



VLT® OneGearDrive Selection Guide

# Powerful, efficient and hygienic – all in only one frame size



# EHEDG

Certified

Compliance with the requirements for best cleaning and hygienic design according to EHEDG (European Hygienic Engineering & Design Group)

# Energy efficient, flexible, reliable

## – VLT® OneGearDrive

When Danfoss first launched the world's first production inverter over 40 years ago, the overwhelming argument for their adoption was their ability to provide variable speed control of all makes of standard squirrel-cage induction motors.

This meant that throughout the plant, there were no restrictions on the choice of motor manufacturer. Motor maintenance was minimised and drive reliability was enhanced dramatically.

In those 40 years, the evolution of inverter drives has brought the inverter/cage motor combination to a high peak of performance, capable of matching that of even servo drives. However, times change and with the current climatic and financial issues, the wheel has turned full circle and there are strong arguments for the adoption of high efficiency technology along with equipment rationalisation across the drive users' factory or production facility.

That, and in the face of ever increasing competition and growing political and social pressures, producers are constantly looking for new ways to cut costs, reduce energy consumption and improve the environmental compatibility of manufacturing systems.

Electric drive technology is a key technology in this respect underwriting the future of motion controls. We have now arrived an unique time when proven permanent magnet (PM) motor technology can be supported by modern inverter technology supporting efforts to optimise plant efficiency and reduce energy costs.

### VLT® FlexConcept

To address this situation using a modern, contemporary drive system, Danfoss has seamlessly integrated modern motor technology with the latest motor control components to create a fully coordinated, standard-

ised system, called VLT® FlexConcept, comprising the highly efficient VLT® OneGearDrive combined with a VLT® Decentral Drive FCD 302 or VLT® AutomationDrive FC 302 frequency converter.

For conveyor drives in particular, this system dramatically simplifies project engineering, installation, commissioning and maintenance – regardless of whether the plant operator opts for a centralised or decentralised drive configuration.

The system components allow maximum flexibility with a minimum number of unit variations such as motors, gear unit sizes or frequency converters, all of which offer a uniform user interface concept and the same functionality.

### High efficiency is essential

Energy savings, total cost of ownership (TCO), return on investment (ROI), reduced down-time and reductions in



spares parts holdings are issues constantly challenging industry worldwide.

Current requirements for a global reduction in CO<sub>2</sub> emissions, along with the imminent introduction of the EU Directive 640/2009 mandating higher operational efficiencies for electric motors, (due to come into force in 2011), put further pressure on OEMs and users of process plant. The new objective for industry therefore is to conserve energy and resources while optimising productivity.

Especially in the food and beverage industries, the demand is on energy efficiency and flexibility to meet rising cost pressures. In the past, the various production areas: manufacture, filling, packaging, palletising, and storage etc, required a variety of drive concepts. For example, dozens, perhaps hundreds, of drives are needed just to power the conveyors which interconnect the various production stages.

Previously, the motors used were not particularly efficient, there were a wide variety of transmissions and drives in use and maintenance costs were high. The consequences of this were, and still are, high energy costs and that large stocks of spare parts must be held in stock to minimise down-time.

With the VLT® OneGearDrive concept, Danfoss has developed a more flexible, more efficient drive system

that significantly reduces the number of drive variants across a typical food or beverage process plant, resulting in greatly reduced operating costs and substantial energy savings and carbon oxide reductions.

### Hygienic design required

Especially in food and beverage production areas, but also in pharmaceutical and cosmetic manufacturing plants, hygiene compliance rules in sensitive areas are extremely demanding.

In addition to the standards and guidelines of the EU, operators are increasingly observing the rules of the “European Hygienic Engineering & Design Group” – called EHEDG. The EHEDG provides the specifications and guidelines for the comprehensive, proactive protection of food from contamination with bacteria, fungi and yeasts during processing. The result can be summarised under the heading “Hygienic Design”.

