Standart

Pump • Fire Fighting Units • Booster Set

GENERAL INFORMATION ABOUT BOOSTER PUMPS

What is booster pump ?

The pressurization systems which takes low pressured water from a tank or directly from city network and provide it with required flow rate and pressure are called booster pumps. Their operataions are completely automatic according to intended use.

Depending on the intended use, boosters are generally classified as follows;

•Domestic Water Booster Pumps
•Irrigation System Booster Pumps
•Process Water Booster pumps

According to which Standarts booster pumps should be selected ?

Until today, in Europe, widely accepted standart which describes pressurization systems comprehensively is DIN 1988. Domestic water booster pumps are defined in DIN 1988-5, how and under what conditions they are selected and used are described. The European Union EN 806 standard is valid in the countries of European Union members. However, in some cases it is still being in reference to DIN 1988 norm. Therefore, there is no problem with selections and calculations based on the DIN 1988 standard. Selection and calculation methods in this catalog are taken from DIN 1988-5 and EN 806 standards.

Which parameters should be determined before selecting booster ?

The first condition for long-life booster is selecting according to suitable operating and environmental conditions and determining pump capacities correctly.

In choosing type of booster;

•Positioning of water tank relative to the booster (Does the water come on its own? Or is suction needed?)
•Characteristic of the space where booster will be installed (Is there enough space and air circulation?)
•Correct selection of the number of users and diversity factor
•Properties of the water to be pressurized (hardness, temperature)
•Required head
•Required flow rate and the volume of the expansion tank to be selected

When pump and equipments according to these material and functional characteristics are selected, the right type of booster pump which will be able to work without problems for many years.

How to determine operating pressure range of booster system ?

The pressure in the outlet collector of the booster is the sum of the intake pressure in the inlet collector and the pressure generated by the booster. However, in Turkey boosters are generally supplied from a tank at the same level with the booster and open to atmosphere, so the inlet pressure of the booster is negligible.

While determining operating pressure of booster;
•The static height of the building
•The minimum flow pressure on top fllors
•Friction losses in the pipes
•Water meter losses
•Filters and other equipments losses should be calculated.

Minimum pressure of the booster, if there is no special conditions defined by the user, should be approximately 10-15 mwc on the highest settlement or the most critical user

$$H_{bot} = DPe + Pmin\ fl + S\ (\,l \times R + DpF) + DPwm + DPap - SPLN$$ **(Formula 1)**

H_{bot}	*: Booster bottom pressure*
DPe	*: Building height (mWc)*
Pmin fl	*: Minimum flow pressure (mWc)*
S (l x R + DpF)	*: Friction losses in pipes (mWc)*
DPwm	*: Water meter losses (mWc)*
DPap	*: Losses of filter and other equipments if known (mWc)*
SPLN	*: Minimum pressure at the booster inlet (mWc)*

SPLN is often neglected in applications that booster is fed from a tank. However on some cases (especially oil filling plants), towers are used as water tanks. On that situation, 15-20 mWc inlet pressure is generated.

Another type of connection is to take water directly from the pressurized network and pressurize it where the network pressure is not enough. If this is the case, inlet pressure must be calculated.

Calculation of total losses in the installation may not always be easy. To do this, it is necessary to know the types, quantities and measurements of any fixtures, valves, pipes and fittings and to calculate the losses in the water flow that will pass through them.

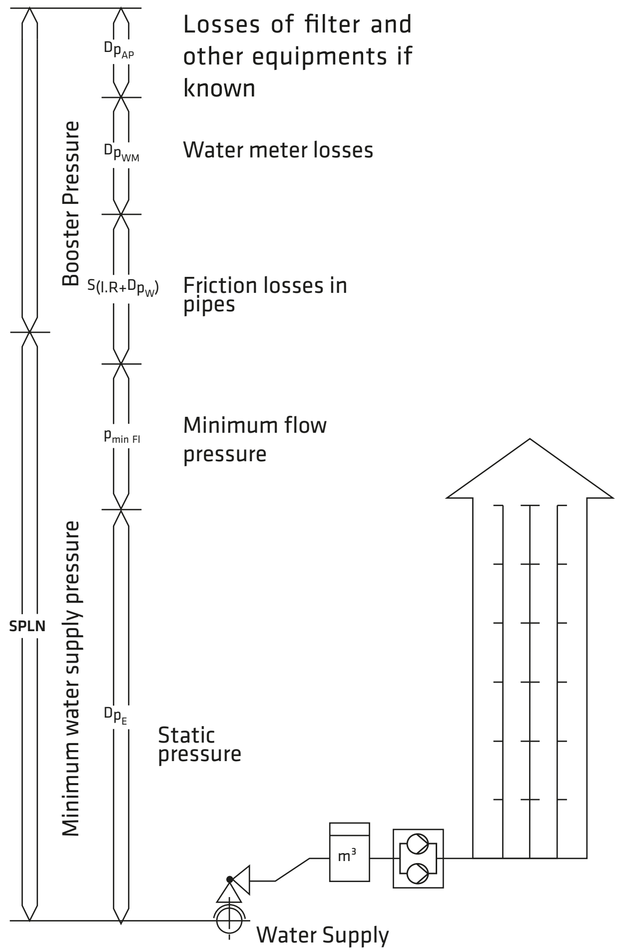


Figure 1

Example of bottom pressure calculation:

Building Height	*= 30m*
Minimum flow pressure	*= 15m*
Total loss of installation	*= 7,5m*
Water meter loss	*= 7,5m*
Filter and otler losses	*= 0 m*
Inlet pressure	*= 0 m*

Let's calculate bottom pressure value of a booster to be selected for an old apartment

H_{bot} = DPe + Pmin fl + S (l x R + DpF) + DPwm + DPap - SPLN
H_{bot} = 30 + 15 + 7,5 + 7,5 + 0 - 0
H_{bot} = 60 mSS

The pressure difference called as operating pressure of the booster ($H_{üst}$-H_{alt}) should be as small as possible and the booster should be intended to give a constant pressure. As this value increases, surge pressure in the installation increases and the comfort of use decreases.

Therefore, (H_{top}-H_{bot}) 1,5 – 2bar difference as operating range is generally adequate and it is tried to be applied. This difference should not exceed 2.5 bar.
H_{top} = H_{bot} + 15 mWc
H_{top}= 75 mWc
According to this, our operating pressure is 60-75 mWc.

Another point to be aware of when calculating the required pressure to be ensured by the booster is that static water pressure should not exceed 5 bar (50mWc) at any point in the installation.
To ensure comfortable use of water and proper operation of fixtures, DIN 1988 standart requires the use of pressure reducer or zoning the installation (regional pressurization) if the inlet pressure exceeds 5 bar. (figure 2)

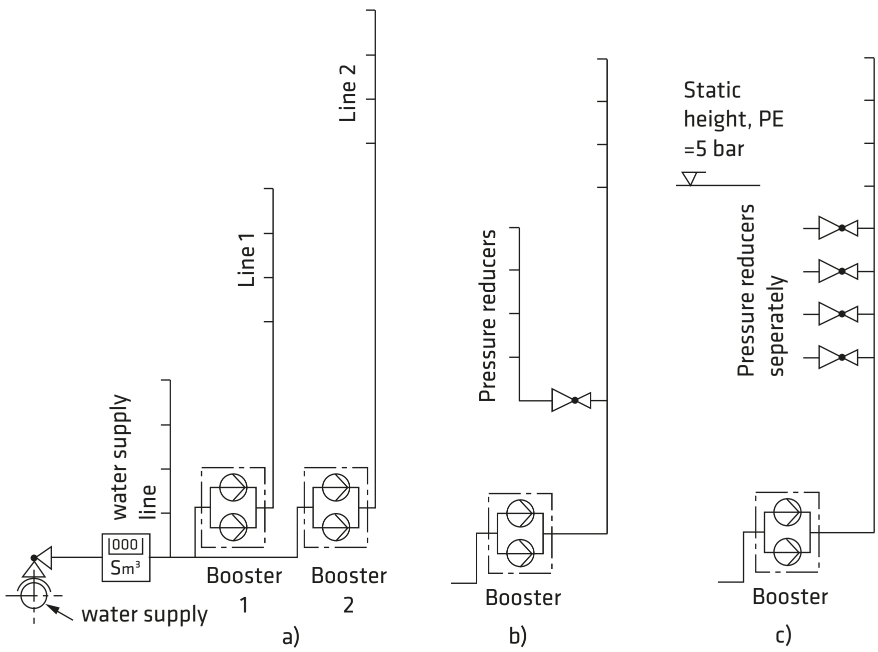


Figure 2

How to determine flow rate of booster system?

Number of flats	Factor of multi-user
4	0,66
5-10	0,45
11-20	0,40
21-50	0,35
51-100	0,30
more than 100	0,25

Table 1

Application Areas	Daily Average. (lt/day)
Corporate housing	150
Luxury housing	200
Luxury Villas	225
Guesthouses	100
Hotels	150
Hospitals	200
Offices	80
Schools	20
Boarding Schools	100
Malls	50

Table 2

Calculation of flow rate has two main criteria. First one is estimated volume of water in unit of time. The other is diversity factor of multi-user systems. We are going to use both critieria when calculating domestic water boosters.

Example of flow rate calculation:

Let's figure out the flow rate of a site where 100 families live in.
EN806 standardında belirtilen formüle göre;

$$Q=\frac{AxBxTxf}{1000}$$ **(Formula 2)**

- *Q=Booster flow rate (m^3/h)*
- *A=Number of flats*
- *B= Number of individuals in the family*
- *T= Daily average water consumption of the individual (liter /day)*
- *f= Diversity factor*

We may take the number of individuals as 4-5 per average family in Turkey. We will use Table 1 for diversity factor and Table 2 for Daily average water consumption. According to this;

$$Q=\frac{100x4x150x0,30}{1000}=18\ m^3/h$$

According to this result, we can select a single pump booster that provides 18 m^3/h flow rate. However, as in the above example, it is more accurate to select multiple pump boosters in crowded places such as hospitals.

According to DIN standards pumps must be selected with backups. While the selected spare pump is not working, other operating pumps total flow rate should be equal to our calculated booster flow rate, which is 18 m^3/h

According to this;
- *2x 18 m3/h or*
- *3x 9 m3/h or*
- *4x 6 m3/h might be selected*

CALCULATION AND SELECTION METHODS OF MEMBRANE EXPANSION/PRESSURED TANKS

Small volume membrane expansion tanks in booster sets, according to producers preference, are used from several liters to 5000 liter capacities. Membrane expansion tanks are produced in various types and capacities such as vertical, horizontal, footed and non-footed. Nowadays, the use of expansion tanks that have membrane made out of Butyl, EPDM or natural rubber separation for water and gas parts has become widespread.

When these tanks are not used or for example their membranes are exploded, irregularities occur in booster's start/stop functions and that causes operation difficulties.

The purpose of using membrane tanks connected to the discharge lines of booster sets is limiting number of switches of booster pumps.

Electric motor manufacturers switch number recommendation is around S=20-30 / hour. That means, more than 20-30 times of start/stop in an hour for motors is not recommended. Continuous start/stop function not only shortens the service life of electrical motor, pump parts and electrical panel equipments but also increases electrical energy consumption due to starting current. Therefore, especially for motors bigger than 3kW, it is advisable to limit switch number.

Absorbing possible system shocks, keeping the pressurized water in a certain amount as a reserve in short power cuts are other purposes of the use of these tanks.

In section 5 of DIN 1988 standard estimated volume calculation for membrane expansion tanks is developed based on calculation of pressure controlled air cushioned expansion tank in DIN 4810 standard.

Accordingly, the nominal volume of the expansion tank to be selected is calculated according to the Formule 3.

$$VE = 0{,}33 x V_{max} \frac{H_{top} + 1}{(H_{top} - H_{bot}) x S}$$ **(Formula 3)**

- *VE* : *Nominal volume of selected tank (liter)*
- *V_{max}* : *Flow rate of a pump at H bottom pressure (m3/hour)*
- *H_{top}* : *Booster's set top pressure (bar)*
- *(H_{top} - H_{bot})* : *Booster's set operating pressure difference (bar)*
- *S* : *Required number of switch (1/ hour)*

Example of membrane nominal volume calculation

In an example, the booster set wich has H_{alt} equals to 45 mSS, $H_{üst}$ equals to 65 mSS and 44 m^3/hour are given. Also the number of pump in booster set is four wich are working rotatory. The required number of switch is given 30/hour.

