

Operating Manual

SERIES *INAX2*

Inclinometer / position sensor for inclination angle measurement of 3 axes



- Measurement of multi-dimensional inclinations for axes X, Y and Z
- Diverse serial or analog output interfaces available
- Compact and robust construction
- System resolution 0.025°
- High shock resistance
- Easy to install

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2 General, Safety, Transport and Storage

2.1 Information 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.
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Tips and recommendations:

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

	<p>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 jewelry.</p>
	<p>PROTECTIVE GLOVES ...for protecting the hands against abrasion, wear and other injury of the skin.</p>
	<p>PROTECTIVE HELMET ...for protection against injuries of the head.</p>

2.7 Conventional Use

The product described in this manual was developed to execute safety-related functions as a part of an entire assembly or machine. The device type ELGO position sensor INAX2 only serves to measure angles of inclinations.



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.



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

The robust constructed INAX2 inclinometer is able to realize a high precision and reliable inclination angle measurement. Inclinations within a range of $\pm 180^\circ$ (Z axis) and $\pm 90^\circ$ (X / Y axes) can be measured.

With the optionally available protection class of IP67, the sensor is also suited for rough environments. Further impressive features of the INAX2 system are its easy installation and high shock resistance.

3.1 Functional principle

With inclinometer measurements, a seismic mass is placed between two capacitor plates. An electrostatic feedback defines the slope change of the sensor. This feedback is converted by an integrated circuit into serial or analog interface signals (see below).

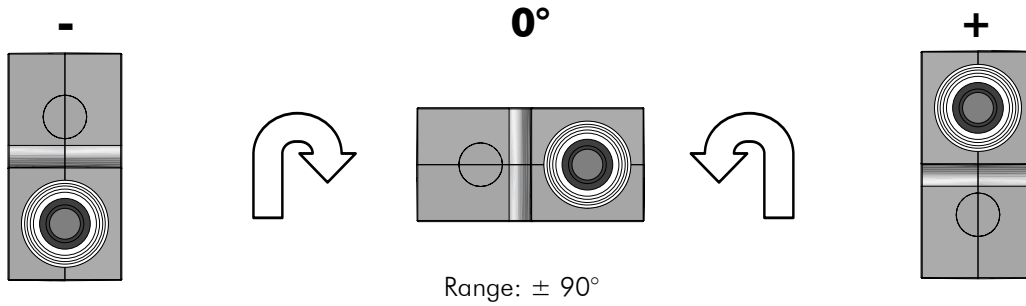
Diverse output interfaces are available:

- CANopen - extended DS406 (☞ 6.1)
- RS422 (☞ 7.2)
- Analog 0 ... 10 V (☞ 7.3)
- Analog 4 ... 20 mA (☞ 7.3)

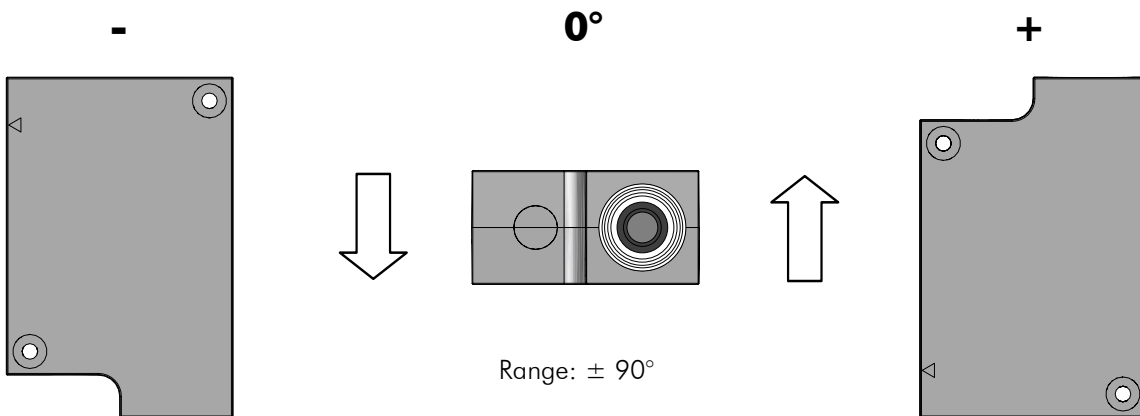
The respective order code can be found in the type designation (☞ 9).

