Operating Manual
Incl. EU Declaration of Conformity

DeviceNet™

for Penning Gauges

PEG100-D

CE

About this document

This document is a supplement to the Operating Manual of the PEG100. It should be used together with it.

Product Identification

In all communications with INFICON, please specify the information on the product nameplate. For convenient reference copy that information into the space provided below.

INFICON AG, LI-9496 Balzers
Typ: .....
No: .....
F-No: .....
..... V⎓ ..... W

Validity

This document applies to products with part numbers

351-003	(PEG100-D,	DN 25 ISO-KF)
351-004	(PEG100-D,	DN 40 CF-F)

The part number (No:) can be taken from the product nameplate.

DeviceNet Interface

The PEG100-D is equipped with a fieldbus interface DeviceNet. Thus, process automatization devices can easily be interconnected.

The fieldbus-system DeviceNet is described in the DeviceNet specification of the Open DeviceNet Vendor Association (ODVA). The technical and functional features of the DeviceNet Standards are specified herein.

The PEG100-D has the functionality of DeviceNet Group 2 Only Slaves.

Scope of Delivery

- Penning Gauge PEG100-D
- Replacement cathode plate of titanium
- Replacement ceramics disc
- Operating Manual PEG100 (German)
- Operating Manual PEG100 (English)
- Operating Manual PEG100-D (English)

Contents

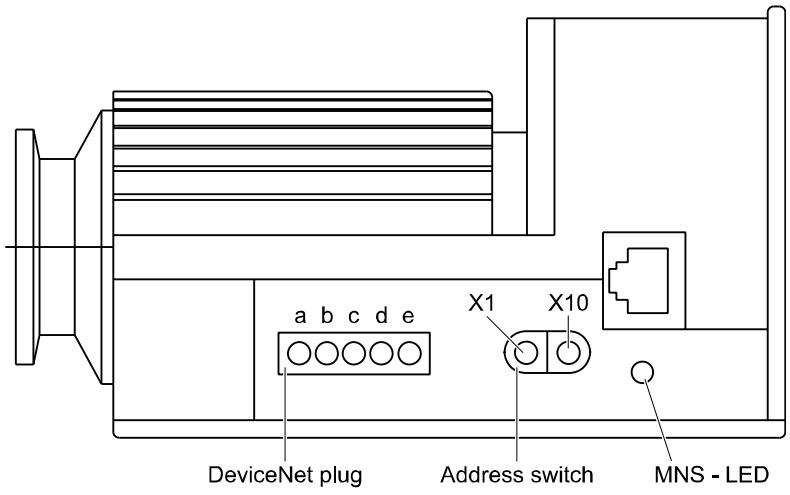
For cross-references within this document, the symbol (→ 🗎 XY) is used.

1 Technical Data

Device type	generic
Baud rates	125 k, 250 k, 500 k Baud
I/O-slave messaging	bit strobe, polling, change of state, cyclic
Input voltage range for DeviceNet option	11 … 25 V
Voltage levels CAN Lines	
Transmitter requirements	
Differential output level (nominal)	2.0 V p-p
Differential output level (minimum) connector, 50 Ohms load	1.5 V p-p
Minimum recessive bus voltage CAN H and CAN L	2.0 V [1)]
Maximum recessive bus voltage CAN H and CAN L	3.0 V [1)]
Output short circuit protection	internally limited
Receiver requirements	
Differential input voltage dominant	0.95 V min.
Differential input voltage recessive	0.45 V max.
Hysteresis	150 mV typ.

[1)] Voltages at CAN H and CAN L are referenced to the transceiver IC ground pin. This voltage (IC ground pin) is app. 0.6 Volt higher than the V-terminal.

Address adjustment	selectable via address switches
Baud rate selection	3 fixed baud rates and auto-baud-rate detection selectable via the address switches
Status signals	1 bicolor combined Module / Network Status LED (MNS)
Operating ambient temperature	0 … 50 °C
Storage temperature	–20 °C … +80 °C



Pin Description of DeviceNet Plug

Pin Number	Function	Pin Number	Function
a	Ground supply	d	CAN +
b	CAN –	e	+24 V supply
c	Shield		

2 Starting-up of the PEG100-D

For starting-up the fieldbus

- the whole system has to be installed electronically
- the master has to be configurated
- the address of the slaves has to be set.

