

AnaGate PROFINET Z-Card



User Manual

Analytica GmbH

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Abstract

This manual describes the interfaces and modes of operation of a *AnaGate PROFINET Z-Card*.

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Revision History

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Introduction

This document describes the features and objectives of the field bus gateway *AnaGate PROFINET Z-Card*.

The *AnaGate PROFINET Z-Card* of Analytica GmbH is designed to interconnect a programming logic controller (PLC) to the *Z-Card* control board of Interroll Automation GmbH. The *AnaGate PROFINET Z-Card* provides easy access to the propriorty CAN bus protocol of the *Z-Card* via a standard *PROFINET* interface.

Interroll Intelliveyor

Intelliveyor is the name of a modular conveyor system with integrated accumulating conveyor technology. It enables unit loads to be conveyed and accumulated with zero pressure, i.e. without ever touching each other. The fact that this is so easy to achieve lies in the *Z-Card*, a proven 24 Volt control PCB. It handles the control of the conveyor line divided in individual zones and communication along the material flow.

For connection to a higher order control a CAN bus interface is available on the *Z-Card*. Up to date information of a *Z-Card* can be obtained (motor status, sensor status, etc.). It is also possible to influence the functions of the control here (e.g. merging or diverting behaviour). Access to the CAN bus can be made by a standard CAN bus gateway. Interroll recommends a device of the *AnaGate CAN* series, which provides access to the CAN bus by standard ethernet protocol.

PROFINET interface for Intelliveyor

If the connection to Intelleveyor is to be made by *PROFINET* a new hardware solution is now available: the *AnaGate PROFINET Z-Card*. This product provides easy access to the proprietary CAN bus protocol of the *Z-Card* via a standard *PROFINET* interface.

The current state of all actuators and sensors of up to 32 *Z-Card* control boards are saved locally on the *AnaGate PROFINET Z-Card* in a process image which is exchanged with a higher controlling device via the *PROFINET* interface.

The CAN bus communication to the single *Z-Card* boards is completely hidden to the controlling PLC, all necessary settings, state changes and monitoring functions on the CAN bus are automatically managed by the *AnaGate PROFINET Z-Card*.

Chapter 1. Description

The *AnaGate PROFINET Z-Card* of Analytica GmbH is designed to interconnect a programming logic controller (PLC) to the *Z-Card* control boards of Interroll Automation GmbH. The *AnaGate PROFINET Z-Card* provides easy access to the propriorty CAN bus protocol of the *Z-Card* via a standard *PROFINET* interface.

