# ZG8150

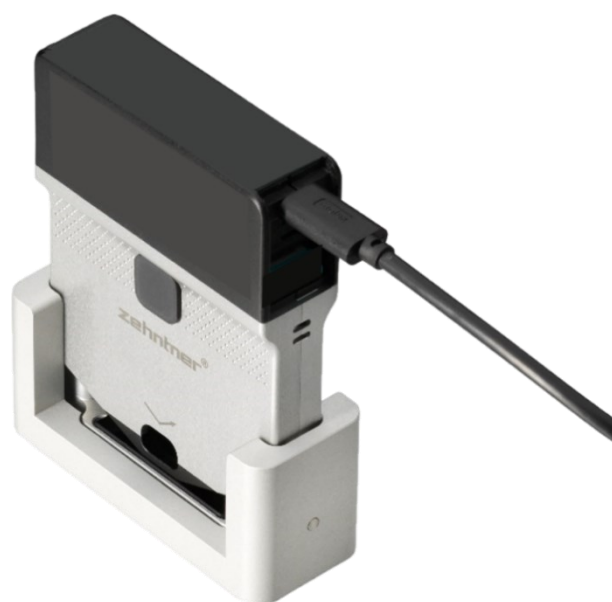## Inline Glossmeter Technical Manual

# Document Information

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| | | - | Initial document |
| | | **SGIA** | |
| | | - | Add drawings |
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| | | - | New formatting and text revision |
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| | | - | Corrections and final formatting |

# Content

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The features described in this instruction manual represent the complete technology of this instrument. These features are either included in the standard delivery or available as options at additional costs.

Illustrations, descriptions as well as the technical specifications conform to the instruction manual at hand at the time of publishing or printing. However, Proceq SA policy is one of continuous product development. All changes resulting from technical progress, modified construction or similar are reserved without obligation for Proceq to update.

Some of the images shown in this instruction manual are of a pre-production model and/or are computer generated; therefore the design/features on the final version of this instrument may differ in various aspects.

The instruction manual has been drafted with the utmost care. Nevertheless, errors cannot be entirely excluded. The manufacturer will not be liable for errors in this instruction manual or for damages resulting from any errors.

The manufacturer will be grateful at any time for suggestions, proposals for improvement and references to errors.

# 1 Introduction

The ZG8150 is a glossmeter for use in a production test system. With a dedicated cable it can be connected to a USB or RS232 interface on the host (e.g. PC).  For that a dedicated cable is used and the device has to be configured accordingly.

## 1.1 Scope of this document

This document is an instruction manual for the ZG8150 Inline Glossmeter.
It describes in technical details, the mounting and explains the connection setup, the protocol format, the command set and their parameters, the answer-strings of the device as well as possible error reports.

# 2   Mounting of the device

To integrate the ZG8150 into a production line, the device can be mounted to fixtures or robotic arms.

To facilitate the mounting, the device has a threaded hole on the top and two mounting guide holes. Follow the steps

