Danfoss Enspire®
a web-based SCADA software application

Description

Enspire® is a web-based SCADA software application (Supervisory Control And Data Acquisition) for district heating systems. Enspire® is built on strong bases of already established Danfoss solutions with new and improved features for remote monitoring, control and optimization of your district heating.

A reliable and stable software solution brings you a cost effective and energy efficient management and lays the foundations for a connected future of your district energy system.

Enspire® is typically installed locally at the heating utility and will automatically configure its user interface and functionality to support the application in the connected controllers (for example Danfoss ECL Comfort 296/310 and NOPRO OPR0020 controllers).

The user of Enspire® can remote control and monitor the parameters settings in the controllers and monitor actual, reference and historical values of sensors and energy consumption meters connected to the controllers.
Data sheet

**User benefits**

The advantages of Enspire® are among others:

**Customized for district energy**

Enspire® was developed and tailored specifically for district energy systems, but at the same time you can customize it to the specific needs of your district heating utility.

**Safe and secure**

Your data will stay safe and secure as Danfoss Enspire® provides protection for all interfaces and stores data with the trusted security mechanisms.

**Open, connected and transparent**

Benefit from open communication and data interfaces.

Besides a wide range of Danfoss products, you can integrate devices from other providers and manage them from one system. Collected data can also be easily available for other business (billing, business intelligence, ...) and operational systems (optimization tools, building energy management systems, etc...).

**Operate with more control and better efficiency**

The software was developed with a special attention on your daily tasks and our dedication to simplify them to save your time.

Get a better overview of your system with improved alarming features and reporting. And with easier commissioning, group settings, etc. you are now able to manage your daily business in a faster and more efficient way.

**Always up-to-date**

Your investment will never be outdated. We are dedicated to constantly improve and upgrade the solution and will provide you with the access to all the latest features and improvements.

**Lower your investment cost**

You can buy the software or subscribe to use it as a service. This will allow you to lower investment and IT equipment maintenance cost, consequently unlocking your resources to focus on your primary business.

**Modern web-based solution**

You can access the system from everywhere you require using standard web browser on your desktop or mobile devices.

**Team of experts at your service**

Benefit from our know-how database, access to online and onsite trainings, online video guides, support forums and engineers. This will result in your improved performance and overall satisfaction.
Enspire® automatically adapts its user interface to fit the application in the controller.

The following controller applications are supported:

- ECL Comfort 310 controller
  - Please see "List of application keys supported by Enspire®".
  - In the 'Documentation' menu select 'Electronic Controllers & PI Controllers > SCADA Solutions > Data sheet'.
- OPR0020 Controller
  - Firmware R9 and newer

As an option the ECL Apex 20 controller can be integrated into Enspire® to remote control and monitor the district heating utility or boiler house.

This requires a system integrator to develop a customized application for the ECL Apex 20 controller as well as a customized HMI for the Enspire® system using the OPC server software for ECL Apex 20 (not included in Enspire®).

Below is an application example of Enspire® in a biomass district heating network using Modbus-RS485 for data communication. The server, which has Enspire® installed, is located in the district heating utility and a central laptop is used for operating the Enspire® system. An external service provider also has access to the Enspire® system using his laptop connected to the internet. The server and the ECL Comfort 296/310 controllers are communicating via an RS485 serial link using the Modbus protocol.

1. Private house
2. Boiler house for biomass
3. Modbus-RS485 network
4. Internet
5. Enspire® server
6. Enspire® client (external service provider)
7. Enspire® client (central administration)
8. ECL Comfort 296/310 controller
**Application**

Below is an application example of Enspire® in a biomass district heating network using Modbus-TCP (ethernet) for data communication. It is similar to the previous example except that the ECL Comfort 296/310 controllers are communicating with the server via standard internet connections using the Modbus protocol. These internet connections may be used also by laptops in the houses for browsing the internet and also to access Enspire®.