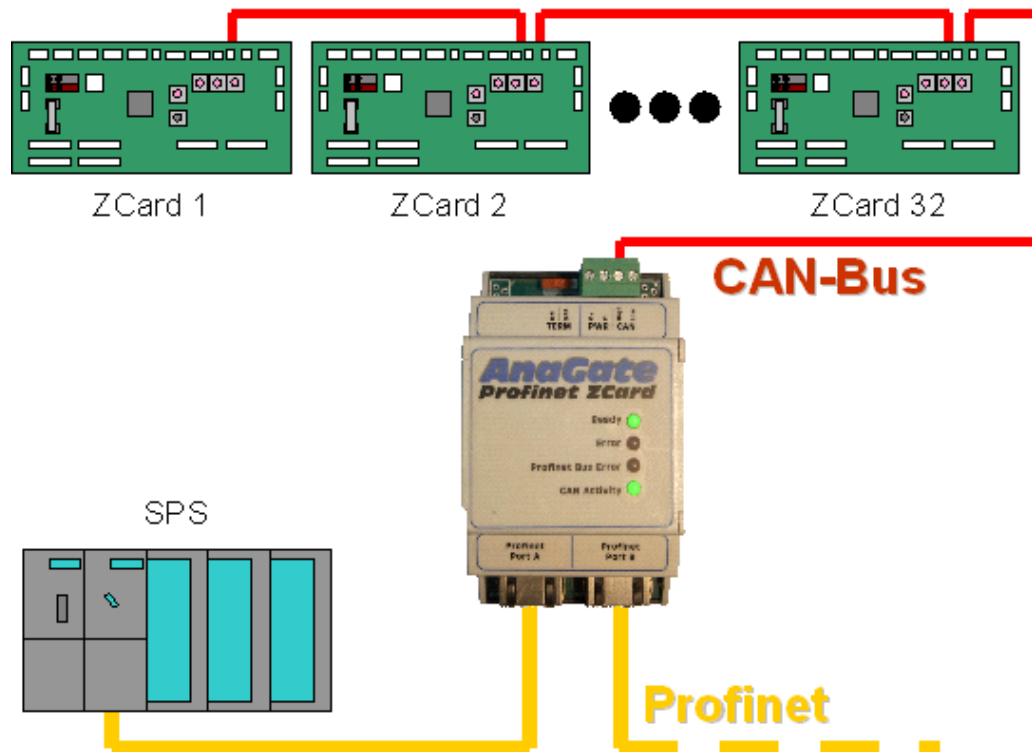


Figure 1.1. Field of application, AnaGate PROFINET Z-Card

The current state of all actuators and sensors of up to 32 *Z-Card* control boards are saved locally in a process image which is exchanged with a higher controlling device via the *PROFINET* interface.

The CAN bus communication to the single *Z-Card* boards is completely hidden to the controlling PLC, all necessary settings, state changes and monitoring functions on the CAN bus are automatically managed by the *AnaGate PROFINET Z-Card*.

1.1. Specification

Technical aspect		Specification
Housing	DIN rail casing	TS 35 (EN 50022) / DIN rail 35
	Measurements	62,2mm x 53,6mm x 89,7mm
	Material	polycarbonate
	Protection class	IP20

Technical aspect		Specification
	Weight	approx. 59g
CAN bus	Baud rate	250 kbps
	Termination	activatable via DIP switch
PROFINET	Baud rate	100 Mbit
	Interface	RJ45 socket
	Port switches	2
	Vendor ID	0x287
Voltage supply	Voltage	9V-28V direct current, reverse polarity protected
	Power consumption	max. 1.5W
Ambient conditions ¹	Storage	-40 .. 85 °C
	In operation	-20 .. 60 °C
	Relative humidity	10 - 90%, without condensation
Standards	Interference emission	EN6100-6-4 (industrial)
	Interference immunity	EN6100-6-2 (industrial)

¹The components may not be used without additional protection in the locations where dust, corrosive chemicals or ionizing radiation are present.

Table 1.1. Technical data, AnaGate PROFINET Z-Card

1.2. Scope of delivery

The AnaGate PROFINET Z-Card is supplied with the following components:

- 1x AnaGate PROFINET Z-Card
- 1x CD with manual, device description file (GSDML)
- 1x 4 pole plug connector with screw terminals (CAN bus and power supply)

