HEIDENHAIN

Product Information

Gateway

For Connecting EnDat Encoders to PROFIBUS-DP

April 2012

PROFIBUS Gateway
For Connecting EnDat Encoders

Encoders with EnDat interface for connection via gateway
All absolute encoders from HEIDENHAIN with **EnDat interface** are suitable for PROFIBUS-DP. The encoder is electrically connected through a **gateway.** The complete interface electronics are integrated in the gateway, as well as a voltage converter for supplying EnDat encoders with DC 5 V ± 5 %. This offers a number of benefits:
- Simple connection of the field bus cable, since the terminals are easily accessible.
- Encoder dimensions remain small.
- No temperature restrictions for the encoder. All temperature-sensitive components are in the gateway.
- No bus interruption when an encoder is exchanged.

Besides the EnDat encoder connector, the gateway provides connections for the PROFIBUS and the power supply. In the gateway there are coding switches for addressing and selecting the terminating resistor.

Since the gateway is a bus member, the cable to the encoder is not a stub line, although it can be up to 40 meters long.

PROFIBUS DP
PROFIBUS is a nonproprietary, open field bus in accordance with the EN 50 170 standard. The connecting of sensors through field bus systems minimizes the cost of cabling and reduces the number of lines between encoder and subsequent electronics.

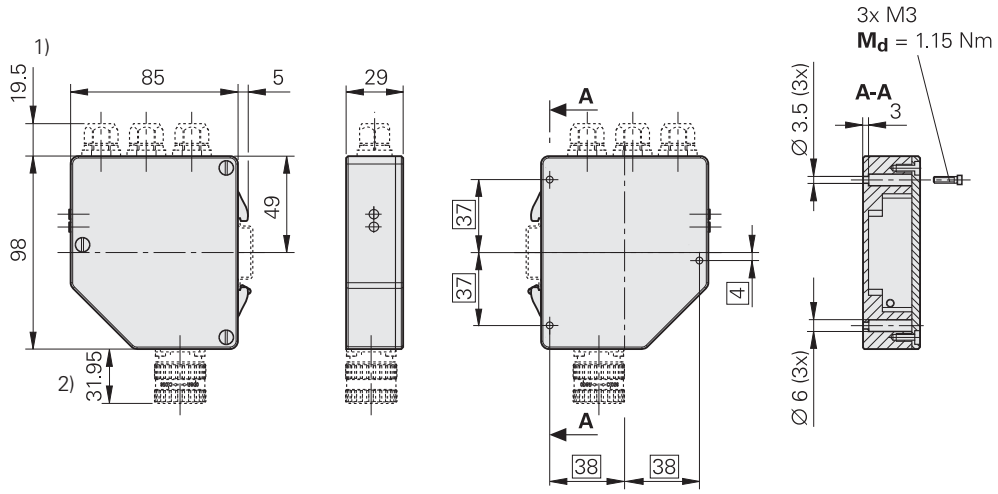
PROFIBUS-DP profile
The PNO (PROFIBUS user organization) has defined a standard, nonproprietary profile for the connection of absolute encoders to the PROFIBUS-DP. This ensures high flexibility and simple configuration on all systems that use this standardized profile.

Self-configuration
The device identification records (GSD) completely and clearly describe the characteristics of the gateway in an exactly defined format. The GSD file can be downloaded from the HEIDENHAIN FileBase.

DP-V0 profile
This profile can be obtained from the Profibus user organization (PNO) in Karlsruhe, Germany, under the order number 3.062. There are two classes defined in the profile, where class 1 provides minimum support, and class 2 allows additional, in part optional functions.

DP-V1 and DP-V2 profiles
These profiles can be obtained from the Profibus user organization (PNO) in Karlsruhe, Germany, under the order number 3.162. This profile also distinguishes between two device classes:
- Class 3 with the basic functions and
- Class 4 with the full range of scaling and preset functions.

Optional functions are defined in addition to the mandatory functions of classes 3 and 4.