2.1 Baud Rate and Address

Baud rate

Alternatively you can choose between two kinds of baud rate installations:

- Auto - Baud - Rate - Detection

  If the unit is switched on during data transfer on the net work (minimum: 2 nodes installed with data traffic between these nodes) the unit detects automatically the installed baud rate on the bus.

- Pre-installed baud rate

  You can install three baud rates (125 kBaud, 250 kBaud and 500 kBaud) by using the address switches (see figure 🗎 4).

The function of the address switches (see figure 🗎 4) is as follows:

Address	Function
0 - 64	MAC ID (address selection by address switches
90	Baud rate 125 kBaud
91	Baud rate 250 kBaud
92	Baud rate 500 kBaud
99	Initialization with default values and auto baud rate detection

How to install a fixed baud rate

- Switch off the power of the DeviceNet option.
- Set the address switches to the address 90, 91 or 92 (depending on the baud rate you want).
- Switch on the power of the DeviceNet option. The MNS - LED will glow orange.
- Switch off the power of the DeviceNet option.
- Set the address switches to the MAC ID you want the device to work with.
- Switch on the power of the DeviceNet option. The MNS - LED will flash green if a communication between the PEG and an other device takes place.

After power ON the unit must find a device to communicate with (duplicate MAC ID check) (for example a master or a monitor) otherwise the MNS - LED will not flash green and it will be impossible to allocate the PEG. The installed baud rate is saved in EEPROM. After power ON/OFF the unit works with this installed baud rate.

How to install the auto baud rate detection

If a fixed baud rate is installed and you want to change this fixed baud rate to auto baud rate detection, you have to proceed as follows:

- Switch off the power of the DeviceNet option.
- Set the address switches to the address 99 (initialization of all values with default values).
- Switch on the power of the DeviceNet option. The MNS - LED will glow orange.
- Switch off the power of the DeviceNet option.
- Set the address switches to the MAC ID you want the device to work with.
- Switch on the power of the DeviceNet option. The MNS - LED will flash green if a communication bet- ween the PEG and an other device takes place.

The installed auto baud rate detection is saved in EEPROM. After power ON/OFF the unit works with this installed auto baud rate detection.

After power ON the unit must find a device to communicate with (duplicate MAC ID check) (for example a master or a monitor) otherwise the MNS - LED will not flash green and it will be impossible to allocate the PEG.

Address setting

It is necessary in a network to give each device a specific address. Therefore the address switches have to be set to the requested MAC ID (addresses between 0 and 64 are possible).

2.2 MNS - LED

The MNS - LED corresponds to the ODVA standard. The following additional features were integrated:

LED color	Function
ORANGE permanent	The address switches are set to one of the possible baud rate settings (90, 91, 92) or to "Initialization with default values" (99).
RED permanent	Not allowed MAC ID

3 Object Structure

3.1 Identity Object (Class Code 01_{hex})

Class Code: 1 (01_{hex})
Class Attributes: None

Instance attributes

Attribute ID	Access rule	Name	Description
1 (01_{hex})	get	INFICON	Vendor identification Vendor ID: 144 dez.
2 (02_{hex})	get	Generic device	Device type
3 (03_{hex})	get	Product code	Vendor product code
4 (04_{hex})	get	Revision	DeviceNet software version number
5 (05_{hex})	get	Status	Device status
6 (06_{hex})	get	Serial number	
7 (07_{hex})	get	Product name	PEG100-D

Services

Service code	Name
5 (05_{hex})	Reset
14 ($0E_{hex}$)	Get attribute single
15 (10_{hex})	Set attribute single

