



# HEIDENHAIN



Product Information


## **ECN 200 Series**

Absolute Angle Encoders

October 2009

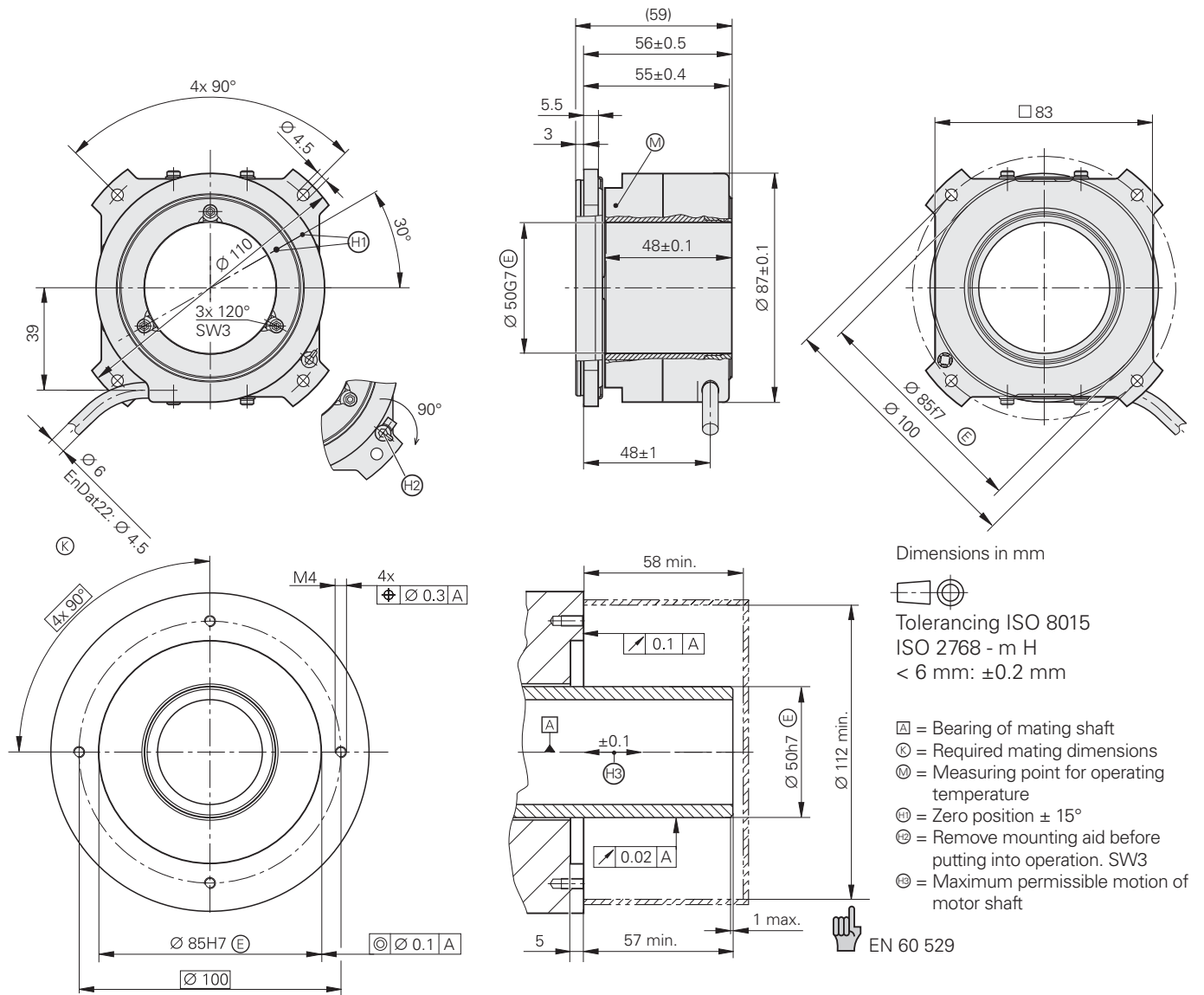
# ECN 200 Series

- Absolute angle encoder with mounted stator coupling
- Hollow through shaft with  $\varnothing 20$  mm and  $\varnothing 50$  mm

