# P16800

## SIL-Compliant Transducer for the Duplication, Conversion, and Isolation of Rotary Encoder Signals

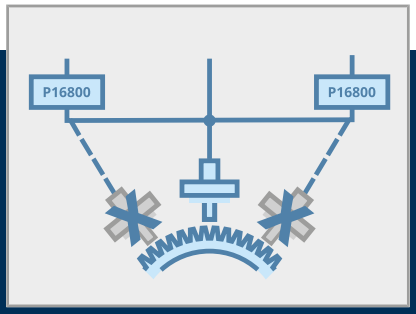

**The P16800 speed signal doubler is an innovative solution patented for safety-critical applications.**

The pulse transducer carries out non-interacting signal decoupling for one or two-channel speed sensors and transmits the duplicated signals to downstream devices in a functionally safe manner. In addition, high isolation and double-shielded optical signal transmission ensure extreme immunity to interference and undistorted signal doubling. The P16800 flexibly adapts rotary encoder signals to the conditions of downstream control units.

5 year warranty

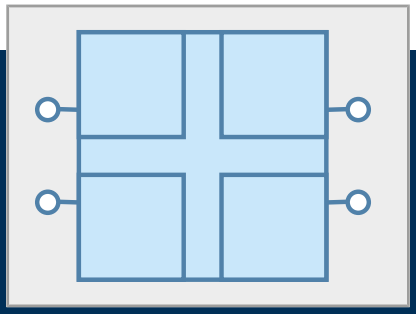

### Functionally Safe

- Non-interacting signal decoupling in accordance with SIL 4
- Option of functionally safe signal transmission in accordance with SIL 2
- Optimized for use on rolling stock




### Reduces Costs for New Units

- Reduced number of rotary encoders
- Signal conditioning by converting voltage signals into current signals and vice versa, as well as by frequency division
- Reduced assembly and maintenance costs



### Provides a High Level of Isolation

- Ensures galvanic isolation between the rotary encoder and controller
- Protects downstream devices

## Product Code

| **P16800 Product Family** | **P** | **1** | **6** | **_** | **_** | **_** | **P** | **_** | **_** | **/** | **_** | **_** | **_** | **_** | **_** | **_** | **_** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Input pulses/output pulses | | | | **8** | | | | | | | | | | | | | |
| 1 input → 1 output | | | | | **1** | | | | | | | | | | | | |
| 2 inputs → 2 outputs | | | | | **2** | | | | | | | | | | | | |
| 2 inputs → 2 outputs, configurable as DOT (direction of travel), frequency division 1:1 or 2:1 or 4:1 with retention of 90° phase shift[1) 2)] | | | | | **9** | **0** | | | | | **3** | | | | | | |
| With non-interacting input (SIL 4) | | | | | | **0** | | | | | | | | | | | |
| With non-interacting input (SIL 4) and with functionally safe transmission of the signal to the output (SIL 2)[3)] | | | | | | **2** | | | | | | | | | | | |
| Modular enclosure [4)] | | | | | | | | **3** | | | | | | | | | |
| Two-tier terminals in push-in version, pluggable | | | | | | | | | **1** | | | | | | | | |
| Frequency division 1:1 or 2:1[5)] | | | | | | | | | | | **2** | | | | | | |
| Frequency division 1:1 or 4:1[5)] | | | | | | | | | | | **4** | | | | | | |
| Frequency division 1:1 or 8:1[5)] | | | | | | | | | | | **8** | | | | | | |
| Power supply/auxiliary power 10…33.6 V | | | | | | | | | | | | **0** | | | | | |
| Special types | | | | | | | | | | | | | **-** | **S** | **x** | **x** | **x** |

## Specifications (Excerpt)

Excerpt from the user manual. Detailed information → *knick-international.com*

### 1 Input

| | |
|---|---|
| Input signal | Voltage U or current I |
| Waveform | Square |
| Input frequency $f_{in}$ | 0…25 kHz |

### 1.1 Voltage Reference

| | |
|---|---|
| Voltage reference $U_S$ | 10…33.6 V |
| Error detection open cable $U_S$ | < 8…10 V; typically 9.45 V |

### 1.2 Voltage Input

| | |
|---|---|
| Input voltage | 0…$U_S$ |
| Input switching level | Low: min. 27 % of $U_S$ |
| | High: max. 77 % of $U_S$ |

1) Without middle voltage generation

2) Information about this product is available in a separate document: P16890P31/30.

3) No functionally safe transmission of signals to the output (SIL 2) when middle voltage detection is activated

4) For 35 mm DIN rail or wall mounting with the ZU1472 wall-mount adapter (optional)

5) The phase shift is lost for P1682*P**.

