

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

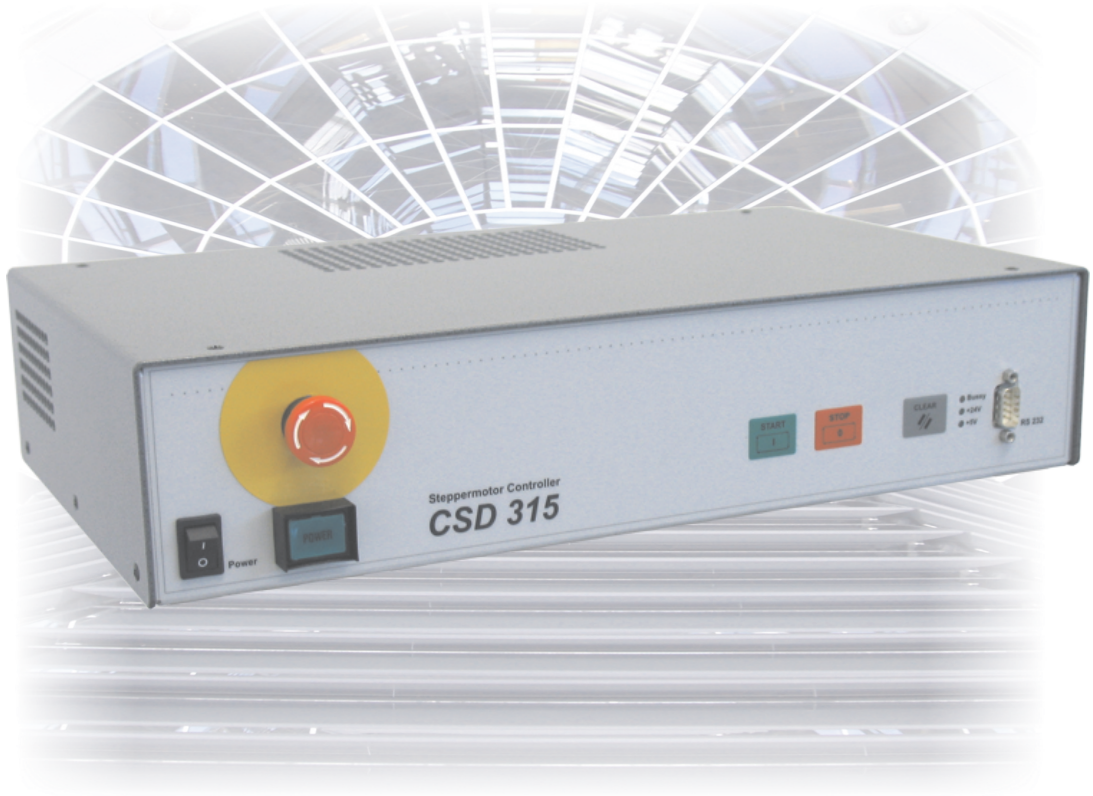
Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

3-Axes Stepper Control Unit

CSD 315
CSD 315-S



- *Low-cost stepper control unit to control up to three 2-phase stepper motors*
- *Linear interpolation of all three axis, circular interpolation of xy-, xz-, or zy-axes*
- *DNC Mode (on-line mode), CNC Mode (RAM memory 60kB)*
- *7x optically isolated input, 7x relay output*
- *1x relay output (AC 230V/max 3A)*
- *Bipolar power stages, 44V/ 3,5A (fullstep / halfstep mode)*
- *200VA primary switched power supply, wide range input 100VAC - 260VAC, PFC*
- *Desktop unit (WxDxH) 395 x 235 x 82mm*
- *According to EN 55011B, EN 50082-1, EN 50178*

Technical Documentation / Manual

Gie-Tec GmbH • An der Schlierbach 18 • D-36132 Eiterfeld • Tel.: 0049 6672 869794-30 • email: info@gie-tec.de

www.gie-tec.de

Safety instructions

- **The *CSD315* is for controlling 2 phase stepper motors only. The maximum motor current is 3,5 Amp. Other using of the control unit is not allowed.**
- **The equipment may only be operated in perfect technical condition. Faults must be remedied immediately.**
- **Children and untrained persons may not put the device into operation.**
- **Only authorized personell is allowed to wire and work with the CSD 315 into account the regulations of the electrical industry and accident prevention.**
- **Never use the control unit without connecting the protective conductor.**
- **The device may only be opened by the manufacturer or after consultation with our service department.**
- **Before demount the cover, the device must be disconnected from the power supply and the mains plug must be removed.**
- **Assembly and use of the equipment must be carried out in accordance to the standards of the declaration of conformity. The regulations and limit values, observed by the manufacturer do not protect against improper use of the equipment.**
- **Ambient temperature 0 to + 40° C**
- **Storage temperature -10° to + 60° C**
- **Do not expose the unit to high humidity, strong vibrations or explosive gases.**
- **Compliance with the EMC limit values requires a low-resistance equipotential bonding of the machine and controller**
- **Keep these operating instructions in a safe place and oblige every user to comply with them!**
- **Failure to follow these operating instructions can result in property damage, personal injury, and even death.**

