ITP15-M LED Bargraph Indicator
User guide

1. Recycling and disposal



The device is considered an electronics device for disposal in terms of European Directive 2012/19/EU and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

2. Introduction

This manual describes the functions, configuration, mounting and operating instructions of the ITP15– M LED Bargraph indicator (hereinafter referred to as the device).

Connection, setup and maintenance of the device must be performed only by fully qualified personnel after reading this user guide.

3. Terms and abbreviations

PC – personal computer

akYtec Tool Pro – configuration software

USB (Universal Serial Bus) – serial communication interface

4. Overview

The device is designed for conversion, indication and signalling of physical values of temperature, DC voltage and DC (U / I signals).

Functions:

- displaying a value level on the bargraph indicator;
- color-coded indication of changes in the value;
- signalling by color-coded indication about exceeding the set thresholds of the measured value;
- color-coded signalling when the value is in the critical zone;
- alarm indication:
  - indication of a break or short circuit in the "device-sensor" communication line ;
  - cold junction sensor (CJS) failure;
  - value out of range.

5. Specifications

Table 1 Specifications

Parameter	Value
Electrical	
Power supply	24 (10..30) VDC
Power consumption, max.	1 W
Appliance class	III
Galvanic isolation for circuits input-to-output, input-to-power supply, output-to-power supply, power supply-to-enclosure	500 V
Input signals	
Number	1
Input resistance at voltage measuring, min.	100 kΩ
Input voltage drop at current measuring, max.	1.6 V
Input signals supported	see *Section 7*
Sampling time, max.	1 s
Measurements	°C (°C/°F)
Tolerance	
Bargraph indicator error limit (excluding hysteresis), max.	± 10 %
Measurement accuracy (when reading using micro-USB interface), max.	
• RTD (resistance temperature detector), U / I signals	± 0,25 %
• TC (thermocouples), pyrometers	± 0,5 %
Output	
NPN transistor, loading capacity	200 mA, 42 VDC
Configuration interface	
Connector for configuration with akYtec Tool Pro	micro-USB
Display	
Colors	red, green, yellow
Segments	10 (0...100 % scale)
Indication range	user-configurable in Bar.L and Bar.H parameters
Display hysteresis (segment switching / segment color switching)	±1 % of indication range
Display events	signal < 0% signal = 0% 0% < signal < 100% signal = 100% signal > 100% fault
Mechanical	
Dimensions	48 × 26 × 72 mm
IP code (front / rear)	(IP65 / IP20)
MTBF	100000 hours
Average service life	12 years
Weight	approx. 150 g

6. Environmental conditions

The device is designed for natural convection cooling which should be taken into account when choosing the installation site.

The following environmental conditions must be observed:

- clean, dry and controlled environment, low dust level;
- closed non-hazardous areas, free of corrosive or flammable gases.

Table 2 Environmental conditions

Condition	Permissible range
Ambient temperature	-40…+60 °C
Relative humidity	30…80 % (non-condensing)
Transportation and storage temperature	-25 … +55 °C
Transportation and storage relative humidity	5…95 % (non-condensing)
Altitude	up to 2000 m ASL
EMC emission / immunity	conforms to IEC 61000-6-3-2016

NOTE
When operating the device at an altitude above 1000 m above sea level, it is necessary to take into account the reduction of the electrical insulation as well as the reduction in the cooling effect of the air.

