MICROPROCESSOR-BASED BRIX TRANSMITTER SD–3000

Introduction

Thank you for choosing our MICROPROCESSOR-BASED BRIX TRANSMITTER SD–3000. To ensure its proper and efficient usage, it's important to read this manual thoroughly to understand how to operate the SD–3000, before putting it into operation.

About this Manual

1. This manual should be delivered to the end user of the SD–3000.

2. The contents of this manual are subject to change without notice.

3.

4. The specifications contained herein are limited to standard models and do not cover special products made by order.

5. All precautions were taken on preparing this manual, in order to guarantee the quality of its information.

CAUTION!

The instrument described in this technical user manual is a device suitable for application in a specialized technical area. DLG supplied products are submitted to a strict quality control process. However, industrial control electronic equipment can cause damage to machinery or processes controlled by them in the event of any failure or improper operations and may even endanger human lives. The user is responsible for setting and selecting values of the parameters of the instrument. The manufacturer warns of the risks of incidents with injuries to both people and goods, resulting from the incorrect use of the instrument.

Contents

Presentation

The Microprocessor-based Brix Transmitter SD–3000 transmits signals proportional to the Brix of a mixture in which the electrode is inserted, where Brix is the unit of measurement of soluble solids in sucrose solutions.

The transmitter is applied in mass cooking process for production of sugar, among other applications. (note 1, page 8).

It has a temperature measurement element (RTD) in direct contact with the system, eliminating the installation of another temperature transmitter.

Using a modern technique of radio frequency, the SD–3000 provides two programmable analog signals: Xs and Rs, which are proportional to the capacitance and resistance of the cooked mass, respectively.

Moreover, its design eliminates the need for cleaning the transmitter when it is used in batch cooking process, greatly increasing the interval between cleaning operations for continuous cooking.

The sensing part is built in a 316 stainless steel casing and the electronic circuit is housed in aluminum housing, making it suitable for mounting on brackets and / or flanges, within the process.

How to Specify

SD–3000 / ____ - ___	
Useful length for measurement (B+30+C) – see Figure 1:	
/L1	115 mm
/L2	165 mm
/L3	320 mm
/E	Special (specify)
- ___	Without flange
- F	With flange

Typical Applications

Degree Brix measurement in liquors, dissolved sugar, sugar massecuite A, B and C.
Note 1: other applications on request.

Technical Specifications

Input characteristics

Type	Parameter	Min.	Max.	Comments	Unit
Input signal	Current	0	20		mA
		4	20		
	Brix	50	95	@27MHz	Bx
	Rod temp.	0	130	RTD	ºC
Input impedance	Current	10			Ω
A/D precision (FS)	DC current	0 ~ 20	± 1		uA
		4 ~ 20	± 1		
	Degree Brix	± 0.5			%
	Probe temp.	Pt	± 0,1		ºC
Linearization	Degree Brix	0,1			%
	PT-100	0,1			ºC

Analog outputs characteristics

Output Type	Range	Resolution	Output Impedance
Current	0 ~ 20 mA	4,8 uA	750Ω max
Current	4 ~ 20 mA	4,8 uA	750Ω max

General Characteristics

Parameter	Characteristics
Power consumption	7,2 W
Input voltage	24 Vdc
Operating frequency	27MHz
IP protection	IP–65
Scan time	150 ms
Scale	–30000 a +30000 in engineering units
Modbus timeout	Adjustable from 3 ms to 60 ms (3 ms multiples)
Alarms	2 alarms, with 2 solid state relay outputs: max 240 Vca; 130 mA ca; Isol. 3750 Vca
Xs and Rs linearization	50 interpolation points
Communication	2 RS-485 ports, with 1500 V isolation and transient protection filter Configurable even, odd or no parity Baud rates (bps): 9600, 19200, 38400, 57600 and 115200 Modbus RTU protocol
Electronic unit operating temperature	0 ºC - 75 ºC
Thermal stability	±0,005% / ℃ span @ 25℃.
Relative humidity	Up to 90%
Construction	Aluminum housing AISI-316 stainless steel rod Polyamide dielectric 6.6
Placement	Fast clamping connection flange
Electrical connection	22AWG wire with fast clamping connectors
Aprox. weight	3 kg
Sampling time	6 samples per second

Dimensions

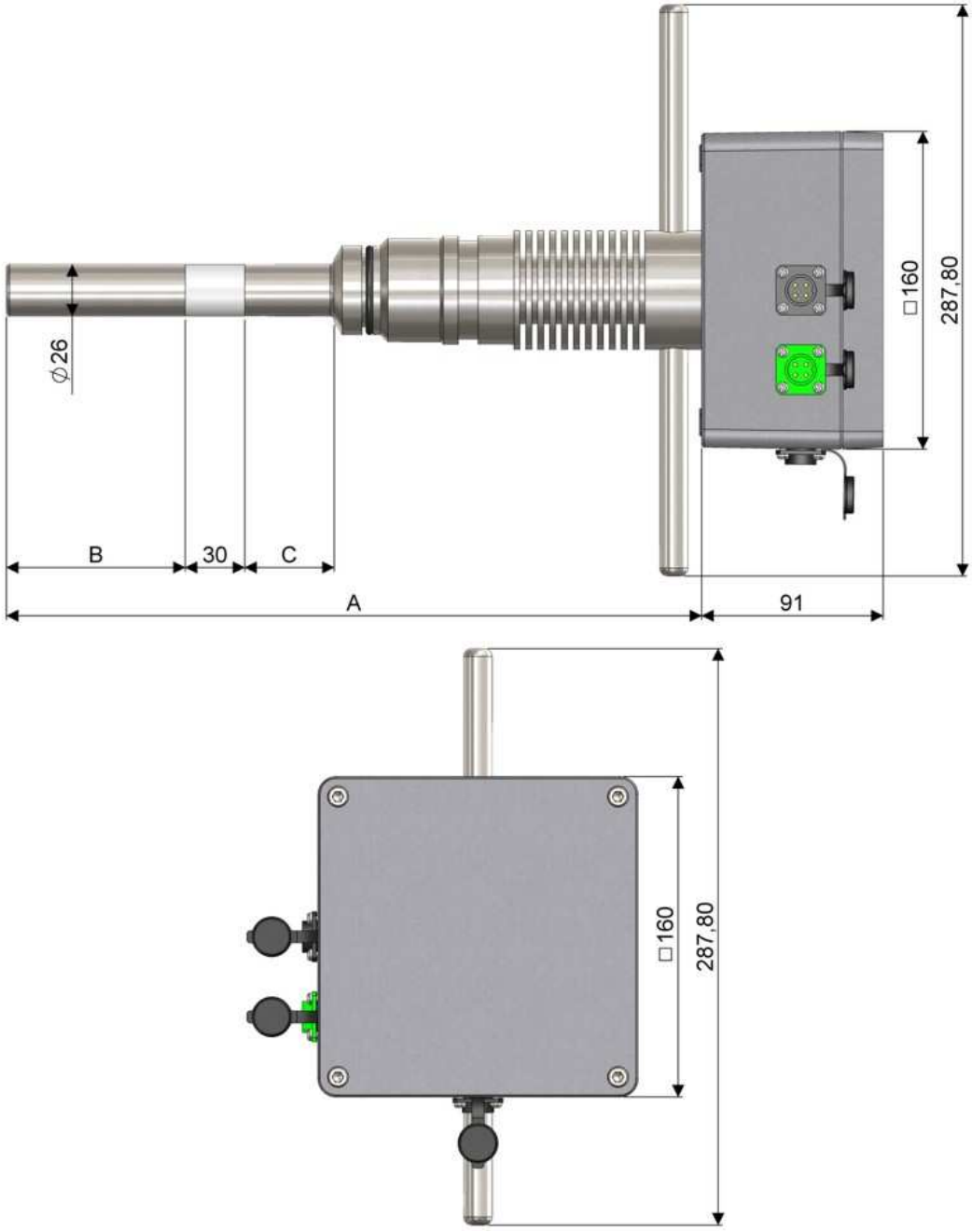


Figure 1 – Scaling mount (dimensions in mm)

Dimensions	SD-3000/L1	SD-3000/L2	SD-3000/L3
A (mm)	300	350	505
B (mm)	40	90	90
C (mm)	45	45	200

Operation

The SD–3000 transmitter measures the Brix of the product around its contact area, based on electrical principles. The electrical characteristics of a product depends on several factors, including the Brix. Thus, measuring the difficulty of an electrical signal to go through the mass, it is possible to determine the degree Brix.

The SD–3000 is an instrument that measures two electrical quantities, resistance and capacitance. The RS channel is proportional to the resistance and the other channel, XS, is proportional to the capacitance.

The two channels can be used in control applications. However, experience shows that the channel XS is more immune to variations of impurities.

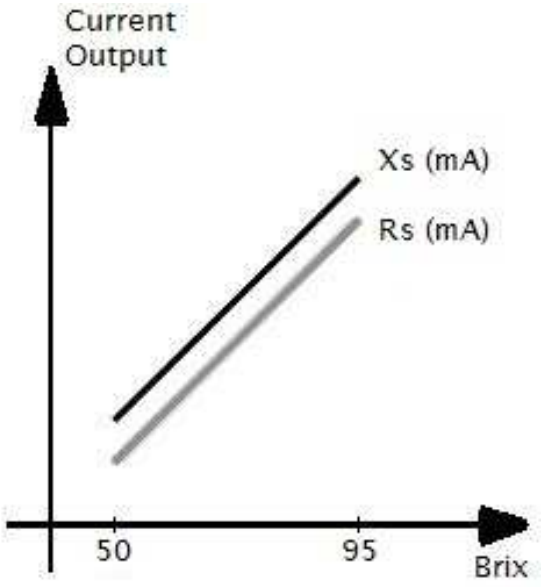


Figure 2 – SD-3000 operation.

Note: illustrative figure which may differ according to the process.

The transmitter channels obey a linear variation with the resistance and capacitance, but these quantities do not obey a linear function when compared with the degree Brix. The SD–3000 is able to linearize this curve to indicate the value in Brix and its main characteristic is repeatability.

The most important feature is the repeatability, i.e., if a specific control operation point in a process has a specific current in mA (in resistance or capacitance), this value will be repeatable and may be used always in the process, including other batches.

The SD–3000 performs linearization in order to estimate the Brix. A specific linearization must not be used in other processes different than the one that was used to calculate the linearization parameters. Once a specific linearization RS x Brix or XS x Brix is obtained few changes should occur in the process.

Determining the Brix x Capacitance or Brix x Resistance curve

The SD–3000 has two signal linearization tables, with 50 points each. Using this feature, we can estimate the Brix of the measured mass. Therefore, it is necessary to use a precision refractometer as reference for the sample.

Initially, a table must be created. This table must have annotations of the RS, XS and Brix values. The DLGTools software has this feature which automates the linearization process (see Software and configuration → Configuration → LOG).

Start collecting mass samples and at the moment the sample is collected, record the value of channels RS and XS. Keep the sample and measure its Brix in the refractometer. Repeat this step for different values of Brix.