Control switches CSD 315 / CSD 315-S



Main

The main switch is switching off the main supply (2 pole switch).

(only at *CSD 315-S*)



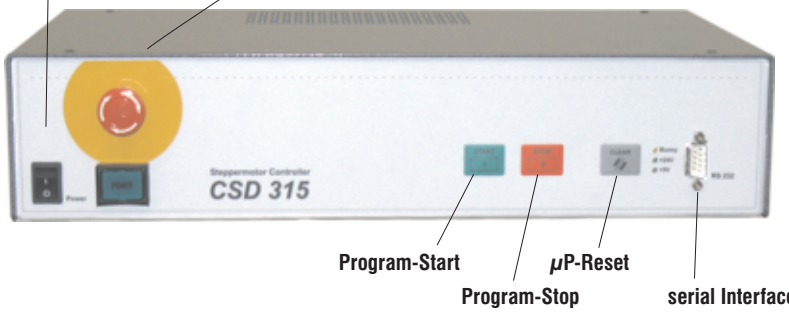
EMERGENCY



POWER

When EMERGENCY is pressed, the power supply of the stepper power stages are switched off. Further the AC-output relay is switched off.

To unlock the EMERGENCY, turn the button in the direction of the arrow.
The stepper power stages itself only becomes active again after pressing the POWER button and then the μP reset button (CLEAR).





This button starts the program sequence of the control system after a STOP command.

In memory mode (CNC mode), START is starting an NC program, stored in the program memory.

If the START button is pressed while the power supply of the control unit is being switched ON, the microcontroller starts a self-test routine.



This button interrupts the program run of the control by initiating a stop ramp.

By this, the movement of the stepper will be stopped slowly with a ramp. So the movement can be started again (e.g. with START) to reach the target point, without losing any step.



Reset function for the internal microcontroller.

If the CLEAR key is pressed while the stepper is active, the motor will be stopped abruptly. After the restart, a reference run generally has to be done.

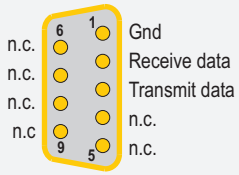
Serial interface RS 232

(9 pin D-Sub connector (male))

The serial interface is used for communication of the ***CSD 315.***
A shielded, 3-wire cable is required as connecting cable.
Data exchanging is using a special protocol.
Software handshake ensures error-free transfer of ASCII characters.
Transfer rates of 2400Bd, 4800Bd, 9600Bd or 19200Bd can be selected.

For connect the interface, please use only the special serial cable, which is part of delivery.

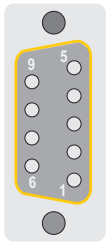
Part no: 392782



ATTENTION: The pin out is not according the standard!

Stepper output connector (X axis, Y axis, Z axis)

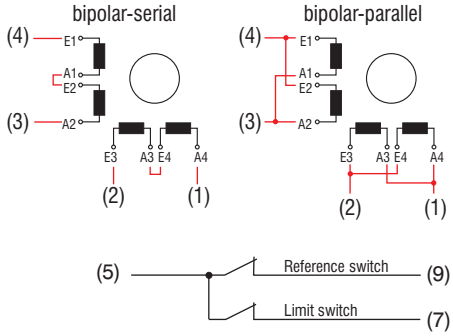
(9 pin D-Sub connector (female))



Reference switch
Motor brake GND
Limit switch
Motor brake + 24V

+24V/50mA
Stepper phase 1A
Stepper phase 1B
Stepper phase 2A
Stepper phase 2B

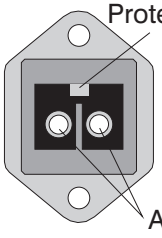
Excample: 2 phase stepper (8 wire cable)



