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Neles Automation is introducing a new era in process automation. The many benefits of the Damatic XDi system have been enhanced and further developed to create a completely new concept. The Dynamic Network of Applications is based on the free networking of knowledge and information, control automation and embedded field control applications. nelesDNA is a network where diverse applications based on different hardware and software solutions cooperate together allowing the plant to flexibly select automation and information applications in response to its prevailing needs.
A response to your business goals.

New open technologies are changing distributed systems into dynamic application networks where the focus is on people and supporting them in their diversified tasks. nelesDNA, the Dynamic Network of Applications networks all automation and information activities from field to office — strengthening both teamwork and decision-making. In this network, applications based on different hardware and software solutions cooperate together allowing the plant to flexibly select automation and information applications in response to its prevailing needs.

**Comprehensive continuous and alarm history completed with user tools**

nelesDNA, the Dynamic Network of Applications provides your plant with a comprehensive data warehousing solution for all process and product related information. Composed of historians for continuous, alarm and batch histories, this data warehouse forms a solid basis for a diversity of user tools.

The user tools are advanced software products for analysing and reporting on both production and product information. With their efficient information analysis capabilities, these tools can enhance the plant’s decision-making to improve production management and process understanding, and to reduce disturbances.

**The knowledge network**

In addition to its completely embedded historian, nelesDNA contains a totally new database for building process knowledge. This database provides an advance from the conventional information management concept to a new level — defined as knowledge management. The new level combines the results of information analysis and users’ experience to create an organizational memory and shared experience. In the nelesDNA knowledge network, knowledge works together with the history and real-time process data to support decision-making, for instance, in disturbance management.

**A new operator interface — the best support for your production team**

nelesDNA provides your production team with dynamic tools to control even the largest and most complicated processes efficiently. The sophisticated Operations Activity provides your operators with a complete process view enabling instant accessibility and flexible utilization of information and knowledge.

The ergonomic operator desktop supports easy adaptability to various tasks. Integration of design knowledge and team experience helps the operator to manage exceptional situations, disturbances and complicated tasks. This feature is especially valuable for an operator who takes the responsibility of the night shift alone.

**Open network**

Openness increases connectivity and compatibility. The nelesDNA network offers a new concept of openness that extends from full scalability to seamless connectivity and compatibility. Standards, like OPC, ADO, OLEDB and ODBC, have changed the traditional concept of platform openness. Application developers are free to build new applications, or select third-party control packages flexibly.

Versatile engineering tools and de facto standards, such as JAVA, IEC 61131-3 and Microsoft technologies enable the realization of all necessary process control and information management activities in an open vendor-independent environment. Open field connectivity is supported with industry-proven fieldbus standards, such as Foundation Fieldbus, Profibus and HART connections.

**Engineering and maintenance productivity**

nelesDNA increases your plant’s engineering and maintenance productivity, ensuring quality of the design, efficient changes and reliable functioning of your automation and information network for its entire life cycle. The nelesDNA Engineering and Maintenance Activity manages all the documentation that you need during the conceptual design, the project phase, the start-up and through the years of maintenance. With modern web-based network operations, you can handle up-to-date engineering data and documents wherever you need them.

The engineering tools visualize your whole plant as a hierarchical map, which enables easy navigation to the desired department or process area — and even deeper — to separate loop information and bottom level function blocks and parameters. Or you can also open a loop with a CAD tool to graphically see the loop’s composition of function blocks and their interconnections. The risk to production disturbances has been minimized by providing the virtual nelesDNA environment for testing the modifications.
Advanced maintenance support is provided by versatile diagnostic tools, and by tools that enable maintenance people to move freely. Redundancy of activities and networks ensures an extraordinarily high level of reliability. Neles Automation’s Cyber Service provides valuable assets for improved maintenance and service activities through constant on-line support by the experts of nelesDNA technology.

**Embedded automation**

Valmet Automation and Neles Controls are both recognized pioneers in embedding intelligence inside the process and even the process equipment itself. Smart valve and diagnostics solutions, embedded I/Os, Valmet IQProfilers and wireless temperature sensors are examples of embedding intelligence inside the process. These embedded solutions narrow the interface between process and instrumentation and raise the automation level of process equipment deliveries. For Neles Automation, embedded automation is one step in the development path from DCS systems towards open automation networks that extend from field controls to information management.

**Total control of your batch process – from start to finish**

The DNAbatch provides you with a graphical and easy to use batch control environment. You can model your plant, manage recipes, execute batches, create electronic batch records, and generate reports on any batch process. DNAbatch is consistent with ISA S88.01 and NAMUR NE33 batch processing standards providing you with easy integration of your batch solution with higher level business systems such as SAP. In all, your DNA-batch encompasses robust control logic incorporated in the nelesDNA Process Controllers.

**Freedom to grow from SoftDCS to mill-wide networks**

The nelesDNA network is fully scalable. You can start from as small a solution as you need or build up a network that satisfies the needs of the largest and most complicated processes in the industry. This new and open network replaces task-bound user interfaces. Like a living organism, your dynamic nelesDNA network grows in response to your plant’s business goals.

When necessary, the required automation activities such as the user interface, process control, engineering together with field and external connections can be located into one or many Windows NT PCs. The result is a SoftDCS, which provides all the operations conventionally associated with a distributed system.

Reflecting the spirit of the Damatic age, nelesDNA has been created to support the earlier technologies, not to replace them. Flexible compatibility with Damatic XD/ allows a smooth update from Damatic to nelesDNA.
nelesDNA is built up from Activities consisting of related network functions. One example is the Information Management Activity. Activities may be spread throughout the network, or may be concentrated in a single hardware location called a node. The nelesDNA Activities communicate with each other without separate connection stations.
Network

The backbone of nelesDNA is the set of networks connecting activities together. All of these networks may be redundant.

The Control Room Network connects nelesDNA user interface components together. It is based upon standard Ethernet technology.

The Process Control Network connects process controllers together. It uses a deterministic token passing protocol. Process controllers are also connected to the control room network, allowing the user interfaces to communicate with the process controllers.

Field Buses connect I/O’s, field devices and process controllers together. Different kinds of field buses are supported like Foundation Fieldbus and Profibus.

The Office Network of the plant is also part of the overall nelesDNA networking. The user interface components can be connected either to the control room network or to the office network. The control room network is separated from the office network to provide security for the control room network and to save the office network from unnecessary load increases.

Activities

The Information Management Activity consists of high performance continuous, alarm and batch history databases, which are empowered with reporting and information analysis tools.

The Operations Activity incorporates process operation user interfaces, alarm processors and batch clients.

The Controls Activity consists of batch servers and continuous process controllers. All levels of control from basic loop and machine logic to advanced quality optimization and batch operations are implemented in this activity.

The Field Activity contains normal rack I/O, embedded field and motor I/O as well as standard fieldbus interfaces like Foundation Fieldbus and Profibus. Fast and independent controls can be executed in intelligent field I/O components (configured with IEC 61131-3). Field Activity includes PaperIQ scanners and profilers.

The Connectivity Activity provides external interfaces to different systems like computers, logic systems and special measuring devices. It also includes full linkage to earlier Damatic, DamaticXD and DamaticXDi systems.

The Engineering and Maintenance Activity includes the engineering data repository and engineering tools for the design and modification of the activities functionality. Extensive maintenance tools support document management, tuning, self-diagnostics and troubleshooting.

The Cyber service concept permits Neles Automation’s Service personnel to provide on-line support through communication networks and thus provides the best possible service response and service quality.

Hardware

The user interface components run in Windows NT workstations, while database and web servers run in Windows NT servers. Process controllers and connectivity components run in VME-nodes or Windows NT computers.
Even the best plants and mills must work hard to maintain the necessary touch for a competitive edge. The production team needs the right tools for continuous development towards superior performance. Continuous process and product development guarantees high customer satisfaction which is the cornerstone of profitability. The nelesDNA information management concept is the key to your success.

The key benefits:

• Comprehensive process history
• Flexible user tools for reporting and analysis
• Scalable from long-term trending to data warehousing
• Open to all data accessed using industry standard interfaces, such as ODBC and ADO
Comprehensive history completed with user tools

The nelesDNA Information Management Activity contains a comprehensive data warehousing solution for all process and product related information. The data warehouse is composed of historians for continuous, alarm, and batch histories. In addition to these, nelesDNA contains a database for building process knowledge.

The long-term historian provides facts and figures for development and management. The data from different sources – nelesDNA networks, other DCS, QCS, MCS, WIS, PaperLab and laboratory entries – are collected and stored in the database.

The comprehensive data warehouse forms a solid basis for user tools. The user tools are advanced software products for analysing and reporting on both production and product information. The user tools make the results of information analysis available to the whole organization. The tools can create, save, present and report information, which supports the plant’s decision-making capabilities. This enables improved production management, sharpens understanding of the process, and reduces disturbances.

Knowledge networking

Organizations can be geographically distributed in different locations – even in different countries. People work in various shifts at different times. Departments can be separated by remarkable distances even inside one mill or plant. With the help of information technology, nelesDNA can network the whole organization, including the process associated information and knowledge of the personnel.

The networks help manage and distribute knowledge inside the organization and make it available for everyone everywhere, regardless of time and place. In this way, the expertise available inside and outside the plant can be utilized efficiently. Running a process is a team effort. It requires the combined knowledge of the various sources in the plant’s organization. Efficiency is built from the team functioning correctly, while utilizing the best tools.
Systematic approach for continuous development

The user tools together with comprehensive historians form a state-of-the-art platform for process analysis and development. The easy-to-use tools can be used to visualize data into illustrative displays or the process data can be analyzed using advanced algorithms such as correlation analysis, energy balance calculations or Fourier analysis.

