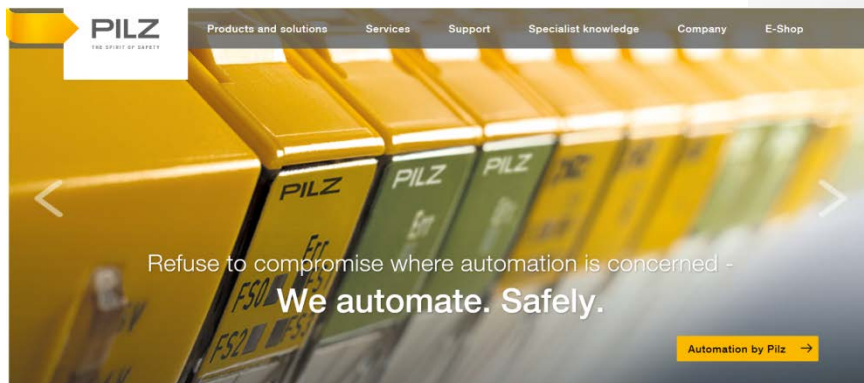


# Pilz Automation on Tour 2016

*PSS4000 - PASvisu*

**PILZ**  
THE SPIRIT OF SAFETY

**AUTOMATION**  
**ON TOUR**  
with Pilz



The automation system PSS4000

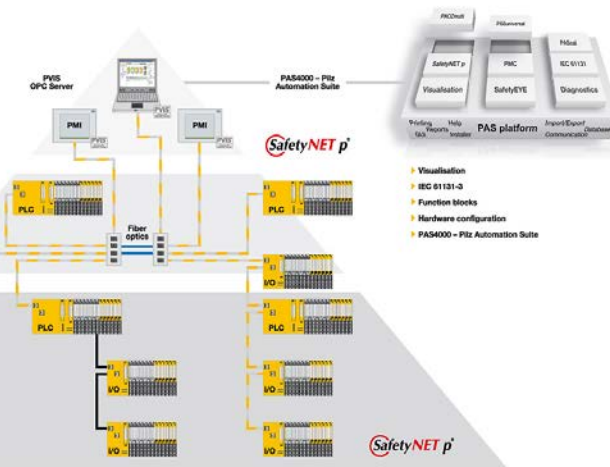
PASvisu , the web-based visualisation software

Functions and applications (analogue , speed control , FS/ST)

Project demo – PAS4000 & PASvisu



# ► Automation system PSS 4000



Automation system PSS 4000 =

- **Hardware** components
- **Software** components
- Real-time Ethernet : **SafetyNET p**
- **Network** components
- Various **functions** / **applications**
- **Visualisation** with PASvisu
- **Diagnostics**
- **Standard and Safety**

# ▶ Automation system PSS 4000

## The system

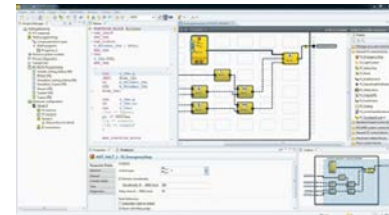
### PSS 4000 is a... SAFETY CONTROLLER

- ▶ **Small** size: terminal block style – used for de-centralized installations
- ▶ **Flexibility**: full variety of function calls (bit, word, integer, structs ,... operations)



### PSS 4000 is an... AUTOMATION CONTROLLER

- ▶ Same **programming** for **safety and ST-automation** (IEC 61131-3) in one tool
- ▶ Same **declaration**, same variables, same devices, same network
- ▶ **Hardware independent** workflow: first program - then select device
- ▶ **Open** system: different industrial communication protocols



### PSS 4000 is ... SAFETYNET P

- ▶ Flexibility, robustness, long distances, wireless, fiber optics
- ▶ Using existing ETH-infrastructure, coexistence with other protocols



# ▶ Automation system PSS 4000

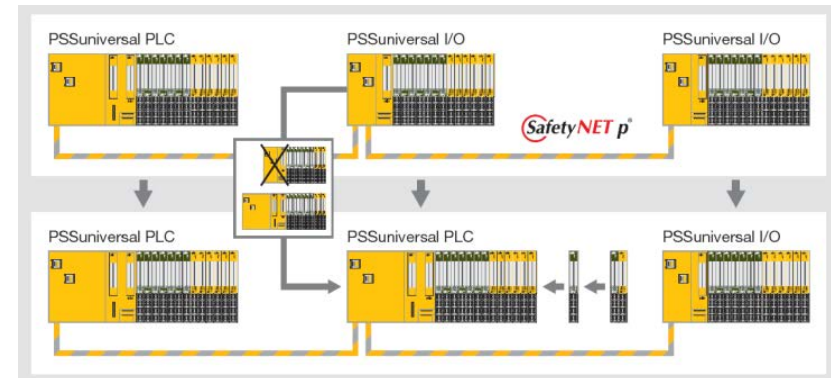
## The system

**PSS 4000 is a...** REDEFINING DECENTRALISATION

DISTRIBUTED ARCHITECTURE WITH A CENTRALIZED VIEW

### ▶ Central editing

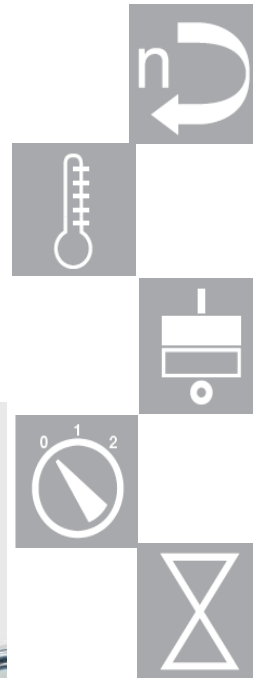
- ▶ PAS4000 tool : **Centralised** programming, configuration & parameter settings
- ▶ **Distributed** runtime system
- ▶ **Data exchange** takes place automatically
- ▶ No additional engineering to establish **communication** links between PLC's
- ▶ One common **datapool**, available for all PLC's



# ▶ Automation system PSS 4000

## Hardware – PSSuniversal PLC

- ▶ **9 tasks** in Standard & Safety
- ▶ Programming **independent** from hardware (**I/O mapping**)
- ▶ **Special** applications
  - ▶ approval for Railway ('-R')
  - ▶ extended temperature '-T' (-40 ... + 70°C)
- ▶ Various **ST** and **FS** electronic modules
  - ▶ digital, analogue, communication, counters, ...
- ▶ Different **fieldbus** connections :
  - ▶ Modbus TCP , UDP Raw , Profibus, Profinet
  - ▶ Ethernet/IP, OPC



# ► Automation system PSS 4000

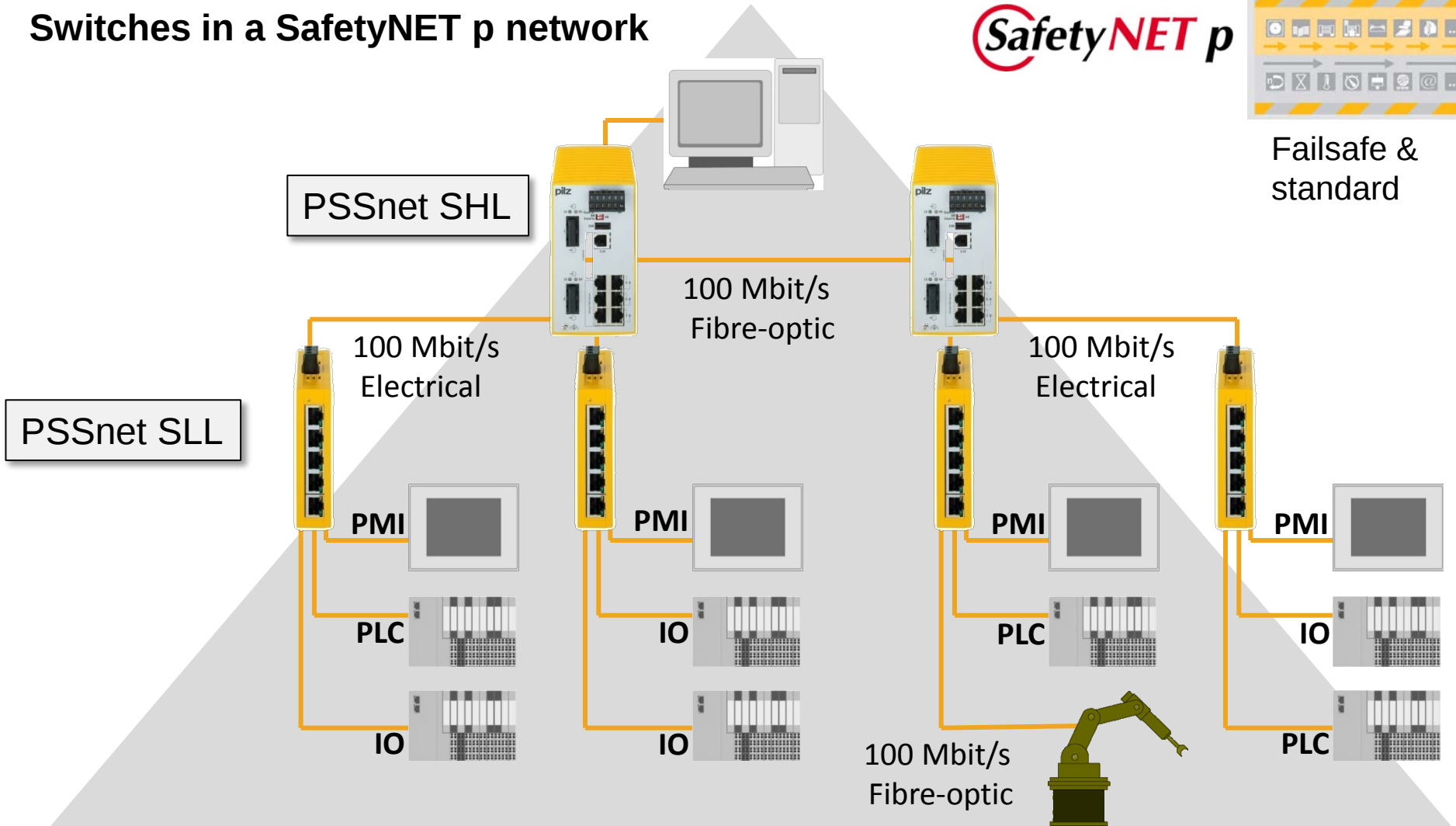
Real-time Ethernet SafetyNET p / Network components

## Switches in a SafetyNET p network

**SafetyNET p**



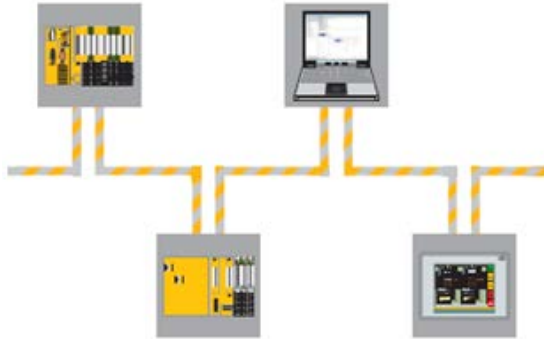
Failsafe & standard



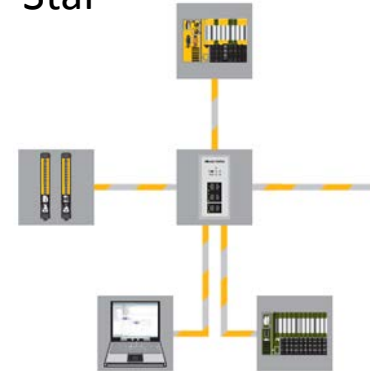
# ► Automation system PSS 4000

## Real-time Ethernet SafetyNET p / Network topologies

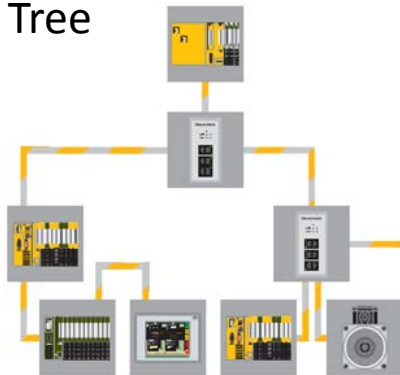
Linear



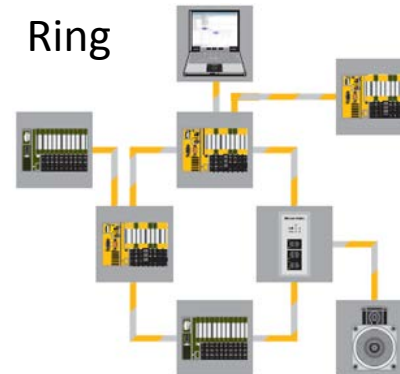
Star



Tree



Ring



Parallel Redundancy Protocol

# ► Automation system PSS 4000

## Software - PAS4000 tool

- One **common data-pool** for the **whole** project
  - **Multiple** data input is avoided
  - all **blocks** for **ST and FS** functions **included**
  - IEC 61131 and PASmulti programming
  - Approved **software blocks** for all kinds of functions
  - Easy data exchange between resources

