Installation Manual

Tetra Centri®
Self-Cleaning Separators

Separator type:	Product No.:
A 614HGV-14C	881208-01-02
C 614HGV-74C	881208-01-02
D 614HGV-34C	881208-01-02
H 614HGV-74C	881208-01-02
W 614HGV-74C	881208-01-02
WD614HGV-34/74C	881208-01-02
A 714HGV-14C	881208-02-02
BM714HGV-14C	881208-02-02
C 714HGV-74C	881208-02-02
H 714 HGV-74C	881208-02-02
W 714HGV-74C	881208-02-02
BB 714HGV-34C	881208-02-02
D 714HGV-34C	881208-02-02
WD714HGV-34/74C	881208-02-02
C 518HGV-74C	881209-01-02
H 518HGV-74C	881209-01-02
W 518HGV-74C	881209-01-02
WD 518HGV-74C	881209-01-02
BM618HGV-14C	881209-02-03
C 618HGV-74C	881209-02-03
F 618HGV-74C	881209-02-03
H 618HGV-74C	881209-02-03
W 618HGV-74C	881209-02-03
BB 618HGV-34C	881209-02-03
D 618HGV-34C	881209-02-03
WD 618HGV-34/74C	881209-02-03
D 718HGV-34C	881209-03-02
H 718HGV-74C	881209-03-02
W 718HGV-74C	881209-03-02
C 718HGV-74C	881209-03-02
WD 718HGV-34/74C	881209-03-02
BM818HGV-14C	881210-01-05
BB 818HGV-34C	881210-01-05
H 818HGV-74C	881210-01-05
W 818HGV-74C	881210-01-05
C 818HGV-74C	881210-01-05
WD 818HGV-34C/74C	881210-01-05

Product No.:	Multiple
Book No.:	582343-02 Rev. 6

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Contents

Read and understand instruction manuals and observe the warnings before installation, operation, service and maintenance.

Not following the instructions can result in serious accidents.

In order to make the information clear only foreseeable conditions have been considered. No warnings are given, therefore, for situations arising from the unintended usage of the machine and its tools.

1 Safety Instructions

The centrifuge includes parts that rotate at high speed. This means that:

- Kinetic energy is high
- Great forces are generated
- Stopping time is long

G0010421

Manufacturing tolerances are extremely fine. Rotating parts are carefully balanced to reduce undesired vibrations that can cause a breakdown. Material properties have been considered carefully during design to withstand stress and fatigue.

The separator is designed and supplied for a specific separation duty (type of liquid, rotational speed, temperature, density etc.) and must not be used for any other purpose.

Incorrect operation and maintenance can result in unbalance due to build-up of sediment, reduction of material strength, etc., that subsequently could lead to serious damage and/or injury.

The following basic safety instructions therefore apply:

- **Use the separator only for the purpose and parameter range specified by Alfa Laval.**
- **Strictly follow the instructions for installation, operation and maintenance.**
- **Ensure that personnel are competent and have sufficient knowledge of maintenance and operation, especially concerning emergency stopping procedures.**
- **Use only Alfa Laval genuine spare parts and the special tools supplied.**

S0151211

Disintegration hazards

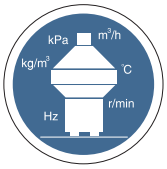
- When power cables are connected, always check direction of motor rotation. If incorrect, vital rotating parts could unscrew.


S01512F1

- If excessive vibration occurs, **stop** separator and **keep bowl filled** with liquid during rundown.

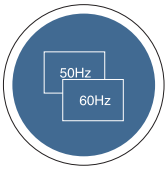

S01512N1

- Use the separator only for the purpose and parameter range specified by Alfa Laval.



S01512P1

- Check that the gear ratio is correct for power frequency used. If incorrect, subsequent overspeed may result in a serious break down.
- Since the separator is equipped with a frequency controlled motor, it is extremely important to ensure that the motor speed does not exceed the allowed maximum speed. A serious break down may be the consequence.



S01512L1

- Welding or heating of parts that rotate can seriously affect material strength.


