



Smart encoders & actuators

User's guide

AQ58S and AQ59H



- Programmable incremental encoder
- IP65 high resolution encoder for demanding applications
- Resolution from 1 to 16,384 PPR
- Output voltage +5Vdc or + 30Vdc
- USB connection kit available for configuration

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The logo for Lika Electronic s.r.l. consists of the word "lika" in a bold, lowercase, sans-serif font. The letter "i" has a dot, and the "a" has a tail that extends to the right.

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Typographic and iconographic conventions

In this guide the following symbols are used:

	<p>This icon, followed by the word WARNING, is meant to highlight the parts of the text where information of great significance for the user can be found: user must pay the greatest attention to them! Instructions must be followed strictly to guarantee the safety of the user and a correct use of the device. Failure to heed a warning or comply with instructions could lead to personal injury and/or damage to the unit or other equipment.</p>
	<p>This icon, followed by the word NOTE, is meant to highlight the parts of the text where important notes needful for a correct and reliable use of the device can be found. User must pay attention to them! Failure to comply with instructions could cause the equipment to be set wrongly: hence a faulty and improper working of the device could be the consequence.</p>
	<p>This icon is meant to highlight the parts of the text where suggestions useful for making it easier to set the device and optimize performance and reliability can be found. Sometimes this symbol is followed by the word EXAMPLE when instructions for setting parameters are accompanied by examples to clarify the explanation.</p>

Preliminary information

This guide is designed to provide the most complete and exhaustive information the operator needs to correctly and safely install and operate the following programmable incremental encoders:

- AQ58S and AQ59H series

AQ58S and AQ59H programmable encoders from Lika Electronic and solely sold by Automation Direct are designed to maximize customization and versatility and really allow the operator to get, along with the position information, a complete parametrization and the better configuration that perfectly suit specific needs in a good many applications and machines. The operator can configure the desired resolution and set the point in the revolution at which the Z signal is output.

The AQ58S and AQ59H programmable encoders are available in both solid shaft AQ58S and hollow AQ59H shaft versions.

Setup of the AQ58S/AQ59H programmable encoders is achieved through a software expressly developed and released by Lika Electronic. The program is supplied for free and can be installed in any PC fitted with a Windows operating system (Windows 7 or later). It allows the operator to set the working parameters of the device and monitor whether the device is running properly.

Programming interface

The AQ58S and AQ59H programmable encoder is equipped with a serial interface for the parametrization and set-up of the device through a PC. To communicate with the encoder.

Use one of the following methods to configure the encoder:

- KIT-IP/IQ58-USB-M12 programming cable
- Combination of KIT-IP/IQ58 and EC-IP/IQ58-M12
- Combination of KIT-IP/IQ58 and EC-M12F12-LKT12-xx

Use KIT-IP/IQ58-USB-M12 for a direct connection between the USB type A port on your PC to the encoder.

To connect the encoder to the KIT-IP/IQ58 and EC-IP/IQ58-M12 (or EC-M12F12-LKT12-xx) programming kit, please refer to the following table and to the label applied to the connection kit terminal. First connect the cable to the KIT-IP/IQ58. Next connect the other end of the cable to the encoder. Finally plug in the KIT-IP/IQ58 to the PC.

Function	Encoder/cordset cable	Terminal
+5Vdc power supply *	Brown_Green	PWR+
0Vdc	White_Green	PWR-
SCL Serial Clock Line	Black	SCL
SDA Serial Data Line	Red	SDA

After wiring is complete launch the Lika encoder setup utility.



* WARNING

+5Vdc power supply from the USB connection. Do not connect any external power supply sources.

**WARNING**

Please make sure that only one encoder is connected to the KIT-IP/IQ58 when you activate the USB connection.

Configuring the encoder using the software tool

AQ58S and AQ59H programmable incremental encoder is supplied with software expressly developed and released by Lika Electronic to easily program and configure the device.

The software is supplied for free and can be installed in any PC fitted with a Windows operating system (Windows 7 or later). The name of the program executable file is ADC_KIT_IP_IQ58_vx.x.x.exe where vx.x.x is the release version of the file. The program is available for download at AutomationDirect.com.

The program is designed to be installed simply by copying the executable file (*.exe file) to the desired location and there is no installation process. To launch the program just double-click the file icon. To close the program, press the EXIT button in the title bar.