Overview of PAS4000



```
VAR
VAR 1      : BOOL           ; // Boolean           ( 1 bit )
VAR 2      : BYTE           ; // Byte           ( 8 bit)
VAR 3      : WORD           ; // Word           ( 16 bit)
VAR 4      : DWORD          ; // Double Word    ( 32 bit)

VAR 5      : INT            ; // Integer        -32.768      ... +32.767
VAR 7      : DINT           ; // Double Integer -2.147.483.648 ... +2.147.483.647
VAR 6      : SINT           ; // Short Integer  -128      ... +127

VAR 9      : USINT          ; // Unsigned Short Integer  0 ... 255
VAR 8      : UINT           ; // Unsigned Integer   0 .. 65.535
VAR 10     : UDINT          ; // Unsigned Double Integer 0 ... 4.294.967.295

VAR 11     : ARRAY[0..100] OF BOOL ; // Array of ....

END_VAR
```

**DEMO**

```
DDT1 x
TYPE
  DDT1:
    STRUCT
      START      : BOOL      ; // Start condition
      SAFE_OK     : SAFEBOOL  ; // SAFE conditions OK
      SPEED_REF   : SAFEINT   ; // SPEED reference
      SPEED_ACTUAL: UDINT     ; // Actual speed machine
      DIAGNOSIS   : WORD      ; // Diagnostic information
    END_STRUCT;
END_TYPE
```

# ► Automation system PSS 4000

## Software - PAS4000 tool



**PILZ**  
THE SPIRIT OF SAFETY

PLC programming - editors in accordance with  
**EN/IEC 61131-3** (PSSu PLC)

- **PAS IL** (Instruction List)
  - Low-level language, but efficient
  - Compare with Assembler
- **PAS STL** (Structured Text)
  - High-level language
  - Comparable with Pascal
- **PAS LD** (Ladder Diagram)
  - graphical editor
  - Similar to connection scheme

Program Editor **PASmulti**

- Very simple, understandable and intuitive block-structured language

the editors can be combined **for standard and safety functions**

PAS IL (Instruction List)

PAS STL (Structured Text)

PAS LD (Ladder Diagram)

PASmulti Editor

# ▶ Automation system PSS 4000

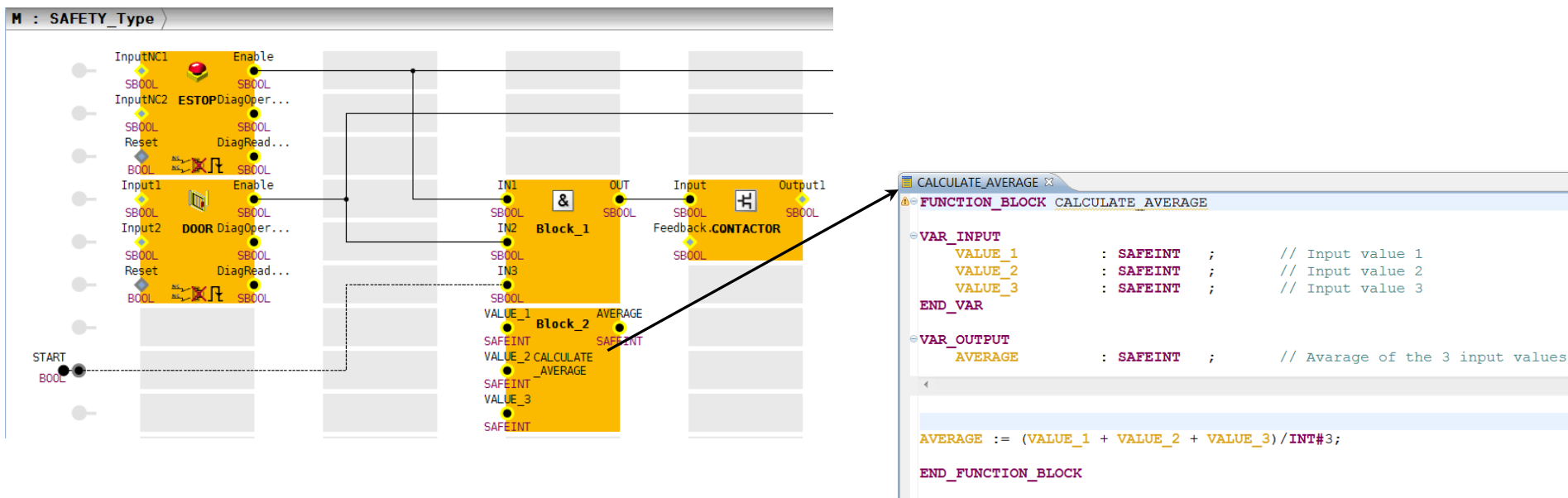
Software - PAS4000 tool



**PILZ**  
THE SPIRIT OF SAFETY

## Program Editor PASmulti

- ▶ Mouse is used for **wiring** – inputs/outputs can be freely configured and linked through logic elements
- ▶ Simple **combination** of **PASmulti** and the **PLC programming languages** (EN/IEC 61131-3)
- ▶ **Standard** and **Safety** in one system
- ▶ Comprehensive **library** of failsafe and standard blocks

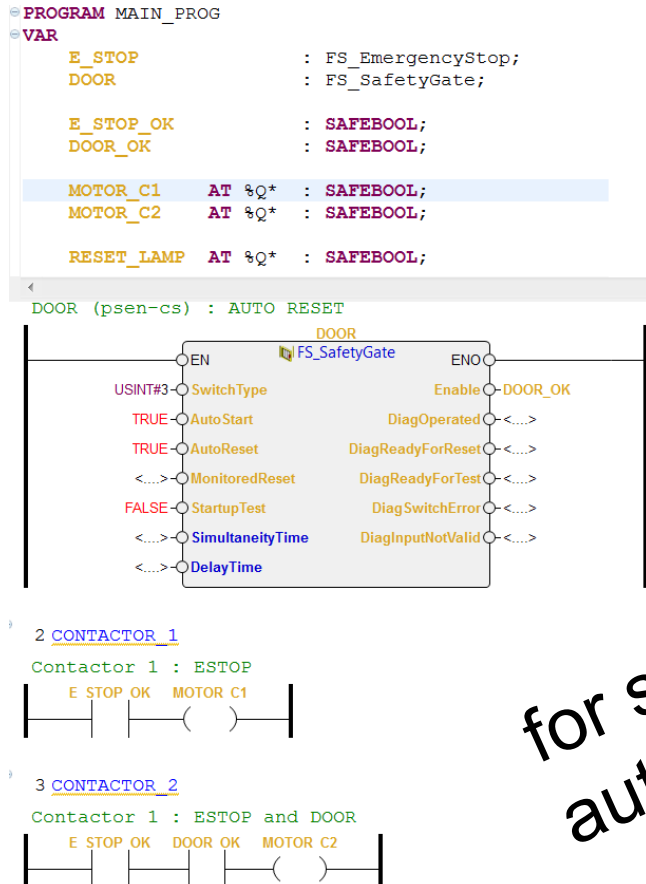


# ► Automation system PSS 4000

Software - PAS4000 tool



## PAS LD (Ladder Diagram)



for safety and automation

## PAS STL (Structured Text Language)

```
FUNCTION_BLOCK SPEED_REGULATOR

VAR_INPUT
  MAX_SPEED      : DINT ;           // SPEED from HMI : 0 .. 100 %
  DELAY_TIME     : INT  ;
  START          : BOOL  ;
  SHUT_DOWN      : BOOL  ;
END_VAR

VAR_OUTPUT
  SPEED          : DINT ;
  SPEED_CALC_PROC : DINT ;
END_VAR

T1( IN := NOT T2.Q AND SHUT_DOWN, PT:= T#40ms );
T2( IN := T1.Q, PT := T#40ms );

RE_T1( CLK := T1.Q );
RE_SHUTDOWN( CLK := SHUT_DOWN );

IF START AND NOT SHUT_DOWN THEN SPEED_CALC:=MAX_SPEED*INT#1000;END_IF;
IF RE_SHUTDOWN.Q THEN SPEED_CALC := MAX_SPEED * DINT#1000 ; END_IF;

IF RE_SHUTDOWN.Q AND (DELAY_TIME > 0 )
  THEN SPEED_STEP := SPEED_CALC / (DELAY_TIME *INT#10);
END_IF;
```

# ► Automation system PSS 4000

## Software - PAS4000 tool



### Software blocks

- Comprehensive **library** of ready-made failsafe and standard blocks

- Projects are organized and structured by function

- Blocks

- Change

```

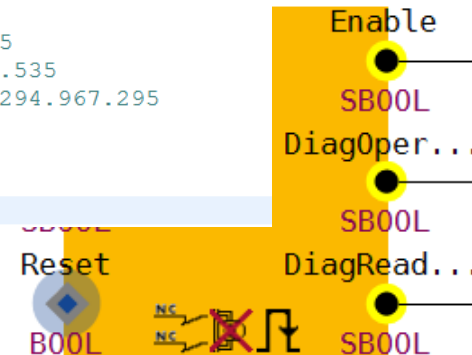
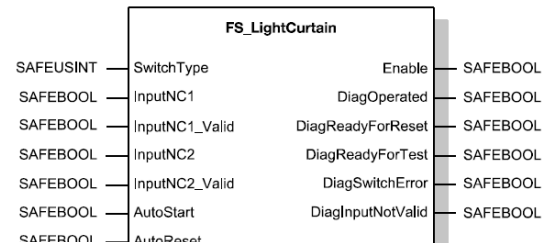
VAR
VAR 1      : BOOL      ; // Boolean      ( 1 bit )
VAR 2      : BYTE      ; // Byte        ( 8 bit)
VAR 3      : WORD      ; // Word        ( 16 bit)
VAR 4      : DWORD     ; // Double Word ( 32 bit)

VAR 5      : INT       ; // Integer      -32.768 ... +32.767
VAR 7      : DINT      ; // Double Integer -2.147.483.648 ... +2.147.483.647
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VAR 9      : USINT     ; // Unsigned Short Integer 0 ... 255
VAR 8      : UINT      ; // Unsigned Integer 0 .. 65.535
VAR 10     : UDINT     ; // Unsigned Double Integer 0 ... 4.294.967.295

VAR 11     : ARRAY[0..100] OF BOOL ; // Array of ....
    
```