- *V_{max} = 44 / 4 = 11 m^3/saat (maximum flow rate of a pump)*
- *H_{top} = 6,5 bar*
- *H_{bot} = 4,5 bar*
- *S = 30 / hour*

The nominal volume of required membrane expansion tank (VE)

$$VE = 0{,}33x11 \frac{6{,}5 + 1}{(6{,}5 - 4{,}5) \times 30} = 0{,}453\ m^3 = 453\ lt$$

The nominal volume of the tank is 500 liters. In the operating conditions of this tank, the useful water volume (VF)

$$VF = VE \frac{H_{top} - H_{bot}}{H_{top} + 1}$$ **(Formula 4)**

$$VF = 500 \frac{6{,}5 - 4{,}5}{6{,}5 + 1}$$ *= 133 liters are calculated.*

Another criteria in membrane expansion tank selection is pressure class that tank should have.

The zero flow rate pressures of the pumps used in boosters are determining the pressure class of the tank. Tank nominal operating pressure should be higher than zero flow rate pressures of pumps.

The pre-air pressure of the tank is dependent of operating conditions and should be set to a value that 10% lower than the H_{bot} operating pressure.

In the above example booster application with H_{bot} =45 mWc, pre-gas pressure of required membrane expansion tank should be set to approximately 40 mWc = 4 bar.

There are varios methods of connecting membrane tanks to the booster's discharge line. Generally, one side of the pressure collector connects to the tank and the other side to the installation. It is also possible to connect the tank to anywhere on building's installation line.

Important point of making connections is that the connections can be quickly detached for membrane change or equivalent situation and can be isolated from installation by using an additional valve.

ACCORDING TO PUMP TYPES RECOMMENDED MINIMUM TANK VOLUMES			
SB M/T 80 PUMPS	100 lt.	CDLF 4 PUMPS	200 lt.
SB M/T 90 PUMPS	200 lt.	CDLF 8 PUMPS	300 lt.
SB M/T 100 PUMPS	300 lt.	CDLF 12 PUMPS	500 lt.
SB /T 130 PUMPS	500 lt.	CDLF 16 PUMPS	500 lt.
GRV VD PUMPS	200 lt.	CDLF 20 PUMPS	750 lt.
GRV VB PUMPS	300 lt.	CDLF 32 PUMPS	750 lt.
SKMV 32 PUMPS	500 lt.	CDLF 42 PUMPS	1000 lt.
SKMV 40 PUMPS	750 lt.	CDLF 65 PUMPS	2x1000 lt.
SKMV 50 PUMPS	1000 lt.	CDLF 85 PUMPS	2x1500 lt.
SKMV 65 PUMPS	2x1000 lt.		

Table 3

INSTALLATION OF BOOSTERS

Boosters can operate connected to a tank or directly to city network. (Figure 3)

For directly connected to city network boosters, it is precondition that inlet pressure is not surging more than 1 bar and is not lower than 0,5 bar. In networks with unfulfilled regarding conditions, it is not true to connect the booster directly to the city network. Due to inadequacy in network pressures, this system is rarely used in Turkey.

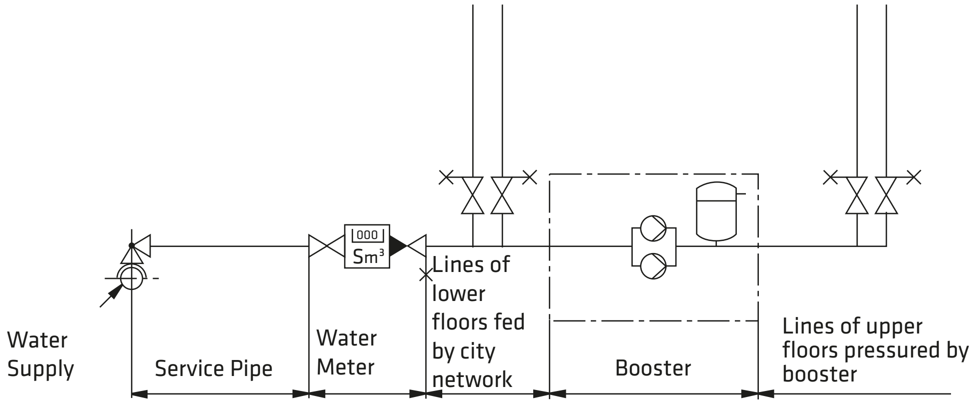


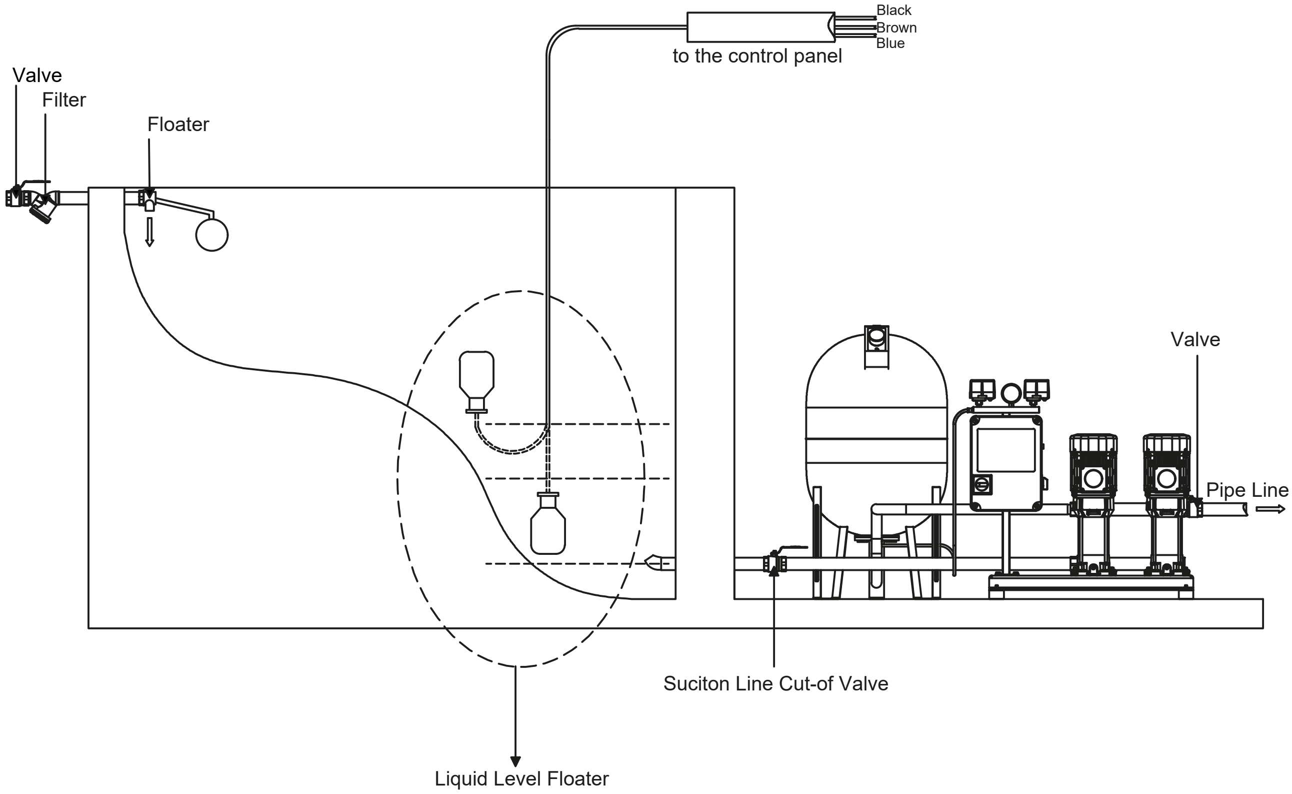
Figure 3

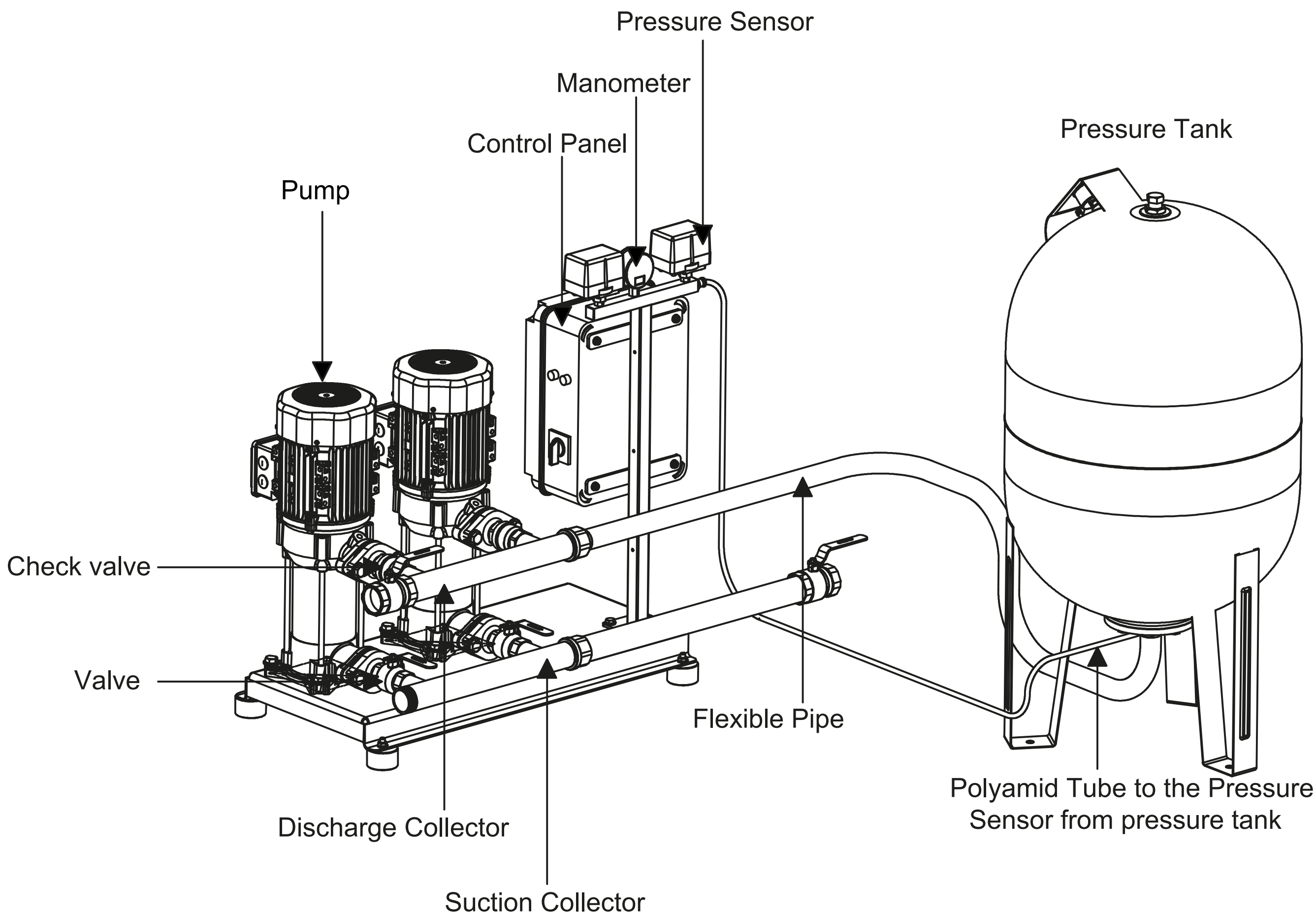
In a booster system that operates by taking water from a tank, the water must be able to flow towards the pump by its own weight and a pre-pressure of about 0.2 bar must be generated at the suction port of the pump.

Operation of the booster by suction is actually not correct. However, when this is forced to, the installation should be designed using a pipe whose internal diameter is at least one diameter wider than the suction mouth of the pump. From the shortest possible path, the installation should be determined using the least amount of elbow and fittings. Valve diameter should be kept as large as possible. It is mandatory that each pump has a separate suction line.

