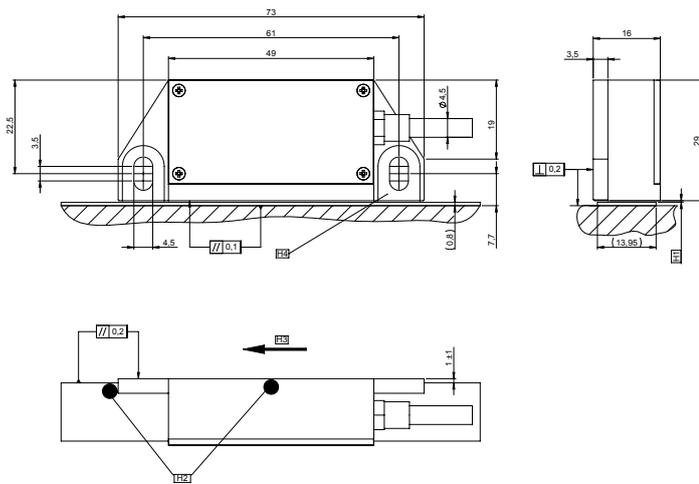


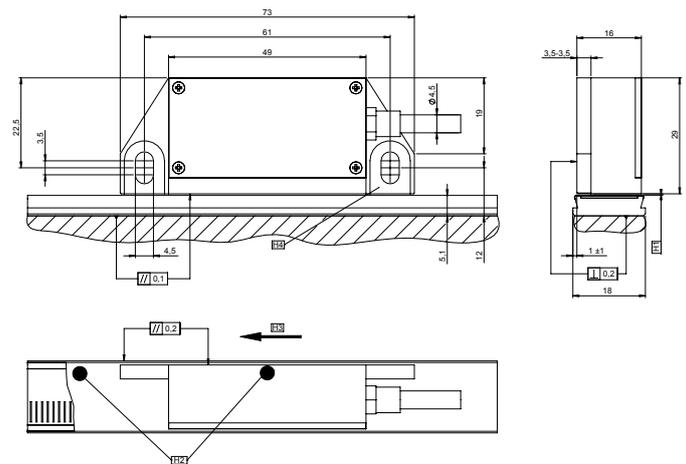
Scanning head - LMK 2030 series

- Incremental, modular linear encoders
- Grating period 3000µm
- Scanning head with integrated electronics
- In combination with scale type LMB 1030 and LMT 4030

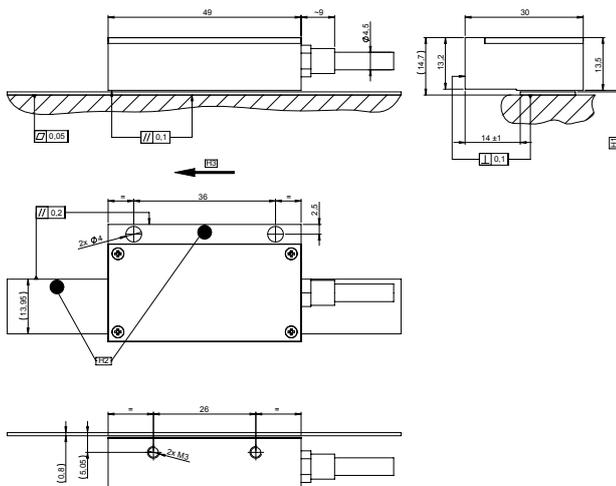
Design 20
with scale type LMB 1030



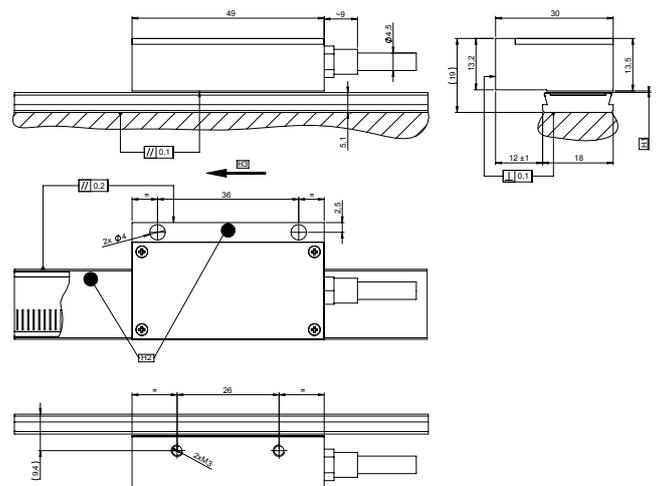
Design 20
with scale type LMT 4030



Design 21
with scale type LMB 1030



Design 21
with scale type LMT 4030



 Tolerance principle in accordance with SO8015
General tolerances in accordance with ISO 2768-fH
All dimensions in mm

