SUPPLEMENTARY OPERATING INSTRUCTIONS

TRANSIC151LP USB-Interface

Installation
Operation
Maintenance

SICK
Sensor Intelligence.

Document Information

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Original Documents
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Legal Information
Subject to change without notice.

Warning Symbols


Service interface danger (general)
Please consult the documentation.


Hazard through corrosive substances

Hazard in potentially explosive atmospheres


Hazard by explosive substances/mixtures


Hazards through noxious substances


Hazard through toxic substances


Hazard by laser radiation


Hazards through high temperature or hot surfaces


Hazard for the environment/nature/organic life

Warning levels / signal words

DANGER
Risk or hazardous situation which *will* result in severe personal injury or death.

WARNING
Risk or hazardous situation which *could* result in severe personal injury or death.

CAUTION
Hazard or unsafe practice which *could* result in personal injury or property damage.

NOTICE
Hazard which *could* result in property damage.

Information Symbols

Information on product condition with regard to protection against explosions (general)

Important technical information for this product

Important information on electric or electronic functions

Nice to know

Supplementary information

Link to information at another place

TRANSIC151LP USB-Interface

1 Important Information

Main operating information
Intended use
Responsibility of user

1.1 Main operating information

Observe the following safety precautions:

> ***NOTICE:*** **This Manual is only valid in combination with the TRANSIC151LP Operating Instructions.**
>
> ► Observe all the operating information of the TRANSIC151LP Operating Instructions!

1.1.1 Installation location

> **WARNING: Risk of explosion for cabling in potentially explosive atmospheres.**
>
> ► The data cable for the Service interface may only be used in a non-hazardous area

1.1.2 Additional documentation/information

This document is a supplement for the Operating Instructions (Part No. 8015384) for the TRANSIC151LP oxygen measuring device.

It extends the Operating Instructions with technical information on the TRANSIC151LP USB-Interface and entering commands via the serial interface.

► Observe the TRANSIC151LP Operating Instructions included in the delivery (Part No. 8015384).

1.2 Intended use

The TRANSIC151LP USB-Interface only serves setting the TRANSIC151LP.

► Do not use the TRANSIC151LP USB-Interface for permanent operation.

1.3 Responsibility of user

Designated users

All operators of the TRANSIC151LP USB-Interface should be specifically trained on this device, knowledgable of relevant regulations, and able to assess potential hazards related to its operation.

Correct use

► Use the TRANSIC151LP USB-Interface only as described in these Operating Instructions.
The manufacturer bears no responsibility for any other use.

► Do not remove, add or change any components in or on the TRANSIC151LP USB-Interface unless such changes are officially allowed and specified by the manufacturer. Failure to observe these precautions could result in

- voiding the manufacturer's warranty
- causing the device to become dangerous

Special local conditions

Current must be supplied to the TRANSIC151LP in order to use the data cable. Only use the TSA151 voltage supply unit to provide current.

► Follow all local laws, regulations and company policies applicable at the respective installation location.

Retention of documents

These Operating Instructions:

- ► Must be available for reference.
- ► Must be conveyed to new owners.
- ► Keep passwords in a separate, safe place and secure against unauthorized use.

TRANSIC151LP USB-Interface

2 Product Description

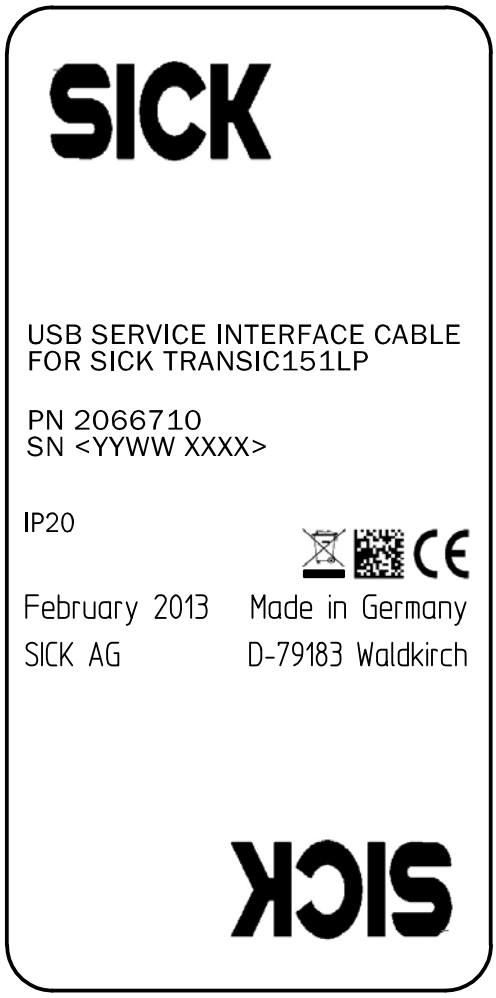
Product identification
Functional principle

2.1 Product identification

Product name:	TRANSIC151LP USB-Interface
Manufacturer:	SICK AG Erwin-Sick-Str. 1 · D-79183 Waldkirch · Germany

Type plate

Fig. 1 Example - type plate for the TRANSIC151LP USB-Interface



2.2 Functional principle/measuring principle

A USB-Interface serves to connect the data cable of the TRANSIC151LP interface to a computer. A virtual COM port is realized and serves to exchange data.

TRANSIC151LP USB-Interface

3 Installation

Information
Connections

3.1 Installation information

WARNING: Risk of explosion for cabling in potentially explosive atmospheres.

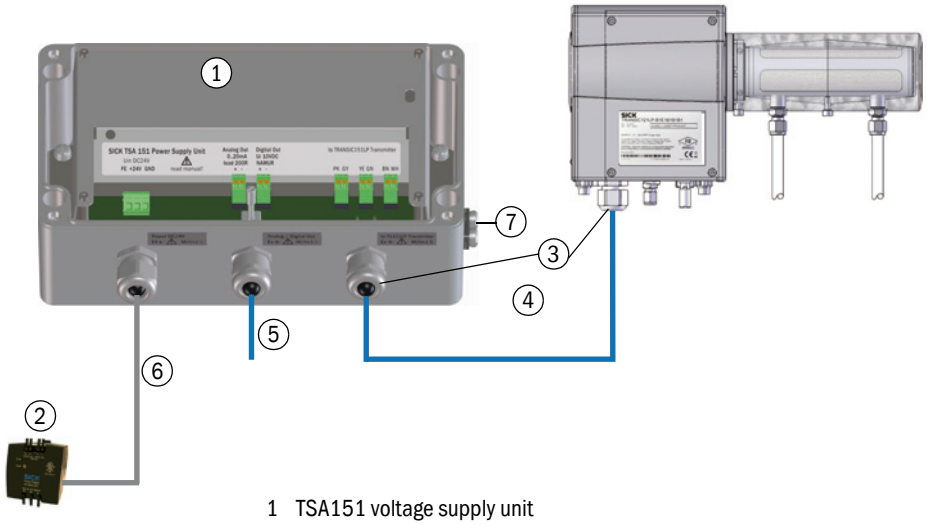
- The data cable for the Service interface may only be used in a non-hazardous area.

***NOTICE:* Use a TSA151 voltage supply unit**

Current must be supplied to the TRANSIC151LP in order to use the data cable. Only use the TSA151 voltage supply unit to provide current.

3.2 Connections

Fig. 2 Connections and shielding



1 TSA151 voltage supply unit
2 Power supply 24 V PELV DC provided by the customer or optionally available
3 EMC cable gland
4 Connection cable: 0.5 / 2.5 / 5 m (shielded, twisted pair)
5 Analog and digital output
6 Wiring to 24 V DC PELV, twisted pair
7 Ground terminal

WARNING: Unallowed voltage supply voids the Ex certification
Only connect the TRANSIC151LP via the TSA151 voltage supply unit.
Only use a 24V DC PELV power supply unit on the TSA151 voltage supply unit.

WARNING: Using unallowed cables voids the Ex certification
If the cables used are not SICK standard cables, they must meet the cable specifications in Table → p. 69, 9.3.2.

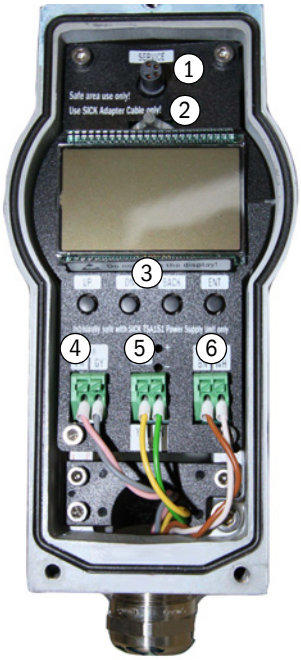
WARNING: Damage to cabling through heat
► Only use cables specified for temperatures > 70 °C.

***NOTICE:* Risk of damage to the TSA151 through dust or humidity**
► Only open the TSA151 in a dry environment free from dust.

Other cables can also be used. These must meet the specifications in the Technical Data → p. 69, 9.3.2.

3.2.1 Connecting the TRANSIC151LP transmitter

Fig. 3 TRANSIC151LP - electrical connections



1 Service interface (SICK USB-Interface required)
2 LED lamp
3 Keypad
4 Voltage supply
5 Analog output
6 Digital output (NAMUR)

1 Ensure the device is disconnected from the power supply and potential-free.
2 Remove the cover on the front side of the TRANSIC151LP.
3 Push the cable through the cable gland. (Max. cable length: 5 m).
4 Connect voltage supply terminals to U-in (4) PK (pink) and GY (gray).
5 Connect analog output to I-out (5) YE (yellow) and GN (green).
6 Connect digital output to D-out (6) BN (brown) and WH (white). A NAMUR digital output is located between terminals BN and WH.
7 Connect the shielding to the cable gland.

