



# STÖBER

## MC6

## Manual



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## 1 General instructions

Shorter cycle times and a higher level of precision mean ever increasing requirements for drive technology.

Motion sequences are becoming faster and must be coordinated with each other with high precision. The controller and drive technology are therefore the key factors for the increase in productivity and flexibility.

A high-performance Motion Controller is the suitable requirement for a reliable motion and function sequence for an increasing number of applications, a high level of functional complexity or even for very demanding applications.

With the development of the MC6 Motion Controller, STÖBER can offer completely independent drive and Motion Control architecture from one source.

### Properties

- CODESYS programming environment for open Motion Control system concepts
- Suitable for PLC solutions
- For complex interlinked processes with high positioning and adjustment accuracy
- Track travel with the interpolation of several axes and robot functions
- Available as a switch cabinet PC or in combination with a touch panel

## 1.1 About this manual

This manual describes the Motion Controller MC6. It includes relevant information on connections and installation as well as commissioning. This manual is intended for specialists who are familiar with PLC and CODESYS programming.

### This documentation applies to the following devices:

- Motion Controller MC6 versions A, B or C as well as hardware version 0, 1 or 5
- CODESYS programming system version 3.5 or higher

### Original version

The original version of this manual is in German.

### What is new?

ID	Index	Date	Changes
442461	00	04/2013	First edition
	01	07/2013	General corrections
	02	10/2014	<ul style="list-style-type: none"> <li>• General corrections</li> <li>• Additions               <ul style="list-style-type: none"> <li>• Version B</li> <li>• EtherCAT master settings</li> </ul> </li> </ul>
	03	06/2015	<ul style="list-style-type: none"> <li>• General corrections</li> <li>• Additions               <ul style="list-style-type: none"> <li>• Hardware version 1 with Dual Core Atom</li> <li>• Hardware version 5 with Core i3 Dual Core</li> </ul> </li> </ul>

## 1.2 Further documentation

The documentation listed in the following table provides relevant information on the SD6 drive controller.

You can find the latest document versions at [www.stoeber.de](http://www.stoeber.de).

Device/Software	Documentation	Contents	ID
SD6 drive controllers	Manual	System environment, technical data, commissioning, communication, diagnosis	442426
EtherCAT EC6 communication module	Manual	Technical data, installation, commissioning, data transfer	442516
CANopen CA6 communication module	Manual	Technical data, installation, commissioning, data transfer	442637

## 1.3 Further support

If you have technical questions that are not answered by this document, please contact:

- Phone: +49 7231 582-3060
- E-mail: [applications@stoeber.de](mailto:applications@stoeber.de)

If you have questions about the documentation, please contact:

- E-mail: [electronics@stoeber.de](mailto:electronics@stoeber.de)

If you have questions about training sessions, please contact:

- E-mail: [training@stoeber.de](mailto:training@stoeber.de)

## 1.4 Directives and norms

The MC6 Motion Controller meets the requirements of the following directives and standards:

- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC

You can obtain the Declaration of Conformity upon request from [electronics@stoeber.de](mailto:electronics@stoeber.de).

## 1.5 Trademarks

The following names that are used in conjunction with the device, its optional equipment and its accessories are trademarks or registered trademarks of other companies:

Trademarks	
CANopen, CiA	CANopen and CiA are registered Community trademarks of CAN in Automation e.V., Nuremberg, Germany.
CODESYS	CODESYS is a registered trademark of 3S-Smart Software Solutions GmbH, Kempten, Germany.
EtherCAT	EtherCAT and the EtherCAT logo are registered trademarks of Beckhoff Automation GmbH, Verl, Germany.
Intel, Intel Atom, Intel Core	Intel, the Intel logo, Intel Atom and Intel Core are registered trademarks of Intel Corporation or its subsidiaries in the USA or other countries.
Microsoft, Windows, Windows XP, Windows 7	Microsoft, Windows, Windows XP and the Windows logo are registered trademarks of Microsoft Corporation in the USA and/or other countries.
PROFIBUS, PROFINET	The PROFIBUS/PROFINET logo is a registered trademark of PROFIBUS Nutzerorganisation e. V. Karlsruhe, Germany.

All other trademarks that are not listed here are the property of their respective owners.

Products that are registered as trademarks are not specially indicated in this documentation. Existing property rights (patents, trademarks, protection of utility models) are to be observed.

## 2 Notes on safety

### 2.1 Operation in accordance with its intended use

The Motion Controller MC6 is intended exclusively for automation in industrial systems for use within the general conditions defined by the technical data. Other applications are not permitted.

### 2.2 Component part of the product

The technical documentation is a component part of a product.

- Since the technical documentation contains important information, always keep it handy in the vicinity of the device until the machine is disposed of.
- If the product is sold, disposed of, or rented out, always include the technical documentation with the product.

### 2.3 Risk assessment

Before the manufacturer may bring a machine onto the market, he must conduct a risk assessment according to Machine Directive 06/42/EC. As a result, the risks associated with the use of the machine are determined. The risk assessment is a multi-stage and iterative process. On no account can sufficient insight into the Machine Directive be given as part of this documentation. For this reason, seek detailed information about the norms and legal position. When installing the drive controller in machines, commissioning is forbidden until it has been determined that the machine meets the requirements of EC Directive 06/42/EC.

### 2.4 Qualified personnel

Devices may cause residual risks. For this reason, all work on the devices as well as operation and disposal must only be performed by qualified personnel who are aware of the possible dangers.

Qualified personnel are persons who have acquired the authorisation to perform these activities by

- Training from specialists and/or
- Instruction from specialists

In addition, they must have

- read,
- understood and
- observed the applicable regulations, legal provisions, rules and standards and existing technical documentation including the safety information contained in it.

### 2.5 System security

If the MC6 is connected with network access to the Internet, STÖBER recommends placing an industrial firewall in between. It is also advisable to perform remote maintenance processes only via a secured VPN network. Anti-virus software is not recommended on the MC6 in this situation, as it may affect the real-time response in some circumstances.

## 2.6 Disposal

Please observe the current national and regional regulations! Dispose of the individual parts separately depending on the quality and currently applicable regulations, e.g. as

- Electronic waste (circuit boards)
- Plastic
- Sheet metal
- Copper
- Aluminum
- Battery

## 2.7 Presentation of notes on safety

### NOTICE

#### Notice

means that property damage may occur

- ▶ if the stated precautionary measures are not taken.



### CAUTION!

#### Caution

with warning triangle means that minor injury may occur

- ▶ if the stated precautionary measures are not taken.



### WARNING!

#### Warning

means that there may be a serious danger of death

- ▶ if the stated precautionary measures are not taken.



### DANGER!

#### Danger

means that serious danger of death exists

- ▶ if the stated precautionary measures are not taken.



#### Information

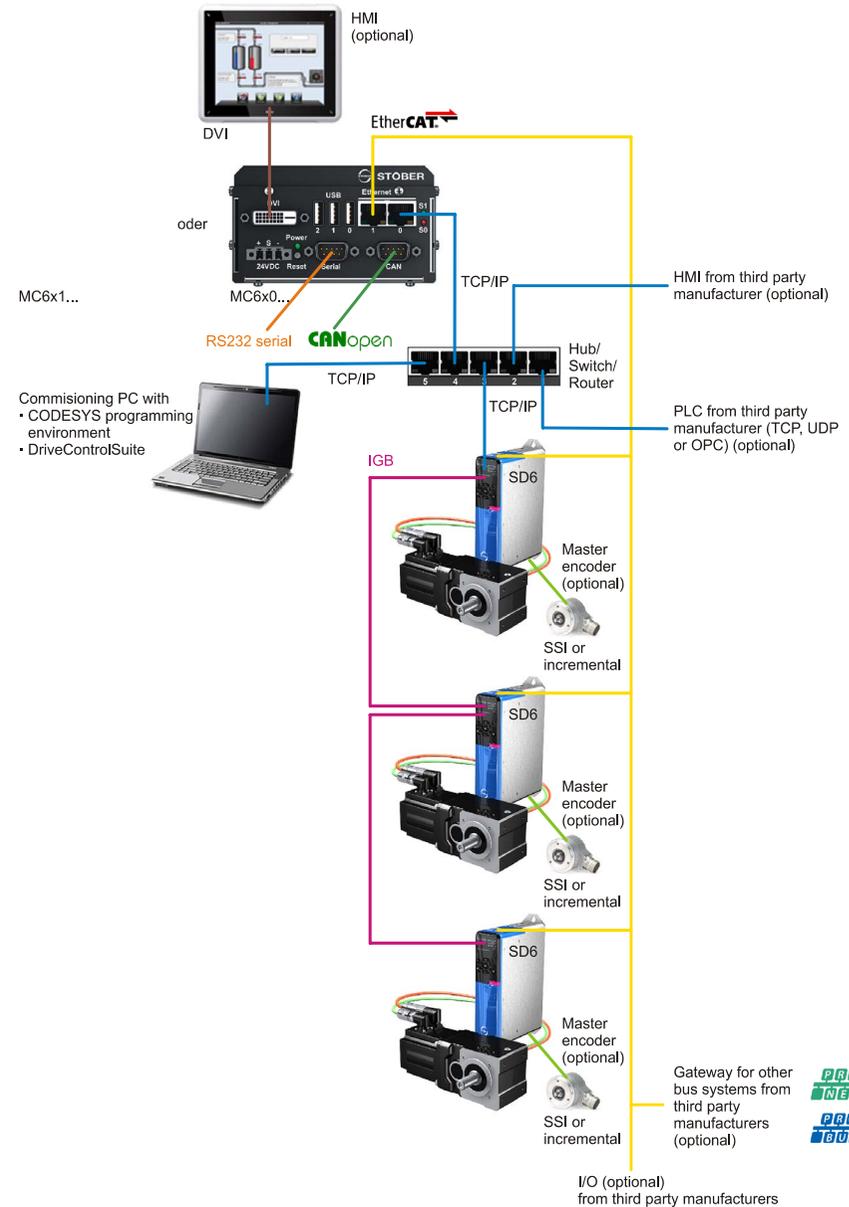
refers to important information about the product or serves to emphasize a section in the documentation to which the reader should pay special attention.