S01512J1

- Wear on the large lock ring thread must not exceed safety limit. ϕ-mark on lock ring must not pass opposite ϕ-mark by more than specified distance.

S01512G1

- Inspect regularly for **corrosion** and **erosion** damage. Inspect frequently if process liquid is corrosive or erosive.


S01512H1

Entrapment hazards

- Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.

S0151201

- To avoid accidental start, switch off and lock power supply before starting **any** dismantling work.

  Assemble the machine **completely** before start. **All** covers and guards must be in place.

S0151261

Electrical hazard

- Follow local regulations for electrical installation and earthing (grounding).
- To avoid accidental start, switch off and lock power supply before starting **any** dismantling work.

S0151271

Crush hazards

- Use correct lifting tools and follow lifting instructions.

S01512M1

Do **not** work under a hanging load.

S01512Y1

Noise hazards

- Use ear protection in noisy environments.

S0151291

Burn hazards

- Lubrication oil, machine parts and various machine surfaces can be hot and cause burns. Wear protective gloves.

S01512A1

Skin irritation hazards

- When using chemical cleaning agents, make sure you follow the general rules and suppliers recommendation regarding ventilation, personnel protection etc.
- Use of lubricants in various situations.

S01512D1

Cut hazards

- Sharp edges, especially on bowl discs and threads, can cause cuts. Wear protective gloves.

S01512B1

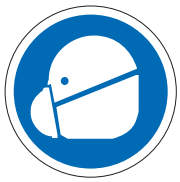
Flying objects

- Risk for accidental release of snap rings and springs when dismantling and assembly. Wear safety goggles.

S01512C1

Health hazard

- Risk for unhealthy dust when handling friction blocks/pads. Use a dust mask to make sure not to inhale any dust



S01512V1

1.1 Warning signs in text

Pay attention to the safety instructions in this manual. Below are definitions of the three grades of warning signs used in the text where there is a risk for injury to personnel.

DANGER

Type of hazard

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Type of hazard

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

CAUTION

Type of hazard

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTE

NOTE indicates a potentially hazardous situation which, if not avoided, may result in property damage.

1.2 Environmental issues

Unpacking

Packing material consists of wood, plastics, cardboard boxes and in some cases metal straps.

Wood and cardboard boxes can be reused, recycled or used for energy recovery.

Plastics should be recycled or burnt at a licensed waste incineration plant.

Metal straps should be sent for material recycling.

Maintenance

During maintenance oil and wear parts in the machine are replaced.

Oil must be taken care of in agreement with local regulations.

Rubber and plastics should be burnt at a licensed waste incineration plant. If not available they should be disposed to a suitable licensed land fill site.

Bearings and other metal parts should be sent to a licensed handler for material recycling.

Seal rings and friction linings should be disposed to a licensed land fill site. Check your local regulations.

Worn out or defected electronic parts should be sent to a licensed handler for material recycling.

1.3 Requirements of personnel

Only **skilled** or **instructed** persons are allowed to operate the machine, e.g. operating and maintenance staff.

- **Skilled person**: A person with technical knowledge or sufficient experience to enable him or her to perceive risks and to avoid hazards which electricity/mechanics can create.
- **Instructed person**: A person adequately advised or supervised by a skilled person to enable him or her to perceive risks and to avoid hazards which electricity/mechanics can create.

In some cases special skilled personnel may need to be hired, like electricians and others. In some of these cases the personnel has to be certified according to local regulations with experience of similar types of work.

2 Technical reference

2.1 Product description A / C/ D/ H / W / WD / 614HGV

Alfa Laval ref. 580373, rev. 8(spec. 881208-01-02/6)

Application

Dairy A: anhydrous milk fat, C: cold milk, D: desludger, H: hot milk, W: whey and WD: whey.

Technical design

Variable discharge system (OWMC).
Water cooled jacket.
Hermetic design.

Designed in accordance with directives and standards:

(CE marking is possible if manuals are included in the delivery)

98/37/EC	Machinery directive
89/336 EEC	EMC directive.
2006/95 EEC	Low voltage directive.
EN 60204-1	Safety of machinery – Electrical equipment of machines – Part 1: General requirements.
EN ISO 12100-1 EN ISO 12100-2	Safety of machinery – Basic concepts, general principles for design.
EC 1935/2004	Regulation of the European Parliament and Council relating to materials and articles intended to come in contact with food.