**WARNING**

Please always close the programming interface before disconnecting the encoder !

Starting the program

To launch the program double-click the ADC_KIT_IP_IQ58_vx.x.x.exe executable file.

The main page of the configuration interface will appear on the screen. A further page is dedicated to the diagnostic information; it can be accessed by pressing the ADVANCED DIAGNOSTICS button.

The main page allows the operator to choose the language used to display text and items in the user interface. Click the Italian flag  icon at the top-right of the page to choose the Italian language; click the UK flag  icon to choose the English language.

Two sections can be found in the main page of the configuration interface:

- A top section groups the items needful for establishing the connection between the encoder and the interface, the connection buttons as well as the drop-down boxes designed to select the interface type and the series of the encoder to connect;
- A bottom section called PROGRAMMABLE PARAMETERS shows the list of the parameters to be used to program the encoder; also the buttons needful for checking the work status of the encoder and entering the diagnostic information page can be found below in this section.

Connection with the encoder

When you start the program, the system automatically recognizes the programming kit. If there is a red ✘ on the Interface row, unplug and reinsert the KIT IP/IQ58 device. Then press the Connect button on the Interface row. If the connection is established properly, green tick ✔ appears next to both the CONNECT buttons.

If the program is not able to establish a connection to the encoder, a red ✘ appears next to either button or next to both buttons. You must select the series of the encoder you need to connect to instead. To do this, open the ENCODER drop-down box and select from the options in the list: "AQ58, AQ59". The encoder model can be found in the label applied to the encoder housing.

After positive connection the fields in the page are filled with information acquired from the connected device. Furthermore the buttons and the commands become active.

