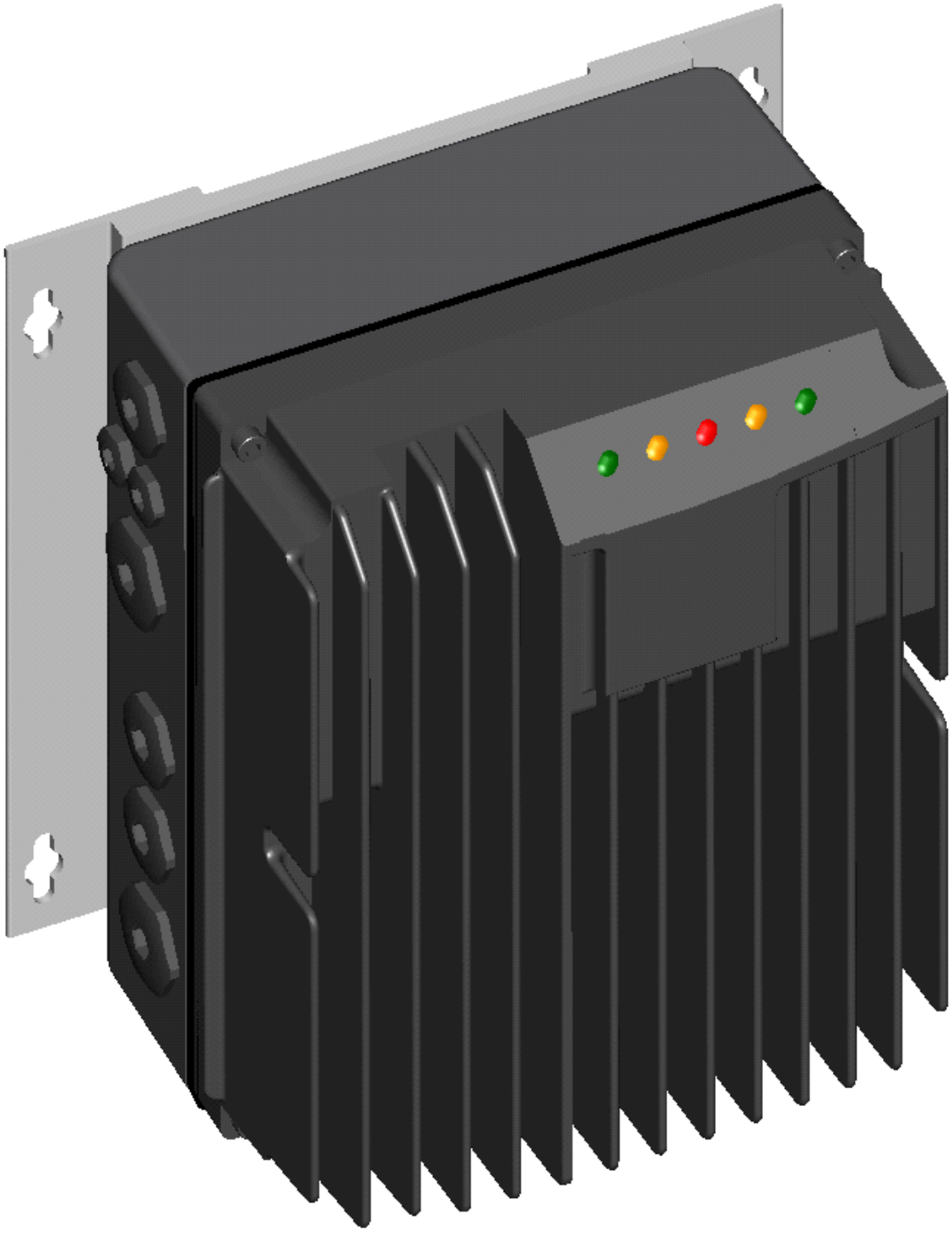
## ■ FCD 300



## ■ Order form

This section makes it easier for you to specify and order an FCD 300.

### Choice of frequency converter

The frequency converter must be chosen on the basis of the present motor current at maximum loading of the unit. The frequency converter's rated output current $I_{INV.}$ must be equal to or greater than the required motor current.

### Mains voltage

FCD 300 is available for mains voltage range: 380-480 V.

The frequency converter is connected to a mains voltage of:
- 3 x 380 - 480 V three-phase AC voltage

3 x 380 - 480 Volt mains voltage

| Typical shaft output $P_{INV.}$ | | | Max. constant output current $I_{INV.}$ | Max. constant output power at 400 V $S_{INV.}$ |
|---|---|---|---|---|
| Type | [kW] | [HP] | [A] | [kVA] |
| 303 | 0.37 | 0.50 | 1.4 | 1.0 |
| 305 | 0.55 | 0.75 | 1.8 | 1.2 |
| 307 | 0.75 | 1.0 | 2.2 | 1.5 |
| 311 | 1.1 | 1.5 | 3.0 | 2.0 |
| 315 | 1.5 | 2.0 | 3.7 | 2.6 |
| 322 | 2.2 | 3.0 | 5.2 | 3.6 |
| 330 | 3.0 | 4.0 | 7.0 | 4.8 |

## ■ Enclosure

All FCD 300 units are supplied with IP 66, NEMA 4x (Indoor) enclosure as standard.

## ■ Brake

FCD 300 is available with or without an integral brake module. See also the section entitled *Brake resistors* for ordering a brake resistor.
Including mechanical brake control/supply.

## ■ 24 V external supply

Back up of control supply with 24 V DC is available as optional function.

## ■ RFI filter

FCD 300 has an integral 1A RFI-filter. The integral 1A RFI filter complies with EMC standards EN 55011-1A. See the sections *Cable lengths* and *Cross section* for further details.

## ■ Harmonic filter

The harmonic currents do not affect power consumption directly, but they increase the heat losses in the installation (transformer, cables). That is why in a system with a relatively high percentage of rectifier load it is important to keep the harmonic currents at a low level so as to avoid a transformer overload and high cable temperature. For the purpose of ensuring low harmonic currents, the units are fitted with coils in their intermediate circuit as standard. This reduces the input current $I_{RMS}$ by typically 40 %.