|   | ECN 225  |   | ECN 223F                            | ECN 223M                               |
|---|--|---|-------------------------------------|--|
| <b>Absolute position values</b>                     | EnDat 2.2  | EnDat 2.2   | Fanuc 02 serial interface           | Mitsubishi High Speed Serial Interface |
| Ordering designation                                | EnDat 22   | EnDat 02  | Fanuc 02                            | With 02-4                              |
| Positions per revolution                            | 33554432 (25 bits)   |   | 8388608 (23 bits)                   |  |
| Elec. permissible speed                             | 3000 min <sup>-1</sup>   |   |                                     |  |
| Clock frequency                                     | ≤ 8 MHz  | ≤ 2 MHz   | –                                   |  |
| Calculation time $t_{cal}$                          | 5 $\mu$ s  |   | –                                   |  |
| <b>Incremental signals</b>                          | –  |  1 V <sub>pp</sub> | –                                   |  |
| Line count  | –  | 2048  | –                                   |  |
| Cutoff frequency –3 dB                              | –  | ≥ 200 kHz   | –                                   |  |
| <b>Recommended measuring step</b>                   | 0.00001° (approx. 0.04")   |   | 0.00004° (approx. 0.15")            |  |
| <b>System accuracy</b>                              | ± 10"  |   |                                     |  |
| <b>Power supply</b>                                 | 3.6 V to 5.25 V max. 200 mA (without load)   |   |                                     |  |
| <b>Electrical connection*</b>                       | Cable 1 m, with M12 coupling   | Cable 1 m, with M23 coupling  | Cable 1 m, with M12 or M23 coupling |  |
| <b>Cable length</b><br>with HEIDENHAIN cable        | ≤ 150 m  |   | ≤ 30 m                              |  |
| <b>Shaft*</b>                                       | Hollow through shaft D = 20 mm, 50 mm  |   |                                     |  |
| <b>Mech. permissible speed</b>                      | ≤ 3000 min <sup>-1</sup>   |   |                                     |  |
| <b>Starting torque</b><br>at 20 °C                  | <i>D = 20 mm:</i> ≤ 0.1 Nm<br><i>D = 50 mm:</i> ≤ 0.15 Nm  |   |                                     |  |
| <b>Moment of inertia</b> of rotor                   | <i>D = 20 mm:</i> 138 · 10 <sup>-6</sup> kgm <sup>2</sup><br><i>D = 50 mm:</i> 215 · 10 <sup>-6</sup> kgm <sup>2</sup> |   |                                     |  |
| <b>Natural frequency</b>                            | ≥ 1000 Hz  |   |                                     |  |
| <b>Permissible axial motion of measured shaft</b>   | ± 0.1 mm   |   |                                     |  |
| <b>Vibration</b> 55 to 2000 Hz<br><b>Shock</b> 6 ms | ≤ 100 m/s <sup>2</sup> (EN 60068-2-6)<br>≤ 1000 m/s <sup>2</sup> (EN 60068-2-27)                                       |   |                                     |  |
| <b>Max. operating temp.</b>                         | 70 °C  |   |                                     |  |
| <b>Min. operating temp.</b>                         | <i>Moving cable:</i> –10 °C<br><i>For fixed cable:</i> –20 °C  |   |                                     |  |
| <b>Protection</b> EN 60529                          | IP 64  |   |                                     |  |
| <b>Weight</b>                                       | <i>D = 20 mm:</i> 0.8 kg<br><i>D = 50 mm:</i> 0.7 kg   |   |                                     |  |

