Data sheet
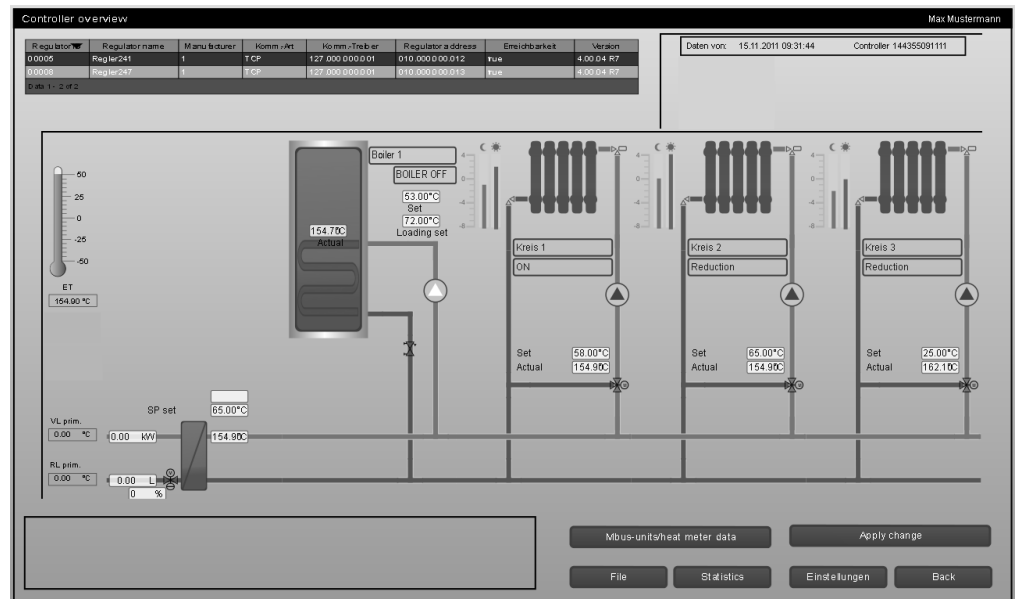
DECS 2.0
Danfoss Energy Control System

Description

DECS 2.0

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The Danfoss Energy Control System (DECS) is a web-based SCADA software solution (Supervisory Control And Data Acquisition) for district heating systems.

This SCADA solution is typically installed locally at the heating utility and will automatically configure its user interface and functionality to support the application in the controller (for example Danfoss ECL Comfort 310).

The user of the DECS 2.0 system is able to remote control and monitor the parameters settings in the controllers and also monitor actual, reference and historical values of sensors and meters connected to the controller.

Danfoss ECL Comfort 310, OPR0010 and OPR0020 controllers are supported by the auto-configuration features of DECS 2.0, but the ECL Apex 20 controller can also be supported by manually adding graphics and programs into DECS 2.0.

User benefits

The advantages of DECS 2.0 are among others:

Easy installation
Automatic configuration makes installation easy

Advanced techniques are used for simplifying and automating the installation process. Once the controller is installed and connected to the network, the web-based user interface is generated on the DECS server with just a few mouse clicks. The DECS server software is installed at the heating plant and has no special requirements except for a reliable PC connected to the internet.

Easy customization
User interface and functionality suits project specific needs

DECS is a visualisation platform based on the Atvise SCADA system. The user interface and functionality is easily customized by the system integrator to project specific requirements using the Engineering Tool. The scaleability of DECS ensures an optimized SCADA solution for small, large and growing district energy networks.

Easy access
Access to control and monitor locally and remotely

Data is constantly exchanged between the controllers and the DECS Server. The server provides an intuitive user interface, which is accessible from any standard browser on a PC, laptop or smartphone connected to the internet. You can control and monitor your heating station and substation installations from everywhere.

