

Operating Manual



CULO-FW

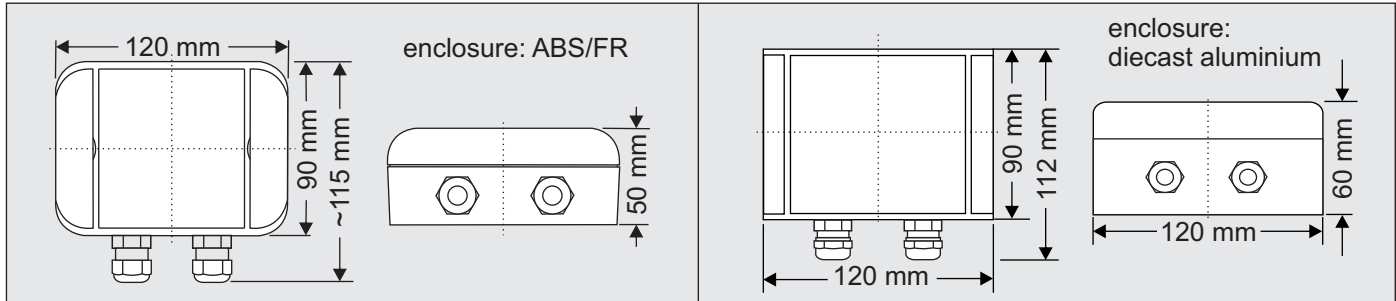
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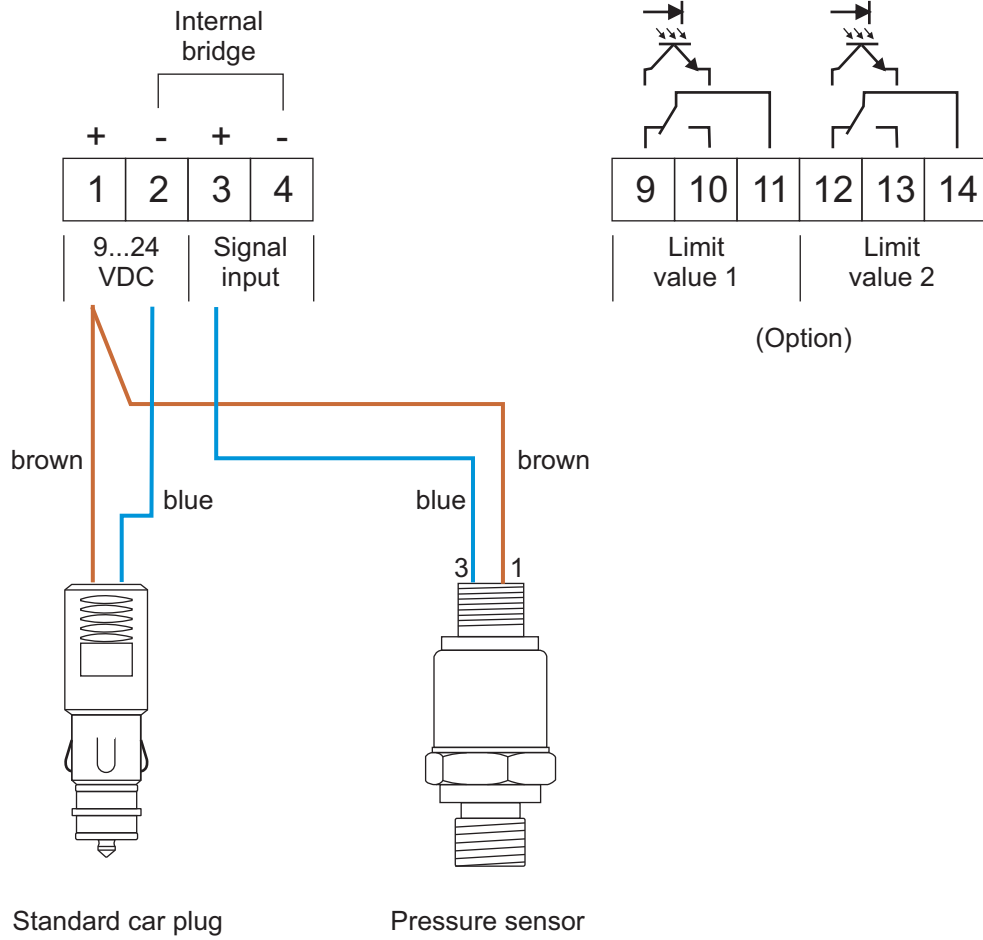
● Safety warnings

When mounting, initiating and operating this indicator the safety precautions and regulations have to be observed. Only staff with a corresponding qualification should work with the indicator. A non-observance of the safety regulations may cause serious injuries and/or damages. Check before initial operation the suitability of the indicator for this area of application. The technical data of this manual have to be followed.

