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1	Introduction.....	4
1.1	Content of this Document.....	4
1.2	Target Group, Personnel	4
1.3	Symbols Used	5
2	Product Description	6
2.1	Use and Application	6
2.2	LED Indicators and Controls	7
2.3	Accessories.....	9
3	Installation.....	10
3.1	Affixing the Code Tape	10
3.2	Mounting of the Reader.....	12
3.3	Electrical Connection	14
3.4	PROFINET Connection	16
4	Commissioning.....	17
4.1	Aligning the Read Head	17
5	Operation and communication.....	19
5.1	Communication via PROFINET.....	19
5.1.1	General Information on Communication via PROFINET	19
5.1.2	PROFINET I/O Interface	19
5.1.2.1	Identification & Maintenance (I&M) Data.....	20
5.1.3	Project Planning Using Device Description	21
5.1.4	PROFINET Address and Identifying a Device.....	21
5.1.5	Overview of Available PROFINET Modules	22
5.1.5.1	Configuration Module (Global Primary Data)	23
5.1.5.2	Position Data X Module.....	25
5.1.5.3	Position Data Y Module	25
5.1.5.4	Speed Module	26
5.1.5.5	Status Module.....	26
5.1.5.6	Event Module (Marker Number)	27
5.1.5.7	Warning Module.....	27
5.1.5.8	Reduced X Position Resolution Module	28
5.1.5.9	Quality Grade Information Module	29
5.1.5.10	Output Data Module.....	31
6	Appendix	32
6.1	ASCII table.....	32

1 Introduction

1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include information on the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal



Note

For full information on the product, refer to the further documentation on the Internet at www.pepperl-fuchs.com.

The documentation comprises the following parts:

- This document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Other documents

1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:



Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols



Note

This symbol brings important information to your attention.



Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

2 Product Description

2.1 Use and Application

The **Data Matrix Positioning System** is the positioning system in the Pepperl+Fuchs incident light process. The heart of the system is the reader, which has features including a camera module with an integrated illumination unit. This enables the reader to detect position markers printed onto a self-adhesive code tape in the form of 2-D **Data Matrix codes**.

The **code tape** is mounted on a fixed part of the plant (e.g. the wall of an elevator shaft or the rail on a monorail conveyor). The reader is mounted on a moving "vehicle" positioned in parallel with the code tape (e.g. on the elevator cab or on the chassis of a monorail conveyor).

Maximum Length of the Code Tape

Resolution of the Reader [mm]	Maximum Length of the Code Tape [km] PXV100-F200-B17-V1D	Maximum Length of the Code Tape [km] PXV100Q-F200-B17-V1D
10	10	100
1	10	100
0,1	10	100

The code tape length of up to 10 km is sufficient for even very large applications. It also offers sufficient reserves for extensions or systems with several branches and parallel conveyor routes.

The extensive yet user-friendly parameterization options as well as the freely configurable inputs and outputs mean that the reader can easily be adapted to suit each application.

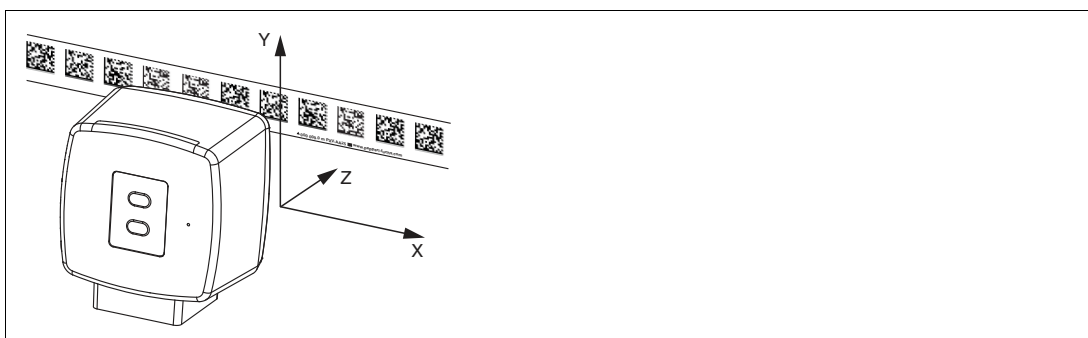


Figure 2.1 Schematic diagram of the alignment of the code tape and reader

2.2 LED Indicators and Controls

The reader has seven indicator LEDs for visual function checks and rapid diagnosis.

Activate the alignment aid and parameterization mode using the two control buttons on the back of the device.

Button 1 is labeled "ADJUST". Button 2 is labeled "CONFIG".

