Alfa Laval LeviMag® UltraPure

Mixers

Introduction

The Alfa Laval LeviMag® UltraPure is an aseptic magnetic mixer that uses a patented levitating impeller and advanced design to mix down to the last drop and maximize product yield.

Compact, energy-efficient and easy to maintain, it provides dry-running capabilities and efficient mixing at low speeds, which ensures gentle product treatment, as well as at high speeds for high-intensity mixing. This provides greater process flexibility to handle a wide range of fluid types and mixing duties.

Its open design and low-speed rotation during cleaning contribute to no dead zones, effective residue removal and minimize contamination risks from wear particles. All this contributes to fast return on investment and maximum product yield in tanks ranging in size between 30 litres and 40,000 litres.

It is supplied with Alfa Laval Q-doc, a comprehensive documentation package that provides full transparency of the entire supply chain and helps make the validation process easy.

Applications

Alfa Laval LeviMag UltraPure offers effective mixing for multiple processes, such as those involving serums, vaccines, plasma fractions, bacteria and cell cultures, and APIs, in the biotechnology, pharmaceutical and other industries with demanding sterile or high-purity applications.

Benefits

- Maximum process efficiency, minimal product loss
- Optimal flow with higher efficiency and less energy consumption
- Mixing down to the last drop for maximum yield due to low agitation and dry-running capability
- Optimized Cleaning-in-Place (CIP) due to full drainability
- Minimized downtime due to ease of maintenance

Standard design

The Alfa Laval LeviMag UltraPure consists of a detachable drive unit, levitating impeller unit with radial blades, seals, ceramic bearings and magnetic coupling, weld plate and connections. It is available in five sizes, with mixing speeds ranging from 10 rpm up to 800 rpm.

Working principle

An impeller with radial blades installed inside the tank rotates due to the torque from the magnetic coupling. The rotation of the impeller mixes the fluid inside the tank. The unique design of the Alfa Laval magnetic coupling ensures the levitation of the impeller at all times. This enables dry-running and complete drainability of process fluids from the tank possible. This ensures highly efficient mixing down to the last drop and, subsequently, maximum yield. It also enables the free flow of CIP liquid and steam around all parts of the mixer, thereby ensuring thorough cleaning. Impeller levitation also eliminates axial wear.

Available versions

- Impeller with male/female bearing
- Impeller complete, with drive unit
- Impeller prepared for Speed Sensor
- ATEX version (Cat. II -/2G Ex h IIC T4 -/Gb)
- SS EN 1.4435 (316L) as standard, Special Alloys EN 1.4529 or EN 2.4602 available on request
- EPDM, FPM or FFKM elastomers

Drive unit versions

- Painted (fan ventilated)
- Clean room finish, Sealed Surface Conversion Treatment (smooth, closed, none fan ventilated)
- Extended console for insulated tanks

Motor efficiency

- IE5 (standard)
- Premium (CUS for US)
- IE2/IE3 for EX motors

Safety class

- No requirements (IE5, Premium)
- Ex db eb IIC T4 Gb (on ATEX version)
- Class I div.I, group D T4

Accessories

- Weld plates
- Speed Sensor
- Inspection & Service tools
- Installation tools

Technical data

Internals	
Product Wetted Surface finish:	Ra <0.38 µm Mech. polished and Electropolished (Acc. to ASME BPE SF4)
Working pressure:	-1 to 7 bar(g)
Impeller diameters:	100, 150, 200, 250 & 300 mm Standard or prepared for speed sensor
Versions:	Standard or prepared for speed sensor

Weld Plate	
Size WP50:	For impeller size 100 & 150 mm
Size WP81:	For impeller size 200, 250 & 300 mm