H1 = Air gap $0,40 \pm 0,20$ mm, set with spacer foil
H2 = Reference track marking
H3 = Direction of scanning head movement for positive counting
H4 = Ground plane

Technical data

- LMK - Scanning head for modular linear encoders
- Grating period 3000 μ m

| Scanning head 3000 μ m | LMK 2030 | |
|---|--|--------------------------------------|
| Performance | Standard | |
| Interface | 1Vpp | TTL |
| Position error per grating period ¹⁾ | $\pm 4,0\mu$ m | |
| Maximum speed | 60m/s | |
| TTL - Interpolation/ 1Vpp signal period | | |
| Signal period ²⁾ Interpolation | - - | 750 μ m to 3 μ m 1 to 250 |
| Signal period Dividing factor | 3000 μ m or 120 μ m 1 or 25 | - |
| Max. output frequency | 400KHz | 5MHz |
| Electrical connection | Cable with M23 coupling 12pin male | |
| Cable length on the encoder | 0,50m - 6,00m | |
| Power supply | 1Vpp: DC 4,0V to 7,0V TTL: DC 5,0V +/- 0,5V | |
| Power consumption | Design 20, 21: ≤ 1300 mW at 5V | |
| Typ. current consumption | Design 20,21: ≤ 220 mA at 5V (without load) | |
| Vibration 55 to 2000 Hz | < 200 m/s ² (EN 60068-2-6) | |
| Shock 6 ms | < 2000 m/s ² (EN 60068-2-27) | |
| Operating temperature | -10°C to 100°C | |
| Storage temperature | -20°C to 100°C | |
| Protection | IP67 | |
| Mass | 38g Design: 20, 21 | |

¹⁾ The position error per grating period and the accuracy of the grating results together in the encoder specific error; additional deviations caused by mounting and bearing are not considered in this error.

²⁾ After 4-edge-evaluation.

Ordering code

- LMK - Scanning head for modular linear encoders
- Grating period 3000µm

LMK 2030 S . - - , - -

Interface

07 = TTL
08 = 1Vpp

Reference mark

RV = Rectangle pulse linked (90° el.) for TTL
RI = Rectangle pulse linked (360° el.) for 1Vpp

Functional safety

.. = No
FA = Analog signal (1Vpp) can be used for safety related equipment¹⁾

Incremental signals/Multiplication

| | | 1Vpp | | TTL | |
|----|----------|------|---|-----|---|
| | | S | S | S | S |
| 01 | 1-fold | | x | | |
| 05 | 5-fold | | | | x |
| 10 | 10-fold | | | | x |
| 25 | 25-fold | x | x | | |
| 50 | 50-fold | | | | x |
| A3 | 250-fold | | | | x |

Pin configuration

UJ = 01, 02S12, 03S12
J5 = 16S15

Electrical connection

01 = Free cable end
02S12 = M23-12 pin connector male
03S12 = M23-12 pin coupling male
16S15 = D-SUB-15 pin 2-row male

Cable length

0,50 = 0,50 m
1,00 = 1,00 m
1,50 = 1,50 m
2,00 = 2,00 m
2,50 = 2,50 m
3,00 = 3,00 m
4,00 = 4,00 m
5,00 = 5,00 m
6,00 = 6,00 m

Design of the scanning head

20 = Standard
21 = Standard, flat

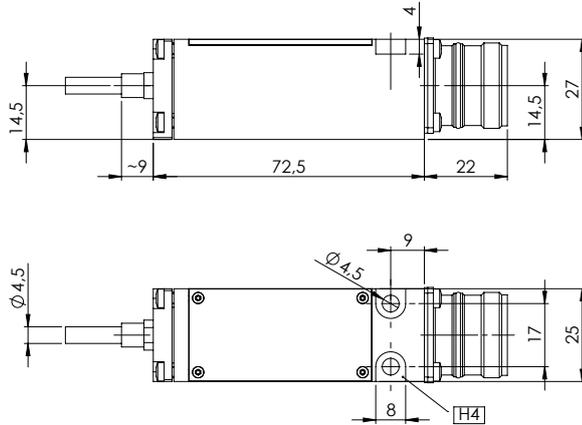
¹⁾ Option „FA“ only used for dividing factor „01“.

