CiA 402 Drive Based

Operation manual
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1 General Information

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Using the CiA 402 Drive Based (CiA 402 DB) application in the SD6 drive controller, you can implement applications with reference value assignments by a controller (type MC6, for example) and the calculation and execution of the movement profile in the drive controller.

1.1 About this manual

This manual describes the control of the drive controller, operation modes and functions of the CiA 402 Drive Based (CiA 402 DB) application. It also describes projecting and setup of the application and drive controller in the DriveControlSuite commissioning software and how to place the drive and control unit in operation. The manufacturer-specific jog operation mode is available for commissioning, emergency mode and for maintenance and repair work. You can also use different operation modes as specified by CANopen device profile CiA 402. This makes the Homing mode operation mode available for referencing. In Production mode, choose between Profile position mode, Profile velocity mode or Profile torque mode. Associated with each operation mode is the corresponding control mode of the drive (position, velocity, or torque/force control).

In accordance with CiA 402 you can use the Touch probe function with CiA 402 DB for the position measurement with a binary signal.

This documentation applies to the following devices:
- Drive controller SD6 from DriveControlSuite V 6.1-A

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 (Services).

<table>
<thead>
<tr>
<th>Device/Software</th>
<th>Documentation</th>
<th>Contents</th>
<th>ID</th>
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</thead>
<tbody>
<tr>
<td>SD6 drive controllers</td>
<td>Manual</td>
<td>System environment, technical data, commissioning, communication, diagnosis</td>
<td>442426</td>
</tr>
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<td>SD6 drive controllers</td>
<td>Commissioning instructions</td>
<td>Technical data, installation, commissioning, function test</td>
<td>442537</td>
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<tr>
<td>EtherCAT EC6 communication module</td>
<td>Manual</td>
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<td>442516</td>
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<tr>
<td>CANopen CA6 communication module</td>
<td>Manual</td>
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<td>MC6 Motion Controller</td>
<td>Manual</td>
<td>Technical data, installation, commissioning, diagnosis</td>
<td>442461</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Index</th>
<th>Date</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>10/2015</td>
<td>First edition</td>
</tr>
</tbody>
</table>
1.3 Technical 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

1.4 Important information and conventions

1.4.1 Safety instructions and pictograms
The devices can represent a source of danger. Therefore observe
• the safety guidelines, technical rules and regulations given in the following sections
• and points.

STOBER shall assume no liability for damage resulting from failure to comply with the instruction manual or relevant regulations. We reserve the right to make technical changes for the purpose of improving the devices.

The following conventions apply to the safety instructions used in this documentation:

**WARNING!**

**Warning**
means that there may be a serious danger of death
► 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.
1.4.2 Abbreviations, symbols, indexes

The following abbreviations, formula symbols and indices are used in this documentation.

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<th>Abbreviations</th>
<th>Formula symbol</th>
<th>Indices</th>
</tr>
</thead>
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<tr>
<td>CAN</td>
<td><strong>F</strong></td>
<td><strong>hex</strong></td>
</tr>
<tr>
<td>CiA 402 DB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CiA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drv follows</td>
<td></td>
<td></td>
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<tr>
<td>Enc</td>
<td><strong>M</strong></td>
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<tr>
<td>IGB</td>
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<td>LS</td>
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<tr>
<td>neg</td>
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<tr>
<td>ZP</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Abbreviations</strong></th>
<th><strong>Formula symbol</strong></th>
<th><strong>Indices</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN</td>
<td>Force</td>
<td>hex</td>
</tr>
<tr>
<td>CiA 402 DB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CiA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drv follows</td>
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<tr>
<td>Enc</td>
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<td>IGB</td>
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<td>LS</td>
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<td>neg</td>
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<td>pos</td>
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<td>pp</td>
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<td></td>
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<tr>
<td>pv</td>
<td></td>
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<tr>
<td>RS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.5 Instructions for use

1.5.1 Using the software

The DriveControlSuite software package can be used to select the application and adjust the parameters and signal monitoring of the 6th generation of STÖBER drive controllers. The functionality is specified by selecting an application and transmitting these data to a drive controller.

The software is the property of STÖBER ANTRIEBSTECHNIK GmbH & Co. KG and is copyrighted. The software is licensed for the user.

The software is only provided in machine-readable form. STÖBER ANTRIEBSTECHNIK GmbH & Co. KG gives the customer a non-exclusive right to use the software (license) provided it has been legitimately obtained. The customer is authorized to use the software for the above activities and functions and to make copies of the software, including a backup copy for support of this use, and to install same.

The conditions of this license apply to each copy. The customer promises to affix the copyright notation to each copy of the software and all other property notations.

The customer is not authorized to use, copy, change or pass on/transmit the software for purposes other than those in these regulations. The customer is also not authorized to convert the software (i.e., reverse assembly, reverse compilation) or to compile it in any other way. The customer is also not authorized to issue sublicenses for the software, or to rent or lease it out.
1.5.2 Product maintenance

The obligation to maintain refers to the two latest software versions created by STÖBER ANTRIEBSTECHNIK GmbH & Co. KG and approved for use. STÖBER ANTRIEBSTECHNIK GmbH & Co. KG will either correct software errors or will provide the customer with a new software version. This choice will be made by STÖBER ANTRIEBSTECHNIK GmbH & Co. KG. If, in individual cases, the error cannot be immediately corrected, STÖBER ANTRIEBSTECHNIK GmbH & Co. KG will provide an intermediate solution which may require the customer to comply with special operation regulations. A claim to error correction only exists when the reported errors are reproducible or can be indicated with machine-generated outputs. Errors must be reported in a reconstructable form and provide information which is useful to error correction.

The obligation to correct errors ceases to exist for software which the customer changes or edits in any way unless the customer can prove that such action is not the cause of the reported error.

STÖBER ANTRIEBSTECHNIK GmbH & Co. KG will keep the respective valid software versions in an especially safe place (fireproof data safe, bank deposit box).
2 Basic information

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This section contains essential information about the basic settings that must be considered in each project for the drive controller and adjusted for your application. This chapter describes the control of the drive controller and the operation modes available. A description of the CiA-402-compliant Touch probe function is also included.

2.1 Controller

The application is based on the internationally standardized CANopen device profile CiA 402 for electrical drives. The SD6 drive controller is controlled accordingly with CiA-402-compliant control and status words.

2.1.1 Device state machine according to CiA 402

The illustration below shows the device states and possible changes in state in accordance with CiA 402.

![Device state machine according to CiA 402](image-url)

Fig. 2-1 Device state machine according to CiA 402
The table below shows the conditions for changes in the state machine.