AC Output

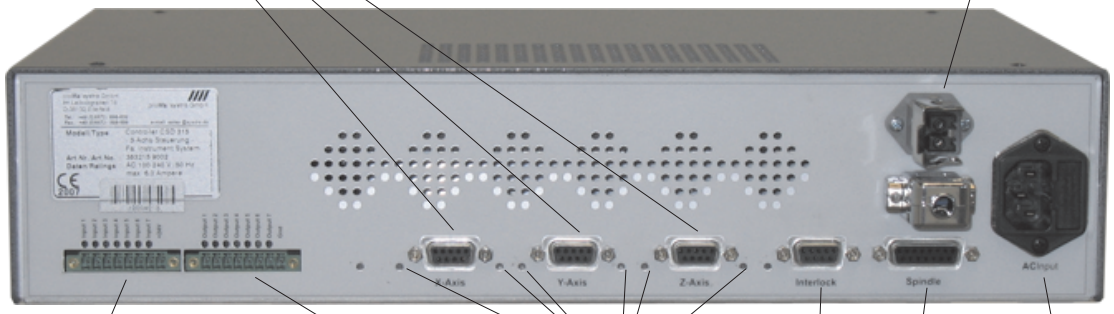
(IEC connector)

Relay output, AC 230V/3A



The fuse of this output is mounted inside the device.

5A high break down (HBD)



Control LED of reference switch

Interlock ***Spindle***
*(only at **CSD 315-S**)*

AC-Input
Fuse inside the device
5.0A HBD (5x20mm)

User inputs

(Phoenix, MSTB 10 pin)

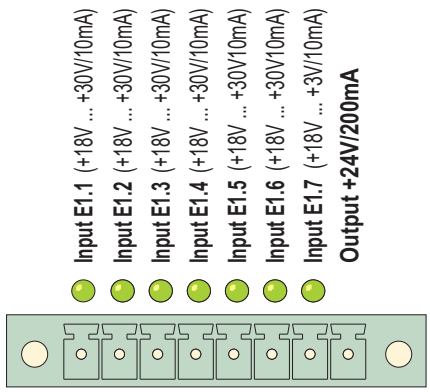
The inputs are optically isolated. For get the status of the input port, the micro controller read the storage address #65531.
The command structure looks like:

CNC mode on_port 65531,6=1,{target}

DNC mode @0b65531

The internal power supply deliver a +24V at Pin8). Maximun load of the +24V output is 200mA.

ATTENTION!



User I/O - outputs -

(Phoenix, MSTB 10pol.)

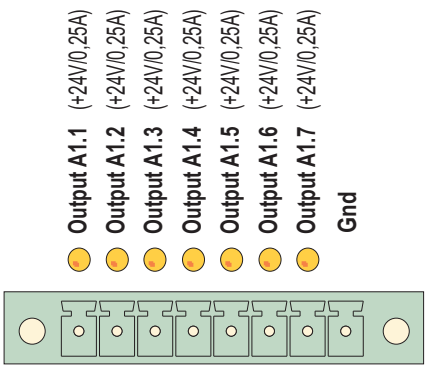
The relay output can be programmed bit-wise or byte-wise.
For this, the microcontroller is programming the address #65532.
The command structure looks like:

CNC mode: set_port 65532,4=1 (activates output 4)

DNC mode: @0B65532,255
@0B65532,2,1

The maximum output power of all relay output together is limited at 1,0A

ATTENTION!



EMERGENCY STOP

CSD 315

After switching on the ***CSD 315***, the controller goes into a standby mode. In this state, the microcontroller is active, but all stepper power stages are blocked.
This operating state also is assumed, when the EMERGENCY STOP switch is pressed.
After releasing the EMERGENCY STOP button, you can communicate with the microcontroller, but the power supply of the stepepr power stages and the relay outputs remain blocked.
The front button CLEAR is used to switch the microcontroller from standby mode to online mode. Now the output stages and relay outputs are enabled.
The controller is now fully functional.

CSD 315-S

Switching on the ***CSD 315-S*** by using the POWER switch, only the power supply is switched on. The microcontroller, the stepper power stages and the relay outputs are blocked.
This operating state is also assumed when the EMERGENCY STOP button is pressed.
After releasing the EMERGENCY STOP button (standby mode), you can communicate with the microcontroller, but the stepper power stages and the relay outputs remain blocked.

To switch from standby mode to online mode, press the front POWER button and then the CLEAR button.

By reading storage address # 65529, bit 7, you can record the operating status of the power output stage and process it in terms of programming.

