ELGO
ELECTRONIC

Operating Manual
SERIE *Z60-000*

1… 3 Axes Position Indicator (24 VDC)

- Position indicator with signal inputs for 1 up to 3 axes
- Inputs for conventional encoders as well as for ELGO
- measuring systems (incremental or absolute)
- Adjustable reference value, tool-offset and saw blade thickness
- Digital control input (configurable) for each axis
- Modes for pulses, speed or concentricity
- 2 Open Drain and 2 Relay outputs
- Analog output available (option)
- With serial RS232 interface
- Graphical LCD display
- Power down memory

1   Contents

2 General, Safety, Transport and Storage

2.1 Information about the Operating Manual

This manual contains important information regarding the handling of the device. For your own safety and operational safety, please observe all safety warnings and instructions. Precondition for safe operation is the compliance with the specified safety and handling instructions. Moreover, the existing local accident prevention regulations and the general safety rules at the site of operation have to be observed. Please read the operating manual carefully before starting to work with the device! It is part of the product and should be kept close to the device and accessible for the staff at any time. The illustrations in the manual are for better demonstration of the facts. They are not necessarily to scale and can slightly differ from the actual design.

2.2 Explanation of Symbols

Special notes in this manual are characterized by symbols. The notes are introduced by signal words which express the magnitude of danger. Please follow this advice and act carefully in order to avoid accidents, damage, and injuries.

Warning notes:

⚠	**DANGER!** This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons. Failure to heed these instructions can result in serious damage to health and even fatal injury.
⚠	**WARNING!** This symbol in connection with the word „Warning" means a possibly impending danger for the life and health of persons. Failure to heed these instructions can result in serious damage to health and even fatal injury.
⚠	**CAUTION!** This symbol in connection with the signal word "Caution" indicates a possibly dangerous situation. Failure to heed these instructions can lead to minor injuries or damage of property.

Special safety instructions:

⚡	**DANGER!** This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons due to voltage. Failure to heed these instructions can result in serious damage to health and even fatal injury. The operations may only be carried out by a professional electrician.

Tips and recommendations:

ℹ	**NOTE!** …points out useful tips and recommendations as well as information for an efficient and trouble-free operation.

Reference marks:
☞ Marks a reference to another chapter of this manual.
📖 Marks a reference to another chapter of another document.

2.3   Statement of Warranties

The producer guarantees the functional capability of the process engineering and the selected parameters.

2.4   Demounting and Disposal

Unless acceptance and disposal of returned goods are agreed upon, demount the device considering the safety instructions of this manual and dispose it with respect to the environment.
Before demounting, disconnect the power supply and secure against re-start. Then disconnect the supply lines physically and discharge remaining energy. Remove operational supplies and other material.
Disposal:
Recycle the decomposed elements: Metal components in scrap metal, Electronic components in electronic scrap, Recycle plastic components, dispose the remaining components according to their material consistence.

⚠	CAUTION! Wrong disposal causes environmental damages! Electronic scrap, electronic components, lubricants and other auxiliary materials are subject to special refuse and can only be disposed by authorized specialists!

Local authorities and waste management facilities provide information about environmentally sound disposal.
Safety

⚠	CAUTION! Please read the operating manual carefully, before using the device! Observe the installation instructions!Only start up the device if you have understood the operating manual.The operating company is obliged to take appropriate safety measure. The initial operation may only be performed by qualified and trained staff. Selection and installation of the devices as well as their embedding into the controlling system require qualified knowledge of the applicable laws and normative requirements on the part of the machine manufacturer.

2.5   General Causes of Risk

This chapter gives an overview of all important safety aspects to guarantee an optimal protection of employees and a safe and trouble-free operation.
Non-observance of the instructions mentioned in this operating manual can result in hazardous situations.

2.6   Personal Protective Equipment

Employees have to wear protective clothing during the installation of the device to minimize danger of health.
Therefore:
Change into protective clothing before performing the works and wear them throughout the process.
Additionally observe the labels regarding protective clothing in the operating area.