These nelesDNA tools are designed for a systematic analysis of events and deviations in processes, process equipment, raw materials and product quality. The tools are able to pinpoint the reasons behind disturbances and deviations quickly, which allows for fast corrective actions.

Scalable and open

The nelesDNA Information Management Activity is a highly scalable platform for process information and knowledge management: from a few tags to comprehensive data warehousing, from long-term trending to process analysis, from basic reports to plant-wide information management and from a single PC to a corporate information sharing network.

All data in the historians are accessible using industry standard interfaces whether ODBC or the state-of-the-art OLE based ADO (ActiveX Data Objects) interface. Both interfaces are recognized by practically all modern Microsoft Windows-based applications, like MS-Excel® or Visual Basic®.
Powerful tools for your tasks

The right trend for your task

The nelesDNA Information Management Activity enables customized trending to all user groups. Operators can look at long-term trends from the process operation’s user interface. They can easily evaluate past, present and future trends from one and the same user interface.

Production management can call up, for example, the previous days’ facts and figures in a morning meeting using a DNAprocessExplorer.

The DNAprocessExplorer provides powerful features for exploring the history database in the form of trends, process graphics and correlations.

Evaluation of the process status is fast and easy using DNAprocessExplorer’s process graphics displays and trends. To complete the overview from a specified time span, you can use DNAsummary. It calculates summary information, which provides a comprehensive view of the entire process at a glance.

Powerful tools for disturbance management

The Information Management Activity includes a selection of tools, which complement and complete the Operation Activity’s disturbance management features. These tools include, the alarm reporting and analysis package, DNAalarm and the process graphics replay tool, DNAreplay. When the power of these tools is combined with nelesDNA trending and reporting tools, the result is a powerful toolbox for process disturbance analysis. And since the tools utilize historians, the disturbance analysis can be handled after the event and compared with earlier occurrences.

DNAalarm allows you to search and sort the alarms in the DNAalarmHistorian. The advanced browsing features guide you to the roots of the disturbance thus helping you to predict and avoid similar problems in the future.

With DNAreplay you can review the past. It allows an ordered view into what happened in the process and, thus, enables pin-pointing where the problem started. DNAreplay is an excellent training tool to prevent future production disturbances.

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Remote users can access the history data through networks and dial up lines using DNAtrend@web capabilities. The DNAweb user interface is based on Microsoft Internet Explorer and it transfers all information from the databases using the standard HTML protocol.

Versatile tools for production monitoring

With nelesDNA tools you can achieve an informed view of the production line. Using DNAlogReport tools you can receive clear production reports or equally, you can customize your production reporting with Crystal Reports™ report builder.
Visualized quality

nelesDNA integrates a mill’s quality information into one system. The illustrative tools visualize all information whether it is collected from on-line systems or manually entered in the laboratory.

DNAalarm is the flexible tool for laboratory data management. It provides information that cannot be measured on-line. DNAalarm integrates quality data with production management. The data can be accessed and combined using all reporting tools in a similar manner as well as with on-line measurement data.

For paper mill quality management, reporting and analysis, nelesDNA offers PaperMap. It contains a wide variety of tools including quality maps, reel and run reports, production efficiency reporting, profile shape analysis and laboratory data entry.

Flexible solution for maintenance

Efficient maintenance procedures help you optimize maintenance scheduling and prevent unplanned stops. The nelesDNA User Tools are perfect companions in all your maintenance tasks.

DNAalarm enables you to more accurately and price-efficiently plan process maintenance. Analyzing the frequencies of alarming devices becomes easier as you can locate which devices are causing problems. You can also find out which alarms are unnecessary or which alarm limits are not properly set.

DNAruntime provides facts for the maintenance scheduling of equipment and improves the effective utilization of maintenance resources. The tool gives you clear statistics about device runtimes and the number of device starts. All this information can be completed with, for example, correlation analysis using DNAProcessExplorer or on-line process documentation using Process Helps.

Complete solution for process analysis

Process analysis using powerful nelesDNA tools based on reliable history data is the key to understanding and further developing your process. Using the DNAProcessExplorer, process analysis becomes clearer. The trends, correlations and statistics can be completed with Microsoft Excel features or a DNAalarm disturbance statistics display.

Software and hardware licences

KCL-WEDGE provides a software tool package for systematic analysis of events and deviations in processes, processes equipment, raw materials and product quality. This tool is able to locate the reasons behind disturbances and deviations quickly and allow for fast corrective actions.

DNANeuroSense helps you find interdependencies within complicated processes. The tool itself includes a selection of neural network tools, for example, Self Organizing Maps, that can be used for building up process models that can be verified by simulation.

History database licences

- DNAhistorian
- DNAhistorian capacity, license / tag
- DNAalarmHistorian
- DNAalarmHistorian capacity, license / tag

User Tool Licences

- DNAProcessExplorer, licence / client PC
- DNAsummary, licence / client PC
- DNAruntime, licence / client PC
- DNAtotal, licence / client PC
- DNAreplay, licence / client PC
- DNAalarmBrowser, licence / client PC
- DNAalarm, licence / client PC
- DNAlogReports, licence / client PC
- DNAhistoryODBC, licence / client PC
- DNAreplay@web, licence / client PC
- DNAtrend@web, licence / client PC

Hardware for historians

- Windows NT PC Model M
- Windows NT Server Model L
- Windows NT Server Model XL
- Windows NT Server Model XXL

Hardware for User Tools

- Windows NT PC Model S
- Windows NT PC Model M

Performance

- DNAhistorian
- PC Model M: ??
- Server Model L: ??
- Server Model XL: ??
- Server Model XXL: ??

- DNAalarmHistorian
- 12000 events in 2 hours, peak performance: 150 events / second
- Max: 28000 event points / database

User Tools

According to separate specification
In the process industries, one operator may have to control several units and thousands of measurements. Dynamic situations, especially in large and highly automated plants, often require the cooperation of many different experts.

Correct handling of the various tasks and early detection of disturbances for quick recovery create a basis for profitable operations. nelesDNA, the Dynamic Network of Applications, provides your production team with the tools to control even the largest and most complicated processes.

The key benefits:

- Efficient support for a complete process view
- Instant accessibility, flexible utilization of information and knowledge
- Integration of engineering knowledge and team experience
- Easy adaptability to various operator’s tasks
The nelesDNA Operations Activity provides instant access to the relevant process information and knowledge. Because the on-target information and knowledge is accessible with just one click, the operator tends to use it also when working under stress in quick and complicated situations. The relevant information and knowledge create alternative perspectives and break down false mental sets. The operators may recall or deduce few alternative causes for a problem and nelesDNA suggests five more. Dynamic information and knowledge tools provide the operator with the team’s experience collected to nelesDNA. Considerable savings can be made when the night shift operator alone in charge is able to detect problems at an early stage and solve them quickly.

**Operator’s work center**

The nelesDNA operator’s work center consists of:

- 1-3 monitors
- pointing device, e.g. mouse
- a standard text keyboard and optional process operator keyboard

The monitors display information and knowledge. Using a mouse, the operator can address actions on targets displayed on the monitor. Some of these actions can be performed directly from the process operator keyboard without using the mouse. A text keyboard is used for entering both the texts and numbers.

**Ergonomic desktop – information easily at hand**

A desktop comprises the set of windows displayed on the monitors of one nelesDNA work center. Thus, one desktop can include several monitors. The desktop components include: the header windows, the picture windows and the favourites picture bar.

A header represents a process section, such as power plant, reactors or storage tanks. It indicates an overall alarm situation from a particular section and facilitates one key access to the roots of a disturbance. The header also contains a toolbar with general desktop operations, such as opening new windows or alarm acknowledgement. The operator can keep several headers open at the same time, each of them presenting a view to a different process section.

A picture provides more detailed information on process events. The operator opens picture windows from the header and selects pictures with efficient and flexible selection methods. They ensure quick access to relevant information and knowledge. The tool bar of this window contains picture selections and alarm management.
Loop windows

A loop window presents detailed parameter and diagnostic information from a tag, including for instance, controller’s parameters, alarm limits and alarm masks. The loop window is opened by pointing at a tag and selecting “Loop window” from the menu. Several loop windows can be opened on the desktop at the same time.

Trends based on long-term history with high resolution

History plays a central role when determining how the process behaves or what has been happening in the process. It is therefore important to have accurate historical information extending far enough into the past.

nelesDNA eliminates the traditional separation between a high-resolution short-term history and a low-resolution long-term history by providing the plant’s production personnel with a new high-resolution long-term history. The nelesDNA activities include a user interface for quick and flexible retrieval of history information needed for process analysis.

Point and click process operations

Process operations, such as starting up the pumps, opening valves, inputting new setpoint values, are performed through pictures. The operations are based on point and click actions. The object of the operation is selected with a cursor and the left mouse button is used to initiate an operation. This opens an operating dialog for completing the action.
Knowledge provides organizational memory

Running production requires a lot of knowledge and understanding of the process and automation functions. This knowledge is partly created during the design of the plant and partly during the plant’s operation. A challenge for today’s technology is to put this knowledge into use in operational situations.

The dynamic nelesDNA constitutes a plantwide organizational memory, which grows together with your production personnel’s understanding. The nelesDNA network provides loop descriptions, disturbance descriptions and other tools, which accumulate and mediate between both the engineering and experience knowledge.

The loop descriptions explain the functions of a loop in a simple and easy to read form to make them efficient in disturbance situations. The loops include updating process information for quick diagnostics, as well as guides for specific disturbance situations. New guides and short instructions can be added on-line by the production personnel themselves.