<table>
<thead>
<tr>
<th>Change of state</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Device start-up &gt; self test</td>
<td>Control board power supply turned on.</td>
</tr>
<tr>
<td>1 Self test &gt; switch on disable</td>
<td>Self test completed without errors AND initialization complete.</td>
</tr>
<tr>
<td>2 Switch on disable &gt; ready to switch on</td>
<td>Enable active AND DC link charged AND command <em>Shutdown</em> AND safety technology deactivated AND IGB motion bus inactive OR (IGB motion bus active AND IGB state = 3:IGB motion bus OR IGB exception mode active OR Local mode active)).</td>
</tr>
<tr>
<td>3 Ready to switch on &gt; switched on</td>
<td>Enable active AND command <em>Switch On</em></td>
</tr>
<tr>
<td>4 Switched on &gt; operation enabled</td>
<td>Enable active AND command <em>Enable operation</em></td>
</tr>
<tr>
<td>5 Operation enabled &gt; switched on</td>
<td>Enable active AND command <em>Disable operation</em></td>
</tr>
<tr>
<td>6 Switched on &gt; ready to switch on</td>
<td>Enable active AND command <em>Shutdown</em></td>
</tr>
<tr>
<td>7 Ready to switch on &gt; switch on disable</td>
<td>Enable inactive OR DC link not charged OR command <em>Quick stop</em> OR command <em>Disable voltage</em> OR safety technology active OR (IGB motion bus active AND IGB state not equal to 3:IGB motion bus AND IGB exception mode inactive AND local mode inactive)</td>
</tr>
<tr>
<td>8 Operation enabled &gt; ready to switch on</td>
<td>Shutdown command</td>
</tr>
</tbody>
</table>
## Change of state

<table>
<thead>
<tr>
<th>Change of state</th>
<th>Conditions</th>
</tr>
</thead>
</table>
| 9 Operation enabled > switch on disable | Enable inactive  
OR command Disable voltage  
OR safety technology active |
| 10 Switched on > switch on disable | Enable inactive  
OR DC link not charged  
OR command Quick stop  
OR command Disable voltage  
OR safety technology active  
OR (IGB motion bus active AND IGB state not equal to 3:IGB motion bus AND IGB exception mode inactive AND local mode inactive)  |
| 11 Operation enabled > quick stop | Command Quick stop  
OR (Enable inactive AND Quick stop signal with enable off signal active)  |
| 12 Quick stop > switch on disable | Quick stop complete  
OR DC link below 130 V  
OR safety technology active  
OR command Disable voltage  |
| 13 All states > fault response active | Fault detected  |
| 14 Fault response active > fault | Fault response complete |
| 15 Fault > switch on disable | Command Fault reset (positive edge) |
The device state machine must receive specific commands for changes of state. The commands are given as a bit combination in the control word in accordance with CiA402 (parameter \textit{A515 Control word}). The table below shows the states of the bits in A515 and how they are combined for commands (bits marked with X are irrelevant).

### Command Table

<table>
<thead>
<tr>
<th>Command</th>
<th>Bit of the control word (\textit{A515 control word})</th>
<th>Manufacturer-specific designation</th>
<th>Designation according to CiA 402</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shutdown</td>
<td>0 X 1 1 0</td>
<td>Not ready to switch on</td>
<td>Self test</td>
</tr>
<tr>
<td>Switch on</td>
<td>0 0 1 1 1</td>
<td>Switch on disabled</td>
<td>Switch on disable</td>
</tr>
<tr>
<td>Disable voltage</td>
<td>0 X X 0 X</td>
<td>Ready to switch on</td>
<td>Ready to switch on</td>
</tr>
<tr>
<td>Quick stop</td>
<td>0 X 0 1 X</td>
<td>Switched on</td>
<td>Switched on</td>
</tr>
<tr>
<td>Disable operation</td>
<td>0 0 1 1 1</td>
<td>Operation enabled</td>
<td>Operation enabled</td>
</tr>
<tr>
<td>Enable operation</td>
<td>0 1 1 1 1</td>
<td>Fault</td>
<td>Fault</td>
</tr>
<tr>
<td>Fault reset</td>
<td>X X X X X</td>
<td>Fault reaction active</td>
<td>Fault reaction active</td>
</tr>
</tbody>
</table>

The standard device state machine has the same states as in the device state machine according to CANopen device profile CiA 402.

The table below lists manufacturer-specific designations and the designations according to CiA.

<table>
<thead>
<tr>
<th>Manufacturer-specific designation</th>
<th>Designation according to CiA 402</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self test</td>
<td>Not ready to switch on</td>
</tr>
<tr>
<td>Switch on disable</td>
<td>Switch on disabled</td>
</tr>
<tr>
<td>Ready to switch on</td>
<td>Ready to switch on</td>
</tr>
<tr>
<td>Switched on</td>
<td>Switched on</td>
</tr>
<tr>
<td>Operation enabled</td>
<td>Operation enabled</td>
</tr>
<tr>
<td>Fault</td>
<td>Fault</td>
</tr>
<tr>
<td>Fault reaction active</td>
<td>Fault reaction active</td>
</tr>
<tr>
<td>Quick stop active</td>
<td>Quick stop active</td>
</tr>
</tbody>
</table>
2.2 Operating modes

Different operation modes are available with the CiA 402 DB application.

For commissioning, emergency mode and for maintenance and repair work:

- Jog
  Control-independent movement of the drive.

You can also use the following operation modes with CiA 402 DB in accordance with CANopen device profile CiA 402.

For referencing:

- Homing mode
  Control-independent referencing of the drive. The drive calculates the necessary motion profiles independently.

In production mode:

- Profile position mode
  Target position assignment by a controller. The drive calculates the necessary motion profiles independently.

- Profile velocity mode
  Reference velocity assignment by a controller. The drive calculates the necessary motion profiles independently.

- Profile torque mode
  Reference torque/force assignment by a controller. The drive calculates the necessary motion profiles independently.

2.2.1 Selection of the active operation mode

You can choose the desired operation mode in parameter A541 Modes of operation. The currently active operation mode is displayed via the parameter A542 Modes of operation display.

2.2.2 Jog

You can use Jogging mode to move the drive independently of the control unit, for example during commissioning, in emergency mode, or for setup and repair work.
2.2.2.1 Input and output signals

- I14
- A568 Position range limit (607B,IS)
- A570 Software position limit (607D,IS)
- I12
- I10
- I13
- I45
  - A604 Max acceleration (60C5,IS)
  - A605 Max deceleration (60C6,IS)
  - A578 Quick-stop deceleration (6085,IS)
  - A559 Max torque (6072,IS)
- I18
- I16

- A545 Position actual value (6064,IS)
- A553 Velocity actual value (606C,IS)
- A564 Torque actual value (6077,IS)

Limit

Motion core

Minimum
### 2.2.2.2 Function

If signals `TipPos` and `TipNeg` are set to 1 at the same time, the drive brakes to a complete stop:

If signal `TipPos` is set to 1, the drive accelerates with ramp `I13` and jerk limit `I18` to velocity `I12`. If signal `TipPos` is set to 0, the drive brakes with ramp `I45` to a complete stop.

If signal `TipNeg` is active, the drive will accelerate to `-I12`. The same applies to acceleration and jerk.
2.2.2.3 Control commands and status information

To select the Jog operation mode, set the parameter \( A541 \) to the value -1. The active operation mode is output in parameter \( A542 \). If Jog operation mode is active, the display contains as information -1: Jog.

The following mode-specific bit is used in the control word \( A515 \).

<table>
<thead>
<tr>
<th>Bit</th>
<th>Designation</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>TipPos</td>
<td>1 = Jog in positive direction</td>
</tr>
<tr>
<td>5</td>
<td>TipNeg</td>
<td>1 = Jog in negative direction</td>
</tr>
</tbody>
</table>

No mode-specific bit is used in the status word \( A516 \).

