CONTENTS

- OVERVIEW ......................................................... page 4
- ELECTRICAL SPECIFICATIONS .............................. page 6
- MECHANICAL SPECIFICATIONS ............................... page 7
- INCREMENTAL ENCODERS
  - GENERAL INFORMATION .................................. page 8
  - SERIE 10 ......................................................... page 10
  - SERIE 58 ......................................................... page 12
  - SERIE 20 ......................................................... page 14
  - SERIE 21 ......................................................... page 16
  - SERIE 30 ......................................................... page 18
  - SERIE 59 ......................................................... page 20
  - SERIE 19 ......................................................... page 22
  - SERIE 77 ......................................................... page 24
  - SERIE 80 ......................................................... page 26
- ABSOLUT ENCODERS
  - GENERAL INFORMATION .................................. page 28
  - SERIE CS10 / CSP10 ........................................ page 32
  - SERIE CS30 / CSP30 ........................................ page 34
  - SERIE CM10 / CMP10 ........................................ page 36
  - SERIE CM30 / CMP30 ........................................ page 38
- ENCO-FLEX COUPLINGS ........................................ page 40
  - THE ENCO-FLEX RANGE .................................... page 41
  - ALU-FLEX ....................................................... page 42
  - POLY-FLEX ..................................................... page 43
  - SPRING-FLEX ................................................ page 44
  - OLDHAM-FLEX ............................................... page 45
- FLANGES ......................................................... page 46
- SUPPORT ANGLES ............................................. page 48
- LINEAR MEASURING SYSTEMS ............................... page 49
- ENCO-METER .................................................. page 50
- CONNECTORS AND CONNECTION DIAGRAMS .............. page 53
- SERIES DXE .................................................. page 54
- GENERAL CONDITIONS OF SALE ........................... page 55
## INCREMENTAL ENCODERS

<table>
<thead>
<tr>
<th>SERIE</th>
<th>SERIE 10</th>
<th>SERIE 58</th>
<th>SERIE 20</th>
<th>SERIE 21</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of pulses</td>
<td>1…10,000</td>
<td>1…10,000</td>
<td>1…2,048</td>
<td>1…500</td>
</tr>
<tr>
<td>Shaft diameter (mm)</td>
<td>6…12 mm</td>
<td>6 mm</td>
<td>6 mm</td>
<td>Ø40 mm</td>
</tr>
<tr>
<td>Body (mm)</td>
<td>Ø58 mm</td>
<td>Ø58 mm</td>
<td>Ø58 mm</td>
<td>Ø58 mm</td>
</tr>
<tr>
<td>Max. no of revs (rpm)</td>
<td>6,000 rpm</td>
<td>6,000 rpm</td>
<td>6,000 rpm</td>
<td>5,000 rpm</td>
</tr>
<tr>
<td>Maximum axial shaft load (N)</td>
<td>40 N</td>
<td>40 N</td>
<td>20 N</td>
<td>5 N</td>
</tr>
<tr>
<td>Maximum radial shaft load (N)</td>
<td>60 N</td>
<td>60 N</td>
<td>30 N</td>
<td>5 N</td>
</tr>
<tr>
<td>Torque (Ncm)</td>
<td>2 Ncm</td>
<td>2 Ncm</td>
<td>0.5 Ncm</td>
<td>0.4 Ncm</td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>-20…+80 °C</td>
<td>-20…+80 °C</td>
<td>-20…+60 °C</td>
<td>-20…+60 °C</td>
</tr>
<tr>
<td>Protection</td>
<td>IP65/67</td>
<td>IP65</td>
<td>IP55</td>
<td>IP41</td>
</tr>
<tr>
<td>Connection</td>
<td>axial/radial</td>
<td>axial/radial</td>
<td>axial cable</td>
<td>axial cable</td>
</tr>
<tr>
<td>Output</td>
<td>RS422/Push-Pull/OC</td>
<td>RS422/Push-Pull/OC</td>
<td>Push-Pull/TTL</td>
<td>RS422/Push-Pull/OC</td>
</tr>
<tr>
<td>Power supply (VDC)</td>
<td>5/11…30 V</td>
<td>5/11…30 V</td>
<td>5/11…30 V</td>
<td>5/11…30 V</td>
</tr>
</tbody>
</table>

## ABSOLUT ENCODERS

<table>
<thead>
<tr>
<th>SERIE</th>
<th>CS10/CSP10</th>
<th>CS30/CSP30</th>
<th>CM10/CMP10</th>
<th>CM30/CMP30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>Max. singleturn</td>
<td>Max. singleturn</td>
<td>Max. multturns</td>
<td>Max. multturns</td>
</tr>
<tr>
<td>Configuration</td>
<td>Switch / Cable / PC</td>
<td>Switch / Cable / PC</td>
<td>Switch / Cable / PC</td>
<td>Switch / Cable / PC</td>
</tr>
<tr>
<td>Configurable parameters</td>
<td>points per turn(^a), direction, reset(^a), led passing through zero(^a), code, presets(^a)</td>
<td>points per turn(^a), direction, reset(^a), led passing through zero(^a), code, presets(^a)</td>
<td>points per turn(^a), no of turns(^a), direction, reset(^a), led passing through zero(^a), code, presets(^a)</td>
<td>points per turn(^a), no of turns(^a), direction, reset(^a), led passing through zero(^a), code, presets(^a)</td>
</tr>
<tr>
<td>Special inputs</td>
<td>enable(^b), store(^b)</td>
<td>enable(^b), store(^b)</td>
<td>enable(^b), store(^b)</td>
<td>enable(^b), store(^b)</td>
</tr>
<tr>
<td>Shaft diameter (mm)</td>
<td>6-10 mm</td>
<td>12 mm</td>
<td>6-10 mm</td>
<td>12 mm</td>
</tr>
<tr>
<td>Body (mm)</td>
<td>Ø58 mm</td>
<td>Ø90 mm</td>
<td>Ø58 mm</td>
<td>Ø90 mm</td>
</tr>
<tr>
<td>Max. no of revs (rpm)</td>
<td>6,000 rpm</td>
<td>6,000 rpm</td>
<td>6,000 rpm</td>
<td>6,000 rpm</td>
</tr>
<tr>
<td>Maximum axial shaft load (N)</td>
<td>40 N</td>
<td>80 N</td>
<td>40 N</td>
<td>80 N</td>
</tr>
<tr>
<td>Maximum radial shaft load (N)</td>
<td>60 N</td>
<td>100 N</td>
<td>60 N</td>
<td>100 N</td>
</tr>
<tr>
<td>Torque (Ncm)</td>
<td>2 Ncm</td>
<td>5 Ncm</td>
<td>2 Ncm</td>
<td>5 Ncm</td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>-20…+80 °C</td>
<td>-20…+80 °C</td>
<td>-20…+80 °C</td>
<td>-20…+80 °C</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP65/67</td>
<td>IP65/67</td>
<td>IP65/67</td>
<td>IP65/67</td>
</tr>
<tr>
<td>Output</td>
<td>RS-485/422, PNP, 0..10V/4...20mA, NPN</td>
<td>RS-485/422, PNP, 0..10V/4...20mA, NPN</td>
<td>RS-485/422, PNP, 0..10V/4...20mA, NPN</td>
<td>RS-485/422, PNP, 0..10V/4...20mA, NPN</td>
</tr>
<tr>
<td>Power supply</td>
<td>10…30V</td>
<td>15…30V</td>
<td>10…30V</td>
<td>10…30V</td>
</tr>
<tr>
<td>Output codes</td>
<td>Binary, Gray, BCD(^a), Gray excess(^b)</td>
<td>Binary, Gray, BCD(^a), Gray excess(^b)</td>
<td>Binary, Gray, BCD(^a), Gray excess(^b)</td>
<td>Binary, Gray, BCD(^a), Gray excess(^b)</td>
</tr>
<tr>
<td>Interface</td>
<td>Parallel, SSI, Analogue</td>
<td>Parallel, SSI, Analogue</td>
<td>Parallel, SSI</td>
<td>Parallel, SSI</td>
</tr>
</tbody>
</table>

\(^a\) Only parallel interface. \(^b\) Only analogue interface. \(^c\) Only programmable by PC. \(^d\) Only SSI output.
### ENCO-FLEX COUPLINGS

**Page 41**

- **ALU-FLEX**: flexible slotted aluminium couplings
- **POLY-FLEX**: flexible slotted acetal couplings
- **SPRING-FLEX**: flexible helicoid spring couplings
- **OLDHAM-FLEX**: lateral slippage couplings

### FLANES

**Page 46**

All flange types are available in anodised aluminium alloy. Syncro-flange types.
Stainless steel flanges are available, suitable for securing hollow shaft encoders.

HONHER encoders comply with EC codes in relation to EMC. Noise immunity and emission comply with the EN 50082-2 and EN 50081-2 codes.
An incremental pulse generator in combination with an electronic counter or microprocessor is a precise method of measuring angular and linear displacements, but in any case, in order to guarantee this precision (not degraded by electrical interference), certain codes have to be taken into account.

A- Reduce interference by employing screened cable that is correctly connected to earth, a suitable choice of counter position, cable output, adequate voltage and the possibility of using a differential level output (complementary).

B- Attenuate interference due to high frequency by means of an RC filter.

The various problems that may be encountered when installing a generator system-control system are listed below, together with some solutions for them.

**Electrostatic coupling or interference**

Electric interference can be reduced by taking the corresponding precautions. The signals produced by the generator must be carried over suitable screened cables that are connected to earth at only one end. Unscreened wiring is only suitable for short runs and interference-free locations.

**Electromagnetic coupling or interference**

This type of effects with wide radii of action are more difficult to combat, one type of protection that can be employed is twisted pair wiring, which is normally sufficient as the voltages induced in the two conductors cancel each other out.

**Earth point selection**

The following rule should be followed when selecting an earth point: the earth connection must be made at only one point of the electric circuit, all other system points that require an earth connection must be made to this one single point.

**Cable run**

The cable between the generator and the counter must be separate from the high-voltage wiring and follow the shortest, most direct path between them.

**Differential receiver**

One effective form of interference rejection is to use a differential receiver. The signal and its complement are fed to the two inputs of the comparator. The comparator amplifies the difference between the two inputs and any interference pulses are ignored.

**Signal loss over long distances**

Voltage drops over long wiring runs can lead to problems. It is not only the current fed to the generator that is reduced, but that the high signal is reduced and the low signal is greater, therefore the resulting signal is outside the required limits. This is especially important in 5 V systems, but 12 V systems are also vulnerable to these effects.

**Deformed pulses**

The presence of noise in slow signal changes can cause interference and give false measurement readings. This effect can be eliminated by using a Schmitt Trigger circuit at the input to the counter. This circuit will ignore any changes in voltage that are less than the hysteresis.

**Recommended input circuit**

The following circuit provides high noise immunity and can be employed at 50 kHz.
All our pulse generators are fitted with preloaded ball bearings. The lifetime of these bearings largely depends on the load supported by the encoder shaft. Minimising this load is very important in order to guarantee a reasonable encoder lifetime. Under no circumstances should the axial (Fa) and radial (Fr) components at the end of the shaft must not exceed, even briefly, the established limits for each of the series.

There are several solutions for protecting the shaft from excessive loads depending on the encode types and its application:

- **Encoders with shaft: connection with machine shafts**
  If the connection between the encoder shaft and that of the machine is rigid, any misalignment between the two can lead to very high loads on the bearings. In order to prevent this, the shafts must be connected by means of flexible couplings that are able to absorb the expected misalignment, vibration and any possible axial shaft movement.
  
  *See page 41: Flexible couplings.*

- **Encoders with shaft: connections to measuring wheels, pulleys and pinions**
  These components can be fixed directly to the encoder shaft provided there are no radial loads produced in excess of the acceptable limits. Otherwise, an auxiliary shaft must be installed to support these components.
  
  If measuring wheels are employed or rack and pinion measuring systems, it is possible that constant free-play cannot be guaranteed, which would make it necessary to use a flexible angle to secure the encoder to the machine chassis, making it possible to move it.
  
  *See page 48-49: Angles, measuring systems.*

- **Hollows shafts encoders**
  In most cases these are fixed to a rigid shaft. In these cases, the encoder body must never be rigidly fixed to the machine chassis; instead, it must be simply prevented from rotating with the shaft. This may be achieved with an elastic flange or retaining pin.

**PROTECTION AGAINST CONTACT**

In order to comply with the CE Machine Directive, after installing the encoder, all rotating parts, such as shafts, couplings, wheels and clamps etc, must be protected against accidental contact during machine use.
General information

Incremental encoders are probably the most common type of encoder employed in industry because of the wide variety of applications in which they can be used. Incremental encoders generate pulses when the shaft is rotated, where the number of pulses per turn can determine a measurement of speed, length or position. They can be classified, according to function, into uni-directional (a single output channel A), employed whenever it is not necessary to detect the direction of rotation, such as addition and subtraction in counters or tachometers, and bi-directional (with two output channels A and B), which allows the detection of rotation direction, with channel B being 90° out of phase with channel A.

A third reference or zero signal (0 output channel) can be made available, which provides a pulse for each full turn of the shaft that, for example, permits a position reference to be determined and this signal can be synchronised with respect to channel A or B, or to both, and it can also be non-synchronised. All these signals are also available in inverted form, usually employed in environments where there is noise and/or long wiring runs.

Maximum frequency response

This is the maximum frequency at which the encoder can electrically respond, it refers to the number of output pulses the encoder can produce per second. This frequency is related to the encoder shaft rotation speed and the number of pulses, so that:

\[
\text{Frequency (Hz)} = \frac{\text{No of shaft turns per minute}}{60} \times \text{No of encoder pulses}
\]

Each incremental encoder includes a disc that is marked with a series of uniform lines through a single track around the perimeter, the opaque lines have the same width as the transparent sections, working with a light emitting unit, with an associated capture unit, when the disc is rotated, these lines generate signals, which are then processed to produce the outputs corresponding to an incremental encoder.

The tolerance of these in 360° electrical is ±10% and as has already been stated, the phase difference between A or its inverted value with respect to B is 90° electrical (1/4 period) with a tolerance of ±25%, values of down to ±5% can be supplied on order.

In all Hohner encoders, the B signal lead the A signal by 90° (electrical) when the encoder rotates in a clockwise direction (CW), in other words rotating in a clockwise direction looking at it from the end.