Bit 2 = 0 -- Stepper power stages are blocked
Bit 2 = 1 -- Steppe power stages are active

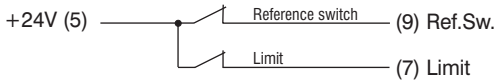
The stepper power stages of the CSD 315 are locked via a logic circuit only. As a result, the stepper motors remain energized even after an EMERGENCY STOP.
The EMERGENCY STOP of the CSD 315-S is switching off the power supply of the stepper output stages. Further the control signals (Clk, Dir) are disabling by the microcontroller.

ATTENTION!

Reference switch - input -

(9 pin D-Sub connector (female)

The microcontroller of the stepper controller CSD 315 is supervising one reference switch at every axis. The reference switch normally is mounted at the motor side of the linear axis . Optionally a limit switch (mounted at the opposite side of the linear axis) can be supervised.



The status of theswitches can be read:

DNC mode: @0b65529

Assignment:
Bit 3 - Reference switch X axis
Bit 4 - Limit switch X axis
Bit 5 - Reference switch Y axis
Bit 6 - Limit switch Y axis
Bit 7 - Reference switch Z axis
Bit 8 - Limit switch Z axis

For visualize the status of the reference switch, a LEDs on the back, next to each motor output connector is provided. These lights up when the respective signal input is correctly connected and receives a + 24V signal.
If a stepper motor output is not connected, the reference switch input must be bridged (connection pin 9 - pin 5).

Analog -Output -

The ***CSD 315-S*** stepper motor controller provides an analog voltage at the connector "Spindle" for speed control of frequency converters. This is the output of a 7-bit D/A converter that is programmed via address # 65528.

CNC mode: set_port 65528,255=255 (max. value)
set_port 65528,255=129 (min. value)

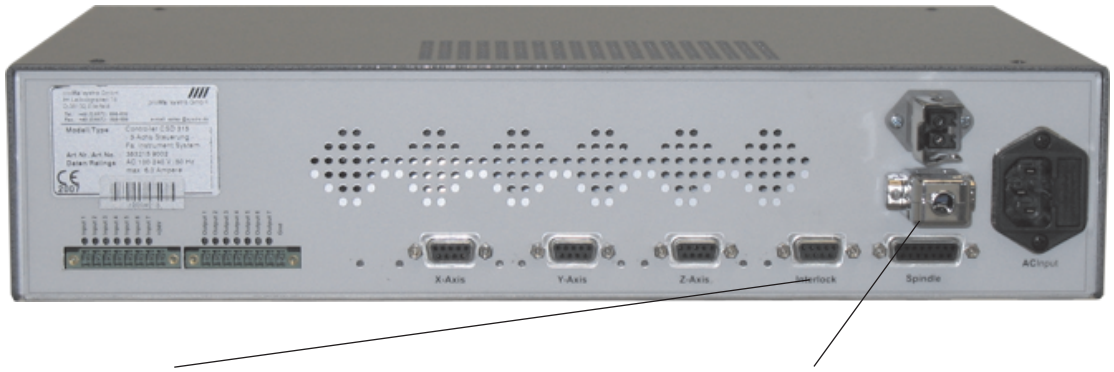
DNC mode: @0B65528,255,128

Control bit: Bit 1 to Bit 7 - value of the analog output
Bit 8 - Spindle motor ON

The output voltage range of the D/A converter is 0V ... + 10V.

Bit 8 of the address #65528 is controlling the Start/Stop of the connected frequency converter. At the same time the control bit is switching a power relay (rear side connector „AC-output")

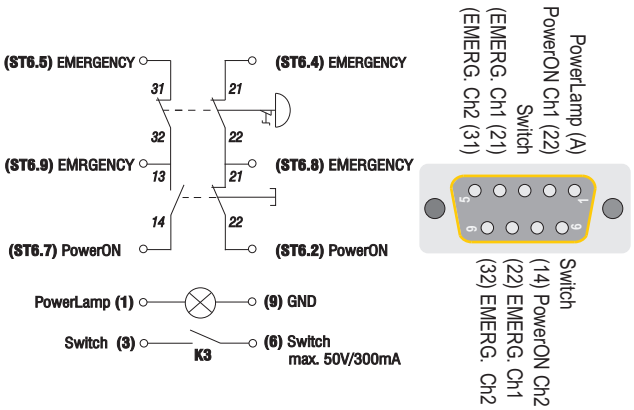
Bit 8 = 1 Spindle motor/ frequency converter = ON
Bit 8 = 0 Spindle motor/ frequency converter = OFF



Interlock (only *CDS 315-S*, (#383215 1650)

(9 pin D-Sub (female))

This connector is provided to connect external switches **EMERGENY-STOP** und **POWER**.



