INSEVIS

Periphery
Manual

- S7-Panel-PLC
- S7-Compact-PLC
- S7-Panel-HMI
- **Periphery**
- Software
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Changes to older versions of the manual

Rev. 02 / 2012:	update information to analog modules AI4O4 and RTD8
Rev. 03 / 2012:	changes in measure ranges of modul RTD8, all modules with new block diagrams and wiring samples chapter „ConfigStage" renewed
Rev. 01 / 2013	increasment of the resolution of analog inputs by expanding the integration time
Rev. 02 / 2013	DI16/ DIO16: in-/ output delay times changed
Rev. 03 / 2013	description ConfigStage changed
Rev. 01 / 2014	description ConfigStage changed
Rev. 02 / 2014	more wirings (3-/4- wires) added, more information to DIO16 (bitwise switch off the outputs), RTD8O2 (broken wire information, AI4O4 wiring for 3-/4-wire applications corrected)
Rev. 01 / 2015	implementation of PC351V/P onboard-periphery
Rev. 02 / 2015	implementation of new DIO8Z...-03 and of bolt flange connectors
Rev. 03 / 2015	rework state LEDs DP3xxC, new ConfigStage-CPU-T
Rev. 01 / 2016	new description for download functions into DIO8-Z by ConfigStage V 1.0.14.26 with OS 2.3.5 (CPU-V/-P) / 2.3.7 (CPU-T)
Rev. 02 / 2016	Expansion of DIO8-Z description with function download by ConfigStage and SSI-functionality PM-EMESS UI integrated, Measurement area of PT100 new described Description of decentral periphery head expandes
Rev. 01 / 2017	Expansion of DIO8-Z description with new function Info about CAN-settings and LED-Status of DP3xxX Info about max. length between CPU and extension at E-Mess-UI-scheme
Rev. 02 / 2017	PM-E-Mess UI: Hint for grounding prohibition ref. to DIN VDE 0100-557:2014-10
Rev. 03 / 2017	PM-MIO84 added
Rev. 01/2019	new screenshots from 2019-Stage software inserted
Rev. 01/2020	PM AI8 added, for all CPU-V/P from 2.5.1 and -T from 2.7.0 and with ConfigStage 1.0.14.40
Rev. 01 / 2022	CPU Typ P and lift arm connectors discontinued, AI8 Perephery Card added, Corrections.
Rev. 02 / 2022	improved description MIO84
Rev. 01 / 2024:	INSEVIS Vertriebs GmbH
Rev. 01 / 2025:	fixed periphery board in CC/PCxxx1T and DP301C added, small explenations in ConfigStage updated

Hint for better understanding by application videos

On our english **INSEVIS-En** Youtube channel we provide tutorial videos in various playlists sorted by topic, referring to single details and functions described in this manual

This will help you to get familiar with INSEVIS much faster – PLEASE use it beside this manual!
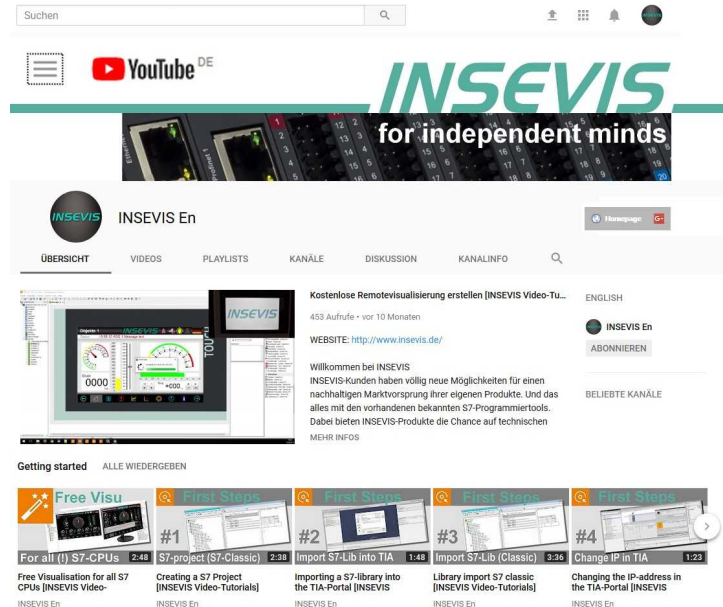
General instructions

Safety instructions

This manual contains instructions to avoid material damage and must be carefully attended for your own safety. These instructions are identified with a warning triangle with a note of exclamation inside and a signal word *(Signalwort)* below.

Danger	Death, heavy bodily harm or material damage will appear, if appropriated precautions are not taken over.
Warning	Death, heavy bodily harm or material damage will appear, if appropriated precautions are not taken over.
Caution	Bodily harm or material damage will appear, if appropriated precautions are not taken over.
Attention	means, that a unwished results or states can occur, if the appropriated instruction is not noticed.
Important	means the commitment to a special behavior or operation for the safe treatment of the controller / machine.

Qualified personnel

All devices described in this manual may only be used, built up and operated together with this documentation. Installation, initiation and operation of these devices might only be done by instructed personnel with certified skills, who can prove their ability to install and initiate electrical and mechanical devices, systems and current circuits in a generally accepted and admitted standard.

Operation according to regulations

This device might be only used for this operation written in this manual and only in combination with other certified external devices. For a correct operation a proper transportation, storage, initiation and maintenance is necessary.
All valid safety instructions and regulations for the prevent of industrial accidents are to be attended carefully.
The power supply must be connected to a central ground potential in a starlikely wiring.

Maintenance

Modifications / repairs of an INSEVIS device might be done only by special educated and trained personnel of INSEVIS in an ESD-safe area. Every unauthorized opening might cause damages and will terminate all warranty claims.

Data security

Each customer is responsible by himself for protecting his IT-environment against illegal external attacks. INSEVIS shall not be held liable for any direct, indirect or consequential damages respect to any claims arising from the possible illegal external access to their PLCs or HMIs by Ethernet. If you are not sure, how to protect your environment ask for help at professional legal IT-companies.

Copyright

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All property and copy rights of theses documentation and software and every copy of it are reserved to INSEVIS GmbH.

Trade Marks

INSEVIS refers that all trade marks of particular companies used in own documentation as e.g.
- STEP®, SIMATIC® and other as reserved trade mark of Siemens AG.
- CANopen® and other as reserved trade mark of CAN in Automation eG
and more reserved trade marks are property of the particular owners and are subjected to common protection of trade marks.

Disclaimer

All technical details in this documentation were created by INSEVIS with highest diligence. Anyhow mistakes could not be excluded, so no responsibility is taken by INSEVIS for the complete correctness of this information. This documentation will reviewed regulary and necessary corrections will be done in next version.

Essential knowledge and experiences

To understand this documentation basic knowledge and experiences of the automation technology in general and the programming with STEP®7 are essential.

With publication of this manual all other versions are no longer valid.

INSEVIS

About INSEVIS

S7-system components for industrial automation technology
The range of INSEVIS- product families enables an integrated solution and easy to handle for small and medium automation application with latest technology, very high quality level and with additional interfaces like CANopen® and Modbus, to be configured easily.

The easy integration of INSEVIS-products into the S7-world meanwhile is famous and exemplary. Complex communication settings will be assigned easily and intuitively, so that these properties expand the common S7-world by far. A large and multilingual visualization in a modern design is done by a few clicks and the work flow is known by every WinCCflex user. It can be simulated on the visualization PC and is accessible remote.

The S7-CPUs -V and -P are the base of the successfully INSEVIS product families with Profibus DP Master/Slave.
With the new S7-CPU-T Panel-PLCs and Compact-PLCs are available with Profinet IO Controller.

Step®7-Programability
INSEVIS-S7-CPUs are programmable by STEP 7® - AWL, KOP, FUP, S7-SCL, S7-Graph from Siemens and in general command-compatible to Siemens-CPU S7-315-2PNDP. Some special INSEVIS-blocks expand the functionality and allow outstanding solutions. The S7-programming will be done by good known tools SIMATIC®-Manager or by TIA-Portal® from Siemens always.

Independence
INSEVIS-products does not base on Windows or Linux, they have an own firmware. Thereby the hard- and software can be exactly designed for a perfect co-ordination with this firmware and a low power consumption. Booting times of less than 4 seconds and completely no software licenses and a current drain of <100mA @ 24V are the result of these facts.

Get your software rid of licenses
INSEVIS stands for a clear and honest license policy, what gives the customer sustainable cost benefits. Because of the ownership of BIOS, firmware and PC-software for visualization, configuration and remote access INSEVIS can offer its products completely without licenses.

Made in Germany
Development, PCB-design and -production, test and mounting of all INSEVIS-products - all this is made in Germany. So every product is a proof for the combination of German engineering and economy and is available with a certification of German origin.

INSEVIS operates a yearly certified quality management system ref. to DIN EN ISO 9001:2015

All suppliers of INSEVIS obligate to this quality management and contribute to the high quality level of INSEVIS-products.

Already during planning these families one goal was indicated as most important: to design highest quality and ergonomics into all products.

These products were put into comprehensive validation tests before they were produced in selected and certified production lines.

INSEVIS - Made in Germany

Product family Periphery

Communication to PLC

While onboard periphery has its access to INSEVIS S7-CPU by the integrated rear bus, the head stations of the decentral periphery communicate with the CPUS by a protocol, compatible to CANopen®. Because CAN is not so common in the S7-world, INSEVIS maps its decentral periphery only by inserting the CAN-node. All others is made automatically and no INSEVIS-customer needs to know anything about CAN.

Onboard-Peripherie
digital I/Os
(24V/0,5A / 230V(5A)
analog I/Os
(U,I,R / 12-16 bit)
counter
(5V/24V/RS422, 125kHz)

1...127x Dezentrale Peripherie DP3xxC
digital I/Os
(24V/0,5A / 230V(5A)
analog I/Os
(U,I,R / 12-16 bit)
counter
(5V/24V/RS422, 125kHz)
all CANopen slave
(e.g. I/Os, drives, FCs, etc.)

Periphery modules

Decentral head stations DP303C/DP307C/DP311C
with 3 / 7 / 11 periphery slots
Periphery module DI16
(16 digital inputs 24V)
Periphery module DIO16
(16 digital in- or outputs 24V / 0,5A)
Periphery module DO4-R
(4 relay outputs 230V / 3A)
Periphery module MIO84
(8 digital- and 4 analog in- or outputs)
Periphery module AI4O4
(4 analog in- and 4 analog outputs)
Periphery module AI8O2
(8 analogin- and 2 analog outputs)
Periphery module RTD8O2
(8 analog in- and 2 analog outputs)
Function module DIO8-Z
(2 Encoder inputs A,B,Z and 2 digital in- or outputs)

Hint:
More product information to all modules are available at INSEVIS-web sites in the Product / Periphery - area and contain more information for wiring and block schemes

Data valid for all periphery and function modules:	
Property	**Technical data**
Operating temperature range Storing temperature range	-20°C ... +60°C (without condensation) -30°C ... +80°C
Dimension (W x H x D) Weight	20 x 108 x 70 mm ca. 150 g
Wire length unshielded (max.) shielded (max.)	30 m 100 m
Connection technology	Cage clamp technology for cross section up to max. 1,5mm^2

Delivery scope
- Rear foil with
  - signal overview stripe (changeable)
  - inserting stripe for identification V
- Technical data

Accessories
- Connector 20-pin (lift arms/ bolt flanges) with max. 1,5mm²,
- Inserting stripes V with customer logo

Most important properties at a glance

High packing factor
By a module width of < 20mm lots of I/Os fit in a compact PLC or decentral head station. A slim mounting depth of < 95mm and an angled connection layer towards the cable channel pre-assembled cable harness

Easy configerable head station
Assign decentral head stations by 2 node-IDs only. Once directly at the head stations turn switches and once in the cost free configuration software. That´s all.

High resolution
All analog INSEVIS-I/Os resolution is minimum 12Bit If you allow a little more integration time to the inputs of AI4O4, you can increase this resolution up to 16Bit. Of course without more costs. As always at INSEVIS.

Intelligent configuration
Selecting the functionality bitwise as digital input or output. Assign the wiring of analog inputs as 2-, 3- or 4- wire configuration. Choose between current or voltage an analog I/Os. Do it all by a mouse click in the cost free configuration software.

The wiring of the decentralised peripheral head station

The head station on the left slot of the peripheral carrier is responsible for communication with the PLC. With the type "C" head station, communication between the PLC and the decentralised peripheral interface takes place via a CANopen® -compatible protocol, without the need for any CAN knowledge during S7 programming. Two hexadecimal rotary switches on the head module of the decentralised periphery are used to parameterise the node number. The baud rate is recognised automatically.
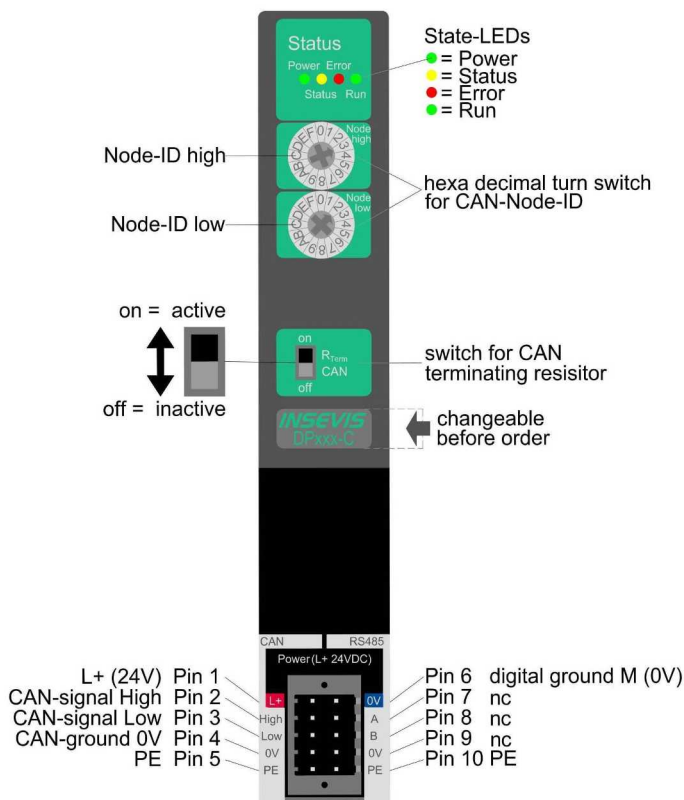
Software for peripheral configuration

The INSEVIS software tools are free of charge, working on Windows PCs and can be executed in either German or English.

Configuration
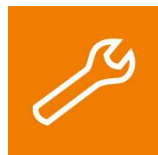
With the configuration tool „ConfigStage" you can config the additional functions of the INSEVIS-CPUs and download it into the PLC. The onboard- or decentral INSEVIS-periphery will be added easily by drag´n drop to the periphery slots. Parameters and address areas will be assigned in a box right below. Also you may assign S7-CPU-parameters like in your programming tools from Siemens (like startup, diagnostic, cycle and clock, retententive memory, etc.). A web server can be configured at CPU-T-PLCs.

With the „ConfigStage"-software these interfaces can be assigned:
- RS232 with free ASCII,
- RS485 with free ASCII and Modbus RTU,
- Ethernet-connections (S7-connection, ISO-on-TCP, TCP, UDP, Modbus-TCP, INSEVIS-Panel-HMI),
- CAN (CANopen® by pre-defined parameters or by imported and mapped EDS-files),
- A web server can be activated for all PLCs with CPU-T.

Product family Periphery

Accessories for periphery

There are available pin marked removable connectors with bolt flanges to connect INSEVIS-devices. This allows a explicit positioning of each pin to the signals and makes the wiring easier. The wire-contact is done by maintenance free cage-clamps for max. 1,5mm² cross sections without wire end sleeves.
The connectors E-CON XX with lift arms are discontinued and replaced by E-CONS XX connectors with bolt flanges.)

A grounding terminal is part of every delivery of head stations. Every periphery module contains the referring rear foil, standard inserting and signal stripes.

Figure of accessories	accessories	Article-no.	MOQ (pcs)
Connectors E-CONS10 bolt flanges (pin marked connectors for max. 1,5mm² cross sections)	**For head stations** Connector 2x5pin, bolt flanges (mechanically compatible replacement for discontiunued E-CON10) From 2023 the Pin-Numbers are printed on the sides.	E-CONS10-00	1
E-CONS20D bolt flanges (pin marked connectors for max. 1,5mm² cross sections)	**For digital and mixed modules** Connector 2x10pin, bolt flanges (mechanically compatible replacement for discontiunued E-CON20D) From 2023 the Pin-Numbers are printed on the sides.	E-CONS20D-00	1
E-CONS20A bolt flanges (pin marked connectors for max. 1,5mm² cross sections)	**For analog modules** Connector 2x10pin, bolt flanges (mechanically compatible replacement for discontiunued E-CON20A) From 2023 the Pin-Numbers are printed on the sides.	E-CONS20A-00	1
E-CON08 (connector for max. 1,5mm² cross sections)	**For relay module DO4-R** Connector 1x8pin	E-CON08	1
Customized labeling	Inserting stripes V with customer logo (rear)	E-LABV-00	100
Software	ConfigStage	-	free download
Spare parts **Hint:** grounding terminal is part of every delivery	Additional grounding terminals	E-MNT00-00	10

Attached parts and customized designs on request.

INSEVIS

Product family Periphery

Technical data	type of device		
Type of models	DP303C	DP307C	DP311C
Dimension W x H x D (mm) Weight	82 x 116,5 x 92 ca. 400g	161 x 116,5 x 92 ca. 600g	240 x 116,5 x 92 ca. 800g
Mounting IP-leak protection class	to clip on a 35mm DIN-rail IP41		
Operating temperature range Storage temperature range	-20°C ... +60°C (without condensation) -30°C ... +80°C		
Connection technology	unlockable connector with self-lock and 2 lift-arms (cage clamp technology) for cross section up to max. 1,5mm^2		
Load voltage L+	24V DC (11 ... 30V DC)		
Current consumption Power dissipation	20 mA ... 275 mA 0,5 W (typ.), 4,5 W (max.)	20 mA ... 350 mA 0,5 W (typ.), 7 W (max.)	20 mA ... 485 mA 0,5 W (typ.), 10 W (max.)
Start-up current	< 3A		
Onboard periphery slots for INSEVIS periphery modules	3 free slots	7 free slots	11 free slots

Status-display by LEDs in the periphery heads DP3xxC
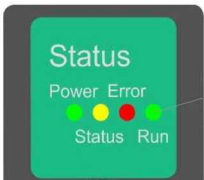
Status-LEDs
● = Power
● = Status
● = Error
● = Run

Green Power LED   signalizes proper power supply.

Yellow Status-LED   warns about missing traffic. If no data were received for > 150 ms, this LED will lit up. (To avoid an unpleasant user experience due to a flashing or flickering Status-LED in applications with low data traffic (rare changes in outgoing data), the guarding time of the respective DPs can be reduced to 100ms in the ConfigStage.)

Red Error-LED   signalizes communication problems, mostly caused by wiring.
     1x flash: warning level reached due to too many corrupted data
     2x flash: NodeGuardEvent - node returns into PREOPERATIONAL due to lost host connection
     Steady light (2 seconds):   internal communication error, Timeout by peripheral module
     Steady light (5 seconds):   switch into bus-off due to too many corrupted data
     Steady light: at memory override, if more then 4PDOs per DP are occupied

RUN-LED
Slowly blinking   signalizes node state PREOPERATIONAL: Station is waiting for configuration data. There is no process data communication.
Steady light   signalizes node state OPERATIONAL: Configuration is done, station is ready and updates process data.

Fast flashing between
RUN- and ERROR-LED   signalizes Auto-Baud-Mode after power up until first data are recognized.

Hint: Why NO automatic station return at the CAN head station?

In opposition to Profibus an automatic station return after OFF/ON of the saves is not allowe3d corresponding to actual spezifikation. It means, INSEVIS-Peripherie also does not return automatically into operation after OFF/ON or PULL/PUT the CAN-cable.

Therefore the INSEVIS-CPU must be set into STOP and into RUN again, OR
     manual state control and new start must be done by software.
     (Sample program NMT at the download web sites www.insevis.com)

Configuration with the Software „ConfigStage"

This software can be used with operating system Windows 10 only. It is very easy to configure and parametrize all INSEVIS-PLCs and internal or external CAN-Periphery with the free software tool „ConfigStage". First you select your device from the list of offered devices. After having selected your device there opens up a window with some areas.

VIDEO-tutorials available
There are available different video tutorial in the ConfigStage play list at INSEVIS Simatic®-®-channel INSEVIS EN. Sample programs are ready to download from INSEVIS web site.

Basic settings

Middle	PLC you selected (from rear side) without any periphery
Left	self constructing project tree with the configurable functions of the CPU, free slots and the periphery already configured
Right	catalog area with all periphery modules and decentral CAN-peripheries available - periphery modules will be moved by drag`n drop to the preferred slot - CAN-head stations will be also moved by drag´n drop to the green area in the CPUs image or to the CAN-pins in the connectors image
Bottom	Configuration area, where the properties wil be configured
Bottom right	Information area of the selected module
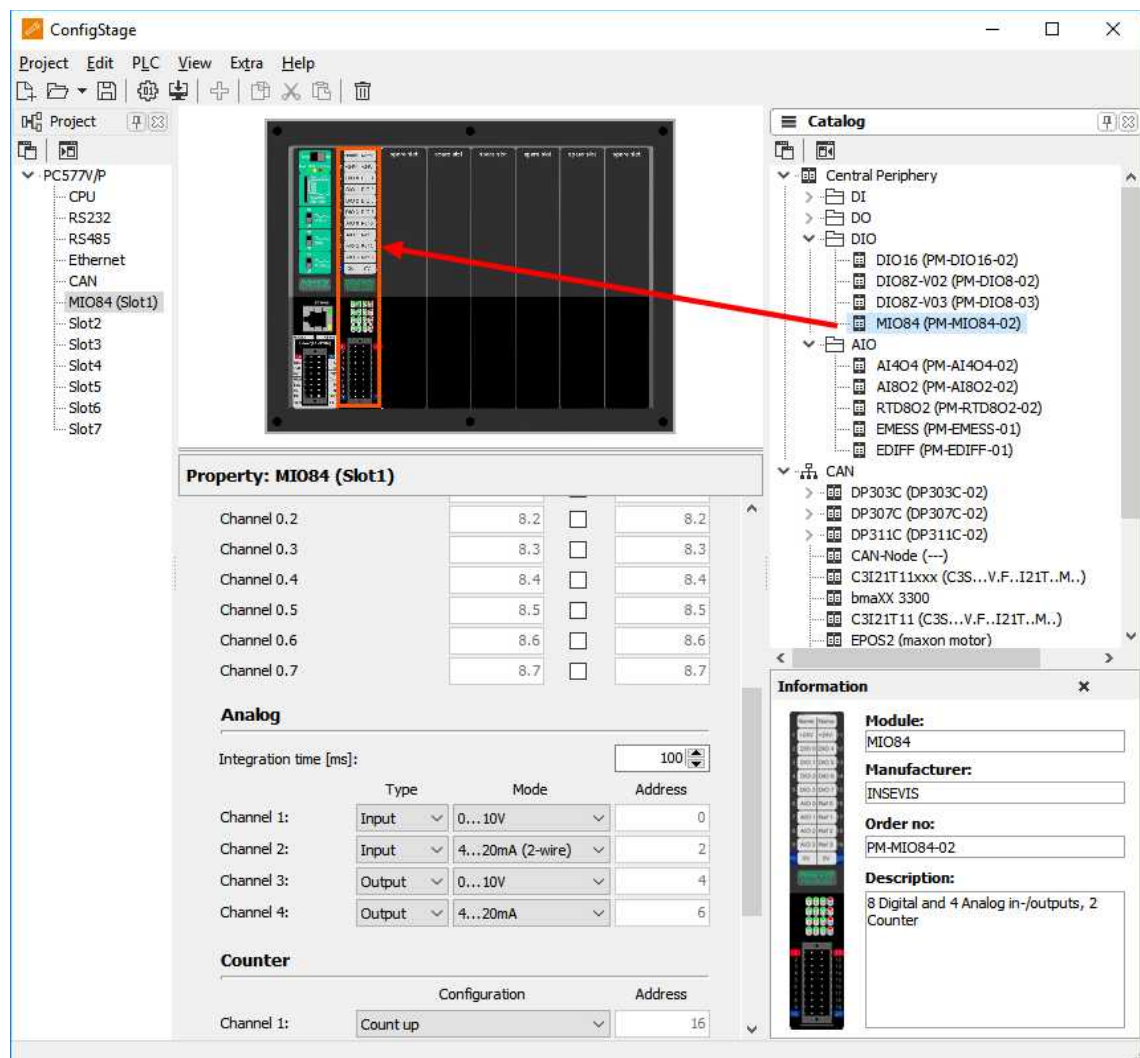
Hint: The Profibus- and CPU-configuration (without INSEVIS-specific settings for Ethernet, serial and CAN) can be made in the Simatic® Manager. The download of the Simatic® Manager overwrites all SDBs completely.
Please do config Profibus and CPU **FIRST** and download it into the PLC. Than configure all the other configurations (CPU with Ethernet, RS232/485, Modbus, CAN and (de-)central periphery and) with the ConfigStage and download it **LATER**. This download does overwrite only the configured SDBs and keeps the Profibus- and CPU-settings oft the Simatic®- Manager.

Configuration with the Software „ConfigStage"

Assign the IP-address
ConfigStage can change the IP-address of the target device.
Either
- Click on „Ethernet" in the project tree
- Enter the IP-address, netmask and router-address (if checked)

or:
- enter the download-dialog box (F12). (There will be used the service "Accessible devices" like in other INSEVIS-Stages)

In this sample a IP-address 192.168.80.50 was assigned in the configuration, see below.

This new configuration must be downloaded to the old IP-adress 192.168.80.67 once before it is active. This target-IP-address is to be
- entered manually
  or
- selected from a list of accessible devices (press „Refresh")

For the download the PLC will be switched to STOP mode and restarts later.

Change target device
If an existing configuration should be transferred to another INSEVIS-S7-PLC, it can be done at the „Project"-menu.
It helps saving time and prevents errors.

Addressing of the onboard periphery

Standard addressing ind the INSEVIS- PLCs

Without using software tool „ConfigStage" the following address area will be set up in a standard way:

digital module: 4 byte inputs, 4 byte outputs
analog module: 16 byte inputs,   16 byte outputs

| start address \ slot	slot 1	slot 2	slot 3	slot n
digital inputs	byte 0	byte 4	byte 8	byte (n-1)x4
digitale outputs	byte 0	byte 4	byte 8	byte (n-1)x4
analog inputs	byte 128	byte 144	byte 160	byte (n-1)x16 +128
analog outputs	byte 128	byte 144	byte 160	byte (n-1)x16 +128

⚠ **Attention** If a functional module FM DIO8-Z is placed, all following digital address areas will be moved for 8 byte more.

Configuration with the Software „ConfigStage"

Different addressing in PLCs and addressing of decentral periphery

If decentral periphery is used and/or other should be used other address areas in the PLCs, it will be configured with the
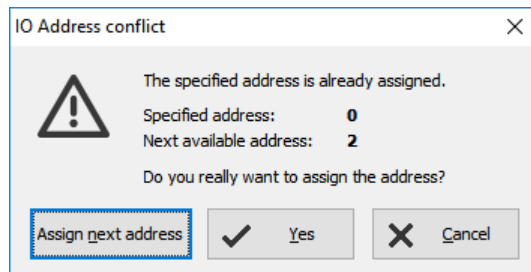
software tool „ConfigStage" and the set up date will be stored in the system data blocks (SDBs).
The used periphery address area can be displayed in an own window. The pull down menue „View" → „Address overview" creates this window with all periphery addresses used. When addresses will be assigned there is an plausibility check already and only if you skip the warning an address conflict is possible. This conflict is shown in the address overview in red.

Type	Address	Module	Node	Slot
Input	0 .. 1	DI 16		1
Input	1 .. 2	DI 16		2
Input	8 .. 9	DIO 16		3
Output	8 .. 9	DIO 16		3
Input	12 .. 23	DIO8Z-V03		4
Output	12 .. 23	DIO8Z-V03		4
Output	24 .. 24	DO4R		7
Input	24 .. 25	DP303C.DIO 16	1	1
Output	25 .. 26	DP303C.DIO 16	1	1

CPU settings

The CPU settings are compatible to the Siemens-CPU S7-315-2PNDP in the Simatic®-Manager. Either via project tree or by clicking directly on the image all different CPU properties can be set up easily in the ConfigStage.

General
Insert plant- and location designation

Startup
Box checked: CPU shall start, if the present configuration mismatches to actual configuration
Timeout: multiply this value with 100 milliseconds, the maximal value is limited to 1000 seconds

Diagnostic
Box checked: Reports the cause for STOP-condition to the connected devices (PG, host system,...) to be entered in diagnostic buffer too.

Know-how protection
The write or read/write protection.
Password protection from Simatic®- Manager is not affected of it and to activate there.

Communication
INSEVIS-CPUs contain as well as the Siemens CPU 315-2PN/DP system internal **16 passive S7-connections.** 1

Additionally there can be parameterized **up to 16 active S7-connections** by the ConfigStage and numbered by an own ID-number.

More at **Information about TSAPs**

Configuration with the Software „ConfigStage"

Cycle
Cycle monitoring time:
(Insert it in ms, max. 6000ms = 6 seconds):

Cycle load from communication
(cycle time extension, min. 10% , max. 50%)
for communication (Ethernet, field bus, PG), visualization, file system of Micro-SD®-card)

Cycle	
Scan cycle monitoring time [ms]:	320
Scan cycle load from communication [%]:	20
Process input image area size:	128
Process output image area size:	128

The declaration of the cycle time in the PG is carried out from control point to control point. This contains communication and visualization. Independent from the S7-program an unsteady cycle time can occur.