Standard
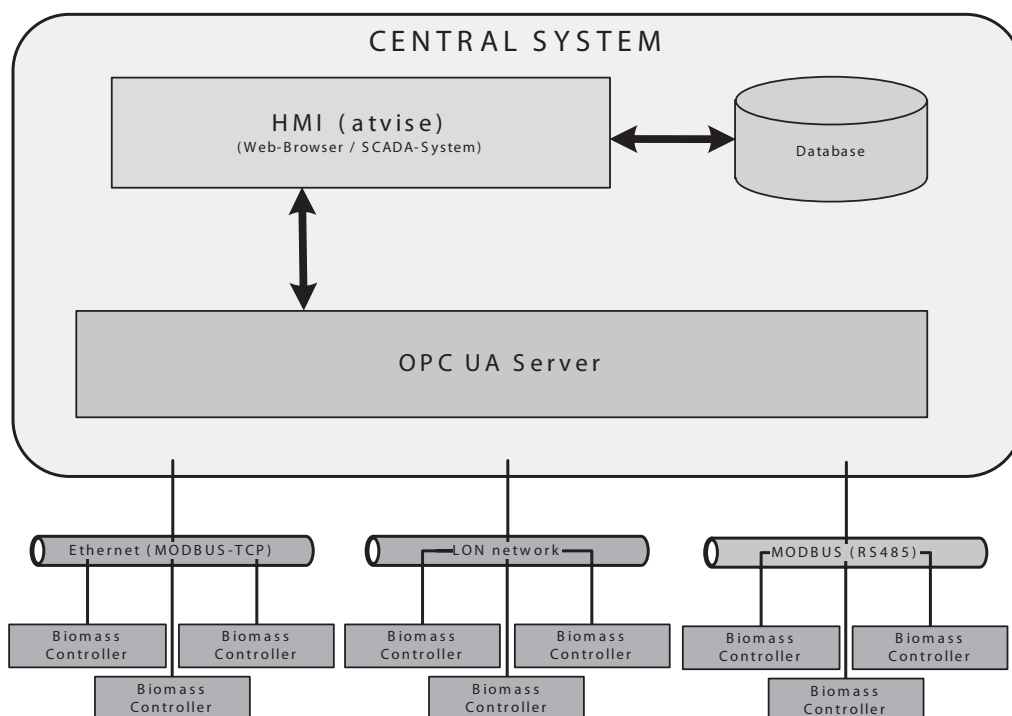*System is built on standardized software and interfaces*

Standardized DECS Server software increases reliability, lowers hardware complexity and allows integration of other building automation systems into the heating system. The communication interfaces are based on the well-known Modbus-RTU or Modbus-TCP protocols, which provide a reliable, low complexity network.

System architecture

The architecture of DECS 2.0 is shown below.

The central building blocks of the DECS 2.0 system are the HMI (Human Machine Interface) using the Atvise SCADA Client software from Certec, the database for storing all logged data from the controllers and the OPC UA Server software handling the data communication with the controllers.

DECS 2.0 supports data communication between the server and controllers using Modbus-TCP (Ethernet), LON bus and Modbus-RS485.