## ■ Display unit

On the FCD 300 unit there are 5 indicator lamps for voltage (ON), warning, alarm, status and bus.

In addition, an LCP control panel to be connected via a plug to the frequency converter is available as an option. The LCP control panel can be installed up to 3 metres away from the frequency converter, e.g. on a front panel, by means of a mounting kit.
All displays of data are via a 4-line alpha-numerical display, which in normal operation is able to show 4 operating data items and 3 operation modes continuously. During programming, all the information required for quick, efficient parameter Setup of the frequency converter is displayed. As a supplement to the display, the LCP has three indicator lamps for voltage (ON), warning (WARNING) and alarm (ALARM). Most of the frequency converter's parameter Setups can be changed immediately via the LCP control panel. See also the section entitled *The LCP control unit* in the Design Guide.

## ■ Fieldbus protocols

Danfoss frequency converters are able to fulfill many different functions in a process control system. The frequency converter can be integrated directly in an overall surveillance system, which will allow detailed process data to be transferred via serial communication.
The protocols listed below are based on an RS 485 bus system with a maximum transmission speed of 9600 baud. The following telegram profiles are supported as standard:

- FC protocol, which is a profile adapted to Danfoss.
- Profidrive protocol, which supports the profidrive profile

See *Serial communication for FCD 300* for further details of telegram profiles.

## ■ Fieldbus option

The increasing information requirements in industry make it necessary to collect or visualize many different process data. Important process data help the system technician with the daily monitoring of the system. The large amounts of data involved in major systems make a higher transmission speed than 9600 baud desirable.

Profibus is a fieldbus system, which can be used for linking automation devices such as sensors and actuators with the controls by means of a two-conductor cable.
Profibus DP is a very fast communication protocol, made specially for communication between the automation system and various types of equipment.

Danfoss FCD 300 can be supplied with the Profibus® DP in a 3 mbit and a 12 mbit version. Units with Profibus protocol can either be controlled by FC protocol or Profidrive protocol.

Profibus is a registered trade mark.

## ■ Ordering numbers for FCD 300, 380-480 V

| 0.37 kW | For motor mounting FCD 303 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N1698 |
| ST | - | 175N1699 |
| ST | Profibus DP 3 MB | 175N1700 |
| ST | Profibus DP 12 MB | 175N1701 |
| ST | AS(i)** | 175N1702 |
| EX | - | 175N1703 |
| EX | Profibus DP 3 MB | 175N1704 |
| EX | Profibus DP 12 MB | 175N1705 |
| EX | AS(i)** | 175N1706 |
| EB | - | 175N1707 |
| EB | Profibus DP 3 MB | 175N1708 |
| EB | Profibus DP 12 MB | 175N1709 |
| EB | AS(i)** | 175N1710 |

| 0.55 kW | For motor mounting FCD 305 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N1750 |
| ST | - | 175N1751 |
| ST | Profibus DP 3 MB | 175N1752 |
| ST | Profibus DP 12 MB | 175N1753 |
| ST | AS(i)** | 175N1754 |
| EX | - | 175N1755 |
| EX | Profibus DP 3 MB | 175N1756 |
| EX | Profibus DP 12 MB | 175N1757 |
| EX | AS(i)** | 175N1758 |
| EB | - | 175N1759 |
| EB | Profibus DP 3 MB | 175N1760 |
| EB | Profibus DP 12 MB | 175N1761 |
| EB | AS(i)** | 175N1762 |

| 0.37 kW | For stand alone mounting FCD 303 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N1711 |
| ST | - | 175N1712 |
| ST | Profibus DP 3 MB | 175N1713 |
| ST | Profibus DP 12 MB | 175N1714 |
| ST | AS(i)** | 175N1715 |
| EX | - | 175N1716 |
| EX | Profibus DP 3 MB | 175N1717 |
| EX | Profibus DP 12 MB | 175N1718 |
| EX | AS(i)** | 175N1719 |
| EB | - | 175N1720 |
| EB | Profibus DP 3 MB | 175N1721 |
| EB | Profibus DP 12 MB | 175N1722 |
| EB | AS(i)** | 175N1723 |

| 0.55 kW | For stand alone mounting FCD 305 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N1763 |
| ST | - | 175N1764 |
| ST | Profibus DP 3 MB | 175N1765 |
| ST | Profibus DP 12 MB | 175N1766 |
| ST | AS(i)** | 175N1767 |
| EX | - | 175N1768 |
| EX | Profibus DP 3 MB | 175N1769 |
| EX | Profibus DP 12 MB | 175N1770 |
| EX | AS(i)** | 175N1771 |
| EB | - | 175N1772 |
| EB | Profibus DP 3 MB | 175N1773 |
| EB | Profibus DP 12 MB | 175N1774 |
| EB | AS(i)** | 175N1775 |

ST: Standard unit.
EX: Unit with 24 V external supply.
EB: Unit with 24 V external supply and brake.
*: Only cable entries on the right side.
**: For availability, contact Danfoss.

| 0.75 kW | For motor mounting FCD 307 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N1802 |
| ST | - | 175N1803 |
| ST | Profibus DP 3 MB | 175N1804 |
| ST | Profibus DP 12 MB | 175N1805 |
| ST | AS(i)** | 175N1806 |
| EX | - | 175N1807 |
| EX | Profibus DP 3 MB | 175N1808 |
| EX | Profibus DP 12 MB | 175N1809 |
| EX | AS(i)** | 175N1810 |
| EB | - | 175N1811 |
| EB | Profibus DP 3 MB | 175N1812 |
| EB | Profibus DP 12 MB | 175N1813 |
| EB | AS(i)** | 175N1814 |

| 1.1 kW | For motor mounting FCD 311 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N1854 |
| ST | - | 175N1855 |
| ST | Profibus DP 3 MB | 175N1856 |
| ST | Profibus DP 12 MB | 175N1857 |
| ST | AS(i)** | 175N1858 |
| EX | - | 175N1859 |
| EX | Profibus DP 3 MB | 175N1860 |
| EX | Profibus DP 12 MB | 175N1861 |
| EX | AS(i)** | 175N1862 |
| EB | - | 175N1863 |
| EB | Profibus DP 3 MB | 175N1864 |
| EB | Profibus DP 12 MB | 175N1865 |
| EB | AS(i)** | 175N1866 |