For that case it is possible to declare a limit value in relation to the cycle monitoring time, what is used for filling out the „free time" with time for communication (or visualization, etc).
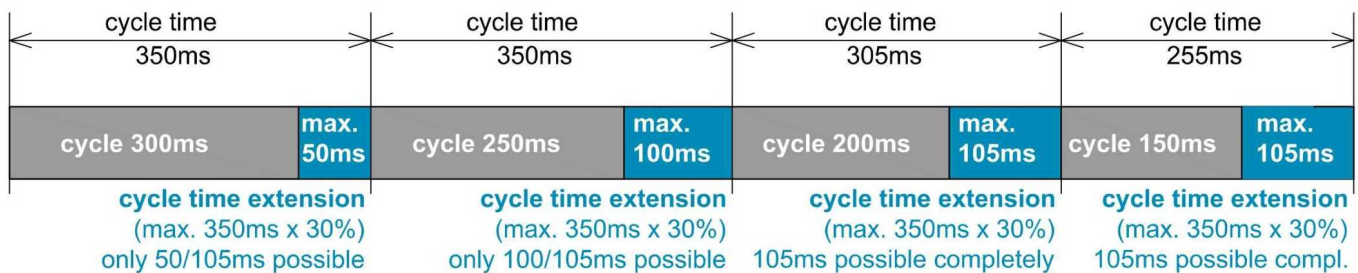
In this sample the cycle time can be extended max. by 30% of 350ms (= 105ms). If this time is not needed for communication (visualization, etc), it is available for other tasks.

Clock
check memory byte and insert its number from value 0

Clock	
☐ Clock memory byte	0

Retentive memory
Merkerbytes:
total 2.048 (thereof 0..15 preset)
Timer and counter:
total 256 (no preset)

Retentive memory	
Number of memory bytes starting MB0:	16
Number of S7 timers starting with T0:	0
Number of S7 counters starting with C0:	8

Time-Of-Day interrupt
Box checked: Time-Of-Day interrupt activated
Insert interval areas, starting date and starting time

Time-Of-Day interrupt		
☐ OB10 (Priority 2)	Execution:	None
	Start date:	01.01.1994
	Start time:	00:00:00

Cyclic interrupt
CPUs -V/P support the OB35 only Value in milliseconds (ms), maximal value is 1 minute (60,000 ms)
CPU -T supports the OB32...OB34 too Value in milliseconds (ms), maximal value is 1 minute (60,000 ms)

Cyclic interrupt		
OB35 (Priority 12)	Execution [ms]:	100

Configuration with the Software „ConfigStage"

WebServer

The PLCs with CPU-T inside contain a static web server, what provides
- general data (serial no., etc.),
- actual entries of diagnostic buffer,
- addresses of I/Os and,
- an fiel to require the actual value of a variable.

The activation of this web server is on the bottom at the CPU-settings.

Cyclic interrupt

OB35 (Priority 12)

OB34 (Priority 11)

OB33 (Priority 10)

OB32 (Priority 9)
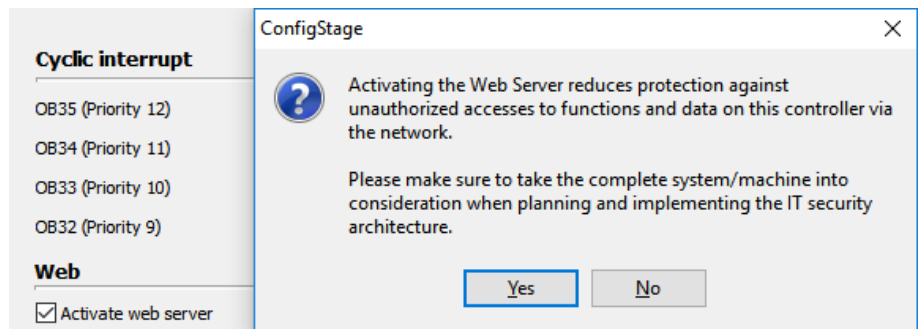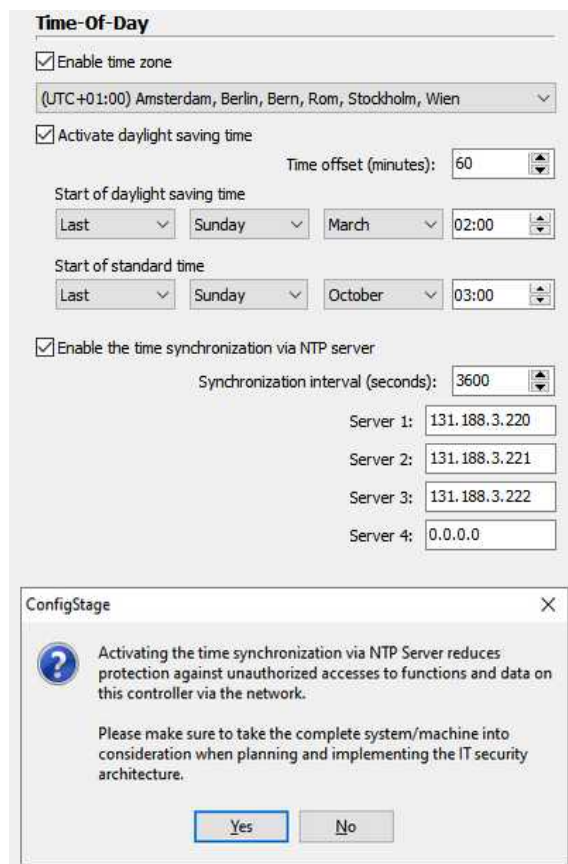
Web

☑ Activate web server

ConfigStage ✕

Activating the Web Server reduces protection against unauthorized accesses to functions and data on this controller via the network.

Please make sure to take the complete system/machine into consideration when planning and implementing the IT security architecture.

[Yes] [No]

> ⚠ **Attention**
>
> By connecting to the internet it is possible that unauthorized get access to the PLC and they could manipulate it and cause harms.
> The programmer and final user are responsible for installing and running suitable security actions to provide this unauthorized access.
> INSEVIS is not responsible and does not take over responsibility for damages caused by unauthorized access.

Time settings (time zone, daylight saving time, NTP- server)

Time-Of-Day

☑ Enable time zone

(UTC+01:00) Amsterdam, Berlin, Bern, Rom, Stockholm, Wien

☑ Activate daylight saving time

Time offset (minutes): 60

Start of daylight saving time

| Last | Sunday | March | 02:00 |

Start of standard time

| Last | Sunday | October | 03:00 |

☑ Enable the time synchronization via NTP server

Synchronization interval (seconds): 3600

Server 1: 131.188.3.220

Server 2: 131.188.3.221

Server 3: 131.188.3.222

Server 4: 0.0.0.0

ConfigStage ✕

Activating the time synchronization via NTP Server reduces protection against unauthorized accesses to functions and data on this controller via the network.

Please make sure to take the complete system/machine into consideration when planning and implementing the IT security architecture.

[Yes] [No]

For PLCs with CPU-T can be done these system time settings by ConfigStage 1.0.14.41

Activation of a time zone
(important for NTP- usage)

Activation of daylight saving time
The respective changeover dates are entered here. The PLC then changes over automatically.If the unit was switched off during the changeover and the battery has enough float voltage for the real time clock, the unit from firmware 2.7.2 adapts the time during booting process to the present time. If the unit has been switched off for a longer period of time so that the real time clock has become voltage-free, the time must be set manually.

Use of NTP servers
NTP servers send the Universal Coordinated Time (UTC), which is the basis for calculating your own time. In the figure on the left 3 time servers of the FAU University Erlangen-Nuremberg were addressed (131.188.3.220/1/ 2 correspond to the ntp0/1/2 of fau.de)

ATTENTION: In the ConfigStage under "Ethernet", configure the router according to the selected NTP servers (in this case 192.168.80.1)

ATTENTION: By connecting to the internet it is possible that unauthorized get access to the PLC and they could manipulate it and cause harms. The programmer and final user are responsible for installing and running suitable security actions to provide this unauthorized access.
INSEVIS is not responsible and does not take over responsibility for damages caused by unauthorized access.

Communication settings

RS232 and RS485

The assign of RS232 and RS485 is self-explanatory. If you select at the RS485 the protocol „Modbus-RTU", you will be asked to assign the node-ID as well as to map your S7-operands to input-bits and -words and to output-bits and -words.
If „Modbus Server is deactivated, Modbus RTU-telegrams will be received and sended by SFB60/61

Ethernet

If you want to use the Ethernet-interface, there are to assign up to 16 connections, to select the communicaton protocol and to parameterize it. Each Ethernet-connection gets a connection-ID to be assigned in the S7-program

CPU-V/-P: There is ONE Ethernet-interface available (RJ45)
(right)

Property: Ethernet

IP Protocol

IP Address:	192.168.80.50
Netmask:	255.255.255.0
☐ Router address:	192.168.80.50

Connections

⊞ Add   🗑 Delete   ✏ Edit

ID	Type	Active	Local	Partner	Partner IP
1	S7 connection	Yes	10.02	10.02	0.0.0.0

CPU-T: There are TWO Ethernet-interfaces available (RJ45),
(below)   what can be used either
- as switch with common IP-address (left image) or
- as seperated Ports with differen IP- (and MAC-) addresses and net masks. (right image).

Property: Ethernet

General

Operation mode
- ⦿ 2-port ethernet Switch
- ○ 2 separate ethernet ports

Ethernet 1
☑ Activate this port for use
Transmission medium / duplex: Automatic ⌄
☐ Disable auto negotiation

Ethernet 2
☑ Activate this port for use
Transmission medium / duplex: Automatic ⌄
☐ Disable auto negotiation

IP Protocol

IP Address:	192.168.80.50
Netmask:	255.255.255.0
Router:	

Protection

Permit access with S7 Communication from remote partner   ☑ Ethernet 1
(PG, PLC, HMI, OPC, ...) via   ☑ Ethernet 2

Connections

⊞ Add   🗑 Delete   ✏ Edit

ID	Type	Active	Local	Partner	Partner IP
1	S7 connection	Yes	10.02	10.02	0.0.0.0

Both ports can be used

Property: Ethernet

General

Operation mode
- ○ 2-port ethernet Switch
- ⦿ 2 separate ethernet ports

Ethernet 1
☑ Activate this port for use
Transmission medium / duplex: Automatic ⌄
☐ Disable auto negotiation

Ethernet 2
☑ Activate this port for use
Transmission medium / duplex: Automatic ⌄
☐ Disable auto negotiation

IP Protocol

	Ethernet 1	Ethernet 2
IP Address:	192.168.80.50	192.168.70.50
Netmask:	255.255.255.0	255.255.255.0
Router:		

Protection

Permit access with S7 Communication from remote partner   ☑ Ethernet 1
(PG, PLC, HMI, OPC, ...) via   ☑ Ethernet 2

Connections

⊞ Add   🗑 Delete   ✏ Edit

ID	Type	Active	Local	Partner	Partner IP
1	S7 connection	Yes	10.02	10.02	0.0.0.0

Port 2 can not more communicate by S7 (protection)

Configuration with the Software „ConfigStage"

> **Hint:**
>
> To prevent unauthorized access by the „classic" S7-communication, the ConfigStage allows to switch off this communication at one port. This prevents an unauthorized manipulation of PLC-data.

Depending on the connection type, the selected connection is parameterised in a further configuration box.

Settings for S7 connection (active)
- Local TSAP,
- Partner-TSAP,
- Partner-IP-Adress

Settings for INSEVIS panel HMI
- Local TSAP
  (only necessary if the PLC is to switch language
  and pages on the HMI)

Settings for TCP send/receive connection
- Local port (fixed or variable),
- Partner-Port,
- Partner-IP-Adress

Settings for UDP send/receive connection
- Local port

Settings for ISO on TCP
  Detailed settings in the manual for
  Panel and Compact PLC in the chapter
  Communication and Ethernet.

Settings for Modbus client and server
  Detailed settings in the manual for
  Panel and Compact PLC in the chapter
  Communication and Ethernet.

Property: Ethernet

General

Operation mode
- ○ 2-port ethernet Switch
- ● 2 separate ethernet ports

Ethernet 1
- ☑ Activate this port for use
- Transmission medium / duplex: Automatic
- ☐ Disable auto negotiation

Ethernet 2
- ☑ Activate this port for use
- Transmission medium / duplex: Automatic
- ☐ Disable auto negotiation

IP Protocol

	Ethernet 1	Ethernet 2
IP Address:	192.168.80.50	
Netmask:	255.255.255.0	
Router:		

Protection

Permit access with S7 Communication from remote partner (PG, PLC, HMI, OPC, ...) via ☑ Ethernet 1 ☑ Ethernet 2

Connections

➕ Add   🗑 Delete   ✏ Edit

ID	Type	Active	Local	Partner	Partner IP	Interface
1	S7 connection	Yes	10.02	02.02	0.0.0.0	Both Ethernet
2	TCP Send/Receive	No	2000	0	0.0.0.0	Both Ethernet
3	TCP Send/Receive	No	2001	0	0.0.0.0	Both Ethernet
4	UDP Send/Receive		2000			Both Ethernet
5	ISO-on-TCP Send/Receive	No	ISOonTCP-1		0.0.0.0	Both Ethernet
6	ModBus TCP Client	Yes	2000	505	192.168.80.17	Both Ethernet
7	ModBus TCP Server		502			Both Ethernet

> **Hint:**
> If "Modbus server" is deactivated, Modbus RTU telegrams are sent/received via
> SFB 60/61 Modbus RTU telegrams are sent/received.

Configuration with the Software „ConfigStage"

Communication / Information about TSAPs

INSEVIS-CPUs contain as well as the Siemens CPU 315-2PN/DP system internal **16 passive S7-connections.** Their local TSAPs are defined by Siemens-definition xx.yy as follows:
- for PG= 01.02,
- for OP= 02.02,
- for WinCC etc.= 03.01
- xx=01 (for PG),
- xx=02 (for OP) and
- xx=03 (for WINCC etc.)
- yy for all 02 (= Slot2 for CPU)

CPU-T: Assigning properties to one or both of the single Ethernet interfaces (see image right)
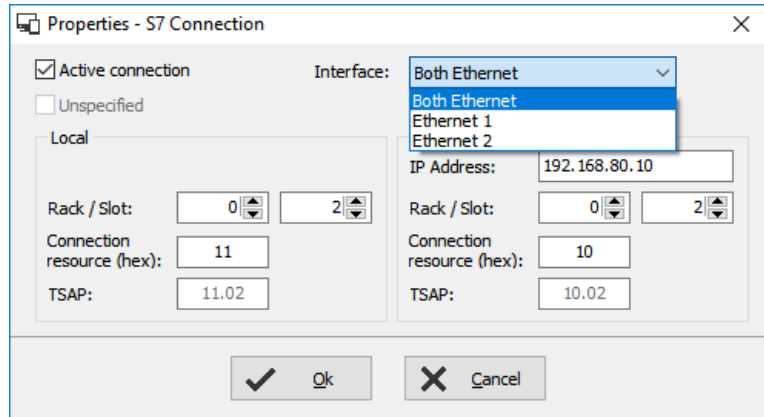
Additionally there can be parameterized **up to 16 active or passive S7-connections** by the ConfigStage and numbered by an own ID-number. Here the Siemens-definition is not valid but it is **necessary**
1. to keep the TSAPs unique and
2. to not even use the TSAPs from the system internal passive connections.

Profinet
Profinet settings will be assigned by Simatic®-Manager or TIA®-Portal (like as Profibus settings)

CAN configuration

Decentral INSEVIS periphery
There is **no need to have CAN-knowledge** to include decentral INSEVIS- periphery to the INSEVIS-S7-CPUs.

After having placed your INSEVIS head station on the CPU, this module appears in the project tree and in the display.

Now you can insert general start addresses for the head station for in-/outputs (no more possible at the single modules).

The periphery modules will be added per drag´n drop from a special sub area of the catalog tree below the CAN-title.

You type in the node-ID-number you have set up before at the INSEVIS- head stations hardware with the hexadecimal turn-switches.

Also you insert the guarding time you want. Than all i/os will be used in Step®7 like onboard I/Os of an INSEVIS-PLC.
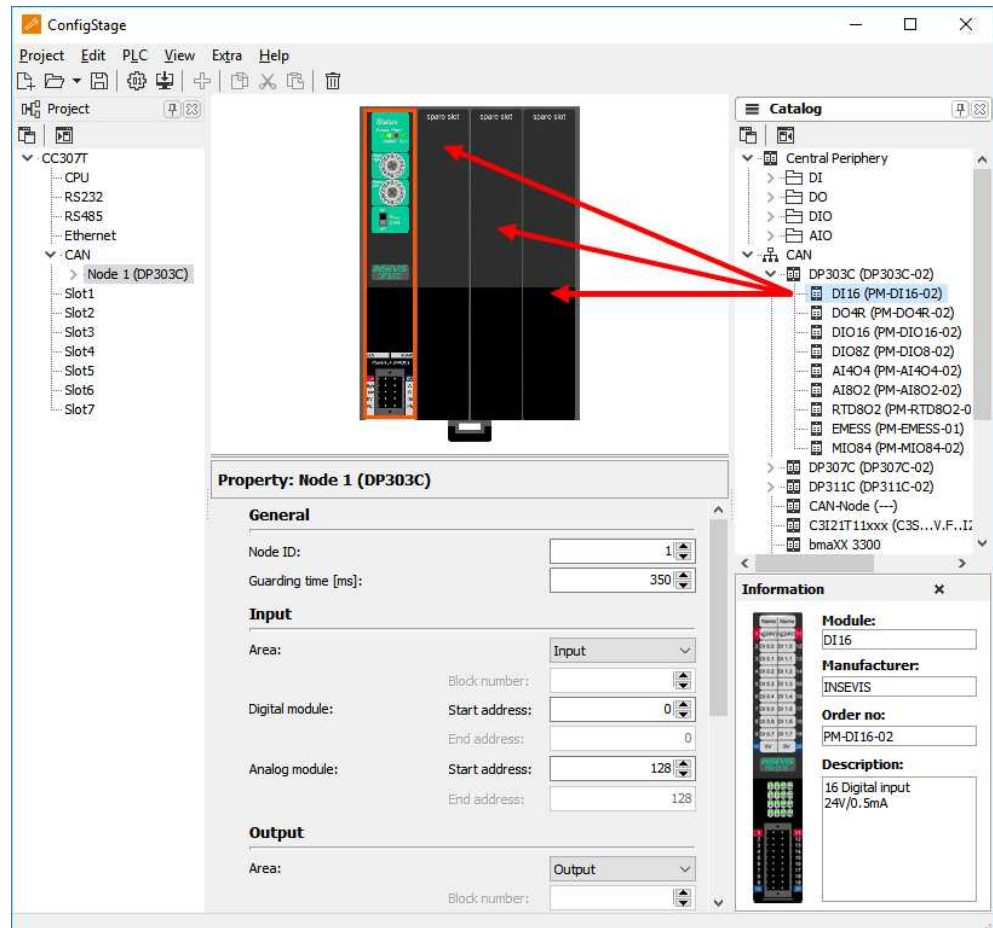
Configuration with the Software „ConfigStage"

Configure decentral external periphery manually

Instead of an INSEVIS- head station you drag´n drop a neutral CAN-node onto your CPU. Then all common settings of for the **node-ID** and the **guarding parameters** will be done.

If the field "**NMT Control**" is activated, the node will be started and stopped together with the PLC. Therefore the NMT-messages "goto OPERATIONAL" with change to RUN (after OB100, before first OB1) and "goto PREOPERATIONAL" with change to STOP will be sent to the node.

Is the node not ready while PLC starts, the "goto OPERATIONAL"-message will be ignored. The must be considered in the user program with a state request. Eventually the NMT-commands need to be programmed in the S7-program.

With the check box „**NMT-Download**" will be assigned, if the communication parameters „Guarding-Time" / „Lifetime" / Heartbeat-Time" should be downloaded to the node during the start up or not. This is useful only, if these parameters are not implemented in the node itself or assigned by other tools

For the process data are available each **32 Tx- and Rx-PDOs**. If more as **4 PDOs** of it will be used, PDO-identifiers of other node-IDs will be used for it.

These node-IDs should not be assigned again. (Only CiA-conform TxPDO-identifier are valid.)

Received Tx-PDOs will be buffered and transferred synchronous to the control point to the process image,

RxPDOs will be send event- and time-controlled in the control point always.

An 8-byte-data field on a selectable S7-operand is to assign to every PDO.

The Tx-PDO communication parameters define the sending behavior of the node, the Rx-PDO define the sending behavior of the master.
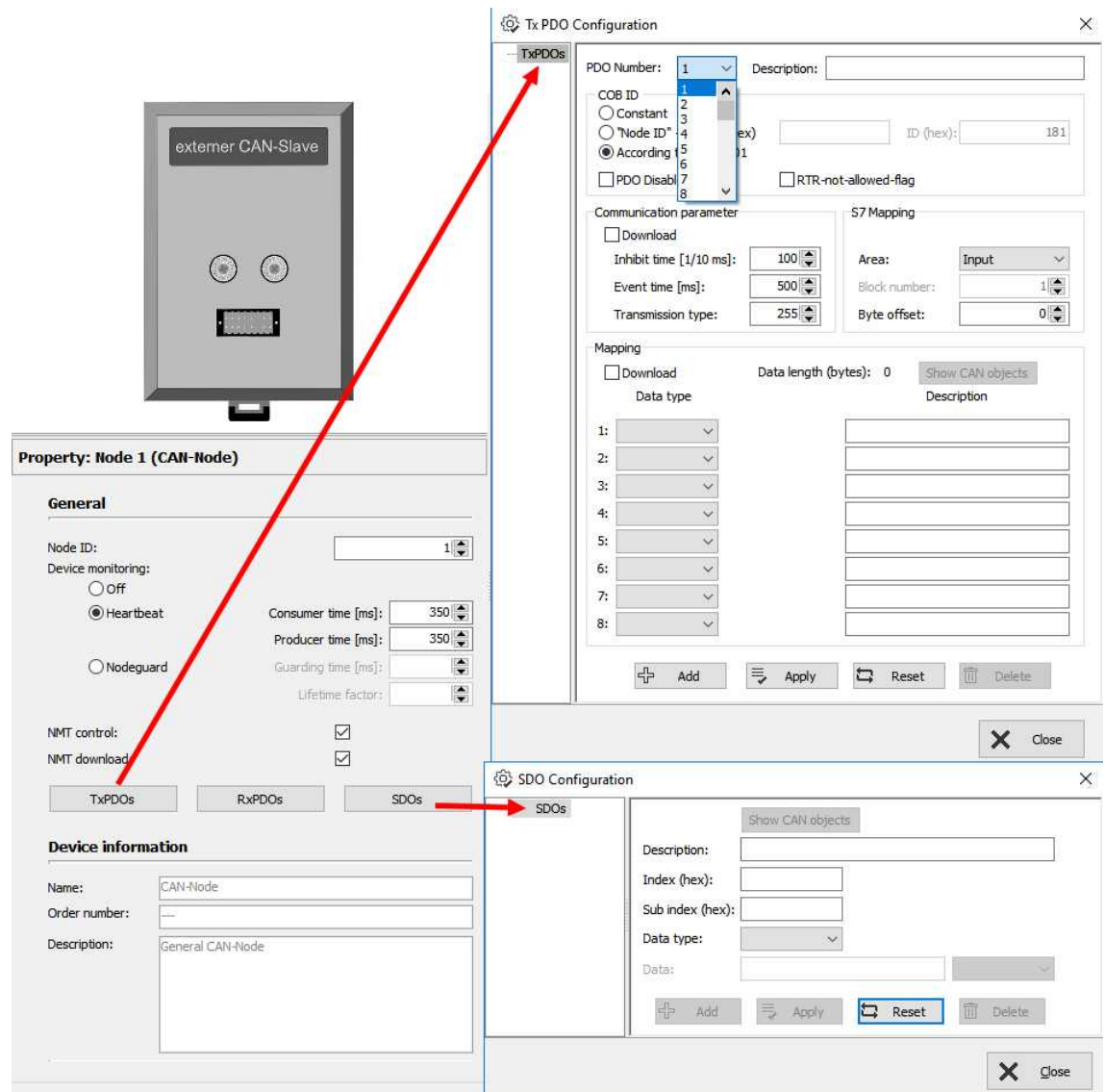
The inhibit-time prevents a to excessive sending, when data are changing permanently; the event-time forces the sending, even if there is no data change.

Entering of single CAN-objects (Index, Subindex) in the mapping field is optional, as long the download of the mapping is not activated. Always assign the data type to define the telegrams length and to allow a real byte swapping.
With activated download of complete mapping-parameter the PLC configures the content of the PDS during start up.

To assign more configurations in the start up, **SDO**s can be defined (e.g. for operational modi or metering ranges, etc.).

Create library elements of your CAN-slaves

Optional: If this „mapping" is made, the new configured CAN-node (CAN-slave) can be stored locally in the ConfigStage to use this part as a library element with pre-defined values.

Therefore click with the right mouse key on the just configured CAN-node.
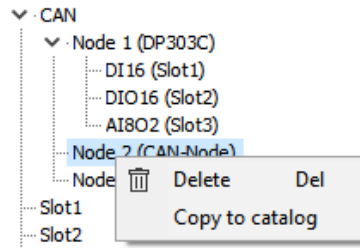
Then a new mask opens. Insert all information (and image) and acknowledge with „OK",

So you will get an own CAN-slave, pre-defined for further use and with your internal information.

⚠ Attention	The nomenclature **TX** (Transmit) and **RX** (Receive) are at CANopen®-PDOs always from the CAN-nodes view (slave). It means, with a TX-PDO a node sends its input data to the PLC and with a RX-PDO it receives its output data.

Configure decentral external peripherie by EDS-file

You need a EDS-file of
the external CAN-slave
you want to configure.
Import it like shown here:

Extra | Help

⚙ Settings
🌐 Language ▶
↵ Import CAN device
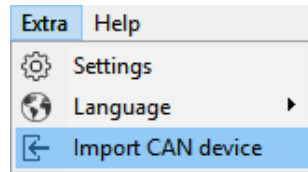
Than a new window opens like described above (Create library elements of your CAN-slave). After having assigned texts, order information and images there is an „empty" library element, what must be configured like described in following items.

PDO configuration

By „Show CAN objects" an object browser opens up with all CAN-objects available. These were filtered from the EDS-file automatically. Move single or multiple CAN-objects by Drag´n Drop into your configuration.

Configuration with the Software „ConfigStage"

SDO- configuration

By „Show CAN objects" an object browser opens up with all CAN-objects available. These were filtered from the EDS-file automatically.
Move single or multiple CAN-objects by Drag´n Drop into your configuration. In the „Data" field assign your parameter value.
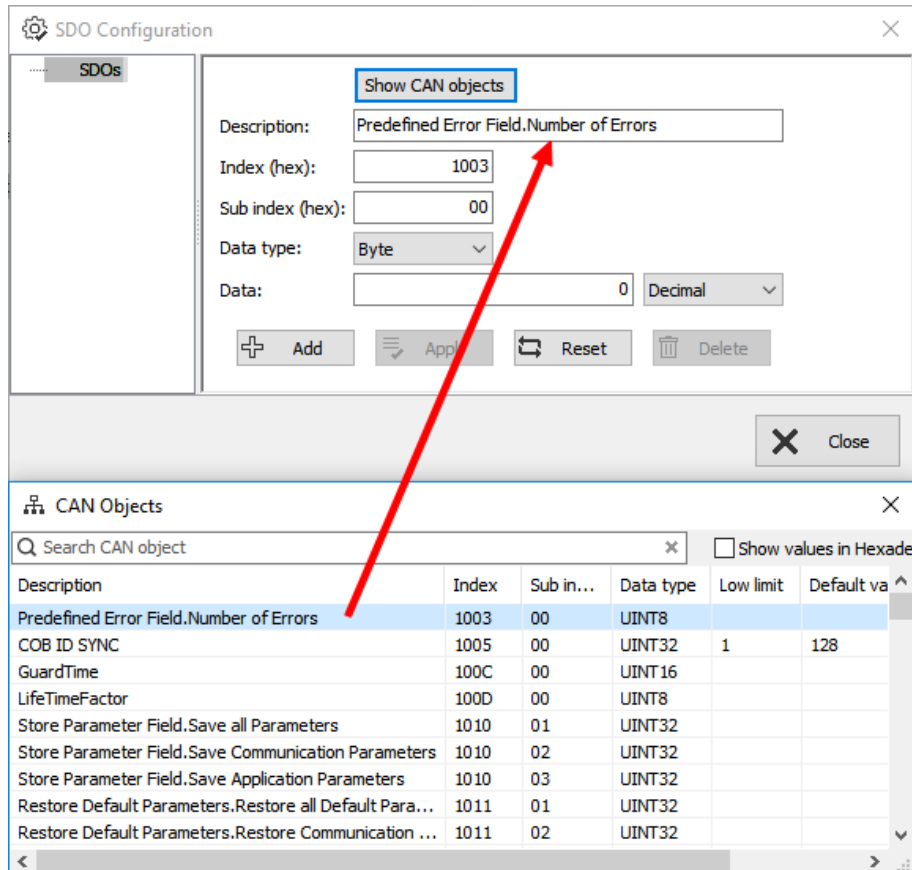
Decentral external periphery / motion controller pre defined

Pre-defined CAN-devices, especially motion controller, allow the S7-user an immediately access to these devices.
Because this configuration data is open to change, it could be adapted to customers needs or extended easily.

INSEVIS offers on its website free of charge various DataBlocks to drive complex motion controllers as e.g. Parker C3, Maxon EPOS2. With these DBs it is possible to control different complex systems with one S7-program

The special advantage is the architecture with different small DBs für each function (jog, acc, dec, home,...). This allows to swap these motion engines with only a few efforts to adapt the S7-program. Normally you can re-write your program, when you replace one drive-specific large DB of one motion vendor to another large DB of another motion vendor.

The complete description with demonstration program and data blocks is available at our website

Samples for external CANopen devices

Sample for decentral CANopen periphery ref. to DS401
If a device with digital and analog In- and outputs is used referring to CANopen-Profile DS401, the in/outs are

- digital inputs in TxPDO1, e.g. 32 bit

- digital outputs in RxPDO1, e.g. 16 bit

- analog inputs in TxPDO2 to 4

- analog outputs in RxPDO2 to 4

(Images in German language but self explaining)

Therewith the in- and outputs can be used on the configured S7-address (in this sample from EB0, AB0) as usually.

> ⚠ **Attention**
>
> The PDO-number 1 is reserved for digital I/Os only.
> The analog I/Os can be mapped starting from PDO-number 2

Configuration with the Software „ConfigStage"

To transfer parameters (e.g. metering ranges for analog modules), SDOs need to be configured specific referring to the vendor.