Please make sure: Every external switch must be a potential-free contact. That means, the switches don´t have contact to any external circuit.
The internal safety relay is supervising two independend channels of the EMEREGNCY STOPP
The output „Switch“ is closed when the safety relay is on and the power supply of the stepper amplifier is switched ON.

ACHTUNG!

Order information:
A switch box with EMERGENCY STOP and POWER switch is available.
Part no.:*148221 1000*

Locking (only *CDS 315-S*, (#383215 1650))

(9 pin D-Sub (female))

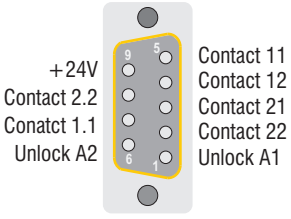
This connector is provided to connect a safety switches of an optionally machine cover.
In automatic mode the safety switch prevents, that the stepper motor are in operation while the machine housing is open.
A safety switch with lock also prevents access to the work area. The hood only can be opened by press a “COVER“ switch (unlock the guard lock).
An additional OPERATING MODE switch (key switch) enables a switchover from the "Automatic" operating mode to the "Setup mode".
In operating mode „Setup“, the machine housing can be opened without the stepper motors are switched OFF.

ATTENTION!

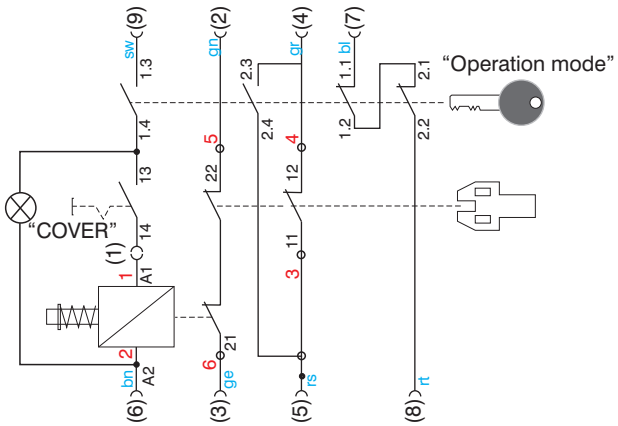
OPERATING MODE
Opening the machine housing while the stepper motor and the spindle motor are in operation increases the risk potential. This mode of operation is therefore only permitted if additional precautionary measures are taken into account.

Locking

(9 pin D-Sub (female))



Wiring diagram: Safety switch with lock (AZM170), “OPERATION MODE” switch and “COVER” switch

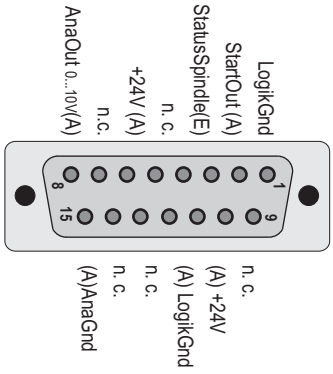




Spindle

(15 pin D-Sub connector (female))

This output is provided for controlling an external frequency converter for a spindle motor drive.
Currently this output connector will not be supported.



(1) LogikGnd
GND for all logic input and output signals.

(2) StartOut
Control signal for activate the spindle motor (aktiv +24V).
The output is controlled by Bit 8 of the address 65528.

Example: **@07,B,65528,255,128**

(3) StatusSpindle
This input indicates the status of the spindle motor (for example Motor-Stop).
To supervise the input please read out address ,65529 (Bit 1) #

Example: **@07b65529**

(5) +24V
Power supply output for logic signals +24V/max. 100mA.

(8) AnaOut
The analog output (0V ... +10V) is provided for controlling the speed of the spindle motor. The resolution is 7Bit.

Programming the output:
Example: **@07B65528,255,129** (lowest spindle speed)
@07B65528,255,255 (highest spindle speed)

(8) AnaOut

Address #65528
Bit 1 to Bit 7 - 7-Bit D/A converter (analog output)
Bit 8 =1 - Spindle motor ON
Bit 8 =0 - Spindle motor OFF

(10) +24V
Power supply output +24V, max. load 10mA.

(11) LogikGnd
GND for power output (Pin 10).