Alarm management

Alarms alert operators in exceptional situations. They, and more generally the events, can be used to trace the course of a disturbance in on-line situations and afterwards to understand what really happened. By retrieving statistics from their occurrence, alarms can be used for analysing process and automation conditions.
nelesDNA user interface gives the operator overall information about the alarm situations and facilitates a one-click access to the process picture where the disturbance is located. In this way, it provides the operator with first-hand information about the incident. 1 ms resolution alarms guarantee accurate and reliable information about what has happened. Versatile tools for classification and statistical operations support flexible and efficient off-line analysis.

**Batch process management with dynamic phase logic operations**

When managing batch operations efficient utilization of process equipment is important. This is achieved by implementing flexible and highly usable batch operations. The nelesDNA batch tools offer an easy and flexible development of recipes and an efficient management of batches during operation of the plant.

The nelesDNA batch user interface supports tasks ranging from scheduling the batch and its execution to a complete historical record. Through a series of pictures it provides the operator with full monitoring functions and flexible control of both the recipes and the equipment on which they execute. Both normal operation and exceptions can be dealt with efficiently from the batch level down to the phase level.

### Software and hardware licences

Operations Activity components can be installed to standard Windows NT PCs.

**Software component licences**
- Operator interface licence, per PC
- Operator interface capacity licence
  - # norm displays per PC
- Alarm processing capacity licence
  - # alarm events per PC
- DNAbatch client

**Hardware component options:**
- Operator Keyboard OKB, IP 65
- Industrial Mouse IP 66, Durapoint
- Additional graphic controller, up to 3 monitors
- Dual Channel 10/100 Mb Network Adapter for PC
- Industrial PC hardware
- Flat panel PC

### Performance

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. number pictures</td>
<td>No practical limit</td>
</tr>
<tr>
<td>Max. number objects per pictures</td>
<td>No practical limit</td>
</tr>
<tr>
<td>Picture change time</td>
<td>Typ. 1-2 s</td>
</tr>
<tr>
<td>Picture update for main window</td>
<td>Typ. 1 s</td>
</tr>
<tr>
<td>Max. # picture windows per operator interface</td>
<td>No practical limit</td>
</tr>
<tr>
<td>Max. # loop windows per operator interface</td>
<td>No practical limit</td>
</tr>
<tr>
<td>Motor start operation --response at BOU8 output</td>
<td>Typ. 1 s</td>
</tr>
<tr>
<td>Motor start operation --feedback on display</td>
<td>Typ. 2 s</td>
</tr>
<tr>
<td>Alarm resolution = scan interval for binary events</td>
<td></td>
</tr>
<tr>
<td>- time stamp for embedded field I/O (BIR 8)</td>
<td>1 ms</td>
</tr>
<tr>
<td>- time stamp for rack I/O (BIU 8)</td>
<td>5 ms</td>
</tr>
</tbody>
</table>
nelesDNA provides a complete solution for all your control tasks. The nelesDNA network of control applications encloses your plant’s control tasks within one growing network and you don’t need to build up separate systems for PLC operations, basic controls, batch control or for optimizing controls. It guarantees efficient control ranging from basic, advanced, and safety critical to batch. Top-of-the-line paper quality measurements are included.

**The key benefits:**

- Completely integrated fast analog and logic control
- Open to third-party JAVA applications
- Fast real-time trending for spotting deviations quickly
- Advanced controls to solve complex control challenges
- Better productivity and performance with DNAbatch
- Paper quality controls
Complete control from fast logic to batch

Basic Controls

The nelesDNA basic process controls include:
- Integrated analog and logic controls
- Quick and safety-critical controls
- Intelligent embedded field controls
- Sequences and parameter recipes
- Real-time trending

Integrated analog and logic controls

These controls cover measurements, alarm detections, on/off valve controls, motor and motor valve controls, interlocking and group starts. In addition, all forms of logic and calculations can be performed.

Quick and safety critical controls

These purpose-designed basic controls are used for safety interlocking, emergency shutdowns and machine controls. A programmable logic unit (PLU) and an analog controller unit (ACU) provide fast cycle-times from 5 ms for logic and 20 ms for PI-controls. A configuration of applications at a unit level in non-volatile memory and hard-wired connections for communications between the units provide high reliability and independent operations.

Intelligent embedded field controls

By using intelligent embedded I/O's with IEC 61131-3 language configuration, the user can design stand-alone solutions and embed them into machinery.

Sequences and parameter recipes

Automatic sequential control is achieved through sequences. These are based on consecutive steps, during which actions can be executed. A step is a collection of actions that can be taken at one time. A sequence proceeds to the next step if the transition conditions are met. Sequences use expressions, which are based on the IEC 60848 standard. The conditions and actions are created with function blocks.

Parameter recipes are used for storing parameter tables, which, when loaded into the process, can change the whole structure of control operations. When producing several different end products with the same equipment and procedure the process is controlled by changing the selection and ratios of the original ingredients, such as timing, temperature, pressure, regulator properties and so on.

The parameter recipe is a list of such parameters stored in a process control component. Each recipe may contain several variations, each with different parameter values. Different recipes are applied to different tasks, and the variations of one recipe are used for performing the same task with different parameter values.

Real-time trending

Real-time trending collects and pre-processes history data for trend displays and for the historian database. The historian database, DNAhistorian, enables the storage of process data with up to 200 ms resolution. nelesDNA's complete historian offers powerful functions for archiving an analog disturbance history, consisting of a disturbance storage, and an advanced data storage for disturbance detection.

Advanced Controls

nelesDNA Advanced Controls cover:
- Fuzzy logic controls
- Neural networks
- JAVA for process control
- Paper quality controls based on solutions for machine and cross-direction controls.

Fuzzy logic controls

Fuzzy logic enables the capture of the operator’s process experience in verbal form within the control algorithms. Fuzzy solutions have proven to be especially useful in processes consisting of many controls and measurements at the same time. Such processes include, for instance, the recovery boiler bed and symmetry control or the control of cross-coupling variables in pulp bleaching. Fuzzy logic applications can be flexibly configured just by defining the parameters to the fuzzy control function blocks of the nelesDNA application network. These function blocks (for fuzzification, rule base and defuzzification) feature built-in management for faulty signals, forced control and manual/auto changes. Operators can tune their fuzzy controls by using non-mathematical and verbal expressions in a user-friendly tuning display.
Neural networks

Advanced controls with neural networks are targeted for process specialists who aim at analyzing process behaviour or developing new control strategies. Neural networks have a “training” rule whereby the weights of connections are adjusted to the basis of the data. The neural networks can learn from the training data examples.

DNAneuroSense has two neural network methods: the MultiLayer Perceptron (MLP) and Self Organizing Map (SOM).

In the nelesDNA network, you can create the following process models with NeuroSense:
- Multi Layer Perceptron (MLP) Neural Net models
- Linear static model as a regression model
- Custom static models (NeuroSense calculates parameter values for the model according to given a formula)
- The Self-Organizing Map (SOM)
- Dynamic linear ARX models. The DNA TuneUp tool uses similar models.

JAVA for Process Control

JAVA for Process Control offers powerful calculation methods, like matrix operations and Fast Fourier Transformation (FFT) for creating applications with the high level programming language.

JAVA for Process Control can be used, for example, for advanced controls, calculations, search operations and estimations. Excellent results have been achieved when multivariable control algorithms have been applied to processes which feature cross-correlating variables with different process delays. Providing a secure execution environment, JAVA enables reliable and flexible free programming of applications inside a function block package. The JAVA virtual machine for Process Controller enables the commercial use of nelesDNA in modern object-oriented process supplier programs.

Paper quality controls

The nelesDNA control activities comprise dynamic model-based controls which can be used for advanced paper machine controls. The MultiPredictive controls, for instance, are machine-direction model-based controls providing a unique triple-predictor technique. This control method ensures superior control performance when compared to conventional dead-time compensated model-based algorithms. The benefits are clear: faster controls, better stability and top-performance all the time.

The cross-direction controls are implemented by using a wide variety of array calculation function blocks. These function blocks can be used for solving complex control tasks. Neles Automation has ready-made application packages of these control alternatives for the paper industry.

