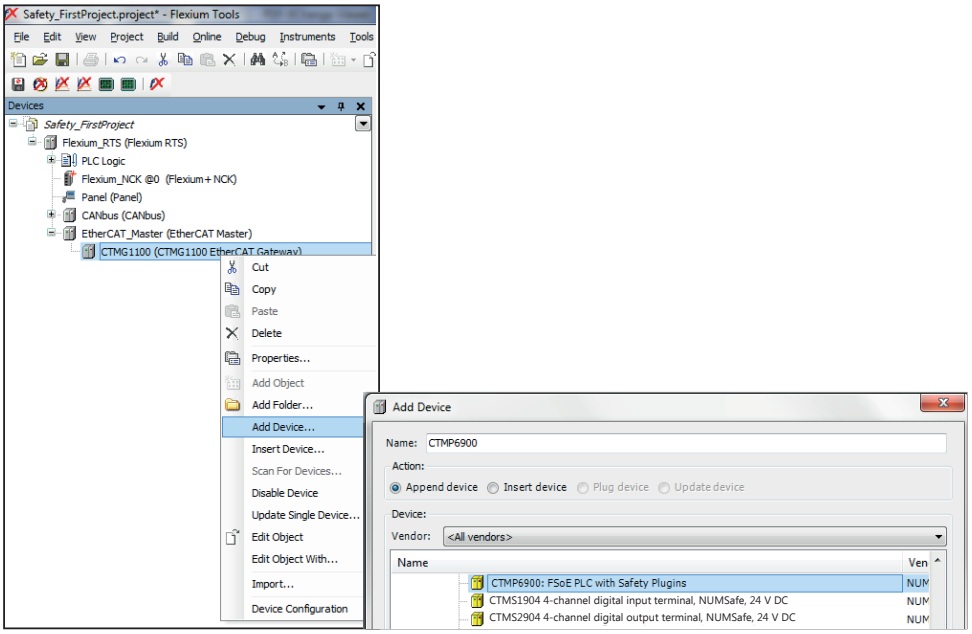
A double-click on the *“EtherCAT Master”* device in the device tree opens the associated editor for setting the parameters. In this example the desired network adaptor is selected and the dialog is quit with *“OK”* .




*EtherCAT Master - settings*

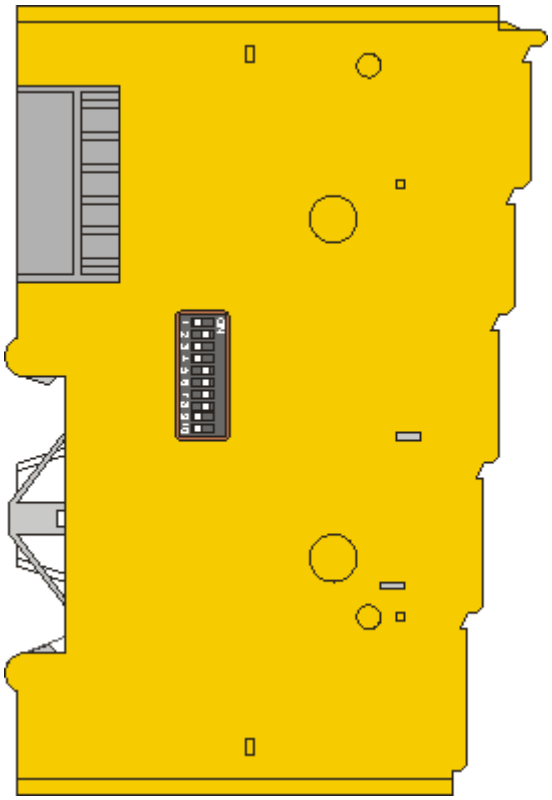
### 4.4.5 Adding a CTMP6900

A right-click on the NUMEtherCAT gateway (CTMG1100) opens the context menu, from which the *"Add device..."* command is selected. The *"CTMP6900"* device is then selected in the following dialog.




*Adding a CTMP6900*

### 4.4.6 Address settings on the NUMSafe EtherCAT terminals



*Address settings on NUMSafe terminals with 1023 possible addresses*

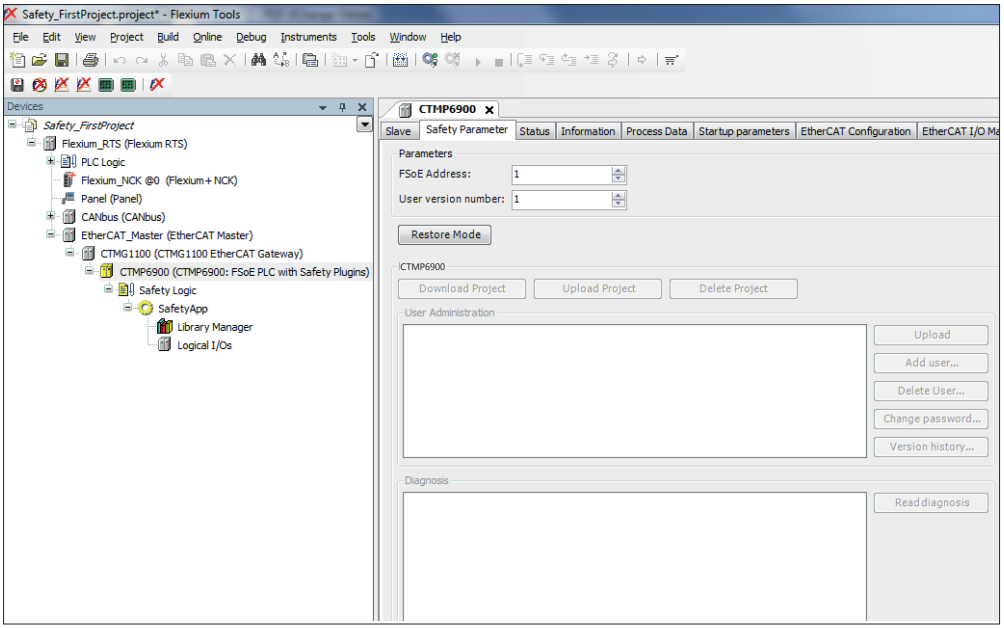
The EtherCAT terminal address of the terminal is set via the 10-way DIP switch on the left-hand side of the EtherCAT terminal. NUMSafe addresses between 1 and 1023 are available.

| **DIP switch** | | | | | | | | | | **Address** |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | |
| OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | **0** |
| **ON** | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | **1** |
| OFF | **ON** | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | **2** |
| **ON** | **ON** | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | **3** |
| OFF | OFF | **ON** | OFF | OFF | OFF | OFF | OFF | OFF | OFF | **4** |
| **ON** | OFF | **ON** | OFF | OFF | OFF | OFF | OFF | OFF | OFF | **5** |
| OFF | **ON** | **ON** | OFF | OFF | OFF | OFF | OFF | OFF | OFF | **6** |
| **ON** | **ON** | **ON** | OFF | OFF | OFF | OFF | OFF | OFF | OFF | **7** |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | **...** |
| **ON** | **ON** | **ON** | **ON** | **ON** | **ON** | **ON** | **ON** | **ON** | **ON** | **1023** |

| | |
|---|---|
| **WARNING** | **NUMSafe address**<br><br>Each NUMSafe address may only be used once within a network / a configuration!The address 0 is not a valid NUMSafe address! |

### 4.4.7 Entering the NUMSafe addresses in the System Manager

The NUMSafe address set at the DIP switch must also be entered under the Safety Parameter tab.