Precision

The unit of measure that defines the encoder precision is the “electrical degree”. This is:

\[
360° \text{ electrical} = \frac{360° \text{ mechanical}}{\text{Nº of encoder pulses}}
\]

The error of a rotating encoder is not accumulative, it does not increase when the shaft rotates more than a full turn.
### Output circuits

**Push-Pull**

- Output circuit: BC 327, BC337 or equivalent
- Load capability: 40 mA per channel
- Length of cable allowed: 50 m (Vcc = 24 Vdc)
- Recommended load resistance: $R_L = 1.8\,\text{k}\Omega$ (Vcc = 24 Vdc)
- “Low” signal level: $V_{OL} < 2\,\text{V}$ (Vcc = 24 Vdc)
- “High” signal level: $V_{OH} > 22\,\text{V}$ (Vcc = 24 Vdc)
- Power supply: 11...30 Vdc
- Maximum ripple: 300 m V Vcc
- Short circuit protection: Not permanent
- Max. standard frequency: 100 kHz

**TTL line driver**

- Output circuit: SN 75114 or equivalent
- Load capability: 40 mA per channel
- Length of cable allowed: 100 m
- “Low” signal level: $V_{OL} < 0.2\,\text{Volt}$
- “High” signal level: $V_{OH} > 2.4\,\text{Volt}$
- Short circuit protection: Not permanent
- Power supply: 5 Vdc ±5%
- Maximum ripple: 300 m V Vcc
- Max. standard frequency: 100 kHz

**Open Collector (O.C.) NPN**

- Output circuit: Driver ULN 2003 or equivalent
- Load capability: 40 mA per channel
- Length of cable allowed: 50 m (Vcc = 24 Vdc)
- Recommended load resistance: $R_L = 1.8\,\text{k}\Omega$ (Vcc = 24 Vdc)
- “Low” signal level: $V_{OL} < 2\,\text{V}$ (Vcc = 24 Vdc)
- “High” signal level: $V_{OH} > 22\,\text{V}$ (Vcc = 24 Vdc)
- Power supply: 11...30 Vdc
- Maximum ripple: 300 m V Vcc
- Short circuit protection: Not permanent
- Max. standard frequency: 100 kHz

**Differential Line driver. Push-Pull**

- Output stage: Dif. Line Driver
- Load capability: 30 mA per channel
- Length of cable allowed: 100 m
- Power supply: 11...30 Vdc
- “Low” signal level: min. 2.5 V
- “High” signal level: max. Vcc - 3V
- Output voltage: Vcc
- Short circuit protection: Yes
- Maximum ripple: 500 m V Vcc
- Max. standard frequency: 100 kHz - 200 kHz

**RS-422. Differential outputs**

- Output circuit: EIA RS 422 Standard
- Load capability: 20 mA
- Length of cable allowed: 1200 m
- Short circuit protection: Not permanent
- Power supply: 5 Vdc ±5%
- Max. standard frequency: 300 kHz
- Recommended receivers: AM26LS32 or equivalent
• Incremental encoder with shaft for industrial applications
• Any number of pulses per turn available from 1 to 10,000 pulses
• Outside diameter 58 mm
• Shaft from 6 to 12 mm
• Protection class IP65 or IP67 according to DIN 40050
• Excellent flange flexibility and various configurations
• Special mechanical, electronic and optical forms available on order
• Connection by cable (any cable length available) or industrial connector

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Aluminium</td>
</tr>
<tr>
<td>Shaft</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Bearings</td>
<td>Ball races</td>
</tr>
<tr>
<td>Bearing lifetime</td>
<td>$1 \times 10^{10}$ rev.</td>
</tr>
<tr>
<td>Maximum number of revolutions permitted mechanically</td>
<td>6,000 rpm.</td>
</tr>
<tr>
<td>Protection against dust and splashes according to DIN 40050</td>
<td>IP65.</td>
</tr>
<tr>
<td>Rotor inertia moment</td>
<td>30 gcm²</td>
</tr>
<tr>
<td>Start-up torque at 20ºC (68ºF)</td>
<td>0.5 Ncm, without seal/ 2.0 Ncm, with seal.</td>
</tr>
<tr>
<td>Maximum load permitted on axial shaft</td>
<td>40 N</td>
</tr>
<tr>
<td>Maximum load permitted on radial shaft</td>
<td>60 N</td>
</tr>
<tr>
<td>Approximate weight</td>
<td>0.5 Kg</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-20ºC to +80ºC</td>
</tr>
<tr>
<td>Vibration</td>
<td>100 m/s² (10Hz...2000Hz).</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>1,000 m/s² (6ms).</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>98% non-condensing.</td>
</tr>
<tr>
<td>Frequency</td>
<td>According to electronic output (page 9).</td>
</tr>
<tr>
<td>Pre-delivery test</td>
<td>48h.</td>
</tr>
<tr>
<td>Maximum pulses per turn</td>
<td>10,000.</td>
</tr>
<tr>
<td>Axial or radial connection</td>
<td>Cable (2 metres) or industrial connector.</td>
</tr>
<tr>
<td></td>
<td>(other cable lengths available on order)</td>
</tr>
</tbody>
</table>

IP67 version available

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Shaft</td>
<td>Ø10 x 20 mm</td>
</tr>
<tr>
<td>Axial connection</td>
<td>2 metres cable.</td>
</tr>
<tr>
<td></td>
<td>(other cable lengths on order)</td>
</tr>
</tbody>
</table>
## Reference Example

Reference example: 10-11127-5000

(*) To consult different flanges, page 46 - 47
(**) To consult connectors and connection diagrams, page 52 - 53
(***) To consult electronic outputs, page 9

### Dimensions

![Diagram](image_url)

(1) Radial signal state for electronics 7 and 9
SERIE 58

- Precision incremental encoder with shaft for industrial applications
- Any number of pulses per turn available from 1 to 10,000
- Outside diameter 58 mm
- 6 mm shaft
- Syncro-flange securing
- Protection class IP65 in accordance with DIN 40050
- Connection by cable (any cable length available) or industrial connector

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Aluminium</td>
</tr>
<tr>
<td>Shaft</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Bearings</td>
<td>Ball races</td>
</tr>
<tr>
<td>Bearing lifetime</td>
<td>$1 \times 10^{10}$ rev.</td>
</tr>
<tr>
<td>Maximum number of revolutions permitted mechanically</td>
<td>6,000 rpm.</td>
</tr>
<tr>
<td>Protection against dust and splashes according to</td>
<td>IP65</td>
</tr>
<tr>
<td>DIN 40050</td>
<td></td>
</tr>
<tr>
<td>Rotor inertia moment</td>
<td>30 gcm²</td>
</tr>
<tr>
<td>Start-up torque at 20°C (68°F)</td>
<td>Max. 2.0 Ncm.</td>
</tr>
<tr>
<td>Maximum load permitted on axial shaft</td>
<td>40 N.</td>
</tr>
<tr>
<td>Maximum load permitted on radial shaft</td>
<td>60 N.</td>
</tr>
<tr>
<td>Approximate weight</td>
<td>0.5 Kg.</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-20°C to +80°C</td>
</tr>
<tr>
<td>Vibration</td>
<td>100 m/s² (10Hz...2000Hz)</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>1,000 m/s² (6ms)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>98% non-condensing</td>
</tr>
<tr>
<td>Frequency</td>
<td>Depends on electronic output (page 9).</td>
</tr>
<tr>
<td>Pre-delivery test</td>
<td>48h.</td>
</tr>
<tr>
<td>Maximum pulses per turn</td>
<td>10,000.</td>
</tr>
<tr>
<td>Axial or radial connection</td>
<td>Cable (2 metres) or industrial connector. (other cable lengths on order)</td>
</tr>
</tbody>
</table>
**REFERENCE**

<table>
<thead>
<tr>
<th>SERIE</th>
<th>SHAFT</th>
<th>FLANGE</th>
<th>OUTPUT SIGNALS</th>
<th>CONNECTION</th>
<th>ELECTRONIC OUTPUT</th>
<th>NUMBER OF PULSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>58</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
</tbody>
</table>

1- Ø6 x 10 mm
1- Without flange (*)
1- Axial cable
2- Radial cable
3- 90.9512 axial
4- 90.9512 radial (**)

1- Differential line driver. Push-Pull 11..30V
2- Standard RS422, 5V

Reference example: 58-11122-5000

(*) To consult different flanges, page 46 - 47
(**) To consult connectors and connection diagrams, page 52 - 53
(***To consult electronic outputs, page 9

**DIMENSIONS**

Reference example: 58-11122-5000

(*) To consult different flanges, page 46 - 47
(**) To consult connectors and connection diagrams, page 52 - 53
(*** To consult electronic outputs, page 9

3 threaded holes, M4x8 at 120°
• Incremental encoder with shaft for simple industrial applications
• Any number of pulses per turn available from 1 to 2,048
• Outside diameter 58 mm
• 6 mm shaft
• Protection class IP65 in accordance with DIN 40050
• Various flanges available
• Connection cable (any cable length available)

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Body</th>
<th>Aluminium.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft</td>
<td>Stainless Steel.</td>
</tr>
<tr>
<td>Bearings</td>
<td>Ballraces.</td>
</tr>
<tr>
<td>Bearing lifetime</td>
<td>$1 \times 10^{10}$ rev.</td>
</tr>
<tr>
<td>Maximum number of revolutions permitted mechanically</td>
<td>6,000 rpm.</td>
</tr>
<tr>
<td>Protection against dust and splashes according to DIN 40050</td>
<td>IP55.</td>
</tr>
<tr>
<td>Rotor inertia moment</td>
<td>10 gcm².</td>
</tr>
<tr>
<td>Start-up torque at 20°C (68°F)</td>
<td>Max. 0.5 Ncm.</td>
</tr>
<tr>
<td>Maximum load permitted on axial shaft</td>
<td>20 N.</td>
</tr>
<tr>
<td>Maximum load permitted on radial shaft</td>
<td>30 N.</td>
</tr>
<tr>
<td>Approximate weight</td>
<td>0.3 Kg.</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-20°C to +60°C.</td>
</tr>
<tr>
<td>Vibration</td>
<td>100 m/s² (10Hz...2000Hz).</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>1000 m/s² (6ms).</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>98% non-condensing.</td>
</tr>
<tr>
<td>Frequency</td>
<td>Depends on electrical output (page 9).</td>
</tr>
<tr>
<td>Pre-delivery test</td>
<td>48h.</td>
</tr>
<tr>
<td>Maximum pulses per turn</td>
<td>2,048.</td>
</tr>
<tr>
<td>Axial connection</td>
<td>Cable (2 meters) (other cable length on order).</td>
</tr>
</tbody>
</table>
### Reference Example

Reference example: 20-11122-500

- (*) To consult flanges, page 46-47
- (**) To consult connections, page 53
- (***) To consult electronic outputs, page 9

### Dimensions

![Dimension Diagram](image-url)

- **Maximum Thrust:** 12
- **Threaded Holes:** M3x6 at 120°
• Miniature incremental encoder with shaft for simple industrial applications
• Any number of pulses per turn available from 1 to 500
• Outside diameter 40 mm
• 6 mm shaft
• Protection class IP41 in accordance with DIN 40050
• Connection cable (any cable length available)

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Aluminium</td>
</tr>
<tr>
<td>Shaft</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Bearings</td>
<td>Ballraces.</td>
</tr>
<tr>
<td>Bearing lifetime</td>
<td>$1 \times 10^{10}$ rev.</td>
</tr>
<tr>
<td>Maximum number of revolutions permitted mechanically</td>
<td>5,000 rpm.</td>
</tr>
<tr>
<td>Protection against dust and splashes in accordance with DIN 40050</td>
<td>IP41.</td>
</tr>
<tr>
<td>Rotor inertia moment</td>
<td>10 gcm².</td>
</tr>
<tr>
<td>Start-up torque at 20°C (68°F)</td>
<td>Max. 0.4 Ncm.</td>
</tr>
<tr>
<td>Maximum load permitted on axial shaft</td>
<td>5 N.</td>
</tr>
<tr>
<td>Maximum load permitted on radial shaft</td>
<td>5 N.</td>
</tr>
<tr>
<td>Approximate weight</td>
<td>0.2 Kg.</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-20°C to +60°C.</td>
</tr>
<tr>
<td>Vibration</td>
<td>100 m/s² (10Hz...2000Hz).</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>1000 m/s² (6ms).</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>98% non-condensing.</td>
</tr>
<tr>
<td>Frequency</td>
<td>Depends on electronic output (page 9).</td>
</tr>
<tr>
<td>Pre-delivery test</td>
<td>48h.</td>
</tr>
<tr>
<td>Maximum pulses per turn</td>
<td>500.</td>
</tr>
<tr>
<td>Axial connection</td>
<td>Cable (1 meter).</td>
</tr>
<tr>
<td></td>
<td>(other cable lengths on order)</td>
</tr>
</tbody>
</table>
### Reference Example: 21-117-500

(* To consult connections, page 53  
(** To consult electronic outputs, page 9

#### Dimensions

<table>
<thead>
<tr>
<th>Option</th>
<th>Dimensions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Option A</strong></td>
<td><img src="image" alt="Option A Diagram" /></td>
<td>3 threaded holes, M3x5 at 120°</td>
</tr>
<tr>
<td><strong>Option B</strong></td>
<td><img src="image" alt="Option B Diagram" /></td>
<td>3 threaded holes, M3x5 at 120°</td>
</tr>
<tr>
<td><strong>Option C</strong></td>
<td><img src="image" alt="Option C Diagram" /></td>
<td>Nut M18x1</td>
</tr>
<tr>
<td><strong>Option D</strong></td>
<td><img src="image" alt="Option D Diagram" /></td>
<td>3 threaded holes, M3x5 at 120°</td>
</tr>
</tbody>
</table>
SERIE 30

- Incremental encoder with shaft for extreme industrial applications
- Any number of pulses per turn available from 1 to 10,000
- Outside diameter 90 mm
- 12 mm shaft
- Protection class IP65 or IP67 in accordance with DIN 40050
- Excellent flange flexibility and various configurations
- Special mechanical, electronic and optical forms available on order
- Connection by cable (any cable length available) or industrial connector

TECHNICAL SPECIFICATIONS

Body .......................................................... Aluminium.
Shaft .......................................................... Stainless Steel.
Bearings ..................................................... Ballraces.
Bearing lifetime ........................................... \(1 \times 10^{10}\) rev.
Maximum number of revolutions permitted mechanically ............ 6,000 rpm.
Protection against dust and splashes in accordance with DIN 40050 .................................................. IP65.
Rotor inertia moment ............................................ 270 gcm².
Start-up torque at 20°C (68°F) ................................ Max. 5.0 Ncm.
Maximum load permitted on axial shaft .................................. 80 N.
Maximum load permitted on radial shaft .................................. 100 N.
Approximate weight .................................................. 1.2 Kg.
Operating temperature range .............................................. -20°C to +80°C.
Vibration ............................................................ 100 m/s² (10Hz...2000Hz).
Shock resistance ..................................................... 1000 m/s² (6ms).
Relative humidity ............................................... 98% non-condensing.
Frequency ......................................................... Depends on electronic output (page 9).
Pre-delivery test .................................................... 48h.
Maximum positions per turn ......................................... 10,000.
Axial or radial connection ............................................ Cable (2 metres) or industrial connector.