END\_VAR



### Zugelassene Fail-Safe-Funktionsbausteine / Approved fail-safe function blocks

| Name             | Funktion/Function                                 | Vers. | CRC  | Datum/Date (Last Modif.) | Prüfbericht Testreport | Sicherheitsmerkmal / Safety feature |
|------------------|---------------------------------------------------|-------|------|--------------------------|------------------------|-------------------------------------|
| FS_EmergencyStop | Not-Halt-Überwachung<br>Emergency stop monitoring | V1.0  | 2FD1 | 28.10.2009               | PO82833T               | SIL3<br>PL e                        |
| FS_SafetyGate    | Schutztür-Überwachung<br>Safety gate monitoring   | V1.0  | C128 | 28.10.2009               | PO82833T               | SIL3<br>PL e                        |

# ▶ Automation system PSS 4000

## PAS4000 - Demo

Tool properties

Programming languages

Assigning and modifying tasks

IO mapping



# ► Agenda

The automation system PSS4000

PASvisu , the web-based visualisation software

Functions and applications (analogue , speed control , FS/ST)

Project demo – PAS4000 & PASvisu



# ► Automation system PSS 4000

## Structure of PASvisu



Projekterstellung mit dem PASvisu Builder



PASvisu PC Runtime  
under Windows 7



PASvisu PMI Runtime



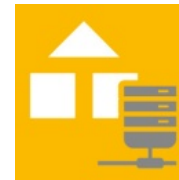
### **PASvisu Builder**

HTML5-based tool for simple, efficient project creation



### **PASvisu PC Runtime**

Runtime for visualisation projects running under WINDOWS 7

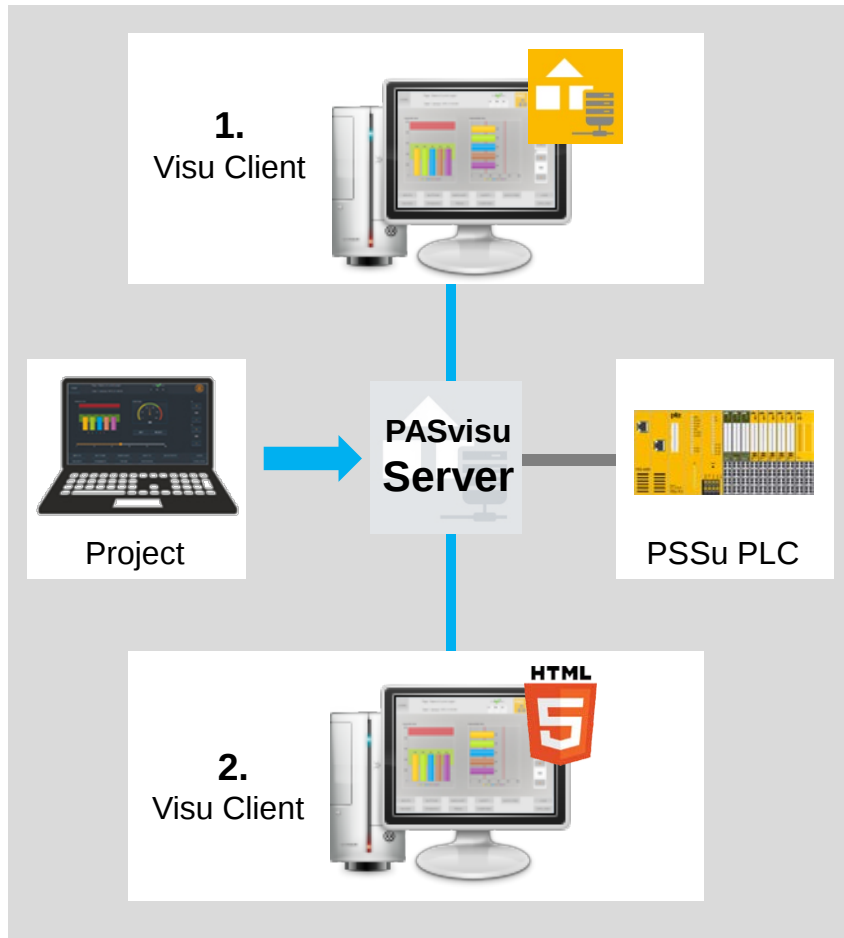


### **PASvisu PMI Runtime**

Runtime for visualisation projects running under WINDOWS Embedded Compact 7

# ► Automation system PSS 4000

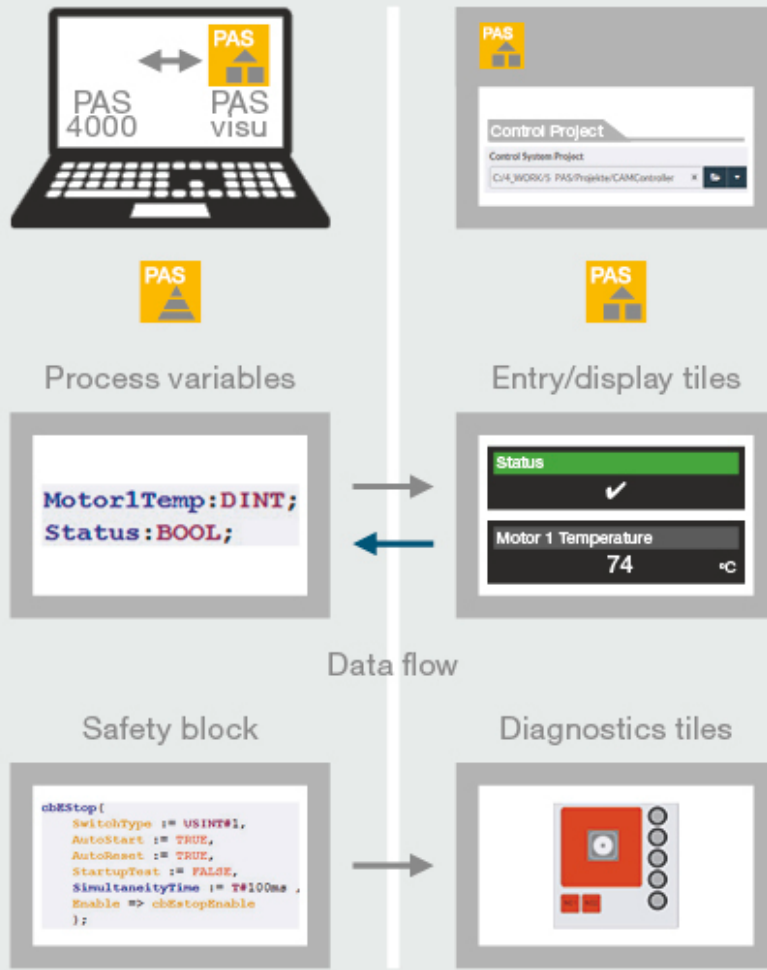
## Workflow of PASvisu



- The PASvisu Server makes the HTML pages available to display to the Visu Clients.
- The visualisation is displayed on a PC based system:
  - ➔ 1. in the PASvisu Viewer (Pilz)
  - ➔ 2. in a HTML 5-compatible web browser.

# ► Automation system PSS 4000

## Project creation with PASvisu Builder



- One-off **linking** of the PASvisu controller
  - Controlling and visualisation are **permanently synchronised**
  - **All the variables** of the controller are transferred
  - All the configured (**safety**) **blocks** can be selected as an instance in PASvisu Builder
  - All the **process data** are visible at any time
-  ► Save time during engineering  
► No error sources



# Automation system PSS 4000

## Project creation with PASvisu Builder

**PASvisu Builder - PASvisu\_Builder**

Project Edit Target Tools Window Licensing Help

**Pages**

- 101\_HOME
- 102\_INPUTS
- 103\_GAUGES
- 104\_BUTTONS
- 105\_DYNAMICS
- 106\_BARCHART**
- 107\_TRENDGRAPH
- 108\_0\_SAFETY
- 108\_1\_SAFETY\_BLOCKS
- 108\_2\_DIAGNOSTIC\_LIST
- 108\_3\_DIAGNOSTIC\_LOG
- 108\_4\_PSS4000\_STATUS
- 109\_OVERVIEW
- 110\_DATATYPES
- 111\_LOGO
- 112\_LOGO\_DYN
- 113\_PIECE\_COUNTER

**Page templates**

- Back

**106\_BARCHART**

Page: <Name of current page>

Date: 1 January 1970, 01:00:00

No Safety Problem

Err. War. Info

sunFactory

**Vertical Bar Chart**

**Radial Gauge**

V4

500

V5

500

SET RESET

0 20 40 60 80 100

INPUTS BUTTONS BARCHART SAFETY DATATYPES LOGO

GAUGES DYNAMICS TREND OVERVIEW DYN LOGO

**Properties**

**Linear/radial gauge**

Title title: Radial Gauge

Variant: Radial gauge

Linear display type: Bar

Data item: visu gauges

Display scale: Yes, calculated automatically

Display ranges

| Colour  | Range start | Range end |
|---------|-------------|-----------|
| #ff200  | 0           | 40        |
| #b5e61d | 40          | 70        |
| #ed1c24 | 70          | 100       |

Display current value numerically: Yes

**Project-wide properties**

Style sheet: Dark 2

Page size: 1280 x 800

**Problems**

Description

<Filter text>

The tile property "\_\_elementName\_\_" must be configured.

The tile property "\_\_elementName\_\_" must be configured.

The tile property "\_\_elementName\_\_" must be configured.

The tile property "\_\_elementName\_\_" must be configured.

The tile property "\_\_elementName\_\_" must be configured.

Source

<Filter text>

112\_LOGO\_DYN → Copy\_of\_ButtonTile\_1

111\_LOGO → ButtonTile\_1

111\_LOGO → Copy\_of\_ButtonTile\_1\_1

111\_LOGO → Copy\_of\_ButtonTile\_1\_2

111\_LOGO → Copy\_of\_ButtonTile\_1\_3

Controller project: cbDemoKofler

PASvisu a1.0.4 -Branch origin/develop [a24ddb] - Build PC-VISU Develop 1225 ALPHA DEV RELEASE

# ► Automation system PSS 4000

## PASvisu – your automation at glance

Fast, safe automation

---

Platform independent

---

Current web technologies



HTML5 : The core technology language of the **Internet**



**JAVE Script** : **Dynamic Script** language in Web browsers



Cacading Style Sheet 3 : Web Browser **stylesheet** language with separation of content and appearance

PASvisu for all phases of the machine lifecycle

---

Control and visualisation project optimally linked

---

Remote access with true client/server functionality



# ► Automation system PSS 4000

## PASvisu – first steps – project creation

- Direct link to the **PSS4000 project** : all project-variables can be accessed

The screenshot displays the PASvisu software interface. At the top, there is a yellow menu bar with the following options: Project, Edit, Target, Tools, Modules, Licensing, and Help. Below the menu bar is a toolbar with icons for file operations. The main window is divided into two tabs: 'Project information' (selected) and 'Licence calculation'. Under the 'Project information' tab, the 'General' section is visible. It contains the following fields:

- Project name:** SALES\_DEMO\_PASVISU
- Controller project:** D:\PAS4000\_Programme\PAS4000\_Projects\_Version\_1\_1\SALES\_DEMO\_PASVISU (This field is highlighted with an orange box)
- Display unit:** PC
- Page size:** 1680 x 1050

