Rel. 20150805

Operating Manual

Pressure Controller

LR-*Cal* LCC 100

DRUCK & TEMPERATUR Leitenberger GmbH • Bahnhofstr. 33 • D-72138 Kirchentellinsfurt • GERMANY
Tel. +49 (0) 7121-90920-0 • Fax +49 (0) 7121-90920-99 • DT-Info@Leitenberger.de • **www.LR-Cal.net** • www.druck-temperatur.de

Notes

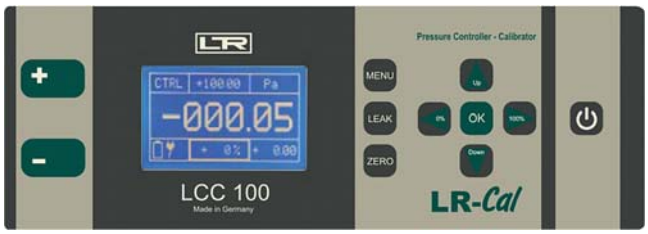
- To avoid damage, please read carefully this manual before using the **LR-*Cal* LCC 100**.
- The maximum allowable pressure shall not be exceeded:
  LR-*Cal* LCC 100-1, **LCC 100**-10 and **LCC 100**-100: 5-fold overload
  LR-*Cal* LCC 100-1000 and **LCC 1000**-2000: 2-fold overload
- The **LR-*Cal* LCC 100** is able to overstep and fall below the target pressure about ±10%.
- The **LR-*Cal* LCC 100** may be opened only by or in consultion with DRUCK & TEMPERATUR Leitenberger GmbH, Germany.

Operating Modes

The **LR-*Cal* LCC 100** has 4 different modes for operation:

Operating mode	Application	Function
CTRL (control)	Calibration of sensors and other devices	Pressure is built up and maintained. Target pressure may be percentage or absolute
MESS (measure)	Measurement of differential and relative pressure	The calibrator analyzes the pressure that are connected to the devices.
AUTO (automatic)	Stored pressure profiles P are running	umps builds up the pressure, based on the stored pressure profiles
MENU	Customer specific adaption to the respective application	Setup-Function for different operating modes.

Operation



- **I/O**: Button to switch on and off the device
- **MENU**: This button will take you to the setup menu. There you can adjust the settings for each mode of operation. When you use the CTRL mode, the calibrator according to the setup menu leave the VENT mode.
- **LEAK**: This button performs a LEAK test of the connected pressure devices.
- **ZERO**: Button for manual zeroing of the integrated sensor.
- **UP**: In CTRL mode you can set the absolute or percentage values; in MENU mode to go into the various submenus.
- **DOWN**: In CTRL mode you can set the absolute or percentage values; in MENU mode to go into the various submenus.
- **OK**: In CTRL mode you can change between the absolute and percentage value with the OK button. In MENU mode, the button serves to confirm each setting. Start the AUTO mode with the OK button.
- **%**: In CTRL mode you can use the % button to change the value from 0 to 100. In submenu for setting the decimal.
- The display, you can always check the battery status and the energy.

Press the MENU button and then press the UP/DOWN until you are on the desired sub menu. With OK you go into the appropriate sub menu. The following items in the submenu are available:

- **RANGE:** Setting of the measurement range (100% value).
- **UNIT:** Selection of the pressure unit (Pa, hPa, kPa, mbar, bar, Torr, mmHg, InHg, psi, mmH2O, inH2O).
- **STEPS:** Setting of the step size in percent.
- **MODE:** Selection of the operating mode
  - CTRL (control): Calibration of pressure sensors and pressure switches
  - MESS (measure): Measurement of differential (gauge) and absolute pressure
  - AUTO (automatic): Deposit the pressure profiles
- **LANGUAGE:** Select language.
- **SETTINGS:**
  - ZEROING: On and off the automatic zeroing function (exit the operating menu). Time frequency of the automatical zeroing.
  - RS232/USB: select interface.
  - DISPLAY: Brightness setting.
  - AUTO: Setting of the range, unit and steps in which the range is divided.
  - STEPS UP/STEPS DOWN: Various values can be assigned.
  - INFO: Information about the **LR-*Cal* LCC 100** device.

