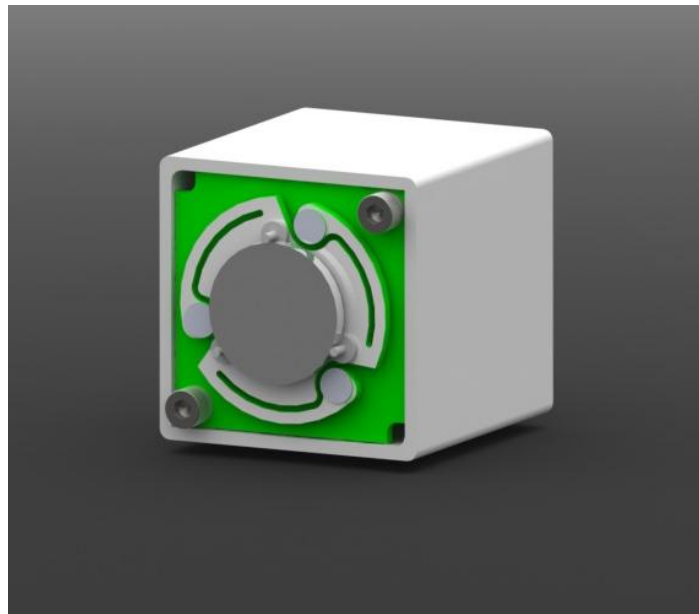


NEW : CYCLOPS™ CYS-A20

Fully Integrated Laser Beam Deflection Head

Manual

The CYS-A20 is a fully integrated laser beam deflection head designed for precision and ease of use. It combines actuator, driver electronics, and control logic in a compact unit, eliminating the need for external steering electronics.



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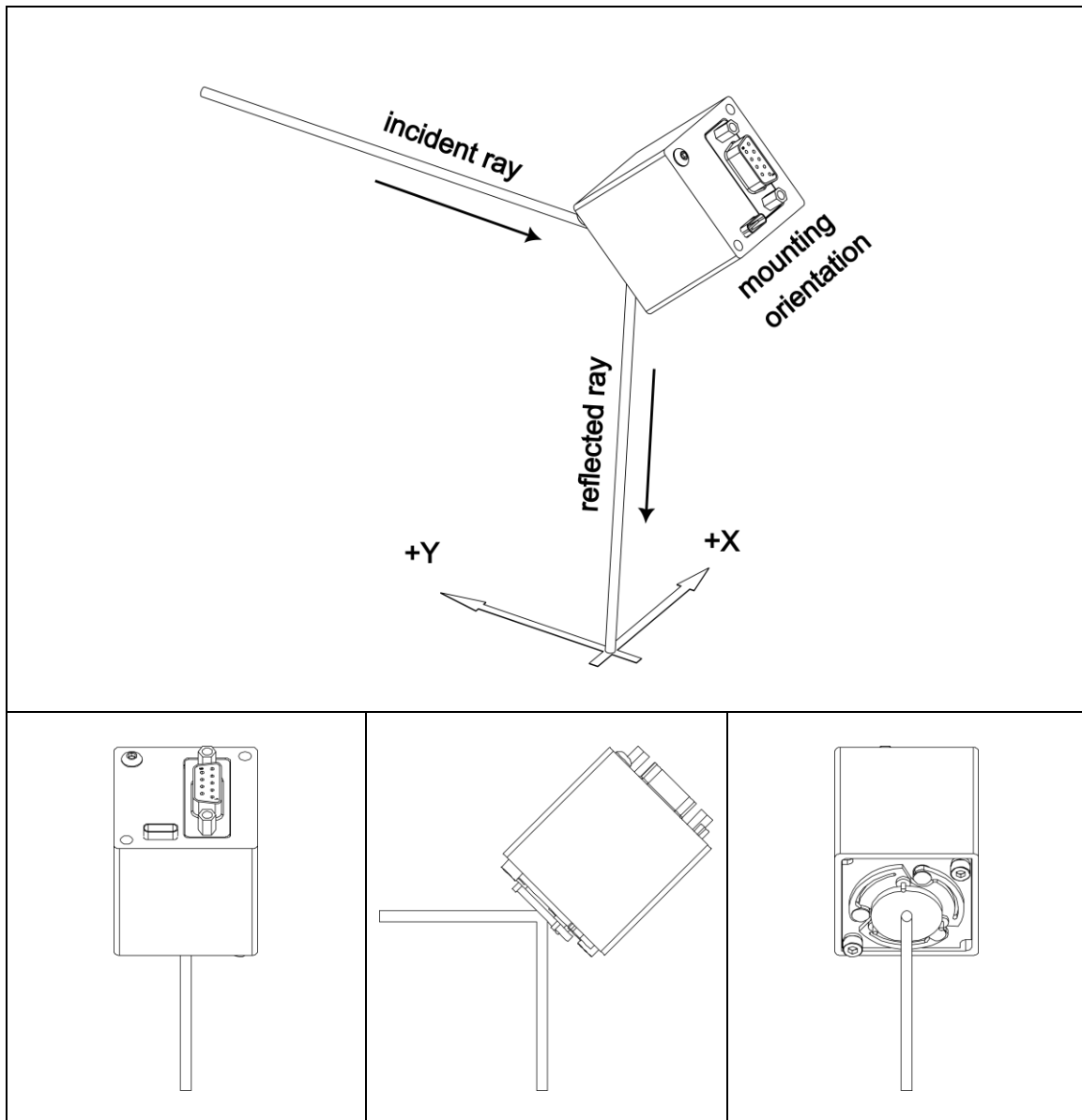
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1. Features of CYS-A20