Once the table is filled, a linearization curve is determined.

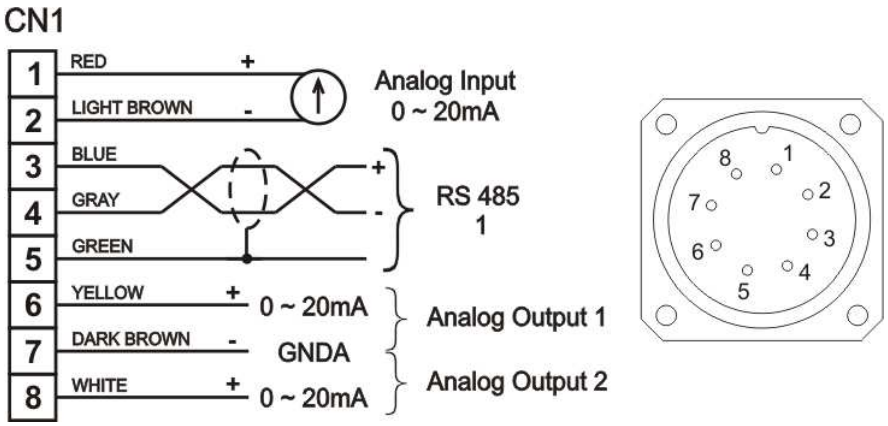
Some care must be taken when the samples are collected:

- The sample should be collected as close as possible to the SD–3000 transmitter;
- Before collecting the sample, check whether there is a significant variation in the RS and/or XS channels;
- Make sure that the collected sample represents the product that is being analyzed by the SD–3000 transmitter;
- Take special care with the collecting pipes. They can accumulate products that may be contaminated or accumulate products from previous samples, which can invalidate the sampling process;
- Pay attention to the sample collecting time. It is good practice to use the values of XS and RS only after the sample is collected;
- It is also recommended to repeat this procedure three times, in order to eliminate discrepancies.

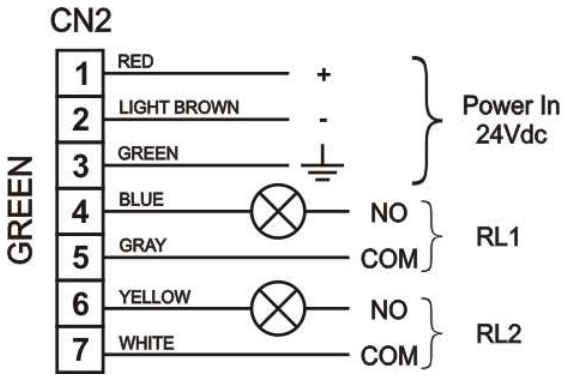
Installation

Cable connection

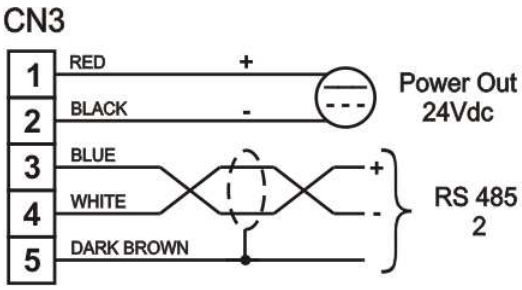
CN1		
Pin	**Function**	**Cable color**
1	Positive, current input	Red
2	Negative, current input	Light Brown
3	Positive, RS-485 communication port 1	Blue
4	Negative, RS-485 communication port 1	Grey
5	Shield, RS-485 communication port 1	Green
6	Positive, current output 1	Yellow
7	GND current outputs 1 and 2	Dark Brown
8	Positive, current output 2	White

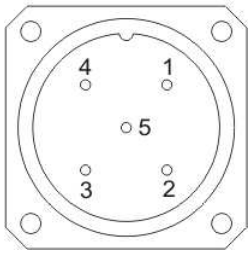


CN2		
Pin	**Function**	**Cable color**
1	Power +24Vdc	Red
2	Power GND	Light Brown
3	Housing GND	Green
4	Normally open (NO) output relay 1	Blue
5	Common relay 1	Grey
6	Normally open (NO) output relay 2	Yellow
7	Common relay 2	White
8	Not used	-



CN3		
Pin	**Function**	**Color cable**
1	Output (HMI) Power +24Vdc	Red
2	Output (HMI) Power GND	Black
3	Positive, RS-485 communication port 2	Blue
4	Negative, RS-485 communication port 2	White
5	Shield RS-485 communication port 2	Dark Brown





Mechanical Installation

The SD–3000 must be installed directly to the process in which Brix measurement is to done. In baking pans (sugar manufacturing) the SD–3000 must be installed underneath or on the side taking care to install it in a location where it is ensured that the transmitter will measure a homogeneous mass.

It is recommended to keep a distance of 0.5 m between the SD–3000 and any metal parts (including paddle stirrer if any). This ensures that the measurement principle of the transmitter will not be influenced by proximity to metal parts.

The SD–3000 should never be installed above the calender or where there is the possibility of bubble formation that may cause errors in measurement.

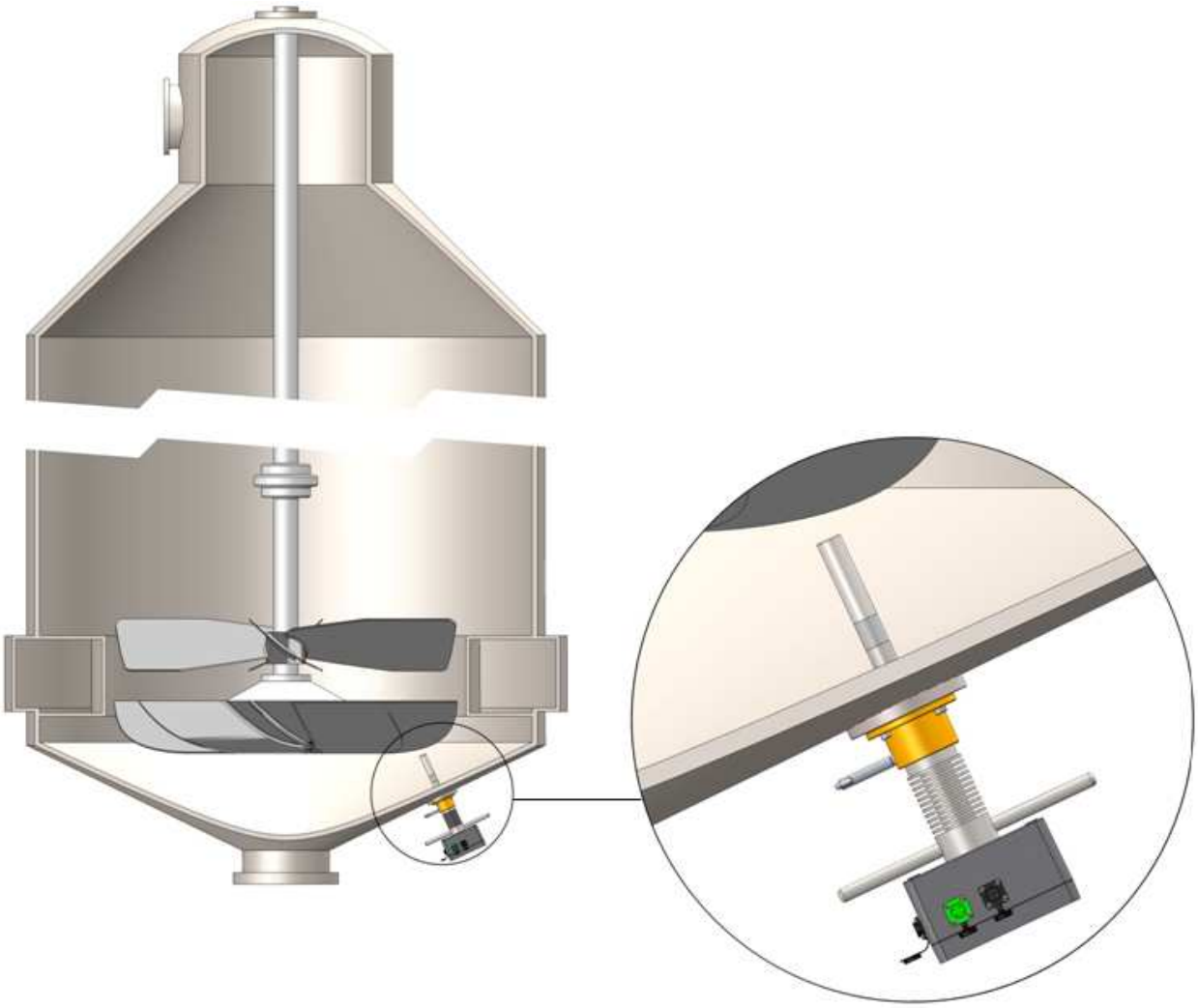


*Figure 3 - Transmitter position in sugar cooking pot (vaccum)