Operating Modes and Operation

1) CTRL (control)

The CTRL mode is used for calibration of pressure sensors, switches and other pressure equipment. The pressure pump is active and regulate the corresponding target pressure. The internal sensor displays the actual value on the LCD.

• Connection
Pressure devices have to be connected to the + and the - port of the calibrator. Absolute pressure devices have to be connected to the + port.

• Setting
- Press the MENU button. Confirm MODE with OK and press UP/DOWN until CTRL is shown on the display. Confirm with OK button.
- Set the upper limit of the range in the submenu RANGE (UP/DOWN and 0%/100%), confirm with OK.
- Set of the unit in the submenu UNIT (UP/DOWN), confirm with OK.
- Set the step sequence (in %) in the submenu STEPS (UP/DOWN and 0%/100%) and confirm with OK.
- MENU button to exit the submenu.

• Use
The unit is located at exit from the menu in VENT mode, ie the sensor of the calibrator is vented. On the middle of the top, the target pressure is displayed. On the botton of the display, the % value is shown. When leaving the menu, this value is 0%. Switch between target pressure and % value with the OK button.
- The % value can be changed with the UP/DOWN (in the fixed step sizes) and using the 0% / 100% buttons.
- The target pressure can only be changed with UP/DOWN. With 0%/100% to the appropriate place, the target pressure be jumped.

• Example
Target pressure: By pressing the OK button, you can switch between the % and target pressure value. Press OK buton until the value (top center display) outlined in bold. Press the 0% or 100% button to jump to the selected location. Choose the required value with the UP and DOWN buttons. Push the OK button to exit target pressure. The marker moves to the % value (middle of the display).

When the calibrator displays a stable value, the data can be recorded:
- Nominal value: right below
- Unit: right above
- Actual value: on the display of the connected device
- Reference value: middle of the display

You can make a manual zero of the internal sensor in the CTRL mode. Connected devices can be leak testet:
- Manual auto zero: Push the ZERO button, the internal sensor is get to zero.
- Leak-Test: Push the LEAK button to switch off the pressure cell. The pressure is held. Control the value via the display of the calibrator. Push the LEAK button again to stop the mode.

2) MESS (measure)

Use the MEASURE mode to measure absolute or differential (gauge) pressure. The internal pump is not active. The pressure is measured by the internal sensor.

• Connection
Connect differential pressure devices to the + and - port. Connect absolute pressure devices to the + port.

• Setting
- Push the MENU button. Confirm MODE with OK and push UP/DOWN till MESS is displayed. Confirm with OK.
- Submenu RANGE and STEPS are not relevant in the MESS mode.
- Push the UP/DOWN buttons to get to the submenu UNIT. Choose the relevant unit and confirm with the OK button.
- Push the MENU button to quit.
- Submenu SETTINGS:
    - Push the UP/DOWN button to get the item SETTINGS and confirm with OK.
    - Choose the item ZERO in the submenu and confirm with OK.
    - Via the item AUTO-ZERO you can de-activate or activate the auto-zero function.

• Use
By leaving the MENU, the internal sensor goes to zero.

The calibrator starts to measure the connected pressure.
- right above: pressure unit
- up in the middle: maximal pressure
- left above: mode
- middle: actual pressure

In the MESS mode you can always make a manual zero with the ZERO button.

• Attention
If the permissible maximum pressure (125%) is exceeded, the internal sensor is sealed off by solenoid valves. The display shows ERROR. With the OK button you can unlock and release the calibrator.

3) AUTO

Store specific profiles in the AUTO mode. Use the AUTO mode to calibrate different pressure devices with identical values. The defined profile can be reperated several times.

• Connection
Connect differential pressure devices to the + and - port. Connect absolute pressure devices to the + port.

• **Settings**

- Push the button MENU. Confirm MODUS with OK and push UP/DOWN until AUTO is displayed. Confirm with OK.
- The submenus RANGE, UNIT and STEPS are not relevant in AUTO mode.
- Push the buttons UP/DOWN till SETTINGS is displayed and confirm with OK. Submenu ZERO is not relevant in this mode.
- Push the buttons UP/DOWN till AUTO-MODUS is displayed and confirm with OK.