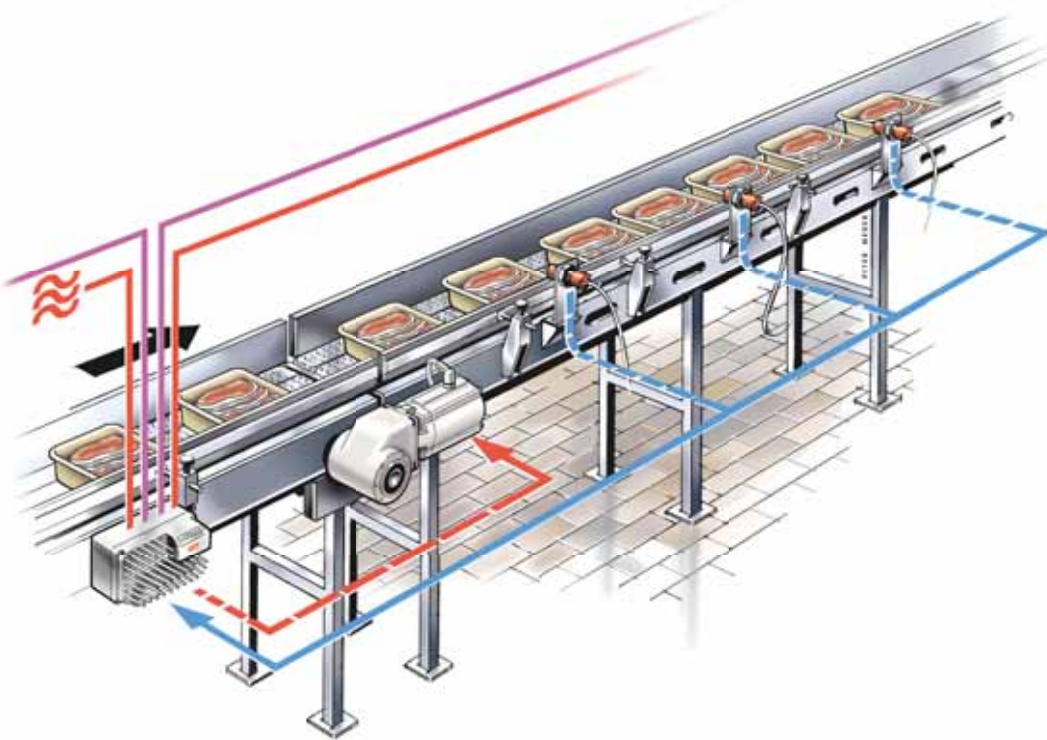
Thus, the responsibility for implementing and achieving these targets lies with the machine manufacturers and operators. The hygienic design of process equipment and components should be based on a sound combination of process and mechanical engineering as well as knowledge in microbiology.

Danfoss has adopted hygienic requirements at the initial stage in developing its drives because upgrading of existing process equipment designs to meet hygienic requirements is often both expensive and unsuccessful.



# Fewer variants

## – run a higher number of applications



### One gear size

Compared to traditional systems, the VLT® OneGearDrive covers all applications with one drive size and a minimal number of variants, reducing spare parts inventory and easing engineering thanks to uniform mechanical dimensions.

With only two motor types and three available gear ratios, the motor concept covers all typical versions for effective conveyor drives commonly

used in the food and beverage industry. Besides this, the restricted range of physical configurations of the OneGearDrive simplifies and cost-reduces spares holding.

### High system efficiency

It also uses optimised bevel gearing, which is more efficient than commonly used worm gears. The system as a whole, comprising permanent-magnet three-phase synchronous

motor, rivaling even the most efficient helical gears available and frequency converter, achieves an efficiency up to 90%, yielding savings of up to 25% compared with conventional systems.

### PM motor

Permanent magnet motors are synchronous motors with rotor mounted permanent magnets. This makes for a more compact motor frame size. At the same time, it is also a highly efficient drive of potentially up to 90% efficiency, high torque and already exceeds the IE4 Super Premium Efficiency class.