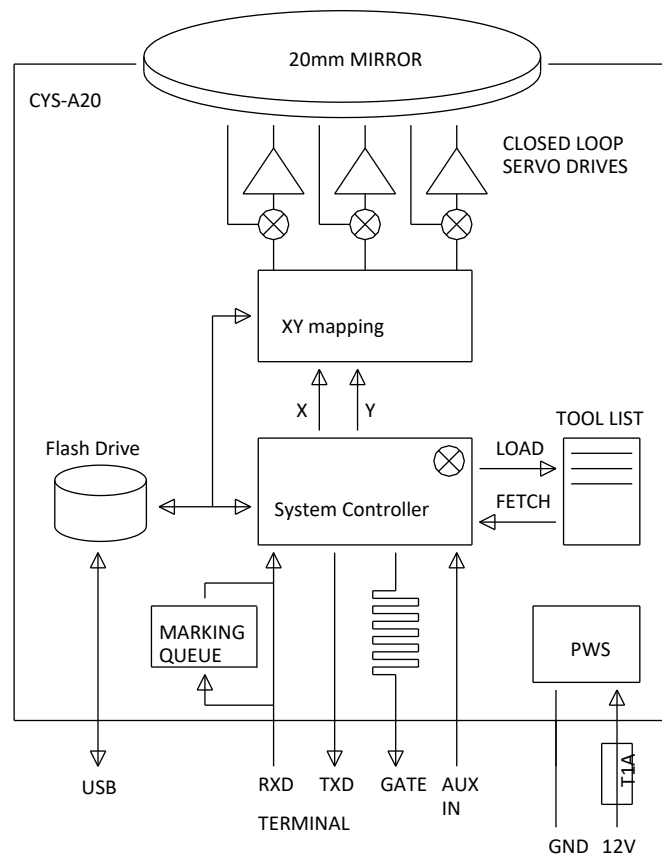
- Compact, high-speed, and accurate 2D single mirror optical beam deflection tool
- Fully integrated system, no additional external steering hardware required!
- Setpoint steering unit supporting speed-controlled linear interpolation for smooth motion
- Full-field calibration using setpoint mapping tables
- Synchronised gate output with adjustable delay
- Standard 20 mm round mirror mount
- Simple control via standard OS tools (Explorer, HyperTerminal...)
- Acts as a flash drive interface for plug-and-play configuration
- DOS-style UART CLI (Command-Line Interface)
- Easy calibration and tuning
- Truly embraces environment: typical power consumption less than 3 Watt!

