

## Packaged Panel Solutions

Flexibility is the key to Danfoss packaged drive solutions. From our unique feature-rich standard packages to our Engineered Drive Systems, Danfoss supplies the package to meet the application. Our packaged solutions are all manufactured in our own UL-certified facilities, without outsourcing, and supported by the same stringent manufacturing standards and warranties as VLT Series drive products. Being your single source supplier of both VFDs and packaged solutions is just one more way that Danfoss reduces your total cost of ownership.



*Danfoss packaged panel solutions are built in Milwaukee, Wisconsin.*

### Typical Package Options

- Two-contactor bypass
- Three-contactor bypass
- Contactor motor selection
- Multiple motor operation
- Main input disconnect
- Main input fusing
- Drive fusing
- Input AC line reactors
- Output dV/dt filters
- 100,000 amp short circuit current rated package
- Common start/stop
- Control switches
- Indicator lights
- Meters
- System communications
- Auxiliary enclosure for customer-supplied equipment
- Multiple drives in a single enclosure
- NEMA/UL Type 1, 12, 3R, or 4X to meet customer requirements

# Packaged Panel Solutions

## Integrated Fused Disconnect Package

- Why supply separate drives and fused disconnects when you can get them in the smallest, easiest package possible?
- Reduced installation cost & time
- Can be ordered with or without drive input fusing

## Engineered Drive Systems

Custom enclosures, soft start bypass panel, custom wiring and pilot devices, or NEMA/UL Type 1, 12, 4 and 4X panels. You name the package and we can engineer and build the unit in our in-house UL panel shop.

## Enhanced Packages

VLT AQUA Drives through 75 HP at 460 or 600 volts and 30 HP at 208 or 230 volts may also be supplied with a UL-listed Type 3R enclosure suitable for outdoor use. These weather-resistant enclosures allow the versatile VLT AQUA Drive to be located with all of its options on a rooftop or other outdoor location.

Enclosure fans help keep the drive within its temperature limits in high ambient temperatures, and a thermostatically controlled heater helps prevent condensation in cool, damp environments.



*NEMA Type 3R enclosures are available for locations exposed to weather.*

*Panel solution products are packaged according to the functional requirements of the system, commonly referred to as Tier 1, 2 and 3. Examples of Tier 1, 2 and 3 enclosure are shown below.*

**Tier 1:** Drive or drive with fuse and/or disconnect

**Tier 2:** Drive with bypass or non-bypass drive with input AC line reactor, output LC filter and/or contactor motor selection

**Tier 3:** Drive with bypass and input AC line reactor, output LC filter and/or contactor motor selection.



## Electronically Controlled Bypass (ECB)

Danfoss ECB is Electronically Controlled Bypass done right. With the highest level of performance and protection, and the easiest operator interface on the market, our ECB offers the best solution for even the most critical of applications.

### Enhanced Performance and Protection

#### Motor Protection

- Phase loss / imbalance protection
- Overload motor protection in bypass
- Overload reset from drive keypad, drive digital input or over BAS

#### 24 VDC Switch Mode Power Supply

- Operates off of any two of the three input phases
- Continued drive operation at a reduced load when any input phase is lost
- Eliminates contactor dropout on voltage conditions as low as 70% of nominal voltage
- Separate power source for drive logic
- Eliminates the need for an undervoltage relay

#### Additional Protection Features

- Drive input fuses supplied with every panel
- Bypass run-time hour meter
- Password protection prevents unauthorized bypass operation
- Manual bypass initiation override ensures operation
- Bypass control through the drive Smart Logic Controller and Real-Time clock
- Bypass fault logging and time stamping



*Bypass-specific keypad provides one-touch access to bypass operation*



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## Electro-Mechanical Bypass (EMB)

For users who prefer the traditional bypass control methods of relay logic and selector switches, Danfoss offers a standard drive and bypass package.

### Door Mounted Operators

- Drive-Off-Bypass selector
- Bypass pilot light indication
- Test selection added with three contactor bypass units

### 24 VDC Switch Mode Power Supply

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- Continued drive operation at a reduced load when any input phase is lost
- Eliminates contactor dropout on voltage conditions as low as 70% of nominal voltage
- Eliminates the need for an undervoltage relay



### Traditional Doesn't Have to be Featureless

- The same flexible power configurations as the ECB
- Common start/stop available
- Run permissive available
- Automatic bypass with adjustable time delay is available
- Class 20 overload

## Main Fusing/Drive Fusing

Danfoss can supply fuses in conjunction with other options built into the standard drive enclosure, resulting in a compact solution with no increase in footprint size.

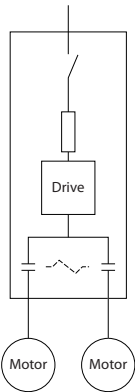
### Drive Fuses

Drive fuses are located ahead of the drive and are a fast-acting type. Drive fuses are standard in two-contactor and three-contactor bypasses, so there is no need to add them for bypass units. If drive fuses are required for any non-bypass configuration, order an Input Disconnect Switch and Input Fuse (see right).

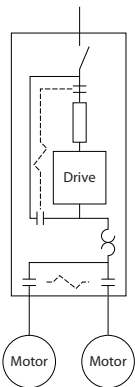
### Main Fuses

Main fuses are used in panels containing a bypass. They are located ahead of the drive, the drive fuses, and the bypass. Main fuses are designed to protect the circuitry within the panel, but are not adequate to protect the drive. Main fuses are dual-element time delay type. These fuses mount within the bypass enclosure.