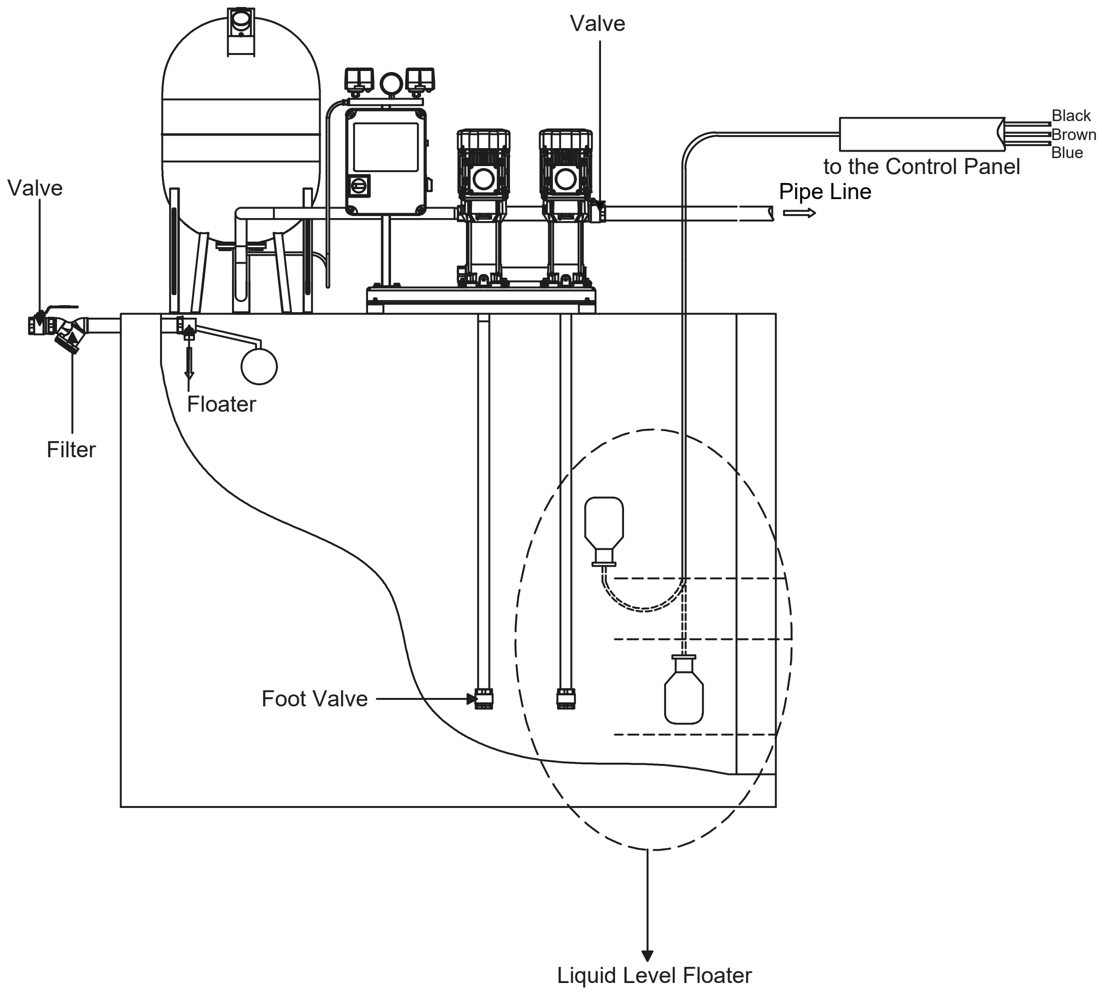
Installation Types

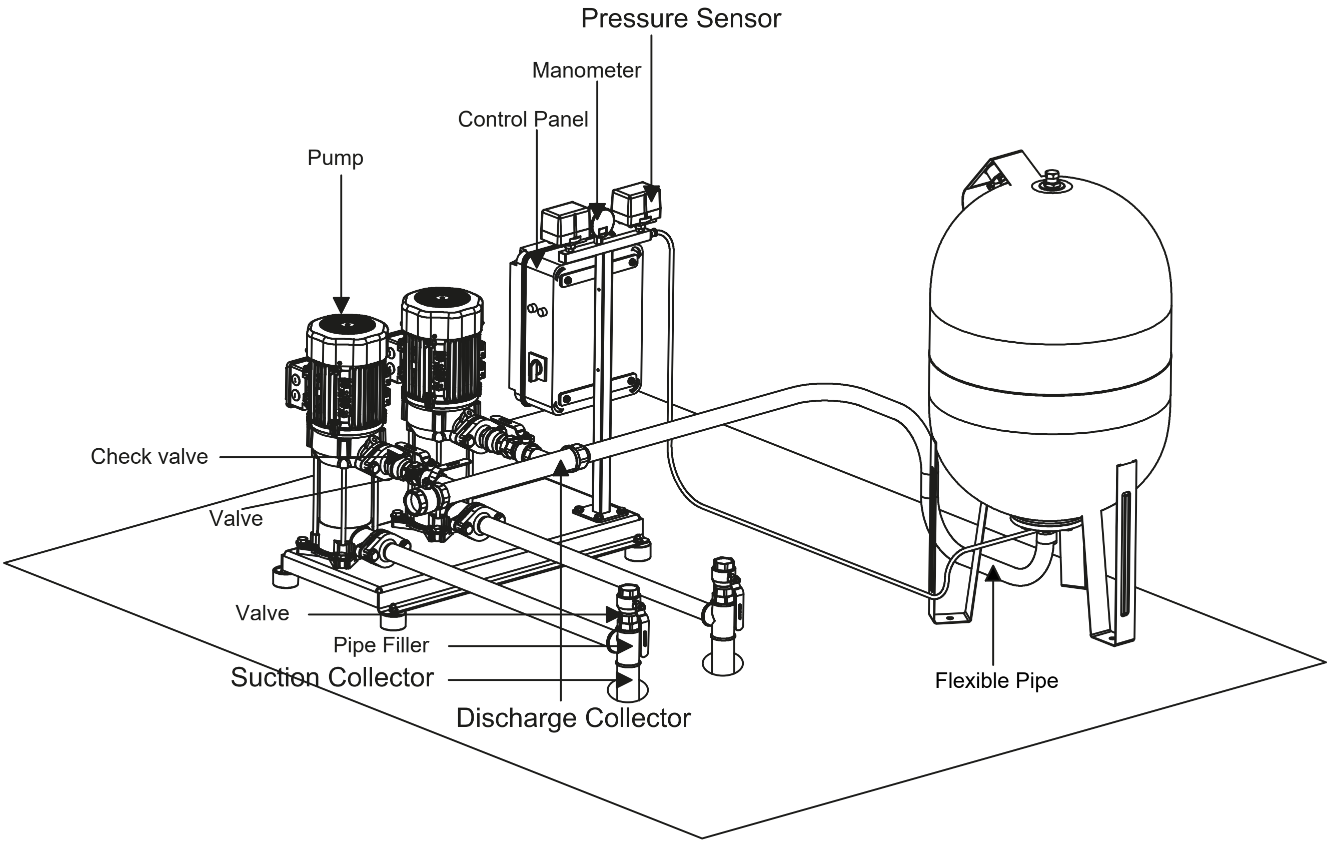
Sample Installation with Suction Height





Sample Installation with Suction Depth





Control Panel Options

Two types of panels are used as standard in boosters.

•The first is pressure switch controlled electrical panels. These panels are run/stopped according to pressure signal received from each pump's separated pressure switches. In this type panel boosters, sufficient volume of expansion tank is used for minimizing number of switches.

•The second is frequency controlled electrical panels. Comfort is important in regarding facilities using these panels. Pressure information received from Transmitter is run on the frequency inverter's PFC macro or PLC and keeps the line pressure constant by reducing the pump's rate according to system flow rate. In this type of panel booster, an expansion tank with a lower volume than the first type is used.

Pressure Switch Controlled Panel Properties

•Works with 380-460 V AC 50 Hz / 60 Hz mains voltage.
•Panel frame is made of thermoplastic material with IP 54 protection class or manufactured from DKP sheet and painted with RAL 7032 electrostatic paint.
•Panels have Manuel – 0 – Automatic selector switch.
•Panels in Automatic position;
-Protection with floater against waterless operation
-Protection against phase interruption and imbalance
-There is co-aging execution by changing turns on each operation.
•During panel's protection relay failure, it works via pressure switches on Manuel position against waterless operation.

Figure 7: Front view of pressure switch controlled panel with triple pump

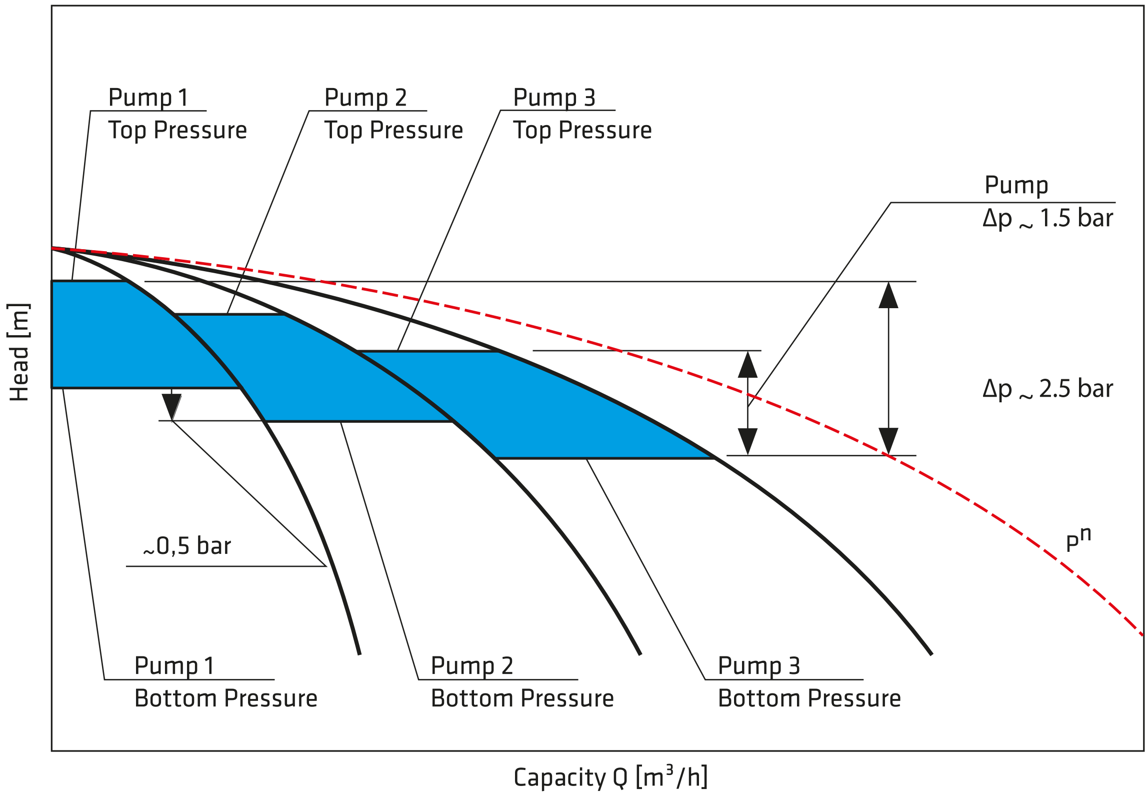


Figure 8. Control Panel With Pressure Sensors

Frequency controlled panel properties

•Works with 380-460 V AC 50 Hz / 60 Hz mains voltage.
•Panel frame is painted with IP 54 protection classed RAL 7032 electrostatic paint
•Panels have ventilation and filter.
•Panel switch can be controlled from front panel.
•Frequency converter device has overheat, motor overheat, motor overcurrent, short circuit, earth leakage, non-overload fault, motor phase loss, over and undervoltage protection and as standard internal EMC and entry shock coil.
•Panel is protected against mains phase loss imbalance and phase reversal.
•During phase fault, user is warned by signal lamps.
•For motors and frequency convertor, there are separate thermal motor protection switches and fuses.
•Up to 4 pump applications in the PFC Macro system, system automation is controlled through PFC macro software and advanced LCD panel by an electronic card on the converter.
•When the number of pumps are 5 or more in PLCOPRT system, PLC and touch panel are used. Via software in the PLC, system automation is controlled by touch panel.
•Upon request, optionally, PLC operator system can be provided in all multi pumps.
•Up to 7,5 kW pumps are operated on direct start, 11 kW and above are operated on star-delta start. Optionally, instead of star-delta start soft start can be used.
•For each motor there are separate ON/OFF keys. Moreover, system can be operated as Automatic or Manuel by separate switch.
•In AUTO position, in the PFC MACRO system, the pressure information from the 1 pressure sensor at the pumps collector output is input to the converter in 4-20mA as analogue. The control software adjusts the pump speed as to provide outlet pressure to the set pressure value from operator panel. When the required pump capacity is exceeded, a second pump is switched on from the network and the pump running on the converter adapts itself according to the new situation and provides regulation. In each additional pump the situation continues in the same way. When the need for water decreases, the pump goes to standby. It steps in again if needed and continues to work in the same way. When there is a problem with any pump, the pump is switched on automatically. After each standby state, the pump entering the circuit runs in sequence.