Operational limits

Hydraulic capacity: 30 m³/h, (A: 25 m³/h)

Feed temperature: 0°C to +100°C, for mechanical reason

Ambient temperature +5°C to +45°C

Discharge intervals: 1-60 min.

Recommended discharge volume: 6 - 8 litres.

Recommended discharge volume in cleaning cycles: 14 - 16 litres

Only land based installations permitted.

Bowl must be kept filled during stopping sequence.

Risk for corrosion and erosion have to be investigated in each case by the segment.

2.1.1 Technical data A / C/ D/ H/ W / WD / 614HGV

Alfa Laval ref. 562172, rev. 1(spec. 881208-01-02/6)

Weight of separator (without motor):	1390	kg
Motor weight:	290	kg
Motor power:	18,5	kW
Power consumption, idling/ max. capacity:	6/ 13	kW
Max. power consumption, start-up:		kW
Start time min./ max.:	10/ 12	minutes
Stop time min./ max.:	16/ 18	minutes
Stop time without brake, average:	45	minutes
Max running time without flow, bowl empty/ filled:	60/ 60	minutes
Sound power:	8,8	Bel(A)
Sound pressure:	71	dB(A)
Vibrations, new separator/ separator in use:	7,1/ 9	mm/s
Alarm levels for vibration monitor, connection 750, 1st/ 2nd:	6/ 8	mm/s
Max. hydraulic capacity: D	40	m^3/h
Max. hydraulic capacity: A	25	m^3/h
Max. hydraulic capacity: C, H, W, WD	30	m^3/h
Lube oil volume:	12,5	litre
Motor speed, syncronous:	1500 / 1800	r/min (50/60 Hz)
Gear ratio:	91/32 / 85/36	50/60 Hz
Bowl speed, syncronous:	4266/ 4250	r/min (50/60 Hz)
Max. bowl inner diameter:	507	mm
Min./ Max. discharge interval:	1/	minutes
Max. density of operating liquid:	1000	kg/m^3
Min./ Max. feed temperature:	0/ 100	°C
Bowl material:		AL 111 2377-02
Min./Max. ratio of density:	/	

Bowl: C, H, W, WD, A		
Bowl liquid volume:	30	litres
Min. /Max. discharge volume:	5/ 30	litres
Sludge volume, efficient/ total:	9,8/ 9,8	litres
Max. density feed/ sediment:	1100/ 1380	kg/m³
Bowl weight:	594	kg
Jp reduced to motor shaft:	209,2/144,2	kgm² (50/60 Hz)
Bowl: D		
Bowl liquid volume:	30	litres
Min./ Max. discharge volume:	5/ 25	litres
Sludge volume, efficient/ total:	9,8/ 17,8	litres
Max. density feed/ sediment:	1100/ 1247	kg/m³
Bowl weight:	595	kg
Jp reduced to motor shaft:	295,4/209,2	kgm² (50/60 Hz)

There are no other metallic materials than stainless steel in bowl

2.2 Product description A / BB / BM / C / D / H / W / 714HGV

Alfa Laval ref. 580378, rev. 2 (spec. 881208-02-02/2)

Application	Dairy, A: anhydrous milk fat, BM: bactofuge, BB: bactofuge, C: cold milk, D / H: hot milk, W: whey).	
Technical design	Variable discharge system (OWMC). Water cooled jacket. Hermetic design.	
Designed in accordance with directives and standards	98/37/EC	Machinery directive
	89/336 EEC	EMC directive.
	EC 1935/2004	Regulation of the European Parliament and Council relating to materials and articles intended to come in contact with food.
Operational limits	Hydraulic capacity: 30 m³/h (A / C), 40 m³/h (BB:, B / D/ H/ W)	
	Feed temperature: 0°C to +100°C, for mechanical reason	
	Ambient temperature +5°C to +45°C	
	Discharge intervals: 1-60 min.	
	Recommended discharge volume: 6 - 8 litres.	
	Recommended discharge volume in cleaning cycles: 14 - 16 litres.	
	Only land based installations permitted.	
	Bowl must be kept filled during stopping sequence.	
	Risk for corrosion and erosion have to be investigated in each case by the application centre.	