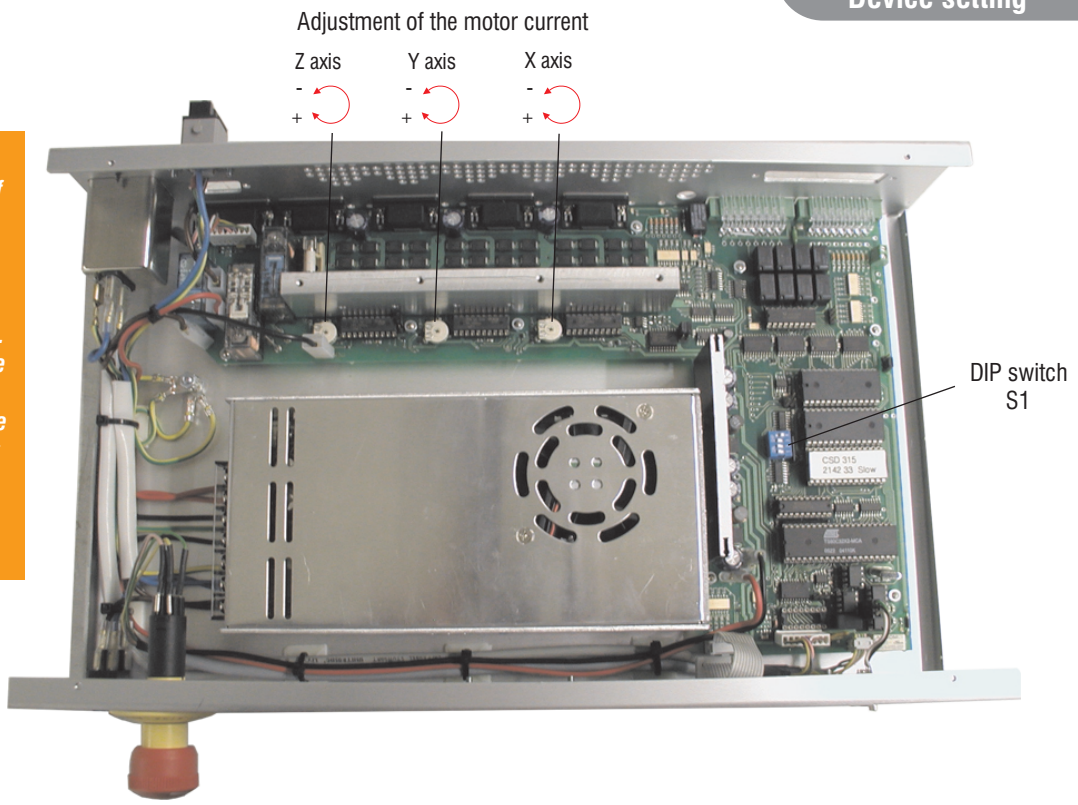
(15) AnaGnd
GND potential only for analog output (8).

n. c. Do not connect this pin!

ATTENTION!

DANGER!

Safety note:
Before you demount the cover of the CSD 315, you must disconnect the device from the power supply.
This is done by removing the mains cable from the IEC socket. Failure to observe this protective measure can result in serious injuries and electric shock, since not all parts of the power supply are covered!



Adjustment: Baud Rate
Adjustment: Acceleration

Baud Rate of the serial communication port and acceleration ramp of the stepper motor are adjusted by DIP switch S1.

Baud Rate

The speed of the communication of the serial port will be determined by switch 3 and 4 of the DIP switch S1



Baud Rate 19200 Bd



Baud Rrate 9600 Bd
(set at delivery)



Baud Rate 4800 Bd



Baud Rate 2400 Bd

Acceleration

The acceleration will be determined by switch 1 and 2 of the DIP switch S1.
The value is is showing the increasing the step rate per time unit 1ms.

Acceleration 100 Hz/ms



Acceleration 75 Hz/ms



Acceleration 50 Hz/ms

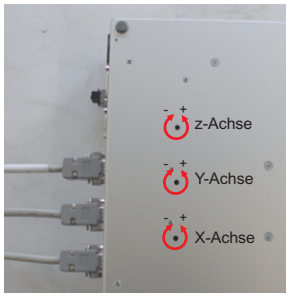


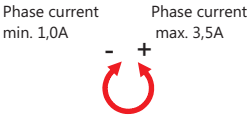
Acceleration 25 Hz/ms
(set at delivery)



Motor current (Phase current)

The stepper control units ***CSD 315, CSD 315-S*** supports an settable motor current of 1,0A up to 3,5A.
When the device is delivered, the phase current is set to approx. 2.0A.
The phase current is individually adjusted using three potentiometers. These can be reached through holes in the controller's base plate and with the help of an adjustment slotted screwdriver (0.4x2.5).





View: Bottom side CSD 315x

ACHTUNG!