### 3 The Motion Controller MC6 ...

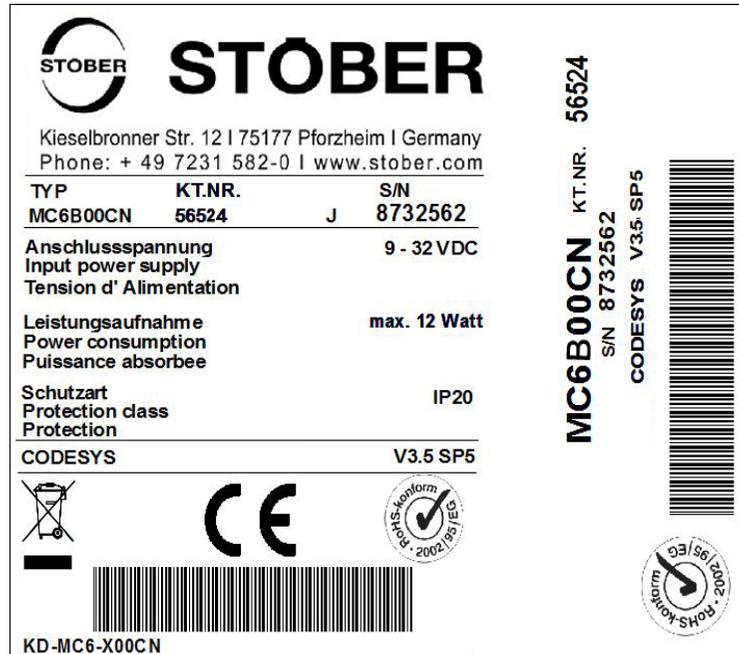
The Motion Controller MC6 is the ideal requirement for a reliable, coordinated motion and function sequence for an increasing number of applications, a high level of functional complexity or even for very demanding applications.

The following figure shows one of the possible system environments for the interaction of the MC6 and the SD6 drive controller.

Note that a SD6 drive controller can only be connected as a SoftMotion axis via EtherCAT with the MC6.



### 3.1 Nameplate



Designation	Value in the example	Meaning
TYPE	MC6B00CN	Device type according to type key
KT.NO.	56524	Purchased part number
S/N	8732562	Serial number
Input power supply	9–32 V <sub>DC</sub>	
Power consumption	max. 12 watts	Power consumption
Protection class	IP20	
CODESYS	V3.5 SP5	Version of the software in memory at the time of delivery

### 3.2 Type designation

#### Sample code

MC	6	A	0	0	C	T
----	---	---	---	---	---	---

#### Explanation

Code	Designation	Design
MC	Series	Motion Control
6	Generation	6th generation
A, B, C	Software version	Version of the image
0	Design	As control cabinet PC
1		With touch panel
0...9	Hardware version	0: Atom Single-Core
		1: Dual-Core Atom
		5: Core i3 Dual-Core
N	"Motion" software option	Control
S		SoftMotion
C		SoftMotion CNC
N	"Visualization" software option	Without
T		Target visualization
W		Web visualization
A		Target visualization and web visualization

### Versions

The following MC6 versions are currently available.

Type	KT-No.	Description
MC6A00CN	56444	MC6 Motion Controller with software option 3.5: SoftMotion CNC (without visualization) (Application: only for service purposes)
MC6A00CT	56445	MC6 Motion Controller with the software options: <ul style="list-style-type: none"> <li>• SoftMotion CNC</li> <li>• Target visualization</li> </ul> (Application: only for service purposes)
MC6A10CT	56446	MC6 Motion Controller with 15" touch panel and software options: <ul style="list-style-type: none"> <li>• SoftMotion CNC</li> <li>• Target visualization</li> </ul> (Application: only for service purposes)
MC6B00CN	56524	MC6 Motion Controller with software option 3.5.5.0: SoftMotion CNC (without visualization)
MC6B00CT	56525	MC6 Motion Controller with the software options 3.5.5.0: <ul style="list-style-type: none"> <li>• SoftMotion CNC</li> <li>• Target visualization</li> </ul>
MC6C10CT	56526	MC6 Motion Controller with 15" touch panel and software options 3.5.5.0: <ul style="list-style-type: none"> <li>• SoftMotion CNC</li> <li>• Target visualization</li> </ul>
MC6B00NT	56527	MC6 Motion Controller with the software options 3.5.5.0: <ul style="list-style-type: none"> <li>• CODESYS Control</li> <li>• Target visualization</li> </ul>

Type	KT-No.	Description
MC6C01CT	56564	MC6 Motion Controller Dual Core with the software options 3.5.6.40: <ul style="list-style-type: none"> <li>• SoftMotion CNC</li> <li>• Target visualization</li> </ul>
MC6C11CT	56565	MC6 Motion Controller Dual Core with the software options 3.5.6.40: <ul style="list-style-type: none"> <li>• SoftMotion CNC</li> <li>• Target visualization</li> </ul>
MC6C05CA	56566	MC6 Motion Controller Core i3 with the software options 3.5.6.40: <ul style="list-style-type: none"> <li>• SoftMotion CNC</li> <li>• Target and web visualization</li> </ul>
MC6C15CA	56567	MC6 Motion Controller Core i3 with touch panel and software options 3.5.6.40: <ul style="list-style-type: none"> <li>• SoftMotion CNC</li> <li>• Target and web visualization</li> </ul>

If you require other versions that are not included in the list but correspond to the type key, please contact the sales team of STÖBER ANTRIEBSTECHNIK GmbH & Co. KG:

Fon: + 49 7231 582-1165 Fax: + 49 7231 582-4165sales@stoeber.de

## 3.3 Control and visualization software

### 3.3.1 "Motion" software option

Three versions of the "Motion" controller software are available with different functionalities.

#### "Control (N)" license

The Control license (key "N") is a basic license that is included in the scope of delivery as standard.

"Control" enables flexible programming according to IEC 61131-3 and supports the following languages:

- Structured text (ST)
- Sequential language (AS, SFC)
- Graphical function plan (CFC)
- Function plan diagram (FUP)
- Contact plan (KOP)
- Instruction list (AWL)

#### "SoftMotion (S)" license

The SoftMotion license (key "S") is based on the Control license and also enables motion programming with PLCopen-compliant modules.

The integrated disk cam editor can either be used online in the target system or offline in the programming system.

Cams can be directly connected to cam disks. In addition any number of couplings is possible between virtual and real axes using a cam disk or electronic gear units. This license also supports a cam disk change on the fly. Cam data can be an integral part of the project.

#### "SoftMotion CNC (C)" license

The SoftMotion CNC license (key "C") is based on the SoftMotion license and also enables numerous coordinate transformations for commonly used mechanical processes, for example:

- 6 different Gantry drives
- H portal (wrap-around belt)
- T portal (wrap-around belt)
- SCARA drive, 2 articulation points
- SCARA drive, 3 articulation points
- Bipod drive
- 2 different tripods
- 5-axis pelletizing robot
- 6-axis articulated robot

The creation of your own transformations is also supported.

The SoftMotion CNC license also makes a 3D CNC editor as defined by DIN 66025 (G code, dynamic) available. Cam and CNC data can be an integral part of the project. The PLC program can influence the CNC trajectory dynamically at runtime.

You also have the option to transfer CNC data from 3D design programs. Furthermore, complex 3D trajectories can be created independently by the mechanics.

### 3.3.2 "Visualization" software option

The connection of graphic user interfaces is possible using the "Visu" visualization software. Two versions of the software are available with different functionalities.

#### "Target visualization (T)" license

The target visualization license (key "T") supports the visualization options of the target system. The license offers a large selection of predefined visualization elements. For example, they generate control masks in the visualization editor or complete control masks can be reused as individual visualization elements.

Complex visualization elements can be instantiated by an interface for the parameter transfer. Visualization is possible using an integrated editor for text lists in multiple languages.

#### "Web visualization (W)" license

The web visualization license (key "W") supports the same visualization options as the target visualization license. However access does not occur via a visualization of the target system but via the network by means of HTML5 from a network-compatible panel, PC or tablet.

#### "Target visualization and web visualization (A)" license

This license (key "A") combines both the target visualization and web visualization licenses.

### 3.4 Combinable drive controllers

You can operate the following STÖBER devices in combination with the MC6 controller:

- 5th generation devices: SDS 5000, MDS 5000, FDS 5000
- SD6 drive controllers

Please note that no axis switching can be used on these devices during operation with the MC6.

Currently the interaction of MC6 and SD6 with the "SoftMotion" and "SoftMotion CNC" software options is possible.

If you require a different type of license, please contact us.

### 3.5 Measures for data security

Control systems are frequently used in areas where an orderly shutdown or switching off is not possible.

Especially if control systems are based on PC technology and use a standard operating system, this involves the risk that the file system will be damaged.

The only reliable method for protecting a Windows file system is to use an uninterruptible power supply (UPS). These systems supply the current required for shutdown if the power supply fails. These systems also inform the operating system via a potential input or a serial interface so that shutdown can be initiated immediately.

The disadvantages of this hardware solution include higher costs for the additional hardware. UPS systems also usually store energy in containers with several batteries that have only a limited service life, which unavoidably leads to higher maintenance overhead.

Solutions based entirely on software are unable to prevent the file system from being damaged if the current is shut off. However suitable measures reduce the frequency of occurrence or enable a repair. Furthermore there are no expenses for additional hardware and maintenance.

Measures are described below that can be taken with systems from STÖBER to increase the security of the file system and data in them for the event of a power failure.

#### **First shut down the system, then turn it off**

If the MC6 is shut off while the software is writing a file to the Solid State Drive (SSD) or CFast storage media, the file will be damaged in most cases.

Control software generally describes these storage media independently in intervals of a few seconds. Because of this, the probability of causing damage due to shutdown when the software is running is very high. However various measures have been taken to minimize the occurrence of these conditions.

#### **EFW Manager**

The standard measure for protecting an application in an NTFS-based Windows file system is the *Enhanced Write Filter* (EFW), which is included with delivery of the embedded versions of Windows operating systems.

When EFW is activated, the operating system stores the data for the file system in main memory during the boot process, thereby preventing the data storage media from being written to directly.

Therefore if the voltage supply fails, only the data in main memory is affected. In contrast, damage to the file system on the data storage media is prevented.

The EFW protects the entire partition, but at the same time prevents data from being stored persistently on it. It does appear that data is being saved.

However, the data is located in main memory after the process is complete, not on the storage medium! To write the data on the storage medium, the EFW must first be deactivated and the system restarted. This means that it is impossible to save data while the PLC is running without losing the protection of the file system that is desired.

However, parts of the CODESYS runtime environment that are not variable (software, licenses, configurations) can be protected by the EFW filter.

Several partitions have been set up on the MC6 for this purpose. One of them contains the operating system and the non-variable elements of the CODESYS runtime environment. This partition is protected by the EFW. Other partitions are enabled for writing and are then used to store the boot project and if necessary data that is generated by the PLC application.

This procedure can be used to ensure that the partition with the operating system and CODESYS environment remains undamaged. It also makes it possible to store variable data as well.

#### **File system check**

The CODESYS runtime environment on the MC6 is not started by the conventional autostart mechanism of the operating system. Instead a batch script is used for starting. The last command of this script initiates the start of the runtime environment.

