Interfaces
SSI Absolute Position Values

The **absolute position value,** beginning with the most significant bit, is transferred over the data lines (DATA) in synchronism with a CLOCK signal from the control. The SSI standard data word length for singleturn absolute encoders is 13 bits, and for multiturn absolute encoders 25 bits. In addition to the absolute position values, sinusoidal **incremental signals** with 1-V_{PP} levels are transmitted. For signal description see *Incremental signals 1 V_{PP}*.

For the ECN/EQN 4xx and ROC/ROQ 4xx rotary encoders, the following **functions** can be activated via the programming inputs of the interfaces by applying the supply voltage U_P:

- **Direction of rotation**
  Continuous application of a HIGH level to pin 2 reverses the direction of rotation for ascending position values.

- **Zero reset** (setting to zero)
  Applying a positive edge (t_{min} > 1 ms) to pin 5 sets the current position to zero.

Note: The programming inputs must always be terminated with a resistor (see input circuitry of the subsequent electronics).

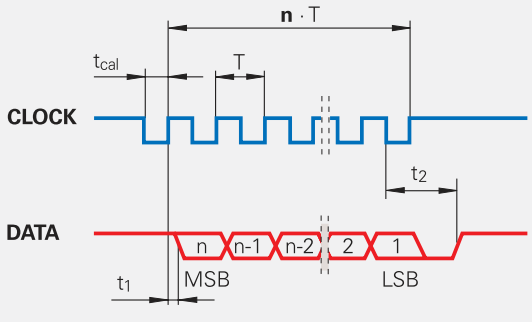
Interface	**SSI** serial
Data transfer	Absolute position values
Data input	Differential line receiver according to EIA standard RS-485 for the CLOCK and $\overline{\text{CLOCK}}$ signals
Data output	Differential line driver according to EIA standard RS 485 for the DATA and $\overline{\text{DATA}}$
Code	Gray code
Ascending position values	With clockwise rotation (viewed from flange side) (can be switched via interface)
Incremental signals	~ 1 V_{PP} (see *Incremental Signals 1 V_{PP}*)
Programming inputs Inactive Active Switching time	Direction of rotation and zero reset (for ECN/EQN 4xx, ROC/ROQ 4xx) LOW < 0.25 x U_P HIGH > 0.6 x U_P t_{min} > 1 ms
Connecting cable Cable length Propagation time	HEIDENHAIN cable with shielding PUR [(4 x 0.14 mm²) + 4(2 x 0.14 mm²) + (4 x 0.5 mm²)] Max. 150 m at distributed capacitance 90 pF/m 6 ns/m

Control cycle for complete data word
When not transmitting, the clock and data lines are on high level. The current position value is stored on the first falling edge of the clock. The stored data is then clocked out on the first rising edge.

After transmission of a complete data word, the data line remains low for a period of time (t_2) until the encoder is ready for interrogation of a new value. If another data-output request (CLOCK) is received within this time, the same data will be output once again.

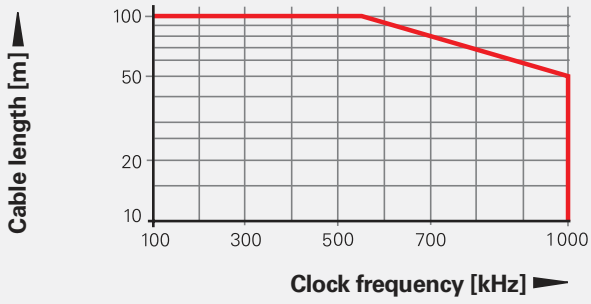
If the data output is interrupted (CLOCK = high for $t \geq t_2$), a new position value will be stored on the next falling edge of the clock, and on the subsequent rising edge clocked out to the subsequent electronics.