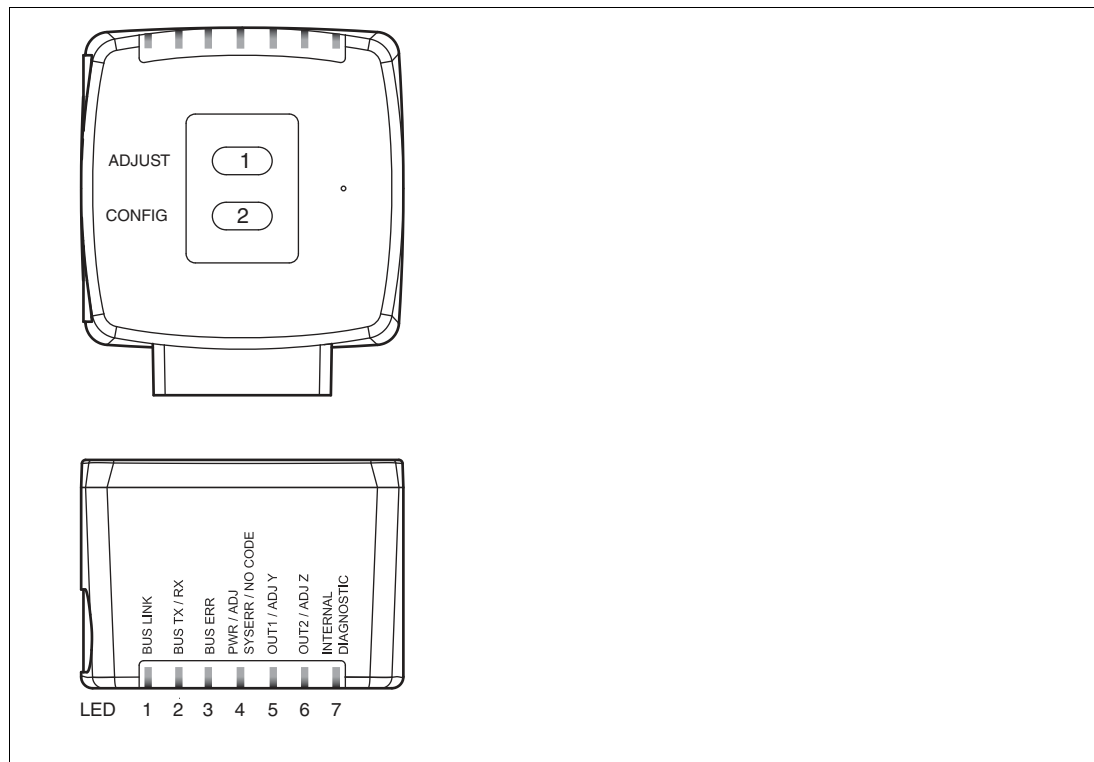


Figure 2.2 Overview of LED indicators and controls

LED	[#1] BUS LINK	[#2] BUS TX/RX	[#3] BUS ERR	[#4] PWR/ADJ SYSERR/NO CODE	[#5] OUT 1/ADJ Y	[#6] OUT 2/ADJ Z	[#7] INTERNAL DIAGNOSTIC	
Color	Green	Yellow	Red	Red/green	Yellow	Yellow	Red/green /yellow	Description
Status	Off	Off	Off	Flashes green	Off	Off	Off	Alignment Y > setpoint value f _{flash} = 2 Hz
	Off	Off	Off	Flashes green	Lights up	Off	Off	Alignment Y < setpoint value f _{flash} = 2 Hz
	Off	Off	Off	Flashes green	Flashes	Off	Off	Alignment Y = setpoint value f _{flash} = 2 Hz
	Off	Off	Off	Flashes green	Off	Off	Off	Alignment Z > setpoint value f _{flash} = 2 Hz
	Off	Off	Off	Flashes green	Off	Lights up	Off	Alignment Z < setpoint value f _{flash} = 2 Hz
	Off	Off	Off	Flashes green	Off	Flashes	Off	Alignment Z = setpoint value f _{flash} = 2 Hz
	Off	Off	Off	Flashes red	Off	Off	Off	Alignment Code tape outside read range f _{flash} = 2 Hz
	x	x	x	Lights up red	x	x	x	System error
	x	x	x	Lights up green	x	x	x	Normal operation, code tape detected
	Lights up	x	x	x	x	x	x	PROFINET connection activated
	x	Flashes	x	x	x	x	x	PROFINET TX/RX data transfer
	x	x	Lights up	x	x	x	x	PROFINET communication error
	x	x	x	Flashes red	x	x	x	Code not recognized f _{flash} = 2 Hz
	x	x	x	x	x	Lights up	Lights up	Internal error Return to Pepperl+Fuchs

x = LED status has no meaning

2.3 Accessories

Compatible accessories offer enormous potential for cost savings. Such accessories not only save you a great deal of time and effort when commissioning for the first time, but also when replacing and servicing our products.

If products are used in harsh ambient conditions, appropriate Pepperl+Fuchs accessories can be used to extend the service life of these products.

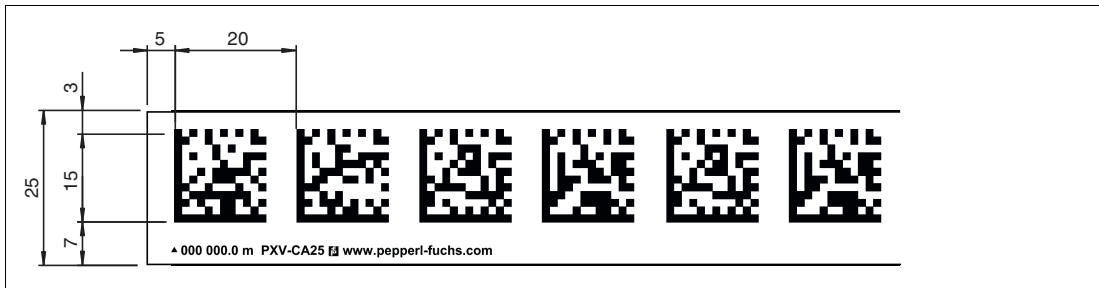
Order Designation	Description
V19-G-ABG-PG9	M12 single-ended female cordset, 8-pin, shielded, field-attachable
V19-G-ABG-PG9-FE	Grounding terminal and plug (set)
PCV-SC12 PCV-SC12A	Grounding clip
V1SD-G-*M-PUR-ABG-V1SD-G	PROFINET bus cable, M12 to M12, available in several different lengths
VAZ-V1S-B	Stopping plug for M12 plug
V19-G-*M-*	Configurable connection cable
PCV-KBL-V19-STR-USB	Cable unit for service interface with power supply
Vision Configurator Software	Software for camera-based sensors that enables convenient parameterization
PCV-MB1	Mounting bracket
Vision Configurator	Configuration software

More information on accessories can be found in the datasheet for the reader at www.pepperl-fuchs.com.

3 Installation

3.1 Affixing the Code Tape

Dimensions of the Code Tape



The code tape is made of silicone-free polyester film. A position marker appears every 100 mm along the lower edge of the code tape (see "Dimensions, Code Tape"). These position markers are used to affix the code tape in the correct position.

The back of the code tape is covered with a modified acrylate-based adhesive designed for permanent adhesion. Affix the self-adhesive code tape along the desired traverse distance. To do so, proceed as follows:



Affixing the Code Tape

1. Clean the surface of any greasy or oily deposits and dust.
2. Ensure that the surface is dry, clean, and stable.
3. Pull away a few centimeters of the protective film at the beginning of the code tape. Place the code tape at the precise point of the required starting position on the surface, and press to attach.
4. Then affix the code tape along the desired traverse distance. Please note the following information:
5. Remove the protective film gradually so that the code tape does not accidentally adhere to the surface in an incorrect position. When affixing the code tape, ensure that it does not become creased or trap air bubbles.

↳ The adhesive on the code tape hardens after 72 hours.

Note

Thermal Expansion of the Code Tape

The affixed code tape corresponds to the thermal expansion coefficient of the surface with regard to its thermal expansion. Keep this in mind when installing expansion joints, for example.