3.2 Inclination angles and measuring ranges of axes X/Y/Z

Axis X



Axis Y



Axis Z

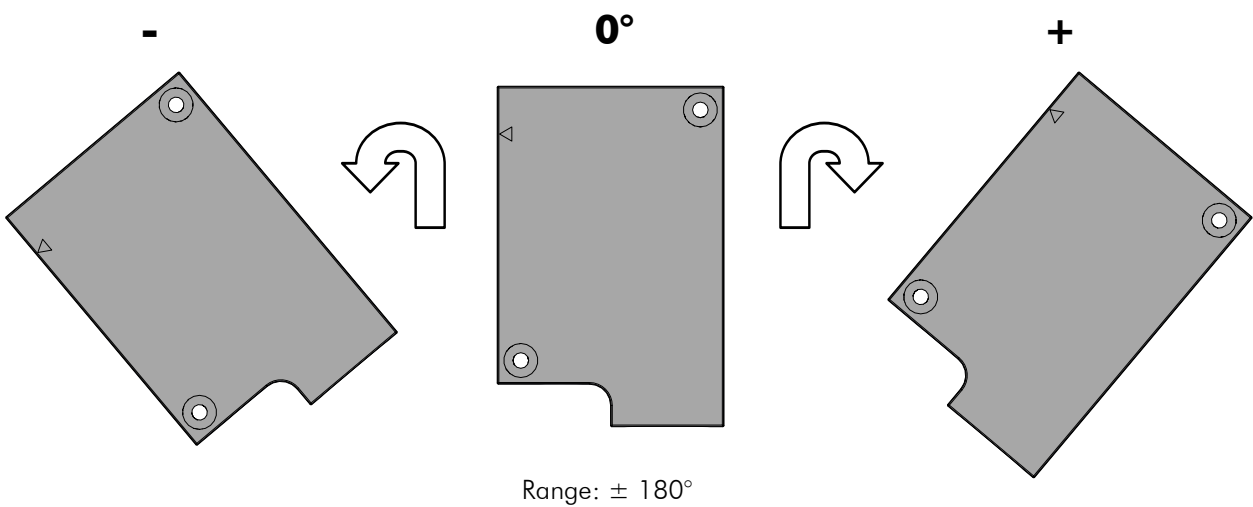


Figure 1: Inclination angles and measuring ranges

4 Technical Data

4.1 Identification

The type label serves for the identification of the unit. It is located on the housing of the sensor and gives the exact type designation (☞ 9) with the corresponding part number. Furthermore, the type label contains a unique, traceable device number. When corresponding with ELGO please always indicate this data.

