ENGINEERING
TOMORROW

Design Guide

DC Filters

VACON® NXP DC/DC Converter

drives.danfoss.com | VACON®

Contents

1 Introduction

1.1 Purpose of this Design Guide

This design guide is intended for qualified personnel, such as:

- Project and systems engineers.
- Design consultants.
- Application and product specialists.

The design guide provides technical information for the DC filters used in VACON® NXP DC/DC Converter applications. Its purpose is to provide design considerations and planning data for integration of the device into a system. It caters for the selection of the filters for the application in a diversity of installations. Reviewing the detailed product information in the design stage enables developing a well-conceived system with optimal functionality and efficiency.

The filter range is designed for typical Energy Storage systems which is the main application area for DC/DC converters.

1.2 Additional Resources

Other resources are available to understand installation, programming, operation, and options.

- The VACON® NXP DC/DC Converter operating guide provides information about the installation and operation of the VACON® NXP DC/DC Converter application.
- The VACON® NXP DC/DC Converter application guide provides greater detail on how to work with the application software and how to set the parameters of the AC drive modules.
- VACON® NXP Common DC Bus and VACON® NXP Liquid-cooled Common DC Bus user manuals provide detailed information for the installation, commissioning, and operation of the AC drive modules.
- The operating and installation guides for VACON® options give detailed information about specific drive options.

Supplementary publications and manuals are available from Danfoss. See www.danfoss.com for listings.

1.3 Version History

This design guide is regularly reviewed and updated. All suggestions for improvement are welcome.

The original language of this design guide is English.

Table 1: VACON® NXP DC/DC Converter DC Filters Design Guide Version History

Version	Remarks
A	First release

2 Safety

2.1 Safety Notice

These instructions are intended for the use of personnel who are experienced in the installation, operation, and maintenance of power quality filters. Because of the high voltages required by the application, the personnel involved in the installation, operation, and maintenance of these filters must be aware of the necessary safety precautions for this type of equipment. Carefully read the instructions in this manual before installing the DC filter.

The Danfoss DC filter has been run through several demanding factory tests before the delivery. Carefully inspect the package for any damage that may have occurred during the transportation. Follow the instructions for unpacking the DC filter and carefully inspect it for any signs of possible damage. If the installation of this equipment is going to be in the future, cover and store the filter in a clean and dry location.

When the DC Filter has been in storage, before applying power to the filter, make sure that there is no condensation on the internal components of the filter.

2.2 Safety Symbols

The following symbols are used in this guide:

⚠ D A N G E R ⚠

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ W A R N I N G ⚠

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ C A U T I O N ⚠

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

N O T I C E

Indicates information considered important, but not hazard-related (for example, messages relating to property damage).

2.3 Warnings

⚠ D A N G E R ⚠

SHOCK HAZARD FROM TERMINALS

The terminals and components of the filter can be live 5 minutes after the filter is disconnected from the mains. Touching any of the exposed power connectors during operation or while voltage is present can cause death or serious injury.

- Do not touch the terminals when the filter is connected to mains. Before working on the DC filter, wait at least the voltage discharge time stated in the manual for the corresponding DC/DC converter. Use a measuring device to make sure that there is no voltage.

⚠ C A U T I O N ⚠

DAMAGE FROM INSUFFICIENT GROUNDING

Insufficient grounding can damage the DC filter.

- The DC filter must be grounded before switching on the power. To ground the filter, use the terminal marked with the PE symbol. Make sure that the ground connection is clean and all varnish is removed.

⚠ C A U T I O N ⚠

LIFTING HEAVY LOADS

The center of gravity of the unit can be in an unexpected location. Unbalanced loads can fall over or tilt unexpectedly during lifting and transport. Falling loads can cause death, serious injury, or damage to the equipment.

- Take proper lifting precautions:
  Never walk under suspended loads.
  Wear personal protective equipment.
  Observe the weight of the unit and make sure that proper lifting equipment is used.
  Before lifting the load, check the center of gravity.
  Use the lifting holes to lift the filter. Never use the electrical connectors or terminals of the filter for lifting purposes.

⚠ C A U T I O N ⚠

BURN HAZARD FROM HOT SURFACES

The filter surface turns hot during operation.

- Wait for the filter to cool down before touching it.

N O T I C E

DAMAGE FROM LOOSE CONNECTIONS

Loose or improperly secured connections can damage the filter or lead to decreased performance.

- Only a qualified electrician is allowed to perform the electrical installation of the DC filter.

N O T I C E

ELECTROMAGNETIC INTERFERENCE

Noise and EMI from the cables can cause malfunctions in the installation.

- To reduce noise and EMI, and to prevent malfunctions in the installation, use shielded cables:
  Between the DC/DC converter output and DC filter input
  Between DC-filter output and Energy storage input

3 Product Overview

3.1 DC Filter for DC/DC Converter

The DC filter is used as an energy storage and damping element between the DC source and the DC/DC converter.

The filter inductor stores energy and reduces the di/dt slope of the load current. The stored energy is released back to the system with decreasing current.

The DC filter reduces the harmonic content of the load current and keeps it at an acceptable level. The amount of ripple current allowed in the system depends on the type of energy storage.

Sometimes the DC filter consists only of an inductor. In some applications, capacitors are needed, and an LC filter is used.

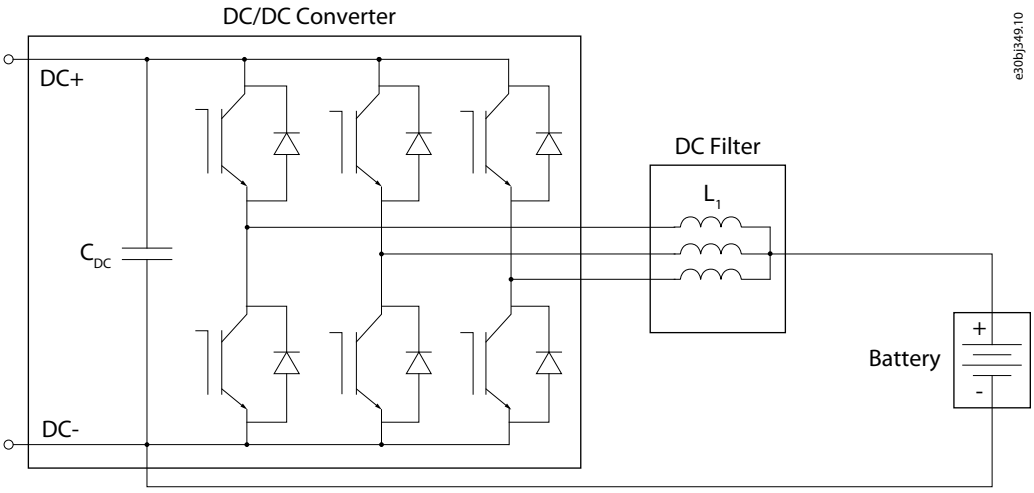

Illustration 1: Example DC/DC Converter Application with a DC Filter

3.2 Voltage and Current Range

The DC filter is designed for 380–690 V AC voltage systems. The voltage span across the DC filter is typically high. The difference between input and output voltage can be as high as 1100 V, that is 1150 V D input and 50 V DC output. Due to the high voltage difference, a high inductance value is required to guarantee proper functionality in all operation points. The DC filters are designed according to a 5 kHz switching frequency.

