SWISS PRECISION

DIMETIX
LASER DISTANCE SENSORS

Application Note

AN2019

D-Series

Moving target characteristic with SSI

V 1.03
Please check www.dimetix.com
for the latest version

Abstract

This Application Note describes how to use the "Moving target" measurement characteristic. This measurement characteristics is optimized for fast and precise distance measurements of continuously moving targets. As communication interface the SSI is used. In addition the digital output is described, which can be operated concurrently with the SSI Interface.

Dimetix AG • Degersheimerstr. 14 • 9100 Herisau • Switzerland • Phone +41 71 353 00 00 • Fax +41 71 353 00 01 • info@dimetix.com • www.dimetix.com

Table of content

1 Introduction

Different measurement characteristics are implemented on the D-Series laser distance sensors. These measurement characteristics provide the necessary flexibility to configure the sensors for various applications.

This document describes the configuration and wiring of the D-Series laser distance sensors for the use with the "Moving Target" characteristic and the SSI interface.

While this document provides step by step configuration instructions, the Technical Reference Manual gives a more detailed description (available on our website www.dimetix.com).

Using the SSI interface and the "Moving Target" characteristics enables an output rate of up to 1kHz.

Like with any digital interface the SSI Interfaces advantage is that the measurement results are transmitted without the loos of accuracy. In contrary, when using the analog interface accuracy is lost by the digital to analog conversion on the sensor and by reconverting the analog signal back to digital on the SSI Master device. The analog interface is also affected by noise.

1.1 Feedback positioning

Figure 1 shows a typical positioning application, that uses "Moving target characteristic". In this application, the laser distance sensor measures absolute distances, that can be used as real time feedback for the position controller implemented in the drive.

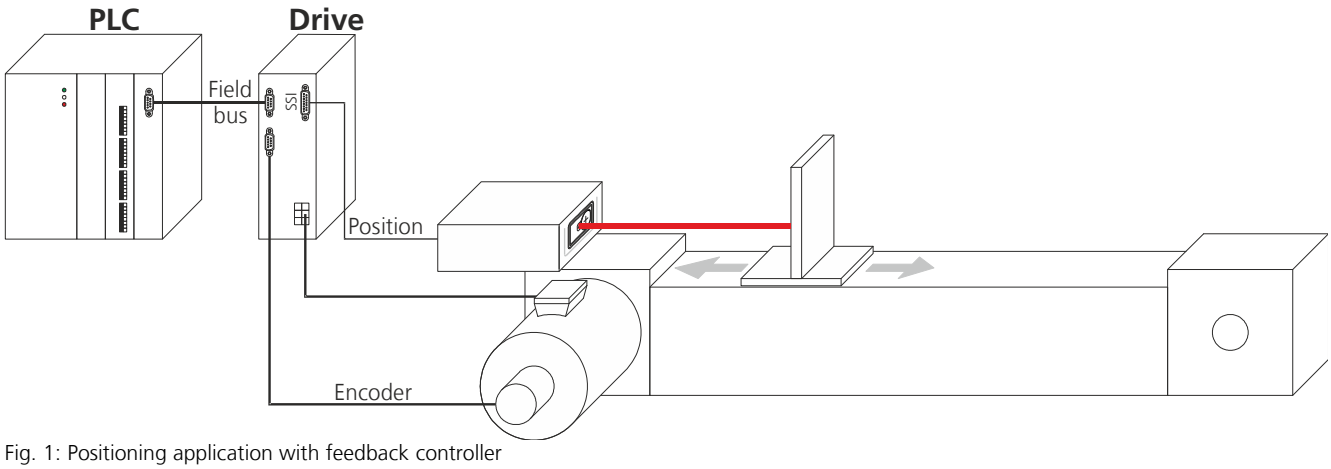

Fig. 1: Positioning application with feedback controller

1.2 Usable sensors

Except for the DBx-xx-xxx sensor types all D-Series sensors support the "Moving Target" characteristics. Check the Technical Reference Manual of the D-Series for measurement speed and accuracy specifications.

2 Preparation

The following items are needed to configure the sensor.