2.2.1 Technical data A / BB / BM /C / D / H/W / 714HGV

Alfa Laval ref. 562177, rev. 1 (spec. 881208-02-02/2)

Bowl speed, synchronous	5069 / 5119	r/min 50 Hz / 60 Hz
Motor speed, synchronous	1500 / 1800	r/min 50 Hz / 60 Hz
Revolution counter speed, synchronous	125 / 150	r/min 50 Hz / 60 Hz
Gear ratio	98:29	50 Hz
	91:32	60 Hz
Hydraulic capacity:		
C:, H:, W:	30	max. m^3/h
BB:, D:, BM:	40	max. m^3/h
A:	25	max. m^3/h
Ambient temperature	+ 5 to + 45	°C
Feed temperature	0 to + 100	°C min./max.
Max. density of feed / sediment	1100 / **)	kg/m^3
Max. density of operating liquid	1000	kg/m^3
Motor power	22	kW
Power consumption	9 / 18	kW (idling / at max. capacity)
Jp reduced to motor shaft	295,4 / 209,2	kgm^2 50 / 60 Hz
Max running time without flow, bowl empty / filled	60 / 80	minutes
Start time	16 / 17	minutes (min./max.)
Stopping time with brake	16 / 18	minutes (min./max.)
Stopping time without brake	45	minutes (average)
Sound power	8,7	Bel(A)
Sound pressure level	70	dB(A)
Vibration level max.	7,1 / 9	mm/s (new sep./sep. in use)
Alarm levels for vibration monitor, connection 750, 1st / 2nd	6 / 8	mm/s
Lubricating oil volume	12,5	litres
Weight of separator	1390	kg (without motor)
Motor weight	290	kg
Max. bowl inner diameter	507	mm
Bowl body material	AL 111 2377-02	

There are no other materials than stainless steel in contact with process fluid except for sealings and gaskets.

BM:

Bowl liquid volume	30	litres
Min./max. discharge volume	5 / 25	litres
Sludge volume, efficient/total	1,6 / 9,8	litres
Max. density feed/sediment	1100 / 2033	kg/m^3
Bowl weight	595	kg
JP reduced to motor shaft	295,4/209,2	kgm^2 50/60 Hz

BB:

Bowl liquid volume	30	litres
Min./max. discharge volume	5 / 25	litres
Sludge volume, efficient/total	9,8 / 9,8	litres
Max. density feed/sediment	1100 / 1367	kg/m^3
Bowl weight	595	kg
JP reduced to motor shaft	295,4/209,2	kgm^2 50/60 Hz

D:

Bowl liquid volume	30	litres
Min./max. discharge volume	5 / 25	litres
Sludge volume, efficient/total	9,8 / 17,8	litres
Max. density feed/sediment	1100 / 1247	kg/m^3
Bowl weight	595	kg
JP reduced to motor shaft	295,4/209,2	kgm^2 50/60 Hz

A:, C:, H:, W:

Bowl liquid volume	30	litres
Min./max. discharge volume	5 / 30	litres
Sludge volume, efficient/total	9,8 / 9,8	litres
Max. density feed/sediment	1100 / 1380	kg/m^3
Bowl weight	594	kg
JP reduced to motor shaft	295,4/209,2	kgm^2 50/60 Hz

2.3 Product description C / H / W / WD / 518HGV

Alfa Laval ref. 580382, rev. 2 (spec. 881209-01-02/2)

Application

Dairy, C: cold milk, H: hot milk, W: whey and WD: whey.

Technical design

Variable discharge system (OWMC).
Water cooled jacket.
Hermetic design.

Designed in accordance with standards

(CE. marking is possible if manuals are included in the delivery.)