Code Tapes with a Starting Position of 0 m

Model number	Description
PXV00001-CA25-*	Code tape, 1-track, length: 1 m
...	...
PXV100000-CA25-*	Code tape, 1-track, length: 100,000 m



Note

Expansion Joints and Code Tapes

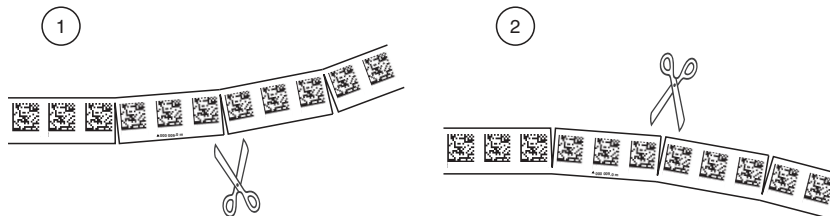
If the system covers longer distances, the plant structure usually contains expansion joints. In this case, we recommend creating breaks along the code tape. The resulting gap must not exceed 75 mm.



Note

Inclines and Declines

If you affix the code tape on inclines or declines, cut the code tape several times at the transition point to the horizontal as shown.



1. Linkskurve
2. Rechtskurve

If the read head leaves the zero line when traversing along the X axis, the threshold may result in an error. If the error exceeds the defined threshold, a warning code is issued.

3.2 Mounting of the Reader



Mounting the Reader

Make sure that you are able to mount the reader in a stable position. Before mounting the reader, make sure that the travel of the moving system part is arranged so that this part does not move outside of the reader's depth of focus range during operation.

1. Mount the reader on the moving part of the system and secure the reader in place using four screws through the mounting adapter on the reader.
2. Mount the reader **vertically** so that the lens of the reader with the ring light and camera module is aligned toward the code tape.

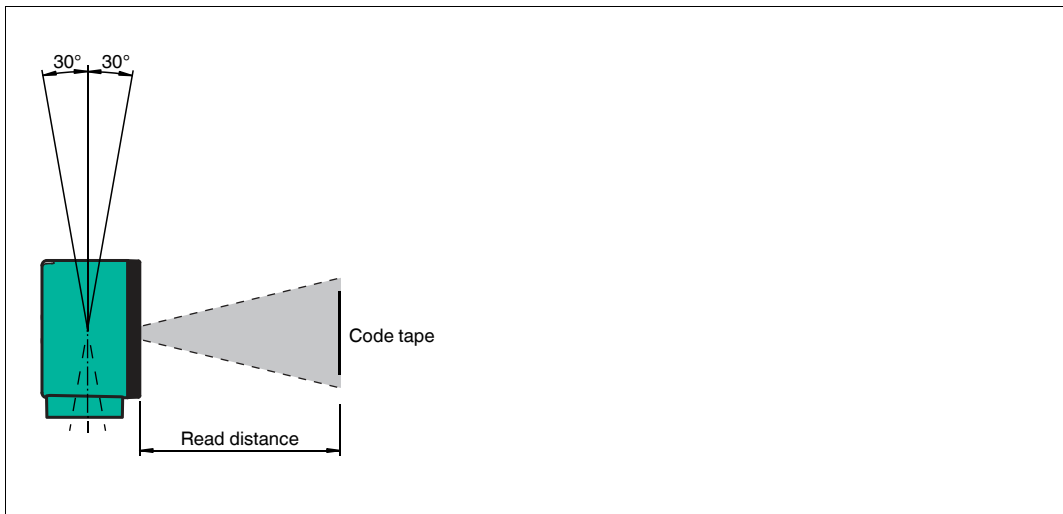


Figure 3.1 Vertical alignment tolerance

3. Alternatively, mount the reader **horizontally** so that the lens of the reader with the ring light and camera module is aligned toward the code tape.

