

# TR-Electronic Safe Rotary Encoder Product Information CD\_75

**SIL3, PL<sub>e</sub>**



## TR-Electronic – Your Partner in Automation










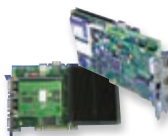








TR-Electronic can look back on more than 25 years of success, and is represented worldwide with an export share of more than 40 %. The core business comprises the development and manufacture of industrial angular and position measuring technology, as well as compact drive technology with integrated position control and measurement. The company is divided into three Business Units (BU) and is thus well positioned for further growth in the future.

Products in the **Rotary Encoder Business Unit** with optical or magnetic scanning precisely acquire position in steel production, wind power plants, cranes and ships as well as in explosion-proof versions in painting lines. Miniature versions ensure the correct position in medical technology. SIL3 approved absolute rotary encoders ensure the necessary safety.

In the **Linear Encoders Business Unit** magnetostrictive position sensors position injection molding machines, for example, or are directly integrated into hydraulic cylinders. Cascadable distance measurement sensors position parting units. With their high precision, glass scales on machine tools ensure precise position. Laser sensors based on phase difference measuring techniques position aisle stackers in warehousing and materials handling technology.

In the **Drives Business Unit** angle sensors are combined with compact drives: no external electronics are required, position, speed and torque controllers, power electronics and absolute rotary encoders are compactly integrated into the drive and thus bring intelligence directly to the drive shaft via the field bus. Compact drives are used for diverse applications in the printing and packaging industry and on palletizers.



| Rotary Encoder   | Linear Encoder  | Drives   | Components  | Engineering   | Unidor  |
|--|---|--|---|---|---|
| <br>Incremental Encoder | <br>Magnetostriction | <br>Actuator          | <br>I/O Module     | Automation Solutions<br>     | Punching and forming Measurement and control systems<br> |
| <br>Absolute Encoder    | <br>Glass scale      | <br>Positioning Drive | <br>Controls      | Retrofit<br>                 | Sensors<br>  |
| <br>Draw Wire Encoder   | <br>TOF laser        | <br>Processing Drive  | <br>Industrial-PC | Process monitoring tools<br> |   |
| <br>Barcode Positioning |   |  |   |   |   |

The portfolio is supplemented by the affiliated TRsystems with customized controls, industrial PCs, hydraulic controls as well as control units and sensors for punching and forming.

An essential factor for the success of TR-Electronic are the now more than 300 employees who actively help to shape the product portfolio with innovations and successfully implement customer projects. Through its commitment to the regional colleges, TR-Electronic supports the high quality training of young employees and thus guarantees the highest level of innovation and quality at its Trossingen location.

A high degree of vertical integration allows customer-specific requirements to be responded to very quickly. The constantly new requirements on the mechanical design of sensors, on innovative new operating interfaces and new plug connectors result in a rapidly increasing product diversity. With TR-Electronic you have a partner who can fulfil these requirements.

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## Functional safety – plant safety and personal security

For a lot of applications in automation technology, there are high safety requirements. Dangerous plant conditions can be avoided by using SIL3/PL e certified rotary encoders. You don't have to separately prove the functional safety of these position sensors.

### Current solution

Until now, for applications with high safety requirements, absolute rotary encoders with additional incremental signals have been used. The incremental signals function as a control over the positioning values. With this method, there was a safety deficit when turning on the machine, because there was only one absolute value available.

If this value was wrong due to data loss or an adjustment value, it couldn't be detected.

### Certified solution

The absolute rotary encoder CD\_75 M captures the revolution information through a mechanical gear without a battery backed revolution counter. Development, technology and production of this device is certified through the TÜV\*. They are used in plants and equipment requiring safety integrity level 3 (SIL3: IEC 61508/EN 62061) or a performance level e (PL e: EN ISO 13849 -1). The CD\_75 PROFIsafe additionally gives out safe speed values.

\*German Association for Technical Inspection

### Advantage of certified components

The basic safety norm IEC 61508 differentiates between measures to eliminate errors and measures to control errors. The measures to eliminate errors embrace the entire design and development process. These are required for the development of individual components and they serve to avoid systematic errors. Important for error control are quantifiable characteristics of the considered components and of the complete system. Priority has the probability of a dangerous failure of the safety function. The calculation results of the rated failure probability of all individual components for the entire safety chain.

It is checked and documented how systematic errors can be avoided or controlled for certified components. If not certified components are chosen to be used solely based on their mathematical safety value the responsibility is laid upon the person who made the construction. The producer of components with certification makes a clear statement: "Yes, ideal for safety oriented applications." As a user of certified components you can rely on this – after all the certification according to SIL3 or PL e has been given by independent specialists.

### SIL and PL - two scales for safety

**SIL** The safety integrity level (SIL) is described in the international norm according to IEC 61508. It serves to judge electrical/programmable systems relying on dependability of safety functions. The aimed-at level indicates which safety-related construction principals have to be satisfied to minimize the risk of malfunctions.

**PL** Within the norm EN ISO 13849-1 five categories are defined called performance levels (PL). They are building up on each other starting with a, b, c, d and e. The different levels help to classify safety-related performances. They are determined out of the average probability value of a dangerous failure and the diagnostic coverage and considering the structural construction of a system (how many channels has the system, how independent are they from each other). Our safety rotary encoders are certified according to PL "e" the highest performance level.

## Safety rotary encoder with PROFIsafe or 2 SSI interfaces

The double rotary encoder system with hollow shaft and multi turn detection fulfills the requirement of EN 61508<sup>1</sup>. The use of certified individual components makes it easier for the system integrator to fulfill safety requirements of the entire application, for example within the event technology and storage and logistic technology. The use of our SIL3 certified safety absolute rotary encoder liberates the user from the obligation to prove functional safety for this positioning sensor separately. With certified components the strict safety guidelines will be achieved. The double rotary encoders CD\_75 M are

available with hollow and solid shaft. They are approved for applications according to SIL3 or PL e.



SIL3, PL e

For local motor feedback, there is an optional rectangle or sine/cosine incremental output available. Different resolutions can be chosen (period/revolution).

### Possible application areas:

- \_crane technology
- \_event and stage technology
- \_drive technology
- \_conveying systems and logistics
- \_machinery and plant engineering
- \_automation technology
- \_wind energy plant

**Cranes with overlapping work areas or with obstacles within the working area** – through measurement of rope positions and rotation angles, collisions can be avoided.

**Numerous travelling cranes on a common track** – through safe measurement of each position, collision can be avoided.

**Common work areas of men and machines** – through safe position detection the various areas of safety, parameters can be differentiated from each other.

**Processes with minimal or maximum speed** – through safe speed sensing (PROFIsafe over PROFIBUS) it is assured that the drive never oversteps a maximum speed or that it safely achieves a required speed, before starting a process.

**Synchronous run monitoring<sup>2</sup>** – a not safe electrical axial synchronization can be made safe by using a certified SIL3/PL e rotary encoder with an external attached safety system.

**Shaft control<sup>2</sup>** – rotation through overload or a twist-off will be detected through a SIL3/PL e rotary encoder with an external safety system.

| PROFIsafe over  |                    | PROFIsafe over  |                    | 2 x SSI with checksum  |                   |
|---|--------------------|---|--------------------|--|-------------------|
| Solid shaft   | Hollow shaft       | Solid shaft   | Hollow shaft       | Solid shaft  | Hollow shaft      |
| CDV 75 M PROFIsafe  | CDH 75 M PROFIsafe | CDV 75 M PROFIsafe  | CDH 75 M PROFIsafe | CDV 75 M SSI   | CDH 75 M SSI      |
|   |                    |   |                    |  |                   |
| resolution<br>13 bit x 32.768 revolutions   |                    |   |                    | resolution<br>13 bit x 4.096 revolutions in system 1<br>13 bit x 4.096 revolutions in system 2 |                   |
| flange/shaft combination, e.g. centering collar 50 mm/36 mm,  | 20 mm with groove  | Flansch-/Wellen-Kombinationen, z.B. Zentrierbund 50 mm/36 mm, Welle mit Nut | 20 mm mit Nut      | flange/shaft combination, e.g. centering collar 50 mm/36 mm, shaft with groove                 | 20 mm with groove |
| shaft with groove   |                    |   |                    | -  |                   |
| <p><b>Your configuration possibilities:</b><br/>additional incremental signals, resolution is factory provided, optional rectangle 5 V 1.024, 2.048, 4.096, 8.192, 16.384, 32.768 impulses/revolution or sine/cosine 1Vss 1.024, 4.096 periods/revolution</p> |                    |   |                    |  |                   |

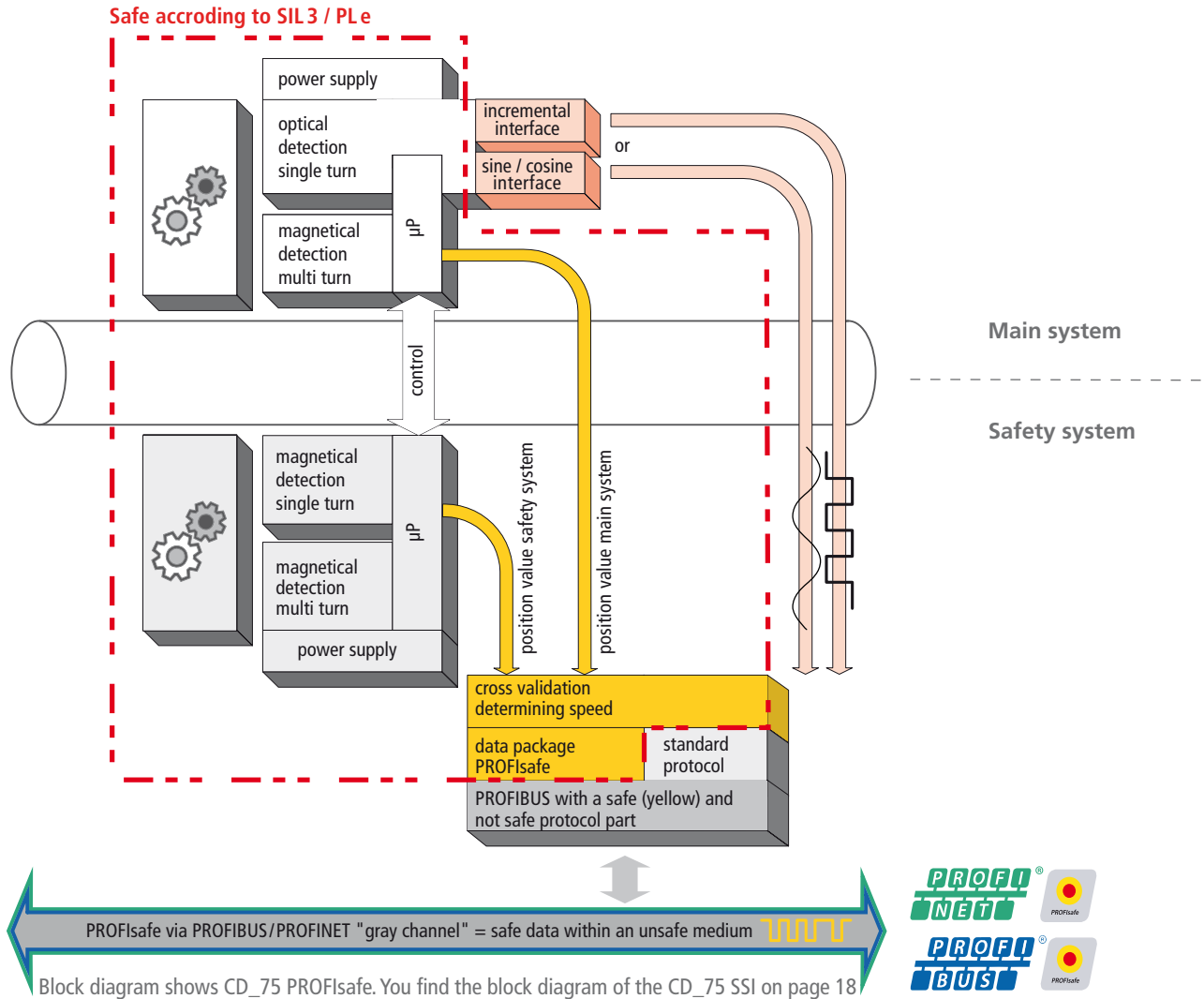
<sup>1</sup>test regulations category 4/PL e according to EN ISO 13849-1, SIL CL3 according to EN 61800-5-2/EN 62061 and IEC 61508. <sup>2</sup>on request