● Dimensions



● **Connection (external supply)**



● Use of the keys for configuration

1. Connect the instrument according to the wiring diagram.
2. Switch power of the current loop (current between 4...20 mA) or the external power supply on. This is followed by an initialisation and a segment test. Then **CULO** is indicated and afterwards the version of firmware (eg **F1.16**). Subsequent current loop display is switching to the operation mode.
3. Press the **P** key. Indication of program number **P 0**.
4. Change the program number by simultaneous pressing of **P & ▲** keys or **P & ▼** keys.
5. With the desired program number being chosen, go to the stored value by pressing the **P** key.
6. Short pressing of **P** results in a change of digit. The value of the chosen digit is changed by pressing the **▼** or **▲** key.
7. Storing of the new settings is effected by pressing the **P** for approx. 2 sec. This procedure is acknowledged by transversal bars in the display.
8. If no other key is actuated, the unit switches to its operation mode after seven seconds.

Additional key functions in standard mode for indication of min/max values

The **▲** key serves for indicating the value of the Max memory in the display for some seconds

The **▼** key serves for indicating the value of the Min memory in the display for some seconds

Simultaneous pressing of the **▲** and **▼** keys erases the values of the memory (minimum / maximum)

● Underflow / Overflow

Standard input range:	4,00...20 mA
Displayed standard input range:	3,90...20,10 mA
Usable input range:	3,60...21,50 mA
Warning underflow:	3,60...<3,9 mA
Warning overflow:	>20,10...21,50 mA
Indication underflow:	<3,60 mA
Indication overflow:	>21,50 mA

On warning the indicator flashes (normal indication is changing with bars).

Values below 3,60 mA: A bar is changing with indication **undr**.

Values above 21,50 mA: A bar is changing with indication **over**.

● Program table

PN	Description	Range	Delivered state ¹⁾
0	Calibration mode 0 = sensor calibration (with applied signal, factory configuration) 1 = programming (indicated value at 4/20 mA, 0/20 mA, 0/10 V)	0/1	1
1	Final value (Programming the value at 20 mA (10 V), eg 600)	-999...9999	250
2	Initial value (Programming the value at 4 mA (0 mA, 0 V), eg 100)	-999...9999	0
3	Selection of decimal point or unit (Programming a unit the indication shifts to the left)	0 0.0 0.00 0.000 °C °F	°C
4	Time of averaging / refresh of display (in 1/10 seconds)	5...10	10
5 ²⁾	Stabilisation zero (the ± range where 0000 is indicated)	0...100	2
9	Switch off time of average (jump of input signal of x% of adjusted range of indication)	5...100	5
42	Interval of measurement input 1 = current, external supply, circular carrier (BUZ-H) 2 = current, external supply and loop 3 = voltage (CULO-B, CULO-F) 4 = voltage 0,4...4,5 V (CULO-B, CULO-F)	1...4	2
43	Function of tare key 0 = „down“ key shows minimum value 1 = „down“ key triggers tare function (indication is 0000) 2 = (function in preparation)	0...2	1
44	Auto-Freeze (Enable) 0 = not active 1 = active	0/1	0
45	Auto-Freeze (FreezeIgnoreDelay) (10...600 x 0,1 s)	10...600	10
46	Auto-Freeze (FreezeAveragingTime) (5...600 x 0,1 s)	5...600	20
47	Auto-Freeze (FreezeDisplayDuration) (0...600 x 0,1 s)	0...600	200
48	Auto-Freeze (FreezeMinusDeltaVal)	1...9999	10
49	Auto-Freeze (FreezeMinusDeltaForceReInit)	2...9999	100
50 ³⁾	Definition PIN-code for programming interlock (value >0000)	0000...9999	0000
51	Version of program		
52	Version of program day/month		
53	Version of program year		
54	Serial number manufacturer		
55	Serial number customer		
56	Day/month of delivery		
57	Year of delivery		
100	Number of calibration setpoints (calibration points for sensor calibration only, calibration points reduce the measuring rate)	0...30	0
101...130	Calibration points (the visible number of calibration points is fixed under PN100)	-999...9999	0
150 ⁴⁾	Limit value 1: trigger value	-999...9999	110
151 ⁴⁾	Limit value 1: reset value (hysteresis value)	-999...9999	90
152	Limit value 1: delay of trigger (x100 ms)	0...9000	0
153	Limit value 1: delay of reset (x100 ms)	0...9000	10
160 ⁴⁾	Limit value 2: trigger value	-999...9999	40
161 ⁴⁾	Limit value 2: reset value (hysteresis value)	-999...9999	60
162	Limit value 2: delay of trigger (x100 ms)	0...9000	0
163	Limit value 2: delay of reset (x100 ms)	0...9000	10
200	TAG number	0000...9999	0