![Diagram](image)

1. Private house
2. Boiler house for biomass
3. Modbus-TPC network (internet)
4. Internet
5. Enspire® server
6. Enspire® client (external service provider)
7. Enspire® client (central administration)
8. ECL Comfort 296/310 controller

**Languages**

The following languages are supported by the graphical user interface of Enspire®:

- English
- German
- Italian
- Danish
Supported controllers
The following controllers are supported by Enspire®

- Danfoss ECL Comfort 296 electronic controllers
- Danfoss ECL Comfort 310 electronic controllers
- Danfoss ECL Comfort 310B electronic controllers
- NOPRO OPR0020 electronic controller (via built-in OPC-UA server)
- Danfoss ECL APEX20 free programmable controller (via built-in OPC-UA server)

Supported application keys
Please see data sheet ‘List of application keys supported by Enspire®’ (VD.LV.A).

Note: In case the built-in OPC-UA server of Enpire® is used to communicate with a network of controllers then it is the applications supported by this OPC-UA server which can be visualized in Enspire®. An example is when a Modbus-RS485 subnet of ECL controllers or OPR0020 controllers, or a mix thereof, is connected to Enspire® via this OPC-UA server.

Note: The OPC-UA server is not required when ECL controllers are connected to Enspire® via Modbus-TCP over LAN or Internet. Enspire® then supports all application keys for the ECL controller.

Supported energy meters (M-bus)
Please see data sheet ‘Energy meters supported by Danfoss SCADA solutions and ECL Comfort 296/310’ (VD.HX.J). Please be aware that battery operated energy meters are not recommended, because the data communication will shorten the battery life time.

Data communication
The options for data communication between controllers and server are listed below:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus-RS485</td>
<td>Modbus communication via RS485 serial link is supported by ECL Comfort 296/310 controllers. Additional network components may be needed, i.e. repeaters and gateways.</td>
<td></td>
</tr>
<tr>
<td>Modbus-TCP</td>
<td>Modbus communication via ethernet (LAN or Internet) is supported by OPR0020 and ECL Comfort 296/310 controllers. Additional network components may be needed, i.e. router and firewall.</td>
<td></td>
</tr>
<tr>
<td>LON bus</td>
<td>LON bus communication via twisted pair serial link is supported by OPR0020 and ECL Comfort 296/310 controllers. The ECL Comfort 296/310 controller must be equipped with the ECA34 LON module. Licenses for components using LON bus are needed.</td>
<td>LON networks should not be offered in new Enspire® projects. Modbus is recommended instead.</td>
</tr>
</tbody>
</table>
To use Enspire® a server must have the Enspire® application installed.

A license for Enspire® is ordered using the code no. for Silver, Gold or Platinum Edition of Enspire®.

Additionally, an "Enspire® controller license" must be ordered for each controller registered to Enspire®.

Miscellaneous data communication components and software drivers may also be needed to establish an Enspire® system. The components needed depend on the size of the data communication network and type of network, i.e. Modbus or LON.

If a LON network is used the ECL Comfort 310 controller must be equiped with an ECA34 LON module and the Enspire® server must be equipped with the Loytec LON NIC.

In order to use ECL Comfort 296/310 controllers in an Enspire® system, each ECL Comfort 296/310 controller must have a supported application key installed.

If Enspire® is customized to include also remote control and monitoring of the district heating utility an ECL Apex 20 controller and ECL Apex 20 OPC server software are needed.

### Technical data

#### Modbus-RS485 data communication:

| Data format   | • 1 start bit  
|              | • 8 data bits  
|              | • even parity  
|              | • 1 stop bit   |
| Communication protocol | Modbus RTU  
| Electrical interface | RS485  
| Cable type | Twisted pair + Modbus reference (signal ground)  
| Max. bus cable length | 1200 m (dependent on cable type and installation)  
| Communication speed | • 38.4 Kbit/s half duplex (default)  
|                     | • 19.2 Kbit/s half duplex  
|                     | • 9.6 Kbit/s half duplex  
| Network     | According to the standard Modbus Serial Line Implementation Guide V1.0  
| Max. number of Modbus masters | 30  
| Max. number of controllers per Modbus master | 247  