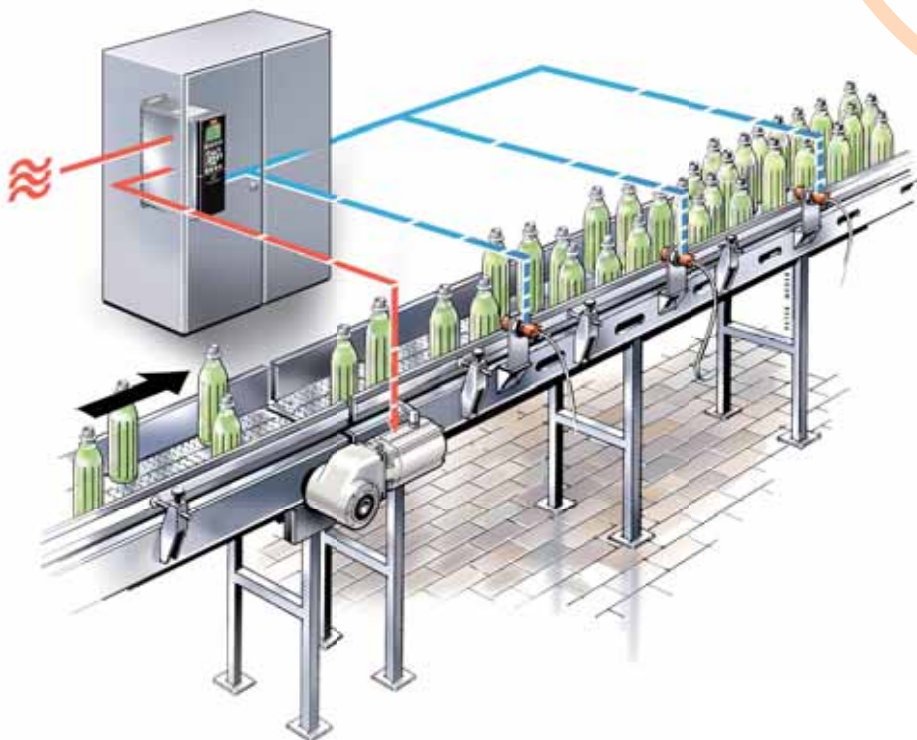
### Less expensive, fewer variants

There are lower losses, a smaller moment of inertia, a wide torque and speed range and a high short-term overload capability, therefore high maximum torque over a wide speed range. This gear motor is a drive, which, considered over its lifetime is

# 25%

cost savings

compared to conventional system by using VLT® OneGearDrive together with VLT® AutomationDrive FC 302.



less expensive than conventional geared motor units (GMUs). In addition to energy savings, the number of GMU variants decreases across the plant.

### Long service intervals

The VLT® OneGearDrive runs 35,000 operating hours in partial operation between oil changes (by using food grade oil) – this means long service intervals, low maintenance cost and effort, and low operating cost.

### Flexible plant design

The OneGearDrive lends itself equally well to central and decentral installations, giving the plant designer complete flexibility from the outset. Whether the inverter portion of the drive is to be housed immediately adjacent to the geared motor unit or housed in a central drive cabinet exceptional shaft performance is available. Of course the normal rules governing cable length between inverter and GMU must be observed.

### Dry, wet and wash- down aseptic areas

The VLT® OneGearDrive comes in two versions, the VLT® OneGearDrive Standard™ for use in dry and wet production areas while the VLT® OneGearDrive Hygienic™ for use in aseptic areas heralds a new threshold in food hygiene and cleanability.

### For conveying systems

The compact design of the VLT® OneGearDrive makes it predestined for use in transport and conveying systems as well as machines and equipment. The drive has been designed especially for use in the food and beverage industry although this new generation of transmission products offers significant benefits in all conveyor drive applications.



reddot design award  
winner 2010

### Awarded design

The design of the VLT® OneGearDrive Hygienic also opens up totally new aesthetic and key stylistic elements in drive technology. The motor and gearbox together form a clean, simple entity and the product won the reddot design award 2010 for “high product quality, expressing innovation in form and function in an exemplary manner”.

# Hygienic design

## Food safety

In food and beverage production areas where the product may come into direct contact with equipment and motors, the hygienic design of process equipment has a tremendous impact on diminishing the risks of contamination, which also means that the shelf life of products is improved. If the applied process equipment is of a poor hygienic design, it is difficult to clean it of micro-bacterial contamination.

## New hygienic trends

EU regulations for the compliance of hygienic equipment to be used in the manufacturing of popular food and beverages are becoming increasingly tight. For example, in the beverage industry, still water, fruit juices and alcohol free beers are all highly reactive to external influences.

New packaging materials also raise the demands on the hygienic conditions. Plastic packaging for cosmetics, including PET bottles in the drinks industry, require new measures as they do not tolerate heat sterilization or cleaning that previously rendered glass containers aseptic.