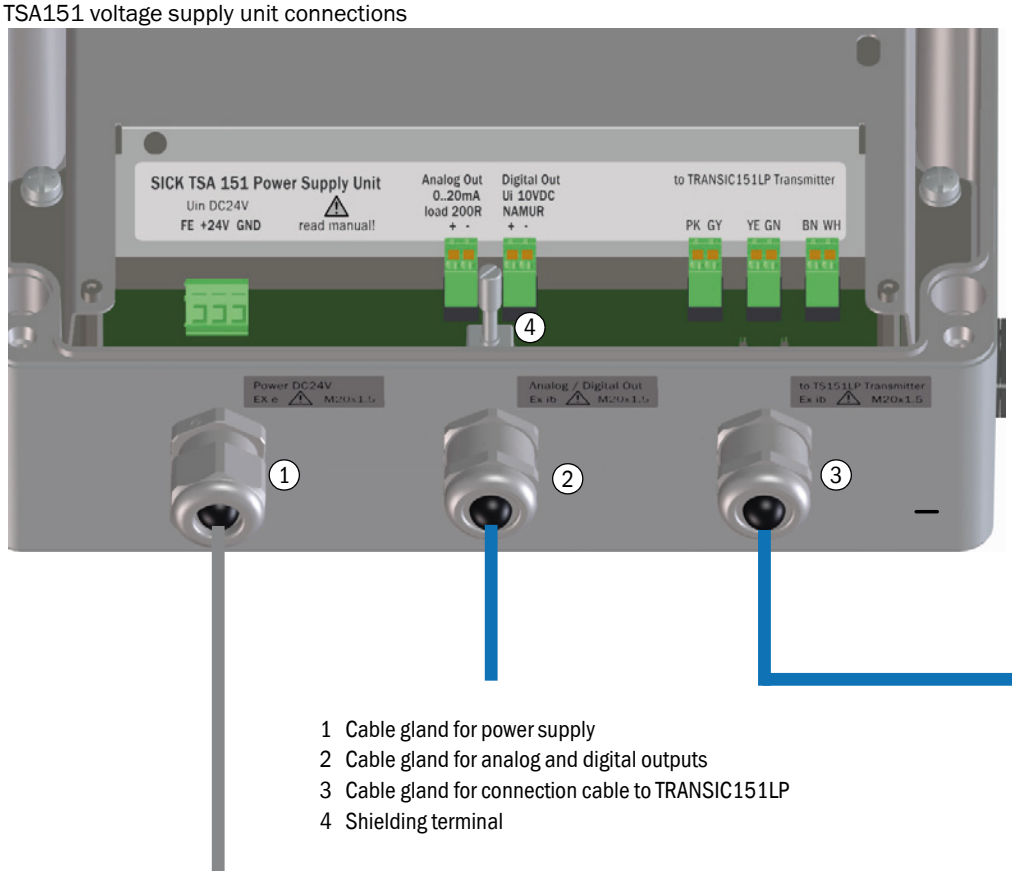
Cable colors are oriented to DIN47100.

3.2.2 Connecting the TSA151 voltage supply unit

NOTICE: **Risk of damage to the TSA151 through dust or humidity**
► Only open the TSA151 in a dry environment free from dust.

The TRANSIC151LP is delivered with the TSA151 voltage supply unit already fitted.
The TSA151 supplies the TRANSIC151LP with an intrinsically safe (ib) power circuit.

Fig. 4 TSA151 voltage supply unit connections



1 Cable gland for power supply
2 Cable gland for analog and digital outputs
3 Cable gland for connection cable to TRANSIC151LP
4 Shielding terminal

1 Ensure the voltage is switched off.
2 Remove the cover of the TSA151 voltage supply unit.
3 Push the cable through cable gland (3). (Max. cable length: 5 m).
4 Connect power supply terminals PK (pink) and GY (gray).
5 Connect the analog output YE (yellow) and GN (green).
6 Connect the digital output to BN (brown) and WH (white). A NAMUR contact is located between the terminals BN (brown) and WH (white).
7 Connect the shielding to the cable gland.

3.2.3 Connecting the analog and digital output

The analog output must be connected using an Ex separation stage with a maximum sense resistance of 200 Ohm (e.g., SICK 6051123).

The digital output is implemented as a NAMUR contact. This must be connected via a NAMUR switching amplifier (e.g., SICK 6051124).

1 Ensure the voltage is switched off.
2 Remove the cover of the TSA151 voltage supply unit.
3 Analog output: connect analog out + and -.
4 Digital output: connect digital out + and -.

3.2.4 Connecting the power supply to the TSA151 voltage supply unit

CAUTION: Electrical voltages!

► Always make sure the lines are disconnected before starting any electrical work.

A 24 V DC PELV power supply unit is mandatory to guarantee a fault voltage of max. 60 V.
SICK Part No. 7028789.

1 Ensure the voltage is switched off.
2 Remove the cover of the TSA151 voltage supply unit.
3 Push the cable through cable gland (1).
4 Connect the supply voltage to terminals +24V and GND.
Terminal FE serves as optional internal connection of the functional ground.

The 24 V DC PELV power supply unit must have a protection device against overvoltage.

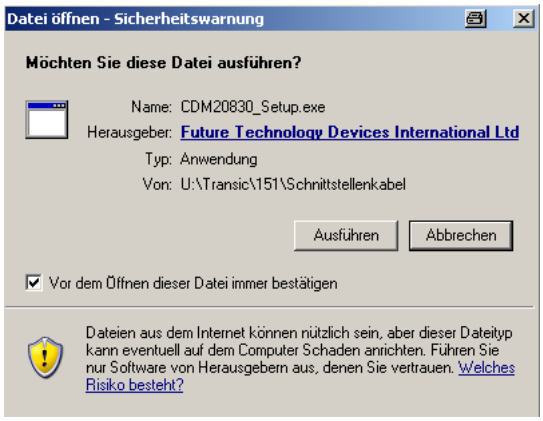
In order to switch the TSA151 disconnected from the power supply and potential-free, a disconnecting device must be planned in the Ex-free zone before the PELV power supply unit. Install the disconnecting device as close as possible to the power supply unit and easily accessible.

3.2.5 Driver installation

The driver for the TRANSIC151LP USB-Interface can be found on the TRANSIC151LP Product CD or in internet: http://www.ftdichip.com/Drivers/VCP.htm.

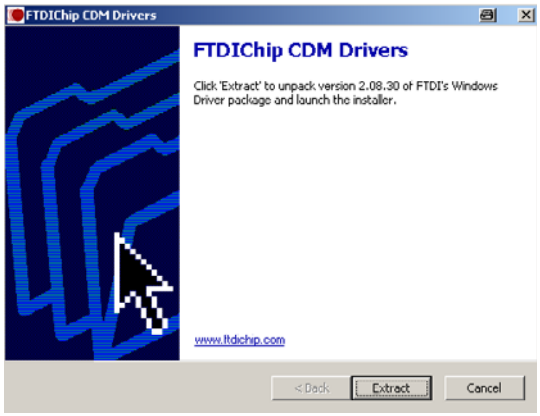
Administrator rights are required for driver installation

Fig. 5 1st step



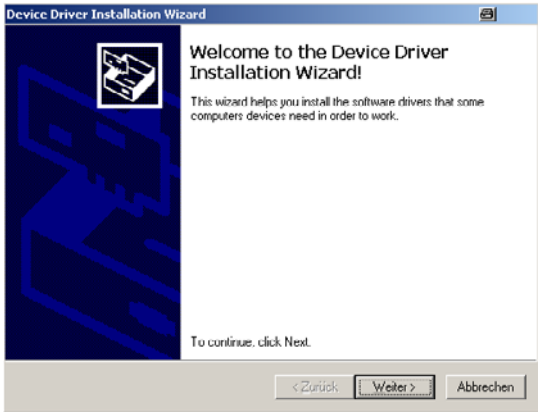
A safety prompt can appear when the file is executed. Click “Ausführen" (Run) as confirmation.

Fig. 6 2nd step



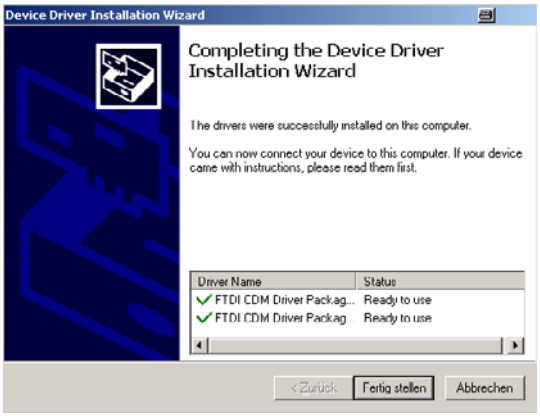
The “Driver Extract Wizard“ opens. Click “Extract" to confirm.
The files are extracted and the “Installation Wizard" opens.

Fig. 7 3rd step



Click “Weiter" (Continue) to continue installation.

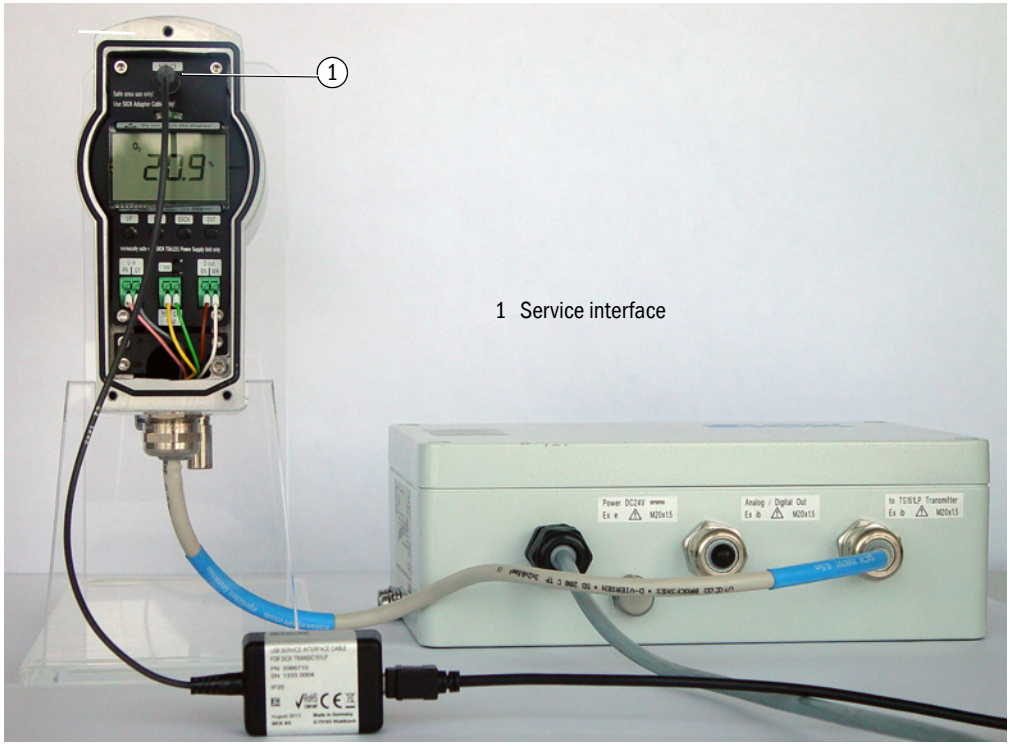
Fig. 8 4th step



Click “Fertig stellen" (Finish) to complete installation.

3.2.6 Connecting the TRANSIC151LP USB-Interface

Fig. 9 Connecting the maintenance cable to the Service interface and computer



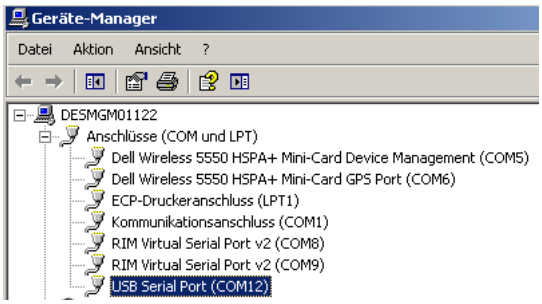
1 Connect the TRANSIC151LP USB-Interface to the Service interface of the TRANSIC151LP (1).

2 Connect the USB plug of the TRANSIC151LP USB-Interface to the computer.

3 The computer assigns a virtual COM port to the TRANSIC151LP USB-Interface.

This COM port then serves to connect the terminal program on the computer to the TRANSIC151LP.

Fig. 10 Reading out the assigned COM port



CAUTION: Usage of unspecified cables voids the Ex certification

Only the original TRANSIC151LP USB-Interface Part No. 2066710 may be connected to the TRANSIC151LP. Connecting a different cable voids the Ex certification.