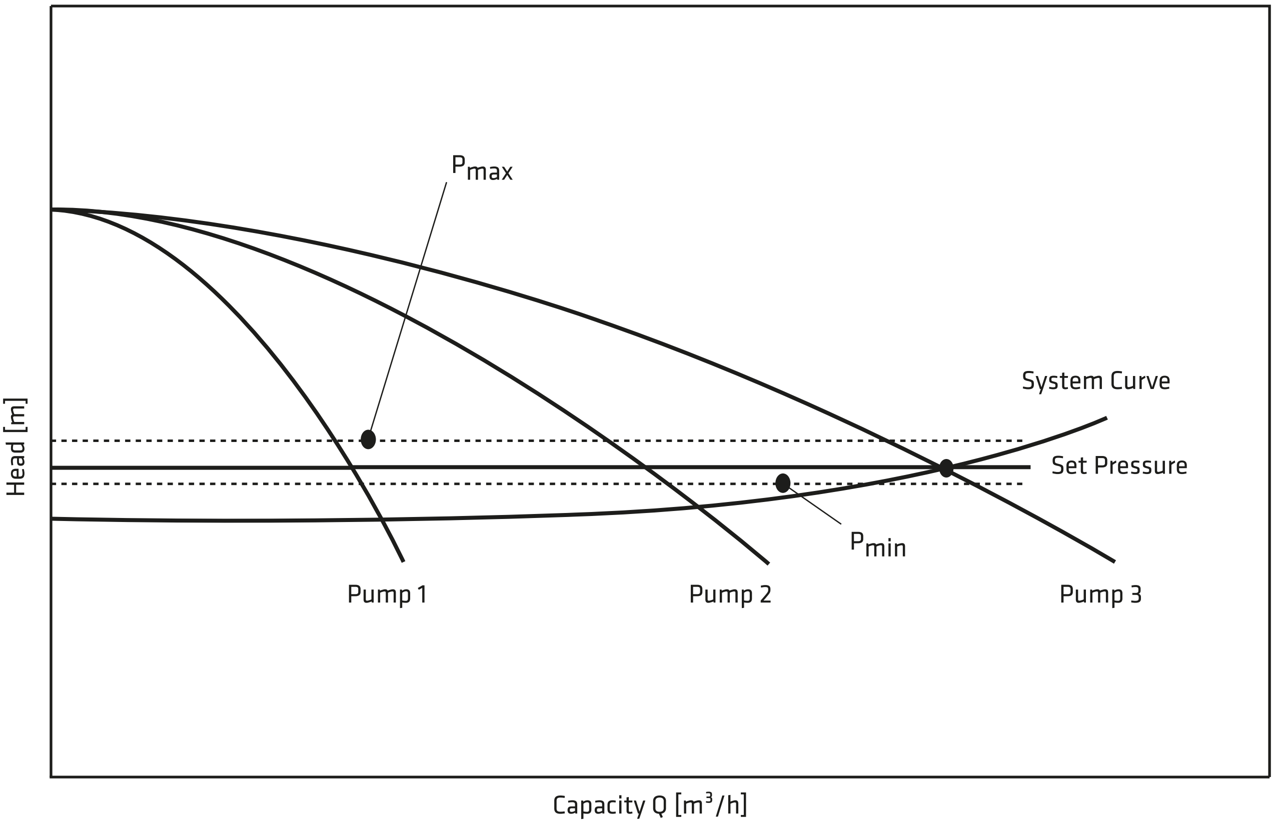


Figure 9. Frequecy Controlled Booster

•The operation in PLC OPRT system in AUTO mode is same as above. The pressure sensor is connected to the PLC and the pumps are controlled via the software in the PLC. System information entries are made via the operator touch panel located on the panel.

•In case of a malfunction on the electronic system or on the converter in MANUEL position, the pumps that are switched on are operated directly or star-delta via the contactors on the panel. In this case, the pressure is adjusted by the pressure switches at the outlet of the collector.

•Separate operating and fault lamp for each motor.
•Lamp for converter failure.
•Lamp for phase protection.
•Dry contact output for general failure.
•Panel is delivered as ready to commissioning.
•The input shock coil is available as STANDARD to reduce the harmonic distortion in the mains supplied by the panel.

Figure 10: Front view of frequency controlled panel with double pump

Minimum Pipe and Valve Diameters for Suction Boosters					
	Suction Pipe	**Flap**		**Suction Pipe**	**Flap**
SB M/T 80	1¼”	1½”	**CDLF 4**	1½”	2”
SB M/T 90	1½”	2”	**CDLF 8**	2”	2½”
SB M/T 100	2”	2½”	**CDLF 12**	2”	2½”
SB T 130	2½”	3”	**CDLF 15**	2”	2½”
GRV VD	2”	2½”	**CDLF 20**	2½”	3”
GRV VB	2”	2½”	**CDLF 32**	2½”	3”
SKMV 32	2”	2½”	**CDLF 42**	3”	4”
SKMV 40	2½”	3”	**CDLF 65**	4”	5”
SKMV 50	3”	4”	**CDLF 85**	4”	5”
SKMV 65	4”	5”			

NOTE: Recommendation for suction pipe diameter is given for steel pipe, if plastic pipe is used diameter of pipe should be increased.

Table 4

Standart

Pump • Fire Fighting Units • Booster Set

TH CDLF

STAINLESS BOOSTERS

TH CDLF Rev.11 09.2021

General Information

High pressure, quiet running, compact and low power consumption.
All surfaces that contact with the liquid are stainless steel, In-line (straight pipe attachable) type pumps.
CDLF pumps are suitable for pumping non-abrasive, clean or slightly contaminated, low-viscosity liquids without solid & fibrous particles.
Bearing is provided by tungsten carbide sliding bearings.
Vertical structure saves space.

Technical Data

Capacity	up to 110 m^3/h
Head	up to 160 m
Design Temperature	-10 °C to 120 °C
Casing Pressure	10 - 16 - 25 bar

•Electric motors of high efficiency class conforming to IEC 60034-30 standard are used.
•Booster pumps can be manufactured with valve, check-valve, stainless steel base plate, depending on request.
•The booster pumps can be manufactured as a variable-speed frequency control for convenience.
•At 11 kW and above, the booster pump base plate is NPU iron construction.

Design Features

•TH CDLF booster pumps are manufactured as vertical pump.
•The booster pumps are produced as single, double and triple pumps as a standard according to the desired flow rate. Upon request, up to 6 pumps can be set.
•For Single-pump booster pumps have a water level float (electric floater).
•Phase control system (PCS) is available in single pump, three-phase motorized booster pumps.
•Sequencing, phase control and liquid level control are standard features for multiple pumped booster pumps.
•Booster pumps can operate in two different modes; automatically and manually.
•Electrical materials used in the booster pump panels are selected from reliable and quality brands.

Booster Designation

TH -1 x CDLF 4 / 10

- **Booster Type** — TH
- **Number of Pumps** — 1
- **Pump Type** — CDLF
- **Model** — 4
- **Number of Stage** — 10

Material Information

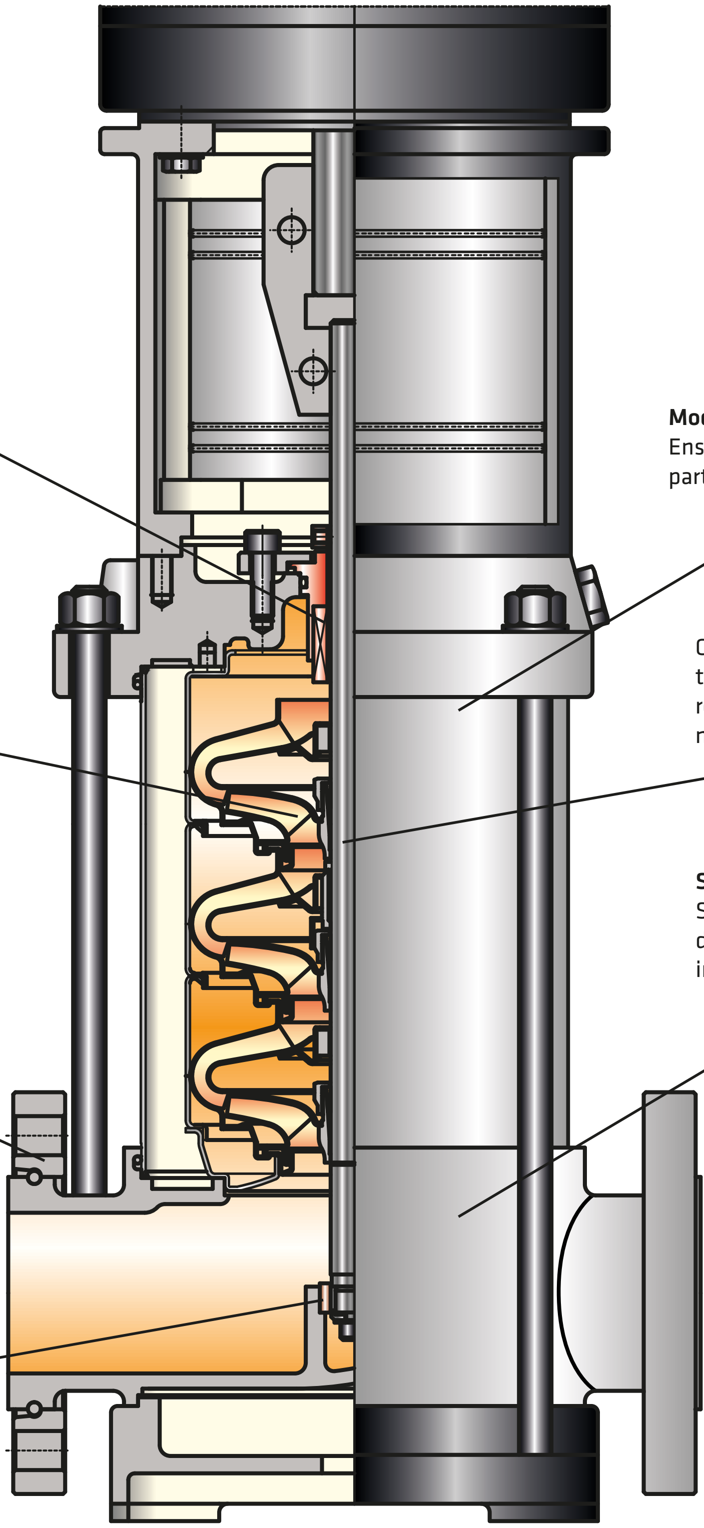
Part Name	Material	
	Standard	Optional
Pump		
Base Plate	GG 25	-
Stage Casing	AISI 304	-
Intermadiate Stage	AISI 304	-
Impeller	AISI 304	-
Shaft	AISI 304	-
Tube	AISI 304	-
Panel	Pressure Switch Controlled	Frequency Controlled
Collector	AISI 304	AISI 316 L / Galvanized Steel
Frame	Steel	AISI 316 L
Accessories		
Valve	Brass	AISI 304
Check Valve	Brass	AISI 316

Shaft Sealing:
Mechanical seal is provided. The pump can be changed without separating the installation/facility.

Stainless Steel Impeller:
Highly productive design produced by Sheet Forming Technology

Rotary Connection Flanges:
Hole axis adjustment is easier by means of the rotating structure.

Pump Bearings:
It has a long life and silent structure by means of tungsten carbide bearings.



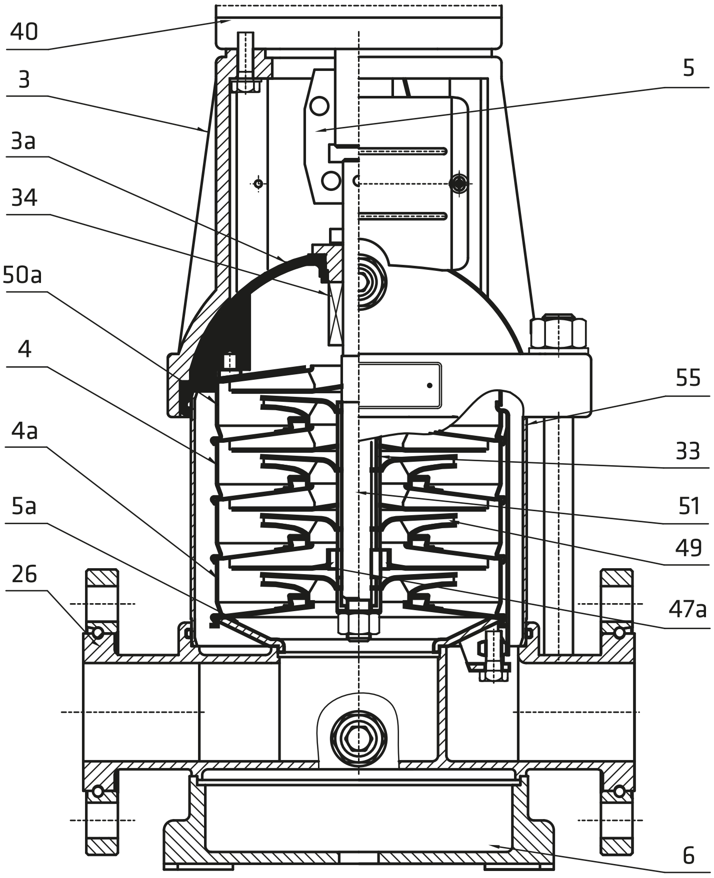
Modular Structure:
Ensures to reduce costs of spare parts and stock.

Connection without key technology makes it easy to remove the impellers during maintenance.