Setting the parameters



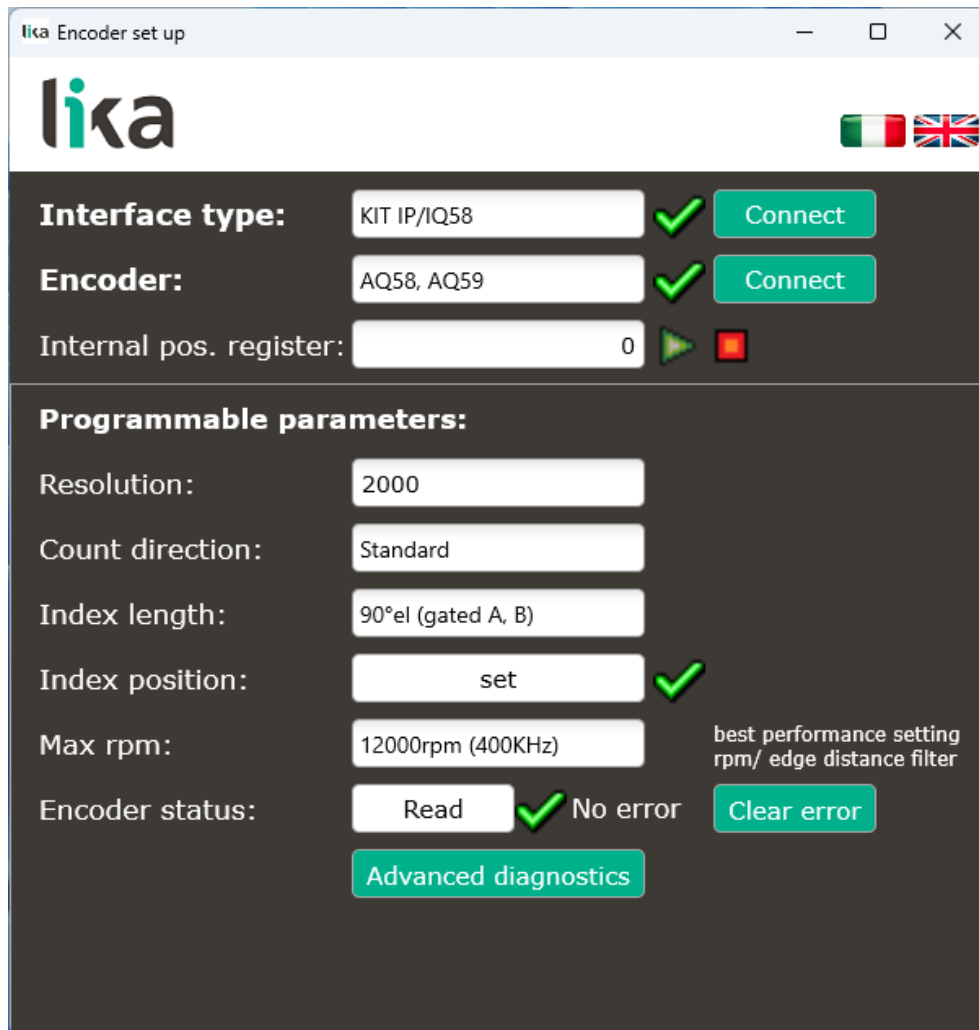
WARNING

To save the data on the EEPROM permanently, you must press the ENTER button in the keyboard after having entered the new value. The parameter is saved instantly.



Summary of the parameters that can be set or read:

- Internal pos. Register
 - Click the 'play' button to see the live position of the encoder
- Resolution (PPR)
 - Resolution from 1 to 16,384 PPR
- Count direction

- Standard = Clockwise rotation represents Channel A leads Channel B
- Inverted = Counterclockwise rotation represents Channel A leads Channel B
- Index Length
 - 90° (gated A, B)
 - 180° (gated A)
- Index Position
 - When 'set' is pressed, the Z pulse will be configured at the current position of the shaft. The shaft must be still during Z pulse configuration.
- Max RPM
 - This will automatically adjust to the maximum depending on the PPR resolution set.
 - EX: A PPR of 16384 will result in an 1831 RPM max (500 kHz). A PPR of 360 will result in a 12000 RPM max which is the mechanical max RPM allowed.
- Encoder Status
 - Displays any errors with the encoder when 'Advanced Diagnostics' is pressed



Internal pos. Register

It is used to show the value in the internal position register: the current position of the encoder. When you start the program, 0 appears next to this item. Press the START  button to start the routine which allows continuous reading and displays the current position: the current position of the encoder appears on the field. Press the STOP  button to stop the routine; the last position value is kept "frozen" in the display field. After having set a new resolution value, the index position (Z pulse) must be set again.

Resolution

This parameter allows the operator to set the custom number of pulses that the encoder will output per each revolution (PPR). Please enter the desired value and then press the ENTER button to confirm. If you set a value that is out of range (lower or greater than allowed), the system automatically sets either the minimum or the maximum value in the range.

After having set the resolution, the maximum rpm possible will be set in the Max rpm field. The encoder maximum rotational speed can be lowered depending on the PPR setting. Please always consider the pulse multiplication factor (x 1, x 2 or x 4) of the subsequent electronics before entering a new resolution value.

Default = 1024 (min. value = 1; max. value = 16384)

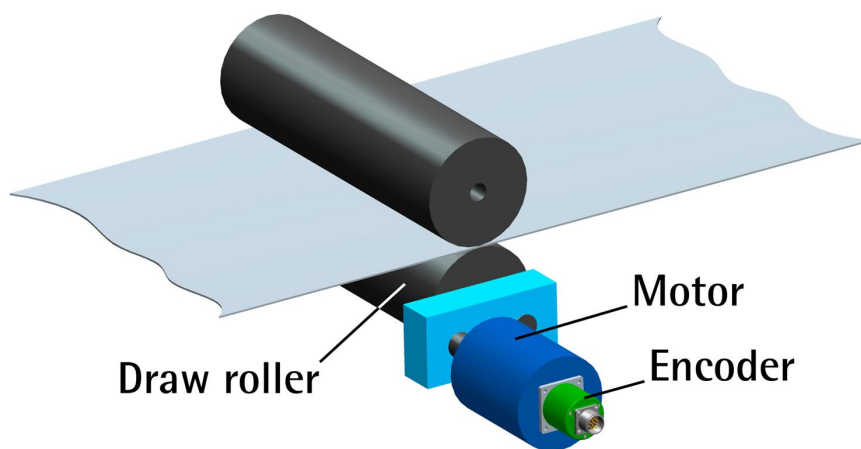
**EXAMPLES**

Here are some examples useful for better understanding the application field of the programmable resolution. We assume that the pulse multiplication factor in the following electronics is x 1.