7. Input signals

Table 3 Signals and sensors

Indication*	Description	Measurement range
RTD		
C 50	Cu50 (α = 0,00426 °C^{-1})	–50...+200 °C
50 C	50M (α = 0,00428 °C $^{-1}$)	–180...+200 °C
P 50	Pt50 (α = 0,00385 °C^{-1})	–200...+850 °C
50P	50P (α = 0,00391 °C $^{-1}$)	–200...+850 °C
C100	Cu100 (α = 0,00426 °C^{-1})	–50...+200 °C
100C	100M (α = 0,00428 °C^{-1})	–180...+200 °C
P100	Pt100 (α = 0,00385 °C $^{-1}$)	–200...+850 °C
100P	100P (α = 0,00391 °C $^{-1}$)	–200...+850 °C
100n	100N (α = 0,00617 °C $^{-1}$)	–60...+180 °C
P500	Pt500 (α = 0,00385 °C $^{-1}$)	–200...+850 °C
500P	500P (α = 0,00391 °C $^{-1}$)	–200...+850 °C
C500	Cu500 (α = 0,00426 °C $^{-1}$)	–50...+200 °C
500C	500M (α = 0,00428 °C $^{-1}$)	–180...+200 °C
500n	500N (α = 0,00617 °C $^{-1}$)	–60...+180 °C
C 1.0	Cu1000 (α = 0,00426°C^{-1})	–50...+200 °C
1.0 C	1000M (α = 0,00428 °C^{-1})	–180...+200 °C
P 1.0	Pt1000 (α = 0,00385 °C^{-1})	–200...+850 °C
1.0 P	1000P (α = 0,00391 °C^{-1})	–200...+850 °C

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Indication*	Description	Measurement range
1.0 n	1000N (α = 0,00617 °C^{-1})	–60...+180 °C
TC		
tC.L	L	–200...+800 °C
tP.HA	K	–200...+1300 °C
tC.J	J	–200...+1200 °C
tC.n	N	–200...+1300 °C
tC.t	T	–200...+400 °C
tC.S	S	0...+1750 °C
tC.r	R	0...+1750 °C
tC.b	B	+200...+1800 °C
tC.A1	A-1	0...+2500 °C
tC.A2	A-2	0...+1800 °C
tP.A3	A-3	0...+1800 °C
TC in accordance with DIN 43710		
tC.dL	L	–200...+900 °C
I signals**		
I 0.5	0…5 mA***	0...100 %
I0.20	0…20 mA***	0...100 %
I4.20	4…20 mA	0...100 %
U signals**		
U-5.5	-50...+50 mV***, ****	0...100 %
U 0.1	0…1 V***	0...100 %
U2.10	0…10 V***	0...100 %
U0.10	2…10 V***	0...100 %
Pyrometers		
Plr.1	RK-15	+400...+1500 °C
Plr.2	RK-20	+600...+2000 °C
Plr.3	RS-20	+900...+2000 °C
Plr.4	RS-25	+1200...+2500 °C

NOTE
* The name is displayed in *akYtek Tool Pro*.
** The range is user-configurable in di.Lo and di.Hi parameters.
*** For correct line-break detection when operating with a voltage/current signal source, the source output must be shunted with a 10 kΩ resistor. Without this shunt, line-break detection may not operate correctly.
**** Accuracy is not standardized.

8. Safety

DANGER
Dangerous voltage!
Electric shock could kill or seriously injure.
All work on the device must be performed by a fully qualified electrician.
Ensure that the mains voltage matches the voltage marked on the device.
Ensure that the device is provided with its power supply line and electric fuse.
The device may not be used in aggressive environments, in atmospheres in which there are chemically active substances.
The output port and internal electrical elements of the device must be protected from the humidity.

NOTICE
De-energize the device before working on it. Switch on the power supply only after completing all work on the device.

9. Mounting

To mount the device:

1. Prepare the mounting cutout with Ø of 22.5 mm in the switchboard where the device should be mounted (see *Fig. 2*).
2. Carefully position the supplied gasket (see *Fig. 1*).
3. Place the device with the installed gasket in the prepared mounting cutout and tighten the nut (included in the scope of delivery) to fix the device.

NOTICE
Do not use any tools to tighten the nut. Tighten the nut only by hand.

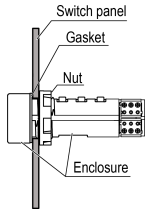


Fig. 1 Mounting

Removing proceeds in the reverse order.