- Windows PC with USB or RS-232 interface
- USB Mini type B cable or RS-232 cable
- 24V DC power supply

Steps	Description
1	Download the “Laser Sensor Utility” software from https://dimetix.com/en/products/software/ and install it on the PC.
2	Connect the sensor to the PC and to the 24V DC Power supply as shown in Figure 2 or 3.
3	Start the “Laser Sensor Utility” software on the PC.

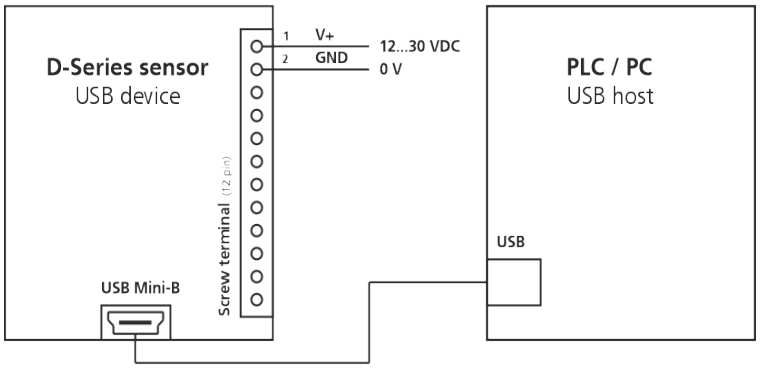

Fig. 2: USB Configuration connection

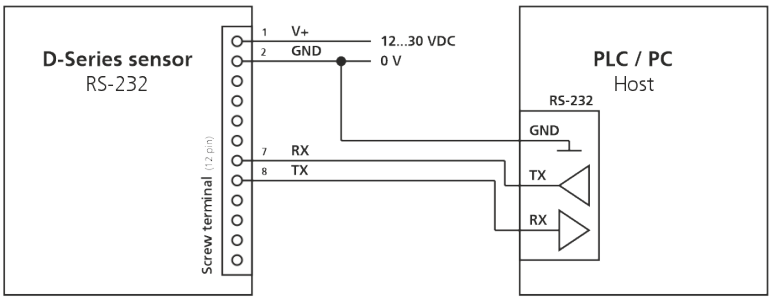

Fig. 3: RS232 Configuration connection

2.1 Reset of D-Series sensor

Before proceeding, it is recommended to reset the sensor to its factory defaults. But keep in mind that all previously done settings will be lost when performing a factory reset.

Steps	Description
1	Switch off the power supply used for the device
2	Press the reset push button and keep it pressed
3	Switch on the power supply used for the device
4	Keep the reset push button pressed until all status LED's (POWER, ERROR, DO1, DO2) flash for a short time (about 0.5 seconds)
5	Release the reset push button
6	Switch off the power supply and wait 5 seconds
7	Switch on the power supply and wait until the green status LED (POWER) is on
8	Reset procedure executed successfully

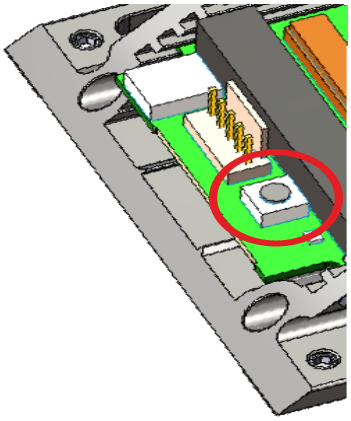

Fig. 4: Reset push button

2.2 Connection of Laser Sensor Utility with D-Series sensor

The USB configuration interface is handled as a virtual COM port and is therefore accessed over its COM Port number like any other serial interface. In this example the USB port no. is COM3. On your PC the port number might be different.

Steps	Description
1	After start-up of the Laser Sensor Utility software the window shown in figure 5 is visible.
2	Set the "Communication parameters" to 19200 Baud, 7 data bits, parity even
3	Set the device ID to 0
4	Press the "CHECK CONNECTION" button.