3.2 Device Manager(DM) Object (Class Code 64_{hex})

Class Code: 100 (64_{hex})
Class Attributes: None

Instance attributes

Attribute ID	Access rule	Name	Data / type	Description
49 (31_{hex})	get	Device type	String [3] 43 49 47	Device type SEMI "CIG" (Cold cathode ion gauge)
50 (32_{hex})	get	Standard revision level	String [5] 44 52 41 46 54	"DRAFT"
51 (33_{hex})	get	Device manufacturer identifier	String [5] 4c 45 59 42 4f 4c 44	Vendor identification "INFICON"
52 (34_{hex})	get	Manufacturer model number	String [5]	Part number
53 (35_{hex})	get	Firmware revision level	String [5] 31 2e 30 30 30	Software version
54 (36_{hex})	get	Hardware revision level	String [5] 30 2e 30 30 30	Hardware version
55 (37_{hex})	get	Serial number	String [5]	
56 (38_{hex})	get	Device configuration	String [8]	PEG100-D
57 (38_{hex})	get	Device status	UNIT	Device status 1 = Initializing 2 = Idle (HV on) 4 = Executing (HV on)
58 ($3A_{hex}$)	get / set	Reporting mode	BYTE	Polling, bit strobe = 6 COS / Cyclic = 0
60 ($3C_{hex}$)	get	Exception status	BYTE	0_{hex} = ok 1_{hex} = HV on, no plasma 2_{hex} = HV off

Services

Service code	Name
14 ($0E_{hex}$)	Get attribute single

3.3 Assembly Objects (Class Code 04_{hex})

A collection of assembly objects allows the sending of attributes from different application objects in one message (i.e.: Polling I/O).

Output Assemblies

Messages which a master sends to the PEG100-D.

Output Assembly 1

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	res	res	res	res	res	res	HV ON / OFF	HV ON / OFF Control

Input Assemblies

Messages which the PEG100-D sends to the master.

Input Assembly 2

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	res	res	res	res	res	HV ON / OFF Source	HV status	Sensor status
1	Exception Status							
2	Pressure value (Low Byte)							
3	Pressure value (Low Middle Byte)							
4	Pressure value (High Middle Byte)							
5	Pressure value (High Byte)							

Input Assembly 3

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	res	res	res	res	res	HV ON / OFF Source	HV status	Sensor status
1	Exception Status							

3.4 Sensor Pressure Object (Class Code 67_{hex})

The Sensor Pressure Object contains characteristics and behavior of the PEG. This object is specified as a SAC-Object. All defined services for SAC-Objects are valid.

Class Code: 103 (67_{hex})
Class Attributes: None

Instance attributes

Attribute ID	Access rule	Name	Data / type	Description
3 (03_{hex})	get	Sensor status	BOOL	Sensor status (gauge ON = 1 / gauge off
100 (64_{hex})	get / set	HV ON / OFF	BIT	1 = HV ON 2 = HV OFF
101 (65_{hex})	get / set	HV ON / OFF Source	BYTE	0 = Control by analog input signal 1 = Control by DeviceNet
102 (66_{hex})	get / set	HV status	BYTE	0 = OFF 1 = ON

Services

Service code	Name
14 ($0E_{hex}$)	Get attribute single
16 (10_{hex})	Set attribute single

3.5 Transform Pressure Object (Class Code 68_{hex})

Class Code: 104 (68_{hex})
Class Attributes: None

Instance attributes

Attribute ID	Access rule	Name	Data / type	Description
1 (01_{hex})	get	Pressure value	REAL	Pressure value
3 (03_{hex})	get / set	Pressure units	BYTE	0 = mbar 1 = Torr 2 = Pascal

Services

Service code	Name
14 ($0E_{hex}$)	Get attribute single
16 (10_{hex})	Set attribute single

3.6 Analog Output Point Object (Class Code 6A$_{hex}$)

Class Code: 106 (6A$_{hex}$)
Class Attributes: None

Instance attributes

Attribute ID	Access rule	Name	Data / type	Description
101 (65$_{hex}$)	get	Analog output mode	BYTE	0 = log

Services

Service code	Name
14 (0E$_{hex}$)	Get attribute single
16 (10$_{hex}$)	Set attribute single

4 Supported Modes

The PEG100-D acts as a "DeviceNet Group Two Only Slave". It supports the modes Polling, Bit-Strobe, Change of State/ Cyclic and explicit messages. Please set the "Interscan Delay" of your master to app. 20 ms if your system is as fast that is polls the PEG100-D at regular intervals shorter than 20 ms.

4.1 Pit Strobe

The HV may be switched on and off by the Bit-Strobe application.
Bit-Strobe Bit = 1 → HV on, and response with Input Assembly 1
Bit-Strobe Bit = 0 → HV off

4.2 Change of State

Connection Object Instance Attribute (Class 5 / Instance 4/ Attribute 100)

Attribute ID	Access rule	Name	Data / type	Description
100 (64_{hex})	get / set	Pressure change	BYTE	See below

Pressure change

The attribute describes the deviation in percent of the measurement value which will result in a COS message on the bus.