Data transfer
T = 1 to 10 µs
t_{cal} see *Specifications*
$t_1 \leq$ 0.4 µs (without cable)
t_2 = 17 to 20 µs for ECN/EQN 4xx ROC/ROQ 4xx
12 to 30 µs for ECN/EQN 10xx ROC/ROQ 10xx
n = Data word length
13 bits with ECN/ROC
25 bits with EQN/ROQ



$\overline{\text{CLOCK}}$ and $\overline{\text{DATA}}$ not shown

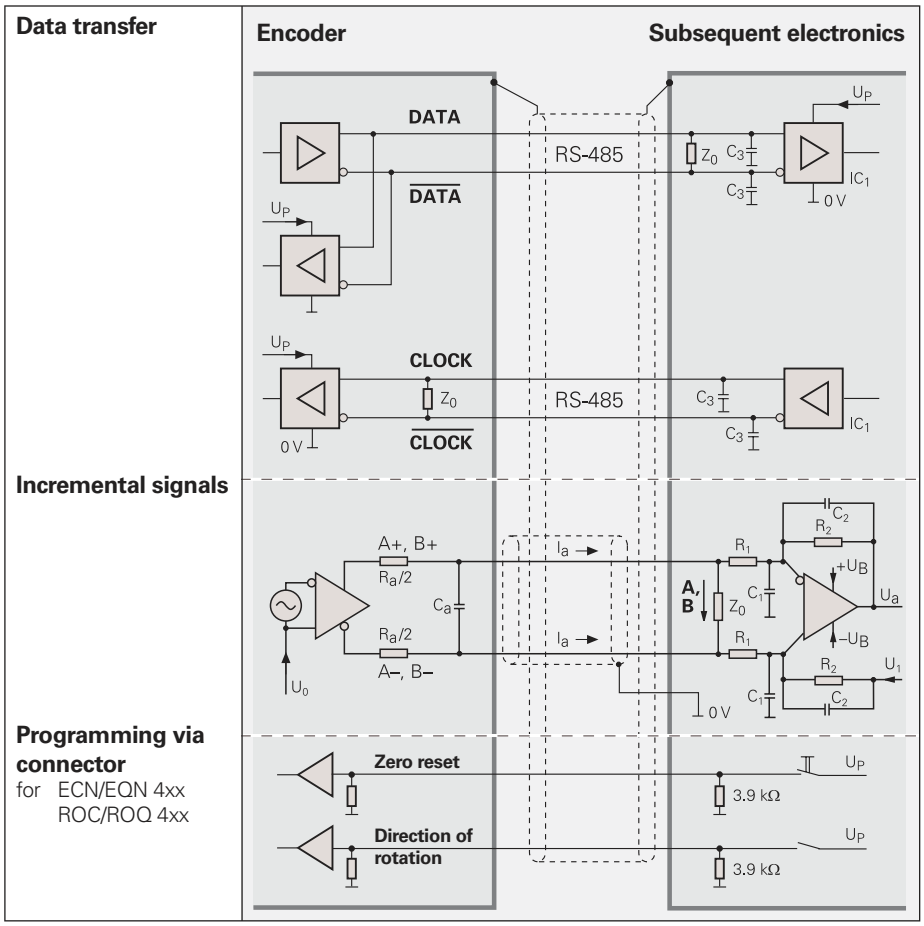
Permissible clock frequency with respect to cable lengths



Input circuitry of the subsequent electronics

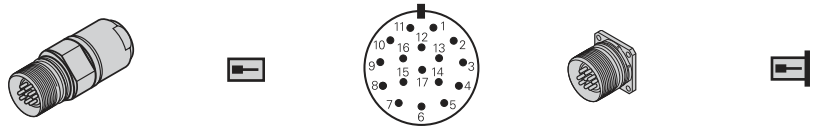
Dimensioning
IC_1 = Differential line receiver and driver
E.g. SN 65 LBC 176
LT 485

Z_0 = 120 Ω
C_3 = 330 pF (serves to improve noise immunity)



Pin layout

17-pin M23 coupling



	Power supply					Incremental signals				Absolute position values				Other signals	
	7	**1**	**10**	**4**	**11**	**15**	**16**	**12**	**13**	**14**	**17**	**8**	**9**	**2**	**5**
	UP	**Sensor** UP	**0 V**	**Sensor** 0 V	**Inside shield**	**A+**	**A–**	**B+**	**B–**	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**	**Direction of rotation**[1]	**Zero reset**[1]
	Brown/ Green	Blue	White/ Green	White	/	Green/ Black	Yellow/ Black	Blue/ Black	Red/ Black	Gray	Pink	Violet	Yellow	Black	Green

Shield on housing; **UP** = power supply voltage
Sensor: With a 5 V supply voltage, the sensor line is connected internally with the corresponding power line.
[1] Vacant on ECN/EQN 10xx and ROC/ROQ 10xx