# ► Automation system PSS 4000

## PASvisu – first steps – project style

► Select the desired **style**

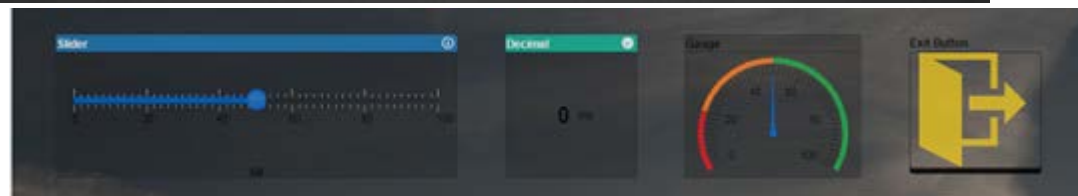
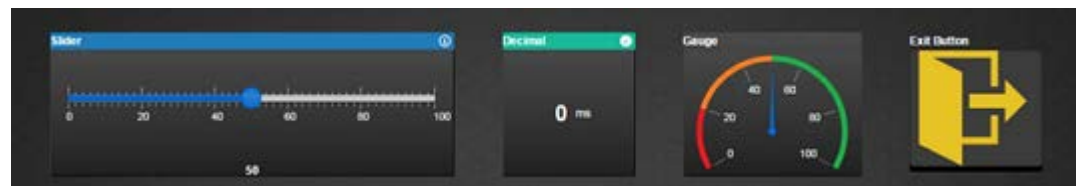
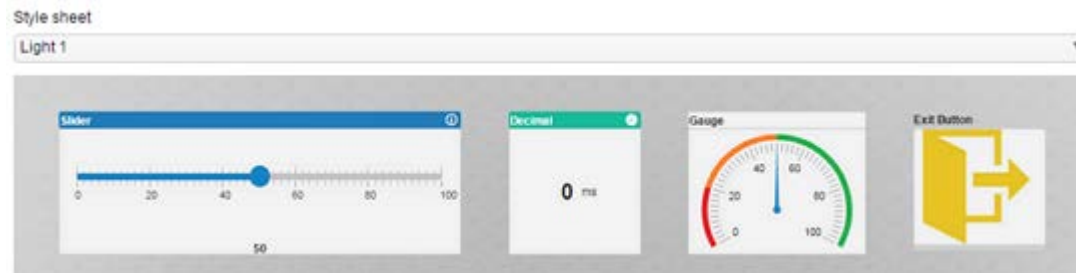
**Project-wide properties**

Style sheet  
Dark 1

Display unit  
PC

Page size  
1680 x 1050

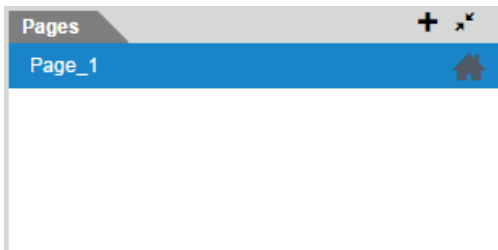
Project language  
English



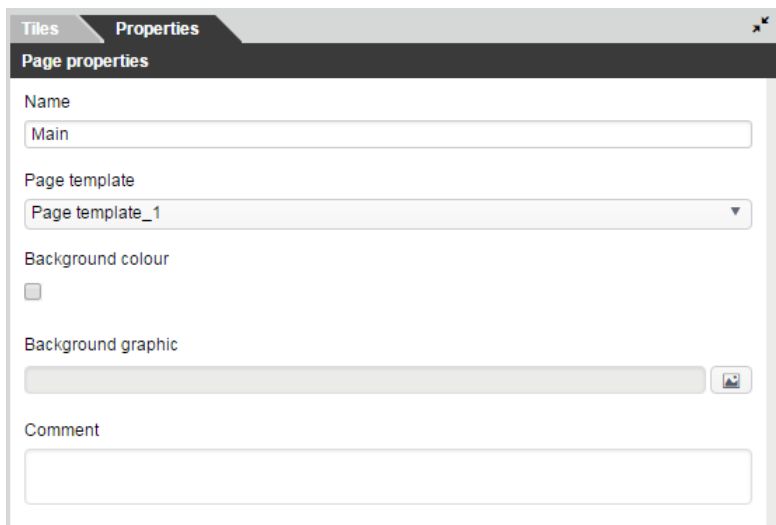
# ▶ Automation system PSS 4000

## PASvisu – first steps – pages, templates

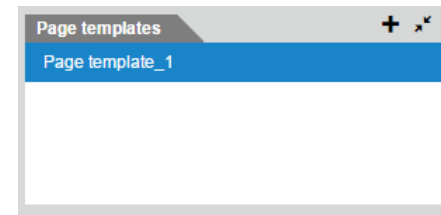
### ▶ Adding a **page**



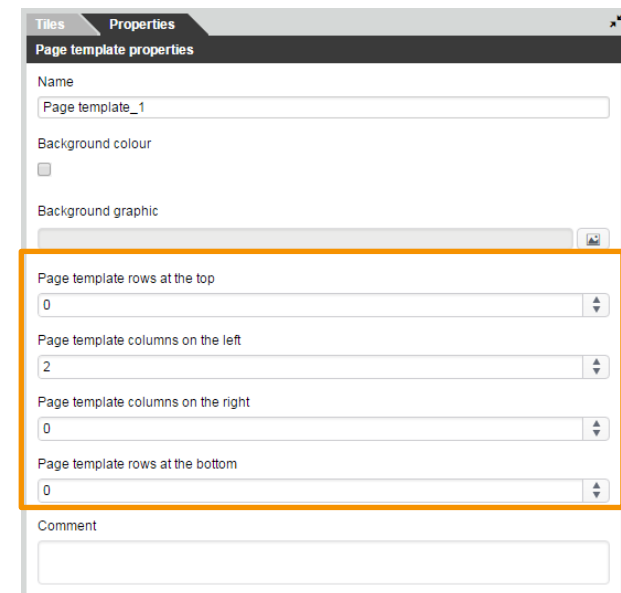
### ▶ Change the **name** of the page



### ▶ Open/make a **template**



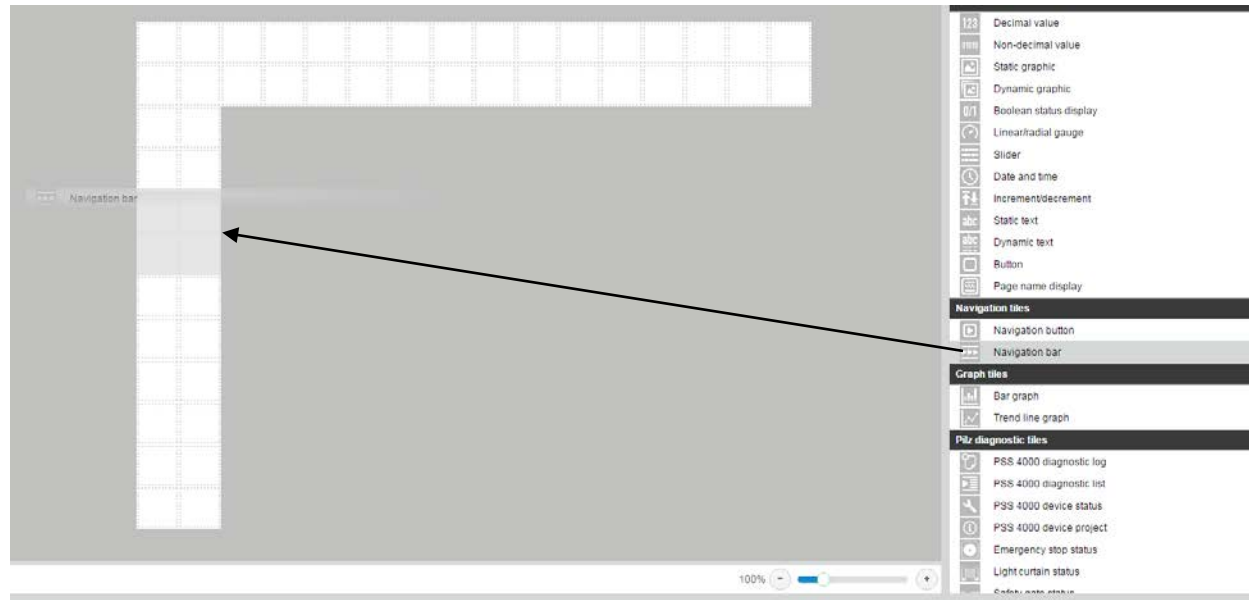
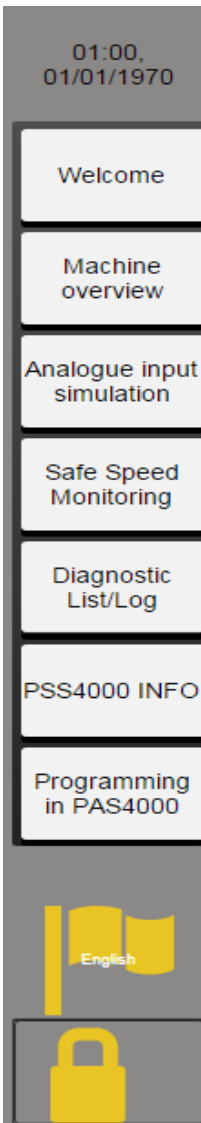
- ▶ Change **template-size** (= columns /rows)
- ▶ Make more templates if necessary



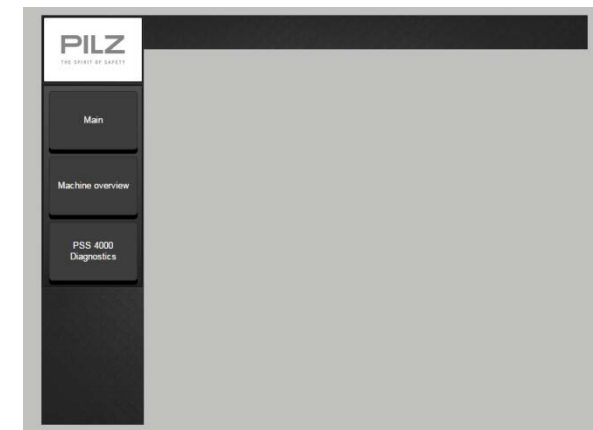
# ► Automation system PSS 4000

## PASvisu – template - navigation bar

### ► Create your own navigation bar



See demoproject



# ► Automation system PSS 4000

## PASvisu – create PASvisu variables

### PSS4000 project variables

editor Variable editor User management

Namespace/address space

- Multi programming
  - MAIN\_PAS\_MULTI
    - Blink\_1 : blink
    - MACHINE\_1\_CONTACTOR : contactor
    - MACHINE\_1\_SAFETY : safety
      - Block\_1 : and
      - DOOR : FS\_SAFETYGATE
      - ESTOP : FS\_EMERGENCYSTOP**
      - Lamp\_ON : or
      - Operated : or
      - RFR\_Blink : and
      - Ready\_Reset : or
      - Blink : BOOLEAN
      - LAMP\_FBL : BOOLEAN
      - ESTOP\_OK : BOOLEAN
      - ESTOP\_DOOR\_OK : BOOLEAN
      - SAFETY\_OK : BOOLEAN
      - LAMP\_RESET : BOOLEAN
- IEC 61131 programming
  - main\_iec
  - main\_speed
  - analog
- Resource global variables
- Network
- Diagnostics

### PAS visu variables

| Visu variables                        |                                       |                  | System variables |
|---------------------------------------|---------------------------------------|------------------|------------------|
| New variable                          |                                       |                  | Delete           |
| Visu variable                         | Namespace element/address             | Data type        |                  |
| <Filter text>                         | <Filter text>                         | <Filter text>    |                  |
| MAIN_PAS_MULTI.MACHINE_1_SAFETY.ESTOP | MAIN_PAS_MULTI.MACHINE_1_SAFETY.ESTOP | FS_EMERGENCYSTOP |                  |

- **All variables** (FS & ST) of the PSS program can be accessed
- Variables in the **ST-program** can be written

# ► Automation system PSS 4000

## PASvisu – tiles

**Basic tiles**

- 123 Decimal value
- 01010 Non-decimal value
- Static graphic
- Dynamic graphic
- 0/1 Boolean status display
- Linear/radial gauge
- Slider
- Date and time
- Increment/decrement
- Static text
- Dynamic text
- Button
- NUMBER button
- Page name display

← Basic tiles

**Navigation tiles**

- Navigation button
- Navigation bar

← Navigation buttons/bar

**Graph tiles**

- Bar graph
- Trend line graph

← Graphs

PSS 400 information

Visualisation of FS-blocks

User management

**Pilz diagnostic tiles**

- PSS 4000 diagnostic log
- PSS 4000 diagnostic list
- PSS 4000 device status
- PSS 4000 device project
- Emergency stop status
- Light curtain status
- Safety gate status
- Two-hand pushbutton status
- Foot switch status
- Enabling switch status
- Output with feedback loop status

**User action tiles**

- Login/Logout button
- Administration
- Logged in user
- Exit button
- Switch language

# ► Automation system PSS 4000

## PASvisu – diagnostic tiles

### ► Visualisation of the diagnostic list/log + PSS device/project status



| Diagnostic LIST |                        |                                                                   |                    |          |                      |                         |
|-----------------|------------------------|-------------------------------------------------------------------|--------------------|----------|----------------------|-------------------------|
| Priority        | Time sta...            | Description                                                       | Name of priority   | Severity | Device               | Details                 |
|                 | 21.08.2015<br>06:12:43 | E-STOP pushbutton has been operated.                              | Error              | 3        | ---                  | <a href="#">Details</a> |
|                 | 21.08.2015<br>06:11:16 | An input signal is invalid.                                       | Error              | 3        | ---                  | <a href="#">Details</a> |
|                 | 21.08.2015<br>06:11:22 | More Ethernet telegrams are being received than can be processed. | Warning            | 8        | PSSu H PLC1 FS SN SD | <a href="#">Details</a> |
|                 | 21.08.2015<br>06:11:16 | Temperature is too low                                            | Warning            | 8        | Visu Program         | <a href="#">Details</a> |
|                 | 21.08.2015<br>06:11:09 | Project is unlicensed.                                            | Status information | 13       | PSSu H PLC1 FS SN SD | <a href="#">Details</a> |

1 to 5 of 5 diagnostic messages

# ► Automation system PSS 4000

## PASvisu – users and access levels

Create, edit or delete users

Configure automatic  
logout (after x min.)