## Rotary encoder, safe according to SIL 3/PL e

Within the revolution in system 1 the shaft position is detected with an optical single turn encoder. The revolutions are detected over mechanically attached satellites. This gives the absolute positioning value of measurement system one. For system two, the revolution position is transferred on a magnetic central detection, the revolutions are detected with magnetic equipped satellites. This gives the absolute

positioning value of measurement system two. The CPUs give each other signs of life.

The optical detection gives out incremental signals. It can be chosen between rectangle and sine/cosine outputs with various resolutions. For safety reasons, the resolutions of the measurement systems are not programmable.



### Certification, PROFIBUS

SIL CL 3 according to IEC 61508 PL e according to EN ISO 13849-1

PROFIBUS/PROFIsafe: certified has been the PROFIBUS activation (PI certificate Z01522), the PROFIsafe conformance (PI certificate Z20031) as well as the fulfillment of the safety standards (TÜV Rheinland, 01/205/5015/10).



### Certification, PROFINET

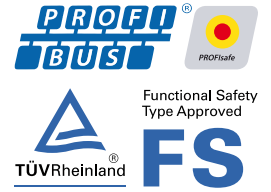
SIL CL 3 according to IEC 61508 PL e according to EN 61800-5-2

PROFINET/PROFIsafe: certified has been the PROFINET (PI certificate Z10472), the PROFIsafe conformance (PI-Zertifikat Z20068) as well as the fulfillment of the safety standards (TÜV Rheinland, 01/205/5221/12).



## SIL rotary encoder with solid shaft and PROFIsafe via PROFIBUS

- + PROFIBUS interface with PROFIsafe protocol
- + design with solid shaft
- + functional safety according to  
DIN EN 61508: SIL 3  
EN ISO 13849-1: PL e
- + 13 bit resolution, 32.768 revolutions
- + sine/cosine signals or incremental signals for position feedback



### Electrical data

|                                |                      |
|--------------------------------|----------------------|
| Voltage supply                 | 11 ... 27 V DC       |
| Current consumption at no-load | < 150 mA, at 24 V DC |

### Main measurement system

|                    |        |
|--------------------|--------|
| Capacitance        | 28 bit |
| Steps / revolution | 8.192  |
| Revolutions        | 32.768 |

### Safety system

|  |  |
|--|--|
|  | 2 redundant scanning systems with internal cross validation. Adjustable window of difference. Safety system optional external connected (cf. page 13). |
|--|--|

|                    |   |
|--------------------|---|
| Capacitance        | The data of the internal safety system will not be separately issued. |
| Steps / revolution |   |
| Revolutions        |   |

### Safety standard

|                              |                            |
|------------------------------|----------------------------|
| Safety Integrity Level (SIL) | SIL 3 (DIN EN 61508)       |
| Performance Level (PL)       | PL e (EN ISO 13849)        |
| PFH, complete system         | $8,45 \times 10^{-10}$ 1/h |

### Mechanical data

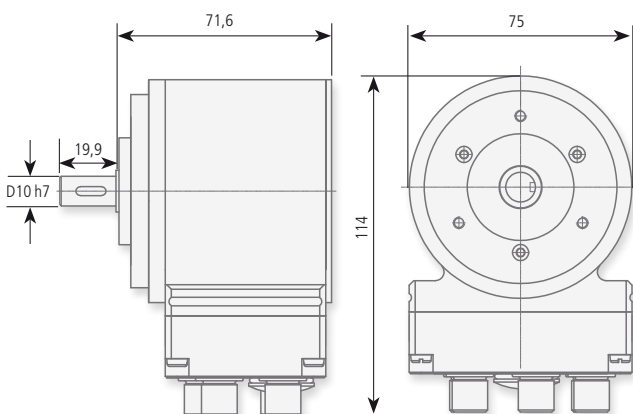
|                                  |   |
|----------------------------------|---|
| Mechanically permissible speed   | $\leq 6.000 \text{ min}^{-1}$                       |
| Shaft load (end of the shaft)    | $\leq 50 \text{ N axial}, \leq 90 \text{ N radial}$ |
| Bearing life time                | $\geq 3,9 \times 10^{10}$ revolutions               |
| - at speed                       | $\leq 3.000 \text{ min}^{-1}$                       |
| - at operating temperature       | $\leq 60 \text{ }^\circ\text{C}$                    |
| Permissible angular acceleration | $\leq 10^4 \text{ rad/s}^2$                         |
| Mass (typical)                   | 1 kg  |

### Environmental conditions

|                                     |   |
|-------------------------------------|---|
| Protection class DIN EN 60529       | IP 54   |
| Working temperature                 | -20 °C ... +70 °C                             |
| Relative humidity, DIN EN 60068-3-4 | 98 %, non condensing                          |
| Storage temperature                 | -30 °C ... +80 °C, dry                        |
| Vibration, DIN EN 60068-2-6         | $\leq 100 \text{ m/s}^2$ , sine 50–2.000 Hz   |
| Shock DIN EN 60068-2-27             | $\leq 1.000 \text{ m/s}^2$ , half-sine, 11 ms |
| Emitted interference                | class B, industrial areas                     |

### Interface

| Protocol                     | PROFIBUS  |
|------------------------------|---|
| Transferred values           | safe position, safe speed (PROFIsafe); position, speed (PROFIBUS)     |
| Programmable parameter       | integration time, window of difference, direction of rotation, preset |
| Unsafe incremental interface | A, A-, B, B-  |
| Number of pulses (fixed)     | sine/cosine (1 Vss): 1.024 or 4.096                                   |
| or                           |   |
| Number of pulses (fixed)     | rectangle (RS 422): 1.024, 2.048, 4.096, 8.192, 16.384 or 32.768      |



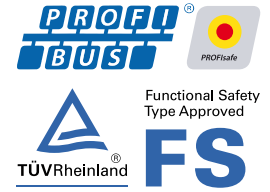
Please ask for detailed drawings.

### Order information:

|                          |  |
|--------------------------|--|
| Order number             | CDV75M-00002   |
| Flange / shaft           | centering collar 50 h7<br>shaft 10 h7<br>with groove 3 N9 × 10,2     |
| Unsafe incremental track | Rectangle (RS 422)<br>4.096 steps/revolution.<br>Further on request. |

## SIL rotary encoder with hollow shaft and PROFIsafe via PROFIBUS

- + PROFIBUS interface with PROFIsafe protocol
- + design with hollow shaft (max. 20 mm shaft diameter)
- + functional safety according to  
DIN EN 61508: SIL 3  
EN ISO 13849-1: PL e
- + 13 bit resolution, 32.768 revolutions
- + sine/cosine signals or incremental signals for position feedback



### Electrical data

|                                |                      |
|--------------------------------|----------------------|
| Voltage supply                 | 11 ... 27 V DC       |
| Current consumption at no-load | < 150 mA, at 24 V DC |

### Main measurement system

|                  |        |
|------------------|--------|
| Capacitance      | 28 bit |
| Steps/revolution | 8.192  |
| Revolutions      | 32.768 |

### Safety system

|                  |  |
|------------------|--|
|                  | 2 redundant scanning systems with internal cross validation. Adjustable difference. Safety system optional external connected (cf. page 13). |
| Capacitance      | The data of the internal safety system will not be separately issued.  |
| Steps/revolution |  |
| Revolutions      |  |

### Safety standard

|                              |                            |
|------------------------------|----------------------------|
| Safety Integrity Level (SIL) | SIL 3 (DIN EN 61508)       |
| Performance Level (PL)       | PL e (EN ISO 13849)        |
| PFH, complete system         | $8,45 \times 10^{-10}$ 1/h |

### Mechanical data

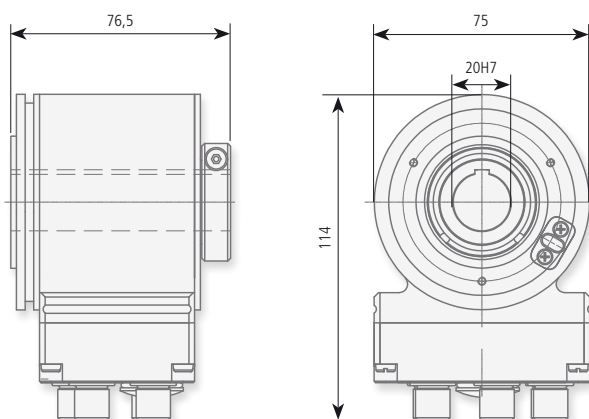
|                                  |                                       |
|----------------------------------|---------------------------------------|
| Mechanically permissible speed   | $\leq 3.000 \text{ min}^{-1}$         |
| Shaft load (end of the shaft)    | dead weight of the rotary encoder     |
| Bearing life time                | $\geq 3,9 \times 10^{10}$ revolutions |
| - at speed                       | $\leq 1.500 \text{ min}^{-1}$         |
| - at operating temperature       | $\leq 60 \text{ }^\circ\text{C}$      |
| Permissible angular acceleration | $\leq 10^4 \text{ rad/s}^2$           |
| Mass (typical)                   | 1 kg                                  |

### Environmental conditions

|                                     |   |
|-------------------------------------|---|
| Protection class DIN EN 60529       | IP 54   |
| Working temperature                 | -20 °C ... +70 °C                             |
| Relative humidity, DIN EN 60068-3-4 | 98 %, non condensing                          |
| Storage temperature                 | -30 °C ... +80 °C, dry                        |
| Vibration, DIN EN 60068-2-6         | $\leq 100 \text{ m/s}^2$ , sine 50–2.000 Hz   |
| Shock DIN EN 60068-2-27             | $\leq 1.000 \text{ m/s}^2$ , half-sine, 11 ms |
| Emitted interference                | Class B, industrial areas                     |

### Interface

|                              |   |
|------------------------------|---|
| Protocol                     | PROFIBUS  |
| Transferred values           | PROFIsafe<br>Safe position, safe speed (PROFIsafe);<br>Position, speed (PROFIBUS)                             |
| Programmable parameter       | integration time, window of difference, direction of rotation, preset   |
| Unsafe incremental interface | A, A-, B, B-  |
| Number of pulses (fixed)     | sine/cosine (1 Vss): 1.024 or 4.096<br>or<br>rectangle (RS 422): 1.024, 2.048, 4.096, 8.192, 16.384 or 32.768 |



Please ask for detailed drawings.