### 1.3 Current Input

| | |
|---|---|
| Input current | 6…20 mA |
| Input switching level at Low = 6/7 mA | Low: min. 9.025 mA |
| Input switching level at High = 14/20 mA | High: max. 12.075 mA |
| Error detection open cable | < 1.8…2.6 mA; typically 2.2 mA |

### 2 Output

| | |
|---|---|
| Output signal | Voltage U or current I |
| Waveform | Square |
| Signal conversion options | Current → current |
| | Voltage → voltage |
| | Current → voltage |
| | Voltage → current |

### 2.1 Voltage Output

| | |
|---|---|
| Voltage level | Low: < 1 V (at max. 20 mA) |
| | High: $U_B$…$U_B$ − 2 V (at max. 20 mA) |
| | High ($U_B$ open): > 5.5 V (at max. 20 mA) |
| | Detected standstill: 6.9…7.5 V; typically 7.2 V (middle voltage) (at max. I = ($U_B$ − 7.2 V)/3 kΩ) |

### 2.2 Current Output

| | |
|---|---|
| Current level<br>High level dependent on configuration | Low: 4…8 mA; typically 6 mA |
| | High = 14 mA: 12…16 mA; typically 14 mA |
| | High = 20 mA: 18…22 mA; typically 20 mA |

### 2.3 Switch Output

| | |
|---|---|
| Technical version | Solid state relay |
| | Normally closed contact (N/C), opens if an error occurs |
| Fault response time | < 1 s |

### 3 Transfer Characteristics

| | |
|---|---|
| Functional behavior | The output level follows the input level. |
| | Optional: Frequency division |
| Setpoint standstill detection | 0.7…1.3 Hz; typically 1 Hz |
| Response time standstill detection | Max. 3 s |
| Reaction of outputs to detected error: | |
| Current output | 0…100 µA |
| Voltage output | Not inverted: High |
| | Inverted: Low |

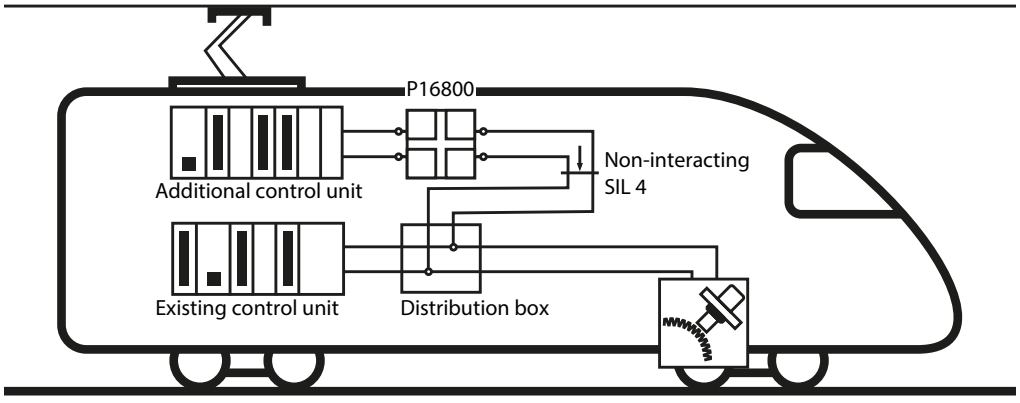
## 4 Auxiliary Power

| | | |
|---|---|---|
| Requirements for the voltage source | Specific source in accordance with EN 50155 Section 5.1.1. For direct connection to a battery, burst immunity is restricted to evaluation criterion B. The influence on galvanic isolation must be considered. | |
| Electrical safety | All connected current and voltage circuits must meet the SELV, PELV, or EN 50153 Section I requirements. | |
| Supply of the output | $V_S$: Supply of the P16800[6] | |
| | $U_B$: Supply of output driver[7] | |
| Power supply | $V_S$: 10…33.6 V | |
| | $U_B$: 10…33.6 V | |

## 5 Isolation

| | | |
|---|---|---|
| Galvanic isolation | Input circuits against output circuits | |
| | Input circuit channel In 1 against input circuit channel In 2 | |
| Type test voltage | Input against output: | 8.8 kV AC/5 s |
| | | 5 kV AC/1 min |
| | Channel 1 against channel 2: | 3 kV AC/1 min |
| | Output against outer shield of the output (screen): | 710 V AC/5 s |
| | | 600 V AC/60 s |
| | Input against outer shield of the input (screen): | 2,200 V AC/5 s |
| | | 700 V AC/60 s |
| | Input against DIN rail: | 3,550 V AC/5 s |

**Application Example**




6) The entire device, including the input stage, is supplied via $V_S$.

7) The output stage can be supplied separately via the $U_B$ connection. Next, the output voltage levels are set via $U_B$.

105529 TB-257.401-KNEN04 2026-01-12

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