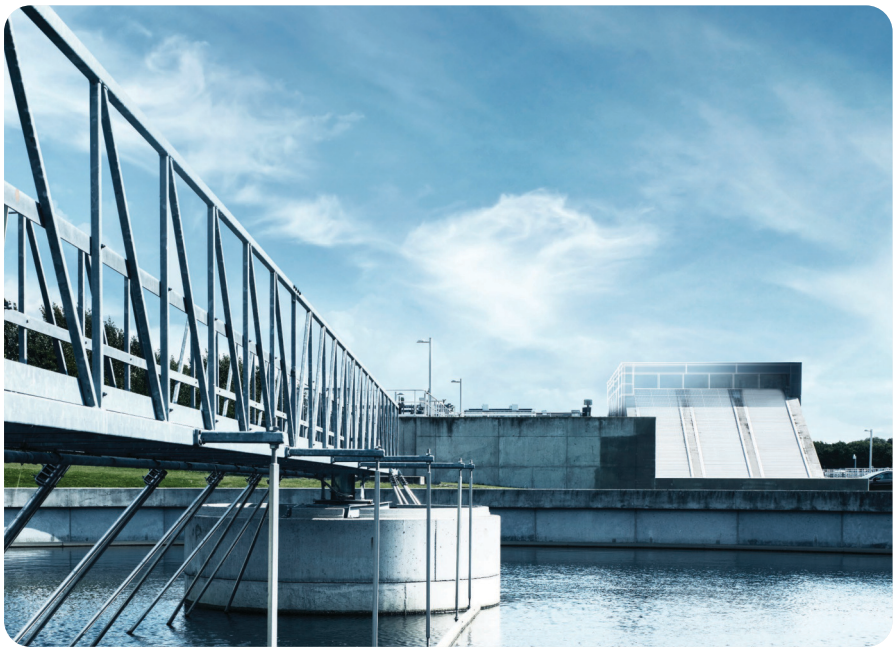
Danfoss iC7-Aqua:
Intelligent VFDs for efficient water and wastewater systems

Highlights

- Water sector focus: Enhanced intelligence with more sensors, analytics, and dedicated functions for optimal pump performance
- Superior design: Highly compact IP20 modules and lightweight IP55 enclosures, for flexible installation
- Ultra low-harmonic: iC7-Aqua ULH variant delivers supreme THDi (<3%) for distortion-sensitive sites
- Cybersecurity: Advanced, hardware-based cybersecurity for decades of protection against unauthorized access
- Integrated fieldbuses: Eliminate hardware options with integrated fieldbuses for seamless communication
- EMC compliance: Built-in EMC filter for categories C1 and C2, ensuring electromagnetic compatibility

iC7-Aqua optimizes system performance in key water sector industries including water supply and distribution, wastewater treatment, industrial water purification, reverse osmosis for desalination, and irrigation for agriculture.



Advanced ultra low-harmonic drive

The iC7-Aqua ULH variant features an integrated active rectifier, delivering exceptional THDi (<3%) and minimal losses. This results in unmatched efficiency, compactness, low weight, and simplified integration. Ideal for applications requiring superior power quality.

Uncompromised cybersecurity

Protect your water services with market-leading, hardware-based cybersecurity. A built-in crypto chip on the control unit provides robust protection against unauthorized access. End-to-end encrypted data transfer during datalogging and software downloads ensures data integrity. Malicious firmware prevention guarantees that only genuine firmware is executed. Encrypted software safeguards locally stored data.

Supply voltage and power range

- 3 x 380-480 V AC…0.37-710 kW (0.5-1000 hp)
- Available in IP20 (UL Open Type), IP21 (UL Type 1) and IP54/IP55 (UL Type 12) protection ratings to match different installation locations.
- Mains disconnect switch available

Learn more about iC7-Aqua

Robust and intelligent for optimal pump performance

A suite of dedicated features optimizes pump performance, protects equipment, and reduces total cost of ownership. Features like dry-run detection, flow compensation, and end-of-pump-curve detection safeguard pumps, while pipe fill mode and check valve ramps prevent water hammering. Energy savings are achieved through sleep mode, no/low flow detection, and pump cascade control. The integrated Logic controller can often eliminate the need for a PLC, and optional advanced multi-pump control provides maximum uptime. Additional features such as deragging, and pre/post lubrication further enhance pump life and system reliability.

World's most efficient cooling

Unique back-channel cooling removes up to 90% of heat losses from the electrical room, for maximum efficiency and space optimization. Extend the service life of electronic equipment and reduce energy costs significantly with dramatically less air conditioning load.

Prevent problems and improve uptime with condition-based monitoring

Integrated condition-based monitoring (CBM) functionality leverages built-in and connected sensors to deliver real-time data analytics, self-monitoring, and lifetime assessment. This enables proactive maintenance, minimizing downtime and maximizing the lifespan of your equipment, using

- Motor stator winding monitoring
- Vibration monitoring
- Load envelope monitoring
- Cavitation detection

Using edge computing, these functions are performed within the drive, with no need to take the information to the cloud for analysis. This protects the drive better from unauthorized access.

Functional safety compliance with integrated SIL3/PLe

Integrated Safe Torque Off (STO) meets SIL3/PLe safety levels. Integrated diagnostics eliminate the need for external safety relays, simplifying system design and reducing costs.