### Order information:

|                          |  |
|--------------------------|--|
| Order number             | CDH75M-00008   |
| Flange / shaft           | hollow shaft 20 H7 with nut 5 J59; flange sided attachment for rotation prevention |
| Unsafe incremental track | Rectangle (RS 422)<br>32.768 steps/revolution.<br>Further on request.              |

## SIL-rotary encoder with solid shaft over PROFINET

- + PROFINET interface with PROFIsafe protocol
- + design with solid shaft
- + functional safety according to
  - DIN EN 61508: SIL 3
  - EN ISO 13849-1: PL e
- + 13 bit resolution, 32.768 revolutions
- + sine/cosine signals or incremental signals for position feedback



### Electrical data

|                                |                           |
|--------------------------------|---------------------------|
| Voltage supply                 | 13 ... 27 V DC, SELV/PELV |
| Current consumption at no-load | < 180 mA, at 24 V DC      |

### Main measurement system

|                  |  |
|------------------|--|
| Capacitance      | 28 bit   |
| Steps/revolution | 8.192  |
| Revolutions      | 32.768   |
| Safety principle | 2 redundant scanning systems with internal cross validation. |

|                                    |  |
|------------------------------------|--|
| Parameter <sup>1)</sup>            |  |
| - Integration time, safe/unsafe    | 50 ... 500 ms/5 ... 500 ms                             |
| - Size of monitoring window        | 50 ... 4.000 increments                                |
| - Standstill tolerance Preset      | 1 ... 5 increments / integration time, safe            |
| - Direction of counting            | Forward, Backward                                      |
| Output code                        | binary   |
| Cycle time                         | ≥ 1 ms (IRT/RT)  |
| Transmission rate                  | 100 MBit/s   |
| TR specific functions <sup>1</sup> | velocity output in increments / integration time, safe |

### Mechanical data

|                                  |                                      |
|----------------------------------|--------------------------------------|
| Mechanically permissible speed   | ≤ 6.000 min <sup>-1</sup>            |
| Shaft load (end of the shaft)    | ≤ 50 N axial, ≤ 90 N radial          |
| Bearing life time                | ≥ 3,9 × 10 <sup>10</sup> revolutions |
| - at speed                       | ≤ 3.000 min <sup>-1</sup>            |
| - at operating temperature       | ≤ 60 °C                              |
| Permissible angular acceleration | ≤ 10 <sup>4</sup> rad/s <sup>2</sup> |
| Start-up torque at 20 °C         | typically 0,6 Ncm                    |
| Mass (typical)                   | 1 kg                                 |

### Environmental conditions

|  |  |
|--|--|
| Protection class DIN EN 60529 <sup>2</sup> | IP 54                                      |
| Working temperature                        | 0 °C ... +60 °C                            |
| Relative humidity, DIN EN 60068-3-4        | 98 %, non condensing                       |
| Storage temperature                        | -30 °C ... +80 °C, dry                     |
| Vibration DIN EN 60068-2-6                 | ≤ 100 m/s <sup>2</sup> , Sinus 50–2.000 Hz |
| Shock DIN EN 60068-2-27                    | ≤ 600 m/s <sup>2</sup> , half-sine, 5 ms   |

|                           |              |
|---------------------------|--------------|
| EMC                       |              |
| - Immunity to disturbance | EN 61000-6-2 |
| - Transient emissions     | EN 61000-6-3 |

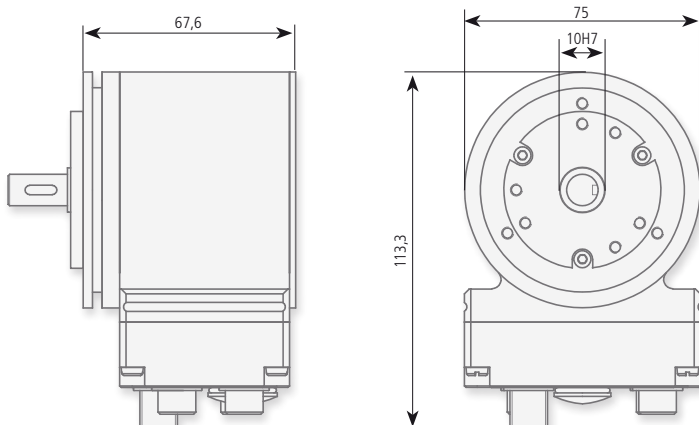
### Interface

|   |   |
|---|---|
| Protocol                                | PROFINET  |
| Incremental output without zero impulse | -   |
| - Or Sin/Cos-output                     |   |
| - Number of pulses, factory setting     | 4.096, 8.192, 12.288, 16.384, 20.480                  |
| PROFINET IO - Device                    | IEC 61158, IEC 61784-1; PROFIsafe-profile: No. 3.192b |
| Additional features                     | Preset  |

### Safety of the total system

|                              |                             |
|------------------------------|-----------------------------|
| PFH, „High demand“ mode      | 1.45 × 10 <sup>-9</sup> 1/h |
| PFD <sub>av</sub> (T = 15 a) | 9.53 × 10 <sup>-5</sup>     |
| MTTF <sub>d</sub> high       | 421 a                       |
| DC <sub>avg</sub> high       | 95 %                        |

<sup>1</sup>secured programmable parameter <sup>2</sup>valid with screwed on mating connector and /or screwed together cable gland



### Order information:

|                          |  |
|--------------------------|--|
| Order number             | CDV75M-00012   |
| Flange/shaft             | centering collar 50 h7<br>shaft 10 h7<br>with groove 3 N9 × 10,2     |
| Unsafe incremental track | Rectangle (RS 422)<br>4.096 steps/revolution.<br>Further on request. |

Please ask for detailed drawings.



## SIL-rotary encoder with hollow shaft over PROFINET

- + PROFINET interface with PROFIsafe protocol
- + design with hollow shaft (max. 20 mm shaft diameter)
- + functional safety according to  
DIN EN 61508: SIL 3  
EN ISO 13849-1: PL e
- + 13 bit resolution, 32.768 revolutions
- + sine/cosine signals or incremental signals for position feedback



### Electrical data

|                                |                           |
|--------------------------------|---------------------------|
| Voltage supply                 | 13 ... 27 V DC, SELV/PELV |
| Current consumption at no-load | < 180 mA, at 24 V DC      |

### Main measurement system

|                    |  |
|--------------------|--|
| Capacitance        | 28 bit   |
| Steps / revolution | 8.192  |
| Revolutions        | 32.768   |
| Safety principle   | 2 redundant scanning systems with internal cross validation. |

### Parameter<sup>1</sup>

|                                    |  |
|------------------------------------|--|
| - Integration time, safe / unsafe  | 50 ... 500 ms / 5 ... 500 ms                           |
| - Size of monitoring window        | 50 ... 4.000 increments                                |
| - Standstill tolerance Preset      | 1 ... 5 increments / integration time, safe            |
| - Direction of counting            | Forward, Backward                                      |
| Output code                        | binary   |
| Cycle time                         | ≥ 1 ms (IRT / RT)                                      |
| Transmission rate                  | 100 MBit/s   |
| TR specific functions <sup>1</sup> | velocity output in increments / integration time, safe |

### Mechanical data

|                                  |                                      |
|----------------------------------|--------------------------------------|
| Mechanically permissible speed   | ≤ 3.000 min <sup>-1</sup>            |
| Shaft load                       | Own mass                             |
| Bearing life time                | ≥ 3,9 × 10 <sup>10</sup> revolutions |
| - at speed                       | ≤ 1.500 min <sup>-1</sup>            |
| - at operating temperature       | ≤ 60 °C                              |
| Permissible angular acceleration | ≤ 10 <sup>4</sup> rad/s <sup>2</sup> |
| Start-up torque at 20 °C         | typically 6 Ncm                      |
| Mass (typical)                   | 1 kg                                 |

### Environmental conditions

|                                      |  |
|--------------------------------------|--|
| Protection class DIN EN 60529        | IP 54                                      |
| Working temperature                  | 0 °C ... +60 °C                            |
| - optionally                         | -20 °C ... +70 °C                          |
| Relative humidity, DIN EN 600068-3-4 | 98 %, non condensing                       |
| Storage temperature                  | -30 °C ... +80 °C, dry                     |
| Vibration DIN EN 60068-2-6           | ≤ 100 m/s <sup>2</sup> , Sinus 50–2.000 Hz |
| Shock DIN EN 60068-2-27              | ≤ 600 m/s <sup>2</sup> , half-sine, 5 ms   |
| EMC                                  |  |
| - Immunity to disturbance            | EN 61000-6-2                               |
| - Transient emissions                | EN 61000-6-3                               |

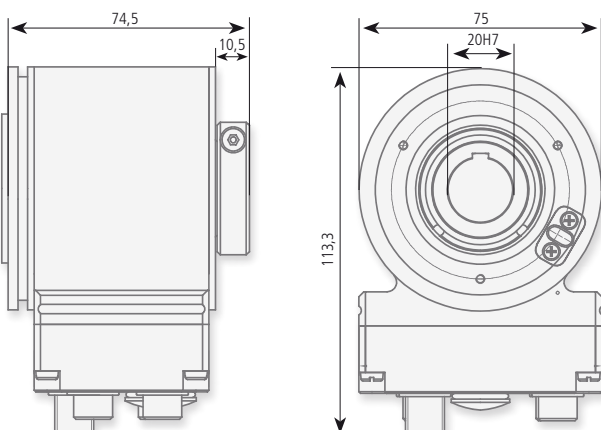
### Interface

|   |   |
|---|---|
| Protocol                                | PROFINET  |
| Incremental output without zero impulse | -   |
| - Or: Sin / Cos-output                  |   |
| - Number of pulses, factory setting     | 4.096, 8.192, 12.288, 16.384, 20.480                  |
| PROFINET IO - Device                    | IEC 61158, IEC 61784-1; PROFIsafe-profile: No. 3.192b |
| Additional features                     | Preset  |

### Safety of the total system

|                              |                             |
|------------------------------|-----------------------------|
| PFH, „High demand“ mode      | 1.45 × 10 <sup>-9</sup> 1/h |
| PFD <sub>av</sub> (T = 15 a) | 9.53 × 10 <sup>-5</sup>     |
| MTTF <sub>d</sub> high       | 421 a                       |
| DC <sub>avg</sub> high       | 95 %                        |

<sup>1</sup>secured programmable parameter <sup>2</sup>valid with screwed on mating connector and / or screwed together cable gland



### Order information:

|                          |  |
|--------------------------|--|
| Order number             | CDH75M-00010   |
| Flange / shaft           | hollow shaft 20 H7 with nut 5 JS9; flange sided attachment for rotation prevention |
| Unsafe incremental track | Rectangle (RS 422) 32.768 steps/revolution. Further on request.                    |

Please ask for detailed drawings.