***Note:** Figure 3 is an illustrative example, not having a real scale.

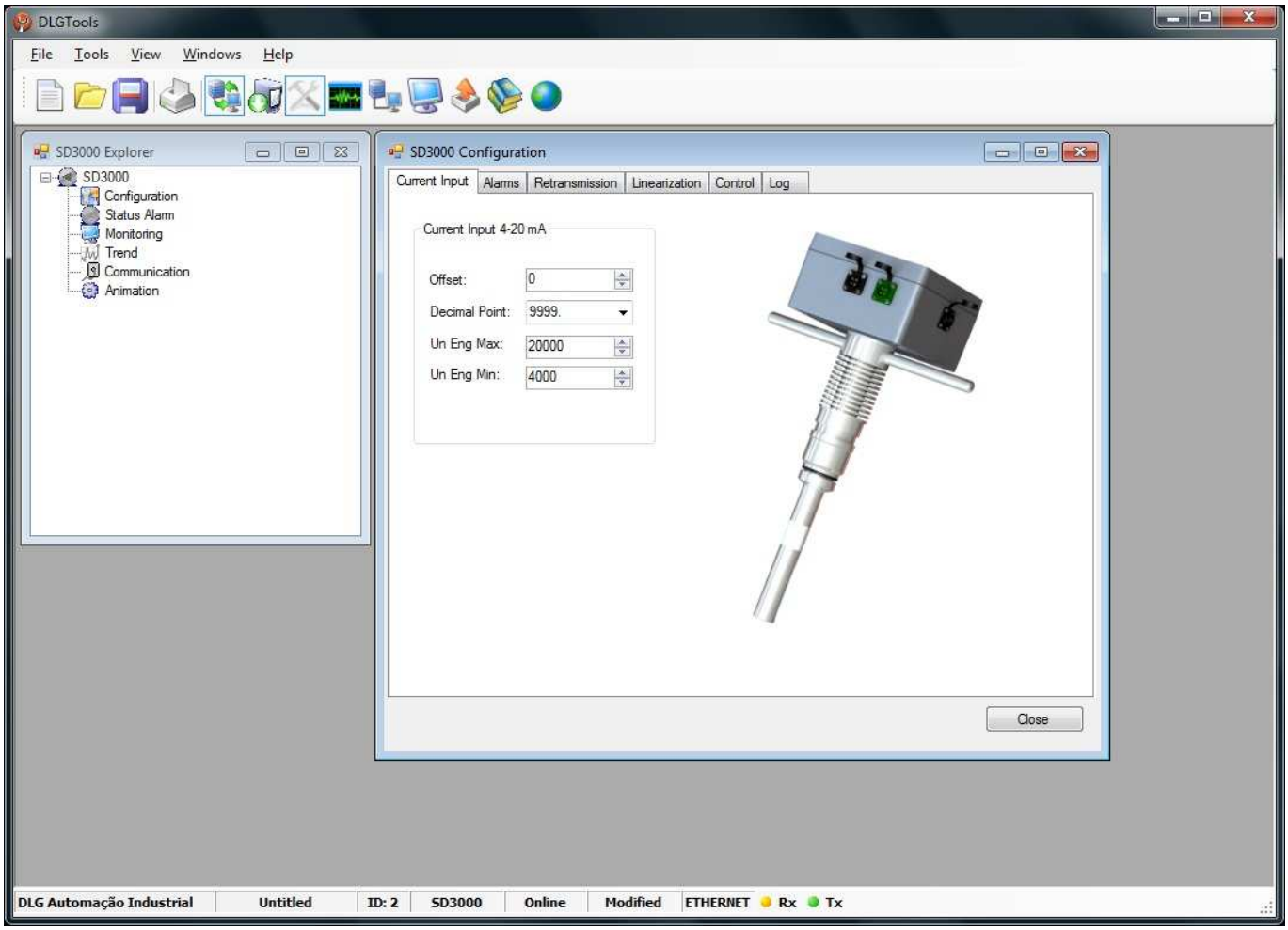
Software and Configuration

***Note:** Before configuring the SD–3000, make sure that the equipment has been operating for approximately 20 minutes.

The SD–3000 is configured by DLGTools.

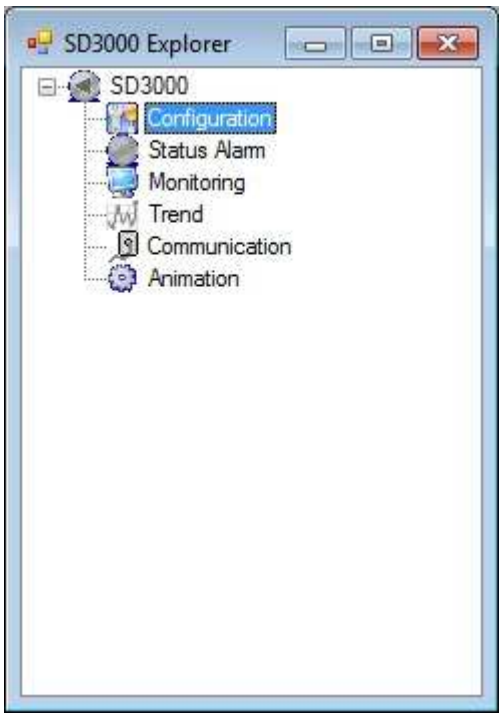
After DLGTools is opened, click in the icon ONLINE/OFFLINE to find the SD–3000 devices in the Modbus network.

Select the correct SD–3000 and click in Upload. DLGTools will upload all parameters from the SD–3000.



In the configuration screen it is possible to parameterize all SD–3000 registers.

The DLG Tools Explorer window can select all the configuration and operation functions of the SD–3000.



Configuration: Configure all SD–3000 parameters, as current inputs, alarms, retransmission, linearization, control and sample logs;

Status Alarm: Monitors the alarm statuses and whether the output relays are triggered or not;

Monitoring: Monitors all SD–3000 Modbus registers, automatically or manually;

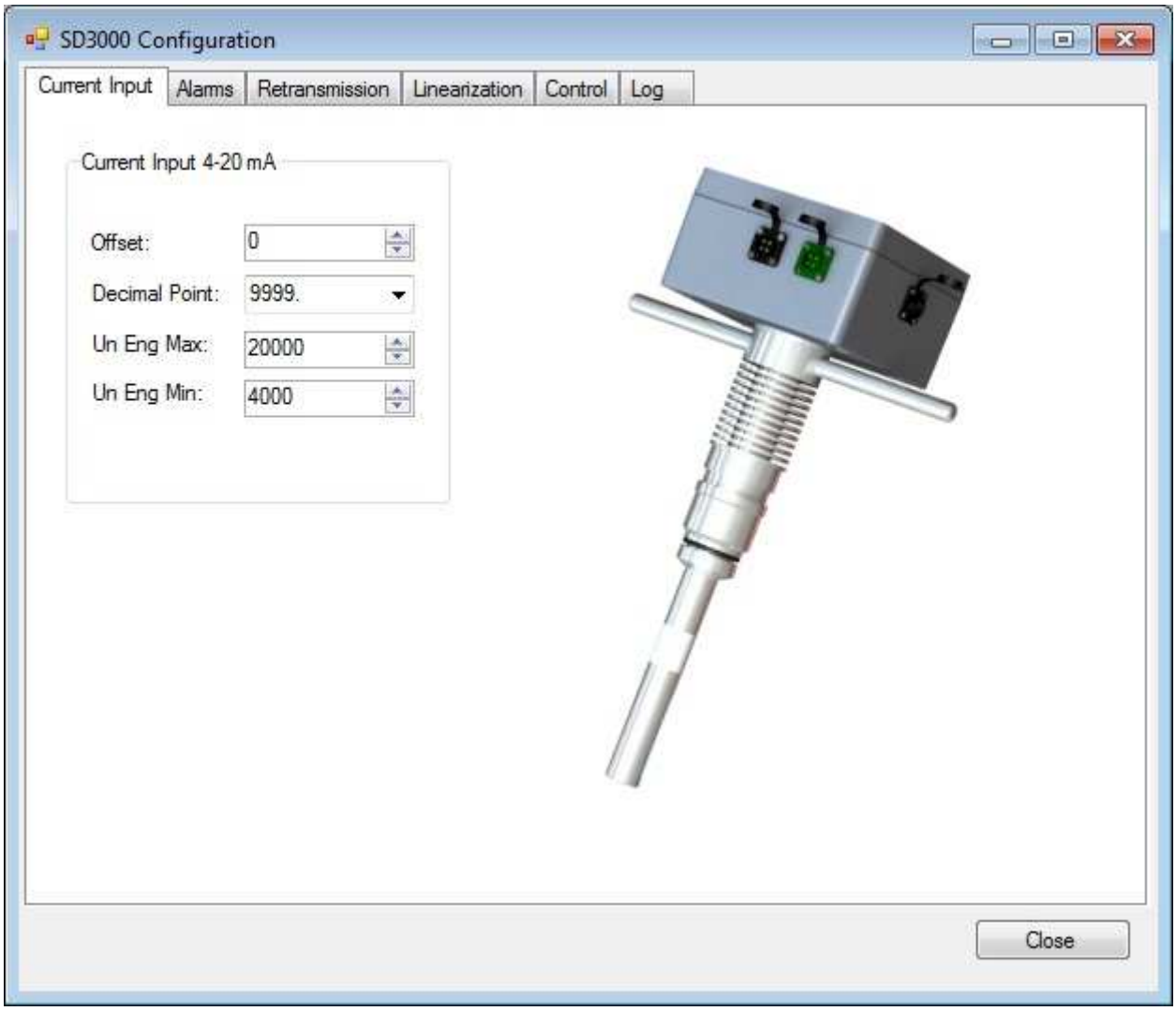
Trend: Display the XS, RS, linearized XS, linearized RS, temperatures, current input, rod temperature and internal temperature.

Communication: Display RS-485 port configuration parameters and the UPLOAD and DOWNLOAD commands.

Animation: Graphical resources for representing the inputs.

Configuration

Current Input



Parameters:

- **Offset:** Adds an offset value to the value read from the current input. Example: If the reading is 10.00 and the offset is 1.00 then the value shown in the channel will be 10.00 + 1.00 = 11:00

- **Decimal Point:** Determines the number of places after the comma, and may be from 0 up to 3.
  Example: 10.000, 10.00, 10.0 ou 10.

- **Un Eng Max:** Determines what will be the value displayed in the current channel when the input is equal to 20 mA.

- **Un Eng Min:** Determines what will be the value displayed in the current channel when the input is equal to 0 mA.

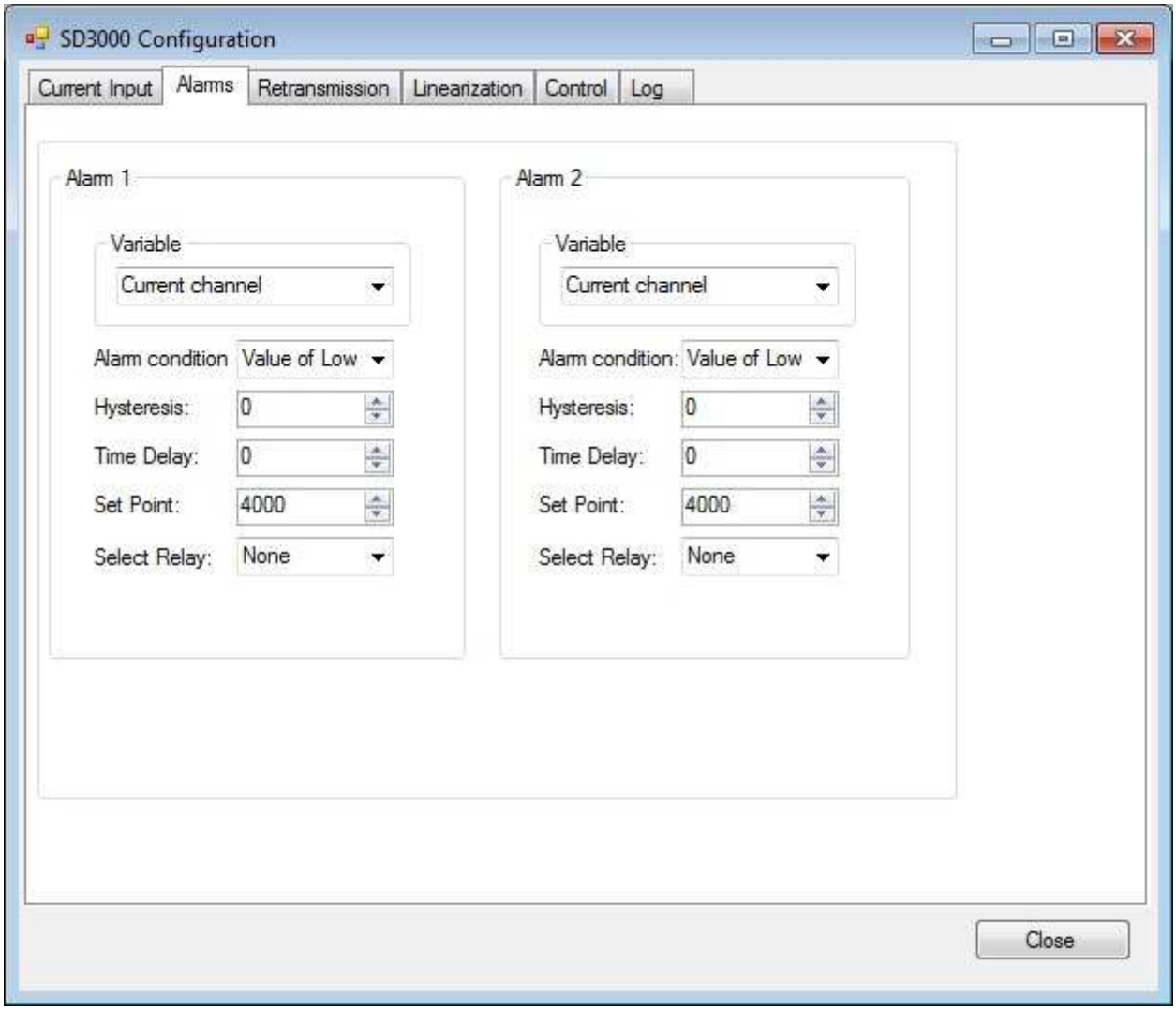
The configuration parameters for the current input determine which value will be displayed in the current channel.