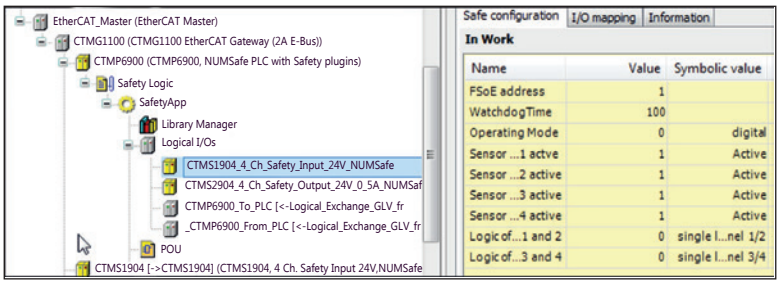

*Entering NUMSafe addresses*

### 4.4.8 Adding other NUMSafe terminals

Using the same method applied for the CTMP6900, other NUMSafe terminals (CTMS1904 and CTMS2904) can be added as well and the FSoE address is also set in the same manner.

### 4.4.9 Settings of the parameters of the logical I/Os

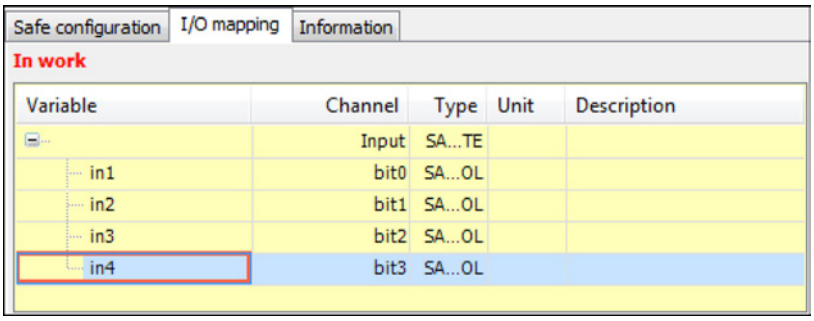
In the next step the addresses of the logical devices are set. To this end the FSoE address “2” is set for the “CTMS1904” module and the address “3” for “CTMS2904”.



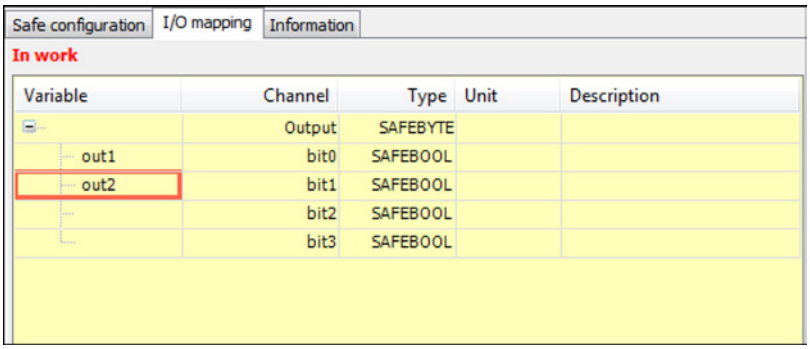

*Logical I/Os - settings*

### 4.4.10 Definition of the I/O image of the logical devices

Variables can be assigned to the individual channels of the module on the second tab of the editor. This is defined for the two modules as shown below:



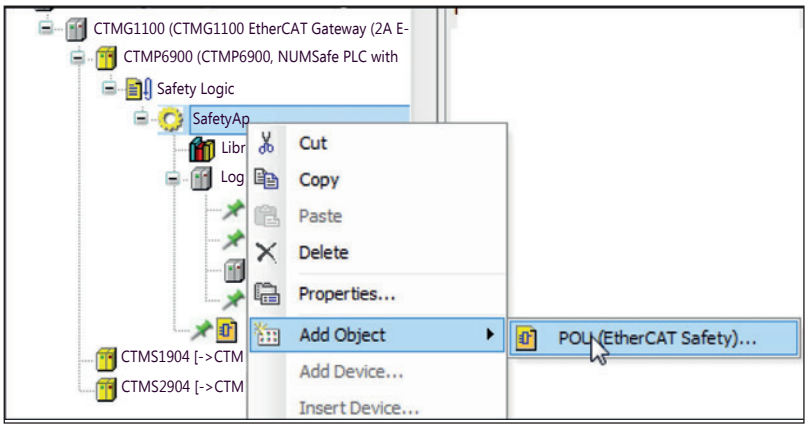

*CTMS1904 logical I/Os - I/O mapping*




*CTMS2904 logical I/Os - I/O mapping*

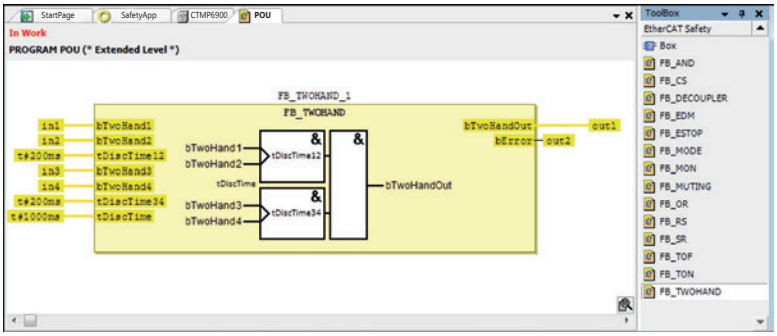
### 4.4.11 Creation of a program (POU)

A POU is added via the SafetyApp context menu or via the menu command *“Project* è *Add Object* è *POU (EtherCAT Safety)”*




*Addition of a POU*

The “FB_TWOHAND” function block is inserted in the editor of the added POU – this is done by selecting the FB in the Tools overview and moving it to the “Start here” field on the desktop by drag&drop.