2.2.3 Homing mode

During the referencing in Homing mode, the reference system of the machine and controller are absolutely matched to each other. The drive is only able to perform absolute movements in the referenced state (movements to defined positions).

- **Information**
  For all graphical displays of axes in this section, the smallest position value is on the left, the largest on the right. Accordingly positive motion moves to the right, negative to the left.
2.2.3.1 Input and output signals

A568 Home methods (6098\textsubscript{res})
A569 Home offset (607C\textsubscript{res})
A587 Homing speeds (6099\textsubscript{res})
A588 Homing acceleration (609A\textsubscript{res})
A574 Profile velocity (6081\textsubscript{res})
I10

A604 Max acceleration (60C5\textsubscript{res})
A605 Max deceleration (60C6\textsubscript{res})
A578 Quick-stop deceleration (6085\textsubscript{res})
A559 Max torque (6072\textsubscript{res})
I16

Homing method

Limit

A553 Velocity actual value (606C\textsubscript{res})
A545 Position actual value (6064\textsubscript{res})
A564 Torque actual value (6077\textsubscript{res})

Motion core

Limit

Minimum
2.2.3.2 Reference position

The reference position is the value that is set in the reference point. The reference point is determined by the referencing method, which is described in greater detail on the following pages.

Position A569 Home offset = 2.50 m is assigned to the reference point by means referencing.

When the reference has been set, the drive comes to a complete stop just after the reference position.
### 2.2.3.3 Referencing methods

You can implement the following referencing method, which are described in greater detail on the following pages.

<table>
<thead>
<tr>
<th>Switch position (S) and initial direction of travel when the switch is not activated</th>
<th>Referencing method</th>
<th>Reference to Limit switch</th>
<th>Torque/force (M/F)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Switch diagram" /></td>
<td>1</td>
<td>yes</td>
<td>yes</td>
<td>Negative limit switch, encoder zero pulse, negative initial movement.</td>
</tr>
<tr>
<td><img src="image2.png" alt="Switch diagram" /></td>
<td>5</td>
<td>yes</td>
<td>—</td>
<td>Negative reference switch, encoder zero pulse, negative initial movement.</td>
</tr>
<tr>
<td><img src="image3.png" alt="Switch diagram" /></td>
<td>17</td>
<td>—</td>
<td>yes</td>
<td>Negative limit switch, negative initial movement.</td>
</tr>
<tr>
<td><img src="image4.png" alt="Switch diagram" /></td>
<td>21</td>
<td>—</td>
<td>—</td>
<td>Negative reference switch, negative initial movement.</td>
</tr>
<tr>
<td><img src="image5.png" alt="Switch diagram" /></td>
<td>2</td>
<td>yes</td>
<td>yes</td>
<td>Positive limit switch, encoder zero pulse, positive initial movement.</td>
</tr>
<tr>
<td><img src="image6.png" alt="Switch diagram" /></td>
<td>3</td>
<td>yes</td>
<td>—</td>
<td>Positive reference switch, encoder zero pulse, positive initial movement.</td>
</tr>
<tr>
<td><img src="image7.png" alt="Switch diagram" /></td>
<td>18</td>
<td>—</td>
<td>yes</td>
<td>Positive limit switch, positive initial movement.</td>
</tr>
<tr>
<td><img src="image8.png" alt="Switch diagram" /></td>
<td>19</td>
<td>—</td>
<td>—</td>
<td>Positive reference switch, positive initial movement.</td>
</tr>
<tr>
<td><img src="image9.png" alt="Switch diagram" /></td>
<td>7</td>
<td>yes</td>
<td>—</td>
<td>Centrally arranged reference switch, encoder zero pulse, positive initial movement.</td>
</tr>
<tr>
<td><img src="image10.png" alt="Switch diagram" /></td>
<td>23</td>
<td>—</td>
<td>—</td>
<td>Centrally arranged reference switch, positive initial movement.</td>
</tr>
</tbody>
</table>
### Switch position (S) and initial direction of travel when the switch is not activated

<table>
<thead>
<tr>
<th>Referencing method</th>
<th>Zero pulse</th>
<th>Reference to Limit switch</th>
<th>Torque/force (M/F)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>yes</td>
<td>—</td>
<td>—</td>
<td>Centrally arranged reference switch, encoder zero pulse, negative initial movement.</td>
</tr>
<tr>
<td>27</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Centrally arranged reference switch, negative initial movement.</td>
</tr>
<tr>
<td>33</td>
<td>yes</td>
<td>—</td>
<td>—</td>
<td>Encoder zero pulse, negative initial movement.</td>
</tr>
<tr>
<td>34</td>
<td>yes</td>
<td>—</td>
<td>—</td>
<td>Encoder zero pulse, positive initial movement.</td>
</tr>
<tr>
<td>37 (35)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Set reference (method was moved from 35 to 37).</td>
</tr>
<tr>
<td>-1</td>
<td>—</td>
<td>—</td>
<td>yes</td>
<td>Torque/force stop, positive initial movement.</td>
</tr>
<tr>
<td>-3</td>
<td>yes</td>
<td>—</td>
<td>yes</td>
<td>Torque/force stop, negative initial movement.</td>
</tr>
<tr>
<td>-2</td>
<td>—</td>
<td>—</td>
<td>yes</td>
<td>Torque/force stop, encoder zero pulse, positive initial movement.</td>
</tr>
<tr>
<td>-4</td>
<td>yes</td>
<td>—</td>
<td>yes</td>
<td>Torque/force stop, encoder zero pulse, negative initial movement.</td>
</tr>
</tbody>
</table>
2.2.3.3.1 Referencing method 1
Referencing method 1 is characterized by the following features:
- Negative limit switch
- Encoder zero pulse
- Negative initial movement

Sequence
1. The drive starts in negative direction with ramp $A588$ and speed $A587.0$.
2. The drive turns around on the negative limit switch and changes to speed $A587.1$.
3. When the zero pulse is detected, the reference is set.
4. The drive comes to a complete stop with ramp $A588$.

2.2.3.3.2 Referencing method 2
Referencing method 2 is characterized by the following features:
- Positive limit switch
- Encoder zero pulse
- Positive initial movement

Sequence
1. The drive starts in positive direction with ramp $A588$ and speed $A587.0$.
2. The drive turns around on the positive limit switch and changes to speed $A587.1$.
3. When the zero pulse is detected, the reference is set.
4. The drive comes to a complete stop with ramp $A588$. 
2.2.3.3 Referencing method 3
Referencing method 3 is characterized by the following features:

- Positive reference switch
- Encoder zero pulse
- Positive initial movement

**Sequence**

Case I: The drive has not activated the reference switch yet.
1. The drive starts in positive direction with ramp \( A588 \) and speed \( A587.0 \).
2. The drive turns around on the reference switch and changes to speed \( A587.1 \).
3. When the zero pulse is detected, the reference is set.
4. The drive comes to a complete stop with ramp \( A588 \).

Case II: The drive is already located on the reference switch.
1. The drive starts in negative direction with ramp \( A588 \) and speed \( A587.1 \).
2. After the negative edge of the reference switch, the reference is set when the zero pulse is detected.
3. The drive comes to a complete stop with ramp \( A588 \).