Example:

Offset	= 1,00
Decimal Point	= 2
Un Eng Max.	= 30.00
Un Eng Min.	= 3,00

When the input is 10 mA, the indication will be 16.50.

Alarms



Parameters:

- **Variable:** Defines which variable will be associated to alarm 1 or 2. The possible variables are:

    - XS;
    - RS;
    - Linearized XS;
    - Linearized RS;
    - Current Input;
    - Rod temperature.

- **Alarm Condition:** Defines which the condition mode of alarms 1 and 2 is. The possible modes are:

    - Value of Low: operates when the input value falls below the Set Point.
    - Valor of High: operates when the input value goes above the Set Point.
    - Differential: operates when the input value lies outside the range defined by Set Point and Hysteresis, where Set Point is the center of the range and Hysteresis defines its upper and lower limits.
    - Inverted Differential: operates when the input value lies inside the range defined by Set Point and Hysteresis, where Set Point is the center of the range and Hysteresis defines its upper and lower limits.
    - Inoperative: disables the alarm.

- **Hysteresis:** For each alarm condition type Hysteresis has a different function:

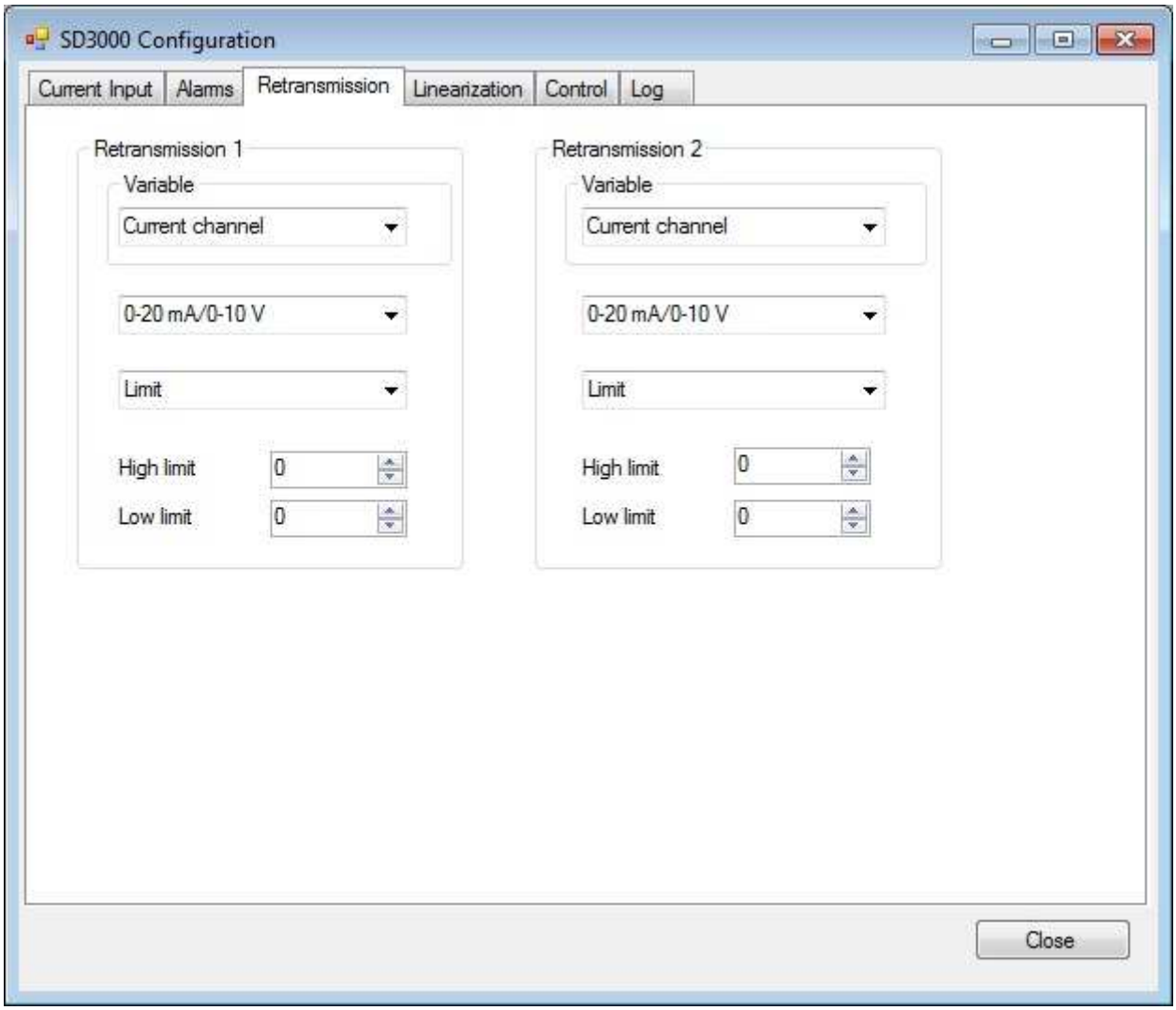
    - Value of Low: Hysteresis defines an offset to disable the alarm. The alarm will be disabled when the input value is greater than the Set Point plus Hysteresis.
    - Value of High: Hysteresis defines an offset to disable the alarm. The alarm will be disabled when the input value is less than the Set Point plus Hysteresis.
    - Differential: Hysteresis defines high and low limits for alarm operation. Set Point is the center of the range and Hysteresis defines upper and lower limits. Example: Set Point 5.00 and Hysteresis 1.00 defines a range from 4.00 to 6.00, and the alarm is enabled when the input value is OUTSIDE this range.
    - Inverted Differential: Hysteresis defines high and low limits for alarm operation. Set Point is the center of the range and Hysteresis defines upper and lower limits. Example: Set Point 5.00 and Hysteresis 1.00 defines a range from 4.00 to 6.00, and the alarm is enabled when the input value is INSIDE this range.

- **Time Delay:** Sets a timer to enable the alarm. If the input is within the alarm range the timer is triggered and when the specified time elapses the alarm will be enabled. If the input value leaves the alarm range the timer will reset and will trigger again when the input value lies inside the alarm range.

- **Set Point:** Reference value for alarm activation.

- **Select Relay:** Defines which relay will be activated by the alarm.

Retransmission



Parameters:

- **Variable:** This parameter defines which variable will be associated with retransmission 1 or 2.

  The possible variables are:

  - XS;
  - RS;
  - Linearized XS;
  - Linearized RS;
  - Current channel;
  - Rod temperature.

- **Output Range:** Defines the retransmission ranges:
  - 0 ~ 20 mA and 0 ~ 10 Volts
  - 4 ~ 20 mA and 2 ~ 10 Volts

- **Scale:** Defines the scales associated with retransmission:

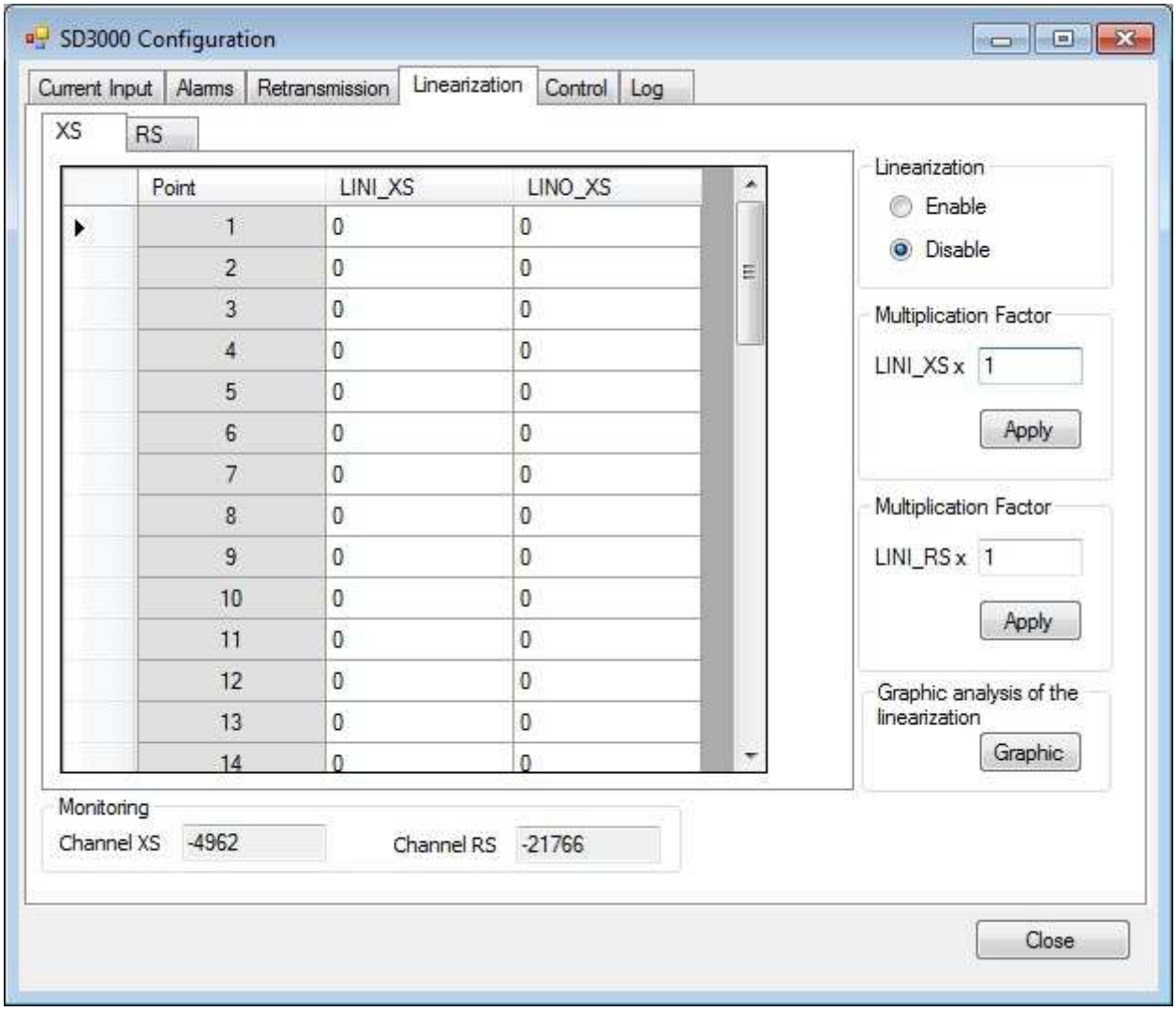
  - Engineering: uses Un Max Eng and Un Min Eng as retransmission limits. Only Current channel and Rod temperature can be selected in this case.