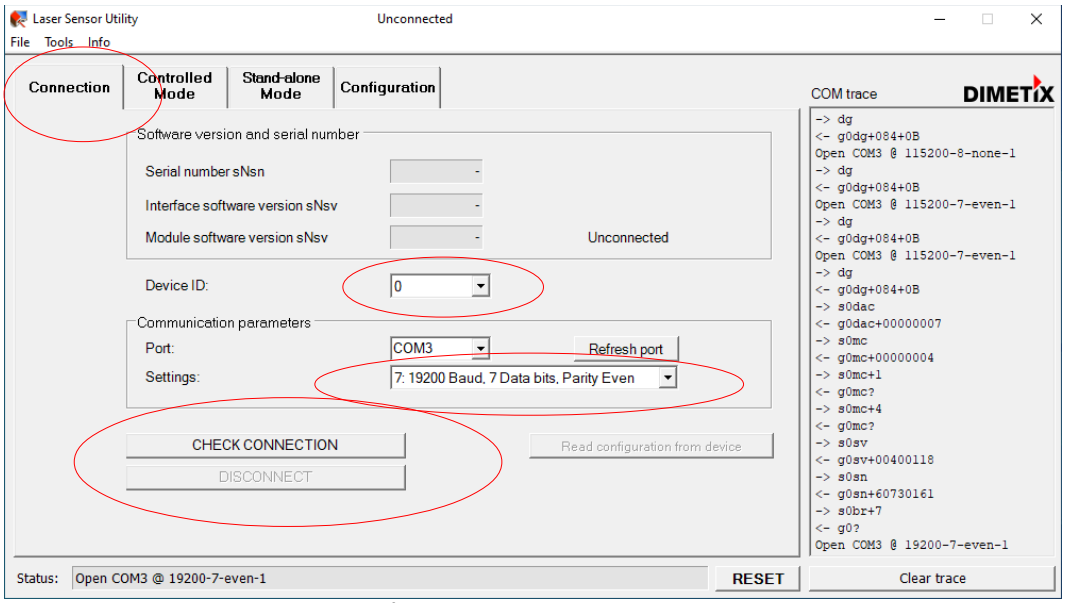

Fig. 5: Start window Laser sensor utility software

After the Laser Sensor Utility software connected successfully to the sensor, the "Software version and serial number" section is updated as shown in figure 6. Further the "Status:" field at the bottom will show "OK".