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

[1] Maximum values, depending on whether cable gland or M12
[2] Maximum values, depending on whether M12 or M23

Specifications	PROFIBUS DP Gateway
Input	Encoders with EnDat interface, ordering designation EnDat21[1)]
Connection*	M12 flange socket (female) 8-pin M23 flange socket (female) 17-pin
Cable length	≤ 40 m (with HEIDENHAIN cable), greater lengths upon request
Power supply of encoder	DC 5 V ± 5 % (max. 400 mA)
EnDat clock frequency	500 kHz
Output	PROFIBUS DP-V0, classes 1 and 2 PROFIBUS DP-V1, DP-V2, classes 3 and 4 Integrated T-junction and bus termination (can be switched off)
Operating status displays	Integrated LED displays: • "Modules" ≙ Gateway status • "Bus" ≙ Profibus status
PROFIBUS clock frequency	9.6 kb/s to 12 Mb/s
Bus connection* (bus in, bus out, power)	3 x M12 connecting element, 4 or 5 pins 3 x cable gland M16[2)] (terminal strip in the device)
Setting range for address	0 to 126 (set by switch)
Cable length	≤ 400 m for 1.5 Mb/s ≤ 100 m for 12 Mb/s
Power supply	DC 9 to 36 V (including residual ripple)
Power consumption	Maximum: *9 V:* ≤ 4.8 W; *36 V:* ≤ 4.8 W Typical: 1.5 W + $P_{encoder}$ x 1.33
Operating temperature	–40 °C to 80 °C
Vibration 50 to 2000 Hz **Shock** 11 ms	≤ 100 m/s^2 (EN 60068-2-6) ≤ 300 m/s^2 (EN 60068-2-27)
Protection EN 60529	IP 65
Weight	400 g
Dimensions	Approx. 150 mm x 90 mm x 30 mm
Fastening	Top-hat rail mounting[3)]

***** Please select when ordering

1) EnDat encoders with the ordering designations EnDat01, EnDat02 and EnDat22 can also be connected. However, the information available via PROFIBUS is generated on the basis of the EnDat21 interface. The position value corresponds to the absolute value transmitted via the EnDat interface without interpolation of the 1 V_{PP} signals.

2) Only in connection with the M23 input connector

3) A mounting kit is available under ID 680406-01 for mounting on the existing holes of the ID 325771 gateway.

Supported functions
Particularly important in decentralized field bus systems are the **diagnostic functions** (e.g. warnings and alarms), and the **electronic ID label** with information on the type of encoder, resolution, and measuring range. But also programming functions such as counting direction reversal, **preset/ zero shift** and **changing the resolution (scaling)** are possible. The operating time of the encoder can also be recorded.

DP-V0

Feature *Data word width*	**Class**	**Rotational encoders** *≤ 16 bits*	 *≤ 31 bits*[1]	**Linear encoders** *≤ 31 bits*[1]
Position value in pure binary code	1, 2	✓	✓	✓
Data word length	1, 2	16	32	32
Scaling function Measuring steps/rev Total resolution	 2 2	 ✓ ✓	 ✓ ✓	 – –
Reversal of counting direction	1, 2	✓	✓	–
Preset (output data 16 or 32 bits)	2	✓	✓	✓
Diagnostic functions Warnings and alarms	 2	 ✓	 ✓	 ✓
Operating time recording	2	✓	✓	✓
Speed	2	✓ [2]	✓ [2]	–
Profile version	2	✓	✓	✓
Serial number	2	✓	✓	✓

[1] With data word width > 31 bits, only the upper 31 bits are transferred
[2] Requires a 32 bit output data and a 32 +16 bit input data configuration

DP-V1, DP-V2

Feature *Data word width*	**Class**	**Rotational encoders** *≤ 32 bits*	 *> 32 bits*	**Linear encoders**
Telegram	3, 4	81-84	84	81-84
Scaling function	4	✓	✓	–
Reversal of counting direction	4	✓	✓	–
Preset/ Zero point shift	4	✓	✓	✓
Acyclic parameters	3, 4	✓	✓	✓
Channel-dependent diagnosis via alarm channel	3, 4	✓	✓	✓
Operating time recording	3, 4	✓ [1]	✓ [1]	✓ [1]
Speed	3, 4	✓ [1]	✓ [1]	–
Profile version	3, 4	✓	✓	✓
Serial number	3, 4	✓	✓	✓

[1] Not supported by DP V2

Electrical Connection
PROFIBUS DP

M16 cable gland
In the versions with M16 cable gland, the bus lines and the power supply are applied to a terminal strip.