#### Modbus-TCP data communication:

| Communication protocol | Modbus TCP  
| Electrical interface | Ethernet, RJ45 connector  
| Cable type | Standard Ethernet cable (CAT 5)  
| Max. bus cable length | According to Ethernet standard  
| Communication speed | • 10 Mbit/s  
|                     | • 100 Mbit/s  
| TCP Port number | 502 (default for Modbus TCP protocol)  
| Network     | Star network according to the standard Ethernet implementation guidelines  

#### LON data communication:

| Communication protocol | LonWorks  
| Electrical interface | RS485  
| Cable type | Twisted pair with shield  
| Max. bus cable length | 500 m (dependent on cable type, termination and installation)  
| Communication speed | • 78.1 Kbit/s  
| Network     | Serial line, star or loop network according to the LonWorks implementation guidelines by Echelon  
| Max. number of controllers per NIC-interface | 500
**System requirements**

<table>
<thead>
<tr>
<th>Requirements to Enspire® server:</th>
</tr>
</thead>
</table>
| Operating system | Minimum: Windows 7 Professional 64bit  
  Recommended: Windows 10 Professional 64bit |
| CPU | Intel Core i5 |
| RAM | 8GB |
| Free disc space | Minimum: 250GB 7200RPM SATA  
  Recommended: 500GB SSD  
  Better performance can be achieved by using  
  SSD compared to SATA discs.  
  Requirements to disc space depends on number  
  of devices registered in Enspire® (Controllers,  
  M-bus devices…) and period for storing the  
  data. |
| Video | Minimum resolution is 1280*1024 pixel |
| 3rd party software | Oracle VM VirtualBox |
| Web browser | SVG capable internet browser:  
  • MS Internet Explorer  
  • Firefox  
  • Chrome  
  • Safari  
  Supported browser versions:  
  The newest version available at the time the  
  user accesses Enspire® and one year back in  
  time. |
| Backup recommendations | RAID Level 1 for mirroring of data.  
  It is highly recommended to install a separate  
  backup system which automatically backs up  
  the Linux image of the Enspire® Database. |

**Data communication interface on Enspire® server:**

| Modbus-RS485 | RS485 port compatible with  
  • MOXA UPort 1130  
  • MOXA NPort 5150  
  • Phoenix Contact FL COM SERVER RS485 |
| Modbus-TCP | Ethernet compatible interface |
| LON bus | Loytec LON NIC (LonWorks/EIA 709) using PCI,  
  Parallel or USB for LON networks |

**Requirements to the client computer accessing Enspire®**

| Web browser | • MS Internet Explorer  
  • Firefox  
  • Chrome  
  • Safari  
  Supported browser versions:  
  The newest version available at the time the  
  user accesses Enspire® and one year back in  
  time. |
System requirements

Requirements to the ECL Comfort 296/310 controllers:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller software</td>
<td>ECL Comfort 296 / ECL Comfort 310 controllers must be software version 1.11 (or newer). If it is version 1.11 – 1.30 then it will automatically be updated by the application key to at least version 1.30. If it is older than version 1.11 then it cannot be used for Enspire®.</td>
</tr>
<tr>
<td>Application key software</td>
<td>1.04 (or newer)</td>
</tr>
<tr>
<td>ECA 30 Remote Control (optional)</td>
<td>1.30 (or newer)</td>
</tr>
</tbody>
</table>

Requirements to the NOPRO OPR0020 controller:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller software</td>
<td>NOPRO OPR0020 controllers must be software version R9 (or newer).</td>
</tr>
</tbody>
</table>

Technical literature and additional information

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Literature no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix to data sheets</td>
<td>Energy meters supported by Danfoss SCADA solutions, Enspire® and ECL Comfort 296 / 310</td>
<td>VD.HX.J</td>
</tr>
<tr>
<td>Appendix to data sheet on Enspire®</td>
<td>List of application keys supported by Enspire®</td>
<td>VD.LV.A</td>
</tr>
</tbody>
</table>

For further information on supported application keys please visit http://heating.danfoss.com.

In the ‘Documentation’ menu select ‘Electronic Controllers & PI Controllers > SCADA Solutions.’