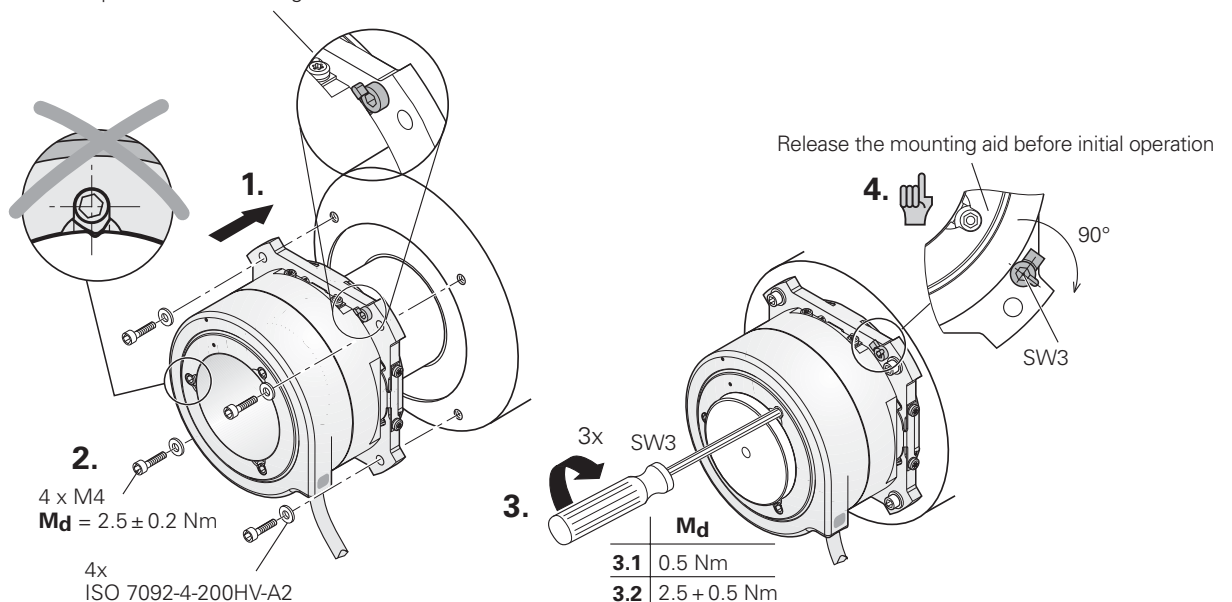
\* Please select when ordering

# Hollow Shaft D = 50 mm

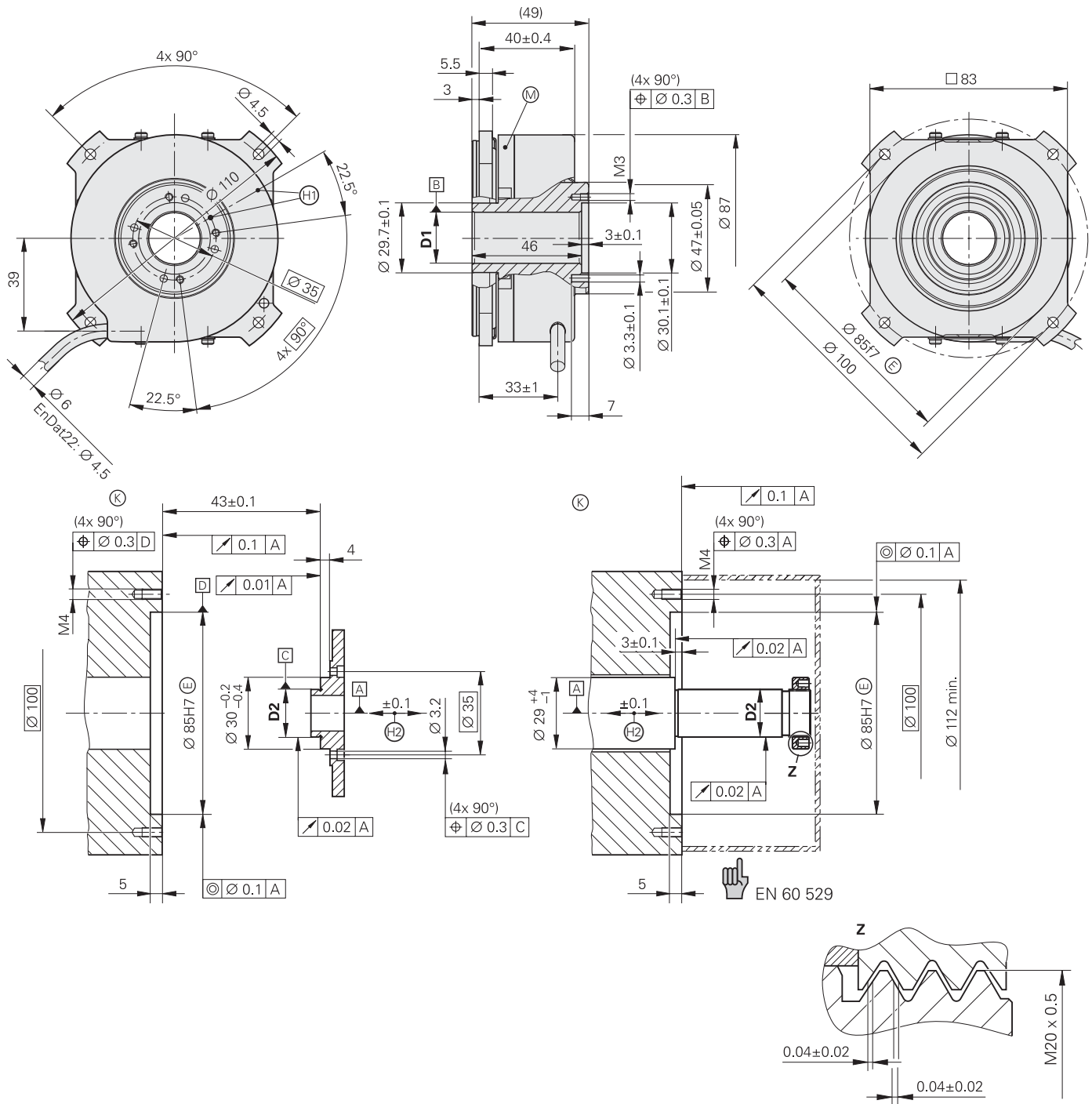


## Mounting

Mounting aid ensures compliance