## Communication with PROFIsafe via PROFIBUS/PROFINET

The actual values will be transferred over PROFIsafe. Within the safe protocol part the actual value and the speed will be transferred. These values are also available over not safe normal PROFIBUS/PROFINET telegrams. Therefore, safe and normal control parts have access to it. Certified are the PROFIBUS/PROFINET activation, the PROFIsafe compliance, as well as the fulfilling of the safety standards (Further information you will find on page 5).

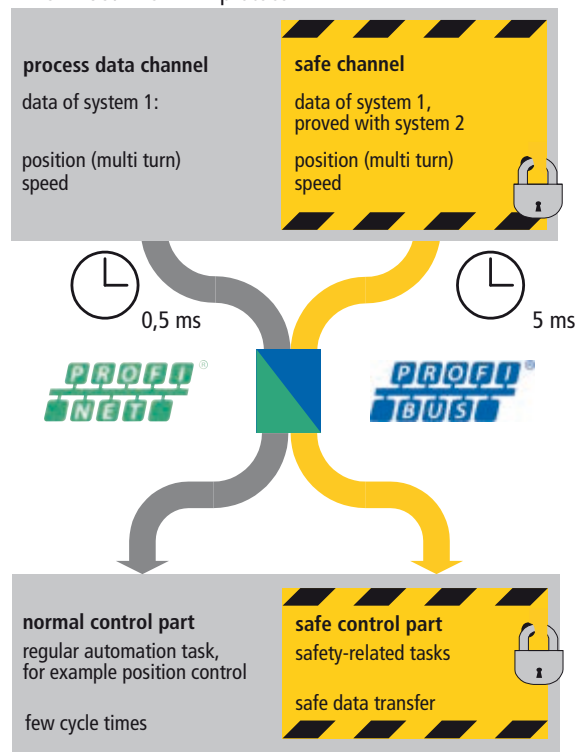
The actual values for position and speed are transferred in two slots:

For safe transmission the actual position values of both rotary encoder systems are compared. If the difference is smaller than the adjusted control window, the rotary encoder value does count as safe. The safe actual position value and the hence calculated safe speed value will be transferred over the PROFIsafe telegram.

The part of the control taking on the safety related tasks can process these values.

The actual position value and the calculated speed of the main rotary encoder are directly transferred within the not safe process data channel. Usually, this channel is processed more often by the controller. Normal automation processes can access more often actual position values.

PROFIBUS/PROFINET protocol

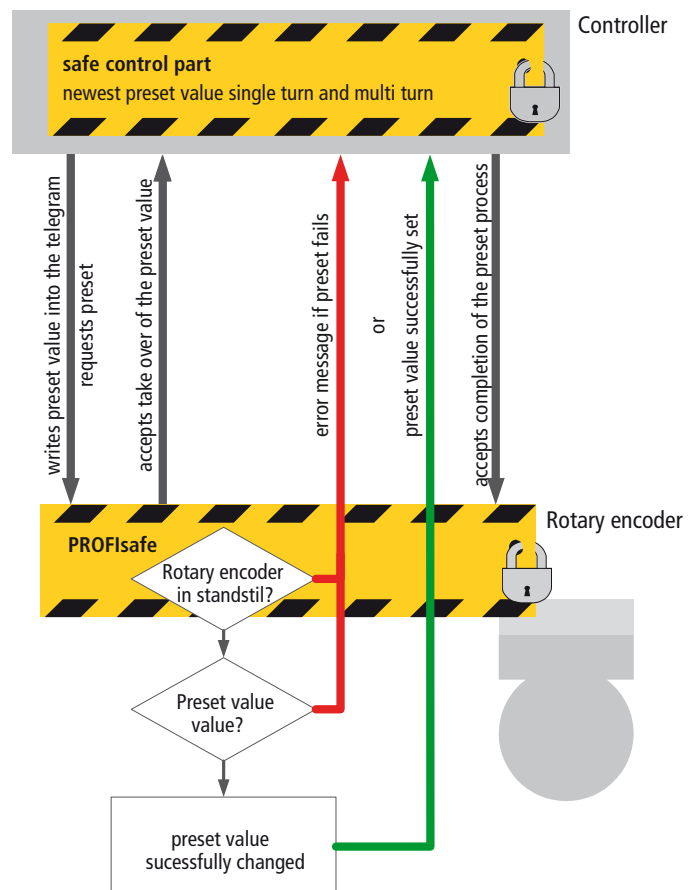


## Preset over PROFIsafe

By setting a preset value, the actual issued value of the rotary encoder can be placed arbitrarily at a value within the maximum measurement range. With this, the shown position can be placed electronically at a machine referencing position. The offset value will be saved within the rotary encoder.

Setting a preset value is a safety-relevant process. An arising jump of the actual value, for example using a controller, can lead to an uncontrolled movement of the machine. Therefore, setting a preset value can only be done when the concerning machine part is standing still. The preset is already locked within the rotary encoder and can solely be activated over a special part within the safe protocol part.

Even if all preconditions of the controller are fulfilled, the preset will only be executed when the rotary encoder shaft stands still. Further measures have to be taken in account. The controller can start the preset process only when the related drives are locked against running. It is recommended, to lock the preset process from the controller through further safety measurements (for example key switches, password prompts, ...).





## Parameterization via PROFIsafe

Parameters are transferred each time over the bus when the machine runs up. The set of parameters will be saved over a checksum.

### Window of difference

Permissible difference between the rotary encoder values of system 1 and system 2.

### Window of standstill

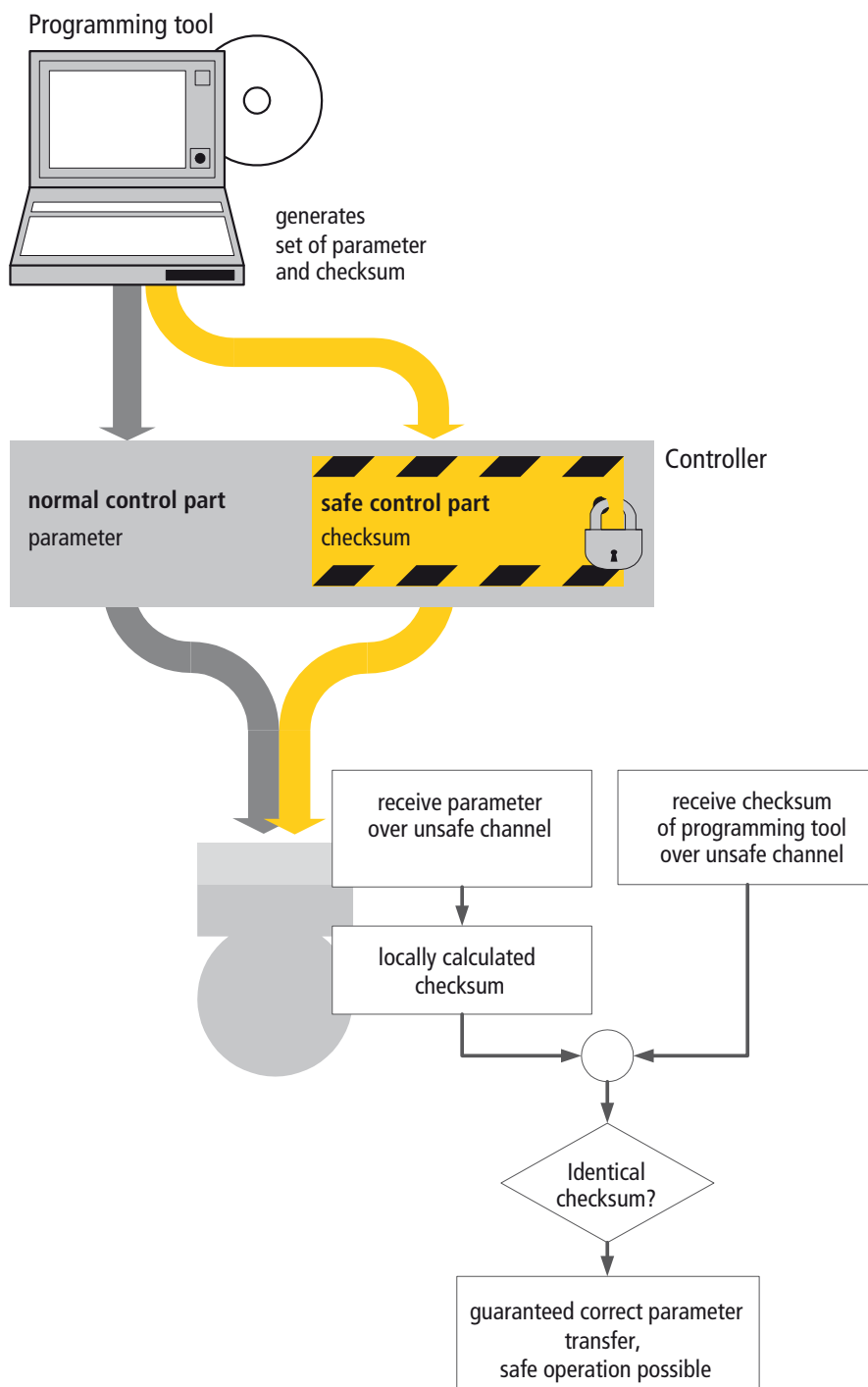
To trigger a preset process (see page 8), the rotary encoder must stand still. Depending on the drive, it is necessary to specify its tolerance range.

### Direction of rotation

Positive count direction clockwise/counterclockwise.

### Integration time

Time base of the speed calculation. High integration times enable high resolution measurements at a low rotary speed. A small integration time shows speed changes faster: well suited for high rotation speeds and great dynamics. Information is multiple of the cycle time of the rotary encoder system. For process data channel (not safe) 5 ... 500 ms, for safe channel 50 ... 500 ms.



## Integrated Safety – CD\_75M

For numerous industrial applications such as presses, cranes and robots, it is important to exactly capture the movement in position and speed. These movements could permanently be accompanied by a hazard. Therefore, working stations, positions and speed are always controlled.

In general, controls like this require a higher standard in technology. The according functions are interpreted as safety functions with necessary SIL / PL. For positioning sensors, the following ways of secured data are possible.

### Secured Speed Data

Secured speed data is needed, to allow access to a usually dangerous area where such as maintenance or start-up work has to be done. The CD\_75M delivers a safe position information which is used in a controller to realize a secured maximum speed (SLS: Safely Limited Speed).