98/37/EC	Machinery directive
EN 292-2	Safety of machines. Use of the machine in applications subject to hygienic demands requires a well adapted cleaning program.
89/336 EEC	EMC and amendments related to said directive.
EC 1935/ 2004	Regulation of the European Parliament and Council relating to materials and articles intended to come in contact with food.

Restrictions

Hydraulic capacity: 35 m^3/h

Feed temperature: 0°C to +100°C

Ambient temperature +5°C to +45°C

Discharge intervals: 1-60 min.

Recommended discharge volume: 18 litres.

Maximum discharge volume in cleaning cycles: 35 litre discharges allowed in cleaning cycles (max 10 discharges / day.)

Only land based installations permitted.

Bowl must be kept filled during stopping sequence.

Risk for corrosion and erosion have to be investigated in each case by the application centre.

2.3.1 Technical data C / H / W / WD / 518HGV

Alfa Laval ref. 562184, rev. 1 (spec. 881209-01-02/2)

Bowl speed, synchronous	3955 / 3932	r/min 50 Hz / 60 Hz
Motor speed, synchronous	1500 / 1800	r/min 50 Hz / 60 Hz
Revolution counter, synchronous	125 / 150	r/min 50 Hz / 60 Hz
Gear ratio	87:33	50 Hz
	83:38	60 Hz
Jp reduced to motor shaft	595,4 / 408,7	kgm² 50 / 60 Hz
Max. bowl inner diameter	644	mm
Hydraulic capacity	30	m³/h
Min./max. discharge volume		l
during operation	10 / 18	litres
Min. discharge interval	1	minute
Max. discharge volume during		
cleaning cycles	35	litres
Ambient temperature	+ 5 to + 45	°C
Feed temperature	0 to + 100	°C min./max.
Max. density of feed / sediment	1100 / 1481	kg/m^3
Max. density of operating liquid	1000	kg/m^3
Max. pressure operating liquid	50	kPa
Motor power	22	kW
Power consumption	12 / 16	kW (idling / at max. capacity)
Start time	14 / 16	minutes (min./max.)
Stopping time with brake	20 / 23	minutes (min./max.)
Stopping time without brake	80	minutes (average)
Max running time without flow,		
bowl empty / filled	60 / 60	minutes
Sound power	9,2	Bel(A)
Sound pressure level	78	dB(A)
Vibration level max.	7,1 / 9	mm/s (new sep./sep. in use)
Alarm levels for vibration monitor,		
connection 750, 1st / 2nd	6 / 8	mm/s
Lubricating oil volume	12,5	litres
Bowl liquid volume	65	litres
Sludge volume, efficient / total	17 / 17	litres
Bowl weight	1160	kg
Weight of separator	2080	kg (without motor)
Motor weight	290	kg
Bowl body material	AL 111 2377-02	

There are no other materials than stainless steel in contact with process fluid except for sealings and gaskets.

2.4 Product description BB / BM / C / D / F /H / WD / W / 618HGV

Alfa Laval ref. 580390, rev. 2 (spec. 881209-02-03/2)

Application

Dairy, BB: bactofuge, BM: bactofuge, C: cold milk, D: desludger, F: cream concentration, H: hot milk, W: whey, WD: whey.

Technical design

Variable discharge system (OWMC).
Water cooled jacket.
Hermetic design.

Designed in accordance with standards

(CE. marking is possible if manuals are included in the delivery.)

98/37/EC	Machinery directive
EN 292-2	Safety of machinery - Basic concepts, general principles for design.
89/336 EEC	EMC directive.
73/23/EEC	Low voltage directive
EC 1935/2004	Regulation of the European Parliament and Council relating to materials and articles intended to come in contact with food.

Restrictions

Hydraulic capacity: 25 m³/h (F:), 30 m³/h (BM:), 35 m³/h (C:), 40 m³/h (H/W/WD/), 45 m³/h (BB: D:)

Feed temperature: 0°C to +100°C

Ambient temperature +5°C to +45°C

Discharge intervals: 1-60 min.

Recommended discharge volume: 18 litres.

Maximum discharge volume in cleaning cycles:35 litre discharges allowed in cleaning cycles
(max 10 discharges / day.)

Only land based installations permitted.