- Remove cap for mounting
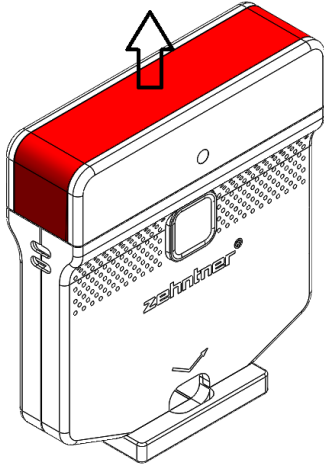
Cap can be pierced with a drill and put back on
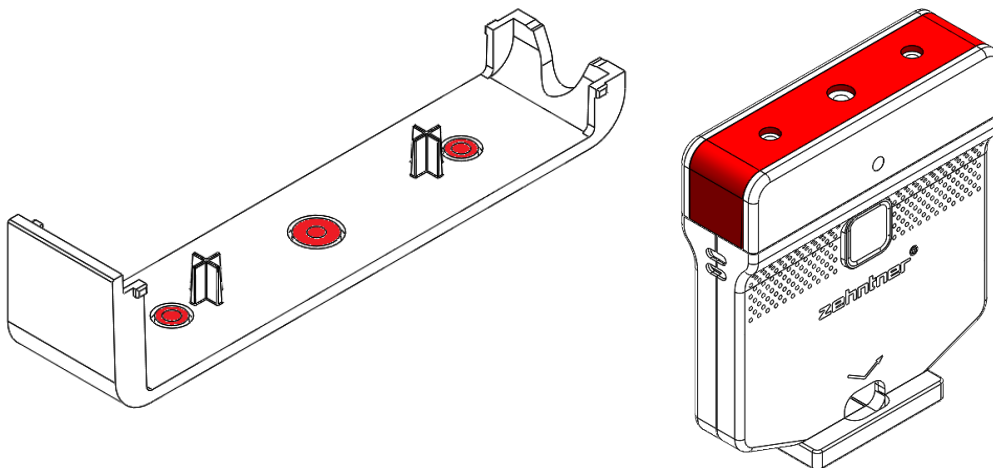
Drill diameter: 4.5mm + 6mm