Application

DECS 2.0 software automatically adapts its user interface to fit the application in the controller.
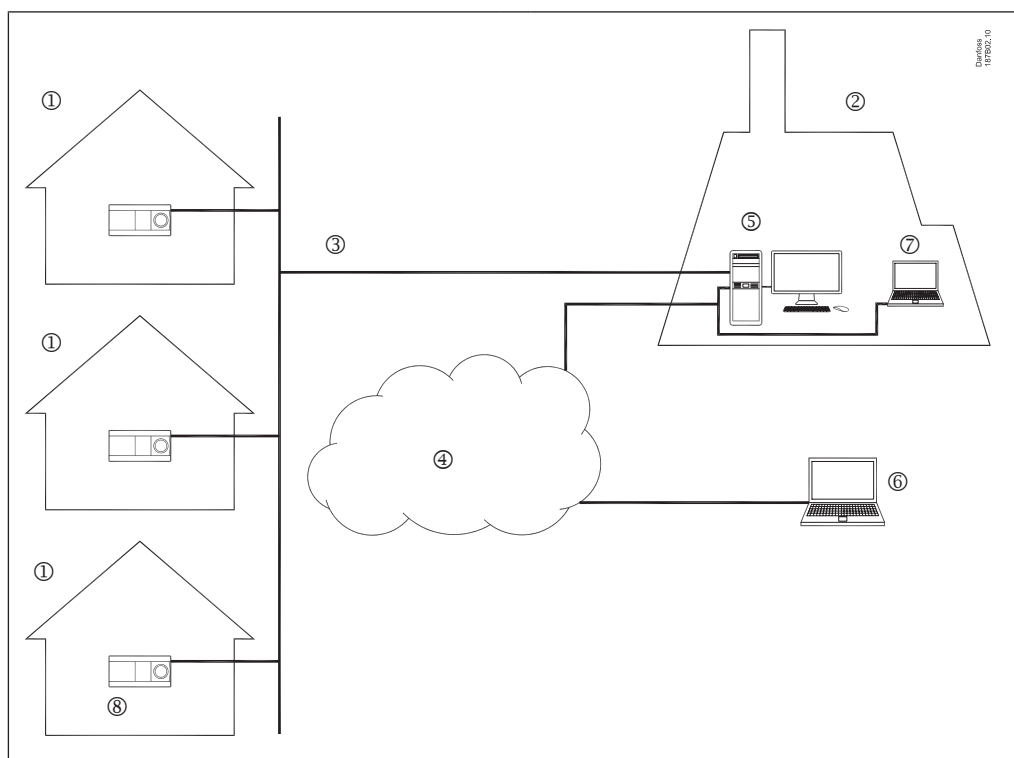
The following controller applications are supported:

- ECL Comfort 310 controller
  * Please see 'List of application keys supported by DECS 2.0'
    Go to http://heating.danfoss.com. In the 'Documentation' menu select 'Electronic Controllers & PI Controllers > SCADA Solutions > Data sheet'.

- OPR0020 Controller
  * Firmware R4 and newer

- OPR0010 Controller
  * Firmware v3.

Below is an application example of DECS 2.0 in a biomass district heating network using Modbus-RS485 for data communication. The server, which has DECS 2.0 installed, is located in the district heating utility and a central laptop is used for operating the DECS 2.0 system.

As an option the ECL Apex 20 controller can be integrated into DECS 2.0 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 DECS 2.0 system using the OPC server software for ECL Apex 20.