TRANSIC151LP USB-Interface

4 Operation

Interfaces

***NOTICE:* Risk of damage to the TSA151 through dust or humidity**

► Only open the TSA151 in a dry environment free from dust.

NOTICE: Read the Instructions through carefully before making any settings or parameter changes. SICK accepts no responsibility for parameter or setting changes nor adjustments made by the user. Contact SICK Customer Service when you require technical support.

DANGER: Hazard through incorrect parameter settings

Incorrect settings for parameters can have severe consequences. This is why the password may only be available for authorized technicians.

► Note the password in the Manual → p. 72, 10.1 and keep it safe somewhere else.

The password can be found in the Annex → p. 72, 10.1.

4.1 Interfaces

There are 2 control interfaces

- Keypad (on the front TRANSIC151LP panel)
- Service interface

Access to change parameters is password-protected. The password allows access for 30 minutes after entry.

4.1.1 Control via keypad

Information on control via the keypad can be found in the TRANSIC151LP Operating Instructions.

4.1.2 Service interface

The Service interface is above the display. It serves:

- Maintenance
- Calibration
- Changing parameters.

All adjustable parameters can be accessed with a PC terminal program (e.g., Hyperterminal) via the serial Service interface.

The TRANSIC151LP USB-Interface serves to connect the TRANSIC151LP and the PC.

The Service interface provides more configuration options for alarm threshold(s) or other settings than the keypad and display.

4.1.3 Analog output

The TRANSIC151LP has a non-insulated current output. The configuration of the analog outputs (0 or 4 ... 20 mA) and the switching behavior in error states are determined at order time. These parameters can be changed via the Service interface.

4.1.4 NAMUR digital output

The NAMUR digital output can be configured at order time so that it signals limit value overflows or underflows, warnings or device errors. These settings can be changed via the Service interface.

4.2 Interface commands

Table 1 Significance of command line elements

Element	Significance	Text style used
SAMPLE	Name of the command or utility program	UPPER CASE BOLD
{variable}	Specifies several options from which the user must select one, several or all options.	Lower case letters (in round brackets}
[option]	Specifies optional elements.	Lower case letters in [square brackets]
. , : ;	Punctuation marks are part of the command and must be entered as such.	Lower case letters
<cr>	Stands for pressing Enter (on the computer keyboard)	Lower case letters

Table 2 Standard settings for the serial interface of the TRANSIC151LP

Property	Description / value
Baud rate	19200
Data bits	8
Parity	None
Stop bits	1

4.2.1 List of interface commands

Table 3 List of interface commands without password

Interface command	Description
?	Display device information
??	Display device information with overwriting in POLL mode
ADDR	Display/set device address
CALCS	Display measuring parameters
CINFO	Display calibration information
CLOSE	Close serial interface (POLL mode)
DATE	Display/set date
ECHO	Set Echo mode
ERRS	Display errors detected
FORM	Set output format
HELP	List commands
INTV	Display/set continuous output interval
OPEN	Open communication line
PARAM	Display all changeable parameter values
PASS	Output password
R	Start continuous output
S	Stop continuous output
SAVE	Save parameters in EEPROM
SEND	Send measuring results
SERI	Display/set serial communication settings
SERI2	Display/define serial communication settings for RS-485
SIL	Measure signal level
SMODE	Display/set serial communication mode

Table 3 List of interface commands without password

Interface command	Description
SMODE2	Display/set serial communication mode for RS-485
STATS	Display status information
TIME	Display/set time
VERS	Display product name and software version
XPRES	Set pressure for compensation

Table 4 List of additional interface commands with password

Interface command	Description
ADJUST	Freeze outputs for calibration
CO2	Display/set CO_2 for compensation
COXY1	Perform one-point adjustment
COXY2	Perform two-point adjustment
DB	Display status of display range
ENV	Set several/all ambient parameters with one command
ERR	Display error control status
ERRL	Display error protocol
ERRT	Display error Table
FCRESTORE	Reset factory calibration
H2O	Display/set H_2O for compensation
ICAL	Calibrate analog output
ITEST	Set test current for analog output
LTC	Display status of laser temperature controller
MEA	Display measuring status
OUT	Display output status
OUT_PARAMS	Display/set output parameters
PRES	Display/set pressure for compensation
RELAY_MODE	Display/set relay operating mode
RESET	Reset device
RSEL	Display/set relay switching point
SCI1	Display status of serial interface
SCI2	Display status of serial RS-485
STATUS	Display status of submenu item

4.3 Output of measuring result

4.3.1 Start continuous output (command R)

Starts RUN mode. Outputs values defined with the command *FORM* (→ p. 28, 4.3.9). Command *INTV* → p. 26, 4.3.3) defines the output interval. Command *S* (→ p. 26, 4.3.2) stops RUN mode.

Syntax: `R<cr>`

Example:

```
>r
Oxygen =    21.0
Oxygen =    21.0
Oxygen =    21.0
```

4.3.2 Stop continuous output (command S)

Stops RUN mode and switches the serial output to STOP.

Syntax: `S<cr>`

Example:

```
>S
>
```

4.3.3 Display/set continuous output interval (command INTV)

Sets the frequency for measured value output in RUN mode (→ p. 26, 4.3.1).

Syntax: `INTV [Value] [Unit]<cr>`

Value	=	Tine interval in which results are output (0 ... 255)
Unit	=	Interval time unit, S for seconds, MIN for minutes or H for hours

Example:

```
>intv
INTERVAL : 1   ? 5
UNIT S ? min
```

4.3.4 Send measuring results (command SEND)

Outputs the last results (in accordance with *FORM,* → p. 28, 4.3.9) in STOP mode. The command can be used with an address in POLL mode.

Syntax:

`SEND [Address]<cr>`

`SEND [Formatting string]<cr`

Address	=	Device address
Formatting string	=	Character string specifying the output format for the measuring results

Example:

```
>send   20.9   20.8   24.5
```

4.3.5 Display/set serial communication mode (command SMODE)

Defines the mode of the serial interface used to enter the command. Possible modes are STOP, POLL and RUN. Command *SAVE* (→ p. 38, 4.11.1) saves the setting.

Syntax: SMODE [Mode]<cr>

Mode	=	Serial communication mode, possible modes are STOP, POLL and RUN

Example:

```
>smode
SMODE          : STOP ?
>
```

4.3.6 Display/define serial communication settings (command SERI)

Sets the parameters for serial communication.

NOTICE:
Defines the parameters of the interface used to enter the command.

Valid baud rates for the Service interface are 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200,

NOTICE:
To be able to use the new settings, save them in EEPROM with command *SAVE* (→ p. 38, 4.11.1) and then reset the device with command *RESET* (→ p. 38, 4.12.1).

Syntax: *SERI* [Baud] [Data] [Parity] [Stop]<cr>

Baud	=	Valid baud rates are 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 (max. baud rate for the RS-485 interface is 38400)
Data	=	Number of data bits (7 or 8)
Parity	=	Parity (n = none, e = even, o = odd)
Stop	=	Number of stop bits (1 or 2)

Example:

```
>seri

BAUD RATE      : 19200 ?
DATA BITS      : 8        ?
PARITY         : NONE ?
STOP BITS      : 1        ?
```

4.3.7 Display status of serial Service interface (command SCI1)

Displays and sets the status of the Service interface with the associated variables.

Syntax: SCI1<cr>

Example:

```
>sci1
*** SERVICE INTERFACE (SCI1) ***:
Mode           : STOP
Seri           : 19200 8 NONE 1

Seri           : 19200 8 NONE 1
ECHO           : ON
SMODE          : STOP
```

4.3.8 Display measuring status (command MEA)

Displays the measurement status with the associated variables.

Syntax: MEA<cr>

Example:

```
>mea
*** OXYGEN MEASUREMENT (MEA) ***
Mode            : NORMAL
State           : PEAK_SEARCH
OP (DAC/mA)     : 20960 / 1.92
...
```

4.3.9 Format measuring results (command FORM)

Configures the output format for the commands *SEND (see* →p. 26, 4.3.4) and *R* (→p. 26, 4.3.1) and can therefore also be changed as required.

Syntax: FORM [x]<cr>

X = Formatting string

The formatting string comprises the data to be shown and the associated formatting commands.

► Select one or more of the following variables by entering the abbreviation after the command *FORM*:

Table 5 Abbreviations and variables in the formatting string

Abbreviation	Data
O2	Filtered O_2 results
TGASC	Gas temperature (Centigrade)
TGASF	Gas temperature (Fahrenheit)
TIME	Time elapsed since last reset
DATE	Date (set by user, comes after the time elapsed since last reset)
ERR	Error category (0 = no error, 1 = non-fatal, 2 = fatal)
ADDR	Measuring device address (0 ... 99)

Following formatting commands are available:

Table 6 Commands in formatting string

Formatting command	Description
x.y	Change value for length (whole numbers and decimal places). The changed length parameters are used for all following variables.
\t	Tab stop
\r	Enter key
\n	Line feed
\xxx	Any character code (decimal value with three digits)
" "	String constant
U5	Field and length of the unit; units are output in standard width when U is entered without length specification

+i # can be used for \.

Examples:

Configuration of an output format comprising the oxygen measuring result (displayed with 3 decimal places) and the gas temperature in degrees Centigrade (also displayed with 3 decimal places). Text strings are inserted after the measured values for the output units. Tab stop \t separates the various formatting commands and character \r for Enter starts a new line after each measured result output. Command *SAVE* (→p. 38, 4.11.1) saves the

setting.

```
>form 2.3 O2 \t “%O2" \t 2.3 TGASC \t “C" \r \n
>save
EEPROM (basic) saved successfully
EEPROM (op) saved successfully
EEPROM (op_log1) saved successfully
EEPROM (op_log2) saved successfully
>send
2.504 %O2 28.065 C
```

Command *FORM* without parameters outputs the current formatting string:

`>form`

Example:

```
2.3 O2 \t “%O2" \t 2.3 TGASC \t “C" \r \n
The standard output format is used with command FORM /:
>form /
F0
>send
Oxygen =    21.0
```

4.3.10 Display/set date (command DATE)

Sets the date.

`Syntax: DATE [YYYY] [MM] [DD]<cr>`

YYYY	=	Current year
mm	=	Current month
DD	=	Current day

Example:

```
>date
YEAR      :  2003 ?
MONTH     :  7 ?
DAY       :  17 ?
>
```

NOTICE:
The device does not have a real-time clock so that the date set by the user is reset to 0000-01-01 after every switch-on.

4.3.11 Display/set time (command TIME)

Displays the time elapsed since the last device switch-on. The time can be set to the real time by entering the current time as a parameter. The time switch switches from 23:59:59 to 00:00:00.

NOTICE:
The device does not have a real-time clock so that the time set by the user is reset to 00:00:00 after every switch-on.

`Syntax: TIME [hh:mm:ss]<cr>`

hh	=	Hours
mm	=	Minutes
ss	=	Seconds

Examples:

```
>time
03:28:32
>time 11:23:01
11:23:01
>
```

4.4 Commands for access at maintenance level

DANGER: Hazard through incorrect parameter settings
Incorrect settings for parameters can have severe consequences. This is why the password may only be available for authorized technicians.