| 0.75 kW | For stand alone mounting FCD 307 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N1815 |
| ST | - | 175N1816 |
| ST | Profibus DP 3 MB | 175N1817 |
| ST | Profibus DP 12 MB | 175N1818 |
| ST | AS(i)** | 175N1819 |
| EX | - | 175N1820 |
| EX | Profibus DP 3 MB | 175N1821 |
| EX | Profibus DP 12 MB | 175N1822 |
| EX | AS(i)** | 175N1823 |
| EB | - | 175N1824 |
| EB | Profibus DP 3 MB | 175N1825 |
| EB | Profibus DP 12 MB | 175N1826 |
| EB | AS(i)** | 175N1827 |

| 1.1 kW | For stand alone mounting FCD 311 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N1867 |
| ST | - | 175N1868 |
| ST | Profibus DP 3 MB | 175N1869 |
| ST | Profibus DP 12 MB | 175N1870 |
| ST | AS(i)** | 175N1871 |
| EX | - | 175N1872 |
| EX | Profibus DP 3 MB | 175N1873 |
| EX | Profibus DP 12 MB | 175N1874 |
| EX | AS(i)** | 175N1875 |
| EB | - | 175N1876 |
| EB | Profibus DP 3 MB | 175N1877 |
| EB | Profibus DP 12 MB | 175N1878 |
| EB | AS(i)** | 175N1879 |

ST: Standard unit.
EX: Unit with 24 V external supply.
EB: Unit with 24 V external supply and brake.
*: Only cable entries on the right side.
**: For availability, contact Danfoss.

| 1.5 kW | For motor mounting FCD 315 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N1906 |
| ST | - | 175N1907 |
| ST | Profibus DP 3 MB | 175N1908 |
| ST | Profibus DP 12 MB | 175N1909 |
| ST | AS(i)** | 175N1910 |
| EX | - | 175N1911 |
| EX | Profibus DP 3 MB | 175N1912 |
| EX | Profibus DP 12 MB | 175N1913 |
| EX | AS(i)** | 175N1914 |
| EB | - | 175N1915 |
| EB | Profibus DP 3 MB | 175N1916 |
| EB | Profibus DP 12 MB | 175N1917 |
| EB | AS(i)** | 175N1918 |

| 2.2 kW** | For motor mounting FCD 322 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N1958 |
| ST | - | 175N1959 |
| ST | Profibus DP 3 MB | 175N1960 |
| ST | Profibus DP 12 MB | 175N1961 |
| ST | AS(i)** | 175N1962 |
| EX | - | 175N1963 |
| EX | Profibus DP 3 MB | 175N1964 |
| EX | Profibus DP 12 MB | 175N1965 |
| EX | AS(i)** | 175N1966 |
| EB | - | 175N1967 |
| EB | Profibus DP 3 MB | 175N1968 |
| EB | Profibus DP 12 MB | 175N1969 |
| EB | AS(i)** | 175N1970 |

| 1.5 kW | For stand alone mounting FCD 315 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N1919 |
| ST | - | 175N1920 |
| ST | Profibus DP 3 MB | 175N1921 |
| ST | Profibus DP 12 MB | 175N1922 |
| ST | AS(i)** | 175N1923 |
| EX | - | 175N1924 |
| EX | Profibus DP 3 MB | 175N1925 |
| EX | Profibus DP 12 MB | 175N1926 |
| EX | AS(i)** | 175N1927 |
| EB | - | 175N1928 |
| EB | Profibus DP 3 MB | 175N1929 |
| EB | Profibus DP 12 MB | 175N1930 |
| EB | AS(i)** | 175N1931 |

| 2.2 kW** | For stand alone mounting FCD 322 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N1971 |
| ST | - | 175N1972 |
| ST | Profibus DP 3 MB | 175N1973 |
| ST | Profibus DP 12 MB | 175N1974 |
| ST | AS(i)** | 175N1975 |
| EX | - | 175N1976 |
| EX | Profibus DP 3 MB | 175N1977 |
| EX | Profibus DP 12 MB | 175N1978 |
| EX | AS(i)** | 175N1979 |
| EB | - | 175N1980 |
| EB | Profibus DP 3 MB | 175N1981 |
| EB | Profibus DP 12 MB | 175N1982 |
| EB | AS(i)** | 175N1983 |

ST: Standard unit.
EX: Unit with 24 V external supply.
EB: Unit with 24 V external supply and brake.
*: Only cable entries on the right side.
**: For availability, contact Danfoss.

| 3.0 kW** | For motor mounting FCD 330 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N2010 |
| ST | - | 175N2011 |
| ST | Profibus DP 3 MB | 175N2012 |
| ST | Profibus DP 12 MB | 175N2013 |
| ST | AS(i)** | 175N2014 |
| EX | - | 175N2015 |
| EX | Profibus DP 3 MB | 175N2016 |
| EX | Profibus DP 12 MB | 175N2017 |
| EX | AS(i)** | 175N2018 |
| EB | - | 175N2019 |
| EB | Profibus DP 3 MB | 175N2020 |
| EB | Profibus DP 12 MB | 175N2021 |
| EB | AS(i)** | 175N2022 |

| 3.0 kW** | For stand alone mounting FCD 330 3 x 380-480 V | |
|---|---|---|
| Unit | Fieldbus | Ordering no. |
| ST* | - | 175N2023 |
| ST | - | 175N2024 |
| ST | Profibus DP 3 MB | 175N2025 |
| ST | Profibus DP 12 MB | 175N2026 |
| ST | AS(i)** | 175N2027 |
| EX | - | 175N2028 |
| EX | Profibus DP 3 MB | 175N2029 |
| EX | Profibus DP 12 MB | 175N2030 |
| EX | AS(i)** | 175N2031 |
| EB | - | 175N2032 |
| EB | Profibus DP 3 MB | 175N2033 |
| EB | Profibus DP 12 MB | 175N2034 |
| EB | AS(i)** | 175N2035 |

ST: Standard unit.
EX: Unit with 24 V external supply.
EB: Unit with 24 V external supply and brake.
*: Only cable entries on the right side.
**: For availability, contact Danfoss.