Drive Unit	
Motor, IE5 (standard)	
An Integrated Permanent Magnet Synchronous Motor (IPMSM) that operates with a frequency inverter suitable for IPMSM motors.	
The frequency converter (not Alfa Laval supply) must be ordered for the voltage available at the place of operation.	
For countries with grid voltage in the interval 3x200-240V choose 230V motor version.	
For countries with grid voltage in the interval 3x380-and up choose 400V motor version.	
Efficiency class:	IE5
Enclosure / Motor protection:	IP66
Country Code:	All (one type covers all)
Configuration:	WP50, Blue, 400V
Nominal Power:	0.5 kW
Nominal Voltage and frequency (from frequency converter):	Output 343 VAC, connected in star, 160 Hz, 2400 RPM
Nominal Current:	1.12 A
Configuration:	WP81, Blue, 400V
Nominal Power:	1.15 kW
Nominal Voltage and frequency (from frequency converter):	Output 338 VAC, connected in star, 160 Hz, 2400 RPM
Nominal Current:	2.95 A
Configuration:	WP50, Blue, 230V
Nominal Power:	0.5 kW
Nominal Voltage and frequency (from frequency converter):	Output 203VAC, connected in star, 160 Hz, 2400 RPM
Nominal Current:	1.88 A
Configuration:	WP81, Blue, 230V
Nominal Power:	1.5 kW
Nominal Voltage and frequency (from frequency converter):	Output 205 VAC, connected in star, 160 Hz, 2400 RPM
Nominal Current:	4.87 A
Configuration:	WP50, Cleanroom, 400V
Nominal Power:	TBD
Nominal Voltage and frequency (from frequency converter):	TBD
Nominal Current:	TBD
Configuration:	WP81, Cleanroom, 400V
Nominal Power:	TBD
Nominal Voltage and frequency (from frequency converter):	TBD
Nominal Current:	TBD
Configuration:	WP50, Cleanroom, 230V
Nominal Power:	TBD
Nominal Voltage and frequency (from frequency converter):	TBD
Nominal Current:	TBD

Drive Unit	
Motor, IE5 (standard)	
Configuration:	WP81, Cleanroom, 230V
Nominal Power:	TBD
Nominal Voltage and frequency (from frequency converter):	TBD
Nominal Current:	TBD

Motor, option Premium/CUS	
Efficiency class:	Premium
Enclosure / Motor Protection:	IP66
Configuration:	Blue, WP50
Nominal Power:	0.37 kW
Nominal Voltage and frequency (from frequency converter):	Output 265 VAC, connected in delta, 60 Hz
Nominal Current:	1.40 A
Configuration:	Blue, WP81
Nominal Power:	0.75 kW
Nominal Voltage and frequency (from frequency converter):	Output 265 VAC, connected in delta, 60 Hz
Nominal Current:	2.72 A
Country Code:	US/CA

Motor, option ATEX/EX only	
Efficiency class:	IE2/IE3
Enclosure / Motor Protection:	IP66
Safety class:	Ex db eb IIC T4 Gb
Configuration:	Blue, WP50
Nominal Power:	0.25 kW
Nominal Voltage and frequency (from frequency converter):	Output 230 VAC, connected in delta, 50 Hz
Nominal Current:	1.30 A
Configuration:	Blue, WP81
Nominal Power:	0.75 kW
Nominal Voltage and frequency (from frequency converter):	Output 230 VAC, connected in delta, 50 Hz
Nominal Current:	2.94 A
Country Code:	EU + Not specific

Motor, option LV Explosion Proof Motor	
Efficiency class:	Premium
Enclosure / Motor Protection:	IP66
Safety class:	Class1 Div1 Group D
Configuration:	Blue, WP50
Nominal Power:	0.37 kW
Nominal Voltage and frequency (from frequency converter):	Output 208-230 VAC, connected in delta, 60 Hz
Nominal Current:	2.1 – 2.0 A
Configuration:	Blue, WP81
Nominal Power:	1.1 kW
Nominal Voltage and frequency (from frequency converter):	Output 230 VAC, connected in delta, 60 Hz
Nominal Current:	4.4 A
Country Code:	US/CA

Gear	
High efficiency helical bevel right angle gearbox	
Lubricant:	Food compatible oil
Maximum mounting angle acc. to horizontal:	0° - 45° (Different angle intervals based on configuration - Note: Motor may not point downwards)
Surface finish drive unit, standard:	Painted Blue RAL 5010
Surface finish drive unit, Clean Room option:	Sealed Surface Conversion Treatment, Smooth Body (no fan)

Console/flange	
Standard height or option for extended height for insulated tanks	
Attachment, Size WP50:	Clamp connection
Attachment, Size WP81:	Flange-bolt connection

Physical data

Materials	
Impeller and Weld plate:	EN 1.4435 (316L/UNS31603), Optionally: EN 1.4529 or EN 2.4602
Drive Rotor, shaft and console/flange:	AISI304 (UNS S30400)
Gear motor, Painted:	C2 according to DIN 12944 (NSF/ANSI 51-2009e)
Gear motor, Clean room:	Permanent Bond Surface (nsd tupH) - compl. w. FDA Title 21 CFR 175.300
Male Bearing:	
Female bearing:	Silicium Carbide (EN 12756)
Seals:	EPDM, Optionally: FPM or FFKM
Gearbox oil:	USDA H1