Ultimate user-friendliness with intuitive UI and digital tools

Keypad-based guided commissioning is streamlined with the set-up assistant, which directly navigates you to the relevant pump-specific settings.
A unified user interface ensures a consistent experience across all control panel variants. Furthermore, the iC7 drives leverage the advanced MyDrive® digital tools for PC, offering comprehensive support for engineering, guided commissioning, and monitoring.

Discover MyDrive®Suite digital tools

Halo indicator
Normal operation = white
Warning = orange
Fault = red

Key specifications

Input	
Supply voltage	380-480 V AC, -15%, /+10%
Supply frequency	45-65 Hz
Output	
Power range	0.37-710 kW (0.5-1000 hp)
Output current	1.3-1260 A
Overload ratings	110% (fans, pumps and compressors), 150 %
Output frequency	0-590 Hz
Environmental conditions	
Protection ratings	
– Frames Fx02-Fx08	IP20 (UL Open Type), IP21 (UL Type 1), IP55 (UL Type 12)
– Frames Fx09-Fx12	IP20 (UL Open Type), IP21 (UL Type 1), IP54 (UL Type 12)
Cooling versions	Flange mount *(up to 90 kW (125 hp))*, back-channel cooling *(110 kW (150 hp) and above)*
Ambient operating temperature [1]	-30 to 60 °C (-22 to 140 °F) *Refer to design guide for derating*
Maximum altitude	4400 m (14400 feet)
Relative humidity	3K22, maximum 95% non-condensing
Chemically active substances (IEC 60721-3-3:2019)	– C3 (P1) – Medium corrosivity – Non coated – C4 (P2) – High corrosivity – Coated
Shock & vibration (IEC 60721-3-3:2019)	3M12
Harmonic mitigation and THDi	
iC7-Aqua	DC coil integrated, THDi <40 % (full load)
iC7-Aqua ULH	Active front-end integrated, THDi <3 % (full load), THDi <5 % (50-90% load)

EMC protection (EN/IEC 61800-3 compliance class)	**Cable length [2]**
C1	Up to 50 m
C2	Up to 150 m
C3	Up to 300 m
Compliance	
Efficiency class (IEC61800-9-2)	IE2
Approvals	UL, CE, others available soon
Functional safety I/O	
STO	SIL3, PLe
Control I/O – standard	
Analog inputs (AI)	2
– Voltage mode	0-10 V, scalable
– Current mode	0/4-20 mA
– Temperature sensor support	Pt1000, Ni1000, KTY81, KTY82, KTY84
Analog outputs (AO)	1 (0/4-20 mA)
Digital inputs (DI)	4+2 (0/24V, selectable PNP or NPN)
Digital outputs (DO)	2 (0/24 V) Digital outputs are reconfigured from digital inputs
Relay outputs (RO)	2 (NO/NC), 2 A/250 V AC
Auxiliary voltages	10 V output (10 mA), 24 V output (150 mA), 24 V external supply input (2 A)

[1] *Rated operating temperature varies between products*
[2] *Cable length varies with product size*

Key specifications (continued)

Power options	
Mains input variants	Mains switch, AC fuses
Output filters (integrated)	Common-mode filter
Output filters (external)	dU/dt filters, sine-wave filters, common-mode filters
Functional extension options	
General Purpose I/O OC7C0	General purpose I/O extension board (3xDI, 2xDO, 2xAI, 1xAO, temperature measurement)
Relay Option OC7R0	Relay I/O extension board, with 3 relays (2 NO/NC , 1 NO up to 250 V AC/2 A)
Temperature Measurement OC7T0	Temperature measurement extension board with 5 sensor inputs, Pt100, Pt1000, Ni1000, and KTY81
Fieldbus options (embedded)	
Ethernet	Modbus TCP, EtherNet/IP, PROFINET RT, PROFINET RT/S2 [1], EtherCAT
Serial	Modbus RTU
Other protocols	OPCUA [1]
Ease-of-use	
Control panel	
– Display	2.8", up to 8 lines, with graphic curves and visuals
– Buttons	"Undo", "on-board manual", rem/loc (HOA) etc
Commissioning	Guided setup and setup assistant
Parameter backup and restore	
Commissioning tools	MyDrive® Insight
Engineering tools	MyDrive® Harmonics, MyDrive® Select, MyDrive® Energy
Easy cable installation	Terminal sliders for 30-90 kW (45 -125 hp) units. Pluggable terminals for IP20 units up to 22 kW (30 hp).

Dedicated pump features	
Dry run detection	Protects the pump
Flow compensation function	Saves energy
2 step ramps (initial/final ramp) and minimum speed monitor	Protects deep well pumps
Check valve ramp	Protects against water hammering and saves installation cost for soft close valves
Pipe fill mode	Eliminates water hammering
Built-in motor alternation feature	Duty stand by operation, cost reduction
Sleep Mode and no/low flow detection	Save energy and protect the pump
End of pump-curve detection	Pump protection, leakage detection
Pump cascade controller	Saves energy and reduces equipment cost
MyDrive® Logic controller	Often makes PLC omissible
Advanced multi-pump control [1]	Fully redundant cascade system for maximum uptime
Deragging	Preventive/reactive pump cleaning
Pre/Post Lubrication	System and pump protection
Free programmable infos/warnings/ alerts	Perfect system integration and adaptation to the application
Flow confirmation	System and pump protection

[1] *Available soon*