## ■ Ordering numbers for brake resistors

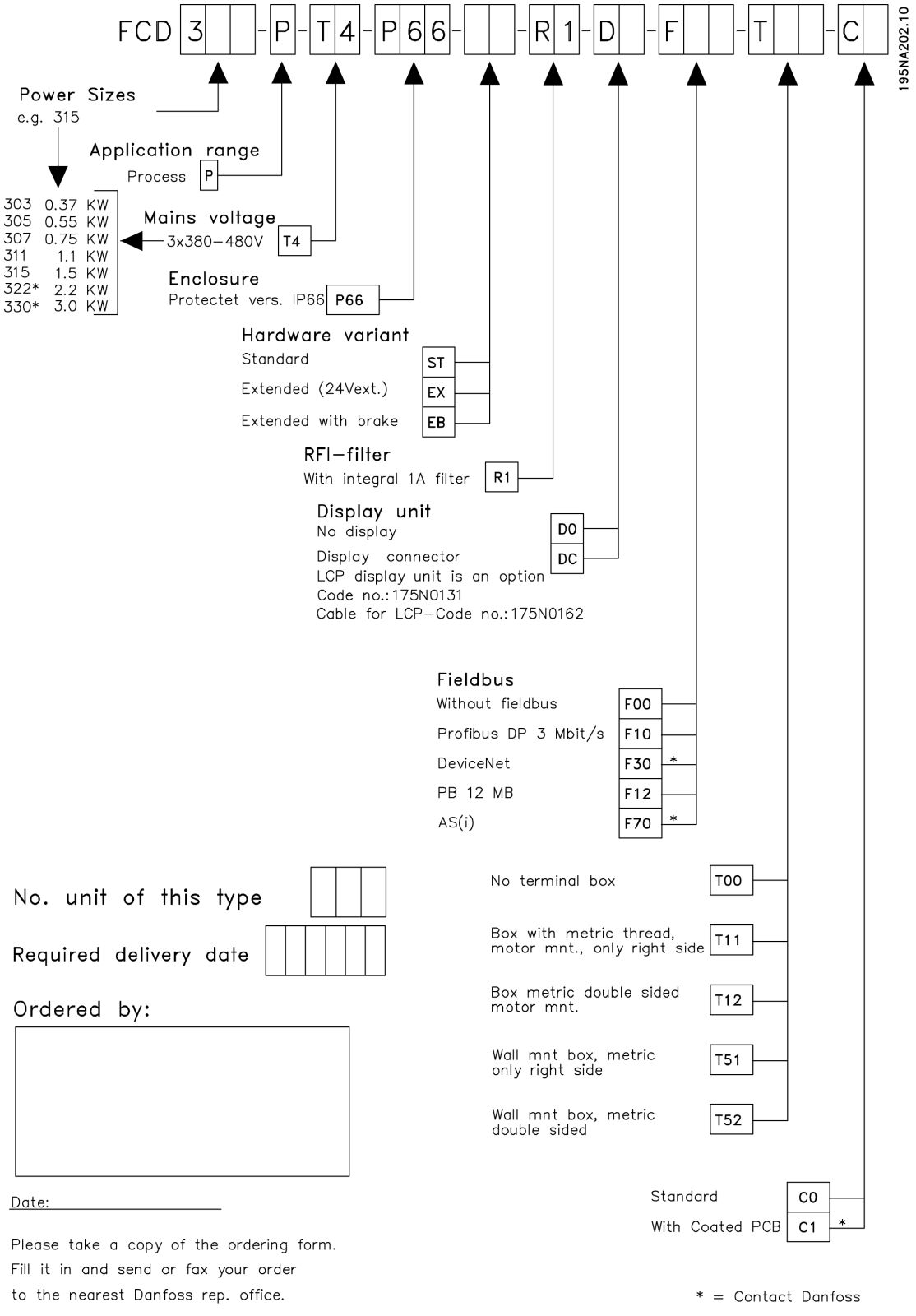
Flatpack brake resistors IP 54

| Type | $P_{motor}$ [kW] | $R_{MIN}$ [Ω] | Size [Ω] / [W] per item | Duty cycle % | Order no. 175Uxxxx |
|---|---|---|---|---|---|
| 303 (400 V) | 0.37 | 747 | 830 Ω / 100 W | 20 | 1000 |
| 305 (400 V) | 0.55 | 747 | 830 Ω / 100 W | 20 | 1000 |
| 307 (400 V) | 0.75 | 558 | 620 Ω / 100 W | 14 | 1001 |
| 311 (400 V) | 1.10 | 387 | 430 Ω / 100 W | 8 | 1002 |
| 315 (400 V) | 1.50 | 297 | 310 Ω / 200 W | 16 | 0984 |
| 322 (400 V) | 2.20 | 198 | 210 Ω / 200 W | 9 | 0987 |
| 330 (400 V) | 3.00 | 135 | 150 Ω / 200 W | 5.5 | 0989 |