Possible values for "Pressure Change": 1 … 100 %.

5 Format of Real Values

According to the IEEE-754 standard real values are stored in floating point format. The floating point values are transmitted according to the following format:

Byte	2	3	4	5
Content	SEEE EEEE	EMMM MMMM	MMMM MMMM	MMMM MMMM

"S" means: Sign Bit, which means 1 = negative, 0 = positive

"E" means: Two-complement exponents with offset 127

"M" means: 23 bit mantissa. The most significant bit is always 1 and is, therefore, not stored

Example

The value –12.5

Byte number of the floating point value	Byte 3: C1 hex	Byte 2: 48 hex	Byte 1: 00 hex	Byte 0: 00 hex
Content	SEEE EEEE	EMMM MMMM	MMMM MMMM	MMMM MMMM
Content in this example	1100 0001 binary	0100 1000 binary	0000 0000 binary	0000 0000 binary

Sign bit

The bit S in this example is 1. That means the sign bit of the whole value (or of the mantissa) is "minus".

Exponent

The EEEE EEEE have the value: 1000 0010 binary. This value converted in decimal it is: 130 decimal. This value has the offset 127. So the exponent is: 130 – 127 = 3

Mantissa

Because the mantissa is normalized the most significant bit has the value 1, the next bit has the value 0.5, the next bit has the value 0.25.

Bit number	Value of the bit, if the bit is set to 1
Bit 24 (MSB)	1
Bit 23	0.5
Bit 22	0.25
Bit 21	0.125
Bit 20	0.0625
Bit 19	0.03125
Bit 18	0.015625
Bit 17	0.0078125

and so on

The MMM MMMM MMMM MMMM MMMM MMMM (23 bit) have the value 100 1000 0000 0000 0000 0000. The most significant bit (MSB) is always 1 (and not stored). You have to implement this most significant bit.

So the value of the mantissa is: 1100 1000 0000 0000 0000 0000 (binary).

Bit number		Value
Bit 24 is set to 1	⇒	1
Bit 23 is set to 1	⇒	+0.5
Bit 20 is set to 1	⇒	+0.0625

So the mantissa has the value 1.5625

Whole value

The whole value is: $-1.5625 \times 2^3 = -12.5$

6 Returning the Product

WARNING

WARNING: forwarding contaminated products

Products returned to INFICON for service or repair should, if possible, be free of harmful substances (e.g. radioactive, toxic, caustic or microbiological). Otherwise, the type of contamination must be declared.

Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a completed contamination declaration (Form under www.inficon.com).

Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.

Products not accompanied by a duly completed declaration of contamination are returned to the sender at his own expense.

7 Disposal

DANGER

DANGER: contaminated parts

Contaminated parts can be detrimental to health and environment.

Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

WARNING

WARNING: substances detrimental to the environment

Products or parts thereof (mechanical and electric components, operating fluids etc.) can be detrimental to the environment.

Dispose of such substances in accordance with the relevant local regulations.

Separating the components

After disassembling the product, separate its components according to the following criteria:

Contaminated components

Contaminated components (radioactive, toxic, caustic or biological hazard etc.) must be decontaminated in accordance with the relevant national regulations, separated according to their materials, and disposed of.

Other components

Such components must be separated according to their materials and recycled.

EU Declaration of Conformity

CE

We, INFICON, hereby declare, that the equipment mentioned below complies with the following directives:

- 2014/30/EU, OJ L 96/79, 29.3.2014
  (EMC directive; Directive on electromagnetic compatibility)
- 2011/65/EU, OJ L 174/88, 1.7.2011
  (RoHS directive; Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment)

Product

Penning Gauge
PEG100-D

Part numbers

351-003
351-004

Standards

Harmonized and international / national standards and specifications:

- EN 61000-6-2:2005 (EMC: generic immunity standard)
- EN 61000-6-3:2007 + A1:2011 (EMC: generic emission standard)
- EN 61010-1:2010 (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326: 2013; Group 1, Class B (EMC requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer / Signatures

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6 December 2017

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Notes

Original: English

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