### Safe Position

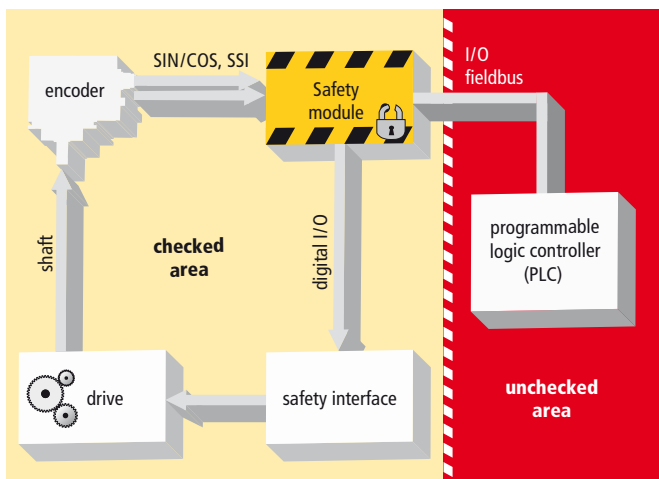
A safety function needs reliable position information, when in different areas different safety requirements should be determined. With this information for example a "Safe Direction – SDI" can be realized or other safety parameters in dependence of the position can be determined. Der CD\_75M sends the safe position information directly over PROFIBUS respectively PROFINET or safely over PROFIsafe protocol within the safety control.

### Your Advantages:

- ✓ integrated safety
- ✓ no additional external SIL evaluation
- ✓ no additional expenditures in further sensors
- ✓ no extra time for installation and cabling of external SIL evaluations
- ✓ no additional integration into the controller

## Conventional Standard versus Integrated Safety

### Conventional Standard

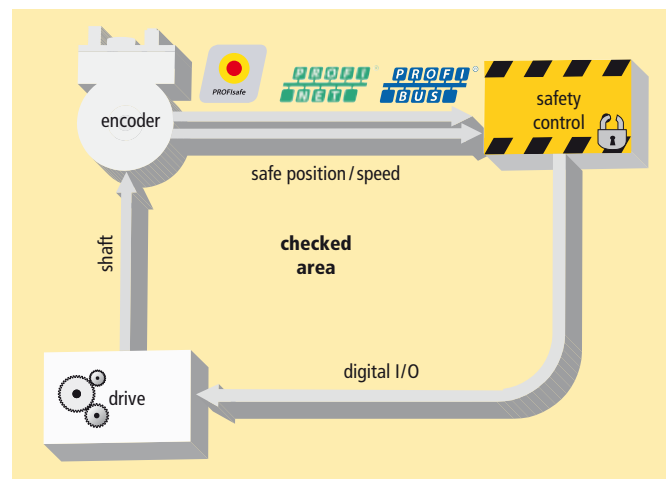


The tests of the signals are done in a safety module. Depending on the features of the rotary encoder, the safety module can identify the safe speed or single / multi turn position.

The safety module decides based on the parameters of limited values and functions whether the status of the machine is safe or the drive keeps running or has to stop. The safety function solely is restricted to this part of the plant. Are real positioning and speed values requested (e.g. controller), a second rotary encoder is needed. Both, the controller as well as the safety module have to be correctly programmed and parameterized.

For individual plant parts, this technology can be retrofitted. The rotary encoders used don't have to be certified. They only have to fulfill the requirements of the producer of the safety modules.

### Integrated Safety – CD\_75M



The measurement values of safe speed and safe multi turn position are determined within the certified rotary encoder. They are transmitted over a safe bus system to an equally certified safety module. Therefore, the safe sensor values are available for each controller of the entire machine or plant.

This enables intelligent safety concepts where humans and machines share the work environment without mechanical safety devices. Work areas can be divided into different zones with adjusted safety requirements.

Position and speed values are available for either safety applications over a secured channel as well as for normal automation functions over a not secured channel (see page 11). Therefore, a rotary encoder for position feedback is unnecessary. Due to the integration of the PLC a safe operation with a large range of functions can be guaranteed.

## Monitoring of the synchronisation and the shaft\*

Normally, the quality of the position value will be saved within the second rotary encoder system of the CD\_75 M PROFIsafe. Alternatively, a CD\_75 M SSI can be used. The actual values of both mechanically separated systems are compared with each other. If the difference between the positions is less than the adjusted window of difference, the position value counts as save.

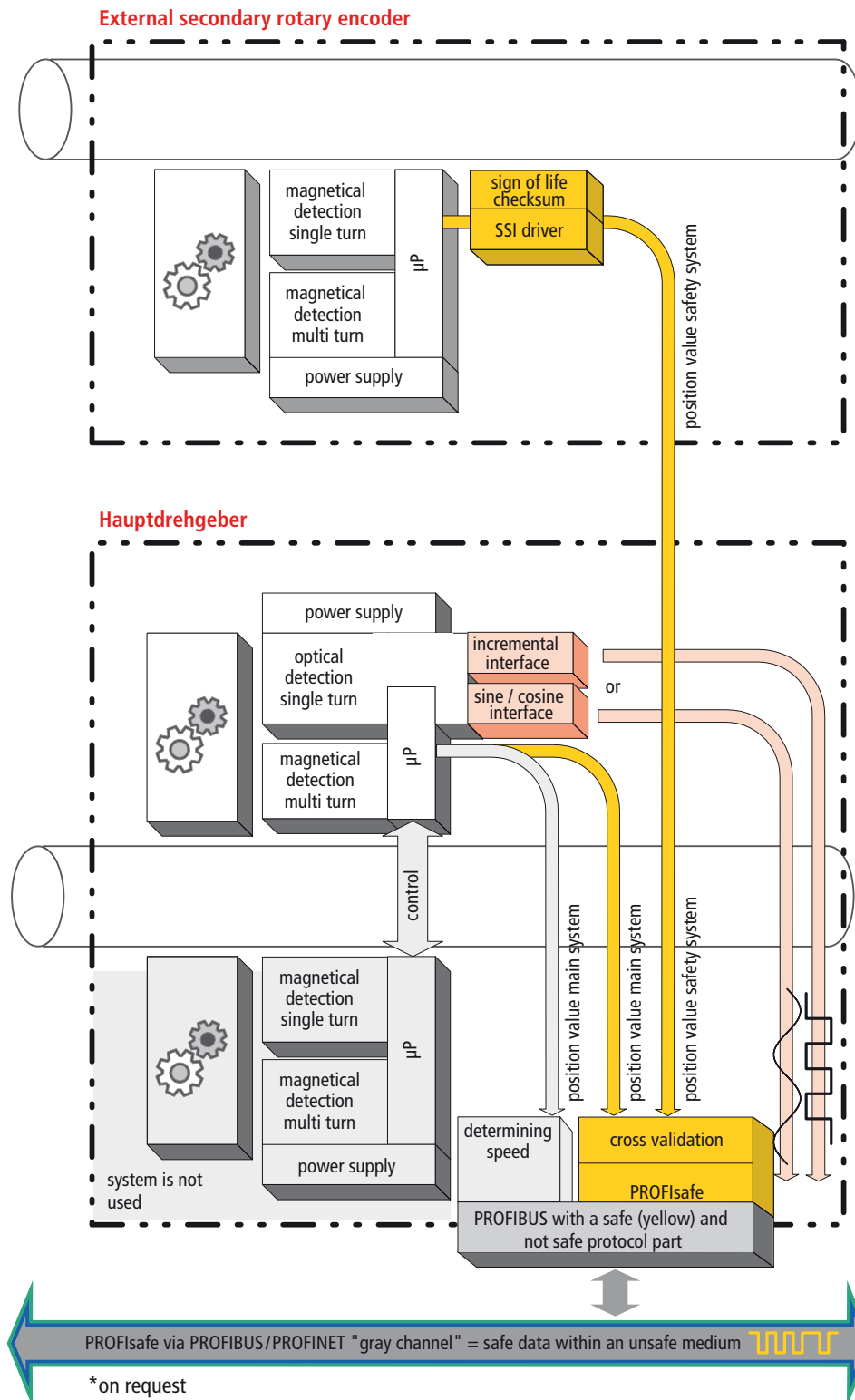
### Monitoring of the synchronization

The two rotary encoders CD\_75 M PROFIsafe (primary system) and CD\_75 M SSI (secondary system) will be mounted on the opposite of the drive train for example at a gantry crane. If the actual difference

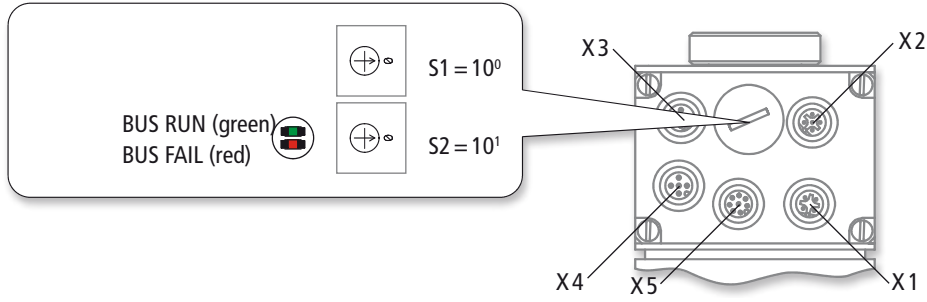
between both systems is bigger than the allowed window of difference, it will be reported as an error and the superior control can react safely.

### Monitoring of the shaft

The rotary encoder CD\_75 M PROFIsafe (primary system) will be mounted on the drive and the CD\_75 M SSI will be mounted at the drive side. With an incorrect rotation of the shaft (due to overload or fracture) the position values of both systems differ. If this value is outside the window of difference, it will be reported as an error and the superior control can react safely.



### Pin assignment CD\_75 M PROFIBUS with PROFIsafe protocol

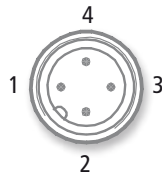


The shielding is to be connected with a large surface on the mating connector!

#### X 1, voltage supply

| X 1 | Pin (M 12 × 1-4 pol.) |
|-----|-----------------------|
| 1   | + 24 V DC             |
| 2   | N.C.                  |
| 3   | 0 V, GND              |
| 4   | N.C.                  |

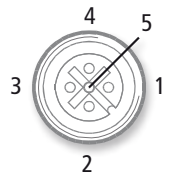
A-coded



#### X 4, alternativ sine / cosine, differential

| X 4 | Connector (M 12 × 1-5 pol.) |
|-----|-----------------------------|
| 1   | Sine +, 1 Vss               |
| 2   | Sine -, 1 Vss               |
| 3   | Cosine +, 1 Vss             |
| 4   | Cosine -, 1 Vss             |
| 5   | 0 V, GND                    |

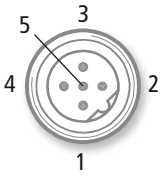
A-coded



#### X 2, PROFIBUS IN

| X 2 | Pin (M 12 × 1-5 pol.) |
|-----|-----------------------|
| 1   | N.C.                  |
| 2   | PROFIBUS, data A      |
| 3   | N.C.                  |
| 4   | PROFIBUS, data B      |
| 5   | N.C.                  |

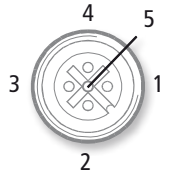
B-coded



#### X 4, rectangle differential

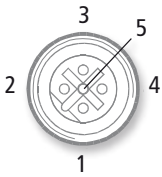
| X 4' | Connector (M 12 × 1-5 pol.) |
|------|-----------------------------|
| 1    | Channel B +, 5 V            |
| 2    | Channel B -, 5 V            |
| 3    | Channel A +, 5 V            |
| 4    | Channel A -, 5 V            |
| 5    | 0 V, GND                    |

A-coded



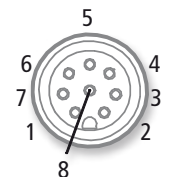
#### X 3, PROFIBUS OUT

| X 3 | Pin (M 12 × 1-5 pol.) |
|-----|-----------------------|
| 1   | 5 V, termination      |
| 2   | PROFIBUS, data A      |
| 3   | GND, termination      |
| 4   | PROFIBUS, data B      |
| 5   | N.C.                  |



#### X 5, optional: SSI external safety channel

| X 5 | Connector (M 12 × 1-8 pol.) |
|-----|-----------------------------|
| 1   | SSI-Clock_OUT -             |
| 2   | SSI-Clock_OUT +             |
| 3   | SSI-Data_IN +               |
| 4   | SSI-Data_IN -               |
| 5   | NC                          |
| 6   | NC                          |
| 7   | + 24 V DC_OUT               |
| 8   | 0 V, GND                    |



If there is no further bus user, a PROFIBUS terminating resistor has to be plugged on. The terminating resistor is not included into the delivery and has to be ordered additionally.