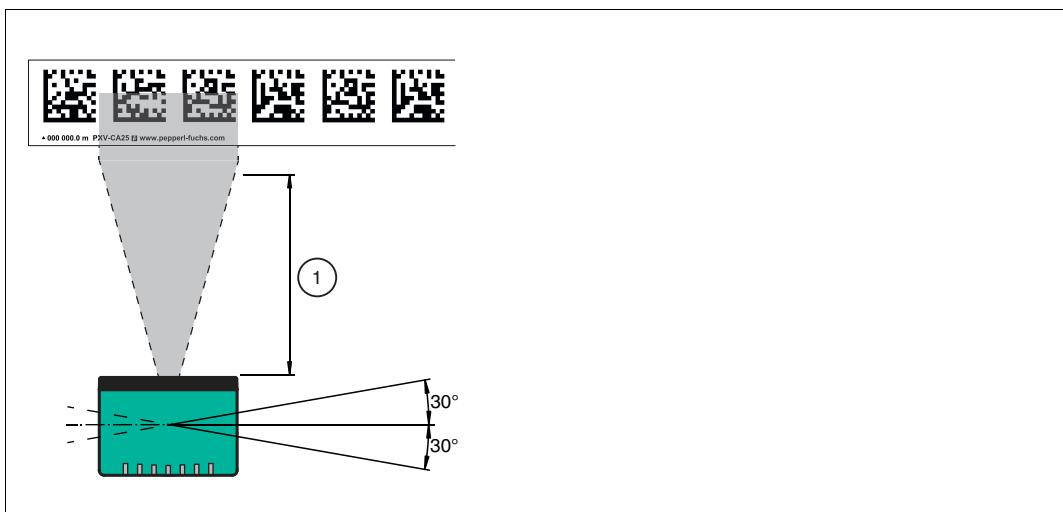


Figure 3.2 Horizontal alignment tolerance

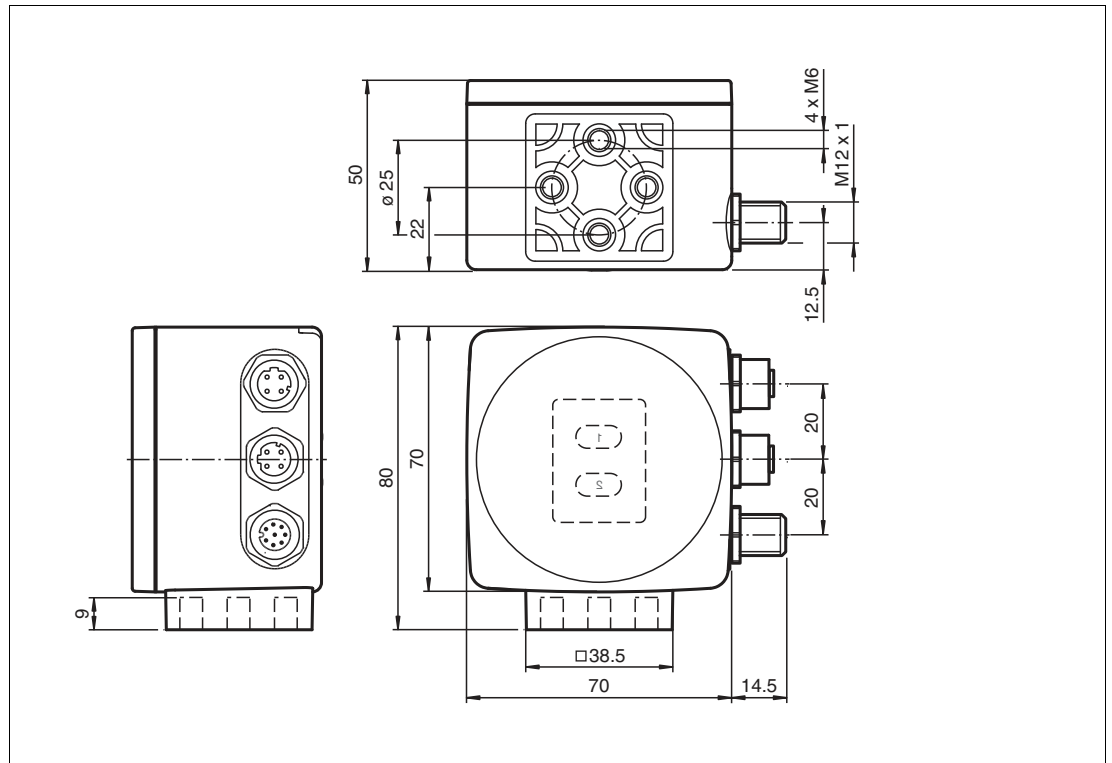
1 Read Distance

4. Check that the distance between the reader and the code tape is equal to the read distance of the reader:

Optimum Read Distance (Z-Axis)

Order Designation	Read Distance [mm]	Depth of Focus [mm]
PXV100*	100	± 50

Dimensions of the Reader



Caution!

When selecting the length of the mounting screws, ensure that the maximum insertion depth of the screws in the threaded inserts on the reader is 8 mm.

Using longer screws may damage the reader.



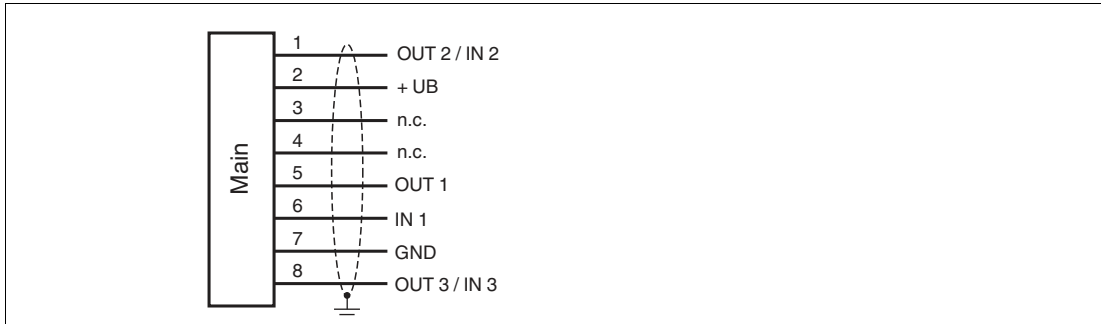
Caution!

The maximum torque of the mounting screws must not exceed 9 Nm.

Tightening the screws to a higher torque may damage the reader.

3.3 Electrical Connection

The reader is connected to an 8-pin M12 x 1 connector plug at the side of the housing with the label "Main". This connection is used to provide the power supply and communicate with the peripherals in one. The configurable inputs and outputs for the reader are also available on this connection.



Plug Assignment



Color Assignment

Pepperl+Fuchs single-ended female cordsets are manufactured in accordance with EN60947-5-2. When using a type V19-... single-ended female cordset with an open cable end on the **Main** connection, the colors are assigned as follows:

Connection Pin	Strand Color	Color Abbreviation
1	White	WH
2	Brown	BN
3	Green	GN
4	Yellow	YE
5	Gray	GY
6	Pink	PK
7	Blue	BU
8	Red	RD

Shielding Cables

The shielding of connection lines is required to suppress electromagnetic interference. Establishing a low resistance or low impedance connection with the protective conductor or equipotential bonding circuit is a particularly important factor in ensuring that these interference currents do not become a source of interference themselves. Only use connection lines with braid. Avoid connection lines with foil shield because this would increase the line capacities. The shielding is integrated at both ends, i.e., in the switch cabinet or on the PLC, **and** on the read head. The grounding terminal available as an accessory allows easy integration in the equipotential bonding circuit.

In exceptional cases, the shielding of a connection at one end may be more favorable if:

- An equipotential bonding cable is not laid or cannot be laid.
- A film shield is used.

The following points relating to shielding must be noted:

- Use metal cable clips that cover large areas of the shielding.
- Place the cable shield onto the equipotential bonding rail immediately on entering the switch cabinet.
- Direct the protective grounding connections to a common point in a star configuration.
- The cross-section of the cables used for grounding should be as large as possible.

Additional Ground Connection

Order Designation	Description
PCV-SC12	Clip for mounting an additional ground connection.
PCV-SC12A	



Caution!

Damage to the device

Connecting an alternating current or excessive supply voltage can damage the device or cause the device to malfunction.

Electrical connections with reversed polarity can damage the device or cause the device to malfunction.

Connect the device to direct current (DC). Ensure that the supply voltage rating is within the specified device range. Ensure that the connecting wires on the female cordset are connected correctly.

3.4 PROFINET Connection

The reader is connected to PROFINET via two 4-pin, D-coded connector sockets, M12 x 1, **Profinet 1** and **Profinet 2**, on the side of the housing.

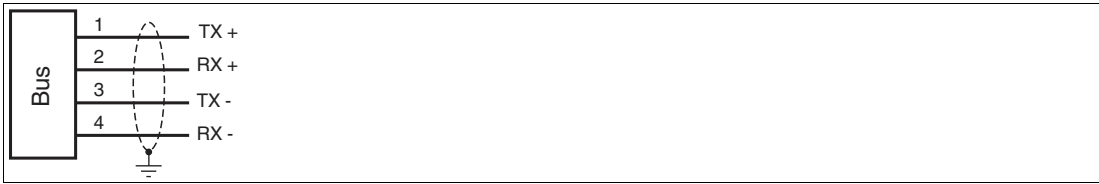


Figure 3.3 PROFINET connection diagram

Connector Assignment



Figure 3.4 PROFINET connector assignment

Suitable PROFINET cables can be found in the accessories section of the reader datasheet at www.pepperl-fuchs.com.