Protective clothing:

🧥	PROTECTIVE CLOTHING … is close-fitting working clothing with light tear strength, tight sleeves and without distant parts. It serves preliminarily for protection against being gripped by flexible machine parts. Do not wear rings, necklaces or other jewellery.
🧤	PROTECTIVE GLOVES …for protecting the hands against abrasion, wear and other injury of the skin.
⛑	PROTECTIVE HELMET …for protection against injuries of the head.

2.7   Conventional Use

The ELGO-device is only conceived for the conventional use described in this manual.
The ELGO Z60 position indicator only serves to visualize positions, pulses or other specified units.

⚠	CAUTION!
	Danger through non-conventional use!
	Non-intended use and non-observance of this operating manual can lead to dangerous situations.
	Therefore:
	
	    ▪ Only use the device as described
	    ▪ Strictly follow the instructions of this manual
	Avoid in particular:
	    ▪ Remodeling, refitting or changing of the construction or single components with the intention to alter the functionality or scope of the device.

Claims resulting from damages due to non-conventional use are not possible.
Only the operator is liable for damages caused by non-conventional use.

2.8 Safety Instructions for Transport, Unpacking and Loading

⚠	CAUTION! Transport the package (box, palette etc.) professionally. Do not throw, hit or fold it.

2.9 Handling of Packaging Material

Notes for proper disposal: ☞2.4

2.10 Inspection of Transport

Check the delivery immediately after the receipt for completeness and transport damage.
In case of externally recognizable transport damages:

- Do not accept the delivery or only accept under reserve.
- Note the extent of damages on the transportation documents or delivery note.
- File complaint immediately.

ℹ	NOTE! Claim any damage immediately after recognizing it. The claims for damage must be filed in the lawful reclaim periods.

2.11 Storage

Store the device only under the following conditions:

- Do not store outside
- Keep dry and dust-free
- Do not expose to aggressive media
- Protect from direct sun light
- Avoid mechanical shocks
- Storage temperature (☞ 4.3) needs to be observed
- Relative humidity (☞ 4.3) must not be exceeded
- Inspect packages regularly if stored for an extensive period of time (>3 months)

3 Product Features

3.1 General Information

The compact position indicatorr Z60 has an LCD display which allows a comfortable and accurate reading actual positions. Commands like Reset or Preset to an arbitrary reference value can be done either via the dustproof front keypad or external signals to 0 or to an arbitrary reference value.

The unit evaluates incremental square wave signals from conventional encoders as from ELGO magnetic linear encoders (e. g. ELGO types LMIX, EMIX, MIX or PMIX.

Further, an ELGO absolute measuring system EMAX can be connected at terminal S2 (☞ 10).

NOTE!
During de-energized state, movements or displacements of the measuring system or encoder are not evaluated! After powering up an incremental measuring system, a referencing procedure must be performed. Information can be found in the operating manual of the respective measuring system.

3.2 Product Features:

The Z60 unit has numerous useful features and functions:

- 3 encoder inputs to evaluate up to 3 axes
- Graphical display (120 x 80 pixels)
- 3 digital inputs
- 2 open-drain outputs
- 2 shutter relay outputs (opener contacts on request available)
- 2 Limit value presets (parameters)
- Status indication for inputs and outputs
- 1 analog output 0 … 10 VDC
- 1 analog output 4 … 20 mA
- 1 serial RS232 interface
- Easy mounting
- Tool offset
- Incremental / absolute measurement switchover
- Power down memory
- Adjustable reference value
- Adjustable multiplication factor and edge evaluation (triggering)
- Operating mode up/down
- Inverse display mode
- Display contrast adjustable

Further information about these functions can be found within this manual.