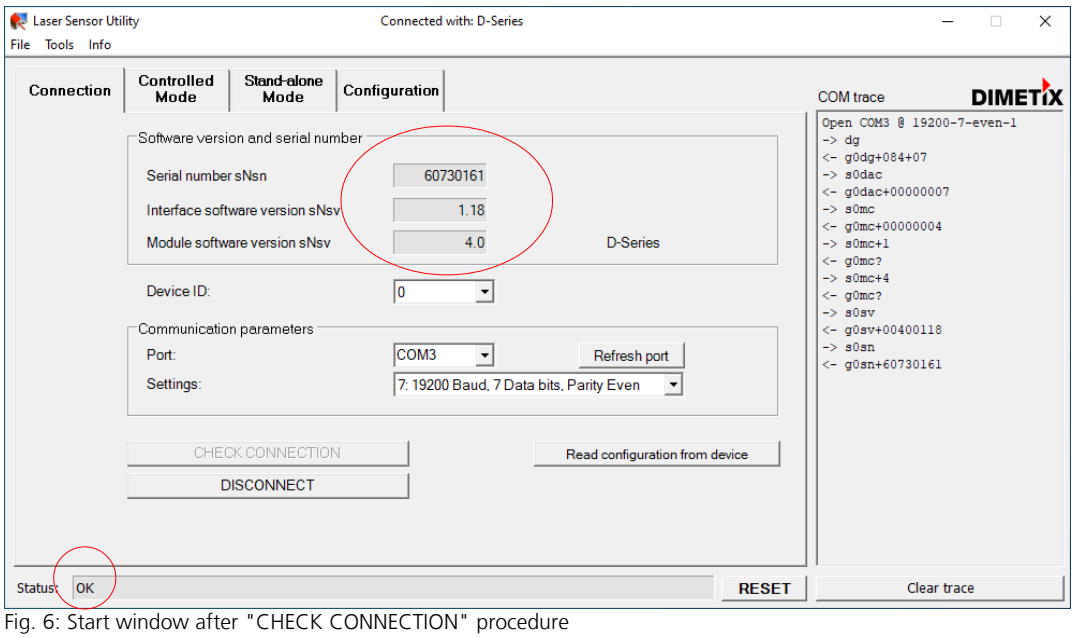

Fig. 6: Start window after "CHECK CONNECTION" procedure

3 Measurement characteristic configuration

Now configure the “Moving Target” characteristic.

Steps	Description
1	Select the “Configuration” tab
2	Select the “Measurement characteristic” sub tab on the left
3	Check “Moving Target”
4	Click the “DOWNLOAD TO DEVICE” button to save the settings on the sensor.

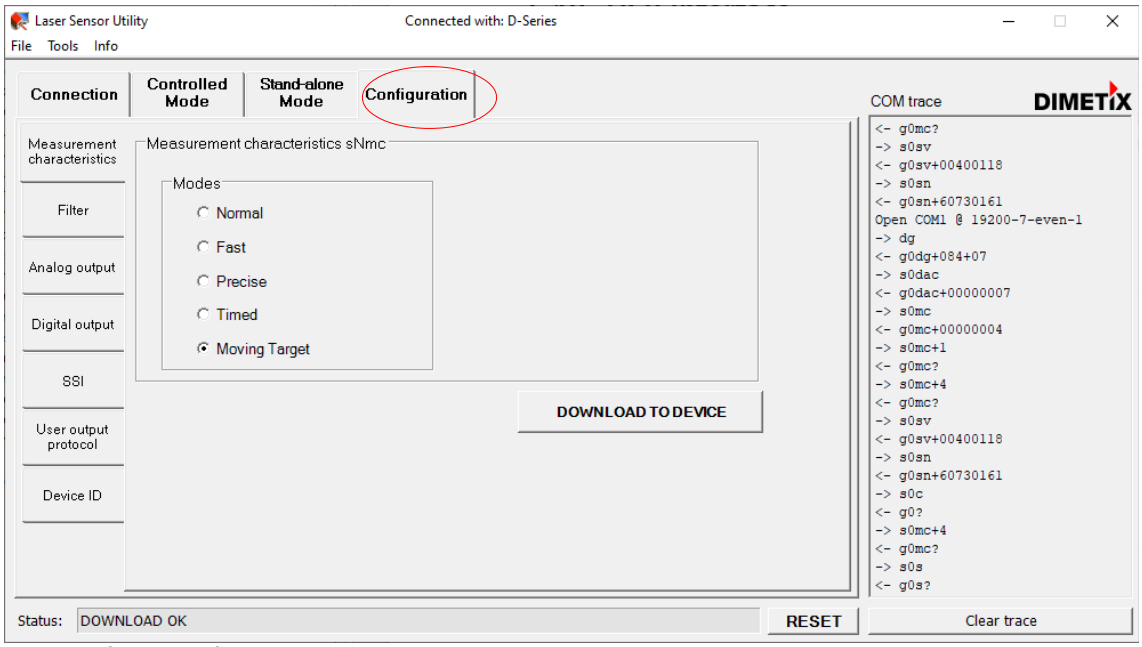

Fig. 7: Configuration of the “Moving target” characteristic

4 Interface setup

4.1 SSI

The sensor is the SSI slave and therefor the host has to act as the SSI master and generate the SSI clock.

The sensors SSI-Slave interface shares its connection pins with the integrated RS422 interface. Hence the RS422 and the SSI interface can not be used at the same time.

Never connect the sensor to a SSI master before its interface is configured as SSI.