# 3   Dimensional Drawings

**device with nose**

**device without nose**

measuring point

measuring point

A-A (1 : 1)
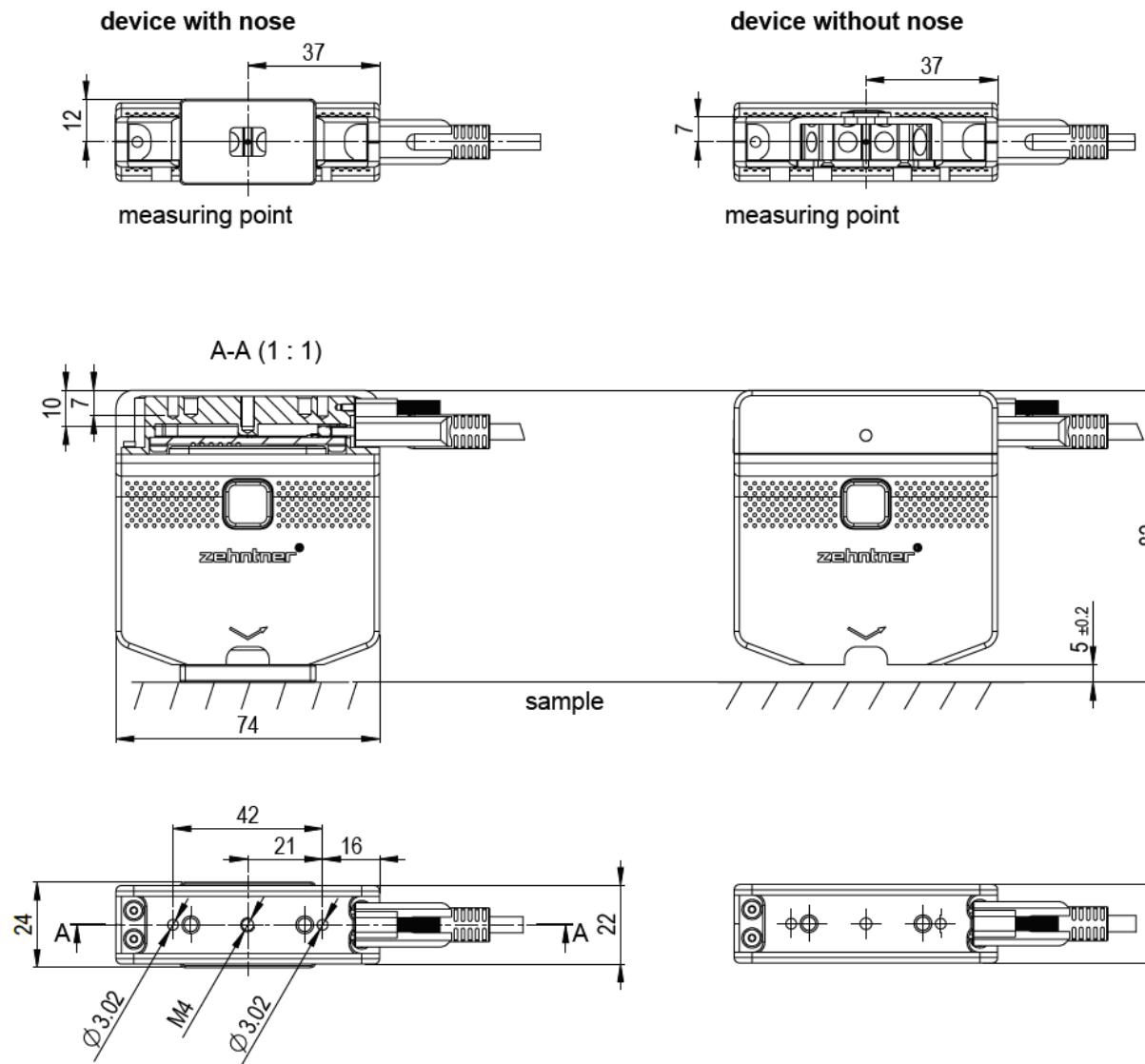
sample

## 3.1 Mounting Example – with custom mounting plate

The following example shows how the ZG8150 can be mounted on a custom made mounting plate, which allows versatile mounting options to robot arms or fixtures.