RANGE: Relevant pressure range
UNIT: Pressure unit (see settings)
STEPS: The pressure range is divided into sections

Further settings of AUTO mode can be set in the submenu CONFIGURATION.

Cycles: Set the number of cycles that have to be realized in the AUTO mode.
T Start: Wait for vent of the internal sensor
Stop: Wait after reaching the maximum pressure
T Pause: Wait between two cycles
AUTO-ZERO: Automatic zeroing at the end of every cycle.

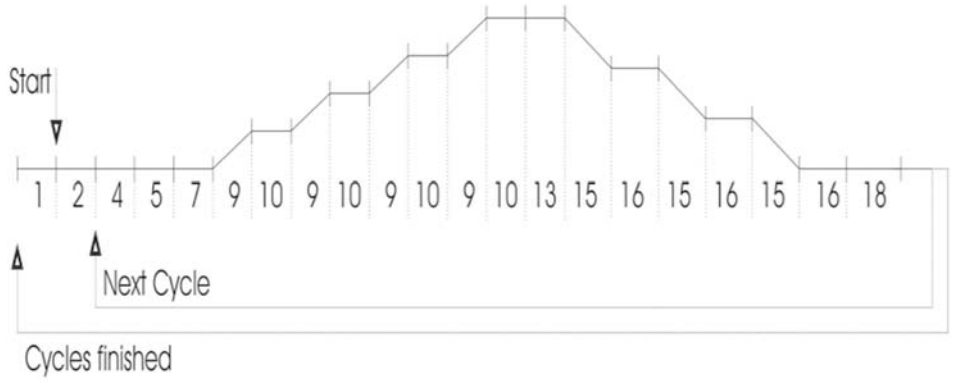
Exit of the submenu by pushing the button MENU.

• **Use**

After exit of the MENU, the calibrator is on wait status. All informations about AUTO mode are shown on the display.

- right above: pressure unit
- in the middle: phase 1, sensor is venting (pressure = 0)
- left in the middle: first of ten cyles
- down in the middle: actual target pressure in %
- in the middle above: target pressure

Press OK button to start the AUTO mode.



This figure shows the flow chart of the AUTO mode. There you can get detailed informations about the cycles and the function (see next page).

Phase 1:	Wait - Start with OK button
Phase 2:	Wait - can be configurated in the MENU
Phase 4:	Duration of zeroing the internal sensor
Phase 7:	Duration at point of zero
Phase 9:	Time of the adjustment till the next step
Phase 10:	Stop time
Phase 13:	Wait (target pressure)
Phase 15:	Time of the adjustment till the next step
Phase 16:	Duration at point of zero
Phase 18:	Stop - can be configured in the MENU

Between the phases 10 and 16, the data - if a stable value is displayed - of the calibrator can be evaluated and recorded. Exit of AUTO mode with the MENU button. VENT is shown left above in the display.

4) LEAK (leakage)

In the CTRL mode it is possible to check connected pressure device for leaks.

• Connection
Pressure devices have to be connected to the + and - port of the calibrator. Absolute pressure devices have to be connected to the + port.

• Settings
To check pressure devices for leaks, you have to work in the CTRL mode.
- Enter the desired pressure with the buttons UP/DOWN or the buttons 0%/100%.
- As soon as the required pressure is reached and value is stable, push the LEAK button. The internal pump will be switched off and pressure is held.

• Use

- left above: actual mode
- in the middle above: target pressure
- right above: unit
- down in the middle: difference between actual and target pressure (in %)
- right down: difference between actual and target pressure (absolute)
- left down: time

Interfaces

You have the option of using a PC for monitoring and controlling the calibrator via the interfaces (RS232 and USB). In control, measurement and automatic mode, a cyclical issue of the current device status can be switched on and off. Output interval is 1 second.

• USB
The PC can access through the USB interface on the LR-Cal LCC 100 (virtual COM port). The control via USB is not different from the control via RS232.