Sample configuration CANopen-drive controller ref. to DS402

If a CANopen-drive controller ref. to profile DS402 is used, at least the controller-internal state machine must be managed by

- a 16-bit control word and

- 16-bit status word

(Images in German language but self explaining)

Assign these both words to S7-operands by the PDO-mapping and than the controller can be driven by the S7-program.

Description

PC351V/P contains an onboard periphery as follows:

Standard configuration:
• **4 digital backreadable outpots 24V**

INSEVIS-benefit DI/O:
Each single outputs can be switched off, so that you can realize different ratios of I/Os e.g.1dI and 3dO or 3dI and 3dO. Only the total sum of I/Os must be ≤4.

• **2 analog in- or outputs (software configurable)**
  Inputs:
  - 0..10V, 0 (4)..20 mA
  - 4..20 mA or +/- 20 mA
  for 4-wire-encoders
  Outputs:
  - 0..10V
  - 0 (4)..20 mA

INSEVIS-benefit AI/O:
This module has an internal supply for the 2-wire encoders (4-20mA). So it is not necessary to care for external supply!
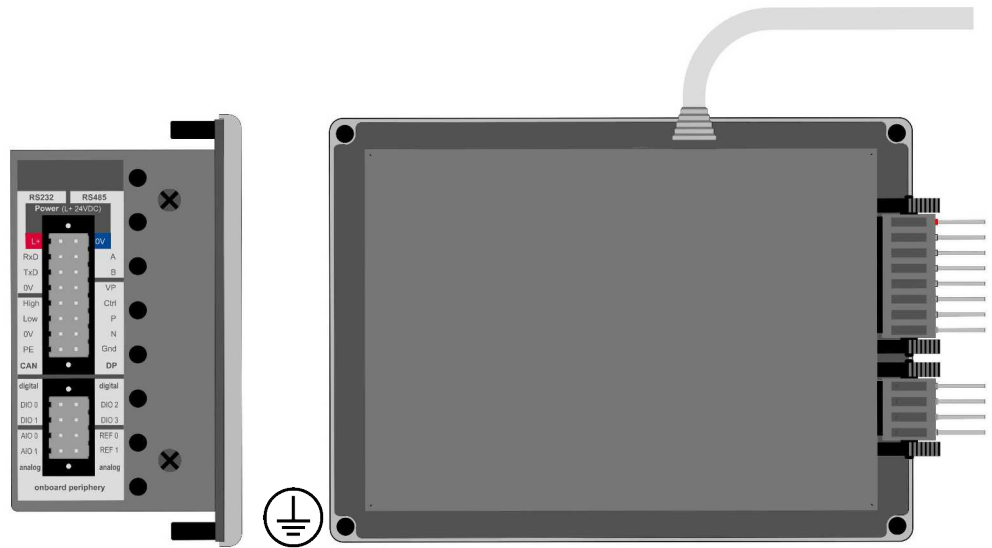
Figure above: Panel-PLC PC351V/P, rear view and view from the side
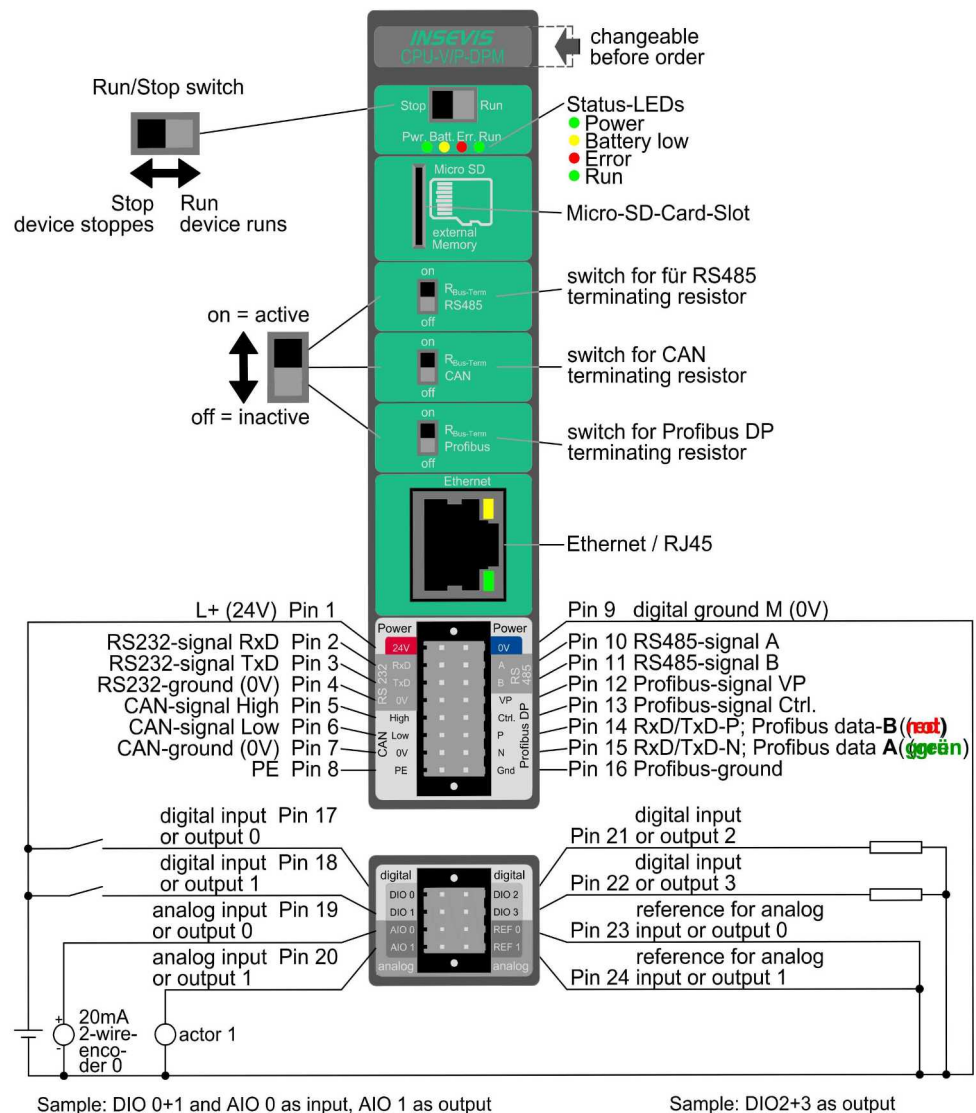
Figure above: Identification of CPU and onboard periphery of PC351V/P with Profibus DP Master

Onboard periphery of PC351V/P

Technical data	Device
Dimensions W x H x D (mm) Cut out W x H (mm) Weight	132 x 96 x 49 118 x 89 ca. 450 g
Operating temperature range Storage temperature range	-20°C ... +60°C (without condensation) -30°C ... +80°C

IP-protection class
   front panel
   rear side
	
	IP65
	IP41

Connection technology	cage clamp connector with lift-arms or bolt flanges on the sides (cage clamp technology) for cross section up to max. 1,5mm^2
Load voltage L+	24V DC (11 V ... 30V DC)
Current consumption Power dissipation	20 mA ... 350 mA 1,5 W (typ.), 4,2 W (max.)
Start-up current	< 3A
Diagonal of display (inch) Display resolution (pixel)	3,5" (89mm) 320x240 pixel (QVGA)
Display unit Operating unit	TFT display with 16Bit colors analog resisitive touch screen
Visualization software Reference unit	VisuStage PC350

Technical data	CPUs	
CPU-type	**Type V** (PC350**V**)	**Type P** (PC350**P**)
Working memory = battery backed load memory Diagnostic buffer	512kB, thereof 256 kByte remanent data 100 messages (all remanent)	640kB, thereof 384 kByte remanent data 100 messages (all remanent)

Flash
   internal - for visualization
   external memory
	4 MByte
	Micro SD, up to max. 8 GByte
		24 MByte
		Micro SD, up to max. 8 GByte

OB, FC, FB, DB Local data Number of in- and outputs Process image Number of Merkerbytes Number of Taktmerker Number of timer, counter Depth of nesting	each 1.024 32kByte (2kByte per block) in each case 2.048 Byte (16.384 Bit) adressable in each case 2.048 Byte (default set is 128 Byte) 2.048 (remanence adjustable, default set is 0..15) 8 (1 Merkerbyte) in each case 256 (each remanence adjustable, default set is 0) up to 16 code blocks	
Real-time clock elapsed hour counter	yes (accumulator-backed hardware clock) 1 (32Bit, resolution 1h)	
Program language Program system	STEP 7® - AWL, KOP, FUP, S7-SCL, S7-Graph from SIEMENS SIMATIC® Manager from SIEMENS or compatible products	
Operating system Program unit to reference	compatible to S7-300® from SIEMENS CPU 315-2PNDP	
Serial interfaces (protocols)	COM1: RS 232 (free ASCII) COM2: RS 485 (free ASCII, Modbus-RTU)	
Ethernet (protocols)	Ethernet: 10/100 Mbit with CP343 functionality (RFC1006, TCP, UDP, Modbus-TCP)	
CAN (protocols)	CAN-Telegramms (Layer 2), compatible to CANopen® MasterSlave 10 kBaud ... 1 MBaud	
Profibus (protocols)	Profibus DP V0 master/ slave 9,6kBaud ... 12 MBaud	
Decentral periphery	- INSEVIS- Periphery (with automatic configuration via „ConfigStage") - all CANopen® Slaves according to DS401 - all Profibus DP-V0-Slaves - diverse external periphery families	

Onboard periphery of PC351V/P

Technical data		digital in-/ outputs	
Load voltage L+ Power dissapation	24V DC (10 V ... 30 V DC) interal limited	Wire length unshielded (max.) shielded (max.)	30 m 100 m
Digital in-/ outputs	4 outputs (each with backreadable input)	Outputs: Input delay Output delay	50 µs (typ.) 30 µs (typ., without load)
Diagnostic LEDs	none	Inputs: Input delay Output delay	25µs
Output current for signal 0 for signal 1	0,5 mA (max.) 0,5 A (max. to 60°C)	Max. switching frequency of outputs	100 Hz with ohmic load
Cumulated current	2 A (max. to 60°C)	Counter	2 counter with gate function or 2 incremental encoder
		Total frequency limit (Number of impulses of all 4 counting signals / s)	10 kHz
Broken wire detection Error diagnostic Potential seperation to PLC	no no	Signal level of outputs for signal 0 for signal 1 Signal level of intputs for signal 0 for signal 1	1,0 V at 500 Ω (max.) L+ - 1,0 V at 0,5 A load (min.) 0V ... +5 V +7,5V ... +30 V

Block diagrams for digital in-/ outputs
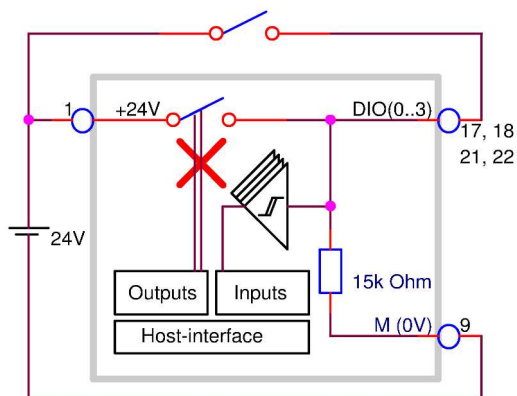
Block diagram of digital I/Os as input for 2-wire-encoders
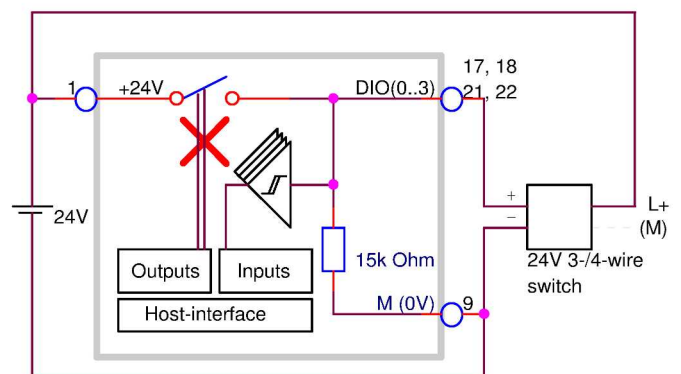
Block diagram of digital I/Os as input for 3/4-wire-encoders

Block diagram of digital I/Os as backreadable output

Configuration block of start-/ end addresses
(in Byte) and I/O parameterizing in the ConfigStage

Onboard periphery of PC351V/P

Configuration of the onboard counter inputs

Available at PC351V/P from 3/2015 in combination with ConfigStage version 1.0.14.15

Counter 1 (settings by ConfigStage)

Configuration „**counting forward (up)**"

→ rising edges will be counted at DI 0.0

Configuration „**counting for- / backwards (down)**"
→ rising edges will be counted at DI 0.0 and
→ DI 0.1 is used as direction bit (0=backwards, 1=forward)

Configuration „**Encoder**"
→ DI 0.0/ 0.1 with quadruple evaluation

Counter 2 (settings by ConfigStage)

Configuration „**counting forward (up)**"

→ rising edges will be counted at DI 0.2

Configuration „**counting for- / backwards (down)**"
→ rising edges will be counted at DI 0.2 and
→ DI 0.3 is used as direction bit (0=backwards, 1=forward)

Configuration „**Encoder**"
→ DI 0.2/ 0.3 with quadruple evaluation

Hints for usage of the onboard counter inputs

- read in counter by reading of ED16 / ED20 (synchronous to control point)
- set counter by writing to PAD16 / PAD20 (by direct periphery access only)
- this configuration can be modyfied in runtime with Step7 too:

Configuration word for counter 1 is PAW24
Configuration word for counter 2 is PAW28

"inactive"	0x00
"counting forward / up"	0x01
"for- / backward (pulse, direction)"	0x02
"encoder (x4)"	0x03

- all addresses are specified as offset relating to the configured start address

Onboard periphery of PC351V/P

Technical data		analog in-/ outputs	
Load voltage L+	24V DC (17 V ... 30 V DC) connected by device supply	Wire length unshielded (max.) shielded (max.)	30 m 100 m
Analog inputs Input areas	2 (alternatively to outputs what is to be configured by software) ±20 mA, 4...20 mA, 0..10 V	Valid voltage between inputs and A-GND (max.)	-1 V ... +24 V DC
Diagnostic LEDs	4 green: signal in valid area 4 red: override or saturation no displaying broken wires and open inputs	Error message during override metering area	adjustable diagnosis- and limit value alert on request
Value number format	9400 ... 6C00 (hexadecimal) for range ± 20 mA all other 0000 ... 6C00 (hexadecimal)	Broken wire detection	by overrun / shortfall of metering area
Override area	20 mA ... 22 mA 10V … 11,3 V	Acces of sensor	unsymetric against A-GND (single ended)
Input resistance	0Ω (typ.) for metering area current 1MΩ (typ.) for metering area voltage	Metering priciple / conversion priciple Resolution	successive approximation 12 Bit
Sampling cycle time = Integration time	adjustable 1ms ... 35767 ms default: 100 ms (=line frequency filter 50Hz and 60Hz)	Specifity (based on input area)	< 1%
Analog outputs Output area (nominal values)	2 (alternatively to inputs what is to be configured by software) 0(4)...20mA, 0...10V	Value number format	0000 ... 6C00 (hexadecimal)
Resolution	12 Bit	Short cut protection	yes
Diagnostic LEDs	none	Override area	20 ... 23 mA 10 ... 11,3 V
Setting time: response time τ (typ)	1,5 ms	Short cut current (typ.)	20 mA (at 10V) 32 mA (at mA)
Load resistance against A-GND	mA: 500 Ω (max.) V: 1 kΩ (min.)	Specifity (based on output area)	< 1%

Configuration of the process image Module allocates 16 word process data input and output.			
Offset	I/O	Function	Description
0,2	I	Input AI0..AI1	Measuring range according to configuration
4,6	I	Reserved	
0,2	O	Output AO0..AO1	Measuring range according to configuration
4,6	O	Reserved	
8	I	Digital inputs .0 to .3	(Byte-access)
8	O	Digital outputs .0 to .3	(Byte-access)
10, 12,14	I/O	reserved	
16, 20	I/O	Counter 0 and 1	Counter value (DINT, DWORD access)
24,..31	I/O	Counter parameter	Configured by ConfigStage or FC's

Block diagrams for analog in-/ outputs
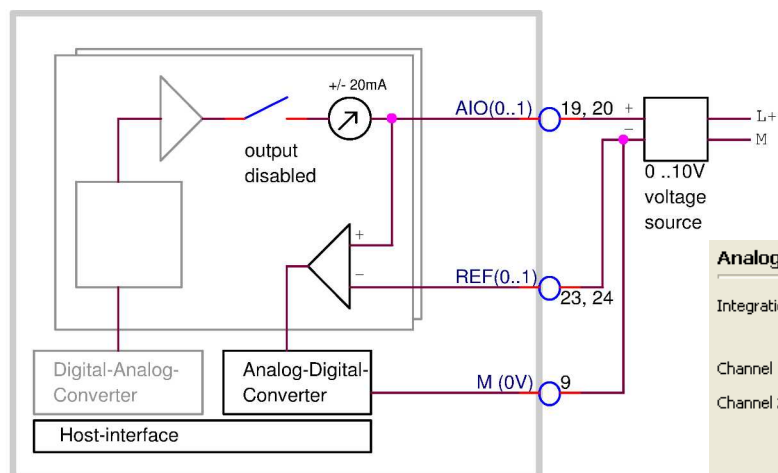
Block diagram for analog inputs for 0 .. 10 V
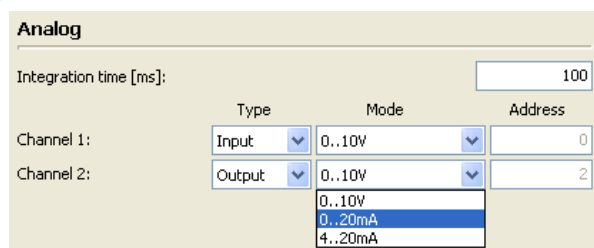
Configuration block of I/O-parameterizing in the ConfigStage
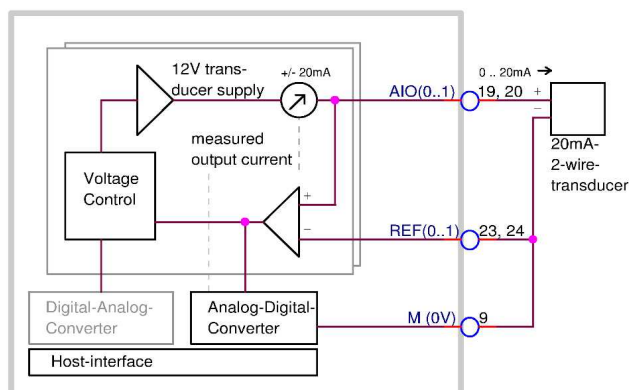
Block diagram for analog inputs for 20 mA with 2-wire-encoder
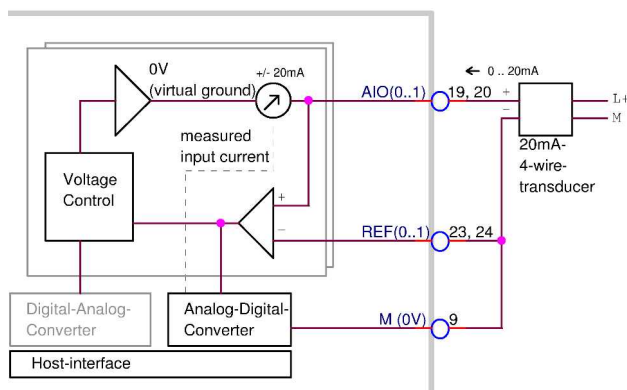
Block diagram for analog inputs for 20 mA with 3/4-wire-encoder
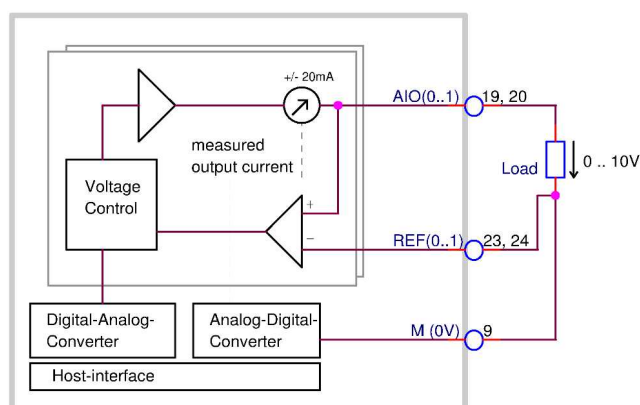
Block diagram for analog outputs for 10 V
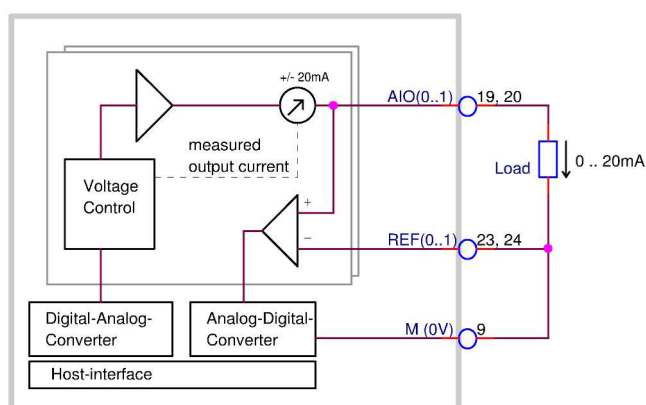
Block diagram for analog outputs for 20 mA

Onboard periphery CC/PCxxx1T and block DP301C

In the PC431T-0-02, PC711T-0-02, PC1011T-0-02 and PC1561-0-02 assemblies and the CC301T-0-02 compact PLC assembly, as well as in the DP301C decentralised peripheral block, a peripheral board with fixed layout but flexibly configurable I/Os is used.

A partially populated version of this peripheral board with exclusively digital I/Os is used in the Panel PLC PC431T-D-02, PC711T-D-02, PC1011T-D-02 and PC1561-D-02 assemblies and the Compact PLC CC301T-D-02.

Onboard periphery:

12 digital I/Os
 thereof 2 PWM-Outputs
 thereof 2 PushPull-Outputs

12 digital Inputs´s
 thereof 2 Counters 1kHz
 thereof 2 Counters 100kHz

3 analog I/O's
 ((switchable per channel as
 input/output and for U / I)

3 analog Inputs
(customizable as RTD/ U/
I/ TC/ strain gauge)

Configuration in
ConfigStage at
„Periphery"

Right image:
Periphery connectors
of decentral periphery
module DP301C

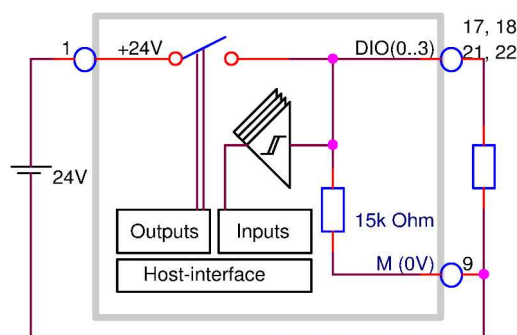| Technical data	digital Inputs/ Outputs (DIO 0...11 and DI 12...23)		

Load voltage L+
Current consumption
Power loss
Diagnostic LEDs
	10 V ... 30 V DC
	10 mA (without load)
	internally limited
	none
		Cable length
		   - unshielded (max.)
		   - shielded (max.)
			30 m
			100 m

Digital inputs/outputs	8 outputs (DIO 0...7) (each with read-back input) 2x2 push-pull outputs (DIO 8...11) (can be switched off in pairs) **(each with read-back input: *** **→ do not apply +24VDC here! ***	Outputs: Switch-on delay Switch-off delay Function of the push-pull outputs Number format PWM uni 0 … 100% PWM bidir -100%..0%..100%	50 µs (type.) 30 µs (typ., without load) output PWM (0..100%) PWM + direction bit (0 .. +/- 100% 0000...6C00 (hex) 9400 … 0000 ... 6C00 (hex)

Output current
   for signal 0
   for signal 1
Input current
   for signal 1
	0,5 mA (max.)
	0,5 A (max. up to 60°C)
	
	1 mA (type)
		Max. switching frequency
		of the outputs
			100 Hz (with resistive load)

Signal level of the outputs
   for signal 0
   for signal 1
Input voltage
   for signal 0
   for signal 1
	1,0 V at 500 Ω (max.)
	L+ - 1,0 V at 0,5 A load (min.)
	
	0V ... +5 V
	+10,5V ... +30 V
		Max. switching frequency
		of the push/pull PWM outputs
			50 kHz (with resistive load)

Onboard periphery CC/PCxxx1T and block DP301C

Technical data	digital Inputs/ Outputs (DIO 0...11 and DI 12...23)		
Digital inputs	4 inputs (DI 12...15)	Inputs: Switch-on delay Switch-off delay	1,5 ms 4,5 ms
Function slower counter	2 up counters (DI-C 16...17) 16 bit optionally as counter value or frequency [Hz]	Function fast counters	2 counters (DI-A/B/Z 18...22) 16 bit Incremental encoder 4-fold or up-counter Optionally with zero-track reference function
max. frequency slow counter	1 kHz	max. frequency at input pins high-speed counters	100 kHz
Open-circuit monitoring, fault diagnosis Potential isolation to the PLC DO 8...11: Short-circuit protection against 0V	no no no*	Total current	2 A (max. up to 60°C)

* Warning of risk of damage when using DIO 8...11 as input/output
→ If DIO 8...11 is in PWM uni, PWM bidir or input/output mode, +24VDC must NOT be applied!

Block diagrams digital inputs/outputs (DIO 0...7)
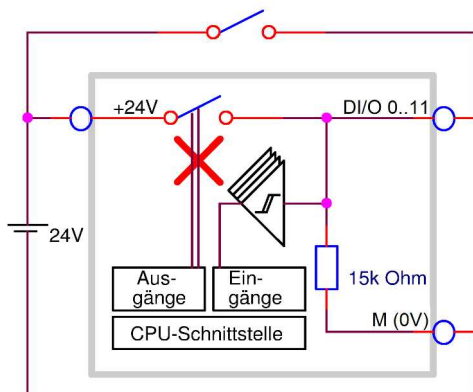
Block diagram of the DIOs only as input for 2-wire encoders
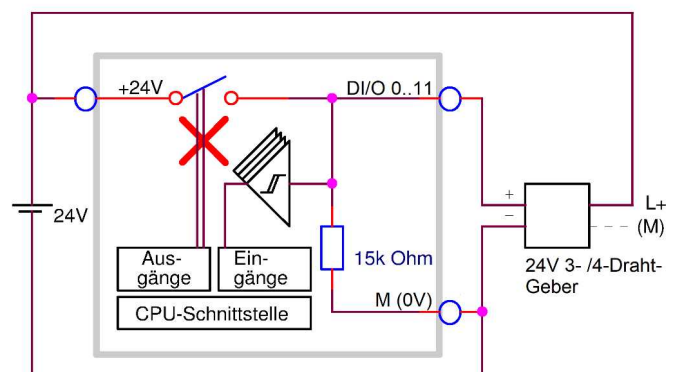
Block diagram of the DIOs for 3-/4-wire encoders
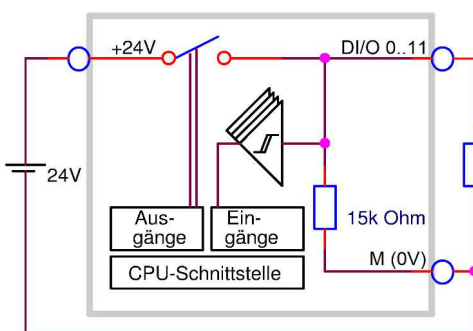
Block diagram of the DIOs as read-back output

Configuration block start/end addresses (in bytes)
and I/O assignment in the ConfigStage

Configuration of the PWM outputs (DIO 8...11)

**Push-pull outputs or PWM
(setting via ConfigStage)**
Channel 1.0/1.1 and 1.2/1.3 in pairs

Configuration **"Input"**
→ both outputs deactivated

Configuration "**Input/Output**"
→ 2 read-back outputs
(active high AND low switching !)

Configuration **"PWM uni"**
→ DIO 8 resp. DIO 10 deactivated as bit
Set value of the PWM duty cycle
in the specified output word,
Specification of the frequency constant
→ DIO 9 resp. DIO 11 as output (can be read back)

Configuration „**PWM bidir**"
→ DIO 8 resp. DIO 10 as uni, but setpoint with sign
→ DIO 9 resp. DIO 11 as direction bit (= sign)

Digital input and output or PWM output

	Mode	Input address	Output address	Duty cycle Output address	Frequency [Hz]
DIO 8:	Input	1.0			
DIO 9:	Input	1.1			
DIO 10:	Input	1.2			
DIO 11:	Input	1.3			
DI 12:		1.4			
DI 13:	Input	1.5			
DI 14:	Input	1.6			
DI 15:	Input	1.7			

Dropdown options: Input, Input/Output, PWM uni, PWM bidir

Notes:
When DIO 8 is in "PWM uni" or "PWM bidir" mode, DI-A 21 is only available in "Input" mode.
When DIO 10 is in "PWM uni" or "PWM bidir" mode, DI-A 18 is only available in "Input" mode.

Warning:
When DIO8, DIO10 is in "PWM uni", "PWM bidir" or "Input/Output" mode, should not connect to 24V. Risk of damage.

Configuration of the counter inputs (DI-C 16/17 and DI-A/B/Z 18..23)

**Slow counters
(setting via ConfigStage)**

Configuration **"Input"**
→ DI-C 16 resp DI-C 17 are normal inputs,
  Counter is switched off
Configuration **"counting up"**
→ On DI-C 16 resp DI-C 17, rising edges are counted
  Address of the counter word and the reset bit are displayed
  (input bit switched off)

"**Frequency measurement**" configuration → The frequency [Hz] is output instead of the counter value

Digital input or Low speed counter

	Mode	Input address	Counter word input address	Reset bit output address
DI-C 16:	Input	2.0		
DI-C 17:	Input	2.1		

Dropdown options: Input, Counter up, Frequency measure

Configuration of the counter inputs (DI-C 16/17 and DI-A/B/Z 18..23)

Fast counters (setting via ConfigStage)

Digital input or High speed counter

	Mode	Input address	Counter word input address	Reset bit output address	Enable bit referencing output address
DI-A 18:	Input ▼	2.2			
DI-B 19:	Input	2.3			
DI-Z 20:	Count up	2.4			
DI-A 21:	Up/Down (Pulse/Dir)	2.5			
DI-B 22:	Up/Down (Pulse/Dir/Zero)	2.6			
DI-Z 23:	Encoder (x4)	2.7			
	Encoder (x4) Zero				

Notes:
   When DI-A 18 is in "Counter" or "Encoder" mode, DIO 10 is only available as an "Input" or "Input/Output."
   When DI-A 21 is in "Counter" or "Encoder" mode, DIO 8 is only available as an "Input" or "Input/Output."