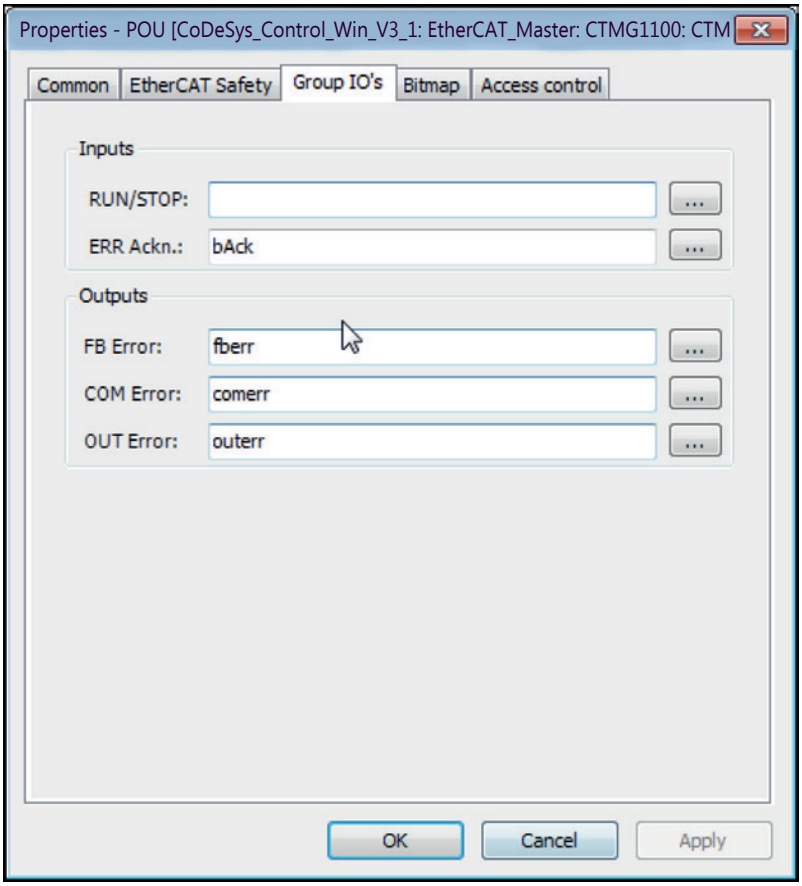



*Addition of the “FB_TWOHAND” FB*

The inputs and outputs of the function block are connected with variables according to the diagram above.

### 4.4.12 Setting the group I/Os of the “POU” program

The group I/Os are set in the properties of the newly created POU (right-click on the POU in the device tree - *“Properties”*). These variables control the state of the POU and can signal errors.




*POU - Properties*

#### NUMSafe group inputs

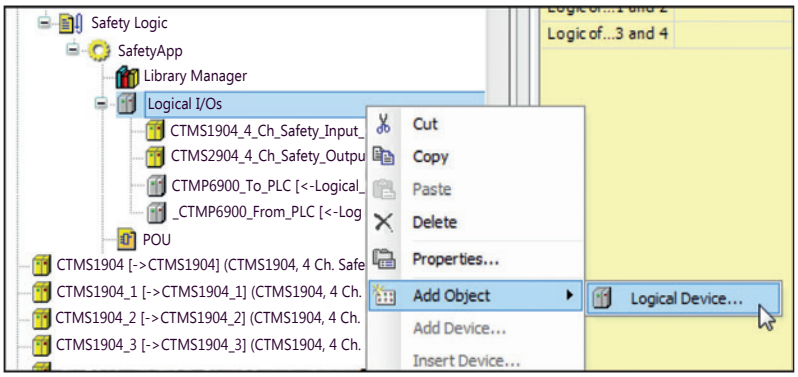
| Name | Permitted type | Description | |
|---|---|---|---|
| **RUN** | FB-Out<br>Standard-In | TRUE: | The function blocks assigned to the NUMSafe group are executed. When the input is not linked it is in the TRUE state. |
| | | FALSE: | All of the NUMSafe group assigned function blocks are at a STOP state and thus all associated outputs are in a safe state. |
| **ERR Ack** | FB-Out<br>Standard-In | All pending errors in the assigned function blocks and in the NUMSafe connections are acknowledged by the FALSE->TRUE->FALSE signal sequence. | |

#### NUMSafe group outputs

| Name | Permitted type | Description | |
|---|---|---|---|
| **FB ERR** | NUMSafe-Out<br>FB-In<br>Standard-Out | TRUE: | At least one assigned function block has an error. |
| | | FALSE: | All assigned function blocks have no errors. |
| **COM ERR** | NUMSafe-Out<br>FB-In<br>Standard-Out | TRUE: | At least one NUMSafe connection of NUMSafe group has an error. |
| | | FALSE: | All NUMSafe connections of the NUMSafe group have no errors. |
| **OUT ERR** | NUMSafe-Out<br>FB-In<br>Standard-Out | FALSE: | Always FALSE, since the CTMP6900 has no local outputs. |

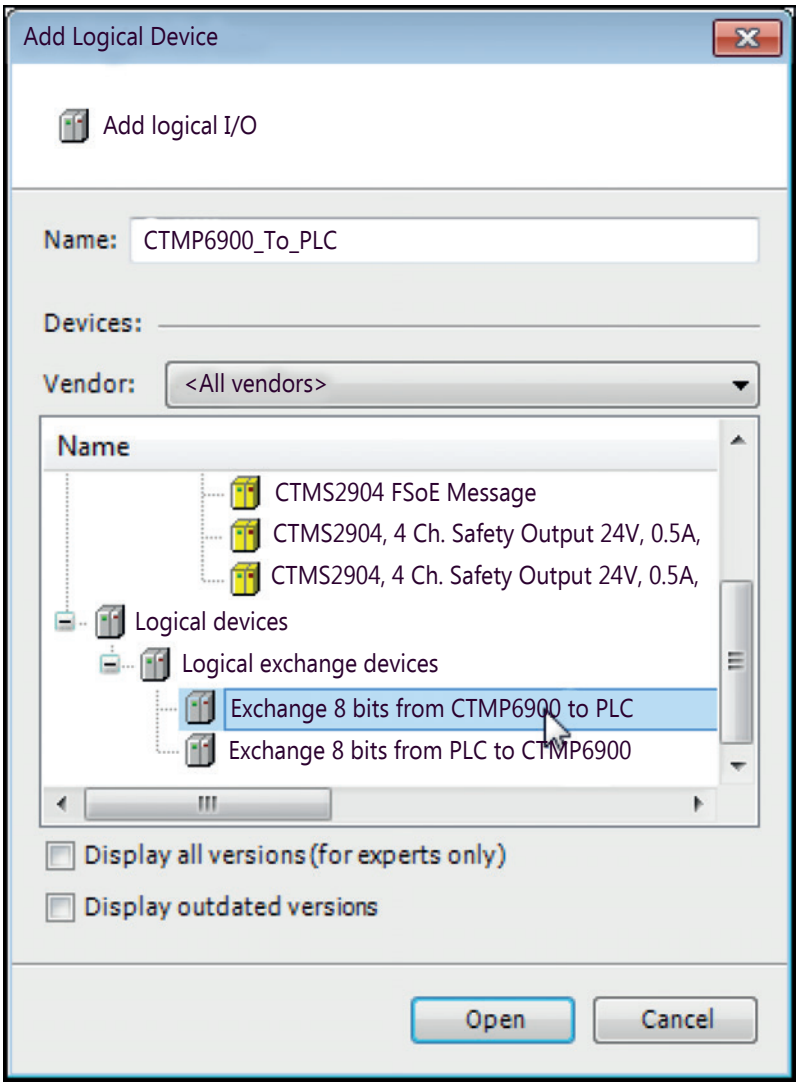
### 4.4.13 Addition of logical devices for data exchange