**User management**

New user Edit Delete

| User name | Access right         | Password |
|-----------|----------------------|----------|
| admin     | Level 4 (all rights) | *****    |
| sales     | Level 3              | *****    |

**Project-wide properties**

Session timeout [minutes]  
3

Target page on session timeout  
[20] Welkom @ PAS visu

User may change his own password online  
☒

Configured users

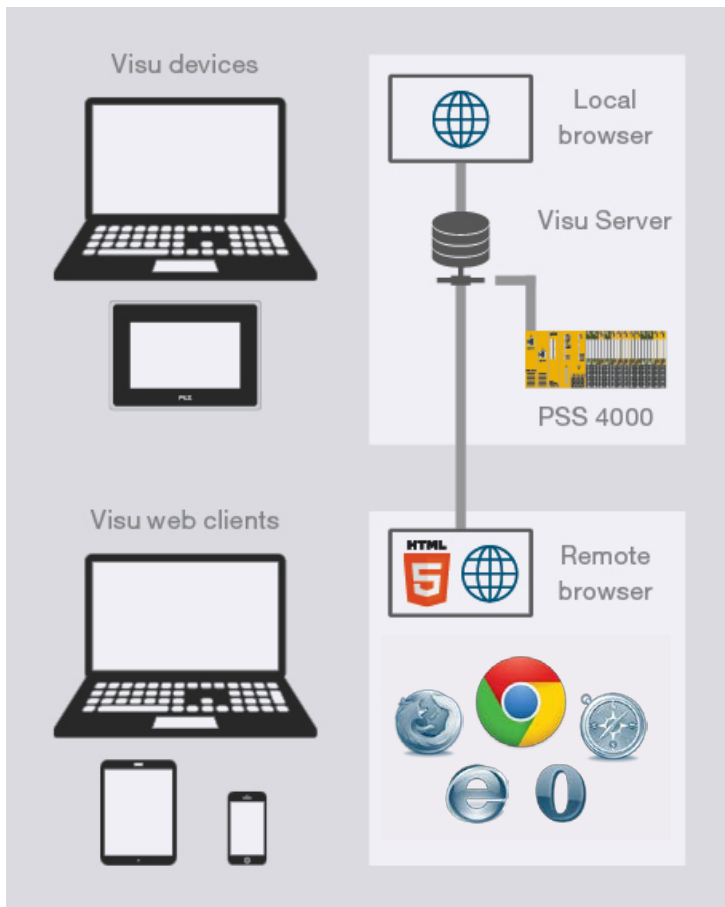
| Level | Rights of level            |
|-------|----------------------------|
| 1     | 1                          |
| 2     | 1, 2                       |
| 3     | 1, 2, 3                    |
| 4     | 1, 2, 3, 4<br>(all rights) |

Password

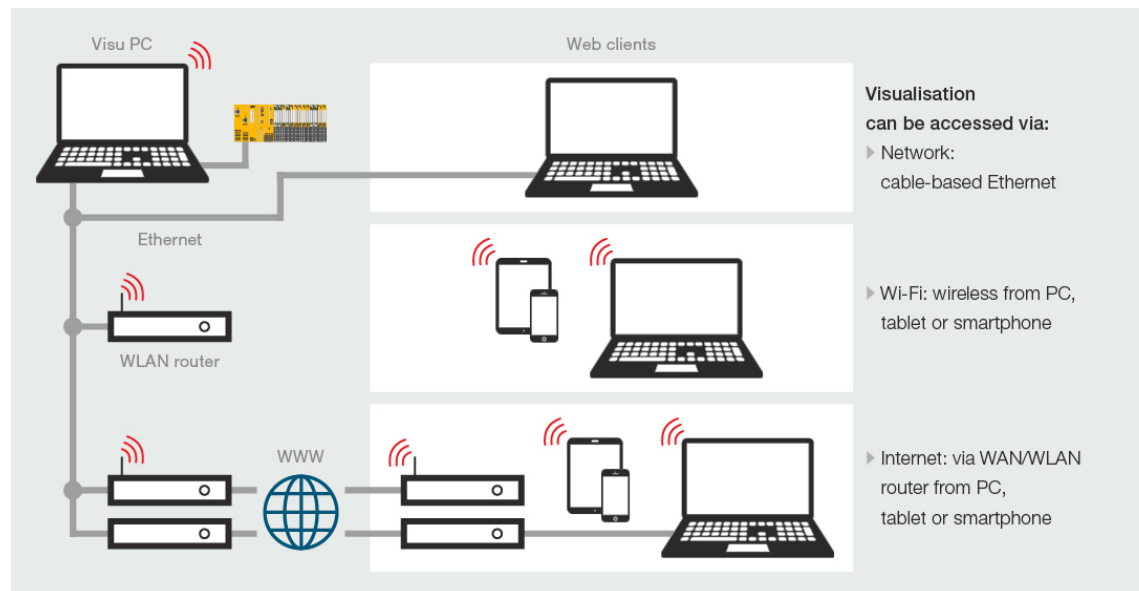
See demoproject

# ► Automation system PSS 4000

## PASvisu – access Visu client



- Device-/platform-independent access
- Access also possible via smartphones/tablets
- Each Web Browser can be used (HTML5 compatible)
- Access: <http://ip-adress-server:40856/index.html>



Basics

Tiles



## ► Agenda

The automation system PSS4000

PASvisu , the web-based visualisation software

Functions and applications (analogue , speed control , FS/ST)

Project demo – PAS4000 & PASvisu



# ► Functions & applications



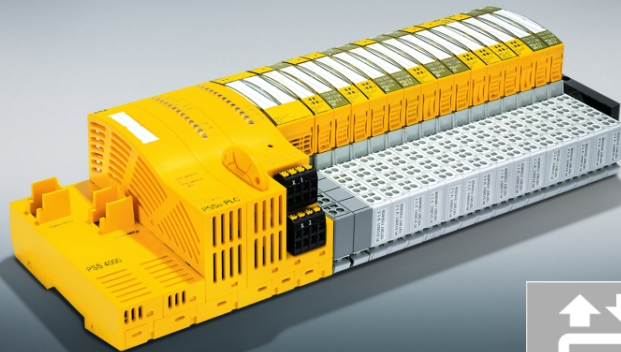
# ► Functions & applications



# ► Functions & applications

## Special approvals

### Approval passenger & service lifts



### Approval Railway (-R)



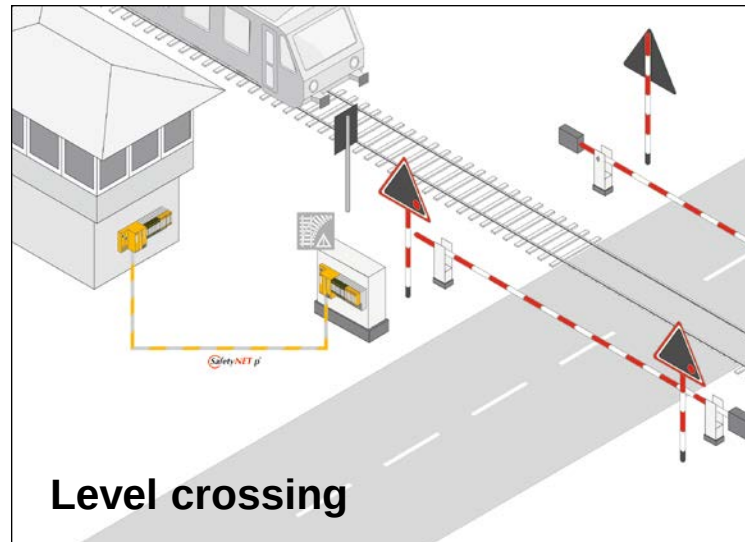
Up to SIL 4

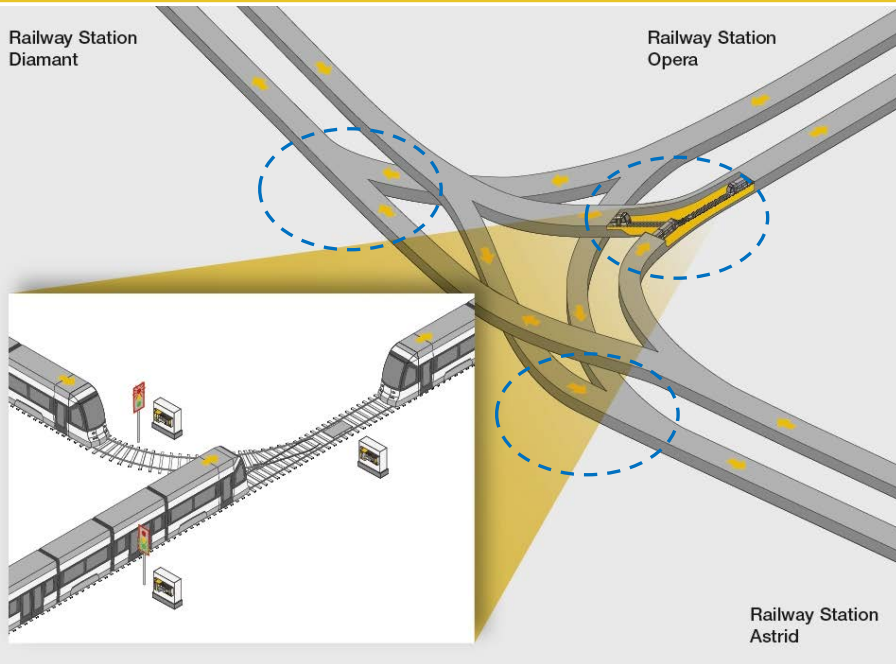


### Fast Control Unit (FCU)



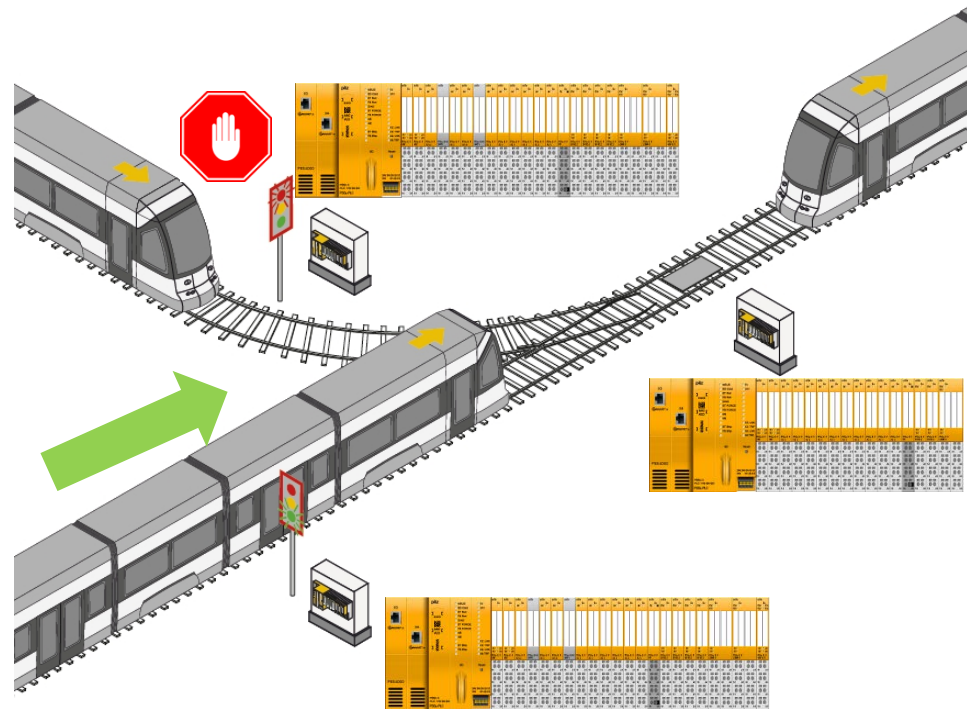
Safe signal detection up to 200  $\mu$ s





