The company was founded in 1976 by Dipl. Ing. Horst Stange. He laid the foundation for the success story of an independent, medium-sized company in Gummersbach. Since the company was founded, STANGE Elektronik has successfully faced the constantly changing in technical and economic requirements of the market.

The product range has changed from simple setpoint devices to today’s complex control system technology. For more than three decades, STANGE Elektronik has developed and produced innovative automation and control technology products.

STANGE Elektronik increases productivity in heat treatment with innovative products, systems and services. Due to our many years of experience and the continuous advancement of our products, STANGE customers produce faster, more flexibly and cost-efficiently with constantly increasing quality.

As a full service partner, we offer a broad range of services and products: ranging from program controllers and automation devices, field bus connections and sensor technology to software solutions. The comprehensive range of services we offer should be highlighted in particular: beginning with the modification and modernization of heat treatment plants up to technical advice in process engineering, we leave little to be desired.

“Made in Germany” quality
Our products are produced exclusively in Germany and we only use high quality components in our systems.

STANGE Elektronik is certified according to DIN EN ISO 9001:2008.

We make plants future-proof
The modernization of existing plants is often a cost effective alternative to new investments. STANGE Elektronik supports its customers during planning of the automation solution. Our project engineers advise the customer to find the optimum solution for the corresponding task. In order to realize customer projects, experts from software, hardware and process engineering closely work together. Therefore, complete project handling up to installation, start-up and employee training is offered.

Close contact with users makes constant further development and improving products and services possible. This ensures our customers’ ability on a high quality level.

Peter Jaspert
Managing Director
Quality according to DIN EN ISO 9001:2008

Fields of Application

STANGE Elektronik increases productivity in heat treatment with innovative products, systems and services. Due to our many years of experience and the continuous advancement of our products, STANGE customers produce faster, more flexibly and cost-efficiently with constantly increasing quality.

A deep understanding of customer technology and comprehensive automation know-how are crucial for the efficiency and profitability of an automation solution.

The integrated embedding of automation solutions in overlying IT systems leads to more flexible and more transparent processes. This applies for new plants as well as for the individual modernization and/or expansion of plants. Control technology and automation increase plant productivity and increase the quality of products. The availability and utilisation of plants is improved by automation in a sustainable way.

Metal working industries
- Heat treatment
- Surface refinement
- Hardening

Ceramic industries
- Drying plants
- Burning kilns, sintering furnaces

Glass industries
- Tubs
- Feeders
- Autoclaves

Plastics industries
- Extruders
- Dryers

Food industries and pharmacy
- Autoclaves
- Metering and mixing plants
- Sterilizing plant

Cooling and air conditioning
- Environmental simulation
- Climatic chambers

Semiconductor industries
- Crystal forming furnaces
- Furnaces for wafer treatment

...and much more
References
Contents

Program Controller, Industrial Controls

Program controller SE-702
for small to medium-sized automation solutions.
Programmer with 8 setpoint values, 32 digital tracks, 99 programs
Configuration interface RS232.

Program controller SE-707 / SE-709
or OP-Panel with PBS/PBNet for small to medium-sized automation
solutions. Programmer with 30 setpoint values, 64 digital tracks,
250 programs. Interface for remote peripherals (CAN-I/Os) or
Profibus.

Industrial control SE-604
Controller and visualization combined as an automation solution.
6.5 inch TFT color display, key operation.
Freely programmable multitasking PLC according to IEC 61131.

Industrial control SE-607
Controller and visualization combined as an automation solution.
10.4 inch TFT color display, touchscreen operation.
Freely programmable multitasking PLC according to IEC 61131.

Industrial control SE-609
Controller and visualization combined as an automation solution.
15 inch TFT color display, touchscreen operation.
Freely programmable multitasking PLC according to IEC 61131.

Remote Peripherals

SIOS Peripherals
Flexible for configuring remote peripherals. Adjustment of desired
digital/analogue I/Os through extendable modules.
One node consists of 64 modules maximum.

Remote CAN Peripherals
CAN peripherals consisting of base station and up to 4 pluggable
I/O modules. Communication takes place via CANopen protocol.

Energy Management

Energy Management System
The STANGE energy management system offers various measuring
options, is freely scalable with simple parametrisation.
Sensor Technology

H2-Sensor
Hydrogen sensor for the definition of the nitriding atmosphere
Applicable for nitriding, nitrocarburizing, oxinitriding, X-nitriding as well as carburizing processes.

H2-Sensor with digital display
Hydrogen sensor for the definition of the nitriding atmosphere
Applicable for nitriding, nitrocarburizing, oxinitriding, X-nitriding as well as carburizing processes.

O2-Sensor
Sensor for determination of leakage rates and measurement of oxygen concentration in furnace atmospheres.

O2-Sensor
O2 Sensor with digital display

Oxygen Probe
 Probe for oxygen concentration measurement and carbon potential calculation.

Gas Analyzer
Transportable gas analysis system for measurement and examination of carburizing atmospheres including data logger.

Software

Process Control System ECS
Process control software to control, monitor and log processes.
ECS is optimized for the use with STANGE program controllers SE-4xx, SE-5xx, SE-6xx and Siemens S7.

Simulation Software CarboDiS
Diffusion Calculation Software for carburizing processes with simulation and optimization with extendable material database.

Nitriding Potential Module OffLine ECS-NKZ
Nitriding potential module for fast determination of process parameters.

Compound Layer Module ECS CLT-NHD
Calculation of compound layer thickness, nitriding hardness depth and surface hardness.

STANGE Services
STANGE products efficient and practical use:
Technical support, training, project planning, modernization, start-up, maintenance and repair.
Control devices

Control Technology
STANGE controls are specifically designed for the visualization and control of industrial heat treatment processes. Fast creating, testing, operating and providing of information are in the foreground.

The control system of a heat treatment process and the constructive design of a plant are crucial for the quality of the end products achieved. The controls have already been used thousands of times worldwide. Further development takes place in cooperation with the end users, in order to ensure a practice-oriented flexible system design with possibilities for adjustment and individual extensions.

In addition to reliability, the controllers are characterized in particular by easy handling via display and control elements at the front panel (IP 65). For each task, a precisely tailored automation device is available.

The controllers can be equipped for different process engineering tasks through software modules. In addition to the C-level control and the nitriding potential control, an online diffusion calculation is available. Multilingual operating dialogues and remote maintenance enables the systems to be used worldwide.

The process control connection takes place, depending on the control, via Ethernet (SE-6xx devices) or serial RS422 with MODBUS/JBUS protocol (SE-4xx and 5xx devices).
**Trendsetting program controller with multitouch operation**

- **Easy configuration at the device**
  Configuration of functions by filling in tables. No external software necessary for function configuration (only for visualization).

- **High quality design**
  Stainless steel housing, front panel with glass touch-screen glued in aluminum mounting profile.

- **Easy operation for the end user**
  Clear operating structure divided in program management, operation and configuration.

- **Top price-performance ratio**
  Excellent price-performance ratio by using state-of-the-art electronics.

- **Data logger with touch operation**
  Moving the diagram by wipe technique on the axis of time. Zoom with two finger touch operation.

- **Visualization, own designer**
  Creation of animated plant graphics.

- **Capacitive touch**
  iPhone technology with innovative operating concept.

- **High display resolution (>130 dpi)**
  Brilliant representation made possible by high display resolution with 16 million colours.

- **ProfiNet interface to Siemens**
  Standardized interface to Siemens PLC, all data are automatically mirrored in the Siemens PLC and/or sent back to the SE-702. The interface is already pre-configured. Corresponding functional modules for the Siemens PLC are part of the scope of delivery.

- **Client/Server Structure**
  The user interface can be started again in the network (Ethernet) on one or several Windows PCs. The SE-702 serves as data server for the user interface.
Application fields
• Industrial furnaces
• Climate-/cooling simulation chambers
• Autoclaves
• Dryers
• Sterilisers
• Plastics industry
• Machinery and plant manufacturing
• Test stands etc.

Functions
• Simple menu-driven configuration without programming knowledge
• Program controller with 8 set values, 32 digital tracks, 99 programs
• 8 control zones with 8 PID parameter sets, 1 tolerance band and 2 limit values per zone
• 64 alarms
• 8 formula
• 16 tolerance bands, 16 limit values
• PLC with 3200 statements, 64 timers, programmable in STL
• Self optimising function for determining the optimal PID control parameter (Xp, Tn, Tv)
• 5 analogue value multiplexer
• Humidity control
• User administration with 5 log-in levels
• Creation of the plant visualization with graphic editor SE-Designer (PC software)
• Interfaces: 1 x Ethernet, 2 x USB, CAN-Master
• Interfaces I/O system: STANGE SIOS or CAN (via CAN-Bus), up to 16 analogue inputs, 16 analogue outputs, 64 digital inputs, 64 digital outputs
• Memory: Micro-SD-Card for Program/Configuration and separate SD-Card for data logger (option)
• Actual value correction: For each actual value up to 5 correction points can be freely defined
• Actual value filtering: False measured values can be filtered off with this function

Optional
• Interface modules (PROFINET, PROFIBUS)
• C-level control
• Data logger for up to 16 values
• Extension functional range: 20 control zones, 30 set values, 64 control tracks, 250 programs, 40 tolerance bands, 20 formula, 40 limit values, 200 alarms, 48 analogue inputs, 32 analogue outputs, 200 digital inputs, 200 digital outputs
### SE-702 - The Program Controller

Universal compact automation device for heat treatment systems with touch operation

<table>
<thead>
<tr>
<th>Technical Data</th>
<th>SE-702</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Display</strong></td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td>TFT LCD 7” (17,8 cm)</td>
</tr>
<tr>
<td>Resolution</td>
<td>800 x 480 pixels (WVGA)</td>
</tr>
<tr>
<td>Number of colours</td>
<td>16 million colours</td>
</tr>
<tr>
<td>Backlight</td>
<td>CCF</td>
</tr>
<tr>
<td>Front</td>
<td>Glas 3 mm</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td></td>
</tr>
<tr>
<td>Capacitive touch</td>
<td></td>
</tr>
<tr>
<td><strong>Protection class front</strong></td>
<td>IP 65</td>
</tr>
<tr>
<td><strong>Protection class back</strong></td>
<td>IP 20</td>
</tr>
<tr>
<td><strong>EMC interference resistance</strong></td>
<td>EN 61000-6-2</td>
</tr>
<tr>
<td>Electromagnetic radiation</td>
<td>EN 61000-6-3</td>
</tr>
<tr>
<td>Processor</td>
<td>Freescale™ i.MX 6 ARM, 800 Mhz</td>
</tr>
<tr>
<td>Random access memory</td>
<td>1 GB DRAM</td>
</tr>
<tr>
<td>PLC retain memory</td>
<td>1 MB SRAM, battery backed</td>
</tr>
<tr>
<td>SD program storage</td>
<td>≥ 1 GB</td>
</tr>
<tr>
<td><strong>I/O interfaces</strong></td>
<td></td>
</tr>
<tr>
<td>CAN Master, Modbus TCP-Slave, S7-Modbus (option), Proﬁbus DP-Slave (option), Proﬁnet IO-Device (option)</td>
<td></td>
</tr>
<tr>
<td>System LEDs</td>
<td>PLC, CAN, Alarm, Watchdog</td>
</tr>
<tr>
<td>Ethernet 10/100</td>
<td>1x</td>
</tr>
<tr>
<td>USB 2.0</td>
<td>2x</td>
</tr>
<tr>
<td>CAN</td>
<td>1x</td>
</tr>
<tr>
<td>Power supply</td>
<td>24 V DC (18 ... 36V)</td>
</tr>
<tr>
<td>Undervoltage</td>
<td>10 ms according to EN 61000-6-2</td>
</tr>
<tr>
<td>Reverse voltage protection</td>
<td>yes</td>
</tr>
<tr>
<td>Solder fuse, 4 A delay time</td>
<td></td>
</tr>
<tr>
<td><strong>Potential separation</strong></td>
<td>yes</td>
</tr>
<tr>
<td>Current consumption</td>
<td>Typ. 500 mA at 24 V DC</td>
</tr>
<tr>
<td>Power consumption</td>
<td>Typ. 12 W</td>
</tr>
<tr>
<td>Battery back-up</td>
<td>Lithium battery</td>
</tr>
<tr>
<td>Real-time clock (RTC)</td>
<td>Date/time</td>
</tr>
<tr>
<td>Accuracy</td>
<td>50 ppm (max. 131 seconds deviation per month)</td>
</tr>
<tr>
<td>Time leveling</td>
<td>Manual</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 ... 45 °C</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows Embedded Compact 7</td>
</tr>
<tr>
<td>Visualization</td>
<td>SE-Designer</td>
</tr>
<tr>
<td>PLC</td>
<td>PLC with 3200 statements, 64 timers, programmable in STL</td>
</tr>
<tr>
<td>Dimension (W x H x D)</td>
<td>210 x 144 x 55 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>1,2 kg</td>
</tr>
<tr>
<td>Functions</td>
<td>SE-702</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Program controller</strong></td>
<td></td>
</tr>
<tr>
<td>Programs</td>
<td>99 (optional: 250)</td>
</tr>
<tr>
<td>Loops</td>
<td>8 per program</td>
</tr>
<tr>
<td>Set values</td>
<td>8 (optional: 30)</td>
</tr>
<tr>
<td>Digital tracks</td>
<td>32 (optional: 64)</td>
</tr>
<tr>
<td>Segments</td>
<td>50 segments per program maximum</td>
</tr>
<tr>
<td>Process steps</td>
<td>50 maximum, freely configurable</td>
</tr>
<tr>
<td><strong>Controller</strong></td>
<td></td>
</tr>
<tr>
<td>Control zones</td>
<td>8 (optional: 20)</td>
</tr>
<tr>
<td>Controller types</td>
<td>PID linear, 2-point, 2-point PID, 3-point, 3-point PID, 3-point stepping (PI), configurable</td>
</tr>
<tr>
<td>PID parameters</td>
<td>8 parameter sets (X_p, T_n, T_v) per control zone</td>
</tr>
<tr>
<td>Tolerance band</td>
<td>1 per control zone (+tolerance/-tolerance)</td>
</tr>
<tr>
<td>Limit values</td>
<td>2 limit values per control zone (high/lolw limit value)</td>
</tr>
<tr>
<td><strong>Formula</strong></td>
<td></td>
</tr>
<tr>
<td>Formula</td>
<td>8 (optional: 20), Operations: (+, -, *, :, ), (\sqrt{x}), (e^x), (\log_{10}) logarithm, absolute value (</td>
</tr>
<tr>
<td><strong>Tolerances</strong></td>
<td></td>
</tr>
<tr>
<td>Tolerances</td>
<td>16 (optional: 40)</td>
</tr>
<tr>
<td>Tolerance outputs</td>
<td>32 (1 for each plus-tolerance, 1 for each minus-tolerance)</td>
</tr>
<tr>
<td>Comparisons</td>
<td>(A_v-S_v), (A_v-A_v), formula value (X-S_v), (X-A_v), (X-X)</td>
</tr>
<tr>
<td><strong>Limit values</strong></td>
<td></td>
</tr>
<tr>
<td>Limit values</td>
<td>16 (optional: 40)</td>
</tr>
<tr>
<td>Possible values</td>
<td>(S_v), (A_v), formula value (X), variable value, controller actual value, controller set value</td>
</tr>
<tr>
<td><strong>Alarms</strong></td>
<td></td>
</tr>
<tr>
<td>Alarms</td>
<td>64 (optional: 200)</td>
</tr>
<tr>
<td>Internal error alarms</td>
<td>16</td>
</tr>
<tr>
<td>Alarm priority levels</td>
<td>8</td>
</tr>
<tr>
<td>Alarm delays</td>
<td>8 (= priorities), 0.1 ... 99.9 sec, configurable</td>
</tr>
<tr>
<td>Alarm processing</td>
<td>1:1, binary or BCD, configurable</td>
</tr>
<tr>
<td>System alarm output</td>
<td>Visual and acoustic signal, acknowledgement of individual alarms optional</td>
</tr>
<tr>
<td><strong>Analogue multiplexers</strong></td>
<td></td>
</tr>
<tr>
<td>MUX modules</td>
<td>5 (optional: 10)</td>
</tr>
<tr>
<td>Possible values</td>
<td>(S_v), (A_v), formula value (X), variable</td>
</tr>
<tr>
<td>Analogue inputs per MUX module</td>
<td>4</td>
</tr>
<tr>
<td><strong>Internal PLC function</strong></td>
<td></td>
</tr>
<tr>
<td>Number of statements</td>
<td>3,200 maximum</td>
</tr>
<tr>
<td>Programming</td>
<td>Statement list (STL)</td>
</tr>
<tr>
<td>Possible commands</td>
<td>Logical commands, timer commands (switch-on, switch-off delay, time impulse)</td>
</tr>
<tr>
<td>Number of timers</td>
<td>64</td>
</tr>
<tr>
<td>Number of flags</td>
<td>512</td>
</tr>
<tr>
<td>Cycle time</td>
<td>100 ms</td>
</tr>
</tbody>
</table>
SE-702 - The Program Controller