Temperatures	
During product Mixing, media:	Max. 90 °C
During product Mixing, media WFI:	Max. 90 °C
During CIP (max. 50 RPM):	Max. 95 °C
During SIP (max. 50 RPM):	Max. 125 °C
During SIP (max. 0 RPM):	Max. 150 °C

Max. speed		Asyncronous	Syncronous
Impeller size	Max. speed	IE2/IE3/Premium	IE5
	RPM	Hz	Hz
100	800	81.0	161.6
150	480	48.5	97.0
200	480	83.0	148.8
250	230	40.0	71.3
300	200	34.5	62.0

Speed sensor

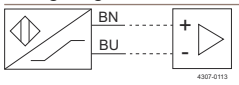
(Accessory, can only be used for impeller configuration “prepared for speed sensor”)

Alfa Laval Magnetic-Inductive Speed Sensor for LeviMag - the Magnetic inductive proximity sensor is actuated by magnetic fields and capable of detecting permanent magnets in the impeller through the non-magnetic tank material.

Technical Data	
Electrical design:	NAMUR
Approval:	ATEX category II 1G
	KEMA 02 ATEX 1090X
	SIL2 (Low Demand Mode) acc. to IEC 61508
	PL c acc. to ISO 13849-1 at HFT0
	SIL3 (All Demand Mode) acc. to IEC 61508
	PL e acc. to ISO 13849-1 with redundant
	configuration HFT1
Connection:	DC 2-wire, nom. 8.2 VDC
Output:	Acc. to DIN EN 60947-5-6 (NAMUR)
Switching frequency:	1 kHz
Current consumption non-actuated:	< 1.2 mA
Current consumption actuated:	< 2.1 mA

Physical data	
Materials:	Cable 4 mm, 2 x 0.25 mm^2, Blue, Lif9YYW, PVC, 2 m

Wiring Diagram



Enclosure:	IP67

Documentation:

As standard with UltraPure Q-Doc including:

- Compliance with Regulation (EC) No.: 1935/2004
- Compliance with (Ex/ATEX) directive 2014/34/EU (ATEX option, II -/2G Ex h IIC T4 -/Gb)
- Compliance to the EC Regulation for GMP
- 3.1 Material Certificates acc. to EN10204 (MTR) for all wetted parts
- Compliance to USP Class VI <88> and FEP/FKM seals
- Compliance to FDA CFR 21 (non-metallic parts) for elastomers, ceramics and gear oil
- TSE (Transmissible Spongiform Encephalopathy) / ADI (Animal Derivative Ingredient) Declaration
- Surface finish compliance declaration

Options:

- Surface roughness measurements included
- Weld Log included

Build up:

1. Impeller
2. Seals
3. Female Bearing
4. Male Bearing
5. Weld Plate
6. Clamp ring connection (WP50 only)
7. Flange-Bolt Connection (WP81 only)
8. Drive unit
9. Speed Sensor (Accessory)