This is not a measure that contributes directly to improving the security of the file system. However, it does make it possible to run checks before the start of the runtime environment, so that possible damage to the file system can be detected and countermeasures can be introduced.

Before the CODESYS runtime environment starts, the consistency of the file system is checked automatically after a system starts up. This is done in ReadOnly mode, which makes it possible to reduce the time required for the check to a minimum.

If the file system is damaged, a repair is initiated automatically. The system must leave ReadOnly mode to do this, but the required measure takes only a few seconds. It is only started in the event that damage has occurred and further contributes to increasing data security by automatically eliminating minor defects.

## 3.6 Dual-use goods



### Information

Note that version A of the MC6 in the CNC variant (for example MC6A10CT) requires approval for export outside the EU in accordance with item 2D002 of the List of Dual-Use Goods 1 cat. 2 (for example as a replacement part). You can obtain information about the approval process from the responsible office (in Germany the Federal Office for Economics and Export Control).

If the MC6 is installed in a machine in the CNC variant, categorization as a machine applies for the approval process.

From version B, the CNC variant does not require approval for export. Note that the no more than 4 axes can be interpolated together at the same time at a interpolator with the export version that does not require approval.

## 4 Technical data

### 4.1 Device features

#### 4.1.1 MC6xx0 Atom Single-Core

<b>Processor</b>	<ul style="list-style-type: none"> <li>• Intel Atom Processor Z530, 1.6 GHz</li> <li>• Front Side Bus, 533 MHz</li> <li>• L2 Cache, 512 kB</li> </ul>
<b>Memory</b>	<ul style="list-style-type: none"> <li>• DDR2-RAM, 1 GB</li> <li>• Internal SSD with 4 GB</li> <li>• 128 kB nvSRAM (no battery backup necessary)</li> <li>• Internal CFast socket for SATA-based SSD modules</li> </ul>
<b>Voltage supply</b>	<ul style="list-style-type: none"> <li>• MC6x00: 9 – 32 V<sub>DC</sub></li> <li>• MC6x10: 14 – 32 V<sub>DC</sub></li> </ul>
<b>Power consumption</b>	<ul style="list-style-type: none"> <li>• MC6x00: max. 12 W</li> <li>• MC6x10: max. 25 W</li> </ul>
<b>Front connections</b>	<ul style="list-style-type: none"> <li>• Realtek RTL8111 Ethernet controller, 10/100/1000 Mbit/s</li> <li>• Single Chip fast Ethernet NIC controller, 10/100 Mbit/s</li> <li>• 3 x USB 2.0 interfaces, type A, 480 Mbit/s, with 500 mA current carrying capacity per output</li> <li>• Reset button and power LED</li> <li>• Serial RS-232 interface (RTS/CTS only): D-sub connector, 9-pin</li> <li>• CANopen interface: D-sub connector, 9-pin</li> <li>• 2 freely programmable front panel LEDs</li> </ul>
<b>Protection class</b>	<ul style="list-style-type: none"> <li>• IP20</li> </ul>

#### Other

- CODESYS IEC61131-3 runtime for SoftMotion CNC environment (note the functional differences between the software licenses)
- Windows XP Embedded operating system
- Battery-supported real-time clock (internal watchdog)

## 4.1.2 MC6xx1 Dual-Core Atom

<b>Processor</b>	<ul style="list-style-type: none"> <li>Intel Atom Dual-Core E3825, 2x 1.33 GHz</li> <li>L2 Cache, 1 MB</li> </ul>
<b>Memory</b>	<ul style="list-style-type: none"> <li>DDR3-RAM, 2 GB</li> <li>128 kB nvRAM (no battery backup necessary)</li> <li>CFast card, 8 GB</li> </ul>
<b>Voltage supply</b>	<ul style="list-style-type: none"> <li>MC6x01: 9 – 32 V<sub>DC</sub></li> <li>MC6x11: 14 – 32 V<sub>DC</sub></li> </ul>
<b>Power consumption</b>	<ul style="list-style-type: none"> <li>MC6x01: max. 10 W</li> <li>MC6x11: max. 23 W</li> </ul>
<b>Front connections</b>	<ul style="list-style-type: none"> <li>Realtek RTL8111 Ethernet controller, 10/100/1000 Mbit/s</li> <li>Single Chip fast Ethernet DM9102D controller, 10/100 Mbit/s</li> <li>3 x USB 2.0 interfaces, type A, 480 Mbit/s, with 500 mA current carrying capacity per output</li> <li>Reset button and power LED</li> <li>Serial RS-232 interface (RTS/CTS only): D-sub connector, 9-pin</li> <li>CANopen interface: D-sub connector, 9-pin</li> <li>2 freely programmable front panel LEDs</li> </ul>
<b>Protection class</b>	<ul style="list-style-type: none"> <li>IP20</li> </ul>
<b>Other</b>	<ul style="list-style-type: none"> <li>CODESYS IEC61131-3 runtime for SoftMotion CNC environment (note the functional differences between the software licenses)</li> <li>Windows 7 Embedded operating system</li> <li>Battery-supported real-time clock (internal watchdog)</li> </ul>

## 4.1.3 MC6xx5 Core i3 Dual-Core

<b>Processor</b>	<ul style="list-style-type: none"> <li>Intel Core i3-3120ME, 2x 2.4 GHz</li> <li>L2 Cache, 3 MB</li> </ul>
<b>Memory</b>	<ul style="list-style-type: none"> <li>DDR3-RAM, 2 GB</li> <li>128 kB MRAM (no battery backup necessary)</li> <li>CFast card, 8 GB</li> </ul>
<b>Voltage supply</b>	<ul style="list-style-type: none"> <li>MC6x05: 9 – 32 V<sub>DC</sub></li> <li>MC6x15: 14 – 32 V<sub>DC</sub></li> </ul>
<b>Power consumption</b>	<ul style="list-style-type: none"> <li>MC6x05: on request</li> <li>MC6x15: on request</li> </ul>
<b>Front connections</b>	<ul style="list-style-type: none"> <li>2x Realtek RTL8111 Ethernet controllers, 10/100/1000 Mbit/s</li> <li>4 USB 3.0 interfaces, type A, 480 Mbit/s, with 500 mA current carrying capacity per output</li> <li>Reset button and power LED</li> <li>Serial RS-232 interface (RTS/CTS only): D-sub connector, 9-pin or CANopen DVI monitor connection</li> </ul>
<b>Protection class</b>	<ul style="list-style-type: none"> <li>IP20</li> </ul>
<b>Other</b>	<ul style="list-style-type: none"> <li>CODESYS IEC61131-3 runtime for SoftMotion CNC environment (note the functional differences between the software licenses)</li> <li>Windows 7 Embedded operating system</li> <li>Battery-supported real-time clock (internal watchdog)</li> </ul>

## 4.2 Touch Panel

The following features also apply for the version with touch panel:

<b>Display</b>	<ul style="list-style-type: none"> <li>• 15.0" (38.1 cm) XGA TFT LCD</li> <li>• CCFL backlight</li> <li>• Pixel pitch 0.297 × 0.297</li> <li>• Display mode: normal white</li> <li>• Resolution 1,024 × 768</li> <li>• 16.7 million colors</li> <li>• Contrast rate 700:1 (typical), at least 480:1</li> <li>• Brightness 450 cd/m<sup>2</sup> (typical)</li> <li>• Viewing angle horizontal 160°, vertical 160°</li> <li>• MTBF 50,000 h</li> </ul>
<b>Touch screen</b>	<ul style="list-style-type: none"> <li>• Resistive 4-line touch screen</li> <li>• Protection class IP65</li> </ul>

## 4.3 Weight

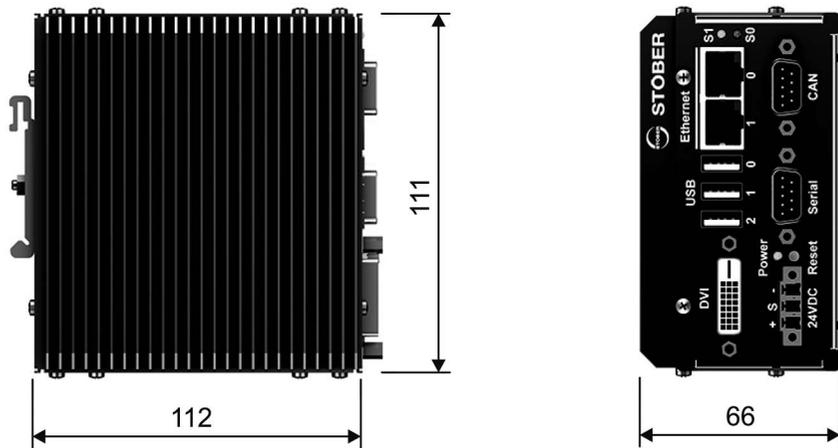
The following table includes the total weight of the individual MC6 versions.

Type	Total weight (kg)
MC6x00	0.8
MC6x01	0.8
MC6x05	1.95
MC6x10	4.8
MC6x11	4.8
MC6x15	5.95

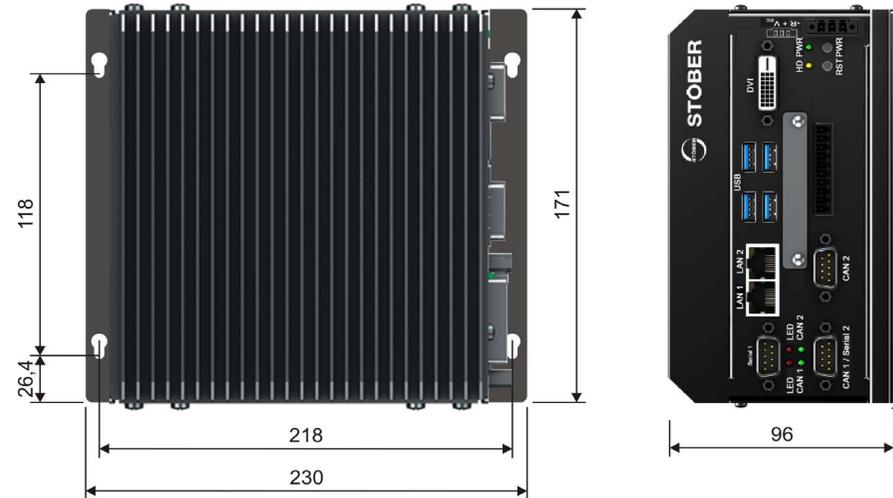
## 4.4 Dimensions

Type	Height (mm)	Width (mm)	Depth (mm)
MC6x00, MC6x01	111	66	112
MC6x05	171	230	96
MC6x10, MC6x11	306	382	100
MC6x15	306	382	128