4 Commissioning

4.1 Aligning the Read Head

The read head provides an integrated alignment aid to enable simple, optimal alignment of the read head relative to the code tape in the Y-coordinate and the Z-coordinate.



Note

The alignment aid can only be activated within 10 minutes of switching on the read head.

You can switch the read head from normal operation to parameterization mode at any time, if necessary. Press button 1 on the back of the read head and hold for at least 2 seconds to do so.



Using the Alignment Aid

1. Press button 1 for longer than 2 seconds.
 - ↳ If the read head has recognized the code tape, LED 2 flashes green. If the read head has not recognized the code tape, LED 2 flashes red.
2. Set the optimal distance Z between the read head and the code tape so that the yellow LED 5 and the green LED 2 flash synchronously.

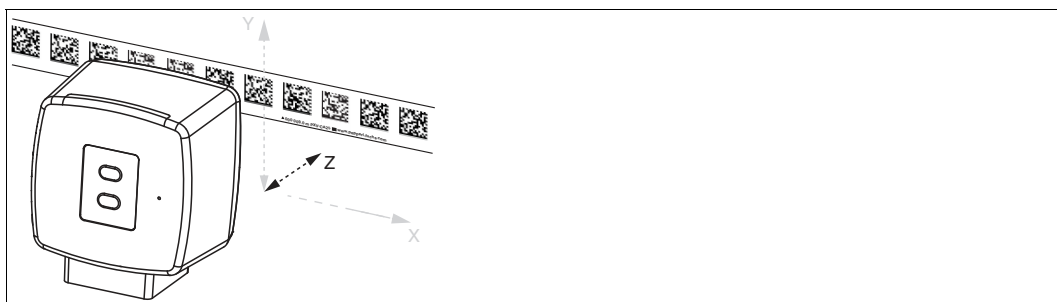


Figure 4.1 Distance Z

↳ Z orientation:

Distance from camera to code tape is too small: Yellow LED 5 lights up.

Distance from camera to code tape too large: Yellow LED 5 goes out.

Distance from camera to code tape within the target range: LED 5 and LED 2 flash simultaneously yellow and green.

3. Align the read head optimally with the code tape in the Y-axis so that the yellow LED 4 and the green LED 2 flash simultaneously.

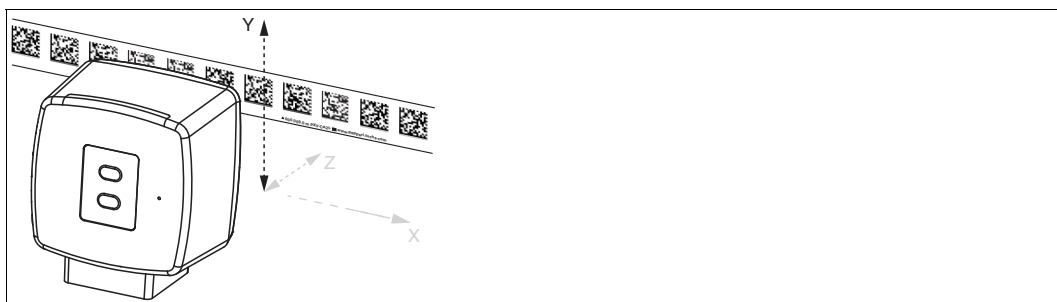


Figure 4.2 Distance Y

↳ **Y orientation:**

Read head too low relative to code tape: Yellow LED 4 lights up.

Read head too high relative to code tape: Yellow LED 4 goes out.

Orientation of the read head within the target range: LED 4 and LED 2 flash simultaneously yellow and green.

4. Briefly press button 1 to close the alignment aid.

↳ The read head now switches to normal operation.

5 Operation and communication

5.1 Communication via PROFINET

5.1.1 General Information on Communication via PROFINET

PROFINET is an open standard for industrial automation based on industrial Ethernet. PROFINET integrates information technology with established standards such as TCP/IP and XML in automation technology.

Within PROFINET, PROFINET IO is the communication concept for the construction of decentralized applications. This means that decentralized field devices are integrated through PROFINET IO. The familiar IO view of PROFIBUS DP is used where the usable data of the field devices is transferred to the controller process image in cycles. PROFINET IO is a device model consisting of slots and channels, which is based on the main features of PROFIBUS DP. The field device properties are written in a Generic Station Description Markup Language (GSDML) based on XML. PROFINET IO is engineered in the same way as has long been the case for system integrators of PROFIBUS DP. The decentralized field devices are assigned in the design of a controller.

PROFINET IO distinguishes between the following three device types:

- IO controller: Controller that executes the automation program.
- IO device: Decentrally assigned field device that is assigned to an IO controller.
- IO supervisor: Programming unit/PC with commissioning and diagnostic functions.

5.1.2 PROFINET I/O Interface

The reader functions as a PROFINET I/O device that communicates cyclically with the assigned PROFINET I/O controller during operation.

The PROFINET interface of the reader supports the following features:

- 100 Mbits/s transfer rate
- Real-time category (RT)
- The range of functions in accordance with **Conformance Class B**
- Identification and maintenance functions (I&M) IM0 ... IM4

5.1.2.1 Identification & Maintenance (I&M) Data

Identification and maintenance data (I&M data) is information stored in a device. I&M data uniquely identifies a device within a plant. The identification data (I data) includes information about the device, for example the item number and device name. Identification data cannot be changed.

Maintenance data (M data) includes information about the device within the plant, for example the installation location and installation date. Maintenance data is initially stored in the device during installation. Maintenance data can be changed.



Accessing and Editing I&M Data

The Step7 software from Siemens can be used to display and change the I&M data.