2.2.3.4 Referencing method 5
Referencing method 5 is characterized by the following features:

- Negative reference switch
- Encoder zero pulse
- Negative initial movement

**Sequence**

Case I: The drive has not activated the reference switch yet.
1. The drive starts in negative direction with ramp \( A588 \) and speed \( A587.0 \).
2. The drive turns around on the reference switch and changes to speed \( A587.1 \).
3. When the zero pulse is detected, the reference is set.
4. The drive comes to a complete stop with ramp \( A588 \).

Case II: The drive is already located on the reference switch.
1. The drive starts in positive direction with ramp \( A588 \) and speed \( A587.1 \).
2. After the negative edge of the reference switch, the reference is set when the zero pulse is detected.
3. The drive comes to a complete stop with ramp \( A588 \).
2.2.3.3.5 Referencing method 7

Referencing method 7 is characterized by the following features:

- Centrally arranged reference switch
- Encoder zero pulse
- Positive initial movement

Case I: The drive is located between the negative limit switch and the reference switch.
1. The drive starts in positive direction with ramp A588 and speed A587.0.
2. The drive turns around on the reference switch and changes to speed A587.1.
3. After the negative edge of the reference switch, the reference is set when the zero pulse is detected.
4. The drive comes to a complete stop with ramp A588.

Case II: The drive is already located on the reference switch.
1. The drive starts in negative direction with ramp A588 and speed A587.1.
2. After the negative edge of the reference switch, the reference is set when the zero pulse is detected.
3. The drive comes to a complete stop with ramp A588.

Case III: The drive is located between the reference switch and the positive limit switch.
1. The drive starts in positive direction with ramp A588 and speed A587.0.
2. The drive turns around on the positive limit switch.
3. With a positive edge of the reference switch, the drive changes to speed A587.1.
4. After the negative edge of the reference switch, the reference is set when the zero pulse is detected.
5. The drive comes to a complete stop with ramp A588.

Sequence
Case I: The drive is located between the negative limit switch and the reference switch.
1. The drive starts in positive direction with ramp A588 and speed A587.0.
2. The drive turns around on the reference switch and changes to speed A587.1.
3. After the negative edge of the reference switch, the reference is set when the zero pulse is detected.
4. The drive comes to a complete stop with ramp A588.
Referencing method 11 is characterized by the following features:

- Centrally arranged reference switch
- Encoder zero pulse
- Negative initial movement

**Sequence**

Case I: The drive is located between the reference switch and the positive limit switch.
1. The drive starts in negative direction with ramp $A588$ and speed $A587.0$. 
2. The drive turns around on the reference switch and changes to speed $A587.1$.
3. After the negative edge of the reference switch, the reference is set when the zero pulse is detected.
4. The drive comes to a complete stop with ramp $A588$.

Case II: The drive is already located on the reference switch.
1. The drive starts in positive direction with ramp $A588$ and speed $A587.1$.
2. After the negative edge of the reference switch, the reference is set when the zero pulse is detected.
3. The drive comes to a complete stop with ramp $A588$.

Case III: The drive is located between the negative limit switch and the reference switch.
1. The drive starts in negative direction with ramp $A588$ and speed $A587.0$.
2. The drive turns around on the negative limit switch.
3. With a positive edge of the reference switch, the drive changes to speed $A587.1$.
4. After the negative edge of the reference switch, the reference is set when the zero pulse is detected.
5. The drive comes to a complete stop with ramp $A588$. 
2.2.3.3.7 Referencing method 17
Referencing method 17 is characterized by the following features:
• Negative limit switch
• Negative initial movement

Sequence
1. The drive starts in negative direction with ramp $A588$ and speed $A587.0$.
2. The drive turns around on the negative limit switch and changes to speed $A587.1$.
3. When the negative limit switch edge is detected, the reference is set.
4. The drive comes to a complete stop with ramp $A588$.

2.2.3.3.8 Referencing method 18
Referencing method 18 is characterized by the following features:
• Positive limit switch
• Positive initial movement

Sequence
1. The drive starts in positive direction with ramp $A588$ and speed $A587.0$.
2. The drive turns around on the positive limit switch and changes to speed $A587.1$.
3. When the negative limit switch edge is detected, the reference is set.
4. The drive comes to a complete stop with ramp $A588$. 
2.2.3.3.9 Referencing method 19
Referencing method 19 is characterized by the following features:
- Positive reference switch
- Positive initial movement

Sequence
Case I: The drive has not activated the reference switch yet.
1. The drive starts in positive direction with ramp \( A588 \) and speed \( A587.0 \).
2. The drive turns around on the reference switch and changes to speed \( A587.1 \).
3. When the negative reference switch edge is detected, the reference is set.
4. The drive comes to a complete stop with ramp \( A588 \).

Case II: The drive is already located on the reference switch.
1. The drive starts in negative direction with ramp \( A588 \) and speed \( A587.1 \).
2. When the negative reference switch edge is detected, the reference is set.
3. The drive comes to a complete stop with ramp \( A588 \).

2.2.3.3.10 Referencing method 21
Referencing method 21 is characterized by the following features:
- Negative reference switch
- Negative initial movement

Sequence
Case I: The drive has not activated the reference switch yet.
1. The drive starts in negative direction with ramp \( A588 \) and speed \( A587.0 \).
2. The drive turns around on the reference switch and changes to speed \( A587.1 \).
3. When the negative reference switch edge is detected, the reference is set.
4. The drive comes to a complete stop with ramp \( A588 \).

Case II: The drive is already located on the reference switch.
1. The drive starts in positive direction with ramp \( A588 \) and speed \( A587.1 \).
2. When the negative reference switch edge is detected, the reference is set.
3. The drive comes to a complete stop with ramp \( A588 \).
2.2.3.3.11 Referencing method 23
Referencing method 23 is characterized by the following features:

- Centrally arranged reference switch
- Positive initial movement

**Sequence**

**Case I:** The drive is located between the negative limit switch and the reference switch.
1. The drive starts in positive direction with ramp $A588$ and speed $A587.0$.
2. The drive turns around on the positive limit switch.
3. With a positive edge of the reference switch, the drive changes to speed $A587.1$.
4. When the negative reference switch edge is detected, the reference is set.
5. The drive comes to a complete stop with ramp $A588$.

**Case II:** The drive is already located on the reference switch.
1. The drive starts in negative direction with ramp $A588$ and speed $A587.1$.
2. When the negative reference switch edge is detected, the reference is set.
3. The drive comes to a complete stop with ramp $A588$.

**Case III:** The drive is located between the reference switch and the positive limit switch.
1. The drive starts in positive direction with ramp $A588$ and speed $A587.0$.
2. The drive turns around on the positive limit switch.
3. With a positive edge of the reference switch, the drive changes to speed $A587.1$.
4. When the negative reference switch edge is detected, the reference is set.
5. The drive comes to a complete stop with ramp $A588$. 
2.2.3.3.12 Referencing method 27

Referencing method 27 is characterized by the following features:
- Centrally arranged reference switch
- Negative initial movement

Case I: The drive is located between the reference switch and the positive limit switch.
1. The drive starts in negative direction with ramp $A588$ and speed $A587.0$.
2. The drive turns around on the reference switch and changes to speed $A587.1$.
3. When the negative reference switch edge is detected, the reference is set.
4. The drive comes to a complete stop with ramp $A588$.