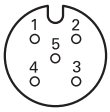
Connecting terminals			
Power supply		**Absolute position values** BUS-in or BUS-out	
+E	**0 V**	**A**	**B**
U_P	**0 V**	**DATA (A)**	**DATA (B)**

Flange socket M12
PROFIBUS-DP and the power supply are connected via the M12 connecting elements. The necessary mating connectors are:

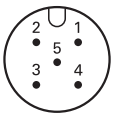
Bus input:
M12 connector (female), 5-pin, B-coded
Bus output:
M12 coupling (male), 5-pin, B-coded
Power supply:
M12 connector, 4-pin, A-coded

Accessory:
Adapter M12 (male), 4-pin, B-coded
Fits 5-pin bus output, with PROFIBUS terminating resistor. Required for last participant if the encoder's internal terminating resistor is not to be used.
ID 584217-01

Mating connector:
Bus input
5-pin connector (female)
M12 B-coded



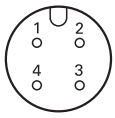
Mating connector:
Bus output
5-pin coupling (male)
M12 B-coded



	Power supply				Absolute position values	
	1	**3**	**5**	**Housing**	**2**	**4**
BUS in	**/**	**/**	**Shield**	**Shield**	**DATA (A)**	**DATA (B)**
BUS out	**U**[1)]	**0 V**[1)]	**Shield**	**Shield**	**DATA (A)**	**DATA (B)**

[1)] For supplying the external terminating resistor

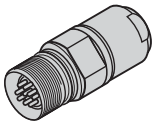
Mating connector:
Power supply
4-pin connector (female)
M12 A-coded



	1	**3**	**2**	**4**
	U_P	**0 V**	**Vacant**	**Vacant**

Encoders with EnDat Interface

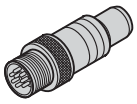
Mating connector:
17-pin M23 **coupling**



	Power supply					Incremental signals[1]				Absolute position values			
	7	**1**	**10**	**4**	**11**	**15**	**16**	**12**	**13**	**14**	**17**	**8**	**9**
	U_P	**Sensor** U_P	0 V	**Sensor** 0 V	**Internal shield**	**A+**	**A–**	**B+**	**B–**	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**
	Brown/ Green	Blue	White/ Green	White	/	Green/ Black	Yellow/ Black	Blue/ Black	Red/ Black	Gray	Pink	Violet	Yellow

Cable shield connected to housing; **U_P** = 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!
[1] Only with ordering designations EnDat 01 and EnDat 02; not evaluated by the gateway

Mating connector:
8-pin M12 **coupling**



	Power supply				Absolute position values			
	8	**2**	**5**	**1**	**3**	**4**	**7**	**6**
	U_P	**U_P**[1]	**0 V**	**0 V**[1]	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**
	Brown/Green	Blue	White/Green	White	Gray	Pink	Violet	Yellow

Cable shield connected to housing; **U_P** = power supply voltage
Vacant pins or wires must not be used!
[1] The parallel-configured power line is connected in the encoder with the corresponding power supply

HEIDENHAIN

DR. JOHANNES HEIDENHAIN GmbH
Dr.-Johannes-Heidenhain-Straße 5
83301 Traunreut, Germany
☎ +49 8669 31-0
FAX +49 8669 5061
E-mail: info@heidenhain.de

www.heidenhain.de

For more information
- Catalog: *Rotary Encoders*
- Catalog: *Position Encoders for Servo Drives*
- Catalog: *Angle Encoders with Integral Bearing*
- Catalog: *Linear Encoders for Numerically Controlled Machine Tools*