4.2 Dimensions INAX2

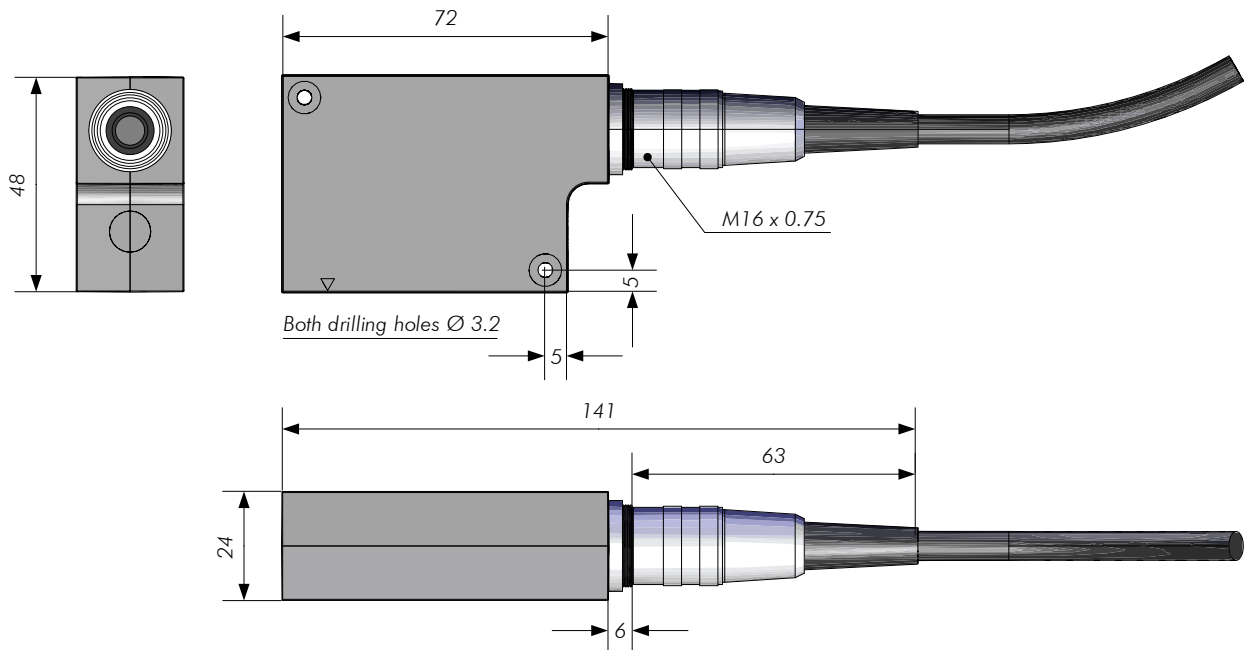


Figure 2: Dimensions of INAX2

4.3 Technical Data INAX2

Table 1: Technical Data INAX2

INAX2 (standard version)	
Mechanical Data	
Measurement principle	inclinometrical
Housing material	zinc die cast
Housing dimensions	L x W x H = 72 x 48 x 24 mm
Max. Measuring range	X axis: $\pm 90^\circ$ Y axis: $\pm 90^\circ$ Z axis: $\pm 180^\circ$
Connection type	open cable ends
Weight	INAX2: ca. 150 g without cable Cable: ca. 60 g per meter
Electrical Data	
Power supply voltage	+ 24 VDC (+/- 20 %)
Consumption	max. 50 mA
Available interfaces (☞ 9)	RS422 CANopen (device profile: extended DS406) Analog 0 ... 10 V Analog 4 ... 20 mA
Sensor cable	3 m standard cable length (others on request), drag chain suitable
System resolution	0.025 °
Conversion time	max. 500 ms
Ambient conditions	
Storage temperature	-25 ... +85° C
Operating temperature	-25 ... +85° C
Protection class	IP54 (standard) IP67 (option, ☞ 9)

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 qualified 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 Output interfaces

6.1 CAN open

Device profile DS406 24 bit data

Bit rate: 250 KB/s
Identifier: 184 hex
Number of Bytes: 2 bytes per axis
LSB first
Sequence of axes: x -> y -> z, a total of 6 bytes
Transmission every 5 ... 10 ms

Signal example:

- 90 ° = 0x31F1
0 ° = 0x0000
+ 89,975 ° = 0x0E0F

6.2 RS422

Data protocol:

9600 bit/s, 8 data bits, 1 stop bit, no parity

Structure of the protocol:

STX; // 0x02
Status byte // status byte
X position // hex data MSB
X position // hex data
X position // hex data LSB
Y position // hex data MSB
Y position // hex data
Y position // hex data LSB
Z position // hex data MSB
Z position // hex data
Z position // hex data LSB
ETX; // 0x03
CR; // 0x0D

Status byte:

b15 = 0 ≙ OK
b15 = 1 ≙ ERROR

6.3 Analog Output

The analog output works linear from 0 ... 10 V or 4 ... 20 mA and is only for one of the three axes available. When order, the corresponding axis must be defined in the order code resp. type designation (☞ 9).

7 Connections

7.1 CANopen

Signal cable	Function
White	0 V / GND
Brow	+ 24 VDC
Yellow/violet	CAN HIGH
Grey/green	CAN LOW
Screen	-

7.2 RS422

Signal cable	Function
White	0 V / GND
Brown	+ 24 VDC
Black	TxD
Orange	TxD/
Screen	-

7.3 Analog

Signal cable	Function
White	0 V / GND
Brown	+ 24 VDC
Violet	0 ... 10 VDC out
Green	4 ... 20 mA out
Screen	-

8 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 8.1. 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).

8.1 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 through 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 μ F / 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

8.2 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

8.3 Maintenance

The device is maintenance-free.