**NOTE:**
This mounting plate is for reference purposes to make your integration easier and not available as a product.

### device with mounting plate
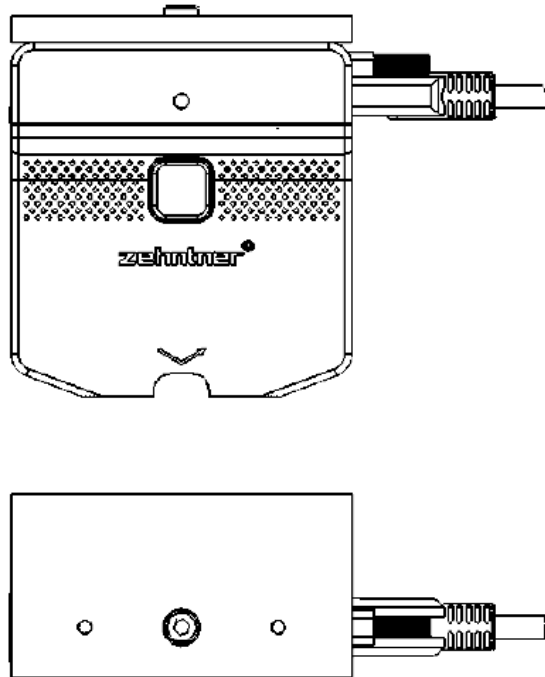


### mounting plate (not available)
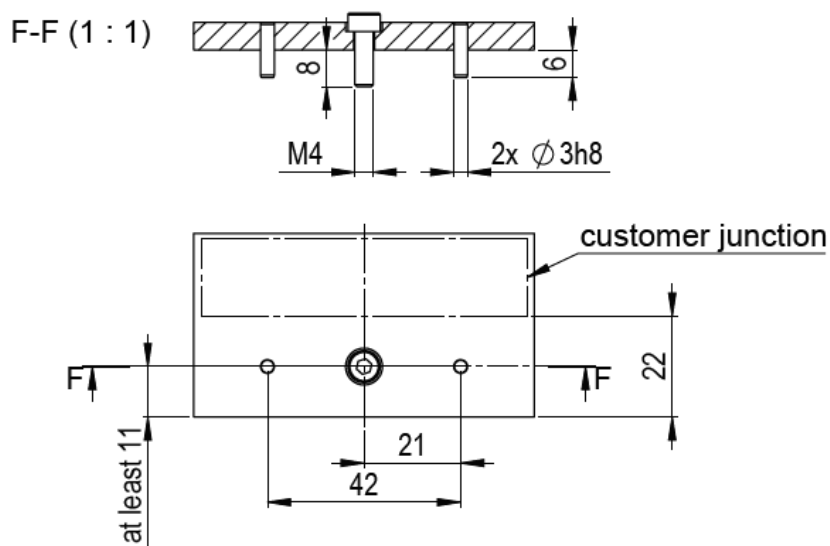
## 3.2 Mounting Tolerances

In order to guarantee the specified performance, the device shall be mounted to fulfill the following mounting tolerances.
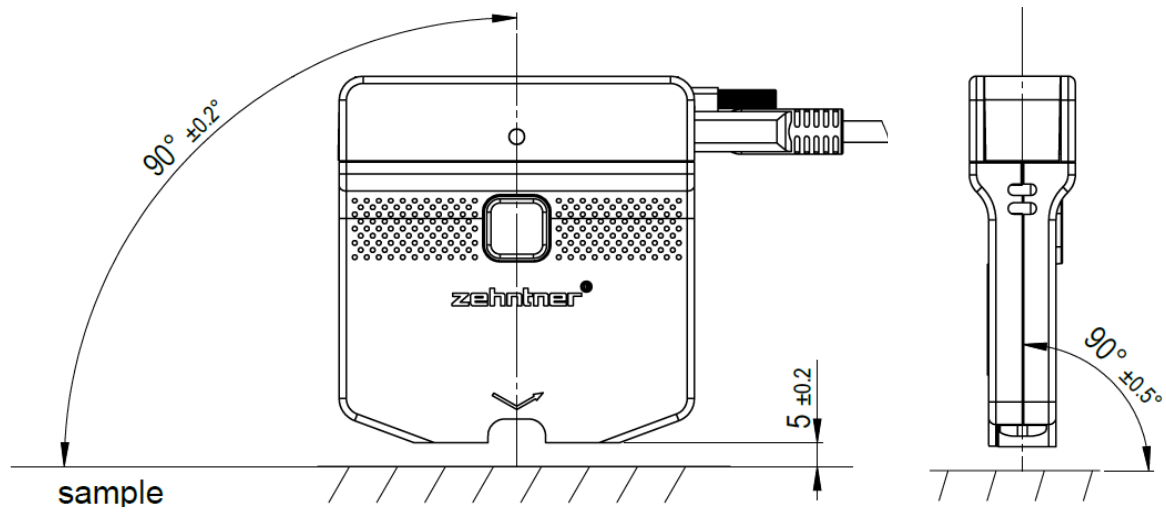
# 4 Connection setup

The glossmeter has a USB connection and can be connected to a USB or RS232. Interface on the host (e.g. PC). For that a dedicated cable is used and the device must be configured accordingly.

## 4.1 USB connection setup

To connect the device to a USB port a USB type C to type A cable is used. The device needs to be setup for USB connection.
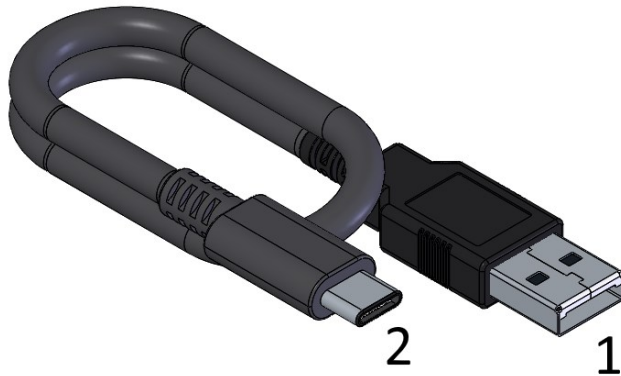


| Connector | Type | Description |
|-----------|------|-------------|
| 1 | A (male) | Plugged on PC side |
| 2 | C (male) | Plugged on device side |

| Setting | Value |
|---------|-------|
| Baudrate | 115200 |
| Data Bits | 8 |
| Stop Bits | 1 |
| Parity | None |
| Flow Control | None |