IP67 version available

Body .......................................................... Stainless Steel.
Shaft .......................................................... Ø12 x 25 mm.
Axial connection ................................................ 2 metres cable.

(other cable lengths on order)
Reference example: 30-3467-5000

(*) To consult flanges, page 46 - 47
(**) To consult connectors and connection diagrams, page 52- 53
(***) To consult electronic outputs, page 9

<table>
<thead>
<tr>
<th>SERIE</th>
<th>OUTPUT SIGNALS</th>
<th>CONNECTION</th>
<th>ELECTRONIC OUTPUT</th>
<th>NUMBER OF PULSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>(*)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30- A</td>
<td>0- Axial cable</td>
<td></td>
<td>0- Open collector NPN 11..30V</td>
<td></td>
</tr>
<tr>
<td>32- A + 0</td>
<td>1- 90.9504 axial</td>
<td></td>
<td>1- Push-Pull 11..30V</td>
<td></td>
</tr>
<tr>
<td>40- A + B</td>
<td>2- 90.9505 axial</td>
<td></td>
<td>2- Line driver, TTL 5V</td>
<td></td>
</tr>
<tr>
<td>42- A + B + 0</td>
<td>3- 90.9507 axial</td>
<td></td>
<td>7- Standard RS422, 5V</td>
<td></td>
</tr>
<tr>
<td>43- A + B + 0</td>
<td>4- 90.9512 axial</td>
<td></td>
<td>9- Differential line driver, Push-Pull 11..30V</td>
<td></td>
</tr>
<tr>
<td>34- A + A</td>
<td>5- Radial cable</td>
<td>6- 90.9504 radial</td>
<td>(***)</td>
<td></td>
</tr>
<tr>
<td>35- A A + BB</td>
<td>7- 90.9505 radial</td>
<td>7- 90.9505 radial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36- A A + BB + 00</td>
<td>8- 90.9507 radial</td>
<td>8- 90.9507 radial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9- 90.9512 radial</td>
<td>9- 90.9512 radial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C- 90.9589 axial</td>
<td></td>
<td>C- 90.9589 axial</td>
<td></td>
</tr>
<tr>
<td></td>
<td>V- 90.9589 radial</td>
<td></td>
<td>V- 90.9589 radial</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M- 90.9510 axial</td>
<td></td>
<td>M- 90.9510 axial</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N- 90.9510 radial</td>
<td></td>
<td>N- 90.9510 radial</td>
<td></td>
</tr>
</tbody>
</table>

DIMENSIONS

3 threaded holes, M6x12 at 120°
- Incremental through-hole hollow shaft encoder for industrial applications
- Resolution up to 10,000 pulses per turn
- Outside diameter 58 mm
- Through-hole hollow shaft, 10, 12 or 14 mm
- Protection class IP65 according to DIN 40050
- Connection cable or industrial connector
- Fixed to shaft by front or rear clamp
- Anti-rotation system using elastic flange or centre pin

<table>
<thead>
<tr>
<th>TECHNICAL SPECIFICATIONS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body</strong></td>
<td>Aluminium.</td>
</tr>
<tr>
<td><strong>Shaft</strong></td>
<td>Treated aluminium / stainless steel.</td>
</tr>
<tr>
<td><strong>Bearings</strong></td>
<td>Ballraces.</td>
</tr>
<tr>
<td><strong>Bearing lifetime</strong></td>
<td>$1 \times 10^{10}$ rev.</td>
</tr>
<tr>
<td><strong>Body securing</strong></td>
<td>Flexible flange 90.1014 / 90.1024</td>
</tr>
<tr>
<td><strong>Shaft securing</strong></td>
<td>Clamp. Front or rear.</td>
</tr>
<tr>
<td><strong>Hollow shaft diameter (mm)</strong></td>
<td>10, 12 or 14 mm.</td>
</tr>
<tr>
<td><strong>Maximum number of revolutions permitted mechanically</strong></td>
<td>6,000 rpm.</td>
</tr>
<tr>
<td><strong>Protection against dust and splashes in accordance with DIN 40050</strong></td>
<td>IP65.</td>
</tr>
<tr>
<td><strong>Rotor inertia moment</strong></td>
<td>30 gcm$^2$.</td>
</tr>
<tr>
<td><strong>Start-up torque at 20°C (68°F)</strong></td>
<td>Max. 2 Ncm.</td>
</tr>
<tr>
<td><strong>Maximum load permitted on axial shaft</strong></td>
<td>Max. 40 N.</td>
</tr>
<tr>
<td><strong>Maximum load permitted on radial shaft</strong></td>
<td>Max. 60 N.</td>
</tr>
<tr>
<td><strong>Permitted misalignment: Flexible flange 90.1014/90.1024</strong></td>
<td>±0.5 mm axial, ±0.3 mm radial.</td>
</tr>
<tr>
<td><strong>Approximate weight</strong></td>
<td>0.5 Kg.</td>
</tr>
<tr>
<td><strong>Operating temperature range</strong></td>
<td>-20°C to +80°C.</td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
<td>$100 , \text{m/s}^2$ (10Hz...2000Hz).</td>
</tr>
<tr>
<td><strong>Shock resistance</strong></td>
<td>$1000 , \text{m/s}^2$ (6ms).</td>
</tr>
<tr>
<td><strong>Relative humidity</strong></td>
<td>98% non-condensing.</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>Depends on electronic output (page 9).</td>
</tr>
<tr>
<td><strong>Pre-delivery tests</strong></td>
<td>48h.</td>
</tr>
<tr>
<td><strong>Maximum pulses per turn</strong></td>
<td>10,000.</td>
</tr>
<tr>
<td><strong>Radial connection</strong></td>
<td>Cable (2 metres) or industrial connector. (other cable lengths on order)</td>
</tr>
</tbody>
</table>
### REFERENCE

<table>
<thead>
<tr>
<th>SERIE</th>
<th>SECURING</th>
<th>HOLLOW SHAFT</th>
<th>OUTPUT SIGNALS</th>
<th>CONNECTION</th>
<th>ELECTRONIC OUTPUT</th>
<th>NUMBER OF PULSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>59 (*)</td>
<td></td>
<td>1- Ø10 mm 2- Ø12 mm 3- Ø14 mm</td>
<td>1- A+B+B+00 2- A+BB</td>
<td>1- Radial cable 2- 90.9512 radial</td>
<td>1- Differential line driver. Push-Pull 11..30V 2- Standard RS422. 5V</td>
<td>⚫⚫⚫⚫⚫⚫</td>
</tr>
</tbody>
</table>

1- Rear clamp  
2- Front clamp

Reference example: 59-11122-5000

(*) To consult elastic flanges, page 47  
(**) To consult connector and connection diagrams, page 52 - 53  
(***) To consult electronic outputs, page 9

### DIMENSIONS

#### Rear clamp

![Rear clamp diagram](image-url)

Screw DIN912 M3x12

#### Front clamp

![Front clamp diagram](image-url)

3 threaded holes M4x5 at 120°

Consult page 7 and 47 for mechanical installation instructions
**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Aluminium.</td>
</tr>
<tr>
<td>Shaft</td>
<td>Treated aluminium / stainless steel.</td>
</tr>
<tr>
<td>Bearings</td>
<td>Ballraces.</td>
</tr>
<tr>
<td>Bearing lifetime</td>
<td>$1 \times 10^{10}$ rev.</td>
</tr>
<tr>
<td>Maximum number of revolutions permitted mechanically</td>
<td>6,000 rpm.</td>
</tr>
<tr>
<td>Protection against dust and splashes in accordance with DIN 40050</td>
<td>IP65.</td>
</tr>
<tr>
<td>Rotor inertia moment</td>
<td>30 gcm².</td>
</tr>
<tr>
<td>Start-up torque at 20°C (68°F)</td>
<td>Max. 2.0 Ncm.</td>
</tr>
<tr>
<td>Maximum load permitted on axial shaft</td>
<td>40 N.</td>
</tr>
<tr>
<td>Maximum load permitted on radial shaft</td>
<td>60 N.</td>
</tr>
<tr>
<td>Permitted misalignment: Flexible flange, 90.1014/90.1024</td>
<td>±0.5 mm axial, ±0.3 mm radial.</td>
</tr>
<tr>
<td>Approximate weight</td>
<td>0.5 Kg.</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-20°C to +80°C.</td>
</tr>
<tr>
<td>Vibration</td>
<td>100 m/s² (10Hz...2000Hz).</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>1000 m/s² (6ms).</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>98% non-condensing.</td>
</tr>
<tr>
<td>Frequency</td>
<td>Depends on electrical output (page 9).</td>
</tr>
<tr>
<td>Pre-delivery test</td>
<td>48h.</td>
</tr>
<tr>
<td>Maximum pulses per turn</td>
<td>10,000.</td>
</tr>
<tr>
<td>Axial or radial connection</td>
<td>Cable (2 metres) or industrial connector. (other cable lengths on order)</td>
</tr>
</tbody>
</table>
**REFERENCE**

<table>
<thead>
<tr>
<th>SERIE</th>
<th>MECHANICAL OPTION</th>
<th>SEMI-HOLLOW SHAFT</th>
<th>OUTPUT SIGNALS</th>
<th>CONNECTION</th>
<th>ELECTRONIC OUTPUT</th>
<th>NUMBER OF PULSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 (*)</td>
<td>1- Clamp</td>
<td>1- Ø6 x 26 mm</td>
<td>1- A</td>
<td>1- 90.9504 radial</td>
<td>0- Open collector NPN 11..30V</td>
<td>⚫ ⚫ ⚫ ⚫ ⚫</td>
</tr>
<tr>
<td></td>
<td>2- Retainer</td>
<td>2- Ø7 x 26 mm</td>
<td>2- A + B</td>
<td>2- 90.9505 radial</td>
<td>1- Push-Pull 11.30V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3- Ø8 x 26 mm</td>
<td>3- A + B + 0</td>
<td>3- Radial cable</td>
<td>2- Line driver, TTL 5V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4- Ø10 x 26 mm</td>
<td>4- A + A</td>
<td>4- 90.9507 radial</td>
<td>7- Standard RS422, 5V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5- Ø12 x 26 mm</td>
<td>5- A + B + 00</td>
<td>5- 90.9512 radial</td>
<td>9- Differential line driver. Push-Pull 11..30V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6- A + 0</td>
<td>6- 90.9504 axial</td>
<td>(***) To consult elastic flanges, page 47</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7- A + 00</td>
<td>7- 90.9505 axial</td>
<td>(***) To consult connectors and connection diagrams, page 52 - 53</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8- A + B + 0</td>
<td>8- Axial cable</td>
<td>(***) To consult electronic outputs, page 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9- A + 0</td>
<td>9- 90.9507 axial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0- A + 0</td>
<td>0- 90.9512 axial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C- 90.9589 axial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>V- 90.9589 radial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M- 90.9510 radial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N- 90.9510 axial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reference example: 19-11657-5000

(*) To consult elastic flanges, page 47

(**) To consult connectors and connection diagrams, page 52 - 53

(*** To consult electronic outputs, page 9

---

**DIMENSIONS**

**Clamp**

1- Ø6 x 26 mm
2- Ø7 x 26 mm
3- Ø8 x 26 mm
4- Ø10 x 26 mm
5- Ø12 x 26 mm

---

**Retainer**

2 retainers DIN916 M4 at 90°

---

Consult pages 7 and 47 for mechanical installation instructions
• Incremental, through-hole hollow shaft encoder for industrial applications
• Resolution up to 5,000 pulses per turn
• Outside diameter 77 mm
• Through-hole hollow shaft from 15 to 25 mm
• Protection class IP65 according to DIN 40050
• Connection cable or industrial connector
• Fixed to shaft with front or rear retainers
• Anti-rotation system using elastic flange

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Aluminium.</td>
</tr>
<tr>
<td>Shaft</td>
<td>Stainless Steel.</td>
</tr>
<tr>
<td>Bearings</td>
<td>Ballraces.</td>
</tr>
<tr>
<td>Bearing lifetime</td>
<td>$1 \times 10^9 \text{ rev.}$</td>
</tr>
<tr>
<td>Body securing</td>
<td>Flexible flange, 90.1025</td>
</tr>
<tr>
<td>Shaft securing</td>
<td>Retainers. Front or Rear.</td>
</tr>
<tr>
<td>Hollow shaft diameter</td>
<td>15...25 mm.</td>
</tr>
<tr>
<td>Maximum number of revolutions permitted mechanically</td>
<td>6,000 rpm.</td>
</tr>
<tr>
<td>Protection against dust and splashes in accordance with DIN 40050</td>
<td>IP65.</td>
</tr>
<tr>
<td>Rotor inertia moment</td>
<td>Max. 1 Kg cm$^2$.</td>
</tr>
<tr>
<td>Start-up torque at 20ºC (68ºF)</td>
<td>4 Ncm.</td>
</tr>
<tr>
<td>Maximum load permitted on axial shaft</td>
<td>Max. 100 N.</td>
</tr>
<tr>
<td>Maximum load permitted on radial shaft</td>
<td>Max. 200 N.</td>
</tr>
<tr>
<td>Permitted misalignment: Flexible clamp 90.1025 (one)</td>
<td>±0.5 mm axial, ±0.3 mm radial.</td>
</tr>
<tr>
<td>Flexible clamp 90.1025 (three)</td>
<td>±0.4 mm axial, ±0.2 mm radial.</td>
</tr>
<tr>
<td>Approximate weight</td>
<td>0.5 Kg.</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-20ºC to +80ºC.</td>
</tr>
<tr>
<td>Vibration</td>
<td>100 m/s$^2$ (10Hz...2000Hz).</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>1000 m/s$^2$ (6ms).</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>98% non-condensing.</td>
</tr>
<tr>
<td>Frequency</td>
<td>Depends on electronic output (page 9).</td>
</tr>
<tr>
<td>Pre-delivery test</td>
<td>48h.</td>
</tr>
<tr>
<td>Maximum pulses per turn</td>
<td>5,000.</td>
</tr>
<tr>
<td>Radial connection</td>
<td>Cable (2 metres) or industrial connector.</td>
</tr>
<tr>
<td>SERIE</td>
<td>SECURING</td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
</tr>
<tr>
<td>77</td>
<td></td>
</tr>
</tbody>
</table>

1- Rear retainers 2- Front retainer

15- Ø15 mm 16- Ø16 mm 18- Ø18 mm 20- Ø20 mm 24- Ø24 mm 25- Ø25 mm

Reference example: 77-125111-1024
Recommended anti-rotation flange, 90.1025

(*) To consult connectors and connection diagrams, page 52 - 53
(**) To consult electronic outputs, page 9