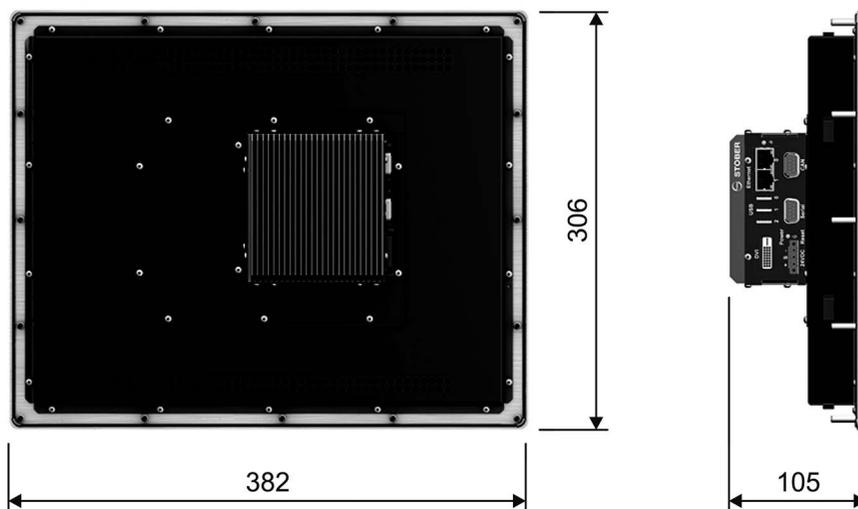
MC6x00 and MC6x01



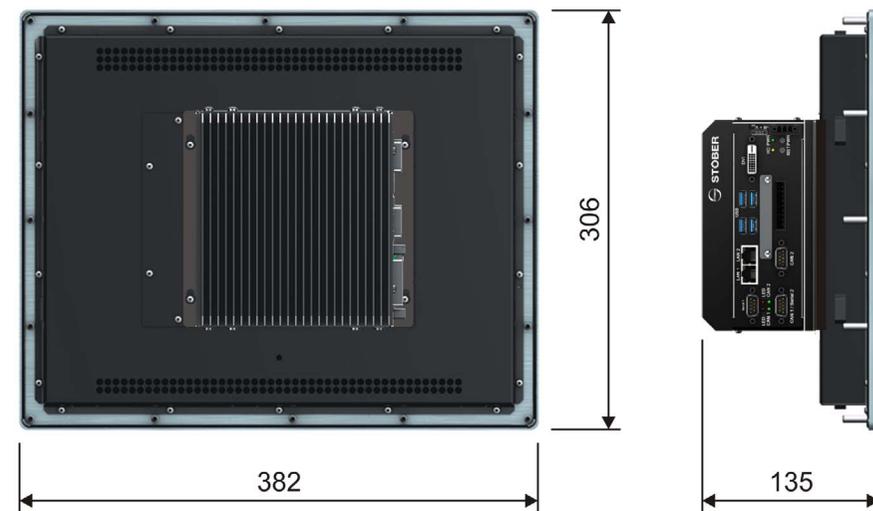
MC6x05



MC6x10 and MC6x11



MC6x15



## 4.5 Status display

The MC6 has three status LEDs with different functions.

- LED Power: displays the voltage supply.
- LEDs S0 and S1: display the CANopen status or visualize the individual program states (see section 8.6 Accessing status LEDs).

## 4.6 Transportation, storage and operating environment

### DANGER!

#### Explosion hazard!

The device could ignite a potentially explosive atmosphere in an area subject to explosion hazard.

- ▶ Do not operate the device in an area subject to explosion hazard.

### WARNING!

#### Fire hazard!

This product does not meet the requirements for a fire cover in accordance with DIN EN 60950-1 in all possible installation positions.

- ▶ The device may only be installed above non-flammable materials.

### CAUTION!

#### Device damage!

Overheating inside the device will lead to device damage.

- ▶ Operate the device within the specified operating conditions.
- ▶ Ensure that the ventilation openings are not covered.

Type	MC6xx0	MC6xx1, MC6xx5
Operating temperature	0 – 50 °C	0 – 45 °C
Storage temperature	-20 – 75 °C	
Relative humidity	0 – 80 %, non condensing	

## 4.7 Accessories

CFAST memory cards can be installed as an option.

## 5 Installation

### WARNING!

#### Danger of fire and overheating!

The MC6 produces heat, which is dissipated through the housing.

- ▶ Make certain the ventilation slots and heat sinks are uncovered.
- ▶ Ensure that there are no flammable materials are in the vicinity of the device.

### 5.1 MC6x0 - Control cabinet version

### CAUTION!

#### Danger of overheating!

The MC6 device has no fan. The heat produced by the device is dissipated through the heat sink and ventilation slots into the surrounding area through convection.

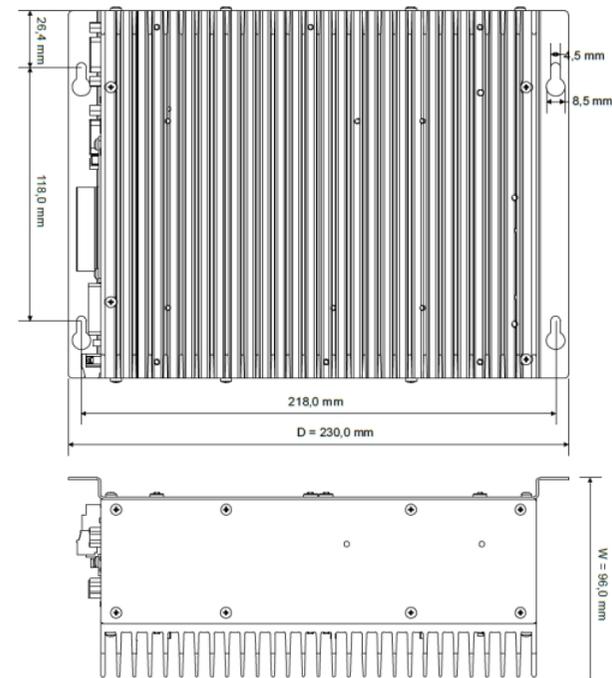
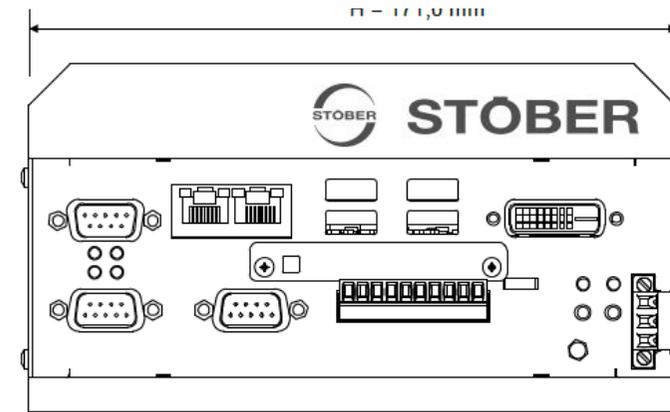
- ▶ Mount the MC6x0 so that the ventilation openings are on the top and bottom and the heat sink fins are arranged vertically (horizontal top-hat rail).

With the exception of type MC6x05, all MC6x0 versions can be mounted on a top-hat rail according to DIN EN 60715 TH35.

#### Installation – MC6x05

The MC6x05 Motion Controller is not suitable for top-hat rail mounting due to its size.

Note the following dimensions for installation.





## 6 Connection

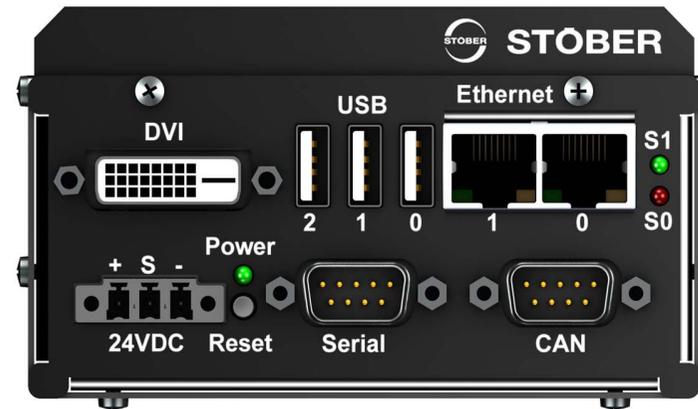
### WARNING!

#### Electric shock hazard!

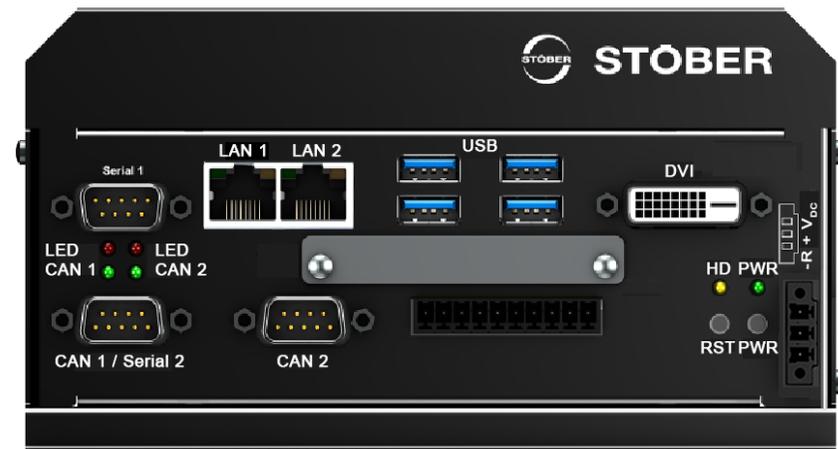
- ▶ Connect the interfaces of the MC6 exclusively with SELV voltage.

### 6.1 Overview of terminals

#### Front connections – MC6x00 and MC6x01



#### Front connection – MC6x05



## 6.2 Power supply

### NOTICE

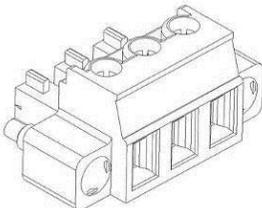
#### Device damage due to overload!

The device may be damaged by a current that is too high.

- Ensure that the current at the 24 V supply terminals does not exceed 2 A.

The external 24 V<sub>DC</sub> power supply must be connected to pins 1 (+) and 3 (-). The additional input 2 (S) is the Sense input for optional monitoring of the power supply voltage directly at the device. Do not connect this input if monitoring is not used.

If the power LED is not lit when the voltage is applied, check whether the polarity of the power supply is reversed. The connector is included with delivery.