## Metro , De Lijn' (Antwerpen)

- Signal-lamp monitoring
- Speed control
- Sequence control / priorities / brake activation
- Analog signal monitoring



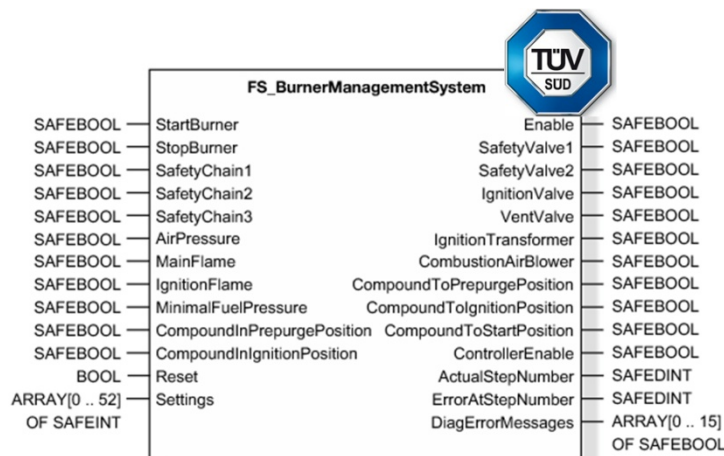
# ► Functions & applications

## Burner management



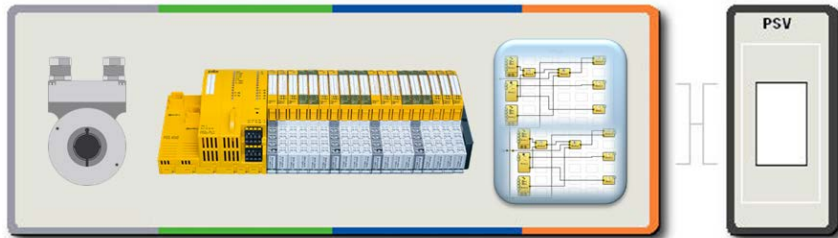
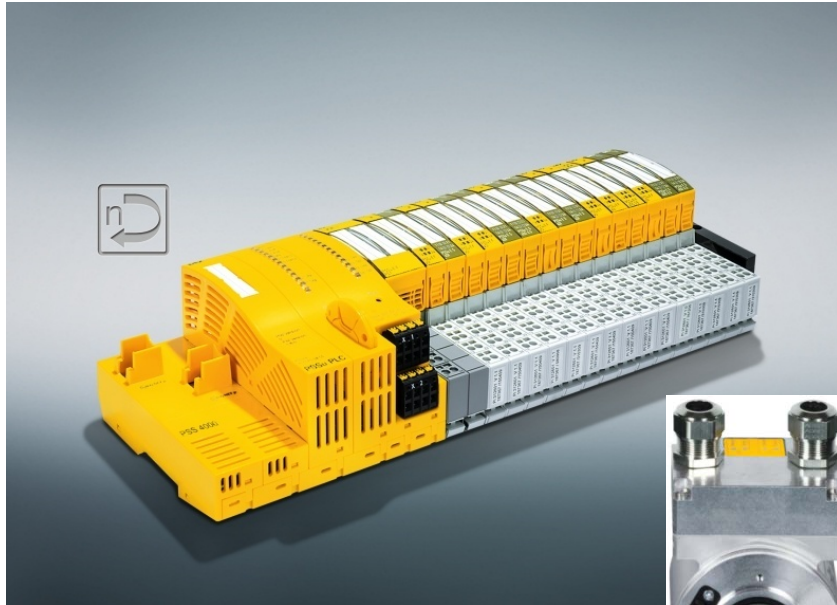
"Burner management" software block to control and monitor various types of burner

- Suitable for burners with or without **ignition** burners, for **master** and slave **burners**
- Integrated **tightness control**
- Inputs for **external safety** chains (e.g. E-Stop or maximum temperature)
- Comprehensive **diagnostics** and configurable **step times**
- **Approved** in accordance with all applicable European standards for automatic burner controls, burners, thermoprocessing equipment and steam boilers → **up to SIL 3 of EN 61508**



# ► Functions & applications

PSSuniversal Safe position , safe speed



## The solution for speed monitoring:

- Combination of **counter modules**, special **function blocks** and **standard rotary encoders**
- Safe evaluation of **speed**, **position** and **standstill** using standard rotary encoders

## Applications

- Presses, press brakes (in combination with PSEnvip)
- Robotics, handling technology, turntables
- Stage technology
- Packaging technology
- Storage and conveyor technology
- Gantry cranes, gantry robots

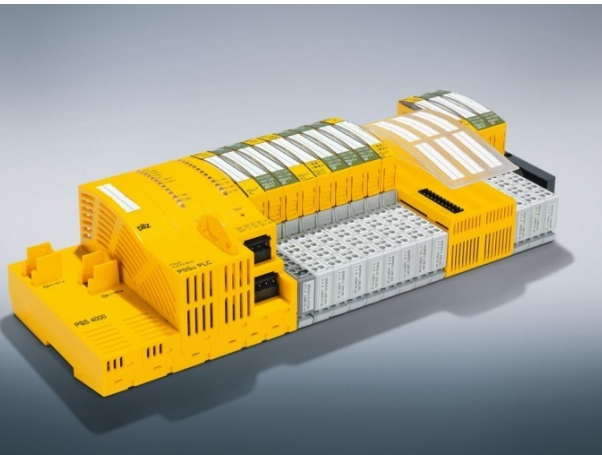
# ► Functions & applications

Mechanical press : new or revamping

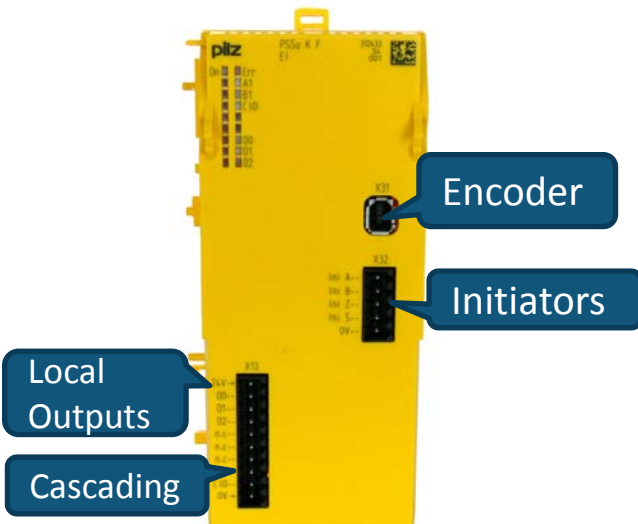


## ► Functions & applications

PSSu K F EI : Motion and speed monitoring



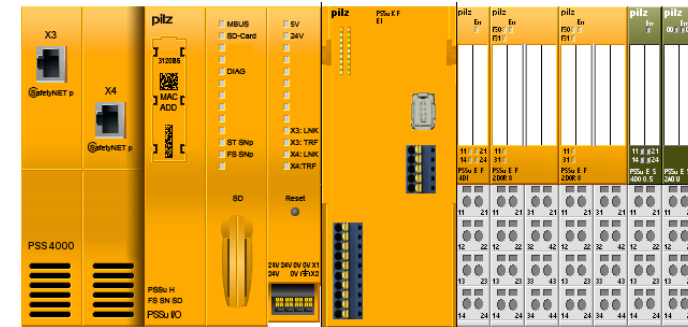
- Compact module to monitor speed for PSSuniversal PLC and PSSuniversal multi : Up to **8 axes per control system**
- A wide range of **different external encoder types** and feedback systems can be evaluated and monitored, also sin/cos (PL d)
- **Fast local shutdown** functions : a reaction can be triggered immediately if a limit value is exceeded – irrespective of the PLC cycle time.
- **Cascading** : a joint, fast shutdown of a network of axes can be implemented via an external "jumper". If one module in this network triggers an error reaction, all other modules will shut down together with a delay of approx. 1 ms.
- **Synchronisation monitoring**  
Despite local intelligence, the speed values are still available to the user program. Additional functions such as synchronisation monitoring on multiple axes can be implemented in this case



# ► Functions & applications

## PSSu K F EI : Motion monitoring

- Fast reaction times and high productivity due to fast shutdown of drives, independent of the PLC cycle time
- Speed functions are conveniently set up in the software
- Simple, exact adjustment of the application simply by changing the threshold values (e.g. limit speed) in the user program
- Simple commissioning, time is saved during operation thanks to simple diagnostics of the set parameters
- Saves costs by using existing encoder systems, ability to connect to all common rotary encoder/feedback systems (sin/cos, TTL, HTL, proximity switches)



### Monitoring Functions and User Defined Units

The following settings contain the configuration of the monitoring functions. To calculate the user defined units, click on "Unit Calculator" on the "User Defined Units" tab.

User Defined Units: SSM0, SSM1, SSR-M, SDI-M, SOS-M, Outputs

Units/Resolution

Mechanical Conversion

Scaling = 1 Revolutions

Time Conversion

Time = 1 Seconds

Units

Position: Increments

Speed: Increments/Seconds[Hz]

Information

Increments/Revolution for User Defined Units: 1024

Max. Position: 536.870.911 Increments

Min. Increment Value for Position: 1 Increments

Max. Speed: 500.000 Increments/Seconds

Min. Increment Value for Speed: 0.001 Increments/Seconds

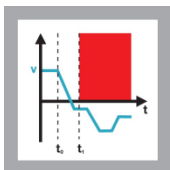
Motor Gear Work Machine External Brake

Unit Calculator

|                                                                                                             |                                                                                         |
|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <div> <div> EI (X31, X32) </div> <div> Sensor Type </div> </div>                                            | <div> <input checked="" type="checkbox"/> TTL Differential </div>                       |
| <div> <div> Increments/Revolution for User Defined Units </div> <div> Max. Frequency AB [mHz] </div> </div> | <div> <input checked="" type="checkbox"/> TTL Differential </div>                       |
| <div> <div> Sensor Resolution </div> <div> Max. Frequency Z [mHz] </div> </div>                             | <div> <input checked="" type="checkbox"/> TTL Differential + Z-Index </div>             |
| <div> <div> Validation Cut-off Frequency [mHz] </div> <div> Monitor Track S </div> </div>                   | <div> <input checked="" type="checkbox"/> TTL Differential + Z-Frequency Ini pnp </div> |
| <div> <div> Umax Track S [mV] </div> <div> Umin Track S [mV] </div> </div>                                  | <div> <input checked="" type="checkbox"/> TTL Single Ended </div>                       |
| <div> <div> Invert Motion Direction </div> <div> Hysteresis [%] </div> </div>                               | <div> <input checked="" type="checkbox"/> TTL Single Ended + Z-Index </div>             |
|                                                                                                             | <div> <input checked="" type="checkbox"/> No </div>                                     |
|                                                                                                             | <div> <input checked="" type="checkbox"/> 0 </div>                                      |
|                                                                                                             | <div> <input checked="" type="checkbox"/> 0 </div>                                      |
|                                                                                                             | <div> <input checked="" type="checkbox"/> No </div>                                     |
|                                                                                                             | <div> <input checked="" type="checkbox"/> 0 </div>                                      |

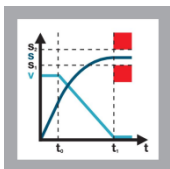
# ► Functions & applications

## PSSu K F EI : Motion monitoring



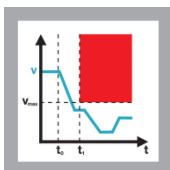
### SDI – Safe direction

A drive can only move in one (defined) direction. If the specified direction is violated, the drive is shut down safely.