Configuration „**Input**"
→ DI-A 18, DI-B 19, DI-Z 20 resp. DI-A 21, DI-B 22, DI-Z 23 are
   normal Inputs,
   Counter is switched off

Configuration **"counting up"**
→ Rising edges are counted on DI-A 18 resp. DI-A 21 ,
→ the other signals (B and Z) are inputs

Configuration **"counting up/down"**
→ rising edges are counted on channel DI-A 18 resp. DI-A 21 and
→ Channel DI-B 19 resp. DI-B 22 serves as a direction bit (0=backwards, 1=forwards)
→ Z is input

Configuration **"Encoder x4"**
→ DI-A 18/DI-B 19 resp. DI-A 21/DI-B 22 form an encoder input with quadruple evaluation
→ Z is input
Configuration **"counting up/down zero" "Encoder x4 zero"**
→ In addition, the Z input can be activated via the "enable reference" bit:
On a rising edge at the Z bit, the counter is reset to 0 and the enable reference bit is deleted.
Notes on using the counter inputs

Notes on using the counter inputs (DI-C 16/17 and DI-A/B/Z 18..23)

- Counters can only be set (and held) to zero by setting the reset bit (static)
- the configuration cannot be changed at runtime under Step7:
- all addresses are specified as an offset in relation to the configured start address

Technical data	analog Inputs/Outputs U/I (AIO 0...2)		

Load voltage L+	-
	(internal supply)
		Cable length
		  - unshielded (max.)
		  - shielded (max.)
			30 m
			100m

Analogue inputs Input ranges	3 (alternatively configurable to outputs via software) 0...20 mA, 4...20 mA, +/- 20mA 0..10 V	Permissible voltage between inputs and A-GND (max.)	-1 V ... + 24 V DC
Diagnostic LEDs	none	Error message if range is exceeded	Parameterizable diagnostic and limit value alarms on request
Number format +/- 20mA: -20 mA ..0..20 mA otherwise	9400 ... 0000 … 6C00 (hex) 0000 ... 6C00 (hex)	Wire break monitoring	by exceeding or falling below the measuring range (for 4..20 mA)
Overload range	20 mA ... 22 mA 10V … 11,3 V	Signal transmitter connection type	unbalanced to A-GND (single ended)
Input resistance	0Ω (typ.) for measuring range current 1MΩ (typ.) for voltage measuring range	Measuring principle/ Conversion principle Resolution	successive approximation 12 Bit
Abtastzykluszeit = IntegrationszeitSampling cycle time = Integration time	parameterizable 1ms ... 35767 ms default: 100 ms (= mains frequency filter 50Hz and 60Hz)	Accuracy (related to measuring range)	< 1%
Analog outputs Output ranges	3 (alternatively to inputs configurable via software) 0(4)...20mA , 0...10V	Number format	0000 ... 6C00 (hexadecimal)
Output resolution	12 Bit	Short-circuit protection	yes
Diagnostic LEDs	none	Overdrive range	20 ... 23 mA 10 ... 11,3 Vsettling timeSettling time:
Settling time:	Time constant t (typ) 1,5 ms	Short-circuit current (typ.)	20 mA (at 10V) 32 mA (at mA)
Load resistor/ load resistor to A-GND	mA: 500 Ω (max.) V: 1 kΩ (min.)	Accuracy (related to measuring range)	< 1%

Block diagrams analog inputs/outputs U/I (AIO 0...2)
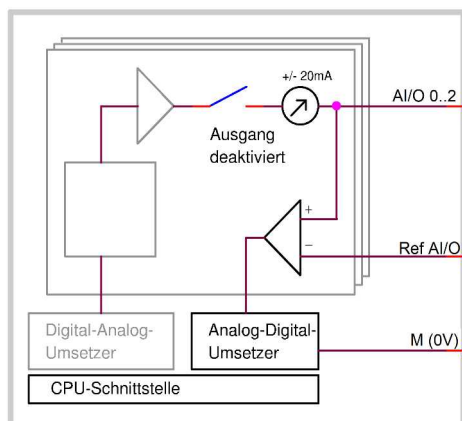
Block diagram of the analog inputs for 0 ... 10 V
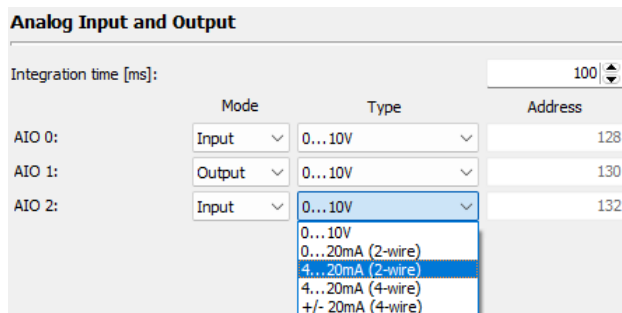
*Configuration block addresses (in bytes)
and measuring range configuration Analogue I/O in the ConfigStage*

*Block diagram of the analogue inputs for 20 mA
with 2-wire encoder*

*Block diagram of the analogue inputs for 20 mA
with 3/4-wire encoder*

Block diagram of the analogue outputs for 10 V

Block diagram of the analogue outputs for 20 mA

Technical data	Analog Inputs U/ I/ RTD/ TC/ Strain gauge (AI 3...5)		

Load voltage L+	-
	(internal supply)
		Cable length
		  - unshielded (max.)
		  - shielded (max.)
			30 m
			100m

Input ranges	0...20 mA, 4...20 mA, 0..10 V, DMS, PT100, PT1000, 2 kOhm, TC Typ K, J, N possible combinations: - 3x 20 mA or 10 V - 1x DMS - 3x PT100/PT1000/R (2 wire) - 1x PT100/PT1000/R (3 wire) + 1x PT100/PT1000/R (2 wiret) - 2x ThermoCouples , 1x PT	Permissible voltage between inputs and A-GND (max.)	-1 V ... + 24 V DC
Diagnostic LEDs	none	Error message if range is exceeded	Parameterizable diagnostic and limit value alarms on request
Number formats: 0 (4) .. 20mA /10V: PT100 standard / TC PT100 clima / PT1000 clima 2 kOhm	0 ... 6C00 (hex) 1/10 °C 1/100 °C 0 … 2000 (dez)	Wire break monitoring	due to overrange or underrange
TC numerical Limits Overflow > 1622°C Underflow< F0C4 (hex) (transmitter error)	7FFF (hex) 8000 (hex)	TC-Terminal point compensation:	External: connect PT100/PT1000 on AI 5 Internal: connect AI 5 to AI Ref instead of PT100/PT1000 → usage of PCB temperature
Overdrive range	20 mA ... 22 mA 10V … 11,3 V	Connection type of the signal transmitter Measuring ranges mA, V: otherwise:	unbalanced (single ended) against 0V potential-free (floating)
Input resistance	70Ω (typ.) for measuring range mA 1MΩ (typ.) otherwise	Measuring principle/ Conversion principle Resolution	Sigma Delta 16 Bit
Sampling cycle time = Integration time	parameterizable default: 100 ms depending on the measuring range	Accuracy (related to measuring range)	< 1%

Block diagrams analog inputs U/I / RTD/ TC/ Strain gauge (AI 3...5)
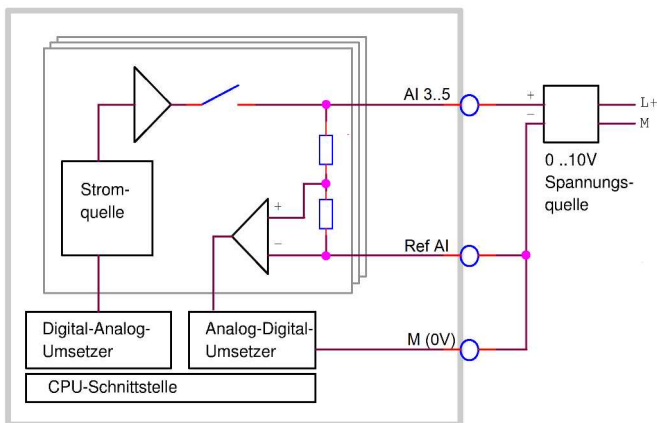
Block diagram of the analog inputs for 0 ... 10 V

*Configuration block addresses (in bytes)
and measuring range configuration in the ConfigStage
Voltage/current mode*
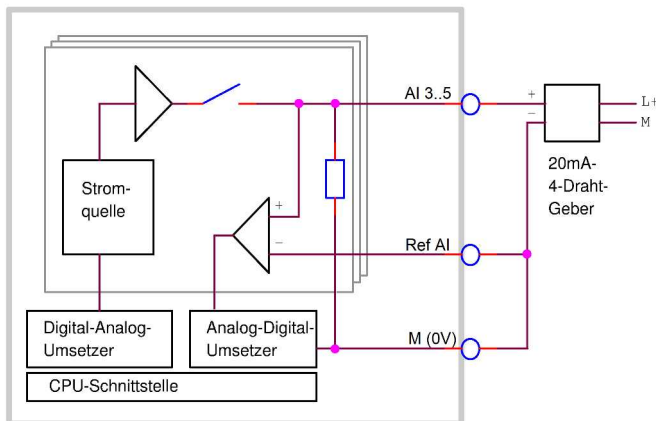
Block diagram of the analog inputs for 20 mA with 3/4 wire encoder
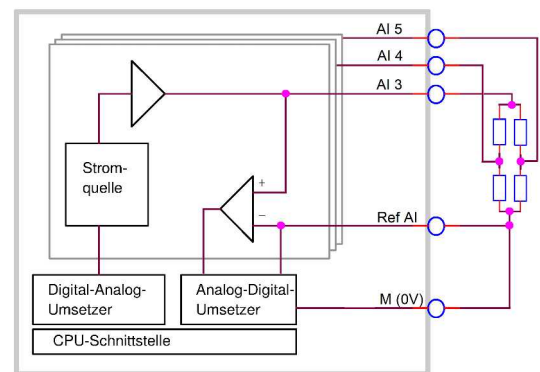
Block diagram of the analog inputs for strain gages (strain gauge)
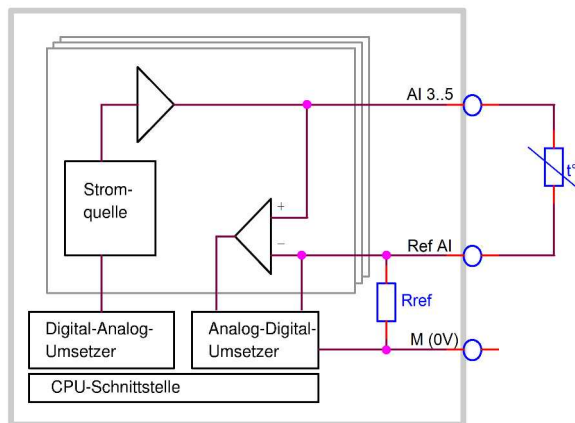
Block diagram of the analog inputs for PT100/PT1000/R 2-wire
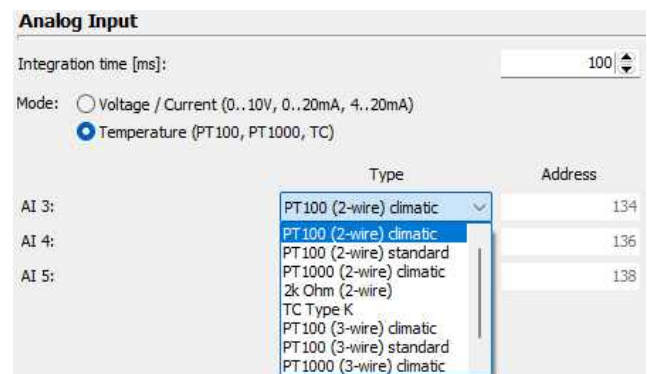
Configuration block addresses (in bytes) and measuring range configuration Analog Input in the ConfigStage Mode temperature
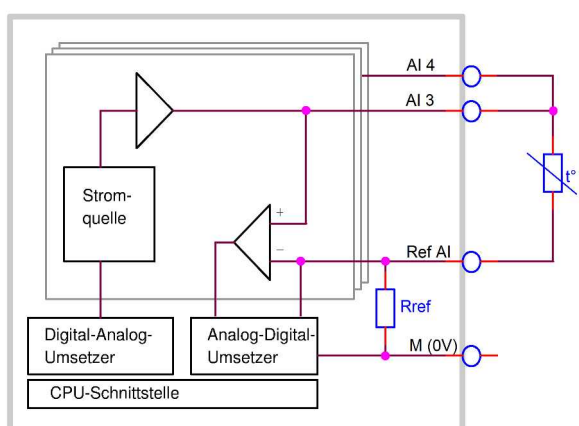
Block diagram of the analog inputs for PT100/PT1000/R 3-Wire
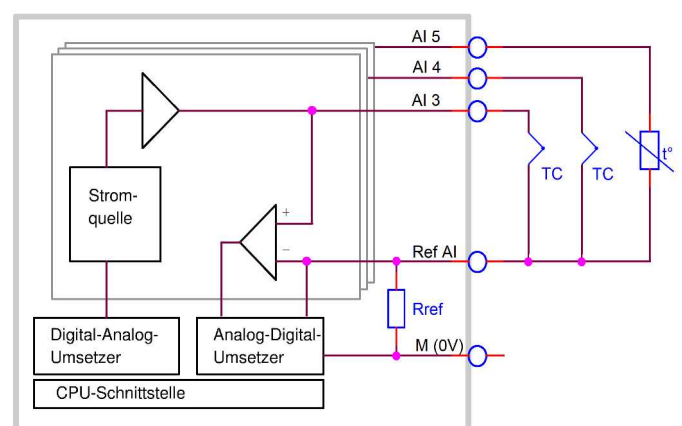
Block diagram of the analog inputs for thermocouples with Terminal compensation

For terminal point compensation:

- either with PT100/1000 temperature at the terminal point or

- Connect AI5 (Pin33) to Ref AI (Pin34) (less accurate)

Attention

Assignment of the process image

Assignment of the process image: Digital inputs The module occupies 16 bytes in the process image (from the configured start address).			
Offset	I/O	Function	Description
0..2	I	Input DI0.0..DI2.7	Input bits (possibly blocked - depending on configuration)
3	I	reserved	
4,5	I	Slow counter 0	Counter word (16-bit high-endian), measuring range depending on configuration
6,7	I	Slow counter 1	Counter word (16-bit high-endian), measuring range depending on configuration
8..11	I	Fast counter 0	Counter word (32-bit high-endian), measuring range depending on configuration
12..15	I	Fast counter 1	Counter word (32-bit high-endian), measuring range depending on configuration

Assignment of the process image: Digital outputs The module occupies 8 bytes in the process image (from the configured start address).			
Offset	I/O	Function	Description
0	O	Output DO0..DO7	Standard-PLC outputs
1	O	Output DO8..DO11	4 push/pull outputs (4 bits unused)
2	O	Resetbits slow counter	.0 Reset Counter 0, .1 Reset Counter1
3	O	Reset-/Controlbits fast counter	.0 Reset Counter 0, .1 Reset Counter1 .2 EnableRef Counter 0, .3 EnableRef Counter1
4,5	O	PWM 0 target value	(16 Bit high-endian)
6,7	O	PWM 1 target value	(16 Bit high-endian)

Assignment of the process image: Analog inputs The module occupies 6 input words in the process image (from the configured start address).			
Offset	I/O	Function	Description
0,2,4	I	Input AI0..AI2	Measurement range depending on configuration
6,8,10	I	Input AI3..AI5	Measurement range depending on configuration

Assignment of the process image: Analog outputs The module occupies (from configured start address) 3 output words in the process image.			
Offset	I/O	Function	Description
0,2,4	O	Output AO0..AO2	Measurement range depending on configuration

Periphery module DI16 (16 digital inputs 24V)

Description

compact periphery module for 16 digital inputs 24V

- green diagnostic LED for each input

- insertion stripe with description field for every signal
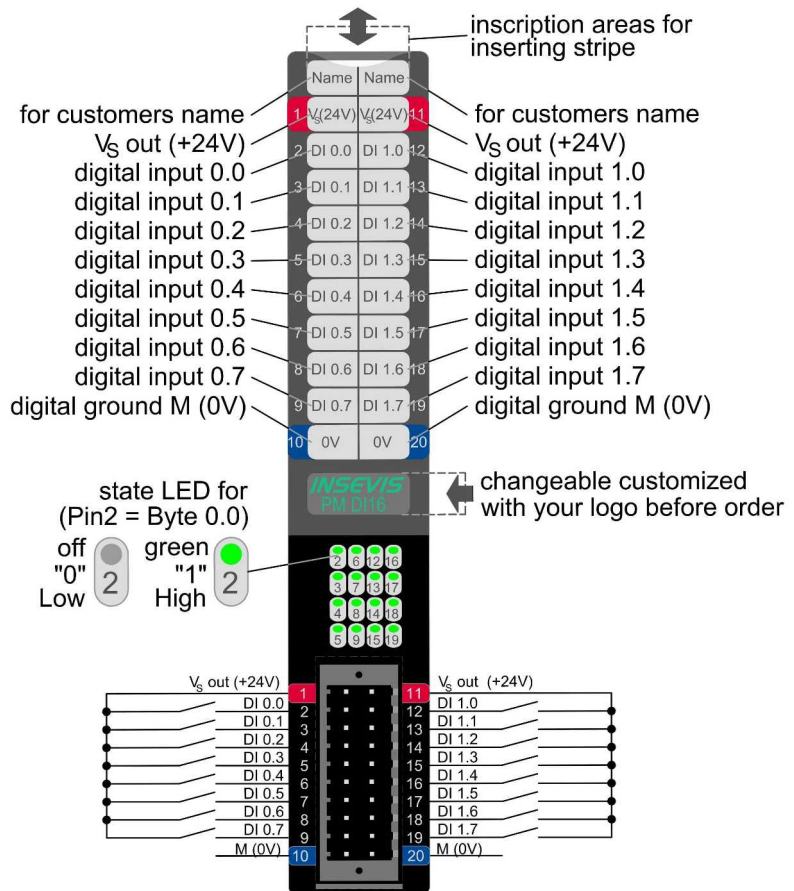
Figure above: Description and wiring of all connections of periphery module DI16
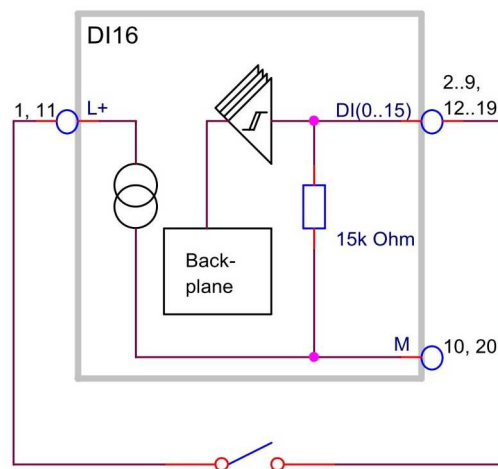
Figure above: Block diagram of DI16 for 2 wire switches

Figure above: Configuration block of start-/ end addresses of DI16-inputs (in byte) in the ConfigStage

INSEVIS

Periphery module DI16 (16 digital inputs 24V)

Technical data	
Dimensions W x H x D (mm) Weight	20 x 108 x 70 mm ca. 150 g
Operating temperature range Storage temperature range	-20°C ... +60°C (no condensation) -30°C ... +80°C
Connection technology	cage clamp connector with lift-arms or bolt flanges on the sides (cage clamp technology) for cross section up to max. 1,5mm^2
Sensor supply Load voltage L+	short circuit proof output, current limited to 30 mA (typ.) 24V DC (11V ... 30V DC, is connected by device supply)

Wire length
    unshielded (max.)
    shielded (max.)
	
	30 m
	100 m

Digital inputs Diagnostic LEDs	16 16, green

Input voltage
    for signal 0
    for signal 1
	
	0V ... +5 V
	+7,5V ... +30 V

Input current for signal 1	1 mA
Broken wire detection Potential separation to PLC Access of 2-wire-BERO	no no no
Input delay Output delay Sampling cycle time	90 µs (typ.) 1,4 ms (typ.) as onboard modul on the PLC = cycle synchronous

Periphery module DIO16 (16 digital in- or outputs 24V)

Description

compact periphery module for **16 digital transistor outputs 24V with back-readable inputs**

• green diagnostic LED for each in-/ output

• insertion stripe with description field for every signal

• **Scope of delivery:**
  - technical information
  - brief instruction

Notice:
more wiring samples are shown in the technical information sheets at the periphery modules in the web.

INSEVIS-benefit:
Each single outputs can be switched off, so that you can realize different ratios of I/Os e.g.10dI and 6dO or 7dI and 9dO. Only the total sum of I/Os must be ≤16.

Attention:
L+supplys of the outputs are separated for each byte (left and right).
→ At a use as outputs only all these outputs can be switched off together by switching off the L+ supply of this byte.
→ If there are used aome of these bits as inputs, they may not have applied a voltage (24V) while switching off.

inscription areas for inserting stripe

for customers name
L+ Byte0 (+24V)
digital in- or output 0.0
digital in- or output 0.1
digital in- or output 0.2
digital in- or output 0.3
digital in- or output 0.4
digital in- or output 0.5
digital in- or output 0.6
digital in- or output 0.7
digital ground M (0V)

for customers name
L+ Byte1 (+24V)
digital in- or output 1.0
digital in- or output 1.1
digital in- or output 1.2
digital in- or output 1.3
digital in- or output 1.4
digital in- or output 1.5
digital in- or output 1.6
digital in- or output 1.7
digital ground M (0V)

changeable customized with your logo before order

state LED for (Pin2 = Byte 0.0)
off "0" Low / green "1" High

L+ Byte0 (+24V)
DI 0.0
DI 0.1
DI 0.2
DI 0.3
DI 0.4
DI 0.5
DI 0.6
DI 0.7
M (0V)

L+ Byte1 (+24V)
DO 1.0
DO 1.1
DO 1.2
DO 1.3
DO 1.4
DO 1.5
DO 1.6
DO 1.7
M (0V)
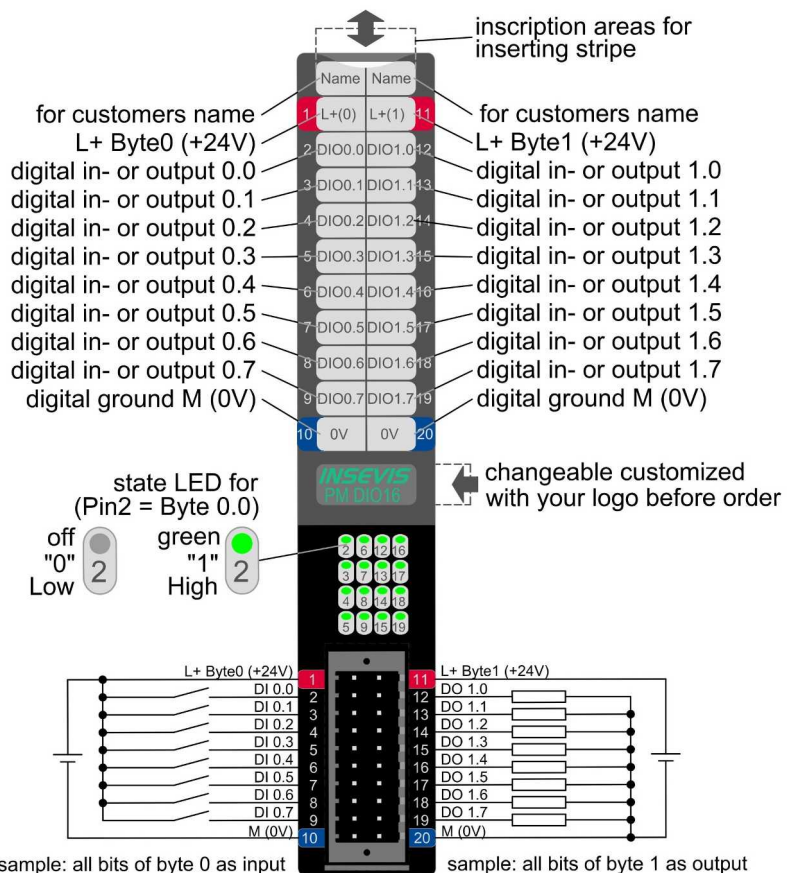
sample: all bits of byte 0 as input

sample: all bits of byte 1 as output

Figure above: Description and wiring of DIO16 for 2-wire switches

DIO16
1, 11 L+Byte0 L+Byte1
DIO(0..7) DIO(8..15)
2..9, 12..19
24V
Back-plane
15k Ohm
M 10, 20
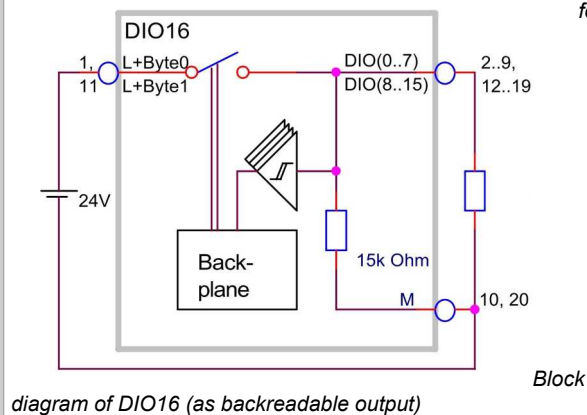
Block diagram of DIO16 (as backreadable output)

DIO16
1, 11 L+Byte0 L+Byte1
DIO(0..7) DIO(8..15)
2..9, 12..19
24V
Back-plane
15k Ohm
M 10, 20
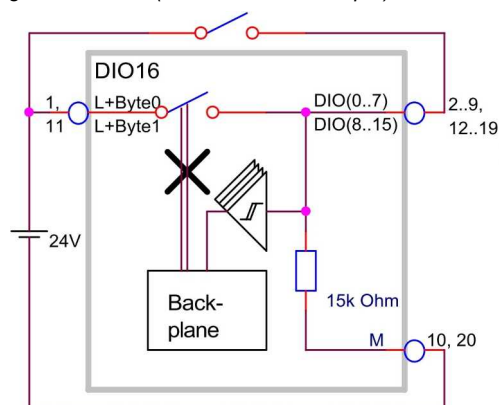
Figure above: Block diagram of DIO16 (as input only)

Input
Start address: 0
End address: 1

Output
Start address: 0
End address: 1

Mode

	Disable the output
Channel 0.0	☑
Channel 0.1	☑
Channel 0.2	☑
Channel 0.3	☑
Channel 0.4	☑
Channel 0.5	☑
Channel 0.6	☑
Channel 0.7	☑
Channel 1.0	☐
Channel 1.1	☐
Channel 1.2	☐
Channel 1.3	☐
Channel 1.4	☐
Channel 1.5	☐
Channel 1.6	☐
Channel 1.7	☐

Figure above: configuration block of DIO16-in-/outputs (in byte) in the ConfigStage

Periphery module DIO16 (16 digital in- or outputs 24V)

Description	Application wit 3- or 4-wire switches

Description (left column):

compact periphery module for
16 digital transistor outputs 24V with back-readable inputs

- green diagnostic LED for each in-/ output

- insertion stripe with description field for every signal

- **Scope of delivery:**
  - technical information
  - brief instruction

INSEVIS-benefit:
Each single outputs can be switched off, so that you can realize different ratios of I/Os e.g.10dI and 6dO or 7dI and 9dO. Only the total sum of I/Os must be ≤16.

Attention:
L+supplys of the outputs are separated for each byte (left and right).
→ At a use as outputs only all these outputs can be switched off together by switching off the L+ supply of this byte.
→ If there are used aome of these bits as inputs, they may not have applied a voltage (24V) while switching off.

above: Description and wiring of DIO16 for 3-/ 4-wire switches
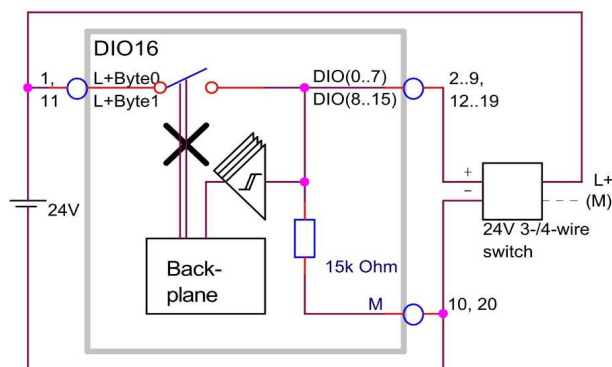
Block diagram of DIO16 for 3- or 4-wire switches

configuration block of DIO16 -in-/outputs (in byte) in the ConfigStage

Periphery module DIO16 (16 digital in- or outputs 24V)

Technical data			
Dimensions W x H x D (mm) Weight	20 x 108 x 70 mm ca. 150 g		
Operating temperature range Storage temperature range	-20°C ... +60°C (without condensation) -30°C ... +80°C		
Connection technology	cage clamp connector with lift-arms or bolt flanges on the sides (cage clamp technology) for cross section up to max. 1,5mm^2		
Load voltage L+ Current consumption Power dissapation	10 V ... 30 V DC 50 mA (without load) internal limited		

Wire length
    unshielded (max.)
    shielded (max.)
	30 m
	100 m		

Digital in-/ outputs Diagnostic LEDs	16 in- or outputs (adjustable by software) 16, green		

Output current
    for signal 0
    for signal 1
Cumulated current
  per output-byte
	0,5 mA (max.)
	0,5 A (max. bis 60°C)
	
	3 A (max. bis 60°C)
		Input current for signal 1	1 mA (typ.)

Signal level of outputs
    for signal 0
    for signal 1
	1,0 V at 500 Ω (max.)
	L+ - 1,0 V at 0,5 A load (min.)
		Input voltage
		    for signal 0
		    for signal 1
			0V ... +5 V
			+7,5V ... +30 V

Input delay Output delay	50 µs (typ.) 30 µs (typ., without load)	Input delay Output delay Sampling cycle time	1,5 ms (typ.) 4,6 ms (typ.) synchronous to cycle
Max. switching frequency with ohmic load	100 Hz		
Broken wire detection Error diagnostic Potential separation to PLC	no no		

Periphery module DO4-R (4 relay outputs 230V)

Description

compact periphery module
for 4 relay outputs 230V AC

- 4 potential separated contacts

- 4 glass bulb fuses 5x20mm (1 for each relay)

- insertion stripe for 2 name fields

- green diagnostic LED for each output

- screwed contact connector

- **Note:**
  Because of the fuses position this module is to be placed in the 3 very right slots only..