Now further logical devices are added which will handle the exchange of data with the standard controller later on. To do this the “Add logical device” dialog is called ( *“context menu of logical I/Os ➔ Add Object ➔ Logical Device”* ).




*Addition of a logical device*

The device “8 bits exchange object from CTMP6900 to PLC” is selected from the dialog and is given the name “CTMP6900_to_PLC”.

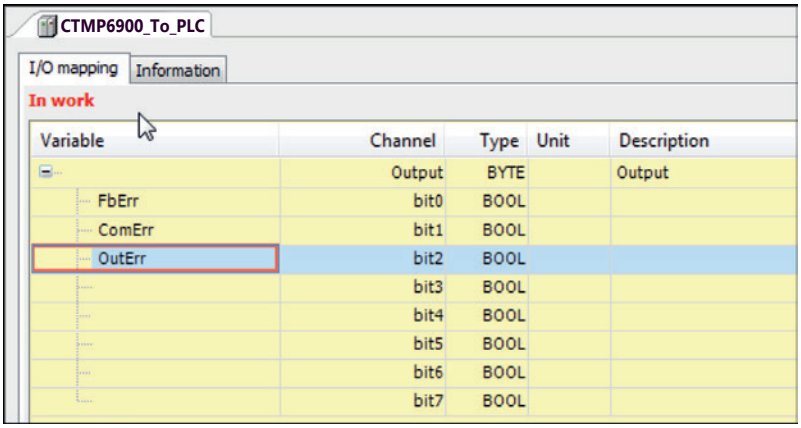



*Addition of a logical device – exchange device*

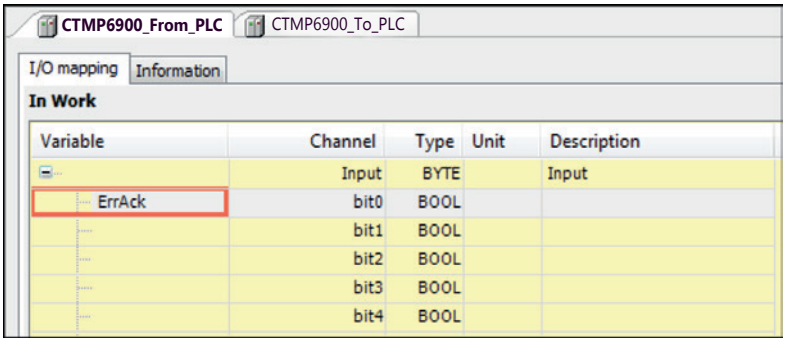
In a similar way a logical device “8 bits exchange object from PLC to CTMP6900” is created with the name “PLC_To_CTMP6900”.

### 4.4.14 Definition of the variables of the exchange objects

Double-clicking on the newly added logical devices opens the associated editor. The variables are entered here as shown below. These variables are subsequently connected with a global variable list of the standard controller.



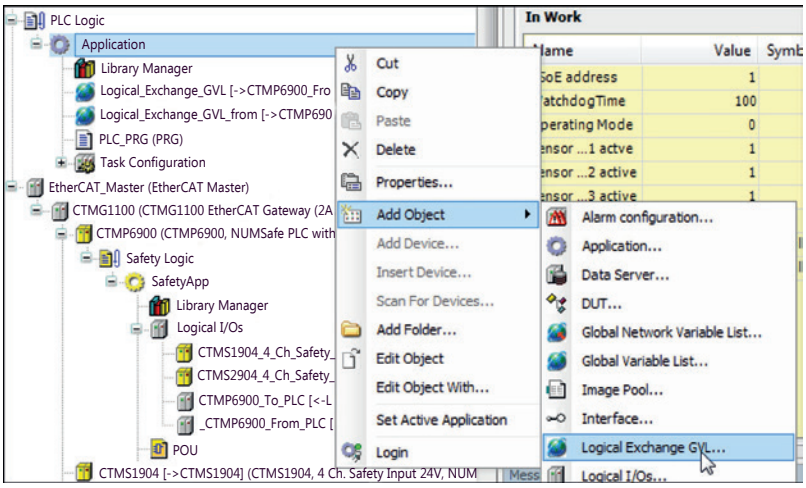

*Logical device CTMP6900 --> PLC: variable definition*




*Logical device PLC --> CTMP6900: variable definition*

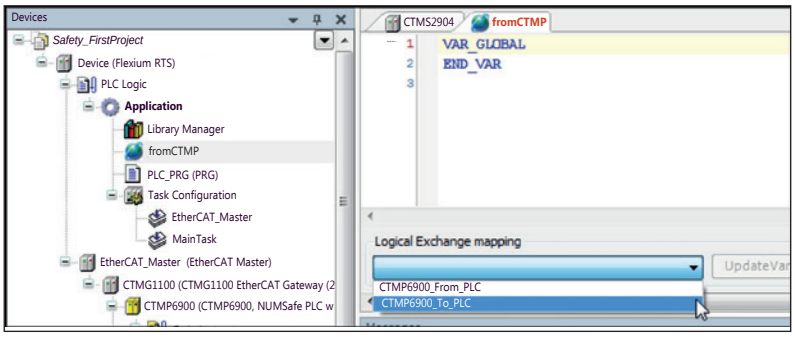
### 4.4.15 Addition of global variable lists for the logical exchange

Now GVLs for the logical exchange are added to the device tree (*"context menu of the application* è *Add Object* ➔ *GVL for logical exchange"*).




*Addition of a GVL for logical exchange*

The new GVL (with the name "fromCTM") is added to the device tree. A double-click opens its editor. The variables of the logical device "CTMP6900_To_PLC" are now mapped to this GVL in the lower section of the editor.

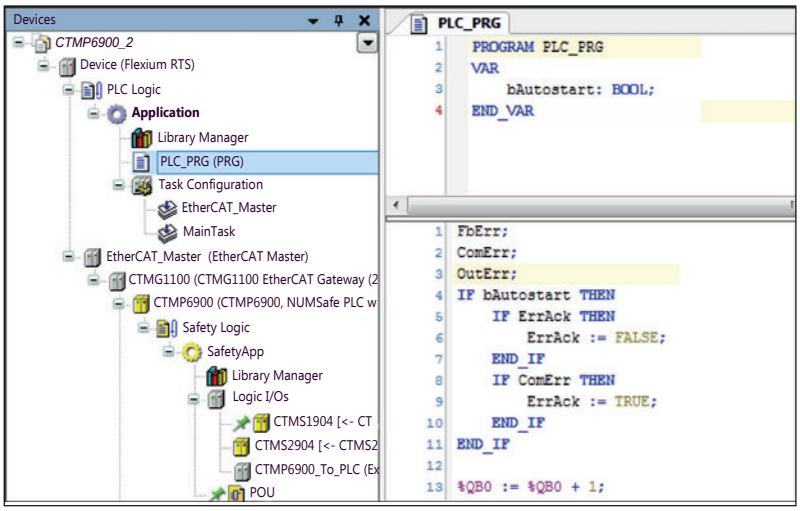



*GVL - Assignment of the logical I/Os*

The GVL "toCTM" is created in a similar way and connected with the logical I/Os of "CTMP6900_To_PLC".

### 4.4.16 “PLC_PRG” program

The variables of the safety application are read and written via the “PLC_PRG” program.
The `FbErr`, `ComErr` and `OutErr` variables were inserted so that the states can be monitored.
If `bAutostart` is set, the `ErrAck` flag is set for one cycle in the case of an error in the safety block (recognised via `ComErr`) so that the error is acknowledged in the safety controller.




*PLC_PRG program*

## 4.4.17 CTMP6900 user and version administration

### 4.4.17.1 Overview of safety access protection

Rights can be assigned in such a way in the project user management that safety objects of a project can be created or modified only by certain user groups (“Safety Developer”).
The entire access protection of “CODESYS Safety for EtherCAT Safety Module” safety applications is realised by the user management in the project.

| | |
|---|---|
|  Note | It is urgently recommended to configure a user management with safe access protection for each project!<br>Without user management in the project, each person who collaborates in the project possesses all rights to the standard and safety applications in the project!. |

### 4.4.17.2 User management in the project

| | |
|---|---|
|  Note | In a project without user management each user possesses **all rights**. The project manager must ensure that the safety application is worked on only by persons qualified to do so. |

**Creation of a new project without a user management template**

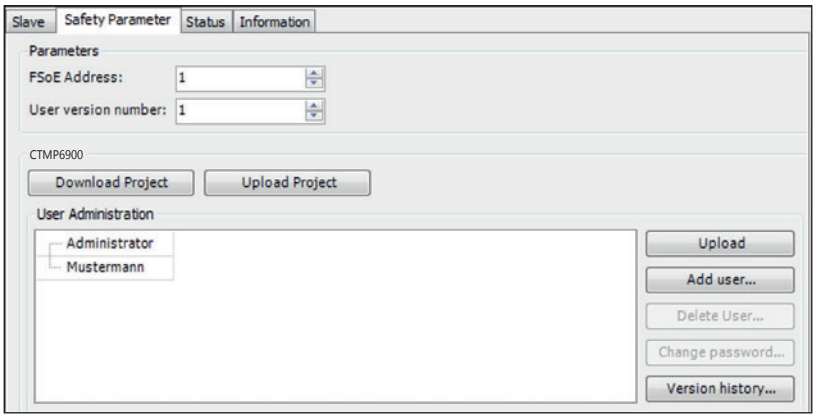
If a new project is created as an *“empty project”* , then the project manager must create a suitable user management for the safety application of the project. Refer to the Standard CODESYS online help for the exact procedure and detailed information on the creation of this user management in the project.

In order to facilitate the selection of the safety specific commands for the developer, *“Safe”* or *“Safety”* is placed in front of the commands that are relevant for the safety developer when assigning rights. In the rights objects the safety objects are easily recognisable by the suffix *“(Safety)”* after the object.

| | |
|---|---|
|  Note | If the developer does not have the rights for a particular operation, he can logon during the operation using a user name with more rights. |

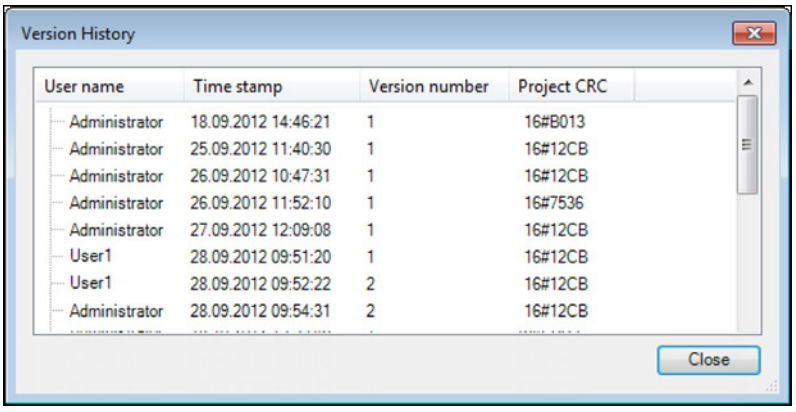
### 4.4.17.3 User management – EtherCAT safety module

In addition to the standard user management of CODESYS, the safety controller offers its own user management. This allowsusers to be setup with the associated passwords. These data must be entered during “Project Download”. Before changes are made to this user management, the current version of the user management must be loaded from the safety controller into the CODESYS project ( *“Upload”* button in the *“User Administration”* section).




*User management – EtherCAT safety modules*

- *“Upload” :* Transfer of the current user management of the safety controller into CODESYS for display and editing.
- *“Add user…” :* The creation of a new user.
  The input of the administrator password is necessary for this.
- *“Delete user...” :* The deletion of the selected user.
  The input of the administrator password is necessary for this.
- “Change password...” : The current password must be entered before a new password can be defined.
- “Version history” : After the execution of the command the version history is read from the safety controller.




*Safety module version history*

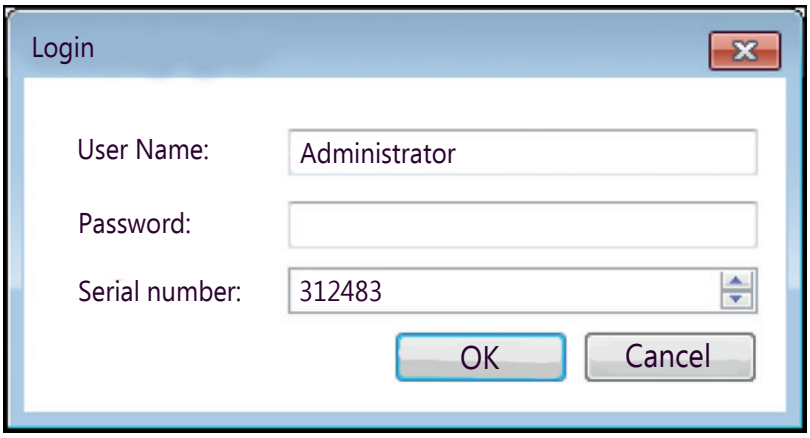
### 4.4.17.4 Access protection with link to source control

| | |
|---|---|
| **Note** | If a source control is used, then a user management corresponding to the user management in the project must also be set up in the source control. |

### 4.4.18 Loading the project into the CTMP6900

selected, the *«Administrator»* user will be used. The download procedure is actuated from the «Safety parameters» tab of the editor for the node of the EtherCAT safety controller.

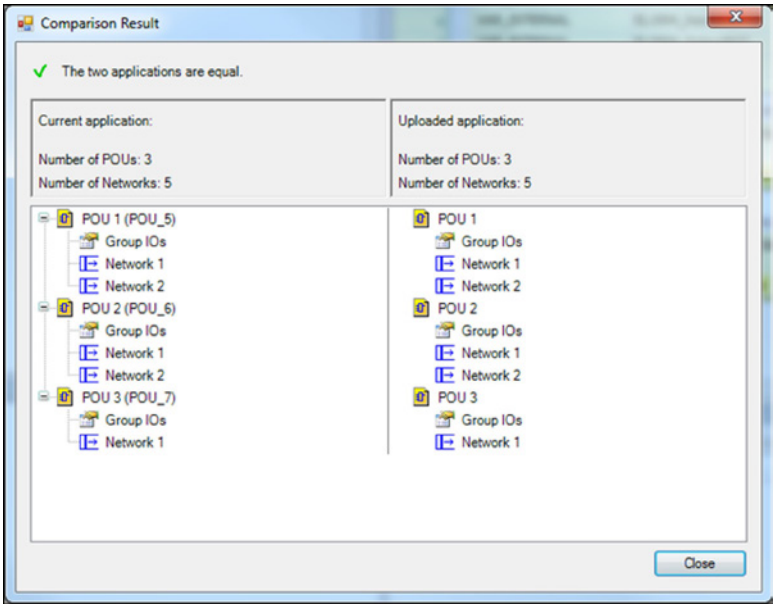
The user password and the serial number of the terminal must be entered in order for the data record to be accepted by the terminal.




*Login dialog*

A re-translation takes place automatically after the download of the application in order to check the generated code. To do this the translated code is decompiled again and compared at source code level. By means of this diverse method the function of the compiler is checked at each download. Both random and systematic errors are thereby determined.

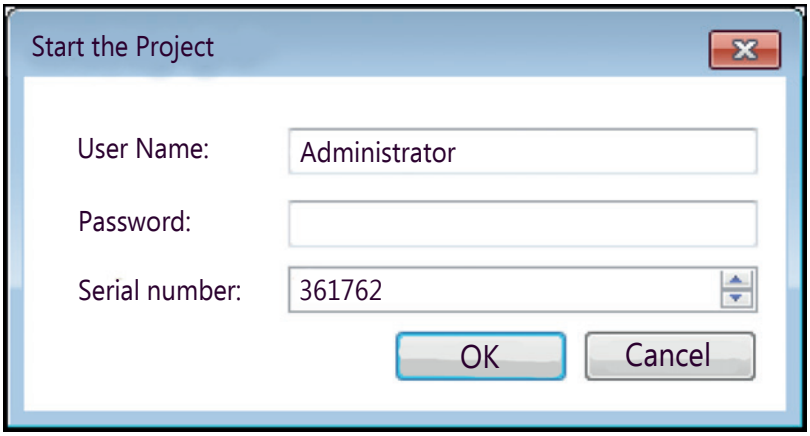
The result of the comparison (same or different) is displayed to the user. The number of function blocks and networks compared is also indicated. If equality is determined the download is valid and can be confirmed by the user via the offered dialog box.




*Dialog: Comparison result = “same projects”*

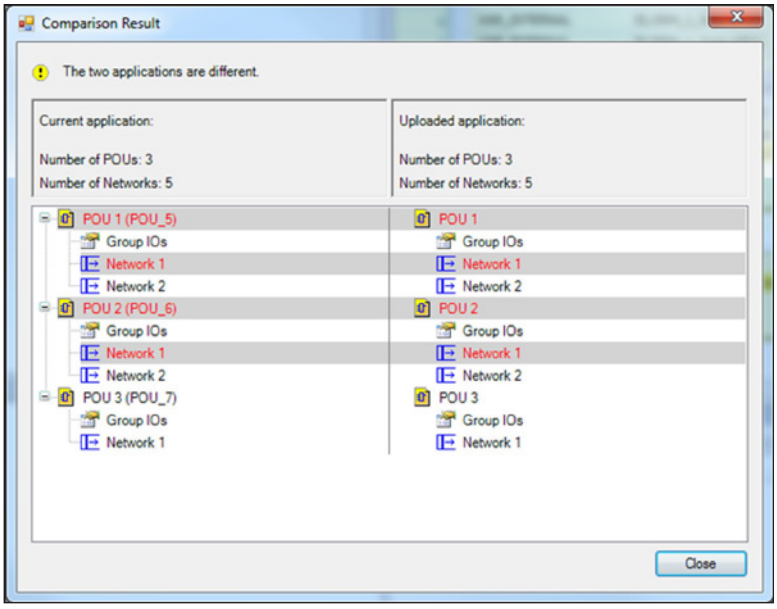
If equality is determined the download is valid and can be confirmed by the user. After entering the user name and password again the enabling data record is loaded to the controller. Afterwards the controller is ready to start. The application must be started from the user program.

This is done by a rising edge of the variables defined in the group I/Os.