**DIMENSIONS**

Front retainers
- Incremental, through-hole hollow shaft encoder for industrial applications
- Resolution up to 5,000 pulses per turn
- Outside diameter 100 mm
- Through-hole hollow shaft from 25 to 42 mm
- Protection class IP65 according to DIN 40050
- Connection cable or industrial connector
- Fixed to shaft with front or rear retainers
- Anti-rotation system using elastic flange

### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Aluminium</td>
</tr>
<tr>
<td>Shaft</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Bearings</td>
<td>Ballraces</td>
</tr>
<tr>
<td>Bearing lifetime</td>
<td>$1 \times 10^{10}$ rev.</td>
</tr>
<tr>
<td>Body securing</td>
<td>Flexible flange, 90.1025</td>
</tr>
<tr>
<td>Shaft securing</td>
<td>Retainers. Front or Rear.</td>
</tr>
<tr>
<td>Hollow shaft diameter</td>
<td>25...42 mm</td>
</tr>
<tr>
<td>Maximum number of revolutions permitted mechanically</td>
<td>3,500 rpm</td>
</tr>
<tr>
<td>Protection against dust and splashes in accordance with DIN 40050</td>
<td>IP65.</td>
</tr>
<tr>
<td>Rotor inertia moment</td>
<td>1 - 1.8 Kg cm$^2$.</td>
</tr>
<tr>
<td>Start-up torque at 20°C (68°F)</td>
<td>4 Ncm.</td>
</tr>
<tr>
<td>Maximum load permitted on axial shaft</td>
<td>Max. 100 N.</td>
</tr>
<tr>
<td>Maximum load permitted on radial shaft</td>
<td>Max. 200 N.</td>
</tr>
<tr>
<td>Permitted misalignment: Flexible flange 90.1025 (one)</td>
<td>±0.5 mm axial, ±0.3 mm radial.</td>
</tr>
<tr>
<td>Permitted misalignment: Flexible flange 90.1025 (three)</td>
<td>±0.4 mm axial, ±0.2 mm radial.</td>
</tr>
<tr>
<td>Approximate weight</td>
<td>0.7 Kg.</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-20°C to +80°C</td>
</tr>
<tr>
<td>Vibration</td>
<td>100 m/s$^2$ (10Hz...2000Hz).</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>1000 m/s$^2$ (6ms).</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>98% non-condensing.</td>
</tr>
<tr>
<td>Frequency</td>
<td>Depends on electronic output (page 9).</td>
</tr>
<tr>
<td>Pre-delivery test</td>
<td>48h.</td>
</tr>
<tr>
<td>Maximum pulses per turn</td>
<td>5,000.</td>
</tr>
<tr>
<td>Radial connection</td>
<td>Cable (2 metres) or industrial connector.</td>
</tr>
<tr>
<td></td>
<td>(other cable lengths on order)</td>
</tr>
</tbody>
</table>
### Reference

Reference example: 80-242111-1024
Recommended anti-rotation flange 90.1025

(*) To consult connectors and connection diagrams, page 52 - 53
(**) To consult electronic outputs, page 9

## Dimensions

**Front retainers**

- **Hollow Shaft**:
  - 30 - Ø30 mm
  - 32 - Ø32 mm
  - 38 - Ø38 mm
  - 40 - Ø40 mm
  - 42 - Ø42 mm

- **Output Signals**:
  - 1 - A A + B B + 0 0
  - 2 - A A + B B

- **Connection**:
  - 1 - Radial cable
  - 2 - 90.9512 radial

- **Electronic Output**
  - 1 - Differential line driver. Push-Pull 11..30V
  - 2 - Standard RS422. 5V

- **Number of Pulses**
  - 1
  - 2

---

**Diagram**

- Elastic flange 90.1025
- Dimensions:
  - Height: 71.5 mm
  - Diameter: 71.5 mm
  - 30 mm hole

---

**Table**

<table>
<thead>
<tr>
<th>SERIE</th>
<th>SECURING</th>
<th>HOLLOW SHAFT</th>
<th>OUTPUT SIGNALS</th>
<th>CONNECTION</th>
<th>ELECTRONIC OUTPUT</th>
<th>NUMBER OF PULSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td></td>
<td></td>
<td>1- A A + B B + 0 0</td>
<td>1- Radial cable</td>
<td>1- Differential line driver. Push-Pull 11..30V</td>
<td>2- Standard RS422. 5V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- Front retainers</td>
<td>2- A A + B B</td>
<td>2- 90.9512 radial (**)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1- Rear retainers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Absolut encoders are widely employed throughout industry. Unlike incremental measurement systems, absolut encoders always provide the true positional value. If the system is mechanically moved while power is off, when it is restored, the actual position will be immediately read.

Hohner offers a wide variety of absolut encoders, singleturn and multiturn, serial, parallel or analogue outputs, together with a wide range of output codes. It also provides the possibility of programmable encoders that allow the user to program the encoder’s most important parameters.

All this enables us to offer our customers solutions to assign a specific and unique value to each shaft position. Absolut encoders are classified into two groups: singleturn and multiturn. Singleturn absolut encoders code the 360° of a revolution into “n” point per turn and the code is repeated for each turn.

If a measurement is required for more than one turn of the shaft, a multiturn encoder is required, which is used to provide a precise position in longer paths.

### Special inputs and configurable parameters

All configurable parameters except ZERO can be controlled by cable or switches. In both cases, the signals are optically coupled and can be powered from 0 to 30 volts in the case of cables.

<table>
<thead>
<tr>
<th>Signal</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction DIR</td>
<td>1 (Vcc or open):</td>
<td>Ascending code when rotating in a clockwise direction. 0 (GND): Descending code when rotating in a counter clockwise direction.</td>
</tr>
<tr>
<td>CODE</td>
<td>COD</td>
<td>1 (Vcc or open): GRAY output codes 0 (GND): BIN output codes</td>
</tr>
<tr>
<td>Store STOR</td>
<td>1 (Vcc or open):</td>
<td>Encoder position updating 0 (GND): Encoder position frozen.</td>
</tr>
<tr>
<td>Enable EN</td>
<td>1 (Vcc or open):</td>
<td>High-impedance or tri-state outputs. 0 (GND): Outputs enabled.</td>
</tr>
<tr>
<td>Reset RES</td>
<td>1 (Vcc or open):</td>
<td>Current position. 0 (GND): Reset the encoder position.</td>
</tr>
<tr>
<td>Indicator ZERO</td>
<td>Indicator using an LED for the encoder absolut zero position.</td>
<td></td>
</tr>
</tbody>
</table>

### Programmable optical absolut encoders

All essential encoder parameters are user-programmable in our programmable absolut encoders. Available for singleturn and multiturn encoders in various mechanical options.

The programming software is really simple. It enables the user to select the zero or reference, the number of positions per turn, up to 8,192 point per turn, (13 bits), the number of turns in the multiturn case, up to 4,096 turns, rotation direction and output code: Binary, Gray, Excess Gray, BCD.

There are advantages, such as the possibility of electronic misadjustment and optimisation in mechanical systems that are subject to tolerances etc.

Since the same encoder can be installed in different applications and their specific programming assigned during the actual installation, this translates into savings in both stock and maintenance.

#### Programming the encoder

In order to program a Hohner encoder, a PC is required, together with the programming software and the connection cable between the encoder and PC (the last two are supplied with the encoder).

The encoder is connected to a power supply (24 Vdc) and the communications cable is connected to the PC serial port.

By following the simple instruction in the manual, the user will be able to program the most important encoder parameters in a simple manner.

#### Output codes

In singleturn encoders, Hohner can offer any resolution per turn, up to a maximum of 13 bits per turn (8,192 points per turn). Any number of turns, 2n, can be provided, up to 4,096 turns, in other words, 2, 4, 8, 16, 32 etc, up to 4,096. Codes are available in both clockwise and counter clockwise directions. In the clockwise direction, the code increases when the shaft rotates in a clockwise direction looking at the shaft, and in the counter clockwise direction, the code increases when the shaft rotates in a counter clockwise direction looking at the shaft.

#### Binary code

The binary code is based on 2, in other words, the information is coded using only “0” and “1”.

#### Gray code

The Gray code is a special form of binary code where only one bit changes from one combination to another, this permits higher transmission speeds and greater security, because in the case of natural binary codes, for example, “n” bits are changed and there is a series of intermediate steps that can be interpreted as other positions, and depending on the data read speed of the control system, one of these intermediate positions could constitute incorrect data if one bit changes faster than the others. The Gray code is therefore, a very reliable code for data transmission because in all cases of one position to another, only one bit varies and there are no doubtful intermediate positions between one and the next.
In many cases, the data transmitted from one system to another are subjected to magnetic fields and noise, by using standard interfaces, such as RS-485, the effects of such interference can be reduced. The “Synchronous Serial Interface” (SSI) is an industrial output standard that only requires four lines for data transmission. This transmission system for absolute encoders provides several advantages with respect to traditional parallel transmission and asynchronous serial methods:

- Reduced component count.
- Simple code modification.
- Data transmission between the encoder and the receiver are controlled by the receivers clock signal.
- High transmission speeds in function of distance and the data block to be transmitted.

### BCD Code

In certain cases, the information processed by the system must be converted to decimal so that it may be more easily interpreted, this is the main reason why Binary Coded Decimal (BCD) exists. In BCD, each decimal number is directly coded in binary in order to represent the ten digits from zero to nine, which requires four bits, meaning that each decade needs four bits.

<table>
<thead>
<tr>
<th>Dec</th>
<th>Binary code</th>
<th>Gray code</th>
<th>BCD Code</th>
<th>2nd decade</th>
<th>1st decade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2^4  2^3  2^2  2^1  2^0</td>
<td>2^4  2^3  2^2  2^1  2^0</td>
<td>2^4  2^3  2^2  2^1  2^0</td>
<td>2^4  2^3  2^2  2^1  2^0</td>
<td>2^4  2^3  2^2  2^1  2^0</td>
</tr>
<tr>
<td>0</td>
<td>0 0 0 0 0</td>
<td>0 0 0 0 0</td>
<td>0 0 0 0 0</td>
<td>0 0 0 0 0</td>
<td>0 0 0 0 0</td>
</tr>
<tr>
<td>1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
</tr>
<tr>
<td>2</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
</tr>
<tr>
<td>3</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
</tr>
<tr>
<td>4</td>
<td>0 0 1 0 0</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
</tr>
<tr>
<td>5</td>
<td>0 0 1 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
</tr>
<tr>
<td>6</td>
<td>0 0 1 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
</tr>
<tr>
<td>7</td>
<td>0 0 1 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
<td>0 0 0 0 1</td>
</tr>
<tr>
<td>8</td>
<td>0 1 0 0 0</td>
<td>0 1 1 0 0</td>
<td>0 1 1 0 0</td>
<td>0 1 1 0 0</td>
<td>0 1 1 0 0</td>
</tr>
<tr>
<td>9</td>
<td>0 1 0 0 1</td>
<td>0 1 1 0 1</td>
<td>0 1 1 0 1</td>
<td>0 1 1 0 1</td>
<td>0 1 1 0 1</td>
</tr>
<tr>
<td>10</td>
<td>0 1 0 1 0</td>
<td>0 1 1 1 1</td>
<td>0 1 1 1 1</td>
<td>0 1 1 1 1</td>
<td>0 1 1 1 1</td>
</tr>
<tr>
<td>11</td>
<td>0 1 0 1 1</td>
<td>0 1 1 1 1</td>
<td>0 1 1 1 1</td>
<td>0 1 1 1 1</td>
<td>0 1 1 1 1</td>
</tr>
<tr>
<td>12</td>
<td>0 1 1 0 0</td>
<td>0 1 0 0 0</td>
<td>0 1 0 0 0</td>
<td>0 1 0 0 0</td>
<td>0 1 0 0 0</td>
</tr>
<tr>
<td>13</td>
<td>0 1 1 0 1</td>
<td>0 1 0 0 1</td>
<td>0 1 0 0 1</td>
<td>0 1 0 0 1</td>
<td>0 1 0 0 1</td>
</tr>
<tr>
<td>14</td>
<td>0 1 1 1 0</td>
<td>0 1 0 1 0</td>
<td>0 1 0 1 0</td>
<td>0 1 0 1 0</td>
<td>0 1 0 1 0</td>
</tr>
<tr>
<td>15</td>
<td>0 1 1 1 1</td>
<td>0 1 0 1 1</td>
<td>0 1 0 1 1</td>
<td>0 1 0 1 1</td>
<td>0 1 0 1 1</td>
</tr>
<tr>
<td>16</td>
<td>1 0 0 0 0</td>
<td>1 1 0 0 0</td>
<td>1 1 0 0 0</td>
<td>1 1 0 0 0</td>
<td>1 1 0 0 0</td>
</tr>
</tbody>
</table>

Correspondence table from Decimal to Binary, to Gray and to BCD.

### Interfaces

#### SSI Interface

In many cases, the data transmitted from one system to another are subjected to magnetic fields and noise, by using standard interfaces, such as RS-485, the effects of such interference can be reduced. The “Synchronous Serial Interface” (SSI) is an industrial output standard that only requires four lines for data transmission. This transmission system for absolute encoders provides several advantages with respect to traditional parallel transmission and asynchronous serial methods:

- Reduced component count.
- Simple code modification.
- Data transmission between the encoder and the receiver are controlled by the receivers clock signal.
- High transmission speeds in function of distance and the data block to be transmitted.
**Data format**
The clock signal produced by the PLC or device connected to the encoder intervenes in the transmission. When no data is being transmitted, the encoder data serial output remains at a “1” level. When the clock rising edge appears, data transmission commences. Each clock rising edge transmits one bit for the current position. The transmission commences with the Most Significant Bit (MSB) and ends with the Least Significant Bit (LSB). When the “n” position bits have been transmitted, the special bit(s) are transmitted (this is optional). When transmission is completed, the clock signal is stopped for \( t_m \) (while data transmission remains at “0”). This cause the monostable (Sload) to reset and update the encoder position, so that the encoder is once again ready to transmit the new position.

P: This is the parity bit. It is used to establish whether the transmitted data is correct or not. It is a logic level “1” if the total number of “1s” in the block is even. If this number is odd, then it will be a “0”.

A: This is the alarm bit. When it is a “1” it indicates insufficient power supply levels.

The total number of clock bits will be equal to the total number of resolution bits plus one. If the special bit is transmitted, an additional pulse must be added.

**CLK input circuit**
Since the clock signal is an input to the encoder, it is protected by means of an optical coupler, which electrically isolates the encoder from the PLC or similar. In this way, the encoder is protected against over-voltages and overloads.