4.4.1 Enter password (example PASS)

Entering the password allows access to the maintenance level (SERVICE). The maintenance commands remain available for 30 minutes after the password has been entered. All other passwords or the command *PASS* without parameter activate the basic commands (BASIC).

Syntax: PASS [Password]<cr>

Example:

```
>pass 2020
>
(2020 is a password example)
```

The password allows access to the maintenance level via the serial interface and the keypad. A message is sent via the serial interface when the password has expired (only in STOP mode):

NOTE: PASSWORD EXPIRED

4.5 Commands for calibration and adjustment

4.5.1 Freeze outputs for calibration (command ADJUST)

Retains the current values for all outputs or releases the output again.

This command serves to check the calibration based on a known span gas or for online adjustments so that measured value changes do not disturb process control.

Syntax: *ADJUST* [on/off]<cr>

Example:

```
>adjust on
Outputs (analog, relay, POLL/Run and MT300) frozen
>
```

4.5.2 Set water content for compensation (command H2O)

Allowable range is 0 ... 600 g/m³ H_2O.

Use command *SAVE* (→ p. 38, 4.11.1) to save the setting to EEPROM.

Syntax: *H2O* [Water]<cr>

Water	=	Water content in measured gas (g/m³ H_2O)

Example:

```
>H2O 100
WATER(g/m3)  : 100     ?
```

4.5.3 Set carbon dioxide content for compensation (command CO2)

Use command *SAVE* (→ p. 38, 4.11.1) to save the setting to EEPROM. Allowable range is 0 ... 100 vol.-% CO_2.

Syntax: *CO2* [Carbon dioxide]<cr>

Carbon dioxide	=	CO_2 concentration in measured gas (vol.-% CO_2)

Example:

```
>co2 10
CO2(%)   : 10      ?
```

4.5.4 Set several/all ambient parameters with one single command (command ENV)

Syntax: *ENV* [Pressure] [Water] [Carbon dioxide]<cr>

Pressure	=	Pressure setting (bar_a)
Water	=	Water content in measured gas (g/m^3 H_2O)
Carbon dioxide	=	CO_2 concentration in measured gas (vol.-% CO_2)

Example:

The ENV command without parameters displays the current values for ambient parameters. Press Enter to confirm the current setting. Enter other values to change the parameters.

```
>env
PRESSURE(bar)  : 1.013    ?
H2O (g/m3)       : 0        ?
CO2 (vol-%)      : 0        ?
>
Set pressure 1.000 bara, water content 50 g/m3 and CO2 content  20 vol-% CO2:
>env 1 50 20
PRESSURE(bar)    : 1.000
H2O (g/m3)       : 50
CO2 (vol-%)      : 20
>
```

4.5.5 Calibrate analog output (command ICAL)

Calibrates the current output. Calculates and sets the values for parameters Gain (GI) and Offset (OI).

Syntax: ICAL<cr>

Example:

```
>ical
 Ilow  (mA)  ? 3.42
 Ihigh (mA)  ? 17.6
>
```

4.6 Scaling and setting the analog output

4.6.1 Display/set output parameters (command OUT_PARAMS)

Syntax: *OUT_PARAMS*<cr>

Example:

```
>out_params
NONFATALI (mA) : 3.000    ?
FATALI (mA)    : 3.000    ?
I4             : 1        ?
OUTMAXO2 (%)   : 20.000   ?
OUTMINO2 (%)   : 0.000    ?
```

NONFATALI	=	Current output (in mA) for non-fatal error
FATALI	=	Current output (in mA) for fatal error
I4	=	Parameter to determine whether the current output range starts with 0 or 4 mA: When I4 = 0, the current output is 0...20 mA When I4 = 1, the current output is 4...20 mA
OUTMAXO2 (%)	=	Oxygen concentration OUTMAXO2 (%) is set for current output 20 mA
OUTMINO2 (%)	=	Oxygen concentration OUTMINO2 (%) is set for current output 0/4 mA

4.6.2 Display/set pressure for compensation (command PRES)

1 Sets the pressure for compensation.

2 Use command *SAVE* (→ p. 38, 4.11.1) to save the setting in EEPROM.

Syntax: *PRES* [Pressure]<cr>

Pressure	=	Pressure of the measured gas (bar_a)

Saving the settings with command *SAVE* prevents the settings being lost at the next reset.

```
>pres 1.300
PRESSURE(bar)  : 1.300     ?
>save
EEPROM (basic) saved successfully
EEPROM (op) saved successfully
EEPROM (op_log1) saved successfully
EEPROM (op_log2) saved successfully
>
```

Set pressure for compensation (command XPRES)

This command is suitable for systems where the pressure value is measured continuously and sent to the oxygen measuring device.

NOTICE: The setting *CANNOT* be saved in EEPROM with command *SAVE*.

Syntax: *XPRES* [Pressure]<cr>

Pressure	=	Pressure setting (bar_a)

Example:

```
>xpres 1.300
PRESSURE(bar)  : 1.300     ?
```

4.7 Checking the analog output

4.7.1 Set test current for analog output (command ITEST)

Starts and stops the mode for checking the current output.

Syntax: `ITEST [Current]<cr>`

Where		
Current	=	test current (mA)

Example:

```
>itest 4
Test current set to 4 mA. Use ITEST to stop Test mode.
>itest
Current Test mode stopped.
>
```

4.8 Relay operation

4.8.1 Display/set relay operating mode (command RELAY_MODE)

Sets the relay operating mode.→ p. 33, 4.8.1.

Syntax: *RELAY_MODE* [warn-alarm / fault_alarm / high_open / low_open]<cr>

warn_alarm	=	Relay open when maintenance request exists for error
fault_alarm	=	Relay open when error exists
high_open	=	Relay open when measuring result above upper point
		Relay closed when measuring result below lower point
low_open	=	Relay open when measuring result below lower point
		Relay closed when measuring result above upper point

The digital output is implemented as a NAMUR contact.

4.8.2 Display/set relay switching point (command RSEL)

Sets the relay switching points.

Syntax: *RSEL*<cr>

Example:

```
>rsel
LO POINT (%02)  : 10.0     ?
HI POINT (%02)  : 11.0     ?
```

4.9 Device information and other general commands

4.9.1 Display device information (command ?)

Outputs general device information. Command *STATUS* displays the status of various objects. → p. 38, 4.10.3.

Syntax: ?<cr>

Example:

```
>?
*** SICK TRANSIC100LP ***
Device         : TRANSIC100LP
SW version     : 9165087 0000 / 1.36
SNUM           : 12345678
Calibrated     : 2009-11-24
Calib. text    : Normal
ADDR           : 0
```

4.9.2 Display device information with overwriting in POLL mode (command ??)

As in command *?*, command *??* outputs general device information and the addressing can be overwritten with *??* in POLL mode. This allows accessing a device with an unknown address to determine the address.

Syntax: *??*<cr>

Example:

```
>??
*** SICK TRANSIC100LP ***
Device         : TRANSIC100LP
SW version     : 9165087 RC01 / 1.36
SNUM           : 12345678
Calibrated     : E2009-11-24
Calib. text    : Normal
ADDR           : 91
```

NOTICE:

The output is delayed with *??* depending on the address assigned to the device.

4.9.3 Display measuring parameters (command CALCS)

Displays all parameters the device can measure.

Syntax: *CALCS*<cr>

Example:

```
>calcs
O2          - Filtered O2 results
TGASC       - Gas temperature (centigrade)
TGASF       - Gas temperature (fahrenheit)
```

4.9.4 Display calibration information (command CINFO)

Displays information from the last adjustment.

Syntax: *CINFO*<cr>

Example:

```
Factory calibration:
Calibrated   : 2009-11-24
Calib. text  : Normal

Cal. point 1:
Given oxygen               : 0.00
Gas temperature (C)        : 20.81
Ref path temperature (C)   : 21.90

Cal. point 2:
Given oxygen            : 21.00
Gas temperature (C)     : 20.81
Ref path temperature (C): 21.90
...
```

4.9.5 Display status of display range (command DB)

Displays the current status of the interfaces.

Syntax: *DB*<cr>

Example:

```
*** DISPLAY BOARD (DB) ***
Mode           : NORMAL
State          : NORMAL
Fault HW state : OFF
Display state  : O2
Red led        : OFF
Green led      : SLOW
Relay          : CLOSE
RELAY_MODE     : FAULT_ALARM
LO POINT (%O2) : 10.0
HI POINT (%O2) : 11.0
...
```

4.9.6 List commands (command HELP)

Using this command without a parameter lists the commands accessible with the entered password. Using the command with a command name as parameter displays a detailed description of the respective command.

Syntax: *HELP* [Command]<cr>

Com-mand	=	Name of the desired command

Example:

```
>help
?       Prints information about the device
??      Prints information even in POLL mode
.
.
>
```

4.9.7 Display status of laser temperature controller (command LTC)

Displays the state of the laser temperature controller with the associated variables.

Syntax: *LTC*<cr>

Example:

```
>ltc
*** LASER TEMPERATURE CONTROLLER (LTC) ***
Mode            : ON
State           : TEMP_OK
Set Temp (C)    : 29.074
Temp (C)        : 29.073
Diff (C)        : -0.001
PID Output      : -773
DAC Output      : 29227
```

4.9.8 Display output statues (command OUT)

Displays the state and settings of the analog output and the associated variables.

Syntax: *OUT*<cr>

Example:

```
>out
*** ANALOG OUTPUT (OUT) ***
Mode            : NORMAL
State           : NORMAL
Oxygen  (%)     : 0.00
Current (mA)    : 3.00
DAC Output      : 50000

GI              : 1.0000
OI              : 0.0000
NONFATALI (mA)  : 3.000
FATALI (mA)     : 3.000
I4              : 1
OUTMAX02 (%)    : 20.000
OUTMIN02 (%)    : 0.000
```

4.10 Display all changeable parameter values (command PARAM)

Displays the current values of all parameters that can be set by the user.

Syntax: *PARAM*<cr>

Example:

```
>param
Customer Interface
SERI            : 19200 8 NONE 1
ECHO            : ON
SMODE           : STOP
Service Interface
SERI            : 115200 8 NONE 1
ECHO            : ON
SMODE           : STOP
Common Serial parameters
ADDR            : 0
INTV            : 1 S
FORM            :  F0
Analog Output
OUTMINO2 (%)    : 0.000
OUTMAXO2 (%)    : 25.000
I4                          : 1
NONFATALI (mA) : 3.000
FATALI (mA)     : 3.000
Relay Output
RELAY_MODE      : FAULT_ALARM
LO POINT (%O2) : 10.0
HI POINT (%O2) : 11.0
Measurement parameters-
INSTALLATION    : Process measurement
PRESSURE(bar)   : 1.000
H2O (g/m3)      : 50
CO2 (vol-%)     : 20
```

4.10.1 Measure signal level (command SIL)

Checks the signal level. The laser signal intensity is compared against the signal intensity of the factory calibration. The result is shown as a percentage value of the original signal intensity set. This allows measuring the contamination on optical surfaces.

Syntax: *SIL*<cr>

Example:

```
>sil
Signal level is 100% compared to signal level at factory
```

The laser signal intensity can rise during operation. This means values higher than 100% are possible.