## 4.2 RS232 connection setup

To connect the device to a RS232 port the RS232 connection kit is used.
This consists of
1. a USB Y-cable
2. a USB-to-RS232 converter
3. a gender changer adapter

| Connector | Type | Description |
|---|---|---|
| 1 | A (female) | Plugged to the RS232 adapter |
| 2 | C (male) | Plugged on device side |
| 3 | A (male) | Plugged to power 5V (e.g. PC side) |
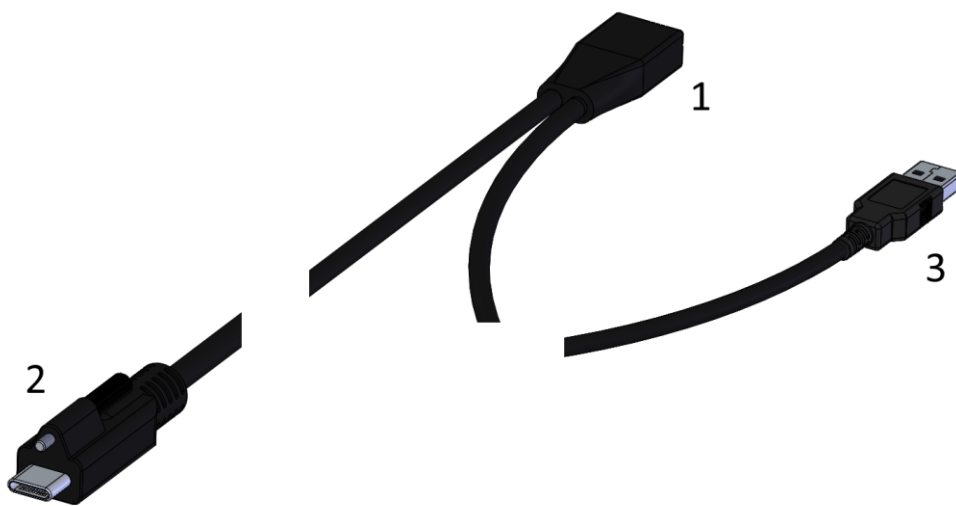


In order to communicate to a RS232 port the device needs to be setup for RS232 communication (see section 6).

The serial port of the computer has to be set to the following communication settings:

| Setting | Value |
|---|---|
| Baudrate | 115200 |
| Data Bits | 8 |
| Stop Bits | 1 |
| Parity | None |
| Flow Control | None |

## 4.3 Firmware update

A firmware update can only be performed view a USB connection. Therefore the USB connection setup (see 4.1) is required.

If the device is used in USB setup, the device can be connected to a PC via USB and the firmware can be updated using the "pqUpgrade" tool.

If the device is used in RS232 setup, the device needs to be configured for USB setup first.

There are two ways to switch to USB connection setup:

1. Using a command string (see 6.4) After the communication is set to a USB connection setup, the device resets and starts in the selected communication setup.
2. Press the measurement button of an unplugged device. Plug in the USB cable (USB set-up) connected to the PC and wait 10s before release the measurement button. Then the update tool "PqUpgrade" will find the device. "PqUpgrade" will start the device in USB virtual com port setup. In order to return to the same communication setup as before the update a reset is required.

# 5 Communication protocol

The communication with the ZG8150 is completely string based. All commands are composed of ASCII-character strings. This allows an easy control of the device, for example with a commercially available terminal program such as "HyperTerminal".

## 5.1 Command and return string

The communication works synchronous, with the following communication scheme:

3. A command is sent to the device
4. The command is executed
5. and a return string is sent from the device

Only after a complete sequence a new command is accepted.
In scan mode or continuous mode another scheme is used:

6. a command to start the scan mode or continuous mode is sent to the device
7. the device starts the respective mode
8. and sends data, until the mode is stopped

Only after this mode is stopped, new commands can be sent.