#### PROFIBUS addresses

The PROFIBUS address has to be adjusted over the address switch S1 and S2 within the connection cap:

S1=10<sup>0</sup>, S2=10<sup>1</sup>

Valid PROFIBUS addresses = 1- 99

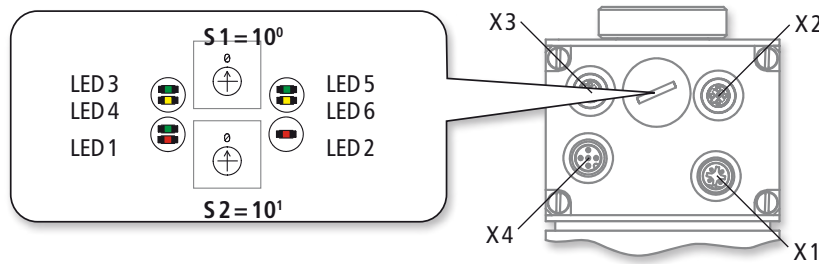
#### PROFIBUS status LEDs

- ON
- OFF
- flashing
- 3 × 5 Hz

- BUS RUN:**
- ready for operation
- missing supply, hardware error
- invalied F\_parameter
- communication OK, reintegration requested

- BUS FAIL:**
- no error, bus within cycle
- rotary encoder of the master is not
- addressed safety relevant error, passivation

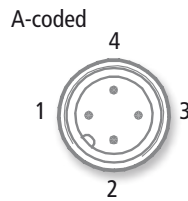
## Pin assignment CD\_75 M PROFINET with PROFIsafe protocol



The shielding is to be connected with a large surface on the mating connector!

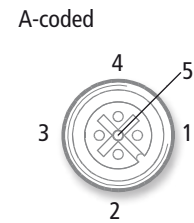
### X1, voltage supply

| X 1 | Male Connector (M 12 × 1-4 pol.) |
|-----|----------------------------------|
| 1   | + 24 V DC                        |
| 2   | N.C.                             |
| 3   | 0 V, GND                         |
| 4   | N.C.                             |



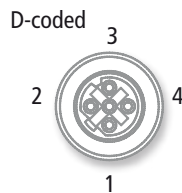
### X4, alternativ SIN/COS, differential

| X 4' | Female Connector (M 12 × 1-5 pol.) |
|------|------------------------------------|
| 1    | Sine +, 1 Vss                      |
| 2    | Sine -, 1 Vss                      |
| 3    | Cosine +, 1 Vss                    |
| 4    | Cosine -, 1 Vss                    |
| 5    | 0 V, GND                           |



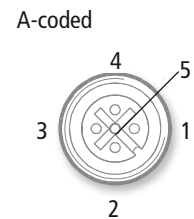
### X2, PORT 2

| X 2 | Female Connector (M 12 × 1-4 pol.) |
|-----|------------------------------------|
| 1   | TxD +, Transmission Data +         |
| 2   | RxD +, Receive Data +              |
| 3   | TxD -, Transmission Data -         |
| 4   | RxD -, Receive Data -              |



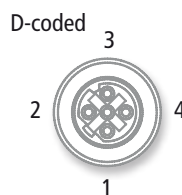
### X4, incremental

| X 4 | Female Connector (M 12 × 1-5 pol.) |
|-----|------------------------------------|
| 1   | Channel B +, 5 V, differential     |
| 2   | Channel B -, 5 V, differential     |
| 3   | Channel A +, 5 V, differential     |
| 4   | Channel A -, 5 V, differential     |
| 5   | 0 V, GND                           |



### X3, PORT 1

| X 3 | Female Connector (M 12 × 1-4 pol.) |
|-----|------------------------------------|
| 1   | TxD +, Transmission Data +         |
| 2   | RxD +, Receive Data +              |
| 3   | TxD -, Transmission Data -         |
| 4   | RxD -, Receive Data -              |



### PROFINET-address

My means of the address switches S1 and S2 in the connection hood the PROFIsafe destination address is adjusted:

S1=10<sup>0</sup>, S2=10<sup>1</sup>  
Valid addresses = 1- 99

### PROFINET LED Conditions

- on
- off
- flashing
- 3 × 5 Hz

- LED 1** bicolor, device status:
- ready for operation
  - missing supply, hardware error
  - re-integration required
  - System or safety relevant error

- LED 3 = Link, LED 4 = Data Activity**
- Ethernet connection established
  - Data transfer TxD/RxD

- LED 2** BUS Status:
- No error
  - Parameter- or F-Parameter error
  - No link to the IO-Controller

- LED 5 = Link, LED 6 = Data Activity**
- Ethernet connection established
  - Data transfer TxD/RxD

## SIL rotary encoder with solid shaft and SSI interfaces

- + two redundant SSI interfaces
- + design with solid shaft
- + proved for the use in affiliation with SIL 3 safety functions
- + functional safety according to DIN EN 61508; VDE 0803: SIL 3 and EN ISO 13849-1: PL e
- + master system: 13 bit resolution, 4.096 revolutions, sine/ cosine - or incremental signals for position feedback
- + safety system: 13 bit resolution, 4.096 revolutions



**SSI**  
**SSI**

### Electrical data

|                                |                      |
|--------------------------------|----------------------|
| Voltage supply                 | 11 ... 27 V DC       |
| Current consumption at no-load | < 150 mA, at 24 V DC |

### Main measurement system

|                    |        |
|--------------------|--------|
| Capacitance        | 25 bit |
| Steps / revolution | 8.192  |
| Revolutions        | 4.096  |

### Safety system

2 redundant detection systems with separate output; mutual monitoring of  $\mu\text{C}$ ; via CRC and sign of life counter safed SSI protocol. The cross validation/safety analysis must happen within the controller.

|                    |        |
|--------------------|--------|
| Capacitance        | 25 bit |
| Steps / revolution | 8.192  |
| Revolutions        | 4.096  |

### Safety standard

|                              |                               |
|------------------------------|-------------------------------|
| Safety Integrity Level (SIL) | SIL 3 DIN EN 61508 / VDE 0803 |
| Performance Level (PL)       | PL e EN ISO 13849             |
| PFH, complete system         | $10 \times 10^{-9}$ 1/h       |

### Mechanical data

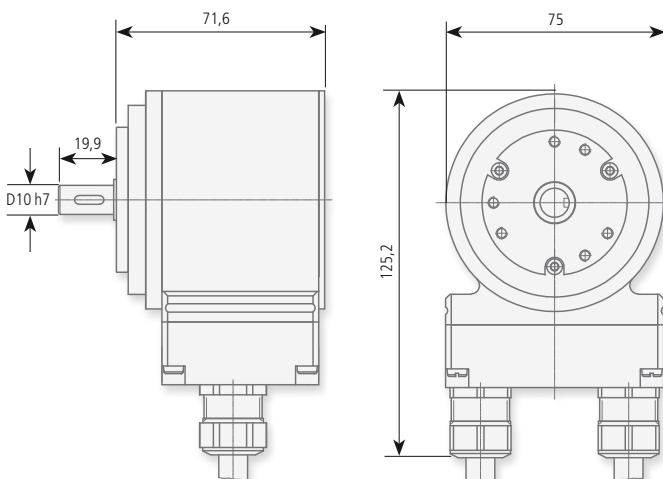
|                                  |   |
|----------------------------------|---|
| Mechanically permissible speed   | $\leq 6.000 \text{ min}^{-1}$                         |
| Shaft load (end of the shaft)    | $\leq 50 \text{ N}$ axial, $\leq 90 \text{ N}$ radial |
| Bearing life time                | $\geq 3,9 \times 10^{10}$ revolutions                 |
| - at speed                       | $\leq 3.000 \text{ min}^{-1}$                         |
| - at operating temperature       | $\leq 60 \text{ }^\circ\text{C}$                      |
| Permissible angular acceleration | $\leq 10^4 \text{ rad/s}^2$                           |
| Mass (typical)                   | 1 kg  |

### Environmental conditions

|                                     |   |
|-------------------------------------|---|
| Protection class DIN EN 60529       | IP 54   |
| Working temperature                 | 0 °C ... +60 °C                               |
| - optionally                        | -20 °C ... +70 °C                             |
| Relative humidity, DIN EN 60068-3-4 | 98 %, non condensing                          |
| Storage temperature                 | -30 °C ... +80 °C, dry                        |
| Vibration DIN EN 60068-2-6          | $\leq 100 \text{ m/s}^2$ , sine 50–2.000 Hz   |
| Shock DIN EN 60068-2-27             | $\leq 1.000 \text{ m/s}^2$ , half-sine, 11 ms |
| Emitted interference                | class B, industrial areas                     |

### Interfaces

|                              |  |
|------------------------------|--|
| Protocol                     | 2 × SSI<br>CRC-safed protocol with additional information  |
| Transferred values           | channel 1: position, error bit, sign of life counter, CRC<br>channel 2: position, sign of life counter, status bits, CRC |
| Programmable parameter       | -  |
| Unsafe incremental interface | A, A-, B, B-   |
| Number of pulses (fixed) or  | sine / cosine (1 Vss): 1.024 or 4.096  |
| Number of pulses (fixed)     | rectangle (RS 422): 1.024, 2.048, 4.096, 8.192, 16.384 or 32.768   |
| Code                         | binary   |



### Order information:

|                          |   |
|--------------------------|---|
| Order number             | CDV 75 M-00001  |
| Flange / shaft           | Centering collar 50 h7<br>shaft 10 h7<br>with groove 3 N9 × 10,2                            |
| Connection               | 2 cable glands,<br>removable connection cap   |
| Unsafe incremental track | Rectangle (RS 422)<br>4.096 steps/revolution,<br>K1, K2 and inverse.<br>Further on request. |

Please ask for detailed drawings.