4.10.2 Display statistic information (command STATS)

Displays statistic information.

Syntax: *STATS*<cr>

Example:

```
>stats
All cleared     : 2006-01-18 13:40:04
Uptime (h)      : 140
Resets          : 7
O2 max:21.06
O2 min          : 4.91
Tg max          : 29.71
Tg min          : 23.39
Ti max          : 32.53
Ti min          : 24.55
```

4.10.3 Display status of submenu item (command STATUS)

Displays the settings and status of all submenu items.

Syntax: *STATUS*<cr>

Example:

```
>status
Submenu items are mode and status:

*** LASER TEMPERATURE CONTROLLER (LTC) ***
Mode           : ON
State          : TEMP_OK
*** OXYGEN MEASUREMENT (MEA) ***
Mode           : MODE2
State          : PEAK_LOCKED
Run Time Func.: OFF
*** ANALOG OUTPUT (OUT) ***
Mode           : NORMAL
State          : NORMAL
*** ERROR CONTROL (ERR) ***
Mode           : ON
State          : NO ERRORS
*** CUSTOMER INTERFACE (SCI2) ***:
Mode           : STOP
*** SERVICE INTERFACE (SCI1) ***:
Mode           : STOP
*** DISPLAY BOARD (DB) ***
Mode           : NORMAL
State          : NORMAL
>
```

4.10.4 Display product name and software version (command VERS)

Displays the device name and software version.

Syntax: *VERS*<cr>

Example:

```
>vers
TRANSIC100LP 9165087 0000 / 1.36
```

4.11 Using storage

4.11.1 Save parameters (command SAVE)

> ***NOTICE:***
> Remember to save parameter changes with the command *SAVE* so that the changes are not lost.

Saves the parameters from RAM to EEPROM.

Syntax: *SAVE*<cr>

Example:

```
>save
EEPROM (basic) saved successfully
EEPROM (op) saved successfully
EEPROM (op_log1) saved successfully
EEPROM (op_log2) saved successfully
```

4.12 Resetting the measuring device

4.12.1 Reset (command RESET)

Resets the transmitter. This has the same effect as switching the transmitter off and on again.

Syntax: *RESET*<cr>

Example:

```
>reset
Resetting...
TRANSIC100LP 9165087 0000 / 1.36
SICK, 2011
...
```

4.12.2 Restoring factory calibration

Restore factory calibration (command FCRESTORE)

Syntax: *FCRESTORE*<cr>

Example:

```
>fcrestore
Customer calibration removed - remember SAVE command
Save the changes by issuing the command:
>save
```

4.13 Errors

4.13.1 Display error control status (command ERR)

Displays the error status and active errors.

Syntax: *ERR*<cr>

Example:

```
>err
*** ERROR CONTROL (ERR) ***
Mode            : ON
State           : WARNING
ERRORS:
WARNING         : WATCHDOG RESET OCCURRED
>
```

4.13.2 Display Error protocol (command ERRL)

Displays the events in the Error protocol.

Syntax: *ERRL*<cr>

Example:

```
>err
*** ERROR CONTROL (ERR) ***
Mode            : ON
State           : WARNING
ERRORS:
WARNING         : WATCHDOG RESET OCCURRED
>
```

4.13.3 Display errors detected (command ERRS)

Displays all errors active in the device.

Syntax: *ERRS*<cr>

Example:

```
>errs
ERROR: LOW SIGNAL
ERROR: FP SLOPE FAILURE
>
```

4.13.4 Display Error Table (command ERRT)

Displays the Error Table.

Syntax: *ERRT*<cr>

Example:

```
>errt
# :St :Cnt  :CategoryError text
 1:OFF:    0:FATALEEPROM BASIC PARAMS NOT AVAILABLE
 2:OFF:    0:FATALEEPROM OPERATION PARAMS NOT AVAILABLE
...
31:OFF:    0:NON FATALSIGNAL LEVEL LOW
32:OFF:    0:NON FATALSIGNAL CUT
...
52:OFF:    0:WARNINGEEPROM LOG&STATS CORRUPTED
53:OFF:    0:WARNINGWATCHDOG RESET OCCURRED
```

TRANSIC151LP USB-Interface

5 Setting Ambient Parameters

Compensation of ambient parameters

5.1 Compensation of ambient parameters

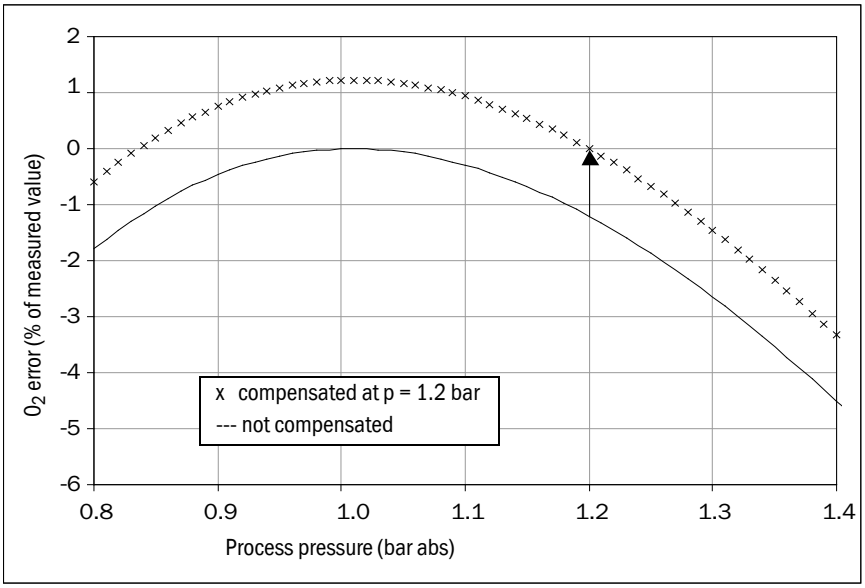
The TRANSIC151LP can compensate the temperature, pressure of the operating environment as well as water and CO_2 content of the background gas.

Table 7 Compensation of ambient parameters

Ambient parameters	Standard	Activated	Remarks
Operating pressure (process pressure)	Standard ambient parameters: Pressure 1013.25 hPa	Must be activated, ambient parameters must be set.	The pressure outside the process in which the measuring device enclosure is installed should be normal ambient air pressure.
Humidity	Water content 0 g/m³H_2O		
CO_2	Relative carbon dioxide concentration 0 vol.-% CO_2, compensation is deactivated		
Temperature	2 integrated temperature sensors: Inner temperature Process temperature	Automatic, always active	A significant difference between process gas temperature and the temperature in the measuring device enclosure can influence the measured value result.

The typical effect of the error depending on the process pressure is shown in the non-compensated curve in → p. 57, Fig. 13. The error magnitude is smallest at normal ambient air pressure.

Fig. 11 Effect of process pressure compensation



5.1.1 Pressure compensation

Setting the value of the average process pressure value compensates the measurement error more or less to zero in the immediate vicinity of the pressure value in question.

► Set the average pressure as parameter for the device. Use the command *PRES*. (→ p. 32, 4.6.2.)

→ p. 42, Fig. 11 illustrates the effect of pressure compensation where the average process pressure is set to 1.2 bar_a. The original error of approximately 1% of the measured value at 1.2 bar_a is compensated to zero. Pressure dependency remains for other values.

Pay particular attention that setting the pressure compensation does not shift the parabola-like curve in → p. 42, Fig. 11 along the X-axis. This means, even with compensation activated, pressure changes of the compensation value have a more significant effect than with 1.013 bar_a.

NOTICE:
To disable pressure compensation, reset the average process pressure value to the standard ambient air pressure of 1.013 bar_a. The magnitude of pressure compensation is zero with this setting.

The allowable pressure range for compensation is 0.800 ... 1.400 bar_a

5.1.2 Background gas effects

Individual absorption line widths of O_2 gas are sensitive to intermolecular collisions between O_2 and background gas molecules. This affects the measured O_2 values. The magnitude of this effect depends on the amount and type of background gas molecules. TRANSIC151LP factory calibration is carried out using dry N_2 and O_2 mixtures. Humidity and CO_2 concentrations of the span gases are 0%. Apart from dry N_2, all background gases result in a percentage measured value error for O_2 measurement.

Carbon dioxide and water vapor are the most common gases requiring compensation. Compensation for the average water and CO_2 contents of the background gas is integrated. The compensation is based on manual user settings for the values for the water and CO_2 content of the background gas in the device. The water content is expressed in terms of absolute humidity in g/m_3 H_2O. Conversion Table, see → p. 44, Table 8. The conversion formulas can be found in Section → "Water content of background gas".

***NOTICE:* Adapting compensation values to ambient conditions**
When humidity and CO_2 compensation is/are activated, and when the ambient conditions deviate from the ambient conditions during adjustment:

1 Set the water and CO_2 content according to the adjustment environment.
2 These settings then have to be changed back to represent those of the operating conditions when the TRANSIC151LP is reinstalled in the process.

Water content of background gas

The dependency on water content is expressed as absolute humidity in g/m^3 H_2O because relative humidity is strongly dependent on the temperature.

► Calculate the absolute humidity in g/m³ H_2O with the following equation:

$$H_2O\ (g/m^3) = C \times P_W / T$$

T	=	gas temperature in K (= 273.15 + T °C)
P_W	=	water vapor pressure in hPa
C	=	216.679 gK/J

$$P_W = P_{WS} \times RH\,(\%) / 100$$

RH(%)	=	relative humidity, and P_{WS} is the saturation pressure of the water vapor, or

$$P_{WS} = 1000 \times 10^{28.59051 - 8.2 \log T + 0.0024804\,T - 3142/T}$$

T	=	as specified above

Example for calculating absolute humidity in g/m³:

Gas temperature is 40 °C and relative humidity is 90%.

1 First calculate the water vapor pressure
P_W: P_W (hPa) = P_{WS} (40 °C) × 90/100 = 66.5

2 Use this result to calculate absolute humidity:
H_2O (g/m³) = 216.679 × 66.5 / (273.15 + 40 °C) = 46.0

The Table below gives a quick overview of the values for converting temperature and relative humidity into absolute humidity as well as the effect these conditions have on the O_2 measured value of the device.

Table 8 Table to convert temperature and relative humidity to absolute humidity

			Effect of humidity on measured O_2 values (% measured value)	
T °C	%RH	g/m³ H_2O	Dependency	Dilution
-20	50	0.5	0.0	-0.1
-20	90	1.0	0.0	-0.1
0	50	2,4	-0.1	-0.3
0	90	4,4	-0.2	-0.5
25	50	11.5	-0,4	-1,6
25	90	20,7	-0,7	-2.8
40	50	25,6	-0.9	-3,6
40	90	46.0	-1,6	-6,6
60	50	64.9	-2.1	-9.8
60	90	116.8	-3,6	-17,7
80	50	145.5	-4.2	-23,4
80	90	262.0	-6.3	-42.1

The water content of the background gas influences the oxygen measuring result.

1 The water molecules contained by the background gas displace a certain amount of oxygen molecules.

2 Collisions between the water and oxygen molecules affect the shape of the oxygen absorption lines.

The first effect is the dilution of the oxygen concentration of the measured gas (water displaces oxygen so there is a lower oxygen concentration in the measured gas). This is not compensated during measurement. Only the second effect is due to the measuring principle and can be compensated.