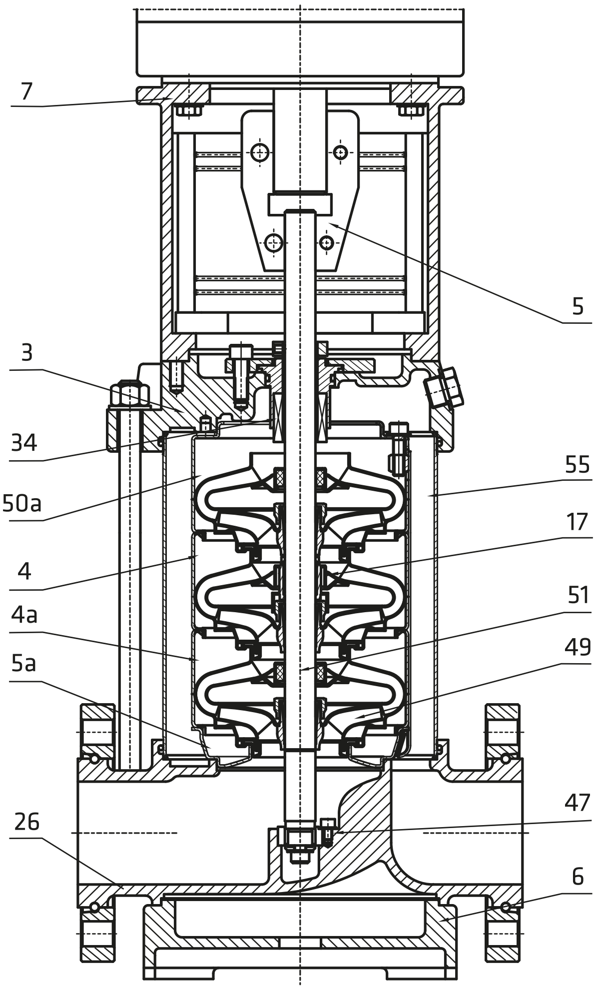
Suction and Discharge Casing:
Stainless steel body in-line design makes it easy for installation.

Sectional Drawings

CDLF 4,8,12,16,20



CDLF 32,42,65,85



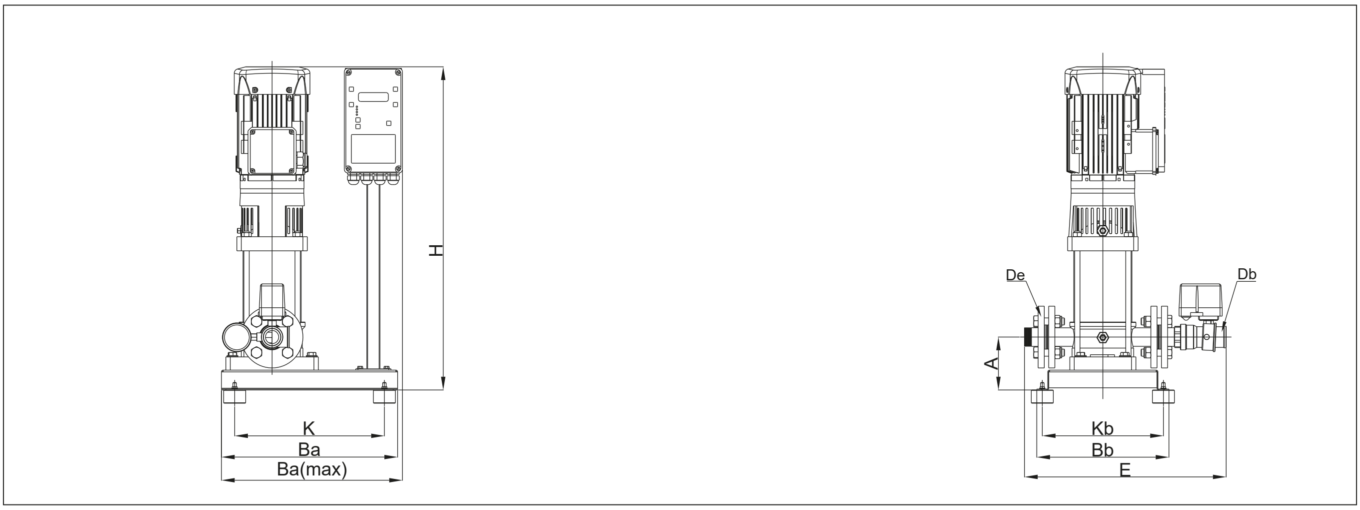
Part List

3	Upper Body	Cast Iron (GG 25)
3a	Liner	Stainless Steel (AISI 304)
4	Diffuser	Stainless Steel (AISI 304)
4a	Lower Diffuser	Stainless Steel (AISI 304)
5	Coupling	Carbon Steel
5a	Inducer	Stainless Steel (AISI 304)
6	Baseplate	Cast Iron (GG 25)
26	Suction and Discharge Casing	Stainless Steel (AISI 304)
33	Sleeve	Stainless Steel (AISI 304)
34	Mechanical Seal	-
40	Electric Motor	-
47a	Bearing	Tungsten carbide
49	Impeller	Stainless Steel (AISI 304)
50a	Upper Diffuser	Stainless Steel (AISI 304)
51	Pump Shaft	Stainless Steel (AISI 304)
55	Cover Plate	Stainless Steel (AISI 304)

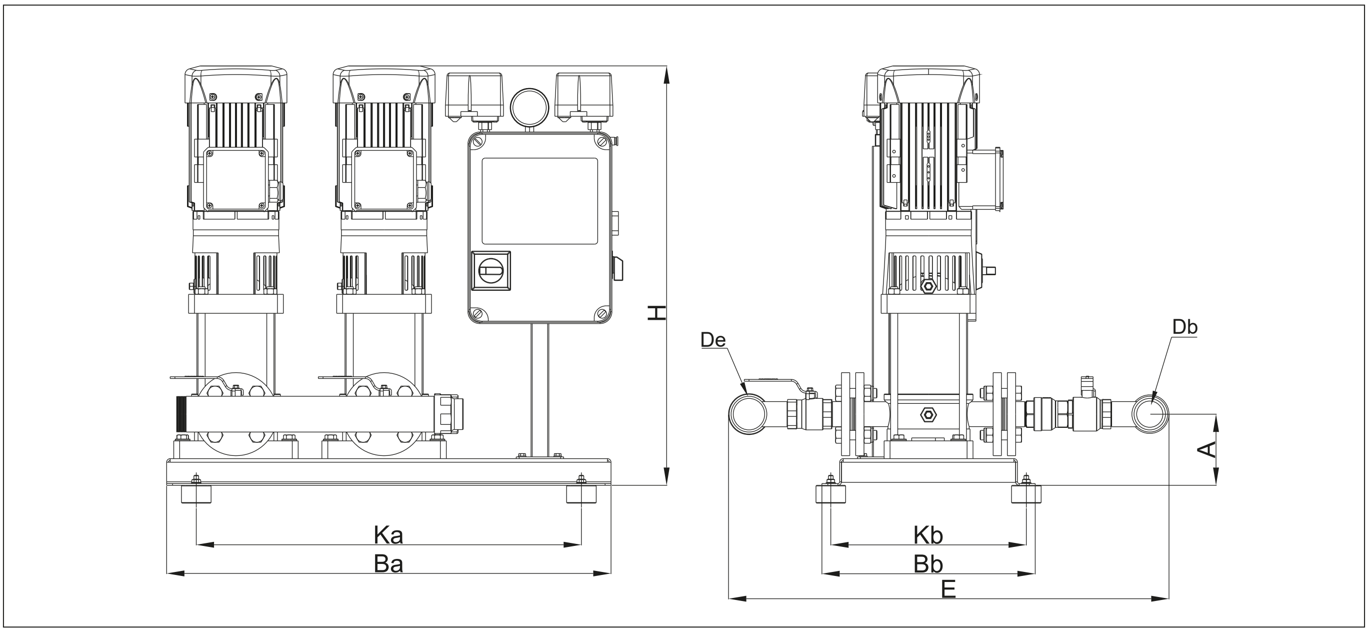
3	Upper Body	Stainless steel (AISI 304)
4	Diffuser	Stainless steel (AISI 304)
4a	Lower Diffuser	Stainless steel (AISI 304)
5	Coupling	Carbon Steel
5a	Inducer	Stainless steel (AISI 304)
6	Baseplate	Cast Iron (GG 25)
7	Motor Pedestal	Cast Iron (GG 25)
17	Bearing	Tungsten carbide
26	Suction and Discharge Casing	Stainless steel (AISI 304)
34	Mechanical Seal	-
47	Lower Bearing	Tungsten Carbide
49	Impeller	Stainless steel (AISI 304)
50a	Upper Diffuser	Stainless steel (AISI 304)
51	Pump shaft	Stainless steel (AISI 304)
55	Cover Plate	Stainless steel (AISI 304)