A command string is basically structured like this:

*CMD | TID | PARAMS:*

| Name | Description |
|------|-------------|
| **CMD** | The command defines which operation is executed. |
| **TID** | The transaction ID can be used to identify a communication transfer. |
| **PARAMS** | The parameters are added after the TID. The number of parameter can differ from command to command. |

For separation of the different values the pipe character "|" (ASCII 0x7C) is used.
As terminator is the character colon ":" (ASCII 0x3A) used.
e.g. 2|xy|3:

## 5.2 Transaction ID (TID)

The recommended value ranges of the 2 ASCII characters are following:

0x21…0x2F

0x3B…0x40

0x42…0x7B

0x7D…0x7E

Return strings from device which are not triggered explicitly by user side will use only ASCII numbers (0x30…0x39).

## 5.3 Parameter "AngleBinary"

The parameter "AngleBinary" includes the information which geometries are selected. The value corresponds to binary coded integer (active high) and the bit field is as follows:0x21…0x2F

| Angle 3 (A2) | Angle 2 (A1) | Angle 1 (A0) | Value |
|---|---|---|---|
| 0 (inactive) | 0 (inactive) | 1 (active) | **1** |
| 0 | 1 | 0 | **2** |
| 0 | 1 | 1 | **3** |
| 1 | 0 | 0 | **4** |
| 1 | 0 | 1 | **5** |
| 1 | 1 | 0 | **6** |

A0 always denotes the smallest angle according to the perpendicular to the measuring plane.
For example a device with the geometries 20°/60°/85°, A0 would be 20°, A1 = 60°, A2 = 85°.

## 5.4 Invalid measurement values

It can happen that a measurement return values smaller than zero.

| Value | Meaning |
|---|---|
| -1 | No measurement value |
| -2 | Overflow |

# 6 Commands

In this section the command strings supported by the glossmeter are listed. Some possible access by commands not described is provided for other use than inline (e.g. factory configuration/calibration/diagnostic).

## 6.1 2 – AdvancedMeasureValue

This command executes a single measurement.

Command:           2
Command string:    2|TID|AngleBinary:
Return string:     2|TID|AngleBinary|Unit|ValueAn:

Parameter:
AngleBinary        Angle combination
ValueAn            Measured value per angle n (n = 0…2), format %4.1f
Unit               GU or %

| Example | | |
|---|---|---|
| Send | 2\|xy\|3: | Command: 2<br>TID: xy<br>AngleBinary: 3 (angle A0 and A1) |
| Receive | 2\|xy\|3\|GU\|91.2\|94.5: | Command: 2<br>TID: xy<br>AngleBinary: 3 (angle A0 and A1)<br>Uint: GU<br>Measured values: A0 = 91.2, A2 = 94.5 |

## 6.2 3 – StartScan Measurement

This command starts the scan measurements until the device receives the stop command. Scan measurement mode executes measurements at the fastest possible rate and sends them consecuteively. Do not send other commands while scan mode is active. If you want to sent another command, first execute the StopScanMeasurement command.

Command:           3
Command string:    3|TID|AngleBinary:
Return string:     3|TID|AngleBinary|Unit|ValueAn:

Parameter:
AngleBinary        Angle combination
ValueAn            Measured value per angle n (n = 0…2), format %4.1f
Unit               GU or %

| Example | | |
|---|---|---|
| Send | 3\|xy\|2: | Command: 2<br>TID: xy<br>AngleBinary: 2 (angle A1) |

| Receive | `3|xy|2|GU|70.5:` | Command: 2 |
| | `3|00|2|GU|70.9:` | TID: xy, 00, 01, 02, … |
| | `3|01|2|GU|71.0:` | AngleBinary: 2 (angle A1) |
| | `3|02|2|GU|70.7:` | Uint: GU |
| | … | Measured values: |
| | | A1 = 70.5, 70.9, 71.0, 70.7, … |

## 6.3   5 – StopScanMeasurement

This command stops the scan measurements.