with mounting dimension  $2.5 \pm 0.3$  mm



# Hollow Shaft D = 20 mm



Dimensions in mm



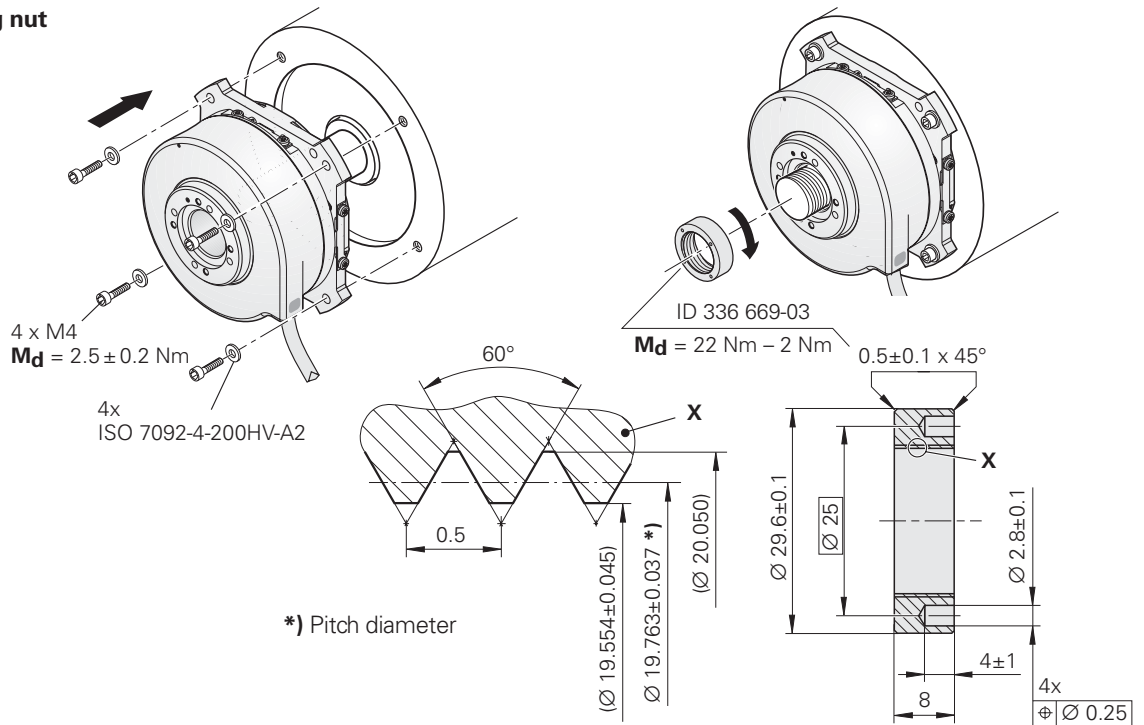
Tolerancing ISO 8015  
ISO 2768 - m H  
< 6 mm: ±0.2 mm