Case II: The drive is already located on the reference switch.
1. The drive starts in positive direction with ramp $A588$ and speed $A587.1$.
2. When the negative reference switch edge is detected, the reference is set.
3. The drive comes to a complete stop with ramp $A588$.

Case III: The drive is located between the negative limit switch and the reference switch.
1. The drive starts in negative direction with ramp $A588$ and speed $A587.0$.
2. The drive turns around on the negative limit switch.
3. With a positive edge of the reference switch, the drive changes to speed $A587.1$.
4. When the negative reference switch edge is detected, the reference is set.
5. The drive comes to a complete stop with ramp $A588$.
2.2.3.3.13 Referencing methods 33 and 34
Referencing method 33 is characterized by the following features:
- Encoder zero pulse
- Negative initial movement
Referencing method 34 is characterized by the following features:
- Encoder zero pulse
- Positive initial movement

Sequence
Referencing method 33:
1. The drive starts in negative direction with ramp A588 and speed A587.1.
2. When the zero pulse is detected, the reference is set.
3. The drive comes to a complete stop with ramp A588.

Referencing method 34:
1. The drive starts in positive direction with ramp A588 and speed A587.1.
2. When the zero pulse is detected, the reference is set.
3. The drive comes to a complete stop with ramp A588.

2.2.3.3.14 Referencing method 35
Sequence
The position where the drive is located is set as the reference position. No movement takes place.

Information
The Homing method 35 was moved by the EtherCAT User Group from 35 to 37, Homing method 35 was reserved. Switch to Homing method 37 (supported from firmware 6.0-C). However, the previous behavior of Homing method 35 will continue to be supported until a new functionality is defined.

2.2.3.3.15 Referencing method 37
Sequence
The position where the drive is located is set as the reference position. No movement takes place.
2.2.3.3.16 Referencing method -1
Referencing method -1 is characterized by the following features:
- Torque/force stop
- Positive initial movement

Sequence
1. The drive starts in positive direction with the ramp set in A588 and at the speed set in A587.0.
2. If the torque limit set in I28 is interrupted for at least the time set in I29 or more, the reference is set.
3. Reference values are ramped to zero with a value set in A588.

2.2.3.3.17 Referencing method -2
Referencing method -2 is characterized by the following features:
- Torque/force stop
- Negative initial movement

Sequence
1. The drive starts in negative direction with the ramp set in A588 and at the speed set in A587.0.
2. If the torque limit set in I28 is interrupted for at least the time set in I29 or more, the reference is set.
3. Reference values are ramped to zero with a value set in A588.
## Referencing method -3
Referencing method -3 is characterized by the following features:
- Torque/force stop
- Encoder zero pulse
- Positive initial movement

**Sequence**
1. The drive starts in positive direction with the ramp set in A588 and at the speed set in A587.0.
2. If the torque limit set in I28 is reached or exceeded without interruption for at least the time set in I29, the reference values are ramped to zero with the value set in A588.
3. The drive moves in negative direction with the ramp set in A588 and at the speed set in A587.1.
4. When the zero pulse is detected, the reference is set.
5. The drive comes to a complete stop with the ramp set in A588.

## Referencing method -4
Referencing method -4 is characterized by the following features:
- Torque/force stop
- Encoder zero pulse
- Negative initial movement

**Sequence**
1. The drive starts in negative direction with the ramp set in A588 and at the speed set in A587.0.
2. If the torque limit set in I28 is reached or exceeded without interruption for at least the time set in I29, the reference values are ramped to zero with the value set in A588.
3. The drive moves in positive direction with the ramp set in A588 and at the speed set in A587.1.
4. When the zero pulse is detected, the reference is set.
5. The drive comes to a complete stop with the ramp set in A588.
2.2.3.4 Control commands and status information

To select the Homing mode operation mode, set the parameter A541 to the value 6.

The active operation mode is output in parameter A542. If Homing mode operation mode is active, the display contains as information 6: Homing.

The following mode-specific bit is used in the control word A515.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Designation</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Homing operation start</td>
<td>1 = Start referencing.</td>
</tr>
</tbody>
</table>

The following bit has a mode-specific meaning in the status word A516.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Designation</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Target reached</td>
<td>1 = Referencing completed</td>
</tr>
<tr>
<td>12</td>
<td>Homing attained</td>
<td>1 = Reference reached</td>
</tr>
<tr>
<td>13</td>
<td>Homing error</td>
<td>1 = Error during referencing</td>
</tr>
</tbody>
</table>
2.2.4.1 Input and output signals

- A567 Target position (607A_{rea})
- A568 Position range limit (607B_{rea})
- A570 Software position limit (607D_{rea})
- A574 Profile velocity (6081_{rea})
- A572 Max profile velocity (607F_{rea})
- A576 Profile acceleration (6083_{rea})
- A577 Profile deceleration (6084_{rea})
- A604 Max acceleration (60C5_{rea})
- A605 Max deceleration (60C6_{rea})
- A578 Quick-stop deceleration (6085_{rea})
- A559 Max torque (6072_{rea})
- A590 Profile jerk (6081_{rea})
- I16

Limit

A545 Position actual value (6064_{rea})

Motion core

A553 Velocity actual value (606C_{rea})

A564 Torque actual value (6077_{rea})

Limit

Minimum
2.2.4.2 Function

2.2.4.3 Control commands and status information

To select the "Profile position mode" operation mode, set the parameter A541 to the value 1. The active operation mode is output in parameter A542. If "Profile position mode" operation mode is active, the display contains the information 1: pp.

The following bit has a mode-specific meaning in the status word A516.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Designation</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Target reached</td>
<td>1 = Actual position in window See I180</td>
</tr>
<tr>
<td>12</td>
<td>Set-point acknowledge</td>
<td>1 = Positioning process active. Transfer of a new target position depends on A515 bit 5 Only supported in CiA 402 Drive Based.</td>
</tr>
<tr>
<td>13</td>
<td>Following error</td>
<td>1 = Following error active Only supported in CiA 402 Drive Based.</td>
</tr>
</tbody>
</table>

The following mode-specific bit is used in the control word A515.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Designation</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>New setpoint</td>
<td>1 = Transfer of new target position and start of the movement</td>
</tr>
<tr>
<td>5</td>
<td>Change set immediately</td>
<td>0 = &quot;New setpoint = 1&quot; is only performed when no positioning process is currently active. 1 = &quot;New setpoint = 1&quot; is performed, a positioning process that is still active may be cancelled.</td>
</tr>
<tr>
<td>6</td>
<td>abs/rel</td>
<td>0 = Target position is an absolute position 1 = Target position is a relative distance. Depending on A621.</td>
</tr>
</tbody>
</table>
2.2.5 Profile velocity mode

You can use Profile velocity mode to implement a reference velocity assignment with a controller. The calculation of the movement profile and the position control takes place in the drive. The drive includes a reference velocity, reference acceleration, reference delay and a reference jerk. The application calculates the movement profile from this and forwards it to the velocity controller.
2.2.5.1 Input and output signals

- A638 Target velocity (60FF_{Hex})
- A572 Max profile velocity (607F_{Hex})
- A576 Profile acceleration (6083_{Hex})
- A577 Profile deceleration (6084_{Hex})
- A604 Max acceleration (60C5_{Hex})
- A605 Max deceleration (60C6_{Hex})
- A578 Quick-stop deceleration (6085_{Hex})
- A559 Max torque (6072_{Hex})
- A590 Profile jerk (6081_{Hex})
- I16

Limit

Motion core

A545 Position actual value (6064_{Hex})
A553 Velocity actual value (606C_{Hex})
A564 Torque actual value (6077_{Hex})
2.2.5.2 Function

2.2.5.3 Control commands and status information

To select the "Profile velocity mode" operation mode, set the parameter A541 to the value 3.