Befor setting the phase current, you must take account to the current specifications of the adapted stepper motor. An impermissibly high phase current can destroy the motor.

One possible procedure for setting the actually required phase current is, to change the setting of the potentiometer while the motor is running until the motor turns with a uniform “buzz”.
The motor should not “hook” or even stop when changing direction.
A phase current that is too low leads to the motor movement being aborted, a current that is set too high leads to a “scratching sound” of the motor and frequently to resonance phenomena.

Commands DNC mode

In DNC mode, the commands and data sets transferred from a control computer are evaluated and executed directly by the integrated microcontroller. This requires an initialization at the beginning of data communication. It consists of a data opening character @, the **0** (standard) and the number of axes to be traversed (e.g. 7 = x, y, z axis).
Then the instructions of the program sequence are transmitted individually to the microcontroller. He executes the instruction directly.
Corresponding ASCII characters are sent back to the control computer via the serial interface to confirm data communication or to report errors that have occurred (software handshake).

Number of axes	Initializing the microcontroller by transfer the number of axis which be controlled.	**@07** X, Y and Z axis are aktive **@01** X axis ist aktive only
Speed of move to reference switch	This command determine the speed of the linear axis while doing reference movement. The information is needed for every axis separately.	**@0d 1000,3000,2000** Ref. speed X axis = 1000steps/sec Ref. speed Y axis = 3000steps/sec Ref. speed Z axis = 2000steps/sec
2,5D / 3D linear interpolation	This command determine the interplotaion mode either 2,5D or 3D interpolation.	**@0z1** **3-D Interpolation active** **@0z0** 2.5-D Interpolation active
Level of interpolation	This command define the level of interpolation for circular interpolation. The X-Y level is specified as the default level	**@0e0** **X-Y** Interpolation level **@0e1** X-Z Interpolation level **@0e2** Y-Z Interpolation level
Reference move	The microcontroller is moving all defined linear axis to the limit switch. If all axes are defined, the sequence is: Z - Y - X axis	**@0R7** X, Y and Z axis are moving to the machine-zero **@0R3** X, Y axis are moving to the machine-zero
Set Zero	The control unit set the virtuell zero-point of the machine at the current position. Thus all absolute positioning commands are based at this zero-point.	**@0n1** X position is set as zero-point **@0n3** X and Y position are set as zero-point **@0n7** X, Y und Z position are set as zero-point
Motion relative	The control unit is moving all defined axes by the programmed distance.The axis are positioned simultaneously that means, all axes starts and ends the movement at the same time	**@0A 30,800,100,900,40,90,-40,90** X axis: 30 steps, max. speed 800 Hz (2 rev./sec) Y axis: 100 steps, max. speed 900 Hz Z axis: 40 steps, max. 90 Hz Z axis: -40 steps, max. speed 90 Hz
Motion absolute	The control unit is moving all defined axes to the programmed position.The axis are positioned simultaneously that means, all axes starts and ends the movement at the same time	**@0M 3000,800,10000,900,400,900,0,0** X axis: Movement to absolute position 3000 steps Y axis: Movement to absolute position 10000 steps Z-axis: Movement to absolute position 400 steps
Free usable inputs	The control unit provides 7 optically isolated inputs. The status of the input port can be read by address #65531 (Bit 1 to Bit 7). Note: The input byte can not be read while movement of stepper motors.	**@0b65531** Read status of input port *Input 1* The microcontroller send the software handshake "0" and then the status as Hex data **0,01** (**01hex** = 0000 0001 bin) input 1 is set **0,16** (**16hex** = 0001 0110 bin) input 2, 3 and 5 are set
Free usable outputs	The control unit provides 7 relay outputs. Programming the outputs is done by write at address # 65532 (Bit1 to Bit7). **Note:** The outputs can not be programmed while movement of the stepper motors.	**@0B65532,128,9** (0000 1001 bin) set Output 4 and Output 1 (byte-wise) **@0B65532,128,3** (0000 0011 bin) clear Output 4, set Output 1 and Output 2 **@0B65532,8,1** set Output 8 (bit-wise) **@0B65532,8,0** clear Output 8 (bit-wise)
Direction of circ. interpolation	This command determines the direction of movement of the positioning axes during circular interpolation.	**@0f-1** The movement is done counterclockwise (ccw) **@0f0** The movement is done clockwise (cw)
Circular interpolation	After the direction of circular interpolation is defined, now with this command, the control receives information about the arc length of the circle segment, the traversing speed, the starting points of the X and Y axis as well as the circular quadrant in which the movement should start. The complete detailed description can be found in the documentation of the operating system 5.0	**@y1600,500,200,0,400,1,-1** 1600 - arc length 1600 steps 500 - speed 1500 steps/sec 200 - interpolation parameter 0 - start position of X axis 400 - start position of Y axis 1 - start direction of X axis -1 - start direction of Y axis