1. To do so, open the hardware configuration **HW Config** and call up the "Target system" menu.
2. Open one of the following functions:
 - "Download module identification"
 - "Download module identification in PG"

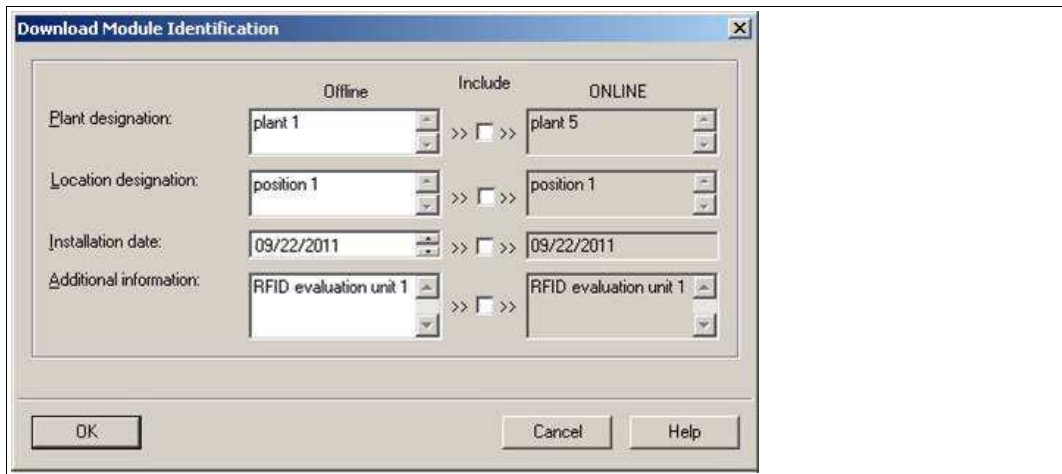


Figure 5.1

3. Depending on the requirement, read or edit the following I&M data:
 - I&M data 1: higher-level assignment, location designation
 - I&M data 2: installation date
 - I&M data 3: additional information

5.1.3 Project Planning Using Device Description

As with PROFIBUS DP, a field device is integrated into the project planning tool by way of a device description. The field device properties are described in the GSD file. The GSD file contains the field device data that you need to operate the device in a PROFINET network. This includes technical features and information about communication.

Import the GSD file into a project planning tool. Assign peripheral addresses to the individual channels of the field devices as usual. The peripheral input addresses incorporate the received data. The user program evaluates and processes this data. The user program generates the peripheral output values and sends them to the control interface.

Once project planning is complete, the IO controller receives the project planning and configuration data. The IO controller parameterizes and configures the field devices automatically.

Downloading the GSD File

You can find the relevant GSD file in the **Software** section of the product detail page for the device.

To access the product detail page for the device, go to <http://www.pepperl-fuchs.com> and type e.g., the product description or the item number into the search function.

5.1.4 PROFINET Address and Identifying a Device

Every PROFINET IO device has a unique device identification. This device identification is comprised from the following:

- A unique **MAC ID**. This MAC ID is printed on the back of the device.
- A **device name**. The default device name for the product as delivered is `pcv-f200`.
- An **IP address**. The default IP address for the product as delivered is `192.168.2.2`.

5.1.5 Overview of Available PROFINET Modules

Combination of Device Versions and Modules

		Device versions			
		PXV100-F200-B17-V1D	PXV100I-F200-B17-V1D	PXV100-F200-B17-V1D-3636	PXV100Q-F200-B17-V1D
Modules	Configuration	x	x	x	x
	X position	x	x	x	x
	Y position	x	x	x	x
	Speed	x	x	x	x
	Status	x	x	x	x
	Event	x	x	x	x
	Warning	x	x	x	x
	X position reduced resolution			x	x
	Quality grade information				x
	Output data				x

Description of the Modules

Module	Description	Link
Configuration	Configuration of the global primary data	See chapter 5.1.5.1
X position	Output of the position value in X direction	See chapter 5.1.5.2
Y position	Output of the position value in Y direction	See chapter 5.1.5.3
Speed	Movement speed output	See chapter 5.1.5.4
Status	Output of status: NoPosition, Error, Warning, and Event present	
Event	Output of the event marker number last read	See chapter 5.1.5.6
Warning	Output of the alert message last generated	See chapter 5.1.5.7
X position reduced resolution	Output of the position value in X direction (100x)	See chapter 5.1.5.8
Quality grade information	Output of the code quality, number of read codes	See chapter 5.1.5.9
Output data	Disable the control data for the read head, such as lighting	See chapter 5.1.5.10

5.1.5.1 Configuration Module (Global Primary Data)

The global primary data allows you to parameterize the read head using PROFINET. Global primary data is always transferred to the read head in full.

Module ident number 0x00000012

Submodule ident number 0x00000102

Parameter	Index Length Byte offset	Data type	Value	Default value Value	Description
Orientation	193 1 byte 1	Unsigned8	0: 0° 1: 180° 2: 0°, or 180° 3: 0°, 90°, 180°, or 270°	0	Orientation of read head in relation to the Data Matrix code tape
Code tape type	194 1 byte 1	Unsigned8	0 ... 8	1:1 row	Type of Data Matrix code tape used
Resolution settings (Index: 195, 6 bytes, X, Y, speed)					
X position resolution	195 1 byte 1	Unsigned8	0: 0.1 mm 1: 1 mm 2: 10 mm	1: 1 mm	Multiplier for the length in the direction of the X coordinate
Y position resolution	195 1 byte 3	Unsigned8	0: 0.1 mm 1: 1 mm 2: 10 mm	1: 1 mm	Multiplier for the length in the direction of the Y coordinate
Speed resolution	195 1 byte 5	Unsigned8	0: 0.1 m/s 1: 0.01 m/s 2: 0.001 m/s	0: 0.1 m/s	Multiplier for the velocity output
Input 1	196 1 byte 1	Unsigned8	128: No function	128	Function for No Function input signal
Horizontal offset for the device	201 4 bytes 1	Integer32	-100,000,000 ... 100,000,000	0	Offset in the direction of the X coordinate
No position behavior (index: 200; length: 27 bytes, NoPosX, NoPosY, NoPosSpeed)					
Behavior in the event of missing position for X data	200 4 bytes 1	Unsigned32	0: Last valid value 1: Specified value	0: Last valid value	X value if Data Matrix code tape is not visible
Stored value for X data	200 5 byte 5	Integer32	0 ... 100,000,000	0	Specifies position for X
Behavior in the event of missing position for Y data	200 4 bytes 10	Unsigned32	0: Last valid value 1: Specified value	0: Last valid value	Y value if Data Matrix code tape is unknown
Stored value for Y data	200 5 byte 14	Integer32	- 10,000,000 ... 10,000,000	0	Specifies position for Y