1.3. Interfaces and plugs

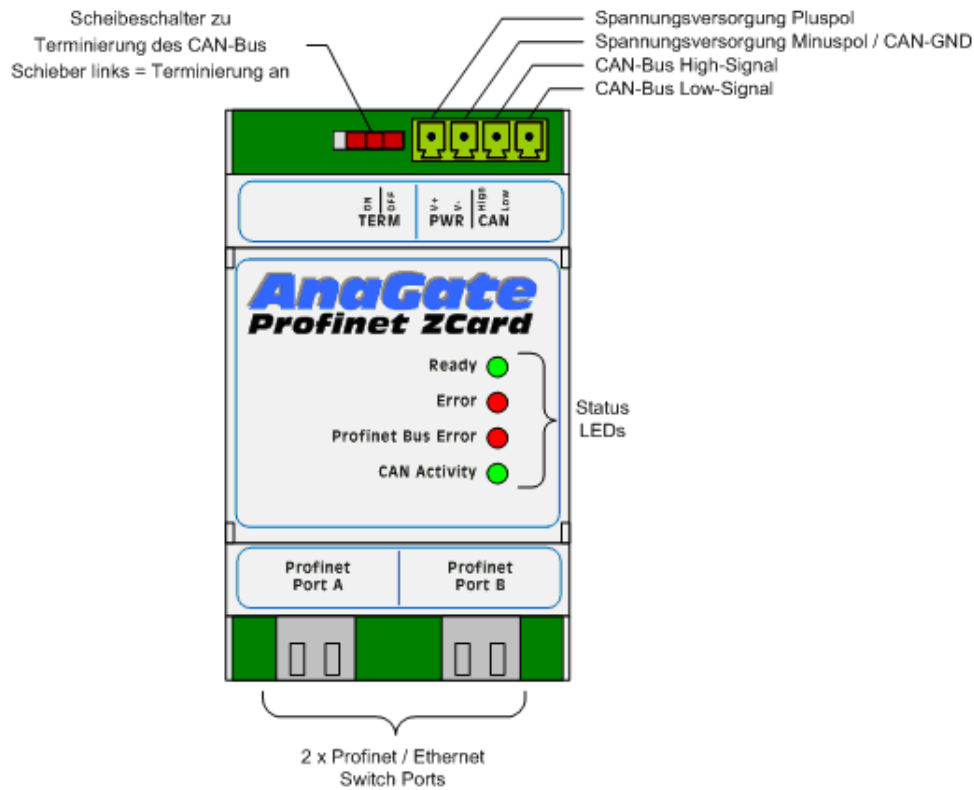


Figure 1.2. Top view, AnaGate PROFINET Z-Card

The upper connector strip of the *AnaGate PROFINET Z-Card* features the following connectors (from left to right):

TERM Sliding switch for termination of CAN bus (slide on the left side = termination on).

PWR/CAN 4 pole plug to connect the CAN bus and power supply. The corresponding connector plug is included in delivery (screw terminal up to 1,5mm²). The pin allocation of the plug can be inferred from the following table:

Pin	Description	
1	V+	
2	V- / CAN_GND	
3	CAN_L	
4	CAN_H	

Table 1.2. Pin layout, PWR/CAN plug

The lower connector strip of the *AnaGate PROFINET Z-Card* features the following connectors (from left to right):

Port A PROFINET / Ethernet switch port A.

Port B PROFINET / Ethernet switch port B.

1.4. LEDs

The cover strip of the *AnaGate PROFINET Z-Card* features the following leds (from top to bottom):

Term	Color	State	Description
Ready	green	on	device is operable
		off	internal error (TPS not ready)
		flashing	internal error (not configured by host cpu)
Error	red	on	diagnostic error
		off	no diagnostic error
Profinet Bus Error	red	on	no PROFINET link
		off	The device is successfully connected to the PROFINET IO controller and data is exchanged.
		flashing	PROFINET link present, but no active communication to IO controller.
CAN Activity	green	flashing	The LED is flashed for each received/sent CAN telegram. The higher the bus load, the higher is the pulse rate.

Table 1.3. LEDs, AnaGate PROFINET Z-Card

Chapter 2. Installation and startup

2.1. Assembly

The *AnaGate PROFINET Z-Card* can be mounted directly to 35mm connection rails according to DIN EN 50 022 (TS 35). The DIN rail must be connected to ground and its material rail must be resistant to corrosion.

To dismount the unit, pull the orange bottom catch down using a screwdriver and remove the unit upwards.