4.1.1 Configuration of the SSI interface

Steps	Description
1	On the “Configuration” tab, select the “SSI” sub tab on the left.
2	In the “4-pole serial port usage sNSSI” area select “SSI” to deactivate the RS-422 interface and to activate the SSI interface.
3	Further define the “Error behavior”. In Figure 8 “Replacement value = 0” is selected. This means that in case of an error 0 will be transmitted in the SSI frames data field.
4	Click the “DOWNLOAD TO DEVICE” button to save the settings on the sensor.

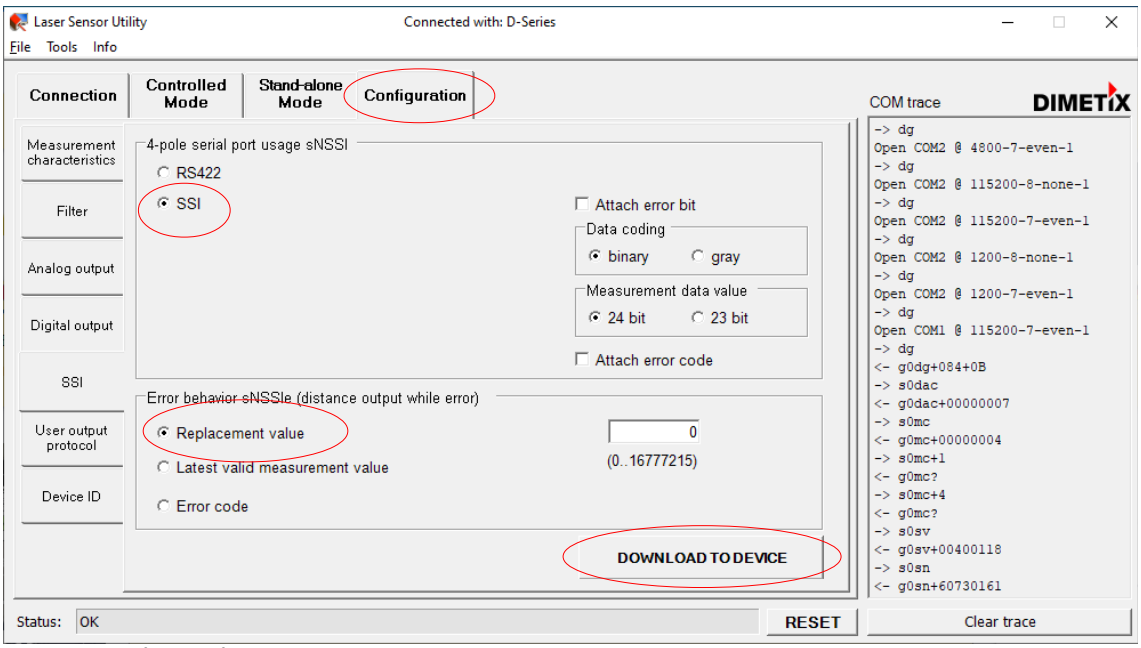

Fig. 8: SSI interface configuration

Data format

The following figure shows the format of the output with the maximum length. Error code and Error bit can be switched of and the data can be reduced to 23 bit. The data can be either binary or gray coded.

Error behavior

In case of an error the data field contains a replacement value, the last valid distance or the error code, depending on the configuration.

4.1.2 Wiring

Never connect the sensor to a SSI master before its interface is configured as SSI.

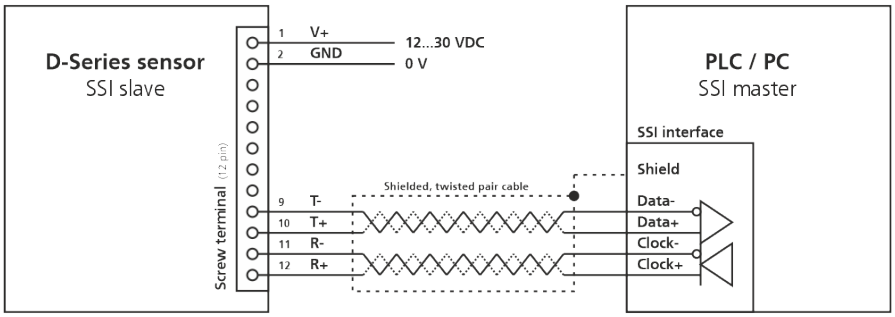

Fig. 9: SSI interface connection

Connect the SSI interface to the SSI master as shown in Figure 9. As soon as the master activates the clock, the sensor returns the SSI data. For more detailed information about the SSI interface see the Technical Reference Manual and Application Note AN2002 (SSI Interface Usage).