    Example: if the current channel is being retransmitted and the configured engineering units are from 0.00 to 30.00 then input 0.00 is retransmitted as 0 mA (or 4 mA) and input 30.00 is retransmitted as 20 mA.

  - Limit: uses the configured limits (High Limit and Low Limit) for retransmission. Any channel may be selected.

    Example: if the current channel is being retransmitted and the configured engineering units are from 0.00 to 30.00, and the configured limits are from 10.00 to 20.00, then input 10.00 is retransmitted as 0 mA (or 4 mA) and input 20.00 is retransmitted as 20 mA. The output is limited to the selected range keeping proportionality with the input.

Linearization

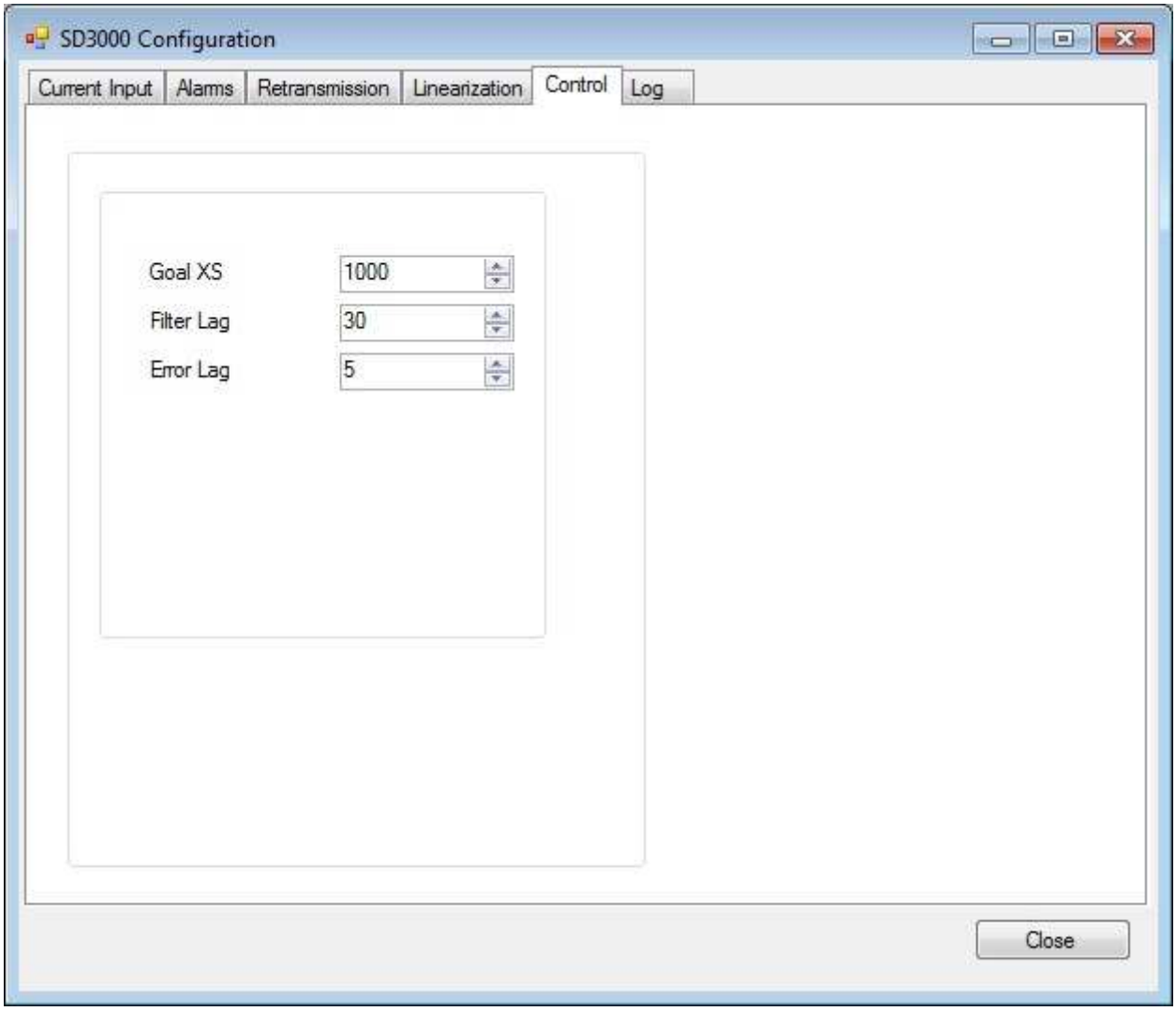


The SD–3000 has 2 linearization tables (XS and RS), with 50 points each. Linearization is enabled when bit 1 from the SD–3000 control register (address 40035) is set.

The number of linearization steps should be chosen as follows:

1 - Edit columns LINI_ and LINO_ inserting the desired number of rows.
2 - After the last row LININ_ and LINO_ must be zero.
3 - The first LINI_ value is not editable and is always zero.
4 - LINI_ values cannot lie outside the RS (0 to 15000) and XS (0 to 1500) limits.

Control



Parameters:

- **XS Goal:** Set point value relative to the phase difference in which the SD–3000 has constant control.
- **Phase Filter:** Filter value applied to the SD–3000 phase control signal.
- **Phase Error:** Maximum error allowed to phase control considering the set point value fixed in XS Goal.

Log

This feature is useful to create a linearization table, with the samples measured in a laboratory.

- Collect the sample and click in  .
- Put an identification number on the sample and in the TAG column in the table.
- Send the sample to the laboratory.
- After receiving the results from the laboratory fill the table.
- Repeat this step for the number of samples wanted.

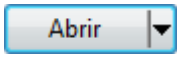
To create a new file:

- Click in 

.
- Give a name to the file and save it.

To use an existent file:

- Click in 

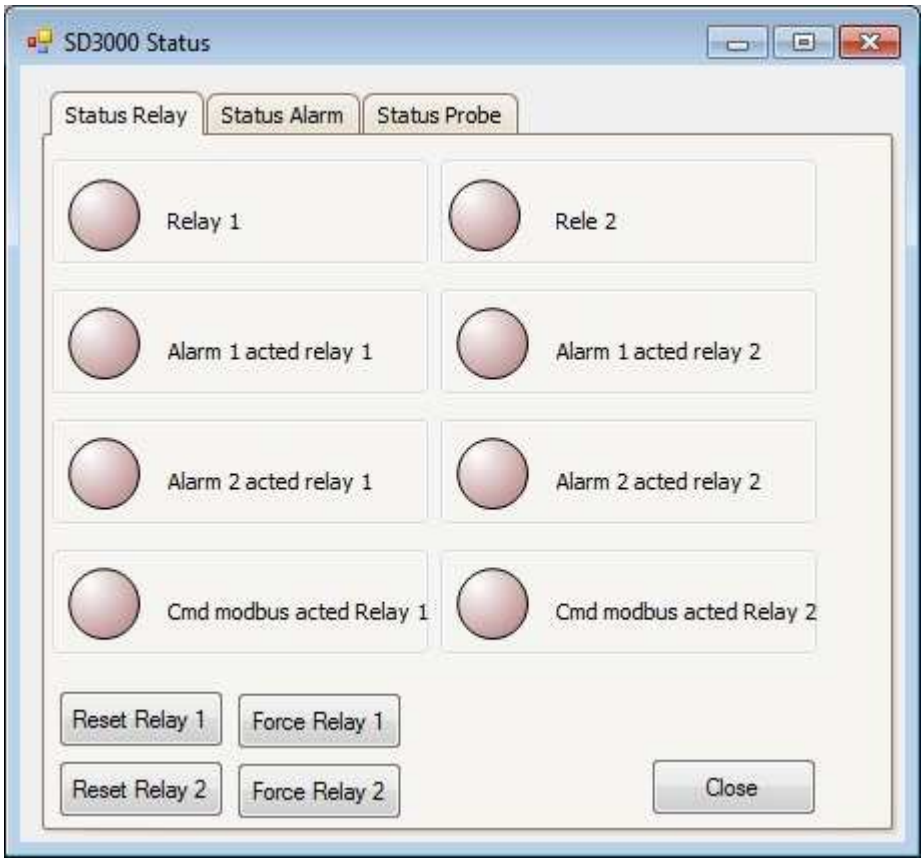
.
- Selected the file and click in 

(Open).

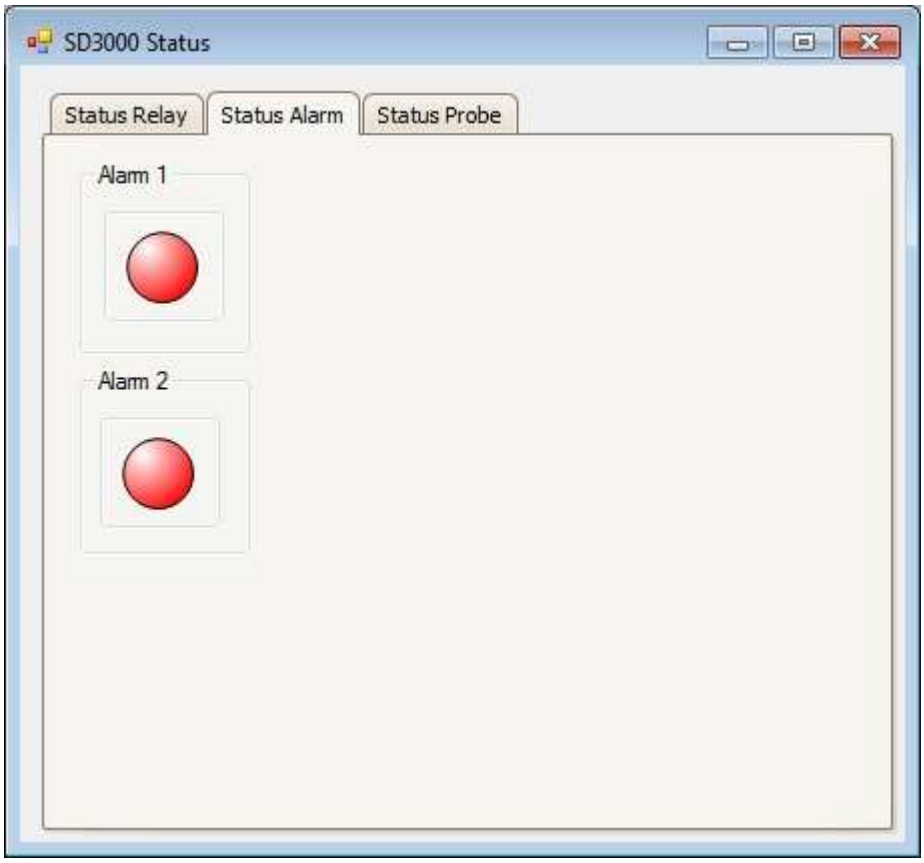
It is possible to export data to Microsoft Excel, clicking in 

and selecting a name to the new file.

