General Features

Absolute linear encoder for CNC machine tools.

- Absolute optical scale with glass measuring support, SSI - BiSS C (unidirectional) interface
- Resolutions up to 0.001 µm
  Accuracy grade up to ± 2 µm
- Central fixed expansion point (**FEP**).
  On request positioned on the right (**RT**) or on the left (**LT**), for a linear expansion consistent with the type of application
- Direct reading of absolute measure
- Rugged and heavy profile of considerable section
- Adjustable cable output, through double connector
- Pressurization from both sides of the scale or from the transducer
- Option: 1 Vpp analog sig

Technical Characteristics

Measuring support Grating pitch Linear thermal expansion coefficient	Glass scale 20 µm 8 x 10^{-6} °C^{-1} 
Incremental signal	sine wave 1 Vpp (optional)
Resolution 1 Vpp	up to 0.01 µm *
Serial interface	SSI - BiSS C (unidirectional)
Resolution absolute measure	1 – 0,1 – 0,05 – 0,01 – 0,0025 – 0,001 µm
Accuracy grade	± 5 µm ** standard version ± 3 µm ** high-accuracy version (± 2 µm for measuring length up to 640 mm)
Interpolation error (SDE)	± 70 nm ***
Hysteresis	90 nm ***
Measuring length ML in mm	140, 240, 340, 440, 540, 640, 740, 840, 940, 1.040, 1.140, 1.240, 1.340, 1.440, 1.540, 1.640, 1.740, 1.840, 2.040, 2.240, 2.440, 2.640, 2.840, 3.040, 3.240 max.
Fixed expansion point (FEP)	central or positionable on the right (RT) or on the left (LT)
Max. traversing speed	180 m/min
Max. acceleration	50 m/s^2 in measuring direction
Required moving force	≤ 2.5 N
Vibration resistance (EN60068-2-6)	100 m/s^2 [55 ÷ 2000 Hz]
Shock resistance (EN60068-2-27)	150 m/s^2 [11 ms]
Protection class (EN 60529)	IP 54 standard, IP 64 pressurized
Operating temperature	0 °C ÷ 50 °C
Storage temperature	-20 °C ÷ 70 °C
Relative humidity	20 % ÷ 80 % (not condensed)
Reading block sliding	by ball bearings
Power supply	5 VDC ±10 %
Current consumption	255 mA max. (with R = 120 Ω)
Max. cable length	50 m (serial + analog output) 70 m (serial output) ****
Electrical connections	see related table
Connector	on the transducer, with adjustable output
Electrical protections	inversion of polarity and short circuits
Weight	0.55 kg + 2.8 kg/m

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* Depending on CNC division factor.
** The declared accuracy grade of ± X µm is referred to a measuring length of 1 m.
*** The error declared is subject to the respect of the alignment tolerances.
**** Ensuring a minimum power supply voltage of 5 V to the transducer.

Electrical Characteristics

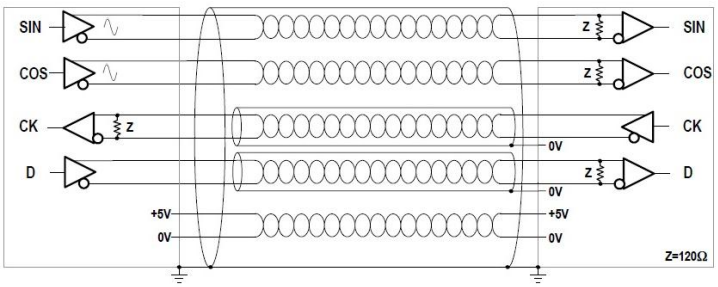
Analog Output + Serial Output

GVS 808 T absolute optical scale is supplied with a 10-wire shielded cable, ∅ = 6,2 mm, PUR external sheath, with low friction coefficient, oil-resistant and suitable for continuous movements.
Inside the cable, a further shield for the twisted two-wire line of the analog signal (1 Vpp).
Conductors section:
- power supply: 0.30 mm²
- signals: 0.10 mm²

Notice
The cable's bending radius should not be lower than 80 mm.