NPU Base Plate Design

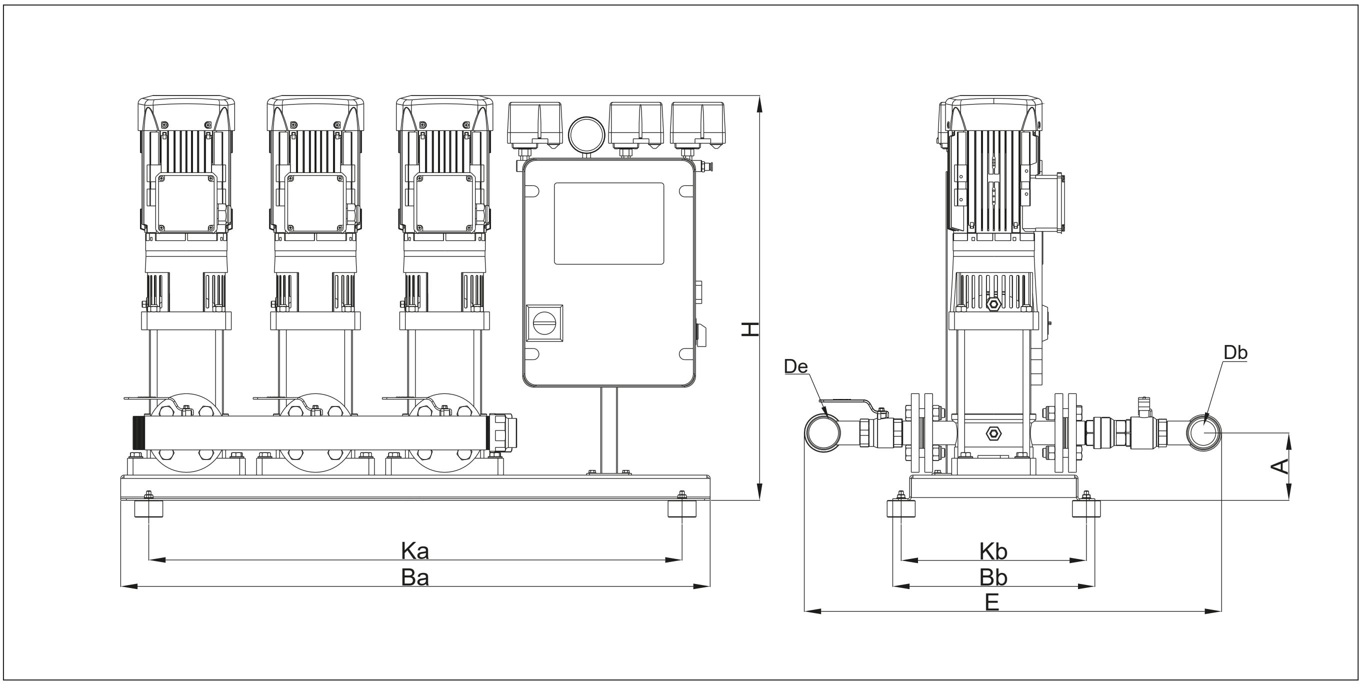
Booster set with one pump

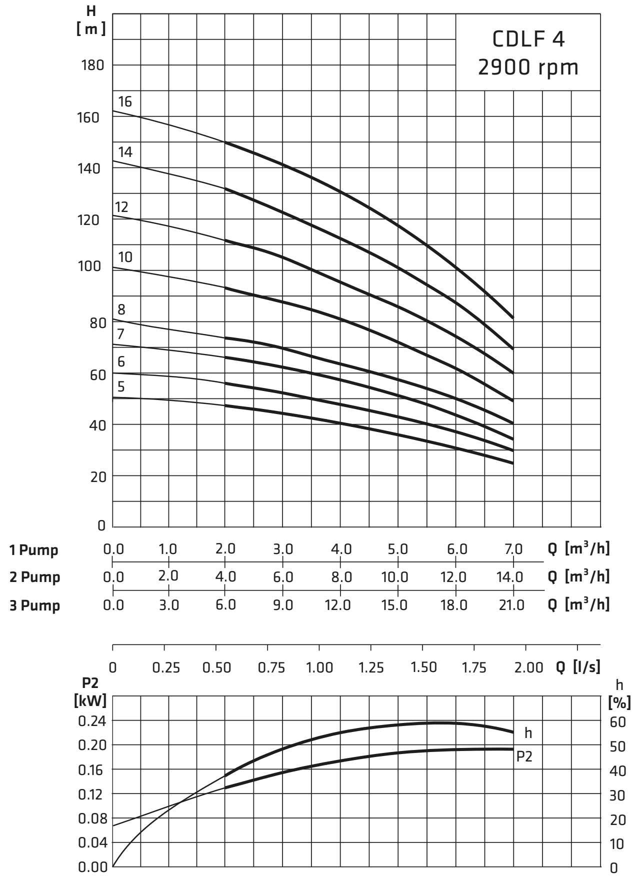


Booster set with two pump



Booster set with three pump



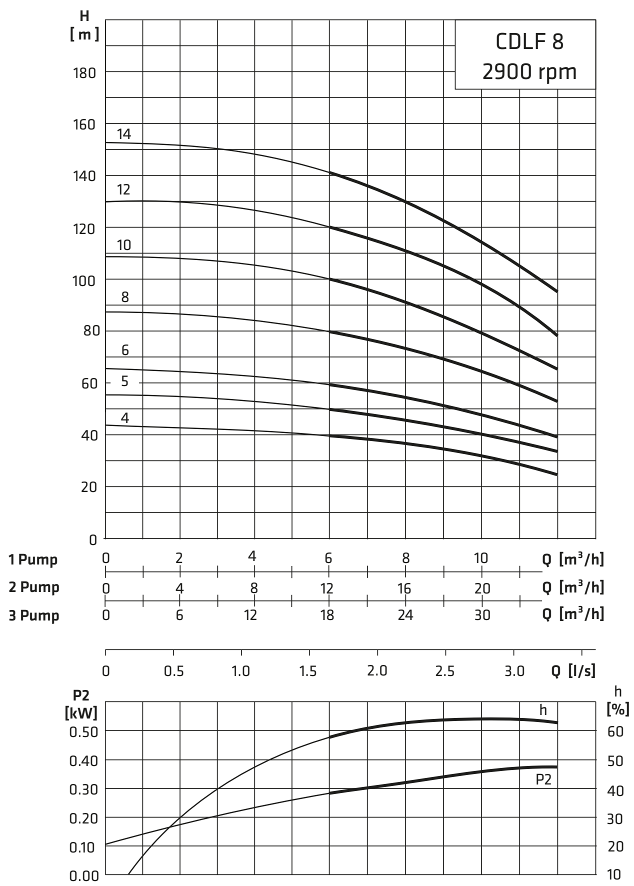


Performance curves are given according to ISO9906:2012 Gr3B

Pump Type	kW	De	Db	Ba	Bb	Ba(max)	H	Ka	Kb	E	A	kg
TH-1xCDLF 4-5	1,1	1 1/4"	1 1/4"	400	300	415	660	340	275	430	120	39
TH-1xCDLF 4-6							685					39
TH-1xCDLF 4-7	1,5						765					45
TH-1xCDLF 4-8							795					45
TH-1xCDLF 4-10	2,2						835					49
TH-1xCDLF 4-12							900					50
TH-1xCDLF 4-14	3						990					58
TH-1xCDLF 4-16							1045					60

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	kg
TH-2xCDLF 4-5	1,1	2"	2"	750	360	660	650	330	750	120	115
TH-2xCDLF 4-6						685					115
TH-2xCDLF 4-7	1,5					765					127
TH-2xCDLF 4-8						795					127
TH-2xCDLF 4-10	2,2					835					135
TH-2xCDLF 4-12						900					137
TH-2xCDLF 4-14	3					990					153
TH-2xCDLF 4-16						1045					157

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	kg
TH-3xCDLF 4-5	1,1	2"	2"	1050	360	660	950	330	750	120	161
TH-3xCDLF 4-6						685					161
TH-3xCDLF 4-7	1,5					765					179
TH-3xCDLF 4-8						795					179
TH-3xCDLF 4-10	2,2					835					191
TH-3xCDLF 4-12						900					194
TH-3xCDLF 4-14	3					990					218
TH-3xCDLF 4-16						1045					224

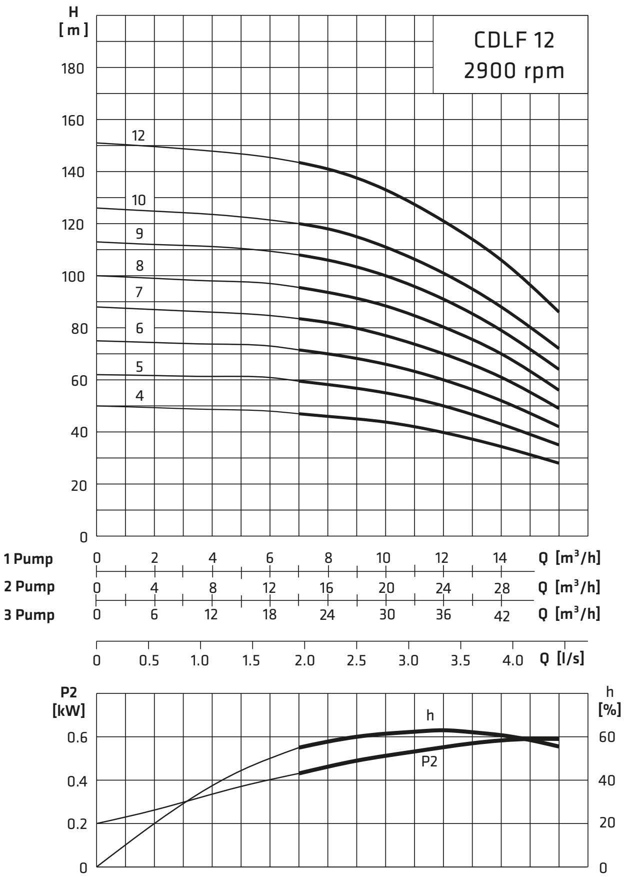


Performance curves are given according to ISO9906:2012 Gr3B

Pump Type	kW	De	Db	Ba	Bb	Ba(max)	H	Ka	Kb	E	A	kg
TH-1xCDLF 8-4	1,5	1 1/2"	1 1/2"	400	300	415	755	240	410	510	130	54
TH-1xCDLF 8-5	2,2						785					58
TH-1xCDLF 8-6							815					59
TH-1xCDLF 8-8	3						907					67
TH-1xCDLF 8-10	4						987					78
TH-1xCDLF 8-12							1047					80
TH-1xCDLF 8-14	5,5						1222					95

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	kg
TH-2xCDLF 8-4	1,5	2"	2"	850	360	755	750	330	850	125	145
TH-2xCDLF 8-5	2,2					785					153
TH-2xCDLF 8-6						815					155
TH-2xCDLF 8-8	3					907					171
TH-2xCDLF 8-10	4					987					193
TH-2xCDLF 8-12						1047					197
TH-2xCDLF 8-14	5,5					1222					227

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	kg
TH-3xCDLF 8-4	1,5	2 1/2"	2 1/2"	1350	360	755	1250	330	900	125	204
TH-3xCDLF 8-5	2,2					785					216
TH-3xCDLF 8-6						815					219
TH-3xCDLF 8-8	3					907					243
TH-3xCDLF 8-10	4					987					276
TH-3xCDLF 8-12						1047					282
TH-3xCDLF 8-14	5,5					1222					327

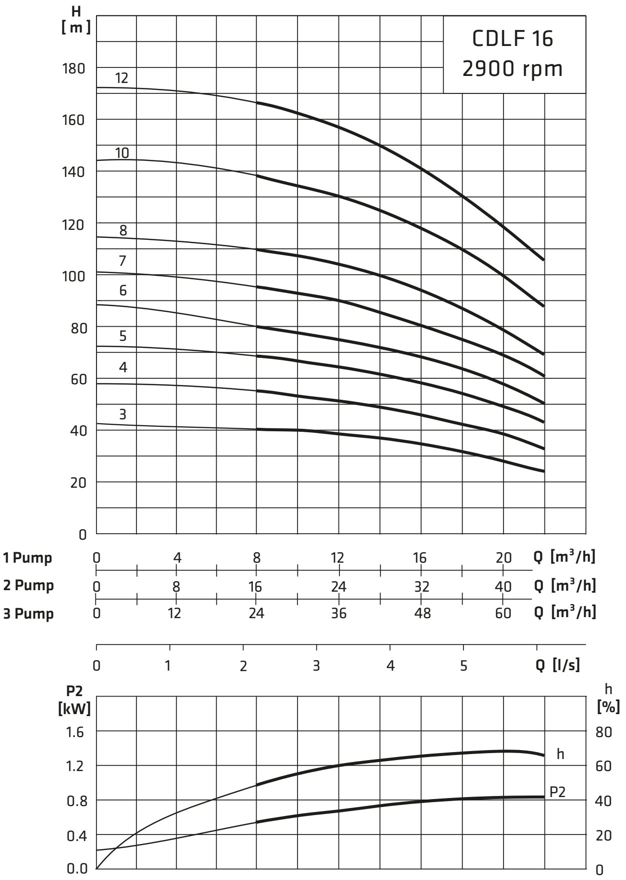


Performance curves are given according to ISO9906:2012 Gr3B

Pump Type	kW	De	Db	Ba	Bb	Ba(max)	H	Ka	Kb	E	A	kg
TH-1xCDLF 12-4	3	2"	2"	400	300	415	800	340	275	540	135	65
TH-1xCDLF 12-5							830					67
TH-1xCDLF 12-6	4						880					75
TH-1xCDLF 12-7	5,5						1025					87
TH-1xCDLF 12-8							1055					88
TH-1xCDLF 12-9							1085					90
TH-1xCDLF 12-10	7,5						1115					110
TH-1xCDLF 12-12							1175					114

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	kg
TH-2xCDLF 12-4	3	2 1/2"	2 1/2"	900	360	800	800	330	950	135	167
TH-2xCDLF 12-5						830					171
TH-2xCDLF 12-6	4					880					187
TH-2xCDLF 12-7	5,5					1025					211
TH-2xCDLF 12-8						1055					213
TH-2xCDLF 12-9						1085					217
TH-2xCDLF 12-10	7,5					1115					246
TH-2xCDLF 12-12						1175					254

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	kg
TH-3xCDLF 12-4	3	3"	3"	1250	360	800	1150	330	980	135	237
TH-3xCDLF 12-5						830					243
TH-3xCDLF 12-6	4					880					267
TH-3xCDLF 12-7	5,5					1025					303
TH-3xCDLF 12-8						1055					306
TH-3xCDLF 12-9						1085					312
TH-3xCDLF 12-10	7,5					1115					419
TH-3xCDLF 12-12						1175					432

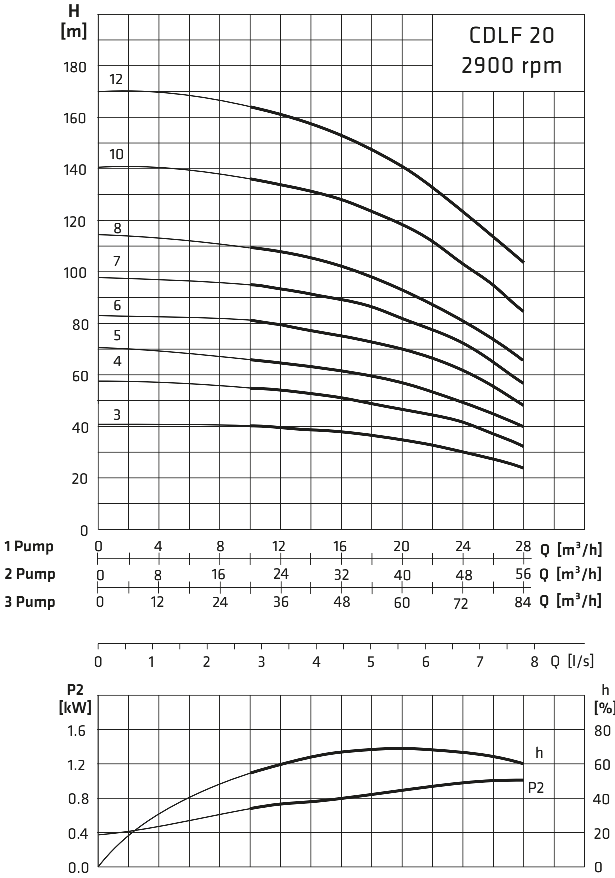


Performance curves are given according to ISO9906:2012 Gr3B

Pump Type	kW	De	Db	Ba	Bb	Ba(max)	H	Ka	Kb	E	A	kg
TH-1xCDLF 16-3	3	2"	2"	400	300	415	815	340	275	540	135	64
TH-1xCDLF 16-4	4						880					73
TH-1xCDLF 16-5	5,5						1040					90
TH-1xCDLF 16-6							1085					91
TH-1xCDLF 16-7	7,5						1130					98
TH-1xCDLF 16-8							1175					100
TH-1xCDLF 16-10	11						1410					182
TH-1xCDLF 16-12							1500					185