The active operation mode is output in parameter A542. If "Profile velocity mode" operation mode is active, the display contains the information 3: pv.

No mode-specific bit is used in the control word A515.

The following bit has a mode-specific meaning in the status word A516.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Designation</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Target reached</td>
<td>1 = Motion profile done</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See I85</td>
</tr>
<tr>
<td>12</td>
<td>–</td>
<td>1 = Actual velocity is zero</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See I199</td>
</tr>
<tr>
<td>13</td>
<td>–</td>
<td>1 = Difference between reference velocity I426 and actual velocity I88</td>
</tr>
<tr>
<td></td>
<td></td>
<td>is greater than the velocity window C40</td>
</tr>
</tbody>
</table>
2.2.6.1 Input and output signals

- A558 Target torque (6071<sub>nax</sub>)
- A578 Quick-stop deceleration (6085<sub>nax</sub>)
- A559 Max torque (6072<sub>nax</sub>)

Motion core

- A545 Position actual value (6064<sub>nax</sub>)
- A553 Velocity actual value (606C<sub>nax</sub>)
- A564 Torque actual value (6077<sub>nax</sub>)
2.3 Additional functions

2.3.1 Touch probe

The Touch probe 1 and 2 functions make it possible to apply position measurement to a binary signal. Set the source of the signal for Touch probe 1 in \textit{I110} (for example binary input 1), for Touch probe 2 in \textit{I126}.

2.3.1.1 Function

The Touch probe function is explained here based on Touch Probe 1. Touch Probe 2 functions in an identical manner and is controlled similarly to Touch probe 1 with bits 8 to 15 in parameter \textit{A594}.

The function of Touch probe 1 is explained with several examples below.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Designation</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Target reached</td>
<td>Target reached 1 = Actual torque/force in the window</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Difference between target torque/force \textit{I428} and actual torque/force \textit{E90} is smaller than the torque/force window \textit{G900}</td>
</tr>
</tbody>
</table>
If Touch probe 1 is turned on (A594 bit 0 = 1), the acknowledgement occurs via A595 bit 0 = 1. The function is set so that triggering occurs for each event (A594 bit 1 = 1). Triggering to the positive edge and to the negative edge of the POSI-Latch signal are both turned on (A594 bit 4 = 1 and bit 5 = 1). Accordingly the position in A596 (positive edge) and A597 (negative edge) respectively is written for each edge of the POSI-Latch signal.

The first write processes to A595 bit 1 = 1 (triggering to a positive edge occurred) and bit 2 = 1 (triggering to a negative edge occurred) are displayed. If Touch probe 1 is turned off (A594 bit 0 = 0), all status bits in A595 are reset. The positions in A596 and A597 are retained.
In contrast to the first example, triggering in example 2 is only for the first event (bit 1 = 0). Triggering to the positive edge of the POSI-Latch signal is turned off and triggering to the negative edge is turned on (bit 4 = 0 and bit 5 = 1). Accordingly the position for the first negative edge of the POSI-Latch signal (t₂) is written to A597 (negative edge).
In example 3 Touch Probe 1 is turned on twice in the time period that is shown (bit 0 = 1), and in each case triggering is to the first event (bit 1 = 0). Triggering to the positive and negative edge of the POSI-Latch signal is turned on (bit 4 = 1 and bit 5 = 1). For the first negative edge of the POSI-Latch signal (t₂) the position is accordingly written to A597 (negative edge), for the second positive edge (t₃) to A596.
3 Commissioning

Overview of sections

3.1 Projecting ................................................................. 45
3.2 Set up ................................................................. 46
3.3 Put into operation ....................................................... 46
You can project the application and drive controller in the DriveControlSuite commissioning software. You can also configure the drive and control unit there before placing them both in operation.

3.1 Projecting

Information
Note that you can only administer one axis for the drive controller with the CiA 402 Drive Based application.

1. Start the DriveControlSuite and click on Create new standard project.
   ⇒ The project planning window opens, the Drive controller button is active.

Projecting the drive controller

2. Properties tab:
   specify the necessary characteristics of the drive controller.

3. Drive controller tab:
   select the device type that corresponds with the drive controller. The latest firmware version is activated by default.

4. Option modules tab:
   select the EC6A communication module.

5. Device controller tab:
   select the CiA 402 device controller as well as EtherCAT Rx and EtherCAT Tx for the transfer of the process data.

Project axis

6. Click on Axis 1 in the left navigation area.

7. Properties tab:
   enter the necessary characteristics of the axis.

8. Application tab:
   select the CiA 402 Drive Based application.

9. Motor tab:
   select the motor type that you operate via this axis.

10. Confirm with OK.
3.2 Set up

To set up the drive and the control unit, follow these steps:

The following requirements apply:
• You have projected the application and the drive controller.

Setting up the drive and control unit

1. Start DriveControlSuite and open your project.
2. **Project view:**
   Select the axis and click on *Wizards*.
   ↩ The window opens - *Wizards* - A : axis window appears.
3. *Wizard A* : *Axis* > *Motor*:
   Parameterize the motor.
4. *Wizard A* : *Axis* > *Axis model*:
   Parameterize the mechanical axis model.
5. *Wizard A* : *Axis* > *Application*:
   Parameterize the application.
6. **Project view:**
   Select the drive controller and click on *Wizards*.
   ↩ The *Wizards* - AR1 : Drive controller window opens.
7. *Wizard AR1* : *Drive controller1*:
   Parameterize the drive controller and fieldbus communication.
8. Transfer the project to the drive controller and save the project there.
   ↩ You have set up the drive.
9. Set up the control unit. Follow the instructions in the manufacturer’s documentation, for example the MC6 operating instructions.

3.3 Put into operation

For commissioning of the drive and control unit, follow these steps:

The following requirements apply:
• You have set up the drive controller and the control unit.

Placing the drive and control unit in operation

1. Check the drive controller, its accessories and the control unit in the control enclosure to ensure they are installed correctly.
2. Check all electrical connections to make certain the connection is made correctly.
3. Turn on the power supply voltages.
4. Check to ensure communication is functioning correctly.
5. Check to ensure the parameterization of the motor, mechanical drive model and drive controller is correct.
6. Check to ensure the drive and control unit are functioning properly.
   ↩ You have placed the drive and the control unit in operation.
### Object directory - References

#### 4.1 Communication objects - CiA 402

The following list of communication objects that are in the index range between $6000_{\text{hex}}$ and $67FF_{\text{hex}}$ are implemented according to CiA 402 Drives and motion control device profile in the "CiA 402 Controller Based", "CiA 402 Controller Based HiRes Motion" and "CiA 402 Drive Based" applications.