Coiled wire brake resistors Duty-cycle 40%

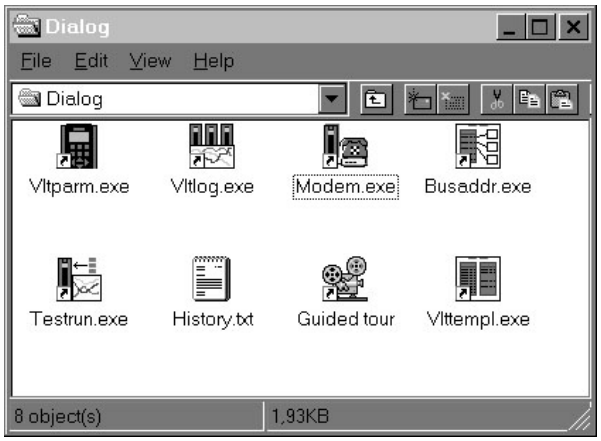
| Type | $P_{motor}$ [kW] | $R_{MIN}$ [Ω] | $R_{REC}$ [Ω] | $P_{peak}$ [kW] | $P_{avg.}$ [kW] | Order no. 175U0xxx |
|---|---|---|---|---|---|---|
| 303 (400 V) | 0.37 | 747 | 830 | 0.60 | 0.25 | 976 |
| 305 (400 V) | 0.55 | 747 | 830 | 0.60 | 0.25 | 976 |
| 307 (400 V) | 0.75 | 558 | 620 | 0.90 | 0.36 | 910 |
| 311 (400 V) | 1.10 | 387 | 430 | 1.32 | 0.53 | 911 |
| 315 (400 V) | 1.50 | 297 | 330 | 1.80 | 0.72 | 912 |
| 322 (400 V) | 2.20 | 198 | 220 | 2.60 | 1.06 | 913 |
| 330 (400 V) | 3.00 | 135 | 150 | 3.60 | 1.44 | 914 |

$R_{REC}$ = Recommended brake resistor.
$P_{peak}$ = Max. brake effect at 160% brake torque.
$P_{avg}$ = Mean power based on Duty-cycle.
See dimensions of Coiled wire brake resistors in instructions MI.50.D2.XX.


FCD 3 - P - T4 - P66 - R1 - D - F - T - C
195NA202.10
Power Sizes
e.g. 315
303 0.37 KW
305 0.55 KW
307 0.75 KW
311 1.1 KW
315 1.5 KW
322* 2.2 KW
330* 3.0 KW
Application range
Process P
Mains voltage
3x380–480V T4
Enclosure
Protectet vers. IP66 P66
Hardware variant
Standard ST
Extended (24Vext.) EX
Extended with brake EB
RFI–filter
With integral 1A filter R1
Display unit
No display D0
Display connector DC
LCP display unit is an option
Code no.:175N0131
Cable for LCP–Code no.:175N0162
Fieldbus
Without fieldbus F00
Profibus DP 3 Mbit/s F10
DeviceNet F30 *
PB 12 MB F12
AS(i) F70 *
No terminal box T00
Box with metric thread, motor mnt., only right side T11
Box metric double sided motor mnt. T12
Wall mnt box, metric only right side T51
Wall mnt box, metric double sided T52
Standard C0
With Coated PCB C1 *
No. unit of this type
Required delivery date
Ordered by:
Date:
Please take a copy of the ordering form.
Fill it in and send or fax your order
to the nearest Danfoss rep. office.
* = Contact Danfoss

## ■ PC software and serial communication

Danfoss offers various options for serial communication. Using serial communication, it is possible to monitor, program and control one or several frequency converters from a centrally located computer.
In addition, all FCD 300 units have an RS 485 port as standard, thereby enabling communication e.g. with a PC. For this purpose, a program called VLT Software Dialog is available.
VLT Software Dialog comes in three modules, as a minimum containing the programs of the Basic module.




**The Basic module covers:**
*TEST RUN* used for controlling and running in a frequency converter, including
- Setting of reference value.
- simultaneous showing of selected parameters in the form of graphs.
- option of DDE link, e.g. to spreadsheet.

*PARAMETER SETUP* is used for setting up and transmitting parameter sets, including:
- setting of frequency converter parameters.
- parameter sets can be collected from and copied to a frequency converter.
- documentation / setup print incl. charts.

*HISTORY* where the different development stages of VLT Software dialog can be studied.

*BUS ADDRESS SETUP* is used for addressing FCD 300.

**The logging module covers:**
*LOGGING* is used for collecting and displaying historical or real-time operating data.
- presentation of selected parameters from several frequency converters in the form of graphs.
- collection of log data for file.
- option of DDE link, e.g. to spreadsheet.

*MODEM SETUP* is used to set up the frequency converter's modem. The module sets up the frequency converter's modem via the PC's communication port.

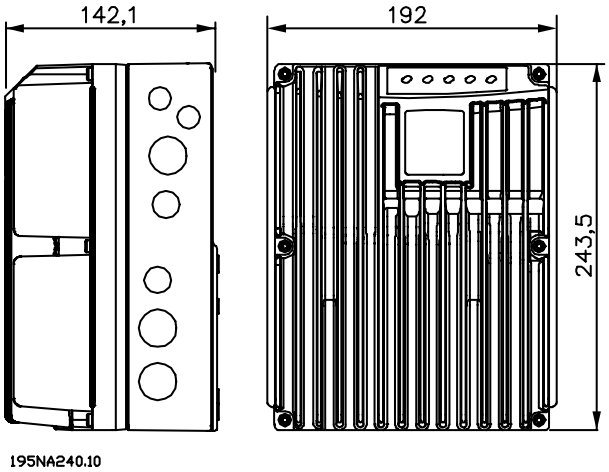
**The template module covers:**
*TEMPLATE SETUP* is used for setting up template files for *PARAMETER SETUP*.
- the template file acts as a screen that limits the number of accessible parameters when a parameter file is to be made or edited in *PARAMETER SETUP*
- the template file may contain preset values for the parameters of the frequency converter

**NB!:**
The Logging and Template modules call for the Basic module to be installed on the same PC.

**Guided tour covers:**
Guided tour offers a demonstration of the VLT Software Dialog program.

## ■ Mechanical dimensions, motor mounting

**FCD 303–315 340–480 Volt**

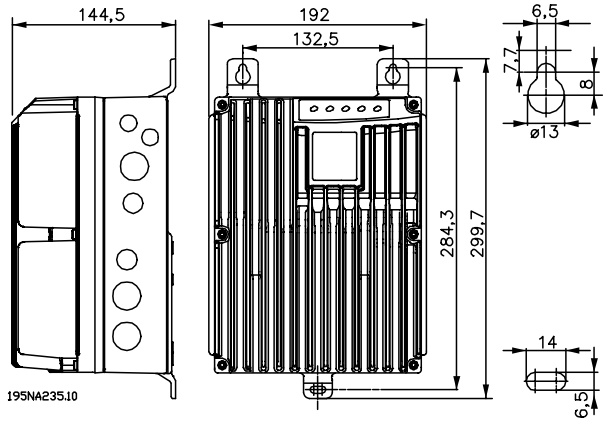



**FCD 322–330 340-480 Volt**

## ■ Mechanical dimensions, stand alone mounting

The drawings below give the mechanical dimensions.
All dimensions are in mm.