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	kg
TH-2xCDLF 16-3	3	2 1/2"	2 1/2"	850	360	815	750	330	860	135	165
TH-2xCDLF 16-4	4					880					183
TH-2xCDLF 16-5	5,5					1040					217
TH-2xCDLF 16-6						1085					219
TH-2xCDLF 16-7	7,5					1130					233
TH-2xCDLF 16-8						1175					237
TH-2xCDLF 16-10	11			1450		1410	1350				396
TH-2xCDLF 16-12						1500					402

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	kg
TH-3xCDLF 16-3	3	3"	3"	1250	360	815	1150	330	870	135	234
TH-3xCDLF 16-4	4					880					261
TH-3xCDLF 16-5	5,5					1040					312
TH-3xCDLF 16-6						1085					315
TH-3xCDLF 16-7	7,5					1130					336
TH-3xCDLF 16-8						1175					342
TH-3xCDLF 16-10	11			1800		1410	1600				591
TH-3xCDLF 16-12						1500					599



Performance curves are given according to ISO9906:2012 Gr3B

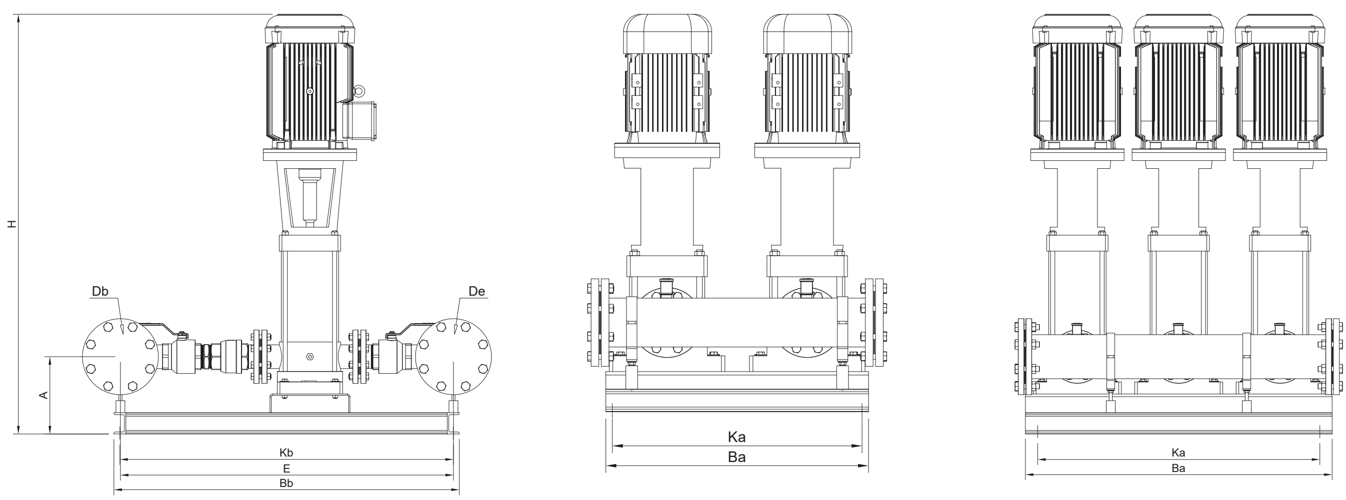
Pump Type	kW	De	Db	Ba	Bb	Ba(max)	H	Ka	Kb	E	A	kg
TH-1xCDLF 20-3	4	2"	2"	400	300	415	835	410	240	540	135	72
TH-1xCDLF 20-4	5,5						995					88
TH-1xCDLF 20-5							1040					90
TH-1xCDLF 20-6	7,5						1085					96
TH-1xCDLF 20-7							1130					98
TH-1xCDLF 20-8	11						1320					179
TH-1xCDLF 20-10							1410					183
TH-1xCDLF 20-12	15						1500					196

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	kg
TH-2xCDLF 20-3	4	2 1/2"	2 1/2"	850	360	835	750	330	920	135	181
TH-2xCDLF 20-4	5,5					995					213
TH-2xCDLF 20-5						1040					217
TH-2xCDLF 20-6	7,5					1085					229
TH-2xCDLF 20-7						1130					233
TH-2xCDLF 20-8	11			1450		1320	1350				413
TH-2xCDLF 20-10						1410					421
TH-2xCDLF 20-12	15					1500					452

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	kg
TH-3xCDLF 20-3	4	3"	3"	1250	360	835	1150	330	935	135	306
TH-3xCDLF 20-4	5,5					995					354
TH-3xCDLF 20-5						1040					360
TH-3xCDLF 20-6	7,5					1085					378
TH-3xCDLF 20-7						1130					384
TH-3xCDLF 20-8	11			1800		1320	1600				611
TH-3xCDLF 20-10						1410					623
TH-3xCDLF 20-12	15					1500					667

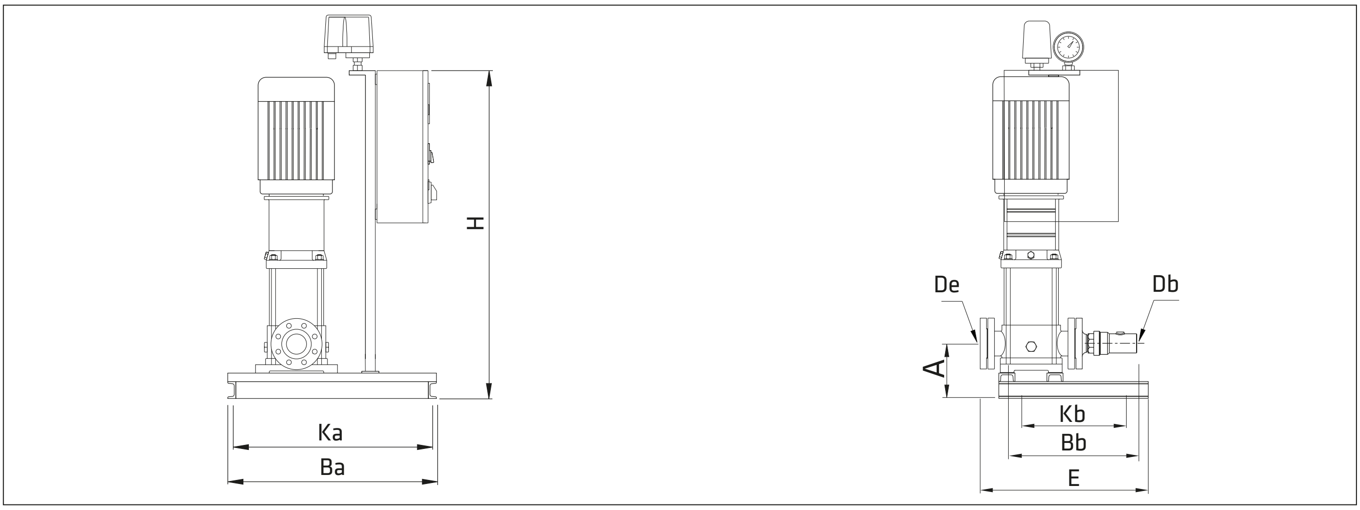
Dimensions CLDF (32,42,65 ve 85)

The drawings which are given below illustrates the booster sets which are CDLF 32, 42, 65 and 85 series with 18.5 kW and above motor power. Control panel of those booster set are supplied seperately from base plate.