The current range of the DC filters is 10–1150 A.

3.3 Cooling

The cooling methods used for DC filters:

- Natural convection (AN)
- Forced air cooling (AF)
- Liquid cooling

For the cooling method used for each filter type, see 7.4 Technical Data.

3.4 DC Filter Types

An L-type inductor is used as default and the same inductor can be used as the inductor part for an LC filter. A typical filter solution consists of three 1-phase inductors which are installed at the outputs of the individual phases of the DC/DC converter.

Note: The type codes are for filter assemblies, which include three 1-phase inductors. For example, LDC-0092-5-0-APt consist of 3 x 92 A, 750 V DC inductors.

Example

The type code can have this format, for example:

LDC-0092-5-0-APtX

Table 2: Type Code Description

Code	Description
LDC	**Filter type**

Code	Description
	LDC = DC inductor
0092	**Maximum current [A]**
5	**Nominal voltage** 2 = 200 V 5 = 500 V 6 = 690 V
0	**Protection rating** 0 = IP00 2 = IP21 5 = IP54
A	**Cooling method** A = Natural convection B = Forced air cooling C = Liquid cooling
Pt	**Temperature measurement type** Pt = Pt100 temperature sensor Tr = Thermal relay
X	**Reserved for variants**

4 Selection

4.1 Selecting the DC Filter

Two operating conditions are given for filter selection in the tables, one at high voltage and another at low voltage. The high voltage refers to the maximum storage voltage in the application. The low voltage is the voltage level at 50% duty cycle of the drive, which is thermally the worst case condition for the DC filter.

The filter selection can differ depending on the energy storage requirements. The selections in the tables are recommendations. The selection is typically made according to the maximum output current at low voltage.

4.2 DC Filter Selection, Air-cooling

Table 3: DC Filter Selection for Air-cooled 500 V Drives According to Energy Storage Requirements

Drive enclosure size	Drive type	High Voltage @ 750 V DC, f_s = 5 kHz		Low Voltage @ max current, f_s = 5 kHz	
		I_{out} nominal [A]	Filter selection	I_{out} max [A]	Filter selection
FR4	NXI_0004 5	< 4.8	LDC-0010-6-0-Axx	8	LDC-0010-6-0-Axx
	NXI_0009 5	< 10		18	
	NXI_0012 5	< 13.4		24	
FR6	NXI_0016	< 18	LDC-0010-6-0-Axx	32	LDC-0020-5-0-Axx
	NXI_0022 5	< 26		44	
	NXI_0031 5	< 35	LDC-0020-5-0-Axx	62	
	NXI_0038 5	< 43		76	LDC-0030-6-0-Axx
	NXI_0045 5	< 51		90	
FR7	NXI_0061 5	< 69	LDC-0030-6-0-Axx	122	LDC-0050-6-0-Axx
	NXI_0072 5	< 82		144	
	NXI_0087 5	< 100	LDC-0050-6-0-Axx	174	LDC-0092-5-0-Axx
	NXI_0105 5	< 121		210	
FR8	NXI_0140 5	< 161	LDC-0092-5-0-Axx	280	
FI9	NXI_0168 5	< 196		336	LDC-0170-6-0-Axx
	NXI_0205 5	< 239		410	
	NXI_0261 5	< 304	LDC-0170-6-0-Axx	500	
	NXI_0300 5	< 350		500	
FI10	NXI_0385 5	< 454		770	LDC-0270-5-0-Axx
	NXI_0460 5	< 542	LDC-0270-5-0-Axx	920	LDC-0420-5-0-Axx or LDC-0400-6-0-Bxx
	NXI_0520 5	< 613		930	
FI12	NXI_0590 5	< 695	2 x LDC-0170-6-0-Axx	1180	2 x LDC-0270-5-0-Axx
	NXI_0650 5	< 766		1300	
	NXI_0730 5	< 870		1460	
	NXI_0820 5	< 977		1640	

Drive enclosure size	Drive type	High Voltage @ 750 V DC, f_s = 5 kHz		Low Voltage @ max current, f_s = 5 kHz	
		I_{out} nominal [A]	Filter selection	I_{out} max [A]	Filter selection
	NXI_0920 5	< 1096	2 x LDC-0270-5-0-Axx	1750	2 x LDC-0400-6-0-Bxx
	NXI_1030 5	< 1227		1750	
FI13	NXI_1150 5	< 1370	LDC-0540-6-0-Bxx	2300	LDC-0900-5-0-Bxx
	NXI_1300 5	< 1549		2550	
	NXI_1450 5	< 1727	LDC-0900-5-0-Bxx	2550	
FI14	NXI_1770 5	< 2109	2 x LDC-0400-6-0-Bxx	3540	2 x LDC-0900-5-0-Bxx
	NXI_2150 5	< 2561	2 x LDC-0540-6-0-Bxx	4300	
	NXI_2700 5	< 3217		5000	

Table 4: DC Filter Selection for Air-cooled 690 V Drives According to Energy Storage Requirements

Drive enclosure size	Drive type	High Voltage @ 1025 V DC, f_s = 5 kHz		Low Voltage @ max current, f_s = 5 kHz	
		I_{out} nominal [A]	Filter selection	I_{out} max [A]	Filter selection
FR6	NXI_0010 6	< 11.1	LDC-0010-6-0-Axx	14.6	LDC-0010-6-0-Axx
	NXI_0013 6	< 14.6		19	
	NXI_0018 6	< 20.3		26.3	
	NXI_0022 6	< 25		32	
	NXI_0027 6	< 31		39	LDC-0020-5-0-Axx
	NXI_0034 6	< 39	LDC-0020-5-0-Axx	49	
FR7	NXI_0041 6	< 47		60	
	NXI_0052 6	< 60		62	
FR8	NXI_0062 6	< 71	LDC-0030-6-0-Axx	90	LDC-0030-6-0-Axx
	NXI_0080 6	< 92		117	LDC-0050-6-0-Axx
	NXI_0100 6	< 117	LDC-0050-6-0-Axx	135	
FI9	NXI_0125 6	< 146		183	LDC-0092-6-0-Axx
	NXI_0144 6	< 168	LDC-0092-6-0-Axx	210	
	NXI_0170 6	< 198		248	
	NXI_0208 6	< 245		250	
FI10	NXI_0261 6	< 308	LDC-0170-6-0-Axx	382	LDC-0170-6-0-Axx
	NXI_0325 6	< 383		475	
	NXI_0385 6	< 454		490	
	NXI_0416 6	< 490		490	
FI12	NXI_0460 6	< 548	2 x LDC-0092-6-0-Axx	673	2 x LDC-0170-6-0-Axx

Drive enclosure size	Drive type	High Voltage @ 1025 V DC, f_s = 5 kHz		Low Voltage @ max current, f_s = 5 kHz	
		I_{out} nominal [A]	Filter selection	I_{out} max [A]	Filter selection
	NXI_0502 6	< 598	2 x LDC-0170-6-0-Axx	734	
	NXI_0590 6	< 703		863	
	NXI_0650 6	< 775		951	
	NXI_0750 6	< 894		977	
	NXI_0820 6	< 977		977	
FI13	NXI_0920 6	< 1102	LDC-0400-6-0-Bxx	1346	LDC-0540-6-0-Bxx
	NXI_1030 6	< 1234	LDC-0540-6-0-Bxx	1414	
	NXI_1180 6	< 1414		1414	
FI14	NXI_1500 6	< 1797	2 x LDC-0400-6-0-Bxx	2196	2 x LDC-0400-6-0-Bxx
	NXI_1900 6	< 2276		2675	2 x LDC-0540-6-0-Bxx
	NXI_2250 6	< 2696	2 x LDC-0540-6-0-Bxx	2675	

4.3 DC Filter Selection, Liquid-cooling

Table 5: DC Filter Selection for Liquid-cooled 500 V Drives According to Energy Storage Requirements

Drive enclosure size	Drive type	High Voltage @ 750 V DC, f_s = 5 kHz		Low Voltage @ max current, f_s = 5 kHz	
		I_{out} nominal [A]	Filter selection	I_{out} max [A]	Filter selection
CH5	NXP_0168 5	< 195	LDC-0160-6-0-Cxx	336	LDC-0160-6-0-Cxx
	NXP_0205 5	< 238		410	
	NXP_0261 5	< 306		522	LDC-0340-6-0-Cxx
CH61	NXP_0300 5	< 352		600	
	NXP_0385 5	< 456		770	
CH62	NXP_0460 5	< 545	LDC-0340-6-0-Cxx	920	
	NXP_0520 5	< 616		1040	
	NXP_0590 5	< 699		1180	LDC-0700-6-0-Cxx
	NXP_0650 5	< 770		1300	
	NXP_0730 5	< 865		1460	
CH63	NXP_0820 5	< 972		1640	
	NXP_0920 5	< 1090	LDC-0700-6-0-Cxx	1840	
	NXP_1030 5	< 1221		2060	
	NXP_1150 5	< 1378		2200	
CH64	NXP_1370 5	< 1642		2740	LDC-1150-6-0-Cxx

Drive enclosure size	Drive type	High Voltage @ 750 V DC, f_s = 5 kHz		Low Voltage @ max current, f_s = 5 kHz	
		I_{out} nominal [A]	Filter selection	I_{out} max [A]	Filter selection
	NXP_1640 5	< 1965		3280	
	NXP_2060 5	< 2469	LDC-1150-6-0-Cxx	4120	2 x LDC-0700-6-0-Cxx
	NXP_2300 5	< 2756		4200	

Table 6: DC Filter Selection for Liquid-cooled 690 V Drives According to Energy Storage Requirements

Enclosure size	Drive	High Voltage @ 1025 V DC, f_s = 5 kHz		Low Voltage @ max current, f_s = 5 kHz	
		I_{out} nominal [A]	Filter selection	I_{out} max [A]	Filter selection
CH61	NXP_0170 6	< 199	LDC-0160-6-0-Cxx	340	LDC-0160-6-0-Cxx
	NXP_0208 6	< 244		416	
	NXP_0261 6	< 309		500	
CH62	NXP_0325 6	< 385		650	LDC-0340-6-0-Cxx
	NXP_0385 6	< 456		770	
	NXP_0416 6	< 493		832	
	NXP_0460 6	< 545	LDC-0340-6-0-Cxx	920	
	NXP_0502 6	< 595		975	
CH63	NXP_0590 6	< 699		1180	LDC-0700-6-0-Cxx
	NXP_0650 6	< 770		1300	
	NXP_0750 6	< 889		1500	
CH64	NXP_0820 6	< 972		1640	
	NXP_0920 6	< 1090	LDC-0700-6-0-Cxx	1840	
	NXP_1030 6	< 1221		2060	
	NXP_1180 6	< 1414		2360	LDC-1150-6-0-Cxx
	NXP_1300 6	< 1558		2600	
	NXP_1500 6	< 1798		3000	
	NXP_1700 6	< 2040		3400	

5 Installation Guidelines

5.1 Cabling

The DC filter is connected between the DC/DC converter and the DC source. Three L-type inductors are required for a typical DC/DC converter application. The order code for the listed L-type DC filters includes three 1-phase inductors.

For EMI reasons, keep the cable length between the DC source and DC/DC converter as short as possible. Sometimes, the parasitic components of the source and cable can resonate with the DC filter inductors, causing instability in the control. The resonance can be avoided by adding an external filtering capacitor (C) to the output of the DC filter. The formed LC filter resonance must be well below the switching frequency.

To reduce the radiation of electromagnetic noise into the environment and to prevent malfunctions in the installation, use shielded cables.

If unshielded cables are used, make sure that the installation minimizes the possibility of cross-coupling with other cables that are carrying sensitive signals. This can be achieved, for example, by cable routing.

Follow the instructions for cable size selection for the DC/DC converter.

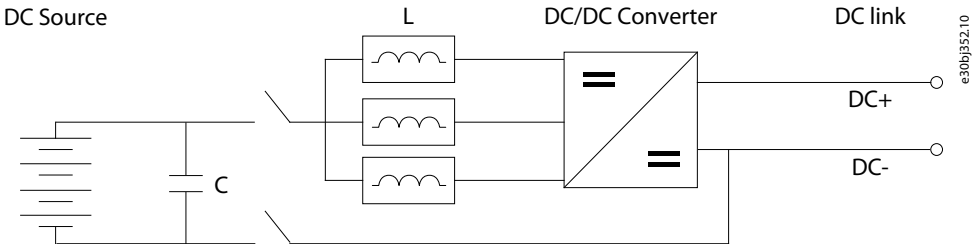

Illustration 2: DC Filter Connections

The L-type inductors have two winding poles connected in series. The terminals are at the top of the 1-phase inductors, and are marked as shown in Illustration 3.

- 10–30 A inductors have terminal connectors.
- 50–1150 A inductors have busbar terminals.

DC filter terminal sizes and mounting specifications are given in 7.6 Terminal and Torque Specifications.

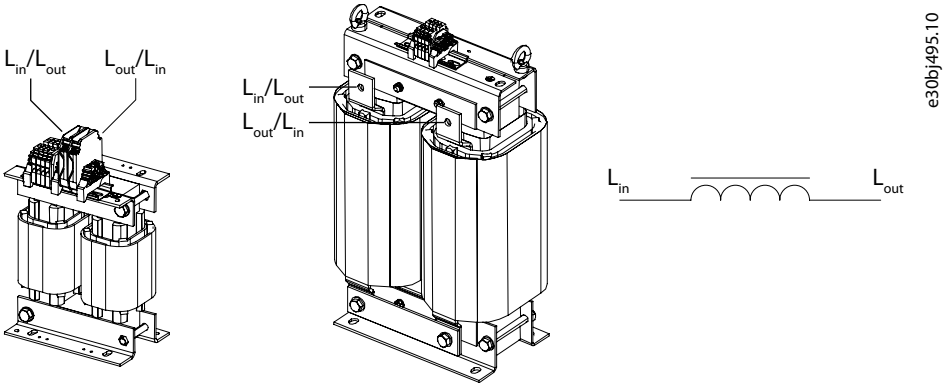

Illustration 3: DC Filter Terminals

5.2 Thermal Protection

Depending on requirements, the DC filter can be selected with built-in Pt100 temperature sensors or thermal relays (normal closed). If temperature level monitoring is required, select the Pt100 type DC filter. The thermal relay type protection is used for indication of alarm and fault limits of the DC filter. The temperature sensors are mounted in all three separate inductors. The wiring of the temperature sensors is shown in Illustration 4.

The option board OPT-BH is required for the Pt100 sensors. Each sensor is wired to its own channel. Thermal relay type sensors can be connected to any digital input of the drive. One digital input is used for the alarm signal and another for the fault signal by wiring the sensors in series. The auxiliary power input is the same for both the alarm and fault sensors.

Switching temperatures of the thermal relays depend on the DC filter type. See the datasheet of the DC filter for specific values. The temperature limits are:

- Alarm = 125–140 °C
- Fault = 140–155 °C

The recommended temperature limits for Pt100 sensors are the same as the switching temperatures of the thermal relays.

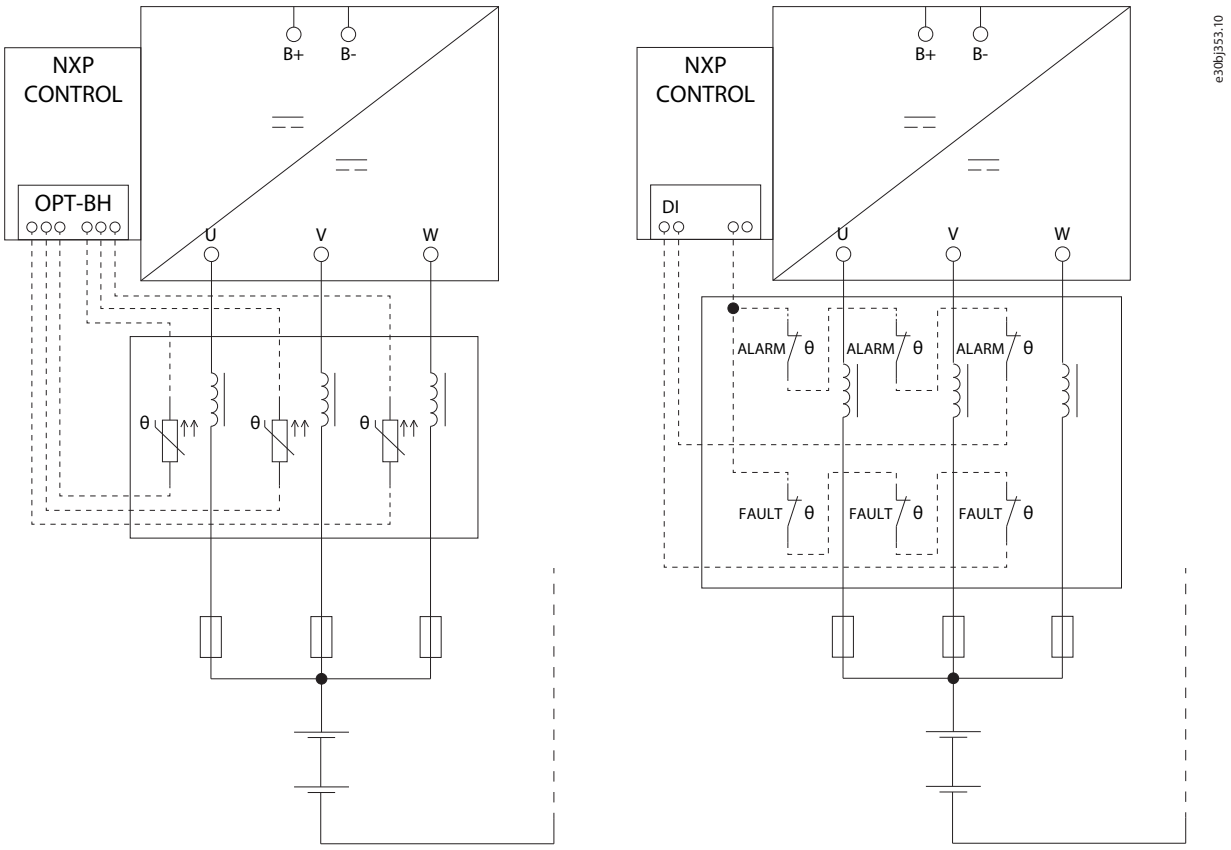

Illustration 4: DC Filter Wiring Diagrams with PT100 (Left) and Thermal Relays (Right)

The thermal sensors are connected to 4 mm^2 feedthrough terminals.

Pt100 temperature sensors:

- Connected between terminals 1 and 2.

Thermal relays:

- Alarm signal connected to terminals 1 and 2.
- Fault signal connected to terminals 3 and 4.

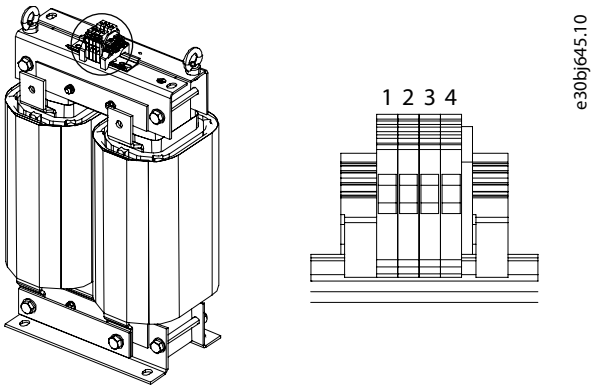

Illustration 5: Terminals for Thermal Protection

5.3 Mounting

The DC filter is typically mounted inside a cabinet next to the DC/DC converter. If there is not enough space for the side-by-side mounting, install the inductors on top of each other. See the example in Illustration 6. Use the lifting eyes or holes to mount the inductors.

Note: In any environment where vibration is present, mount the filters with top and bottom clamps for reliable installation.

The distance from the cabinet walls to the inductors must be at least 20 mm.

See the dimensions of the DC filters in 7.5 Dimensions.

To avoid excess temperature rise of the top mounted inductors in the cabinet installation, sufficient airflow through the inductors must be guaranteed. To guide the airflow through the inductors, use air baffles with an external cooling fan as shown in Illustration 6.

The power losses of filters in the low current range (10–50 A) are typically low enough to install the inductors without extra air baffles and fan. In the filter range above 50 A, the cooling arrangement must be implemented.

The cabinet cooling must be guaranteed also with liquid-cooled DC filters. Typically 30–40% of the power losses from the filter are transferred to air and 60–70% into liquid.

Note: If a forced air-cooled filter is used, the cooling fan or blower must be provided separately.

See the specifications for the cooling system in 7.3 Cooling System Requirements.

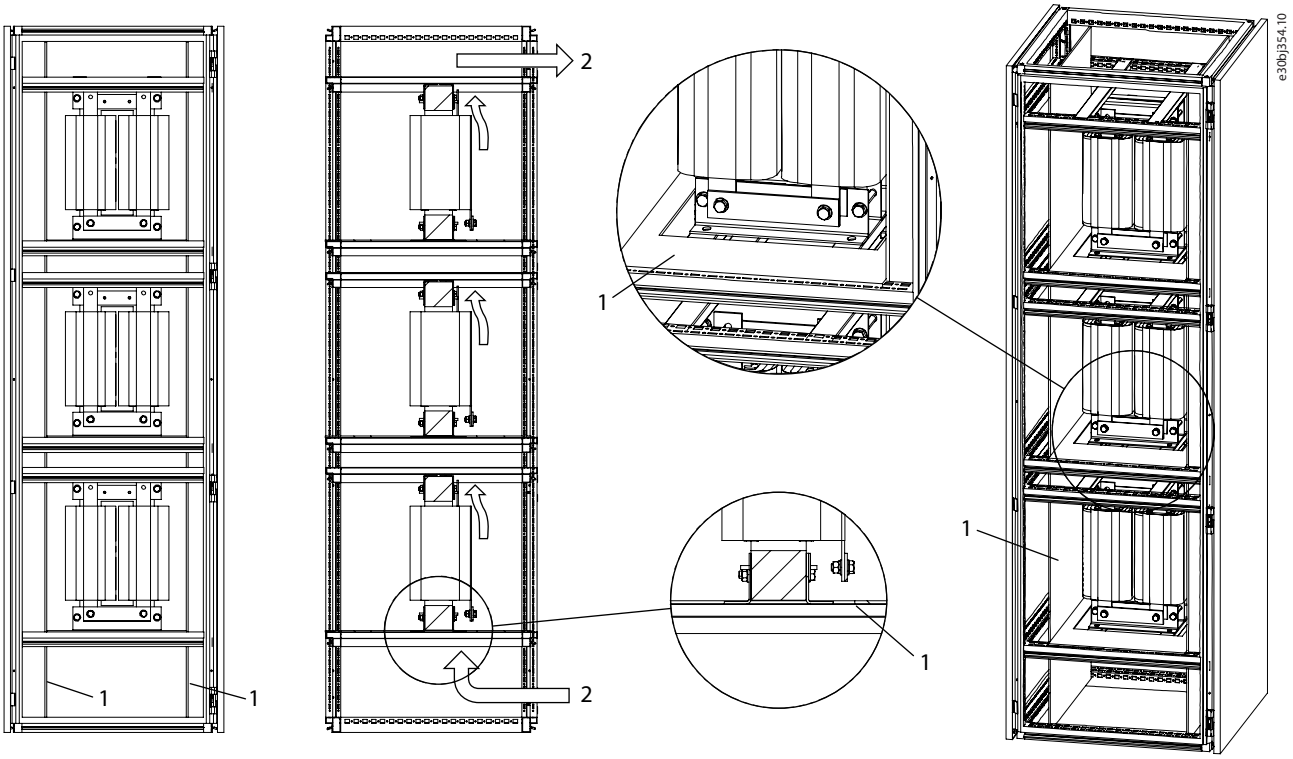

Illustration 6: DC Filter Mounting Example

1	Air guides
2	Airflow

6 Maintenance

6.1 Preventive Maintenance Recommendations

To maintain trouble-free operation of the DC filter, environmental conditions, load, cooling, and voltage levels have to be within the specifications given for the DC filter.

Regular maintenance is recommended to ensure long lifetime and undisturbed operation. It is also recommended, as a good service practice, to record a maintenance log with counter values, date, and time describing the maintenance and service actions.

At least the following maintenance actions must be taken after one year from installation and thereafter every five years:

- **Visual inspection**: Check for the unusual, for example, for signs of overheating, aging, corrosion, and for dusty and damaged components.
- **Cleaning**: Use compressed air or a vacuum cleaner to remove dust and dirt. To avoid damaging sensitive insulations, handle the wiring area of the cabinet with care. **Do not use** liquids for the cleaning.
- **Tightening torques**: Check that the tightening torques of the cable connections are according to the specifications. See 7.6 Terminal and Torque Specifications.

6.2 Recommended Disposal

When the filter reaches the end of its service life, its primary components can be recycled.

Contact your local Danfoss office for further information on environmental aspects and recycling instructions for professional recyclers. End of life treatment must follow international and local regulations.

This symbol on the product indicates that it must not be disposed of as household waste. Do not dispose of equipment containing electrical components together with domestic waste.

It must be handed over to the applicable take-back scheme for the recycling of electrical and electronic equipment.

- Dispose of the product through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

7 Specifications

7.1 General Specifications

Table 7: General Specifications for DC Filters

Item	Specification
Nominal voltage	750 V DC (Voltage range: 0–1200 V DC)
	1025 V DC (Voltage range: 0–1200 V DC)
Switching frequency	5 kHz
Power loss	See 7.4 Technical Data
Overload capacity	1.5 x I_{NOM} 1 min overload/10 min total cycle, RMS = I_{NOM} overcycle
Protection level	IP00
Insulation class	Class H (180 °C)
Standards	IEC61800-5-1, UL61800-5-1
	REACH, RoHS 3, China RoHS, IEC 62474
	IEC60721-3-3
	IEC60076-6
	UL 1741

7.2 Environmental Data

Table 8: Environmental Data for the DC Filters

Item	Specification
Temperature during operation	-10…+50 °C, full performance +50…+60 °C, limited performance Current derating of 2% for each increased degree Celsius.
Temperature during storage and transportation	-40…+70 °C
Relative humidity (during operation)	0–95%, no condensation
Pollution degree (EN61800-5-1)	PD 3
Air quality Contamination levels (IEC 60721-3-3)	Chemically active substances: 3C2 Mechanically active substances: 3S2
Altitude (during operation)	Maximum 2000 m above sea level. Current derating according to equivalent DC/DC converter.

7.3 Cooling System Requirements

Table 9: Requirements for Air Cooling

Cooling type	Requirement
Natural convection	Sufficient airflow through inductors, when mounted on top of each other.
Forced air cooling	Nominal airflow 3 m/s.
	External fan/blower is required.

Table 10: Requirements for Liquid Cooling

Requirement	Specification
Coolant flow rate	6 l/min
Maximum operating system pressure	6 bar
Maximum pressure	Maximum peak 30 bar/60 s according to UL61800-5-1
Pressure drop (at flow rate 6 l/min)	0.2 bar
Nominal temperature of coolant	5–45 °C
Maximum temperature of coolant	70 °C
Allowed coolants	Drinking water according to 98/83/EY Demineralized water Non-corrosive Propylene glycol or ethylene glycol mixture with the preceding water qualities
Cooling system connections	Following the drive system connections
Cooling system materials	Stainless steel: AISI304, AISI316 Aluminum: Corrosion resistant Glycol-tolerant plastics **Not allowed:** Copper, brass, PVC

7.4 Technical Data

Some of the DC filters with rated voltage 750 V DC can be used at nominal 1025 V DC system voltage due to the high impedance value. See the tables in 4 Selection.

Table 11: Technical Data for Air-cooled DC Filters

Code Number	Filter type code	Manufacturer part code	Rated voltage [V DC]	Cooling	Nominal current at 50 °C [A]	Power loss at 20 °C [W]	Protection rating	Switching frequency [kHz]
181B5954	LDC-0010-6-0-APt	40277-SET-PT100	1025	AN	10	60	IP00	5
181B5955	LDC-0010-6-0-ATr	40277-SET-THERMIK						
181B5956	LDC-0020-5-0-APt	40260-SET-PT100	750	AN	20	110	IP00	5
181B5957	LDC-0020-5-0-ATr	40260-SET-THERMIK						
181B5958	LDC-0030-6-0-APt	56606-SET-PT100	1025	AN	30	200	IP00	5

Code Number	Filter type code	Manufacturer part code	Rated voltage [V DC]	Cooling	Nominal current at 50 °C [A]	Power loss at 20 °C [W]	Protection rating	Switching frequency [kHz]
181B5959	LDC-0030-6-0-ATr	56606-SET-THER-MIK						
181B5960	LDC-0050-6-0-APt	36326-SET-PT100	1025	AN	50	250	IP00	5
181B5961	LDC-0050-6-0-ATr	36326-SET-THER-MIK						
181B5962	LDC-0092-5-0-APt	36327-SET-PT100	750	AN	92	340	IP00	5
181B5963	LDC-0092-5-0-ATr	36327-SET-THER-MIK						
181B5966	LDC-0092-6-0-APt	56771-SET-PT100	1025	AN	92	330	IP00	5
181B5967	LDC-0092-6-0-ATr	56771-SET-THER-MIK						
181B5964	LDC-0092-5-0-BPt	36584-SET-PT100	750	AF	92	300	IP00	5
181B5965	LDC-0092-5-0-BTr	36584-SET-THER-MIK						
181B5970	LDC-0170-6-0-APt	37404-SET-PT100	1025	AN	170	450	IP00	5
181B5971	LDC-0170-6-0-ATr	37404-SET-THER-MIK						
181B5972	LDC-0270-5-0-APt	38739-SET-PT100	750	AN	270	460	IP00	5
181B5973	LDC-0270-5-0-ATr	38739-SET-THER-MIK						
181B5976	LDC-0400-6-0-APt	38331-SET-PT100	1025	AN	400	840	IP00	5
181B5977	LDC-0400-6-0-ATr	38331-SET-THER-MIK						
181B5978	LDC-0400-6-0-BPt	38349-SET-PT100	1025	AF	400	1100	IP00	5
181B5979	LDC-0400-6-0-BTr	38349-SET-THER-MIK						
181B5980	LDC-0420-5-0-APt	39023-SET-PT100	750	AN	420	750	IP00	5
181B5981	LDC-0420-5-0-ATr	39023-SET-THER-MIK						
181B5982	LDC-0540-6-0-BPt	44079-SET-PT100	1025	AF	540	1300	IP00	5
181B5983	LDC-0540-6-0-BTr	44079-SET-THER-MIK						
181B5986	LDC-0900-5-0-BPt	53552-SET-PT100	750	AF	900	1900	IP00	5
181B5987	LDC-0900-5-0-BTr	53552-SET-THER-MIK						

Table 12: Technical Data for Liquid-cooled DC Filters

Code Number	Filter type code	Manufacturer part code	Rated voltage [V DC]	Cooling	Nominal current at liquid temperature 45 °C [A]	Power loss at liquid temperature 45 °C [W]	Protection rating	Switching frequency [kHz]
181B5968	LDC-0160-6-0-CPt	41787-SET-PT100	1025	Liquid	160	600	IP00	5
181B5969	LDC-0160-6-0-CTr	41787-SET-THERMIK						
181B5974	LDC-0340-6-0-CPt	36858-SET-PT100	1025	Liquid	340	1100	IP00	5
181B5975	LDC-0340-6-0-CTr	36858-SET-THERMIK						
181B5984	LDC-0700-6-0-CPt	38175-SET-PT100	1025	Liquid	700	2200	IP00	5
181B5985	LDC-0700-6-0-CTr	38175-SET-THERMIK						
181B5988	LDC-1150-6-0-CPt	36859-SET-PT100	1025	Liquid	1134	2700	IP00	5
181B5989	LDC-1150-6-0-CTr	36859-SET-THERMIK						

7.5 Dimensions

The dimensions in Table 13 refer to drawings shown in Illustration 7, Illustration 8, and Illustration 9. Details of the terminal connections can be found in the mechanical drawing of the specific filter.