Software and hardware licences

<table>
<thead>
<tr>
<th>Software Licences</th>
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<tbody>
<tr>
<td>Capacity 500 norm I/O</td>
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<tr>
<td>Capacity 1000 norm I/O</td>
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<tr>
<td>Capacity 1500 norm I/O</td>
</tr>
<tr>
<td>Capacity 2000 norm I/O</td>
</tr>
<tr>
<td>Capacity 2500 norm I/O</td>
</tr>
<tr>
<td>Fuzzy Logic, (per control)</td>
</tr>
<tr>
<td>DNAbatch Server</td>
</tr>
<tr>
<td>DNAbatch Phase Templates</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Process Control node (VME)</td>
</tr>
<tr>
<td>- Model M, Model L</td>
</tr>
<tr>
<td>- Both models can be redundant</td>
</tr>
<tr>
<td>- Both models can be equipped with floating point co-processor</td>
</tr>
<tr>
<td>- Optional Field Bus Controller for redundant or additional field bus</td>
</tr>
<tr>
<td>- Windows NT PC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance / Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O capacity per Process Control node</td>
</tr>
<tr>
<td>- Model M max. 2000 norm I/O, redundant 1300 norm I/O</td>
</tr>
<tr>
<td>- Model L max. 2500 norm I/O, redundant 1600 norm I/O</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minimum cycle time</th>
</tr>
</thead>
<tbody>
<tr>
<td>- logic 5 ms (*)</td>
</tr>
<tr>
<td>- control 20 ms **)</td>
</tr>
</tbody>
</table>

*) with Programmable Logic Unit (PLU)
**) with Analog Controller Unit (ACU)
设备模型和仿真

Neles Automation的DNAbatch是您的现代、灵活的批控制系统。它集成Intellution的iBatch™，是批处理软件的领导者。DNAbatch帮助您实现批过程的生产力和性能，覆盖了您所遇到的批过程的每一个方面。无论您处于哪个批行业，DNAbatch都能帮助您成功应对您今天和未来的挑战。

DNAbatch提供了图形化、易用的批控制环境，您可以在该环境中建模、管理配方、执行批次、创建电子批记录，并生成任何批次过程的报告。它涵盖了robust控制逻辑，集成在nelesDNA Process Controllers中。此外，DNAbatch还与批处理标准ISA S88.01和NAMUR NE33兼容。DNAbatch还允许您轻松地将批解决方案与更高层次的业务系统集成，如SAP。

配方开发与管理

DNAbatch让您能够快速、轻松地创建主配方，使用IEC 61131-3标准的Sequential Function Charts（SFC）。您的主配方可以用于生产任何数量的最终产品，您选择的任何生产线，实现最大资产利用率。

批生产

DNAbatch Server具有全热备份能力。如果服务器因任何原因需要重启，例如停电，它可以重启所有批，以停止时相同的状态。这允许生产继续而不中断，节省时间和材料。

DNAbatch Client存在于Windows NT环境中的用户界面的其余部分，提供了一个完整的生产概述。

关系数据库连接

DNAbatch通过开放数据库连接（ODBC）轻松地连接到任何标准关系数据库。您可以存储您的配方和批次日志在系统中，如Microsoft SQL Server或Oracle，并轻松地在整个组织中共享数据。这些信息也可以与连续历史和事件历史结合，提供您生产的全面视图。
DNAbatch integrates production and control

Process control

The phases that execute in the DNAbatch Server communicate with the phase logic in the nelesDNA process controllers, using OPC (OLE for Process Control).

Individual phases are created from template modules, where the complete interface, including state-transition, command, parameter, and request handling, has been pre-configured and fully tested, leaving the engineer to concentrate on the specifics of the phases.

The phases may be reviewed and controlled through displays, again created from templates.

Active Binding™

The Active Binding feature of DNAbatch allows binding and re-binding of units at any time in a batch’s life cycle. Binding can occur when a batch is created, scheduled, started or in production, either manually or automatically. Active Binding maximizes your capital equipment investment by reducing cycle times and increasing production.

Active Journaling™

Active Journaling supplies you with accurate, real-time information so you can make more effective business decisions, faster than ever before. Now you’ll have up-to-the-second batch data available for processing and reporting and without having to wait until the end of a batch to get it.

DNAbatch Integration Service

The DNAbatch Integration Services (DBIS) is a collection of interfaces that allow external third-party applications direct communication with your DNAbatch application. An automation interface is exposed for calling from languages such as Visual Basic. DBIS exposes the power of the Batch Server to the end user for configuring front-end interfaces. Inventory management systems, schedulers and parameter calculations are just some of the custom applications DBIS allows you to create.

Software licences

- DNAbatch Server Licence
- DNAbatch Client Licence (Operations Activity)
- DNAbatch Phase Templates

Performance

Essentially performance and capacity are limited only by the available memory and processing power of the PCs.

*) iBatch, Active Binding and Active Journaling are Trademarks of Intellution® Inc.
nelesDNA is an open network, which contains versatile interfaces compatible with process computers, PLCs and other external systems, utilizing commonly used standards. These interfaces are available both on VME nodes and on Windows NT® nodes.

The key benefits:

- Full connectivity to Damatic, Damatic XD and Damatic XD$i Systems
- Wide variety of external interface protocols
- Profibus DP interface
- OPC interface
Process computer interfaces

Alternative protocols for the Computer Interface Component include: the TEK-126 protocol, used already in the Damatic system, the Configurable and Name-based Protocol (CNP) and an Extended Name-based Protocol (ENP).

A selection of source, object code and executable software packages implementing the CNP and ENP protocols are provided for a variety of operating systems, including the MS-DOS, Windows NT, SCO and HP-UNIX. The physical connection of CNP and ENP can be executed either using multiple RS channels or via the Ethernet network. The nelesDNA DDE Server is a Microsoft Windows application program that acts as a DDE (Dynamic Data Exchange) Server enabling other Windows application programs to access data from the nelesDNA Computer Interface. Any Microsoft Windows program capable of acting as a DDE Client may be used by this Server.

Internal interfaces

The interface to a Damatic system is built by using a DIS VME node. The DIS is connected with Damatic's control room bus, the capacity can be increased by using several DIS nodes in one Damatic bus.

To provide Single Window operations for QXD-9000 Paper Machine Quality Controls, the nelesDNA can be interfaced to the quality system using the multiple channel high-speed link of the SIS component in a VME node.

Programmable logic interfaces

The Logic Interface Component supports the protocols used in most PLC units. The most frequently used protocols include: MODBUS RTU, Allen-Bradley fx, and Siemens 3964/3964R. In addition to these, there is a number of serial and Ethernet protocols for PLCs, analyzers, weighing devices and QCS systems.

The most commonly used protocols have also been implemented for a Logic Interface Component used in Windows NT node. Some of these interfaces are available only for Windows NT.

In the VME node, the physical connection can be made using multiple RS-channels or Ethernet (depending on the protocol). In the Windows NT node, a multichannel RS-card, Ethernet or Profibus DP network can be used.

Interfaces using serial line

<table>
<thead>
<tr>
<th>Name of the protocol or interface</th>
<th>VME node</th>
<th>Windows NT node</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABB MicroScada (Modbus with timestamps)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>ABB-Accuracy 362CG Profile Protocol (Accuracy Communication Std.)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>ABB-Accuracy DIU link</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>ABB-Strömberg SPA - bus (protection relays)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Allen-Bradley fx, half duplex</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Allen-Bradley full duplex (ANSI X3.28 sub. 3, 1 D1 and F1 definitions, 1771-KE/KF module)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Beolit (actuator)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Comil (Alfa Laval PLC)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Free ASCII protocol</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Hima PLC (Modbus with timestamps)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>HMx SCL/SPCL master and slave mode (MX quality processor)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>IEC 60870-5-101 protocol</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Impact protocol</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Jetmatic (actuator)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Kajaani analysers interfaces</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lippe QCS interface</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Majiq (MIS)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Mauekk PLC (Modbus with timestamps)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Mitsubishi Melsec-A (PLC)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Modbus RTU master and slave mode</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Nematron terminal interface</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Omron C-series PLC</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Premid (identification system)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SAIA (PLC)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Siemens 3964 and 3964R (RK512) master and slave mode</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Siemens 3964R DUST master mode</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>TAD weighter</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Interfaces using Ethernet TCP/IP

<table>
<thead>
<tr>
<th>Name of the protocol or interface</th>
<th>VME node</th>
<th>Windows NT node</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABB PPS-200 Drive System (Modbus RTU)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>GE Drive System (Modbus RTU)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>GE Mark V Turbine controller</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>HMx Lan Server (ASCII–protocol)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Mitsubishi Melsec-A PLC</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Siemens 55 with CP581 (Casommat system)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Siemens 57 SAPI interface</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Valmet Road system</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>XDI Log, Event Based Data</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Data Logging Interface</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Open network

**OPC interface for real-time data**

**An OPC overview**

OPC (OLE for Process Control) is based on Microsoft’s OLE and COM technologies consisting of a standard set of interfaces, properties and methods for use in process control and manufacturing automation applications. OPC is designed to enable the client applications to access the plant floor data in a consistent manner. The OPC provides an open, plug-and-play standard which allows users to flexibly select new solutions, as well as reduce development and maintenance costs for hardware and software suppliers.

**The nelesDNA OPC server**

The nelesDNA OPC Server is an application in a Windows NT node that provides data for OPC Clients. A Windows NT node uses Ethernet (nelesDNA Control Room Net) in order to communicate with the nelesDNA Process Controllers. The OPC interface offers a custom OPC interface to the nelesDNA network. This means that the OPC Clients supporting this custom interface can access data via the OPC Server. This kind of application is typically used for visualization, reporting and analysis. The data cannot be accessed by higher level applications, such as Microsoft Excel. DNAbatch uses the nelesDNA OPC Server for its communications between the batch server and the process controllers.

**Specification**

- The nelesDNA OPC Server supports the following data types: ana, ints, intl, bin, intsev, intlev, binev, txt2, txt4, txt6, txt8, txt10, txt12, txt16, txt20, txt32, txt64, txt84, txt256, txt512, cha_XX; fails is converted to OPC status data.
- Interface to Process Net via NCU2
- Custom interface available

The following OPC clients have been tested:
- Fix Dynamics 2.0 by Intellution; http://www.intellution.com
- ProcessX Explorer version 2.0 by Matrikon Systems Inc; http://www.matrikon.com
- Descartes OPC Explorer version 1.0-002 by Descartes Systems Sciences; http://www.opcfoundation.org/OPC-CATALOG
- In-touch version 7.0 by Wonderware Corporation; http://www.wonderware.com

**Performance**

- Max. 8000 signals per OPC Server
- Max. 1000 signals /s

**ODBC Interface for History Data**

All data in continuous, alarm and event historians can be accessed from Microsoft Windows using the ODBC interface. Time continuous data can be accessed like data in relational database.
nelesDNA increases your plant’s engineering and maintenance productivity, ensuring quality design, efficient changes and reliable functioning of your automation and information network for its entire lifecycle. The nelesDNA Engineering and Maintenance Activity manages all the documentation that you need during the conceptual design, the project phase, the start-up and through years of maintenance. With modern web-based network operations, you can handle up-to-date engineering data and view documents wherever you need them. The engineering tools visualize your whole plant as a hierarchical map, which enables easy navigation to the desired department or process area and even deeper. Advanced maintenance support is provided by versatile diagnostic tools, and by tools that enable maintenance people to move freely.