Analog Output + Serial Output 10-wire cable

The following output signals are available:



Signal	Conductor Color
V+	red
0 V	blue
A	green
$\overline{A}$	orange
B	white
$\overline{B}$	light-blue
CK	brown
$\overline{CK}$	yellow
D	pink
$\overline{D}$	grey
SCH	shield

Serial Output

GVS 808 T absolute optical scale is supplied with a 6-wire shielded cable, ∅ = 6,2 mm, PUR external sheath, with low friction coefficient, oil-resistant and suitable for continuous movements.
Conductors section:
- power supply: 0.35 mm²
- signals: 0.25 mm²

Notice
The cable's bending radius should not be lower than 70 mm.

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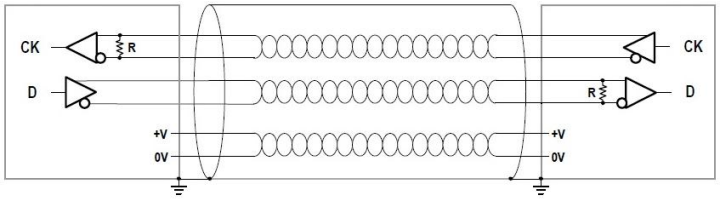
Serial Output 6-wire cable

The following output signals are available:



Signal	Conductor Color
V+	brown
V-	white
CK	green
$\overline{CK}$	yellow
D	pink
$\overline{D}$	grey
SCH	shield

Complying to DIN 47100.

Avoid locating the cable next to any device that may cause electromagnetic interferences (motors, solenoid valves, inverters).
If interferences are detected, act directly on the source of disturb using EMC filters.
If cable extensions are needed, it is necessary to use shielded cables with a section of at least 0.5 mm^2 for power supply and 0.25 mm^2 for signals.

The cable capacity should be: C ≤90 – 100 pF/m.

SSI

Cable length	≤10 m	≤20 m	≤50 m	
Clock frequency	1.2 MHz	0.4 MHz	0.2 MHz	

BiSS

Cable length	≤6 m	≤10 m	≤20 m	≤50 m
Clock frequency	5 MHz	4 MHz	1 MHz	0.5 MHz

The scale is supplied with a standard 4-m long cable, suitable for continuous movements, but longer lengths can be required. Ensuring a minimum power supply of 5 V to the transducer, the maximum cable length can be extended to 70 m.

Notice
In case of cable extension, it is necessary to guarantee:
- the electrical connection between the body of the connectors and the cables shield
- a minimum power supply voltage of 5 V to the transducer

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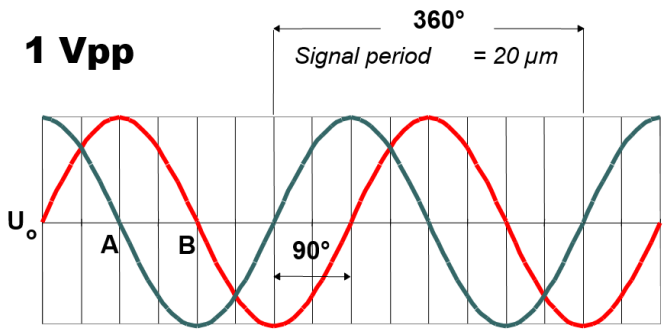
Output Signals

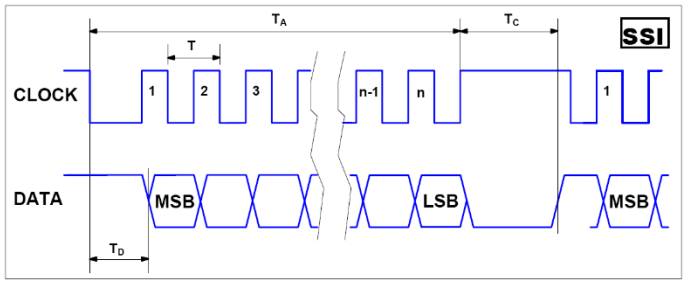
1 Vpp Incremental signals version:



Signals	A, $\overline{A}$, B, $\overline{B}$
Signals amplitude	0.8 Vpp ÷ 1.2 Vpp typical 1 Vpp
Reference voltage U_0	≈ 2.5 V
A and B phase displacement	90° ± 10° electrical

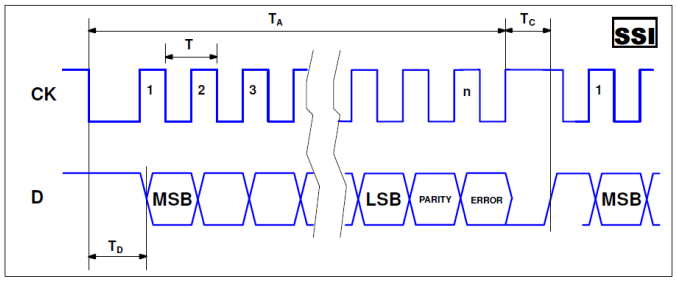
Signals amplitude is referred to differential measurement on 120 Ω impedance with power supply voltage to the transducer of 5 V ± 10%.

Serial signals SSI version:



Interface	**SSI (Synchronous Serial Interface) Binary - Gray**
Signals level	EIA RS422
Clock frequency	0.1 + 1.2 MHz* Working cycle50 % ±10 %
n	26 bit (resolution 1-0.1 µm) 30 bit (resolution 0.05-0.01 µm) 30 / 32 bit (resolution 0,0025 - 0,001 µm)**
T_A	Clock sequence
T_C	max. 15 µs by 100 KHz
T_D	max. 7 µs

* The maximum frequency is guaranteed with a cable length up to 10 m.
** For measuring lengths higher than 2640 mm (resolution 0.0025 µm) or 1040 mm (resolution 0.001 µm), optional bits are not available and the number of position bits will be set at 32 bits.



Interface	**SSI (Synchronous Serial Interface) Binary**
n	Position bit + Parity + Error

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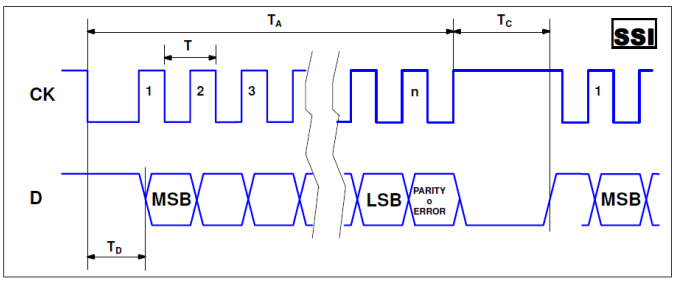

Interface	SSI (Synchronous Serial Interface) Binary
n	Position bit + Parity
	Position bit + Error

Parameters for SSI Protocol

Position bit

The value is transmitted with sign at 26 bit (for resolution 1 - 0.1 µm), 30 bit (for resolution 0.05-0.01 µm) Or 30 /32 bit (for resolution 0.0025 - 0.001 µm)

Optional bit

Parity: an additional bit for odd parity or even parity is transmitted
Error: it signals an error in reading the absolute position

- Error bit = 1 absolute position ok
- Error bit = 0 absolute position wrong

Code

The code used for the transmission of the position is in binary or Gray format.
In case the Gray format is used, it is not possible to have the optional bit in the transmitted frame.

Refresh time

At the end of $\mathbf{T_c}$ period, the sensor provides a new position.
If a new position is not required, the sensor refreshes its position every 500 µs new.