Universal compact automation device for heat treatment systems with touch operation

Configuration
- Menu-assisted configuration (no programming knowledge necessary)
- Easy language switching via menu
- Settings date/time
- Configuration of the IP address / I/Os
- System settings display
- Configuration of data logger / program graph / recorder (option)
- AV correction table (measuring value comparison)
- Load / delete configuration files
- Configuration of PID controller with self-optimization function
- 8 operating levels, up to 32 user
- Configuration backup via USB stick
- Configuration of all software function modules available in the device
- Creation of plant visualization with graphic editor (PC software) (option)
- Configuration changes during operation

Programs (Recipes)
- Configurable process steps
- 99 (optional 250) programs
- Plain text description for programs (up to 30 characters)
- Graphical representation of set value curves and control tracks
- Configurable program loops (8 loops per program)
- Sort, change, copy and delete programs
- Load programs into the operating memory mode
- Save operating program

Operation
- Plant overview with plant pictures (configurable)
- Plain text alarm display with history memory
- Jump in program
- Full display of control zones
- Numerical and graphical display of set values and tracks
- Manual operation for set values and tracks even during program run
- Auto-optimization of control parameters (“self-tuning”)
- Manual operation for the manipulated variable Y (“Y-Man.”)
- Representation of actual values, limit values, tolerance- and formula values
- Login code input page
Supplementary Equipment

- **Profinet IO / Profibus DP**
  Interface to connect a SE-702 to a PROFIBUS-System as slave; Master might be e.g. a Siemens PLC.

- **C-level control**
  Temperature and furnace atmosphere are controlled. A special formula for carbon calculation is used.

- **Data logger for up to 16 values**
  The data logger records and stores all relevant process values and makes them available in an evaluation.

- **Extension functional range:**
  20 control zones, 30 set values, 64 control tracks, 250 programs, 40 tolerance bands, 20 formula, 40 limit values, 200 alarms, 48 actual value inputs, 32 analogue values outputs, 200 digital inputs, 200 digital outputs
Universal compact automation device for heat treatment systems with touch operation

**SE-702 - The Program Controller**

Dimension Diagram (mm)

**Front view**
SE-702

**Side view**
Expansion Slot RJ45 USB 1/2 CAN Alarm Supply Voltage

**Rear view**
Hardware Concept SE-702

- LCD display, background lighting 800 x 480 Pixel
- Power pack 24 VDC (18 ... 36 V)
- CPU board
  - Main memory 512 MB DRAM
  - Memory for fail-safe data (PLC retain memory)
  - Micro-SD memory card 512 MB (internal)
  - SD memory card 2 GB (external for data logger)
- Ethernet interface
- Master CAN interface
- USB interface
- Profibus DP (option) SLAVE
- Modbus TCP (Master/Slave)
- Interface for CAN I/Os e.g. CAN-SIOS
- SLAVE, e.g. connecting Siemens S7
- Watchdog
- Alarm relay
- Remote control
- Control system
- Configuration Import/Export
- Power pack 24 VDC (18 ... 36 V)
SE-707/709 - The Program Controller XL
Universal compact automation device for heat treatment systems with touch operation

**Trendsetting program controller with multitouch operation**

- Easy configuration at the device
  - Configuration of functions by filling in tables. No external software necessary for function configuration (only for visualization).
- MODBUS TCP/IP interface to Siemens PLC
  - Standardized interface to Siemens PLC, all data are automatically mirrored in the Siemens PLC and/or sent back to the SE-7xx. The interface is already pre-configured. Corresponding functional modules for the Siemens PLC are part of the scope of delivery.
- Data logger with touch operation
- Short engineering periods
- Complete operating interface
  - Clear operating structure divided in program management, operation and configuration.
- Visualization, own designer
  - Creation of animated plant graphics.
- Capacitive touch control
  - iPhone technology with innovative operating concept.
- High display resolution (>130 dpi)
  - Brilliant representation made possible by high display resolution with 16 million colours.
- High quality design
  - Stainless steel housing, front panel with glass touch-screen glued in aluminum mounting profile.
- Client/Server Structure
  - The user interface can be started again in the network (Ethernet) on one or several Windows PCs. The SE-7xx serves as data server for the user interface.
Application fields
• Industrial furnaces
• Climate-/cooling simulation chambers
• Autoclaves
• Dryers
• Sterilisers
• Plastics industry
• Machinery and plant manufacturing
• Test stands
  etc.

Functions
• Simple menu-driven configuration without programming knowledge
• Program controller with 8 set values, 32 digital tracks, 99 programs
• 8 control zones with 8 PID parameter sets, 1 tolerance band and 2 limit values per zone
• 64 alarms
• 8 formula
• 16 tolerance bands, 16 limit values
• PLC with 3200 statements, 64 timers, programmable in STL
• Self optimising function for determining the optimal PID control parameter (Xp, Tn, Tv)
• 5 Log-in level
• 5 analogue value multiplexer
• Humidity control
• User administration with log-in levels
• Creation of the plant visualization with graphic editor SE-Designer (PC software)
• Interfaces: 1 x Ethernet, 2 x USB, CAN-Master
• Interfaces I/O system: STANGE SIOS or CAN (via CAN-Bus),
  up to 16 actual value, 16 analogue outputs, 64 digital inputs, 64 digital outputs
• Memory: 512MB Micro-SD-Card for Program/Configuration,
  2 GB SD-Card for data logger (option)
• Actual value correction: For each actual value up to 5 correction points can be freely defined
• Actual value filtering: False measured values can be filtered off with this function

Optional
• Interface modules (PROFINET, PROFIBUS)
• C-level control
• Data logger for up to 16 value
• Extension functional range: 20 control zones, 30 set values, 64 control tracks, 250 programs,
  40 tolerance bands, 20 formula, 40 limit values, 200 alarms, 48 analogue inputs,
  32 analogue outputs, 200 digital inputs, 200 digital outputs
## Technical Data

<table>
<thead>
<tr>
<th>Feature</th>
<th>SE-707</th>
<th>SE-709</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Display</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td>TFT LCD 12,1” (30,7 cm)</td>
<td>TFT LCD 17,3” (43,9 cm)</td>
</tr>
<tr>
<td>Resolution</td>
<td>1280 x 800 pixels (WXGA)</td>
<td>1920 x 1080 pixels (FHD)</td>
</tr>
<tr>
<td>Number of colours</td>
<td>16 million colours</td>
<td>16 million colours</td>
</tr>
<tr>
<td>Backlight</td>
<td>CCF</td>
<td>CCF</td>
</tr>
<tr>
<td>Front</td>
<td>Glas 3 mm</td>
<td>Glas 3 mm</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacitive touch</td>
<td>Capacitive touch</td>
<td>Capacitive touch</td>
</tr>
<tr>
<td>Protection class front</td>
<td>IP 65</td>
<td>IP 65</td>
</tr>
<tr>
<td>Protection class back</td>
<td>IP 20</td>
<td>IP 20</td>
</tr>
<tr>
<td>EMC interference resistance</td>
<td>EN 61000-6-2</td>
<td>EN 61000-6-2</td>
</tr>
<tr>
<td>Electromagnetic radiation</td>
<td>EN 61000-6-3</td>
<td>EN 61000-6-3</td>
</tr>
<tr>
<td>Processor</td>
<td>Freescale™ i.MX 6 ARM, 800 Mhz</td>
<td>Freescale™ i.MX 6 ARM, 800 Mhz</td>
</tr>
<tr>
<td>Random access memory</td>
<td>512 MB DRAM</td>
<td>512 MB DRAM</td>
</tr>
<tr>
<td>PLC retain memory</td>
<td>1 MB SRAM, battery backed</td>
<td>1 MB SRAM, battery backed</td>
</tr>
<tr>
<td>SD program storage</td>
<td>≥ 512 MB</td>
<td>≥ 512 MB</td>
</tr>
<tr>
<td><strong>I/O interfaces</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAN Master, Modbus TCP-Slave, S7-Modbus (option), Profibus DP-Slave (option), Profinet IO-Device (option)</td>
<td>CAN Master, Modbus TCP-Slave, S7-Modbus (option), Profibus DP-Slave (option), Profinet IO-Device (option)</td>
<td></td>
</tr>
<tr>
<td>System LEDs</td>
<td>PLC, CAN, Alarm, Watchdog</td>
<td>PLC, CAN, Alarm, Watchdog</td>
</tr>
<tr>
<td>Ethernet 10/100</td>
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<td>1x</td>
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<tr>
<td>USB 2.0</td>
<td>2x</td>
<td>2x</td>
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<tr>
<td>CAN</td>
<td>1x</td>
<td>1x</td>
</tr>
<tr>
<td>Power supply</td>
<td>24 V DC (18 ... 36V)</td>
<td>24 V DC (18 ... 36V)</td>
</tr>
<tr>
<td>Undervoltage</td>
<td>10 ms according to EN 61000-6-2</td>
<td>10 ms according to EN 61000-6-2</td>
</tr>
<tr>
<td>Reverse voltage protection</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Fuse</td>
<td>Solder fuse, 4 A delay time</td>
<td>Solder fuse, 4 A delay time</td>
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<tr>
<td>Potential separation</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Current consumption</td>
<td>Typ. 800 mA at 24 V DC</td>
<td>Typ. 1100 mA at 24 V DC</td>
</tr>
<tr>
<td>Power consumption</td>
<td>Typ. 20 W</td>
<td>Typ. 26 W</td>
</tr>
<tr>
<td>Battery back-up</td>
<td>Lithium battery</td>
<td>Lithium battery</td>
</tr>
<tr>
<td>Real-time clock (RTC)</td>
<td>Date/time</td>
<td>Date/time</td>
</tr>
<tr>
<td>Accuracy</td>
<td>50 ppm (max. 131 seconds deviation per month)</td>
<td>50 ppm (max. 131 seconds deviation per month)</td>
</tr>
<tr>
<td>Time leveling</td>
<td>Manual</td>
<td>Manual</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 … 45 °C</td>
<td>0 … 45 °C</td>
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<tr>
<td>Operating system</td>
<td>Windows Embedded Compact 7</td>
<td>Windows Embedded Compact 7</td>
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<td>Visualization</td>
<td>SE-Designer</td>
<td>SE-Designer</td>
</tr>
<tr>
<td>PLC</td>
<td>PLC with 3200 statements, 64 timers, programmable in STL</td>
<td>PLC with 3200 statements, 64 timers, programmable in STL</td>
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<tr>
<td>Dimension (W x H x D)</td>
<td>370 x 260 x 106 mm</td>
<td>461,8 x 346,6 x 120 mm</td>
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<td>Functions</td>
<td>SE-707 / SE-709</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
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</tr>
<tr>
<td><strong>Program controller</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programs</td>
<td>99 (optional: 250)</td>
<td></td>
</tr>
<tr>
<td>Loops</td>
<td>8 per program</td>
<td></td>
</tr>
<tr>
<td>Set values</td>
<td>8 (optional: 30)</td>
<td></td>
</tr>
<tr>
<td>Digital tracks</td>
<td>32 (optional: 64)</td>
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<tr>
<td>Segments</td>
<td>50 segments per program maximum</td>
<td></td>
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<tr>
<td>Process steps</td>
<td>50 maximum, freely configurable</td>
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<table>
<thead>
<tr>
<th>Controller</th>
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<tbody>
<tr>
<td>Control zones</td>
<td>8 (optional: 20)</td>
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<tr>
<td>Controller types</td>
<td>PID linear, 2-point, 2-point PID, 3-point, 3-point PID, 3-point stepping (PI), configurable</td>
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<tr>
<td>PID parameters</td>
<td>8 parameter sets (X_p, T_n, T_v) per control zone</td>
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<tr>
<td>Tolerance band</td>
<td>1 per control zone (+tolerance/-tolerance)</td>
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<tr>
<td>Limit values</td>
<td>2 limit values per control zone (high/low limit value)</td>
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<table>
<thead>
<tr>
<th>Formula</th>
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<tr>
<td>Formula</td>
<td>8 (optional: 20), Operations: +, -, *, :,</td>
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<table>
<thead>
<tr>
<th>Tolerances</th>
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<tr>
<td>Tolerances</td>
<td>16 (optional: 40)</td>
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<tr>
<td>Tolerance outputs</td>
<td>32 (1 for each plus-tolerance, 1 for each minus-tolerance)</td>
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<tr>
<td>Comparisons</td>
<td>(\text{Av-Sv}, \text{Av-Av}, \text{formula value} X-Sv, X-Av, X-X)</td>
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<thead>
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<th>Limit values</th>
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<tr>
<td>Limit values</td>
<td>16 (optional: 40)</td>
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<tr>
<td>Possible values</td>
<td>(\text{Sv, Av, formula value} X, \text{variable value, controller actual value, controller set value})</td>
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<th>Alarms</th>
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<tr>
<td>Alarms</td>
<td>64 (optional: 200)</td>
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<tr>
<td>Internal error alarms</td>
<td>16</td>
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<tr>
<td>Alarm priority levels</td>
<td>8</td>
</tr>
<tr>
<td>Alarm delays</td>
<td>8 (= priorities), 0.1 ... 99.9 sec, configurable</td>
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<tr>
<td>Alarm processing</td>
<td>1:1, binary or BCD, configurable</td>
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<tr>
<td>System alarm output</td>
<td>Visual and acoustic signal, acknowledgement of individual alarms optional</td>
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<tr>
<th>Analogue multiplexers</th>
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<tr>
<td>MUX modules</td>
<td>5 (optional: 10)</td>
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<td>Possible values</td>
<td>(\text{Sv, Av, formula value} X, \text{variable})</td>
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<tr>
<td>Analogue inputs per MUX module</td>
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<table>
<thead>
<tr>
<th>Internal PLC function</th>
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<tbody>
<tr>
<td>Number of statements</td>
<td>3,200 maximum</td>
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<tr>
<td>Programming</td>
<td>Statement list (STL)</td>
</tr>
<tr>
<td>Possible commands</td>
<td>Logical commands, timer commands (switch-on, switch-off delay, time impulse)</td>
</tr>
<tr>
<td>Number of timers</td>
<td>64</td>
</tr>
<tr>
<td>Number of flags</td>
<td>512</td>
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<tr>
<td>Cycle time</td>
<td>100 ms</td>
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</table>
SE-707/709 - The Program Controller XL
Universal compact automation device for heat treatment systems with touch operation