External electronics

- General information
- Dimensions

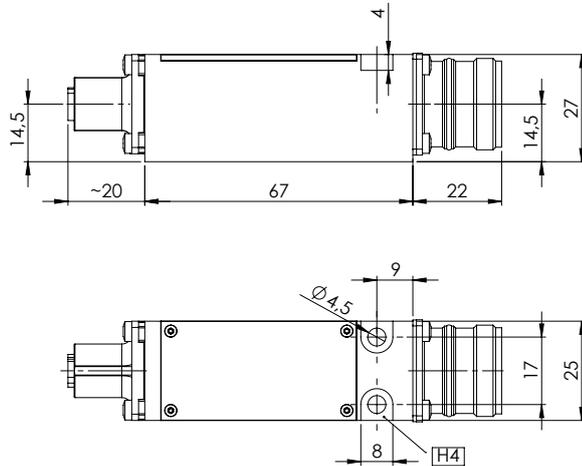
Design 10

- Miniaturized scanning head
- with external electronics on the cable
- Output: Flange socket M23



Design 12

- Miniaturized scanning head
- with external electronics, pluggable on cable via M12 connector
- Output: Flange socket M23



Tolerance principle in accordance with SO8015
 General tolerances in accordance with ISO 2768-fH
 All dimensions in mm

H4= Ground plane

Encoder Cable

Technical Data

| | Cable for incremental encoders and SSI+1Vpp | Cable for encoders with pure serial interfaces |
|-------------------------|--|--|
| Jacket | PUR, high flexible, suitable for energy chains | |
| Diameter | 4,5 +/-0,1mm | |
| Wires | 6x2x0,09mm ² | 1x(4*0,09mm ²) + 4x0,14mm ² |
| Bending radius | ≥ 10mm for single bending | |
| | ≥ 50mm for continuous bending | |
| Max. length | 6m | |
| Resistance according to | UL according to Style 20963 80°C 30V | |

Interfaces

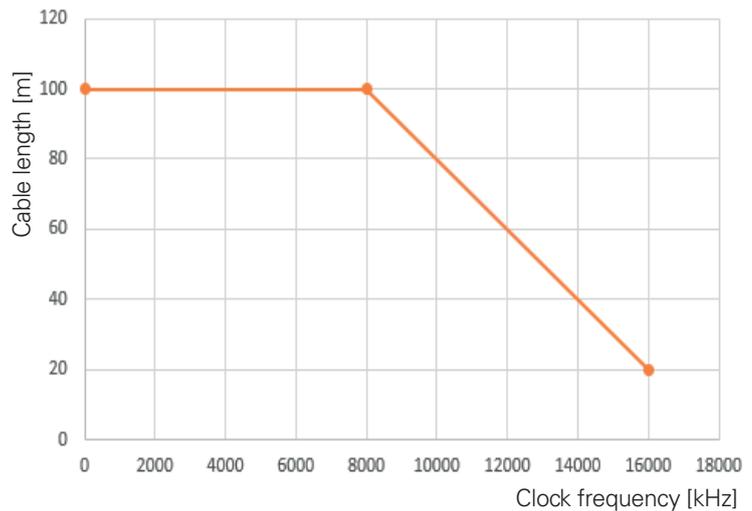
Position values

The EnDat-Interface is a digital, **bi-directional** Interface for measuring systems. With this interface you can read out **position values** and in the measuring system saved informations. This value can also be updated or new values can be saved. Due to the **serial data transfer four signal wires** are enough. The data DATA gets transferred **synchronously** to the form the subsequent electronics given clock frequency CLOCK. The selection from the mode of transmission (position values, parameter, diagnostics,...) is done with mode-commands which are sent from the subsequent electronics to the measuring system.

The clock frequency is variable - depending on the cable length (max. 100m). With propagation electronics, either clock frequencies up to 16MHz are possible or cable length up to 100m. For EnDat encoders the maximum clock frequency is stored in the encoder memory. Propagation-delay compensation is provided for EnDat22.

Transmission frequencies up to 16MHz in combination with large cable length place high technological demands in the cable. Greater cable lengths can be realized with an adapter cable no longer than 6m and an extension cable. As a rule, the entire transmission path must be designed for the respective clock frequency.

| Order code | Instruction set | Incremental signals |
|------------|-----------------|---------------------|
| EnDat2.2 | EnDat 2.2 | Without |



Pin configuration

| Electrical connection: 1SS08 8-pin coupling M12 | | | | | | | | |
|---|----------------------|-----------------------------|-------------|--------------------------|--------------|--------------|---------------|---------------|
| Power supply | | | | Absolute position values | | | | |
|  | 8 | 2 | 5 | 1 | 3 | 4 | 7 | 6 |
| | U_P | Sensor U_P | 0V | Sensor 0V | DATA+ | DATA- | CLOCK+ | CLOCK- |
|  | brown/green | blue | white/green | white | grey | pink | violet | yellow |

Cable Shield is connected with the housing; **U_P** = Power supply voltage
Sensor: The sensor wire is connected internally with the corresponding power supply.
 Non-used pins or wires must not be assigned!

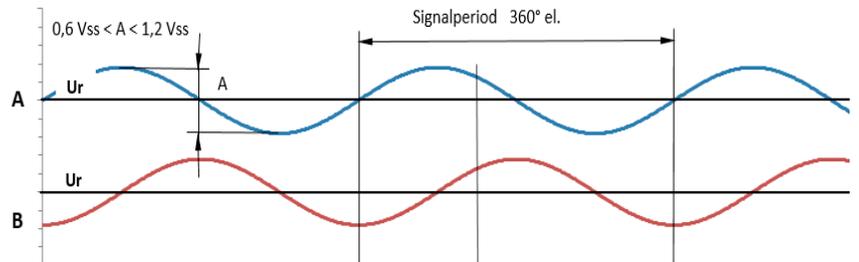
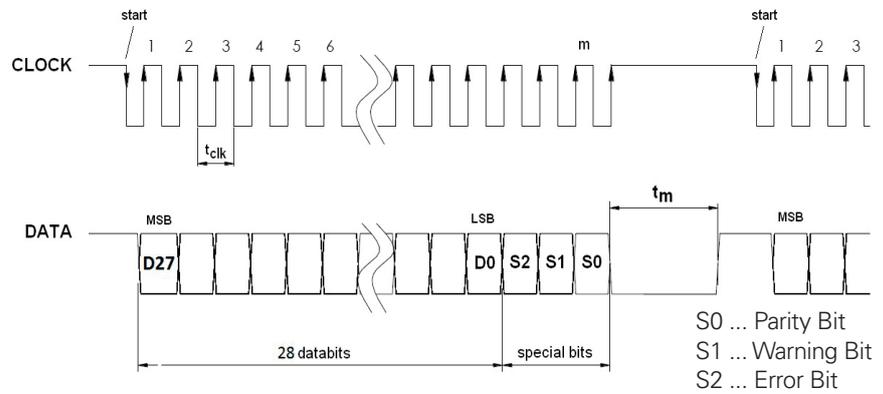
Interfaces

SSI + $\sim 1V_{pp}$

SSI Interface is an unidirectional Interface which can output position values. The Data DATA gets transferred synchronously to the from the subsequent electronic given Clock frequency CLOCK. Additionally three special bits (Error, Warning and Parity) will be transferred

AMO-Encoders with $\sim 1V_{pp}$ -Interface are outputting signals which can be highly interpolated.

The sine shaped **incremental signals** A and B are electrically 90° phase shifted and have a signal - B after A - is valid for the in the connection drawing stated movement direction.