ProgrammStart	This command is starting a NC programm, which is stored in the RAM memory. Further this command restart a NC programm, which was stopped before.	**@0s**
Trace	The microcontroller executes the commands stored in the data memory individually, one after the other. The next command get started by a character on the serial interface	**@0t**
Self-test routine	The self-test includes all functions of the ***CSD315***. The microcontroller checks the available memory area, send some control signals to the motor stages to let the motors move. After this he sends ASCII character sets via the serial interface.	**@0?**
Clear date storage	This command delete a NC programm stored in the data memory (RAM).	**@0k**
CNC-Programm	The micorcontroller will be set in CNC mode. After, all commands will be stored in the data memory (approx.: 60kB).	**@0i**

Error messages DNC

0	Handshake - No error occurred. The transferred command was executed. The next command can be sent.
1	- The microcontroller received a number that could not be interpreted correctly. - The transferred data value is outside the permissible range or contains impermissible characters
2	- While moving the positioning axis, one of the limit switches (Reference switch) of the axis was approached and thus opened. - The reference moving of a positioning axis was not or carried out correctly. Attention: After an error 2 (error „Limit switch“) the microcontroller has to be reinitialized (@07) and a reference run has to be carried out (@0r7).
3	- A command was sent to the microcontroller that contains information about an undefined axis. For example: Position values for a y-axis was sent, although only the x-axis is initialized.
4	- The controller received positioning data or commands without the number of axes being defined before.
5	- Syntax Error! A command was not transmitted correctly, does not exist or cannot be processed by this control.
6	- Is not generated by this control
7	- The microcontroller has received more or less parameters for the command than required. Please check then number of parameters in relation to the initialized number of axes.
8	- Is not generated by this control
9	- General control error. Please contact our service department
A	- Is not generated by this control
B	- Is not generated by this control
C	- Is not generated by this control
D	- The permissible limits for the speed specifications were not observed 0> speed <10000
E	- Is not generated by this control
F	- The user pressed the STOP button on the control. The current travel movement was thus stopped by initiating a braking ramp. The execution of the command can be resumed with the START button or the start command @0s.
G	- The control was given a start command without any movement remaining in the memory (e.g. through a previously issued stop command).
S	- User start; After an interrupted movement (stop command, STOP button), the user pressed the START button and the interrupted movement was continued

SwitchBox panel
(Art. Nr. 148221 1000)

The SwitchBox control panel consists of a robust aluminum profile housing with a handle.
The housing has the dimensions L=125, W=74, H=42mm and has the command devices EMERGENCY STOP and POWER. The connection cable to the control unit is 3,0m.
The EMERGENCY STOP control panel is pin compatibel for connection to the “Interlock” connector of the ***CSD315***

Motor connection cable

The multi-shielded and twisted-pair motor connection cables are used to connect the motor outputs of the ***CSD 315*** to the stepper motors within the positioning units.
Following motr connection cables are available:

Part no.:	Connector Side A	Connector Side B	Length of cable
392100	9 pin D-Sub. (male)	Amphenol C16-3 (female)	L=3m
392780 0301	9 pin D-Sub (male)	9 pin D-Sub (female)	L=3m
392780 0500	9 pin D-Sub (male)	9 pin D-Sub (female)	L=5m

1.5 Conformity Declaration

CE

EC Conformity Declaration

in accordance to Machinery Directive 2006/42/EU, Annex II A

Manufacturer:

Gie-Tec GmbH
An der Schlierbach 18
36132 Eiterfeld

Product designation:

CSD 315
Part no.: 383215 1650

CSD 315-S
Part no.: 383215 9005

conforms with the requirements of the directive(s)- including any amendments valid at the time of declaration

- **Low Voltage Directive** (2006/95/EG)
- **EMC Directive** (2004/108/EG)

Quality Systeme:

ISO 9001:2015

The following harmonized standards were used:

DIN EN 60204-1:2014	Safety of machinery - Electrical equipment of machine - Part1: General requirements
DIN EN 55011:2016	Radiofrequency disturbance - characteristics
IEC 61000-6-1	Electromagnetic compatibility

Eiterfeld, den 28.02.2020
Place, Date

Rainer Giebel, Managing Director, ***Gie-Tec*** GmbH

www.gie-tec.de

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP