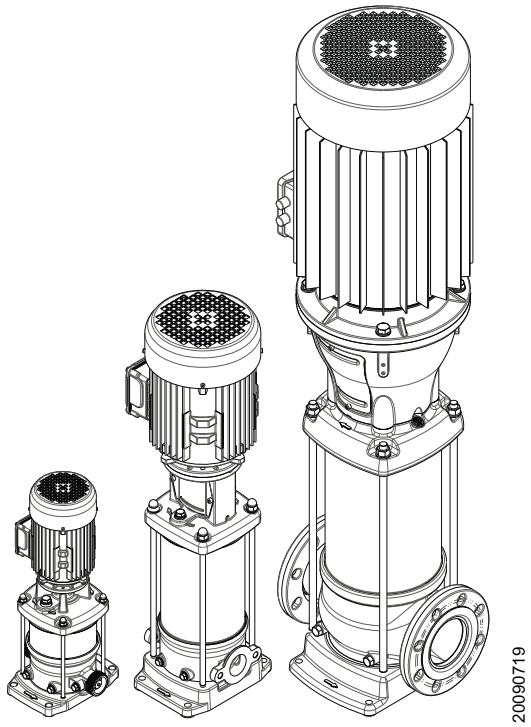
1 Pump introduction

1.1 General

The vertical, single or multi stage centrifugal pump series are designed for pumping clean, or lightly aggressive, watery mediums.
Suction and discharge of the pump are in-line, making the pump easy to install.
The hydraulic assembly is driven by an electric motor.
All hydraulic parts of the pump are made of stainless steel.
The vertical, multi-stage centrifugal DPV pumps are produced by DP-Pumps.



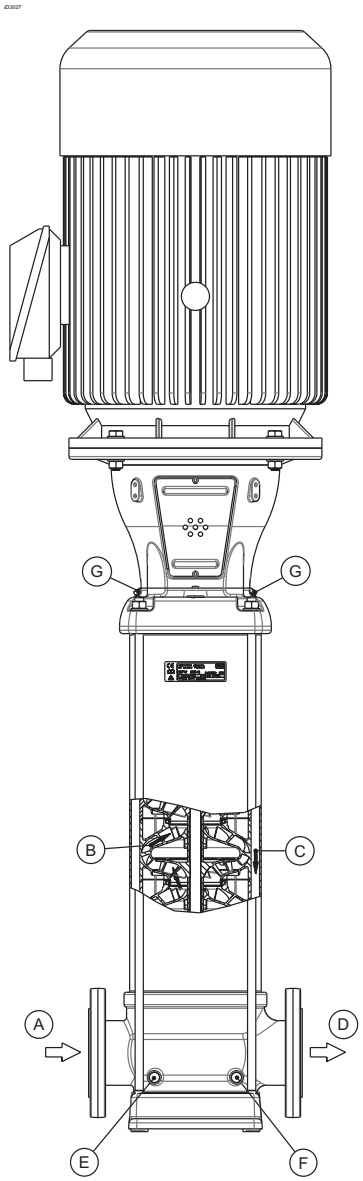
DPV2,4,6 B | DPV10,15 B | DPV 85 B

1.2 Model key

Table 1: Model key Example DPVSF85/3-1 B

	DP	VS	F	85	/3	-1	B	
Label	DP							Product Label
Material/Con-struction		VC						Cast Iron pump foot and top bracket hydr. 1.4301 / AISI 304
		V						All wetted parts Stainless Steel 1.4301 / AISI 304
		VM						All wetted parts Stainless Steel 1.4301 / AISI 304 with closed coupled motor
		VS						All wetted parts Stainless Steel 1.4401 / AISI 316
Connections			E					Male thread (with non-return valve insert)
								Oval flange with female thread
			F					Round flange
			V					Victaulic connections
			T					Tri-clamp connections
				85				Capacity in m^3/h at $Q_{.opt.}$
					/3			Number of stages
					/3	-1		Number of stages of which one stage with reduced head
							B	Design version

1.3 Operation



20080190-A/27022008

Figure 1: DPVF 85

During centrifugal operation of the pump an negative pressure is created at the inlet of the impeller. This underpressure enables the medium to enter the pump at the suction connection (A).
Every stage (B) consists of an impeller and diffuser. The passage of this stage determines the capacity of the pump. The diameter of the stages is related to the centrifugal forces and its “stage pressure”: the more stages, the more pressure.

This total capacity and raised pressure will be guided to the outside of the pump, between the pump stages and the outer sleeve (C) and the medium will leave the pump at the discharge connection (D).

1.4 Measuring, draining and venting

The pump is provided with plugs for measuring, draining and venting.
Connection (E) is meant to drain the inlet part of the pump. Or to measure the inlet / suction pressure using a G ¼ connection.
Connection (F) is meant to drain the outlet part of the pump. Or to measure the discharge pressure using a G ¼ connection.
Connections (G) are meant to vent the pump system when the pump is not in operation. Or to measure the discharge pressure of the pump using a G 3/8 connection.

1.5 Working range

The working range is depending on the application and a combination of pressure and temperature For specific and detailed limits advice the working ranges are described in the chapter 1.8Modular selection.
The overall working range of the pumps can be summarised as follows:
Table 2: Specification of the working range

Pump type	DPV	note
Ambient temperature [°C]	-20 up to 40	1
Minimum inlet pressure	$NPSH_{req.}$ + 1m	
Viscosity [cSt]	1-100	2
Density [kg/m^3]	1000-2500	2
Cooling	forced motor cooling	3
Minimum frequency [Hz]	10	
Maximum frequency [Hz]	60	4
Allowable size of solids pumped	5µm to 1mm	

1. If the ambient temperature exceeds the above value or the motor is located more than 1000 m above sea level, the motor cooling is less effective and could require an adapted motor power. See table 9: Motor load dep. sea level or amb. temp or please contact your supplier for more detailed advice.
2. Deviation in viscosity and/or density could require an adapted motor power. Please contact your supplier for more detailed advice.
3. The free space above the motor cooling fan must be at least 1/4 of the diameter of the inlet of the cooling fan in order to have a sufficient flow of (cooling) air.

4. Pumps that are intended for 50 Hz operation, may not be connected to 60 Hz power supply.

1.5.1 Minimum capacity

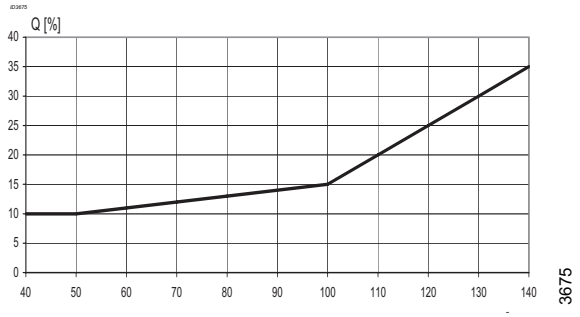
For minimum capacity at medium temperature of 20 °C, see table 3Minimum capacity (Qmin); for higher temperatures, see table 4Minimum capacity vs.temperature (in % of Q optimum).

To prevent the pump from overheating, gathering gas, cavitation etc. a minimum capacity has to be secured. The minimum capacity corresponds to al percentage of the optimum flow Q_{opt} in relation to the temperature of the liquid pumped.

Table 3: Minimum capacity (Q_{min})

size	Q_{min} [m^3/h]			
	50 Hz		60 Hz	
	2 pole	4 pole	2 pole	4 pole
2	0.2		0.2	
4	0.4		0.5	
6	0.6		0.8	
10	1.1	0.5	1.3	0.6
15	1.6	0.8	2.0	1.0
85	8.5	4.3	10.2	5.1

Table 4: Minimum capacity vs.temperature (in % of Q optimum)



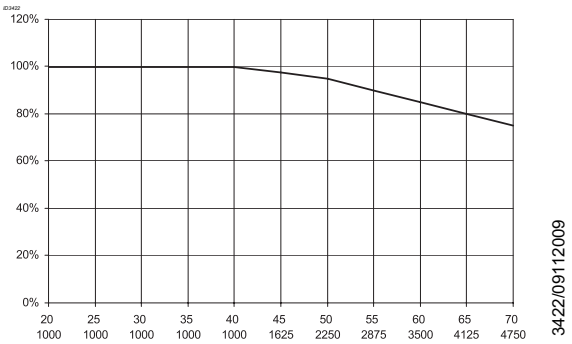
1.5.2 Ambient temperature and higher altitude

If the ambient temperature exceeds the above value or the motor is located more than 1000 m above sea level, the motor cooling is less effective and could require an adapted motor power. See Tabel: 6 Ambient Temperature [°C] above sea level [m] or please contact your supplier for more detailed advice.

Table 5: Ambient Temperature [°C]

Ambient temperature [°C]	Above sea level [m]	motor load
20	1000	100%
25	1000	100%
30	1000	100%
35	1000	100%
40	1000	100%
45	1625	98%
50	2250	95%
55	2875	90%
60	3500	85%
65	4125	80%
70	4750	75%

Table 6: Ambient Temperature [°C] above sea level [m]



1.6 Basic material variants

Table 7: Basic material variants

Model	Hydraulic	Casing	Sealing
V	1.4301	1.4308	EPDM
VS	1.4404	1.4408	Viton
VC	1.4301	JL1040	EPDM

1.7 Pump bearing

Medium lubricated stage bearing
Tungsten Carbide against Ceramic

1.8 Modular selection

To suit almost every application the pump is assembled out of modules which can be selected depending on the required working range.
Basic modules are:

- **Basic pump model,** which defines the capacity, pressure and basic material
- **Connections,** which define the suction and discharge connection as well as the base plate.
- **Sealings,** which define the elastomers, the mechanical seal and the shaft seal type.
- **Electric motor,** which defines all requirements of the motor such as motor size, power, voltage, frequency and all possible motor accessories.

1.9 Approvals

CE Conformity with European Safety Directive
ACS Drinking Water Approval (F)
WRc Drinking Water Approval (GB)
ATEX Conformity with “ATmosphères EXplosibles” Directive

2 Performance characteristics

2.1 Performance range

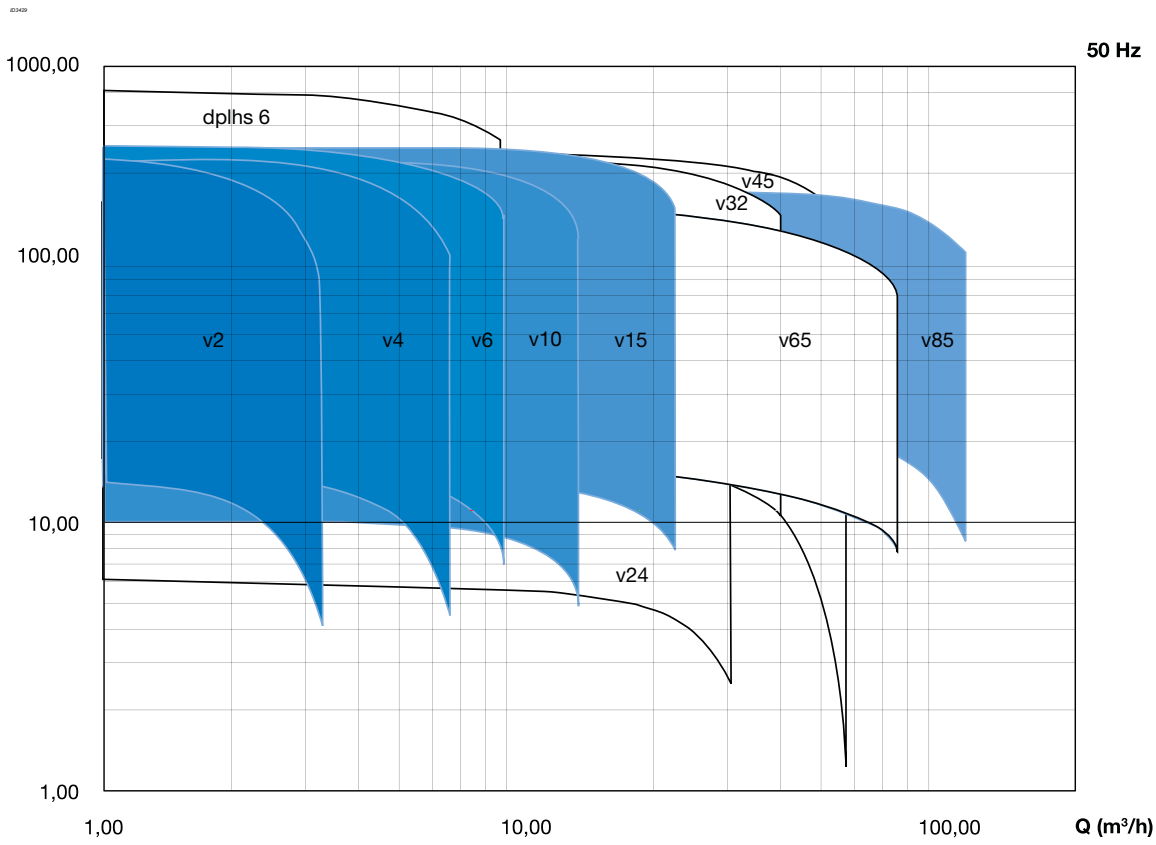


Figure 2: Performance range DPV 2,4,6,10,15 & 85 50 Hz

2.2 Performance curve details

The performance diagrams give a global overview of all the pump models the shaded models are mentioned in this documentation. Detailed characteristics are given for each model showing the hydraulic efficiency, $NPSH_{req}$, and shaft power as well.

The performance of the pump depends on the number of stages. As per example:

DPV 4/2 B:	model DPV 4 B	2 stages with 2 full head impellers
DPV 85/4-1 B	model DPV 85 B	4 stages with 3 full head impellers and 1 reduced impeller

The detailed performance curves are in accordance with ISO 9906 Annex A.

The motors used for the measurements are calibrated motors with a specific rotational speed. Therefore the performance data, like Q/H, efficiency and shaft