Configuration
- Menu-assisted configuration (no programming knowledge necessary)
- Easy language switching via menu
- Settings date/time
- Configuration of the IP address / I/Os
- System settings display
- Configuration of data logger / program graph / recorder (option)
- AV correction table (measuring value comparison)
- Load / delete configuration files
- Configuration of PID controller with self-optimization function
- 8 operating levels, up to 32 user
- Configuration backup via USB stick
- Configuration of all software function modules available in the device
- Creation of plant visualization with graphic editor (PC software) (option)
- Configuration changes during operation

Programs (Recipes)
- Configurable process steps
- 99 (optional 250) programs
- Plain text description for programs (up to 30 characters)
- Graphical representation of set value curves and control tracks
- Configurable program loops (8 loops per program)
- Sort, change, copy and delete programs
- Load programs into the operating memory mode
- Save operating program

Operation
- Plant overview with plant pictures (configurable)
- Plain text alarm display with history memory
- Jump in program
- Full display of control zones
- Numerical and graphical display of set values and tracks
- Manual operation for set values and tracks even during program run
- Auto-optimization of control parameters (“self-tuning”)
- Manual operation for the manipulated variable Y (“Y-Man.”)
- Representation of actual values, limit values, tolerance- and formula values
- Login code input page
Supplementary Equipment

- Profinet IO / Profibus DP
  Interface to connect a SE-702 to a PROFIBUS-System as slave; Master might be e.g. a Siemens PLC.

- C-level control
  Temperature and furnace atmosphere are controlled. A special formula for carbon calculation is used.

- Data logger for up to 16 values
  The data logger records and stores all relevant process values and makes them available in an evaluation.

- Extension functional range:
  - 20 control zones,
  - 30 set values,
  - 64 control tracks,
  - 250 programs,
  - 40 tolerance bands,
  - 20 formula,
  - 40 limit values,
  - 200 alarms,
  - 48 analogue inputs,
  - 32 analogue outputs,
  - 200 digital inputs,
  - 200 digital outputs
Universal compact automation device for heat treatment systems with touch operation

SE-707/709 - The Program Controller XL

Dimension Diagram (mm)

Front view

SE-707

SE-709

Side view

Rear view
Hardware Concept SE-707 / SE-709

- LCD display, background lighting 800 x 480 Pixel
- Power pack 24 VDC (18 ... 36V)
- CPU board
  - Main memory 512 MB DRAM
  - Memory for fail-safe data (PLC retain memory)
  - Micro-SD memory card 512 MB (internal)
  - SD memory card 2 GB (external for data logger)
- Ethernet interface
- Master CAN interface
- USB interface
- Profibus DP (option) SLAVE
- Modbus TCP (Master/Slave)
- Interface for CAN I/Os e.g. CAN-SIOS
- SLAVE, e.g. connecting Siemens S7

- Remote control
- Control system
- Configuration Import/Export
- Watchdog
- Alarm relay
- Power pack 24 VDC (18 ... 36V)
Industrial Control SE-604

Controller and visualization combined as an automation solution with multitasking PLC (CoDeSys)

The controller is equipped with a high-contrast TFT colour display (6.5 inch). A 600MHz fast Pentium based 32bit processor ensures fast signal processing. User friendly operation is achieved via the clearly arranged control dialogue and 34 operating keys.

The operating system VxWorks provides an extremely high operational reliability. A IEC61131 PLC (CoDeSys) operates in the control which achieves the performance of a middle hardware PLC. The well-known advantages of CoDeSys such as fast setting, practical and user friendly handling and high performance can be benefited from. All data are stored on a Compact Flash Card (CF).

Field bus communication is made via STANGE remote CAN peripherals, optionally Profibus. The connection to a process control system is made via a TCP/IP interface (100Mbit). The integrated web server makes operation through remote control possible via the Internet browser.

Application fields:
- Multi-purpose chamber furnace with C-diffusion calculation
- Nitriding furnaces with nitriding potential control
- Vacuum annealing furnaces
- Autoklaves
- Climate chambers
- ... and much more
• Real-time operating system VxWorks for extremely high operating safety
• Freely programmable multitasking PLC according to IEC 61131 (CoDeSys)
• Program controller for up to 50 set values and 64 control tracks
• 8 program loops with 9999 repetitions maximum
• Recipe management for up to 250 recipes (programs)
• Up to 50 control zones
• Up to 500 alarms with alarm history
• Auto optimization function for optimal control parameters
• 8 Login levels
• Online language switching with unicode language support (Russian, Chinese etc.)
• Freely configurable plant visualization
• Web server: Plant remote operation via Java compatible web browser, identification with user password
• Access to internal controller data by the delivered CoDeSys-OPC-Server
• Multi-programmer for up to 10 units
• Operating set value curve with display of 3 set values and 4 actual values (configurable) with time bars and zoom function for the run off curve section.
• Compact Flash 256 MB for configuration and program data
• Interfaces: COM (RS232/RS422), Ethernet (100MBit), CAN, PS/2 (PC keyboard), VGA, USB
• Remote control via smartphone and tablet (Windows / Android / iOS) by VNC client
• UL Certification (UL 61010-1 and UL 61010-2-201): UL file number E474526

Optionally:
• Profibus DP-Master/Slave interface
• Printer interface
• USB Memory stick
• C-level calculation
• C-diffusion calculation with hardness curve
• Nitriding potential control
• Batch logging with recorder function, up to 15 loggers for 250 channels
• Modbus TCP / Modbus RTU
## Technical Data SE-604

<table>
<thead>
<tr>
<th><strong>Display</strong></th>
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</thead>
<tbody>
<tr>
<td>Technology</td>
<td>TFT LCD 6.5”</td>
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<tr>
<td>Resolution</td>
<td>640 x 480 pixels (VGA)</td>
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<tr>
<td>Number of colours</td>
<td>256 colours</td>
</tr>
<tr>
<td>Backlight</td>
<td>CCF</td>
</tr>
<tr>
<td>Front</td>
<td>Antireflective interference coated glass</td>
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<table>
<thead>
<tr>
<th><strong>Operation</strong></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>Foil keyboard, 34 keys</td>
</tr>
<tr>
<td>Protection class front</td>
<td>IP 65</td>
</tr>
<tr>
<td>Protection class back</td>
<td>IP 20</td>
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<tr>
<th><strong>EMC</strong></th>
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<tr>
<td>EMC interference resistance</td>
<td>EN 61000-6-2</td>
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<tr>
<td>Electromagnetic radiation</td>
<td>EN 61000-6-3</td>
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<thead>
<tr>
<th><strong>Processor</strong></th>
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<tbody>
<tr>
<td>Processor</td>
<td>Pentium based 32bit processor</td>
</tr>
<tr>
<td>Random access memory</td>
<td>256 MB DRAM</td>
</tr>
<tr>
<td>PLC retain memory</td>
<td>32 KB SRAM, battery backed</td>
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<tr>
<td>CF program storage</td>
<td>≥ 256 MB</td>
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<table>
<thead>
<tr>
<th><strong>I/O interfaces</strong></th>
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</tr>
</thead>
<tbody>
<tr>
<td>I/O interfaces</td>
<td>CAN, Modbus, Profibus DP (option)</td>
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</table>

<table>
<thead>
<tr>
<th><strong>System LEDs</strong></th>
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<tr>
<td>System LEDs</td>
<td>PLC, CAN, Alarm, Watchdog</td>
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<td>PS/2 connection</td>
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<td>USB 2.0</td>
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<td>RS232</td>
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<td>RS422</td>
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<tr>
<td>CAN</td>
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<table>
<thead>
<tr>
<th><strong>Power</strong></th>
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<tbody>
<tr>
<td>Power supply</td>
<td>24 VDC (18 ... 36V)</td>
</tr>
<tr>
<td>Undervoltage</td>
<td>10 ms according to EN 61000-6-2</td>
</tr>
<tr>
<td>Reverse voltage protection</td>
<td>Yes</td>
</tr>
<tr>
<td>Fuse</td>
<td>Solder fuse, 4 A delay time</td>
</tr>
<tr>
<td>Potential separation</td>
<td>Yes</td>
</tr>
<tr>
<td>Current consumption</td>
<td>Typ. 1000mA at 24 VDC</td>
</tr>
<tr>
<td>Power consumption</td>
<td>Typ. 24W</td>
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<tr>
<td>Battery back-up</td>
<td>Lithium battery</td>
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<tr>
<td>Real-time clock (RTC)</td>
<td>Date/time</td>
</tr>
<tr>
<td>Accuracy</td>
<td>50 ppm</td>
</tr>
<tr>
<td>Time leveling</td>
<td>Manual or over network time server</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 ... 50°C</td>
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<tr>
<td>Operating system</td>
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<tbody>
<tr>
<td>Visualization</td>
<td>ECS EPAM</td>
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<tr>
<td>PLC</td>
<td>IEC 61131 SPS CoDeSys, multitasking capable soft PLC</td>
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<p>| <strong>Dimension (W x H x D)</strong> | 290 x 185 x 90 mm |
| <strong>Weight</strong> | 2.5 kg |</p>
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<th>10x Unit</th>
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<td>480</td>
<td>96</td>
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<tr>
<td>Digital outputs</td>
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<td>480</td>
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<td>Tolerances</td>
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<tr>
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<td><strong>Screen recorder (option)</strong></td>
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<td>C-diffusion calculation</td>
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<td>✔</td>
<td>✔</td>
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<td>Nitriding potential</td>
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</table>
Industrial Control SE-604
Controller and visualization combined as an automation solution with multitasking PLC (CoDeSys)

Configuration
- Configured with IEC 61131 programm CoDeSys (free of charge)
- Online language switching via menu
- Date/time setting
- Configuration of IP address / I/Os
- Display of system settings
- Configuration of data logger / program graph / recorder
- AV correction table (measuring value comparison)
- Settings for automatic batch importing (data storage)
- Configuration of printer interface
- Load / delete configuration files
- Configuration of PID controller with self-optimization function
- 8 operating levels
- Configuration backup via PC
- Completed function modules (controller, programmer, logger etc.) in CoDeSys
- Freely configurable operating interface with ECS-EPAM (based on Excel)
- Configuration changes during operation

Programs (Recipes)
- Configurable process steps
- 250 programs with up to 200 segments
- Plain text description for programs (up to 30 characters)
- Graphical representation of set value curves and control tracks
- Configurable program loops (8 loops per program)
- Sort, change, copy and delete programs
- Load programs into the operating mode
- Save operating program

Operation
- Plant overview with plant pictures (configurable)
- Operating set value curve with graphic representation of up to 2 set values (future) and 3 actual values (configurable)
- Plain text alarm display with history memory
- Jump in program with graphic set value curves display
- Full display of control zones
- Programming of an automatic program start
- Numerical and graphical display of set values and tracks
- Manual operation for set values and tracks even during program run
- Auto-optimization of control parameters ("self-tuning")
- Manual operation for the manipulated variable Y ("Y-Man.")
- Representation of actual values, limit values, tolerance- and formula values
- Power failure definition
- Login code input page
Batch logging with recorder function
• Batch logging with recorder function for up to 250 channels (digital or analogue) per logger.
  Up to 15 loggers can be started parallel
• A batch head with up to 20 configurable data fields is stored for each batch
• Alarms occurred in this period are stored for each batch
• Batch storage takes place on a Compact Flash card (industrial grade) with 2 GB memory capacity
• Batches can be analyzed with batch management on the device
• Analysis includes zoom functions and scale
• Evaluation software ECS-AW is an option for importing stored batch data via Ethernet for comprehensive data analysis on the PC

Nitriding Potential Control
Software module for displaying and controlling the nitriding potential (classical nitriding, nitrocarburizing, oxynitriding, X nitriding, pre-oxidation, post-oxidation, low temperature oxynitriding)

Online-C-Diffusion with Hardness Curve
Mathematical module for calculating the carburizing and hardness progression in the work piece with knowledge of material and process specific characteristics.

Online Printer
Batch protocols, diagrams (pins and colours configurable) and event lists can be printed on the basis of batch recording of the internal data logger
Industrial Control SE-604
Controller and visualization combined as an automation solution with multitasking PLC (CoDeSys)

Dimension Diagram (mm)

Front view
SE-604

Side view

Rear view
Hardware Concept SE-604

- LCD display, background lighting 640 x 480 pixels
- Power Pack 24 VDC (18 ... 36V)
- CompactFlash Memory Card 256 MB
- CPU board
  - Main memory 256 MB DRAM
  - Memory for mains failure safe data (PLC retain memory)
- RS232 interface
- RS422 interface
- Ethernet interface
- Master CAN interface
- USB interface
- ProfibusDP (Option) MASTER or SLAVE
- Watchdog
- Alarm relay
- Remote access for web server
- Control system
- Interface
- Online printer
- Modbus RTU Master
- Modbus TCP (Master/Slave)
- Interface for configuration-, log- and program data
- Interface for CAN-I/Os e.g. CAN-Basis4
- SLAVE, e.g. connection Siemens S7
- MASTER, e.g. connection thyristor controller with Profibus slave, etc.
The controller is equipped with a high-contrast 10.4 inch TFT touch display. A 600MHz fast Pentium based 32bit processor ensures fast signal processing. A user friendly operation is achieved via the clearly arranged control dialogue and touch operating keys.

The operating system VxWorks provides an extremely high operational reliability. A IEC61131 PLC (CoDeSys) operates in the control which achieves the performance of a middle hardware PLC. The well-known advantages of CoDeSys such as fast setting, practical and user friendly handling and high performance can be benefited from. All data are stored on a Compact Flash Card (CF).

Field bus communication is made via STANGE remote CAN peripherals, optionally Profibus. The connection to a process control system is made via a TCP/IP interface (100Mbit). The integrated web server makes operation through remote control possible via the Internet browser.

The requirements of modern furnace engineering have influenced the development of software applications considerably. Up to 50 control zones are processed by the control. The alarm processing stores up to 500 messages and displays these in the alarm history. The integrated recipe manager enables a maximum of 250 recipes (programs) to be created. The programmer processes up to 50 set values and 64 control tracks.

8 login levels increase the working reliability. The access privileges are defined for configuration and operation. Process visualization and a 32 channel recorder (option) are integrated as well. The provided OPC server allows access to the internal data of the control.

Application fields:
- Furnace with C-diffusion calculation
- Nitriding furnaces with nitriding potential control
- Vacuum annealing furnaces
- Autoclaves
- ... and much more

Trend-setting industrial controls for heat treatment plants
Elektronik GmbH

- Real-time operating system VxWorks for extremely high operating safety
- Freely programmable multitasking PLC according to IEC 61131 (CoDeSys)
- Program controller for up to 50 set values and 64 control tracks
- 8 program loop with 9999 repetitions maximum
- Recipe management for up to 250 recipes (programs)
- Up to 50 control zones
- Up to 500 alarms with alarm history
- Auto optimization function for optimal control parameters
- 8 login levels
- Online language switching with unicode language support (Russian, Chinese etc.)
- Freely configurable plant visualization
- Web server: Plant remote operation via Java compatible web browser, identification with user password
- Access to internal controller via the CoDeSys-POC server supplied
- Multi-programmer for up to 10 units
- Operating set value curve with representation of 3 set values and 4 actual values (configurable) with time bars and zoom function for the run off curve section
- Compact Flash 256 MB for configuration and program data
- Interfaces: COM (RS232/RS422), Ethernet (100MBit), CAN, PS/2 (PC keyboard), VGA, USB
- Remote control via smartphone and tablet (Windows / Android / iOS) by VNC client

Optional

- Profibus DP-master/slave interface
- Printer interface
- USB memory stick
- C-level calculation
- C-diffusion calculation with hardness curve
- Nitriding potential control
- Batch logging with recorder function, up to 15 loggers for 250 channels
- Modbus TCP / Modbus RTU
# Industrial Control SE-607

Controller and visualization combined as an automation solution with infrared touch operation.

## Technical Data

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<thead>
<tr>
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<th>SE-607</th>
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<td>Front</td>
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<td>Protection class back</td>
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<td>EN 61000-6-3</td>
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<td>Pentium based 32bit processor</td>
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<td>256 MB DRAM</td>
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<td>Manual or over network time server</td>
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<td>Profibus master</td>
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<td>Profibus slave</td>
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<td>Printer interface</td>
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<td>Modbus</td>
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</tbody>
</table>
Controller and visualization combined as an automation solution with infrared touch operation

**Industrial Control SE-607**

### Configuration
- Configured with IEC 61131 program CoDeSys (free of charge)
- Online language switching via menu
- Date/time setting
- Configuration of IP address / I/Os
- Display of system settings
- Configuration of data logger / program graph / recorder
- AV correction table (measuring value comparison)
- Settings for automatic batch importing (data storage)
- Configuration of printer interface
- Load / delete configuration files
- Configuration of PID controller with self-optimization function
- 8 operating levels
- Configuration backup via PC
- Completed function modules (controller, programmer, logger etc.) in CoDeSys
- Freely configurable operating interface with ECS-EPAM (based on Excel)
- Changes at operation during operation

### Programs (Recipes)
- Configurable process steps
- 250 programs with up to 200 segments
- Plain text description for programs (up to 30 characters)
- Graphical representation of set value curves and control tracks
- Configurable program loops (8 loops per program)
- Sort, change, copy and delete programs
- Load programs into the operating mode
- Save operating program

### Operation
- Plant overview with plant pictures (configurable)
- Operating set value curve with graphic representation of up to 2 set values (future) and 3 actual values (configurable)
- Plain text alarm display with history memory
- Jump in program with graphic set value curves display
- Complete control zones display
- Programming of an automatic program start
- Numerical and graphical display of set values and tracks
- Manual operation for set values and tracks even during program run
- Auto-optimization of control parameters ("self-tuning")
- Manual operation for the manipulated variable Y ("Y-Man.")
- Representation of actual values, limit values, tolerance- and formula values
- Power failure definition
- Login code input page
Batch logging with recorder function
- Batch logging with recorder function for up to 250 channels (digital or analogue) per logger.
  Up to 15 loggers can be started parallel.
- A batch head with up to 20 configurable data fields is stored for each batch
- Alarms occurred in this period are stored for each batch
- Batch storage takes place on a Compact Flash card (industrial grade) with 2 GB memory capacity
- Batches can be analyzed with batch management on the device
- Analysis includes zoom functions and scale
- Evaluation software ECS-AW is an option for importing stored batch data via Ethernet for comprehensive data analysis on the PC

Nitriding Potential Control
Software module for displaying and controlling the nitriding potential (classical nitriding, nitrocarburizing, oxynitriding, X nitriding, pre-oxidation, post-oxidation, low temperature oxynitriding)

Online-C-Diffusion with Hardness Progression
Mathematical module for calculating the carburizing and hardness progression in the component with knowledge of component and process specific characteristics

Online Printer
Batch protocols, diagrams (pins and colours configurable) and event lists can be printed based on batch recording of the internal data logger
Industrial Control SE-607
Controller and visualization combined as an automation solution with infrared touch operation

Dimension Diagram (mm)

Front view

Side view

Rear view
Hardware Concept SE-607

- LCD display, background lighting 640 x 480 pixels
- Power Pack 24 VDC (18 ... 36V)
- CompactFlash Memory Card 256 MB
- CPU board
  - Main memory 256 MB DRAM
  - Memory for mains failure safe data (PLC retain memory)
- RS232 interface
- RS422 interface
- Ethernet interface
- Master CAN interface
- USB interface
- ProfibusDP (Option) MASTER or SLAVE
- Watchdog
- Alarm relay
- Remote access for web server
- Control system
- Interface
- Online printer
- Modbus RTU Master
- Modbus TCP (Master/Slave) Interface for configuration-, log-and program data
- Interface for CAN-I/Os e.g. CAN-Basis4
- SLAVE, e.g. connection Siemens S7
- MASTER, e.g. connection thyristor controller with Profibus slave, etc.
The SE-609 controller is equipped with a high-contrast 15 inch TFT touch display. A 600MHz fast Pentium based 32bit processor ensures fast signal processing. A user friendly operation is achieved via the clearly arranged control dialogue and touch operating keys.

The operating system VxWorks provides an extremely high operational reliability. A IEC61131 PLC (CoDeSys) operates in the control which achieves the performance of a middle hardware PLC. The well-known advantages of CoDeSys such as fast setting, practical and user friendly handling and high performance can be benefited from. All data are stored on a Compact Flash Card (CF).

Field bus communication is made via STANGE remote CAN peripherals, optionally Profibus. The connection to a process control system is made via a TCP/IP interface (100Mbit). The integrated web server makes the operation through remote control possible via the internet browser.

The requirements of modern furnace engineering have influenced the development of software applications considerably. Up to 50 control zones are processed by the control. The alarm processing stores up to 500 messages and displays these in the alarm history. The integrated recipe manager enables the creation of a maximum of 250 recipes (programs). The programmer processes up to 50 set values and 64 control tracks.

8 login levels increase the working reliability. The access privileges are defined for configuration and operation. Process visualization and a 32 channel recorder (option) are integrated as well. The provided OPC server allows access to the internal data of the control.

Application fields:
- Furnace with C-diffusion calculation
- Nitriding furnaces with nitriding potential control
- Vacuum annealing furnaces
- Plasma nitriding furnaces
... and much more
• Real-time operating system VxWorks for extremely high operating safety
• Freely programmable multitasking PLC according to IEC 61131 (CoDeSys)
• Program controller for up to 50 set values and 64 control tracks
• 8 program loop with 9999 repetitions maximum
• Recipe management for up to 250 recipes (programs)
• Up to 50 control zones
• Up to 500 alarms with alarm history
• Auto optimization function for optimal control parameters
• 8 login levels
• Online language switching with unicode language support (Russian, Chinese etc.)
• Freely configurable plant visualization
• Web server: Plant remote operation via Java compatible web browser, identification with user password
• Access to internal controller data by the delivered CoDeSys-OPC-Server
• Multi-programmer for up to 10 units
• Operating set value curve with representation of 3 set values and 4 actual values (configurable) with time bars and zoom function for the run off curve section
• Compact Flash 256 MB for configuration and program data
• Interfaces: COM (RS232/RS422), Ethernet (100MBit), CAN, PS/2 (PC keyboard), VGA, USB
• Remote control via smartphone and tablet (Windows / Android / iOS) by VNC client

Optional
• Profibus DP-master/slave interface
• Printer interface
• USB memory stick
• C-level calculation
• C-diffusion calculation with hardness curve
• Nitriding potential control
• Batch logging with recorder function, up to 15 loggers for 250 channels
• Modbus TCP / Modbus RTU
## Technical Data

<table>
<thead>
<tr>
<th>SE-609</th>
<th>Display</th>
</tr>
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<tbody>
<tr>
<td>Technology</td>
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<td>Backlight</td>
<td>CCF</td>
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<td>Front</td>
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<td>Operation</td>
<td>Infrarot-Touch</td>
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<td>Protection class front</td>
<td>IP 65</td>
</tr>
<tr>
<td>Protection class back</td>
<td>IP 20</td>
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<tr>
<td>EMC interference resistance</td>
<td>EN 61000-6-2</td>
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<tr>
<td>Electromagnetic radiation</td>
<td>EN 61000-6-3</td>
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<tr>
<td>Processor</td>
<td>Pentium based 32bit processor</td>
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<tr>
<td>Random access memory</td>
<td>256 MB DRAM</td>
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<td>PLC retain memory</td>
<td>32 KB SRAM, battery buffered</td>
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<td>Operating temperature</td>
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<td>Number of programs</td>
<td>250</td>
</tr>
<tr>
<td><strong>Screen recorder (option)</strong></td>
<td></td>
</tr>
<tr>
<td>Number of screen recorders</td>
<td>15</td>
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<tr>
<td>Number of data channels</td>
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<tr>
<td>Number of batch texts</td>
<td>20</td>
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<tr>
<td>Number of batch files</td>
<td>200</td>
</tr>
<tr>
<td>Number of user data</td>
<td>500</td>
</tr>
<tr>
<td><strong>Interfaces</strong></td>
<td></td>
</tr>
<tr>
<td>Ethernet</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>CAN</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>USB memory stick</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>Further options</strong></td>
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<tr>
<td>C-level calculation</td>
<td>✔ ✔ ✔</td>
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<tr>
<td>C-diffusion calculation</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>Nitriding potential</td>
<td>✔ 5-fold</td>
</tr>
<tr>
<td>Profibus master</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>Profibus slave</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>Printer interface</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>Modbus</td>
<td>✔ ✔ ✔</td>
</tr>
</tbody>
</table>
Industrial Control SE-609
Controller and visualization combined as an automation solution with multitasking PLC (CoDeSys)

Configuration
- Configured with IEC 61131 program CoDeSys (free of charge)
- Online language switching via menu
- Date/time setting
- Configuration of IP address / I/Os
- Display of system settings
- Configuration of data logger / program graph / recorder
- AV correction table (measuring value comparison)
- Settings for automatic batch importing (data storage)
- Configuration of printer interface
- Load / delete configuration files
- Configuration of PID controller with self-optimization function
- 8 operating levels
- Configuration backup via PC
- Completed function modules (controller, programmer, logger etc.) in CoDeSys
- Freely configurable operating interface with ECS-EPAM (based on Excel)
- Changes for automatic batch importing

Programs (Recipes)
- Configurable process steps
- 250 programs with up to 200 segments
- Plain text description for programs (up to 30 characters)
- Graphical representation of set value curves and control tracks
- Configurable program loops (8 loops per program)
- Sort, change, copy and delete programs
- Load programs into the operating mode
- Save operating program

Operation
- Plant overview with plant pictures (configurable)
- Operating set value curve with graphic representation of up to 2 set values (future) and 3 actual values (configurable)
- Plain text alarm display with history memory
- Jump in program with graphic set value curves display
- Complete control zones display
- Programming of an automatic program start
- Numerical and graphical display of set values and tracks
- Manual operation for set values and tracks even during program run
- Auto-optimization of control parameters ("self-tuning")
- Manual operation for the manipulated variable Y ("Y-Man.")
- Representation of actual values, limit values, tolerance- and formula values
- Power failure definition
- Login code input page
Batch logging with recorder function
- Batch logging with recorder function for up to 250 channels (digital or analogue) per logger.
  Up to 15 loggers can be started parallel.
- A batch head with up to 20 configurable data fields is stored for each batch
- Alarms occurred in this period are stored for each batch
- Batch storage takes place on a Compact Flash card
  (industrial grade) with 2 GB memory capacity
- Batches can be analyzed with batch management on the device
- Analysis includes zoom functions and scale
- Evaluation software ECS-AW is an option for importing stored batch data via Ethernet
  for comprehensive data analysis on the PC

Nitriding Potential Control
Software module for displaying and controlling the nitriding potential
(classical nitriding, nitrocarburizing, oxynitriding, X nitriding, pre-oxidation, post-oxidation,
low temperature oxynitriding)

Online-C-Diffusion with Hardness Progression
Mathematical module for calculating the carburizing and hardness progression in the component
with knowledge of component and process specific characteristics

Online Printer
Batch protocols, diagrams (pins and colours configurable) and event lists can be printed based on
batch recording of the internal data logger
Industrial Control SE-609
Controller and visualization combined as an automation solution with multitasking PLC (CoDeSys)

Dimension Diagram (mm)

Front view

Side view

Rear view
Hardware Concept SE-609

- LCD display, background lighting 1024 x 768 pixels
- Power Pack 24 VDC (18 ... 36V)
- CompactFlash Memory Card 256 MB
- Main memory 256 MB DRAM
- Memory for mains failure safe data (PLC retain memory)
- RS232 interface
- RS422 interface
- Ethernet interface
- Master CAN interface
- USB interface
- ProfibusDP (Option) MASTER or SLAVE
- Modbus RTU Master
- Modbus TCP (Master/Slave)
- Interface for configuration-, log- and program data
- Interface for CAN-I/Os e.g. CAN-Basis4
- SLAVE, e.g. connection Siemens S7
- MASTER, e.g. connection thyristor controller with Profibus slave, etc.

Remote access for web server
Control system
Interface to Online printer
Watchdog
Alarm relay
CAN peripheral equipment for connecting distributed control electronics provides comprehensive system advantages.
Remote peripherals for scaleable solutions

Analogue and digital I/Os for recording the process parameters

STANGE Elektronik offers two types of CAN peripheral systems to choose from. First of all there are, the remote CAN peripherals, consisting of up to 4 pluggable I/O modules. Communication takes place via the CANopen protocol.

The peripheral station is designed for rail mounting. The maximum possible baud rate is 1Mbaud. Depending on the plugged modules, the power consumption is 20 VA maximum.

The microcontroller processes up to 16 actual values, 16 analogue outputs, 64 digital inputs and 64 digital outputs per base in case of SE-4xx or SE-5xx devices. SE-6xx devices process up to 32 actual values, 32 analogue outputs, 128 digital inputs and 128 digital outputs per base. The connections with the mating connector are realized with screw terminals or cage clamps.

The newly developed SIOS is a flexibly configured remote peripheral, which is adaptable to the application, intelligent and future-proof.

A peripheral unit consists of at least one gateway and one power module. The gateway and further modules are powered by the first power module. The SIOS modules consist of the electronic module and clamping module for wiring. Wiring takes place without using tools by spring-type technology. Modules are hot-swap-compliant and can be changed when energized. Modules are mechanically coded in order to prevent mismating.

One node consists of a maximum of 64 modules. The maximum number of nodes is 99.

Because of the large number of nodes and the maximum number of 64 modules, the complete CANopen protocol can be utilized fully. Up to 25,344 digital I/Os or 1024 analogue values can be used in the maximum configuration per network, limited to one type of module.

For each automation solution, a suitable CAN peripheral is available for individual application.
SIOS Peripherals
Remote STANGE I/O-System

SIOS is a flexibly configured remote CAN peripheral device, adaptable to application, intelligent and future proof.

A SIOS peripheral consists of at least one CAN gateway and one power module. The gateway and further I/O modules are powered by the first power module.

SIOS modules consist of an I/O card and clamping module for wiring. Wiring takes place without tools via spring contacts. The modules are hot-swappable and can therefore be changed when energized. The interchanging of modules is impossible due to the mechanical coding.

There are SIOS gateways with different bus systems: SIOS-CAN as CAN bus systems and SIOS-TCPIP as an Ethernet bus system (in progress).

A node consists of a maximum of 64 modules. The maximum number of nodes is 99. Because of the large number of nodes and the maximum number of 64 modules, the complete CANopen protocol can be utilized fully. Up to 25,344 digital I/Os or analogue values can be used in the maximum configuration per network, limited to one type of module.

SIOS STANGE Input/Output System

SIOS Features:
- Flexibly configured remote CAN peripheral device
- A peripheral consists of one CAN gateway and one power module
- Adjustment of desired digital/analogue I/Os by expandable I/O modules (maximum of 64 modules), consisting of I/O card and clamping module
- Spring-type terminal wiring
- Modules are hot-swappable and can therefore be changed when energized
- Interchanging of the I/O cards impossible due to mechanical coding
# Technical Data SIOS

<table>
<thead>
<tr>
<th>Type</th>
<th>Module</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIOS-CAN</td>
<td>SIOS GATEWAY</td>
<td>Flexibly usable with up to 64 modules</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CANopen protocol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Baud rates: 20 kB, 50 kB, 100 kB, 125 kB, 250 kB, 500 kB, 1 MBaud</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CAN connection, galvanically isolated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LED state for CAN communication, IO field communication, energy supply</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incl. power module SIOS PWRG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Housing: 113 x 51 x 73 mm CAN gateway</td>
</tr>
<tr>
<td>SIOS-PWRG</td>
<td>Supply Module</td>
<td>Internal power supply for modules</td>
</tr>
<tr>
<td>SIOS-PWR</td>
<td></td>
<td>Input voltage: 24V DC (reverse polarity protected)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power supply of max. 20 modules (incl. power module)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modul options:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- SIOS-PWRG (for gateway supply and the first 19 modules)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- SIOS-PWR supply module (supply a further 20 modules incl. power module)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dimensions with module: 128 x 12.7 x 74 mm</td>
</tr>
<tr>
<td>SIOS-D14</td>
<td>4 Digital Inputs</td>
<td>Input voltage: 5 ... 24 V for active level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input voltage with active level: approx. 3 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Galvanically isolated to internal field (max. 500 V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(no separation of inputs among each other)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dimensions with module: 128 x 12.7 x 74 mm</td>
</tr>
<tr>
<td>SIOS-D04</td>
<td>4 Digital Outputs</td>
<td>Supply voltage outputs: 7 ... 24 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output current: max. 700 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short-circuit proof outputs</td>
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<td></td>
<td></td>
<td>Galvanically isolated to internal field (max. 500 V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(no separation of outputs among each other)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dimensions with module: 128 x 12.7 x 74 mm</td>
</tr>
<tr>
<td>SIOS-DAC2</td>
<td>2 Analogue Outputs</td>
<td>Configurable as 0 - 10 V, 0 - 20 mA or 4 - 20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 Bit resolution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output accuracy: better than 0.1% from the end of the range</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Current output: max. burden 500 Ohm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Voltage output: min. burden 2 KOhm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Galvanically isolated to internal field (max. 500 V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(no separation of outputs among each other)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dimensions with module: 128 x 12.7 x 74 mm</td>
</tr>
<tr>
<td>SIOS-IW1-XL</td>
<td>1 Universal Analogue Input</td>
<td>Galvanically isolated to internal Bus (max. 500 V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thermocouples, PT100, PT1000, potentiometer (max. 4 kΩ)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 Bit resolution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accuracy: better than 0.1% from the end of the range</td>
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<tr>
<td></td>
<td></td>
<td>Measuring cycle per thermocouple or standard signal approx. 80ms</td>
</tr>
<tr>
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<td></td>
<td>Dimensions with module: 154 x 12.7 x 74 mm</td>
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<tr>
<td>SIOS-IW2</td>
<td>2 Analogue Inputs (standard signal)</td>
<td>0 - 10 V, 0 - 20 mA, 4 - 20 mA</td>
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<td></td>
<td></td>
<td>Accuracy: better than 0.1% from the end of the range</td>
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<tr>
<td></td>
<td></td>
<td>Measuring cycle per input approx. 40 ms</td>
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<td></td>
<td></td>
<td>18 Bit resolution</td>
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<tr>
<td></td>
<td></td>
<td>Galvanically isolated to internal Bus (max. 500 V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(no separation of inputs among each other)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dimensions with module: 128 x 12.7 x 74 mm</td>
</tr>
</tbody>
</table>
Remote CAN Peripherals

Remote signal processing for data logging and process control.

The CAN peripherals consist of a CAN-Basis4 base station and up to 4 pluggable I/O modules. Communication takes place via the CANopen protocol. The peripheral station is designed for top hat rail mounting. The maximum baud rate is 1Mbaud.

The maximum power consumption is 20 VA, depending on the plugged modules. Up to 16 actual values, 16 analogue outputs, 64 digital inputs and 64 digital outputs per base are processed by the microcontroller. The connections with the mating plug are implemented with spring force or screw terminals.

CAN base unit:
- Switch-on current: 3 A/4 msec.
- Operating temperature: +5 ... +50 °C
- CAN connection, electrically isolated
- Function check: supply voltage, connection with the CAN master, watchdog
- Housing: 127 x 117mm, depth 28mm + 7mm
- If XL modules are used, a preferred measuring channel is available per module
### Technical Data

<table>
<thead>
<tr>
<th>Type</th>
<th>Type of Module</th>
<th>Description</th>
</tr>
</thead>
</table>
| CAN-IW4-XL   | Analogue Inputs (actual value processing) | High-end actual value board with 4/8 inputs  
Standard signal inputs: 0 ... +10 V, 0(4) ... 20 mA  
Thermocouples: All types freely configurable  
Pt100: three-wire or four-wire system  
Electrical isolation to CAN base unit  
Electrical isolation of channels among one another (restricted)  
Resolution: 18 Bit  
Measuring time per thermocouple and standard signal input: approx. 160 mS  
Measuring time per PT100 input: approx. 500 mS |
| CAN-IW8-XL   | Analogue Inputs (actual value processing) | High-end actual value board with 4/8 inputs  
Standard signal inputs: 0 ... +10 V, 0(4) ... 20 mA  
Thermocouples: All types freely configurable  
Pt100: three-wire or four-wire system  
Electrical isolation to CAN base unit  
Electrical isolation of channels among one another (restricted)  
Resolution: 18 Bit  
Measuring time per thermocouple and standard signal input: approx. 160 mS  
Measuring time per PT100 input: approx. 500 mS |
| CAN-IW4-XLS  | Analogue Inputs (actual value processing) | High-end actual value board with 4/8 inputs  
Standard signal inputs: 0 ... +10 V, 0(4) ... 20 mA  
Thermocouples: All types freely configurable  
Pt100: three-wire or four-wire system  
Electrical isolation to CAN base unit  
Electrical isolation of channels among one another (restricted)  
Resolution: 18 Bit  
Measuring time per thermocouple and standard signal input: approx. 160 mS  
Measuring time per PT100 input: approx. 500 mS  
Preferred channel measurement for 1 channel possible (starting base version 1.17) |
| CAN-IW8-Q    | Analogue Inputs (actual value processing) | CAN module with 8 standard signal inputs  
Standard signal inputs: 0 ... +10 V, 0(4) ... 20 mA  
Electrical isolation to CAN base unit  
Resolution: 12 Bit  
Measuring time: 100 mS for all inputs possible |
| CAN-IW8-QB   | Analogue Inputs (actual value processing) | CAN module with 8 standard signal inputs  
Bipolar standard signal inputs: -10 ... +10 V  
-20 ... +20 mA (with external resistors)  
Electrical isolation to CAN base unit  
Resolution: 12 Bit  
Measuring time: 100 mS for all inputs possible |
| CAN-DAC1     | Analogue Outputs (DAC) | CAN module, 1 analogue output  
1 analogue output 0 ... +10 V/0(4) ... 20 mA  
Resolution: 12 Bit  
Electrical isolation to CAN base unit |
| CAN-DAC2     | Analogue Outputs (DAC) | CAN module, 2/4 analogue outputs  
2/4 analogue outputs 0 ... +10 V/0(4) ... 20 mA  
Resolution: 12 Bit  
Electrical isolation of channels among one another and to CAN base unit |
| CAN-DAC4     | Analogue Outputs (DAC) | CAN module, 2/4 analogue outputs  
2/4 analogue outputs 0 ... +10 V/0(4) ... 20 mA  
Resolution: 12 Bit  
Electrical isolation of channels among one another and to CAN base unit |
| CAN-E32      | Digital Inputs/Outputs | CAN module, 32 digital inputs  
32 digital inputs via optocoupler, 24 V DC  
Light emitting diode for each input |
| CAN-E16A16   | Digital Inputs/Outputs | CAN module, 16 digital inputs /16 digital outputs  
16 digital inputs via optocoupler, 24 V DC  
16 digital outputs, opto-decoupled, 500 mA per output  
Light emitting diode for each input and each output |
| CAN-A32      | Digital Inputs/Outputs | CAN module, 32 digital outputs  
32 digital outputs, opto-decoupled, 500 mA per output  
Light emitting diode for each output |
| CAN-REL8-8A  | Digital Inputs/Outputs | CAN module, 8 relay outputs  
8 relay outputs 230 V/8 A, 6 changeover contacts, 2 closing contacts  
Light emitting diode for each output |
The STANGE energy management system offers various measuring options, is freely scalable with simple parametrisation. It has never been easier to integrate energy measuring instruments to your automation world. Whether for measuring voltage, current and gas, calculating power and operate values, for continuous monitoring of differential current or for intelligent reducing of power peaks (EM-PMAX) for optimisation of contracts.

The products are not only coordinated but offer an easy integration of further energy measuring instruments by the on-board interfaces.

Energy and production data can be linked as plant information. This enables to determine the energy costs per batch.

The STANGE Energy Management System consists of the following components:
- Energy measuring instrument EM-71
- Energy manager EM-PMAX
- Energy management system ENVIS WEB

Features:
- Energy measurement according to ISO 50001 (current and gas)
- Peak load management
- Assessment energy consumption per batch (current and gas)
The energy measuring instrument EM-71 is intended for energy and gas consumption measuring of the existing plants. Trouble-free integration in existing PLC systems is possible via Ethernet. A batch related recording of energy and gas consumption takes place in connection with STANGE program controllers and control system ECS. Batch related energy data can be transferred to a superordinated ERP system, e.g. ams (from TTC). In this way energy indicators energy/kg can be created.

The EM-PMAX is used as energy manager with peak load optimisation. An intelligent reduction of peak loads can be realised for contract optimisation with the energy provider. Up to 64 consumers can be connected via Ethernet interface with Modbus TCP master. The instrument is freely programmable in Siemens Step 7 or with the TIA portal.

The energy management system ENVIS WEB according to ISO 50001 monitors all consumption data and creates cost centre accountings at the push of a button. All relevant energy and process data are automated recorded and evaluated by the web based software. Thereby decisions can be made promptly and/or processes are adapted in such a way that an exceeding of peak loads can be avoided. The integration into the existing IT environment is quickly ready for use. Common measuring instruments are supported independent of manufacturer and the system is scalable as required referring to the number of counters and locations. Visualisation and reporting enables the implementation of the ISO 50001 certification.
Energy Measuring Instrument EM-71
Multifunctional meter for panel-mounting

The EM-71 is an effective panel-mounting measuring instrument (96x96 mm) and replaces all analogue measuring instruments. 3-phase current and voltage in 6 quadrants operation in class 0,2 is measured and thereby the work in class 0,5 sec. as well as all other network quantities, e.g. harmonics up to the 50th harmonic. Via current transformers can be measured with N/5A and N/1A as well as Rogowski coil [333 mV].

The multifunctional meter has a backlit, large and easy-to-read digital display. It is easily operated via 4 function buttons. A PT100 sensor is integrated. It is used in 400 V as well as in 690 V networks.

The equipment includes Ethernet interface and web server in order to easily connect PLC systems.

The EM-71 is equipped with one digital input and 2 digital outputs.

Energy measurement instrument EM-71

The instrument is parameterized and/or visualized with the ENVIS software.

Fields of application:
- Consumption measurement electric energy
- Consumption measurement gas (digital input)
- Integration in PLC systems
- ISO 50001 certification
Supply voltage:
- UH: 90…275 V AC, 80…350 V DC

Measuring voltage:
- 8 - 620 V LL

Nominal current:
- 5A/1A; 333 mV

Equipment:
- 4 function buttons
- Integrated Pt100 sensor
- Ethernet interface, web server
- 1 digital input
- 2 digital outputs
- Gas pulse recording via digital input
- Modbus TCP slave interface

Weight:
- 400 g

Dimensions:
- 96 x 96 x 80 mm (WxHxD)

Accessories:
- Documentation
- Software ENVIS Basic (parametrize and evaluation software)

Optional:
- Top hat rail adapter

Connection diagram EM-71:
Reducing power peaks intelligent - in the well-known S7 programming environment

The intelligent reduction of power peaks (E-Max) can be used for optimisation of your energy supplier contract. Ensure more contract certainty by not exceeding your agreed peak load.

The energy consumption can be analysed and the load times be influenced with the needed measuring data from EM-71, other energy measuring instruments and signals of your energy supplier. Integrated control algorithms calculate and compare active and target power trend, reasonable priorities, groupings and minimum closing and opening times result quickly in the desired success. The status of each electrical consumer can furthermore be determined via return signal input.

Consumers in remote parts of the building are integrated convenient and trouble-free to a modern IT structure; of course open for other energy measuring instruments like Janitza or Siemens.

All functions of the well-known S7 world are available if you want to use collected data for an own analysis. All additional takes place in the S7 PLC mode whether own data analysis or data exchange with control systems.

Features:
- For up to 64 energy consumers
- Input card for S0 and 15 minutes impulse
- Free programmable in Siemens Step 7 or with TIA Portal
- Ethernet- interface with ModBus TCP Master
- Calculation and administration of batches related energy data for STANGE devices SE-4xx, SE-5xx, SE-6xx and SE-7xx
- Atypical network access (different maximum set values in dependence of day/time)
Reducing power peaks intelligent - in the well-known S7 programming environment

The Intelligent reduction of power peaks (E-Max) can be used for optimisation of your energy supplier contract. Ensure more contract certainty by not exceeding your agreed peak load.

The energy consumption can be analysed and the load times be influenced with the needed measuring data from EM-71, other energy measuring instruments and signals of your energy supplier. Integrated control algorithms calculate and compare active and target power trend, reasonable priorities, groupings and minimum closing and opening times result quickly in the desired success. The status of each electrical consumer can furthermore be determined via return signal input.

Appliances in remote parts of the building are integrated convenient and trouble-free to a modern IT structure; of course open for other energy measuring instruments like Janitza or Siemens.

All functions of the well-known S7 world are available if you want to use collected data for an own analysis. All additional takes place in the S7 PLC mode whether own data analysis or data exchange with control systems.

Features:
- For up to 64 energy appliances
- Input card for 50 and 15 minutes impulse
- Free programmable in Siemens Step 7 or with TIA Portal
- Ethernet- interface with ModBus TCP Master
- Calculation and administration of batches related energy data for STANGE devices SE-4xx, SE-5xx, SE-6xx and SE-7xx

EM-PMAX
Energy manager with peak load optimization

Technical Data

Dimensions WxHxD
116,5 x 82 mm
Weight
approx. 600 g
Operating temperature range
-20°C ... +60°C (non-condensing)
Storage temperature range
-30°C ... +80°C
Mounting
on 35mm standard profile rail
IP code degree of protection
IP41
Connection technology
Detachable connectors with self-locking and sideward flanged connection, tension spring contact for cross section 1,5 mm² maximum
Load voltage L+
24V DC (11 V ... 30V DC)
Power input
20 mA ... 350 mA
Power loss
0,5 W (typ.), 7 W (max.)
Switch on current
< 3 A
Type of CPU
Type V
Working memory
512kB, thereof 256 kByte remanent data, 100 entries (all remanent)
Flash external memory
Micro SD, up to max. 8 GByte (not necessary for operation)
Programming languages
STEP 7® - AWL, KOP, FUP, S7-SCl, S7 graph by SIEMENS
Programming system
SIAMATIC® Manager by SIEMENS or compatible
Operating system
compatible to S7-300® by SIEMENS
Reference component group
CPU 315-2PNDP
Interface protocols:
Serial interface
COM1: RS 232 (free ASCII) COM2: RS 485 (Modbus-RTU, free ASCII)
Ethernet
ETHERNET: 10/100 Mbit with CP343 functionality (RFC1006, TCP, UDP, Modbus-TCP)
CAN
CAN telegrams (Layer 2), CANopen® compatible Master/Slave
10 kBaud ... 1 MBaud
Profibus - optional
Profibus DP V0 Master/Slave 9,6kBaud ... 12 Mbaud
All consumption data can be monitored with the ENVIS WEB energy management system according to ISO 50001. Cost centre accounting is created at the push of a button. The energy management system (EMS) is quickly integrated to the existing IT environment and fully scalable to an unlimited number of counters or locations.

Energy management is the basis for the optimisation of the available energy. Recording and evaluating of all relevant energy and process data takes place automated by the web based software. Due to this data basis it is possible to promptly come to decisions and/or adapt process flows in such a way that exceeding of energy peaks is avoided.

The centralisation and processing of all these energy data needs a highly flexible and efficient platform.

Features:
- Quickly ready for use and integrated in existing IT environment
- Supports common measurement instruments independent of the manufacturer
- Energy consumption is transparent for targeted measures
- Visualisation and reporting for ISO 50001 certification
- Automated monthly reports
- Fully scalable, unlimited number of counters and locations

The basic principle for improvements in efficiency is transparency. The more you have the energy flows in mind, the more potential for savings can be developed. Large companies have numerous locations, use a wide range of energy sources and own a varied infrastructure of measuring instruments, nets and data sources.
KEY FEATURES

General menu navigation
- Start page with user friendly grouping
- Overview of all counters
- Counter measuring instruments configuration
- Backup and data export

Integration in existing systems
- Data import of measuring data (.csv)
- Data export of measuring data (.csv)
- Manual data recording, e.g. counter without communication

Visualisation
- Line graph
- Bar graph
- Sankey diagram
- Load profile analysis
- Individual diagram adjustment
- User-defined measuring values per diagram
- Storage of settings

Alarms
- Individual definition of thresholds
- Individual definition of tolerance bands
- Mail transmission of alarms

Data evaluation
- Output of sums, average values and extreme values
- Create key figures
- Energy consumptions
- Specific energy consumptions
- Energy consumptions per reference value
- Conversions (CO2, costs, etc.)
- Resolution in freely definable time intervals
- Free definition of key figures

Reporting
- Time-controlled reports e.g. daily, monthly
- Event-controlled reports
- Individual report contents
- Mail transmission in common format e.g. PDF

Support & start-up
- Training
- Software set-up and maintenance
- Support (hotline and E-Mail)
- Update service (maintenance contract)
Oxygen and hydrogen sensors to obtain the information necessary for process control.
Oxygen and Hydrogen Sensors

Sensor technology to collect process parameters

To determine the process parameters of production processes, measuring values are recorded during the process using sensors. Since the introduction of ISO 9001, quality consciousness and quality assurance have gained increasing importance and are now mandatory in all areas of heat treatment. The adherence to the strict tolerances throughout the entire production line, from the material composition, the mechanical processing, up to heat treatment is a prerequisite for modern production processes. The progress achieved with the sensor development opens up new opportunities for process control and quality assurance in heat treatment. Robust and insensitive sensors are important prerequisites to be able to surely record the furnace atmosphere. Thus the current reaction state of the gas near the component surface can be carried out repeatedly via a targeted atmosphere regulation.

For determining the process parameters, STANGE Elektronik offers its own sensors.

H2 Sensor
The H2 sensor enables nitriding and carburizing atmospheres to be easily measured. The sensor is also used in low pressure carburizing plants. In all applications, only a free inlet to the furnace atmosphere is required. The created electrical signal is a measurement for the hydrogen content of the analysed gas.

O2 Sensor
The online oxygen measurement imposes greater demands compared to hydrogen measurement in terms of sampling. While hydrogen diffuses very quickly within the inspection room (approx. 6 seconds), in the case of oxygen it may occur that the measured gas phase is not connected or related to the real reactor concentration. The physical characteristics of the oxygen transport are overcome with an oxygen pump with a physical principle similar to that of heat convection.
The H2 sensor enables nitriding and carburizing atmospheres to be easily measured. In all applications, only a free inlet to the furnace atmosphere is required. The created electrical signal is a measurement for the hydrogen content of the analysed gas.


Can be used for nitriding, nitrocarburizing, oxynitriding, X-nitriding as well as carburizing processes.

Simple installation, e.g. by convection pipe connection which is located within the gas atmosphere.

With calibration gas connection and electric connection via connector.

The sensor works according to the diffusion principle - no exhaust gas via sensor.

The sensor can be connected directly to the 4-20 mA input of the automation device (e.g. recorder, programmer etc.)

The hydrogen sensor for defining the nitriding atmosphere is also available with ATEX approval.

Fields of application:
- Nitriding
- Nitrocarburizing
- Oxynitriding
- X-Nitriding
- Carburizing processes
**Technical Data**

- Measuring converter WLD / heat-conductive gas sensor
- Connection temperature at KF flange: < 65°C
- Measuring gas pressure range: 30 mbar up to 10 bar absolut
- Measuring range: 0 ... 60, 0 ... 75, 0 ... 100 Vol.-%
- Output: 4-20 mA linear
- Time response: Output delay 6 ... 20s
- Preheat time: Depending on sensor installation, up to 30 minutes at room temperature
- Dimensions: 105 x 66 x 240 mm (WxHxD)

**Accessories:**
- Documentation
- Power supply unit (optional) 24V/3A, short-circuit proof
- Connecting plug, optional 2 m connecting line with connected plug connector

**Requirements for use:**
- KF16 vacuum flange for connection
- If necessary convection pipe depending on installation, on request

---

**Exemplary installation**

Pit-type furnace

- KF16 vacuum flange
- Flange or pipe coupling
- Overflow slot
- Retort cover
- Pipe from 1½ to 1½”
- Circulator
- Convection pipe 22 * 2 mm 1.4841 / SUH310
- Gas cylinder
Hydrogen sensor with digital display

The H2 sensor enables nitriding and carburizing atmospheres to be easily measured. In all applications, only a free inlet to the furnace atmosphere is required. The created electrical signal is a measurement for the hydrogen content of the analysed gas.

Measuring principle: Heat conductivity of the measuring gas in nitrogen, ammonia, hydrogen and carbonic gases. Can be used for nitriding, nitrocarburizing, oxynitriding, X-nitriding as well as carburizing processes. Simple installation, e.g. by convection pipe connection which is located within the gas atmosphere. With calibration gas connection and electric connection via connector.

The sensor works according to the diffusion principle - no exhaust gas via sensor. The sensor can be connected directly to the 4-20 mA input of the automation device (e.g. recorder, programmer etc.)

Backlit LCD display with H2 value and operating data display - thereby operation possible even without separate evaluation electronic.

Fields of application:
- Nitriding
- Nitrocarburizing
- Oxynitriding
- X-Nitriding
- Carburizing processes
- Measuring converter WLD / heat-conductive gas sensor
- Connection temperature at KF flange: < 65°C
- Measuring gas pressure range: 30 mbar up to 10 bar absolut
- Measuring range: 0 ... 60, 0 ... 75, 0 ... 100 Vol.-%
- Output: 4-20 mA linear
- Time response: Output delay 6 ... 20s
- Preheat time: Depending on sensor installation, approx. 20 minutes at room temperature
- Dimensions: 105 x 66 x 240 mm (WxHxD)

Accessories:
- Documentation
- Power supply unit (optional) 24V/3A, short-circuit proof
- Connecting plug, optional 2 m connecting line with connected plug connector

Requirements for use:
- KF16 vacuum flange for connection
- If necessary convection pipe depending on installation, on request

Exemplary installation
Pit-type furnace

KF16 vacuum flange
Flange or pipe coupling
Overflow slot
Retort cover
Pipe from 1¼ to 1½”
Circulator
Convection pipe 22 * 2 mm 1.4841 / SUH310
Gas cylinder
O2 Sensor

O2 sensor for measuring oxygen levels in furnace atmospheres

The online oxygen measurement imposes greater demands compared to hydrogen measurement in terms of sampling. While hydrogen diffuses very quickly within the inspection room (approx. 6 seconds), in the case of oxygen it may occur that the measured gas phase is not connected or related to the real reactor concentration. The physical characteristics of the oxygen transport are overcome with an oxygen pump with a physical principle similar to that of heat convection. New, revolutionary procedure for continuous oxygen measuring via modified zircon measuring cell (heated), attached to the recipient. The measuring cell is equipped with an oxygen pump and provides permanently an exchange of the atmosphere at the measuring cell.

The oxygen pump works according to a physical principle similarly the heat convection. The sensor is not applicable for carburizing processes.

Fields of application:
- Nitriding plants at pre-oxidation, post-oxidation, oxynitriding
- Residual oxygen measurement in vacuum plants (leakage rate determination)
- No wear
- Vacuum solid
- No exhaust gas via the sensor
- Pressure-insensitive measurement principle
- Max. allowed measuring pressure at the sensor: 3bar
- Min. measuring pressure at the sensor: $10^{-7}$ mbar
- Leak rate <$10^{-7}$ mbar*l/s
- Reaction time depending on installation situation < 20s
- Calculation of the oxygen partial pressure according to Nernst at 0...20,64 Vol.-% O2 and at 600°C measuring cell temperature
- Temperature at KF flange: max. 65 °C
- Measuring range: 0...20,64 Vol.-% O2 (1500 mV to 0 V), 20,65...100 Vol.-% O2 (0 to -35 mV)

Connections:
- Power supply: 24 V DC/1 A
- Mechanical connection: KF40 vacuum-flange

Dimensions:
- 105 x 66 x 250 mm (L x W x H)

Incl. Accessories:
- DIN rail power supply unit 24V/1A short circuit proof
- Connector

Requirement for use:
- KF 40 vacuum flange for connection
- If necessary convection pipe depending on installation on request

Exemplary installation
Pit-type furnace
The online oxygen measurement imposes greater demands compared to hydrogen measurement in terms of sampling.

While hydrogen diffuses very quickly within the inspection room (approx. 6 seconds), in the case of oxygen it may occur that the measured gas phase is not connected or related to the real reactor concentration. The physical characteristics of the oxygen transport are overcome with an oxygen pump with a physical principle similar to that of heat convection.

New, revolutionary procedure for continuous oxygen measuring via modified zircon measuring cell (heated), attached to the recipient. The measuring cell is equipped with an oxygen pump and provides permanently an exchange of the atmosphere at the measuring cell. The oxygen pump works according to a physical principle similarly the heat convection.

The sensor is not applicable for carburizing processes.

Fields of application:
- Nitriding plants at pre-oxidation, post-oxidation, oxynitriding
- Residual oxygen measurement in vacuum plants (leakage rate determination)
Technical Data

- No wear
- Vacuum solid
- No exhaust gas via the sensor
- Pressure-insensitive measurement principle
- Max. allowed measuring pressure at the sensor: 3 bar
- Min. measuring pressure at the sensor: $10^{-7}$ mbar
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- Reaction time depending on installation situation < 20s
- Measuring of the oxygen partial pressure according to Nernst at 600°C measuring cell temperature
- Temperature at KF flange: max. 65 °C
- Measuring range:
  - 0...20,64 Vol.-% O2 (1500 mV to 0 V),
  - 20,65...100 Vol.-% O2 (0 to -35 mV)

Connections:
- Power supply: 24 V DC / 1 A
- Mechanical connection: KF40 vacuum-flange

Dimensions:
- 105 x 66 x 250 mm (L x W x H)

Incl. Accessories:
- DIN rail power supply unit 24V/1A short circuit proof
- Connector

Requirement for use:
- KF 40 vacuum flange for connection
- If necessary convection pipe depending on installation on request

Exemplary installation
Pit-type furnace:
The probe is applicable for case hardening in gas, for heat treatment in protective gas, for carbonitriding as well as for measurement of endothermic gas properties.

The probe is intended for direct gas atmosphere installation and is installed via screw connection (1” male thread).

Length from 650 to 1000 mm and diameter from 22 and 26.9 mm are available.

Characteristics:
- High measuring accuracy
- Short response time
- High durability
Technical Data

- Output: 0 - 1200 mV
- Installation depth: at least 50 mm in the furnace chamber
- Accuracy: ± 0.05 %
- Weight: 2 - 3 kg, depending on length
- Response time: < 1 second
- Reference air: ambient air < 60°C, flow rate approx. 20 l/h
- Purge air: ambient air < 60°C, flow rate approx. 200 l/h
- Protective pipe: Heat-resisting steel (1.4841) for the protection of the sensor from heat- and/or mechanical stress
- Operating temperature: 760 °C - 1100 °C
- Thermocouple: Type S or without

Accessories:
- Connection adapter for mounting parts of other manufacturers (option)
- Documentation

Please check if the operational conditions are in accordance with the aforementioned data. If deviations are existent, ask for consultation in order to check the conditions and be adapted if applicable.

The following types of probe are available:

<table>
<thead>
<tr>
<th>Art-No.</th>
<th>Type of probe</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE-CP-228500</td>
<td>Length: 650 mm; diameter: 22 mm, without thermocouple</td>
</tr>
<tr>
<td>SE-CP-228501</td>
<td>Length: 650 mm; diameter: 22 mm, integrated thermocouple type S</td>
</tr>
<tr>
<td>SE-CP-227500</td>
<td>Length: 750 mm; diameter: 22 mm, without thermocouple</td>
</tr>
<tr>
<td>SE-CP-227501</td>
<td>Length: 750 mm; diameter: 22 mm, integrated thermocouple type S</td>
</tr>
<tr>
<td>SE-CP-228500</td>
<td>Length: 850 mm; diameter: 22 mm, without thermocouple</td>
</tr>
<tr>
<td>SE-CP-228501</td>
<td>Length: 850 mm; diameter: 22 mm, integrated thermocouple type S</td>
</tr>
<tr>
<td>SE-CP-2210000</td>
<td>Length: 1000 mm; diameter: 22 mm, without thermocouple</td>
</tr>
<tr>
<td>SE-CP-2210001</td>
<td>Length: 1000 mm; diameter: 22 mm, integrated thermocouple type S</td>
</tr>
<tr>
<td>SE-CP-266500</td>
<td>Length: 650 mm; diameter: 26,9 mm, without thermocouple</td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>SE-CP-2610001</td>
<td>Length: 1000 mm; diameter: 26,9 mm, integrated thermocouple type S</td>
</tr>
</tbody>
</table>

Electrical connection takes place via 4-pole LEMO connector.
Other connection adapters on request.
Multi-Parameter Gas Analysis SE-MPGA

Transportable gas analysis equipment for carburizing atmospheres, including data logger

The device continuously measures the gas components CO, CO₂, CH₄ and H₂ in carburizing atmospheres. The C-level, the soot limit and the gas constant Beta are calculated from the measured values.

For comparative measurement according to CQI9, the C-level is calculated in parallel on the basis of the probe signal. A zirconium dioxide probe and a thermocouple can be connected for this purpose. Probe signal and temperature can also be simulated by manual input.

All measured and calculated values are shown on the display and can be logged in the device for later evaluation. The recording can be controlled manually or by timer.

Included in delivery is the PC software MPGA-Logger, with which the data can be read out, evaluated, printed or e.g. exported into the ECS format.

Comparative measurements according to CQI9

NEW!

Transportable gas analysis system for carburizing atmosphere

The new version of the gas analysis system has a capacitive touch display with a size of 7 inches (17.8 cm) and can now be operated even better.

With the internal timers, up to 3 potential-free external contacts can now be optionally switched, which can be used for control tasks, e.g. recording of several furnace systems by cyclic switching of the gas supply. Optionally, the measurement data can now also be provided externally via 4-20 mA outputs.

Fields of application:
• Gas analysis of carburizing processes, verification of endgas
• Comparative measurements according to CQI9
• Compliant with SAE AMS 2759

Technical Data

- Measuring range carbon monoxide: 0 ... 30 Vol.% (optional 0 ... 50 Vol.%)
- Measuring range carbon dioxide: 0 ... 0.5 Vol.% and 0 ... 2 Vol.% with automatic changeover
- Measuring range methane: 0 ... 10 Vol.% (optional 0 ... 25 Vol.%)
- Measuring range hydrogen: 0 ... 60 Vol.% (optional 0 ... 100 Vol.%)
- Calculated C-level: 0 ... 2 % C
- Accuracy of measurement: < ± 1 % relative error (from full scale reading)
- Ambient temperature: 5 - 45 °C
- Heating period: approx. 30 min
- Moisture content of measuring gas: 0 ... 10 % relative humidity (condensing humidity is not permitted)
- Withdrawal of gas: integrated filter and flow meter
- Gas flow rate: approx. 0.1 - 0.2 l/min (integrated pump)
- Measuring speed: < 2 min
- Interfaces: Mini-USB to read out the data, RS 232 for factory services
- Dimensions: 19" housing, 4U
- Weight: approx. 10 kg
- Connections: Zirconium oxide probe, thermocouples (Type K, N or S)

Scope of delivery:
Stylus for touch display, mini-USB cable, replacement filter insert, potassium hydroxide (KOH) filter for CO₂ zero point calibration, license for ECS Analysis, USB memory stick with PC software MPGA-Logger, carrying case
2 x Mating plug for the connection of thermocouple and C-probe
2 x Diffusion-proof hose (3 meter)
Instruction by Stange Elektronik employees (excl. additional costs)

Options:
Differential pressure bubble-off bottle
Gas conditioning (Peltier gas cooler with pump and flow meter)
Multi-Parameter Gas Analysis SE-MPGA

Transportable gas analysis equipment for carburizing atmospheres, including data logger

The device continuously measures the gas components CO, CO₂, CH₄ and H₂ in carburizing atmospheres. The C-level, the soot limit and the gas constant Beta are calculated from the measured values.

For comparative measurement according to CQI9, the C-level is calculated in parallel on the basis of the probe signal. A zirconium dioxide probe and a thermocouple can be connected for this purpose. Probe signal and temperature can also be simulated by manual input.

All measured and calculated values are shown on the display and can be logged in the device for later evaluation. The recording can be controlled manually or by timer.

Included in delivery is the PC software MPGA-Logger, with which the data can be read out, evaluated, printed or e.g. exported into the ECS format.

Comparative measurements according to CQI9

New Version!

Transpportable gas analysis system for carburizing atmosphere

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- 2 x Mating plug for the connection of thermocouple and C-probe
- 2 x Diffusion-proof hose (3 meter)
- Instruction by Stange Elektronik employees (excl. additional costs)

Options:
- Differential pressure bubble-off bottle
- Gas conditioning (Peltier gas cooler with pump and flow meter)
Software tools for the configuration, programming and visualisation of your heat treatment solution.
Process Control System and Software Modules

Plant visualization, data evaluation and recording

The ECS process control system is designed for the visualization and control of industrial heat treatment processes. ECS offers a user-friendly (development) environment with a wide range of functions. The main focus is to quickly create, test and operate and to provide information about the automation applications.

The further development of the software, which has already been used thousands of times worldwide, takes place in close cooperation with the end users in order to implement a flexible system design system with possibilities for customisation and individual extensions in a practical way.

The current version of the process control system offers numerous features that make working with the function modules, recipe manager, unit control and evaluation easier. The operator is supported during recipe replacement by menu navigation. This support applies also for connecting program controllers and programmable controllers via the device manager. Visualization and storage of measuring data for Siemens S7 as well as other OPC-compliant systems is implemented. Recorded process data are stored in the evaluation as an extended documentation with text and diagrams.

Process engineering required by plants manufacturers and end users can be easily realized via the process technical software module (diffusion calculation, nitriding potential pre-calculation, online diffusion, nitriding case depth calculation (NCD)).

The operating dialogues are even available in Russian and Chinese language in order to meet the needs of international customers.

The ECS process control system fulfils the constantly increasing tasks in the sector of automation technology and also offers a simple solution to control, monitor and log processes.
The ECS process control system (SCADA) is designed for the visualization and control of industrial heat treatment processes. All necessary functions to control, monitor and log processes are fulfilled. Apart from the plant visualization, ECS offers various data evaluation and log possibilities.

Up to 16 plants can be controlled in the system network with integrated modules for configuration, program creation and administration, online operation with visualization and recording function, batch data evaluation with administration and operating picture design for process visualization.

Different program components process the different parameters and/or offer further functions.

ECS offers functionalities for modern heat treatment methods in order to operate processes easily and save and integrate process control requirements (nitriding potential control, online diffusion, carburizing simulation). TELEPHONY is designed for alarm notification via E-Mail.

Application fields:
- Hardening plants metal
- Glow systems and forging line
- Ceramic furnaces
- Cold and climatic chambers
- Autoclaves (food/pharmacy)
- Glass autoclaves
- Aircraft industry autoclaves
- Semiconductor furnaces
- Laboratory furnaces
- Hardening plants metal
- Glow systems and forging line
- Ceramic furnaces
- Cold and climatic chambers
- Autoclaves (food/pharmacy)
- Glass autoclaves
- Aircraft industry autoclaves
- Semiconductor furnaces
- Laboratory furnaces
- ... and much more
Easy handling and continuous uniform user interface in all modules
- Optimized for the use with STANGE program controllers SE-4xx, SE-5xx, SE-6xx, SE-7xx and Siemens S7
- Operating system Windows XP and Windows 7/10
- Program creation and administration for up to 9999 programs
- Graphic and tabular report print-out
- Online plant operation with visualization and recorder function
- Batch data evaluation and administration
- Graphic evaluation with comparison of process curves
- Graphic representation of setpoint curves and digital tracks
- Batch protocol print-out with screen preview
- Tabular batch overview with filter-/ search function
- Operation picture designer for process visualization
- Reduction of project work by simple duplication of plants
- Configuration program
- Batch data storage, administration and evaluation
- Process data overview tabular or as tree structure
- Operation picture designer for process visualization with symbol library
- Visualization and storage of measuring data for Siemens S7 as well as other OPC compatible systems
- OPC driver for STANGE devices
- ECS Replication for batch data backup in a superordinate directory

Optional
- Alarm notification via e-mail
- Carburizing simulation software with integrated material data base
- Nitriding potential calculation on PC
- Nitriding case depth precalculation on PC
- Interface ECS to the office TTC software for hardening shops or other ERP systems
- Software maintenance contract
Recipes (programs) are created and edited in the Recipe Manager. These can be loaded into the program controller. It is also possible to load recipes from the device onto the PC and to save or edit them from there.

- **Program manager**
  - Administration of up to 9999 programs (recipes) for each plant
  - Tabular display of stored batches with various group and sort functions
- **Program header**
  - Program header with program number, description, date of creation and modification
  - 20 freely configurable information fields for each program
  - Free text field for each program
- **Program table**
  - Easy and clear tabular program input
  - One column per segment, sorted according to process step, segment time, setpoint values and control tracks
- **Program graph**
  - Real-time setpoint value and control track graph
  - Graphical representation of segments
- **Login level (available in all program modules)**
  - Assignment of user privileges for the individual program parts by administrator
  - Each user account can be created individually
Up to 16 plants can be monitored and operated by the unit control. Thereby self created plant pictures are used for each plant with data such as measuring values, valve positions, alarms. Furthermore, fixed pages for program process, control cycles and graphic program profile are available.

- **Visualization**
  - General survey of all plants (floor overview), selection of a plant from there
  - Freely creatable, dynamic visualization pictures (data, picture animations)
  - Free user interface design (e.g. manual mode)
  - Chart creation and animation is carried out by the Graph Designer

- **Programmer**
  - Tabular representation of all current programmer data with control functions

- **Operation Graph**
  - Graphical representation of process data

- **Controller**
  - Tabular display of all control zones with designation, setpoint value, manipulated value and deviation
  - Window for each controller with all parameters

- **Recorder**
  - Recorder with up to 150 channels. Free configuration of all parameters (channels, colour, labelling, etc.)
  - As many configurations as desired can be stored
  - Cross line to read off detail values
  - Zoom can be freely positioned by mouse

- **Online Alarms**
  - Up-to-date display of alarms with time, text, event display (configurable) and status
  - 256 characters of additional text for each alarm

- **Alarm History**
  - Alarm history display, with text, date, configurable events and status (appeared, disappeared, acknowledged)

- **PopUp Window**
  - In case of a defined result, a PopUp window is automatically generated with corresponding note

- **Protocol**
  - Input of additional information according to running batch (batch name, name of plant operator and remark text (255 characters long))
  - Up to 20 freely definable information fields
Stored process data are analyzed in the batch evaluation. They can be edited according to individual ideas and printed as process documentation.

- **Batch Manager**
  - Administration of any number of programs (recipes) for each plant
  - Tabular display of stored batches with various group and sort functions

- **Batch Header**
  - Batch header with number, operator, text, date of creation and modification
  - 20 freely configurable information fields for each batch (e.g. order number etc.)
  - Free text field for each batch
  - Extended documentation based on MS-Word

- **Batch Graph**
  - Graphic presentation of stored analogue and digital values (150 maximum)

- **Table**
  - Representation of logged data in a table with time stamp
  - Two cycle rates (fast/slow) selectable for storage

- **Events (Alarms)**
  - Display of events (alarms) / intervention according to batch with date, event, text and status

- **Graph Evaluation**
  - Graph evaluation with all stored channels
  - Free configuration of all parameters (channels, colours, text, etc.)
  - Any number of configurations can be stored
  - Zoom can be freely positioned by mouse
  - Cross line to read off detail values
  - For comparison, another batch can be displayed at the same time

- **Graph Comparison**
  - Up to 10 batches can be compared channel-wise one upon the other (zoom, cross lines)

- **Daily Files**
  - Enables the display of plant values over a period of up to 6 weeks including event display

- **Export as CSV or XML file**
The Designer is the tool used to create animated plant pictures, which can be used as a plant chart in the Unit Control. A library with screen blocks is integrated and can be edited according to requirements or completed with your own pictures.

- **Background Pictures**
  Creation of background pictures using any bitmap editing software (e.g. Paintbrush);
  Stored in BMP format. The background picture can be changed in the editor at any time without this having any effect on the animations.

- **Data**
  Insertion of programmer data (setpoint values, actual values, formula values, etc.) by drag-and-drop.
  Trouble-free input of values directly into the picture.

- **Digital Animations**
  Up to 3 bitmaps (e.g. on/off/alarm) can be assigned to any digital value from a directory by drag and drop. Trouble-free input of digital states directly into the picture.

- **Text**
  Text can be inserted and freely positioned in the picture.

- **Keys**
  Another plant picture can be retrieved via a 3D button; as many pictures as desired possible.

- **Picture Field**
  With this function scalable bitmaps can be positioned in the main picture.
Process Control System ECS

Process control software to control, monitor and log processes

The available plant(s) is/are set up in the System Configuration. The configuration of the programmer can either be prepared in the System Configuration or an existing configuration readout from the device.

- Configuration Administration
  Configuration administration related to plants (structure tree as the Windows Explorer).
- Plant Administration
  Up to 16 plants (ECS-16) can be administrated.
- Representation
  Representation of configuration groups in clearly arranged tabular form. Modifications can be made directly in the table.
- Data Import
  Importing of external data into the batch protocol. During the batch start, the batch protocol can be filled with external data sources via the DDE, OPC interfaces or file.

ECS Log-In Level
ECS log-in level for allocation of user privileges for the various program modules of ECS. The administrator defines which parts of the software are available for the various users.

ECS Telephony
Transmission of the alarms via e-mail. Communication module for transmission of defined alarms to the chosen persons via e-mail (option).

ECS Replication
Data back-up module
The data (completed batches) from several plants (computers [IPCs]) are automatically duplicated to a back-up PC.
## Licence Versions ECS

<table>
<thead>
<tr>
<th>Version</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process control system ECS for one plant</td>
<td>ECS-01</td>
</tr>
<tr>
<td>Process control system ECS upgrade for one plant</td>
<td>ECS-UG</td>
</tr>
<tr>
<td>Extension module to connect one additional plant (16 plants maximum) to the existing ECS. Complete operating interface with full ECS scope of supply, upgrade for one plant.</td>
<td></td>
</tr>
<tr>
<td>Process control system ECS-Light for one plant</td>
<td>ECS-L01</td>
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<tr>
<td>Unit control without programmer and recipe manager. Includes the following software modules: Configuration; Online recorder function of plants; batch data storage; administration and evaluation; process data overview as tree structure; simple graphic evaluation; configuration program ECS-KONF; OPC driver for STANGE devices (JBUS).</td>
<td></td>
</tr>
<tr>
<td>Process control system ECS-Light, upgrade for one plant</td>
<td>ECS-LUG</td>
</tr>
<tr>
<td>Extension module to connect one additional plant (16 plants maximum) to the existing ECS. Operating interface with the scope of supply like ECS-2K-1L, upgrade for one plant.</td>
<td></td>
</tr>
<tr>
<td>Recipe manager and input (client without OPC driver) for ECS recipe data</td>
<td>ECS-RZ</td>
</tr>
<tr>
<td>- Input and administration of up to 9999 recipes per plant</td>
<td></td>
</tr>
<tr>
<td>- Graphic representation of set value curve and digital tracks</td>
<td></td>
</tr>
<tr>
<td>- Graphic and tabular report print</td>
<td></td>
</tr>
<tr>
<td>Recipe manager (incl. OPC driver) for one plant</td>
<td>ECS-RZ01</td>
</tr>
<tr>
<td>Recipe manager (incl. OPC driver), upgrade for one plant, base module to connect one plant.</td>
<td>ECS-RZUG</td>
</tr>
<tr>
<td>Batch evaluation (without OPC driver)</td>
<td>ECS-AW</td>
</tr>
<tr>
<td>- Tabular overview of process data</td>
<td></td>
</tr>
<tr>
<td>- Graphical evaluation, process curves comparison</td>
<td></td>
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<tr>
<td>- Batch protocol print with screen preview</td>
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<tr>
<td>- Tabular batch overview with filter/search functions</td>
<td></td>
</tr>
<tr>
<td>Batch evaluation (incl. OPC driver), for one plant, base module to connect one plant.</td>
<td>ECS-AW01</td>
</tr>
<tr>
<td>Batch evaluation (incl. OPC driver), upgrade for one plant</td>
<td>ECS-AWUG</td>
</tr>
<tr>
<td>Extension module to connect an additional plant (16 plants maximum) to the existing ECS.</td>
<td></td>
</tr>
<tr>
<td>Software maintenance contract for ECS</td>
<td>ECS-WV</td>
</tr>
<tr>
<td>The maintenance contract includes the following features: Premium support hotline free of charge, help via remote control on your computer free of charge, ECS software free of charge (1x per year minimum); 15% special discount on appropriate valid service hourly rates for services related to ECS; 15% special discount for upgrades and/or additional ECS extension modules (e.g. from 4 to 8 plants); ECS software update to the current version free of charge.</td>
<td></td>
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</table>
Simulation Software CarboDiS

Diffusion Calculation Software for carburizing processes with Simulation and Optimization

The CarboDiS diffusion calculation is integrated into the new program management software. It also contains a material database which is extendable by the user. The material database calculates the alloy factor as well the carbide limit of the material if needed.

CarboDiS is applicable as an offline and online version. Its appearance follows the principles of current office software, enabling fast entry by the user.

For simulation, several factors such as grain size, quenching rate and the carbon content of the limit hardness are considered. Further factors for different component diameters are integrated.

The way to input a program is based on the intuitive look and feel which has distinguished hardware and software from STANGE Elektronik for many years. Here the user will be guided by menus to make the input of programs easier and avoid faults during the programming. The segment times can be programmed as a gradient or absolute.

The simulation can be spooled by the play, pause, forward or rewind button to the desired position.

Options for achieving a mostly horizontal hardness curve are also integrated. The result of the simulation is shown in two separate diagrams. The first one shows the carbon level and the hardness curve in the depth of the component. It also shows values for limit hardness and carbide limit amongst others.

The second diagram provides information about the program curve over the time and shows values such as the soot limit and carbide limit.

Under the bottom line, all interesting dates are shown on one page in a clearly arranged way. The created program can be transferred to a STANGE controller.

To meet the needs of various markets, the software has an integrated online language switch.
• Integrated material database with alloy factor and carbide limit calculation
• Varied calculation factors
• Menu guided programming
• Consideration of soot limit and carbide limit
• Simulation with play, pause, forward and rewind buttons
• Diagram for hardness and C profile
• Options for optimizations

Component Database
• Identifiable by material number, name and internal identification
• Copy function for easier extension of the database
• Most common steel marks are already integrated
• Separate backup module for the component database
Nitriding Potential Module OffLine ECS-NKZ

Nitriding potential module for fast determination of process parameters

According to the desired type of treatment and process data input, the module calculates code numbers such as nitriding potential Kn, Ko etc., the expected layer structure is graphically represented in a diagram (Lehrer/Kunze) and the operating point is faded in. This operating point can be purposefully affected, optimal parameters can be determined by a change of process data.

The calculated potentials and probe signals (Q and H2) can be connected to a program controller for the control of heat treatment processes.

Setting the optimal treatment conditions enables a targeted activation of part surfaces as well as an optimization of gas and energy consumption.

Reproducible results and economical gas and energy consumption as well as the graphic representation of the expected layer composition, embody the advantages of the nitriding potential control.

Overview of the functional characteristics:

- Type of treatment selection
- Selection and/or input of process data such as Kn, temperature, fresh gas quantities with plausibility check
- Display of the calculation results (classification numbers, probe signals Q and H2)
- Graphic representation of the expected layer compositions in component after nitriding
- Depending on the nitriding procedure the expected working point is graphically represented in the corresponding diagram (Lehrer-/Kunze)
- Option of combining nitriding procedures (X nitriding)
1) Process Selection:
- Classical Nitriding
- Nitrocarburizing
- Oxynitriding
- X-Nitriding
- Pre-oxidation
- Post-oxidation

2) Presetting of the set values:
- Temperature [°C]
- Temperature of probe [°C]
- Nitriding potential Kn
- Dissociation

3) Input of the fresh gas proportion:
- Ammonia
- Dissociated Ammonia
- Nitrogen
- Air
- Nitrous oxide
- Water
- Carbon dioxide
- Endogas
- Carbon monoxide
- Exogas
- Hydrogen
- Free

4) Calculation Results:
- Nitriding potential Kn
- Oxygen potential Ko
- Oxygen potential Ko(W)
- Carbon potential Kc(W)
- Carbon potential Kc(B)
- Q probe [mV]
- H2 sensor [mV]

5) Graphic Representation
- Lehrer and/or Kunze diagram
A novel method for calculating the expected compound layer thickness CLT, nitriding hardness depth NHD and case hardness RH in dependence of treatment temperature, processing time and nitriding potential Kn for different nitriding processes.

The calculation is based on numerous test results with different furnaces and different batches. These test results are stored in the integrated steel database with a maximum of 31 (at present) of the most used steel grades.

The calculation algorithm is now significantly accelerated caused by the new practical calculation basis in contrast to previous calculation programs. This enables the immediate and automatic recalculation of each change in value and the display of the results without delay.

The major advantage for the user is to evaluate the effects immediately and thereby get a feeling for the nitriding process when changing parameters.

The calculation results are outputted for CLT and NHD as trend and value, in case of case hardness the expected range is displayed.

Atmosphere values like hydrogen content, remaining ammoniac and carburizing potential Ka(W) or the degree of dissociation are calculated and displayed depending on selected process.

The actual working point is displayed in the modified Lehrer and/or Kunze diagram depending from selected process in order to be able to consider the phase (ε, γ', α, Fe₃C).

The expected layer structure is displayed as easy interpretable sectional representation.
1) Steel grade selection
   • Steel data base with the most used steel grades

2) Setting actual values
   • Processes classical nitriding / nitrocarburizing, oxynitriding
   • Temperature
   • Processing time
   • Nitriding potential

3) Calculation result display
   • Compound layer
   • Hardness depth
   • Case hardness

4. Atmosphere values
   • Hydrogen
   • Remaining ammoniac
   • Degree of dissociation (classical)
   • Carburizing potential (NC / Oxi)

5) Sectional representation
   • Schematic representation of structure, compound layer and calculated values

6) Lehrer / Kunze diagram
   • With working point representation

NCD definition according to DIN 50190-3

Hardness process curve

Hardness limit HL = core hardness CH + 50HV

Core hardness

Surface distance in mm

NCD

Case hardness

HV/0.5
We support our customers in each project planning phase by offering comprehensive support and service.
STANGE-Products - efficient and practical to use

Technical Support
Anyone that chooses STANGE products can rest assured of the excellent support of our experts. Support is available by telephone or via the internet and provides fast and practice-oriented answers to your questions.

Training
We offer comprehensive training for our software and hardware products. Both standard and customized training is possible.

Project Planning
We plan and configure plants according to customer requirements. Creating requirement specifications, planning and project tracking for hardware and software are also part of the service, as well as project management by our experienced project engineers during every project planning phase.

Modernization
The modernization of existing plants is often an economical alternative to new investments. Our project engineer will offer advice so you can find the best solution for your automation task.

Start-up
We also assume plant start-ups for customers on request. Software, hardware and process engineering experts work closely together in order to implement the best solution.

Maintenance and Repair
Maintenance and repair receive the same attention as product development and production. For operating reliability, we offer a special express repair service. The checking and calibration of sensors is also part of our services.
We support our customers in each project planning phase by offering comprehensive support and service.

**Engineering**
- Innovation consultation and support
- Requested specification for automation and control system
- Planning concept for the plant
- Viability clarification
- Project management: costs / time / progress
- Coaching
- Implementations
- Optimization
- Commissioning

**Project Planning**
- Advice and technical assistance / solution concept
- Requested specification for automation and control system
- Project planning concept
- Viability clarification
- Project management: costs / time / progress
- Coaching
- Implementations
- Optimization
- PLC programming
- Software development
- Measurement technology and evaluation
- Electrical engineering documentations
- Simulations
- Start-up

**Modernization**
- Improve productivity and effectiveness of the plant
- Improve accuracy, precision and reliability of the plant
- Future-oriented expansion
- Ensuring the competitiveness
- High level of quality
- Planning
- Circuit diagram created with EPLAN
- Control panel construction
- Gas cabinet construction
- Installation
- Start-up
- Consultation process engineering for nitriding and carburizing
Services

Controller/PLC Programming
- STANGE SE-4xx, SE-5xx, SE-6xx
- Siemens S5, S7
- Honeywell
- Demag
- Jumo
- Eurotherm
- Atmosphere control
- Safety engineering
- Gas nitriding plants

Switchgear Construction according to
- VDE requirements
- Factory specifications
- International specifications
- Customer concept
- Product specifications
- CE compliant production, i.e. compliance with low voltage and EMC directives
- Guaranteed quality in accordance with DIN EN ISO 9001

Maintenance and Repair
- Troubleshooting
- Preventive maintenance
- Repair service
- Function monitoring
- Malfunction diagnosis
- Function and security checks
- Production support during start-up phase

Network Engineering
- XP, Windows 7, Server 2003 and 2008 networks
- Active Directory
- Server virtualization on basis of VMWare
- Server
- Installation
- Maintenance
- Customization
- Consultation
<table>
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<tr>
<th>Office</th>
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<th>Address</th>
<th>Phone</th>
<th>Fax</th>
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