The library for plastics machines

Building a complete machine with modular software and hardware.
The new modular software library for plastics machines forms the basis for your latest generation of machines. Whether extruding, blow molding, injection molding, thermoforming or regulating temperatures, there is an appropriate solution for every one of your requirements.

The new SIMATIC S7-1500 forms the hardware basis for all components of the plastics library.

Due to the new generation of controllers and the associated TIA Portal engineering framework, the creation of software becomes faster and easier.

All modules of the software library include a ready-to-use HMI.

In designing the operating screens, particular value was attached to intuition and a clearly structured view of the individual functionalities.
Hardware for plastics machines

Overview of the software technology packages

Preconfigured solutions

Contact and support
The ultimate plus in automation: SIMATIC S7-1500

- Design and Handling
- Technology Integrated
- Performance
- Integrated system diagnosis
- Security Integrated
- Engineering with TIA Portal
- Safety Integrated

efficiency
Example of a plastics machine:
Hardware structure of the automation for electrical and/or hydraulic machines
ET 200SP Open Controller: CPU 1515SP PC

For the construction of a multifunctional automation system with centralized IO on the basis of ET 200SP

- PLC functionality with innovative S7-1500 software controller
- HMI functionality by means of WinCC RT Advanced or WinCC OA
  - with replaceable CFast flash memory card for operating system, Runtime and project
  - with integrated graphics connection
- PROFINET IO with ET 200SP BusAdapter
- PROFIBUS DP connection via ET 200SP CM
- Open system for Windows applications and C++
ET 200SP Open Controller: System highlights

All-in-One system (PLC+HMI)
- Control: S7-1500 Software Controller
- Visualization: WinCC RT Advanced V13 SP1
- Multifunctional automation system

ET 200SP architecture
- Full support of the ET 200SP backplane bus (central IOs)
- Support of the ET 200SP modules (TM, PtP etc.)
- Handling as for ET 200SP CPU

Openness
- Open system for C/C++ (via ODK)
- Data processing
- User-specific applications

Performance
- WES 7E 32 bit (7P 64bit)
- AMD Dual Core 1.0 GHz
- 2GB RAM (4GB RAM)

Memory
- Replaceable flash memory: CFast card (8/16 GB)
- Security seal
- SD/MMC memory slot

Connections
- 3x USB2.0
- DVI-I graphics connection

Communication
- PROFINET IO interface: 2-port bus adapter
- PROFINET IRT via S7-1500 software controller
- GB-Ethernet interface
- PROFIBUS DP via ET 200SP CM DP
How is independence from Windows achieved?

**Partitioning of the PC**

The Siemens Hypervisor partitions the hardware resources of the unit and assigns them exclusively to the Software Controller. Windows and Windows applications have no access to these resources:

- **Memory**: Exclusive access for best possible security and know-how protection
- **Fieldbus interfaces**: Exclusive access for controller with hard real time

The SIMATIC communication architecture ensures transparent and secure communication between the controller and Windows applications:

- **Local communication between the Software Controller, HMI or other Windows applications**
- **Controlled "bypass access"** to PN and DP devices with HMI or ES
- **Communication with external partners via the Windows interfaces** (ES, HMI, TCP/UDP, Web)

* TCP/UDP; configure local partner in the T_send block (TIA Portal); via virtual Ethernet interface P1; put/get

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HMI: SIMATIC Industrial Flat Panel (IFP)

- Widescreen fronts from 15" to 22", can be used in portrait format
- Pure display or touch devices, but also as keypad version for 15"
- 19" and 22" device also with gesture and multitouch operation
- High resolution, wide viewing angle, dimmable backlighting
- Projected Capacitive Touch technology with 5-finger detection
- Intelligent detection of accidental touches
- All-round glass front
- Scratch-resistant, non-reflective surface with all-round protection of glass edge
- Stylus and glove operation possible
- Individual programming via Windows SIMATIC WinCC
Example of a plastics machine:
Hardware structure of the automation for electrical and/or hydraulic machines

- CPU 1515OC
- PLC and HMI-PC
- ET200SP
- TCP/IP
- SIPLUS HCS
- Drive-CliQ
- Control Unit
- SINAMICS S120 Chassis
- ET200SP distributed Interface module IM 155-6PN with BusAdapter Peripheral modules BaseUnit Server module PROFINET
- SINAMICS S120 Booksize optional
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## Available standard applications – Overview

### TCP

TCP: The temperature control package (TCP) ensures high-precision temperature control and is optimized for the demands of the plastics industry. Apart from its excellent control performance for heating and cooling processes, its key features are various monitoring functions, group switching, weekly timer, cold start monitoring and automatic controller optimization.

### DRV

DRV: The Drive Package enables any number of extruders to be driven and controlled. This package includes all necessary monitoring and control functions, as well as synchronous speed adjustment and throughput or pressure control functions.

### MOT

MOT: Motion Control technology ensures a high-precision positioning of individual electrical, but particularly hydraulic, axes, including those with synchronous operation functionality.