Command:         5
Command string:  5|TID:
Return string:   5|TID:

| **Example** | | |
| --- | --- | --- |
| Send | `5|xy:` | Command: 5 |
| | | TID: xy |
| Receive | `5|xy:` | Command: 5 |
| | | TID: xy |

## 6.4   8 – SetFlash

This command provides write access to angle independent settings.

Command:            8
Command string:     8|TID|Index|Data:
Return string:      8|TID:

Parameter:
Index               Index of the setting (see Index table in 6.5)
Data                Value of the particular setting

| Example | | |
|---|---|---|
| Send | 8|xy|710|1000: | Command: 8<br>TID: xy<br>Index: 710<br>Data: 1000 |
| Receive | 8|xy: | Command: 8<br>TID: xy |

## 6.5   12 – GetFlash

This command provides read access to angle independent settings.

Command:            12
Command string:     12|TID|Index:
Return string:      12|TID|Data:

Parameter:
Index               Index of the setting
Data                Value of the particular setting

| Index | Name | Description |
|---|---|---|
| 500 | Serial Number | Read only string. |
| 503 | Angle Binary | Read only supported angles.<br>Value range: 1-7 (integer) |
| 710 | MsrIntervalTime | Measure interval time for continuous mode.<br><br>Possible values in milliseconds: 500, 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000 |
| 1100 | UsbSettings | Communication setting.<br>USB setup: 0 (integer)<br>RS232 setup: 1 (integer) |
| 1560 | Units | Measurement units<br>Gloss units: 0 (integer)<br><br>Percent: 1 (integer) |

| Example | | |
|---|---|---|
| Send | `12|xy|710:` | Command: 12<br>TID: xy<br>Index: 710 |
| Receive | `12|xy|1000:` | Command: 12<br>TID: xy<br><br>Data: 1000 |

## 6.6   16 – StartContinuousMeasurement

This command starts the continuous measurements until the device receives the stop command.

Command:          `16`
Command string:   `16|TID|AngleBinary:`
Return string:    `16|TID|AngleBinary|Unit|ValueAn:`

Parameter:
AngleBinary       Angle combination
ValueAn           Measured value per angle n (n = 0…2), format %4.1f
Unit              GU or %

| Example | | |
|---|---|---|
| Send | `16|xy|3:` | Command: 16<br>TID: xy<br>AngleBinary: 3 (angle A0, A1) |
| Receive | `16|xy|3|GU|85.3|87.6:`<br><br>`16|35|3|GU|87.5|89.4:`<br><br>`16|36|3|GU|89.4|92.3:`<br><br>`16|37|3|GU|91.2|94.5:`<br><br>… | Command: 16<br>TID: xy, 35, 36, 37, …<br>AngleBinary: 3 (angle A0, A1)<br>Uint: GU<br>Measured values:<br>A0 = 85.3, 87.5, 89.4, 91.2, …<br>A1 = 87.6, 89.4, 92.3, 94.5, … |

## 6.7   18 – StopContinuousMeasurement

This command stops the continuous measurements.

Command:          `18`
Command string:   `18|TID:`
Return string:    `18|TID:`

| Example | | |
|---|---|---|
| Send | `18|xy:` | Command: 18<br>TID: xy |
| Receive | `18|xy:` | Command: 18<br>TID: xy |

## 6.8   28 – GetIsOnStandard

This command returns the information if the device is placed on the working standard or not.

| | |
|---|---|
| Command: | 28 |
| Command string: | 28\|TID: |
| Return string: | 28\|TID\|Data: |

Parameter:
Data                    0 = is not on standard, 1 = is on standard

| Example | | |
|---|---|---|
| Send | 28\|xy: | Command: 18<br>TID: xy |
| Receive | 28\|xy\|1: | Command: 18<br>TID: xy<br>Data: 1 (is on standard) |

## 6.9   53 – LaserEnable

This command enables or disables the laser of the glossmeter.