**The key benefits:**

- Up-to-date documents always available
- ApplALMA and Libraries for competent application definition
- Easy loop modifications with Function Explorer and CAD tools
- Virtual nelesDNA for risk-free application testing
- Efficient Self-Diagnostic and application troubleshooting features
- nelesDNA Wearable for quick process start-ups
Documentation always kept up-to-date

Accurate and up-to-date documents are a critical requirement for your plant’s personnel. nelesDNA fulfills this requirement with an integrated documentation and engineering data management. The ALMA@Web documentation management network connects diagrams and any MS Windows documents to the desired department, loop or device hierarchy. Web-based tools provide easy and safe access to up-to-date documentation in the mill’s intranet or also remotely outside of the mill.

Competent application definition with extensive libraries

nelesDNA provides extensive design libraries for creating automation or information applications, such as level control loops. The ApplALMA allows users to choose applications from the library, define tags and solution-specific parameters, for instance alarm limits – and a functional and reliable loop is created with minimal effort. nelesDNA design libraries include accurately documented items, such as the temperature, level and pressure measurement and motor, valve or other controls.

The Library applications are well tested throughout the years and thus safe to use without extensive internal testing. They also raise your engineering up to the higher abstraction level by providing a solution-specific parameter interface and storing irrelevant information in the background. The nelesDNA libraries can be accumulated with new applications whenever you have one and you want to reuse it. An access to library items can be ordered from Neles Automation’s web-store, Automation@Store.

Clear application outlining and searching

The Function Explorer provides a graphical mill map visualizing your mill’s departments, process areas and loops for individual process areas in a hierarchical tree. An activity tree visualization presents the nelesDNA activity allocation for the loops.

nelesDNA Engineering and Maintenance Activity operations are based on object-oriented navigation through a hierarchical tree views. In this tree, you can select an automation object and choose an operation. For instance, you can change the properties of a function block, open FbCAD to add blocks into the loop’s internal structure, check the loop integrity, online load modified applications to nelesDNA and print loops.

With the process area tree view, you can freely create and modify the process areas. A process area tree can consist of as many process area levels as required. To create a new loop, you can simply locate the loop into the desired process area. To look at an application structure or for finding a specific application, you navigate throughout the process area tree.

The activity tree view presents the nelesDNA activity structure, thus indicating the allocation of your specific application functions, such as the graphics displays, process controller application, interfaces and so on. These loop allocations can be easily changed with the help of the Drag&Drop feature. With a searching feature, you can find the location for an application by defining a few details of that application, such as the tag and parameter values.
Easy to change functionality – even for occasional users

The AppALMA interface can be used for the loop modification by modifying both the tag and the parameters values without having to open internal structure of the application. The tag modification does not require address tables because all activities are name-based, thus enabling self-documenting diagrams.

The Function Explorer provides a direct course through the mill map to the right department, process area and loop. Furthermore, it provides a quick access to the hierarchical internal structure of the loop right down to the bottom level function blocks. The Function Explorer allows you to easily look at and modify parameters at any level of the application. You can modify one loop at a time, or you can select several loops to the same sheet to modify one parameter for all of them simultaneously.

With the Function Explorer, you can open a function diagram to the AutoCAD based FbCAD tool, which shows the internal structure of a loop, the composition of its lower level blocks including connections and parameters. SeqCAD is a tool that provides these same features for the sequence diagram design. GdCAD is a similar tool for the process operation’s graphic display design, enabling creation of clear and highly visual displays with 3D-symbol library components and dynamic blocks.

FbCAD enables graphical modifications, adding new blocks from library, connecting the blocks together, as well as modifying their parameters. The FbCAD allows connecting loops with each other with exact documentation of the cross-references.

Collecting history data from the process signals can be defined by adding an appropriate history function to the loop diagram. A set of tools provides history reporting features, including for instance, Crystal Reports for basic shift, day, week and month reports. The Aspentech Process Explorer reporting tool is used for building a history graphic display with logs and trends. Microsoft Excel and other third-party software or web-based reports can be applied to enhance the reporting functions, and a special tool is designed for batch reporting.

Production people can usually modify some parameters, such as alarm limits of the loops, through their operator user interfaces. These modifications are easily updated in corresponding engineering documents of the loop.

Advanced control design capabilities with basic tools

nelesDNA provides function blocks for advanced control solutions, as, for instance, for fuzzy logic. These functions can be defined with the same user-friendly tools as the basic controls. A user-programmable function block enables programming functions in JAVA language. This function block is easy to define and connect with other function blocks and it communicates seamlessly with the Process Control Activity. The JAVA language enables easy manipulation of measurement, control and error signals.
Risk-free application testing with a virtual nelesDNA

The FTest function test tool together with the virtual nelesDNA environment enables safe testing and accurate simulation of the functions without interfering in the real process. The FTest tool also allows monitoring of functions and changing the values of functions running in the real nelesDNA environment. The virtual nelesDNA network contains a user interface, alarm processor and process controller. With the Virtual nelesDNA you test loops before loading them into the operational environment. Testing and monitoring in both the virtual and real nelesDNA environment is implemented in a highly visualized way. You define various test points and trends, view and change the test signals, or simulate I/O and mix signals to get feedbacks.

Load application to nelesDNA without process interference

Loading a modified loop into the process controller does not interfere with the process. The controllers continue from their previous states, for instance, they hold the M/A status and outputs or the motors keep running. Only the modifications which have been made take effect. Maintenance tasks, such as configuration changes and on-line loading, can be performed effortlessly without disturbance to the operator.

Tune your process for optimal quality

TuneUp provides considerable benefits for your production quality with methods for PID controller tuning. With this tool, you can define the optimal PID controller parameters, which best suit your specific requirements. Fast control loop tuning and analysis is ensured with DDE-connection to the nelesDNA process control activity. TuneUp performs process test, models the process and defines optimal parameters, which is realized with a special optimization algorithm or lambda tuning algorithm. After studying new parameters through simulation, you can load them directly to the PID-controller. Neles Automation's hands-on training courses cover both the theory and practice of the TuneUp operations.

A TuneUp Professional is a special tool for advanced analysis including closed loop simulation with control constraints, controller robustness and graphical tools in frequency and time domain. TuneUp Standard is a tool that includes a basic tuning procedure. The nelesDNA Tuneup runs in any Windows NT PC.

nelesDNA self-diagnostics provides network status at a glance

nelesDNA provides extensive self-diagnostic features to ensure the best possible process availability. Self-diagnostic alarms indicate a problem immediately and the Diagnostics@Web browser monitors the status of the automation and information network. Web-based monitoring provides easy access to self-diagnostic information from any PC in local mill network or remotely.
Maintenance@Web allows you to select your favorite browser in any PC in the mill simply by using the connection to Maintenance@Web server, which is normally installed in the engineering repository server. When the function diagrams are viewed in a browser, a viewer for AutoCAD diagrams is installed in PC. If the web-based loop descriptions include real-time signals, Dynamic signals@Web licences are needed as well as Maintenance@Web server.

**Predictive maintenance for smart valves with Field Browser**

The Field Browser lets you use your favorites web browser to view the status of all your control valves on one easy-to-read screen. By selecting the Field Browser bookmark, you can display the condition of the smart valves or other field devices in seconds. The Field browser can send error messages to e-mail boxes or mobile phones anywhere in the world. For catching a deeper insight into a problem, the valve can be accessed and remotely analyzed through any computer linked to your intranet using Neles Automation’s Valve Manager software.

**Mobility – walk to the field with the nelesDNAwearable**

The nelesDNA network sets maintenance personnel free from the physical limits of the control room and spreads information all over the mill and even further - with top security. It allows users to connect wearable and portable computers wirelessly to the engineering, maintenance, operation and information activities in the plant area. Plant borders can be crossed with the help of the latest advances of communication technology and by using web-based tools like Maintenance@Web, ALMA@Web or Reporting@Web.

nelesDNAwearable provides the important process displays next to the field, thus revolutionizing process start-ups and maintenance work. Instead of the radiophone communication between the field and control room personnel, the engineers can execute the required adjustments directly in the field during the process start-up. The process sample data can be entered to the system near the process, thus reducing the need for local control panels. Also, tuning can be done close to the field equipment. The nelesDNAwearable enables non-stop operation without the kinds of interruptions caused by a worker looking away or letting go of a safety grip.

The nelesDNA network is visualized with a tree-structure presenting hardware layout and locations of the software components. Each component has alarm indicators, which indicates diagnostic alarms for example from the alarming I/O-card channel and reveals the cause of the alarm such as line failure.

Information panels provide a comprehensive overview over the capacity, version, data backup and licences of all the components. For example, load, total memory and free memory of process controllers is easily checked. The alarm module panel creates self-diagnostic alarms for the nelesDNA network.

**Fast trouble-shooting minimizes production losses**

In a disturbance situation, production people can follow the links from the operator display objects to specific loop related descriptions, which contain real-time process signal values. These descriptions are further linked to engineering knowledge by using tagname links. The user can jump from the tagname to the Maintenance@Web tool, which offers detailed real-time information about the loop and the related Function Diagram.