Example 1

Let's assume that the encoder is mounted on the driven draw roller of a slitter and the circumference of the roller is 753 mm.

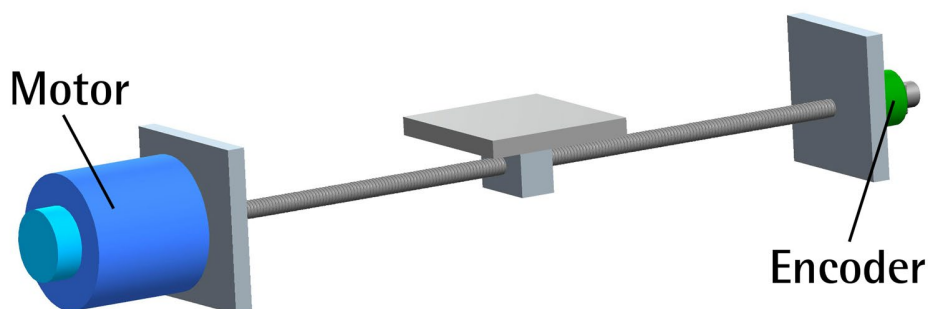
We can set a resolution of 7,530 PPR (**Resolution** = 7530) to control the movement of the roller with a tenth of a millimeter resolution.



In this way we convert a rotary measurement value (for example: 10,000 PPR) into a linear measurement value, thus we can control the unwinding of a plastic or paper web from the reel and activate the blades to cut 1m (3.28 ft) long sheets with a tenth of a millimeter resolution.

Example 2

Let's assume that an axis is guided by a ball screw; a motor fitted with a reduction gearbox having 1:50 reduction ratio is installed in an end of the system, while the encoder is installed in the opposite end of the system.



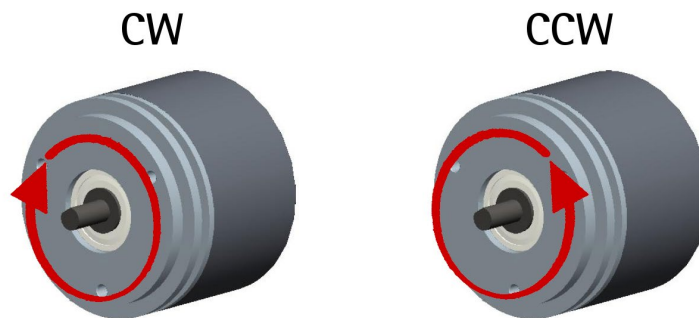
As we know the reduction ratio of the ball screw and gearbox, we can set a suitable resolution to control the motion of the motor precisely and calculate the input speed starting from the known output speed.

Example 3

Let's assume that the encoder is used to control the movement of a chain conveyor. The chain conveyor is equipped with multiple stations and has an overall length of 14.847 m. If we set a resolution of 14,847 PPR (**Resolution** = 14847) we have precise control over the movement of the chain conveyor and its positioning at the stations with a millimeter resolution.

Counting direction

By default, the phase relationship between A and B channels is so that the rising edge of A channel leads the rising edge of B channel when the encoder is rotating in a clockwise direction.



Set **Counting direction** = Standard (CW) to have the increasing count (A leads B) when the shaft is turning clockwise; set **Counting direction** = Inverted (CCW) to have the increasing count (A leads B) when the shaft is turning counter-clockwise. Clockwise and counterclockwise directions are viewed from the shaft side

Default = Standard (CW)