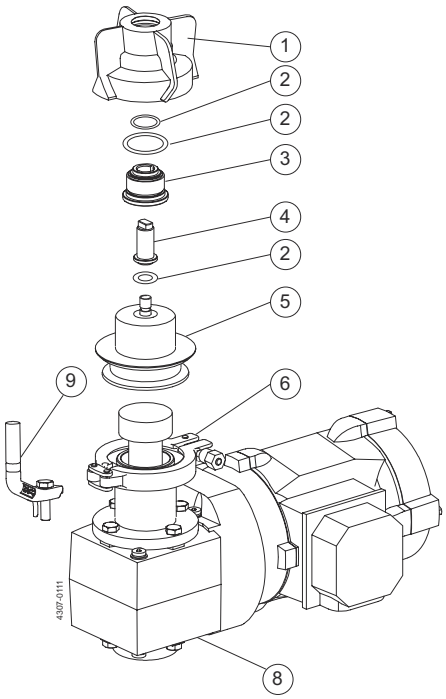


Figure 1. LeviMag WP50

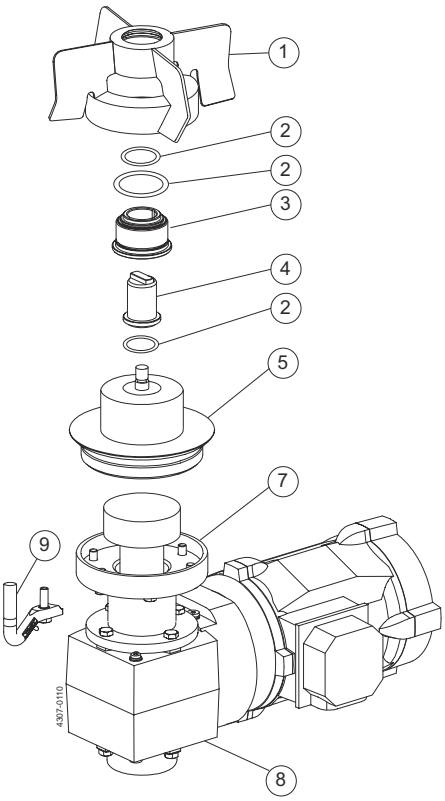


Figure 2. LeviMag WP81

Dimensions: (mm)

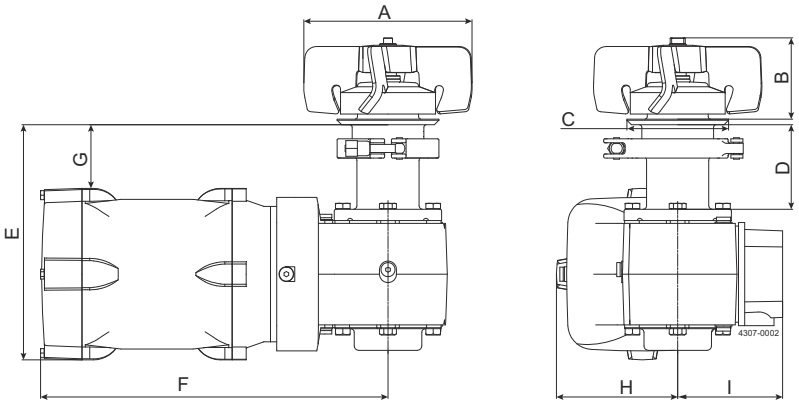


Figure 3. LeviMag WP50

Model	Size WP50 - Ø100 impeller				Size WP50 - Ø150 impeller			
Configuration	Standard console Height + Painted Gear Motor	Extended console Height + Painted Gear Motor	Standard console Height + Clean Room Gear Motor	Extended console Height + Clean Room Gear Motor	Standard console Height + Painted Gear Motor	Extended console Height + Painted Gear Motor	Standard console Height + Clean Room Gear Motor	Extended console Height + Clean Room Gear Motor
A	Ø100	Ø100	Ø100	Ø100	Ø150	Ø150	Ø150	Ø150
B	72	72	72	72	72	72	72	72
C	Ø90	Ø90	Ø90	Ø90	Ø90	Ø90	Ø90	Ø90
D	75	125	75	125	75	125	75	125
E IE5	200	250	TBD	TBD	200	250	TBD	TBD
F IE5	346.5	346.5	TBD	TBD	346.5	346.5	TBD	TBD
G IE5	65.0	115	TBD	TBD	65	115	TBD	TBD
H IE5	104.5	104.5	TBD	TBD	104.5	104.5	TBD	TBD
I IE5	91	91	TBD	TBD	91	91	TBD	TBD
E Premium/CUS	202	252	-	-	202	252	-	-
F Premium/CUS	318	318	-	-	318	318	-	-
G Premium/CUS	63	113	-	-	63	113	-	-
H Premium/CUS	105	105	-	-	105	105	-	-
I Premium/CUS	94	94	-	-	94	94	-	-
E ATEX	202	252	-	-	202	252	-	-
F ATEX	373	373	-	-	373	373	-	-
G ATEX	62	112	-	-	62	112	-	-
H ATEX	105	105	-	-	105	105	-	-
I ATEX	119	119	-	-	119	119	-	-
E LV Explosion Proof	223	273	-	-	223	273	-	-
F LV Explosion Proof	520	520	-	-	520	520	-	-
G LV Explosion Proof	45	95	-	-	45	95	-	-
H LV Explosion Proof	123	123	-	-	123	1123	-	-
I LV Explosion Proof	142	142	-	-	142	142	-	-