### PCO

PCO: The Parison Control Technology (wall thickness control) ensures the precise control of the required tubular profile in blow-forming machines, not only for continuous, but also for accumulator head machines. Various additional functions, such as hose length or fill level control complete the range of possible applications. Thanks to its modular design on an individual channel basis, this technology can also be adapted perfectly to the configuration limits of the machine.

### ACL

ACL: The modular, configurable automation cycle represents the key element of cyclically operating machines. The integrated, step sequence-based process system is freely scalable and can be assigned parameters via the operating system if required. This makes the machine sequence more flexible and helps to drastically reduce the development time.
Available standard applications – Your advantages at a glance

**Modularity**
Independent and autonomous software modules simplify the implementation of our software in your application.

**Reliability**
Your application benefits from the expertise drawn from many years of development and globally accumulated experience.

**Visualization**
Each software module contains a ready-to-use HMI with powerful operating screens.

**Flexibility**
You determine the functionality of your machine and are able to expand it flexibly when the need arises.

**Performance**
The optimized combination of software and hardware copes with any configuration limits with a high level of performance.

**Productivity**
The coordination of the hardware and software reduces your development and commissioning times.
TCP 1500 – Temperature Control Package – Overview

### Basic functions:
- 32 control channels (up to 128 channels)
- Integrated heating and cooling controllers
- Adaptive control behavior for fast regulation
- Self-adjustment of all control parameters

### Extended functions:
- Monitoring functions
- Group switching
- Weekly timer
- Cold-start monitoring
- Automatic controller optimization
- Fine-tuning at operating point:
- and many more

### Software package:
- Preconfigured software project
- New software architecture based on Simatic S7-1500 with low cycle load
- Intuitive SIMATIC HMI interfaces for all parameter settings
- Operation via web server possible as alternative

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**Easy and modular expansion**

**User-friendly visualization and operation**
## DRV 1500 – Drive Technology Package – Overview

### Basic functions:
- Drive control
- Parameter assignment via HMI
- Scaling of all parameters
- Creation of limits for all parameters
- Trend display with archiving

### Extended functions:
- Motor potentiometer
- Pressure control
- Start-stop function
- Grouping of drives
- Overall speed adjustment

### Software package:
- Preconfigured software project
- New software architecture based on Simatic S7-1500 with low cycle load
- Intuitive SIMATIC HMI interfaces for all parameter settings
- Operation via web server possible as alternative

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**Easy and modular expansion**

**User-friendly visualization and operation**
## MOT 1500 – Motion Control Package – Overview

**Easy and modular expansion**

**User-friendly visualization and operation**

### Basic functions:
- Modular structure of the motion function
- 18-stage path-speed profile
- 32 position settings for cam simulation
- Mode selection

### Extended functions:
- Dynamic switchover of speeds, positions and stops
- Control of various motion commands from the control program
- Monitoring functions

### Software package:
- Preconfigured software project
- New software architecture based on Simatic S7-1500 with low cycle load
- Intuitive SIMATIC HMI interfaces for all parameter settings
PCO 1500 – Parison Control Package – Overview

**Basic functions:**
- Wall thickness control via profile specification
- Mandrel position control
- Mode selection: continuous operation, accumulator head operation, two-station operation
- Up to 8 channels

**Extended functions:**
- Monitoring and diagnostics messages
- Tube length control
- Level control
- Ejection control

**Software package:**
- Preconfigured software project
- New software architecture based on Simatic S7-1500 with low cycle load
- Intuitive SIMATIC HMI interfaces for all parameter settings

Easy and modular expansion
User-friendly visualization and operation
### ACL 1500 – Configurable Automatic Cycle – Overview

#### Basic functions:
- Freely programmable sequence control for one machine cycle
- Sequence can be assembled and configured by the user as required.
- All data is stored in the PLC

#### Extended functions:
- Error handling included
- Free and flexible parameter assignment
- Expandable as required
- Changes during runtime are possible

#### Software package:
- Preconfigured software project
- New software architecture based on Simatic S7-1500 with low cycle load
- Intuitive SIMATIC HMI interfaces

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**Easy and modular expansion**  
**User-friendly visualization and operation**
Web server enables HMI to be used on mobile devices

Flexible operation using the web server

- Thanks to the integrated web server, SIMATIC S7-1500 makes the application available
- Independent of operating system and device
- Intuitive operating screens with identical scope of functions and interfaces to those on the SIMATIC HMI.
- Can be used with Google Chrome as of Version 51
Hardware for plastics machines

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Contact and support
IMM 1500 - The complete package for injection molding machines

Tried-and-tested hardware, preconfigured software
- The SIMATIC S7-based injection molding system gives users the ability to implement their machine concepts quickly and economically. The modular structure of hardware and software guarantees users maximum flexibility with minimum development workload.

Incorporate your know-how
- Do you want to solve a particular problem in your own way? The technology blocks can be freely configured to create your own special application from standard software, enabling you to extend the software with blocks of your own.