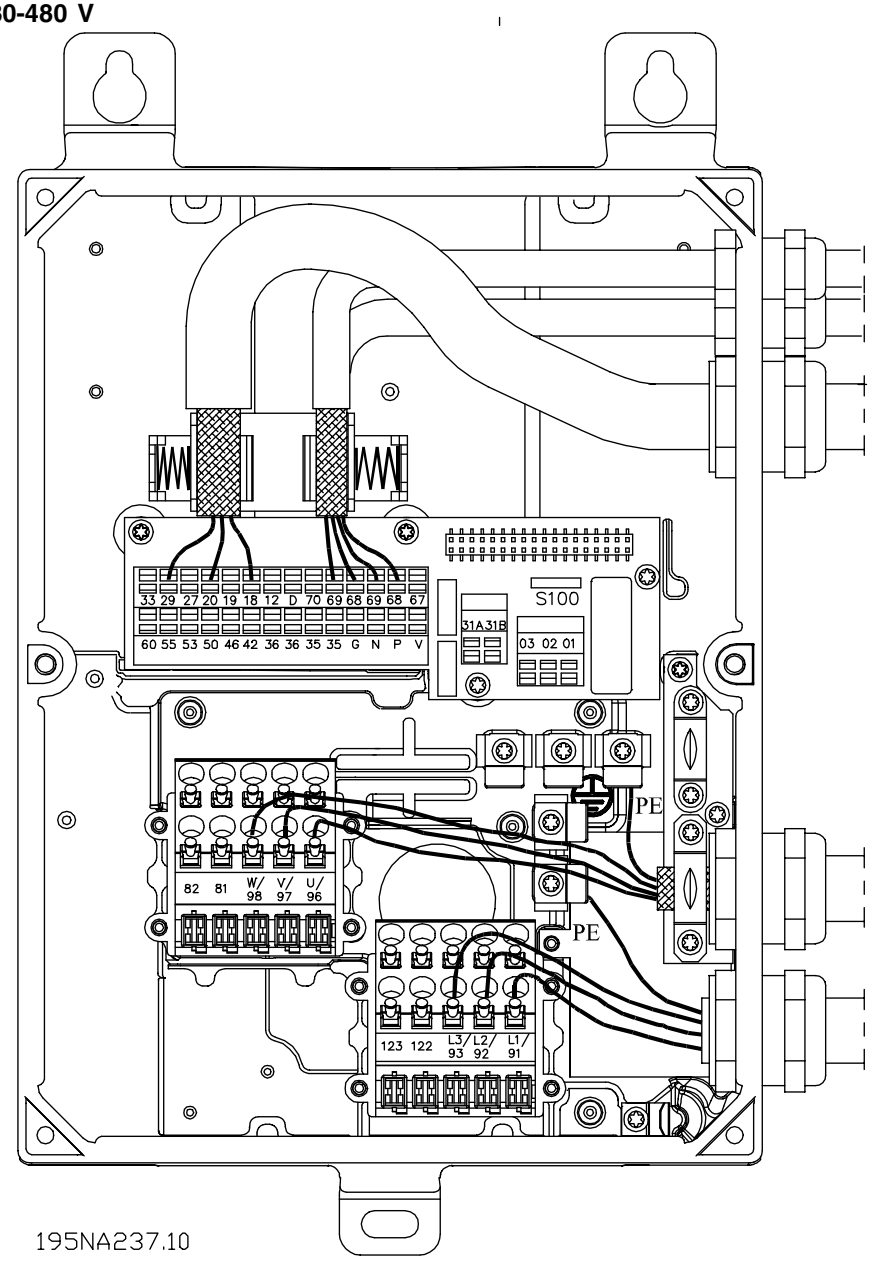
**FCD 303-315 380-480 Volt**




**FCD 322–330 380–480 Volt**

## ■ Electrical installation

**FCD 303-315 380-480 V**



## ■ General technical data

Mains supply (L1, L2, L3):

| | |
|---|---|
| Supply voltage FCD 305-330 380-480 V | 3 x 380/400/415/440/480 V ±10% |
| Supply frequency | 50/60 Hz |
| Max. imbalance on supply voltage | ± 2.0% of rated supply voltage |
| Power factor (400 V) / cos. $\Phi_1$ | 0.90 / 1.0 at rated load |
| Number of connections at supply input L1, L2, L3 | 2 times/min. |
| Max. short-circuit value | 100,000 A |

*See Special Conditions section in the Design Guide*

Output data (U, V, W):

| | |
|---|---|
| Output voltage | 0 - 100% of supply voltage |
| Output frequency | 0.2 - 132 Hz, 1 - 1000 Hz |
| Rated motor voltage, 380-480 V units | 380/400/415/440/460/480 V |
| Rated motor frequency | 50/60 Hz |
| Switching on output | Unlimited |
| Ramp times | 0.02 - 3600 sec. |

Torque characteristics:

| | |
|---|---|
| Starting torque (parameter 101 Torque characteristic = Constant torque) | 160% in 1 min.* |
| Starting torque (parameter 101 Torque characteristics = Variable torque) | 160% in 1 min.* |
| Starting torque (parameter 119 *High starting torque*) | 180% for 0.5 sec.* |
| Overload torque (parameter 101 Torque characteristic = Constant torque) | 160%* |
| Overload torque (parameter 101 Torque characteristic = Variable torque) | 160%* |