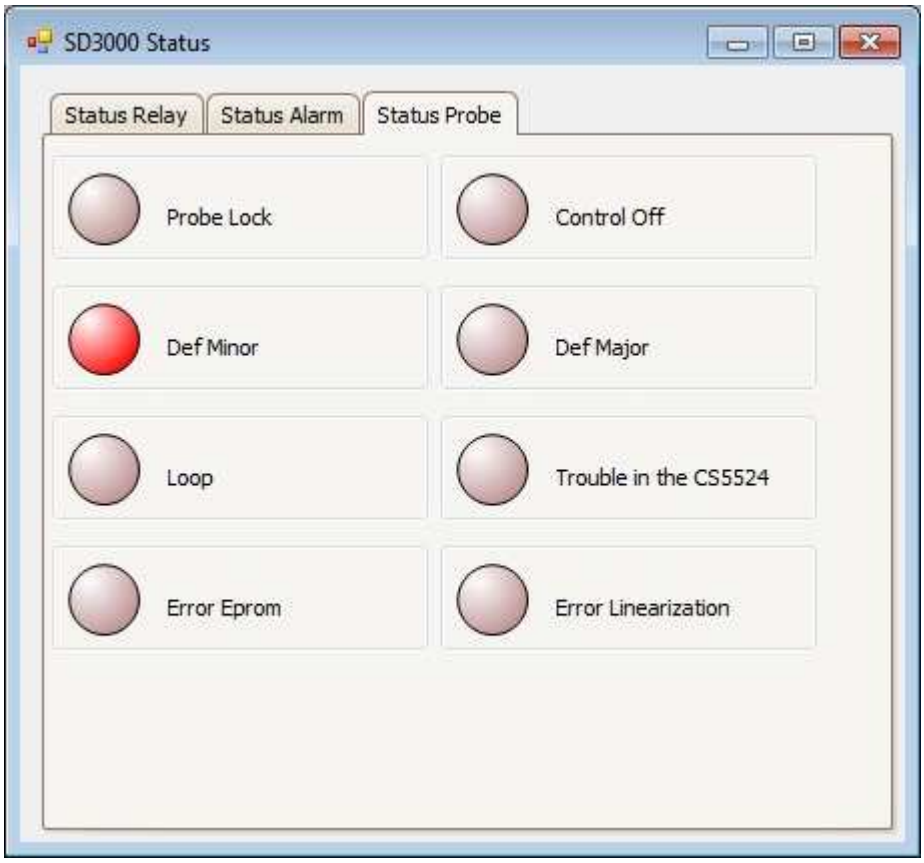
Status Alarm



This feature allows monitoring of the relay activation statuses, based on the alarm configuration. It is also possible to reset or force the relay activation.

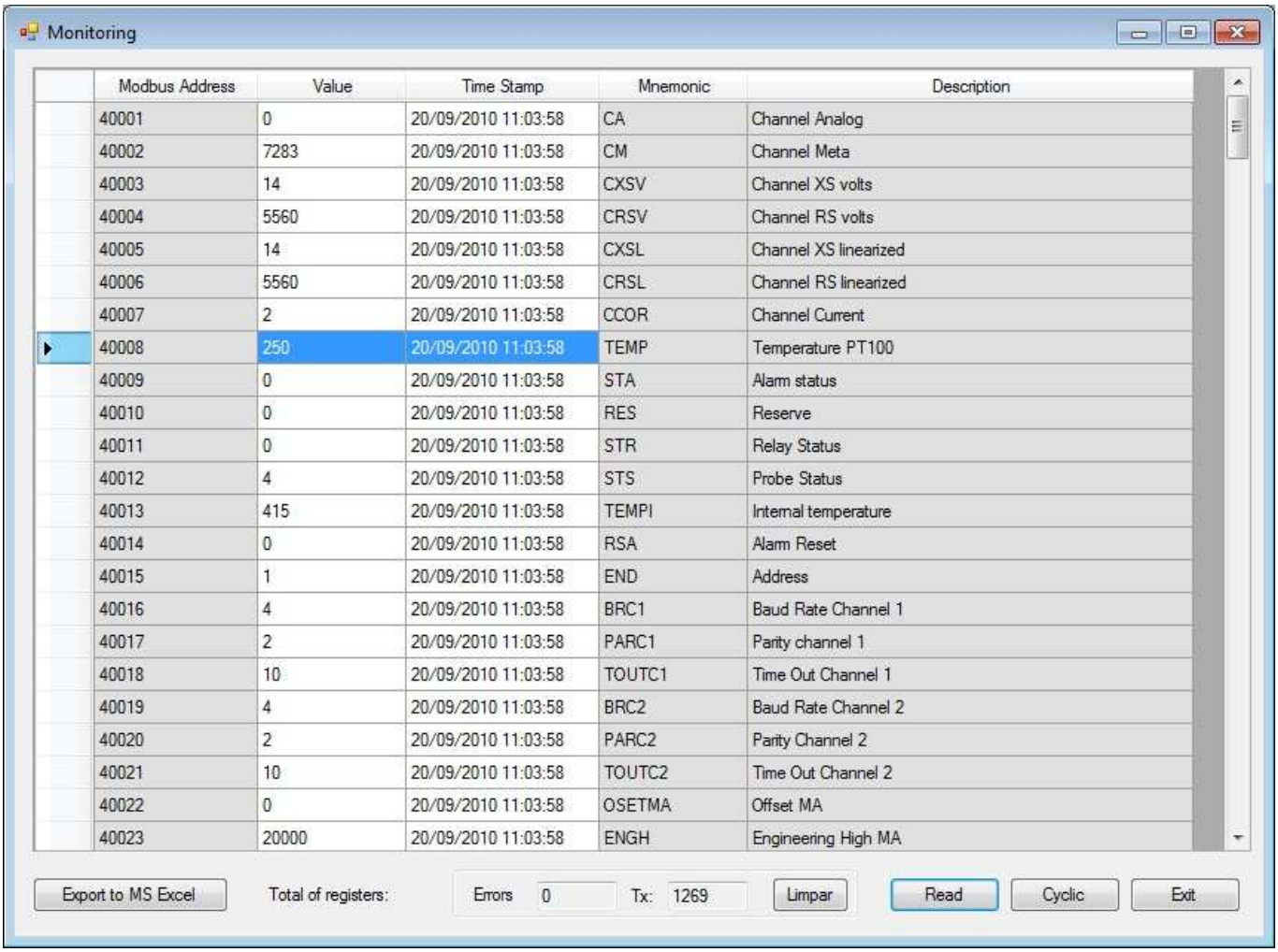


This feature allows monitoring the alarm activation statuses.



This feature allows monitoring the transmitter statuses.

Monitoring



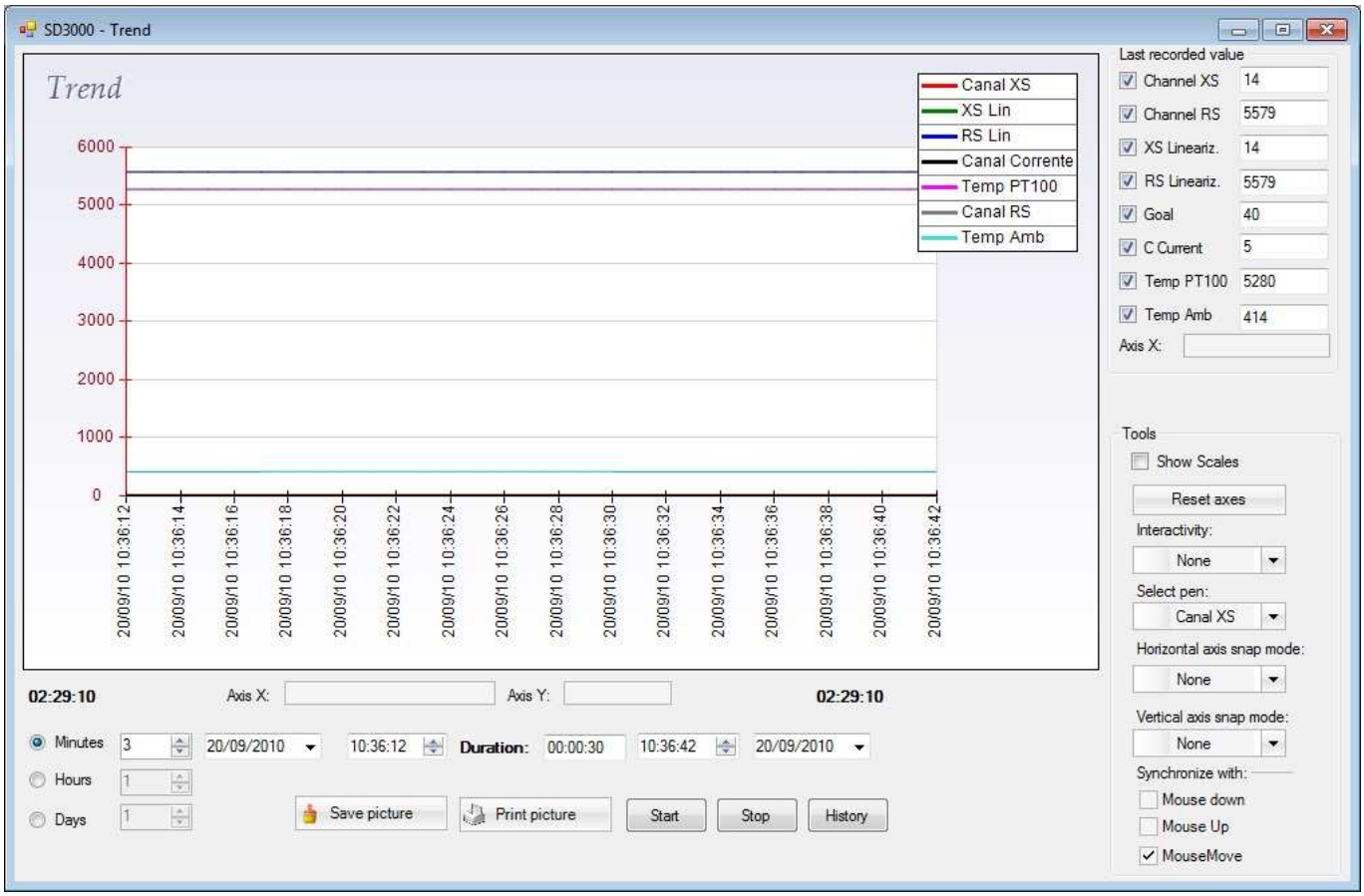
This feature monitors the whole Modbus table, manually or automatically.