## Hygienic design

After years working with the food and beverage industry, Danfoss knows better than most the need for a robust, watertight construction that resists attack by acids or detergents, doesn't harbour bacteria and can be cleaned down quickly and easily, shortening the maintenance window.

## EHEDG compliance

The VLT® OneGearDrive Hygienic™ is the ideal choice for any application where hygiene is especially important. It complies with the requirements for best cleaning and hygienic design – with certification according to EHEDG (European Hygienic Engineering & Design Group).

## Complete smooth surface

The VLT® OneGearDrive Hygienic™ has a complete smooth, easy to clean surface without cooling fins and fan, without any pockets preventing bacteria growth and allowing detergents to drain off freely.

Because these drives do not have fans, they do not suck in airborne germs and blast them back into the

surrounding air. The drive units are also available with totally encapsulated encoders.

## High degrees of protection

The VLT® OneGearDrive Hygienic is resistant to detergents and disinfectants (pH 2 ..12). Danfoss supplies the OneGearDrive Hygienic™ with high IP 67 or IP 69K protection ratings as standard. A proven stainless steel plug-and-socket connector simplifies replacement during maintenance.

## IPA certified

The VLT® OneGearDrive Hygienic™ is certified as usable for clean rooms and aseptic filling by IPA (Fraunhofer institute) according to the dedicated "Air Cleanliness Classification" DIN EN ISO 14644-1.

The VLT® OneGearDrive is designed to be integrated in the plant equipment and to withstand the same detergents and physical cleaning as the rest of the aseptic production equipment.



# VLT® OneGearDrive

## Two versions are all you need

The VLT® OneGearDrive is available in two versions; the VLT® OneGearDrive Standard™ for use in dry and wet production areas, and the VLT® OneGearDrive Hygienic™, for use in wet areas, areas with high cleaning intensity including aseptic and cleanroom production areas.



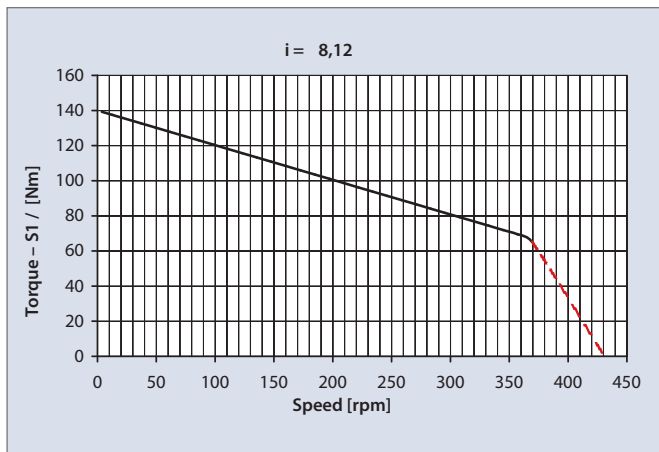
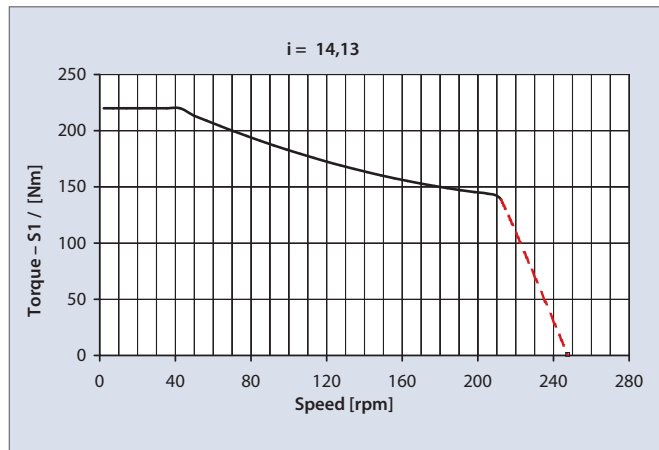
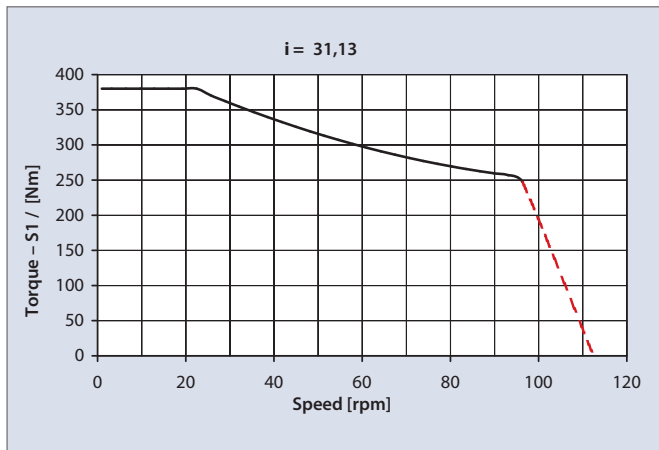
- **Complete smooth surface**  
**Fan-free motor, No cooling fins**  
 In both versions, completely smooth, easy to clean surface without cooling fins, prevents pockets of dirt from forming and allows detergents to drain off freely. The fan-free motor avoids the risk of air-borne germs and dirt particles being drawn in and then expelled back into the surrounding air.
  