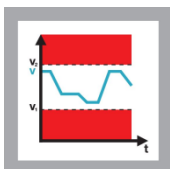
### SOS - Safe operating stop

Monitors the stop position reached by the axis and prevents any deviation from the position window. The drive's control functions are maintained in full. If the position strays outside of the monitored window, the drive is shut down safely.



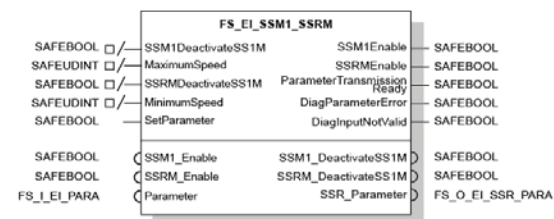
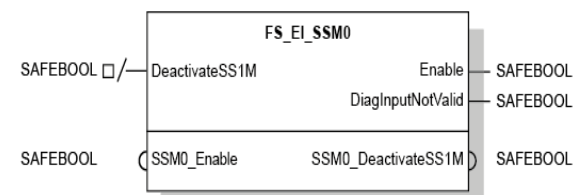
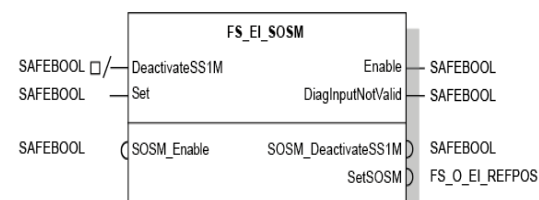
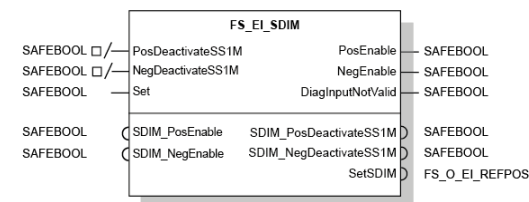
### SSM – Safe speed monitor

Supplies a safe output signal to display whether the motor speed is below the defined limit value.



### SSR - Safe speed range

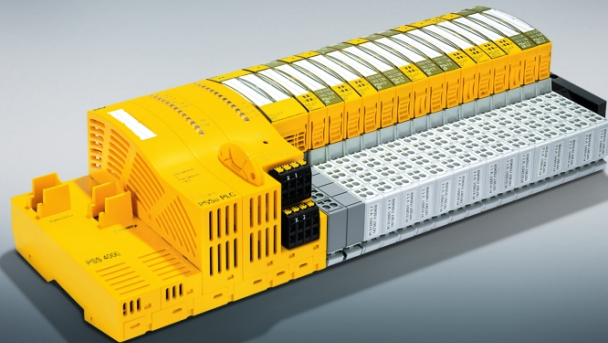
The maximum speed must not exceed a certain value, and the minimum speed must not drop below a certain value. If either of these limits is violated, the drive is shut down.



# ► Functions & applications

## PSSuniversal Safe analogue input modules

FS-AI



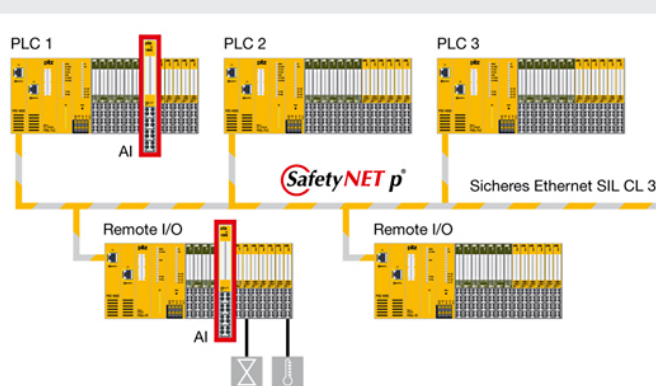
### Applications

- Burner management, burner controls
- Small/medium-sized generators and turbines for power generation
- Cable cars
- Tank farms and filling stations
- Food industry, pharmaceutical industry
- Process engineering, e.g. semiconductor production
- Traffic engineering

### Properties

- Current : 0 ... 25 mA ( Pssu E F AI I )
- Voltage : -10 .. + 10V ( Pssu E F AI U )
- Compact design
- 12 bit

**Safe, (de)centralised analogue input modules in the system network.**

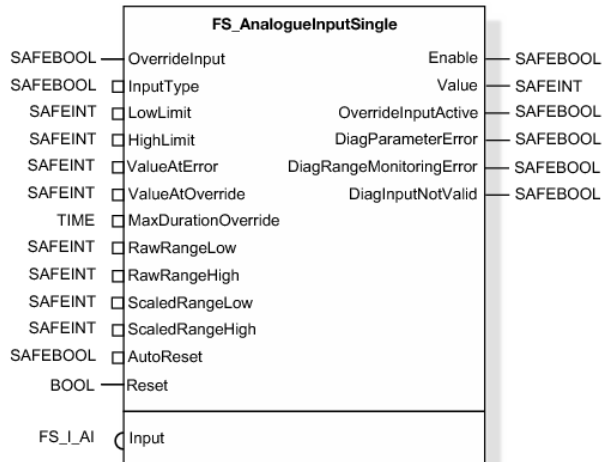


| Operating mode | EN ISO 13849-1: 2008<br>PL | EN ISO 13849-1: 2008<br>Category | EN 62061<br>SIL CL | EN 62061<br>PFH <sub>0</sub> [1/h] | IEC 61511<br>SIL | IEC 61511<br>PFD | EN ISO 13849-1: 2008<br>T <sub>M</sub> [year] |
|----------------|----------------------------|----------------------------------|--------------------|------------------------------------|------------------|------------------|-----------------------------------------------|
| 1-channel      | –                          | –                                | SIL CL 2           | 1,56E-08                           | SIL 2            | 1,37E-03         | 20                                            |
| 2-channel      | PL e                       | Cat. 4                           | SIL CL 3           | 4,37E-09                           | SIL 3            | 2,99E-05         | 20                                            |

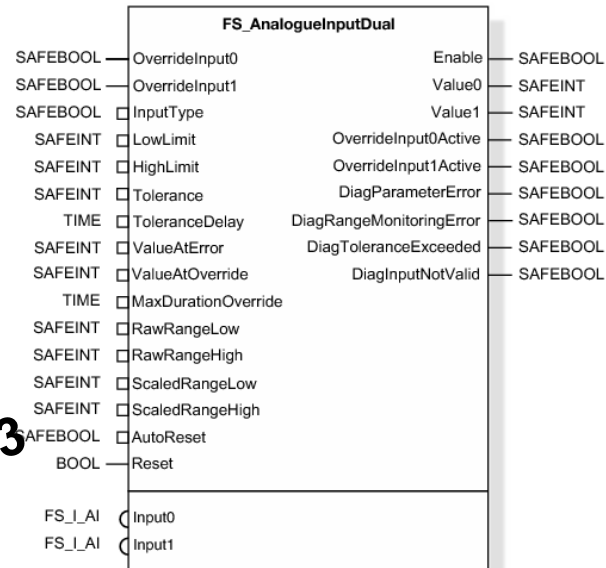
# ► Functions & applications

## PSSuniversal Safe analogue input modules

### Monitoring 1 analogue input

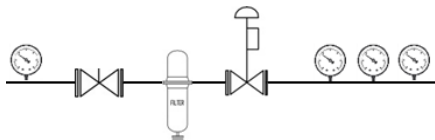
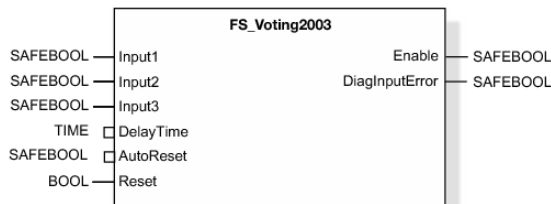


### Monitoring 2 analogue inputs



**Up to PL e / SIL 3**

### 2oo3 monitoring



### Limit value monitoring function block:

- Monitors whether an analogue input value :
  - Exceeds a value range
  - Falls below a value range
- Detects errors on the input, such as
  - Over/undervoltage
  - Open circuit between sensor and module

## ► Agenda

The automation system PSS4000

PASvisu , the web-based visualisation software

Functions and applications (analogue , speed control , FS/ST)

Project demo – PAS4000 & PASvisu



### PSS4000 project

PASvisu

Speed control

Analogue signal monitoring

FS/ST programming



# ► Automation system PSS 4000

## Hardware configuration

Network name : PILZ\_BE  
172.24.56.219  
PILZ\_B1E



Laptop  
172.24.56.201  
PASvisu server

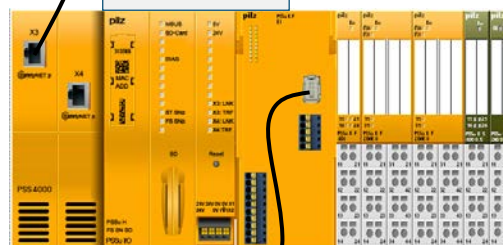
PSS4000 PLC



172.24.56.200



PSS4000 IO



172.24.56.202



ESTOP



DOOR

C1



C2  
MAIN



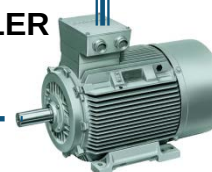
PUMP



C3



FILLER



Incremental encoder  
TTL differential / 1024



<http://172.24.56.201:40856/index.html>

TABLET



# ► Automation system PSS 4000

## Software concept

### ✓ Switch Off matrix

|            | C1<br>pump | C2<br>Main | C3<br>Filler |
|------------|------------|------------|--------------|
| E-STOP     | X          | X          | X            |
| DOOR       |            | X          | X            |
| ST program | X          |            | X            |