<table>
<thead>
<tr>
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<th>STOBER parameter address</th>
<th>Comment</th>
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<tbody>
<tr>
<td>$603F_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Error code</td>
<td>$A514$</td>
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<tr>
<td>$6040_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Control word</td>
<td>$A515$</td>
<td></td>
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<td>$6041_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Status word</td>
<td>$A516$</td>
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<td>$605A_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Quick stop option code</td>
<td>$A536$</td>
<td></td>
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<tr>
<td>$605E_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Fault reaction option code</td>
<td>$A540$</td>
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</tr>
<tr>
<td>$6060_{\text{hex}}$</td>
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<td>Modes of operation</td>
<td>$A541$</td>
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<tr>
<td>$6061_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Modes of operation display</td>
<td>$A542$</td>
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<td>$6064_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Position actual value</td>
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<tr>
<td>$6065_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Following error window</td>
<td>$A546$</td>
<td></td>
</tr>
<tr>
<td>$6066_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Following error time out</td>
<td>$A547$</td>
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<td>$606C_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Velocity actual value</td>
<td>$A553$</td>
<td></td>
</tr>
<tr>
<td>$6071_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Target torque</td>
<td>$A558$</td>
<td></td>
</tr>
<tr>
<td>$6072_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Max torque</td>
<td>$A559$</td>
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<tr>
<td>$6077_{\text{hex}}$</td>
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<td>Torque actual value</td>
<td>$A564$</td>
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<td>$6078_{\text{hex}}$</td>
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<td>Current actual value</td>
<td>$A556$</td>
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<td>DC link voltage</td>
<td>$A567$</td>
<td></td>
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<tr>
<td>$6081_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Profile velocity</td>
<td>$A574$</td>
<td>Only in CiA 402 Drive Based</td>
</tr>
<tr>
<td>$6083_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Profile acceleration</td>
<td>$A576$</td>
<td>Only in CiA 402 Drive Based</td>
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<tr>
<td>$6084_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Profile deceleration</td>
<td>$A577$</td>
<td>Only in CiA 402 Drive Based</td>
</tr>
<tr>
<td>$607A_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Target position</td>
<td>$A567$</td>
<td></td>
</tr>
<tr>
<td>$60A3_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Profile jerk use</td>
<td>$A589$</td>
<td>Only in CiA 402 Drive Based</td>
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<td>$0_{\text{hex}}$</td>
<td>Profile jerk</td>
<td>$A590$</td>
<td>Only in CiA 402 Drive Based</td>
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<tr>
<td>$607B_{\text{hex}}$</td>
<td>$0_{\text{hex}}$</td>
<td>Position range limit, Highest sub-index supported</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>$607B_{\text{hex}}$</td>
<td>$1_{\text{hex}}$</td>
<td>Position range limit, Min position range limit</td>
<td>$A568[0]$</td>
<td>No function</td>
</tr>
<tr>
<td>Index</td>
<td>Subindex</td>
<td>Name</td>
<td>STOBER parameter address</td>
<td>Comment</td>
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<td>-------</td>
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<td>------</td>
<td>--------------------------</td>
<td>---------</td>
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<td>607B&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>2&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Position range limit, Max position range limit</td>
<td>A568[1]</td>
<td>Used as circular length.</td>
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<tr>
<td>607C&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Home offset</td>
<td>A569</td>
<td></td>
</tr>
<tr>
<td>607D&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Software position limit, Highest sub-index supported</td>
<td>A570[0]</td>
<td></td>
</tr>
<tr>
<td>607D&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>1&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Software position limit, Min position range limit</td>
<td>A570[1]</td>
<td></td>
</tr>
<tr>
<td>607E&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Polarity</td>
<td>A571</td>
<td>The bit 7 position polarity is used for the reference and actual values of position, velocity and torque/force.</td>
</tr>
<tr>
<td>607F&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Max profile velocity</td>
<td>A572</td>
<td></td>
</tr>
<tr>
<td>6085&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Quick stop deceleration</td>
<td>A578</td>
<td></td>
</tr>
<tr>
<td>6091&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Gear ratio, Highest sub-index supported</td>
<td>– 2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Index</th>
<th>Subindex</th>
<th>Name</th>
<th>STOBER parameter address</th>
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</tr>
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<tr>
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<td>1&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Gear ratio, Motor revolutions</td>
<td>A584[0]</td>
<td></td>
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<tr>
<td>6091&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>2&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Gear ratio, Shaft revolutions</td>
<td>A584[1]</td>
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<tr>
<td>6092&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Feed constant, Highest sub-index supported</td>
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<td>6092&lt;sub&gt;hex&lt;/sub&gt;</td>
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<td>Feed constant, Feed</td>
<td>A585[0]</td>
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<td>6092&lt;sub&gt;hex&lt;/sub&gt;</td>
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<td>Feed constant, Shaft revolutions</td>
<td>A585[1]</td>
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<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Homing method</td>
<td>A586</td>
<td></td>
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<tr>
<td>6099&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Homing speeds, Highest sub-index supported</td>
<td>– 2</td>
<td></td>
</tr>
<tr>
<td>6099&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>1&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Homing speeds, Speed during search for switch</td>
<td>A587[0]</td>
<td></td>
</tr>
<tr>
<td>6099&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>2&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Homing speeds, Speed during search for zero</td>
<td>A587[1]</td>
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<tr>
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<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Homing acceleration</td>
<td>A588</td>
<td></td>
</tr>
<tr>
<td>60B1&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Velocity offset</td>
<td>A592</td>
<td></td>
</tr>
<tr>
<td>60B2&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Torque offset</td>
<td>A593</td>
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<th>Name</th>
<th>STOBER parameter address</th>
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<tbody>
<tr>
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<td>0_{hex}</td>
<td>Touch probe function</td>
<td>A594</td>
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<tr>
<td>60B9_{hex}</td>
<td>0_{hex}</td>
<td>Touch probe status</td>
<td>A595</td>
<td></td>
</tr>
<tr>
<td>60BA_{hex}</td>
<td>0_{hex}</td>
<td>Touch probe pos1 pos value</td>
<td>A596</td>
<td></td>
</tr>
<tr>
<td>60BB_{hex}</td>
<td>0_{hex}</td>
<td>Touch probe pos1 neg value</td>
<td>A597</td>
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<td>60BC_{hex}</td>
<td>0_{hex}</td>
<td>Touch probe pos2 pos value</td>
<td>A598</td>
<td></td>
</tr>
<tr>
<td>60BD_{hex}</td>
<td>0_{hex}</td>
<td>Touch probe pos2 neg value</td>
<td>A599</td>
<td></td>
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<td>60C0_{hex}</td>
<td>0_{hex}</td>
<td>Interpolation sub mode select</td>
<td>A600</td>
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<tr>
<td>60C1_{hex}</td>
<td>0_{hex}</td>
<td>Interpolation data record, Highest sub-index supported</td>
<td>–</td>
<td>2 Only in CiA 402 Controller Based</td>
</tr>
<tr>
<td>60C1_{hex}</td>
<td>1_{hex}</td>
<td>Interpolation data record, 1st set-point</td>
<td>A601[0]</td>
<td>No function</td>
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<td>60C1_{hex}</td>
<td>2_{hex}</td>
<td>Interpolation data record, 2nd set-point</td>
<td>A601[1]</td>
<td>No function</td>
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<td>60C2_{hex}</td>
<td>0_{hex}</td>
<td>Interpolation time period, Highest sub-index supported</td>
<td>–</td>
<td>2 Only in CiA 402 Controller Based</td>
</tr>
<tr>
<td>60C2_{hex}</td>
<td>1_{hex}</td>
<td>Interpolation time period, Interpolation time period value</td>
<td>A602[0]</td>
<td>Only in CiA 402 Controller Based</td>
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<tr>
<td>60C2_{hex}</td>
<td>2_{hex}</td>
<td>Interpolation time period, Interpolation time index</td>
<td>A602[1]</td>
<td>Only in CiA 402 Controller Based</td>
</tr>
<tr>
<td>60C4_{hex}</td>
<td>0_{hex}</td>
<td>Interpolation data configuration, Highest sub-index supported</td>
<td>–</td>
<td>5 Only in CiA 402 Controller Based</td>
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<tr>
<td>60C4_{hex}</td>
<td>1_{hex}</td>
<td>Interpolation data configuration, Maximum buffer size</td>
<td>A603[0]</td>
<td>No function</td>
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<tr>
<td>60C4_{hex}</td>
<td>2_{hex}</td>
<td>Interpolation data configuration, Actual buffer size</td>
<td>A603[1]</td>
<td>No function</td>
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<td>60C4_{hex}</td>
<td>3_{hex}</td>
<td>Interpolation data configuration, Buffer organization</td>
<td>A603[2]</td>
<td>No function</td>
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<th>Subindex</th>
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<th>Comment</th>
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<tr>
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<td>4&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Interpolation data configuration, Buffer position</td>
<td>A603[3]</td>
<td>No function</td>
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<td>60C4&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>5&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Interpolation data configuration, Size of data record</td>
<td>A603[4]</td>
<td>No function</td>
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<tr>
<td>60C5&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Max acceleration</td>
<td>A604</td>
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<tr>
<td>60C6&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Max deceleration</td>
<td>A605</td>
<td></td>
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<tr>
<td>60E3&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Supported homing methods, Highest sub-index supported</td>
<td>19</td>
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<td>60E3&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>1 - 13&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Supported homing methods, 1&lt;sup&gt;st&lt;/sup&gt; - 19&lt;sup&gt;th&lt;/sup&gt; supported homing method</td>
<td>A619[0] - A619[19]</td>
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<td>60E4&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Additional position actual value, Highest sub-index supported</td>
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<table>
<thead>
<tr>
<th>Index</th>
<th>Subindex</th>
<th>Name</th>
<th>STOBER parameter address</th>
<th>Comment</th>
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<tbody>
<tr>
<td>60E4&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>1&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Additional position actual value, 1&lt;sup&gt;st&lt;/sup&gt; additional position actual value</td>
<td>A620</td>
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<td>60F2&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Positioning option code</td>
<td>A621 Only in CiA 402 Drive Based</td>
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<tr>
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<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Following error actual value</td>
<td>A632</td>
<td></td>
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<tr>
<td>60FD&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Digital inputs</td>
<td>A636</td>
<td></td>
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<tr>
<td>60FE&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Digital outputs, Highest sub-index supported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60FE&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>1&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Digital outputs, Physical outputs</td>
<td>A637</td>
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<td>6502&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>0&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Supported drive modes</td>
<td></td>
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</table>
4.2 Communication objects - STOBER-specific parameters