An external service provider also has access to the DECS 2.0 system using his laptop connected to the internet. The server and the ECL Comfort 310 controllers are communicating via an RS485 serial link using the Modbus protocol.
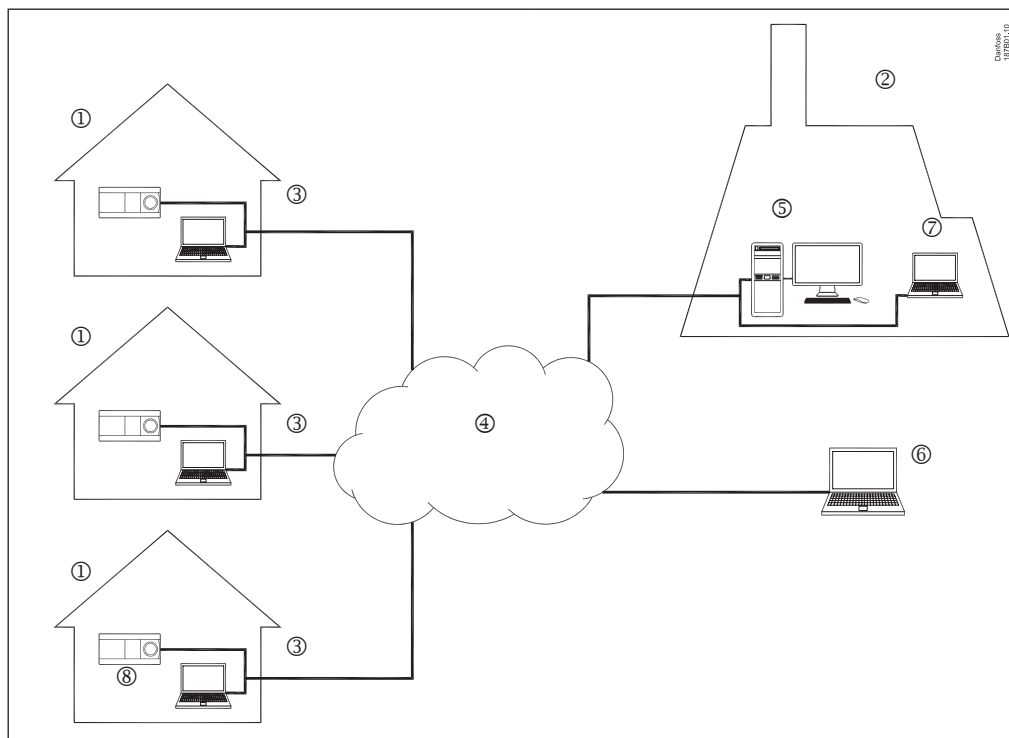

①   Private house

②   Boiler house for biomass

③   Modbus-RS485 network

④   Internet

⑤   DECS 2.0 server

⑥   DECS 2.0 client (external service provider)

⑦   DESC 2.0 client (central administration)

⑧   ECL Comfort 310 controller

Application

Below is an application example of DECS 2.0 in biomass district heating network using Modbus-TCP (ethernet) for data communication. It is similar to the previous example except that the ECL Comfort 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 the DECS 2.0 system.

①	Private house
②	Boiler house for biomass
③	Modbus-TPC network (internet)
④	Internet
⑤	DECS 2.0 server
⑥	DECS 2.0 client (external service provider)
⑦	DESC 2.0 client (central administration)
⑧	ECL Comfort 310 controller

Languages

The following languages are supported by the graphical user interface of DECS 2.0:

- English
- German
- Italian

Data communication

The options for data communication between controllers and server are listed below. See also the selection matrix in the next section for information on selecting the correct data communication type.

Type	Description	Remarks
Modbus-RS485	Modbus communication via RS485 serial link is supported by ECL Comfort 310 controllers. Additional network components may be needed, i.e. repeaters and gateways.	
Modbus-TCP	Modbus communication via ethernet over internet is supported by OPR0020 and ECL Comfort 310 controllers. Additional network components may be needed, i.e. router and firewall.	
LON bus	LON bus communication via twisted pair serial link is supported by OPR0020 and ECL Comfort 310 controllers. The ECL Comfort 310 controller must be equipped with the ECA34 LON module. Licenses for components using LON bus are needed.	LON networks should not be offered in new DECS 2.0 projects. Modbus is recommended instead.

Selection matrix for existing and new DECS networks

This matrix shows which controllers, data communication network and SCADA software are to be used in existing DH networks in case of warranty or expansion projects.

For new DH networks the ECL Comfort 310 controller must be used with a Modbus or Ethernet data network with DECS 2.0.

	Existing DH networks			New DH networks	
Project type	Warranty		Expansion		
Controller (in substation)	OPR0010	OPR0020	ECL Comfort 310 (incl. LON module)	ECL Comfort 310	
Controller (in DH utility)	ECL Apex 20			ECL Apex 20	
Data network	LON (or Ethernet)			Modbus-RS485 or Modbus-TCP	
Software	DECS 1.0 (E3)		DECS 2.0	DECS 2.0	OPC Server (ECL Apex 20)

Ordering

To use the DECS 2.0 system a server must have the Atvise SCADA client software and DECS 2.0 software installed. A combined license for Atvise SCADA Client software and DECS 2.0 software is ordered using the code no. for "DECS 2.0 Software license".