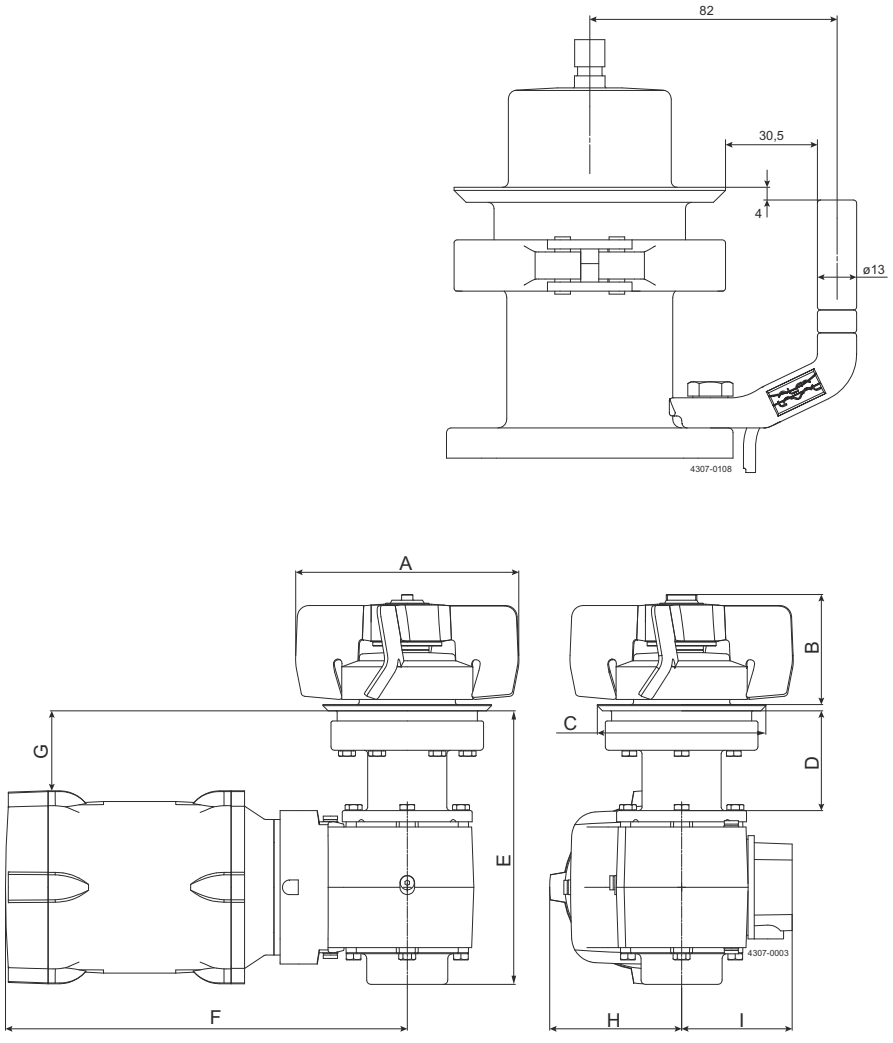
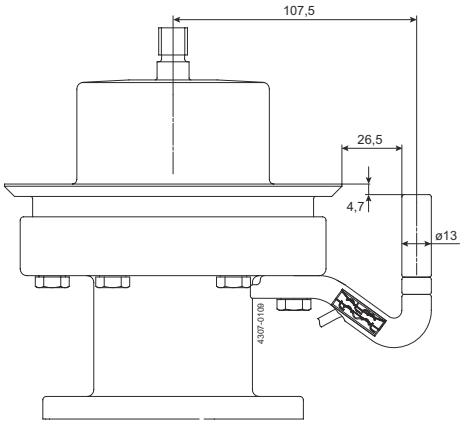