By clicking in Read the Modbus table is scanned once.

By clicking in Cyclic the table is scanned continuously, with period defined in Tools > Communication > Scan > Scan Period. The scan period can be from 0.1 to 5 seconds. To stop scanning, click in Stop.

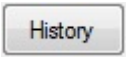
Data can be exported to Microsoft Excel by clicking in Export to MS Excel and defining a name to the new file.

Trend



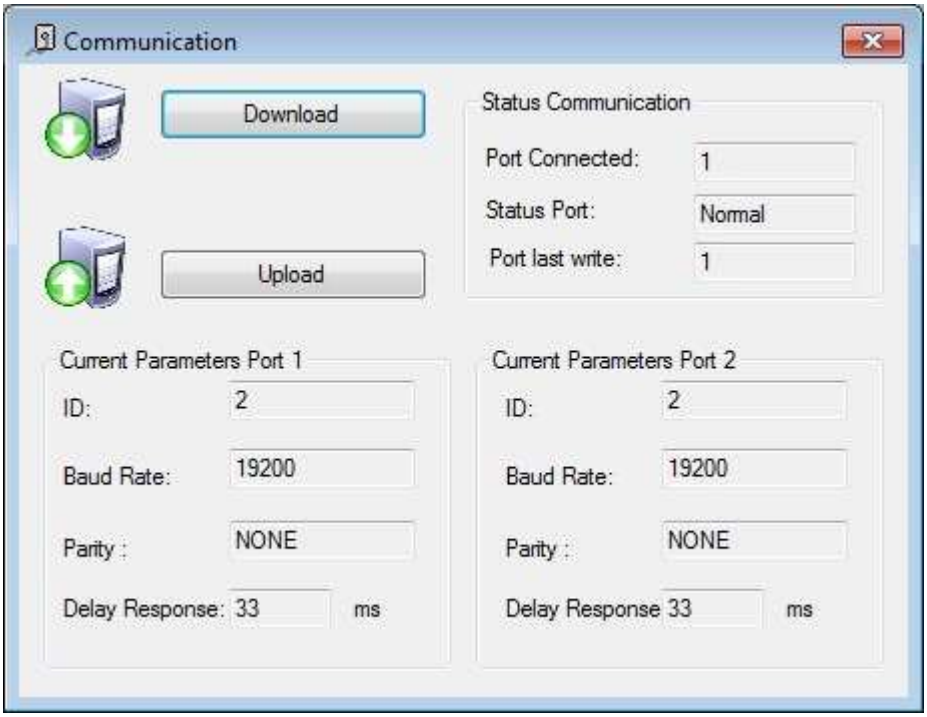
This feature displays a graphical representation of the SD–3000 inputs.

- Set the sampling time, which can be specified in:
  - Minutes
  - Hours
  - Days

- Click in  and create a new file or open an existent one.

- Click in  .

Communication

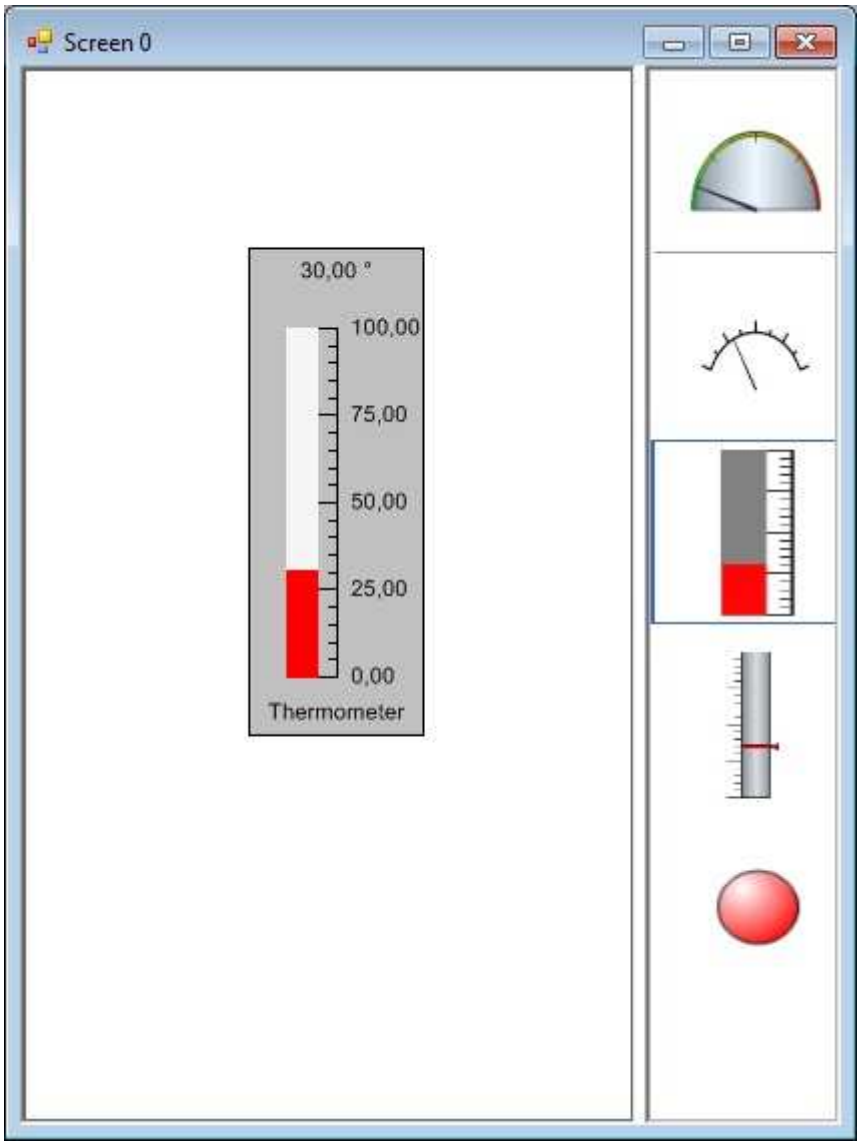


This feature uploads the SD-3000 registers to DLGTools or downloads the DLGTools registers to the SD-3000.

- **Status Communication**:
  - Port Connected: indicates to which RS-485 port in the SD-3000 that DLGTools is connected to.
  - Status Port: indicates if the port is in NORMAL or RESET mode.
  - Port last write: indicates which SD-3000 port last received configuration parameters.

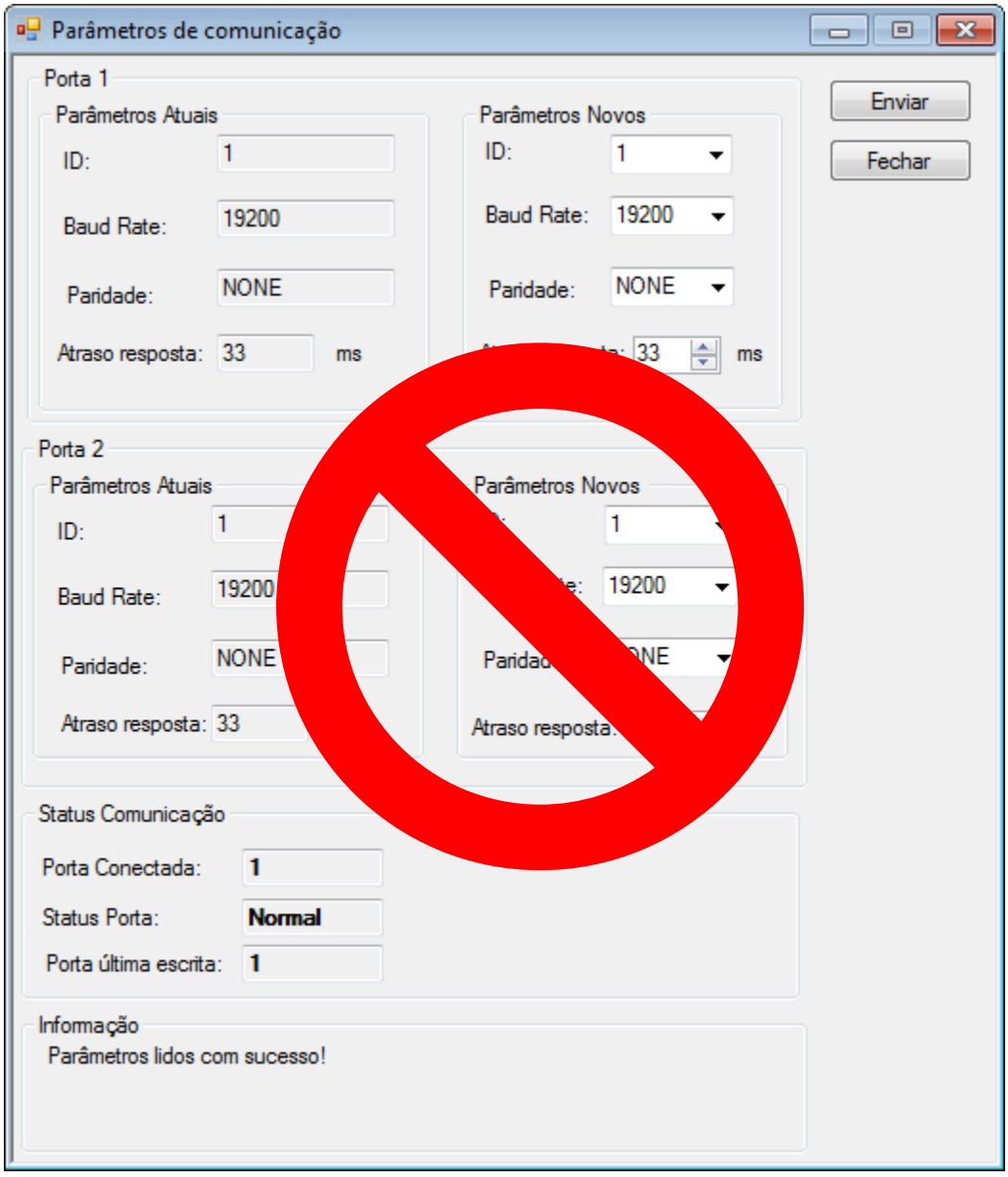
- **Current Parameters Port 1 and 2:** indicates how the RS-485 ports are configured.

Animation



This feature allows animating all analog registers from the Modbus table using graphical objects.

Configuring the Modbus RS-485 Communications Port



In the device search screen, DLGTools can configure the RS-485 communications port parameters of the DLG devices.

Clicking over the desired device and then in Com Prm, the communications configuration screen will be opened. In this screen it is possible to configure:

- **ID:** this is the device Modbus address, ranging from 1 to 255.
- **Baud Rate:** Defines the baud rate, which can be: 9600, 19200, 38400, 57600 or 115200 bps.
- **Paridade:** Defines how parity checking is done: even parity, odd parity or no parity.
- **Atraso resposta:** Defines a delay between the equipment receiving the Modbus request and sending the Modbus response. The delay can range from 10 ms to 100 ms.