Pin configuration

Electrical connection: 03S17
17-pin coupling M23

| | Power supply | | | | Increment signals | | | | Absolut position value | | | |
|--|----------------|-----------------------|-------------|-----------|-------------------|-------|------|------|------------------------|-------|--------|--------|
| | 7 | 1 | 10 | 4 | 15 | 16 | 12 | 13 | 14 | 17 | 8 | 9 |
| | U _P | Sensor U _P | 0V | Sensor 0V | A+ | A- | B+ | B- | DATA+ | DATA- | CLOCK+ | CLOCK- |
| | brown/green | blue | white/green | white | brown | green | grey | pink | red | black | violet | yellow |

Cable Shield is connected with the housing; **U_P** = Power supply voltage

Sensor: The sensor wire is connected internally with the corresponding power supply.

Non-used pins or wires must not be assigned!

Interfaces

Pin layouts Fanuc, Mitsubishi BiSS/C[®]

Fanuc

AMO-Encoders with Fanuc Interface are for connection to a Fanuc-Control.

Fanuc Serial Interface - α interface

Order code: Fanuc02
normal and high speed,
two-pair transmission.

BiSS/C

AMO-Encoders with BiSS/C[®] Interface are suitable for the connection with controls, which have the BiSS/C Interface implemented.

BiSS/C bidirektionales Protokoll

Order code: BiSS
The Standard Encoder Profile - 32bit will be used.

Mitsubishi

AMO-Encoders with Mitsubishi Interface are suitable for connection to a Mitsubishi-Control.

Mitsubishi high speed interface

Order code: MitA1-4 (full duplex) -> two pair transmission
Order code: MitA1-2 (half duplex) -> one pair transmission

Pin configuration

| Electrical connection: 1SS08 8-pin coupling M12 | | | | | | | | |
|---|----------------------|---------------------------------|-------------|--------------------------|--------------|--------------|---------------|---------------|
| Power supply | | | | Absolute position values | | | | |
| | 8 | 2 | 5 | 1 | 3 | 4 | 7 | 6 |
|  | U_P | Sensor U _P | 0V | Sensor 0V | DATA+ | DATA- | CLOCK+ | CLOCK- |
|  | brown/green | blue | white/green | white | grey | pink | violet | yellow |

Cable Shield is connected with the housing; **U_P** = Power supply voltage

Sensor: The sensor wire is connected internally with the corresponding power supply.

Non-used pins or wires must not be assigned!

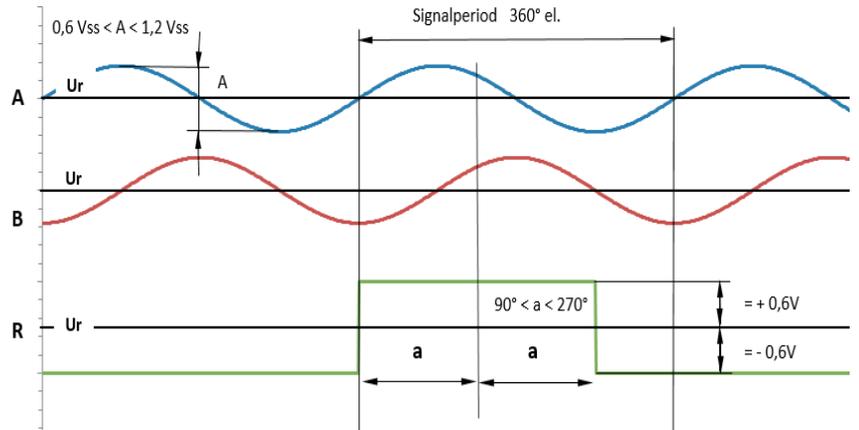
Interface

Incremental signals $\sim 1V_{pp}$

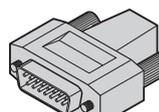
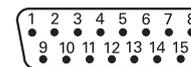
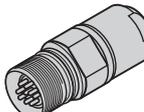
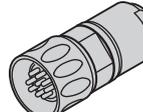
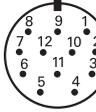
AMO-Encoders with $\sim 1V_{pp}$ -Interface are outputting signals which can be highly interpolated.

The sine shaped incremental signals A and B are electrically 90° phase shifted and have a signal strength from $1V_{pp}$. The showed sequence of the outputted signals - B after A - is valid for the in the connection drawing stated movement direction.

The reference mark signal R has a clear assignment to the incremental signals.