Tried-and-tested hardware with CE and UL certifications for your machines
- SIMATIC S7-1500 and SIMATIC Industry Flat Panels
- SINAMICS drives: S120, G120
- SIMOTICS motors: 1PH8, 1FK7, 1FT7, 1FW3
**Basic functions:**

- For injection molding machines, parts from the plastics library are used. TCP, DRV, MOT and ALC are combined to create a preconfigured solution and are supplemented by specific functions of an injection molding machine.
- The configuration limits of the individual components are retained.

**Software package:**

- Preconfigured software package
- New software architecture based on Simatic S7-1500 with low cycle load
- Examples of a SIMATIC HMI interface created with WinCC Advanced and HMI examples created with WinCC OA
IMM 1500 HMI Configuration:
WinCC OA OEM USP

- Open technology platform
- Sustainable development for OEM solutions – long-term compatibility of 10 years of more
- Long-term compatibility guaranteed, despite innovation capability
- Windows/Linux cross-platform option
- Open GUI for OEM designs by means of QT-Basis
- Dynamic user interfaces – can adapt online to the machine configurations
- Reduced overheads for automatic tests with SQUISH and Code Coverage
- Professional versioning for customer product
- Development system can be installed on minimum platform (part of Runtime)
- Good performance/low resource requirements
- Configuration options can be integrated in end customer Runtime
- Modular, open software architecture – high level of acceptance among developers
- Automated mass generation of projects
• Drive control for up to six extruders, grouping of drives and overall speed adjustment possible for groups of drives.

• 32 temperature control channels (up to 128 channels possible), can be configured as heating or cooling controllers, synchronization of coupled control zones during heating and self-adjustment, integrated time switch, enabling input of heating point and cold-start function, for example

• Modular motion control for electrical and hydraulic axes, with 18-stage path-speed profile, 32 position settings for cam simulation, operating mode selection, consideration of the valve characteristic, synchronous operation of several axes possible

• Wall thickness control with profile specification, mandrel position control for continuous, accumulator head and two-station operation

• Parameter assignment of limit values and monitoring functions
Basic functions:

- For blow-molding machines, the entire plastics library is utilized. TCP, DRV, MOT, PCO and ALC are combined to create a preconfigured solution and are supplemented by specific functions of a blow-molding machine.
- The configuration limits of the individual components are retained.

Software package:

- Preconfigured software project
- New software architecture based on Simatic S7-1500 with low cycle load
- Intuitive SIMATIC HMI interfaces for all parameter settings
EXT 1500 – The complete package for your extrusion system

• Preconfigured drive control for up to six drives, with online parameter assignment and address assignment, limit values for target and actual speed, current and torque, motor potentiometer, pressure control, trend display with archive, collective speed adjustment for groups of drives, synchronous and asynchronous

• 32 temperature control channels (up to 128 channels possible), can be configured as heating or cooling controllers, self-adjustment of all control parameters, synchronization of coupled control zones during heating and self-adjustment, monitoring functions of actual value and control circuit, grouping of zones of one unit (e.g. extruder or head), time switch, enabling input of heating point and cold-start function, for example

• Optimized for use on large-format visualization systems, starting with the 12" TP 1200 Comfort Panel. Depending on the configuration limits, an S7-1513 can already be used as the CPU.
### Basic functions:
- For extrusion systems, the tried-and-tested TCP and DRV software packages are used. Both solutions are bundled in the extrusion package and are supplemented by additional functions.
- "Ready to use" solution for use in extrusion systems for the production of tubes, profiles, films, plates, foils and much more

### Software package:
- Preconfigured software project
- New software architecture based on Simatic S7-1500 with low cycle load
- Intuitive SIMATIC HMI interfaces for all parameter settings
- Operation via web server possible as alternative
TMF 1500 - Thermoforming

Thermographic library
- Simple visualization of heat emitter arrays with the thermographic library for WinCC Advanced
- Convenient creation of an HMI image for heater arrays
- Basic display containing all elements required for a heat image graphic
- Pilot emitter with heating zone assignment
- Simple operator control and monitoring:
  - Of the heat emitter target and actual values
  - Defective emitter flashes
- Reduction of energy consumption

SIPLUS HCS:
- Seamless integration into Totally Integrated Automation (TIA)
- Less cabling
- Fastest possible automation with PROFINET
- Control routines: Even network load
- Control of the heating elements with half-wave accuracy
- Switching at zero point
- Detailed diagnostics: fewer failures, enhanced product quality
- Heating process reproducibility
Basic functions:

- Parts of the plastics library are used in a thermoforming machine. The thermographics, MOT, ACL, TCP and the heating control system HCS are combined to create a preconfigured solution and are supplemented with specific functionalities of a thermoforming machine.

- The configuration limits of the individual components are retained.

Software package:

- Preconfigured S7 project
- New software architecture based on Simatic S7-1500 with low cycle load
- Preconfigured heating image project
- Examples of a heating graphic user interface created with standard TIA functions
Application example
Molding plastics

Fully electrical thermoforming machine

Customer requirements
- Centralized, compact configuration
- Minimal outage times
- High plant productivity
- Simple commissioning and integration into the automation system
- Reduced installation times and costs

Sector/customer type: Plastics / OEM
Application: TMF 1500 Thermoforming
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