2. The hardware

2.1.Setup



2.2. Internal block diagram



3. Hello Word Application

step 1: connect TXD and RXD pins and start your terminal app (UART settings 115200,n,1)

step 2: connect 12V power supply, boot message should be visible on terminal.

step 3: direct a laser pointer on the mirror

step 4: type "LOAD WOBBLE(10000,50,0,10000,75,90)<r><n>" to load a wobble tool

step 5: type "RUN<r><n>" to start actuator

step 6: type "F1<r>" to fetch loaded tool

step 7: type "A30<r><n>" to rotate

step 8: be amazed ;)

4. Flash Drive Mode (LED orange)

The CYS-A20 is designed to be used without dedicated software. When USB is connected, the device presents itself as a flash drive. Any browser can be used to manage configuration data. The drive should be FAT16 formatted and all files stored in root directory.

When shipped the flash contains following files:

"CFG.TXT": a json formatted file comprising settings for the serial port and the gates delay line. At shipment the delay is set to 5000 µsec. Baudrate is set to 115200 bits/sec. The serial connection uses no parity and single stop bit.

```
{  
  "UART": "115200,n,1",  
  "DELAY": 5000  
}  
<EOF>
```

"SQUARE.TXT": a text file comprising marking command to mark a full field square (ref. Run mode)

```
T50000L00000000  
T50000LFFFF0000  
T50000LFFFFFFFFF  
T50000L0000FFFF  
#  
<EOF>
```

"CAL.TXT" : text file comprising an empty mapping table (ref. Mapping point editor). Mapping data is stored in offset binary HEX code. So, the centre position is presented by 80008000.

```
0000FFFF 8000FFFF FFFFFFFF  
00008000 80008000 FFFF8000  
00000000 80000000 FFFF0000  
<EOF>
```

5. Command Line Interface Mode (LED red)

When powered and USB-C disconnected, the system boots in CLI mode polling the serial connection for commands to execute. Commands send to the device must be ascii coded and terminated by a return and newline (<r><n>) sequence. All characters received are upper cased and echoed back to the terminal.

5.1.Supported Commands

"DIR<r><n>" : lists the files available in the root directory of the flash disk.

"TYPE filename<r><n>" : copies the content of "filename" to the serial port.

"VER<r><n>" : copies the supplier ID and bios version string to the serial port

"PATCH<r><n>" : updates the devices bios with the data stored in file BIOS.BIN.

"RESET<r><n>" : resets the device

"RUN<r><n>" : starts the motor and coordinate streaming interface

"CALEDIT<r><n>" : starts the motor and mapping point editor.

"LOAD parameter<r><n>" : loads an image in the tool memory.

6. Run mode (LED green)

When the "RUN" command is received, the system replies with "A" and goes into run mode. The serial connection is now used to exchange scan commands. Commands in this mode do not need separators and may be concatenated. Commands can be divided in marking commands ('L','M','T') and status commands ('R','O','Q','A','X'). Additional fetch commands ('F','#') allow the use of marking tools.

6.1. Marking commands

"LXXXXYYYY": Line command

"MXXXXYYYY": Move command

Switches on/off (line/move) the gate signal and moves the mirror from current position towards target. XXXX and YYYY represent X and Y coordinates in offset binary HEX code. An "M80008000" command will move the mirror to the centre position. Command length is fixed at 9 bytes comprising the header 'L' or 'M' followed by the coordinates each presented by 4 characters.

"T<period>": Time command

This command sets the execution time (period) in μsec for succeeding line and move commands. Because the command length in characters depends on parameter "value" it is terminated by first nonnumeric character.

Example: marking a line in the centre

```
"M70008000T10000L90008000T5000L70008000M80008000"
String transmitted to the device comprises 6 commands:
"M70008000" moves the mirror (gate off) to the start of the line
"T10000" sets the execution time to 10000  $\mu\text{sec}$ 
"L90008000" lasers a line on the X axis with length 8192 bits in 10000  $\mu\text{sec}$  (819200 bit/s)
"T5000" sets the execution time to 5000  $\mu\text{sec}$ 
"L70008000" lasers the same line in opposite direction, 8192 bits in 5000  $\mu\text{sec}$  (1638400 bit/s)
"M80008000" switches of the gate and moves the mirror to the centre.
```

6.2.Status commands

"A": Abort command

This command aborts all commands, switches of the gate and puts the mirror in the centre position.