• RS232
For the connection of RxD, TxD and GND are required. The PC will be connected via a straight interface cable (1 : 1, male x female).

• Settings
Push the UP/DOWN button till SETTINGS is shown on the display and confirm with OK. Then push UP/DOWN till RS232/USB is displayed. The following settings can be made:

- AKTIV: if a interface is required, choose of the individual interface (USB / RS232).
- BAUD: choose of the correct baud rate (1200, 2400, 4800, 9600, 14400, 19200, 28800, 56000, 57600)
- DATA-BITS: default value (8)
- STOP-BITS: default value (1)
- PARITY BITS: default value (N)

• Drivers
You can get the current interface drivers (Windows, Linux, Mac OS) on:

- Homepage URL: http://www.ftdichip.com
- Download URL: http://www.ftdichip.com/Drivers/VCP.htm
  (FTDI Homepage --> Drivers --> VCPDrivers)
- Installation guide: http://www.ftdichip.com/Documents/InstallGuides.htm
  (FTDI Homepage --> Documents --> Installation Guides)

Interface commands

There is no PC software available for the **LR-*Cal* LCC 100**. You can make your own software, if required. **On next pages** you find the list of communication commands.

All interface commands are preceded by a colon and the carriage return (CR) complete.

Command and parameters must be separated by a space.

By appending a question mark at the respective command can otherwise be read to changing parameters.

Receptions commands are acknowledged with „OK“, and missing or incorrect commands with „ERROR“.

Operating mode AUTO	
:saaz <0,1><CR>	Auto Zero before each cycle (phase 4) 0 - On 1 - Off
:acy <1...100><CR>	Number of cycles to be carried out 1...100 - Number of cycles
:asd <1...100><CR>	Steps Down 1...100 - Number of steps until start point is reached
:asu <1...100><CR>	Steps Up 1...100 - Number of steps until end point is reached
:ate <0...10000><CR>	Dwell time at end point (phase 13) 1...10000 - Time in seconds
:ath <1...10000><CR>	Dwell time (phase 10 and 16) 1...10000 - Time in seconds
:atp <1...10000><CR>	Pause (break) time (phase 18) 1....10000 - Time in seconds
:atr <1...10000><CR>	Tolerance range 1...10000 - Tolerance in 0.01% F.S. of units range As soon as the unit regulates within this tolerance range for >1 second, the dwell time starts running.
:ats <1...10000><CR>	Start delay (phase 2) 1...10000 - Time in seconds
Interface output	
:o <0,1><CR>	Output status information via interface 0 - Off 1 - On

Output format of continuous status information:

Master Mode: MESS Output protocol: M;<M,Z,E>;+III.II;EEEEE<CR>

- <M,Z,E> - Measure / MESSEN, ZERO, ERROR
- +III.II - True value applied differential pressure
- EEEEE - actual pressure unit

Master Mode: CTRL Output protocol: C;<C,L,V,Z,E>;<+SSS.SS>;<III.II>;<EEEEE><CR>

- <C,L,V,Z,E> - CONTROL, LEAK, VENT, ZERO, ERROR
- +SSS.SS - Set value differential pressure to be regulated
- +III.II - True value applied differential pressure
- EEEEE - actual pressure unit

Master Mode: AUTO A;<C,L,V,Z,E>;SSS.SS;III.II;EEEEE;P;XX;C;YYY;ZZZ<CR>

- <C,L,V,Z,E> - CONTROL, LEAK, VENT, ZERO, ERROR,
- +SSS.SS - Set value differential pressure to be regulated
- +III.II - True value applied differential pressure
- EEEEE - actual pressure unit
- XX - actual phase
- YYY - actual cycle
- ZZZ - number of cycles to be run

Master Mode: VELO V;<M,Z,E>;+III.II;EEEEE<CR>

- <M,Z,E> - Measure/MESSEN, ZERO, ERROR
- +III.II - True value applied differential pressure
- EEEEE - actual pressure unit

Master Mode:	FLOW	F;<M,Z,E>;+III.II;EEEEE<CR> <M,Z,E> - Measure/MESSEN, ZERO, ERROR +III.II - True value applied differential pressure EEEEE - actual pressure unit

Operating mode CTRL	
:pa <-110...110><CR>	Change set value for x percent -110...110 - changement of set value in %
:pd <CR>	Decrease set value by increment in % (Step DOWN).
:pr <-1100...11000><CR>	Change actual working and measuring range -1100...11000 - new range in 0.01% FS (full scale value)
:ps <-10...110><CR>	Enter set point targetin percent -10...110 - Set point target in %
:pu <CR>	Increase set value by increment in % (Step UP).