The dependency due to the measuring principle is shown in the 4th column of → p. 44, Table 8. This is compensated and eliminated when the water content of the measured gas is entered into the measuring device storage.

The 5th column of → p. 44, Table 8 shows the dilution effect. This effect is much stronger than the measuring principle effect. This is also valid for the water content compensation because it is the actual decrease of oxygen content in the measured gas due to water displacing oxygen in the gas mixture.

Setting the water content for compensation

- Syntax for input via the serial interface → p. 30, 4.5.2.

Setting the CO_2 concentration in background gas

The effect of CO_2 on the measured O_2 value is so small that in most circumstances CO_2 compensation is not necessary. The CO_2 dependency is expressed in terms of relative CO_2 concentration (percent per volume CO_2).

NOTICE:
The gas pressure value must be specified for CO_2 compensation.

Setting the carbon dioxide content for compensation

- Syntax for input via the serial interface → p. 30, 4.5.3.

TRANSIC151LP USB-Interface

6 Adjustment

Calibration

Adjustment

Adjustment for ambient gas measurement device variants

Definitions:

- Calibration: The comparison between the TRANSIC151LP measured value and a reference concentration
- Adjustment: Changing the TRANSIC151LP measured value so that it corresponds to the reference concentration.

Read the Instructions through carefully before making any settings or parameter changes. SICK accepts no responsibility for parameter or setting changes nor adjustments made by the user. Contact SICK Customer Service should you require technical support or assistance.

CAUTION: Differences between calibration and adjustment of the different TRANSIC151LP variants

Calibration and adjustment of the variants for installation in processes and with sample gas cells differ from the variant for measuring ambient gases. Make sure you read the correct Section. *Section 8 covers calibration and adjustment of the ambient gas measurement variant.*

***NOTICE:* Risk of damage to the TSA151 through dust or humidity**

► Only open the TSA151 in a dry environment free from dust.

Preparing the hardware for calibration/adjustment as well as setting up the gas supply, and information on span gases are described in detail in the TRANSIC151LP Operating Instructions.

WARNING: Observe all the operating information of the TRANSIC151LP Operating Instructions!

6.1 Calibration

The analog output can be frozen for calibration. Use the command *Adjust* → *p. 30, 4.5.1* for input via the serial interface.

Using ambient air:

- Normal ambient air provides a convenient way to calibrate the TRANSIC151LP because the oxygen concentration of dry ambient air is constant at 20.95 vol.-% O_2.
  - ► Ensure the sensor is completely in the ambient air. Important: Pay attention to measured oxygen value of 21.0 vol.-% O_2 ±0.2 vol.-% O_2 .
  - ► Correct the humidity.
    The Figure on → p. 49, "Measured oxygen values in relative humidity" shows the calibration display expected for the ambient air as function of the temperature (°C) and relative humidity (% r.h.).

The following Table shows the measured oxygen values (in vol.-% O_2) for a gas concentration of 20.95 vol.-% O_2 with varying humidity values. The Table shows examples for measured values when measuring wet gases without r.h. corrections having been entered in the TRANSIC151LP (i.e.the relative humidity is set to 0% r.h.). Both gas dilution effect and r.h. dependency effect are included in the Table.

Fig. 12 Measured oxygen values in relative humidity

	(% r.h.)										
Temp (°C)	0	10	20	30	40	50	60	70	80	90	100
0	21.0	21.0	21.0	21.0	20.9	20.9	20.9	20.9	20.9	20.9	20.8
5	21.0	21.0	21.0	20.9	20.9	20.9	20.9	20.8	20.8	20.8	20.8
10	21.0	21.0	20.9	20.9	20.9	20.8	20.8	20.8	20.7	20.7	20.7
15	21.0	21.0	20.9	20.9	20.8	20.8	20.7	20.7	20.6	20.6	20.6
20	21.0	20.9	20.9	20.8	20.8	20.7	20.6	20.6	20.5	20.4	20.4
25	21.0	20.9	20.8	20.8	20.7	20.6	20.5	20.4	20.3	20.3	20.2
30	21.0	20.9	20.8	20.7	20.6	20.4	20.3	20.2	20.1	20.0	19.9
35	21.0	20.9	20.7	20.6	20.4	20.3	20.1	20.0	19.8	19.7	19.6
40	21.0	20.8	20.6	20.4	20.2	20.1	19.9	19.7	19.5	19.3	19.1
45	21.0	20.8	20.5	20.3	20.0	19.8	19.5	19.3	19.1	18.8	18.6
50	21.0	20.7	20.4	20.1	19.7	19.4	19.1	18.8	18.5	18.2	17.9
55	21.0	20.6	20.2	19.8	19.4	19.0	18.6	18.3	17.9	17.5	17.2
60	21.0	20.5	20.0	19.5	19.0	18.5	18.1	17.6	17.1	16.7	16.2
65	21.0	20.4	19.7	19.1	18.5	17.9	17.3	16.8	16.2	15.6	15.1
70	21.0	20.2	19.4	18.7	17.9	17.2	16.5	15.8	15.1	14.4	13.8
75	21.0	20.0	19.1	18.2	17.3	16.4	15.5	14.7	13.8	13.0	12.2
80	21.0	19.8	18.7	17.5	16.5	15.4	14.4	13.4	12.4	11.4	10.4

6.1.1 Using bottled gas

- Preparations for calibration with bottled gas can be found under the title *Adjusting gas flow* in the TRANSIC151LP Operating Instructions.

1 When calibration conditions (gas pressure, humidity and CO_2 concentration) are different from the operating conditions of the TRANSIC151LP, set the ambient parameters of the TRANSIC151LP to the adjustment environment for the adjustment duration. These settings must then be changed back to represent the process conditions when the TRANSIC151LP is reinstalled in its operating environment.

2 Let the gas flow in.

3 Wait until the measured value has stabilized.

4 Now compare the TRANSIC151LP display value with the span gas specification.
5 Set the parameters for pressure, humidity and temperature corresponding to the process conditions.
6 Ensure the analog output is no longer frozen.

6.2 Adjustment

6.2.1 Adjustment options

- One-point adjustment
- Two-point adjustment
- Restoring factory calibration

- The reference concentration used determines whether the gain or offset parameter value is changed.
  - Change to the offset value: Oxygen concentration < 10.5 vol.-% O_2
  - Change to the gain value: Oxygen concentration < 10.5 vol.-% O_2
- Two-point adjustment: Always returns new gain and offset values.

6.2.2 One-point adjustment via the serial interface

One-point adjustment procedure via the serial interface (command COXY1)

This adjustment calculates and sets a new gain or offset parameter value (depending on the reference concentration used).

1 Enter the password → p. 30, 4.4.1

2 The analog output can be frozen during an online adjustment with the command *ADJUST ON*.
Input:

```
>adjust on
Outputs (analog, relay, POLL/Run and MT300) frozen
```

3 When adjustment conditions (gas pressure, humidity and CO_2 concentration) are different from the operating conditions of the measuring device, set the ambient parameters of the measuring device to the adjustment environment for the adjustment duration. These settings must then be changed back to represent the process conditions when the TRANSIC151LP is reinstalled in its operating environment. Further information on setting the ambient parameters (command *ENV*) of the TRANSIC151LP can be found in → p. 31, 4.5.4 and Section 5.

4 Enter command *COXY1* and confirm with the Enter button.

5 Connect the gas inlet and let the gas flow in.

6 The adjustment starts. The following commands are now available for selection:
- *Enter* - output the most current measuring result
- *R* + *Enter* - continuous output of measuring results. Press Enter to stop the output mode.
- *Esc* - to terminate the calibration.

7 Wait until the measured value has stabilized. Enter the span gas concentration and press *Enter*. The new gain or offset parameter value is calculated and displayed.
The following is displayed after entering the command *COXY1*:

```
>coxy1

Customer calibration
Current condition/settings:
Pressure (bar)          : 1.013
H2O (g/m3)              : 0
CO2 (vol-%)             : 0
Gas temperature (C)     : 23.64
Internal temperature (C): 24.84

If parameters are not correct, cancel calibration with ESC and change parameters.
Connect ref gas to cuvette.

Connect ref gas to cuvette.
O2 (%):  20.52 Ref  ?
O2 (%):  20.51 Ref  ?
O2 (%):  20.51 Ref  ?
O2 (%):  20.51 Ref  ? 20.50

Calibration data:
Pressure setting (bar)        : 1.013
Measured oxygen               : 20.51
Given oxygen                  : 20.50
Gas temperature (C)           : 23.65
Ref path temperature (C): 24.85
New Gain                      : 1.000
Calibration ready - remember SAVE command
>save
```

8 Now enter command *SAVE* (→ p. 38, 4.11.1) and press *Enter*. The new values are stored in EEPROM.

```
>save
EEPROM (basic) saved successfully
EEPROM (op) saved successfully
EEPROM (op_log1) saved successfully
EEPROM (op_log2) saved successfully
```

9 Enter command *ADJUST OFF* and press *Enter*. The adjustment is completed and the measuring results are displayed again.

```
>adjust off
Outputs to normal state
```

6.2.3 Two-point adjustment via the serial interface

Perform two-point adjustment (command COXY2)

This command starts a two-point adjustment.

Syntax: *COXY2*<cr>

Example:

```
>coxy2
Customer calibration

Current condition/settings:
Pressure (bar)            : 1.013
H2O (g/m3)                : 0
CO2 (vol-%)               : 0
Gas temperature (C)       : 23.66
Internal temperature (C)  : 24.85

If parameters are not correct, cancel calibration with ESC and change parameters

Connect ref gas #1 to cuvette
O2 (%)                    :  20.99 Ref1  ? 21

Connect ref gas #2 to cuvette
O2 (%)                    :  10.05  Ref2 ? 10

Calibration data:
Pressure setting (bar)    : 1.013

Point #1
Measured oxygen           : 20.99
Given oxygen              : 21.00
Gas temperature (C)       : 23.65
Ref path temperature (C): 24.84

Point #2
Measured oxygen            : 10.05
Given oxygen               : 10.00
Gas temperature (C)        : 23.66
Ref path temperature (C)   : 24.85
New Gain                   : 0.995
New Offset                 : 0.990

Calibration ready - remember SAVE command
>save
```

Two-point adjustment via the serial interface

This adjustment calculates and sets new gain and offset parameter values. A two-point adjustment uses one gas to adjust the lower limit value of the measuring range and a different gas to adjust the upper limit value of the measuring range. These can be, for example, pure nitrogen (0.0 vol.-% O_2) and an N_2/O_2 mixture (for example, 21 vol.-% O_2). The minimum difference between the two span gas concentrations in two-point adjustment should be at least 4 vol.-% O_2. It makes no difference whether the gas is first used for the lower or upper span.