**DATA output circuit**
This driver is supplied with a TTL signal at the input, which is converted into a differential signal at the output to cancel any possible noise that could interfere with the transmission.
**Analogue interface**

The analogue interface has two outputs: one provides the absolut position measurement as a voltage (0/10V), and the other as a current (0/20mA or 4/20mA). Both outputs come from a singleturn absolut encoder with a 12-bit resolution, with the 0 absolut position (0 degrees) having a value of 0V at the V+ output and 4 or 0 mA at the I+ output.

When the absolut position is 4095 (359 degrees) the V+ output will be 10V and the I+ output will be 20mA. These outputs consist of four wires (two per output) I+, I- and V+, V-. Thus forming two measurement loops. Depending on the measurement system implemented by the customer, one or the other output will be used.


---

**Output Current**

**Electrical specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output form</td>
<td>0/20mA or 4/20mA</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bits (4,096 positions) for 360º</td>
</tr>
<tr>
<td>Thermal stability</td>
<td>±20 ppm/ºC</td>
</tr>
<tr>
<td>Update frequency</td>
<td>100KHz</td>
</tr>
<tr>
<td>Linearity error</td>
<td>0.07% of the active angle</td>
</tr>
<tr>
<td>R(_{\text{LOAD}}) max</td>
<td>(\frac{(V_{\text{IN}} - 2 \text{V})}{20\text{mA}})</td>
</tr>
<tr>
<td>R(_{\text{LOAD}}) min</td>
<td>150Ω</td>
</tr>
</tbody>
</table>

---

**Output Voltage**

**Electrical specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output form</td>
<td>0/10V (Vcc min. = 12V)</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bits (4,096 positions) for 360º</td>
</tr>
<tr>
<td>Slew Rate</td>
<td>0.7V/us</td>
</tr>
<tr>
<td>Update frequency</td>
<td>100KHz</td>
</tr>
<tr>
<td>Linearity error</td>
<td>0.05% of the active angle</td>
</tr>
<tr>
<td>Load resistance</td>
<td>&gt;5kΩ</td>
</tr>
<tr>
<td>Protection against short circuit</td>
<td>Yes</td>
</tr>
</tbody>
</table>

---

**Parallel interface**

More or less cables are used in parallel mode communications, depending on the resolution. The PLC or similar must employ a digital input card and can have access to the encoder position without any requirement to be synchronised with anything.

The main advantages of the parallel output driver are:

- Tri-state output
- Protection against short circuit
- Protection against polarity inversion
- Diode protection against transients

---

**NPN Open Collector output**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output circuit</td>
<td>Line Driver</td>
</tr>
<tr>
<td>Output load capacity per channel</td>
<td>30mA</td>
</tr>
<tr>
<td>Recommended load resistance</td>
<td>1KΩ(24V)</td>
</tr>
<tr>
<td>Maximum frequency</td>
<td>300KHz</td>
</tr>
<tr>
<td>Protection against short circuit</td>
<td>Yes</td>
</tr>
</tbody>
</table>

---

**Push-Pull output**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output circuit</td>
<td>Line Driver</td>
</tr>
<tr>
<td>Output load capacity per channel</td>
<td>30mA</td>
</tr>
<tr>
<td>“High” signal level</td>
<td>Vcc-1.6V</td>
</tr>
<tr>
<td>“Low” signal level</td>
<td>0.4V</td>
</tr>
<tr>
<td>Maximum frequency</td>
<td>300KHz</td>
</tr>
<tr>
<td>Protection against short circuit</td>
<td>Yes</td>
</tr>
</tbody>
</table>
• Singleturn absolut encoder with shaft for industrial applications
• Resolution up to 13 bits (8,192 points per turn)
• Outside diameter 58 mm
• Shaft from 6 to 12 mm
• Protection class IP65 according to DIN 40050, IP67 stainless steel version available
• Any number of positions per turn available
• Programming by cable, switches or PC.
• Selection of direction, code, enable, store or reset
• Parallel, serial or analogue outputs available (0..10V, 4..20mA, 0..20mA)
• Output codes: Binary, Gray, Excess Gray, BCD
• Axial or radial connection, cable output or industrial connector

**TECHNICAL SPECIFICATIONS**

- **Body**: Aluminium or stainless steel.
- **Shaft**: Stainless steel.
- **Bearings**: Ball races.
- **Bearing lifetime**: 1x10^9 rev.
- **Maximum number of revolutions permitted mechanically**: 6,000 rpm.
- **Protection against dust and splashes in accordance with DIN 40050**: IP65 / IP67.
- **Rotor inertia moment**: 30 gcm².
- **Start-up torque at 20ºC (68ºF)**: Max. 2 Ncm.
- **Maximum load permitted on axial shaft**: 40 N.
- **Maximum load permitted on radial shaft**: 60 N.
- **Approximate weight**: 400 g.
- **Operating temperature range**: -10ºC to +70ºC.
- **Vibration**: 100 m/s² (10Hz...2000Hz).
- **Shock resistance**: 1000 m/s² (6ms).
- **Relative humidity**: 98% non-condensing.
- **Pre-delivery test**: 48h.
- **Maximum consumption**: 100 mA.
- **Supply voltage**: 10 - 30 Vdc (15 - 30 Vdc for analogue output).
- **Interface**:SSI, parallel or analogue.
- **Output electronics**: Push-Pull, NPN OC, RS485/422, 0/10V and 4/20mA or 0/20mA.
- **Configurable parameters**: Direction, Code, Store, Enable, Reset, Preset1 and Preset2.
- **Inputs**: Opto-coupled.
- **Available codes**: Binary, Gray, Excess Gray, BCD.
- **Maximum number of positions per turn**: 8,192 positions (13 bits).
- **Linearity**: ±1/2 LSB.
- **Axial or radial connection**: Cable (2 metres) or industrial connector.

1) Preset1 and Preset2 are only configurable by PC, the others can be configured by switch or cable.
Reference example: CSP10-21120113-8192

(*) To consult different flanges, page 46 - 47
(**) To consult connectors and connection diagrams, page 52 - 53
(***) Consult pages 28-31
SERIE CS30 / CSP30

- Singleturn absolut encoder with specially designed shaft for industrial applications
- Resolution up to 13 bits, (8,192 points per turn)
- Outside diameter 90 mm
- 11 or 12 mm shaft
- Protection class IP65 according to DIN 40050, IP67 stainless steel version available
- Any number of positions per turn available
- Programming by cable, switches or PC
- Selection of direction, code, enable, store or reset
- Parallel, serial or analogue outputs available (0..10V, 4..20mA, 0..20mA)
- Output codes: Binary, Gray, Excess Gray, BCD
- Axial or radial connection, cable output or industrial connector

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Body</th>
<th>Aluminium or stainless steel.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft</td>
<td>Stainless steel.</td>
</tr>
<tr>
<td>Bearings</td>
<td>Ballraces.</td>
</tr>
<tr>
<td>Bearing lifetime</td>
<td>$1 \times 10^{10}$ rev.</td>
</tr>
<tr>
<td>Maximum number of revolutions permitted mechanically</td>
<td>6,000 rpm.</td>
</tr>
<tr>
<td>Protection against dust and splashes in accordance with DIN 40050</td>
<td>IP65 / IP67.</td>
</tr>
<tr>
<td>Rotor inertia moment</td>
<td>270 gc㎡.</td>
</tr>
<tr>
<td>Start-up torque at 20°C (68°F)</td>
<td>Max. 5 Ncm.</td>
</tr>
<tr>
<td>Maximum load permitted on axial shaft</td>
<td>80 N.</td>
</tr>
<tr>
<td>Maximum load permitted on radial shaft</td>
<td>100 N.</td>
</tr>
<tr>
<td>Approximate weight</td>
<td>1.2 Kg.</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-10°C to +70°C.</td>
</tr>
<tr>
<td>Vibration</td>
<td>100 m/s² (10Hz...2000Hz).</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>1000 m/s² (6ms).</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>98% non-condensing.</td>
</tr>
<tr>
<td>Pre-delivery test</td>
<td>48h.</td>
</tr>
<tr>
<td>Maximum consumption</td>
<td>100 mA.</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>10 - 30 Vdc (15 - 30 Vdc for analogue output)</td>
</tr>
<tr>
<td>Interface</td>
<td>SSI, parallel or analogical.</td>
</tr>
<tr>
<td>Output electronics</td>
<td>Push-Pull, NPN OC, RS485/422, 0/10V and 4/20mA or 0/20mA.</td>
</tr>
<tr>
<td>Configurable parameters¹</td>
<td>Direction, Code, Store, Enable, Reset, Preset1 and Preset2.</td>
</tr>
<tr>
<td>Inputs</td>
<td>Opto-coupled.</td>
</tr>
<tr>
<td>Available codes</td>
<td>Binary, Gray, Excess Gray, BCD.</td>
</tr>
<tr>
<td>Maximum number of positions per turn</td>
<td>8,192 positions (13 bits).</td>
</tr>
<tr>
<td>Linearity</td>
<td>±1/2 LSB.</td>
</tr>
<tr>
<td>Axial or radial connection</td>
<td>Cable (2 metres) or industrial connector. (other cable lengths on order)</td>
</tr>
</tbody>
</table>

¹) Preset1 and Preset2 are only configurable by PC, the others can be configured by switch or cable.
REFERENCE

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SERIE</th>
<th>SHAFT</th>
<th>FLANGE</th>
<th>CONNEC-</th>
<th>AXIAL</th>
<th>RADIAL</th>
<th>INTERFACE</th>
<th>CODE</th>
<th>IP</th>
<th>OUTPUT</th>
<th>CONFIG.</th>
<th>RESOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C. Radial max: 20

| 1. | Without flange |
| 2. | Cable |
| 3. | 90.9509 |
| 4. | 90.9512 |
| 5. | 90.9516 |
| 6. | 90.9521 |
| 7. | 90.9526 |

1- Binary CW 2- Binary CCW 3- Gray CW 4- Gray CCW 5- Excess Gray CW 6- Excess Gray CCW 7- BCD CW 8- BCD CCW 9- Prog by PC S- Configuration by switch C- Configuration by cable

R- Reset S- Direction C- Code, Direction, Reset W- Code, Direction LED passing through zero E- Code, Direction Enable, Store

Reference example: CSP30-21510313-8192

(*) To consult different flanges, page 46 - 47
(**) To consult connectors and connection diagrams, page 52 - 53
(***) Consult pages 28-31

DIMENSIONS

CS 30

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø11 x 25 mm</td>
<td>1-</td>
</tr>
<tr>
<td>Ø12 x 25 mm</td>
<td>2-</td>
</tr>
</tbody>
</table>

C. Radial

3 threaded holes, M6x12 at 120°

CSP 30

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø11 x 25 mm</td>
<td>1-</td>
</tr>
<tr>
<td>Ø12 x 25 mm</td>
<td>2-</td>
</tr>
</tbody>
</table>

C. Radial

3 threaded holes, M6x12 at 120°

Sp. programming terminal, ref. 90.9505
SERIE CM10 / CMP10

- Multiturn absolut encoder with shaft for industrial applications
- Singleturn resolution up to 13 bits (8,192 points per turn)
- Multiturn resolution up to 12 bits (4,096 turns)
- Outside diameter 58 mm
- 6 or 10 mm shaft
- Protection class IP65 according to DIN 40050, IP67 stainless steel version available
- Programming by cable, switches or PC
- Selection of direction, code, enable, store, reset, preset1 and preset2
- Parallel or serial outputs available
- Output codes: Binary, Gray, BCD
- Axial or radial connection, cable output or industrial connector

TECHNICAL SPECIFICATIONS

Body ........................................................................................................... Aluminium or stainless steel.
Shaft ................................................................................................................ Stainless steel.
Bearings .......................................................................................................... Ballraces.
Bearing lifetime ............................................................................................ 1x10^6 rev.
Maximum number of revolutions permitted mechanically ................ 6,000 rpm.
Protection against dust and splashes in accordance with DIN 40050 ........ IP65 / IP67 Inox.
Rotor inertia moment .................................................................................. 30 gcm².
Start-up torque at 20°C (68°F) ................................................................. Max. 2 Ncm.
Maximum load permitted on axial shaft .................................................. 40 N.
Maximum load permitted on radial shaft .................................................. 60 N.
Approximate weight ................................................................................... 500 g.
Operating temperature range ...................................................................... -10°C to +70°C.
Vibration ........................................................................................................ 100 m/s² (10Hz...2000Hz).
Shock resistance ........................................................................................... 1000 m/s² (6ms).
Relative humidity .......................................................................................... 98% non-condensing.
Pre-delivery test ........................................................................................... 48h.
Maximum consumption ................................................................................ 150 mA.
Supply voltage ............................................................................................... 10 - 30 Vdc.
Interface ......................................................................................................... SSI, parallel.
Output electronics ........................................................................................... Push-Pull, NPN OC, RS485/422.
Configurable parameters¹ .......................................................................... Direction, Code, Store, Enable, Reset, Preset1 and Preset2.
Inputs .............................................................................................................. Opto-coupled.
Available codes ............................................................................................ Binary, Gray, BCD.
Maximum number of positions per turn .................................................... 8,192 positions (13 bits).
Maximum number of turns ......................................................................... 4,096 turns (12 bits).
Linearity ......................................................................................................... ±1/2 LSB.
Axial or radial connection .......................................................................... Cable (2 metres) or industrial connector.