Parameter	Index Length Byte offset	Data type	Value	Default value Value	Description
Behavior in the event of missing position for SPD data	200 4 bytes 19	Unsigned32	0: Last valid value 1: Specified value	0: Last valid value	Speed value if no Data Matrix code tape is visible
Stored value for SPD data	200 5 byte 23	Unsigned32	0 ... 65535	0	Set speed
Output 1 (index: 197; length: 5 bytes)					
Selection of the output function	197 2 bytes 1	Unsigned8	0: No Function 1: Overspeed 2: Warning 3: Error 4: Event 5: No Position 6: Repair Strip	0: No function	Meaning of the output signal at output 1
Output overspeed value [mm/s]	197 3 bytes 3	Unsigned16	0 ... 65535	12500	Speed at which output 1 is activated 0 ... 65534 mm/s 12500 mm/s
Output 2 (index: 198; length: 5 bytes)					
Selection of the output function	198 2 bytes 1	Unsigned8	0: No Function 1: Overspeed 2: Warning 3: Error 4: Event 5: No Position 6: Repair Strip	0: No function	Meaning of the output signal at output 2
Output overspeed value [mm/s]	198 3 bytes 3	Unsigned16	0 ... 65535	12500	Speed at which output 2 is activated 0 ... 65534 mm/s 12500 mm/s
Output 3 (index: 199; length: 5 bytes)					
Selection of the output function	199 2 bytes 1	Unsigned8	0: No Function 1: Overspeed 2: Warning 3: Error 4: Event 5: No Position 6: Repair Strip	0: No function	Meaning of the output signal at output 3
Output overspeed value [mm/s]	199 3 bytes 3	Unsigned16	0 ... 65535	12500	Speed at which output 3 is activated 0 ... 65534 mm/s 12500 mm/s
Extrapolation	202 2 bytes	Unsigned8	0: Extrapolation deactivated 1: Linear extrapolation	1: Linear extrapolation	Extrapolation of X values
Speed filter mode	202 3 bytes	Unsigned8	0: deactivated 1: activated	0: deactivated	Filtering of the SPD speed value ¹

1. Available for version PXV100Q-F200-B17-V1D. Enabled by default for version PXV100-F200-B17-V1D-3636.

5.1.5.2 Position Data X Module

Response

Size	Type	Content
2 words, consistent	Input data	32 bit X data MSB first MSB = most significant byte

Data type: Integer32

Value range: 0 ... 100,000,000

Resolution: 0.1 mm, 1 mm, 10 mm, binary coded (as per the resolution of the X position in the configuration module)

Example: Int = 1000 corresponds to pos. 1000 with a set resolution of 1 mm = 1000 mm

For standard PXV types with resolutions of 1 mm and 10 mm: $L_{\max} = 10.00 \text{ km} = 10,000,000 \text{ mm}$

For version PXV100Q-F200-B17-V1D: $L_{\max} = 100.00 \text{ km} = 100,000,000 \text{ mm}$

Module ident number: 0x00000013

Submodule ident number: 0x00000103

5.1.5.3 Position Data Y Module

Response

Size	Type	Content
2 words, consistent	Input data	32 bit Y data MSB first MSB = most significant byte

Data type: Integer32

Value range: at resolution of 1 mm/10 mm: $Y_{\max} = \pm 35$

Resolution: 0.1 mm, 1 mm, 10 mm, binary coded in two's complement

Example: At a resolution of 0.1 mm: $Y_{\max} = \pm 25 \text{ mm}$

Module ident number: 0x00000014

Submodule ident number: 0x00000104

5.1.5.4 Speed Module

Response

Size	Type	Content
1 word, consistent	Input data	16 bit speed data Resolution: 0.1 m/s, 0.01 m/s, 0.001 m/s, binary coded

Data type: Integer16

Value range: 0 ... 65535

Example: Speed = 4.7 m/s --> speed output = 47 at a resolution of 0.1 m/s
65535 for unknown speed

Module ident number: 0x00000015

Submodule ident number: 0x00000105

5.1.5.5 Status Module

Size	Type	Content
1 word	Input data	16 bit status

Data type: Unsigned16

Value range: See table below

Module ident number: 0x00000016

Submodule ident number: 0x00000106

Response

Bit no.	Content	Function
	Byte 1 Status	
0	ERR	Error message (error code in XP00 – XP15); remaining bits = 0, see Error Codes
1	NP	No position information/OUT (XP = 0, YP = 0, SP = 0)
2	WRN	Warnings present, see Warning Module
3	EV	Event present
4	posdetected	Valid position information available
...	...	-
15	0	-

Error codes

Error code	Description	Priority
1	Read head tilted 180°	2
2	No clear position can be determined (difference between codes is too great, code distance incorrect, etc.)	3
> 1000	Internal error	1

5.1.5.6 Event Module (Marker Number)

Size	Type	Content
1 word, consistent	Input data	Last event marker Last event number

Data type: Unsigned16

Value range: 0 ... 999

Example: Event number 1 is the current event number.

Module ident number: 0x00000017

Submodule ident number: 0x00000107

5.1.5.7 Warning Module

Size	Type	Content
1 word, consistent	Input data	Last warnings Last warning number

Data type: Unsigned16

Value range: See table below

Module ident number: 0x00000018

Submodule ident number: 0x00000108

Warning Data Set

Bit no.	Con- tent	Description
	Word 1	
0	WRN01	A code with non-PXV content was found.
1	WRN02	The read head is too close to the Data Matrix code tape.
2	WRN03	The read head is too far from the Data Matrix code tape.
3	WRN04	Y position too large. The sensor is just before OUT.
4	WRN05	Y position is too small. The sensor is just before OUT.
5	WRN06	The read head is rotated or tilted in relation to the Data Matrix code tape.
6	WRN07	Low level of code contrast.
7	WRN08	Repair tape detected.
8	WRN09	Temperature too high.
9	WRN10	Reserved
10	WRN11	Reserved
11	WRN12	Reserved
12	WRN13	Reserved
13	WRN14	Reserved
14	WRN15	Reserved
15	WRN16	Reserved

Table 5.1 If no warnings are present, all bits in the warning data set are set to 0.

5.1.5.8 Reduced X Position Resolution Module

Size	Type	Content
2 words, consistent	Input data	32 bit X data MSB first MSB = most significant byte

Data type: Integer32

Value range: 0 ... 100,000,000

Example: Value 100 corresponds to 10,000 mm at a resolution of 1 mm.