Table 13: Dimensions of the 1-phase Inductors

Filter type code	Drawing	Dimensions								Weight [kg]
		A	B	C	D	E	F	G	H	
LDC-0010-6-0-APt	Illustration 7	154±2	116	271±5	100	100	69	7x14	–	8
LDC-0010-6-0-ATr										
LDC-0020-5-0-APt		154±2	129	329±5	100	100	69	7x14	–	10
LDC-0020-5-0-ATr										
LDC-0030-6-0-APt		158±5	141	299±3	100	100	69	7x14	–	14
LDC-0030-6-0-ATr										
LDC-0050-6-0-APt	Illustration 8	260±5	139±5	271±3	96	155	80	9	–	17
LDC-0050-6-0-ATr										
LDC-0092-5-0-APt		303±10	161±5	269±5	96	185	80	9	–	20
LDC-0092-5-0-ATr										
LDC-0092-6-0-APt		305±5	168±3	339±5	96	185	80	9	–	27
LDC-0092-6-0-ATr										

Filter type code	Drawing	Dimensions								Weight [kg]
		A	B	C	D	E	F	G	H	
LDC-0092-5-0-BPt		224±10	128±10	250±5	82	125	66	9	–	10
LDC-0092-5-0-BTr										
LDC-0170-6-0-APt		286±10	172±10	493±5	154	210	118	11x16	–	54
LDC-0170-6-0-ATr										
LDC-0270-5-0-APt		277±10	167±5	470±5	154	210	118	11x17	–	58
LDC-0270-5-0-ATr										
LDC-0400-6-0-APt		373±10	290±10	755±5	270	200	228	11x21	–	236
LDC-0400-6-0-ATr										
LDC-0400-6-0-BPt		325±10	203±10	475±5	154	210	118	11x17	–	64
LDC-0400-6-0-BTr										
LDC-0420-5-0-APt		308±10	273±10	587±7	252	198	220	11x21	–	130
LDC-0420-5-0-APt										
LDC-0540-6-0-BPt		306±10	287±7	560±7	252	198	220	11x21	–	123
LDC-0540-6-0-BTr										
LDC-0900-5-0-BPt		276±10	240±5	484±5	186	210	150	11x16	–	80
LDC-0900-5-0-BTr										
LDC-0160-6-0-CPt	Illustration 9	345±5	213±10	397±5	172	238	148	11	176	48
LDC-0160-6-0-CTr										
LDC-0340-6-0-CPt		406±5	200±4	447±5	175	298	145	11	210	80
LDC-0340-6-0-CTr										
LDC-0700-6-0-CPt		466±5	231±5	503±5	200	358	170±3	11	250	119
LDC-0700-6-0-CTr										
LDC-1150-6-0-CPt		466±5	260±5	557±5	200	358	170	11	250	137
LDC-1150-6-0-CTr										