After the parameters are set, click in Enviar to send them to the SD–3000.

Modbus Table

Address	Offset	Mnemonic	Description	Default	Limits		Type	Read/ Write- Retentive /Non- Retentive
					Max	Min		
40001	0	CA	RESERVED				US	R
40002	1	CM	Goal channel				SS	R
40003	2	CXSV	XS channel volts				SS	R
40004	3	CRSV	RS channel volts				SS	R
40005	4	CXSL	XS channel linearized				SS	R
40006	5	CRSL	RS channel linearized				SS	R
40007	6	CCor	Current channel				SS	R
40008	7	TEMP	PT100 temperature				US	R
40009	8	STA	Alarm status				US	R
40010	9	RES	RESERVED				US	R
40011	10	STR	Relay status				US	R
40012	11	STS	Transmitter status				US	R
40013	12	TEMPI	Internal temperature				SS	R
40014	13	RSA	Alarm reset	0	0x0F	0	US	R/W NR
Communications Configuration								
40015	14	END	Address	1	247	0	US	R/W R
40016	15	BRC1	Channel 1 baud rate	4	7	3	US	R/W R
40017	16	PARC1	Channel 1 parity	2	2	0	US	R/W R
40018	17	TOUTC1	Channel 1 timeout	10	100	10	US	R/W R
40019	18	BRC2	Channel 2 baud rate	4	7	3	US	R/W R
40020	19	PARC2	Channel 2 parity	2	2	0	US	R/W R
40021	20	TOUTC2	Channel 2 timeout	10	100	10	US	R/W R
Engineering								
40022	21	OSETMA	mA Offset	0	30000	-30000	SS	R/W R
40023	22	ENGH	Engineering High MA	20000	30000	-30000	SS	R/W R
40024	23	ENGL	Engineering Low MA	0	30000	-30000	SS	R/W R
40025	24	PDMA	Decimal point MA	3	4	0	US	R/W R

Alarm Configuration								
40026	25	CTRLA	Alarm control	0x55	0x2000	0	US	R/W R
40027	26	CAL	Alarm condition	0	0x44	0	US	R/W R
40028	27	DAL1	Alarm 1 delay	0	10	0	US	R/W R
40029	28	DAL2	Alarm 2 delay	0	10	0	US	R/W R
40030	29	HAL1	Alarm 1 hysteresis	0	30000	0	US	R/W R
40031	30	HAL2	Alarm 2 hysteresis	0	30000	0	US	R/W R
40032	31	SPAL1	Alarm 1 set point	0	30000	-30000	SS	R/W R
40033	32	SPAL2	Alarm 2 set point	0	30000	-30000	SS	R/W R
40034	33	MASRL	Alarm relay mask	0	0x0F	0	US	R/W R
Retransmission Configuration								
40035	34	TRET	Retransmission type	0	0x0F	0	US	R/W R
40036	35	CRET	Retransmission channel	0x55	0x2000	0	US	R/W R
40037	36	LRLXS	CH1 low retransmission limit	0	30000	0	SS	R/W R
40038	37	LRHXS	CH1 high retransmission limit	0	30000	0	SS	R/W R
40039	38	LRLRS	CH2 low retransmission limit	0	30000	0	SS	R/W R
40040	39	LRHRS	CH2 high retransmission limit	0	30000	0	SS	R/W R
40041	40		RESERVED					
40042	41		RESERVED					
Linearization Tables								
40043	42-91	LINOXS0i	XS output value for linearization point i	0	30000	-30000	SS	R/W R
40093	92-141	LINIXS01	XS input value for linearization point i	0	30000	0	SS	R/W R
40143	142-191	LINORS01	RS output value for linearization point i	0	30000	-30000	SS	R/W R
40193	192-241	LINIRS01	RS input value for linearization point i	0	30000	0	SS	R/W R
40243	242	CTRL	SD3000 control	0	0x0F	0	US	R/W R
Calibrations (password needed)								
40244	243	TMASS	Mass type	0	0x7FFF	0	US	R/W R
40245	244	MXS	Goal XS	0	15000	0	US	R/W R
40246	245	DA1	DA1	1000	1500	0	US	R/W R
40247	246	DA2	DA2	0	1500	0	US	R/W R
40248	247	DA3	DA3	937	1500	0	US	R/W R
40249	248	DA4	DA4	600	1500	0	US	R/W R
40250	249	FILD	Phase Drift Filter	30	100	0	US	R/W R
40251	250	ERRD	Phase Drift Error	30	100	0	US	R/W R

US = Unsigned Short SS = Signed Short R = Read
W = Write R = Retentive NR = Non-retentive

Mask and Values for the Registers

Read-only bits

Bit	Function	Comments
Alarm status - 40009		
0	Alarm 1	0 = Deactivated 1 = Activated
1	Alarm 2	
Relay status – 40011		
0	Relay 1	0 = Deactivated 1 = Activated
1	Relay 2	
8	Alarm 1 activated relay 1	0 = False 1 = True
9	Alarm 1 activated relay 2	
10	Alarm 2 activated relay 1	
11	Alarm 2 activated relay 2	
12	Modbus activated relay 1	
13	Modbus activated relay 2	
Transmitter status – 40012		
0	PROBE_LOCK	0 = Deactivated 1 = Activated
1	PROBE_CONTROL_OFF	
2	PROBE_DEF_MINOR	
3	PROBE_DEF_MAJOR	
4	PROBE_LOOP	
5	RESERVED	
6	CS5524 ERROR	
7	EEPROM_ERROR	
8	LINEARIZATION_ERROR	
9	PASSWORD FEEDBACK	

Read/Write bits

Bit	Function	Comments
Relay activation/deactivation – 40014		
0	Deactivate relay 1	0 = No action 1 = Deactivates relay
1	Deactivate relay 2	
2	Activate relay 1	0 = No action 1 = Activates relay
3	Activate relay 2	
Alarm 1 and 2 masks – 40034		
0	Alarm 1 relay 1	0 = Relay not associated with alarm 1 = Relay associated with alarm
1	Alarm 1 relay 2	
2	Alarm 2 relay 1	
3	Alarm 2 relay 2	
Control – 40243		
0	XS control	0 = Enables control 1 = Disables control
1	Linearization	0 = Disables linearization 1 = Enables linearization

Read/Write registers enumerations

Value	Function	Comments
Baud rate – 40016 and 40019		
3	9600	
4	19200	
5	38400	
6	57600	
7	115200	
Parity – 40017 and 40020		
0	Even	
1	Odd	
2	None	
Alarm type – 40026		
0x00	Disabled	**Alarm type 1** The register value must be the sum of “alarm type 1” and “alarm type 2”.
0x01	XS channel	
0x02	RS channel	
0x03	Linearized XS channel	
0x04	Linearized RS channel	
0x05	Current channel	
0x06	PT100 temperature	
0x10	XS channel	**Alarm type 2** The register value must be the sum of “alarm type 1” and “alarm type 2”.
0x20	RS channel	
0x30	Linearized XS channel	
0x40	Linearized RS channel	
0x50	Current channel	
0x60	PT100 temperature	
Alarm condition – 40027		
0	Minimum value	**Alarm condition 1** The register value must be the sum of “alarm condition 1” and “alarm condition 2”.
1	Maximum value	
2	Differential	
3	Differential inverted	
4	Disabled	
0	Minimum value	**Alarm condition 2** The register value must be the sum of “alarm condition 1” and “alarm condition 2”.
8	Maximum value	
16	Differential	
24	Differential inverted	
32	Disabled	

PV retransmission type – 40035		
0x00	0 – 20 mA or 0 – 10 V retransmission based on span and engineering zero	**Retransmission type 1** The register value must be the sum of “retransmission type 1” and “retransmission type 2”.
0x01	0 – 20 mA or 0 – 10 V retransmission based on minimum and maximum limits	
0x02	4 – 20 mA or 2 – 10 V retransmission based on span and engineering zero	
0x03	4 – 20 mA or 2 – 10 V retransmission based on minimum and maximum limits	
0x00	0 – 20 mA or 0 – 10 V retransmission based on span and engineering zero	**Retransmission type 2** The register value must be the sum of “retransmission type 1” and “retransmission type 2”.
0x10	0 – 20 mA or 0 – 10 V retransmission based on minimum and maximum limits	
0x20	4 – 20 mA or 2 – 10 V retransmission based on span and engineering zero	
0x30	4 – 20 mA or 2 – 10 V retransmission based on minimum and maximum limits	
Retransmitted channel – 40036		
0x00	Disabled	**Retransmitted channel 1** The register value must be the sum of “retransmitted channel 1” and “retransmitted channel 2”.
0x01	XS channel	
0x02	RS channel	
0x03	Linearized XS channel	
0x04	Linearized RS channel	
0x05	Current channel	
0x06	PT100 temperature	
0x10	XS channel	**Retransmitted channel 2** The register value must be the sum of “retransmitted channel 1” and “retransmitted channel 2”.
0x20	RS channel	
0x30	Linearized XS channel	
0x40	Linearized RS channel	
0x50	Current channel	
0x60	PT100 temperature	
Mass type – 40244		
0	A or B mass	
1	Free	
2	Calibration	

Modbus relay activation and deactivation

Relay activation/deactivation - 40014	
Value	**Action**
1	Deactivate relay 1
2	Deactivate relay 2
4	Activate relay 1
8	Activate relay 2

If the transmitter receives an activation and deactivation request for the same relay, only the deactivation request is processed.

It is only possible to activate or deactivate a relay from a Modbus request only if the relay is not associated with an alarm, otherwise the request is discarded.

Current channel engineering limits

The SD–3000 transmitter has a current input channel that may be used for any purpose and its engineering limits are described below:

Channel	Eng Max	Eng Min	Comments
Current	30000	-30000	Configurable by the current input

Warranty

The manufacturer assures to the equipment owners, identified by the purchase invoice, warranty of 1 (one) year as follows:

1 - The warranty period begins on the data of the invoice issue.

2 - Within the warranty period, the labor and parts used for repairing damage occurred in normal use are free.

3 - For repairs, send the equipment along with the shipping invoices to our factory in Sertãozinho, São Paulo state, Brazil. DLG's address is available at the end of this manual.

4 - The owner is responsible for transportation costs and risks.

5 - Warranty will be automatically suspended if changed are made to the equipment by personnel not authorized by DLG, defects caused by mechanical shock, exposure to conditions unfit for use or tampering with the product.

6 - DLG disclaims any charge relating to unauthorized repairs or replacements due to failures caused by agents external to the equipment, the improper use of them and as a result of unforeseeable circumstances or major forces.

7 - The DLG ensures full operation of the equipment described herein and all existing operations.

Notes

DLG Automação Industrial Ltda.
Rua José Batista Soares, 53
Distrito industrial – 14176-119
Sertãozinho – São Paulo – Brasil
Fone: +55-16-3513-7400
www.dlg.com.br