| D1         | D2         |
|------------|------------|
| Ø 20H7 (E) | Ø 20g7 (E) |
| Ø 22H7 (E) | Ø 22g7 (E) |

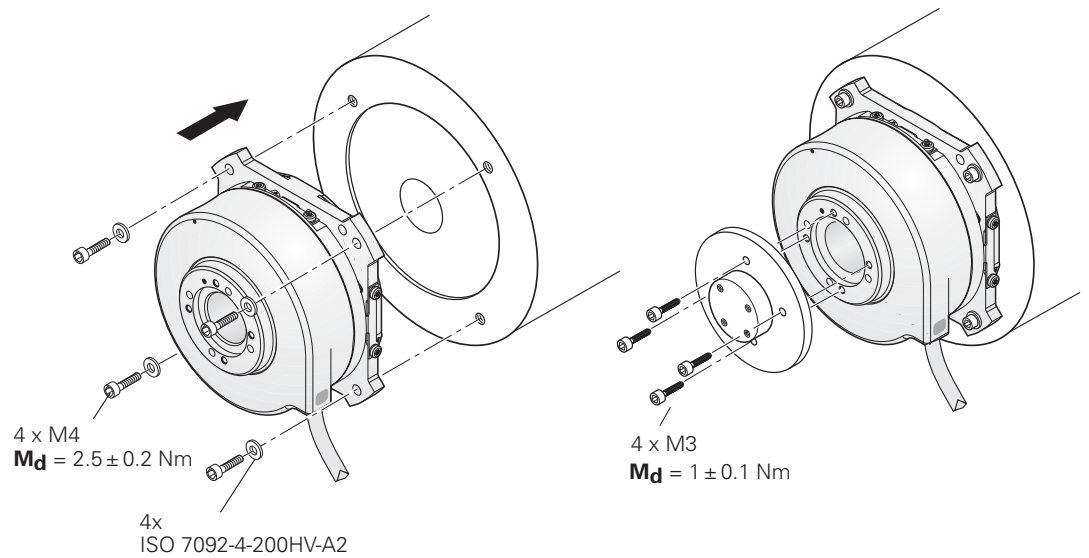
- ▣ = Bearing of mating shaft
- ▣ = Bearing of encoder
- ⊙ = Required mating dimensions
- ⊙ = Measuring point for operating temperature
- ⊙ = Zero position ± 15°
- ⊙ = Maximum permissible motion of motor shaft

## Mounting

### Shaft coupling with ring nut



### Front end shaft coupling








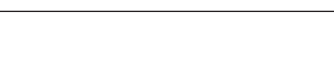
# Electrical Connection

## Connecting Cable





EnDat 22

EnDat 02

ECN 225

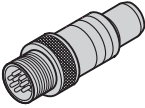




|   |   | 8-pin<br>M12   | 17-pin<br>M23 |
|---|---|--|---------------|
| <b>PUR connecting cable</b>   | <b>Ø 6 mm</b><br><b>Ø 8 mm</b><br><b>Ø 6 mm</b>                                     | <b>8-pin:</b> [(4 x 0.14 mm <sup>2</sup> ) + (4 x 0.34 mm <sup>2</sup> )]<br><b>17-pin:</b> [(4 x 0.14 mm <sup>2</sup> ) + 4(2 x 0.14 mm <sup>2</sup> ) + (4 x 0.5 mm <sup>2</sup> )]<br><b>14-pin:</b> [3(4 x 0.32 mm <sup>2</sup> ) + (4 x 0.32 mm <sup>2</sup> )] |               |
| <b>Complete</b> with connector (female) and coupling (male)                     |    | 368330-xx  | 323897-xx     |
| <b>Complete</b> with connector (female) and D-sub connector (female) for IK 220 |    | 533627-xx  | 332115-xx     |
| <b>Complete</b> with connector (female) and D-sub connector (male) for IK 215   |    | 524599-xx  | 324544-xx     |
| <b>With one connector</b> (female)  |    | 634265-xx  | 309778-xx     |
| <b>With one right-angle connector</b> (female)                                  |   | 606317-xx  | –             |
| <b>Cable only</b> , Ø 8 mm  |  | –  | 266306-xx     |