### ✓ ST program

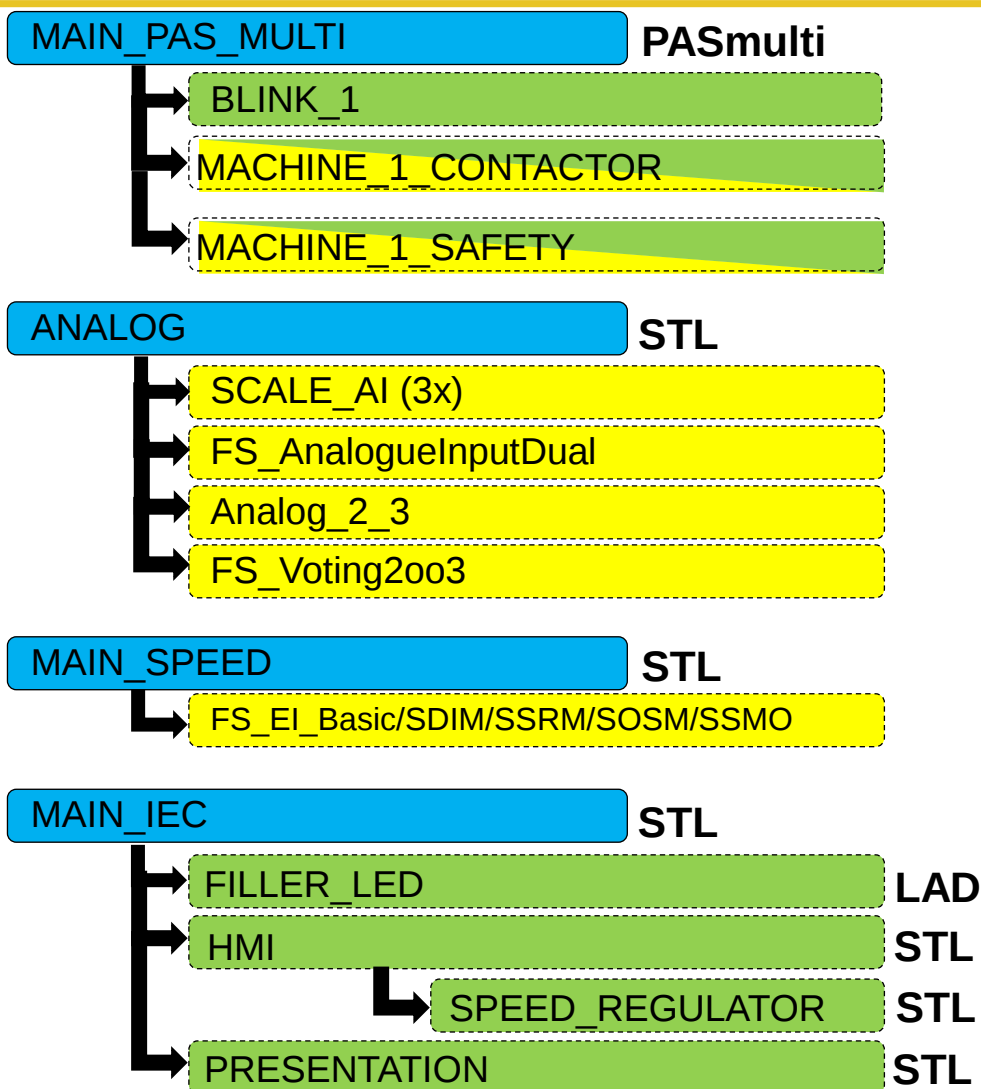
- ✓ Interface between PMI and PSS4000 (PASvisu / OPC server)
- ✓ Speed reference for filler (analog signal)
- ✓ Start / Stop filler (C3) : depending on process
- ✓ Start / Stop Pump (C1) : depending on process
- ✓ LED's control panel

### ✓ FS program

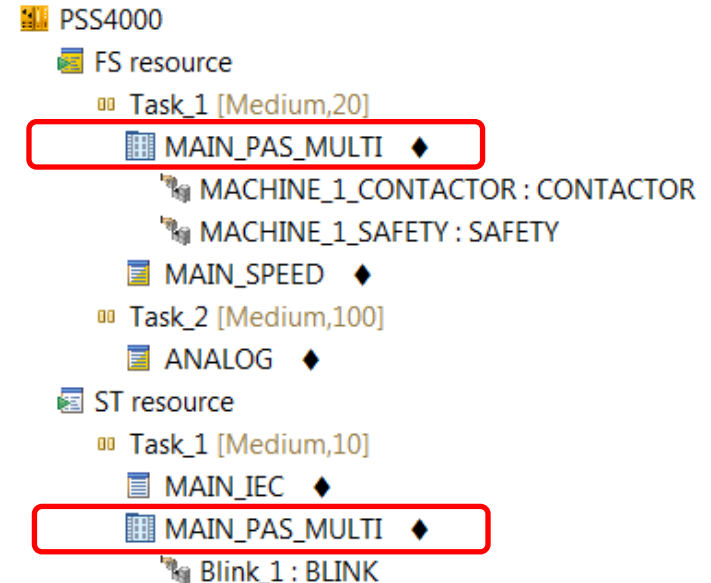
- ✓ E-STOP , Door
- ✓ Safe Switch Off (feedbackloop monitoring contactors)
- ✓ Speed control
- ✓ Analog signal monitoring

# ► Automation system PSS 4000

## Software configuration : TASKS



## Resource Assignment



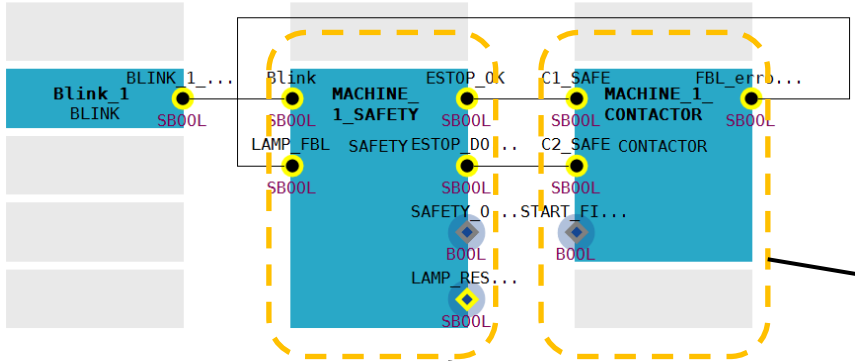
- ✓ MAIN\_PAS\_MULTI ( PASmulti ) is FS **AND** ST
- ✓ 2 different task times
  - ✓ FS : 20 ms
  - ✓ ST : 10 ms

# ► Automation system PSS 4000

## Software configuration

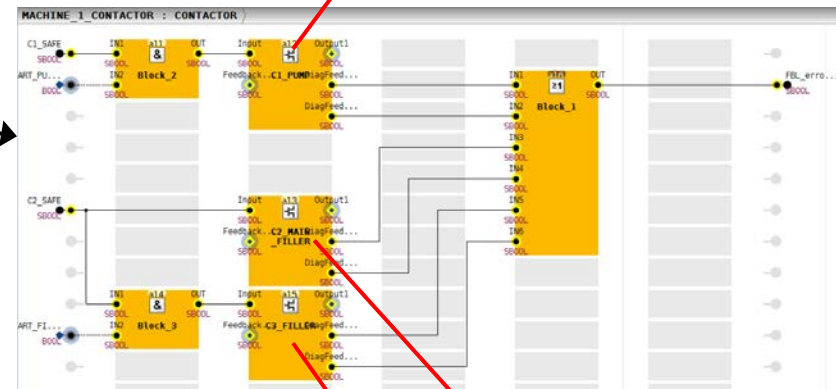
### Safety program in PASMULTI : 'MAIN\_PAS\_MULTI'

MAIN\_PAS\_MULTI



- ✓ Safety devices
- ✓ Switch-off logics

Feedbackloop monitoring



C1  
PUMP



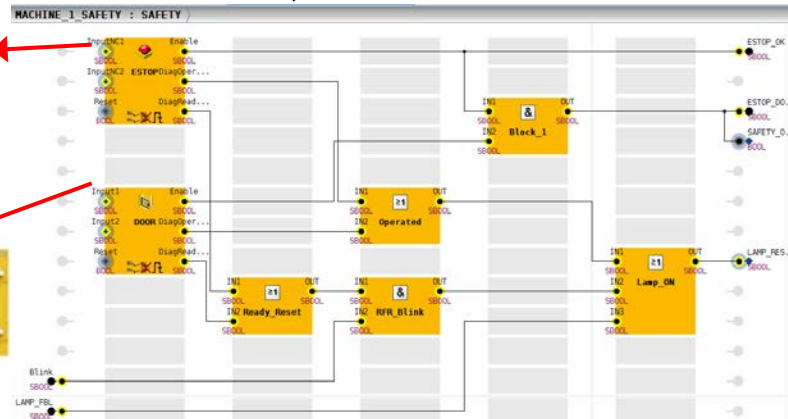
C2  
FILLER  
MAIN



C3  
FILLER



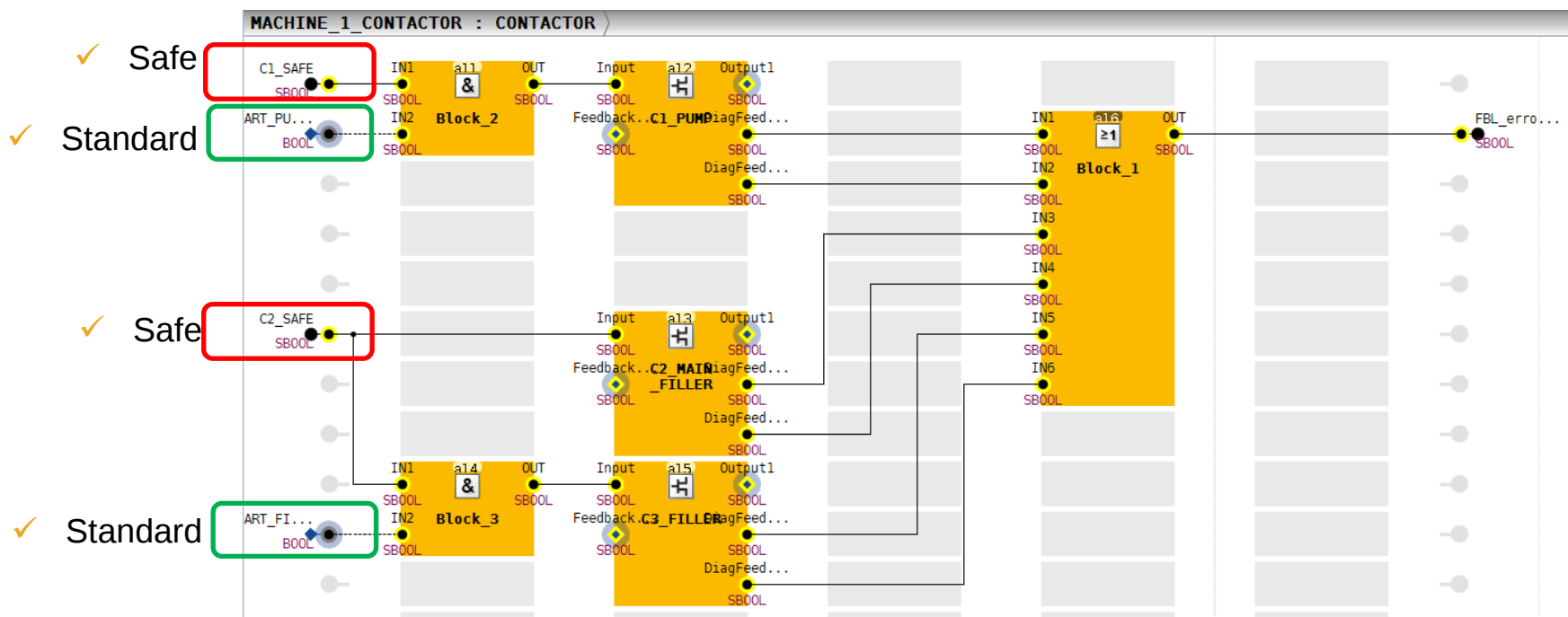
DOOR



# ► Automation system PSS 4000

## Software configuration

### Safety program in **PASmulti** : 'MAIN\_PAS\_MULTI'



COMPONENTS

SYSTEMS

SERVICES

Technical Ecological  
Personal Economical

Bijenstraat 4  
9051 Sint-Denijs-Westrem

**pilz**  
the spirit of safety

Partner of:  
The Best of  
German  
Engineering

A yellow silhouette of the map of Germany, centered on a white background.

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