"X": Exit command

This command switches off the motor and puts the system back in CLI mode.

"R<angle><r>": Rotate command

After receiving the <angle> terminated by a <r>, all Line and Move coordinates are rotated. The parameter angle designates the CCW rotation in degrees. It can be any integer value between 0 and 359 degrees. A running tool can be rotated on the fly ,around it's centre point using this command.

"OXXXXYYYY": Offset command

After receiving, all coordinate values will be shifted. XXXX and YYYY represent X and Y offset values (fixed 4 digits, HEX coded, offset binary). A running tool can be shifted on the fly using this command.

"Q": query command

The device uses a 256 sized FIFO to queue Line and Move commands. To prevent overflow the client can use the <Q> command to query the status.

The systems replies "Q" with:

"b" busy: the queue has 128 line and move commands and should be considered as full
"r" running: the queue has at least 128 free places to append line and move commands
"i" idle: the queue is empty and last command is fully processed

6.3.Fetch commands

"F<index><r>": Fetch command

Marking commands can be preloaded as Tools in a 256 Kbyte tool list. Tools are images that are loaded using the CLI function LOAD prior to invoking RUN. After receiving the <index> terminated by a <r> the controller starts fetching commands from the list. During this execution the system still parses and executes serial commands allowing on the fly rotating (rotate command) and shifting (offset command). However, combining a running tool with marking commands (line, move) will lead to unpredictable results.

"#" : Repeat command

Marking commands stored in a tool can be repeated indefinitely by appending this command. The system is shipped with an example text file, "SQUARE.TXT", illustrating the use of this function.

7. LOAD-function

Before files stored on flash can be used for marking, they must be loaded into the tool list. The function LOAD replies the number of bytes loaded together with the index of the first byte. In run mode the tool can be called using the fetch command with the returned index as parameter. Every time the system exits the run mode (exit command) the tool list gets cleared.

Besides just loading existing text files, the device can also generate wobble style tools.

LOAD WOBBLE(AmplX,FreqX,PhaseX,AmplY,FreqY,PhaseY)<r><n>

The function generates a tool that simulates two harmonic oscillators. One for the X axis and one for Y. After starting, the Lissajous style tool will run forever. Using the rotate and offset functions the wobble movement can be rotated and shifted on the fly over the entire marking field.

AmplX/Y: X/Y amplitude harmonic oscillation in bits

FreqX/Y: X/Y frequency harmonic oscillation in Hz

PhaseX/Y: X/Y start angle harmonic oscillation in degrees (0...359)

8. Mapping Point Editor (LED Green)

The system uses a coordinate mapping system to compensate image distortion and define axis orientation. The CLI function CALEDIT provides an easy way to edit this mapping. When successfully invoked, the system replies with "A<r><n>" and switches on the gate. The function CALEDIT only works when the file "CAL.TXT" is available on the flash drive. Designed to be used with a simple terminal, the use of arrow keys and the return keys is all one needs during editing.

At start, the device is in mapping point selection mode. In this mode the arrow keys allow the selection of the mapping point. The system uses a 3 by 3 mapping scheme. Nine points can be selected. The selection is shown by both the laser (gate is switched on) and a serial message comprising 3 backspaces and a character 'p' followed by X and Y index ('0','1','2'). The leading backspaces facilitate the use of a standard terminal. Pressing the enter key puts the system into mapping point edit mode. The arrow keys are now used to move the point towards the desired location. The system goes back in mapping point selection mode by pressing the return key again.

"<ESC>[A": arrow up

"<ESC>[B": arrow down

"<ESC>[C": arrow right

"<ESC>[D": arrow left

"<r>": return to switch between mapping point selection and editing

"S": Save command

This command exits the mapping point editor and updates the file CAL.TXT.

"X": Exit command

This command exits the mapping point editor without updating the file CAL.TXT.