*Dialog for loading the enabling data record*

If a difference is found the download is not valid and cannot be confirmed. The corresponding confirmation dialog is not offered to the user in this case. Instead, the user is shown where (in which block or network, IO image or parameter) the discrepancy occurred.




*Dialog: Comparison result = “different projects”*

### 4.4.19 CTMP6900 project design limits

| | |
|---|---|
| **NUMSafe connections** | Maximum. 128 (with 1 or 2 bytes safe user data per connection) maximum. 50 connections per NUMSafe group.<br><br>Only 16 connections of an CTMP6900 can be slave connections. |
| **Supported hardware for CTMP6900 NUMSafe connections** | CTMS1904<br>CTMS2904<br>NUM-SAMX |
| **Safe data per connection** | Up to 14 bytes safe user data (correspondingly lower total number of connections) |
| **NUMSafe blocks** | Maximum 255 |
| **NUMSafe groups** | Maximum 32 |
| **Standard PLC inputs** | Dynamic up to 255 bit |
| **Standard PLC outputs** | Dynamic up to 255 bit |

**Note**

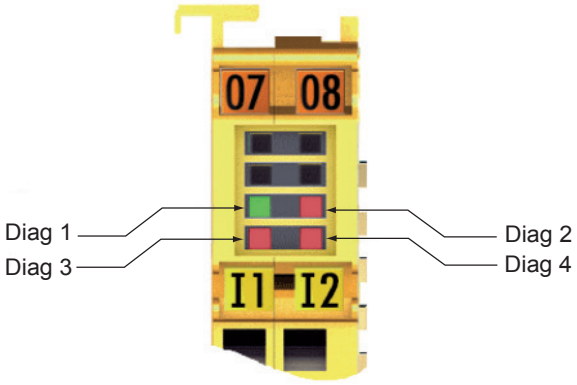
**NUMSafe connection**

Only one NUMSafe connection between two NUMSafe EtherCAT terminals is possible. Between two CTMP6900 logic terminals a connection can be set up that may contain up to 14 bytes safe user data.

## 4.5 Diagnostics

### 4.5.1 Diagnostic LEDs

The LEDs Diag 1 to Diag 4 display diagnostic information for the CTMP6900.




*CTMP6900 diagnostic LEDs*

#### 4.5.1.1 Diag 1 LED (green)

The Diag 1 LED is currently always on when a project is loaded into the terminal.

| Display | Meaning |
|---|---|
| **Lit** | A project is stored in the terminal. |

#### 4.5.1.2 Diag 2 LED (red)

The Diag 2 LED indicates internal process variable errors (in preparation).

| Display | Meaning |
|---|---|
| **in preparation** | |

#### 4.5.1.3 Diag 3 LED (red)

The Diag 3 LED provides further details for the Diag 4 LED (see next page).

### 4.5.1.4 Diag 4 LED (red) if Diag 3 LED (red) is lit

If the Diag 3 LED is lit, the Diag 4 LED indicates internal terminal errors.

| Diag 3 LED | Diag 4 LED | Source of error |
|---|---|---|
| **Lit** | **flashing** | µC1 |
| **Lit** | **off** | µC2 |

| | |
|---|---|
| **Note** | **Returning the terminal**<br><br>These errors lead to shutdown of the terminal (Global Fault). The terminal must be checked by NUMspa. |

### 4.5.1.5 Diag 4 LED (red) if Diag 3 LED (red) is not lit

If the Diag 3 LED is not lit, the Diag 4 LED indicates the state of the NUMSafe terminal.

| Diag 3 LED | Diag 4 LED: Flashing Code | Meaning |
|---|---|---|
| **off** | **1 flash pulse (uniform flashing)** | Function block error in one of the NUMSafe groups. |
| **off** | **2 flash pulses (2 pulses with longer pause in between)** | Communication error in one of the NUMSafe groups. |
| **off** | **3 flash pulses (3 pulses with longer pause in between)** | Function block and communication error in one of the NUMSafe groups. |
| **off** | **Steadily lit** | Supply voltage or internal temperature of the terminal outside the permissible range. The diagnostic object $FA00_{hex}$ provides you with more detailed information. |

## 4.5.2 Diagnostic object


**Do not change CoE objects!**

Do not make any modifications to the CoE objects in the NUMSafe terminals. Any modifications (e.g. via EtherCAT Safety Module" programming system) of the CoE objects would permanently set the terminals to the Fail-Stop state.

### Index $FA80_{hex}$: Internal temperature values

The CoE objects $FA80_{hex}$ indicate the current internal temperature values of the CTMP6900.

| Index | Name | Meaning | Flags | Default |
|---|---|---|---|---|
| **FA80:01** | Temperature Primary MC | Temperature measurement 1. | RO | $0_{bin}$ |
| **FA80:02** | Temperature Secondary MC | Temperature measurement 2. | RO | $0_{bin}$ |

### Index $FA00_{hex}$: Diagnostic object

The CoE object $FA00_{hex}$ displays further diagnostic information.

| Index | Name | Meaning | | Flags | Default |
|---|---|---|---|---|---|
| **FA00:0** | Diag | The following sub indices contain detailed diagnostic information. | | RO | |
| **FA00:03** | Temperature error | $0005_{hex}$ | Maximum temperature exceeded | RO | $0000_{hex}$ |
| | | $0006_{hex}$ | Temperature fell below minimum | | |
| | | $0007_{hex}$ | Temperature difference between the measuring points exceeded | | |
| | Supply error | $0101_{hex}$ | Max. supply voltage µC1 exceeded | | |
| | | $0102_{hex}$ | Max. supply voltage µC2 exceeded | | |
| | | $0103_{hex}$ | Voltage fell below min. supply voltage µC1 | | |
| | | $0104_{hex}$ | Voltage fell below min. supply voltage µC2 | | |


**Differing diagnostic messages possible**

Due to the variable order or execution of the test series, diagnostic messages differing from those given in the table above are possible.