4 Technical Data

4.1 Identification

The type label serves for the identification of the unit. It is located on the housing of the unit and gives the exact type designation (=order reference ☞ 12) with the corresponding part number. Furthermore, the type label contains a unique, traceable device number. When corresponding with ELGO always indicate this data.
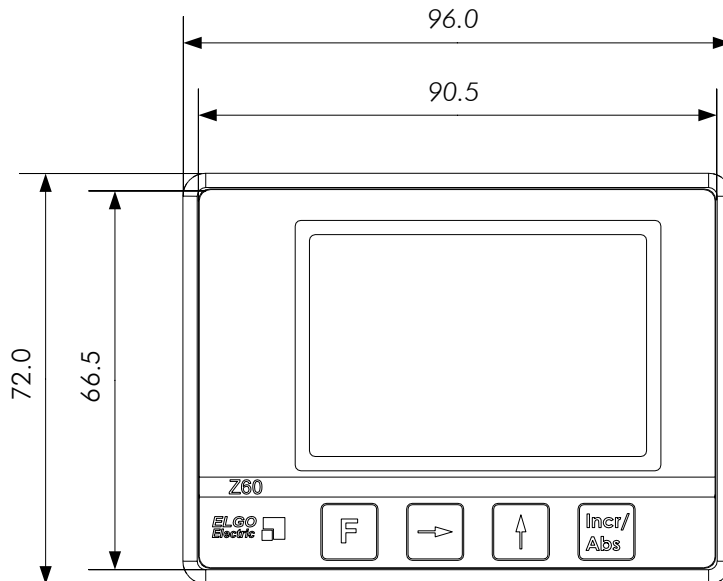
4.2 Dimensions Z60

Figure 1: Dimensions Z60

4.3 Technical Data Z60

Position Indicator Z60-000

Power supply voltage	24 VDC +/- 20 %
Consumption	max. 120 mA (without measuring-system)
Encoder supply	5 VDC or 24 VDC
Load by measuring system	max. 300 mA
Display	LCD 120 x 80 pixels
System accuracy	+/- 1 Digit
Operation temperature	0°... +50° C
Storage temperature	-40°... +70° C
Humidity	max. 80 % (not condensing)
Relay outputs	Potential free shutter relays 24 VDC / max. 1 A
Inputs	input current max. 10 mA, PNP (active high), switching voltage 24 VDC
Power down memory	FRAM

Mechanical Data:

Housing	Panel housing, aluminium
Housing dimensions	W x H = 96 x 72 mm
Installation depth	33 mm (without connectors)
Panel cut out	W x H = 93 x 67 mm
Protection class (front)	IP43

5   Installation and First Start-Up

	CAUTION Please read the operating manual carefully before using the device! Strictly observe the Installation instructions! In case of damage caused by failure to observe this operating manual, the warranty expires. ELGO is not liable for any secondary damage and for damage to persons, property or assets. The operator is obliged to take appropriate safety measures. The first start-up may only be performed by staff that has been trained and authorized by the operator.

5.1   Operating Area

	WARNING! Do not use the device in explosive or corrosive environments! The device must not be installed close to sources of strong inductive or capacitive interference or strong electrostatic fields!

	CAUTION! The electrical connections must be made by suitably qualified personnel in accordance with local regulations. The device may be designed for switchboard mounting. During work on the switchboard, all components must be de-energized if there is a danger of touching the energized parts! (protection against contacts) Wiring works may only be performed in the de-energized state! Thin cable strands have to be equipped with end sleeves! Before switching on the device, connections and plug connectors have to be checked! The device must be mounted in a way that it is protected against harmful environmental influences such as splashing water, solvents, vibration, shock and severe pollution and the operating temperature must not be exceeded.

6   Design and Functions

6.1   Key Assignment

The position display has 4 front keys. The figure shows the respective basic functions:

Function key

Menu navigation for parameter level

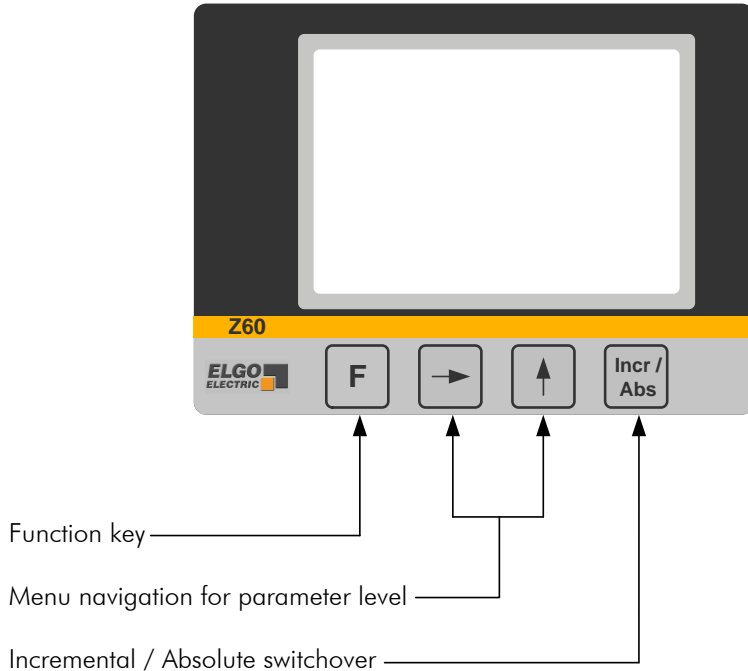Incremental / Absolute switchover

Figure 2: Key Assignment

Detailed functions and combinations are described in the next section (☞ 6.2).

6.2   Key Functions

The operation of the device is divided into 2 levels:

- **Parameter level:** For configuration of the main operating parameters (☞ 7).
- **User level:** Allows access to the basic functions of the unit (depends on software version).

All entries and settings are made exclusively via the 4 front keys or various key combinations.

Normal mode:

Keys	Function
F	Axes selection. The selected axis is shown by the cursor
F + **↑**	Press shortly to reset the display of the selected axis to zero
F + **→**	Press shortly for preset to the reference value of the selected axis
Incr / Abs	Switchover the selected axis between absolute and incremental mode
F + **Incr / Abs**	Press for 3 seconds to select the parameter level

Choosing parameter level:

Keys	Function
F	Press shortly to select the axis The selected axis is shown by the cursor
F + **Incr / Abs**	Press for 3 seconds to select the parameter level

Parameter level:

Keys	Function
Incr / Abs	Press shortly to save changes and jump to the next parameter
→	Press shortly to select the decade
↑	Press shortly to increase the decade
F + **Incr / Abs**	Press for 3 seconds to leave the parameter level

7   Parameter level

This section describes the available parameters and their settings. A parameter list for a quick overview of all available parameters can be found in the next chapter (☞ 8). Specific customer settings can be added there.

P01: Counting direction

Up / down switchover

0 = up

1 = down

P02: Display mode (measurement unit)

Select the desired measurement unit for the display:

0 = mm
1 = inch
2 = m
3 = °
4 = RPM
5 = no unit

P03: Decimal place

To define a decimal place.

0 = 1

1 = 0.1

2 = 0.01

3 = 0.001

P04: Number of axes

To select the number of axes to be displayed (1, 2 or 3)

P06: Edge evaluation

Settings of edge evaluation can be chosen (1, 2 or 4 edge triggering).

0 = x 1 / 1 = x 2 / 2 = x 4

P07: Encoder system selection

To select the measuring system

0 = Incremental encoder

1 = EMAX (absolute, RS422 interface)

2 = INAX2 X axis

3 = INAX2 Y axis

4 = INAX2 Z axis

P08: Multiplication factor

The multiplication factor (pulse scaling) can be defined here.

Range: 0.00001 … 9.99999

Calculation of the factor:

$$\text{Factor} = \frac{\text{Nominal value (defined value)}}{\text{Actual value (shown value)}}$$

Example:

$$\text{Factor:} \quad \frac{100.0}{100.5} = 0.9950$$

P09: Reference value

A reference value can be entered here.

Range: 0.00001 … 9.99999

P10: Tool offset

A tool offset can be defined here.

Range: 0.00001 … 9.99999

P11: Saw blade

The saw blade thickness can be entered here.