**Percentage relates to frequency converter's nominal current.*

Control card, digital inputs:

| | |
|---|---|
| Number of programmable digital inputs | 5 |
| Terminal number | 18, 19, 27, 29, 33 |
| Voltage level | 0 - 24 V DC (PNP positive logic) |
| Voltage level, logic '0' | < 5 V DC |
| Voltage level, logic '1' | > 10 V DC |
| Maximum voltage on input | 28 V DC |
| Input resistance, $R_i$ (terminals 18, 19, 27, 29) | approx. 4 kΩ |
| Input resistance, $R_i$ (terminal 33) | approx. 2 kΩ |

*All digital inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals, and can be functionally separated from other control terminals by opening switch S100. See section entitled Galvanic Isolation.*

Control card, analogue inputs:

Number of analogue voltage inputs ..... 1 pcs.
Terminal number ..... 53
Voltage level ..... ± 0 - 10 V DC (scaleable)
Input resistance, $R_i$ ..... approx. 10 kΩ
Max. voltage ..... 20 V

Number of analogue current inputs ..... 1 pcs.
Terminal number ..... 60
Current level ..... 0/4 - 20 mA (scaleable)
Input resistance, $R_i$ ..... approx. 300 Ω
Max. current ..... 30 mA

Resolution for analogue inputs ..... 10 bit
Accuracy of analogue inputs ..... Max. error 1% of full scale
Scan interval ..... 13.3 msec
*The analogue inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals. See section entitled Galvanic Isolation.*

Control card, pulse inputs:

Number of programmable pulse inputs ..... 2
Terminal number ..... 29, 33
Max. frequency at terminal 29/33 ..... 67.6 kHz (Push-pull)
Max. frequency at terminal 29/33 ..... 5 kHz (open collector)
Min. frequency at terminal 33 ..... 4 Hz
Min. frequency at terminal 29 ..... 30 Hz
Voltage level ..... 0 - 24 V DC (PNP positive logic)
Voltage level, logic '0' ..... < 5 V DC
Voltage level, logic '1' ..... > 10 V DC
Maximum voltage on input ..... 28 V DC
Input resistance, $R_i$ ..... approx. 2 kΩ
Scan interval ..... 13.3 msec
Resolution ..... 10 bit
Accuracy (100 Hz- 1 kHz) terminal 33 ..... Max. error: 0.5% of full scale
Accuracy (1 kHz - 67.6 kHz) terminal 33 ..... Max. error: 0.1% of full scale
*The pulse input is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals. See section entitled Galvanic Isolation.*

Control card, digital/frequency output:

Number of programmable digital/pulse outputs ..... 1 pcs.
Terminal number ..... 46
Voltage level at digital/frequency output ..... 0 - 24 V DC (O.C PNP)
Max. output current at digital/frequency output ..... 25 mA.
Max. load at digital/frequency output ..... 1 kΩ
Max. capacity at frequency output ..... 10 nF
Minimum output frequency at frequency output ..... 16 Hz
Maximum output frequency at frequency output ..... 10 kHz
Accuracy on frequency output ..... Max. error: 0.2 % of full scale
Resolution on frequency output ..... 10 bit
*The digital output is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals. See section entitled Galvanic Isolation.*

Control card, analog output:

Number of programmable analog outputs ..... 1
Terminal number ..... 42
Current range at analog output ..... 0/4 - 20 mA
Max. load to common at analog output ..... 500 Ω
Accuracy on analog output ..... Max. error: 1.5 % of full scale
Resolution on analog output ..... 10 bit
*The analog output is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals. See section entitled Galvanic Isolation.*

Control card, 24 V DC output:

Terminal number ..... 12
Max. load ..... 130 mA
*The 24 V DC supply is galvanically isolated from the supply voltage (PELV) , but has the same potential as the analogue and digital inputs and outputs. See section entitled Galvanic Isolation.*

Control card, 10 V DC output:

Terminal number ..... 50
Output voltage ..... 10.5 V ±0.5 V
Max. load ..... 15 mA
*The 10 V DC supply is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals. See section entitled Galvanic Isolation.*

Control card, RS 485 serial communication:

Terminal number ..... 68 (TX+, RX+), 69 (TX-, RX-)
Terminal number 67 ..... + 5 V
Terminal number 70 ..... Common for terminals 67, 68 and 69
*Full galvanic isolation. See section entitled Galvanic Isolation.*

Relay outputs:

Number of programmable relay outputs ..... 1
Terminal number, control card ..... 1-3 (break), 1-2 (make)
Max. terminal load (AC) on 1-3, 1-2, control card ..... 240 V AC, 2 A
Min. terminal load on 1-3, 1-2, control card ..... 24 V DC 10 mA, 24 V AC 100 mA
*The relay contact is separated from the rest of the circuit by strengthened isolation.*
*See section entitled Galvanic Isolation.*

External 24 Volt DC supply:

Terminal nos ..... 35, 36
Voltage range ..... 20-30 V (max. 37 V DC for 10 sec.)
Max. voltage ripple ..... 2 V DC
Power consumption with/without mains supply ..... 0.1W/5-12W
*Reliable galvanic isolation: Full galvanic isolation if the external 24 V DC supply is also of the PELV type.*

Cable lengths and cross sections:

Max. motor cable length, screened/armoured cable ..... 10 m
Max. motor cable length, unscreened/unarmoured cable ..... 10 m
*Max. cross section to motor, see next section.*
Max. cross section to control wires, rigid wire ..... 4.0 $mm^2$/10 AWG
Max. cross section to control cables, flexible cable ..... 2.5 $mm^2$/12 AWG
Max. cross section to control cables, cable with ferrules ..... 2.5 $mm^2$/12 AWG
**When complying with EN 55011 1A the motor cable length must in certain instances be reduced. See EMC emission.**

Control characteristics:

Frequency range ..... 0.2 - 132 Hz, 1 - 1000 Hz
Resolution of output frequency ..... 0.013 Hz, 0.2 - 1000 Hz
Repeat accuracy of *Precise start/stop*(terminals 18, 19) ..... ≤ ± 0.5 msec
System response time (terminals 18, 19, 27, 29, 33) ..... ≤ 26.6 msec
Speed control range (open loop) ..... 1:15 of synchronous speed
Speed control range (closed loop) ..... 1:120 of synchronous speed
Speed accuracy (open loop) ..... 90 - 3600 rpm: Max. error of ±23 rpm
Speed accuracy (closed loop) ..... 30 - 3600 rpm: Max. error of ±7.5 rpm
*All control characteristics are based on a 4-pole asynchronous motor*