9. Pin Assignments

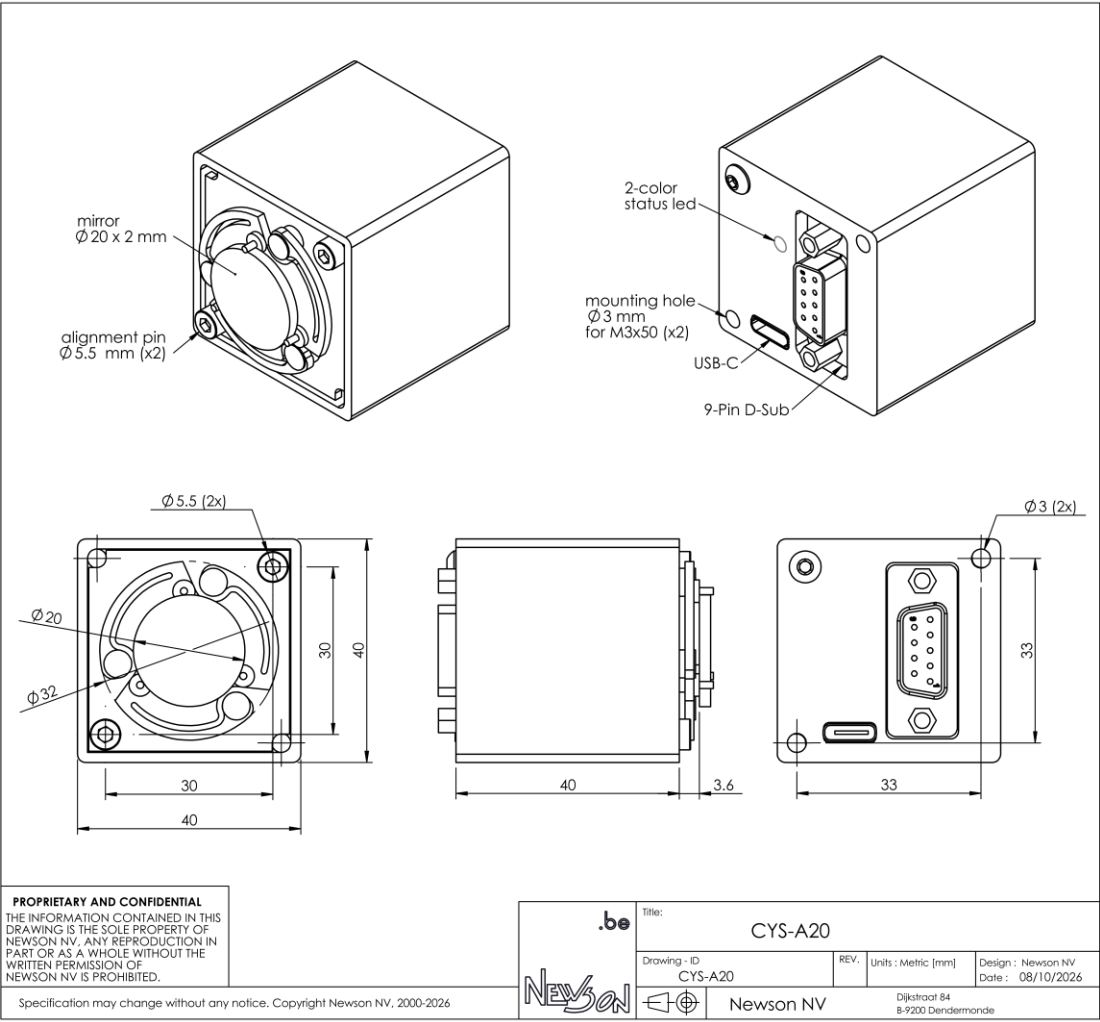
9pin SUB-D socket connector pin assignment

Pin #	Pin description
Pin 1	0V
Pin 2	do not connect
Pin 3	Gate output (3V TTL logic)
Pin 4	UART TXD output (3V TTL logic, pin is high when UART is idle)
Pin 5	0V power supply input
Pin 6	do not connect
Pin 7	Aux 3V input
Pin 8	UART RXD input (3V TTL logic)
Pin 9	12V +/-10% power supply input, Max current 1A

10.LED Indicator

Colour	Status
Orange	Flash Drive Mode
Red	Terminal Mode
Green	Deflector Running (amplifiers On)
Off	Deflector Running (amplifiers Off)

11.Dimensions



12. Unpack

The CYA-S20 is supplied with a mirror protection cover secured by two M3 × 50 screws. Loosen the screws alternately to remove the protection cover.