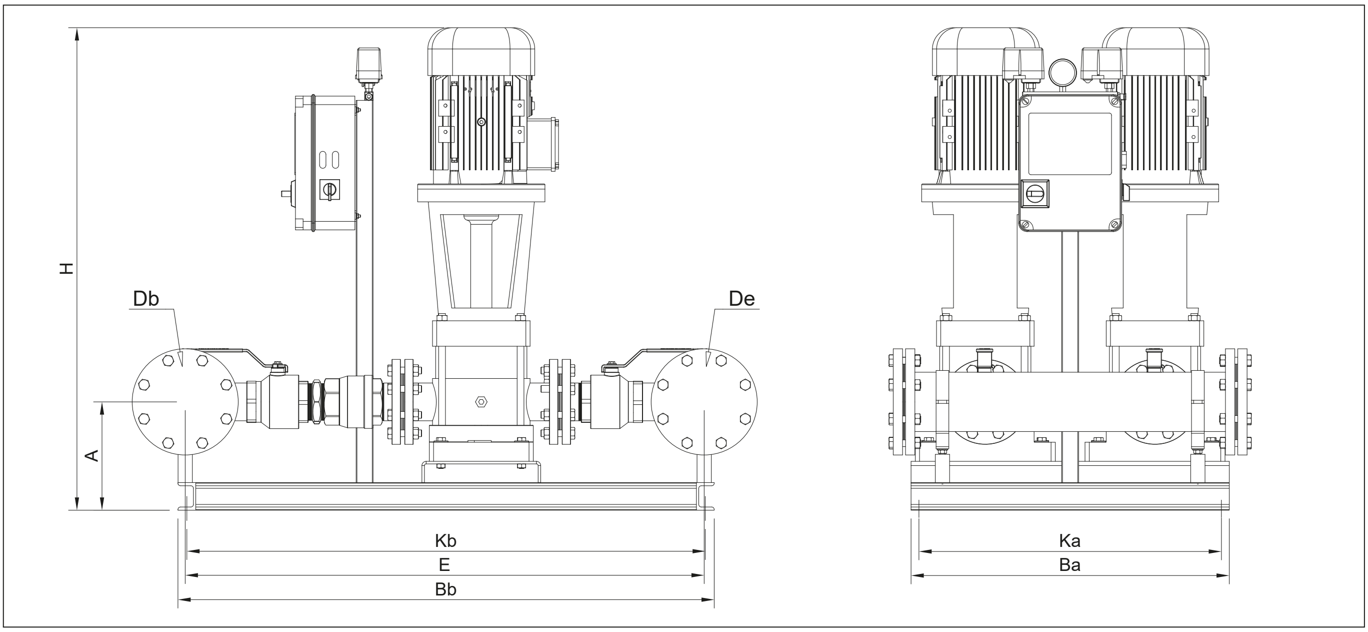


NPU Baseplate Design

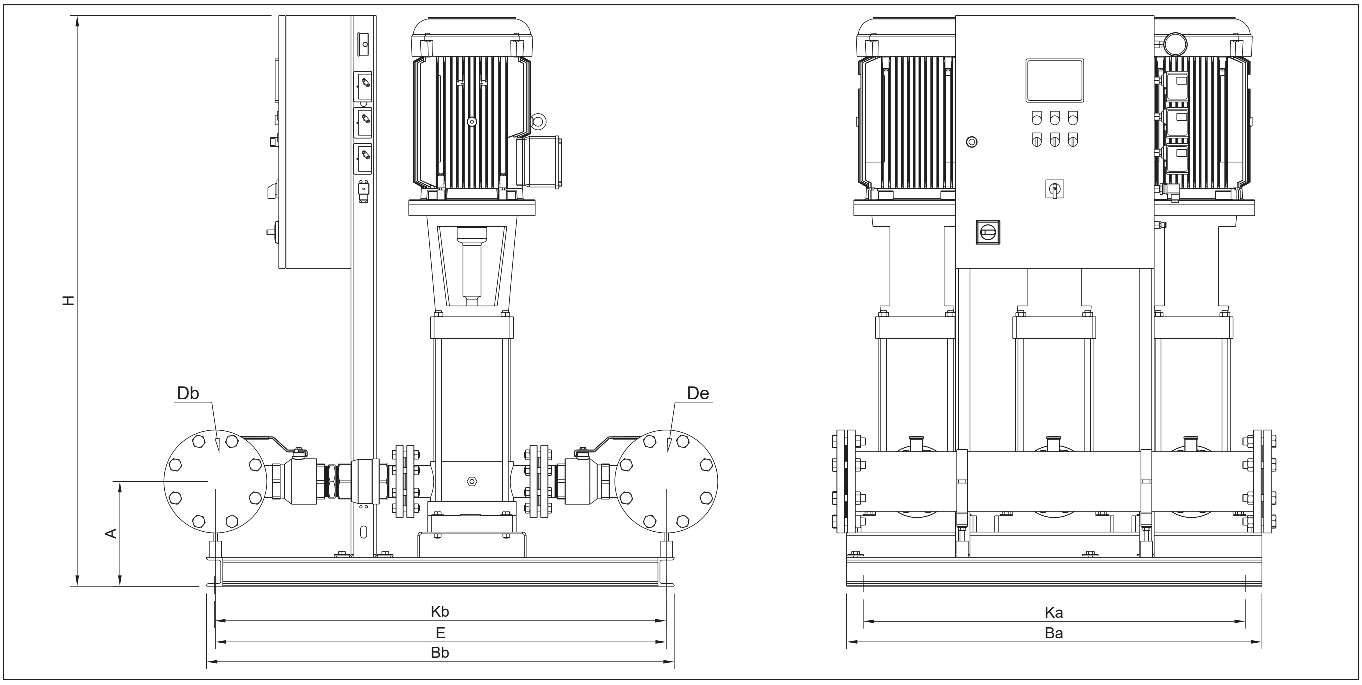
Booster set with one pump

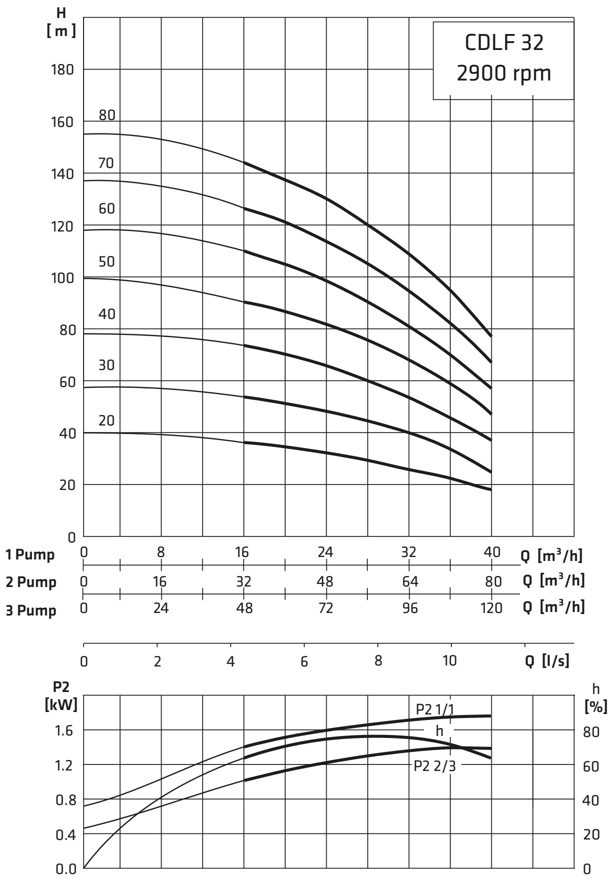


Booster set with two pump



Booster set with three pump



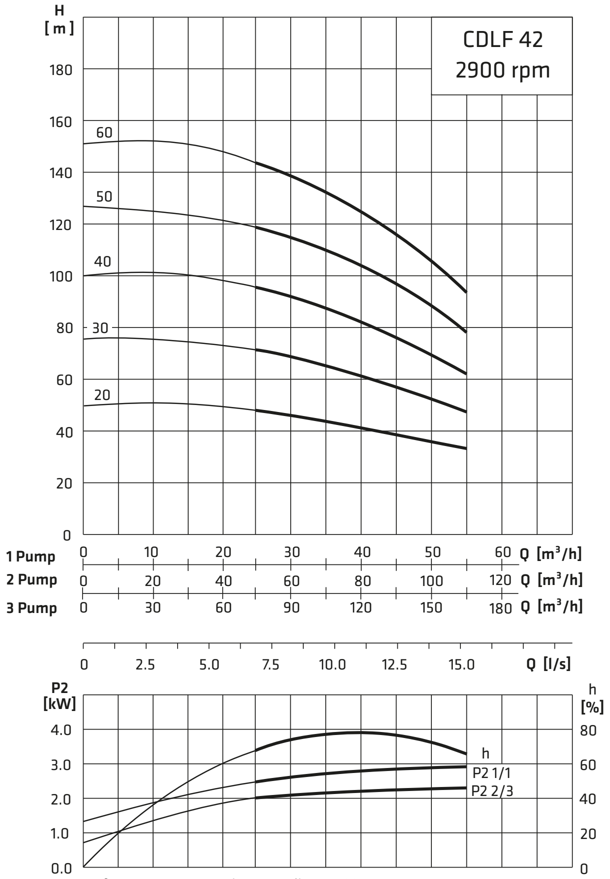


Performance curves are given according to ISO9906:2012 Gr3B

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	Tas.	kg
TH-1xCDLF 32-20	4					1000						116
TH-1xCDLF 32-30	5,5					1150						131
TH-1xCDLF 32-40	7,5					1200						140
TH-1xCDLF 32-50	11	2 1/2"	2 1/2"	570	610	1550	530	470	590	235	B	241
TH-1xCDLF 32-60						1600						245
TH-1xCDLF 32-70	15					1650						264
TH-1xCDLF 32-80						1750						268

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	Tas.	kg
TH-2xCDLF 32-20	4					1000						273
TH-2xCDLF 32-30	5,5					1150						303
TH-2xCDLF 32-40	7,5					1250						321
TH-2xCDLF 32-50	11	4"	4"	850	930	1550	810	790	890	235	B	482
TH-2xCDLF 32-60						1650						490
TH-2xCDLF 32-70	15					1700						518
TH-2xCDLF 32-80						1800						526

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	Tas.	kg
TH-3xCDLF 32-20	4					1000						413
TH-3xCDLF 32-30	5,5					1150						458
TH-3xCDLF 32-40	7,5					1250						485
TH-3xCDLF 32-50	11	5"	5"	1300	950	1550	1260	810	915	235	B	721
TH-3xCDLF 32-60						1650						733
TH-3xCDLF 32-70	15					1700						780
TH-3xCDLF 32-80						1800						792



Performance curves are given according to ISO9906:2012 Gr3B

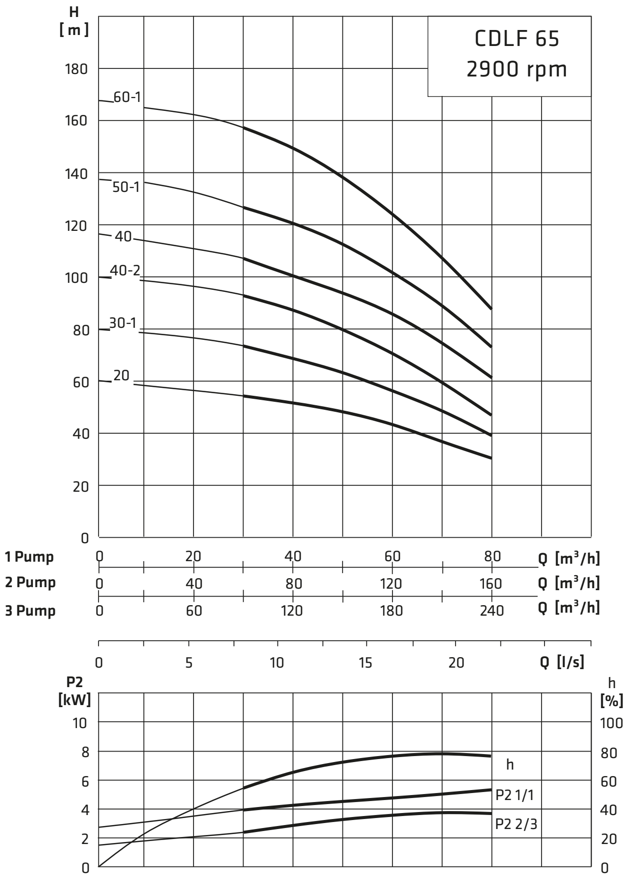
Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	Tas.	kg
TH-1xCDLF 42-20	7,5					1250						149
TH-1xCDLF 42-30	11					1450						222
TH-1xCDLF 42-40	15	3"	3"	570	570	1550	530	430	550	285	B	236
TH-1xCDLF 42-50	18,5					1700						260
TH-1xCDLF 42-60	22					1800						300

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	Tas.	kg
TH-2xCDLF 42-20	7,5					1250						332
TH-2xCDLF 42-30	11					1500						493
TH-2xCDLF 42-40	15	5"	5"	850	1075	1600	810	935	1035	285	B	521
TH-2xCDLF 42-50	18,5					1750						569
TH-2xCDLF 42-60	22					1850						649

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	Tas.	kg
TH-3xCDLF 42-20	7,5					1250						500
TH-3xCDLF 42-30	11					1500						739
TH-3xCDLF 42-40	15	6"	6"	1300	1100	1600	1260	960	1060	285	B	786
TH-3xCDLF 42-50	18,5					1750						858
TH-3xCDLF 42-60	22					1850						978

The specifield dimensions and weights are approximate. Dimensions might be changed.

TH CDLF

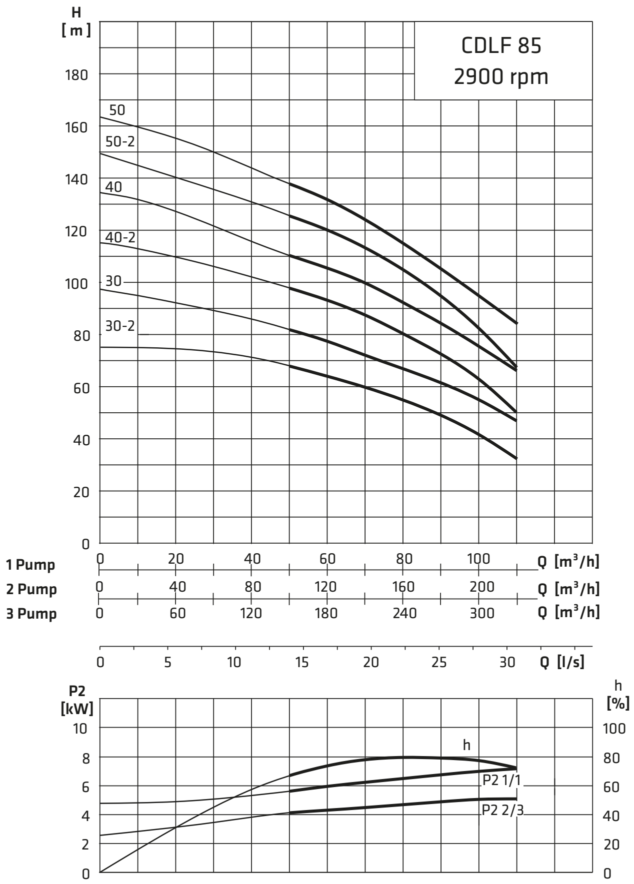


Performance curves are given according to ISO9906:2012 Gr3B

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	Tas.	kg
TH-1xCDLF 65-20	11	4”	4”	570	600	1450	530	460	585	320	B	221
TH-1xCDLF 65-30-1	15					1550						236
TH-1xCDLF 65-40-2	18,5					1650						264
TH-1xCDLF 65-40	22					1700						297
TH-1xCDLF 65-50-1	30					1850						358
TH-1xCDLF 65-60-1	37					1950						388

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	Tas.	kg
TH-2xCDLF 65-20	11	6”	6”	850	1150	1500	810	1010	1085	320	B	486
TH-2xCDLF 65-30-1	15					1550						531
TH-2xCDLF 65-40-2	18,5					1700						592
TH-2xCDLF 65-40	22					1750						663
TH-2xCDLF 65-50-1	30					1900						785
TH-2xCDLF 65-60-1	37					2000						850

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	Tas.	kg
TH-3xCDLF 65-20	11	8”	8”	1300	1150	1500	1260	1010	1110	320	B	731
TH-3xCDLF 65-30-1	15					1550						796
TH-3xCDLF 65-40-2	18,5					1700						885
TH-3xCDLF 65-40	22					1750						984
TH-3xCDLF 65-50-1	30					1900						1167
TH-3xCDLF 65-60-1	37					2000						1262



Performance curves are given according to ISO9906:2012 Gr3B

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	Tas.	kg
TH-1xCDLF 85-30-2	18,5	4”	4”	570	600	1650	530	460	600	340	B	254
TH-1xCDLF 85-30	22					1700						291
TH-1xCDLF 85-40-2	30					1850						351
TH-1xCDLF 85-40						1850						351
TH-1xCDLF 85-50-2	37					1950						375
TH-1xCDLF 85-50						1950						375

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	Tas.	kg
TH-2xCDLF 85-30-2	18,5	6”	6”	850	1150	1700	810	1010	1125	340	B	562
TH-2xCDLF 85-30	22					1700						651
TH-2xCDLF 85-40-2	30					1900						776
TH-2xCDLF 85-40						1900						781
TH-2xCDLF 85-50-2	37					2000						829
TH-2xCDLF 85-50						2000						834

Pump Type	kW	De	Db	Ba	Bb	H	Ka	Kb	E	A	Tas.	kg
TH-3xCDLF 85-30-2	18,5	8”	8”	1300	1250	1700	1260	1110	1180	340	B	860
TH-3xCDLF 85-30	22					1700						991
TH-3xCDLF 85-40-2	30					1900						1176
TH-3xCDLF 85-40						1900						1176
TH-3xCDLF 85-50-2	37					2000						1248
TH-3xCDLF 85-50						2000						1253

The specifield dimensions and weights are approximate. Dimensions might be changed.