ECN 223 F, ECN 223 M

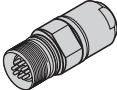

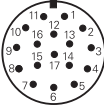


|  |  | ECN 223 F   |           | ECN 223 M |  |
|--|--|---|-----------|-----------|--|
|  |  | M12   | M23       | M12       | M23  |
| <b>Connecting cable</b>  | <b>For M12 connecting element Ø 6 mm</b><br><b>For M23 connecting element Ø 8 mm</b> | <b>8-pin:</b> [(4 x 0.14 mm <sup>2</sup> ) + (4 x 0.34 mm <sup>2</sup> )]<br><b>17-pin:</b> [(4 x 0.14 mm <sup>2</sup> ) + 4(2 x 0.14 mm <sup>2</sup> ) + (4 x 0.5 mm <sup>2</sup> )] |           |           |  |
| <b>Complete</b> with connector (female) and coupling (male)  |   | 368330-xx   | 349314-xx | 368330-xx | 349314-xx                                    |
| <b>With one connector</b> (female)   |   | 634265-xx   | 309778-xx | 634265-xx | 309778-xx                                    |
| <b>Complete</b> with connector (female), 17-pin, and Fanuc connector [(2 x 2 x 0.14 mm <sup>2</sup> ) + (4 x 1 mm <sup>2</sup> )]        |   | –   | 534855-xx | –         | –  |
| <b>Complete</b> with connector (female), 17-pin, and Mitsubishi connector [(2 x 2 x 0.14 mm <sup>2</sup> ) + (4 x 0.5 mm <sup>2</sup> )] |   | –   | –         | –         | 10-pin:<br>573661-xx<br>20-pin:<br>367958-xx |

# Pin Layout

## ECN 225 – EnDat 22

|  |                                   |                      |                        |             |                          |  |              |   |
|--|-----------------------------------|----------------------|------------------------|-------------|--------------------------|--|--------------|---|
| <b>8-pin coupling M12</b>    |                                   |                      |                        |             |                          |  |              |   |
|  | Power supply                      |                      |                        |             | Absolute position values |  |              |   |
|  M12  | <b>2</b>                          | <b>8</b>             | <b>1</b>               | <b>5</b>    | <b>3</b>                 | <b>4</b>                                   | <b>7</b>     | <b>6</b>                                    |
|  | <b>U<sub>P</sub><sup>1)</sup></b> | <b>U<sub>P</sub></b> | <b>0V<sup>1)</sup></b> | <b>0V</b>   | <b>DATA</b>              | <b><math>\overline{\text{DATA}}</math></b> | <b>CLOCK</b> | <b><math>\overline{\text{CLOCK}}</math></b> |
|   | Blue                              | Brown/Green          | White                  | White/Green | Gray                     | Pink                                       | Violet       | Yellow                                      |

## ECN 225 – EnDat 02

|   |                      |                             |              |                  |                     |               |             |           |                          |  |              |   |
|---|----------------------|-----------------------------|--------------|------------------|---------------------|---------------|-------------|-----------|--------------------------|--|--------------|---|
| <b>17-pin coupling M23</b>    |                      |                             |              |                  |                     |               |             |           |                          |  |              |   |
|   | Power supply         |                             |              |                  | Incremental signals |               |             |           | Absolute position values |  |              |   |
|    | <b>7</b>             | <b>1</b>                    | <b>10</b>    | <b>4</b>         | <b>15</b>           | <b>16</b>     | <b>12</b>   | <b>13</b> | <b>14</b>                | <b>17</b>                                  | <b>8</b>     | <b>9</b>                                    |
|   | <b>U<sub>P</sub></b> | <b>Sensor U<sub>P</sub></b> | <b>0V</b>    | <b>Sensor 0V</b> | <b>A+</b>           | <b>A-</b>     | <b>B+</b>   | <b>B-</b> | <b>DATA</b>              | <b><math>\overline{\text{DATA}}</math></b> | <b>CLOCK</b> | <b><math>\overline{\text{CLOCK}}</math></b> |
|    | Brown/ Green         | Blue                        | White/ Green | White            | Green/ Black        | Yellow/ Black | Blue/ Black | Red/Black | Gray                     | Pink                                       | Violet       | Yellow                                      |

**Shield** on housing; **U<sub>P</sub>** = Power supply voltage

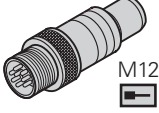


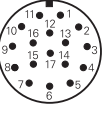
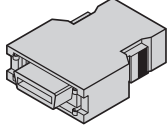
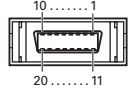




**Sensor:** The sensor line is connected internally with the corresponding power line

Vacant pins or wires must not be used.