- **High degrees of protection**  
 IP 67 and IP 69K (OGD Hygienic) – allows unrestricted use in wash down areas. IP 65 and IP67 (OGD Standard) – high protection in wash down areas.
  
- **10 pole motor for continuous duty S1**  
 High torque availability.
  
- **High efficiency bevel gear**  
 High break-away torque and uniquely compact design.
  
- **Available hollow shaft diameters 30, 35 and 40 mm:**  
 Allow flexible adaptation to customer standards.
  
- **Motor and resolver connection with CleanConnect® stainless steel connectors**  
 Allow safe connection in wet areas, fast replacement, and high cleanability. The proven stainless steel plug-and-socket connectors simplify replacement during maintenance. This allows the replacement to be performed by a mechanical service technician alone, without the assistance of an electrician as in the past.
  
- **Motor and resolver connections via terminal box with CageClamp® technology**  
 Fast, reliable connection lowering installation costs.
  
- H oS **Stainless steel hollow shaft**  
 AISI 316 Ti, corrosion resistant.
  
- H oS **Aseptic coating and food grade lubricants compliant with FDA and NSF requirements**  
 Allow reliable and direct use in product handling areas, with up to 35,000 hours between oil change.
  
- H oS **Certified aseptic coating**  
 Resistant to detergents and disinfectants (pH 2..12).  
  
 On customer request:  
**Antibac® antibacterial coating**  
 Reduces cleaning time and costs – this unique coating kills 99.9% of germs by means of active silver ions.

- = standard for both versions
- H = standard for VLT® OneGearDriveHygienic
- S = standard for VLT® OneGearDrive Standard
- oS = optional for VLT® OneGearDrive Hygienic
- oS = optional for VLT® OneGearDrive Standard

### Two versions

The VLT® OneGearDrive Standard with terminal box and to the left, the VLT® OneGearDrive Hygienic with stainless steel connectors.