WARNING

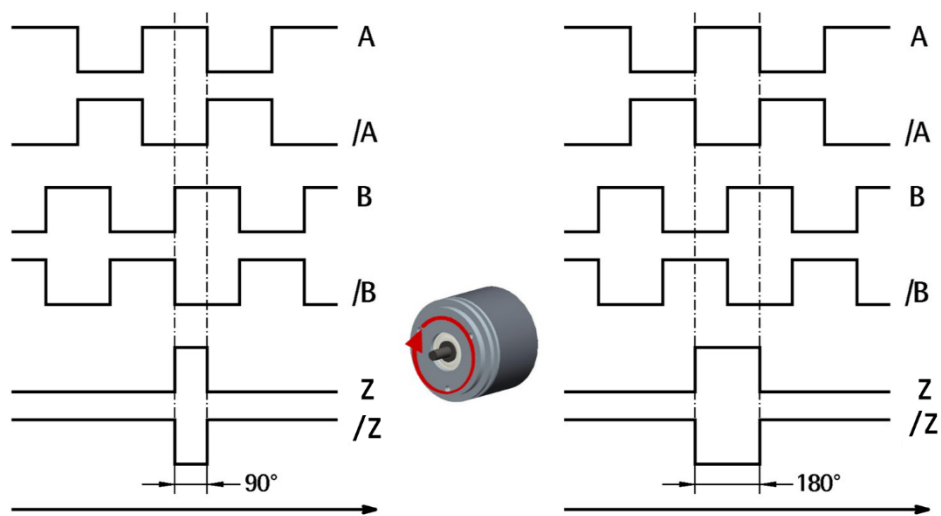
After having set the new counting direction it is necessary to set also the Index pulse.

Index length

This parameter allows to set the width of the Index pulse (Z pulse) expressed in electrical degrees. Two options are available and selectable in the drop-down box: 90° (gated A, B) and 180° el (gated A). Please note that the Z pulse having a width of 90 electrical degrees is synchronized with A and B pulses, while the Z pulse having a width of 180 electrical degrees is synchronized with A pulse. See the Figure below.

Default = 90° (gated A, B)

Min. value = 90° (gated A, B); max. value = 180° (gated A)



Index position

These encoders provide the zero signal (Index pulse) once per revolution as relative positioning reference (home position, see the Figure above). In this way a unique position can be identified at a well-known point in the 360° revolution of the encoder shaft. This function allows the Z pulse to be set at any rotational position of the shaft. It is useful, for example, when you want the zero position of the encoder and the mechanical zero position of the axis to match. When you want to set the position of the Z pulse in the revolution you must move the axis to the desired position, then press the SET button next to this **Index position** field while the encoder and the mechanical assembly is stationary.

Max rpm

Displays the maximum rpm and resulting maximum electrical output frequency available from the encoder. The Max rpm value is calculated by using the programmable resolution entered above and the encoder's maximum electrical output frequency (500kHz).

For the maximum resolution setting 16384 PPR, the Max rpm allowed is 1831rpm (500kHz). This is limited by the electrical output frequency.

For lower resolutions, the Max rpm will increase. But the Max rpm will not exceed 12000rpm (the mechanical limit of the encoder). Example: setting Resolution = 360 PPR will result in a Max rpm value of 12000rpm (72kHz). This is limited by the mechanical maximum speed (12000rpm).

**NOTE**

Please note that the maximum counting frequency of an encoder, expressed in kHz, results from the number of revolutions per minute (RPM) -i.e. its rotational speed- and the number of pulses per revolution (PPR) of one channel (A or B) -i.e. its resolution. It can be calculated by using the following algorithm:

$$\text{Maximum counting frequency (kHz)} = \frac{\text{RPM} * \text{PPR}}{60 * 1000}$$

It follows that the higher the maximum rotational speed of the encoder and its resolution, the higher the counting frequency. This must be considered carefully when you program the encoder, in particular referring to the maximum counting frequency of the encoder as stated in the technical specifications, to the following electronic equipment and to the length of the cables. Longer cables result in degraded signal integrity when the pulse frequency is high.

If you reverse the formula, you can easily calculate the maximum number of revolutions starting from the value of the counting frequency (as allowed by the encoder, permitted by the subsequent electronics) and the desired number of pulses per revolution:

$$\text{RPM} = \frac{\text{Maximum counting frequency (kHz)} * 60 * 1000}{\text{PPR}}$$

The reversed formula can be very useful -for instance- when you know the maximum counting frequency that is applicable to the system (because of the encoder) and you need to calculate the maximum rotational speed the encoder is allowed to reach at the desired resolution.

Encoder status

Displays the work status of the encoder.