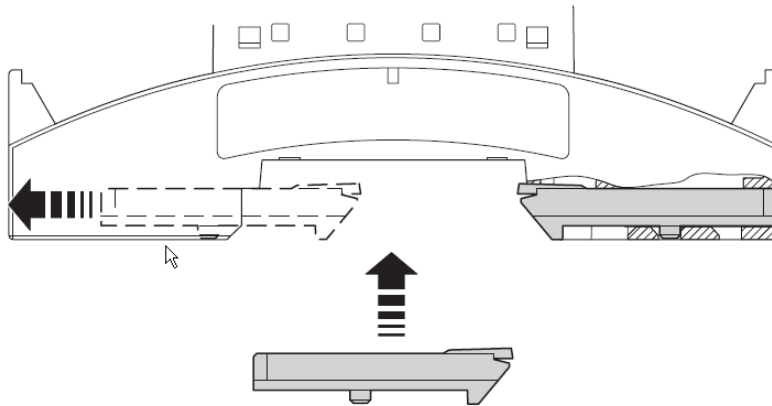


Figure 2.1. Mounting of the foot catches



Technical state

Before assembly the external integrity of the unit must be checked. Damaged or manipulated devices should not put into service.



Electrostatic discharge

The unit contains electronic components that are very sensitive to electrostatic discharge (EDS). The generally accepted safety precautions for ESD sensitive devices must be observed when handling the devices.

2.2. Power supply

To connect the voltage, the included green 4 pole with screw terminal is to be used. The pin layout is shown in Table 1.2, "Pin layout, PWR/CAN plug".

The device can be operated with a voltage of 9 V to 28 V DC.



Tip

Please note, that $v-$ is coupled to the ground of the CAN bus. It is therefore useful to use the same power supply for the *AnaGate PROFINET Z-Card* and the *Z-Card* modules.

2.3. CAN bus

The CAN bus is a serial 2-wired differential bus with a baud rate of 250 kpbs and a termination according to ISO 11898. CAN high speed according to ISO 11898-2 is used, the cable length should not exceed 100 m. Twisted-pair cable with a surge impedance of 120 ohm is to be used. If the cable is shielded, the shield must be grounded.



Important

A bus terminating resistor of 120 Ohm must be connected at the beginning and the end of each CAN bus. If the *AnaGate PROFINET Z-Card* is connected to the beginning or the end of the CAN bus, the termination has to be activated via the CAN termination switch.

CAN bus termination	Switch position
not terminated	right
terminated	left

Table 2.1. CAN bus termination switch

To connect the CAN bus, the included green 4 pole plug with screw terminals is to be used. The pin layout is shown in Table 1.2, "Pin layout, PWR/CAN plug".



Tip

Please note, that $v-$ is coupled to the ground of the CAN bus. It is therefore useful to use the same power supply for the *AnaGate PROFINET Z-Card* and the *Z-Card*.

As soon as an active CAN device is connected to the CAN bus, the CAN activity LED is flashed for each received/sent CAN telegram. The higher the bus load, the higher is the pulse rate.

2.4. PROFINET

The *AnaGate PROFINET Z-Card* contains two *PROFINET* interfaces with integrated switch.

Modular system designs in line or tree topology can be build using *PROFINET* devices with integrated switch. Additional external switches are not needed anymore.

Chapter 3. Process data

3.1. PROFINET IO Slots and Z-Card-IDs

The *AnaGate PROFINET Z-Card* maps the process data from up to 32 *Z-Card* modules to *PROFINET IO*.

Each *Z-Card* is managed by a separate *PROFINET IO* slot. The slot number is identical to the *Z-Card-ID*. The *AnaGate PROFINET Z-Card* provides slot 1 up to slot 32, each assimilating a single *Z-Card* module. Gaps are not allowed.

In practise this means, that only *Z-Card* modules with ID 1 to 32 can be used on the CAN bus of the *AnaGate PROFINET Z-Card*. The physical order of the modules is irrelevant.

3.2. Process data assignment

Each *PROFINET IO* slot provides five input and five output bytes which can be used to control the *Z-Card*.



Note

See *Z-Card* manual of Interroll [ZCard3-2013] (section *CAN-Bus communication*) for additional information about *Z-Card* signals.