	Pin	Description
	1	12 – 30 V <sub>DC</sub>
	2	Sense
	3	GND

## 6.3 Housing ground

The MC6x0 does not require separate grounding as it is automatically grounded with the top-hat rail when mounted. The MC6x1 has a separate grounding terminal on the back of the device.



## 6.4 Serial RS-232

Pin	Description
1	—
2	RxD
3	TxD
4	—
5	GND
6	—
7	RTS
8	CTS
9	—

## 6.5 CANopen

The CANopen interface involves a SJA1000 CAN controller with physical layers according to ISO 11898-2 (high-speed CAN). The interface is floating and has a 120 ohm termination resistor that is permanently active and not variable.

Pin	Designation	Function
1	—	—
2	CAN-L	CAN-Low line
3	GND	Reference ground
4	—	—
5	—	—
6	GND	Reference ground
7	CAN-H	CAN-High line
8	—	—
9	V <sub>EXT</sub>	External supply voltage

## 6.6 Ethernet

### Interface 0: Ethernet

Set up the connection to the programming PC or to other TCP/IP network subscribers in the system on this interface.

### Interface 1: EtherCAT

This interface acts as a synchronous automation bus for controlling drives and I/Os.

## 6.7 DVI

The DVI-D monitor connection is a digital monitor connection that has no analog signals.

## 6.8 USB

MC6xx0 and MC6xx1 each have three USB 2.0 interfaces of type A; MC6xx5 has four USB 3.0 interfaces. All connections are USB downwards-compatible.

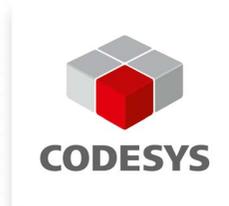
## 7 AS6 development environment

### **AutomationControlSuite AS6 – the multi-axis control for the MC6 Motion Controller**

The AS6 AutomationControlSuite development environment covers all functions included in CODESYS 3.5 for Motion Control (PLCopen, DIN 66025) and for PLCs (Programmable Logic Controllers) (IEC 61131-3).

Additional function blocks were specially developed by STÖBER from drive-related practice and are identified as such.

High performance Drive&Motion libraries are available for creating programs. Furthermore the convenient quick start-up was the focus – without programming effort and within a few minutes.



### **Supplier**

You can obtain the AutomationControlSuite software as well as the associated documentation as a 30-day test version at [www.stoeber.de](http://www.stoeber.de).

To get a valid license, please contact the sales team of STÖBER ANTRIEBSTECHNIK GmbH & Co. KG:

Phone: + 49 7231 582-1165

Fax: + 49 7231 582-4165

[sales@stoeber.de](mailto:sales@stoeber.de)

## 8 AS6 configuration

### 8.1 Integrating the MC6 in an AS6 project

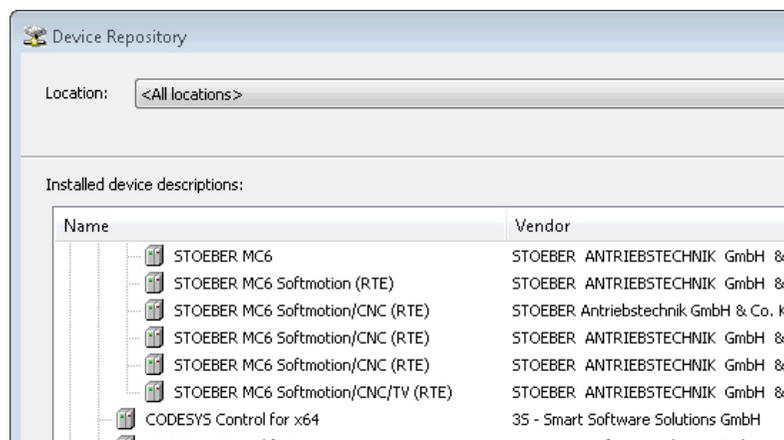
To be able to use the MC6 Motion Controller as a SoftMotion controller with the STÖBER AS6 AutomatioControlSuite development environment, you will need a device description file. You can find the device description files for the different device versions as well as a project template on the CD enclosed with the device or in the Documentation Center at [www.stoerber.de](http://www.stoerber.de).

The device description file contains information about the MC6 and available functionalities.

Each of the following device variants has a device description with the name as indicated:

- MC6AxxxN: *STOEBER MC6 Softmotion CNC RTE.3.5.3.0.devdesc.xml*
- MC6AxxxT: *STOEBER MC6 Softmotion CNC TV RTE.3.5.3.0.devdesc.xml*
- MC6Bxxxx: *STOEBER MC6 all variants 3.5.5.0. devdesc.xml*
- MC6Cxxxx: *STOEBER MC6 all variants 3.5.6.4. devdesc.xml*

The MC6 can be declared in the device repository of the development environment via the device description.



If you would like to use new functionalities yourself by updating the controller, it may be necessary to integrate an updated device description file in the development environment.

It is also required to distinguish between the different versions of the MC6 using different device description files.

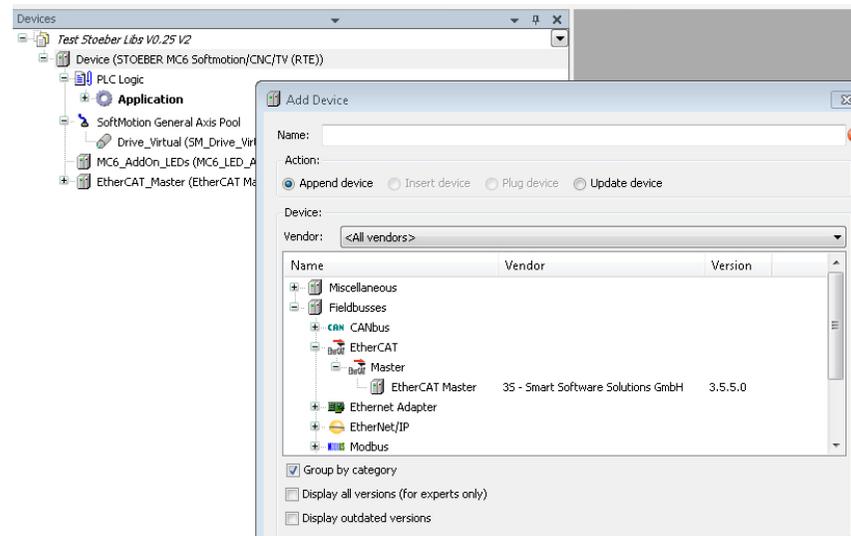
### 8.2 Integrating a drive controller into an AS6 project

Requirements

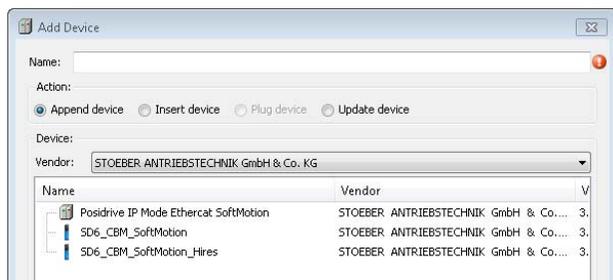
- You have created an AS6 project in the AutomationControlSuite.
- You have added an EtherCAT master in this project.

**Integrating a drive controller into a project**

1. Right click on the EtherCAT master.
2. In the context menu select *Append device*.



3. Choose the manufacturer STÖBER ANTRIEBSTECHNIK GmbH & Co. KG from the picklist.
4. Choose the device type (5th generation device, SD6 or SD6 HiRes).



⇒ You have integrated the drive controller into the AS6 project. All other settings (mapping, address assignments, etc.) are configured automatically by the device driver.

Note the differences between the device drivers in the following sections.

You can select two different device drivers for the SD6 drive controller. The following table explains the differences:

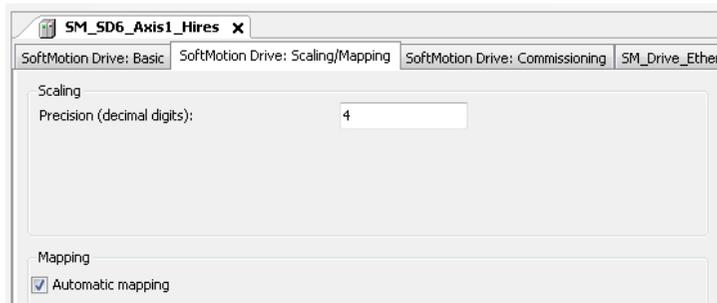
	SD6_xx	SD6_xx_HiRes
Interface for positions	Increments	User units such as mm or °
Interface for speeds	Increments/s	User units such as mm/s or °/s
Module management	In the Motion Controller	In the Drive Controller
Axis model	In the Motion Controller	In the Drive Controller
Multiturn absolute value encoder for modulo axes	Currently not supported	Supported
Scope in the drive controller and in AS6 with the same units	Not technically possible	Supported
Range of motion with limited axes	Range of motion limited to $2^{32}$ increments	Range of motion limited to $2^{32}$ user units
Command <i>MC_SetPosition</i> in the Motion Controller	Possible without restrictions	Possible without restrictions; moves the actual position in the drive to the actual position in the Motion Controller

If the *MC\_SetPosition* command is not required in the Motion Controller, STÖBER recommends using the SD6\_xx\_HiRes driver. Take into consideration that the parameterization of the drive controller has to be changed when the driver is changed.

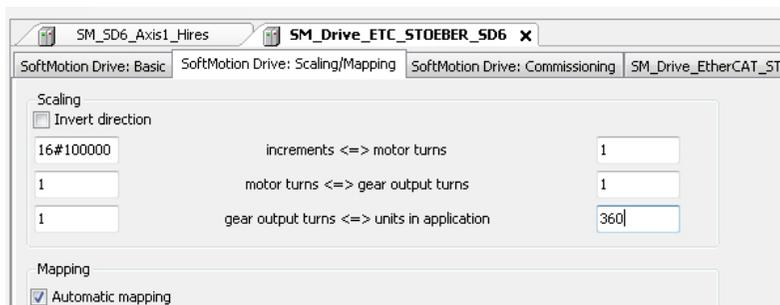
The following sections explain which settings you have to make depending on the device driver selected in the AutomationControlSuite and in the drive controller.

### 8.2.1 Settings in AS6

If you selected the SD6\_xx\_HiRes driver, you only have to enter the number of decimal places in the AutomationControlSuite. The axis model is completely parameterized in the SD6.



If you selected the SD6\_xx driver, you must configure the axis model in the AutomationControlSuite.



The associated settings are:

- 16#100000 ( $2^{20}$  decimal) increments per motor revolution (must be set identically in the SD6, parameter A585[0]).
- One motor revolution is equivalent to one gear unit output revolution (no gear unit present).
- One gear unit output revolution corresponds to 360 user units ( $^{\circ}$ ) in the AutomationControlSuite.