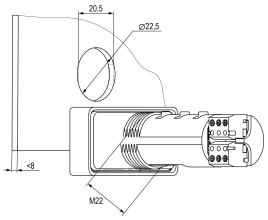


Fig. 2 Mounting cutout

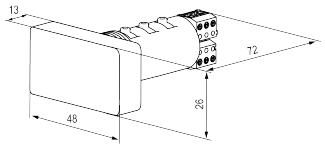


Fig. 3 Dimensions

10. Connection

10.1 General information

Signal cables should be routed separately from the power supply cables as well as from the cables which are sources of high-frequency and impulse interference.

For high-quality clamping and reliable electrical connections, it is recommended to use:

- copper multicore wires, diameter after tinning - 0.9 mm (17 cores, AWG 22) or 1.1 mm (21 cores, AWG 20);
- copper wires with single-wire cores, diameter from 0.51 to 1.02 mm (AWG 24-18).

The ends of the wires should be stripped of insulation by 8 ± 0.5 mm (see *Fig. 4*) and, if necessary, tinned.

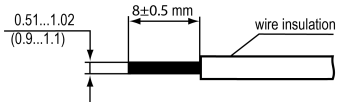


Fig. 4 Wire preparation

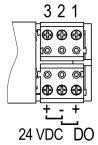


Fig. 5 Terminal assignments

10.2 Wiring

CAUTION
To protect the device input from the influence of industrial electromagnetic interference, the “device-sensor” communication lines should be shielded. To protect the device input circuits from possible breakdown by static electricity charges accumulated on the “device-sensor” communication lines, their wires should be connected to the shield ground screw for 1–2 s before connecting to the device terminal block.

Connect the “device – sensor” communication lines to the primary converter and the device input and connect the device to the power supply (see *Fig. 6*).

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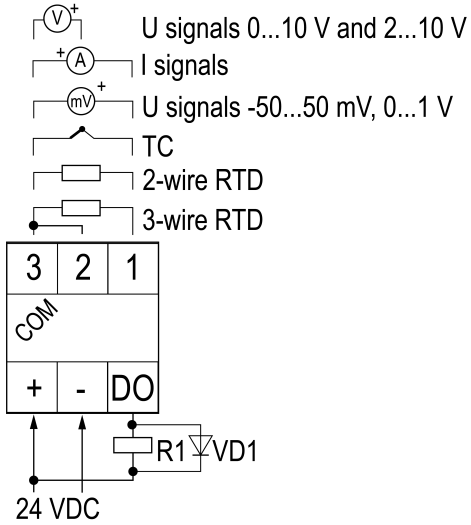


Fig. 6 Wiring diagram

To protect the device against microseconds' impulse noise of the output device (open collector) on the terminals "DO" and "-", it is recommended to use connecting lines no longer than 30 meters or install devices for protection against impulse noise on the DC line.

The VD1 diode should be located as close as possible to the terminals of the relay winding. The parameters of the diode are selected in accordance with the following rules:

- the reverse voltage of the diode must be at least *1.3* U_{PS};
- the forward current of the diode must be at least *1.3 R1* (1.3 of the relay coil current).

11. Indication and control

The 10–segment bargraph indicator on the front panel is designed to display the measured value level and alarms.

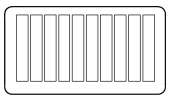


Fig. 7 Front panel

Each of the segments can be in one of the following states:

- off;
- green light;
- red light;
- yellow light;
- fast flashing;
- slow flashing.

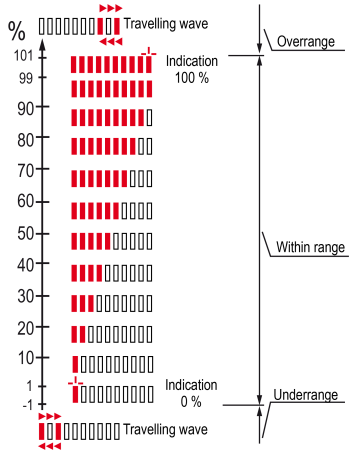


Fig. 8 Displaying the signal

The device can be mounted with vertical or horizontal orientation of the indicator.