The following table contains the communication objects of the object directory index range 2000 – 5FFF (hex), manufacturer-specific parameters as well as their mapping to the corresponding STOBER-specific parameters.

<table>
<thead>
<tr>
<th>Index (hex)</th>
<th>STOBER parameter range</th>
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<tbody>
<tr>
<td>2000 – 21FF</td>
<td>A00 – A511</td>
</tr>
<tr>
<td>2200 – 23FF</td>
<td>B00 – B511</td>
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<tr>
<td>2400 – 25FF</td>
<td>C00 – C511</td>
</tr>
<tr>
<td>2600 – 27FF</td>
<td>D00 – D511</td>
</tr>
<tr>
<td>2800 – 29FF</td>
<td>E00 – E511</td>
</tr>
<tr>
<td>2A00 – 2BFF</td>
<td>F00 – F511</td>
</tr>
<tr>
<td>2C00 – 2DFF</td>
<td>G00 – G511</td>
</tr>
<tr>
<td>2E00 – 2FFF</td>
<td>H00 – H511</td>
</tr>
<tr>
<td>3000 – 31FF</td>
<td>I00 – I511</td>
</tr>
<tr>
<td>3200 – 33FF</td>
<td>J00 – J511</td>
</tr>
<tr>
<td>3400 – 35FF</td>
<td>K00 – K511</td>
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<tr>
<td>3600 – 37FF</td>
<td>L00 – L511</td>
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<td>3800 – 39FF</td>
<td>M00 – M511</td>
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<td>3A00 – 3BFF</td>
<td>N00 – N511</td>
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<tr>
<td>3C00 – 3DFF</td>
<td>O00 – O511</td>
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<td>3E00 – 3FFF</td>
<td>P00 – P511</td>
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<td>4000 – 41FF</td>
<td>Q00 – Q511</td>
</tr>
<tr>
<td>4200 – 43FF</td>
<td>R00 – R511</td>
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<tr>
<td>4400 – 45FF</td>
<td>S00 – S511</td>
</tr>
<tr>
<td>4600 – 47FF</td>
<td>T00 – T511</td>
</tr>
</tbody>
</table>

Index (hex) | STOBER parameter range
---------|------------------------
4800 – 49FF | U00 – U511
4A00 – 4BFF | V00 – V511
4C00 – 4DFF | W00 – W511
4E00 – 4FFF | X00 – X511
5000 – 51FF | Y00 – Y511
5200 – 53FF | Z00 – Z511
5400 – 5FFF | Reserved

To calculate the index, the decimal line number of a parameter is added hexadecimal to the respective start index. The subindex corresponds to the element number of the parameter that is always 0 for normal parameters (only significant for array and record parameters).

**Example**
You want to reach parameter A154.2.

**Calculation**
Start index of parameter group A: 2000\text{hex}
Line of the parameter: 154_{\text{dez}} = 9A_{\text{hex}}
The index and subindex arise as follows:
Index: 2000\text{hex} + 9A_{\text{hex}} = 209A_{\text{hex}}
Subindex: 2
# Global presence

**STOBER subsidiaries**

**Technical offices**
for advice and marketing in Germany

**Global presence**
for advice and marketing in about 25 countries

**Service network**

**Germany**

**Service network international**

<table>
<thead>
<tr>
<th>Country</th>
<th>Address</th>
<th>Telephone</th>
<th>Email</th>
<th>Website</th>
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</thead>
<tbody>
<tr>
<td>USA</td>
<td>STOBER DRIVES INC. 1781 Downing Drive 41056 Maysville Fon +1 606 759 5090 <a href="mailto:sales@stober.com">sales@stober.com</a> <a href="http://www.stober.com">www.stober.com</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>STÖBER SCHWEIZ AG Ruggghözlì 2 5453 Remetschwil Fon +41 56 496 96 50 <a href="mailto:sales@stober.ch">sales@stober.ch</a> <a href="http://www.stober.ch">www.stober.ch</a></td>
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<td></td>
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