  (Other positions ore more than 3 modules possible on request.)
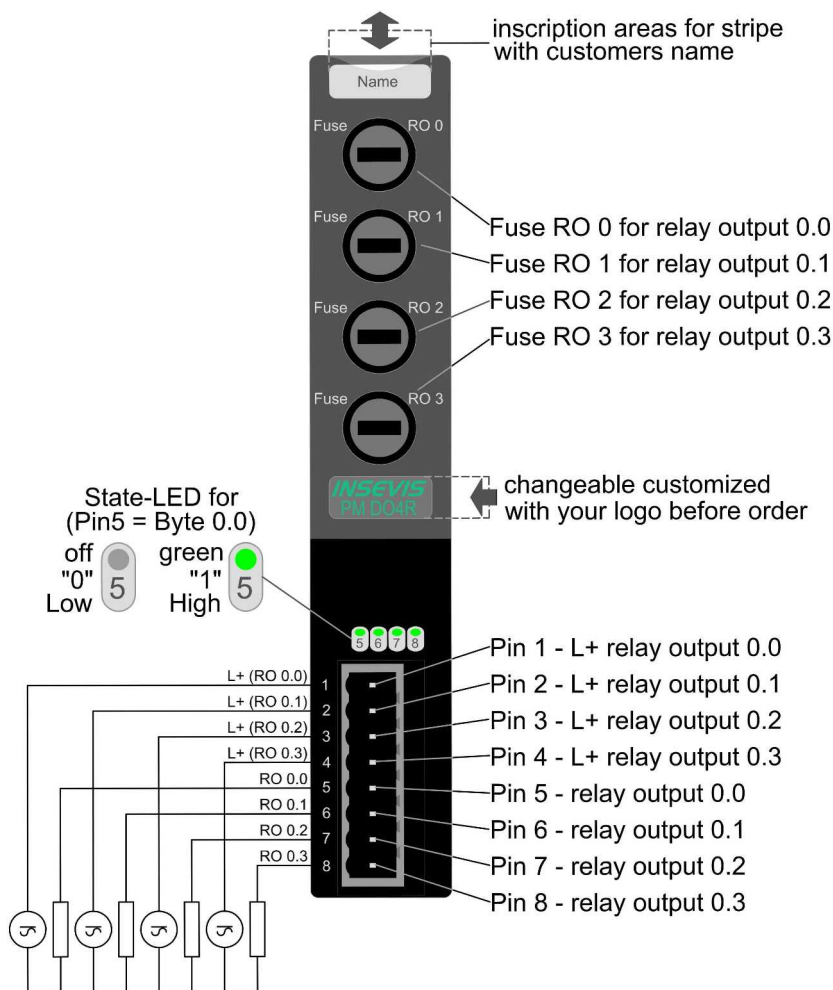
inscription areas for stripe with customers name

Name

Fuse RO 0 for relay output 0.0
Fuse RO 1 for relay output 0.1
Fuse RO 2 for relay output 0.2
Fuse RO 3 for relay output 0.3

changeable customized with your logo before order

State-LED for
(Pin5 = Byte 0.0)

off "0" Low — 5
green "1" High — 5

Pin 1 - L+ relay output 0.0
Pin 2 - L+ relay output 0.1
Pin 3 - L+ relay output 0.2
Pin 4 - L+ relay output 0.3
Pin 5 - relay output 0.0
Pin 6 - relay output 0.1
Pin 7 - relay output 0.2
Pin 8 - relay output 0.3

L+ (RO 0.0) — 1
L+ (RO 0.1) — 2
L+ (RO 0.2) — 3
L+ (RO 0.3) — 4
RO 0.0 — 5
RO 0.1 — 6
RO 0.2 — 7
RO 0.3 — 8

Figure above: Description and wiring of all connections of periphery module DO4-R

DO4R

L0 — R0
L1 — R1
L2 — R2
L3 — R3

Back-plane
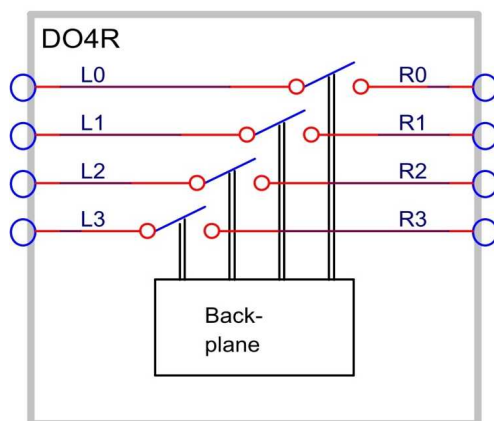
Input	
Start address:	0
End address:	0
Output	
Start address:	8
End address:	8

Figure above: Block diagram of DO4-R

Figure above: Configuration block of start-/end addresses of DO4-R (in byte) in the ConfigStage

Periphery module DO4-R (4 relay outputs 230V)

Technical data	
Dimensions W x H x D (mm) Weight	20 x 108 x 70 mm ca. 150 g
Operating temperature range Storage temperature range	-20°C ... +60°C (without condensation) -30°C ... +80°C
Connection technology	screw connector for cross section up to max. 1,5mm^2
Load voltage L+ Load voltage L+ on the relay Current consumption Power dissapation	24 V (17 V ... 30 V, connected by device supply) 30 V DC (max.), 250 V AC (max.) 45 mA aus L+ (max.) 0,8 W bei 24V (max.)

Wire length
  unshielded (max.)
  shielded (max.)
	30 m
	100 m

Digital outputs Diagnostic LEDs	4 4, green
Topography	4 potential separated contacts
Input delay Output delay	5 ms ... 10 ms (typ.) 2 ms ... 5 ms (typ.)

Switching capacity of contacts
  at inductive load
  at ohmic load
	3A (max.)
	3A (max.)

Max. switching frequency
  mechanical
  with load
	50 Hz
	5 Hz

Type number of
  switching operations
    mechanical
    with 3A
	20Mio
	100.000

Broken wire detection Error diagnostic Potential separation to PLC Short circuit proof	no no yes yes - melting fuse in glass bulbs 5x20mm

Description	for digital signals (2- and 3-/4-wire-switches)

compact periphery module for

8 digital transistor outputs 24V with back-readable inputs

• green diagnostic LED for each in-/ output

• insertion stripe with description field for every signal

• cage-clamp connector with self-lock and 2 lift arms

• **Scope of delivery:**
 - technichal information
 - brief instruction

INSEVIS-benefit:
Each single outputs can be switched off, so that you can realize different ratios of I/Os e.g. 6dI and 2dO or 3dI and 5dO. Only the total sum of I/Os must be ≤8.

above: Description and wiring of MIO84 for 2-wire switches
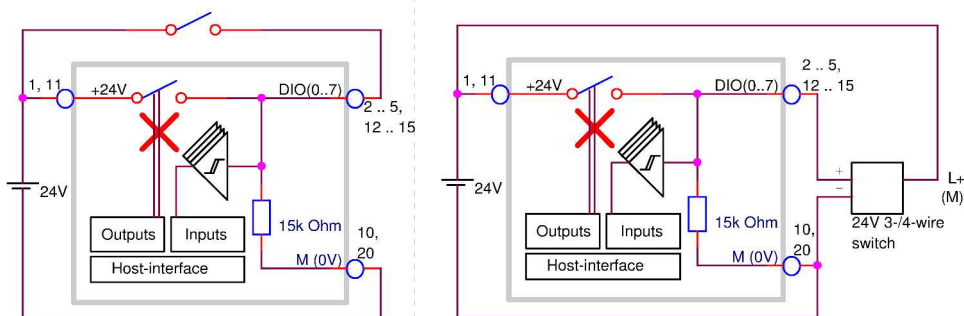
above: Block diagram of digital inputs for 2-wire-switches (left) and 3-/4-wire-switches (right)
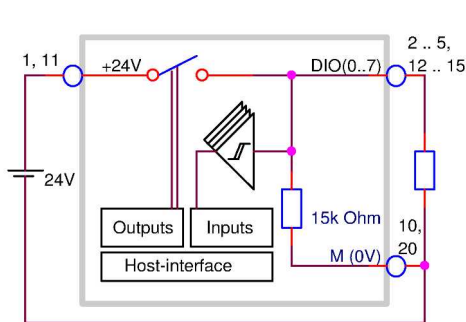
above: Block diagram of backreadable outputs

Digital

	Input address	Output address
		Disable the output
Channel 0.0	16.0	☑
Channel 0.1	16.1	☑
Channel 0.2	16.2	☐ 16.2
Channel 0.3	16.3	☐ 16.3
Channel 0.4	16.4	☑
Channel 0.5	16.5	☐ 16.5
Channel 0.6	16.6	☐ 16.6
Channel 0.7	16.7	☐ 16.7

above: Configuration block of I/O-parametrizing in the ConfigStage

Periphery module MIO84 (8 digital I/O with counter + 4 analog I/O)

Description	for analog inputs (2-wire-encoders)

- 4 analog in- or outputs configurable by software
Inputs:
- 0..10V, 0 (4)..20 mA for 2-wire-encoders including encoder supply
- 4..20 mA or ±20 mA for 4-wire-encoders
Outputs:
- 0..10V
- 0 (4)..20 mA

• Resolution 12 …16 Bit (depending on integration time)

• green diagnostic-LEDs
- LED 6 for A I/O 0
- LED 7 for A I/O 1
- LED 8 for A I/O 2
- LED 9 for A I/O 3

• red diagnostic-LEDs for errors (override or short circuit on AI)
- LED 16 for A I/O 0
- LED 17 for A I/O 0
- LED 18 for A I/O 0
- LED 19 for A I/O 0

• insertion stripe with description field for every signal

• cage-clamp connector with self-lock and 2 lift arms

• **Scope of delivery:**
- technichal information
- brief instruction

Hint:
Connect Ref AIO 0..3 with ground (0V) always

INSEVIS-benefit:
This module has an internal supply for the 2-wire encoders .
So it is not necessary to care for external supply!

above: Description and wiring of all connections of PM MIO84 with 2-wire encoders
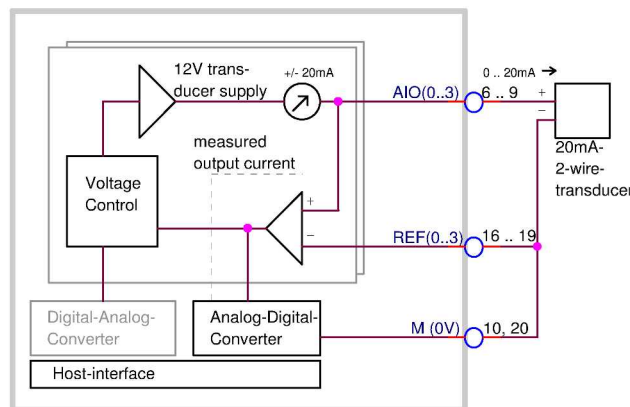
above: Block diagram for 2-wire-encoders (0..20mA)

above: Configuration block of I/O-parametrizing in the ConfigStage

Description	for analog inputs (3-/4-wire-encoders)

- 4 analog in- or outputs configurable by software
Inputs:
- 0..10V, 0 (4)..20 mA for 2-wire-encoders including encoder supply
- 4..20 mA or ±20 mA for 4-wire-encoders
Outputs:
- 0..10V
- 0 (4)..20 mA

• Resolution 12 …16 Bit (depending on integration time)

• green diagnostic-LEDs
 - LED 6 for A I/O 0
 - LED 7 for A I/O 1
 - LED 8 for A I/O 2
 - LED 9 for A I/O 3

• red diagnostic-LEDs for errors (override or short circuit on AI)
 - LED 16 for A I/O 0
 - LED 17 for A I/O 0
 - LED 18 for A I/O 0
 - LED 19 for A I/O 0

• insertion stripe with description field for every signal

• cage-clamp connector with self-lock and 2 lift arms

• **Scope of delivery:**
 - technichal information
 - brief instruction

Hint:
Connect Ref AIO 0..3 with ground (0V) always

above: Description and wiring of all connections of PM MIO84 with 3-/4-wire encoders
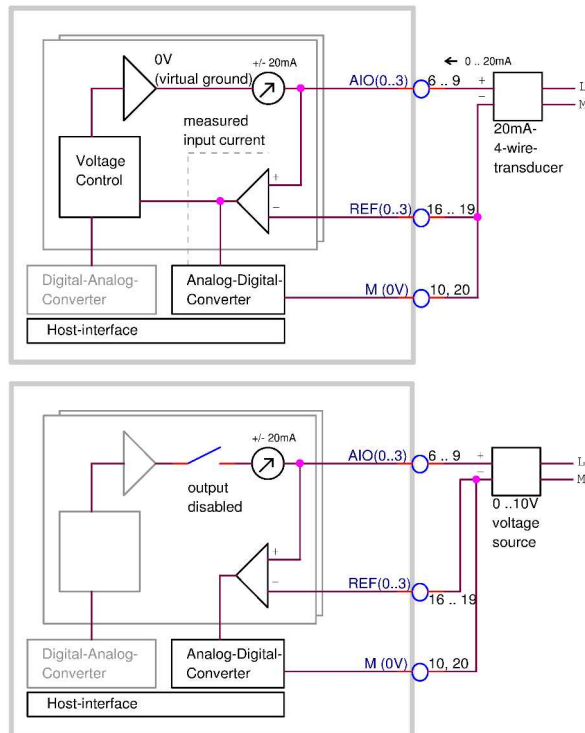
left: Block diagram for 3-/4-wire-encoders (0...20mA)

left: Block diagram for 3-/4-wire-encoders (0...10V)

Periphery module MIO84 (8 digital I/O with counter + 4 analog I/O)

Description	for analog outputs

- 4 analog in- or outputs configurable by software
Inputs:
- 0..10V, 0 (4)..20 mA for 2-wire-encoders including encoder supply
- 4..20 mA or ±20 mA for 4-wire-encoders
Outputs:
- 0..10V
- 0 (4)..20 mA

• Resolution 12 …16 Bit (depending on integration time)

• green diagnostic-LEDs
 - LED 6 for A I/O 0
 - LED 7 for A I/O 1
 - LED 8 for A I/O 2
 - LED 9 for A I/O 3

• red diagnostic-LEDs for errors (override or short circuit on AI)
 - LED 16 for A I/O 0
 - LED 17 for A I/O 0
 - LED 18 for A I/O 0
 - LED 19 for A I/O 0

• insertion stripe with description field for every signal

• cage-clamp connector with self-lock and 2 lift arms

• **Scope of delivery:**
 - technichal information
 - brief instruction

Hint:
Connect Ref AIO 0..3 with ground (0V) always

above: Description and wiring of all connections of PM MIO84 for analog outputs
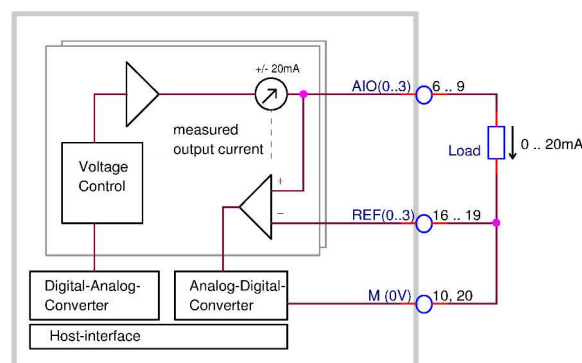
left: Block diagram for analog outputs (0...20mA)

left: Block diagram for analog outputs (0...10V)

Configuration of the counter inputs by ConfigStage

Counter Channel 1 (settings by ConfigStage)

Configuration „**counting forward (up)**"
→ rising edges at input DI 0.0 will be counted

Configuration „**counting for- / backwards (down)**"
→ rising edges at input DI 0.0 will be counted and
→ input DI 0.1 is used as direction bit
  (0=backwards, 1=forward)

Configuration „**Encoder**"
→ inputs DI 0.0 and DI 0.1 represent the encoder interface
  with quadruple evaluation

In " Address " the number of the input double word is displayed, which contains the counter value.

Counter Channel 2 (settings by ConfigStage)

Configuration „**counting forward (up)**"
→ rising edges at input DI 0.2 will be counted

Configuration „**counting for- / backwards (down)**"
→ rising edges at input DI 0.2 will be counted and
→ input DI 0.3 is used as direction bit
  (0=backwards, 1=forward)

Configuration „**Encoder**"
→ inputs DI 0.2 and DI 0.3 represent the encoder interface
  with quadruple evaluation

In " Address " the number of the input double word is displayed, which contains the counter value.

Hints for usage of the counter inputs

All following addresses are specified as offset related to configured start address of the MIO84 module!

onboard:
- read in counter by reading of ED16 / ED20 (synchronous to control point)
- set counter by writing to PAD16 / PAD20 (by direct periphery access only)
- this configuration can be modified in runtime with Step7 too:

  configuration word for counter 1 is PAW24
  configuration word for counter 2 is PAW28
  "inactive"   0x00
  "counting forward / up"   0x01
  "for- / backward (pulse, direction)" 0x02
  "encoder (x4)"   0x03

decentral:
- read in counter by reading of ED12 / ED16 (synchronous to control point)
- direct periphery access is implemented for decentral periphery only for data which are mapped into the process image. To set counters or write configuration use CANopen objects via SDO access.

  configuration word for counter 1   object index 0x3010 + slot-1, subindex 6
  configuration word for counter 2   object index 0x3010 + slot-1, subindex 7
  setpoint counter 1 (dw)   object index 0x3100 + slot-1, subindex 1
  setpoint counter 2 (dw)   object index 0x3100 + slot-1, subindex 2

Periphery module MIO84 (8 digital I/O with counter + 4 analog I/O)

Technical data		digital in-/ outputs	
Load voltage L+ Power dissapation	24V DC (10 V ... 30 V DC) internal limited	Wire length unshielded (max.) shielded (max.)	30 m 100 m
Digital in- / outputs	8 in- or outputs	Outputs: switch on delay switch off delay	50 µs (typ.) 30 µs (typ., without load)
Diagnostic LEDs	8, green	Inputs: switch on delay switch off delay	25µs
Output current for signal 0 for signal 1	0,5 mA (max.) 0,5 A (max. to 60°C)	Max. switching frequency of outputs	100 Hz with ohmic load
Cumulated current	2 A (max. to 60°C)	Counter	2 each as forward counter, forward/backward counter or incremental encoder
		Frequency limit	10 kHz
Broken wire detection Error diagnostic Potential seperation to PLC	no no	Signal level of outputs for signal 0 for signal 1 Signal level of intputs for signal 0 for signal 1	1,0 V at 500 Ω (max.) L+ - 1,0 V at 0,5 A load (min.) 0V ... +5 V +7,5V ... +30 V

Technical data		analog in-/ outputs	
Load voltage L+	24V DC (17 V ... 30 V DC) connected by device supply	Wire length unshielded (max.) shielded (max.)	30 m 100 m
Analog inputs Input areas	4 (alternatively to outputs what is to be configured by software) ±20 mA, 4...20 mA, 0..10 V	Valid voltage between inputs and A-GND (max.)	-1 V ... +24 V DC
Diagnostic LEDs	4 green: signal in valid area 4 red: override or saturation no displaying broken wires and open inputs	Error message during override metering area	adjustable diagnosis- and limit value alert on request
Value number format	9400 ... 6C00 (hexadecimal) for range ± 20 mA all other 0000 ... 6C00 (hexadecimal)	Broken wire detection	by overrun / shortfall of metering area
Override area	20 mA ... 22 mA 10V … 11,3 V	Acces of sensor	unsymetric against A-GND (single ended)
Imput resitance	0Ω (typ.) for metering area current 1MΩ (typ.) for metering area voltage	Metering priciple / conversion priciple Resolution	successive approximation 12…16Bit (depending on integration time assigned in ConfigStage)
Sampling cycle time = Integration time	adjustable 1ms ... 35767 ms default: 100 ms (=line frequency filter 50Hz and 60Hz)	Deviation (based on input area)	< 1%
Analog outputs Output area (nominal values)	4 (alternatively to inputs what is to be configured by software) 0(4)...20 mA, 0...10V	Value number format	0000 ... 6C00 (hexadecimal)
Resolution	15 Bit ΣΔ-Modulation	Short cut protection	yes
Diagnostic LEDs	4 green: signal in valid area 4 rot: override or Load error	Override area	20 ... 23 mA 10 ... 11,3 V
Setting time: response time τ (typ)	1,5 ms	Short cut current (typ.)	20 mA (at 10V) 32 mA (at mA)
Load resistance against A-GND	mA: 500 Ω (max.) V: 1 kΩ (min.)	Deviation (based on output area)	< 1%

Periphery module MIO84 (8 digital I/O with counter + 4 analog I/O)

Process image for onboard use

Configuration of the process image onboard: module allocates 24 bytes of process data input and output.			
Offset	**I/O**	**Function**	**Description**
0, 2, 4, 6	I	Input AI 0..AI 3	Measuring range according to configuration - in voltage output mode: measure of output current - in current output mode: measure of output voltage
0, 2, 4, 6	O	Output AO0..AO 3	Measuring range according to configuration - in input mode: ignored
8	I	Digital inputs .0 to .7	(**Byte** access)
8	O	Digital outputs .0 to .7	(**Byte** access)
9 … 15	I/O	Reserved	
16, 20	I/O	Counter 0, 1	Counter value (**DINT, DWORD** access)

Process image for decentral use

Configuration of the process image as decentral periphery: module allocates 20 bytes of process data input and 9 bytes of process data output.			
Offset	**I/O**	**Function**	**Description**
0, 2, 4, 6	I	Input AI 0..AI 3	Measuring range according to configuration
0, 2, 4, 6	O	Output AO0..AO 3	Measuring range according to configuration
8	I	Digital inputs .0 to .7	(**Byte** access)
8	O	Digital outputs .0 to .7	(**Byte** access)
9 … 11	I	Reserved	
12,16	I	Counter 0, 1	Counter value (**DINT, DWORD** access)

Periphery module AI8 (8 analog inputs)

Description	for 2-wire encoders

compact periphery module for

- **8 analog inputs to be con-figured by software**
  0...20mA,
  4...20mA,
  0...10 V
  ± 2,5V
  ± 5V
  ± 10V

Resolution 12 Bit
- green diagnostic LED
  for each input
  - LED 1 for AI0
  - LED 2 for AI1
  - LED 3 for AI2
  - LED 4 for AI3
  - LED 5 for AI4
  - LED 6 for AI5
  - LED 7 for AI6
  - LED 8 for AI7

- red diagnostic LED
  for each input for error
  (sensor-/ broken wire
  detection)
  - LED 1 for AI0
  - LED 2 for AI1
  - LED 3 for AI2
  - LED 4 for AI3
  - LED 5 for AI4
  - LED 6 for AI5
  - LED 7 for AI6
  - LED 8 for AI7

- Increasement of the
  resolution of analog inputs
  by expanding the integration
  time up to 16Bit

- insertion stripe with
  description field for
  every signal

- cage-clamp connector with
  2 bolt flanges on side

INSEVIS-benefit:

This module has an
internal supply for the
2-wire encoders.

So it is not necessary to
care for external supply!

**If you use these pins 1-8,
do not apply external
encoder supply!**

Figure above: Description and wiring of all connections of periphery module AI8 for 2-wire encoders
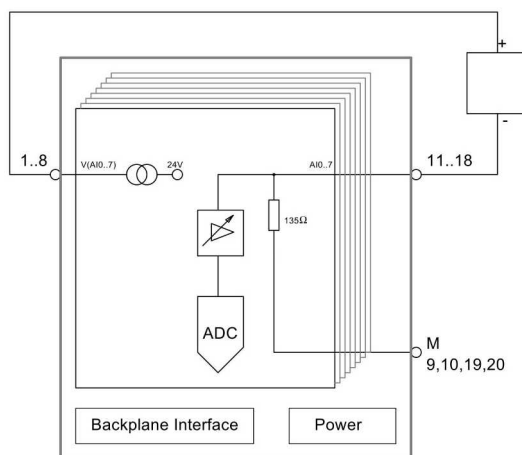
Figure above: Block diagram PM AI8 for wire encoders

Figure above: configuration block of 2-start-/ end addresses of AI8-inputs (in words) in the ConfigStage

Periphery module AI8 (8 analog inputs)

Description	for 3- / 4-wire encoders

compact periphery module for

- **8 analog inputs to be configured by software**
  0...20mA,
  4...20mA,
  0...10 V
  ± 2,5V
  ± 5V
  ± 10V

Resolution 12 Bit

- green diagnostic LED
  for each input
  - LED 1 for AI0
  - LED 2 for AI1
  - LED 3 for AI2
  - LED 4 for AI3
  - LED 5 for AI4
  - LED 6 for AI5
  - LED 7 for AI6
  - LED 8 for AI7

- red diagnostic LED
  for each input for error
  (sensor-/ broken wire
  detection)
  - LED 1 for AI0
  - LED 2 for AI1
  - LED 3 for AI2
  - LED 4 for AI3
  - LED 5 for AI4
  - LED 6 for AI5
  - LED 7 for AI6
  - LED 8 for AI7

- Increasement of the
  resolution of analog inputs
  by expanding the integration
  time up to 16Bit

- insertion stripe with
  description field for
  every signal

- cage-clamp connector with
  2 bolt flanges on side

INSEVIS-benefit:

This module has an
internal supply for the
2-wire encoders.

So it is not necessary to
care for external supply!

**If you use these pins 1-8,
do not apply external
encoder supply!**

Figure above: Description and wiring of all connections of module AI8 for 3-/ 4-wire encoders
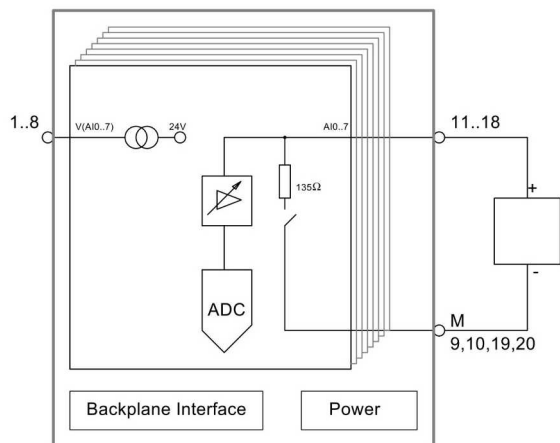
Figure above: Block diagram PM AI8 for 3- / 4-wire encoders

Figure above: configuration block of start-/ end addresses of AI8-inputs (in words) in the ConfigStage

Periphery module AI8 (8 analog inputs)

Technical data

Operating temperature range Storage temperature range Dimensions W x H x D (mm) Weight	-20°C ... +60°C (without condens.) -30°C ... +80°C 20 x 108 x 70 mm ca. 150 g	Load voltage L+ Current consumption Power dissapation	24V DC (11V ... 30V DC, connected by device supply) 100 mA (max.) 2 W (max.)

Connection technology	connector with cage clamp technology for cross section up to max. 1,5mm²	Wire length
		   unshielded (max.)
		   shielded (max.)
			
			30 m
			100 m

Analog inputs Input area (nominal values)	8 (to be configured by software) 0...10V, 0...20mA, 4...20mA ±10V, ±5V, ±2,5V,	Valid voltage between inputs and A-GND (max.)	-15 ... +24 V DC
Diagnostic LEDs	8 green: signal in valid area 8 red: override (mA) or saturation no indication broken wires and open inputs	Error message during override metering area	adjustable diagnosis- and limit value alert on request
Value number format	0000 ... 6C00 (hexadecimal) for range mA and 1...5/ 0...10V all other 9400 ... 6C00 (hex.)	Broken wire detection	by overrun/ shortfall of metering area
Override area	20 mA ... 22 mA (only at mAs)	Access of sensor	unsymmetric against A-GND (single ended)
Input resistance	150Ω (typ.) metering area current 100kΩ (typ.) metering area voltage	Metering principle / conversion principle Resolution depending on integration time *	successive approximation 12 Bit … 16 Bit
Sampling cycle time = Integration time *	adjustable 1ms ... 35767 ms default: 100 ms (=Net frequency filter 50Hz and 60Hz)	Specifity (based on input area)	< 1%

* Increasement of the resolution of analog inputs by expanding the integration time
  (configurable in ConfigStage at the PM-AI8 directly)

for 1...5V / 0..10V:	0...16ms → 13Bit	17...64ms → 14Bit	65...256ms → 15Bit	
for 0(4)...20mA:	0...16ms → 12Bit	17...64ms → 13Bit	65...256ms → 14Bit	> 265ms → 15Bit
for ±2,5V, ±5V, ±10V:	0...16ms → 12Bit	17...64ms → 13Bit	65...256ms → 14Bit	> 265ms → 15Bit
	(+sign)	(+sign)	(+sign)	(+sign)

Process image

Configuration of the process image: the module allocates 8 input words in the process image (Offset 0, 2, 4, 6, 8)

Offset	I/O	Function	Description
0, 2, 4, 6, 8, 10, 12, 14	I	Input AI 0...AI 7	Measuring range according to configuration

Periphery module AI4O4 (4 analog in- and 4 analog outputs)

Description	for 2-wire encoders

compact periphery module for

- **4 analog inputs to be configured by software**
  0...20mA, 4...20mA,
  0...10 V, ±10V, ±5V, ±2,5V

  4 analog outputs to be configured by software
  ± 20mA, 4...20mA, ±10V

- Resolution 12 Bit
- green diagnostic LED
  for each input
  - LED 1 for AI0
  - LED 2 for AI1
  - LED 3 for AI2
  - LED 4 for AI3
  - LED 5 for AO0
  - LED 6 for AO1
  - LED 7 for AO2
  - LED 8 for AO3
- red diagnostic LED
  for each input for error
  (sensor-/ broken wire
  detection)
  - LED 1 for AI0
  - LED 2 for AI1
  - LED 3 for AI2
  - LED 4 for AI3
  (or output error flag)
  - LED 5 for AO0
  - LED 6 for AO1
  - LED 7 for AO2
  - LED 8 for AO3

- Increasement of the
  resolution of analog inputs
  by expanding the integration
  time up to 16Bit

- insertion stripe with
  description field for
  every signal

INSEVIS-benefit:

This module has an internal
supply for the 2-wire
encoders (4-20mA).
So it is not necessary to
care for external supply!