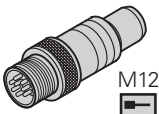

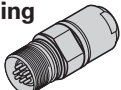
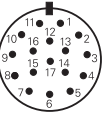
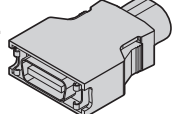
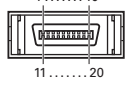




<sup>1)</sup> For parallel supply lines

# Pin Layout

## ECN 223 F

| 8-pin coupling M12  |   | 17-pin coupling M23   |   |   |   | 20-pin Fanuc connector   |                |                |  |
|---|---|---|---|---|---|--------------------------|----------------|----------------|--|
|  |  |  |  |  |  | Only on connecting cable |                |                |  |
|   | Power supply  |   |   |   | Absolute position values  |                          |                |                |  |
|   | <b>2</b>  | <b>8</b>  | <b>1</b>  | <b>5</b>  | <b>3</b>  | <b>4</b>                 | <b>7</b>       | <b>6</b>       |  |
|   | <b>7</b>  | <b>1</b>  | <b>10</b>   | <b>4</b>  | <b>14</b>   | <b>17</b>                | <b>8</b>       | <b>9</b>       |  |
|   | <b>9</b>  | <b>18/20</b>  | <b>12</b>   | <b>14/16</b>  | <b>1</b>  | <b>2</b>                 | <b>5</b>       | <b>6</b>       |  |
|   | <b>U<sub>P</sub></b>  | <b>Sensor U<sub>P</sub></b>   | <b>0V</b>   | <b>Sensor 0V</b>  | <b>Serial Data</b>  | <b>Serial Data</b>       | <b>Request</b> | <b>Request</b> |  |
|   | Brown/Green   | Blue  | White/Green   | White   | Gray  | Pink                     | Violet         | Yellow         |  |

## ECN 223 M

| 8-pin coupling M12  |   | 17-pin coupling M23   |   |   |   | 10 or 20-pin Mitsubishi connector |                |                |  |
|---|---|---|---|---|---|-----------------------------------|----------------|----------------|--|
|  |  |  |  |  |  | Only on connecting cable          |                |                |  |
|   | Power supply  |   |   |   | Absolute position values  |                                   |                |                |  |
|   | <b>2</b>  | <b>8</b>  | <b>1</b>  | <b>5</b>  | <b>3</b>  | <b>4</b>                          | <b>7</b>       | <b>6</b>       |  |
|   | <b>7</b>  | <b>1</b>  | <b>10</b>   | <b>4</b>  | <b>14</b>   | <b>17</b>                         | <b>8</b>       | <b>9</b>       |  |
|   | <b>10-pin</b>   | -   | <b>2</b>  | -   | <b>7</b>  | <b>8</b>                          | <b>3</b>       | <b>4</b>       |  |
|   | <b>20-pin</b>   | <b>20</b>   | <b>19</b>   | <b>1</b>  | <b>11</b>   | <b>6</b>                          | <b>16</b>      | <b>17</b>      |  |
|   | <b>U<sub>P</sub></b>  | <b>Sensor U<sub>P</sub></b>   | <b>0V</b>   | <b>Sensor 0V</b>  | <b>Serial Data</b>  | <b>Serial Data</b>                | <b>Request</b> | <b>Request</b> |  |
|   | Brown/Green   | Blue  | White/Green   | White   | Gray  | Pink                              | Violet         | Yellow         |  |

**Shield** on housing; **U<sub>P</sub>** = Power supply voltage

**Sensor:** The sensor line is connected in the encoder with the corresponding power line

Vacant pins or wires must not be used.

# HEIDENHAIN

**DR. JOHANNES HEIDENHAIN GmbH**

Dr.-Johannes-Heidenhain-Straße 5

83301 Traunreut, Germany

+49 8669 31-0

+49 8669 5061

E-mail: info@heidenhain.de

www.heidenhain.de

For catalogs, brochures and product information sheets, visit

[www.heidenhain.de/docu](http://www.heidenhain.de/docu)

**For more information**

Brochure: *Angle Encoders*