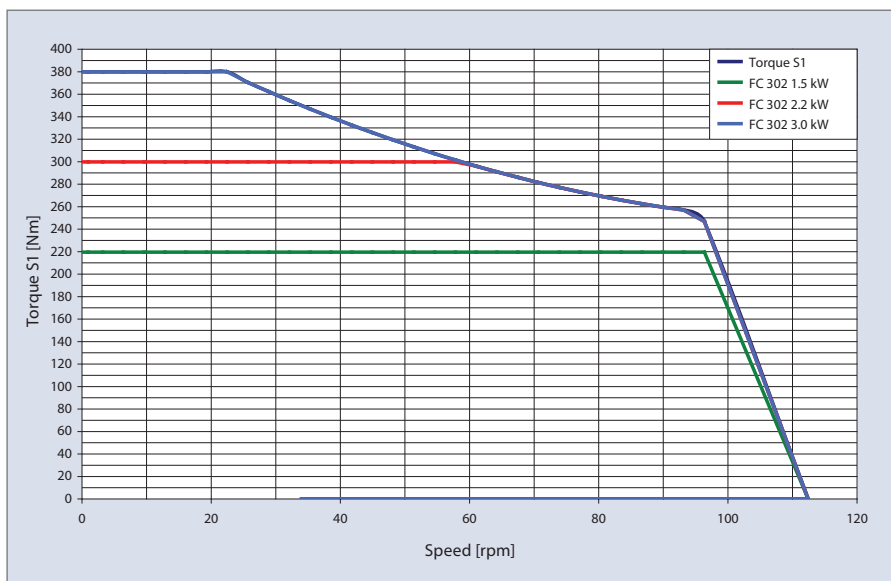
# Speed/torque characteristics



Max current 7.2 A  
3 kW

Gear ratios:  
i = 31.13  
i = 14.13  
i = 8.12

CSA/UL diagrams on request

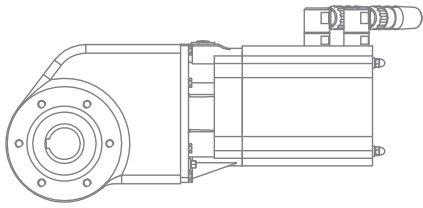


## Example:

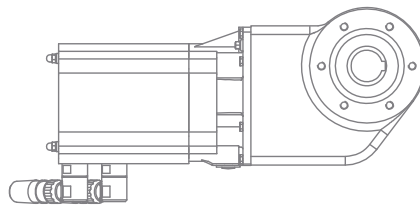
Speed/ torque characteristics in combination with VLT® AutomationDrive FC 302 or VLT® Decentral Drive FCD 302, for gear ratio  $i = 31.13$

For use at higher speeds, please check with our VLT® OneGearDrive sales engineers