Resolution: X position resolution set at 100x mm in the configuration module

For standard PXV types with resolutions of 1 mm and 10 mm: $L_{\max} = 10.00 \text{ km} = 10,000,000 \text{ mm}$

For version PXV100Q-F200-B17-V1D: $L_{\max} = 100.00 \text{ km} = 100,000,000 \text{ mm}$

Module ident number: 0x00000019

Submodule ident number: 0x00000109

5.1.5.9 Quality Grade Information Module

Size	Type	Content
4 bytes	Input data	1 byte quality grade / 1 byte number of decoded codes MSB first MSB = most significant byte

Data type: Unsigned8

Value range: See table below

Module ident number: 0x0000001A

Submodule ident number: 0x00000010A

Quality Grade

The quality grades enable constant monitoring of the code tape and the camera along the entire traverse distance. This enables you to detect and act upon potential damage or contamination of the code tape and camera at the earliest stage possible during commissioning and normal operation. As a result, this maximizes the overall functional reliability of your plant, and it means you are able to immediately localize the issue in the case of a fault.

Evaluations are made using a scale of 1 to 6. The value 1 is the best possible read quality. A value greater than 3 or worse requires the camera and its path to be inspected. The value 7 signifies "No position" because no code was detected.

An evaluation that indicates poor quality as the outcome can be due to a misalignment or incorrect orientation, an incorrect measuring distance, or because the code tape has been affixed incorrectly.

Input Data

Bits	7	6	5	4	3	2	1	0	Function
Bytes									
1	QLV07	QLV06	QLV05	QLV04	QLV03	QLV02	QLV01	QLV00	Quality grade of the code tape
2	DCO07	DCO06	DCO05	DCO04	DCO03	DCO02	DCO01	DCO00	Number of Decoded Codes
3	RES07	RES06	RES05	RES04	RES03	RES02	RES01	RES00	Reserved
4	RES15	RES14	RES13	RES12	RES11	RES10	RES09	RES08	Reserved

Table 5.2 Input data telegrams for quality grades

Number of decoded codes

Normally, the camera detects five codes at a nominal distance of 100 mm. Only one code is required to calculate the position. If there is a constant strong fluctuation of the number of codes read, this can be indicative of individual codes that are dirty or damaged, or an inconsistent measuring distance.

Quality grades during initial installation of the data matrix code:

Note	Description of the grade	Action
1	Excellent installation	None
2	Good installation	None
3	Installation within tolerance range	Check the code tape for dirt; action: Clean
4	Adequate, but unacceptable	Check the code tape for dirt and damage. Also check the length of the code tape; any potentially non-optimal overlaps and cross-overs are excluded from this.
5	Incorrect installation	See Grade 4 / Not acceptable
6	Defective installation	See Grade 4 / Not acceptable
7	Operation not possible now nor at a later stage	See Grade 4 / Not acceptable

Quality grades during operation:

Note	Description of the grade	Action
1	Excellent	None
2	Good	None
3	Satisfactory	Pay particular attention to any positions that are graded ≥ 3 and inspect these during the next routine inspection; clean these if necessary.
4	Acceptable	Immediately inspect any positions that are graded ≥ 4 for dirt and damage; where necessary, clean these or repair them directly.
5	Poor	Immediately inspect any positions that are graded ≥ 5 for dirt and damage; where necessary, clean these or repair them directly.
6	Not acceptable	Immediately inspect any positions that are graded ≥ 5 for dirt and damage; where necessary, clean these or repair them directly.
7	No operation possible	Immediately inspect any positions that are graded ≥ 5 for dirt and damage; where necessary, clean these or repair them directly.

Note

The grades should be monitored by the PLC over time to detect deviations.

Note

The recommended grades and actions assume that the Data Matrix code tape has been applied in one continuous length. Please note that gaps within the code tape can lead to poorer quality grades.



5.1.5.10 Output Data Module

Data type: Unsigned8

Value range: See table below

Module ident number: 0x0000001B

Submodule ident number: 0x00000010B

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-	-	-	IC	-	-	-	-

Bit 4 IC (= illumination control): Lighting control

- 0: ON (default value)
- 1: OFF (lighting off)

6 Appendix

6.1 ASCII table

hex	dec	ASCII	hex	dec	ASCII	hex	dec	ASCII	hex	dec	ASCII
00	0	NUL	20	32	Space	40	64	@	60	96	'
01	1	SOH	21	33	!	41	65	A	61	97	a
02	2	STX	22	34	"	42	66	B	62	98	b
03	3	ETX	23	35	#	43	67	C	63	99	c
04	4	EOT	24	36	\$	44	68	D	64	100	d
05	5	ENQ	25	37	%	45	69	E	65	101	e
06	6	ACK	26	38	&	46	70	F	66	102	f
07	7	BEL	27	39	'	47	71	G	67	103	g
08	8	BS	28	40	(	48	72	H	68	104	h
09	9	HT	29	41	)	49	73	I	69	105	i
0A	10	LF	2A	42	*	4A	74	J	6A	106	j
0B	11	VT	2B	43	+	4B	75	K	6B	107	k
0C	12	FF	2C	44	,	4C	76	L	6C	108	l
0D	13	CR	2D	45	-	4D	77	M	6D	109	m
0E	14	SO	2E	46	.	4E	78	N	6E	110	n
0F	15	SI	2F	47	/	4F	79	O	6F	111	o
10	16	DLE	30	48	0	50	80	P	70	112	p
11	17	DC1	31	49	1	51	81	Q	71	113	q
12	18	DC2	32	50	2	52	82	R	72	114	r
13	19	DC3	33	51	3	53	83	S	73	115	s
14	20	DC4	34	52	4	54	84	T	74	116	t
15	21	NAK	35	53	5	55	85	U	75	117	u
16	22	SYN	36	54	6	56	86	V	76	118	v
17	23	ETB	37	55	7	57	87	W	77	119	w
18	24	CAN	38	56	8	58	88	X	78	120	x
19	25	EM	39	57	9	59	89	Y	79	121	y
1A	26	SUB	3A	58	:	5A	90	Z	7A	122	z
1B	27	ESC	3B	59	;	5B	91	[	7B	123	{
1C	28	FS	3C	60	<	5C	92	\	7C	124	|
1D	29	GS	3D	61	=	5D	93]	7D	125	}
1E	30	RS	3E	62	>	5E	94	^	7E	126	~
1F	31	US	3F	63	?	5F	95	_	7F	127	DEL

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