More details about PN see next page

● **Progam table (continued)**

- 1) With factory configuration
- 2) When programming a value >1 a hysteresis of 0,1% is activated. This avoids a jumping indication.
- 3) Optionally (if a PIN-code is not defined, PN50 is hidden). A PIN-code can be programmed via PC-interface only during factory settings. When there is a definition for a PIN-code (indication of **Pin** during segment test), for programming (after key **P** was pressed) the defined PIN-code of PN51 has to be input. This has to be confirmed by pressing the **P**-Key for 2 seconds. If no key is used for approx. 1 minute, the programming mode is blocked again.
When PN50 is selected to change an existing PIN-code, 5 times **Pin** is indicated before the changings can be started.
- 4) The difference between trigger value and reset value is the hysteresis.

● **PN for use in weighing applications**

Extended calibration functions with PN0, PN1, PN2

For the use of the extended calibration functions, **PN0** has to be 0. To have an as accurate as possible calibration, the **P** key now averages the unsteady sensor signal as long as the key is pressed for storing the calibration. During pressing the key the display shows „**AvEr**“ (averaging) changing with „----“.

PN42: Interval of measurement input

Using the CULO-FW display, **PN42** has always to be 2

PN43: „Down“ key function (Tare, minimum value)

When the tare function is activated (**PN43** = 1), the pressing of the key sets the displayed value to zero (0000). The minimum value can still be shown by pressing first the „up“ key and shortly after the „down“ key. To reset the minimum value first press the „up“ key and hold it. Then press the „down“ key additionally.

The minimum and maximum values are shown for approx. 12 s.

„Auto-Freeze“ with PN44, PN45, PN46, PN47, PN48, PN49

„AutoFreeze“: Automatic detection of a as repeatable as possible measured value for load measuring in systems with unsteady measured values in operation (e.g. indirect measuring of a weight by means of hydraulic pressure on a fork lift).

When **PN44** = 1 (only then), the indication changes between the actual live measured value and 3 horizontal bars, which means that there is currently no valid value. To have acceptable fast measurements, **PN4** (time of averaging) is ignored.

As long as the measured value increases the system is waiting. When the increase stops, the system is waiting until the measured value is decreased by the value of **PN48**. Then the system is waiting the time set in **PN45**. After this waiting time the everaging starts for the time set in **PN46**. Afterwards the valid measured value is indicated for the time of **PN47** (no longer changing with the bars). The value is „frozen“now.

This sequence is starting again when:

- (1) the adjusted time of **PN47** is passed (value 0 = no time out)
- (2) **or** the measured input value decreased by the adjusted value of **PN49**
- (3) **or** the actual measured value is exeeding the up to now maximum measured value

When the adjusted time of **PN47** (1) is 0 seconds, the value is „frozen forever“ (no time out) but the conditions of (2) and (3) are still valid.

PN44: Details see page before

PN45: FreezeIgnoreDelay is the waiting time before averaging the measured value after the peak measured value was detected.

PN46: FreezeAveragingTime is the time in which the measured value is averaged

PN47: FreezeDisplayDuration is the time in which the averaged value is indicated without toggling to the bars. This should be the valid weight.

PN48: FreezeMinusDeltaVal is the value by that the peak measured value has to decrease before the times set in **PN45**, **PN46** and **PN47** become active.

PN49: FreezeMinusDeltaForceReInit is the value the measured value has to decrease before the sequence restarts (the indication of the valid value stops and the actual measured value is changing with three bars). A drop by the value in PN49 or an increase above the current measured value always will abort the duration of freeze.