**If you use these pins 1-4,
do not apply external
encoder supply!**
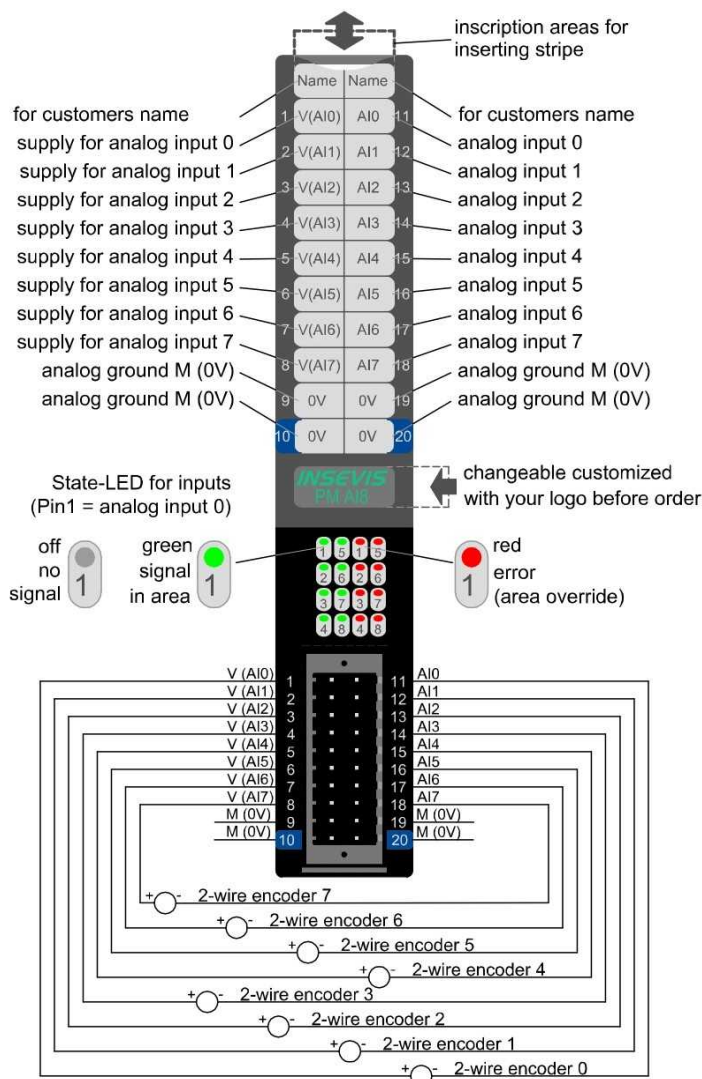
**Always connect Ref0..3
with analog ground (0V)**

Figure above: Description and wiring of all connections of PM AI4O4 with 2-wire encoders

Figure above: Block diagram of PM AI4O4 with 2-wire encoders

Figure above: configuration block of start-/end addresses of AI4O4-i/o´s (in words) in the ConfigStage

Periphery module AI4O4 (4 analog in- and 4 analog outputs)

Description	for 3-/ 4-wire encoders or ±10V voltage source

compact periphery module for

- 4 analog inputs to be configured by software
   0...20mA, 4...20mA,
   0...10 V, ±10V, ±5V, ±2,5V

4 analog outputs to be configured by software
   ± 20mA, 4...20mA, ±10V

- Resolution 12 Bit
- green diagnostic LED for each input
   - LED 1 for AI0
   - LED 2 for AI1
   - LED 3 for AI2
   - LED 4 for AI3
   - LED 5 for AO0
   - LED 6 for AO1
   - LED 7 for AO2
   - LED 8 for AO3
- red diagnostic LED for each input for error (sensor-/ broken wire detection)
   - LED 1 for AI0
   - LED 2 for AI1
   - LED 3 for AI2
   - LED 4 for AI3
   (or output error flag)
   - LED 5 for AO0
   - LED 6 for AO1
   - LED 7 for AO2
   - LED 8 for AO3

- Increasement of the resolution of analog inputs by expanding the integration time up to 16 Bit

- insertion stripe with description field for every signal

Attention!

This module has an internal supply for the 2-wire encoders (4-20mA).

Do not connect pins 1-4 when using 3/4-wire encoders!

Always connect Ref0..3 with analog ground (0V)
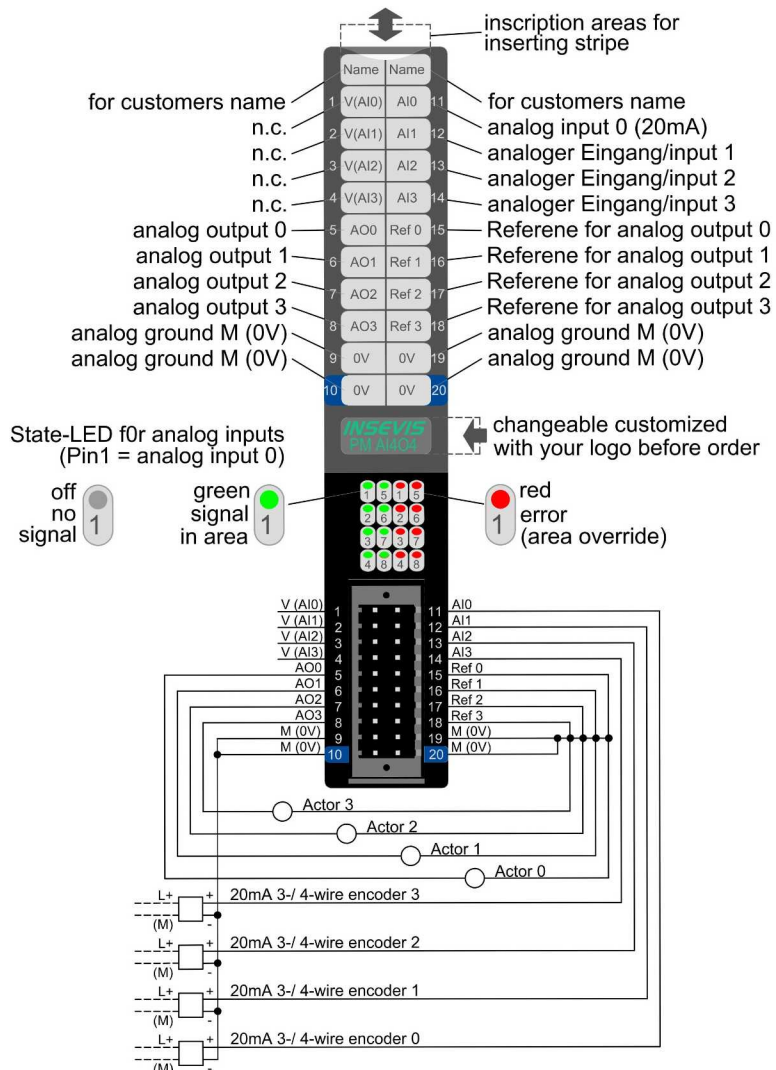
Figure above: Description and wiring of all connections of PM AI4O4 with 3-/ 4-wire encoders or ±10V
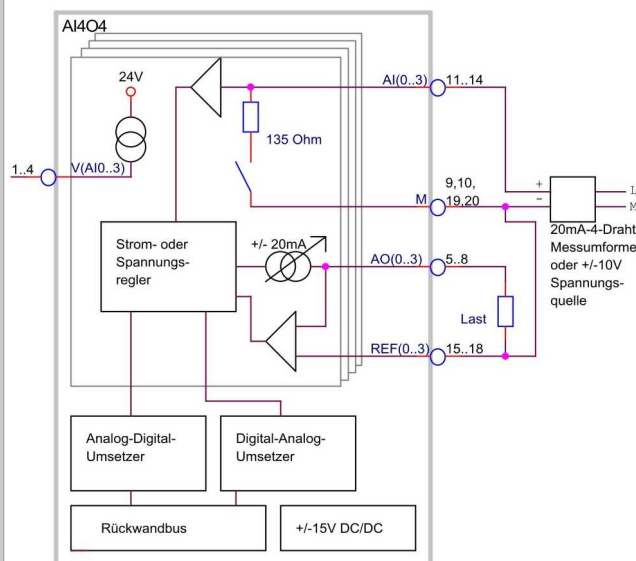
Figure above: Block diagram of PM AI4O4 with wire encoders or ±10V voltage source

Figure above: configuration block of 3-/ 4-start-/ end addresses of AI4O4-i/o´s (in words) in the ConfigStage

Periphery module AI4O4 (4 analog in- and 4 analog outputs)

Technical data			
Operating temperature range Storage temperature range Dimensions W x H x D (mm) Weight	-20°C ... +60°C (without condens.) -30°C ... +80°C 20 x 108 x 70 mm ca. 150 g	Load voltage L+ Current consumption Power dissapation	24V DC (10V ... 30V DC, connected by device supply) 250 mA (max.) 4 W (max.)
Connection technology	cage clamp connector with lift-arms or bolt flanges on the sides (cage clamp technology) for cross section up to max. 1,5mm²	Wire length unshielded (max.) shielded (max.)	30 m 100 m
Analog inputs Input area (nominal values)	4 (to be configured by software) 0...20mA, 4...20mA ±10V, ±5V, ±2,5V, 0..10V	Valid voltage between inputs and A-GND (max.)	-15 V ... +24 V DC
Diagnostic LEDs	4 green: signal in valid area 4 red: override (mA) or saturation no displaying broken wires and open inputs	Error message during override metering area	adjustable diagnosis- and limit value alert on request
Value number format	0000 ... 6C00 (hexadecimal) for range mA and 0 ... 10V all other 9400 ... 6C00 (hexadecimal)	Broken wire detection	by overrun / shortfall of metering area
Override area	20 mA ... 22 mA (only at mAs)	Access of sensor	unsymmetric against A-GND (single ended)
Input resistance	150Ω (typ.) metering area current 100kΩ (typ.) metering area voltage	Metering priciple / conversion priciple Resolution depending on integration time *	successive approximation 12 Bit … 16 Bit
Sampling cycle time = Integration time *	adjustable 1ms ... 35767 ms default: 100 ms (=Net frequency filter 50Hz and 60Hz)	Specifity (based on input area)	< 1%
Analog outputs Output area (nominal values)	4 (to be configured by software) ±20mA , 4...20mA, ±10V	Value number format	0000 ... 6C00 (hexadecimal) for range mA and 0 ... 10V all other 9400 ... 6C00 (hexadecimal)
Resolution	12 Bit	Short cut protection	ja
Diagnostic LEDs	4 green: signal in valid area 4 rot: override (mA) or short circuit	Override area	20 ... 23 mA, -20 ... -23 mA 10 ... 11,3V, -10 ... -11,3V
Resolution	12 Bit	Short cut current (typ.)	32 mA
Load resistance against A-GND	mA: 500 Ω (max.) V: 1 kΩ (min.)	Specifity (based on output area)	< 1%

* Increasment of the resolution of analog inputs by expanding the integration time (configurable in ConfigStage at the PM-AI4O4 directly)

for 0..10V: 0...16ms → 13Bit   17...64ms → 14Bit   65...256ms → 15Bit
for 0(4)..20mA: 0...16ms → 12Bit   17...64ms → 13Bit   65...256ms → 14Bit   > 265ms → 15Bit
for ±2,5V, ±5V, ±10V: 0...16ms → 12Bit   17...64ms → 13Bit   65...256ms → 14Bit   > 265ms → 15Bit
                       (+sign)   *(+sign)*   *(+sign)*   *(+sign)*

Configuration of the process image

The module allocates 8 input words and 4 output words in the process image. (Hardware version 2.0)			
Offset	I/O	Function	Description
0,2,4,6	I	Input AI0..AI3	Measuring range according to configuration
0,2,4,6	O	Output AO0..AO3	Measuring range according to configuration

8,10, 12,14	I	State of the (backreadable) outputs AO0..AO3	.0 FCM Common-Mode Over-Range
			.1 FLD Load Error
			.2 FOT Over Temperature
			.15 ... .3 0 ... 6C00 (hex)
			      at mA: output voltage 0 ... 10V
			      ati ±10V: output current 0 ... 20mA

Periphery module AI8O2 (8 analog in- and 2 analog outputs)

Description	for 2-wire encoders

compact periphery module for

- 8 analog inputs
  4x 4...20mA
  4x PT100 -80°C ... 300°C

2 analog outputs
  2x 4...20mA)

• Resolution 12 Bit

• green diagnostic LED
  for each input

• red diagnostic LED
  for each input for error
  (sensor-/ broken wire
  detection or temperature
  below - 50°C)

• insertion stripe with
  description field for
  every signal

INSEVIS-benefit:

This module has an internal
supply for the 2-wire
encoders (4-20mA).
So it is not necessary to
care for external supply!

**If you use these pins 1-4,
do not apply external
encoder supply!**

for customers name
supply for analog input 0
supply for analog input 1
supply for analog input 2
supply for analog input 3
analog input 4 Pt100 +
analog input 5 Pt100 +
analog input 6 Pt100 +
analog input 7 Pt100 +
analog output 0
analog ground M (0V)

for customers name
analog input 0 (20mA)
analog input 1 (20mA)
analog input 2 (20mA)
analog input 3 (20mA)
analog input 4 Pt100 -
analog input 5 Pt100 -
analog input 6 Pt100 -
analog input 7 Pt100 -
analog output 1
analog ground M (0V)

inscription areas for
inserting stripe

changeable customized
with your logo before order

state-LEDs for analog inputs
(Pin1 = analog input 0)

off
no
signal

green
signal
in area

red
error
(area override)

Figure above: Description and wiring of all connections of periphery module AI8O2 for 2--wire encoders
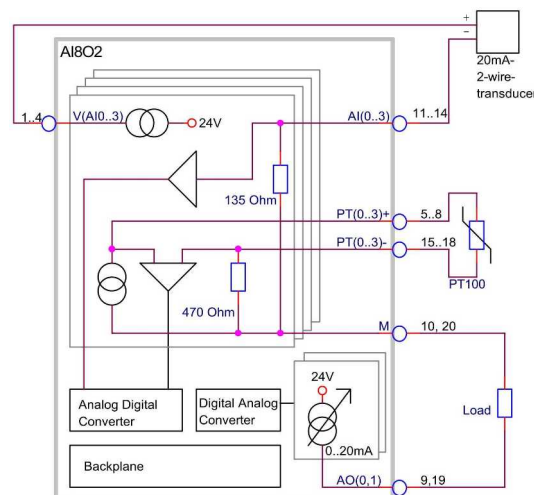
Figure above: Block diagram PM AI8O2 for 2-wire encoders

Figure above: configuration block of the start-/ end addresses of AI8O2-i/o´s (in words) in the ConfigStage

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Periphery module AI8O2 (8 analog in- and 2 analog outputs)

Description	for 3- / 4-wire encoders

compact periphery module for

- 8 analog inputs
 4x 4...20mA
 4x PT100 -80°C ... 300°C

 2 analog outputs
 2x 4...20mA)

• Resolution 12 Bit

• green diagnostic LED
 for each input

• red diagnostic LED
 for each input for error
 (sensor-/ broken wire
 detection or temperature
 below - 50°C)

• insertion stripe with
 description field for
 every signal

Attention!

This module has an internal
supply for the 2-wire
encoders (4-20mA).

**Do not connect pins 1-4
when using 3/4-wire
encoders!**

Figure above: Description and wiring of all connections of periphery module AI8O2 for 3-/ 4-wire encoders
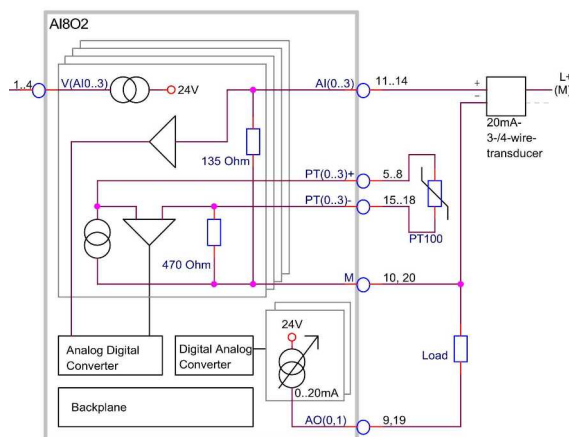
Figure above: Block diagram PM AI8O2 for 3-/ 4-wire encoders

Figure above: configuration block of the start-/ end addresses of AI8O2-i/o´s (in words) in the ConfigStage

Periphery module AI8O2 (8 analog in- and 2 analog outputs)

Technical data			
Operating temperature range Storage temperature range Dimensions W x H x D (mm) Weight	-20°C ... +60°C (without condens.) -30°C ... +80°C 20 x 108 x 70 mm ca. 150 g	Load voltage L+ Current consumption Power dissapation	24V DC (10V ... 30V DC, connected by device supply) 150 mA (max.) 2 W (max.)

Connection technology	cage clamp connector with lift-arms or bolt flanges on the sides (cage clamp technology) for cross section up to max. 1,5mm²	Wire length
		  unshielded (max.)
		  shielded (max.)
			
			30 m
			100 m

Analog inputs	8	valid voltage between inputs and A-GND (max.)	0 V ... +24 V DC
Input area (nominal values)	AE 0....3: 4 mA ... 20 mA AE 4....7: PT100 -200°C ... +300°C	Error message during override metering area	adjustable diagnosis- and limit value alert on request
Under- / override areas	0 mA … < 4mA >20 mA ... 23 mA -243°C ...<-200°C >+300°C ... +450°C	Broken wire detection	by overrun / shortfall of metering area
Diagnostic LEDs	4 green: 4-10mA-signal in valid area 4 green: PT100: -50°C … 300°C 4 red: override (mA) or short circuit 4 red: PT100-short cut or temperature below ≤ - 50°C no displaying broken wires and open inputs	Access of sensor	unsymmetric against A-GND (single ended) for metering area 4 mA ... 20 mA 2-wire, symmetric for metering area PT100
Input resistance	120 Ω (typ.) metering area 20 mA 500 Ω (typ.) metering area PT100	Value number format	0000 ... 6C00 (hexadecimal) for metering area 4 mA ... 20 mA 0,1°C for metering area PT100
Resolution	12 Bit	Integration time	adjustable 17 ms or 20 ms

Metering principle /
  conversion principle
	successive approximation	Specifity
		  (based on input area)
			< 1%

Sampling cycle time (typ)	1 ms	Current limitation	50 mA
Analog outputs	2	Value number format	0000 ... 6C00 (hexadecimal) for metering area 4 mA ... 20 mA
Output area (nominal values)	4 mA ... 20 mA	Short cut protection	yes
Override area	20 mA ... 23 mA	Short cut current (typ.)	32 mA
Resolution	12 Bit	Setting time:	response time τ (typ) 5 ms

Load resistance
  against A-GND
	4..20 mA: 500 Ω (max.)	Specifity
		  (based on output area)
			< 1%

Periphery module RTD8O2 (8 RTD-inputs and 2 analog outputs)

Description

	for 2-wire RTDs

compact periphery module for

- 8 analog inputs to be configurd by software
  Temperature:
  PT100,
  PT1000,
  NI100,
  NI1000,
  KTY81-1xx
  Resistivity survey
  200Ω ,
  2kΩ
  Voltage:
  0 .. 400mV,
  0 .. 1V
  2 analog outputs
  (0,5 ...10V)

• Resolution 12 Bit

• green diagnostic LED
  for each input
  - LED 1 for AI0
  - LED 2 for AI1
  - LED 3 for AI2
    . . .
  - LED 8 for AI7

• red diagnostic LED
  for each input for error
  (sensor-/ broken wire
  detection)
  - LED 1 for AI0
  - LED 2 for AI1
  - LED 3 for AI2
    . . .
  - LED 8 for AI7

• insertion stripe with
  description field for
  every signal

Figure above: Description and wiring of all connections of periphery module RT8O2 with 2-wire RTDs

above: block diagram of RTD8O2 for 2-wire RTDs

above: configuration block of start-/ end addresses of RTD8O2-i/o´s (in words) in the ConfigStage

Periphery module RTD8O2 (8 RTD-inputs- and 2 analog outputs)

Description	for 3-wire RTDs

compact periphery module for

- 8 analog inputs to be configurd by software
Temperature:
  PT100,
  PT1000,
  NI100,
  NI1000,
  KTY81-1xx
Resistivity survey
  200Ω ,
  2kΩ
Voltage:
  0 .. 400mV,
  0 .. 1V
2 analog outputs
(0,5 ...10V)

• Resolution 12 Bit

• green diagnostic LED
  for each input
  - LED 1 for AI0
  - LED 2 for AI1
  - LED 3 for AI2
    . . .
  - LED 8 for AI7

• red diagnostic LED
  for each input for error
  (sensor-/ broken wire
  detection)
  - LED 1 for AI0
  - LED 2 for AI1
  - LED 3 for AI2
    . . .
  - LED 8 for AI7

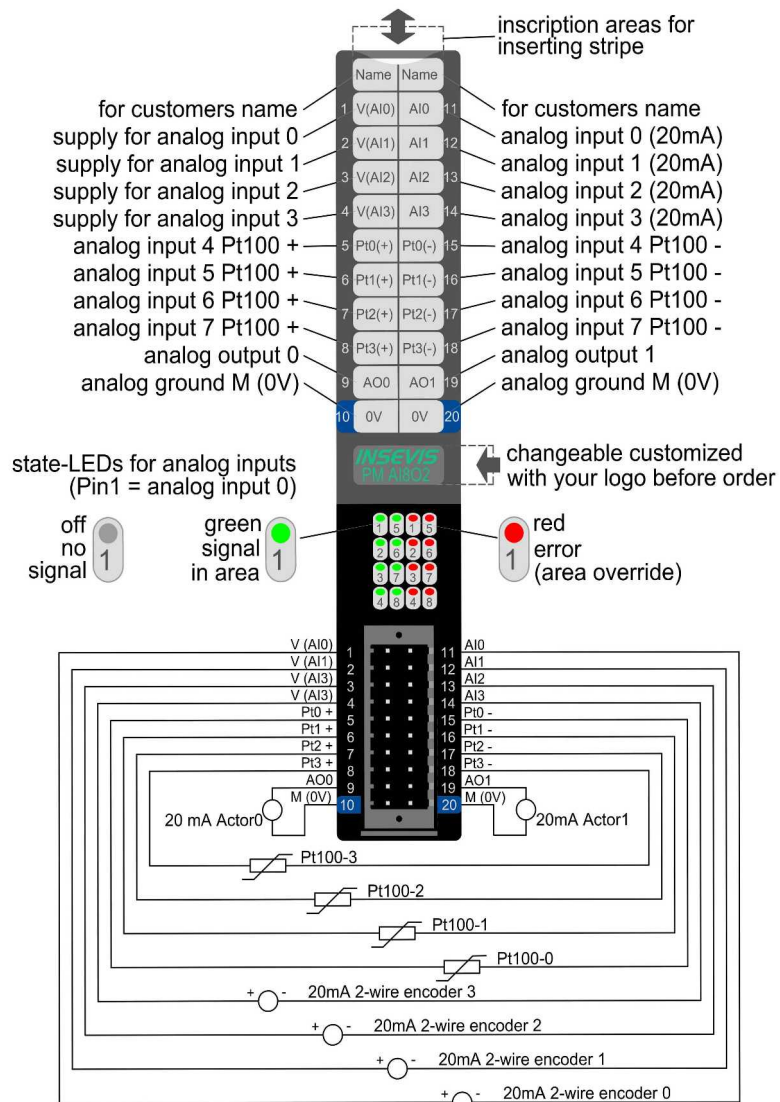• insertion stripe with
  description field for
  every signal

Figure above: Description and wiring of all connections of periphery module RT8O2 with 3-wire RTDs
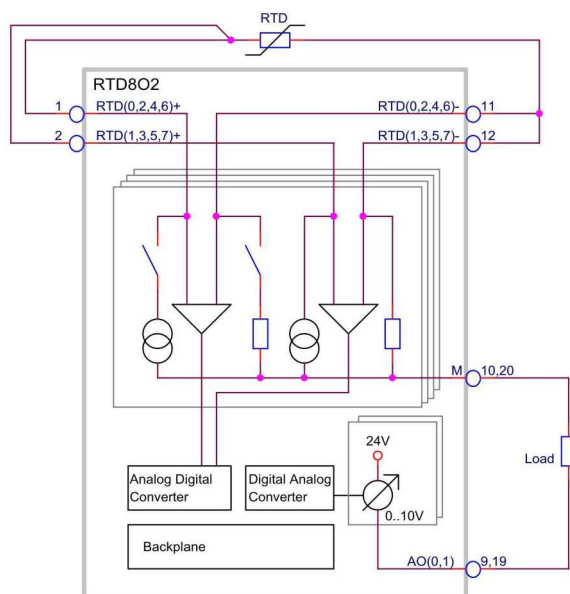
above: block diagram of RTD8O2 for 3-wire RTDs

above: configuration block of start-/ end addresses of RTD8O2-i/o´s (in words) in the ConfigStage

Periphery module RTD8O2 (8 RTD-inputs- and 2 analog outputs)

Description	for 4-wire RTDs

compact periphery module for

- 8 analog inputs to be configurd by software
Temperature:
PT100,
PT1000,
NI100,
NI1000,
KTY81-1xx
Resistivity survey
200Ω ,
2kΩ
Voltage:
0 .. 400mV,
0 .. 1V
2 analog outputs
(0,5 ...10V)

• Resolution 12 Bit

• green diagnostic LED
for each input
- LED 1 for AI0
- LED 2 for AI1
- LED 3 for AI2
. . .
- LED 8 for AI7

• red diagnostic LED
for each input for error
(sensor-/ broken wire
detection)
- LED 1 for AI0
- LED 2 for AI1
- LED 3 for AI2
. . .
- LED 8 for AI7

• insertion stripe with
description field for
every signal
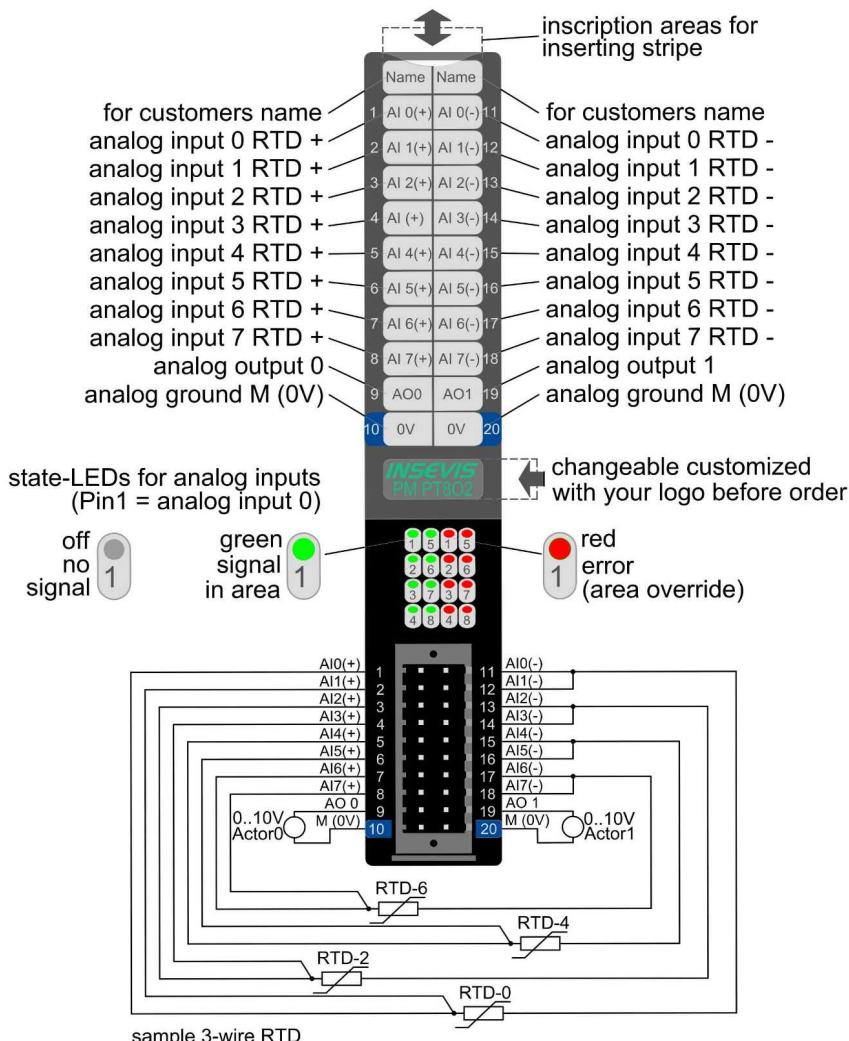
Figure above: Description and wiring of all connections of periphery module RT8O2 with 4-wire RTDs
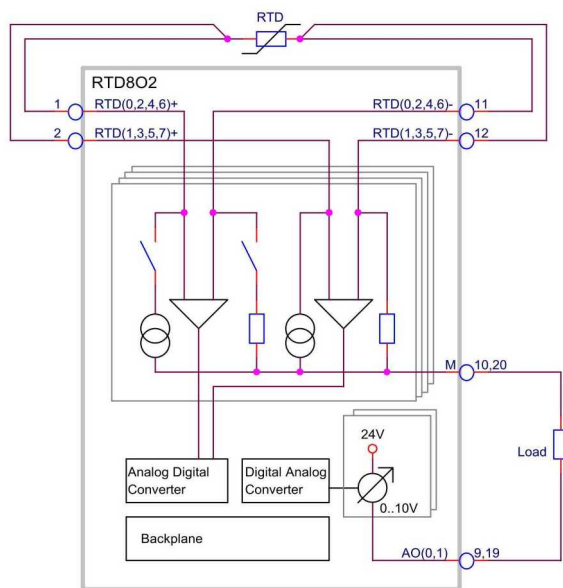
above: block diagram of RTD8O2 for 4-wire RTDs

above: configuration block of start-/ end addresses of RTD8O2-i/o´s (in words) in the ConfigStage