Surroundings:

Enclosure ..... IP 66, NEMA 4x (indoor)
Vibration test ..... 1.0 g
Max. relative humidity ..... 5% - 85% during operation
Ambient temperature IP66 ..... Max. 40 °C (24-hour average max. 35 °C)
*Derating for ambient temperature, see special conditions in the Design Guide*
Min. ambient temperature during full-scale operation ..... 0 °C
Min. ambient temperature at reduced performance ..... - 10 °C
Temperature during storage/transport ..... -25 - +65/70 °C
Max. altitude above sea level ..... 1000 m
*Derating for air pressure, see special conditions in the Design Guide*
EMC standards used, Emission ..... EN 50081-1/2, EN 61800-3, EN 55011
EMC standards used, immunity ..... EN 50082-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6
*See section on special conditions in the Design Guide*

Safeguards:

- Electronic thermal motor protection against overload.
- Temperature monitoring of the power module ensures that the frequency converter cuts out if the temperature reaches 100 °C. An overload temperature cannot be reset until the temperature of the power module is below 70 °C.
- The frequency converter is protected against short-circuits on motor terminals U, V, W.
- If a mains phase is missing, the frequency converter will cut out.
- Monitoring of the intermediate circuit voltage ensures that the frequency converter cuts out if the intermediate circuit voltage is too low or too high.
- The frequency converter is protected against earth fault on motor terminals U, V, W.

## ■ Technical data, mains supply 3 x 380 - 480 V

| According to international standards | Type | 303 | 305 | 307 | 311 | 315 | 322 | 330 |
|---|---|---|---|---|---|---|---|---|
| Output current | $I_{INV.}$ [A] | 1.4 | 1.8 | 2.2 | 3.0 | 3.7 | 5.2 | 7.0 |
| (3 x 380-480V) | $I_{MAX}$ (60s) [A] | 2.2 | 2.9 | 3.5 | 4.8 | 5.9 | 8.3 | 11.2 |
| Output power (400 V) | $S_{INV.}$ [KVA] | 1.0 | 1.2 | 1.5 | 2.0 | 2.6 | 3.6 | 4.8 |
| Typical shaft output | $P_{M,N}$ [kW] | 0.37 | 0.55 | 0.75 | 1.1 | 1.5 | 2.2 | 3.0 |
| Typical shaft output | $P_{M,N}$ [HP] | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 3.0 | 4.0 |
| Max. cable cross section, motor | [$mm^2$/AWG] [1] | | 4/10 | 4/10 | 4/10 | 4/10 | 4/10 | 4/10 |
| Input current | $I_{L,N}$ [A] | 1.2 | 1.6 | 1.9 | 2.6 | 3.2 | 4.7 | 6.1 |
| (3 x 380-480 V) | $I_{L,MAX}$(60s)[A] | 1.9 | 2.6 | 3.0 | 4.2 | 5.1 | 7.5 | 9.8 |
| Max. cable cross section, power | [$mm^2$/AWG] [1] | 4/10 | 4/10 | 4/10 | 4/10 | 4/10 | 4/10 | 4/10 |
| Max. pre-fuses | [IEC]/UL [2] [A] | 25/25 | 25/25 | 25/25 | 25/25 | 25/25 | 25/25 | 25/25 |
| Efficiency[3] | [%] | | 96 | | | | | |
| Power loss at max. load | [W] | 22 | 29 | 40 | 59 | 80 | 117 | 160 |
| Weight | [kg] | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 | 7.0 | 7.0 |
| Enclosure | type | | IP 66 / NEMA 4x (indoor) | | | | | |

1. American Wire Gauge. Max. cable cross section is the largest cable cross section that can be attached to the terminals. Always observe national and local regulations.
2. Type gG pre-fuses must be used. If you want to maintain UL/cUL you must use pre-fuses of the type Bussmann KTS-R 500 V or Ferraz Shawmut, type ATMR (max. 30A). The fuses must be placed for protection in a circuit that is capable of supplying a maximum of 100,000 amps RMS (symmetrical), 500 V maximum.
3. Measured using a 10 m screened/armoured motor cable with a rated load and rated frequency.

## ■ Accessories for FCD 300

| Type | Description | Ordering no. |
|---|---|---|
| LCP2 control unit | LCP2 for programming the frequency converter | 175N0131 |
| Cable for LCP2 control unit | Cable from LCP2 to frequency converter | 175N0162 |
| LCP2 remote-mounting kit | Kit for remote-mounting of LCP2 (incl. 3 m cable, excl. LCP2) | 175N0160 |
| LOP2 (Local Operation Pad) | LOP can be used for setting the reference and start/stop via the control terminals. | 175N0128 |
| VLT Software Dialog | CD-ROM version* | 175Z0953 |
| Motor adaption plate | Plate for adapting to non Danfoss Bauer motors. | 175N2115 |
| Membrane | Membrane for preventing condensation. | 175N2116 |
| Internal brake resistor | Brake resistor for mounting inside the terminal box. | 175N2117 |
| Plug kit for LCP2 | Plug for LCP2 for mounting in the terminal box. | 175N2118 |
| Motor star terminal | Terminal for interconnection of motor wires (star point). | 175N2119 |

* Incl. the modules Basis, Logging, Template, Guided Tour in 6 languages (Danish, English, German, Italian, Spanish and French).

## ■ Supplied with the unit

Below is a list of the literature available for FCD 300. It must be noted that there may be deviations from one country to the next.

Supplied with the unit:

Operating instructions ..... MG.04.BX.YY
Quick setup ..... MG.04.CX.YY
Parameter list ..... MG.04.DX.YY

Various literature for FCD 300:

Design Guide ..... MG.04.AX.YY
Data sheet ..... MD.04 .AX.YY

Communication with FCD 300:

Profibus manual ..... MG.

*X = version number*
*YY = language version*