Additionally a "DECS 2.0 Controller license" must be ordered for each controller registered to the DECS 2.0 system.

Miscellaneous data communication components and software drivers may also be needed to establish a DECS 2.0 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 equipped with an ECA34 LON module and the DECS 2.0 server must be equipped with the Loytec LON NIC.

In order to use ECL Comfort 310 controllers in a DECS 2.0 system, each ECL Comfort 310 controller must have a supported application key installed.

If the DECS 2.0 system 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.

Type	Designation	Code no.
Software	DECS 2.0 Software license DECS 2.0 Controller license	187B1500 187B1501
Data communication	ECA34 LON module for ECL Comfort 310 [1] Loytec LON NIC (PCI/Parallel/USB)	087H3204 004F9067
Application	Please see 'List of application keys supported by DECS 2.0' Go to http://heating.danfoss.com. In the Documentation' menu select 'Electronic Controllers & PI Controllers > SCADA Solutions > Data sheet'.	
Controller [3]	ECL Comfort 310 Controller [2] OPR0020 Controller [2] ECL Apex 20 Controller	087H3040 004F9021 087B2506

Other accessory hardware and software for DECS 2.0 projects are to be purchased locally or outsourced to local partners/suppliers.

[1] No separate data sheet exists for this product.
    To be used only when expanding existing OPR0020/LON
     bus based DH networks with ECL310 controllers

[2] See separate data sheet for this component for ordering details

[3] Max. 1200 controller

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

**DECS 2.0 system
requirements**

DECS 2.0 server:

Operating system	• Microsoft® Windows XP (SP3 with latest updates installed) (32-bit) • Microsoft® Windows 7 (SP1 with latest updates installed) (32-bit)
CPU	Intel® or AMD® processor (>= 1,6 GHz)
RAM	Minimum: 4 GB RAM
Free disc space	500 GB (depending on the number of controllers connected to DECS 2.0 and archieving frequency)
Video	A windows certified graphics card and driver. Minimum resolution is 1280*1024 pixel
3rd party software	• Atvise server V2.1.18 (Certec) • Loytec network interface software 4.1.x for LON networks • Microsoft® .NET Framework 3.5 and compatible versions
Web browser	SVG capable internet browser: • Mozilla Firefox • Internet Explorer • Google Chrome Web browser must comply with requirements of Atvise SCADA Client software. For details about specific browser versions compatible with Atvise please visit http://www.atvise.com/en/resources/system-requirements
Backup recommendations	RAID Level 1 or RAID Level 5

Data communication interface on DECS 2.0
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

DECS 2.0 client:

Operating system	• Microsoft® Windows XP (SP3 with latest updates installed) • Microsoft® Windows 7 (SP1 with latest updates installed)
CPU	Intel® or AMD® processor (>= 1,6 GHz)
RAM	Minimum: 2 GB RAM
Free disk space	1 GB
Video	A windows certified graphics card and driver. Minimum resolution is 1280*1024 pixel
Web browser	SVG capable internet browser: • Mozilla Firefox • Internet Explorer • Google Chrome Web browser must comply with requirements of Atvise SCADA Client software. For details about specific browser versions compatible with Atvise please visit http://www.atvise.com/en/resources/system-requirements

Technical literature and additional information

Type	Description	Literature no.
Operating guide, DECS 2.0	Operating guide for DECS 2.0 software on servers incl. Atvise SCADA client, HMI and database including instructions on how to configure DECS 2.0	VI.HX.C
Operating guide, DECS 2.0	Operating guide on how to use the features of DECS 2.0 at district heating networks	VI.HX.A
User guide, DECS 2.0	User guide on how to use the features of DECS 2.0 in homes	VI.HX.B

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

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

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