4.2 Digital outputs

Optionally the digital outputs can be operated in parallel to the SSI interface, e.g. to monitor if the positioning system is in the allowed range.

The digital outputs are updated each time the sensor executes a measurement.

4.2.1 Configuration of the digital output

Figure 10 shows a possible configuration of the digital outputs. If you use manual start (see 5.2 Manual start), digital output 1 can not be used, since this pin will be used as digital input to trigger the measurement.

In this example, the digital output DO2 will switch off, if the distance is over 1005mm and switch on if below 995mm, hence the hysteresis is 10mm. The digital output type NPN is selected.

Steps	Description
1	On the “Configuration” tab, select the “Digital output” sub tab.
2	Set the values as shown in Figure 10.
3	Click the “DOWNLOAD TO DEVICE” button to save the settings on the sensor.

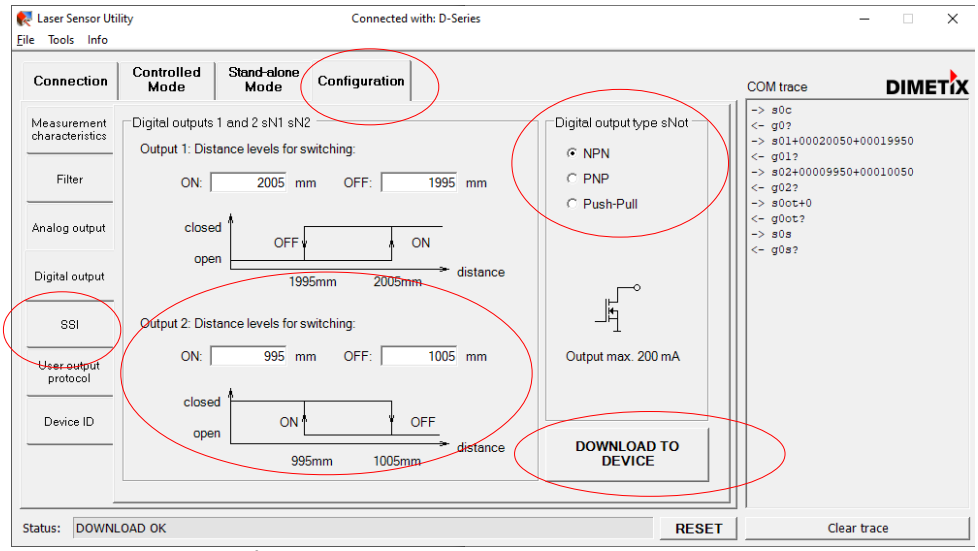

Fig. 10: Digital output configuration

4.3 Wiring

Figure 11 shows how to connect the digital output DO2 (NPN) to a signal lamp.

If you use “Manual start” configuration (see 5.2 Manual start) do not use DO1 as output.

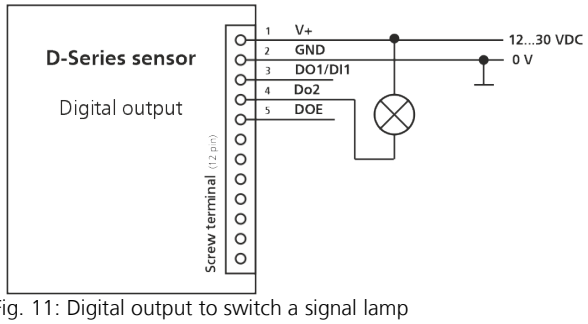

Fig. 11: Digital output to switch a signal lamp

5 Operation mode

After configuring the "Measurement characteristic", the "SSI slave Interface" and the digital outputs, "Stand-alone mode" must be configured. In "Stand alone mode" a serial command is not necessary to start the measurement. The following two configurations are possible for "stand alone mode".