### 8.2.2 Settings in DriveControlSuite

The following table explains the differences in the settings that need to be made in DriveControlSuite for the relevant driver. In both cases the axis is a rotary axis with a circular length of  $360^{\circ}$ .

	SD6_xx	SD6_xx_HiRes
I00 move range	0:limited	1:endless
I05 type of axis	0:user defined, rotational or 1:user defined, translational	0:user defined, rotational or 1:user defined, translational
I06 decimal digits position	Must be 0	Any, for example 4
I09 measure.unit	Inc for increments	$^{\circ}$
A585[0] Feed constant. Feed	$2^{20}$	3600000
A585[1] Feed constant. Shaft revolutions	1	1
A568[1] Position Range Limit	Does not need to be changed.	360,0000

## 8.3 Check EtherCAT master settings

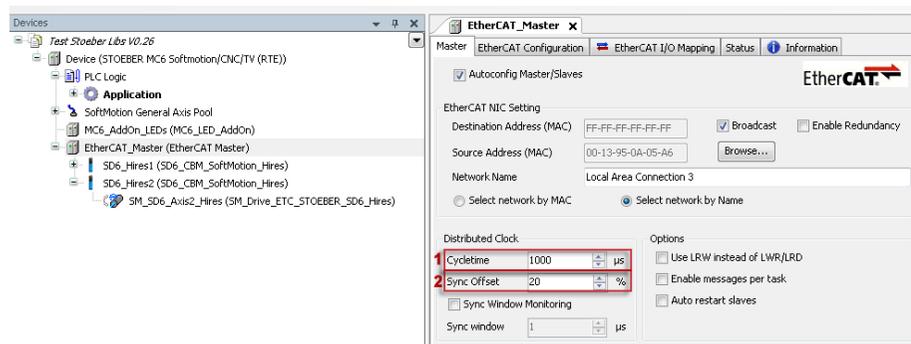
The following settings in the AutomationControlSuite and in the DriveControlSuite commissioning software concern the EtherCAT synchronization. An adjustment of the settings may be required.

### 8.3.1 The master cycle time is identical

If the master cycle time is the same as the slave cycle time, generally no special setting must be configured.

However for extreme utilization of the controller, it may be necessary to reduce the *Sync Offset* value of the master.

Define the master cycle time as well as the *Sync Offset* of the master in the AutomationControlSuite. Specify the slave cycle time for the drive controller in the DriveControlSuite in parameter *A150*. The same values should be selected for each drive controller.



- 1 Master cycle time *Cycletime*.
- 2 *Sync Offset* of the master.

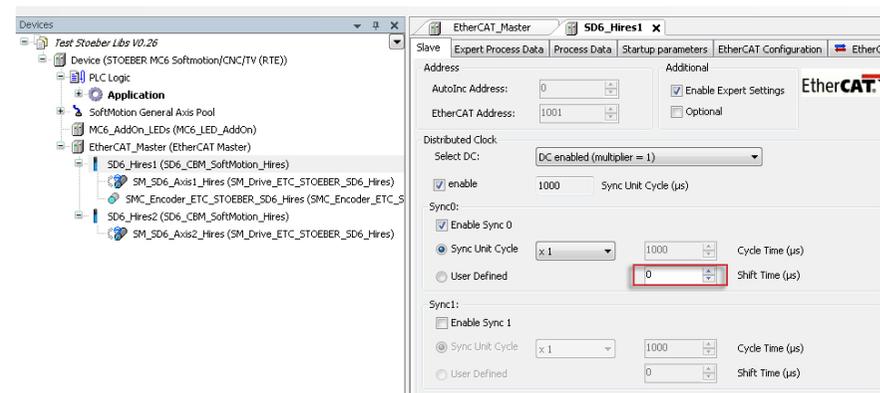
### 8.3.2 Master cycle time is a multiple

If the master cycle time is a multiple of the slave cycle time, check the following condition:

$$\text{Sync Offset}_{\text{Master}} + \text{Shift Time}_{\text{Slave}} - \text{PLL phase offset}_{\text{Drive controller}} < \text{Slave cycle time}_{\text{Drive controller}}$$

- If this condition is met, no special settings are required.
- If the condition is not met, you must configure the *Shift Time*<sub>Slave</sub> so that the condition is met. The *Sync 0* pulse must occur before the drive controller uses the received data.

*Shift Time* is specified for each drive controller in the AutomationControlSuite. *PLL Phase Offset* is defined in the DriveControlSuite in parameter *A292*. Both values should be selected the same for each drive controller.



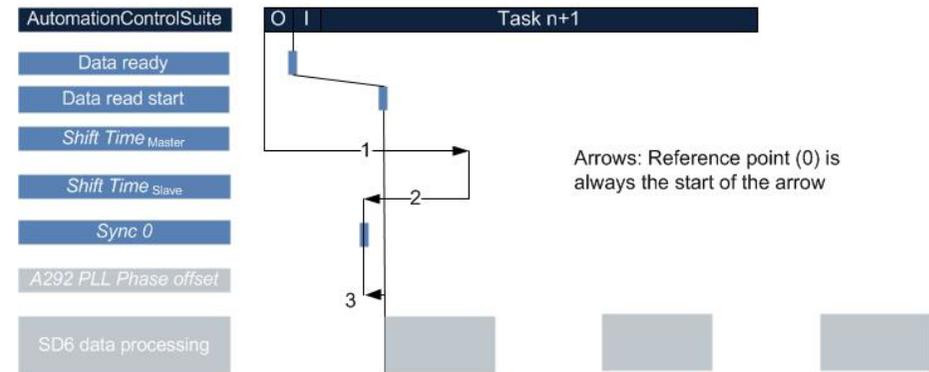
#### Information

STÖBER recommends setting the data transfers (I/O) in the EtherCAT configuration at the start of the task (parameter *MessageAtTaskStart = True*, see figure). As a result one motion cycle is lost but you obtain a significantly smaller jitter.

Parameter	Type	Value
Autoconfig	DWORD	1
MasterCycleTime	DWORD	1000
MasterUseLRW	BOOL	FALSE
SlaveAutostart	BOOL	FALSE
SlaveCheckMode	USINT	0
NetworkName	STRING(100)	\Local Area Connectio...
SelectNetworkByName	BOOL	True
EnableTaskMessage	BOOL	FALSE
DisableTaskGeneration	BOOL	FALSE
FrameAtTaskStart	BOOL	TRUE
ScanForAliasAddress	BOOL	TRUE
DCSyncInWindow	WORD	50
SyncOffset	SINT	20
SyncWindowMonitoring	UDINT	0
NumberOfOutputSlaves	DWORD	0
NumberOfInputSlaves	DWORD	0
SrcAddress1	DWORD	19

### 8.3.3 Principle of operation of the EtherCAT synchronization

The following graphic illustrates the principle of operation of the data synchronization.



#### Parameterization examples

EtherCAT cycle time: 4 ms

Drive controller cycle time: 1 ms

#### Example 1

1  $Shift\ Time_{Master} = 800\ \mu s$  (20% of 4 ms)

2  $Shift\ Time_{Slave} = -400\ \mu s$  3  $PLL\ Offset = -200\ \mu s$

#### Example 2

1  $Shift\ Time_{Master} = 800\ \mu s$  (20% = Default)

2  $Shift\ Time_{Slave} = 0\ \mu s$  (Default) 3  $PLL\ Offset = -100\ \mu s$

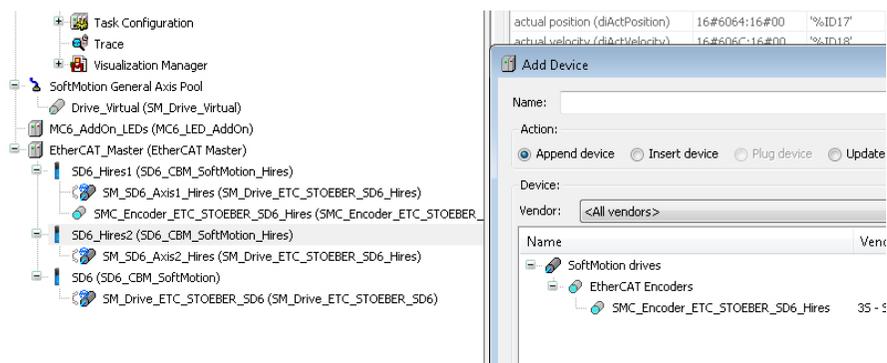
## 8.4 Setting up the SoftMotion encoder

If you combine the MC6 with a drive controller, you can evaluate an encoder simulation on the SD6 interface X120 in MC6 as a SoftMotion encoder.

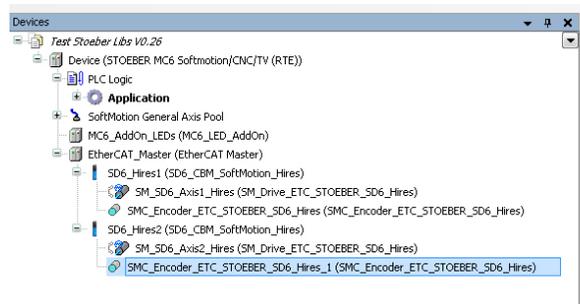
Note that the X120 interface on the SD6 is only available if the optional XI6 terminal module is installed.

The SoftMotion encoder can be used as a master encoder, for example. It is used in the AS6 project as the *Ax\_Ref* of the drive.

To activate the SoftMotion encoder, append it to the SD6 drive controller in the project as a new device:



As part of your AS6 project, the SoftMotion encoder is inserted below a SD6:



## 8.5 Distributing computer power

You can distribute computing power on the MC6 flexibly between the AS6 runtime system and the Windows operating system.

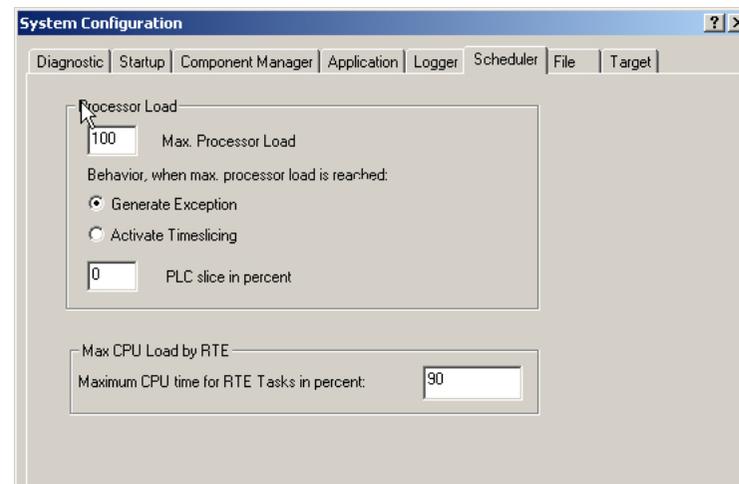
Take into consideration that both the HMI functionality and communication to the AS6 resources are required in the Windows task.