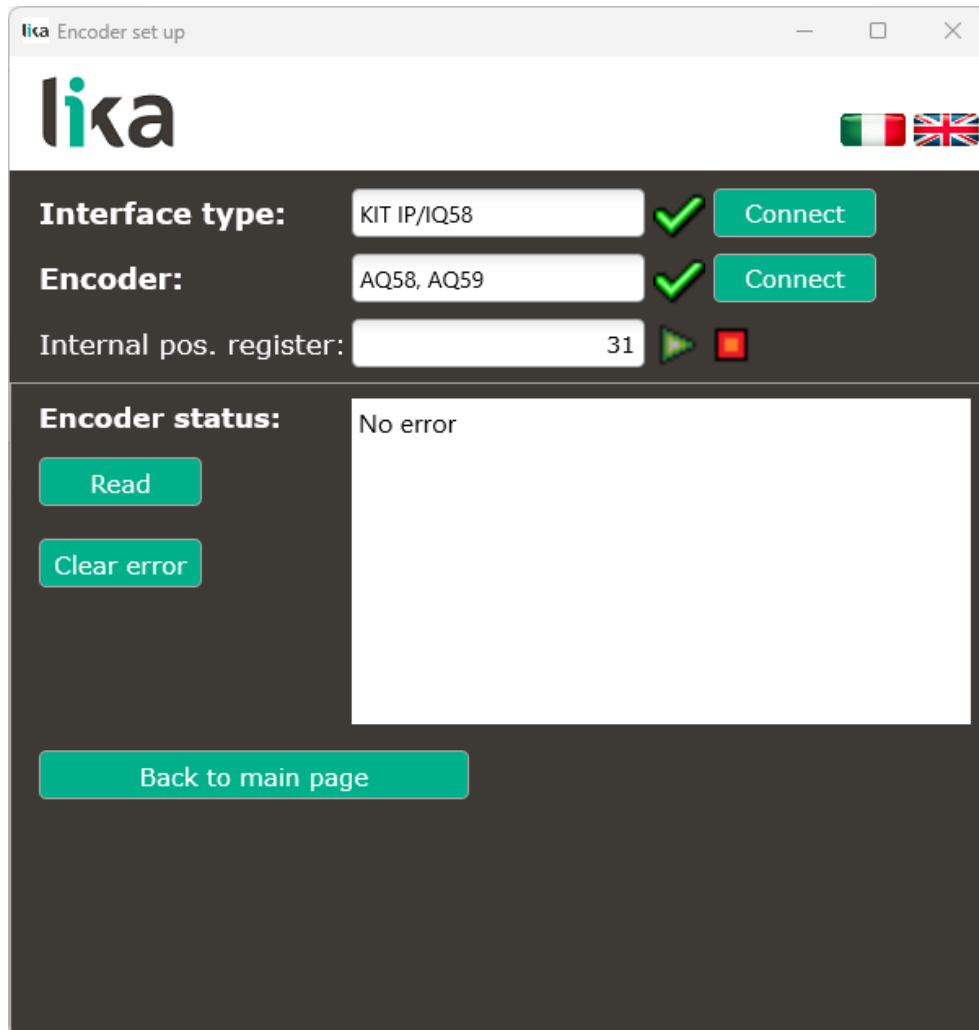
Press the READ button to update the status visualization.

If the encoder is working properly, the NO ERROR message appears on the right of the READ button. If a fault condition arises, the WARNING message appears. By pressing the CLEAR ERROR button the system tries to solve the problem. If this is not possible, please press the ADVANCED DIAGNOSTICS button to learn more about the occurred fault.

Diagnostics page

When you press the ADVANCED DIAGNOSTICS button in the main page, you enter the DIAGNOSTICS page.

In this page you can find detailed information on the work status of the encoder. The current status is described in the window in the middle-right side of the page.



Press the READ button to update the status window.

If an error occurs and the system is not able to resolve it by pressing the CLEAR ERROR button, power down the encoder and power back up and try to clear the error again. If the error still does not clear, please take note of the error code that appears in the window and contact Automation Direct Technical Support.

Press the BACK TO MAIN PAGE button to display the main page.



This device is to be supplied by a Class 2 Circuit or Low-Voltage Limited Energy or Energy Source not exceeding 30 Vdc. Refer to the order code for supply voltage rate.
 Ce dispositif doit être alimenté par un circuit de Classe 2 ou à très basse tension ou bien en appliquant une tension maxi de 30Vcc. Voir le code de commande pour la tension d'alimentation.



Dispose separately



Lika Electronic

Via S. Lorenzo, 25 • 36010 Carrè (VI) • Italy

Tel. +39 0445 806600

Fax +39 0445 806699



info@lika.biz • www.lika.biz