Auto start configuration	Manual start configuration
The sensor is configured to start measuring after power on automatically.	The sensor is configured to start measuring depending on the digital input level.

5.1 Auto start

Use this configuration if the sensor starts measuring automatically after every power on.

Steps	Description
1	In the "Stand-alone Mode" tab, select the "Auto start configuration" sub tab.
2	As shown in Figure 12, check the "ON" box and set the "Sample time" input field to 0 sec for fastest possible measurement.
3	Click the "DOWNLOAD TO DEVICE" button to save the settings on the sensor.

Now the sensor is configured to automatically start measuring immediately after power on.

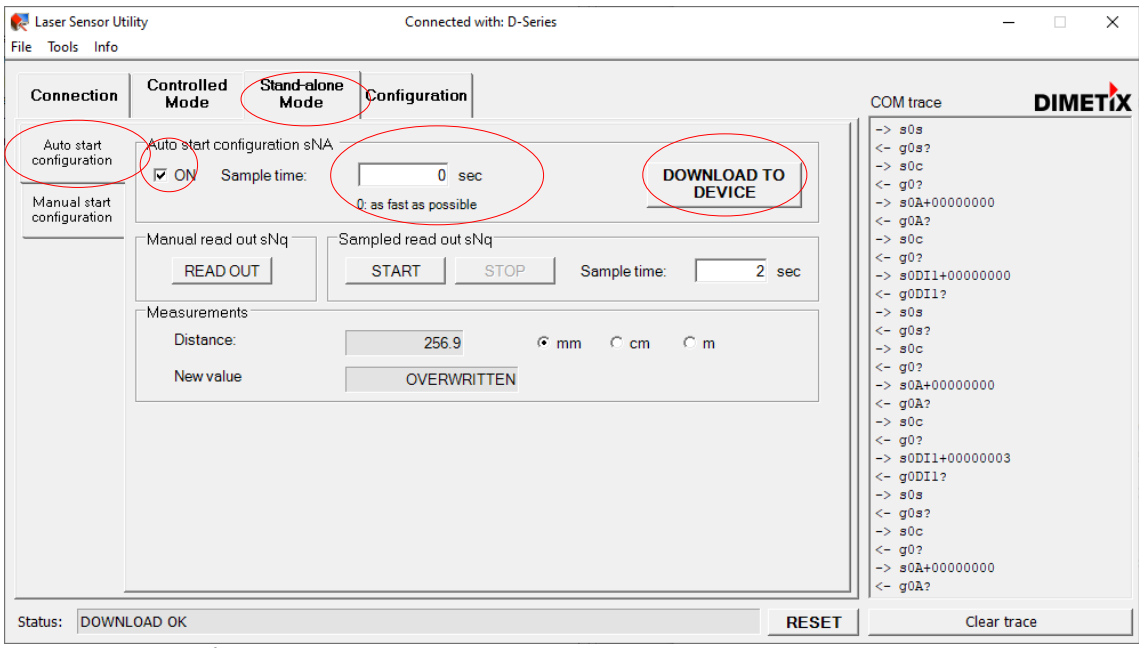

Fig. 12: Auto start configuration

5.2 Manual start

In Manual start configuration, the measurement is controlled by the digital input of the sensor. The function of the digital input can be configured with the Laser Sensor Utility as shown in Figure 13.

Steps	Description
1	On the “Stand-alone Mode” tab, select the sub tab “Manual start configuration”
2	Select “Active” in the “Digital input DI1 sNDI1” area.
3	Additionally select “Start / Stop tracking with buffering”
4	For the maximum measurement speed set “sampling time” to 0.
5	Click the “DOWNLOAD TO DEVICE” button to save the settings on the sensor.