¹) Preset1 and Preset2 are only configurable by PC, the others can be configured by switch or cable.
**REFERENCE**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SERIES</th>
<th>SHAFT</th>
<th>FLANGE</th>
<th>CONN.</th>
<th>AXIAL</th>
<th>INTERFACE</th>
<th>CODE</th>
<th>IP</th>
<th>POWER</th>
<th>CONFIG.</th>
<th>SINGLE</th>
<th>MULTITURN</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMP-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1- Without flange  
2- 90.1002  
3- 90.1003  
4- 90.1004  
5- 90.1005  
6- 90.1006 (*)

1- Axial  
2- Radial  
0- Parallel  
1- SSI  
1- IP65  
2- IP67

1- Binary CW  
2- Binary CCW  
3- Gray CW  
4- Gray CCW  
5- Excess Gray CW  
6- Excess Gray CCW  
7- BCD CW  
8- BCD CCW  
9- Prog by PC  
S- Configuration by switch  
C- Configuration by cable (***)

1- Ø10 x 20 mm  
2- Ø6 x 10 mm  
1- Cable  
3- 90.9512  
4- 90.9516  
5- 90.9521  
6- 90.9526 (**)  
1- Binary CW  
2- Binary CCW  
3- Gray CW  
4- Gray CCW  
5- Excess Gray CW  
6- Excess Gray CCW  
7- BCD CW  
8- BCD CCW  
9- Prog by PC  
S- Configuration by switch  
C- Configuration by cable (***)

Reference example: CM10-11121110W-8192-4096

(*) To consult different flanges, page 46 - 47

(**) To consult connectors and connection diagrams, page 52 - 53

(***) Consult pages 28-31

**DIMENSIONS**

**CM 10**

3 threaded holes M3 x 6 at 120°

**CMP 10**

3 threaded holes M3 x 6 at 120°

Reference example: CMP 10-11121110W-8192-4096

To consult different flanges, page 46 - 47

To consult connectors and connection diagrams, page 52 - 53

Consult pages 28-31
**SERIE CM30 / CMP30**

- Multiturn absolut encoder with specially designed shaft for extreme industrial applications
- Singleturn resolution up to 13 bits (8,192 points per turn)
- Multiturn resolution up to 12 bits (4,096 turns)
- Outside diameter 90 mm
- 11 or 12 mm shaft
- Protection class IP65 according to DIN 40050, IP67 stainless steel version available
- Programming by cable, switches or PC
- Parallel or serial outputs available
- Selection of direction, code, enable, store, reset, preset1 and preset2
- Output codes: Binary, Gray, BCD
- Axial or radial connection, cable output or industrial connector

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Aluminium or stainless steel</td>
</tr>
<tr>
<td>Shaft</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>Bearings</td>
<td>Ballraces</td>
</tr>
<tr>
<td>Bearing lifetime</td>
<td>1x10^10 rev.</td>
</tr>
<tr>
<td>Maximum number of revolutions permitted mechanically</td>
<td>6,000 rpm.</td>
</tr>
<tr>
<td>Protection against dust and splashes in accordance with DIN 40050</td>
<td>IP55.</td>
</tr>
<tr>
<td>Rotor inertia moment</td>
<td>270 gcm².</td>
</tr>
<tr>
<td>Start-up torque at 20°C (68°F)</td>
<td>Max. 5 Ncm.</td>
</tr>
<tr>
<td>Maximum load permitted on axial shaft</td>
<td>80 N.</td>
</tr>
<tr>
<td>Maximum load permitted on radial shaft</td>
<td>100 N.</td>
</tr>
<tr>
<td>Approximate weight</td>
<td>1.3 Kg.</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-10°C to +70°C.</td>
</tr>
<tr>
<td>Vibration</td>
<td>100 m/s² (10Hz...2000Hz).</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>1000 m/s² (6ms).</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>98% non-condensing.</td>
</tr>
<tr>
<td>Pre-delivery test</td>
<td>48h.</td>
</tr>
<tr>
<td>Maximum consumption</td>
<td>150 mA.</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>10 - 30 Vdc.</td>
</tr>
<tr>
<td>Interface</td>
<td>SSI, parallel.</td>
</tr>
<tr>
<td>Output electronics</td>
<td>Push-Pull, NPN OC, RS485/422.</td>
</tr>
<tr>
<td>Configurable parameters¹</td>
<td>Direction, Code, Store, Enable, Reset, Preset1 and Preset2.</td>
</tr>
<tr>
<td>Inputs</td>
<td>Opto-coupled.</td>
</tr>
<tr>
<td>Available codes</td>
<td>Binary, Gray, BCD.</td>
</tr>
<tr>
<td>Maximum number of positions per turn</td>
<td>8,192 positions (13 bits).</td>
</tr>
<tr>
<td>Maximum number of turns</td>
<td>4,096 turns (12 bits).</td>
</tr>
<tr>
<td>Linearity</td>
<td>±1/2 LSD.</td>
</tr>
<tr>
<td>Axial or radial connection</td>
<td>Cable (2 metres) or industrial connector.</td>
</tr>
<tr>
<td></td>
<td>(other cable lengths on order)</td>
</tr>
</tbody>
</table>

¹) Preset1 and Preset2 are only configurable by PC, the others can be configured by switch or cable.
**REFERENCE**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SERIE</th>
<th>SHAFT</th>
<th>FLANGE</th>
<th>CONN-</th>
<th>AXIAL</th>
<th>CODE</th>
<th>IP</th>
<th>POWER</th>
<th>CONFIG.</th>
<th>SINGLE</th>
<th>MULTI</th>
<th>RESOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CM** - Multturn

**CMP** - Multturn Programmable

1. Without flange
2. 90.1008
3. 90.9509
4. 90.9512
5. 90.9516
6. 90.9521
7. 90.9526

1. Cable
2. Ø11 x 25 mm
3. Ø12 x 25 mm

0. Parallel
1. SSI
2. IP65
3. IP67

1. Binary CW
2. Binary CCW
3. Gray CW
4. Gray CCW
5. Excess Gray CW
6. Excess Gray CCW
7. BCD CW
8. BCD CCW
9. Prog by PC
S. Configuration by switch
C. Configuration by cable

R. Reset
S. Dirección
C. Code, Direction, Reset
W. Code, Direction,
   LED passing through zero
E. Code, Direction, Enable, Store.

0. 10...30 Vdc RS485
1. 10...30 Vdc PNP
2. 10...30 Vdc NPN
3. 10...30 Vdc Push-Pull
4. 10...30 Vdc NPN OC

(*) To consult different flanges, page 46 - 47
(*** To consult connectors and connection diagrams, page 52 - 53
(****) Consult pages 28-31

**DIMENSIONS**

**CM 30**

Reference example: CM30-21610311S-4096-4096

3 threaded holes, M6x12 at 120°

**CMP 30**

3 threaded holes, M6x12 at 120°
**Coupling importance**

A large number of mechanical installations involve the problem of transmitting movement between the machine shafts. The coupling is the simplest manner of achieving this transmission since it works by joining the two ends of these shafts, thus transmitting rotation from one to the other. Not only does correct equipment operation depend on good resolution of the transmission problem, but also the useful lifetime of the encoders or coupled machines.

**Selection**

Coupling selection must be a compromise between factors, such as cost, available installation space, the required duration and transmission performance, which must satisfy requirements, such as:

- **Absorption of shaft misalignment and loads**
  
  Due to dimensional errors inherent in all mechanical installations, the shafts to be installed will maintain certain positional differences or “misalignment” between the two and this will hinder the transmission of movement. This misalignment may be axial, radial or angular.

- **For transmission**
  
  This is not important for measurement systems. For power drives, it should be verified that the torque to be transmitted is less than the rated torque given in the performance tables, with greater margins in accordance with the expected misalignment.

- **Kinematic precision**
  
  In measurement systems and high-precision drives, it is important that the coupling does not cause any positional phase differences between the shafts.

  All models in the ENCO-FLEX range are free from torsional play and only the OLDHAM may acquire a certain amount of free play after a time working with significant radial misalignment (and this can be corrected by replacing the disc). If the load torque or inertia in the driven shaft is significant, phase differences may be produced due to the torsional elasticity in the coupling. In such cases, the use of models that are not very rigid, such as the SPRING-FLEX or POLY-FLEX, should be avoided.

- **Rotation speed**
  
  The OLDHAM-FLEX and SPRING-FLEX flex models are not suitable for high-speed shafts, especially if there is significant misalignment. For the rest of the couplings, it must be taken into account that their useful lifetime depends on fatigue and hence the speed at which they operate.

- **Shaft securing**
  
  Couplings can be supplied that are fixed in place with retainers (two at 90°) or with a built-in clamp-flange. Clamp securing has the advantage of not producing any marks on the shafts, thus they are better able to withstand sharp inversions and vibration. Retainer securing are more economic and allow larger diameters to be employed for the same coupling. The inconvenience of retainers is that they can produce jags on the shafts. Moreover, they can work loose with vibration, but this can be avoided by using a semi-permanent adhesive.
The Enco-FLEX range of couplings is made up of four types, with the necessary sizes to cover from Ø4mm up to Ø14mm:

- **ALU-FLEX**: slotted flexible aluminium couplings
- **POLY-FLEX**: slotted flexible acetal couplings
- **SPRING-FLEX**: flexible helicoid spring couplings
- **OLDHAM-FLEX**: lateral slippage couplings

With this range, it is possible to resolve the usual transmission problems that can present themselves in measurement and control systems (encoder couplings) and power systems with small or moderate torsion torque levels.

All couplings are supplied with their associated specifications sheets and the corresponding DIN911 allen key for tightening the screws or retainers.

### THE ENCO-FLEX RANGE

#### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>Reference</th>
<th>Torque</th>
<th>Maximum speed</th>
<th>Maximum elastic misalignment</th>
<th>Elastic torsional constant</th>
<th>Mass</th>
<th>Inertia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Nominal</td>
<td>Static</td>
<td>Angular degree</td>
<td>Axial ±mm</td>
<td>Radial mm</td>
<td>N·m/rad</td>
</tr>
<tr>
<td>ALU-FLEX</td>
<td>91.131.d1.d2</td>
<td>0.3</td>
<td>1.8</td>
<td>20,000</td>
<td>2º</td>
<td>0.4</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>91.141.d1.d2</td>
<td>0.5</td>
<td>3.2</td>
<td>18,000</td>
<td>2º</td>
<td>0.4</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>91.151.d1.d2</td>
<td>1.2</td>
<td>6.0</td>
<td>12,000</td>
<td>2º</td>
<td>0.5</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>91.142.d1.d2</td>
<td>0.5</td>
<td>3.2</td>
<td>18,000</td>
<td>2º</td>
<td>0.4</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>91.152.d1.d2</td>
<td>1.2</td>
<td>6.0</td>
<td>12,000</td>
<td>2º</td>
<td>0.5</td>
<td>0.15</td>
</tr>
<tr>
<td>POLY-FLEX</td>
<td>91.231.d1.d2</td>
<td>0.5</td>
<td>1.4</td>
<td>10,000</td>
<td>10º</td>
<td>1.0</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>91.241.d1.d2</td>
<td>0.8</td>
<td>2.7</td>
<td>10,000</td>
<td>10º</td>
<td>1.0</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>91.251.d1.d2</td>
<td>1.5</td>
<td>5.7</td>
<td>8,000</td>
<td>8º</td>
<td>1.2</td>
<td>0.8</td>
</tr>
<tr>
<td>SPRING-FLEX</td>
<td>91.331.d1.d2</td>
<td>0.5</td>
<td>-</td>
<td>5,000</td>
<td>9º</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>91.341.d1.d2</td>
<td>1.0</td>
<td>-</td>
<td>5,000</td>
<td>9º</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>91.351.d1.d2</td>
<td>1.5</td>
<td>5.0</td>
<td>5,000</td>
<td>9º</td>
<td>1.2</td>
<td>0.3</td>
</tr>
<tr>
<td>OLDHAM-FLEX</td>
<td>91.541.d1.d2</td>
<td>1.6</td>
<td>10.2</td>
<td>2,500</td>
<td>2º</td>
<td>0.2</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>91.551.d1.d2</td>
<td>3.4</td>
<td>13.7</td>
<td>2,500</td>
<td>2º</td>
<td>0.2</td>
<td>2.8</td>
</tr>
<tr>
<td></td>
<td>91.561.d1.d2</td>
<td>8.0</td>
<td>48.1</td>
<td>2,000</td>
<td>2º</td>
<td>0.3</td>
<td>3.5</td>
</tr>
</tbody>
</table>

The values corresponding to torque and maximum speed are given for a perfect joint aligned at 20º.

#### Possible shaft diameters

We can supply the couplings with holes of any of the sizes specified in the table. The holes may be different at either end of the coupling. The hole diameter must be within the margin established for each coupling type and size. Please consult the tables for the maximum and minimum hole size for each model.

The standard size diameters are available from stock so we can immediately deliver these models (please consult the tables). The tolerance for all holes is ISO H8.
SLOTTED FLEXIBLE ALUMINIUM COUPLINGS
• No free play. They do not produce any speed variations in the transmission
• High torsional rigidity
• Available with retainers and built-in flange
• Maintenance-free
• Resistant to oils and chemical products
• Mechanical protection against excessive torque

ALU-FLEX are single flexible couplings in a single piece, machined from hardened aluminium alloy. On special order, we can manufacture them either anodised or stainless steel. They are suitable for transmissions that require moderate torque and when shaft misalignment is not very large. Mechanical fuse protection against excessive torque. These couplings are suitable for measurement and control systems, together with reduced torque drives. They permit transmission of very precise kinematic movement, without free-play and with low torsional elasticity. They are recommended for auxiliary machines, tachometric generators, potentiometers and encoders etc. The coupling will absorb errors in alignment and shaft installation.

DIMENSIONS

<table>
<thead>
<tr>
<th>Reference</th>
<th>D</th>
<th>Ød1 / Ød2</th>
<th>L</th>
<th>A</th>
<th>B</th>
<th>M: Securing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø15</td>
<td>Ø4</td>
<td>Ø6</td>
<td>6.6</td>
<td>23</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Ø19</td>
<td>Ø4</td>
<td>Ø9</td>
<td>6.6</td>
<td>23</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Ø24</td>
<td>Ø6</td>
<td>Ø14</td>
<td>10.10 - 12.12</td>
<td>31</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>Ø19</td>
<td>Ø4</td>
<td>Ø8</td>
<td>6.6</td>
<td>28</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Ø24</td>
<td>Ø6</td>
<td>Ø12</td>
<td>10.10</td>
<td>31</td>
<td>9</td>
<td>13</td>
</tr>
</tbody>
</table>

Elevation A is the maximum shaft depth inside the coupling. Elevation B is the minimum separation distance between shafts.

REFERENCE

<table>
<thead>
<tr>
<th>SERIE</th>
<th>TYPE</th>
<th>SIZE</th>
<th>SECURING</th>
<th>Ød1</th>
<th>Ød2</th>
</tr>
</thead>
<tbody>
<tr>
<td>91</td>
<td>1</td>
<td></td>
<td>1- Retainers</td>
<td>2- Built-in flange</td>
<td></td>
</tr>
</tbody>
</table>

Reference example: 91-141-4-6,35

See above table and page 41 for possible diameters.
POLY-FLEX S.

POLY-FLEX slotted flexible acetal couplings
- Absorption of significant angular and radial deviations
- Low inertia
- They do not produce any speed variations in the transmission
- Torsional vibration attenuation
- Electric and thermal insulation between the shafts
- Mechanical protection against excessive torque

POLY-FLEX flexible couplings manufactured in acetal are of reduced size for applications that do not require high torque and where there is significant shaft misalignment. The material provides excellent fatigue strength, which makes it very suitable for high-speed couplings. It absorbs torsional vibration and insulates the shafts both electrically and thermally, acting, where necessary as a mechanical fuse.

These couplings are suitable for measurement systems and machines that do not offer high resistant torque values. They are recommended for tachometric generators, potentiometers and encoders, etc.

POLY-FLEX couplings can be used in the temperature range of -30º to 85º.