3.2.1. Inputs

Input		Description
Byte 1 (sensor information)	Bit 0	State of sensor 1
	Bit 1	State of sensor 2
	Bit 2	State of sensor 3
	Bit 3	State of sensor 4
	Bit 4	State of sensor 5
	Bit 5	State of sensor 6
	Bit 6-7	Reserved

Table 3.1. IO slot input byte 1

Input		Description
Byte 2 (motor information)	Bit 0	State of motor 1
	Bit 1	State of motor 2
	Bit 2	State of motor 3
	Bit 3	State of motor 4
	Bit 4	Error motor 1
	Bit 5	Error motor 2

Input		Description
	Bit 6	Error motor 3
	Bit 7	Error motor 4

Table 3.2. IO slot input byte 2

Input		Description
Byte 3 (PLC information)	Bit 0	State of PLC input 1
	Bit 1	State of PLC input 2
	Bit 2	State of PLC input 3
	Bit 3	State of PLC input 4
	Bit 4	State of PLC output 1
	Bit 5	State of PLC output 2
	Bit 6	State of PLC output 3
	Bit 7	State of PLC output 4

Table 3.3. IO slot input byte 3

Input		Description
Byte 4 (Up / Down / Side)	Bit 0 - 3	depends on selected <i>Z-Card</i> program ¹
	Bit 4	State of UP
	Bit 5	State of DOWN
	Bit 6	State of SIDE1
	Bit 7	State of SIDE2

¹see *Z-Card* manual for detailed description of *Z-Card* programs

Table 3.4. IO slot input byte 4

Input		Description
Byte 5	Bit 0 - 7	Reserved

Table 3.5. IO slot input byte 5

3.2.2. Outputs

Output		Description
Byte 1 (sensors)	Bit 0	PLC input 1
	Bit 1	PLC input 2
	Bit 2	PLC input 3
	Bit 3	PLC input 4
	Bit 4-5	Reserved
	Bit 6	Reverse sensor signals

Output	Description
Bit 7	Reserved

Table 3.6. IO slot output byte 1

Output	Description	
Byte 2 (Speed motor 1+2)	Bit 0	Logical speed motor 1 bit 0
	Bit 1	Logical speed motor 1 bit 1
	Bit 2	Logical speed motor 1 bit 2
	Bit 3	Logical speed motor 1 bit 3
	Bit 4	Logical speed motor 2 bit 0
	Bit 5	Logical speed motor 2 bit 1
	Bit 6	Logical speed motor 2 bit 2
	Bit 7	Logical speed motor 2 bit 3

Table 3.7. IO slot output byte 2

Output	Description	
Byte 3 (Speed motor 3+4)	Bit 0	Logical speed motor 3 bit 0
	Bit 1	Logical speed motor 3 bit 1
	Bit 2	Logical speed motor 3 bit 2
	Bit 3	Logical speed motor 3 bit 3
	Bit 4	Logical speed motor 4 bit 0
	Bit 5	Logical speed motor 4 bit 1
	Bit 6	Logical speed motor 4 bit 2
	Bit 7	Logical speed motor 4 bit 3

Table 3.8. IO slot output byte 3

Output	Description	
Byte 4 (Up / Down / Side)	Bit 0 - 3	depends on selected <i>Z-Card</i> program ¹
	Bit 4	State of UP
	Bit 5	State of DOWN
	Bit 6	State of SIDE1
	Bit 7	State of SIDE2

¹see *Z-Card* manual for detailed description of *Z-Card* programs**Table 3.9. IO slot output byte 4**

Output	Description
Byte 5	Bit 0 - 7 Reserved

Table 3.10. IO slot output byte 5

3.3. Troubleshooting

Here are some typical faults of the *AnaGate PROFINET Z-Card* during operation:



PROFINET communication problem

The communication between a *AnaGate PROFINET Z-Card* and the *PROFINET* controller is malfunctioning or the interconnection between the devices is interrupted.