Bowl must be kept filled during stopping sequence.

Risk for corrosion and erosion have to be investigated in each case by the application centre.

2.4.1 Technical data BB / BM / C / D / F / H / WD / W / 618HGV

Alfa Laval ref. 562187, rev. 4 (spec. 881209-02-03/2)

Bowl speed, synchronous	4266 / 4250	r/min 50 Hz / 60 Hz
Motor speed, synchronous	1500 / 1800	r/min 50 Hz / 60 Hz
Revolution counter, synchronous	125 / 150	r/min 50 Hz / 60 Hz
Gear ratio	91:32	50 Hz
	85:36	60 Hz
Hydraulic cap. (F:)	25	m^3/h
Hydraulic cap. (BM / H / W / WD:)	40	m^3/h
Hydraulic cap. (C:)	35	m^3/h
Hydraulic cap. (BB:, D:)	45	m^3/h
Min. discharge interval	1	minute
Ambient temperature	+ 5 to + 45	°C
Feed temperature	0 to + 100	°C min./max.
Max. density of operating liquid	1000	kg/m^3
Motor power	25	kW
Motor power (D:)	37	kW
Power consumption	12 / 28	kW (idling / at max. capacity)
Start time	15 / 17	minutes (min./max.)
Stopping time	22/ 25	minutes (min./max.)
Stopping time without brake	80	minutes (average)
Max running time without flow, bowl empty / filled	60 / 60	minutes
Sound power	9,2	Bel(A)
Sound pressure level	78	dB(A)
Vibration level max.	7,1 / 9	mm/s (new sep./sep. in use)
Alarm levels for vibration monitor, connection 750, 1st / 2nd	6 / 8	mm/s
Lubricating oil volume	12,5	litres
Bowl weight	See below	
Weight of separator	2095	kg (without motor)
Motor weight	290	kg
Bowl body material	AL 111 2377-02	

H:, W:, WD:

Bowl liquid volume	70	litres
Sludge volume, efficient / total	17 / 17	litres
Min./max. discharge volume	10 / 35	litres
Max. density of feed / sediment	1100 / 1481	kg/m^3
Bowl weight	1120	kg
Jp reduced to motor shaft	681,2 / 469,6	kgm² 50 / 60 Hz

C:

Bowl liquid volume	77	litres
Sludge volume, efficient / total	17 / 17	litres
Min./max. discharge volume	10 / 35	litres
Max. density of feed / sediment	1100 / 1481	kg/m^3
Bowl weight	1055	kg
Jp reduced to motor shaft	661,8 / 456,2	kgm² 50 / 60 Hz

BM:

Bowl liquid volume	63,5	litres
Sludge volume, efficient / total	1,75 / 17	litres
Min./max. discharge volume	10 / 35	litres
Max. density of feed / sediment	1100 / 2915	kg/m^3
Bowl weight	1175	kg
Jp reduced to motor shaft	699,0 / 481,9	kgm² 50 / 60 Hz

F:

Bowl liquid volume	70	litres
Sludge volume, efficient / total	1,8 / 17	litres
Min./max. discharge volume Max.	10 / 35	litres
density of feed / sediment	1100 / 1481	kg/m^3
Bowl weight	1140	kg
Jp reduced to motor shaft	681,2 / 469,6	kgm² 50 / 60 Hz

BB:

Bowl liquid volume	63	litres
Sludge volume, efficient / total	17 / 17	litres
Min./max. discharge volume Max.	10 / 35	litres
density of feed / sediment	1100 / 1464	kg/m^3
Bowl weight	1175	kg
Jp reduced to motor shaft	697,5 / 480,8	kgm² 50 / 60 Hz

D:

Bowl liquid volume	72	litres
Sludge volume, efficient / total	36 / 36	litres
Min./max. discharge volume Max.	10 / 35	litres
density of feed / sediment	1100 / 1279	kg/m^3
Bowl weight	1105	kg
Jp reduced to motor shaft	661,8 / 456,2	kgm² 50 / 60 Hz

There are no other materials than stainless steel in contact with process fluid except for sealings and gaskets.

