HEIDENHAIN encoders with TTL interface incorporate electronics that digitize sinusoidal scanning signals with or without interpolation.

The **incremental signals** are transmitted as the square-wave pulse trains $U_{a1}$ and $U_{a2}$, phase-shifted by $90^\circ$ elec. The **reference mark signal** consists of one or more reference pulses $U_{a0}$, which are gated with the incremental signals. In addition, the integrated electronics produce their inverse signals $U_{a1}^\prime$, $U_{a2}^\prime$ and $U_{a0}^\prime$ for noise-proof transmission. The illustrated sequence of output signals—with $U_{a2}$ lagging $U_{a1}$—applies for the direction of motion shown in the dimension drawing.

The **fault-detection signal** $U_{as}$ indicates fault conditions such as breakage of the power line or failure of the light source. It can be used for such purposes as machine shut-off during automated production.

The distance between two successive edges of the incremental signals $U_{a1}$ and $U_{a2}$ through 1-fold, 2-fold or 4-fold evaluation is one measuring step.

The subsequent electronics must be designed to detect each edge of the square-wave pulse. The minimum edge separation $a$ listed in the Specifications applies for the illustrated input circuitry with a cable length of 1 m, and refers to a measurement at the output of the differential line receiver. Propagation-time differences in cables additionally reduce the edge separation by 0.2 ns per meter of cable length. To prevent counting error, design the subsequent electronics to process as little as 90% of the resulting edge separation.

The max. permissible **shaft speed** or **traversing velocity** must never be exceeded.

The permissible **cable length** for transmission of the TTL square-wave signals to the subsequent electronics depends on the edge separation $a$. It is max. 100 m, or 50 m for the fault detection signal. This requires, however, that the power supply (see Specifications) be ensured at the encoder. The sensor lines can be used to measure the voltage at the encoder and, if required, correct it with an automatic system (remote sense power supply).
**Input circuitry of the subsequent electronics**

**Dimensioning**

- **IC1**: Recommended differential line receiver
  - DS 26 C 32 AT
  - Only for \( a > 0.1 \mu s \):
  - AM 26 LS 32
  - MC 3486
  - SN 75 ALS 193

- \( R_1 = 4.7 \, k\Omega \)
- \( R_2 = 1.8 \, k\Omega \)
- \( Z_0 = 120 \, \Omega \)
- \( C_1 = 220 \, pF \) (serves to improve noise immunity)

**Pin layout**

- **12-pin flange socket or coupling M23**
- **15-pin D-sub connector at encoder**
- **12-pin connector M23**
- **12-pin PCB connector**

<table>
<thead>
<tr>
<th>Power supply</th>
<th>Incremental signals</th>
<th>Other signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
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<td>10</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
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<td>6b</td>
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<tr>
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<td>U_a</td>
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<tr>
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<td>U_a</td>
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<tr>
<td>Violet</td>
<td>Yellow</td>
<td></td>
</tr>
</tbody>
</table>

**Shield** on housing; \( U_p = \) Power supply voltage

- **Sensor**: The sensor line is connected internally with the corresponding power line
  - \(^1\) LS 323/ERO 14xx: Vacant
  - \(^2\) Exposed linear encoders: TTL/11 \( \mu A_{PP} \) conversion for PWT

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**1-888-354-2525**

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