SSI timeout

In case of error/interruption of the serial line, the sensor goes back in the "ready" status after a period of 400 µs.

Position error condition

In case of wrong absolute position, the status of the error bit, if enabled, is at 0 and a position value equal to 0 is transmitted. If the error bit is not activated, the sensor forces a position value equal to 0.

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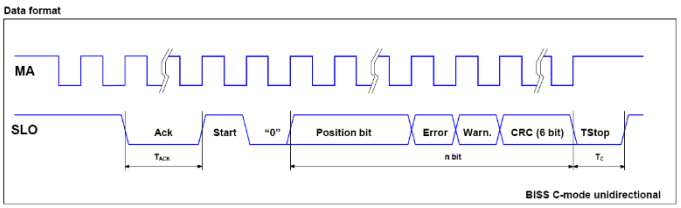
BiSS-C (unidirectional) version:



Interface	BiSS-C unidirectional
Signals level	EIA RS485 / RS422
Clock frequency	0.5 + 5 MHz* Working cycle 50 % ±10 %
n	26 + 2 + 6 bit (resolution 1 - 0.1 µm) 32 + 2 + 6 bit (resolution 0.05-0.010.0025 – 0.001 µm µm)
T_C	Max. 20 µs
T_{ACK}	2 Clock

* The maximum frequency is guaranteed with a cable length up to 6 m.

Parameters for BiSS-C (unidirectional) Protocol

Position bit
The value is transmitted with sign at 26 bit (for resolution 1 - 0.1 µm) or at 32 bit (for a resolution of 0.05 - 0.01 -0.0025 – 0.001 µm) transfer.

Error: it signals an error in the absolute position reading.
- Error bit = 1 absolute position ok
- Error bit = 0 absolute position wrong

Warning
It signals a reading difficulty
- Warning bit = 1 reading ok
- Warning bit = 0 difficulty in reading

Refresh time
At the end of **Tc** period, the sensor provides a new position. If no new position is required, the sensor refreshes its position every 2 ms.

BiSS timeout
In case of error/interruption of the serial line, the scale goes back in the "ready" status after a period of 100 µs.

CRC6 polynomial
CRC at 6 bit inverted, with polynomial 0 x 43, MSB as first bit of the frame.