### Index FA100$_{hex}$: Device Status

This CoE object is also mapped to the CTMP6900 process image under DEVICE Inputs.

| Index | Name | Meaning | | Flags | Default |
|---|---|---|---|---|---|
| **F100:01** | Safety Project State | State of the Safety Logic Project. | | BIT3 | RO |
| | | 0 | OFFLINE<br>Safety Project not loaded. | | |
| | | 1 | RUN<br>Safety Project is executed, EtherCAT is in SAFEOPor OP state. | | |
| | | 2 | STOP<br>Safety Project is loaded, but is stopped, due to alogged in user. | | |
| | | 3 | START<br>Safety Project is loaded, EtherCAT is in INIT or PREOP state. | | |
| | | 4 | RESTORE<br>When RESTORE Mode is configured:<br>Project CRC isread from the FSoE Slaves. | | |
| | | 7 | FAULT<br>The CTMP6900 has switched off due to a severe fault. A safety project can not be loaded or started. | | |
| **F100:08** | Login Active | A user is logged in to the CTMP6900. | | BOOLEAN | RO |
| **F100:09** | Input Size Mismatch | The length of the input data does not match the input data length calculated from the safety Logic. | | BOOLEAN | RO |
| **F100:0A** | Output Size Mismatch | The length of the output data does not match the output data length calculated from the safety Logic. | | BOOLEAN | RO |
| **F100:0F** | TxPDO State | This bit is set, when the Safety Project State is unequal to RUN. | | BOOLEAN | RO |
| **F100:10** | TxPDO Toggle | This bit is toggled each time the EtherCAT input data is updated for the first time after it has been read by the EtherCAT master. | | BOOLEAN | RO |

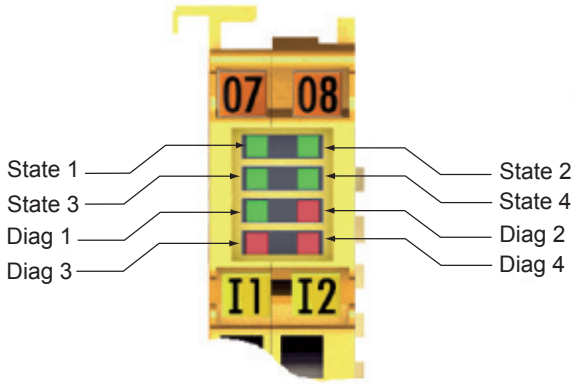
## 4.5.3 Cycle time of the safety project

### Index 1C32$_{hex}$: Cycle Time Measuring

| Index | Name | Meaning | Flags | Default |
|---|---|---|---|---|
| **1C32:05** | Minimum cycle time | Minimum cycle time in ns that should be set by EtherCAT. Corresponds to the maximum program running time of the CTMP6900. | RO | $00000000_{hex}$ |
| **1C32:08** | Command | Cycle time measurement is activated by setting the command to 0001hex. **This value should be reset to 0 once the cycle time has been determined.** | RW | $0000_{hex}$ |

### 4.5.4 Status LEDs

The LEDs State 1 to State 4 indicate the current status of the CTMP6900.




*EL6900 status LEDs*

| State 1 | State 2 | State 3 | State 4 | Meaning |
|---|---|---|---|---|
| off | off | off | lit | • No project present on the terminal |
| off | off | lit | lit | • Project present on the terminal<br>• EtherCAT status: Pre-Operational (Pre-OP) |
| lit | lit | lit | lit | • Project present on the terminal<br>• EtherCAT status: Operational (OP) |

## 4.6 Maintenance

The NUMSafe terminals are maintenance-free!.

| | |
|---|---|
|  WARNING | **Observe the specified environmental conditions!**<br><br>Please ensure that the NUMSafe terminals are only stored and operated under the specified conditions (see technical data). |

If the terminal is operated outside the permitted temperature range it will switch to *Global Shutdown* state.

### 4.6.1 Cleaning

Protect the NUMSafe terminal from unacceptable soling during operation and storage!

If the NUMSafe Bus Terminals were subjected to unacceptable soiling they may no longer be operated!

| | |
|---|---|
|  WARNING | **Have soiled terminals checked!**<br><br>Cleaning of the NUMSafe terminal by the user is not permitted!<br>Please send soiled terminals to the manufacturer for inspection and cleaning! |

## 4.7 Service life

The NUMSafe terminals are designed for a service life of 20 years.

Due to the high diagnostic coverage within the lifecycle no special proof tests are required.

## 4.8 Decommissioning

| | |
|---|---|
|  DANGER | **Serious risk of injury!**<br><br>Bring the bus system into a safe, de-energized state before starting disassembly of the EtherCAT Terminals! |

### 4.8.1 Disposal

In order to dispose of the device, it must be removed and fully dismantled.

- Housing components (polycarbonate, polyamide (PA6.6) are suitable for plastic recycling.
- Metal parts can be sent for metal recycling.
- Electronic parts such as disk drives and circuit boards must be disposed of in accordance with national electronics scrap regulations.

Page deliberately empty.

Page deliberately empty.

# Summary

Page deliberately empty.

# 5 Appendix

## 5.1 NUM Support and Service

NUM and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to NUM products and system solutions.

### 5.1.1 NUM branches and partner companies NUM Support

Please contact your NUM branch office or partner company for local support and service on NUM products!
The contact addresses for your country can be found in the list of NUM branches and partner companies: www.num.com. You will also find further documentation for NUM components there.

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

A1 / 04.11

Product Service

# CERTIFICATE

**No. Z10 17 10 83009 005**

**Holder of Certificate:** **NUM AG**
Battenhusstrasse 16
9053 Teufen
SWITZERLAND

**Factory(ies):** 62386

**Certification Mark:**

**Product:** **Safety components**

**Model(s):** **CTMP6900**

**Parameters:**

| | |
|---|---|
| Supply voltage: | 24VDC (-15%...+20%) |
| Power dissipation: | 2W |
| Protection class: | IP20 |

with "CODESYS Safety for EtherCAT Safety Module".
Note: "CODESYS Safety for EtherCAT Safety Module"
is developed in accordance with EN 61508:2010.

**Tested according to:**
2006/42/EC
EN 61508-1:2010 (SIL1-3)
EN 61508-2:2010 (SIL1-3)
EN 61508-3:2010 (SIL1-3)
EN ISO 13849-1:2015 (Cat 4, PL e)
EN 81-22:2014
EN 81-20:2014
EN 81-50:2014
EN 13243:2015
DIN EN 61000-6-2:2006
DIN EN 61000-6-4:2007

The product was tested on a voluntary basis and complies with the essential requirements. The certification mark shown above can be affixed on the product. It is not permitted to alter the certification mark in any way. In addition the certification holder must not transfer the certificate to third parties. See also notes overleaf.

**Test report no.:** BV82168T

**Valid until:** 2022-10-15

**Date,** 2017-10-18 ( Günter Greil )

719943

Page 1 of 1

TÜV SÜD Product Service GmbH · Zertifizierstelle · Ridlerstraße 65 · 80339 München · Germany

TÜV®

Page deliberately empty.

Page deliberately empty.

**Published by NUM Spa**

Via F. Somma 62
20012 Cuggiono (MI) (Italy)
Tel. : +39 02 979 691
website: www.num.com

Printed Dicember 2017

CNC HighEnd Applications