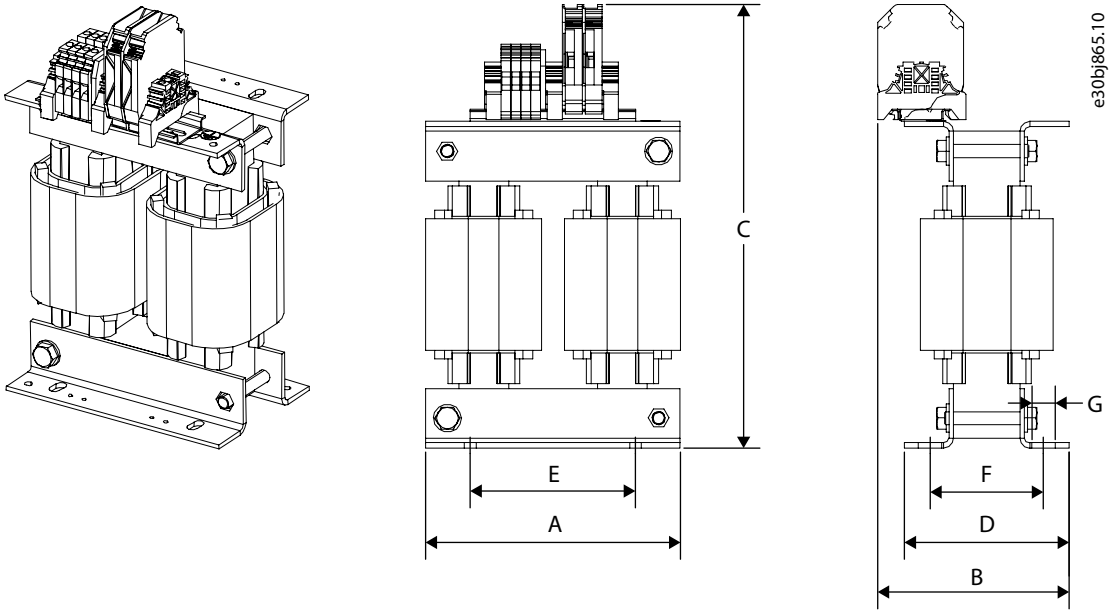

Illustration 7: Dimensions of the Air-cooled Inductors, 10–30 A

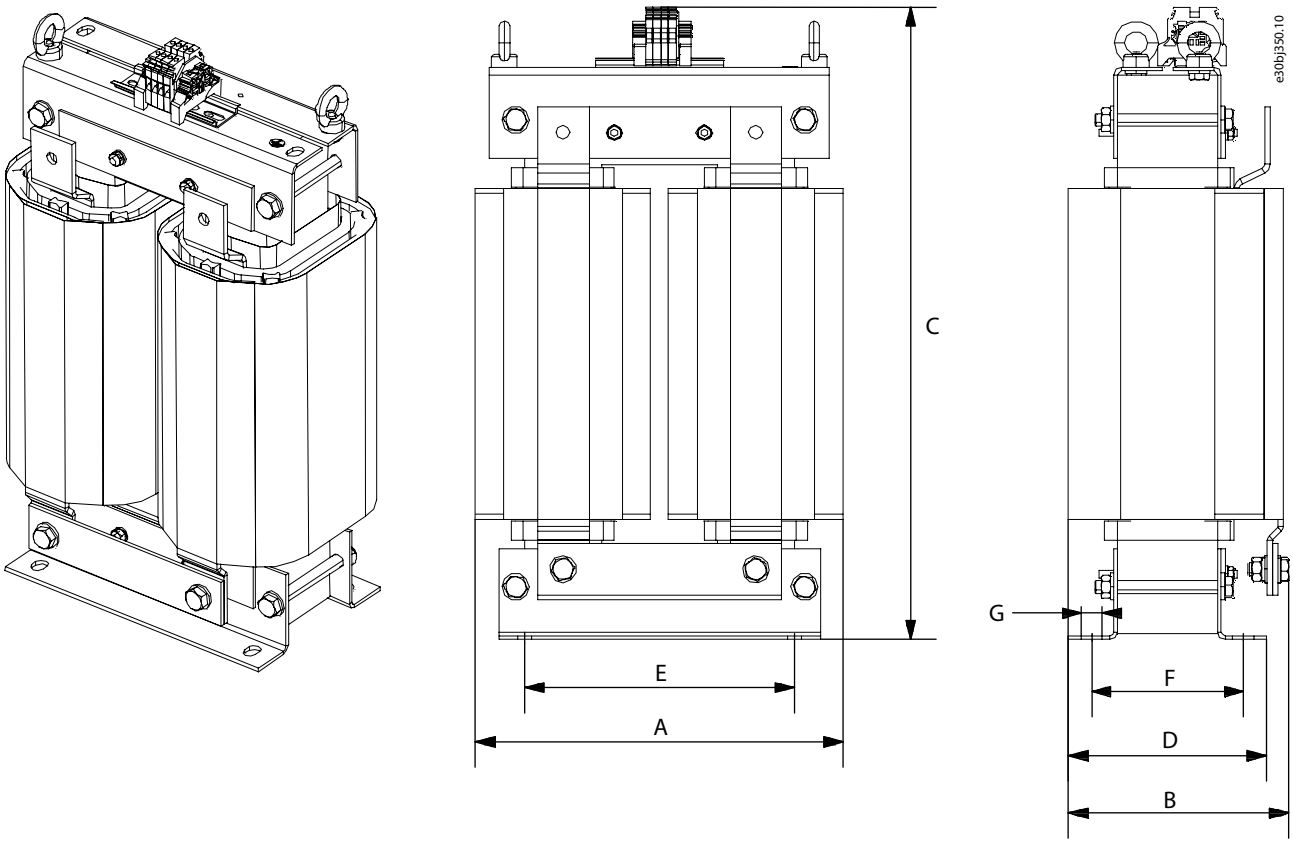

Illustration 8: Dimensions of the Air-cooled Inductors, >30 A

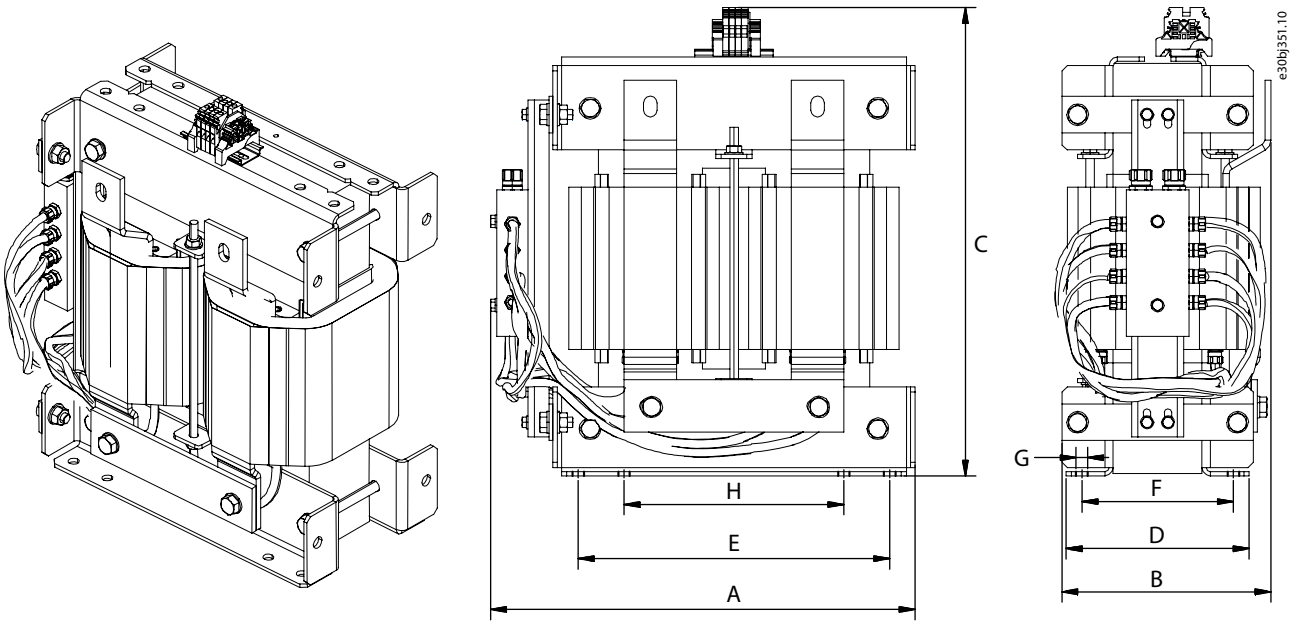

Illustration 9: Dimensions of the Liquid-cooled Inductors

7.6 Terminal and Torque Specifications

Table 14: DC Filter Terminal Sizes and Tightening Torques

Filter type code	Connection size		Connection Torque [Nm]		Mounting location
	Terminal	Grounding	Terminal	Grounding	
LDC-0010-6-0-Axx	≤ 6 mm^2	M6	1.8	9	Base
LDC-0020-5-0-Axx	≤ 6 mm^2	M6	1.8	9	Base
LDC-0030-6-0-Axx	≤ 6 mm^2	M6	1.8	9	Base
LDC-0050-6-0-Axx	Busbar 1 x D9, M8	M8	20	20	Base
LDC-0092-5-0-Axx	Busbar 1 x D9, M8	M8	20	20	Base
LDC-0092-6-0-Axx	Busbar 1 x D9, M8	M8	20	20	Base
LDC-0092-5-0-Bxx	Busbar 1 x D9, M8	M8	20	20	Base
LDC-0170-6-0-Axx	Busbar 1 x D11, M10	M10	40	40	Base
LDC-0270-5-0-Axx	Busbar 1 x D11, M10	M10	40	40	Base
LDC-0400-6-0-Axx	Busbar 1 x D11, M10	M10	40	40	Base
LDC-0400-6-0-Bxx	Busbar 1 x D11, M10	M10	40	40	Base
LDC-0420-5-0-Axx	Busbar 1 x D13, M12	M10	70	40	Base
LDC-0540-6-0-Bxx	Busbar 1 x D13, M12	M10	70	40	Base
LDC-0900-5-0-Bxx	Busbar 2 x D13, 2 x M12	M10	70	40	Base
LDC-0160-6-0-Cxx	Busbar 1 x D9, M8	M10	20	40	Base

Filter type code	Connection size		Connection Torque [Nm]		Mounting location
	Terminal	Grounding	Terminal	Grounding	
LDC-0340-6-0-Cxx	Busbar D(13x20), M12	M10	70	40	Base
LDC-0700-6-0-Cxx	Busbar D(13x20), M12	M10	70	40	Base
LDC-1150-6-0-Cxx	Busbar D(13x20), M12	M10	70	40	Base

Index

ENGINEERING
TOMORROW

Vacon Ltd, Member of the
Danfoss Group
Runsorintie 7
FIN-65380 Vaasa
www.danfoss.com

Danfoss A/S © 2023.01

172F4785A

AJ377845348678en-000101 / 172F4785