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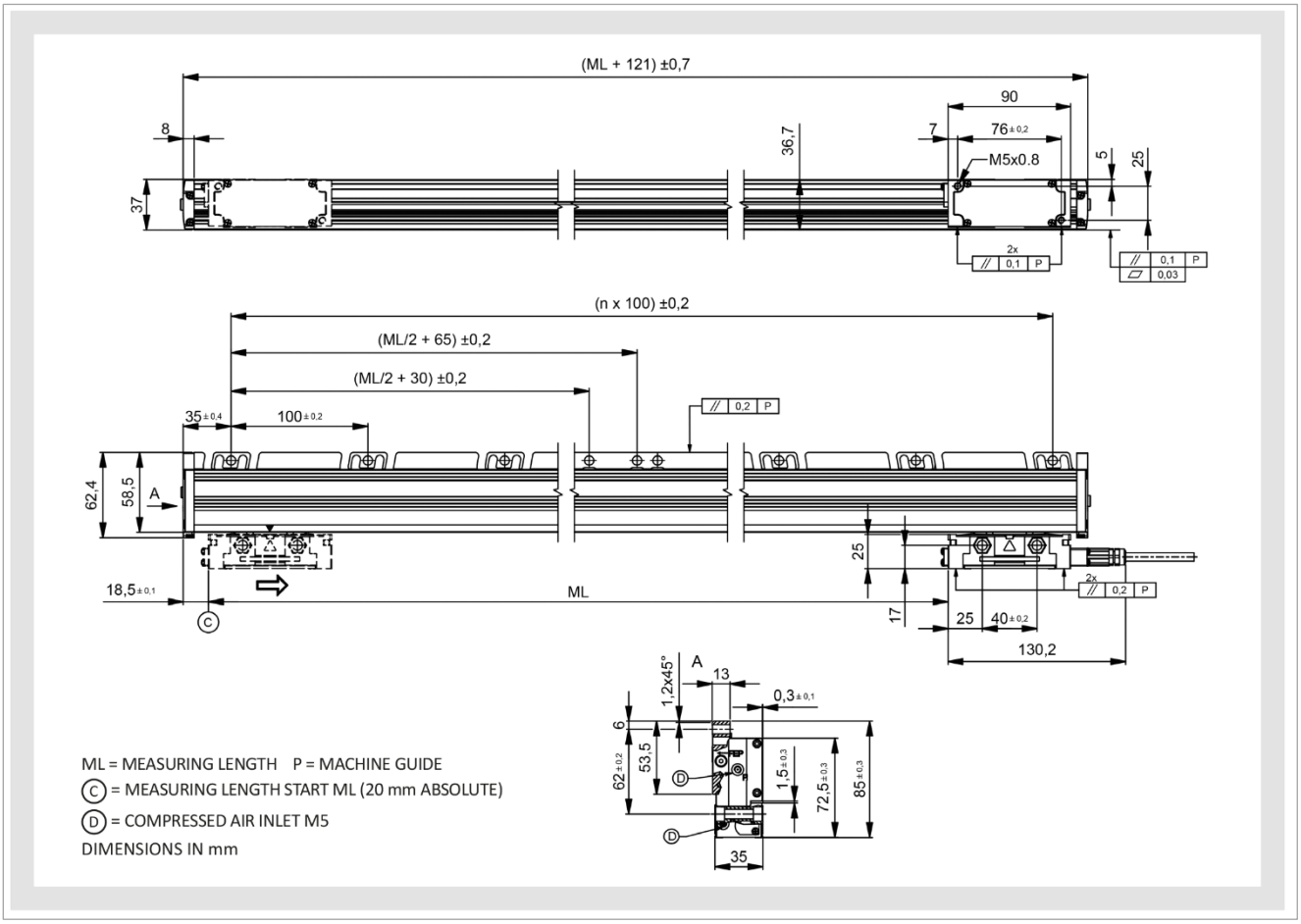
Mechanical Characteristics

- Rugged and heavy **PROFILE** of considerable section, made of anodized aluminum.
  Dimensions 36.7 x 58.5 mm.
- **SPRING SYSTEM** for misalignment compensation and self-correction of mechanical hysteresis.
- Double pair of linear **SEALING LIPS** for a very high protection of the grating.
- Pressurizable **READER HEAD**, consisting of tie rod and reading block,
  with fullyprotected place for electronic boards.
- **READING BLOCK** sliding through ball bearings.
- Die-cast **TIE ROD**, with nickel surface treatment.
- Absolute glass **GRATING**, placed in the scale housing.
- Elastomeric **GASKETS** which allow to reproduce the full protection in mechanical joints
  (in case of disassembling).
- **FULL POSSIBILITY** to disassemble and reassemble it.

Dimensions



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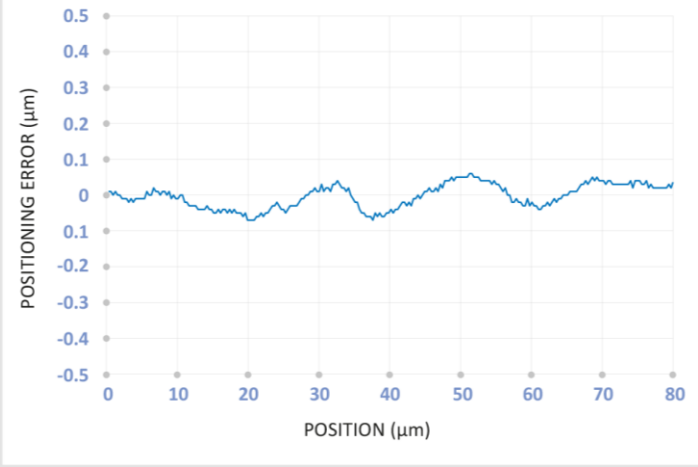
Accuracy

Accuracy graph: deviation between the value measured by the encoder and the value measured by the reference system.