Pin configuration

| | | | | | | | | | | | | | |
|--|-----------------|--------------|-----------------|-----------|--|-------|------|------|-----|-------|---------------|--------|--------|
| Electrical connection: 16S15 15-pin Sub-D-connector    | | | | | | | | | | | | | |
| Electrical connection: 03S12 12-pin coupling M23    | | | | | Electrical connection: 02S12 12-pin connector M23    | | | | | | | | |
| | Power supply | | | | Incremental signals | | | | | | Other signals | | |
|  | 4 | 12 | 2 | 10 | 1 | 9 | 3 | 11 | 14 | 7 | 5/15 | 8 | 6 |
|  | 12 | 2 | 10 | 11 | 5 | 6 | 8 | 1 | 3 | 4 | / | 7 | 9 |
| | U_P | Sensor U_P | 0V | Sensor 0V | A+ | A- | B+ | B- | R+ | R- | Frei | Diag+ | Diag- |
|  | brown/ green | blue | white/ green | white | brown | green | grey | pink | red | black | / | violet | yellow |

Cable Shield is connected with the housing; U_P = Power supply voltage

Sensor: The sensor wire is connected internally with the corresponding power supply.

Non-used pins or wires must not be assigned!

DIAG-wires must not be assigned.

DIAG-signals are for checking the encoder with AMO-STU-60.

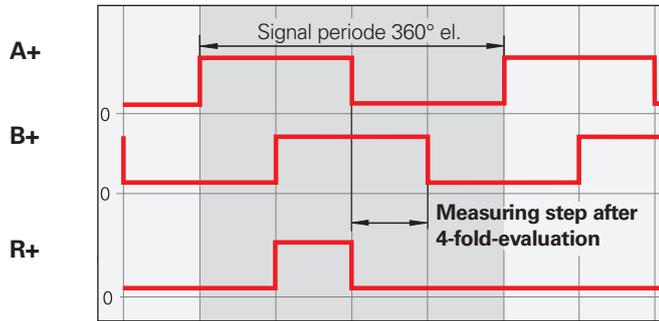
Interfaces

Incremental signals TTL

AMO-Encoders with  TTL Interface contain electronic, which form the sine-form signals - with or without- Interpolation into digital signals.

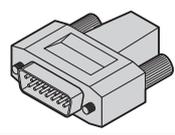
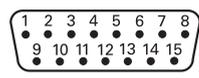
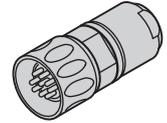
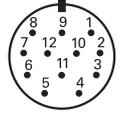
The **incremental signals** are outputted as rectangle pulses A+ and B + with 90° el. phase shifting. The **rectangle-mark-signal** is composed from one or more reference impulses R+, which are assigned with the incremental signals. The integrated electronic additionally creates the **inverse signals** A-, B- and R- for a safe transmission. The showed sequence of the outputted signals - B after A - is valid for the in the connection drawing stated movement direction.

The **measuring step** results through the distance between two flanks from the incremental signals A+ and B+ through 1-fold, 2-fold or 4-fold evaluation.



The inverse signals A-, B- und R- are not shown.

Pin configuration

| | | | | | | | | | | | | | | |
|--|-----------------|-----------|-----------------|-----------|--|-------|------|------|-----|-------|---------------|--------|--------|--|
| Electrical connection: 16S15 15-pin Sub-D-connector    | | | | | | | | | | | | | | |
| Electrical connection: 03S12 12-pin coupling M23    | | | | | Electrical connection: 02S12 12-pin connector M23    | | | | | | | | | |
| | Power supply | | | | Incremental signals | | | | | | Other signals | | | |
|  | 4 | 12 | 2 | 10 | 1 | 9 | 3 | 11 | 14 | 7 | 5/15 | 8 | 6 | |
|  | 12 | 2 | 10 | 11 | 5 | 6 | 8 | 1 | 3 | 4 | / | 7 | 9 | |
| | Up | Sensor Up | 0V | Sensor 0V | A+ | A- | B+ | B- | R+ | R- | Frei | Diag+ | Diag- | |
|  | brown/ green | blue | white/ green | white | brown | green | grey | pink | red | black | / | violet | yellow | |

Cable Shield is connected with the housing; **Up** = Power supply voltage

Sensor: The sensor wire is connected internally with the corresponding power supply.

Non-used pins or wires must not be assigned!

DIAG-wires must not be assigned!

DIAG-signals are for checking the encoder with AMO-STU-60