Range: 0.00001 … 9.99999

P12: Limit Relay 1 (Min) for Axis 1

Limit value preset of Relay 1 (Min)

Range: -99999.9 … 99999.9

P13: Limit Relay 2 (Max) for Axis 1

Limit value preset of Relay 2 (Max)

Range: -99999.9 … 99999.9

P16: Default Initialization[1]

Parameters are reset to default values. (0: not init., 1: default init.)

Enter „1" and confirm by pressing the „Incr/Abs" key.

After power off and on again the device has been reset to default values.

---

[1] After changes switch off the device then switch it on again.

P17: Function of external Inputs

The external inputs can be programmed as following:

0 = The external input has no function

1 = Input will set the selected axis to the reference value (see P09)

2 = Input will add the tools offset (see P10) to the selected axis

3 = Input will reset the selected axis to zero

P20: Operation mode

0 = standard

1 = rotation speed

2 = concentricity

P21: Rotation speed

Enter the number of pulses per revolution

P23: Concentricity

Input switchover. Actual value will be switched to 0.

P24: Display mode

The characters of the display can be inverted by activating this parameter.

Setting 0 = normal mode / setting 1 = inverse mode (default setting)

P24: Display contrast

The contrast of the display can be set between 0 … 9 here.

Default setting = 3

P26: Status indication for inputs and outputs

If this parameter is activated, the current status of the inputs and outputs can be read in the lower line of the display (active inputs / outputs are signaled as "1").

Default setting = 1 (Status indication activated). Disabling is done by setting = 0.

P30 / P31: Analog output Min value / Max value

These values can be chosen for each axis.

0.00000 … 9.99999

Between P30 and P31 the analog output is linear.

The analog output can only be chosen for one axis at the same time.

For the other axes, the output must be deactivated by setting P30 and P31 to 0.00000.

8   Serial Interface

Type: Standard RS232

Data format:
▪ Baud rate = 9600
▪ 8 data bit, 1 stop bit, no parity

The position indicator responds only to requests of the PC.

	NOTE!
	The PC is connected to the 9 pin D-SUB connector S5 (☞ 10). However, the 9-pin D-SUB connector fulfils a dual function. Thus the incremental signal input for axis 3 is not available if the serial RS232 interface is used.

8.1   Commands

Read position (actual value):

(depends on selected axis)

	STX	R	D	X / Y / Z	ETX
Command					
Example	0x02	0x52	0x44	0x58 / 0x59/ 0x5A	0x03

Position

	STX	-	1	0	0	4	5	9	0	CRC	ETX
Answer	0x02	0x2d	0x31	0x30	0x30	0x34	0x35	0x39	0x30	Software calculation	0x03

▪ The data is sent in the ASCII-Code
▪ In case of an invalid command, a „Q" is sent
▪ A return of „!" means „Interface Error"
▪ In case of "Q" or "!", the command must be retransmitted
▪ The CRC is a summation of all data bytes (incl. sign)
▪ An eventual carry-over does not apply

9 Parameter List

Table 1: Parameter List

Par. No.	Function	Default setting	Description	Customer settings
P01	Counting direction	0	upwards	
P02	Measurement unit (display)	0	mm	
P03	Decimal place	1	1 decimal place	
P04	Number of axes	2	2 axes	
P05	Reserved	-		
P06	Edge evaluation	0	1 edge triggering	
P07	Encoder system selection	0	Incremental encoder	
P08	Multiplication factor	1.00000		
P09	Reference value	0.00000		
P10	Tool offset	0.00000		
P11	Saw blade thickness	0.00000		
P12	Limit value Relay 1 (Min)	0.0	-99999.9 ... 99999.9	
P13	Limit value Relay 2 (Max)	0.0	-99999.9 ... 99999.9	
P14	Reserved	-		
P15	Reserved	-		
P16	Default Init	0	not active	
P17	Function of external input	0	not active	
P18	Reserve	-		
P19	Reserve	-		
P20	Operating mode	0	standard	
P21	IMP/rotation	500	Pulses per revolution	
P22	Reserve	-		
P23	Concentricity switchover	0.00000	not active	
P24	Display mode	0	0 = normal / 1 = inverse	
P25	Display contrast	3	Range: 0 ... 9	
P26	Input / output status	1	0 = inactive / 1 = active	
P27	Reserve	-		
P28	Reserve	-		
P29	Reserve	-		
P30	Analog output (Min. Value)	0		
P31	Analog output (Max. Value)	0		
P99	Reserve	-		