1 Enter command *PASS XXXX* (the password) and confirm with Enter.

2 Enter command *ADJUST ON* and confirm with Enter. The analog output can be frozen during an online adjustment.

```
>adjust on
Outputs (analog, relay, POLL/Run and MT300) frozen
```

3 When adjustment conditions (gas pressure, humidity and CO_2 concentration) are different from the operating conditions of the measuring device, set the ambient parameters of the measuring device to the adjustment environment for the adjustment duration with command *ENV*→ p. 31, 4.5.4. These settings must then be changed back to represent the process conditions when the TRANSIC151LP is reinstalled in its operating environment. Further information on setting the ambient parameters of the TRANSIC151LP can be found in Section 5 of this Manual.

4 Enter command *COXY2* and confirm with the Enter button

5 Connect the gas inlet and let the gas flow in.

6 The adjustment starts. The following commands are now available for selection:
   – *Enter* - output the most current measuring result
   – *R + Enter* - continuous output of measuring results. Press Enter to stop the output mode.
   – *Esc* - to terminate the calibration.

7 Wait until the measured value has stabilized. Enter the span gas concentration for the first span and press *Enter*. The following is displayed after the command *COXY2* has been entered (example):

```
>coxy2
Customer calibration
Current condition/settings:
Pressure (bar)          : 1.013
H2O (g/m3)              : 0
CO2 (vol-%)             : 0
Gas temperature (C)     : 23.66
Internal temperature (C): 24.85
If parameters are not correct, cancel calibration with ESC and change parameters.
Connect ref gas #1 to cuvette

O2 (%):  20.99 Ref1  ?
O2 (%):  20.99 Ref1  ?
O2 (%):  20.99 Ref1  ?
O2 (%):  20.99 Ref1  ? 21
Connect ref gas #2 to cuvette
```

8 Now the second span gas has to be fed. Wait until the measured value has stabilized. Enter the span gas concentration for the second span and press *Enter*. The new gain and offset parameter values are now calculated and displayed.

```
Output:
O2 (%):  10.05  Ref2 ?
O2 (%):  10.05  Ref2 ?
O2 (%):  10.05  Ref2 ?
O2 (%):  10.05  Ref2 ? 10
Calibration data:
Pressure setting (bar)  : 1.013
Point #1
Measured oxygen         : 20.99
Given oxygen                 : 21.00
Gas temperature (C)     : 23.65
Ref path temperature (C): 24.84
Point #2
Measured oxygen         : 10.05
Given oxygen                 : 10.00
Gas temperature (C)     : 23.66
Ref path temperature (C): 24.85
New Gain       : 0.995
New Offset     : 0.990
Calibration ready - remember SAVE command>save
>
```


```
Output:
O2 (%):  10.05  Ref2 ?
O2 (%):  10.05  Ref2 ?
O2 (%):  10.05  Ref2 ?
O2 (%):  10.05  Ref2 ? 10
Calibration data:
Pressure setting (bar)  : 1.013
Point #1
Measured oxygen         : 20.99
Given oxygen                 : 21.00
Gas temperature (C)     : 23.65
Ref path temperature (C): 24.84
Point #2
Measured oxygen         : 10.05
Given oxygen                 : 10.00
Gas temperature (C)     : 23.66
Ref path temperature (C): 24.85
New Gain       : 0.995
New Offset     : 0.990
Calibration ready - remember SAVE command>save
>
```

9 It is possible that an error message can appear and new values are not calculated:
Error: Calibration points too close - Not calibrated
In this case, repeat the two-point adjustment with span gases that differ by at least 4 vol.-% O_2.

10 Enter command *SAVE* and confirm with *Enter*. The new values are stored in EEPROM.

```
>save
EEPROM (basic) saved successfully
EEPROM (op) saved successfully
EEPROM (op_log1) saved successfully
EEPROM (op_log2) saved successfully
```

11 Enter command *ADJUST OFF* and confirm with *Enter*. The adjustment is completed and the measuring results are displayed again.

```
>adjust off
Outputs to normal state
```

6.3 Adjustment for TRANSIC151LP ambient gas measurement

This Section solely describes the adjustment and calibration of the TRANSIC151LP variant for ambient gas measurement.
Please read the complete Section 6 for comprehensive information on the calibration and adjustment procedure for the TRANSIC151LP USB-Interface for ambient gas measurement.

With the ambient measurement configuration, it is assumed that the probe and enclosure are installed in an environment with a varying O_2 concentration.
This presents special demands on calibration and adjustment of the TRANSIC151LP variant for ambient gas measurement because the calibration and adjustment gas should be present in both the probe and the enclosure.
SICK recommends the following procedure for a simpler approach:

- For calibration (TRANSIC151LP test): Use normal ambient air or 21.0 vol.-% O_2 span gas. See → p. 56, § 6.3.2.
- For adjustment: Use 21.0 vol.-% O_2 span gas and sample gas cell for one-point adjustment. See → p. 57, § 6.3.3.

SICK recommends using ambient air for calibrating the TRANSIC151LP variant for ambient gas measurement.

6.3.1 Setting up the gas supply

Preparing the hardware for calibration/adjustment as well as setting up the gas supply, and information on span gases are described in detail in the TRANSIC151LP Operating Instructions.

6.3.2 Calibration

The analog output can be frozen for the calibration (command *ADJUST ON* → p. 30, 4.5.1.)

6.3.2.1 Using ambient air

See Section → p. 49, 6.1 for information on calibration with ambient air.

6.3.2.2 Using bottled gas

Preparations for calibration with bottled gas can be found under the title *Adjusting gas flow* in the TRANSIC151LP Operating Instructions.

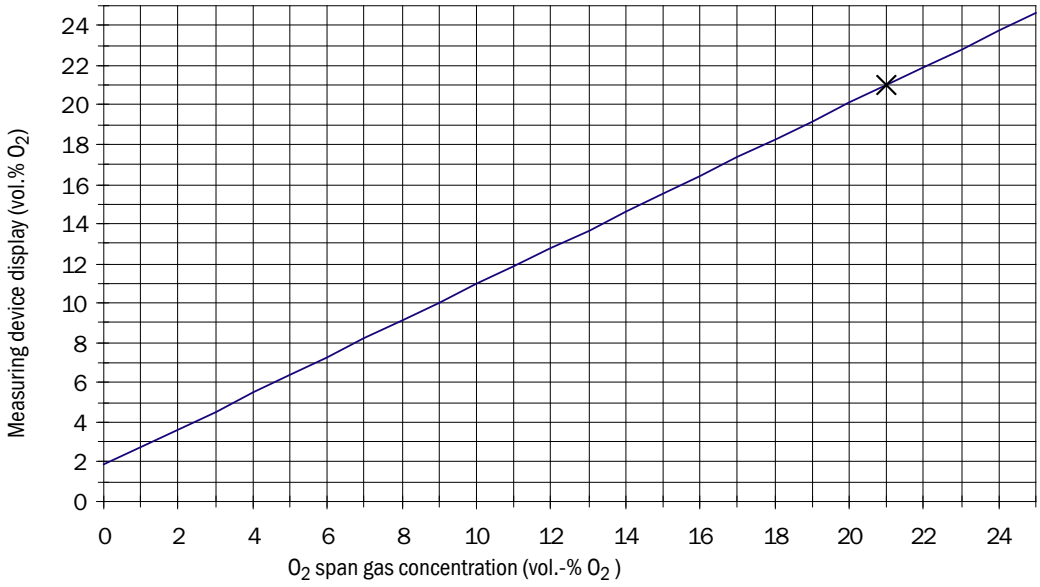
1 When calibration conditions (gas pressure, humidity and CO_2 concentration) are different from the operating conditions of the TRANSIC151LP, set the ambient parameters of the TRANSIC151LP to the adjustment environment for the adjustment duration. (Command *ENV,*→ p. 31, 4.5.4) These settings must then be changed back to represent the process conditions when the TRANSIC151LP is reinstalled in its operating environment.
2 Let the gas flow in.
3 Wait until the measured value has stabilized.
4 Now compare the TRANSIC151LP display value with the span gas specification.

The TRANSIC151LP does not show the span gas concentration completely correctly because only the probe is in the span gas. The correct measured value can be taken from the Figure → p. 57, Fig. 13 for this configuration.

The Figure shows the measured value when only the sample gas cell (and not the measuring device enclosure) is exposed to the span gas.

5 Set the parameters for pressure, humidity and temperature corresponding to the process conditions (command *ENV,*→ p. 31, 4.5.4).
6 Ensure the analog output is no longer frozen (command *ADJUST ON* → p. 30, 4.5.1.).

Fig. 13 Measured values of the TRANSIC151LP USB-Interface depending on the O_2 concentration in the span gas



6.3.2.3 **Span gases**

- Factory calibration: Mixtures of dry N_2 and O_2.
- Humidity / CO_2 concentrations: vol.-% CO_2.
- Gases recommend for adjustment: Nitrogen gas mixtures.
- When using the sample gas cell: Volume flow for calibration and adjustment about 0.5 l/min higher volume flow for shorter reaction times. The higher the gas volume, the higher the gas pressure.
  Select an adequate tubing size for the escaping gas.

> ***NOTICE:***
> Allow enough time for the gas concentration to stabilize when doing calibrations/adjustments.

6.3.3 Adjustment

SICK recommends a one-point adjustment with a dry O_2/N_2 gas mixture with an O_2 concentration of about 21 vol.-% O_2 for this TRANSIC151LP variant.

The span gas concentration must be in both the probe and the enclosure of the TRANSIC151LP. Further information → p. 50, 6.2 and → p. 56, 6.3.1.

6.3.4 Adjustment options

- One-point adjustment (O_2 concentration at 21.0 vol.-% O_2) via the keypad.
- Restoring factory calibration

6.3.5 One-point adjustment via the serial interface

One-point adjustment: Either the gain or offset value of the measurement is changed. When the O_2 concentration of the span gas is >10.5 vol.-% O_2, the one-point adjustment returns a new gain value otherwise a new offset value.

6.3.6 One-point adjustment via the serial interface

One-point adjustment (command COXY1)

This command performs a one-point adjustment. While the program waits for the input of the O_2 concentration, command *R* can be used to trigger continuous output of the current O_2 measured value. Pressing *Enter* once (on the computer keyboard) terminates Print mode. Pressing *Esc* once cancels the adjustment. Syntax: *COXY1*<cr>

Example:

```
>coxy1
Customer calibration
Current condition/settings:
Pressure (bar)             : 1.013
H2O (g/m3)                 : 0
CO2 (vol-%)                : 0
Gas temperature (C)        : 23.64
Internal temperature (C): 24.84
If parameters are not correct, cancel calibration with ESC and change parameters

Connect ref gas to cuvette.
O2 (%):  21.20 Ref  ?
O2 (%):  21.20 Ref  ?
O2 (%):  21.20 Ref  ?
O2 (%): 21.19 Ref  ? 21

Calibration data:
Pressure setting (bar)  : 1.013
Measured oxygen         : 21.20
Given oxygen            : 21.00
Gas temperature (C)     : 23.65
Ref path temperature (C): 24.85
New Gain                : 0.990
Calibration ready - remember SAVE command>save
```

One-point adjustment via the serial interface

This adjustment calculates and sets a new gain or offset parameter value (depending on the reference concentration used).

1 Enter command *PASS* XXXX (the password) and then press *Enter* (on the computer keyboard).

2 Enter command *ADJUST ONF* and press *Enter*.

>adjust on

Outputs (analog, relay, POLL/Run and MT300) frozen

This command freezes the current values of all outputs. This command should be used during online adjustment so that measured value changes do not disturb process control. This step can be omitted when the device to be adjusted has been removed from the process or is separated from process control.