## SIL rotary encoder with hollow shaft and SSI interfaces

- + two redundant SSI interfaces
- + design with hollow shaft, 20 mm shaft diameter
- + proved for the use in affiliation with SIL 3 safety functions
- + functional safety according to DIN EN 61508; VDE 0803: SIL 3 and EN ISO 13849-1: PL e
- + master system: 13 bit resolution, 4.096 revolutions, sine/ cosine - or incremental signals for position feedback
- + safety system: 13 bit resolution, 4.096 revolutions



**SSI**  
**SSI**

### Electrical data

|                                |                      |
|--------------------------------|----------------------|
| Voltage supply                 | 11 ... 27 V DC       |
| Current consumption at no-load | < 150 mA, at 24 V DC |

### Main measurement system

|                  |        |
|------------------|--------|
| Capacitance      | 25 bit |
| Steps/revolution | 8.192  |
| Revolutions      | 4.096  |

### Safety system

2 redundant detection systems with separate output; mutual monitoring of  $\mu\text{C}$ ; via CRC and sign of life counter safed SSI protocol. The cross validation/safety analysis must happen within the controller.

|                  |        |
|------------------|--------|
| Capacitance      | 25 bit |
| Steps/revolution | 8.192  |
| Revolutions      | 4.096  |

### Safety standard

|                              |                             |
|------------------------------|-----------------------------|
| Safety Integrity Level (SIL) | SIL 3 DIN EN 61508/VDE 0803 |
| Performance Level (PL)       | PL e EN ISO 13849           |
| PFH, Complete system         | $10 \times 10^{-9}$ 1/h     |

### Mechanical data

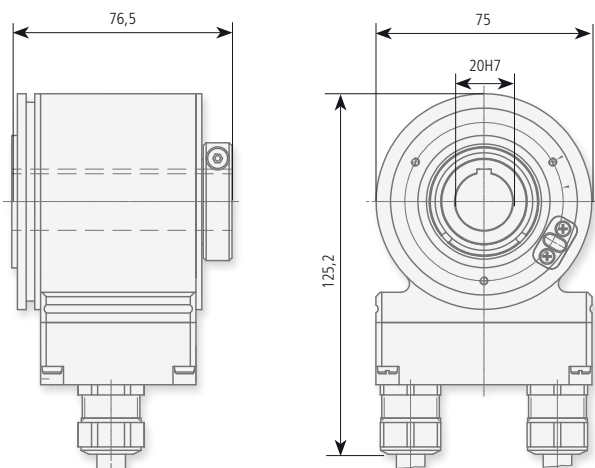
|                                  |                                       |
|----------------------------------|---------------------------------------|
| Mechanically permissible speed   | $\leq 3.000 \text{ min}^{-1}$         |
| Shaft load (end of the shaft)    | dead weight of the rotary encoder     |
| Bearing life time                | $\geq 3,9 \times 10^{10}$ revolutions |
| - at speed                       | $\leq 1.500 \text{ min}^{-1}$         |
| - at operating temperature       | $\leq 60 \text{ }^\circ\text{C}$      |
| Permissible angular acceleration | $\leq 10^4 \text{ rad/s}^2$           |
| Mass (typical)                   | 1 kg                                  |

### Environmental conditions

|                                     |   |
|-------------------------------------|---|
| Protection class DIN EN 60529       | IP 54   |
| Working temperature                 | 0 °C ... +60 °C                               |
| - optionally                        | -20 °C ... +70 °C                             |
| Relative humidity, DIN EN 60068-3-4 | 98 %, non condensing                          |
| Storage temperature                 | -30 °C ... +80 °C, dry                        |
| Vibration DIN EN 60068-2-6          | $\leq 100 \text{ m/s}^2$ , sine 50–2.000 Hz   |
| Shock DIN EN 60068-2-27             | $\leq 1.000 \text{ m/s}^2$ , half-sine, 11 ms |
| Emitted interference                | class B, industrial areas                     |

### Interfaces

|                              |  |
|------------------------------|--|
| Protocol                     | 2 × SSI<br>CRC-safed protocol with additional information  |
| Transferred values           | channel 1: position, error bit, sign of life counter, CRC<br>channel 2: position, sign of life counter, status bits, CRC |
| Programmable parameter       | -  |
| Unsafe incremental interface | A, A-, B, B-   |
| Number of pulses (fixed)     | sine/cosine (1 Vss): 1.024 or 4.096<br>or<br>rectangle (RS 422): 1.024, 2.048, 4.096, 8.192, 16.384 or 32.768            |
| Code                         | binary   |



Please ask for detailed drawings.

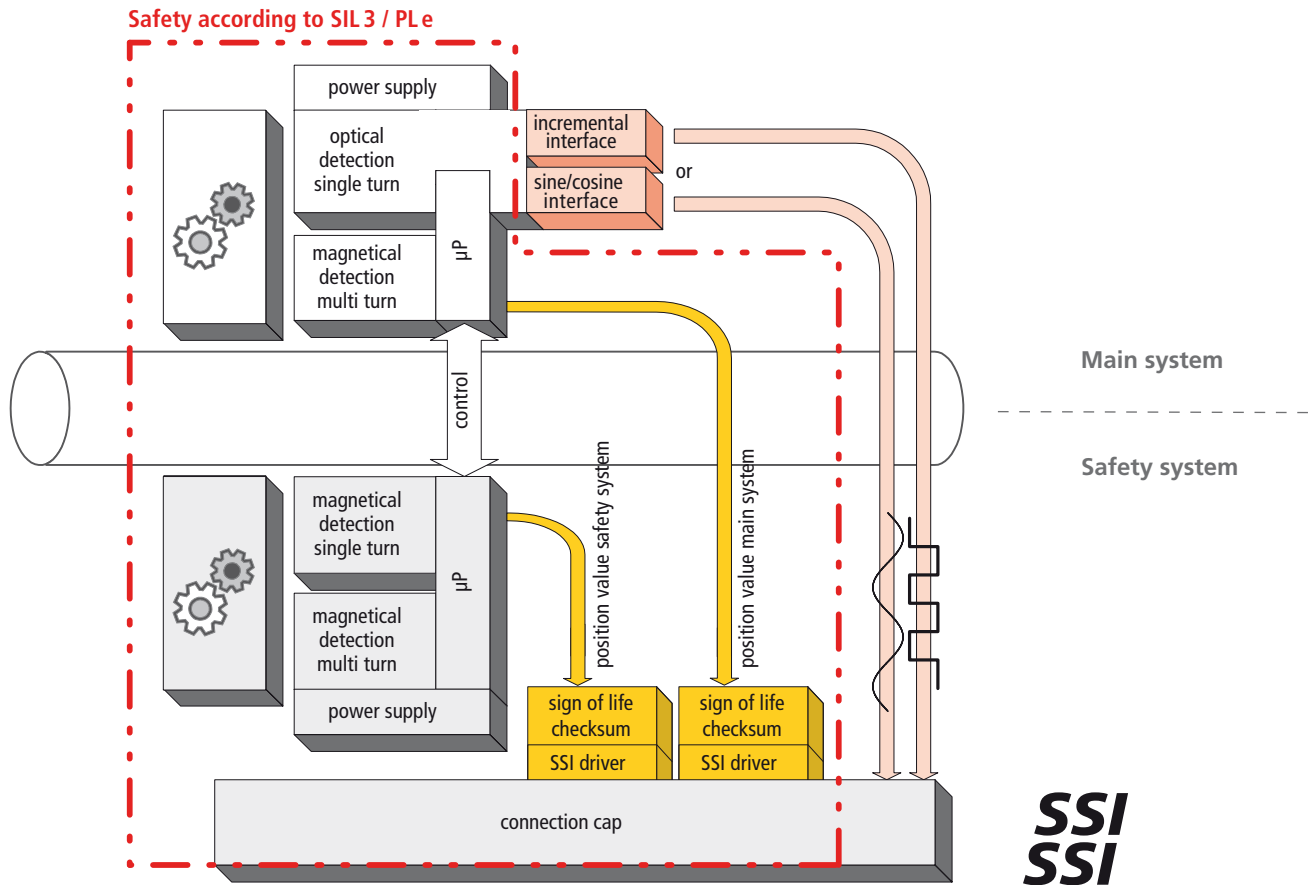
### Order information:

|                          |   |
|--------------------------|---|
| Order number             | CDH75M-00001  |
| Flange / shaft           | hollow shaft 20 H7 with groove 5 JS9;<br>flange sided attachment for rotation prevention    |
| Connection               | 2 cable glands,<br>removable connection cap   |
| Unsafe incremental track | Rectangle (RS 422)<br>4.096 steps/revolution,<br>K1, K2 and inverse.<br>Further on request. |

## Safety according to SIL 3/PL e with 2 x SSI

The determined position values will be enhanced with status information and checksum. These position values will be distributed on separate SSI interfaces. It is the task of the sequential electronic, to determine the accuracy of the measurement values by comparing both values. Hereby, additional information within the SSI telegram is

helpful. The SSI telegram also transfers an error bit of the other system, therefore it is possible to diagnose that you have to look for an error within the rotary encoder (the other system reports the error) or in the cable (the other system reports no error).



### SSI telegram (identical for main and safety system)

| bit 0 ... 11                      | bit 12 ... 24                      | bit 25        | bit 26                        | bit 27 ... 31        | bit 32 ... 39 |
|-----------------------------------|------------------------------------|---------------|-------------------------------|----------------------|---------------|
| measurement value multi turn part | measurement value single turn part | own error bit | error bit of the other system | sign of life counter | checksum CRC  |
| 12 bit                            | 13 bit                             | 1 bit         | 1 bit                         | 5 bit                | 8 bit         |

Both systems transfer the actual position value in an enhanced SSI telegram.

#### Error bit

The error bit of both systems is shown in both SSI channels. Therefore, if there is a difference in one of the SSI channels the error can be transferred into the other channel without doubt. Hence, the diagnosis of both systems can be realized when having one channel operation.

#### Checksum

An 8 bit CRC checksum will be calculated over all user data within the SSI telegram and then it will be put into the SSI telegram. Secured data: MT and ST data, error bits, sign of life counter. Hamming distance = 3: two incorrect data bits will safely be recognized.

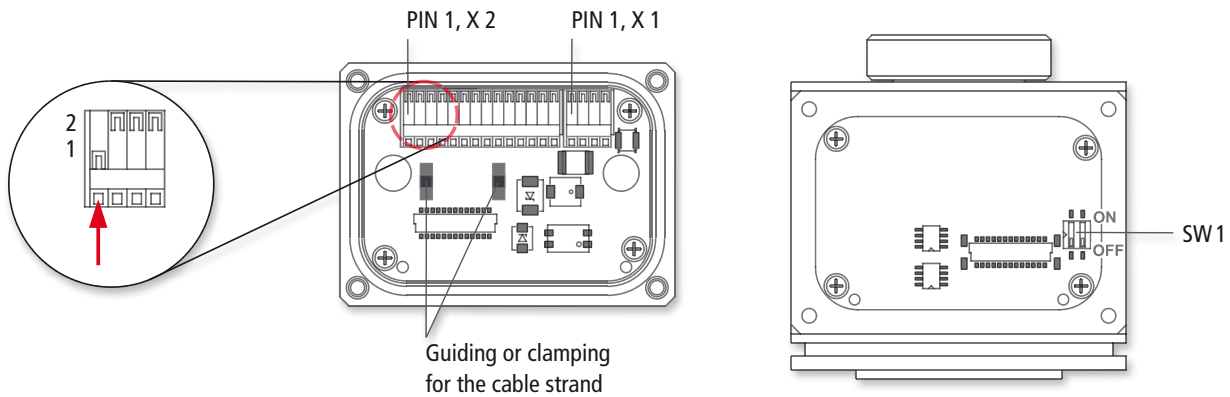
#### Sign of life counter

The sign of life counter will be incremented with each detection process of the rotary encoder system. The incremented sign of life counter makes sure up to the latest telegram, that the actual transferred data comes out of a new position detection.