Figure 4. LeviMag WP81

Model	Size WP81 - Ø200 impeller				Size WP81 - Ø250 impeller				Size WP81 - Ø300 impeller			
Configuration	Standard console Height + Painted Gear Motor	Extended console Height + Painted Gear Motor	Standard console Height + Clean Room Gear Motor	Extended console Height + Clean Room Gear Motor	Standard console Height + Painted Gear Motor	Extended console Height + Painted Gear Motor	Standard console Height + Clean Room Gear Motor	Extended console Height + Clean Room Gear Motor	Standard console Height + Painted Gear Motor	Extended console Height + Painted Gear Motor	Standard console Height + Clean Room Gear Motor	Extended console Height + Clean Room Gear Motor
A	Ø200	Ø200	Ø200	Ø200	Ø250	Ø250	Ø250	Ø250	Ø300	Ø300	Ø300	Ø300
B	98	98	98	98	98	98	98	98	98	98	98	98
C	Ø149	Ø149	Ø149	Ø149	Ø149	Ø149	Ø149	Ø149	Ø149	Ø149	Ø149	Ø149
D	89	139	89	139	89	139	89	139	89	139	89	139
E IE5	242.5	292.5	TBD	TBD	242.5	292.5	TBD	TBD	242.5	292.5	TBD	TBD
F IE5	388.5	388.5	TBD	TBD	388.5	388.5	TBD	TBD	388.5	388.5	TBD	TBD
G IE5	75	125	TBD	TBD	75	125	TBD	TBD	75	125	TBD	TBD
H IE5	110	110	TBD	TBD	110	110	TBD	TBD	110	110	TBD	TBD
I IE5	106	106	TBD	TBD	106	106	TBD	TBD	106	106	TBD	TBD
E Premium/CUS	243	293	-	-	243	293	-	-	243	293	-	-
F Premium/CUS	354	354	-	-	354	354	-	-	354	354	-	-
G Premium/CUS	78	128	-	-	78	128	-	-	78	128	-	-
H Premium/CUS	110	110	-	-	110	110	-	-	110	110	-	-
I Premium/CUS	112	112	-	-	112	112	-	-	112	112	-	-
E ATEX	294	344	-	-	294	344	-	-	294	344	-	-
F ATEX	418	418	-	-	418	418	-	-	418	418	-	-
G ATEX	77	127	-	-	77	127	-	-	77	127	-	-
H ATEX	110	110	-	-	110	110	-	-	110	110	-	-
I ATEX	144	144	-	-	144	144	-	-	144	144	-	-
E LV Explosion Proof	248	298	-	-	248	298	-	-	248	298	-	-
F LV Explosion Proof	534	534	-	-	534	534	-	-	534	534	-	-
G LV Explosion Proof	69	119	-	-	69	119	-	-	69	119	-	-
H LV Explosion Proof	123	123	-	-	123	123	-	-	123	123	-	-
I LV Explosion Proof	142	142	-	-	142	142	-	-	142	142	-	-



Machine Selection:

LeviMag UltraPure can be sized and configurated in Alfa Laval configurator. Selection of size can also be done by use of the below selection charts.

Needed information for selection of size:

- Media Viscosity
- Tank Volume
- Tank diameter and tank bottom shape
- Duty (see below Duty Levels)

Duty Level	Duty	Description
1	Keep media homogenous	Keeping fluids homogenous & low gradient heat transfer
2	Mild blending	Simple blending of miscible fluids & high gradient heat transfer, no specific request to mixing time, create suspension if deposit velocity is below 0.015 m/s
3	Mixing	Mixing of fluids, relative low mixing time, create suspension if deposit velocity is below 0.03 m/s
4	Powerful mixing	Dissolving solids, very low mixing time, create suspension if deposit velocity is below 0.06 m/s

Preconditions for using the selection charts:

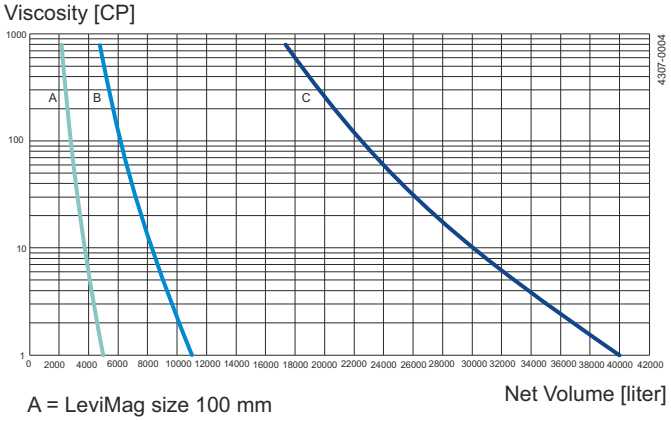
- Specific gravity of the media must be less than or equal to 1.1
- Liquid height must be equal to or lower than 2½ times the tank diameter
- If duty involves suspension of particles (see deposit velocity limits in the duty levels), the tank diameter D must be:

$$D \leq \sqrt[3]{\frac{V \cdot 4}{\pi}}$$

  where V is the Net Volume
- If preconditions are not fulfilled please contact Alfa Laval Global Technical Support