10 Connections

Table 2: Terminal Assignment

Connector S1 (power supply and external inputs)

1	PE / shield
2	0 V / GND
3	+ 24 VDC
4	External input for axis 1
5	External input for axis 2
6	External input for axis 3

Connector S2 (inputs and outputs)

1	PE / shield
2	0 V / GND
3	+ 24 VDC out
4	Transistor output 1
5	Transistor output 2
6	RS422 / 485 (RxD)
7	RS422 / 485 (RxD')
8	Analog input
9	Analog output (voltage)
10	Analog output (current)
11	Relay output 1 (Min)
12	Relay output 1 (Min)
13	Relay output 2 (Max)
14	Relay output 2 (Max)

Z60 Rear / Connections
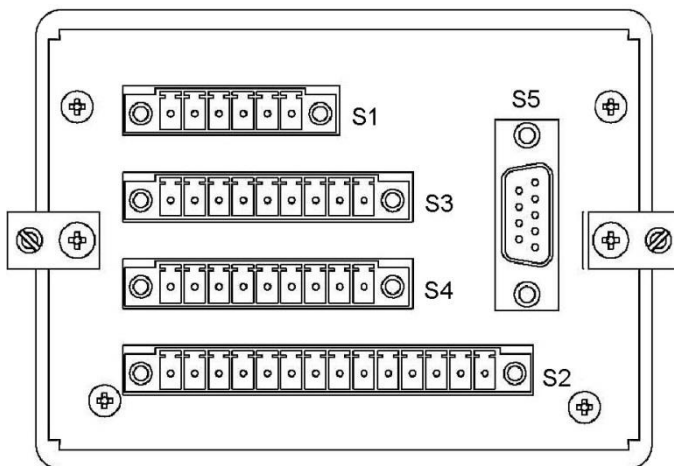
*) **Dual function of the D-SUB socket S5:**

If axis 3 is used as incremental signal input on the basis of the order specification (☞ 12), the RS232 interface is not available! In the reversal, the axis 3 is not available as incremental signal input when the RS232 interface is used.

Phoenix connector S3 - encoder input for **Axis 1**

1	0 V / GND
2	5 VDC or 24 VDC out
3	Channel A
4	Channel B
5	PE / shield
6	Channel A´ (only 5 V-TTL signals)
7	Channel B´ (only 5 V-TTL signals)
8	Channel Z´ (only 5 V-TTL signals)
9	Channel Z

Phoenix connector S4 - encoder input for **Axis 2**

1	0 V / GND
2	5 VDC or 24 VDC out
3	Channel A
4	Channel B
5	PE / shield
6	Channel A´ (only 5 V-TTL signals)
7	Channel B´ (only 5 V-TTL signals)
8	Channel Z´ (only 5 V-TTL signals)
9	Channel Z

D-SUB connector S5* as encoder input for **Axis 3**

1	0 V / GND
2	5 VDC or 24 VDC out
3	Channel A
4	Channel B
5	PE / shield
6	Channel A´ (only 5 V-TTL signals)
7	Channel B´ (only 5 V-TTL signals)
8	Channel Z
9	Channel Z´ (only 5 V-TTL signals)

D-SUB connector S5* as serial **RS232 interface**

1	-
2	TXD
3	RXD
4	-
5	GND
6	-
7	-
8	-
9	-

11 Disturbances, Maintenance, Cleaning

This chapter describes possible causes for disturbances and measures for their removal. In case of increased disturbances, please follow the measures for fault clearance in chapter 11.1. In case of disturbances that cannot be eliminated by following the advice and the fault clearance measures given here, please contact the manufacturer (see second page).