If SSI requests happen faster than the internal detection (500 µs master channel, 500 µs safety channel), the position data and the sign of life counter are still unchanged.

**SSI**  
**SSI**

## Pin assignment CD\_75 M 2 x SSI



- \_bring locking slide into position „1“
- \_insert strand
- \_bring locking slide into position „2“ and lock

### X1, voltage supply

| PIN | Signal                     | Description    |                       |
|-----|----------------------------|----------------|-----------------------|
| 1   | + 24 V DC (11 ... 28 V DC) | Voltage supply | PIN 1/2 wired through |
| 2   | + 24 V DC (11 ... 28 V DC) | Voltage supply |                       |
| 3   | 0 V                        | GND            | PIN 3/4 wired through |
| 4   | 0 V                        | GND            |                       |

**Attention!** Out of safety reasons the GND (PIN 3/4) has to be wired with two different channels!

### X2, measurement system

| PIN | Signal                          | Description                                 |
|-----|---------------------------------|---|
| 1   | N.C.                            | <b>Do not connect!</b>                      |
| 2   | Cosine – / optional channel A – | 1 Vss, differential / differential RS 422   |
| 3   | Cosine + / optional channel A + | 1 Vss, differential / differential RS 422   |
| 4   | N.C.                            | <b>Do not connect!</b>                      |
| 5   | Sine – / optional channel B –   | 1 Vss, differential / differential RS 422   |
| 6   | Sine + / optional channel B +   | 1 Vss, differential / differential RS 422   |
| 7   | Main system SSI-Data_OUT –      | Data –, main system, differential RS 422    |
| 8   | Main system SSI-Data_OUT +      | Data +, main system, differential RS 422    |
| 9   | Main system SSI-Clock_IN –      | Clock –, main system, differential RS 422   |
| 10  | Main system SSI-Clock_IN +      | Clock +, main system, differential RS 422   |
| 11  | Safety system SSI-Data_OUT –    | Data –, safety system, differential RS 422  |
| 12  | Safety system SSI-Data_OUT +    | Data +, safety system, differential RS 422  |
| 13  | Safety system SSI-Clock_IN –    | Clock –, safety system, differential RS 422 |
| 14  | Safety system SSI-Clock_IN +    | Clock +, safety system, differential RS 422 |

# TR-Electronic – Your Partner in Automation

General/Definition

CD\_75 M

PROFIsafe

2 x SSI with checksum



### Programmable rotary encoder

The standard of automation technology, available with all current fieldbus systems: PROFIBUS, Interbus, CANopen, DeviceNet and Industrial Ethernet. Including TR-Electronic's variety of mechanics, interfaces and functions.



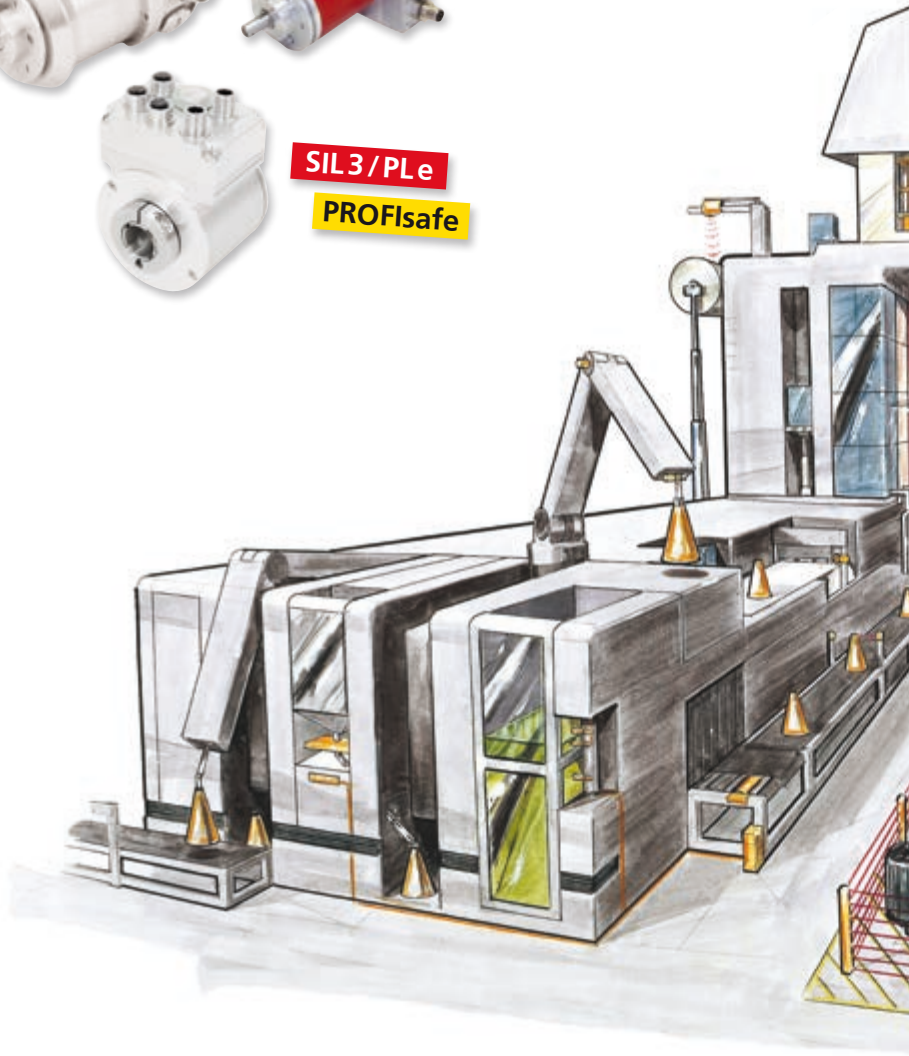
### Incremental rotary encoder

From 24 mm external diameter up to 55 mm hollow shaft – we always have a solution!



### Motor feedback systems

Feedback encoder for modern positioning drives. Optional integrated or directly mounted on the drive shaft via hollow shaft.



### Linear absolute displacement sensors

The compact class for linear absolute measurement. Directly bus-ready, suitable for harsh environmental conditions and for installation in hydraulic cylinders.



### Absolute high resolution linear measurement systems

Linear measurement with absolute sub-micron resolution without referencing.



**Intelligent positioning drive**

Absolute positioning directly via fieldbus. Integrated motor, power electronics, closed loop controller, absolute encoder, PLC functions and fieldbus interface.



**Heavy-duty industrial PC**

Double shock proof mounted housing isolates the electronics from vibration, while front access (MIPC) simplifies configuration and start up. Choose from our wide selection of housings.



**SPC – the PLC for PC**

Turns every PC into an efficient PLC under S5/S7 or IEC 1131 protocols. Combines the comfort of PC control with the safety of a separate processor for PLC tasks.



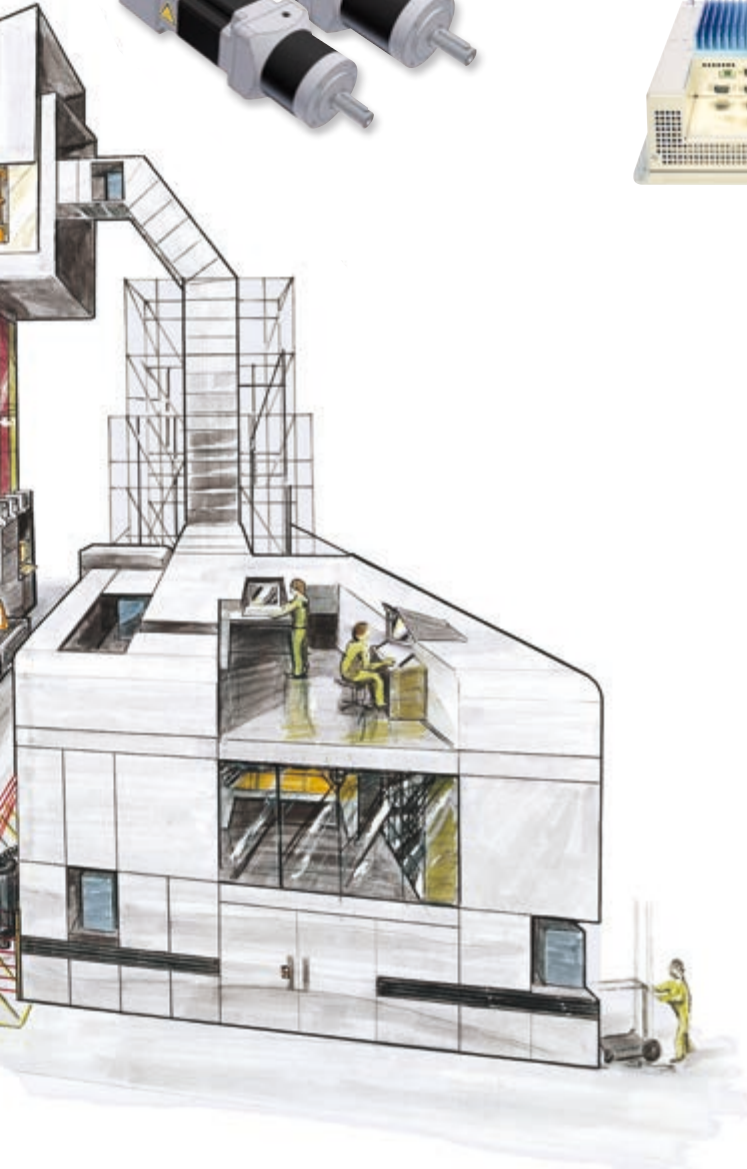
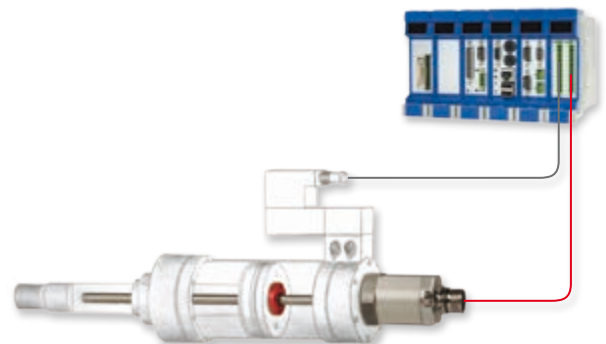
**@ctivelO – more than fieldbus modules**

Modular, rugged fieldbus node system I/O-node, small-scale PLC, decentralized axis controller, high performance cam controller, DIN-rail mounted industrial PC, servo controller for the hydraulic ... with commercial fieldbus systems, such as Profibus-DP, CANopen, DeviceNet, LightBus ... and ETH-ERNET as option!



**Laser distance measuring systems**

Absolute and wear-free measurement of distances up to 200 m via SSI, fieldbus and Ethernet.



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