When adjustment conditions (gas pressure, humidity and CO_2 concentration) are different from the normal operating conditions of the measuring device, set the ambient parameters of the measuring device to the adjustment environment for the adjustment duration. (Command E*NV* → p. 31, 4.5.4.) These settings must then be changed back to represent the process conditions when the TRANSIC151LP is reinstalled in its operating environment. Further information on setting the ambient parameters of the TRANSIC151LP can be found in Section 5 of this Manual.

3 Enter command *COXY1* for one-point adjustment and press *Enter*.

4 Connect the gas inlet and let the gas flow in.

The calibration starts. The following commands are now available for selection:

- *Enter* - output the most current measuring results or terminate continuous Print mode.
- *R* + *Enter* - continuous output of measuring results with an interval of about 1 second. Press *Enter* to terminate Print mode.
- *Esc* - to terminate the calibration.

5 Wait until the measured value has stabilized. Enter the span gas concentration and press *Enter*.

The new gain or offset parameter value is calculated and displayed.

The following is displayed after entering the command *COXY1*:

```
>coxy1
Customer calibration
Current condition/settings:
Pressure (bar)          : 1.013
H2O (g/m3)              : 0
CO2 (vol-%)             : 0
Gas temperature (C)     : 23.64
Internal temperature (C): 24.84

If parameters are not correct, cancel calibration with ESC and change parameters

Connect ref gas to cuvette.
O2 (%):  20.52 Ref  ?
O2 (%):  20.51 Ref  ?
O2 (%):  20.51 Ref  ? 20.50

Calibration data:
Pressure setting (bar)   : 1.013
Measured oxygen          : 20.51
Given oxygen                    : 20.50
Gas temperature (C)       : 23.65
Ref path temperature (C)  : 24.85
New Gain                 : 1.000
Calibration ready - remember SAVE command
>save
```

6 Enter command *SAVE* and press *Enter*. The new values are stored in EEPROM.

```
>save
EEPROM (op) saved successfully
EEPROM (op_log1) saved successfully
EEPROM (op_log2) saved successfully
```

7 Enter command *ADJUST OFF* and press *Enter*.

```
>adjust off
Outputs to normal state
The adjustment is finished and the output returns to displaying the measurement
results.
```

TRANSIC151LP USB-Interface

7 Troubleshooting

Function errors

7.1 Function errors

The TRANSIC151LP monitors its operation. Monitoring includes:

1 Self-test

2 Error detection during operation

3 Error output

7.1.1 Self-test

A self-test is always carried out when the TRANSIC151LP is switched on.

External conditions can cause the self-test to fail, for example, when the lens or mirror are steamed up due to strong condensation and therefore the signal level is not sufficient. The TRANSIC151LP is reset after 10 minutes when the self-test fails due to external factors.

7.1.2 Error control and error categories

There are 3 error categories:

- Fatal errors, which lead to a permanent error state.
- Nonfatal errors are deactivated automatically when certain conditions are fulfilled. These errors can also be deactivated manually.
- Warnings, measurement continues but a maintenance request is reported. Warnings can be deactivated manually.

All errors are always cleared during a start.
All error events are stored in an EEPROM error memory.

7.1.3 TRANSIC151LP behavior when errors occur

Table 9 Device status for error and warnings

TRANSIC151LP	Fatal error	Non-fatal error	Warnings
Analog output	Programmable, Fail High or Fail Low	Programmable, Fail High or Fail Low Standard = 3 mA	Normal operation
LED	Red LED blinking fast	Red LED blinks slowly	Yellow LED blinks
NAMUR digital output	Open	Open	Closed; optional: Open when the digital output is used for signaling warnings.
Display	Error codes are displayed	Error codes are displayed	Measured value is displayed
Service interface	STOP mode: Sends error message RUN mode: O2 value = ***.** POLL mode: O2 value = ***.**	STOP mode: Sends error message RUN mode: O2 value = ***.** POLL mode: O2 value = ***.**	STOP mode: Sends error message RUN mode: Normal operation POLL mode: Normal operation
Error counter	Error counter(s) incremented	Error counter(s) incremented	Error counter(s) incremented
Error log	Error is written to log	Error is written to log	Error is written to log

Emergency shutdown state

If a processor or memory error occurs, the TRANSIC151LP switches to the emergency shutdown state and cannot be started:

Analog output	0.0 mA
LED	Red LED on
NAMUR digital output	Open

7.1.4 Error display

Via serial interface → p. 39, § 4.13.3

7.1.5 Error Table

The Error Table contains the errors determined on the TRANSIC151LP. The most severe errors are listed first. The error text associated with each error gives a description of the error cause.

Table 10 Error Table

Error No.	Error category	Error text	Cause
1	FATAL	EEPROM BASIC PARAMS NOT AVAILABLE (EEPROM basic parameters not available)	Error in EEPROM. (Contact SICK Customer Service)
2	FATAL	EEPROM OPERATION PARAMS NOT AVAILABLE	Error in EEPROM. (Contact SICK Customer Service)
3	FATAL	LASER CURRENT OUT OF RANGE	Error in laser control. (Contact SICK Customer Service)
4	FATAL	SIGNAL LEVEL HIGH	Signal level high Typical: Light incidence too strong Use a filter
5	FATAL	LASER TEMPERATURE SENSOR FAILURE	Laser temperature sensor error (Contact SICK Customer Service)
6	FATAL	GAS 1 TEMPERATURE SENSOR FAILURE	Temperature sensor error, process gas (Contact SICK Customer Service)
7	FATAL	GAS 2 TEMPERATURE SENSOR FAILURE	Temperature sensor error, enclosure (Contact SICK Customer Service)
8	FATAL	IO-EXPANDER CONNECTION	Hardware error (Contact SICK Customer Service)
9	FATAL	LCD-DRIVER CONNECTION	No connection with display (Contact SICK Customer Service)
10	FATAL	ADC2	Hardware error (Contact SICK Customer Service)
11	FATAL	DIGIPOT CONNECTION	No connection with digital potentiometer (gain and offset control) (Contact SICK Customer Service)
12	FATAL	PELTIER	Error in laser block/hardware error (Contact SICK Customer Service)
13	FATAL	LASER CURRENT MEASUREMENT	Laser current error/hardware error (Contact SICK Customer Service)
14	FATAL	FRONT END CONTROLS	Hardware error (Contact SICK Customer Service)
15	FATAL	PELTIER CURRENT SENSE	Peltier current direction/hardware error (Contact SICK Customer Service)
16	FATAL	VAC LIMIT REACHED	Laser aging allows wavelength to drift/hardware error (Contact SICK Customer Service)

Error No.	Error category	Error text	Cause
17	FATAL	SUPPLY VOLTAGES	Cabling problem between transmitter and TSA151 voltage supply unit. Check specifications for voltage supply unit and cables. (see Technical Data, TRANSIC151LP Operating Instructions)
31	NONFATAL	SIGNAL LEVEL LOW	Signal level low. Check optical components for contamination.
32	NONFATAL	SIGNAL CUT	Signal interrupted. Check optical path. Check optical components for contamination.
33	NONFATAL	LASER TEMPERATURE NOT REACHED	Laser temperature has not been reached. Check ambient conditions (temperature).
34	NONFATAL	PEAK LOST	Absorption line lost. Not enough oxygen in enclosure.
35	NONFATAL	TOO LOW SUPPLY VOLTAGE	Supply voltage too low. Cabling problem between transmitter and TSA151 voltage supply unit. Check specifications for voltage supply unit and cables. (see Technical Data, TRANSIC151LP Operating Instructions)
36	NONFATAL	ANALOG OUTPUT LOAD TOO HIGH	Analog output load too high. Check specifications for voltage supply unit, cable and load of the separation stage. (see Technical Data, TRANSIC151LP Operating Instructions)
37	NONFATAL	NO MEASUREMENT RESULTS	No measuring results (results from another error)
38	NONFATAL	ANALOG OUTPUT RANGE	Oxygen concentration value measured outside set output range. Adjust the output range settings when necessary.
51	WARNING	SIGNAL QUITE LOW	Transmission (SIL) <20cuvette Maintenance request for optical components
52	WARNING	EEPROM LOG&STATS CORRUPTED	Non-critical hardware error: EEPROM protocol and statistics erroneous. (Contact SICK Customer Service)
53	WARNING	WATCHDOG RESET OCCURRED	Reset through software error.

TRANSIC151LP USB-Interface

8 Shutdown

Safety information
Preparations
Switch-off procedure
Protecting a shutdown TRANSIC151LP
Disposal
Shipping the TRANSIC151LP to SICK

8.1 Disposal

- ► The TRANSIC151LP can easily be disassembled into its components which can then be sent to the respective raw material recycling facilities.
- ► Dispose of the data cable as industrial waste.

► Observe the respective valid local regulations for the disposal of industrial waste.

TRANSIC151LP USB-Interface

9 Specifications

Compliance
Approval
Technical Data

9.1 Compliances

The TRANSIC151LP USB-Interface is CE compliant.

9.2 Ex certifications

Further information on Ex certification: → p. 13, § 3

WARNING: Ex certification becomes void for unallowed power supply

- ► Only use the TSA151 voltage supply unit to run the TRANSIC151LP.
- ► Only use a 24V DC PELV power supply unit on the TSA151 voltage supply unit.

9.3 Technical Data

9.3.1 Safety information on electrical safety.

WARNING: Risk of explosion when used in Ex area

Used outside areas with explosion risks and protects the intrinsically safe TRANSIC151LP against unallowed energy inputs via the Server interface.

► Always use the TRANSIC151LP USB-Interface outside potentially explosive atmospheres.

9.3.2 Date Table

Table 11 Voltage supply inlet

Options	
Nominal supply voltage	5.0 V supply via computer (USB)
Typical current consumption	< 15 mA
Typical power input	< 0.075 W
Connection data	
Plug (USB-side)	USB-Mini B/ USB Type A
Plug (to TRANSIC151LP)	Line end with M8 plug-in connector (4 pol.)
Driver used	
Virtual COM Port Drivers from FTDI Chip	http://www.ftdichip.com/Drivers/VCP.htm
Operating systems supported	Current : Windows, Linux, Mac Details : See homepage FTDIChip

Table 12 Safety-related technical characteristic data

Connection to TRANSIC151LP	
Max. voltage	5.4 V
Max. current	85 mA
Max. power	460 mW

Intrinsic safety of the TRANSIC151LP USB-Interface

Fuses and Zener diodes limit the energy input in the TRANSIC151LP USB-Interface to max. 460 mW. The switching itself is non-intrinsically safe.

The limitation does however prevent damage to the intrinsically safe circuits of the TRANSIC151LP when errors occur in the connected computer.Component design of the limiting circuit in accordance with EN60079-11. The TRANSIC151LP USB-Interface Adapters may however only be used outside the hazardous zones.

CAUTION: Hazard for operating safety through faulty repairs

Unauthorized repairs are not allowed.

► Send the USB-Interface to SICK for repairs.

TRANSIC151LP USB-Interface

10 Annex

Password

10.1 Password

1010

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E-Mail info@sick.de
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