Interfaces
Incremental Signals ∿ 1 V_{PP}

HEIDENHAIN encoders with ∿ 1 V_{PP} interface provide voltage signals that can be highly interpolated.

The sinusoidal **incremental signals** A and B are phase-shifted by 90° elec. and have an amplitude of typically 1 V_{PP}.
The illustrated sequence of output signals—with B lagging A—applies for the direction of motion shown in the dimension drawing.

The **reference mark signal** R has a usable component *G* of approx. 0.5 V. Next to the reference mark, the output signal can be reduced by up to 1.7 V to an idle level *H*. This must not cause the subsequent electronics to overdrive. In the lowered signal level, signal peaks can also appear with the amplitude *G*.

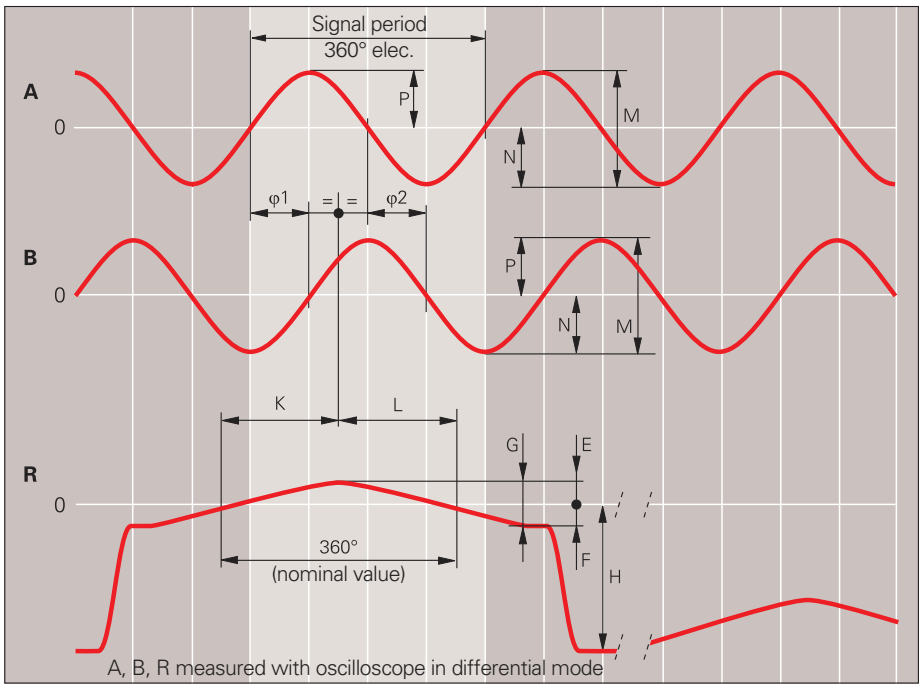
The data on **signal amplitude** apply when the power supply given in the specifications is connected to the encoder. They refer to a differential measurement at the 120 ohm terminating resistor between the associated outputs. The signal amplitude decreases with increasing frequency. The **cutoff frequency** indicates the scanning frequency at which a certain percentage of the original signal amplitude is maintained:
- –3 dB cutoff frequency:
  70 % of the signal amplitude
- –6 dB cutoff frequency:
  50 % of the signal amplitude

Interpolation/resolution/measuring step
The output signals of the 1 V_{PP} interface are usually interpolated in the subsequent electronics in order to attain sufficiently high resolutions. For **velocity control,** interpolation factors are commonly over 1000 in order to receive usable velocity information even at low speeds.

Measuring steps for **position measurement** are recommended in the specifications. For special applications, other resolutions are also possible.

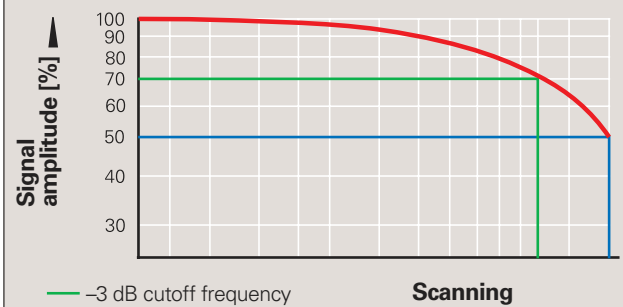
Interface	Sinusoidal voltage signals ∿ **1 V_{PP}**
Incremental signals	**Two nearly sinusoidal signals A and B**
	Signal amplitude M: 0.6 to 1.2 V_{PP}; 1 V_{PP} typical
	Asymmetry |P – N|/2M: ≤ 0.065
	Amplitude ratio M_A/M_B: 0.8 to 1.25
	Phase angle |φ1 + φ2|/2: 90° ± 10° elec.
Reference mark signal	**One or more signal peaks R**
	Usable component G: 0.2 to 0.85 V
	Quiescent value H: 0.04 V to 1.7 V
	Switching threshold E, F: ≥ 40 mV
	Zero crossovers K, L: 180° ± 90° elec.
Connecting cable	HEIDENHAIN cable with shielding PUR [4(2 · 0.14 mm²) + (4 · 0.5 mm²)]
Cable length	Max. 150 m distributed capacitance 90 pF/m
Propagation time	6 ns/m