Menu settings	
:saz <0,1><CR>	Set Auto Zero (in modes Measure/MESS and CTRL) 0 - Off 1 - On
:sbr <0...9><CR>	RS232 baud rate setting 0 - 1200 Baud 1 - 2400 Baud 2 - 4800 Baud 3 - 9600 Baud 4 - 14400 Baud 5 - 19200 Baud 6 - 28800 Baud 7 - 38400 Baud 8 - 56000 Baud 9 - 57600 Baud
:sbu <0...9><CR>	USB baud rate setting (virtual COM-Port) 0 - 1200 Baud 1 - 2400 Baud 2 - 4800 Baud 3 - 9600 Baud 4 - 14400 Baud 5 - 19200 Baud 6 - 28800 Baud 7 - 38400 Baud 8 - 56000 Baud 9 - 57600 Baud
:sci <n,u,r><CR>	Select active interface n - no interface u - USB active r - RS232 active
:sdb <0...100><CR>	Brightness of display 0...100 - Brightness in %
:sdd <1...50><CR>	Damping of display in operating mode Measure/MESSEN Indicated values are dampened with formular (Value_new + d • Value_old)/(d+1) D = 0: damping

:spu <0...10><CR>	Pressure unit 0 - Pa 1 - hPa 2 - KPa 3 - mbar 4 - bar 5 - Torr 6 - mmHg 7 - inHg 8 - psi 9 - mmH2O 10 - inH2O
:sfc <1...99999><CR>	Cross-area section Pitot tube 0...99999 - Area [m³*10000]
:sfd <1...99999><CR>	Density of measured medium 0...99999 - Density [kg/m²*10000]
:ssl <d,e><CR>	Operating language of the LCC 100 device d - German e - English
:ssw <1...100><CR>	Increment 1...100 - Increment while operating the front keys "UP" and "DOWN" in %
:sfp <1...99999><CR>	Pitot tube factor 0...99999 - Pitot tube factor [nondimensional * 10000]
:sfu <0...3><CR>	Flow rate unit 0 - m/s (meter per second) 1 - km/h (kilometer per hour) 2 - fpm (feet per minute) 3 - mph (miles per hour)
:smm <a,c,f,m,v><CR>	Set working mode of the LCC 100 device a - Automatic mode (AUTO) c - Control mode (CTRL) f - Flow rate measurement m - Measure mode (MEAS) v - Velocity measurement
:svu <0...3><CR>	Velocity unit 0 - m³/h 1 - l/s 2 - l/min 3 - cfm
:ssl <d,e><CR>	System language d - German e - English

:swm <a,c,m,z,l.v,s><CR>	Operating mode of the LCC 100 device a - mode AUTO c - mode CTRL m - mode Measure/MESS Only in modes CTRL and Measure/MESS available: z - ZERO Only in mode CTRL available: l - LEAK test l - back to CTRL mode (like pressing "LEAK" key) v - VENT (venting of the complete system Only in mode AUTO available: s -

:szi <1...60><CR>	Zero setting interval 1...60 - Time in minutes
:szm <0,1><CR>	Zeroing during quit of the menu 0 - Off 1 - On

DRUCK & TEMPERATUR Leitenberger GmbH
Bahnhofstr. 33
D-72138 Kirchentellinsfurt / GERMANY

Tel. +49 (0) 7121-90920-0
Fax +49 (0) 7121-90920-99

E-Mail aus Deutschland: DT-Info@Leitenberger.de
E-Mail all countries outside Germany: DT-Export@Leitenberger.de

Internet:
http://www.LR-Cal.net