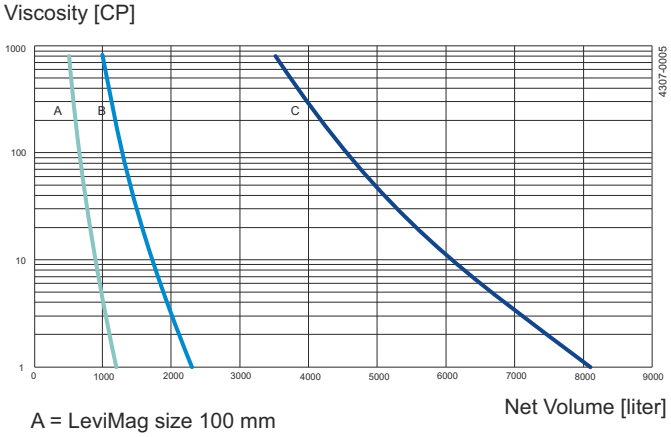
How to select:

1. Select duty
2. Check preconditions
3. Go to the chart for the chosen duty
4. Read out the point for the requested tank volume (X-axis) and viscosity (Y-axis)
5. Choose the curve to the right from the point
6. If physically possible a larger impeller size can always be chosen - eg. to obtain a gentler product treatment (operating at lower speed)



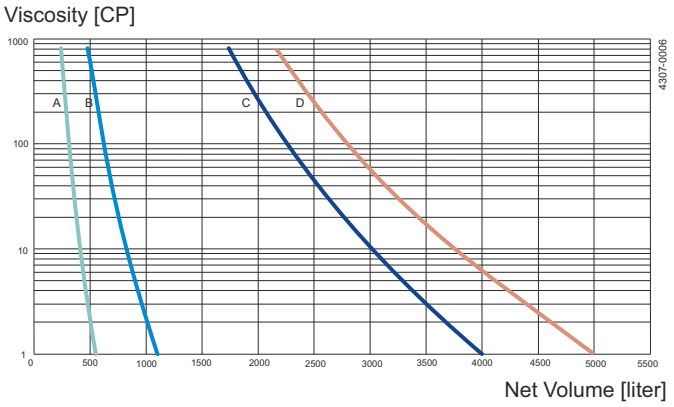
A = LeviMag size 100 mm
B = LeviMag size 150 mm
C = LeviMag size 200, 250 and 300 mm

Figure 5. Duty Level 1: Keep media homogenous Volume vs. Vicosity



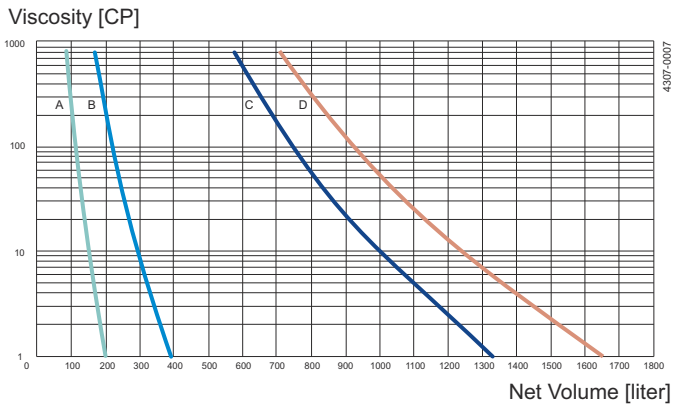
A = LeviMag size 100 mm
B = LeviMag size 150 mm
C = LeviMag size 200, 250 and 300 mm

Figure 6. Duty Level 2: Mild blending Volume vs. Vicosity



A = LeviMag size 100 mm
B = LeviMag size 150 mm
C = LeviMag size 200, 250 mm
D = LeviMag size 300 mm

Figure 7. Duty Level 3: Mixing Volume vs. Vicosity



A = LeviMag size 100 mm
B = LeviMag size 150 mm
C = LeviMag size 200, 250 mm
D = LeviMag size 300 mm

Figure 8. Duty Level 4: Powerfull mixing Volume vs. Vicosity