Interpolation - SDE



SDE (sub-division error) graph: accuracy of the interpolation device within the single grating pitch.

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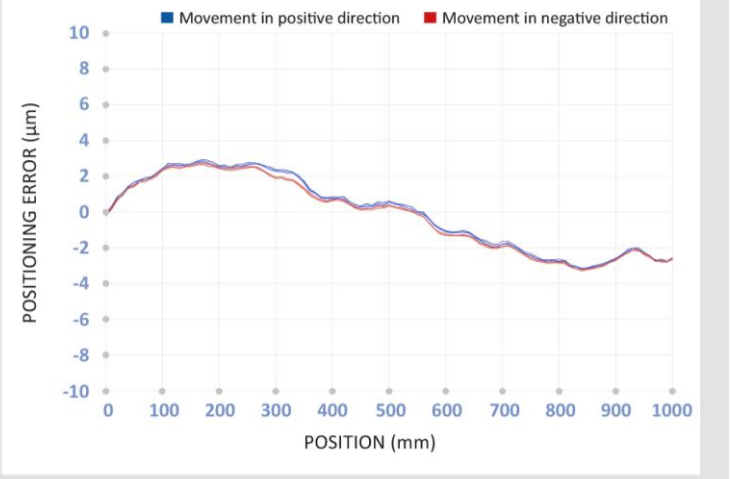
Repeatability



Repeatability graph obtained by carrying out the measurements several times in both directions of advancement.

- Unidirectional repeatability: measurement error detected without inverting the movement direction of the encoder.
- Hysteresis: difference in the measure due to the inversion of the encoder movement direction.

The graphs show tests carried out in a metrological room under controlled climatic conditions:
T= 20 °C ± 0.1 °C and R.H.= 45 ÷ 55%. The reference system for the comparison of position measurements is interferometric with 1 nm resolution and equipped with an environmental compensation device.

INNOVATIVE SYSTEM FEP
FixedExpansionPoint

GVS 808 is supplied with a Fixed Expansion Point (FEP) positioned in the middle (standard). On request it is possible to supply scales with FEP positionable on the left (LT) or on the right (RT). Based on the application, the customer can determine the linear thermal expansion direction, so as to maximize the machining accuracy and repeatability even in the presence of significant temperature changes.

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Ordering Code

Model	GVS 808	-	T1A	-	3240	-	05V	-	S0	-	V	-	M4.0/S	-	SC	-		-

Scale type, resolution
T1 = 1 µm
T01 = 0.1 µm
T005 = 0.05 µm
T001 = 0.01 µm
T00025 = 0,0025 µm
T0001 = 0,001 µm
A = absolute

Measuring length [mm]
3.240 = max. Measuring length*

Power supply
05V = 5 V

Output signals
S0 = SSI programmable
S1 = SSI binary
S2 = SSI binary + even parity
S3 = SSI binary + odd parity
S4 = SSI binary + error
S5 = SSI binary + even parity + error
S6 = SSI binary + odd parity + error
S7 = SSI Gray
B1 = BiSS binary

Incremental signal
V = + 1 Vpp
No cod. = no increm. signal

Cable length, cable type
Mnn = length in m
M4.0 = 4.0 m (standard)
S = PUR cable
M50 = 50 m

Connector, wiring
Cnn = progressive
SC = without connector

FEP (fixed expansion point)
No cod. = central FEP (standard)
SLT = selectable FEP

Special, pressurization
No cod. = standard
SPnn = special nn
PR = pressurized

Without prior notice, the products may be subject to modifications that the Manufacturer reserves to introduce as deemed necessary for their improvement.

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