**DIMENSIONS**

<table>
<thead>
<tr>
<th>Reference</th>
<th>D</th>
<th>Ød1 / Ød2</th>
<th>L</th>
<th>A</th>
<th>B</th>
<th>M: Securing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>min</td>
<td>max</td>
<td>Available in stock</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
</tr>
<tr>
<td>Ø15</td>
<td>Ø4</td>
<td>Ø6</td>
<td>4.4 6.6</td>
<td>20</td>
<td>5 10</td>
<td>DIN916</td>
</tr>
<tr>
<td>Ø19</td>
<td>Ø4</td>
<td>Ø9</td>
<td>6.6</td>
<td>20</td>
<td>5 10</td>
<td>DIN916</td>
</tr>
<tr>
<td>Ø24</td>
<td>Ø6</td>
<td>Ø14</td>
<td>6.6 10.10 12.12</td>
<td>25</td>
<td>6 13</td>
<td>DIN916</td>
</tr>
</tbody>
</table>

Elevation A is the maximum shaft depth inside the coupling. Elevation B is the minimum separation distance between shafts.

**REFERENCE**

<table>
<thead>
<tr>
<th>SERIE</th>
<th>TYPE</th>
<th>SIZE</th>
<th>SECURING</th>
<th>Ød1 INPUT DIAMETER</th>
<th>Ød2 OUTPUT DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>91</td>
<td>2</td>
<td></td>
<td>1- Retainers</td>
<td>See above table and page</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>41 for possible diameters</td>
<td></td>
</tr>
</tbody>
</table>

Reference example: 91-241-4-6,35
SPRING-FLEX couplings are based on the use of a helicoid spring as an elastic transmission element. These springs are constructed from stainless steel with an oval section. The ends of the springs are threaded and secured to the aluminium alloy cores. The result is a highly elastic coupling that enables very misaligned shafts to be coupled without the reactions on the bearings being excessively high. The coupling maintains its properties in both directions of rotation.

They are suitable for measurement systems and machines that do not offer high resistant torque values and where shaft misalignment may be significant or when variations are produced (heat expansion, vibration and movements etc). They are not recommended for very fast, high precision systems (they could cause resonance in closed positioning loops).

**DIMENSIONS**

Elevation A is the maximum shaft depth inside the coupling. Elevation B is the minimum separation distance between shafts.

<table>
<thead>
<tr>
<th>Reference</th>
<th>D</th>
<th>Ød1 / Ød2</th>
<th>L</th>
<th>M: Securing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø14.5</td>
<td>Ø4 Ø6</td>
<td>4.4 6.6</td>
<td>32</td>
<td>DIN916 M3 x 6 1.5 130</td>
</tr>
<tr>
<td>Ø19.7</td>
<td>Ø4 Ø9</td>
<td>6.6</td>
<td>39</td>
<td>DIN916 M4 x 6 2.0 310</td>
</tr>
<tr>
<td>Ø25.7</td>
<td>Ø6 Ø14</td>
<td>6.6 10.10 12.12</td>
<td>44</td>
<td>DIN916 M5 x 6 2.5 570</td>
</tr>
</tbody>
</table>

Reference example: 91-341-4-6,35

Reference D Ød1 / Ød2 L M: Securing

Available in stock mm

Type Tim Key Tightening torque N·cm

- : DIN916 M3 x 6 1.5 130
- : DIN916 M4 x 6 2.0 310
- : DIN916 M5 x 6 2.5 570

Elevation A is the maximum shaft depth inside the coupling. Elevation B is the minimum separation distance between shafts.

**REFERENCE**

Reference example: 91-341-4-6,35

1- Retainers

See above table and page 41 for possible diameters
OLDHAM-FLEX couplings are based on the use of a disc that can move radially with respect to the two shafts, which permits the compensation of large misalignment errors between them. The drums are machined from hardened aluminium alloy. The discs are manufactured from acetal with excellent mechanical properties and low friction coefficient. Due to wear, the coupling may show free-play above 107 revolutions under normal misalignment conditions, which can be corrected by replacing the disc. Because the OLDHAM-Flex couplings are fitted with securing drums with through holes, the discs can be installed and replaced without any need to disassemble the machines in order to separate the shafts. Radial misalignment does not produce any appreciable kinematic errors in transmission. However, angular misalignment can lead to small errors in a similar fashion to “Cardan” types of universal joints. They are suitable for positioning shaft slow drives, spindles and valves, etc. They must never be employed with cantilever or paired shafts.

**DIMENSIONS**

| Reference | D | Ød1 / Ød2 | L | A | B | M: Securing | Type | Dim | Key | Tightening torque N·cm |
|-----------|=|=|=|=|=|=|=|=|=|=|
| 91.541.d1.d2 | Ø19.7 | Ø4 | Ø8 | 4.4 | 6.6 | 22 | 8 | 10 | DIN916 | M3 x 6 | 1.5 | 130 |
| 91.551.d1.d2 | Ø24.7 | Ø7 | Ø10 | 6.6 | 30 | 10 | 11 | DIN916 | M4 x 6 | 2.0 | 310 |
| 91.561.d1.d2 | Ø33.3 | Ø9 | Ø14 | 6.6 | 10.10 | 12.12 | 49 | 13 | 16 | DIN916 | M5 x 6 | 2.5 | 570 |

Elevation A is the maximum shaft depth inside the coupling. Elevation B is the minimum separation distance between shafts.

**REFERENCE**

| SERIE | TYPE | SIZE | SECURING | Ød1 | Ød2 |
|-------|=|=|=|=|=|
| 91 | 5 | Ø19.7 | Ø24.7 | Ø29.6 |

Reference example: 91-541-4-6,35

See above table and page 41 for possible diameters
Standard flanges

<table>
<thead>
<tr>
<th>Reference</th>
<th>Appropriate series</th>
<th>Suitable securing screws</th>
</tr>
</thead>
<tbody>
<tr>
<td>90.1002</td>
<td>10, 20, CM10, CS10</td>
<td>M3 x 6 DIN84, DIN85, DIN7985, DIN7984</td>
</tr>
<tr>
<td>90.1003</td>
<td>10, 20, CM10, CS10</td>
<td>M3 x 8 DIN84, DIN85, DIN7985, DIN7984</td>
</tr>
<tr>
<td>90.1004</td>
<td>10, 20, CM10, CS10</td>
<td>M3 x 6 DIN84, DIN85, DIN7985, DIN7984</td>
</tr>
<tr>
<td>90.1005</td>
<td>10, 20, CM10, CS10</td>
<td>M3 x 10 DIN963, DIN965</td>
</tr>
<tr>
<td>90.1006</td>
<td>10, 20, CM10, CS10</td>
<td>M3 x 10 DIN912</td>
</tr>
<tr>
<td>90.1008</td>
<td>30, CS30</td>
<td>M3 x 10 DIN7991</td>
</tr>
</tbody>
</table>

Manufactured in aluminium alloy and anodised.
Syncro-flange type
In aluminium alloy and anodised (we recommend three flanges per encoder). They enable the encoder to be installed in any angular position.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Suitable series</th>
<th>Securing screws</th>
</tr>
</thead>
<tbody>
<tr>
<td>90.1103</td>
<td>58, CM30, (1)</td>
<td>M4 x 12 DIN84, DIN912</td>
</tr>
<tr>
<td>90.1105</td>
<td>58, 20, (2)</td>
<td>M4 x 12 DIN84, DIN912</td>
</tr>
</tbody>
</table>

(1) Also suitable for series 10 and CS10 with flange 90.1003.
(2) Also suitable for series 10 and CS10 with flange 90.1004.

Elastic flange
In AISI304 bright stainless steel. Suitable for securing hollow shaft encoders. Prevents overloading of the encoder bearings by absorbing jumps caused by shaft eccentricity. It requires three M4 threaded holes distributed around a 62 mm diameter.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Suitable series</th>
<th>Securing screws</th>
</tr>
</thead>
<tbody>
<tr>
<td>90.1014</td>
<td>19, 59</td>
<td>M4 x 6 DIN912, DIN84</td>
</tr>
<tr>
<td>90.1024</td>
<td>19, 59</td>
<td>M4 x 6 DIN912, DIN84</td>
</tr>
</tbody>
</table>

Assembly:
1) Screw the coupling strip to the encoder using screws (A).
2) Secure the encoder to the machine shaft and screw the retainers or clamp.
3) Secure the coupling shaft to the machine using screws (B).
Support angles

<table>
<thead>
<tr>
<th>Reference</th>
<th>Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>90.1201</td>
<td>30, CS30, CM30</td>
</tr>
<tr>
<td>90.1207</td>
<td>10, 20, 58, CS10, CM10</td>
</tr>
<tr>
<td>90.1208</td>
<td>21</td>
</tr>
<tr>
<td>90.1205</td>
<td>30, CS30, CM30</td>
</tr>
<tr>
<td>90.1206</td>
<td>10, 20, 58, CS10, CM10</td>
</tr>
</tbody>
</table>
## Measurement wheels

<table>
<thead>
<tr>
<th>Type</th>
<th>Knurled aluminium</th>
<th>Rubber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>90.9101</td>
<td>90.9111</td>
</tr>
<tr>
<td>Travel (mm)</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Diameter Ø D</td>
<td>63.66 mm</td>
<td>63.66 mm</td>
</tr>
<tr>
<td>Shaft Ø d</td>
<td>6 mm</td>
<td>6 mm</td>
</tr>
<tr>
<td>Width B</td>
<td>12 mm</td>
<td>12 mm</td>
</tr>
<tr>
<td>M (DIN916)</td>
<td>M4 x 6</td>
<td>M4 x 6</td>
</tr>
</tbody>
</table>

**PINION**
- Reference ........... 90.9307
- Material ............ Treated steel
- Module .............. m = DP32 (0,79375)
- Teeth ............... Z = 20

**RACK**
- Reference ........... 90.9306
- Material ............ Steel
- Module .............. m = 0,79577
- Pitch ............... p = 2,5 mm
- There is the possibility of joining several sections
- TRAVEL ................ 1 turn = 50 mm
- Other travels available on order

## Rack and pinion system

This system consists of a modular, straight tooth pinion and a special rack with a modified pitch that achieves an exact movement of 50 mm per turn of the pinion, something that is not possible with conventional racks. If the pinion is secured directly to the encoder shaft, then a flexible support angle should be employed so that the bearings are not excessively loaded.
**EXTENDIBLE CABLE MEASUREMENT SYSTEM**

ENCO-METER systems provide the means of simple, quick economic rotating sensor devices (encoders, and potentiometers etc.) of linear distance measurements of up to eight metres for machines with slow movement, without any sharp acceleration and with an average number of manoeuvres. They consist of a stainless steel micro-cable that has to be connected to the machine’s moving element at its free end. Inside the unit, the other end of the cable is wound on to a precision drum with a leaf spring to maintain it under constant tension. The drum shaft can drive any type of rotating sensor.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Model</th>
<th>EM4</th>
<th>EM8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>90.1401</td>
<td>90.1402</td>
</tr>
<tr>
<td>Travel</td>
<td>200 mm ±0.06 / turn</td>
<td>250 mm ±0.06 / turn</td>
</tr>
<tr>
<td>Cable (1)</td>
<td>Ø0.61 AISI316 stainless steel (structure 19 x 7 + 0)</td>
<td></td>
</tr>
<tr>
<td>Measurement range, up to (mm)</td>
<td>1000</td>
<td>2000</td>
</tr>
<tr>
<td>Maximum cable extension (mm)</td>
<td>1010</td>
<td>2010</td>
</tr>
<tr>
<td>Minimum cable static tension</td>
<td>3 N</td>
<td>6 N</td>
</tr>
<tr>
<td>Maximum cable static tension</td>
<td>7.8 N</td>
<td>8.2 N</td>
</tr>
<tr>
<td>Maximum extension acceleration (2)</td>
<td>35 m/s²</td>
<td>30 m/s²</td>
</tr>
<tr>
<td>Maximum recovery acceleration (2)</td>
<td>14 m/s²</td>
<td>10 m/s²</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>1m/s</td>
<td>0.75 m/s</td>
</tr>
<tr>
<td>Protection against dust and splashes</td>
<td>IP51 according to DIN 40050</td>
<td></td>
</tr>
</tbody>
</table>

(1) Other types of cables are possible on special order.
(2) We can supply EM4s with double drive torque, permitting the recovery acceleration to be doubled.

### Output devices

On order, we can supply the ENCO-METER already coupled to an electronic output device that could be an incremental or absolut encoder or a potentiometer.

If it is required to obtain a determined resolution "r" (mm per pulse) in the case of using an absolut or incremental encoder, the number of encoder pulses will be:

\[ n = \frac{D}{r} \]  
(D is ENCO-METER movement in mm)

Using a potentiometer, an output "r" ratio (in Ω per mm) is obtained in accordance with:

\[ r = \frac{R}{D \times n} \]  
(R is the rated resistance and “n” is the maximum number of turns)

As standard, we have potentiometers of R=10K and n=10 turns available in stock. It must be taken into consideration that the mechanical travel of the potentiometer may limit the ENCO-METER measurement range.