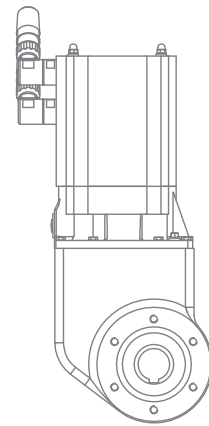
# Installation positions



P1



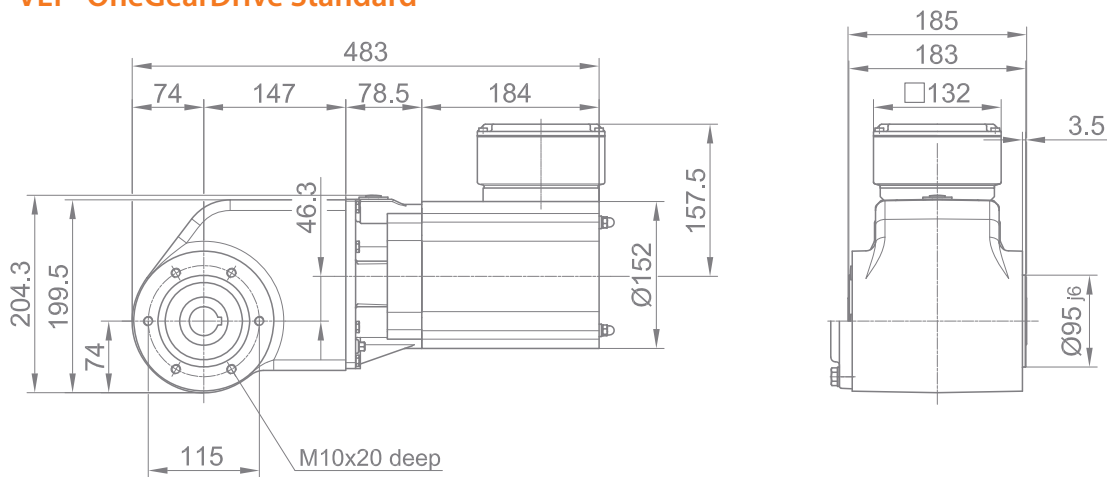
P2



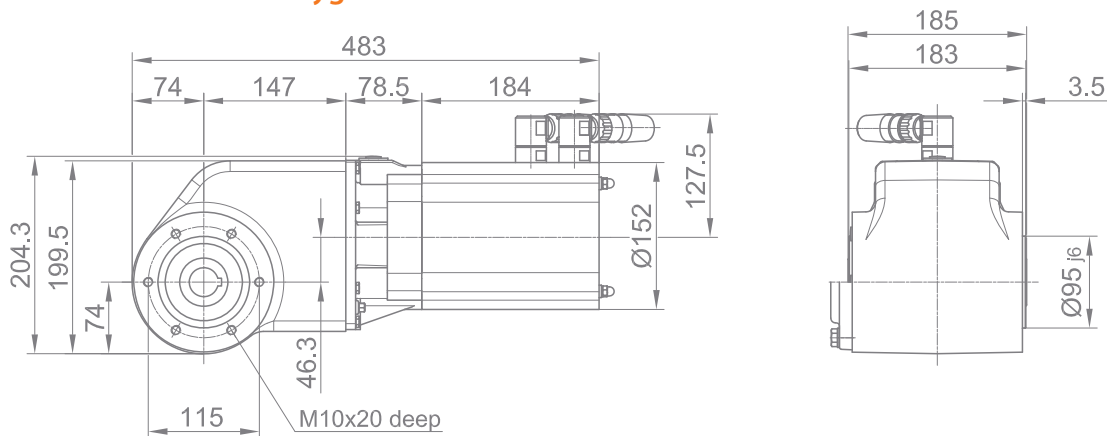
P3

## Dimensions

### VLT® OneGearDrive Standard™



### VLT® OneGearDrive Hygienic™



All measurements are in mm

# Ordering type code for OneGearDrive

Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	
Fixed	O	G	D		K	2						1				L	0	9					1				9	0	1	0								
Variants				S			0	8	K	1	2		3	0	1				R	X	T	B		P	1	A					H	1	B	X	X	X	X	
			H				1	4	K	1	3		3	5	2				R	1	S	1		P	2	S			S	1	B	0	2	4	1			
							3	1	K	1	3		4	0					R	4				P	3					B	1	8	0					
													I	1																								
													I	2																								
													I	3																								

<b>[01-03] Product group</b>	OGD VLT® OneGearDrive
<b>[04] Product variant</b>	S Standard H Hygienic
<b>[05] Gear type</b>	K Bevel gear
<b>[06] Size</b>	2 400 Nm
<b>[07-11] Gear ratio</b>	08K12 8.12 14K13 14.13 31K13 31.13
<b>[12] Output shaft design</b>	1 Hollow shaft
<b>[13-14] Output shaft size</b>	30 30 mm 35 35 mm 40 40 mm I1 1 ¼ inch I2 1 7/16 inch I3 1 ½ inch

<b>[15] Output shaft material</b>	1 Mild steel (OGD-S only) 2 Stainless steel, AISI 316 Ti (standard for OGD-H, option for OGD-S)
<b>[16-18] Motor size</b>	L09 1.5 - 3.0 kW
<b>[19-20] Resolver</b>	RX Without resolver R1 Resolver with plug socket (OGD-H only) R4 Resolver connection in terminal box (OGD-S only)
<b>[21-22] Motor connection</b>	TB With terminal box (OGD-S only) S1 Motor with plug socket (OGD-H only)
<b>[23] Connector position</b>	1 Top
<b>[24-25] Installation position</b>	P1 Horizontal, connections up (see page 9) P2 Horizontal, connections down (see page 9) P3 Vertical, motor up (see page 9)

<b>[26] Surface coating</b>	A Aseptic (standard for OGD-H, option for OGD-S) S Standard (OGD-S only)
<b>[27-30] RAL colour code</b>	9010 Standard
<b>[31-32] Lubricants</b>	H1 Food grade oil (standard in OGD-H; option for OGD-S) S1 Standard (OGD-S only)
<b>[33-36] Brake</b>	BXXX Without brake B024 24 V DC (option OGD-S) B180 180 V DC (option OGD-S)
<b>[37] CSA/UL</b>	X Without 1 CSA/UL (on request)

**NOTE:** For availability of specific options and configurations please refer to Configurator

## Accessories

### VLT® OneGearDrive Hygienic

- Resolver connector without cable
- Resolver connector with 5 m cable
- Resolver connector with 10 m cable
- Motor connector without cable
- Motor connector with 5 m cable
- Motor connector with 10 m cable
- Torque arm stainless steel