If the computing capacity is too low in the Windows task, the associated functions may not work properly.

The *Maximum CPU time for RTE Task in percent* field contains the processor power available for the AS6 runtime system.

All MC6 versions from hardware version 1 and higher have a Dual Core processor. In this way, one Core can be used for real-time use and the other one for Windows support. In this case the *Maximum CPU time for RTE Task in percent* field has no meaning.

STOBER recommends that only experienced users change the configuration as supplied at delivery.



## 8.6 Accessing status LEDs

You can access LEDs *S0* and *S1* via the AutomationControlSuite to display user-defined system states. To do this you need device description file *STOEBER\_MC6\_LEDS.devdesc.xml*.

The MC6xx5 version does not support this function.



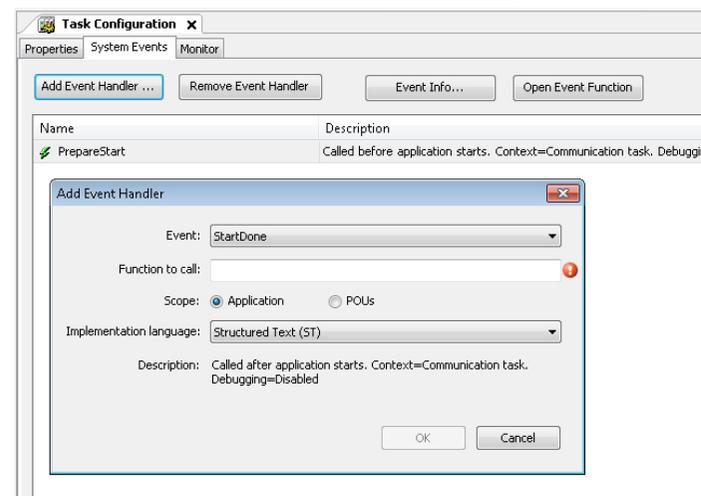
### Information

If you access the LEDs via AS6, the status of the CANopen interface will no longer be indicated by the LEDs. The CANopen functionality is not affected as a result of this and can still be used to its full extent.

On request, you can receive an example project from STÖBER that shows the exact operation (for contact details, see section 1.3 Further support).

## 8.7 Triggering an event

You can add a function to a special event such as a restart of the controller or the occurrence of an exception. To do this, call up an application or POU in the task configuration under *System events* via an *Event Handler*.



## 8.8 Working with persistent variables

Remanent storage of alarms such as errors or messages is performed automatically by the alarm manager on drive *D:* of the MC6.

The Persistence Manager or the NOVRAM of the MC6 are available to save operating hours counters, part counters or other remanent data.

### Persistence manager

If you would like to handle a large amount of remanent data easily, a good way is to use the *Persistence Manager* module.

Configure the module so that the data is stored on the *D:* drive intended for this. Also assign the variables in the global variable list to the channel of the *Persistence Manager* (see following figure).

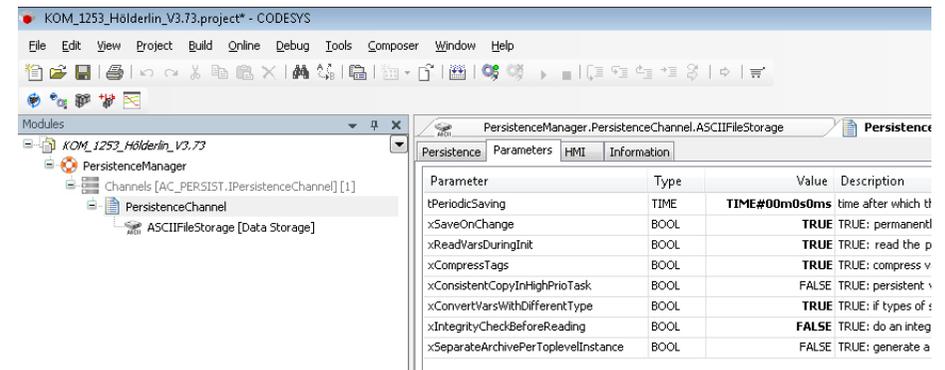
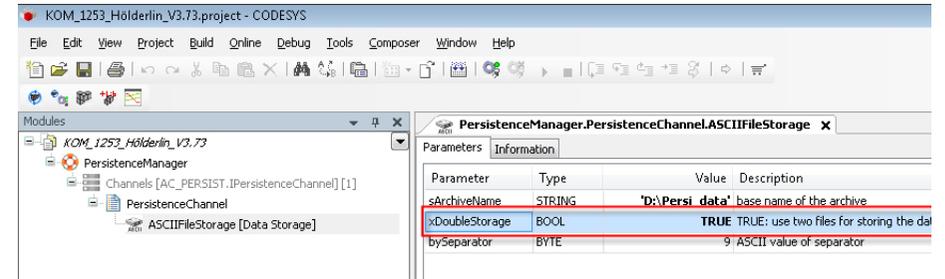
```

408 (* PERSISTENTE VARIABLEN SSD
409 die Variablen des Persistence Managers sollten
410 sich nicht zu häufig ändern, da er auf die SSD schreibt
411 {attribute 'ac_persist':='PersistenceChannel'} *)
412
413 (* Variablen Einstellungen *)
414 {attribute 'ac_persist':='PersistenceChannel'}
415 x_CNCZeile_aenderbar      : BOOL;
416
417 {attribute 'ac_persist':='PersistenceChannel'}
418 t_delay_Riemenrissueberwachung : TIME := T#3s500ms;
419
420 {attribute 'ac_persist':='PersistenceChannel'}
421 t_delay_VentilVorlauf_L      : TIME := T#400ms;
422
423 {attribute 'ac_persist':='PersistenceChannel'}
424 t_delay_VentilRuecklauf_L    : TIME := T#450ms;
425

```

The amount of data is only limited by the space available on the D partition of the SSD card. You can reduce the risk of data loss by using two separate files.

Double storage is realized by setting the *xDoubleStorage* value to TRUE in the Persistence Manager (see following figures).



## NOVRAM

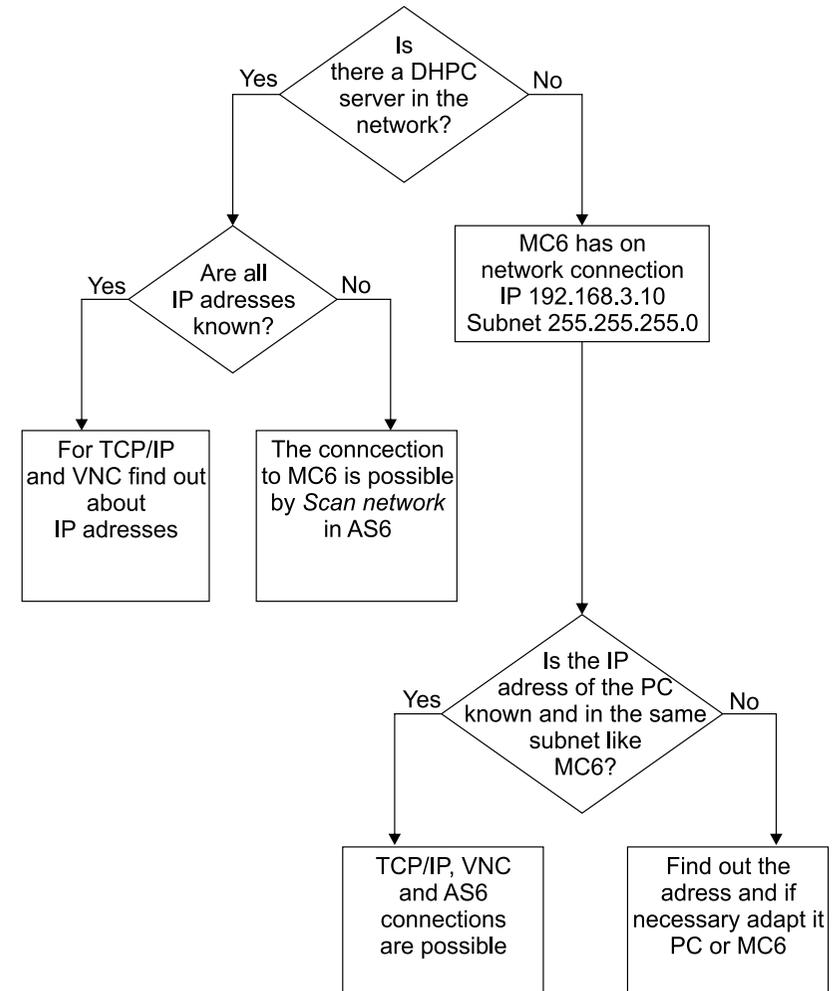
It is also easy to handle the storage of data in the NOVRAM of the MC6. However the maximum size is limited to 128 kB. The capacity utilization of memory is displayed during the transfer to the controller. The NOVRAM can be accessed via the VAR PERSISTENT RETAIN variable declaration.

```

Build
-----
Description
-----
Build started: Application: MC6_STOEBER.Application
The application is up to date
generate code...
generate global initializations ...
generate code initialization ...
generate relocations ...
Persistence channel PersistenceChannel: instances: 76, data size: 589 bytes
Data size of all persistent variables: 589 bytes
Data size for persistence configuration: 1898 bytes
Time for collecting the persistent instances: 0.129 s
Size of generated code: 2979239 bytes
Size of global data: 3005323 bytes
Total allocated memory size for code and data: 5809348 bytes
Memory area 0 contains Data, Input, Output, Memory and Code: size: 7552152 , highest used address: 5809348, largest contiguous
Memory area 2 contains Persistent Data: size: 4096 , highest used address: 301, largest contiguous memory gap: 3795 (92 %)
Build complete -- 0 errors, 8 warnings : ready for download!
  