Reasons of this failure:

- *PROFINET* controller (PLC) powerless or malfunctioning
- *AnaGate PROFINET Z-Card* powerless
- Cabling problems

As a result of communication errors between between *AnaGate PROFINET Z-Card* and *PROFINET* controller is interrupted, "Host-Alive" telegrams are not longer exchanged between *AnaGate PROFINET Z-Card* and *Z-Card* modules. The consequence of this was, that the *Z-Card* modules switch off the controlled motors after a maximum of 250 ms.



CAN communication problem

A *Z-Card* is configured via *PROFINET*, but it is not found on the CAN bus.

Reasons of this failure:

- *Z-Card* powerless
- CAN cabling problems

As result, the assigned data of the *PROFINET* controller is marked as invalid. This error behaviour normally creates a specific error in the connected PLC (programmable logic controller), which can be retrieved from the diagnostic buffer.

Chapter 4. Using SIMATIC STEP7 / TIA portal

The *AnaGate PROFINET Z-Card* can be used in programming environments of SIEMENS just like other Profinet IO devices. Since the *AnaGate PROFINET Z-Card* does not require any special settings, the following will only discuss the essential configuration steps.



Note

More details of using Profinet IO devices can be found in the standard manuals of STEP7 and the TIA portal.

1. Install the GSDML file, which can be found on the included product CD, in the STEP7 system or the TIA portal¹.

Afterwards the *AnaGate PROFINET Z-Card* is found in the hardware catalogue.

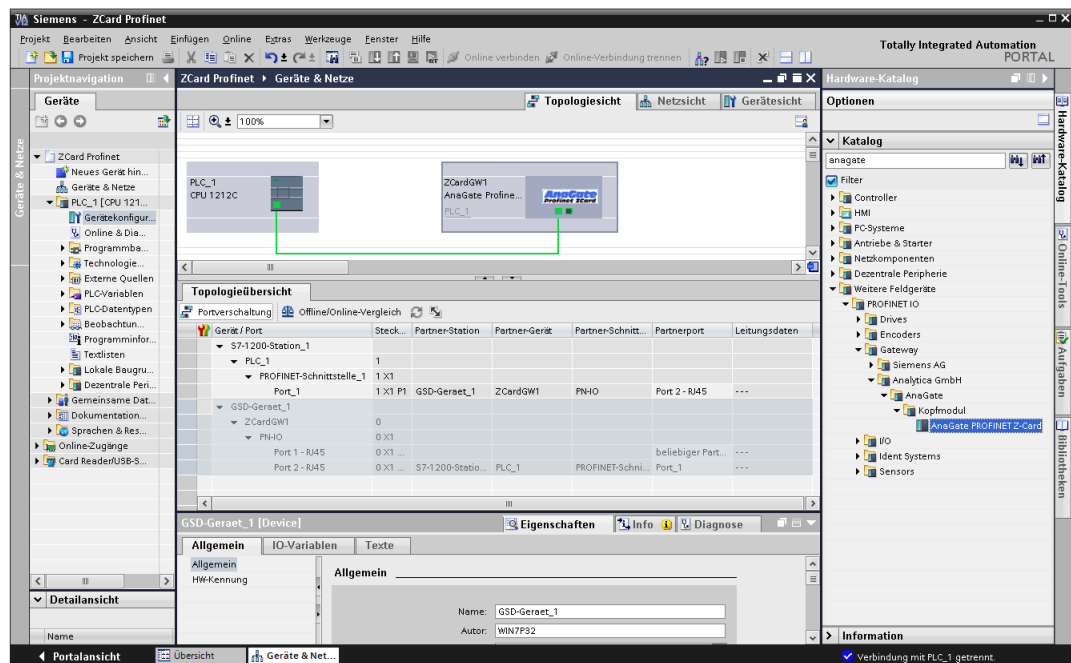


Figure 4.1. Installed AnaGate PROFINET Z-Card in TIA portal

2. Drag the device icon into the hardware configuration pane and wire the Profinet interface with a Profinet IO controller.
3. Switch to the device view of the *AnaGate PROFINET Z-Card*, drag *Z-Cards* into free slots and assign IO addresses.