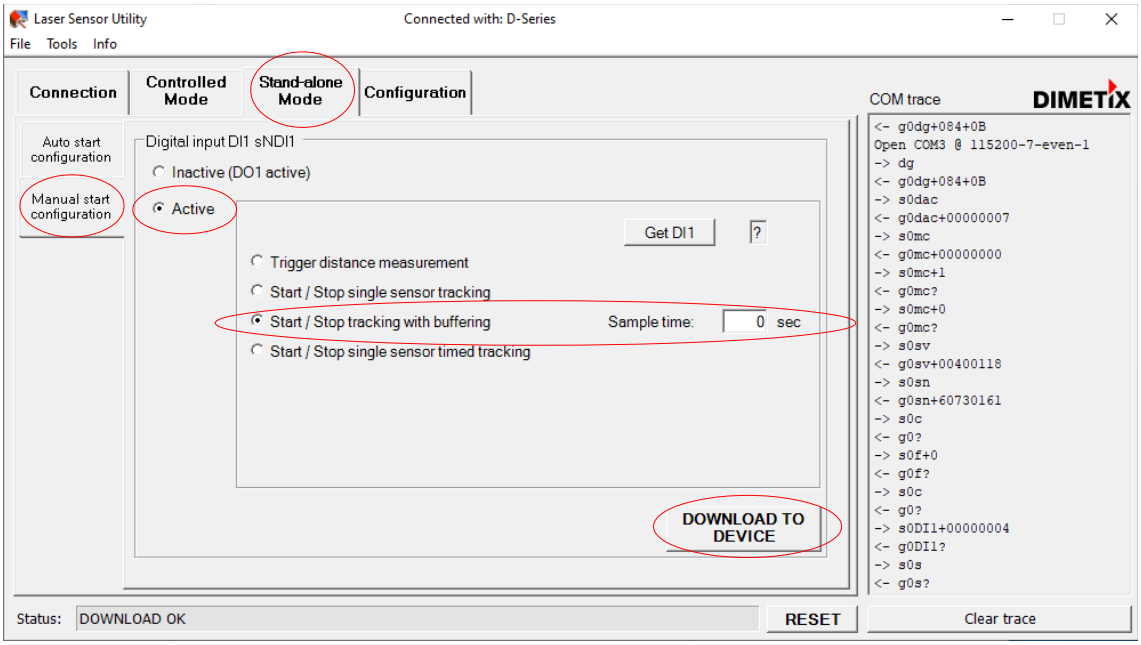

Fig. 13: Manual start configuration (Digital input)

Now the sensor starts measuring when the digital input goes to high level and stops measuring if the digital input goes to low level again.

5.2.1 Digital input connection

After the digital input is configured and connected as shown in Figure 14, the measurement of the sensor can be controlled with an external switch or relays.

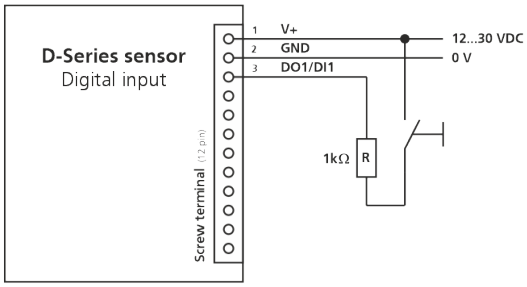

Fig. 14: Digital input wiring

6 Moving Target Filter

With the "Moving Target Characteristics" and the SSI interface output rates of up to 1kHz are possible, while the measurement rate is 250Hz (with a good measuring signal, with a bad measuring signal the measuring rate will be lower). For this the "Moving Target Filter" precalculates additional output values until a new measurement value is available. Indeed the moving target filter is optimized for a continuous moving target.

Further information about the "Moving Target Characteristics" can be found in the following documents:

Document	Chapter	Description
Technical Reference Manual D-Series	Measuring Characteristics	Comparison of the different measuring characteristics of the D-Series sensors.
	Data output	Block diagram showing how the configuration commands influence the signal flow from the measuring machine throw the different filters to the output interfaces.
	Moving Target filter	Explains the "Moving Target Filter".
AN2007 Additional measurement filter - Distance jump	Application Note	Explains the "Distance Jump Detection" filter witch can be used to detect objects blocking the laser beam. This filter can be used in combination with the "Moving Target Characteristics".