Table 4 Error indication and remedy

Indication	Description	Remedy
	Fault in the sensor circuit (short circuit or sensor break); Cold junction sensor (CJS) failure	Check the "device-sensor" communication line. Contact akYtec service staff
Boundary state of value		
	The calculated input value is above the permissible indication limit (> Bar.H)	Ensure that the limits of the Bar.L or Bar.H indication range are set correctly
	The calculated input value is below the permissible indication limit (< Bar.L)	
	Signal indication at the boundary of the indication range: -1...1 % - the left extreme segment flashes; 99...101 % - the right extreme segment flashes	Check the "device-sensor" communication line. Ensure there is no sensor break. Ensure the input channel is correctly connected to the signal source

CAUTION
Short circuit and sensor break are indicated as 0% for signals 0-20 mA and 0-10 V. The output will not be set to the safe state.

In case of a fault, the output is set to the "safe state" defined in parameter 3 (see *Table 7*).

If the indication does not correspond to the real value or when indicating an error, check the set signal type matches the real signal.

Control buttons are located on the cylindrical part of the device (see the figure below).

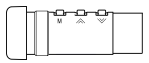


Fig. 9 Control buttons

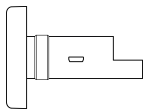


Fig. 10 Micro-USB connector

Table 5 Function buttons

Button	Description
M	• Press for 3 s to edit parameters (or to exit the edit mode) • Press for 1 s to write values in the device memory
or	• Select parameter; • Change the parameter value
	Press for 3 s to enter the parameter setup menu (see *Table 6*)

The device can be reset to factory settings:

- manually without a PC (see *Table 6*);
- using *akYtec Tool Pro* (see *Table 8*).

12. Setup menu at first startup

NOTE
The settings described below are available at the initial start-up of the device if the device has not been configured from a PC.

Indication symbols are explained in the figure below:

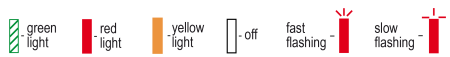


Fig. 11 Explanation of indication symbols

The factory settings are underlined.

Table 6 Setup parameters

No	Parameter	Possible values	Indication
1	Input signal	4...20 mA	
		0...20 mA	
		0...10 V	
		2...10 V	
2	Alarm logic	Output is off	
		Alarm within limits (P)	

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No	Parameter	Possible values	Indication
		Alarm outside limits (U)	
3	Output state in case of conversion error	Output open	
		Output closed	
4	Reset function	Off	
		On	

If any of the above parameters have been edited, further changes using the buttons will be blocked. Further configuration is only possible with the help of a PC, or the device should be reset to factory settings.

13. Main menu

Full settings are available only when connected to a PC via USB. Basic settings accessible from the device buttons are described in *Section 12*.