Periphery module RTD8O2 (8 RTD-inputs- and 2 analog outputs)

Description	for voltage measurement

compact periphery module for

- 8 analog inputs to be configurd by software
Temperature:
  PT100,
  PT1000,
  NI100,
  NI1000,
  KTY81-1xx
Resistivity survey
  200Ω ,
  2kΩ
Voltage:
  0 .. 400mV,
  0 .. 1V
2 analog outputs
(0,5 ...10V)

• Resolution 12 Bit

• green diagnostic LED
  for each input
  - LED 1 for AI0
  - LED 2 for AI1
  - LED 3 for AI2
      . . .
  - LED 8 for AI7

• red diagnostic LED
  for each input for error
  (sensor-/ broken wire
  detection)
  - LED 1 for AI0
  - LED 2 for AI1
  - LED 3 for AI2
      . . .
  - LED 8 for AI7

• insertion stripe with
  description field for
  every signal

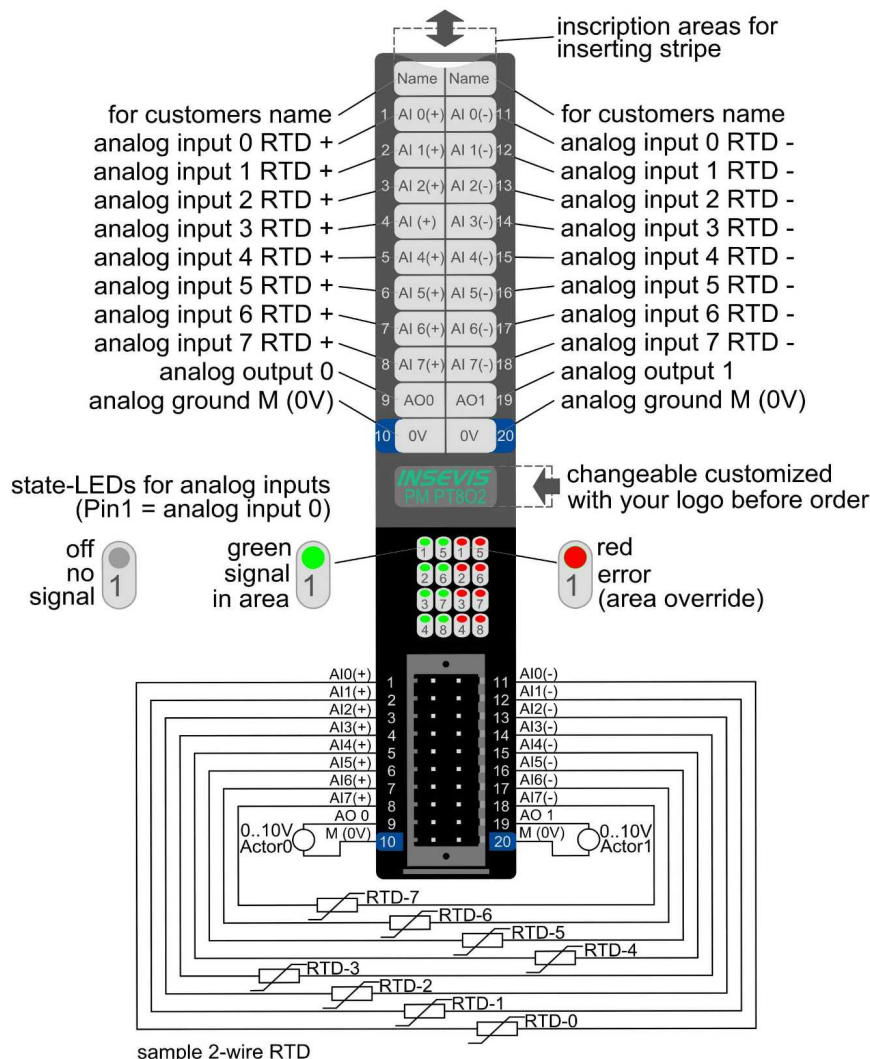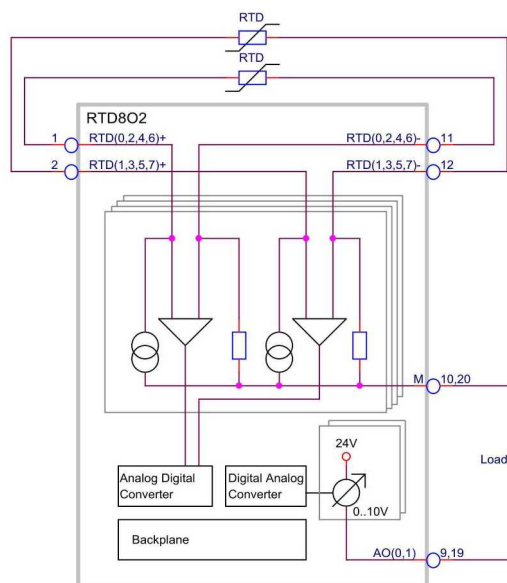*Figure above: Description and wiring of all connections of PM RT8O2 for voltage measurement*
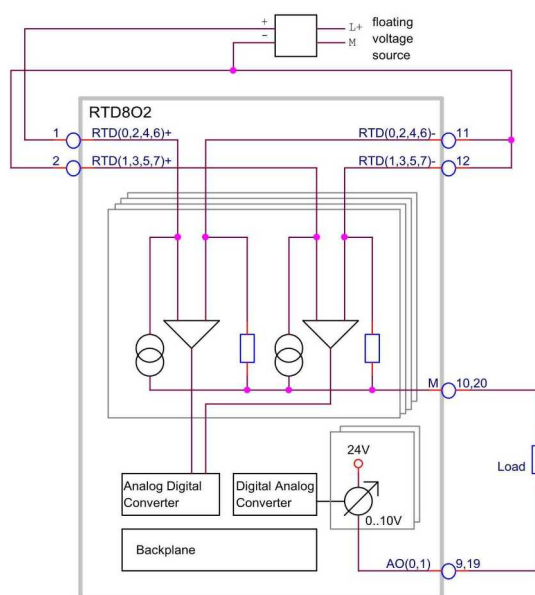
above: block diagram of RTD8O2 for voltage measurement

above: configuration block of start-/ end addresses of RTD8O2-i/o´s (in words) in the ConfigStage

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Periphery module RTD8O2 (8 RTD-inputs- and 2 analog outputs)

Technical data			
Operating temperature range Storage temperature range Dimensions W x H x D (mm) Weight	-20°C ... +60°C (without condens.) -30°C ... +80°C 20 x 108 x 70 mm ca. 150 g	Load voltage L+ Current consumption Power dissapation	24V DC (10V ... 30V DC, connected by device supply) 50 mA (max.) 1,2 W (max.)

Connection technology	unlockable connector with 2 lift-arms or bolt langes on side (cage clamp technology) for cross section up to max. 1,5mm^2	Wire length
		   unshielded (max.)
		   shielded (max.)
			
			30 m
			100 m

Analog inputs	8	valid voltage between inputs and A-GND (max.)	0 V ... +24 V DC
Diagnostic LEDs	8 green: signal in valid area 8 rot: short circuit no displaying broken wires and open inputs	Error message during override metering area	adjustable diagnosis- and limit value alert on request
Input area (nominal values)	PT100: -50°C ... 600°C PT1000: -50°C ... 250°C Ni100: -50°C ... 250°C Ni1000: -50°C ... 150°C KTY81/1xx: -50°C ... 150°C 0 ... 300 Ω, 0... 2 kΩ	Override area (LEDs off)	PT100: >600°C ... 620°C PT1000: >250°C ... 300°C Ni100: >250°C ... 275°C Ni1000: >150°C ... 175°C KTY81/1xx: >125°C ... 150°C >300 Ω ... 325 Ω, >2 kΩ ... 2,1 kΩ
Value number format	0,1°C for temperature metering area, 0,1° Ω for resistor metering area, 0000 ... 6C00 (hexadecimal) for voltage metering area	Underride area (red LED on)	PT100: -200°C ... < -50°C PT1000: -200°C ... < -50°C Ni100: -200°C ... < -50°C Ni1000: -200°C ... < -50°C KTY81/1xx: -75°C ... < -50°C
Input resistance	500 Ω (typ.) metering area PT100	Access of sensor	2- or 4- wire, symmetric
Resolution	12 Bit		
Metering pricniple / conversion principle	successive approximation	Broken wire detection	by overrun, shortfall of metering area *(only at 2 wire use!)*
Sampling cycle time = Integration time	adjustable 1ms ... 35767 ms default: 100 ms (=Net frequency filter 50Hz + 60Hz)	Specifity (based on input area)	< 1%
Analog outputs	2	Value number format	0000 ... 6C00 (hexadecimal)
Output area (nominal values)	0,5 … 10V	Short cut protection	yes
Override area	0 … 11V	Short cut current (typ.)	32 mA
Resolution	12 Bit	Setting time:	response time τ (typ) 1,5 ms
Load resistance against A-GND	1kΩ (max.)	Specifity (based on output area)	< 1%

Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

Description

compact periphery module with 6 dedicated input channels and 2 fast back-readable outputs 24V/2A in 3 hardware versions:

for 24V:
   6 digital inputs 24V
   2 digital back-readable outputs 24V/2A
   (Art.-Nr. PM-DIO8Z-24V-03)

for 5V
   6 digital back-readable outputs 5V
   2 digital back-readable outputs 24V/2A
   (Art.-Nr. PM-DIO8Z-5V-03)

for RS422
   6 bidirectional cannels according RS485 / RS422
   2 digital back-readable outputs 24V/2A
   (Art.-Nr. PM-DIO8Z-422-03)

configurable by software to:
- **2 up/down-counter for encoder or puls and direction signal reference track 2 compare-outputs**

or
- **2 counter to measure frequency or time period for encoder or puls and direction signal 2 compare-outputs**

• alert function
• Counting with 32 Bit
• time resolution 40 ns
• configurable input filter
• green diagnostic LED for each in-/ output
• insertion stripe with description field for every signal

• insertion stripe with description field for every signal
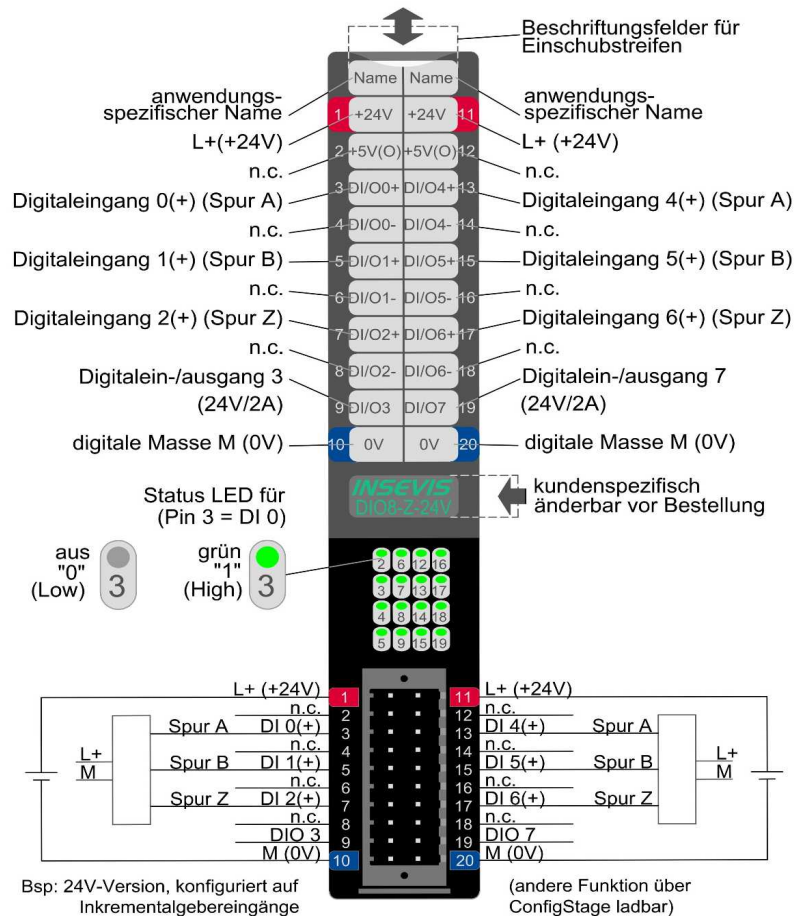
Figure above: description and wiring of all connections of periphery module DIO8Z-24V-03
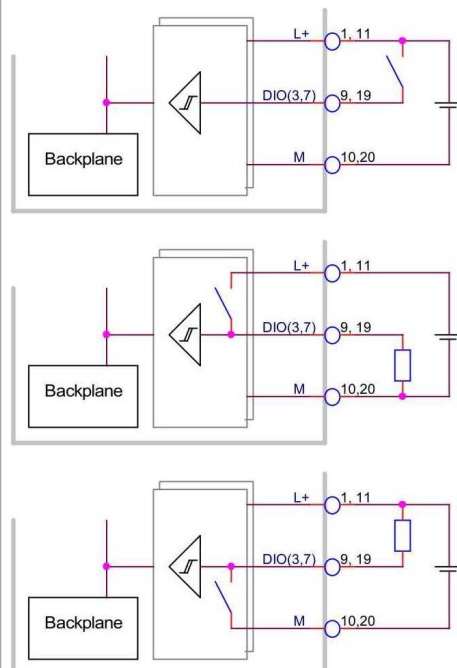
Figure above: block diagram of DIO3 and DIO7 as input (top), as output (L+ switching, middle) and as output (M-switching, down)

Figure above: configuration in ConfigStage

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Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

Technical data

Dimensions W x H x D (mm) Weight	20 x 108 x 70 mm ca. 150 g
Operating temperature range Storage temperature range	-20°C ... +60°C (without condensation) -30°C ... +80°C
Connection technology	cage clamp connector with lift-arms or bolt flanges on the sides (cage clamp technology) for cross section up to max. 1,5mm^2
Load voltage L+ Current consumption Power dissipation	10 V ... 30 V DC 20 mA (max.) without load internal limited

Wire length
  unshielded (max.)
  shielded (max.)
	30m
	100m

DI/O0 ... DI/O2, DI/O4 ... DI/O6	24V	5V	(RS422 without terminating resistor)	RS422	(with terminating resistor)
Digital inputs Diagnostic LEDs	8 (max.), all with alert-function (interrupt) 8, green				
Article number	PM-DIO8Z-24V-03	PM-DIO8Z-5V-03		PM-DIO8Z-422-03	

Input voltage
  for signal 0
  for signal 1
 	
positive switching
	0V ... +5V
	+7,5V ... +30V
	
	DI/O0(+) .. 7(+): signal
	DI/O0(-)..2(-), 4(-) .. 6(-): open
		0 .. +3V
		+4 .. +5V
		
		DI/O0(+) ..2(+), 4(+) .. 6(+): signal
		DI/O0(-)..2(-), 4(-) .. 6(-): open			

Input voltage
  for signal 0
  for signal 1
 	
negative switching
"open collector"
	+2V ... +30V
	0V ... +1V
	
	DI/O0(+) .. 2(+), 4(+) .. 6(+): open
	DI/O0(-) .. 2(-), 4(-) .. 6(-): signal
		+2..+5V
		0..+1V
		
		DI/O0(+) .. 2(+), 4(+) .. 6(+): open
		DI/O0(-) .. 2(-), 4(-) .. 6(-): signal			

Inputs (differential) Outputs	- -	differential reg. RS422 differential reg. RS422			
Input resistance	-	1,5 kOhm		150 Ohm	
Input current for signal 1	max.1mA (subject to change)				
Broken wire detection Error diagnostic Potential separation to PLC	no no no				
Input delay Output delay	2 µs (typ.) 2 µs (typ.)				
Max. counting frequency	125kHz (subject to change)				

DI/O3, DI/O7

Digital outputs Diagnostic LEDs	2 with L+ 2, green			

Output signal level
  for signal 0
  for signal 1
	1,0 V bei 500Ω (max.)
	L+ - 1,0V bei 0,5A Last (min.)
		Input signal level
		  for signal 0
		  for signal 1
			0V ... +5V
			+7,5V ... +30V	

Output current
  for signal 0
  for signal 1
	0,5mA (max.)
	2 A (max. bis 60°C,
	subject to change)			

Output delay	30 µs (typ., without load)	Input delay	50 µs (typ.)	
Max. switching frequency with ohmic load	100 Hz			
Broken wire detection Error diagnostic Potential separation to PLC	no no no			

Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

The function module DIO8Z is a counter module with 6 function channels and 2 fast digital back-readable outputs.

Signal level

Function channels are available in 24V-, 5V- and RS422-versions (to be configured at INSEVIS only).
Bi-directional functions are possible only in 5V- and RS422-versions.

Configuration "up/down counter"

(hardware version 4.0, configuration vers. 1.000)
The function module contains 2 fast forward- and backward counters with alternative interfaces for encoder or pulse and direction signals.
The counter register has a preset- and a reference function.
The encoder interface always quadruples (x4) the number of physical pulses.

Preset and Reset

Counter can be preset in an asynchronous way with any values by the preset function. The new setpoint is written into the setpoint register (for reset write "0") and activated by a bit inside of the control byte.

Homing

The reference (homing-) function sets back the counter in a synchronous way onto an external reference signal (Z-trace).
The homing mode will be started by setting a bit inside of the control byte and keeps active until the reference signal is detected. Then the counter returns into normal operation mode. The appearance of the reference signal can be requested by status bits.

Compare

The compare output will become active when the counter value exceeds the configuren Compare value. To configure the compare value the new value is written into the setpoint register and activated by a bit inside of the controlbyte.
Output 0.3 rsp. 0.7 and the counter compare output are logical xor-ed. Setting the output value bit inverts the compare- output (and vice versa)
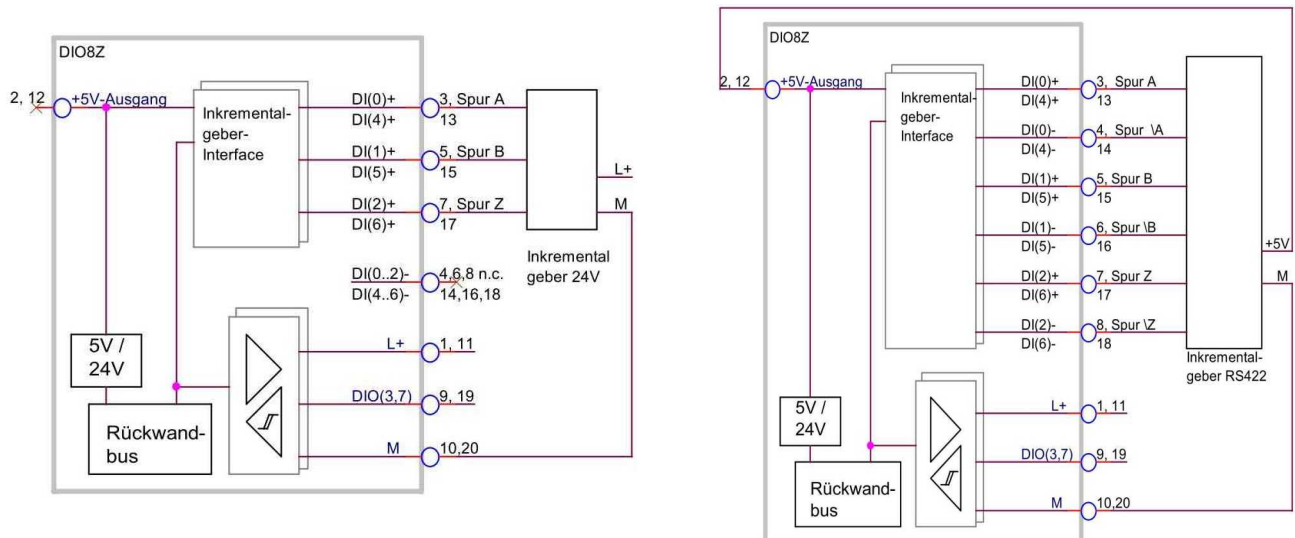
Samples: Block diagrams of DIO8-Z(24V) with 24V-encoders and DIO8-Z(RS422) with RS422-encoders

S7-Data

The 32 bit counters are latched with the read of the less significant byte (LSB) into an mirror register. The remaining bytes are read from there. So it is possible to use byte, word and dword access. Consider to always read the LSB first to get a new and consistent counter value. Due to S7's high endian addressing the physical LSB is read at offset 3 using byte and at offset 2 using word access.
The control byte works static, i.e. the control bits must be set and reset. Consider that the process image will be updated at control point time – wait 1 cycle between set and reset or use direct periphery access.

Setup

The setup für input-mode (inactiv/activ, encoder or pulse/direction), filter time and compare value can be done in the software "ConfigStage". It is also possible to change these value at runtime from S7-code.

Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

Hardware Interrupt (for "-T"-series devises only)
The compare output of each counter is assigned to an alarm channel. Each channel is to be enabled or disabled at runtime by a control bit (offset 11) separately.
In case of enabled channel and active compare output OB40 will be called. While the runtime of OB40 new events of the same channel are ignored.
Parameter OB40_MDL_ADDR of OB40's local data contains the base address of the peripheral modul,
parameter OB40_POINT_ADDR of OB40's local data contains status bits, corresponding the causing channel.
The format of the status bits is identical to the enable bits (.0 counter0, .1 counter1)

Assignment of process image "up/down counter"

The function module uses 12 byte in- and outputs in the process image.

Offset	I/O	Function	Description
0..3	I	Counter 0	32 bit forward and backward counter
	O	Setpoint register counter 0 (Config-, Compare-, Preset-Register)	asynchronous setpoint counter0, operation control bit depended
4..7	I	Counter 1	32 bit forward and backward counter
	O	Setpoint register counter 2 (Config-, Compare-, Preset-Register)	asynchronous setpoint of counter1 operation control bit depended
8	I	Input bits (status bits)	.0 pulse / trace A counter 0 .1 direction / trace B counter 0 .2 trace Z counter 0 .3 input 24V or status output 0.3 .4 pulse / trace A counter 1 .5 direction / trace B counter 1 .6 trace Z counter 1 .7 input 24V or status output 0.7
	O	Output enable bits	.0 - .7 output enable activate output driver of corresponding channel - not allowed when use channel as input - doesn't work at 0.-.2 and .4-.7 in 24V version
9	I	reserved	
	O	Output data bits	.0 - .7 output
10	I	Status byte	.4 reference mode counter 0 .5 reference mode counter 1 '1' reference mode active '0' reference impulse detected and counter resetted Mode 'counting'
	O	Control byte	.0 set preset counter 0 While this bit is 1 the output value from offset 0...3 will be carried over into counter 0. .1 set preset counter 1 While this bit is 1 the output value from offset 4...7 will be carried over into counter 1. .2 set compare value 0 While this bit is 1 the output value from offset 0...3 will be carried over into the compare register of counter 0. .3 set compare value 1 While this bit is 1 the output value from offset 4...7 will be carried over into the compare register of counter 1. .4 enable homing mode counter 1 .5 enable homing mode counter 2 If counter is in homing mode and trace Z is '1', the counter is resetted and the homing mode is left.

Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

Offset	I/O	Function	Description

	O	Control byte	.6 Set Config 0
			.7 Set Config 1
			
			While this bit is 1 the output value from offset 0...3 / 4...7 will be carried over into the configuration register
			   .0 SW-Gate 0=STOP, 1=RUN
			   .1 Mode_INK 0=Puls/Dir, 1=encoder 4x
			   .2 res
			   .3 res.
			   .4 - 5 limit of input bandwith
			                      00 = 500kHz
			                      01 = 30kHz
			                      10 = 8kHz
			                      11 = 2kHz
			   .6 - .15 res.
			   .16 - .31 res.

11	I	Status Alarm enable	State of enabled alarms
	O	Alarm enable	Alarm .0 enable compare counter 0 .1 enable compare counter 1

Description of function pins "up/down counter"

Pin	Identification	Function	Direction
1,11	+24V	common 24V-supply of outputs	Input / supply
2,12	5V(O)	common 5V-outputs to supply the encoders	Output
3	DI/O0+	positive switching input trace A / pulse counter0	Input
4	DI/O0-	negative switching input[1] trace /A counter0	Input
5	DI/O1+	positive switching input trace B / direction counter0	Input
6	DI/O1-	negative switching input[1] trace /B counter0	Input
7	DI/O2+	positive switching input trace Z counter0	Input
8	DI/O2-	negative switching input[1] trace /Z counter0	Input
9	DI/O3+	back-readable output[2] 0.3	In / Out
10,2	0V	common reference potential	Input / supply
13	DI/O4+	positive switching input trace A counter1	Input
14	DI/O4-	negative switching input[1] trace /A counter1	Input
15	DI/O5+	positive switching input trace B counter1	Input
16	DI/O5-	negative switching input[1] trace \B counter1	Input
17	DI/O6+	positive switching input trace Z counter1	Input
18	DI/O6-	negative switching input[1] trace /Z counter1	Input
19	DI/O7+	back readable output[2] 0.7	In / Out

[1] keep pin unconnected at hardware version „24V", optional use in version „5V"
[2] default configuration: input

Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

Description of the status-LEDs configuration "up/down counter"

Pin	Identification	Function
2,12	5V	5V-supply voltage ok
3	DI/O0	State on input .0 pulse / track A counter0
4	DI/O0	Output .0 enabled
5	DI/O1	State on input .1 direction / track B counter0
6	DI/O1	Output .1 enabled
7	DI/O2	State on input .3 track Z counter0
8	DI/O2	Output .2 enabled
9	DI/O3	State on input .3 / back-readable output 0.3
13	DI/O4	State on input .4 pulse / track A counter1
14	DI/O4	Output .4 enabled
15	DI/O5	State on input .5 direction / track B counter1
16	DI/O5	Output .5 enabled
17	DI/O6	State on input .6 track Z counter1
18	DI/O6	Output .6 enabled
19	DI/O7	State on input .7 / back readable output 0.7

Configuration "Frequency and Time measurement"

(hardware version 4.0, configuration version 1.0)
The function module contains 2 fast forward- and backward counters to measure frequency (rsp. revolution speed) or time period

Measure frequency / revolution speed
The counter inputs can be configured as single channel, detecting rising edges or as encoder interface, which quadruples (x4) the number of physical pulses.

Cycle duration / time measurement
The counter measures the time between two rising edges of the pulse input, encoders are treated as single channel. There is no direction detection

Compare
The compare output will become active when the counter value exceeds the configuration Compare value. To configure the compare value the new value is written into the setpoint register and activated by a bit inside of the control byte.
Output 0.3 rsp. 0.7 and the counter compare output are logical xor-ed. Setting the output value bit inverts the compare- output (and vice versa)

S7-Data
The 32 bit counters are latched with the read of the less significant byte (LSB) into an mirror register. The remaining bytes are read from there. So it is possible to use byte, word and dword access. Consider to always read the LSB first to get a new and consistent counter value. Due to S7's high endian addressing the physical LSB is read at offset 3 using byte and at offset 2 using word access.
The control byte works static, i.e. the control bits must be set and reset. Consider that the process image will be updated at control point time – wait 1 cycle between set and reset or use direct periphery access.

Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

Assignment of process image "Frequency and Time measurement"
The function module uses 12 byte in- and outputs in the process image.

Offset	I/O	Function	Description
0..3	I	Counter 0	32 bit forward and backward counter
	O	Setpoint register counter 0 (Config-, Compare-Register)	asynchronous setpoint counter0, operation control bit depended
4..7	I	Counter 1	32 bit forward and backward counter
	O	Setpoint register counter 2 (Config-, Compare-Register)	asynchronous setpoint of counter1 operation control bit depended
8	I	Input bits (status bits)	.0 pulse / trace A counter 0 .1 direction / trace B counter 0 .2 trace Z counter 0 .3 input 24V or status output 0.3 .4 pulse / trace A counter 1 .5 direction / trace B counter 1 .6 trace Z counter 1 .7 input 24V or status output 0.7
	O	Output enable bits	.0 - .7 output enable activate output driver of corresponding channel - not allowed when use channel as input - doesn't work at 0.-.2 and .4-.7 in 24V version
9	I	reserved	
	O	Output data bits	.0 - .7 output

10	I	Status byte	.0 NDR0
			.1 NDR1
			New Data Ready
			  '1' the last read counter value was new
			  '0' no new data (no pulse detected)

	O	Control byte	.0 reset NDR 0
			  While this bit is 1 the NDR0 bit in Status byte will be cleared
			.1 reset NDR 1
			  While this bit is 1 the NDR1 bit in Status byte will be cleared
			.2 set compare value 0
			  While this bit is 1 the output value from offset 0...3
			  will be carried over into the compare register of counter 0.
			.3 set compare value 1
			  While this bit is 1 the output value from offset 4...7
			  will be carried over into the compare register of counter 1.
			.4 res.
			.5 res.
			.6 Set Config 0
			.7 Set Config 1
			  While this bit is 1 the output value from offset 0...3 / 4...7
			  will be carried over into the configuration register
			    .0 SW-Gate 0=STOP, 1=RUN
			    .1 Mode_INK 0=Puls/Dir, 1=encoder 4x
			    .2 Mode_T 0= frequency measurement
			                1= time measurement
			    .3 res.
			    .4 - 5 limit of input bandwith
			           00 = 500kHz
			           01 = 30kHz
			           10 = 8kHz
			           11 = 2kHz
			    .6 - .15 res.
			    .16 - .31 res.