Any limited tolerances in the encoders are listed in the specifications.



A, B, R measured with oscilloscope in differential mode

Cutoff frequency
Typical signal amplitude curve with respect to the scanning frequency



Input Circuitry of the Subsequent Electronics

Dimensioning
Operational amplifier MC 34074
Z_0 = 120 Ω
R_1 = 10 kΩ and C_1 = 100 pF
R_2 = 34.8 kΩ and C_2 = 10 pF
U_B = ±15 V
U_1 Approx. U_0

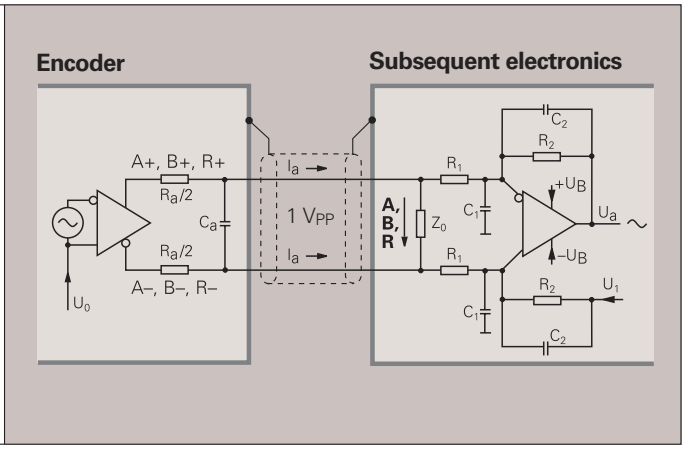
–3dB cutoff frequency of circuitry
Approx. 450 kHz
Approx. 50 kHz with C_1 = 1000 pF
and C_2 = 82 pF
This circuit variant does reduce the bandwidth of the circuit, but in doing so it improves its noise immunity.

Circuit output signals
U_a = 3.48 V_{PP} typical
Gain 3.48

Signal monitoring
A threshold sensitivity of 250 mV_{PP} is to be provided for monitoring the 1 V_{PP} incremental signals.

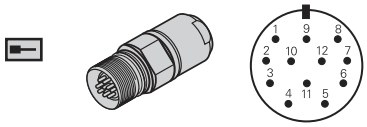
Incremental signals
Reference mark signal

R_a < 100 Ω,
typically 24 Ω
C_a < 50 pF
ΣI_a < 1 mA
U_0 = 2.5 V ± 0.5 V
(with respect to 0 V of the supply voltage)

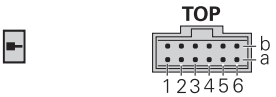


Pin Layout

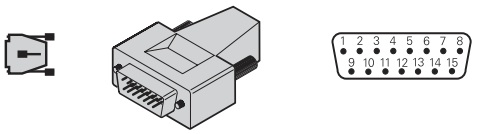
12-pin HEIDENHAIN coupling



12-pin PCB connector



15-pin D-sub connector for IK 115



	Power supply				Incremental signals						Other signals		
	12	**2**	**10**	**11**	**5**	**6**	**8**	**1**	**3**	**4**	**9**	**7**	**/**
	4	**12**	**2**	**10**	**1**	**9**	**3**	**11**	**14**	**7**	**5/8/13/15**	**13**	**/**
	2a	**2b**	**1a**	**1b**	**6b**	**6a**	**5b**	**5a**	**4b**	**4a**	**/**	**3a**	**/**
	U_P	**Sensor** U_P	**0 V**	**Sensor** 0 V	**A+**	**A–**	**B+**	**B–**	**R+**	**R–**	**Vacant**	**Vacant**	**Vacant**
	Brown/ Green	Blue	White/ Green	White	Brown	Green	Gray	Pink	Red	Black	/	Violet	Yellow

Shield is on housing; **U_P** = power supply
Sensor: The sensor line is connected internally to the respective power supply.