¹The latest version of the GSDML file was verified with the TIA portal 12.0 software and a *Siemens S7-1200* PLC. The compatibility with higher versions of the TIA portal software is not guaranteed.

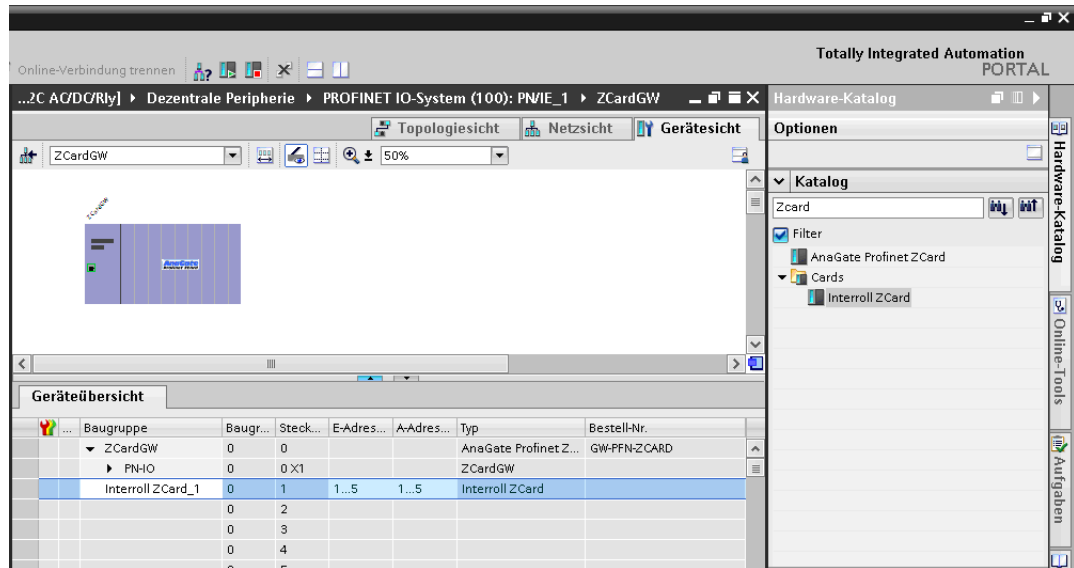


Figure 4.2. Definition of Z-Card in TIA portal

The *slot number* corresponds automatically to the CAN-ID of the Z-Card.

Abbreviations

CAN	<u>C</u> ontroller <u>A</u> rea <u>N</u> etwork
DOWN	Downstream zone See Also SIDE, UP.
PROFINET	<u>P</u> rocess <u>F</u> ield <u>N</u> etwork is the open standard of Profibus & Profinet International (PI) for industrial automation.
PLC	<u>P</u> rogrammable <u>L</u> ogic <u>C</u> ontroller
SIDE	Merge or divert See Also DOWN, UP.
UP	Upstream zone See Also SIDE, UP.

Bibliography

Books

Other publications

[ZCard3-2013] Interroll Automation GmbH. Copyright © 2013 Interroll Automation GmbH.
Interroll Z-Card 3.0. Betriebsanleitung. Version 1.1. 01.07.2013.

Appendix A. Technical support

The AnaGate hardware series, software tools and all existing programming interfaces are developed and supported by Analytica GmbH. Technical support can be requested as follows:

Internet

The AnaGate web site [<http://www.anagate.de/en/index.html>] of Analytica GmbH contains information and software downloads for AnaGate Library users:

- Product updates featuring bug fixes or new features are available here free of charge.

E-Mail

If you require technical assistance over the Internet please send an e-mail to

[<support@anagate.de>](mailto:support@anagate.de)

To help us provide you with the best possible support please keep the following information and details at hand when you contact our support team.

- Version number of the used programming tool or AnaGate library
- AnaGate hardware series model and firmware version
- Name and version of the operating system you are using