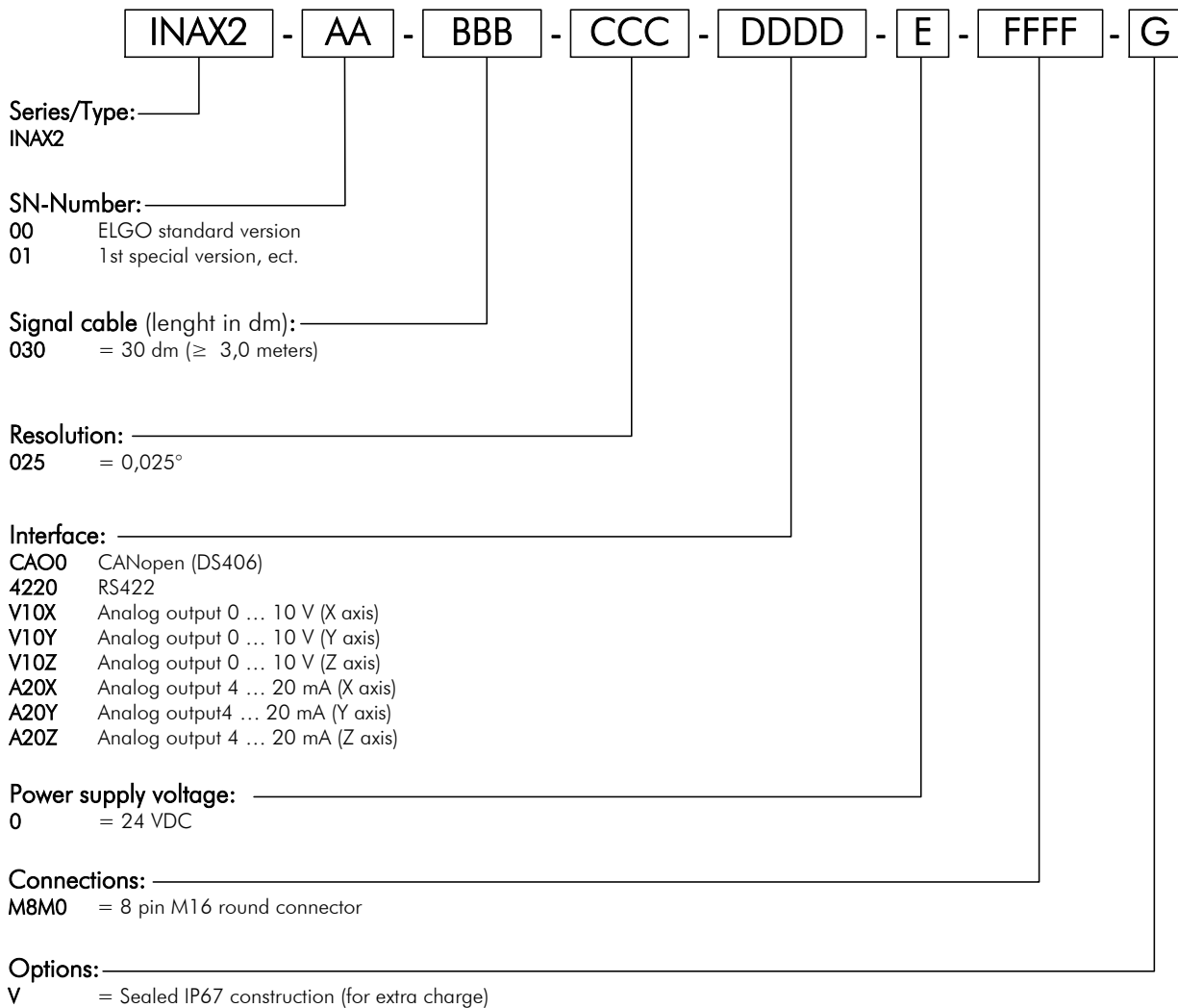
8.4 Cleaning



WARNING!

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

9 Type Designation



Ordering example:

INAX2-00-030-025-0-M8M0-V

INAX2 with 3 m cable, Analog output 0 ... 10 V for axis Z, 24 VDC power supply, 8 pin M16 round connector and as sealed IP67 construction



NOTE

When ordering, please use the here described ordering code (Type Designation).
Options that are not required are filled in with „-“.

Notes:

Notes:

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