Table 7 Main menu

Indication*	Description	Permissible values	Factory settings
in.t	Input signal	see *Section 7*	Pt100
td	Digital filter time constant	0...10 s	0
SQrt	Square root function (for U signals)	on/oFF	oFF
di.Lo**	Signal lower limit (for I / U signals)	–1999...9999	0
di.Hi**	Signal upper limit (for I / U signals)	–1999...9999	100
dP.T	Decimal point position	auto - - - - - - -.- - -.- - -.- - -	- - -.-
2u3u	RTD connection: 2–wire or 3–wire	2-Ln 3-Ln	3-Ln
Corr	Offset correction	–1999...9999	0
Bar.L** Bar.H	Limits of the range displayed on the bargraph indicator. One division of the scale corresponds to 10 % of the selected range. It is possible to set a narrower range for the selected sensor by changing the Bar.L / Bar.H values	–1999...9999	0 100
Cnt	Control function: OFF / Alarm within limits (P) / Alarm outside limits (U)	oFF/ P/U	U
SP.Lo	Setpoint lower limit. A value of -10000 means that the setpoint is off	–1999...9999 –10000	0
SP.Hi	Setpoint upper limit . A value of 10000 means that the setpoint is off	–1999...9999 10000	30
A.HYS	Hysteresis. When “Alarm within limits (P)” or “Alarm outside limits (U)” are selected, the hysteresis blocks the actuation of the output unit with minor fluctuations at the SP.Lo and SP.Hi boundary. The parameter is not displayed when Cnt = oFF	0...9999	0
di.Sh	Characteristics offset	–50.0... +50.0	0
out.E	Output device state in case of sensor failure	on/oFF	oFF
d.FnC	Flashing function. The indicator is flashing, whet the output device is on	on/oFF	oFF
Zon.1	Thresholds for changing the color of indicator zones	–1999...9999	0
Zon.2			50
Zon.3			80
Zon.4			100
Zon.5			100
CoL.1	Indicator zone color	GRN/RED/ YEL	GRN
CoL.2			YEL
CoL.3			RED
CoL.4			RED
CoL.D	Basic indication color outside color zones	GRN/RED/ YEL	GRN

NOTE
* The name is displayed in akYtec Tool Pro.
** For RTD / TC sensors, the Bar.L to Bar.H values are selected from the full conversion range of the respective sensor. For I / U signals, the Bar.L and Bar.H values are selected from the conversion range specified by the di.Lo and di.Hi parameters.

14. Service menu

This menu is only available from *akYtec Tool Pro*.

Table 8 Service menu

Indication	Description
CJS.E	Cold junction sensor on/ off
d.rSt	Reset to factory settings: Current state: **0**. When it is set to **1**, all device settings are reset to default values and the device restarts

15. Indication setup

Segment switching thresholds

The segment switching thresholds are defined by the indication range from Bar.L to Bar.H and divide this range into 10 segments of 10 % each. The color changes with a hysteresis of ±1 % of the Bar.L to Bar.H range.

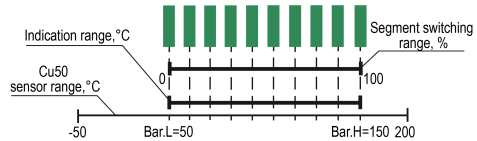


*Fig. 12 Indication range setup. The ranges of –1 to 0 % and **100 to 101 % are not shown***

Color change thresholds and zone colors

The indicator colors change automatically when the input measured value (after applying the settings) reaches the color change threshold.

The color changes with a hysteresis. The hysteresis value is equal to two values of the lowest digit counted from the transition boundary. The distribution of color zone thresholds is shown in the figure below.

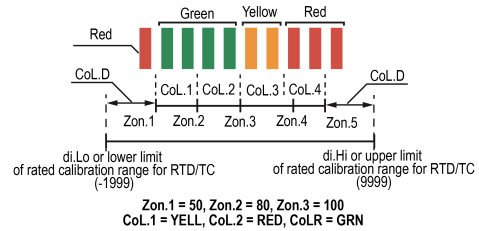


Fig. 13 Color zone setup

Indicator flashing

Flashing is activated by the d.Fnc parameter (see *Table 7*).

The red flashing function is used to attract the operator's attention if the converted value is out of the alarm range.

Figure 12 shows the indication range for a Cu50 sensor with a full range of 250°°C and a given error of ±0.25 %, the absolute measurement error is ±0.625 °C (when read over the USB interface).

The indication range in the Bar.L = 50 and Bar.H = 150 parameters is limited to 100 °C. This range is divided into 10 equal intervals of the indication scale, which define the thresholds for switching the segments. The absolute error of ±0.625 °C for the range of 100 °C calculated in the

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previous step is ±0.625 % of the error of setting the switching thresholds of the indication segments.