If the production people are not able to solve a disturbance, they contact the maintenance person, who utilizes the Maintenance@Web tool on any PC with a web browser to track the problem from field connections, field devices or application software. With web-based operations, the best experts are always available. For security reasons, parameters can be changed only from a pre-defined location using a password.

When the maintenance person tracks function diagram program failures, the FTest testing tool helps him monitor the function diagram signals in a number or trend format, and enables him to see how the application controls the process. Changes are then tested in the virtual nelesDNA environment before loading them to the real process controllers.

When the application functionality is changed, the loop descriptions are updated with HTML-editing features of the browser and by using the nelesDNA’s Dynamic signals@Web feature.
nelesDNA wearable

When installed to a wearable computer, the operator user interface and engineering tools can be used as in any conventional workstation. The wireless Ethernet network consists of base stations and a PCMCIA card with an antenna module in each computer. The computers can be used within the radio coverage of base stations, each covering an area of approximately 40-100 meters of radius depending on the environment.

External connection is established, for example, with modems or ISDN routers. Safe procedures with call-back, passwords and point-to-point protocols are used. The web-based tools can be used remotely.

**Efficient instrumentation and electrification engineering**

Advanced sets of field instrumentation and electrification tools provide comprehensive control of the plant instrumentation and electrification life cycle with fully integrated nelesDNA engineering tools. These tools provide a consistent knowledge base for projects or plants, including conceptual design, detailed design and maintenance. This helps save time and money and promotes better planning and reliable information management.

The ALMA Field Engineering application set includes an integrated Field ALMA database and the Field AXES CAD for intelligent cabling and connection design with automatic cross connection. It can also create loop circuit diagrams and installation type drawings as well as joint drawings.

The loop libraries and design wizards enable easy engineering of new loops. The ALMA Electrification Engineering application set includes integrated ElectALMA database and Electrification AXES CAD for motor electrification.

**Batch engineering**

DNAbatch Engineering is accomplished by using easy and intuitive graphical tools. Area models based upon ISA S88.01 concepts, describing the equipment, paths, and available equipment phases, are configured using the Equipment Editor. The implementation of the equipment logic and displays is created using FbCAD, SeqCAD and GdCAD, coupled with tested template modules.

The Recipe Editor allows graphical design of recipes to create a hierarchy of procedural elements in a Sequential Function Chart (SFC) format, as described in IEC-61131-3. The recipes utilize the equipment and phases defined in the Area Model.

**Engineering environment scalable to your needs**

The Engineering and Maintenance Activity consists of an engineering repository database and the necessary engineering tools. The engineering repository and the tools are typically installed in their own Windows NT PC. A plant can use many engineering repository server computers at the same time, for example, for each department. New users can be added by installing the engineering tool set to the desired workstations of the mill. In a small nelesDNA network, the engineering repository and the engineering tools can be integrated, for example, with operator user interface.
Hardware

The Engineering Repository can be installed to standard Windows NT PC. Models S, M and L are available. Dat tape is added in models S and M. Engineering tools can be installed to standard Windows NT PC. Models S, M and L are available. Wearable PC, Xybernaut Mobile Assistant can be used.

Software licences

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Base licence/PC</td>
<td>Database access</td>
</tr>
<tr>
<td>Engineering Repository capacity</td>
<td>Database capacity</td>
</tr>
<tr>
<td>Engineering Tool Set</td>
<td>Application ALMA, Function Explorer, FbCAD, SeqCAD, GdCAD, HwCAD and Diagnostics@Web</td>
</tr>
<tr>
<td>CdcCAD</td>
<td>Control diagram CAD</td>
</tr>
<tr>
<td>LgCAD</td>
<td>Logic diagram CAD</td>
</tr>
<tr>
<td>Report editor tool</td>
<td>Crystal Reports</td>
</tr>
<tr>
<td>FTest</td>
<td>Control function testing tool</td>
</tr>
<tr>
<td>TuneUp Standard</td>
<td>PID tuning tool</td>
</tr>
<tr>
<td>TuneUp Professional</td>
<td>PID tuning tool with advanced analysis features. Matlab software needed.</td>
</tr>
<tr>
<td>Maintenance@ Web server</td>
<td>Web-based maintenance server</td>
</tr>
<tr>
<td>Maintenance @ Web User</td>
<td>Web-based maintenance user</td>
</tr>
<tr>
<td>Dynamic Signals@Web</td>
<td>Maintenance@Web server needed for dynamically changing loop descriptions.</td>
</tr>
<tr>
<td>ALMA@Web</td>
<td>Web publisher for engineering documentation. Omnis 7.3 WebEnabler needed.</td>
</tr>
<tr>
<td>ALMA Field Engineering Set</td>
<td>Field ALMA and Field AXES CAD</td>
</tr>
<tr>
<td>ALMA Electrification Engineering Set</td>
<td>ElectALMA and</td>
</tr>
<tr>
<td>ALMA Maintenance</td>
<td>Electrification AXES CAD</td>
</tr>
<tr>
<td>OEM software for engineering repository server</td>
<td></td>
</tr>
<tr>
<td>OEM software for engineering tool set</td>
<td></td>
</tr>
<tr>
<td>Omnis 7.3 Web enabler</td>
<td></td>
</tr>
<tr>
<td>Matlab</td>
<td></td>
</tr>
</tbody>
</table>

CAD tools are based on AutoCAD
Repository is based on Objectivity/DB

Performance

- Maximum number of loops: no practical limit (hard disk)
- Repository software hard disk space ?? MB
- Engineering tool set hard disk space ??-?? MB
- Hard disk space / loop approximately ?? MB
- Engineering Repository server model capacities
  - Model M:
    - 2 users / server
    - max. 4 users, when 512 MB Ram
  - Model L:
    - 4 users / server
    - max. 8 users, when 512 Ram
  - Model XL:
    - 8 users / server
    - max. 16 users, when 1 GB Ram

Following software requires capacity if installed to Repository server:
- Maintenance@Web server = 1 user
- General HTML server = 1 user
Neles Automation provides a comprehensive service program throughout the whole lifecycle of your automation and information network. It creates the conditions for efficient collaboration, top process availability and business success. Automation@Store allows you to order hardware, software, spare parts and services simply by navigating through the Internet. Our service specialists are the human link in the chain of high-tech support that connects you and us. Using the latest communications technologies, our best specialists are always close to you and your nelesDNA network.

**The key benefits:**

- Cyber and local service – always near you
- Process enhancements/development
- On-line troubleshooting
- Network audits
- Automation@Store
- Comprehensive training
On-line trouble-shooting with cyber support

Wherever your process is, on-line trouble-shooting support is available from Neles Automation’s service organization through cyber connections. Together with you, our specialists can assess the situation and take the necessary corrective actions. Using modems or ISDN routers, connection to the plant is established with safeguards including call-back, passwords and point-to-point protocols to guarantee process availability.

Secured process availability by new nelesDNA network audit

The new nelesDNA network audit provides a comprehensive summary of your automation and information network status: a detailed performance analysis, overview of system expansion capacity and recommendation for securing high process availability.

Automation@Store – products and services through the Internet

Automation@Store is a brand new service provided by Neles Automation allowing customers to order hardware products, software, spare parts and services simply by navigating through the Internet. Available services include, for example, electronic documentation, an application library and TechNotes, which provide known problems and their solutions as well as hints and tips on product usage.

Automation@Store is located in a secured area of the Internet and can only be accessed with a valid user ID and password. IDs and passwords can be obtained from Neles Automations WWW homepage http://www.nelesautomation.com. The Automation@Store page helps customers find products and services to ensure smooth-running daily operations.

Training: do it yourself or with us

Neles Automation offers a variety of computer-based programs combining audio, video, photos, texts and effects. Using this training method you can take your expertise further by choosing your own time and place to study as well as being able to repeat lessons and retain unusual procedures. Alternately, you can take advantage of the range of training courses organized by Neles Automation professionals – the choice is yours.
Neles Automation provides the solution for complete field management. Its smart valve and diagnostic solutions, embedded I/Os, Valmet PaperIQ Profilers and wireless temperature sensors are examples of embedded solutions, which remove the line between process and instrumentation. Embedded automation speeds up installation and start-ups and opens new opportunities for remote analysis and servicing. Machines and process equipment benefit from the fast and accurate equipment operations resulting from the embedded automation applications.

**The key benefits:**

- Embedded IEC 61131-3 programmable I/O solutions
- New compact and programmable embedded power I/O for increased safety
- Cost savings through less cabling and less rack room space
- FF fieldbus and Profibus DP I/Os for open communications between field devices
- Full range of traditional rack I/O-units with high packing density
Your seamless interface to the field

Versatile units for reliable process interface

nelesDNA provides solutions for all kind of process interfacing needs. These solutions cover
- Rack I/O
- Embedded power I/O
- Embedded field I/O with intelligence
- Foundation Fieldbus and Profieldus DP interfaces

General features of I/O units:

- Signal processing: filtering, 1 ms or 5 ms binary time-stamping
- Integrated field monitoring
- Integrated field supply with overload protection
- Led indicators and test points
- Simulation switches and software
- Plug and play replacement, power on
The rack I/O units provide value-adding benefits, such as the maintenance-friendly centralized solution, high-packing density and extensive selection of standard and special I/O units.
The programmable motor controller, MCP, is a new intelligent motor I/O solution for versatile and quick, 5 ms/cycle logics. This I/O unit is specially applicable to motors requiring local protection logics and local panel controls. It provides both modular construction and intelligence for free programming of fast logics. The intelligent controller can operate independently even when the communication link to the process station has been lost. This feature is an important safety factor.

The new compact uMC motor controller is a cost-efficient and small one-card solution for motor cubicle embedded controls. Like other Neles Automation motor controllers, it fulfills the safety regulations for machine controls and improves the production line’s safety.

<table>
<thead>
<tr>
<th>Embedded Power I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MC/03l</strong>, 120/230 VAC VAC 4 A relay outputs,</td>
</tr>
<tr>
<td><strong>MC/202l</strong>, 120/230 VAC inputs</td>
</tr>
<tr>
<td><strong>uMC</strong></td>
</tr>
<tr>
<td><strong>MC/CI</strong> 1/2/5 A current input</td>
</tr>
</tbody>
</table>
Embedded field I/O with intelligence

The Embedded Intelligent I/O solution is applicable to both I/O and control functions to the field, for example, to implement independent intelligent machine controls. Embedded I/Os can be successfully used also in all the safety-critical applications, where the control must run even when the upper control level is down. For achieving a fast control cycle, the Embedded Intelligent I/O is an ideal solution.

Neles Automation’s Embedded Intelligent I/O solution incorporates a Process Controller Unit, PCR with modular I/O units. The PRC unit can be programmed with languages defined by IEC 61131-3. The nelesDNA Dynamic Network of Applications provides I/O units for binary inputs, binary outputs, analog inputs and analog outputs.

The structure of the embedded I/O with intelligence

The Process Controller Unit is mounted on a Basic Module which has space for four I/O units. Additional I/O units can be installed by using extension modules, each having room for two I/O units. These modules can be chained. The maximum number of I/O units in a PCR is 16 and the maximum length of an I/O chain is 20 m. A 10 MB Ethernet bus (optical or twisted pair) connects PCRs and a Process Control node. This yields fast communication between a PCR and a Process Control node and also between multiple PCRs. A PCR can access I/O and application variables in another PCR by using function blocks. A Process Control node can access I/O and application variables from PCR as easily as normal I/O. An interface between a PCR and an external system can be implemented by using an OPC-server. The PCRs can be installed to work with the nelesDNA Process Control node or stand alone without any other nelesDNA components.

Process Controller Unit

The Process Controller Unit, PCR is designed to control the system with a common number of 20 to 70 I/O points. A typical 20 - 50 ms control cycle-time consists of three phases: reading inputs from the I/O and from other PCRs, executing application functions written by IEC 61131-3 and writing the outputs to I/O and to other PCRs. The application in PCR is stored in a flash memory. When the PCR starts, it immediately loads the application from flash - providing fast start-up. Only when the flash content is empty or corrupted, does the PCR call the application from the Backup component or from a separate Windows NT-server.

Possible I/O units with PCR are binary inputs (BIR), binary outputs (BOR), analog inputs (AIR) and analog outputs (AOR).
SoftPCR

The SoftPCR is a program located on a PC with PCR functionality. The SoftPCR application is configured in exactly the same way as the conventional PCR. Communication between the SoftPCR and PCR works in the same way as between other PCRs. The SoftPCR is capable of accessing I/O units via PCRs in the same network.

IEC 61131-3

The configuration of PCR is based on the IEC 61131-3 standard of programming languages for programmable controllers. This standard acknowledges five programming languages, which consist of two textual and three graphical versions. The textual versions are Instruction List (IL) and Structured Text (ST). The graphical versions are Ladder Diagram (LD), Function Block Diagram (FBD) and Sequential Function Chart (SFC).

IecCAD

IecCAD is the configuration tool used for PCR configuration. It runs on Windows NT environment and consists of the following work phases:
- creating and modifying a PCR application,
- building up the project and downloading it to PCR,
- testing the application by monitoring and setting variables.

The application can also be tested locally on a PC simulator for detecting local errors. The IecCAD can be used as a graphical debugger to on-line monitor program variables, which can be modified, when needed. The monitoring takes place with a real PCR or with a simulator.

Profibus DP

<table>
<thead>
<tr>
<th>BIR</th>
<th>Self-powered short-circuit protected, opto-isolated, PNP/NPN input (24 VDC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIR83</td>
<td>Totally floating, opto-isolated, IEC 61131-2 decision levels for 24 VDC input</td>
</tr>
<tr>
<td>BOR82</td>
<td>Totally floating change over contact, 1.0 A/50 VAC or 1.0 A/75 VDC</td>
</tr>
<tr>
<td>BOR83</td>
<td>Totally floating solid-state contact with supply/channel, 0.5 A/40V</td>
</tr>
<tr>
<td>BOR86</td>
<td>Totally floating solid-state contact with common supply, 0.5 A/40V</td>
</tr>
<tr>
<td>AIR8</td>
<td>0/4 - 20 mA, 0/1 - 5 V</td>
</tr>
<tr>
<td>AOR4</td>
<td>0/4 - 20 mA, 0/1 - 5 V, 0/2 - 10 V</td>
</tr>
</tbody>
</table>

The standard defines a set of operators, functions and function blocks. The user can create new proprietary functions and function blocks with the help of the IEC languages.
Foundation Fieldbus I/O

The Fieldbus is an all-digital, two-way, multi-drop communication system, which can be used for communication between field instruments and control room systems. The field instruments include, for example, transmitters, control valves, on/off valves, motors, pumps, scales, bar-code readers, multiplexers, multi-loop controllers, PLCs, handheld communicators and so on.

The nelesDNA fieldbus applications provide value-adding benefits throughout the automation life cycle of your plant. These benefits create many opportunities to utilize the latest innovations of the field product and reduce wiring and commissioning costs. The fieldbus-based nelesDNA network is completely interoperable and open to the device data from any vendor. Enhanced diagnostics enable you to increase the profitability of your maintenance operations. Increased all-digital accuracy requires no analog connection to digital conversions. The existing analog instrumental wiring can be used for the fieldbus devices.

FF Function blocks and configurator

The Foundation Fieldbus application communicates with the automation applications in Process Controller. The FF specification defines the scheduling of function blocks, as well as the structure of mode, alarms and events. This definition provides interoperability for function blocks located in field devices of different manufacture.

FF Fieldbus configurator is a software, which can be installed to either into a separate PC or into an Engineering Repository Server PC. The configurator is used for configuring FF field devices.

Hardware components

<table>
<thead>
<tr>
<th>Fieldbus Foundation Interface card (FFIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFIC is an interface unit for connecting nelesDNA to the Foundation Fieldbus. The FFIC is installed to I/O rack and it has a connection to Process Controll node in the Serial Bus Controller (SBC 32)</td>
</tr>
</tbody>
</table>

The isolated RS-232C/RS-485 adapter is used as SBC 32 unit’s serial interface unit to create foundation fieldbus interfaces. An adapter is installed behind the SCB card.

<table>
<thead>
<tr>
<th>TECHNICAL CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported FF specification</td>
</tr>
<tr>
<td>Physical medium</td>
</tr>
<tr>
<td>Bit rate for wire media</td>
</tr>
<tr>
<td>Number of devices per link</td>
</tr>
<tr>
<td>32 devices, without power and Exi</td>
</tr>
<tr>
<td>6 with power and Exi</td>
</tr>
<tr>
<td>Maximum distance</td>
</tr>
<tr>
<td>Number of FFIC per I/O-rack</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Profibus DP interface

PROFIBUS is the international and open fieldbus standard.

PROFIBUS-DP is designed for high-speed data communication at the device level. In this case, central controllers (e.g., PLCs/PCs) communicate with their distributed field devices (I/O, drives, valves, etc.) via a high-speed serial link. Most of the data communication with these distributed devices is done in a cyclic manner. The functions required for these communications are specified by the basic PROFIBUS-DP functions in accordance with EN 50 170.

nelesDNA Profibus DP interface

The Profibus DP interface is available for Windows NT node. The industrial PC uses a Profibus Master card from S-S Technologies. The SST interface card supports a maximum of 96 DP slaves.

Configuration of interface application

The configuration of the Profibus interface consists of the Profibus DP network configuration and the ‘cross connection’ between nelesDNA tag names and the Profibus DP data. Windows tools are used for both configurations.

Profibus DP

<table>
<thead>
<tr>
<th>Physical media</th>
<th>RS-486 twisted pair or fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data rate</td>
<td>speed 9.6 Kb-12 Mbit/s</td>
</tr>
<tr>
<td>Devices per bus</td>
<td>max 96 slaves</td>
</tr>
<tr>
<td>Connection to nelesDNA</td>
<td>Profibus DP Interface card in Windows NT</td>
</tr>
<tr>
<td></td>
<td>PC (acting as Profibus DP master)</td>
</tr>
</tbody>
</table>
Traditionally, process manufacturers have automated their small applications with PLC/PC or hybrid DCS systems. This often results in excessive engineering expenses and compilations with multiple databases or vendors. For small applications, Neles Automation offers a scalable NelesDNA network concept called ‘SoftDCS’. It is a network where the functions of a DCS are carried out on PCs with the Windows NT® operating system. Intelligent I/Os are used for fast logic and interlocking. The activities of SoftDCS can be combined into a single PC in a flexible manner, thus creating a cost effective solution.

**The key benefits:**

- Small and scalable
- Windows NT® workstations
- Standard hardware
- Various versatile network formats
- Activities within one PC

**SoftDCS**
The advantages of SoftDCS

Being scalable means that SoftDCS can be implemented as a small network and expanded by adding more hardware or software components. It can be configured to handle continuous, batch and sequenced applications in non-critical process areas requiring up to 1000 I/O channels.

SoftDCS can be easily integrated as part of a full-scale nelesDNA network. SoftDCS provides several possibilities for communication with external systems by means of serial, Ethernet TCP/IP and fieldbus protocols.

Open technology based on standards

Pentium processors used in Windows NT workstations have very high performance enabling the integration of several activities into a Windows NT PC. The openness of the PC and Windows NT platform offers major benefits including the utilization of third party hardware and software and the use of the latest technology.

The hardware used in PCs is standardized and widely available which is a great benefit to any customer using SoftDCS.

Versatile applications

The nelesDNA SoftDCS is applicable in many cases. The following examples illustrate its versatility.

Stand-alone applications

Such applications are usually small and they provide a suitable platform, for example, for machine automation. Intelligent I/O with the IEC 61131-3 configuration is used for fast controls and interlocking functions. Activities on Windows NT are used for higher level controls, operations and engineering.

Small DCS type applications

These small applications are used when the functionality of a DCS is required. Intelligent I/Os are used with IEC 61131-3 application for critical parts. Windows NT is used for controls, external interfaces, operations, engineering and information management.

Applications requiring external interfaces

Applications requiring, eg. Profibus DP or Siemens SAPI S7 interface protocols can be implemented using SoftDCS. A SoftDCS may have interfaces only to external systems and no I/O’s.

Time critical real-time applications

Heavy use of the hard disk or user interface may cause response time variations in a PC. However by installing controls and connectivity in a dedicated PC not performing operations, engineering and back-up functions you can guarantee that the defined cycle times are reached.
A small-size SoftDCS uses one PC in which intelligent I/O runs with IEC-61131-3 application. The nelesDNA’s operations, and controls engineering are performed in a Windows NT PC.

This small-size SoftDCS uses third party PC user interface software. User interface software communicates with nelesDNA intelligent I/Os via the nelesDNA’s OPC Server.

A successful SoftDCS reference has been achieved in Holland, where Valmet Järvenpää has delivered their Coatmatic system to the SAPPi Nijmegen plant. The machine logic is made with Siemens S7 PLC. Higher level controls and connectivity to Measurex QCS system is made with SoftDCS. Communication between SoftDCS and Siemens S7 is done through Ethernet TCP/IP.
Hardware
Hardware

PCs

**Workstations Model S, Model M**
Windows NT PC
- Pentium III, hard disk, CD-ROM, network card, keyboard, mouse, Windows NT

**Servers Model L, Model XL, Model XXL**
Windows NT Server
- multiprocessor Pentium, hard disk, RAID redundancy option, CD-ROM, DAT/DLT, network card, keyboard, mouse, Windows NT Server

**Industrial PC Model S, Model M**
Windows NT PC
- Pentium II, hard disk, CD-ROM, network card, keyboard, mouse, Windows NT

**Flat panel PC Model S, Model M**
Windows NT PC
- Pentium II, hard disk, CD-ROM, network card, keyboard, mouse, Windows NT

**Laptop Model S, Model M**
Windows NT PC
- Pentium II, hard disk, CD-ROM, network card, keyboard, mouse, Windows NT, TFT display

**Wearable PC, Xybernaut Mobile Assistant**
- Pentium 233 PC, hard disk, head mounted display: color 640x480, long life hot-swappable battery, wrist-worn ASCII keyboard, wireless network PCMCIA card with antenna, Windows NT

**Wireless Network Base Station for Office Environment**
- antenna up to 40 (100) m, wall-mounted, 110/230 VAC and ethernet connection

**Wireless Network Base Station IP54 for Field Environment**
- antenna up to 40 (100) m, 110/230 VAC, Ethernet connection, instrument air feed if temp. is over 40°C, max 60°C

**Monitors and keyboards**
- Standard PC monitors 17” – 21”
- Flat screens
- Dedicated Operator Keyboard OKB, IP65
- Standard ASCII keyboard
- Cursor Control Device

**Large screen devices**
- 37” and larger monitors
- 67” – 150” projectors

**Cyber peripherals**
- External modem to be used with MS Windows Remote Access Service (RAS)
- ISDN router

Printers
- Network B/W laser printer
- Network color laser printer
- Network color inkjet printer

Network components

The nelesDNA network is built using commercial standard components. These components support Simple Network Monitoring Protocol (SNMP) for network diagnostics:
- Ethernet hub
- Ethernet switch
- Ethernet router
- optional dual channel Ethernet connection for PC

Networks

<table>
<thead>
<tr>
<th>OFFICE AND CONTROL ROOM NETWORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical media: twisted pair/thin/outdoor/fiber/ wireless Ethernet</td>
</tr>
<tr>
<td>Branch length: 100 m/185 m/500 m/1000 m/ 40 m omnidirectional.</td>
</tr>
<tr>
<td>Protocol: TCP/IP, UDP/IP</td>
</tr>
<tr>
<td>Data rate: 10 or 100 Mbit/s 2 Mbit/s wireless</td>
</tr>
<tr>
<td>Redundancy: optional</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROCESS CONTROL BUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical media: coaxial/outdoor/fiber Ethernet</td>
</tr>
<tr>
<td>Nodes/bus: max. 50</td>
</tr>
<tr>
<td>Total length: unlimited, 2000 m without repeaters</td>
</tr>
<tr>
<td>Link access method: token passing</td>
</tr>
<tr>
<td>Protocol: deterministic Ethernet</td>
</tr>
<tr>
<td>Data rate: 10 Mbit/s</td>
</tr>
<tr>
<td>Update interval: configurable, typically 1 s</td>
</tr>
<tr>
<td>Redundancy: optional</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>nelesDNA I/O FIELD BUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical media: coaxial/fiber</td>
</tr>
<tr>
<td>Number of I/O groups per bus: max. 16</td>
</tr>
<tr>
<td>Total length: up to 4000 m depending on the cable type</td>
</tr>
<tr>
<td>Protocol: HDLC+CRC+retransmission</td>
</tr>
<tr>
<td>Data rate: 1 Mbit/s</td>
</tr>
<tr>
<td>Redundancy: optional</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>nelesDNA ETHERNET FIELD BUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical media: coaxial/fiber/twisted pair</td>
</tr>
<tr>
<td>Number of I/O groups per bus: max. 16</td>
</tr>
<tr>
<td>Protocol: Ethernet</td>
</tr>
<tr>
<td>Data rate: 10 Mbit/s</td>
</tr>
</tbody>
</table>
**Field terminal**

The field terminal is an acid-proof (AISI 316) stainless steel bench board that meets the IP 55 classification.

The dimensions of the field terminal are height 1635 mm, width 628 mm and depth 1134 mm.

**Cabinets**

**PC cabinet**

The PC cabinet is modular and it includes a 19" Eurorack assembly. The height of the cabinet is 2000 mm, width 900 mm and depth 600 mm.

The cabinet consists of two parts: the equipment section and a 300 mm cable riser. The equipment section can be equipped with PCs and the UPS standby power unit. The cable riser includes the 230/120 VAC supply connection, as well as bus and RS interfaces.

---

**Field terminal**

**Cabinets**

**User interface equipment**

**Desk**

The control room desk is assembled from modular sections in accordance with the desired furnishing solution.

The grey tone and warm, beige tone of the furnishings create a peaceful and balanced atmosphere in the control room.
Hardware

VME node cabinet

The modular VME node cabinet uses the 19" Eurorack to mount the equipment. The effective installation height is 40U giving space for three 9U racks. The cabinet's main dimensions are height 2000, width 600 and depth 400 mm.

Each 9U rack houses 2 or 4 VME basic modules. The basic module (BM2) consists of the VME power supply (VPU) and Network Connection Unit (NCU 2) that links the nodes to the process / control room bus and thereby to the other nodes.

The VME nodes consist of 3E-sized plug-in units. The available units are different CPU's, the Field Bus Controllers FBC and the sensor Bus Controller SBC and the Dynamic Memory Unit DMU.

I/O and cross connection cabinets

In a centralized I/O system, the I/O cabinet consists of two cabinets. Eight I/O subracks, a FPU power supply and the cabinet’s cooling fan are installed in the left-hand I/O rack cabinet. The terminals for the field cables, the cross connection and the SPU standby battery unit are installed in the right-hand I/O cabinet.

Power distribution cabinet

The distribution center and isolating transformer are installed in an equipment cabinet. The standard isolating transformer is a 3-phase, 10 kVA transformer.

Field cabinets

The field I/O cabinet is an enclosed cabinet structure that meets the IP55 classification and can be installed in plant conditions. The field I/O cabinet is available in three sizes: 450 mm, 1100 mm and 1500 mm in height. The field I/O cabinet is available as standard construction as well as acid-resistant construction.
Power supply requirements

**GENERAL**
- 400/230 VAC (+6%, -10%), 47 - 63 Hz
- 115 VAC (+6%, -10%), 47 - 63 Hz
- 24 VDC (18 – 32 VDC)

**REMOTE I/O**
- 230 VAC (+10%, -15%), 47 - 63 Hz
- 115 VAC, (+10%, -15%), 47 - 63 Hz
- 24 VDC (18 – 32 VDC)

**STANDBY POWER**
nelesDNA is equipped with standby power units to provide power for typically 30 min.

Degree of protection

<table>
<thead>
<tr>
<th>Cabinet and control room equipment</th>
<th>IP20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field cabinet</td>
<td>IP54</td>
</tr>
<tr>
<td>Field operator terminal</td>
<td>IP65</td>
</tr>
</tbody>
</table>

Type Approvals

The nelesDNA has type approvals of DNV, Lloyds Register of Shipping and Germanischer Lloyds.

The intrinsically safe I/O’s have been approved by the PTB or KEMA.

The hardware units are CE marked.