### INSTALLATION

ENCO-METER units are secured to a flat machine surface by means of three or four M14 screws. Any installation position is possible. The cable must be correctly aligned (\(\alpha < 2^\circ\)) and under no circumstances must it exceed the measurement range.
**CONNECTORS AND CONNECTION DIAGRAMS**

90.9504
- Connector: Din 43650
- Material: Plastic
- Number of poles: 3 + E

90.9507
- Connector: Mil. 7p timer
- Material: Aluminium
- Number of poles: 7

90.9512
- Connector: Circular 12p timer
- Material: Cu Alloy Nickel-plated
- Number of poles: 12

90.9521
- Connector: Circular 21p timer
- Material: Cu Alloy Nickel-plated
- Number of poles: 21

90.9537
- Connector: DIN 37p for overhead installation
- Material: Plastic
- Number of poles: 37

90.9505
- Connector: Circular 5p
- Material: Nickel-plated bronze
- Number of poles: 5

90.9510
- Connector: Mil. 10p timer
- Material: Aluminium
- Number of poles: 10

90.9516
- Connector: Circular 16p timer
- Material: Cu Alloy Nickel-plated
- Number of poles: 16

90.9526
- Connector: Circular 26p timer
- Material: Cu Alloy Nickel-plated
- Number of poles: 26

90.9589
- Connector: DIN 9p
- Material: Plastic
- Number of poles: 9
**INCREMENTAL ENCODER CONNECTION**

<table>
<thead>
<tr>
<th>5x0.14 Cable</th>
<th>6x0.14+2x0.34 Cable</th>
<th>90.9504</th>
<th>90.9505</th>
<th>90.9507</th>
<th>90.9510</th>
<th>90.9512</th>
<th>90.9589</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND</td>
<td>Yellow</td>
<td>Black</td>
<td>1</td>
<td>1</td>
<td>A</td>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>Vcc</td>
<td>White</td>
<td>Red</td>
<td>2</td>
<td>2</td>
<td>B</td>
<td>B</td>
<td>2</td>
</tr>
<tr>
<td>A</td>
<td>Brown</td>
<td>Yellow</td>
<td>3</td>
<td>3</td>
<td>C</td>
<td>C</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>Green</td>
<td>Green</td>
<td>4</td>
<td>4</td>
<td>D</td>
<td>D</td>
<td>4</td>
</tr>
<tr>
<td>A complementary</td>
<td>Brown</td>
<td>4</td>
<td>5</td>
<td>E</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>B complementary</td>
<td>Blue</td>
<td>4</td>
<td>5</td>
<td>G</td>
<td>F</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>0 (reference)</td>
<td>Grey</td>
<td>Grey</td>
<td>4</td>
<td>5</td>
<td>G</td>
<td>G</td>
<td>7</td>
</tr>
<tr>
<td>0 complementary</td>
<td>Grey</td>
<td>Orange</td>
<td>4</td>
<td>5</td>
<td>G</td>
<td>H</td>
<td>8</td>
</tr>
</tbody>
</table>

**CS / CSP PARALLEL OUTPUT CONNECTION**

<table>
<thead>
<tr>
<th>15 x 0.14 Cable</th>
<th>25 x 0.14 Cable</th>
<th>90.9512</th>
<th>90.9516</th>
<th>90.9521</th>
<th>90.9526</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND</td>
<td>Black</td>
<td>Black</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vcc</td>
<td>Red</td>
<td>Red</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Data 0</td>
<td>Brown</td>
<td>Brown</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Data 1</td>
<td>White</td>
<td>White</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Data 2</td>
<td>Yellow</td>
<td>Yellow</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Data 3</td>
<td>Green</td>
<td>Green</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Data 4</td>
<td>Orange</td>
<td>Pink</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Data 5</td>
<td>Violet</td>
<td>Orange</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Data 6</td>
<td>Grey</td>
<td>Grey</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Data 7</td>
<td>Blue</td>
<td>Blue</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Data 8</td>
<td>White - Black</td>
<td>Yellow - Black</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Data 9</td>
<td>White - Red</td>
<td>Yellow - Red</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Data 10</td>
<td>White - Brown</td>
<td>Yellow - Brown</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Data 11</td>
<td>White - Yellow</td>
<td>Yellow - Green</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Data 12</td>
<td>White - Blue</td>
<td>Yellow Grey</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Data 13</td>
<td>White - Black</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Data 14</td>
<td>White - Red</td>
<td>Yellow - Green</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Data 15</td>
<td>White - Brown</td>
<td>Yellow - Blue</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Data 16</td>
<td>White - Red</td>
<td>White - Red</td>
<td>19</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Data 17</td>
<td>White - Green</td>
<td>White - Brown</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Data 18</td>
<td>White - Pink</td>
<td>White - Green</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Data 19</td>
<td>White - Orange</td>
<td>White - Pink</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Data 20</td>
<td>White - Grey</td>
<td>White - Orange</td>
<td>23</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Data 21</td>
<td>White - Blue</td>
<td>White - Grey</td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Data 22</td>
<td>White - Blue</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Data 23</td>
<td>Green - Black</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>26</td>
</tr>
</tbody>
</table>

**CM / CMP PARALLEL OUTPUT CONNECTION**

<table>
<thead>
<tr>
<th>15 x 0.14 Cable</th>
<th>25 x 0.14 Cable</th>
<th>36 x 0.14 Cable</th>
<th>90.9512</th>
<th>90.9516</th>
<th>90.9521</th>
<th>90.9526</th>
<th>90.9537</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND</td>
<td>Black</td>
<td>Black</td>
<td>Black</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vcc</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Data 0</td>
<td>Brown</td>
<td>Brown</td>
<td>Brown</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Data 1</td>
<td>White</td>
<td>White</td>
<td>Yellow</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Data 2</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Data 3</td>
<td>Orange</td>
<td>Pink</td>
<td>Pink</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Data 4</td>
<td>Violet</td>
<td>Orange</td>
<td>Orange</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Data 5</td>
<td>Grey</td>
<td>Grey</td>
<td>Grey</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Data 6</td>
<td>Blue</td>
<td>Blue</td>
<td>Blue</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Data 7</td>
<td>White - Black</td>
<td>Yellow - Black</td>
<td>Yellow - Black</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Data 8</td>
<td>White - Red</td>
<td>Yellow - Red</td>
<td>White - Red</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Data 9</td>
<td>White - Brown</td>
<td>Yellow - Brown</td>
<td>White - Brown</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Data 10</td>
<td>White - Yellow</td>
<td>Yellow - Green</td>
<td>Yellow - Green</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Data 11</td>
<td>White - Blue</td>
<td>Yellow Grey</td>
<td>Yellow Grey</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Data 12</td>
<td>White - Black</td>
<td>Yellow - Blue</td>
<td>Yellow - Grey</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Data 13</td>
<td>White - Red</td>
<td>Yellow - Blue</td>
<td>Yellow - Grey</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Data 14</td>
<td>White - Brown</td>
<td>White - Red</td>
<td>White - Red</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Data 15</td>
<td>White - Green</td>
<td>White - Brown</td>
<td>White - Brown</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Data 16</td>
<td>White - Pink</td>
<td>White - Green</td>
<td>White - Green</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Data 17</td>
<td>White - Orange</td>
<td>White - Pink</td>
<td>White - Pink</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Data 18</td>
<td>White - Grey</td>
<td>White - Orange</td>
<td>White - Orange</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Data 19</td>
<td>White - Blue</td>
<td>White - Grey</td>
<td>White - Grey</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Data 20</td>
<td>White - Black</td>
<td>White - Blue</td>
<td>White - Blue</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Data 22</td>
<td>White - Orange</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data 23</td>
<td>Green - Black</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**STOR**

Only special inputs. In the case of employing RES, DIR, EN, STOR the corresponding pins or wires will be occupied by these inputs and enables as data outputs.

**CS AND CM SSI OUTPUT CONNECTIONS**

<table>
<thead>
<tr>
<th>6x0.14+2x0.34 Cable</th>
<th>90.9512</th>
<th>90.9589</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND</td>
<td>Black</td>
<td>1</td>
</tr>
<tr>
<td>Vcc</td>
<td>Red</td>
<td>2</td>
</tr>
<tr>
<td>Data +</td>
<td>Yellow</td>
<td>3</td>
</tr>
<tr>
<td>Data -</td>
<td>Green</td>
<td>4</td>
</tr>
<tr>
<td>Clock +</td>
<td>Brown</td>
<td>5</td>
</tr>
<tr>
<td>Clock -</td>
<td>Blue</td>
<td>6</td>
</tr>
</tbody>
</table>

**CS ANALOGUE OUTPUT CONNECTION**

<table>
<thead>
<tr>
<th>6x0.14+2x0.34 Cable</th>
<th>90.9512</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND</td>
<td>Black</td>
</tr>
<tr>
<td>Vcc</td>
<td>Red</td>
</tr>
<tr>
<td>I+</td>
<td>Yellow</td>
</tr>
<tr>
<td>I-</td>
<td>Brown</td>
</tr>
<tr>
<td>V+</td>
<td>Green</td>
</tr>
<tr>
<td>V-</td>
<td>Blue</td>
</tr>
<tr>
<td>DIR</td>
<td>Grey</td>
</tr>
<tr>
<td>RES</td>
<td>White - Blue</td>
</tr>
</tbody>
</table>

1) Only special inputs. In the case of employing RES, DIR, EN, STOR the corresponding pins or wires will be occupied by these inputs and enables as data outputs.
• Incremental encoder for severe environments
• Certified: 1 M2 EEx d1 (Ta -20ºC to + 60ºC)
  112GD EEx d11C T6 (Ta -20ºC to +60ºC)
Certificate n°: Sira 02ATEX1018
• Protection class IP66 or IP67 according to DIN 40050, NEMA 6

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body/cover</td>
<td>Stainless steel.</td>
</tr>
<tr>
<td>Shaft</td>
<td>Stainless steel.</td>
</tr>
<tr>
<td>Bearings</td>
<td>6001-2Z / 61804 - 2RZ.</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP66 / IP67.</td>
</tr>
<tr>
<td>Rotor inertia moment</td>
<td>275 gm-cm².</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>3,000 rpm.</td>
</tr>
<tr>
<td>Start-up torque</td>
<td>6 Ncm.</td>
</tr>
<tr>
<td>Maximum load permitted on axial shaft</td>
<td>10 N.</td>
</tr>
<tr>
<td>Maximum load permitted on radial shaft</td>
<td>10 N.</td>
</tr>
<tr>
<td>Approximate weight</td>
<td>4 Kg.</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-20ºC to +60ºC.</td>
</tr>
<tr>
<td>Maximum frequency</td>
<td>150 kHz.</td>
</tr>
<tr>
<td>Consumption</td>
<td>50mA.</td>
</tr>
<tr>
<td>Resolution</td>
<td>Max. 5,000 imp.</td>
</tr>
<tr>
<td>Connection</td>
<td>Screened cable, water, salt, oil and flame-resistant.</td>
</tr>
</tbody>
</table>

**DIMENSIONS**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>500 mm</td>
</tr>
<tr>
<td>Thickness</td>
<td>25 mm</td>
</tr>
<tr>
<td>Width</td>
<td>23 mm</td>
</tr>
<tr>
<td>Height</td>
<td>20 mm</td>
</tr>
<tr>
<td>Shaft Size</td>
<td>12 x 25 mm</td>
</tr>
</tbody>
</table>

**REFERENCE**

<table>
<thead>
<tr>
<th>SERIE</th>
<th>SHAFT</th>
<th>ELECTRONIC OUTPUT</th>
<th>CONNECTION</th>
<th>OUTPUT</th>
<th>RESOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>DXE</td>
<td>K1-</td>
<td></td>
<td>3- 10 m of cable</td>
<td>A- Axial</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5- 20 m of cable</td>
<td>R- Radial</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13- 5..24V Line driver (AÂ®+BÂ®+00)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16- 5..24V NPN Open colector (AÂ®+BÂ®+00)</td>
</tr>
</tbody>
</table>
GENERAL SALES CONDITIONS

1. Application
These Sales Conditions constitute an agreement between the parties in relation to the products that are acquired under these same conditions. Any additional or different terms and conditions shall not have affect when these correspond to the purchaser. The acceptance of any delivery made under these conditions indicates their full acceptance by the purchaser.

2. Confirmation
All orders made by the purchaser are subject to written confirmation from Hohner.

3. Prices
Unless indicated in the contract otherwise in writing by Hohner, the offered prices are valid for a period of thirty (30) days, counting from the offer date, or prior to this when e validity period for making orders expires, in accordance with the purchase-sale contract in relation to the conditions under which such offers have been made.

4. Deliveries
Deliveries are subject to the Hohner delivery plan. The latter shall make all reasonable efforts to carry out delivery on the offered date, but without any failure to do so incurring any responsibility whatsoever.

5. Delays in compliance
Hohner shall not be held responsible for any delays in compliance or non-compliance due to unforeseen circumstances or causes outside its control. In the case where any delays due to causes outside its control continue for a period of time exceeding six (6) months, either of the parties may cancel the contract for those products not delivered.

6. Payment conditions
The sale prices issued by Hohner, shall be satisfied by the Purchaser within a period of time not exceeding thirty (30) natural days counting from the delivery date of the goods. Hohner reserves the right to modify or demand any of the described payment conditions when, in its opinion, the financial circumstances or payment history of the Purchaser so indicate.

7. Insolvency
In the case where either of the two parties is affected by declaration or temporary receivership or bankruptcy, whether voluntary or out of necessity, or in the case in which any agreement is made to cede any assets to third party creditors, the other party may cancel this contract. Under such circumstances and in accordance with the stipulated Reserve of Domain, Hohner shall opt for separation of sold item, repossessing the received partial payments from the Purchaser's assets, after having deducted from the total amount, that corresponding to the damages and losses that are determined in accordance with current usage and law Exceptionally Hohner shall not make use of the Reserve of Domain Agreement, when those administering or managing the Purchaser’s assets, under the stated circumstances subrogate the obligations of the pending payments.

8. Guarantee
A) ALL HOHNER PRODUCTS ARE GUARANTEED against defects in materials and labour. During the guarantee period Hohner may decide to repair or replace THOSE COMPONENTS THAT ARE PROVEN DEFECTIVE.
B) GUARANTEE LIMITATIONS. Under the preceding terms, the guarantee shall not be applicable in the case of defects caused by: 1- Inadequate or inappropriate maintenance by the Purchaser. 2- The production by the Purchaser of incorrect interfaces. 3- Unauthorised modifications or abuse. 4- Operations outside the environmental conditions established for the product. 5- Inadequate preparation and maintenance of the installation site. C) COMMENCEMENT OF THE GUARANTEE PERIOD. The guarantee period shall commence from the delivery date.
D) GUARANTEE PERIOD AND ASSOCIATED SERVICES. The guarantee period and the provision of services INCLUDES SIX (6) MONTHS DURATION, BUT EXCLUDES LABOUR AND ANY INVOLVED TRAVELLING EXPENSES. Within the area of travel defined by Hohner within the national borders, all services under guarantee for the products installed by the latter, shall be carried out without any charge to the Purchaser. Outside the described area of travel, all services under guarantee, shall be carried out on the requirement of the Purchaser, with prior agreement with Hohner, with the Purchaser being responsible for all travelling expenses. In any case, the products shall be returned to Hohner for those services determined by the latter. For those products that lack a defined travel area, those services that have to be provided at the installation site shall be provided at its initial point. If the products covered by this guarantee have been moved to another installation site so that the corresponding guarantee services have to be carried out at a location other than the initial installation site, then the guarantee will continue to be valid only if the Purchaser undertakes to accept an additional inspection and installation at the new site.
F) SHIPPING COSTS, ETC. The purchaser shall pay, in advance, for any shipping charges required for those products that are returned to Hohner so that the corresponding guarantee service may be carried out, and Hohner shall be responsible for the corresponding costs for returning them. However, the Purchaser shall be responsible for all shipping, legal and tax costs for any products shipped to Hohner from abroad.
G) There are no other guarantee undertakings, either expressed or implied in the previously described conditions. Under no circumstances shall Hohner guarantee the marketability or suitability for any specific and particular application.

9. Technical modifications
Hohner reserves the right to modify, at any time, the design or specifications of the products referred to in these General Sales Conditions.

10. Other stipulations
a) If Hohner decides not to exercise any of the rights corresponding to it by virtue of this contract, then under no circumstances shall this be construed as the renunciation or loss of such rights.
b) With express renouncement of any other corresponding legal jurisdiction, the involved parties agree to be bound by the judges and tribunals of Barcelona for whatever litigious matters that affect the interpretation and application of the terms of this Contract.