### VLT® OneGearDrive Standard

- Torque arm stainless steel

# Features and benefits

Feature	Benefit
High-efficiency bevel gear drive	High break away torque
High system efficiency incl. frequency converter	Save money and energy – up to 25% power savings compared to conventional systems
Permanent-magnet three-phase synchronous motor	Better than Super Premium Efficiency class IE4
Motor without cooling fins and fans	Ensure a measurable reduction of airborne germs
10-pole motor for continuous duty S1	High torque available
Available hollow shaft diameters: 30, 35 and 40 mm	Flexible adaption to customer standards
Completely smooth enclosure leaves no crevices or dirt traps	<ul style="list-style-type: none"> <li>– Easy to clean</li> <li>– Safe production</li> </ul>
Motor and resolver connection with Danfoss CleanConnect® stainless steel circular connector	<ul style="list-style-type: none"> <li>– Safe connection in wet areas</li> <li>– Fast replacement</li> <li>– High cleanability</li> </ul>
Motor, resolver and brake connections via terminal box with CageClamp® technology	<ul style="list-style-type: none"> <li>– Fast, reliable connection</li> <li>– Lower installation cost</li> </ul>
Aseptic coating	Resistant to detergents and disinfectants (pH 2..12)
Antibac® antibacterial coating (on request)	Reduced cleaning time and costs
Surface coating and food grade lubricants compliant with FDA and NSF requirements	Reliable and direct use in product handling areas with up to 35,000 hours between oil change
High degrees of protection: <ul style="list-style-type: none"> <li>– IP 67 and IP 69K (OGD- H)</li> <li>– IP 65 and IP 67 (OGD- S)</li> </ul>	<ul style="list-style-type: none"> <li>– Unrestricted use in wash down areas</li> <li>– High protection in wash down areas</li> </ul>
<b>In combination with VLT® AutomationDrive FC 302 or VLT® Decentral Drive FCD 302</b>	
Supply voltage 380 ... 500 V +/-10%	Widely usable
Supply frequency 50/60 Hz	Available as central and decentral solution
Output frequency 0 – 250 Hz	Wide speed control range
Operation with or without speed feedback (resolver option)	<ul style="list-style-type: none"> <li>– Open loop operation for typical conveyor applications</li> <li>– Resolver option allows closed loop operation and synchronising/positioning applications</li> </ul>



# Specifications

VLT® OneGearDrive	
Power rating	1.5 – 3.0 kW
Speed max.	3000 RPM
Frequency max.	250 Hz
Current max.	7.2 A
Torque	1.7 Nm/A
Voltage	120 V/1000 rpm
Weight	approx. 28 kg
CSA/UL	on request





# What VLT® is all about

Danfoss VLT Drives is the world leader among dedicated drives providers – and still gaining market share.

## Environmentally responsible

VLT® products are manufactured with respect for the safety and well-being of people and the environment.

All activities are planned and performed taking into account the individual employee, the work environment and the external environment. Production takes place with a minimum of noise, smoke or other pollution and environmentally safe disposal of the products is pre-prepared.

### UN Global Compact

Danfoss has signed the UN Global Compact on social and environmental responsibility and our companies act responsibly towards local societies.

### EU Directives

All factories are certified according to ISO 14001 standard. All products fulfil the EU Directives for General Product Safety and the Machinery directive. Danfoss VLT Drives is, in all product series, implementing the EU Directive concerning Hazardous Substances in Electrical and Electronic Equipment (RoHS) and is designing all new product series according to the EU Directive on Waste Electrical and Electronic Equipment (WEEE).

### Impact on energy savings

One year's energy savings from our annual production of VLT® drives will save the energy equivalent to the energy production from a major power plant. Better process control at the same time improves product quality and reduces waste and wear on equipment.

## Dedicated to drives

Dedication has been a key word since 1968, when Danfoss introduced the world's first mass produced variable speed drive for AC motors – and named it VLT®.

Twenty five hundred employees develop, manufacture, sell and service drives and soft starters in more than one hundred countries, focused only on drives and soft starters.

## Intelligent and innovative

Developers at Danfoss VLT Drives have fully adopted modular principles in development as well as design, production and configuration.

Tomorrow's features are developed in parallel using dedicated technology platforms. This allows the development of all elements to take place in parallel, at the same time reducing time to market and ensuring that customers always enjoy the benefits of the latest features.

## Rely on the experts

We take responsibility for every element of our products. The fact that we develop and produce our own features, hardware, software, power modules, printed circuit boards, and accessories is your guarantee of reliable products.

## Local backup – globally

VLT® motor controllers are operating in applications all over the world and Danfoss VLT Drives' experts located in more than 100 countries are ready to support our customers with application advice and service wherever they may be.

Danfoss VLT Drives experts don't stop until the customer's drive challenges are solved.