## Contactor Motor Selection.



Allows selection between two motors, either manually, or automatically from a remote signal. (Remote signal source not included.) A door-mounted Motor 1 -- Auto -- Motor 2 selector switch is provided. In the Auto mode, the motor is selected via two external, normally open contacts. Interlocking is provided to ensure soft-start if switching occurs while the drive is running. For proper motor overload protection, both motors must be the same size. Bypass can also be supplied, if required.

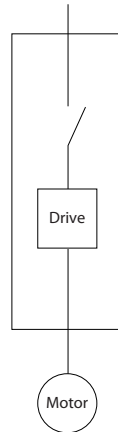


Contactor Motor Selection without Bypass requires a drive with Input Fuses and Disconnect. Contactor Motor Selection with Bypass requires a drive with bypass

## Fuse/Disconnect

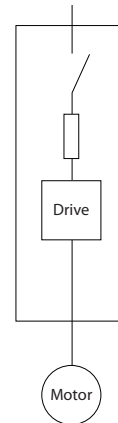
Includes back plate if required and graphical control panel.

### Input Disconnect Switch



A padlockable, defeatable, two-position rotary switch that allows the input line to the drive to be disconnected. For safety, the switch must be in the OFF position before the enclosure cover can be removed. Includes drive and disconnect switch. Disconnect switch mounts below the drive in an extended drive enclosure for 10 HP @ 460V and 3 HP @ 208V and smaller units. No increase in enclosure size for all larger units. For single motor applications only.

### Input Disconnect Switch and Input Fuse



Includes drive, drive fuses, and disconnect switch. Disconnect switch and fuses mount below the drive in an extended drive enclosure for 10 HP @ 460V and 3 HP @ 208V and smaller units. No increase in enclosure size for all larger units. For single motor applications only.

## Short Circuit Current Rating

All VLT AQUA Drives and drives with drive fuses and/or input disconnect switches are rated at 100,000 amps short circuit current rating. (100kA SCCR).

All other standard panels consisting of a VLT AQUA Drive and options are labeled for 5kA SCCR.

Most requirements for a higher SCCR can be satisfied by a 100kA SCCR. We can optionally supply a bypass panel labeled for 100k SCCR. Main fuses (not circuit breaker) are always required for 100kA SCCR.

Please note that the SCCR is what is required to ensure that the panel's rating is sufficient for the source current available. This is not the same as amp interrupting capacity (AIC). AIC is a component rating, and cannot be used as the SCCR, which is a complete drive or panel rating.

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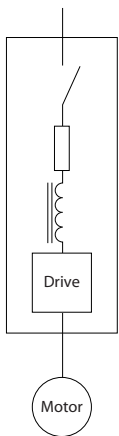
## Input Line Reactor/Output LC Filter

Reactors and filters are in a UL Type 1 option enclosure only. This enclosure is identical in size to the option enclosure that can house a bypass. If a reactor and filter are both required, they will both be mounted in the same enclosure.

Drives without a bypass must have the input disconnect option.

For drives with bypass, neither input line reactors nor output LC Filters can be mounted in the same option panel as the bypass. A total of two option panels will be supplied for drives including both a bypass and an input line reactor or output LC filter.

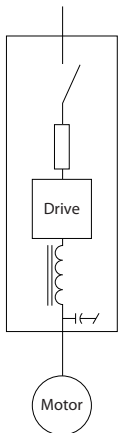
### AC Input Line Reactor



AC input line reactors are used in the input to the drive to filter line noise from the drive and drive noise from the line. An internal 5% dual DC-link reactor is standard on all drives, eliminating the need for AC line reactors in many applications. Available with Contactor Motor Selection on bypass units only.

*Drive with Disconnect Switch, Drive Fuses, and Input Line Reactor*

### Output LC Filter



This low-pass filter allow the use of longer motor leads, and reduces insulation stress, especially on low horsepower motors without interphase insulation. Available with Contactor Motor Section on both bypass and drive only units.

*Drive with Disconnect Switch, Drive Fuses, and Output LC Filter*

## Input EMI Filter

All VLT AQUA Drives are designed to contain and control EMI and RFI to stringent European standard EN 61800-3.

Additional optional filtering is available for even the most sensitive installations.

Optional filters attenuate radio frequencies (150 Hz to 30 MHz) conducted to the AC power line and radiated emissions (30 MHz to 1 GHz).

Drives equipped with this optional filter have been tested to the product norm EN 61800-3 and meet the following standards. The test system included a drive with a motor and shielded motor cables, and a control box with a potentiometer and shielded control cable. When tested in this configuration, these drives are within the EN 55011 test limits for Class A1, A2, and B as shown below using the Danfoss H1 filter for drives less than 150 HP or H4 filter for drives 150 HP and up.

- This filter mounts inside the standard drive enclosure
- Available for both UL Type 1 and UL Type 12 drives
- Must be ordered as part of the drive; field retrofitting is not possible

### EN 55011 Compliance

| Models                        | Conducted Emissions |                   |                  | Radiated Emissions |
|-------------------------------|---------------------|-------------------|------------------|--------------------|
|                               | Class A2            | Class A1          | Class B          | Class A1           |
| 1/2 HP through 60 HP @ 208V   | 500 ft<br>(150 m)   | 500 ft<br>(150 m) | 165 ft<br>(50 m) | Yes                |
| 1/2 HP through 125 HP @ 480 V | 500 ft<br>(150 m)   | 500 ft<br>(150 m) | 165 ft<br>(50 m) | Yes                |