11.1 Fault Clearance

> **CAUTION!**
> The device, the connection line and the signal cable must not be installed next to sources of interference that emit strong inductive or capacitive interference or strong electrostatic fields.
>
> External perturbations can be avoided thorough suitable cable routing.

> The screen of the signal output cable should only be connected to the following circuit on one side. The screens should not be grounded on both sides. Signal cables always have to be routed separately from the load power line. A safety distance of at least 0.5 m has to be kept from inductive and capacitive sources of interference such as contactors, relays, motors, switching power supplies, clocked controllers etc.!
>
> If interferences occur in spite of all the items stated above being observed, please proceed as follows:
> 1. Installation of RC-circuits via contactor coils of AC-contactors (e.g. 0,1 μF / 100 Ω)
> 2. Installation of recovery diodes via DC-inductors
> 3. Installation of RC-circuits via the different motor phases (in the terminal box of the motor)
> 4. Do not connect protective earth and ground
> 5. Connect a mains filter ahead of the external power pack

11.2 Re-start after Fault Clearance

After the fault clearance:
1. Reset the emergency stop mechanism if necessary
2. Reset the error report at the super-ordinate system if necessary.
3. Ensure that there are no persons in the danger area.
4. Follow the instructions from chapter 5.

> **WARNING!**
> **Danger of injury through non-conventional fault clearance!**
>
> Non-conventional fault clearance can lead to severe injuries and damage of property.
>
> Therefore:
>
> - Any work to clear the faults may only be performed by sufficiently qualified staff
> - Arrange enough space before starting the works
> - Make sure that the mounting area is clean and tidy. Loose components and tools are sources of accidents.
>
> If components need to be replaced:
>
> - Pay attention to a correct installation of the spare parts.
> - Reinstall all the fixing elements properly
> - Before turning on the device, ensure that all covers and safety equipment is installed correctly and functions properly
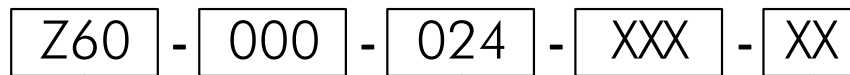
11.3 Maintenance

The device is maintenance-free.

11.4 Cleaning

> **WARNING!**
> The device can only be cleaned with a damp cloth, do not use aggressive cleanser!

12 Type designation

Z60 - 000 - 024 - XXX - XX

Device designation:
Z60 = Position indicator
        (for 1 … 3 axes)

Version:
00 = Standard unit
01 = 1. customised version
02 = 2. customised version (etc.)

Power supply voltage:
024 = 24 VDC

Signal inputs:
1   = A, B, Z / 24 VDC encoder supply / 24 V level (PNP) / 100 KHz*
2   = A, A', B, B', Z, Z' / 24 VDC encoder supply / 5 V-TTL level (PNP) / 100 KHz*
3   = A, A', B, B', Z, Z' / 5 VDC encoder supply / 5 V-TTL level (PNP) / 100 KHz*
5   = ELGO-422 interface modulation for linear EMAX absolute encoders**
6   = A, B, Z / 5 VDC encoder supply / 5 V-TTL level (PNP) / 100 KHz*

Important notes:
1. The selection of signal inputs are each <u>per axis</u>
e. g. „111" = all 3 axes A, B, Z / 24 VDC encoder supply / 24 V level (PNP) / 100 KHz
2. If axis 3 is used as incremental signal input (1, 2, 3 or 6) no RS232 interface is available!
Please note: only encoders with an identical encoder supply are combinable

*)   Higher input frequencies (500 kHz) on request
**) An EMAX absolute encoder can only be connected for 1 axis

Options:
C = Analog input 0 … 10 V (in preparation)
E = Analog input 0 … 20 mA (in preparation)
F = Analog output 0 … 10 V
H = Analog output 4 … 20 mA

NOTE
When ordering, please use the here described ordering code (Type Designation).
Indicate options that are not required with „-„.

12.1 Accessories

Table 3: Accessories

Order Designation	Description
NG24.0	External 24 VDC power pack (primary 115/230 VAC) for supply of the Z60

Notes:

Notes:

Notes:

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