● Procedure to calibrate the weighing system

- Before starting with the calibration the following workings must be completed:
 - The pressure sensor is retrofitted in the hydraulic equipment of the vehicle. These workings should be done by an engineering specialist (way of installation, safety regulations, environmental pollution)
 - The CULO-FW is fitted on the vehicle
 - The electrical connections are made (pressure sensor <> CULO-FW and cigarette lighter socket <> CULO-FW)
- Before starting with the calibration check the parameter of the following PN:
 - PN0: has to be „0"
 - PN43: has to be „1" (normally standard)
 - PN44: has to be „1" (normally standard)
 - PN 2: has to be „0000" (zero load)
 - PN1: has to be the weight, which is used for the calibration (a known weight). The load has to be the maximum load.

Note: If **PN0** is „0", the adjusting of **PN1** and **PN2** includes the current measurement value. If both are set with (nearly) the same value, very small signal changes already will lead to an overflow.

- Calibration

Supposition: Zero load (initial value) is 0 kg
Maximum load (final value) is 3000 kg
Calibration load has to be 3000 kg

- Switch on the power supply of the CULO-FW. During initialization the software version is shown on the display (it must be F2.50 or higher)
- Select **PN2** and then lift the lifting device (fork, loading shovel) of the vehicle without any load for the calibration of the zero point. When the lifting device stops, press the **P** key for 1...3 seconds. Now the pressure signal is assigned to the load of 0 kg.
- Select **PN1** and then lift the lifting device (fork, loading shovel) of the vehicle with the calibration load for the calibration of the final value. When the lifting device stops, press the **P** key for 1...3 seconds. Now the pressure signal is assigned to the load of 3000 kg.

Note for **PN1**, **PN2**: The average value is generated as long as the **P** key is pressed and hold. When releasing the key the detected average value is stored. Recommended is a keystroke of 1...3 seconds, but possibly several tests are necessary to have the accuracy which is possible. Also it could be usefull to press the **P** key half a second before the lifting device stops to move because the averaging starts with a delay of approx. 1 second after pressing the **P** key.

● Technical data

Input		
With external supply:	4...20 mA	
	Input resistance:	Ri : ~10 Ω
Accuracy		
Resolution:	-999...+9999 digit	
Measuring fault:	±0,2% of measuring range, ±1 digit	
Temperature drift:	100 ppm/K	
Measuring principle:	ramp conversion	
Indication		
Display:	7 segments, 14 mm high, red, 4 digits	
Overflow/Underflow:	to HI / to LO	
Time of indication:	0,1 s - 1 s - 10 s (adjustable)	
Memory:	minimum / maximum values	
Limiting contacts		
Electronically:		
	2 open collectors	
	Power:	36 VDC, 150 mA
	Leakage current:	approx. 0,1 mA
Mechanically:		
	2 relays (changeover contact)	
	Switching voltage:	minimum 10 V AC/DC maximum 125 VDC / 250 VAC
	Switching current:	VA: 0,1...1250 W: 0,1...120
Indication:		
	Continuous current:	5 A
	Value reached:	LED red
	Value not reached:	LED green
Adjustment:	With 3 keys:	limiting values, hysteresis values and delay times
Fail-safe function:	Voltage supply "ON":	contacts active
Ambient conditions		
Operating temperature:	0...+60°C	
Storing temperature:	-20...+80°C	
Supply		
External supply:		
	DC: 9...30 VDC	maximum 50 mA
	Galvanical insulation:	without
	Power consumption:	1,5 VA

Programmable features

range of indication / time of indication / decimal point / unit (°C/°F) / stabilisation zero point / limit value 1 / hysteresis value 1 / delay times 1 / limit value 2 / hysteresis value 2 / delay times 2 / locking of programming / calibration points / TAG number

Mechanics

Enclosure starCase:		
	Type:	SC90
	Dimensions:	120 x 90 x 50 mm
	Material:	ABS/FR (halogen free)
	Colour:	light grey (RAL 7035)
	Weight:	approx. 250 g
Enclosure AluCase:		
	Type:	AC90
	Dimensions:	120 x 90 x 60 mm
	Material:	diecast aluminium
	Colour:	aluminium white (RAL 9006)
	Weight:	approx. 700 g
Mounting:	4 screw channels	
Protection:	IP 66 (enclosure)	
Connection:	plug-in terminal strip up to 1,5 mm ²	
Screwed cable gland:	2x M16x1,5	

Possibilities of indication

Programming the decimal point and unit the following scope of representation is possible:
xxxx / xxx.x / xx.xx / x.xxx / xxx°C / xxx°F