The segments are switched with a hysteresis of ±1 % set in relative units of the indication scale. If it is necessary to estimate the value of hysteresis in absolute units of the indication range, a backward recalculation of the hysteresis value is required by solving the proportion. In this example, ±1 % hysteresis on the indication scale corresponds to ±1 °C.

16. Alarm setup

The output device can be used for control or alarm indication.
You can select the alarm logic with the **Cnt** parameter (see *Table 7*) in accordance with *Fig. 14*.

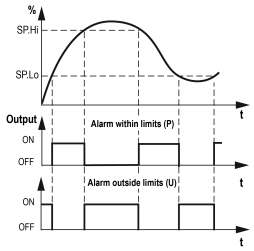


Fig. 14 Output device logic

17. Configuration using akYtec Tool Pro

You can configure the device using *akYtec Tool Pro* software.

To connect the device to *akYtec Tool Pro*:

1. Connect the device to a PC with the USB — micro USB cable.
2. Start *akYtec Tool Pro*.
3. Click **Add devices**.
4. Select the COM port assigned to the device in the **Interface** drop-down menu of the **Network parameters** tab. You can check the port number and name in Windows Device Manager.

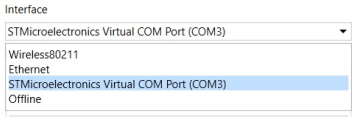


Fig. 15 Interface selection

5. Select **Modbus RTU** in the **Protocol** drop-down menu.



Fig. 16 Protocol selection

6. Select the necessary device in the **Measuring devices** category of the **Devices** drop-down menu.

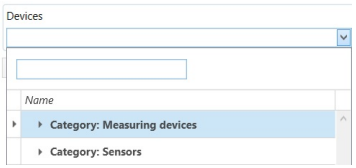


Fig. 17 Device selection

7. If the device is connected for the first time, select **Manually** in the **Connection setup** tab and set the following values:

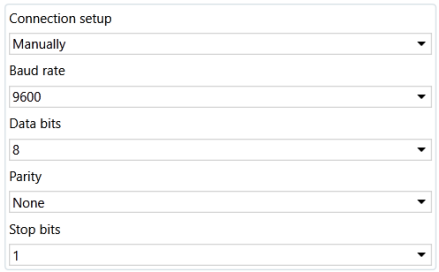


Fig. 18 Connection setup

8. Select **Find device**.
9. Enter the address of the connected device (default address — **16**).

NOTE
The device is available under addresses from 1 up to 255.

10. Click **Search**. The device with the address will be displayed in the window.
11. Select the checkbox next to the device and click the **OK** button.

To get more information about the connection and operation of the device, use the HELP menu of akYtec Tool Pro or press **F1** to call up **HELP** in the program.

18. Maintenance

The safety requirements must be observed when the maintenance is carried out.

DANGER
Cut off all power before maintenance.

The maintenance includes:

- cleaning the housing and terminal blocks from dust, dirt and debris
- checking the device fastening
- checking the wiring (connecting wires, terminal connections, absence of mechanical damages).

NOTICE
The device should be cleaned with a dry or slightly damp cloth only. No abrasives or solvent-containing cleaners may be used.

19. Transportation and storage

Pack the device in such a way as to protect it reliably against impact for storage and transportation. The original packaging provides optimum protection.

If the device is not taken immediately after delivery into operation, it must be carefully stored at a protected location. The device should not be stored in an atmosphere with chemically active substances.

The environmental conditions must be taken into account during transportation and storage.

NOTICE
The device may have been damaged during transportation. Check the device for transport damage and completeness! Report the transport damage immediately to the shipper and akYtec GmbH!

20. Scope of delivery

ITP15–M LED bargraph indicator	1 pc.
User guide	1 pc.
Set of mounting elements	1 pc.

NOTE
The manufacturer reserves the right to make additions to the scope of delivery.

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