```

## 8.9 Setting up a connection

### 8.9.1 IP address and subnet mask

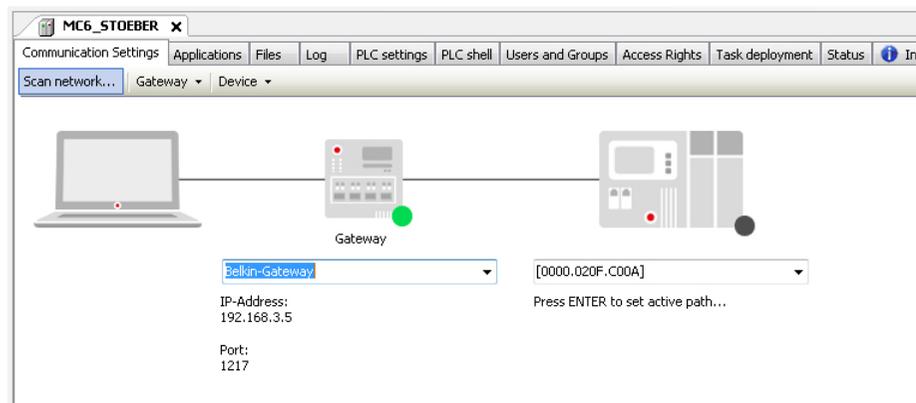


The MC6 is set to DHCP server on network socket 0 in the factory. If no DHCP server is found in the network, the system switches after a certain amount of time to the alternative network setting with the following fixed IP address:

- IP address: 192.168.3.10
- Subnet mask: 122.255.255.0

To switch off searching for a DHCP server on the network at the start, set a fixed IP address. This makes it possible for the programming system to reach the MC6 more quickly after a restart.

If there is a valid network structure present, the target system can be found. The IP addresses of the commissioning PC and the MC6 are not important for a connection. However, it is helpful if the IP address of the commissioning PC and the MC6 are in the same subnet. The IP address of the commissioning PC must be saved in the gateway setting:



There are two batch files on the desktop in the target system which provide a convenient way to switch between the DHCP server and a fixed IP address. The necessary *Commit and Restart* command is already included in the batch files. Always note also section 8.10 Saving changes. You can adjust the configuration.

## 8.9.2 Network name

The MC6 reports with its name. The name consists of *STOEBER-* and the 7-digit serial number of the device.

This means that the MC6 can search by name via the programming system as the serial number is on the nameplate.

A ping query is also possible, for example: *Ping STOEBER-8904002*.

## 8.9.3 Remote connection

The UltraVNC server is installed on the MC6 in the factory. If you would like to reach the desktop of the MC6, you will need the UltraVNC Viewer on your commissioning PC. It is available for x86 and also for x64 systems.

The connection is password-protected. The password is: *stoeber*.

Change this preset password to exclude any security vulnerabilities in the system.



### Information

Please note that you can use both the name and the existing IP address of the MC6 to set up the connection.



### Information

It is not possible to use this connection for remote maintenance without making other adjustments. For this it is recommended to use systems subject to charge for remote support. STÖBER ANTRIEBSTECHNIK GmbH & Co. KG recommends using a VPN tunnel for a remote maintenance connection. For further details ask your provider to offer security solutions for remote maintenance.

**Information**

The remote connection using UltraVNC requires additional resources in the target system. This may lead to faults under production conditions in some circumstances

## 8.10 Saving changes

If you have installed new Windows programs on the MC6 or made changes to system settings, the changes to the file system must then be applied in the write-protected system partition with the *Commit and Restart* command.

Without *Commit and Restart*, all changes will be lost after a restart. This does not apply to application programs that are written to MC6 via the AutomationControlSuite!

You can find the batch files required for *Commit and Restart* on the desktop of the MC6 in the *Batch Files* folder.

### NOTICE

#### Damage to hard disk!

If you disconnect the MC6 from the 24 V supply while the *Commit and Restart* command is running, the file system of the SSD or CFast card may be damaged.

- ▶ Do not interrupt the *Commit and Restart* command.

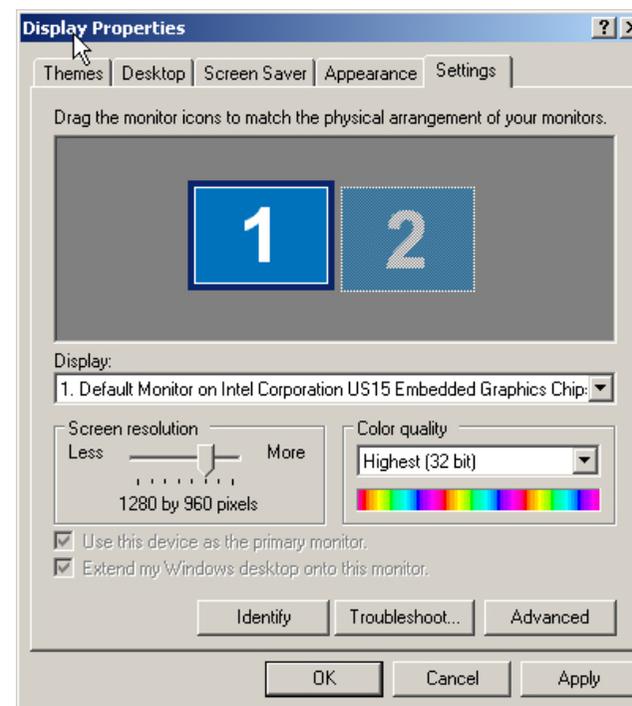
**Information**

*Commit and Restart* may last several minutes and the MC6 will be restarted as part of the process.

## 8.11 Changing the resolution of the monitor display

The resolution of the touch panel is set optimally in the MC6x1 variant. It may be necessary to change the resolution for touch panels of third party manufacturers.

To reach the display menu, right click on the desktop. You can set a resolution of up to 1680 x 1050 under the *Display Properties* menu item.



Note that increasing the resolution will cause Clone operation to be turned off in some circumstances. This is because some graphics units may not support the resolution. The display configuration is automatically set to sdvo-b (single).

**Information**

Note that increasing the resolution will result in a significantly greater computing load for a VISU calculation. Weigh the advantages of a display with higher resolution against the disadvantages of an increased computing load for your system.

## 8.12 Installing the OPC server

It is possible to install a cost-neutral OPC server from 3S-Smart Software Solutions on the MC6 to communicate with the different OPC clients on the market. This communication can be used to integrate visualization or to enable the production data acquisition of machines, for example.

**Information**

Perform a *Commit and Restart* after the software installation (see section 8.10 Saving changes).

## 9 Service

### 9.1 Memory card

#### NOTICE

##### Material damage!

Improper installation or removal of the memory card may cause the card or the MC6 to be damaged.

- ▶ Turn off the power supply before removing or inserting the memory card.
- ▶ Take safety measures in terms of electrostatic discharge (ESD).



#### Information

The memory card does not need to be removed to change its memory contents. Changes can be made via a VNC connection or by the programming system.

Due to the small housing dimensions of the MC6 there is no opening for the memory card on the front side. To reach the memory card slot, the housing of the MC6 must be opened. Note the differences between the MC6x0 and MC6x1 (with touch panel).

#### 9.1.1 Insert memory card in MC6x00 and MC6x01

To insert the memory card, you will need a Phillips screwdriver. Remove the screws marked in the following figure.



Take off the metal plate. The following figure shows the opened housing of the MC6 types MC6x00 and MC6x01 as well as the slot of the memory card.



### 9.1.2 Insert memory card in MC6x10 and MC6x11

To insert the memory card, you will need a Phillips screwdriver. Remove the screws marked in the following figure.



Push the metal plate to the side. The following graphic shows the opened housing of the MC6 of type MC6x10 and MC6x11 as well as the slot of the memory card.



## 9.2 Data backup



### Information

STÖBER recommends performing a data backup after commissioning so that the production system can be restored in case of an error.

If you want to back up the system, note that the SSD or CFast card is divided into three partitions. For a complete copy back up all partitions.

The C partition is write-protected with the Microsoft EWF Manager. The second partition D is used at runtime to be able to save remanent data. You can save CNC programs, databases, error memories and other information on it.

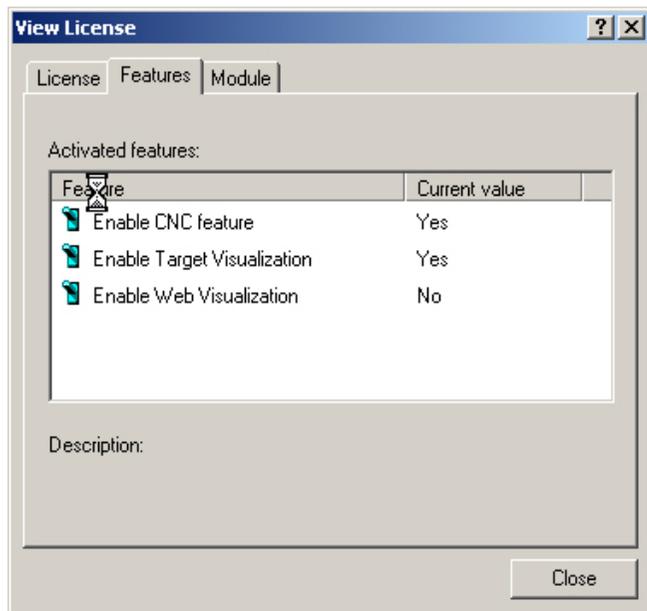
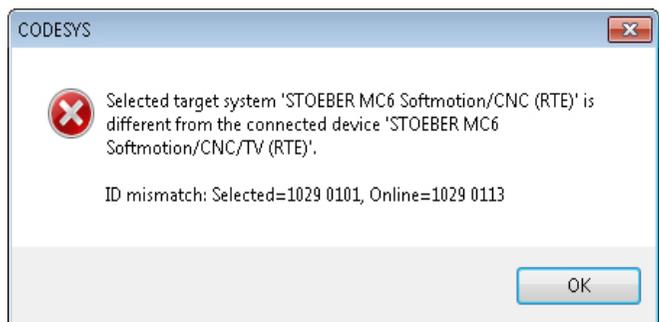
The third partition is used by the system and can therefore only be accessed temporarily.

## 9.3 Error messages

The following error message means that the device connected with the MC6 does not match the projected device.

In this case a MC6x00CT or MC6x10CT is connected.

You can check the associated licensing on the target system via the licensing manager under *View License* on the *Features* tab. For CODESYS version V3.5 SP4 or higher, verify the licensing via the license manager integrated in the AS6.



To eliminate the error, update the device in the project or replace the device.

## 9.4 Restart

To restart the MC6, press the Reset button located close to the power supply plug.

As a result, a cold start of the system is initiated.

## 10 Maintenance

### CAUTION!

#### **Explosion hazard!**

The device is equipped with a lithium battery. If it is replaced by a battery of the wrong type, there is a danger of explosion.

- ▶ Only replace the battery with a battery of the same or comparable type.
- 

The battery (round button CR1632 3V, 125 mAh) is required to support the real-time clock. It must be replaced every 10 years. Please contact STÖBER ANTRIEBSTECHNIK & Co. KG for details. For contact information, see section 1.3 Further support.



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Technische Änderungen vorbehalten  
Errors and changes excepted  
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