Command:           53
Command string:    53|TID|Data:
Return string:     53|TID:

Parameter:
Data               0 = disable laser, 1 = enable laser

| Example | | |
|---|---|---|
| Send | 53\|xy\|1: | Command: 53<br>TID: xy<br>Data: 1 (enable laser) |
| Receive | 53\|xy: | Command: 53<br>TID: xy |

## 6.10  56 – Error

This command returns the error of any command.

Command:           56
Command string:    -
Return string:     56|TID|Command|Error:

Parameter:
Command            Command caused the error
Error              Error code

| Example | Name | Description |
|---|---|---|
| -1 | UNDEFINED_ERROR | |
| 0 | NO_ERROR | |
| 1 | OPCODE_NOT_FOUND | No command with this code exists. |
| 9 | NO_STANDARD_VALUE | No valid standard value is used. |
| 10 | DEVICE_NOT_ON_WORKING_STANDARD | Device is not placed on the working standard. |
| 12 | VALUE_OUT_OF_RANGE | Value is out of range. |
| 13 | PARSE_ERROR | The format of the send string is not correct or wrong send parameters are used. |
| 14 | PARAMETER_ERROR | The index of a setting is wrong. |
| 30 | NO_ACCESS_RIGHTS | The user has no accees rights. |
| 31 | ACCESS_DENIED | No access because it is not possible to access the resource. |

| 32 | BLOCK_CMD_ACCESS | The access is blocked because another action blocks it. |
|----|------------------|--------------------------------------------------------|
| 40 | HW_ERROR | HW error occurred. |
| 61 | TIMEDATE_INCONSISTENT | Time check is not consistent. |
| 201 | FLASH_WRITE_FAILED | Writing ot the settings failed. |
| 202 | FLASH_READ_FAILED | Reading of the settings failed. |

| Example | | |
|---------|--|--|
| Send | `8|xy|0|3:` | Command: 8 <br> TID: xy <br> Index: 0 <br> Data: 3 |
| Receive | `56|xy|0|30:` | Command: 56 <br> TID: xy <br> Command: 0 <br> Error: 30 |

## 6.11  64 – ResetDevice

This command performs a reset.

| | |
|--|--|
| Command: | `64` |
| Command string: | `64|TID:` |
| Return string: | - |

| Example | | |
|---------|--|--|
| Send | `64|xy:` | Command: 64 <br> TID: xy |

## 6.12 70 – AdvancedUserCalibration

This command is used to execute a user calibration.

Command:            `70`
Command string:     `70|TID|AngleBinary|Cal2Std|CalValue:`
Return string:      `70|TID|Deviation:`

Parameter:
AngleBinary         A single angle can be selected
Cal2Std             0 = calibrate to working standard, 1 = calibrate on second standard
CalValue            Calibration value, units depends on setting, if Cal2Std = 0 is CalValue = 0
Deviation           Deviation in ppm (e.g. 6235 = 0.6235%) relative to the used sample

| Example | | |
|---|---|---|
| Send | `70|xy|1|0|0:` | Command: 70<br>TID: xy<br>AngleBinary: 1 (angle A0)<br>Cal2Std: 0 (working standard)<br>CalValue: 0 |
| Receive | `70|xy|2020:` | Command: 70<br>TID: xy<br>Deviation: 2020ppm (0.2020%) |

## 6.13 78 – AcceptUserCalibration

This command is used to accept the executed AdvancedUserCalibration. This valid after user calibration or an accept command. If another command is executed the user calibration is not valid anymore.

Command:            `78`
Command string:     `78|TID|AngleBinary:`
Return string:      `78|TID:`
Parameter:
AngleBinary         A single angle which was user calibrated before.

| Example | | |
|---|---|---|
| Send | `78|xy|2:` | Command: 78<br>TID: xy<br>AngleBinary: 2 (angle A1) |
| Receive | `78|xy:` | Command: 78<br>TID: xy |

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