11	I	Res.	
	O	Res.	

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Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

Description of function pins "Frequency and Time measurement"

Pin	Identification	Function	Direction
1,11	+24V	common 24V-supply of outputs	Input / supply
2,12	5V(O)	common 5V-outputs to supply the encoders	Output
3	DI/O0+	positive switching input trace A / pulse counter0	Input
4	DI/O0-	negative switching input[1] trace /A counter0	Input
5	DI/O1+	positive switching input trace B / direction counter0	Input
6	DI/O1-	negative switching input[1] trace /B counter0	Input
7	DI/O2+	positive switching input trace Z counter0	Input
8	DI/O2-	negative switching input[1] trace /Z counter0	Input
9	DI/O3+	back-readable output[2] 0.3	In / Out
10,2	0V	common reference potential	Input / supply
13	DI/O4+	positive switching input trace A counter1	Input
14	DI/O4-	negative switching input[1] trace /A counter1	Input
15	DI/O5+	positive switching input trace B counter1	Input
16	DI/O5-	negative switching input[1] trace \B counter1	Input
17	DI/O6+	positive switching input trace Z counter1	Input
18	DI/O6-	negative switching input[1] trace /Z counter1	Input
19	DI/O7+	back readable output[2] 0.7	In / Out

[1] keep pin unconnected at hardware version „24V", optional use in version „5V"
[2] default configuration: input

Status-LEDs in configuration "Frequency and Time measurement"

Pin	Identification	Function
2,12	5V	5V-supply voltage ok
3	DI/O0	State on input .0 pulse / track A counter0
4	DI/O0	Output .0 enabled
5	DI/O1	State on input .1 direction / track B counter0
6	DI/O1	Output .1 enabled
7	DI/O2	State on input .3 track Z counter0
8	DI/O2	Output .2 enabled
9	DI/O3	State on input .3 / back-readable output 0.3
13	DI/O4	State on input .4 pulse / track A counter1
14	DI/O4	Output .4 enabled
15	DI/O5	State on input .5 direction / track B counter1
16	DI/O5	Output .5 enabled
17	DI/O6	State on input .6 track Z counter1
18	DI/O6	Output .6 enabled
19	DI/O7	State on input .7 / back readable output 0.7

Configuration "Count-up counter or Time measurement"

(hardware version 4.0, configuration ver. 1.0)
The function module contains 6 fast forward-counters. The counter mode can by changed to measure time period.
To measure frequency the PLC's timebase must be used.
For compatibility purposes to other configurations the counters are grouped into 2 channels with 3 counter each.

Count up
The counter inputs are configured as single channel, detecting rising edges with 16 bit.

Cycle duration / time measurement
The counter measures the time between two rising edges of the pulse input in timesteps of 1µs or 250 µs.

Compare
In this configuration are no compare outputs.

Program
The 16 bit counters are latched with the read of the less significant byte (LSB) into an mirror register. The remaining byte is read from there. So it is possible to use byte, word and dword access. Consider to always read the LSB first to get a new and consistent counter value. Due to S7's high endian addressing the physical LSB of a DW is read at offset 3 using byte and at offset 2 using word access.
The payload data of this configuraion are 16 bit words, the counter bytes are arranged this way to get 6 words
(using "L IW")
The bits of the control byte works static, i.e. the control bits must be set and reset. Consider that the process image will be updated at control point time – wait 1 cycle between set and reset or use direct periphery access.

Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

Assignment of process image "Count-up counter or Time measurement"

The function module uses 12 byte in- and outputs in the process image.

Offset	I/O	Function	Description
0..1	I	Channel 0, counter 0	16 bit forward counter or period time
2..3	I	Channel 0, counter 1	16 bit forward counter or period time
0..3	O	Config-register channel 0, counter 0 - 2	configuration data buffer, control bit depended
4..5	I	Channel 1, counter 0	16 bit forward counter or period time
6..7	I	Channel 1, counter 1	16 bit forward counter or period time
4..7	O	Config-register channel 0, counter 0 - 2	configuration data buffer, control bit depended
8	I	Input bits (status bits) or MSB Channel 0, counter 2	.0 state of input channel 0, counter 0 .1 state of input channel 0, counter 1 .2 state of input channel 0, counter 2 .3 input 24V or status output 0.3 .4 state of input channel 1, counter 0 .5 state of input channel 0, counter 1 .6 state of input channel 0, counter 2 .7 input 24V or status output 0.7
	O	Output enable bits	.3, .7 output enable activate output driver of corresponding channel (0.-.2 and .4-.7 ignored)
9	I	reserved or LSB Channel 0, counter 2	
	O	Output data bits	.3, .7 output data (0.-.2 and .4-.7 ignored)
10	I	Status byte or MSB Channel 1, counter 2	

	O	Control byte	.0 resets channel 0, counter 0 - 2
			.1 resets channel 0, counter 0 - 2
			   Writing this bits '1' resets the corresponding counter synchron
			.2 - .5 res.
			.6 Set Config channel 0
			.7 Set Config channel 1
			   Writing this bits '1' the value from offset 0...3 / 4...7
			   will be carried over into the configuration register
			      .0 - .2 Mode counter 0 – 2
			          0=counter, 1=period time count
			      .3 - .5 Timestep (period time count only)
			          0= 250µs, 1=1 µs
			      .6 - .7 limit of input bandwith
			          00 = 500kHz
			          01 = 30kHz
			          10 = 8kHz
			          11 = 2kHz
			      .8 - .11 Interrupt enable input .0 bis .7

11	I	reserved or LSB Channel 1, counter 2	
	O	Mux	.7 Multiplexor input bytes 8 – 11 0= Status 1= counter 2 or 5

Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

Description of function pins "Count-up counter or Time measurement"

Pin	Identification	Function	Direction
1,11	+24V	common 24V-supply of outputs	Input / supply
2,12	5V(O)	common 5V-outputs to supply the encoders	Output
3	DI/O0+	positive switching input pulse channel 0, counter 0	Input
4	DI/O0-	negative switching input[1] pulse channel 0, counter 0	Input
5	DI/O1+	positive switching input pulse channel 0, counter 1	Input
6	DI/O1-	negative switching input[1] pulse channel 0, counter 1	Input
7	DI/O2+	positive switching input pulse channel 0, counter 2	Input
8	DI/O2-	negative switching input[1] pulse channel 0, counter 2	Input
9	DI/O3+	back-readable output[2] 0.4	Output
10,2	0V	common reference potential	Input / supply
13	DI/O4+	positive switching input pulse channel 1, counter 0	Input
14	DI/O4-	negative switching input[1] pulse channel 1, counter 0	Input
15	DI/O5+	positive switching input pulse channel 1, counter 1	Input
16	DI/O5-	negative switching input[1] pulse channel 1, counter 1	Input
17	DI/O6+	positive switching input pulse channel 1, counter 2	Input
18	DI/O6-	negative switching input[1] pulse channel 1, counter 2	Input
19	DI/O7+	back readable output[2] 0.7	Output

[1] keep pin unconnected at hardware version „24V", optional use in version „5V"
[2] default configuration: input

Status-LEDs in configuration " Count-up counter or measurement"

Pin	Identification	Function
2,12	5V	5V-supply voltage ok
3	DI/O0	State on input .0 pulse channel 0, counter 0
4	DI/O0	-
5	DI/O1	State on input .1 pulse channel 0, counter 1
6	DI/O1	-
7	DI/O2	State on input .2 pulse channel 0, counter 2
8	DI/O2	
9	DI/O3	State on input .3 / back-readable output 0.3
13	DI/O4	State on input .4 pulse channel 1, counter 0
14	DI/O4	-
15	DI/O5	State on input .5 pulse channel 1, counter 1
16	DI/O5	-
17	DI/O6	State on input .6 pulse channel 1, counter 2
18	DI/O6	
19	DI/O7	State on input .7 / back readable output 0.7

Configuration „Synchronous Serial Interface"

(hardware version 4.0, configuration version 1.0)
The function module contains 2 Synchronous Serial Interfaces (SSI).

Structure

Each interface contains a configurable clock output, a bit-counter and a data shift register. The shift register includes always 32 bit, the transmission runs „MSB-first", the LSB will be read and shifted shortly before the (next) rising clock edge.
The data register used in S7 will be updated after the last clock.
Due to 5V-/ RS422- level of the clock output this configuration doesn't run in the 24V-version.

Number of bits, clock-frequency, break length

The number of clocks is configurable from 1 to 32. After the clock burst a configurable break from 8 .. 64 µs occurs.
The clock frequency is configurable from 62,5 kHz to 2 MHz.

Special funktions: Gray-Code, Parity, Latch

Optionally a Gray-Code-Decoder can be switched into the data input path.
At every shift event of the register the parity is determined. The state of the parity is mapped into the status register and must be read separately.
The latch offers sampling synchronized to a digital 24V-signal. „Disabled" causes free running continuously sampling, at „High" or „Low" only during High- resp. Low-level. At switching edges the initiated transfer will be completed. Mode „Edge" causes sampling initiated by both edges (rising and falling).

Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

Assignment of process image „Synchronous Serial Interface"

The function module uses 12 byte in- and outputs in the process image.

Offset	I/O	Function	Description
0..3	I	Data interface 0	32 bit data register
	O	Configuration setpoint register 0	asynchronous input of configuration data, s. control bit
4..7	I	Data interface 1	32 Bit Datenregister
	O	Configuration setpoint register 1	asynchronous input of configuration data, s. control bit
8	I	Input bits (status)0 status of clock-output / interface 0 .1 input data / interface 0 .2 status input or output 0.2 .3 24V-input (Latch interface 0) or status output 0.3 .4 status of clock-output / interface 1 .5 input data / interface 1 .6 status input or output 0.6 .7 24V-input (Latch interface 1) or status output 0.7	.0 status of clock-output / interface 0 .1 input data / interface 0 .2 status input or output 0.2 .3 24V-input (Latch interface 0) or status output 0.3 .4 status of clock-output / interface 1 .5 input data / interface 1 .6 status input or output 0.6 .7 24V-input (Latch interface 1) or status output 0.7
	O	Output enable bits	.0 - .7 output enable activate output driver of corresponding channel - .0 and .4 always output (Clock) - .1 and .5 always input (Data)
9	I	reserved	
	O	Output data bits	.0, .1, .4, .5 not connected (SSI signals) .2, .3, .6, .7 outputs
10	I	Status byte	.0 Parity bit interface 0 .1 Parity bit interface 1

	O	Control byte	.0 ... .5 unused
			.6 Set configuration interface 0
			.7 Set configuration interface 1
			   Writing '1' to these bits causes loading the configuration
			   from setpoint register:
			   .0 ... .4 number of bits [1..32] -1
			   .5, .6 reserved
			   .7 0: Dual Code, 1: Gray Code
			   .8, .9 break length
			        0: 64 µs 1: 32 µs, 2: 16 µs, 3: 8 µs
			   .10, .11 Latch
			        0: disabled, 1: high, 2: low, 3: edge
			   .12 ... .14 clock-frequency
			        0:disabled, 1: 62,5 kHz, 2: 125 kHz, 3: 250 kHz
			        4: 500 kHz, 5: 1 MHz, 6: 1,5 MHz, 7: 2 MHz

11	I	reserved	
	O	reserved	

Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

Description of function pins configuration „Synchronous Serial Interface"

Pin	Identification	Function	Direction
1,11	+24V	common 24V-supply of outputs	Input / supply
2,12	5V(O)	common 5V-outputs to supply the encoders	Output
3	DI/O0+	positive switching ouput[1] clock interface 0	Output
4	DI/O0-	negative switching output[1] clock interface 0	Output
5	DI/O1+	positive switching input[1] data interface 0	Input
6	DI/O1-	negative switching input[1] data interface 0	Input
7	DI/O2+	positive switching general input / output[2] 0.2	Input
8	DI/O2-	negative switching general input / output[2] 0.2	Input
9	DI/O3+	back-readable output 24V[2] 0.3	In / Out
10,2	0V	common reference potential	Input / supply
13	DI/O4+	positive switching Ausgang[1] clock interface 1	Output
14	DI/O4-	negative switching Ausgang[1] clock interface 1	Output
15	DI/O5+	positive switching Eingang[1] data interface 1	Input
16	DI/O5-	negative switching Eingang[1] data interface 1	Input
17	DI/O6+	positive switching general input / output[2] 0.6	Input
18	DI/O6-	negative switching general input / ouput[2] 0.6	Input
19	DI/O7+	back-readable output 24V[2] 0.7	In / Out

[1] default configuration, fixed
[2] default: input

Status-LEDs in configuration „Synchronous Serial Interface"

Pin	Identification	Function
2,12	5V	5V-supply voltage ok
3	DI/O0	State of clock-output Interface 0
4	DI/O0	Run: active during SSI-clock burst interface 0
5	DI/O1	State at data input interface 0
6	DI/O1	Output .1 enabled (LED only, no external function due to data input)
7	DI/O2	State at input .2
8	DI/O2	Output .2 enabled
9	DI/O3	State back-readable output .3
13	DI/O4	State of clock-output Interface 1
14	DI/O4	Run: active during SSI-clock burst interface 1
15	DI/O5	State at data input interface 1
16	DI/O5	Output .5 enabled (LED only, no external function due to data input)
17	DI/O6	State at input .6
18	DI/O6	Output .6 enabled
19	DI/O7	State back-readable output .7

Function module DIO8-Z (8 digital in/ -outputs / encoder inputs)

Hints for downloading functions from ConfigStage into DIO8Z

- ConfigStage : Enabling the Download-option in counter configuration extensive data are stored into system data. After successful download into the PLC the configuration will be transferred into the DIO8Z module at the next startup and stored remanent. After this the download-option can be disabled.

- If the system data of the PLC contain the configuration data of DIO8Z ("Download" activated)
  and
  if the DIO8Z contains another configuration,
  and in the next run up (changeover from STOP to RUN) the physical download of the configuration data from the PLC into the DIO8Z is carried out. This download takes about 4 seconds.

⚠ Attention	**During this time the PLC may NOT be switched off** **and** **no new download from ConfigStage into the PLC may be started.**

- After a successful download of the counter configuration the configuration will be kept remanently in the DIO8Z-module after the next run up. Than the download-option can be deactivated.

- Older DIO8Z-version doesn't support configuration by ConfigStage

- In case of configuration error the operation system does following diagnostic buffer entries:

  ```
  Event:              16# BF05
  OB:                 16# 00
  PK:                 16# FF
  DatID 1/2:          16# 00 00
  Add.info    1:      start address of module
              2:      Slotindex (0..10)
              3:      1: „Programming error" - corrupt VME-data or hardware-error
                      2: „no Data" - Download-Option not enabled or SDB missing or corrupt
                      3: Configuration in ConfigStage for old hardware but new hardware detected
                      3: Configuration in ConfigStage for new hardware but old hardware detected
  ```
  The PLC enters always STOP-state.

INSEVIS

Periphery module E-Mess UI (U/I for L1-3, N)

General wiring of E-Mess UI

- compact periphery module for measurement of current, voltage and calculation power and energy for L1, L2, L3

- Measurement of current in neutral wire

- **4 current transformer-pins** (in/out) (I_{L1}, I_{L2}, I_{L3}, I_N, max. 5A

- **Current transformers must be potential separated and may not be grounded. *)**

- **Current transformers may not be wired in idle mode**

- including 8-pin connector with a bolt flange on each side cage clamp contact technology with 2,5mm^2

- **4x voltage contacts** (in- and out) for each of L1, L2, L3. N

- With compact and contact protected 4x2-pin connector with cage clamp 4mm^2(2 pins per wire to combine wiring of multiple modules)

- 4x red / green diagnostic LEDs, one for each phase

  red: error message for Px / N
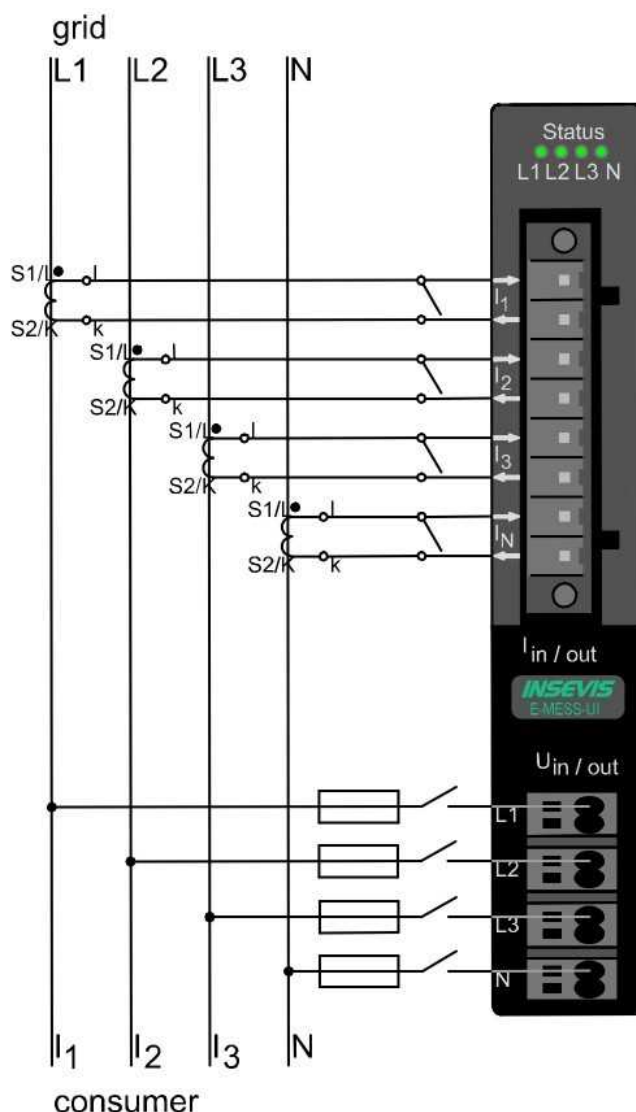 **green:** all values in valid areas

  off: no voltage applied

Figure above: Description and wiring of all connections of E-MESS-UI- module

*) At the connecting of measurement equipment via current transformer to the power circuit following instructions must be followed:
- Secondary circuits of current transformers in low voltage systems may not be grounded, unless the measurement can be done by connecting to ground only.
- In secondary circuits of current transformers interrupting safety guards may not be used.
- Secondary conductors of transformers must be wired in that way, that no active parts can be touched by their isolation or cover, such as no contact with busbars.
- For connecting temporary measurements disconnecting terminals or shortcut clamps shall be provided.
- At the selection of current transformers the load by the secondary conductors (conductor cross section and length) must be considered.

Note:
- To reduce the influence of power resistors to the result of the measurement particularly transformer with a secondary rated current of …/1A shall be used.
- The voltage contact must be protected by short circuit protection equipment.
- The respective DIN VDE 0100-557:2014-10 contains the hint, that secondary circuits of current transformers may not be grounded in the low voltage facilities.

Periphery module E-Mess UI (U/I for L1-3, N)

Technical data PM E-Mess UI

Technical data E-Mess-UI	
Operating temperature range Storage temperature range Dimensions W x H x D (mm) Weight	-20°C ... +60°C (without condens.) -30°C ... +80°C 20 x 108 x 70 mm ca. 150 g
Connection technology	connector with cage clamp for cross sections up to 2,5mm^2 (current) connector with cage clamp for cross sections up to 4mm^2 (voltage)
Load voltage L+	24V DC (10V ... 30V DC, connected by device supply)
Protection class	I
Degree of pollution	2
Power frequency	50 Hz, 60Hz switchable

Voltage measurement	
3-Phase 4-Wire systems with rating voltage (L -N)	Up to 230V eff.
Overvoltage category	300V CAT III
Rated impulse voltage	4kV
Measurement range L-N	Up to max. 350V eff.
Impedance	1 MΩ / Phase
Resolution	0,1 V
Measurement precision (typ.)	0,5%
Sampling frequency	8 kHz

Curren measurement	
Rated current	1 / 5 A
Measurement range	0 - 6 A eff.
Impedance	14 mΩ
Resolution	0,1 A
Measurement precision (typ.)	0,5%
Sampling frequency	8 kHz

E-Mess topology – E-Mess- module integration
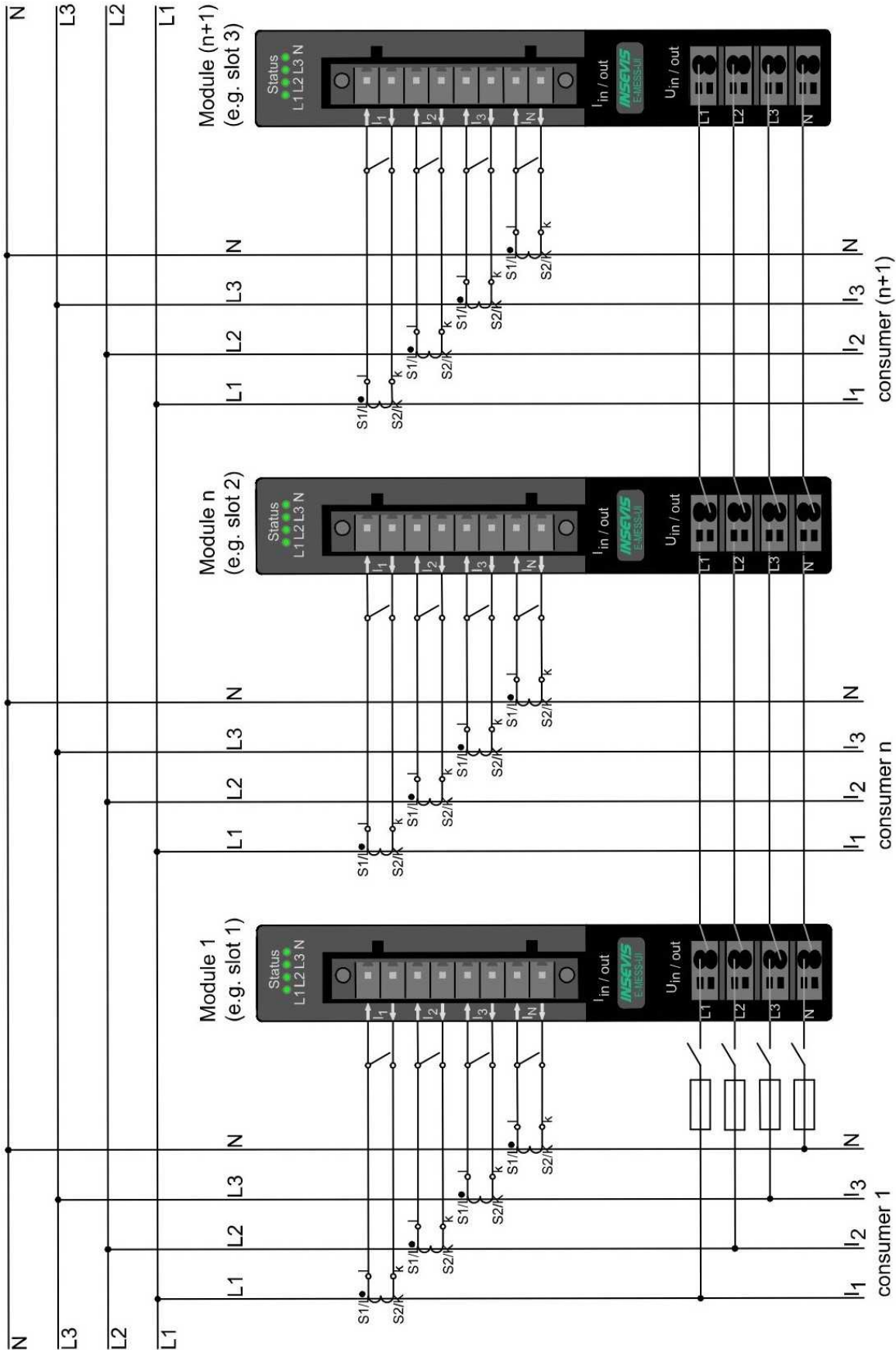
E-Mess sample topology – system net

e.g. CC311V with max. 11x E-Mess-UI

S7-Main-CPU
with n x E-Mess UI
(each for 1 consumer)

Ethernet

CANopen

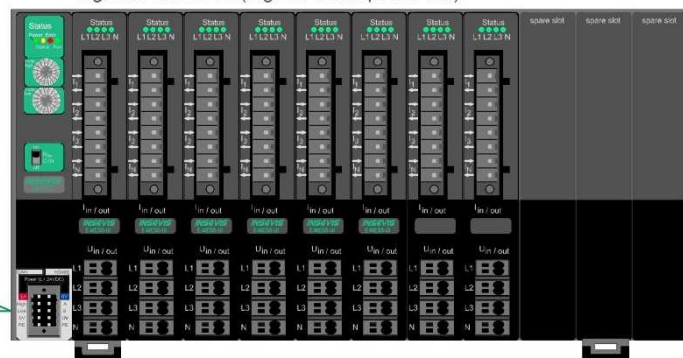e.g. 8x E-Mess-UI (e.g. on a 2nd power rail)

Extension 1
with n x E-Mess UI
(each for 1 consumer)

CANopen

e.g. 6x E-Mess-UI (e.g. on a 3rd power rail)

Extension 2
with n x E-Mess UI
(each for 1 consumer)
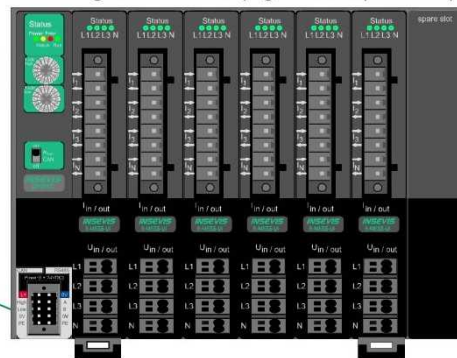
Panel-HMI
7" (optional)

Ethernet

Ethernet

RemoteStage
always possible

(max. length between CPU and extension 30m, no separated potential!)

PM E-Mess-UI process data

The module occupies onboard 128 Byte in- and outputs in process image, only the lower 64 Byte of the input image will be synchronized with the process image at control point. The other process data are respective to the assignment accessable by direct periphery access.

As decentral periphery only the lower 64 Byte of the input process data will be transferred. Use SDO to access output data as well as input data on byte offset 64-128.

Process image inputs

(in process image as far length of process image is configured properly:)

Offset	Function	Format	Unit
0	Voltage L1	uint16	$0,1V_{eff}$
2	Voltage L2	uint16	$0,1V_{eff}$
4	Voltage L3	uint16	$0,1V_{eff}$
6	Net frequenca	uint16	0,01 Hz
8	Current L1	uint16	$0,1 A_{eff}$
10	Current L2	uint16	$0,1 A_{eff}$
12	Current L3	uint16	$0,1 A_{eff}$
14	Current N	uint16	$0,1 A_{eff}$
16	Effective power L1	int16	0,1 W
18	Effective power L2	int16	0,1 W
20	Effective power L3	int16	0,1 W
22	Apparent power L1	int16	0,1 VA
24	Apparent power L2	int16	0,1 VA
26	Apparent power L3	int16	0,1 VA
28	Power factor (cos ϕ) L1	int16	$0,1\% (10^{-3})$
30	Power factor (cos ϕ) L2	int16	$0,1\% (10^{-3})$
32	Power factor (cos ϕ) L3	int16	$0,1\% (10^{-3})$
34	Phase angle L1	int16	0,1°
36	Phase angle L2	int16	0,1°
38	Phase angle L3	int16	0,1°
40	Active energy L1	int32	0,1 kWh
44	Active energy L2	int32	0,1 kWh
48	Active energy L3	int32	0,1 kWh
52	Apparent energy L1	uint32	0,1 kVAh
56	Apparent energy L2	uint32	0,1 kVAh
60	Apparent energy L3	uint32	0,1 kVAh

Process image inputs

(only by direct periphery access:)

Offset	Function	Format	Unit
64...79	Reserved		
80	Tunnel state	uint16	
82	Tunnel ADE-register address	uint16	
84	Tunnel ADE-register data	uint16 / uint32	
88..95	Reserved		

96	Diagnostics / Condition bits
	(set by EMESS, cleared by reading L PEW)
	.0 Overcurrent L1
	.1 L2
	.2 L3
	.3 Overvoltage L1
	.4 L2
	.5 L3
	.6 Undervoltage L1
	.7 L2
	.8 L3
	.9 Res.
	.10 Res.
	.11 Net frequency 0: 50Hz / 1:60 Hz
	.12 Res.
	.13 Phasing wrong
	.14 Res.
	.15 Data invalid:(compare with A96.15:
	    if similar = setup ok
	    if unsimilar = setup running
		uint16	0,1 A_{eff}

98	Threshold overcurrent	uint16	0,1 A_{eff}
100	Threshold overvoltage	uint16	0,1 V_{eff}
102	Threshold undervoltage	int16	0,1 V_{eff}
104	Current transformer- transfer factor primary current	int16	
106	Current transformer- transfer factor secondary current	int16	
108	Current transformer- error correction transfer factor L1	int16	0,1% (10^{-3})
110	Current transformer- error correction transfer factor L2	int16	0,1% (10^{-3})
112	Current transformer- error correction transfer factor L3	int16	0,1% (10^{-3})
114	Current transformer- error correction transfer factor N	int16	0,1% (10^{-3})
116	Current transformer- error correction phase angle L1	int16	°min
118	Current transformer- error correction phase angle L2	int16	°min
120	Current transformer- error correction phase angle L3	int16	°min
122	Reserved (internal use)	uint16	
124	Reserved (internal use)	uint16	
126	Reserved (internal use)	uint16	

Process image outputs

(only by direct periphery access:)

Offset	Function	Format	Unit
0-38	Reserved		
40	Active energy L1	int32	0,1 kWh
44	Active energy L2	int32	0,1 kWh
48	Active energy L3	int32	0,1 kWh
52	Apparent energy L1	uint32	0,1 kVAh
56	Apparent energy L2	uint32	0,1 kVAh
60	Apparent energy L3	uint32	0,1 kVAh
64...79	Reserved		
80	Tunnel Command	uint16	
82	Tunnel ADE-register address	uint16	
84	Tunnel ADE-register data	uint16 / uint32	
88..95	Reserved		
96	Control bits: .0 ... .10 Res. .11 Net frequency 0:50 / 1:60 Hz .12 ... .14 Res. .15 Setup -requirement (Bit toggeling) after writing of setup data in offset 98..120	uint16	
98	Threshold overcurrent	uint16	0,1 A_{eff}
100	Threshold overvoltage	uint16	0,1 V_{eff}
102	Threshold undervoltage	int16	0,1 V_{eff}
104	Current transformer- transfer factor primary current	int16	
106	Current transformer- transfer factor secondary current	int16	
108	Current transformer- error correction transfer factor L1	int16	0,1% (10^{-3})
110	Current transformer- error correction transfer factor L2	int16	0,1% (10^{-3})
112	Current transformer- error correction transfer factor L3	int16	0,1% (10^{-3})
114	Current transformer- error correction transfer factor N	int16	0,1% (10^{-3})
116	Current transformer- error correction phase angle L1	int16	°min
118	Current transformer- error correction phase angle L2	int16	°min
120	Current transformer- error correction phase angle L3	int16	°min
122	Reserved (internal use)	uint16	
124	Reserved (internal use)	uint16	
126	Reserved (internal use)	uint16	

INSEVIS

Zertifiziert nach DIN EN ISO 9001:2015