2.5 Product description C / H / W / WD / 718HGV

Alfa Laval ref. 580388, rev. 3 (spec. 881209-03-02/3)

Application

Dairy, H: hot milk, W: whey, C: cold milk, D: high flow desludger.

Technical design:

Variable discharge system (OWMC)
Water cooled jacket
Hermetic design

Designed in accordance with directives and standards:

98/37/EC	Machinery directive
EN ISO 12100-1 EN ISO 12100-2	Safety of machinery – Basic concepts, general principles for design
73/23/EEC	Low voltage directive.
89/336 EEC	EMC directive.
EN 60204-1	Safety of machinery – Electrical equipment of machines – Part 1: General requirements
EC 1935/2004	Regulation of the European Parliament and Council relating to materials and articles intended to come in contact with food.

Operational limits:

Hydraulic capacity: Max 50 m³/h (C / H / W/ WD:)
Max 70 m³/h (D: high flow)

Feed temperature: 0°C to +100°C, for mechanical reason

Ambient temperature +5°C to +45°C

Discharge intervals: 1-60 min.

Recommended discharge volume: 18 litres.

Maximum discharge volume in cleaning cycles: 35 litre discharges allowed in cleaning cycles (max 10 discharges / day.)

Only land based installations permitted.

Bowl must be kept filled during stopping sequence.

Risk for corrosion and erosion have to be investigated in each case by the application centre.

2.5.1 Technical data C/ H /W /D /WD/ 718HGV

Alfa Laval ref. 562190, rev. 5 (spec. 881209-03-02/3)

Weight of separator (without motor):	2075	kg
Motor weight:	290	kg
Motor power: (C/ H/ W/ WD:):	25	kW
Motor power: (D: high flow):	37	kW
Power consumption, (C/ H/ W/ WD:):	15/ 28,5	kW (idling/max. capacity)
Power consumption, (D:)	- / -	kW (idling/max. capacity)
Start time min./max.:	20/ 22	minutes
Stop time min./max.:	25/ 28	minutes
Stop time without brake, average:	80	minutes
Max running time without flow, bowl empty/filled:	60/ 60	minutes
Sound power:	9,2	Bel(A)
Sound pressure:	78	dB(A)
Vibrations, new separator/separator in use:	7,1/ 9	mm/s
Alarm levels for vibration monitor, connection 750, 1st/2nd:	6/ 8	mm/s
Max. hydraulic capacity (C/ H/ W/ WD:):	50	m^3/h
Max. hydraulic capacity (D:):	70	m^3/h
Lube oil volume:	12,5	litre
Motor speed, synchronous:	1500/ 1800	r/min 50/60 Hz
Gear ratio:	91:32/ 85:36	50/60 Hz
Bowl speed, synchronous:	4266/ 4250	r/min 50/60 Hz
Max. bowl inner diameter:	644	mm
Min./Max. discharge interval:	1/ 60	minutes
Max. density of operating liquid:	1000	kg/m^3
Min./Max. feed temperature:	0/100	°C

Bowl material:	AL 111 2377-02	
Bowl: H: with caulks 0,4, W:		
Bowl liquid volume:	66	litres
Min./Max. discharge volume:	10/ 35	litres
Sludge volume, efficient/total:	17/17	litres
Max. density feed/sediment:	1100/1481	kg/m³
Bowl weight:	1155	kg
Jp reduced to motor shaft:	691,4 / 476,6	kgm² 50/60 Hz
Bowl: C:		
Bowl liquid volume:	77	litres
Min./Max. discharge volume:	10/ 35	litres
Sludge volume, efficient/total:	17/ 17	litres
Max. density feed/ sediment:	1100/1481	kg/m³
Bowl weight:	1055	kg
Jp reduced to motor shaft,	661,8 / 456,2	kgm² 50/60 Hz
Bowl H: with caulks 0,5, WD:		
Bowl liquid volume:	70	litres
Min./ Max. discharge volume:	10/ 35	litres
Sludge volume, efficient/total:	17/17	litres
Max. density feed/sediment:	1100/1481	kg/m³
Bowl weight:	1120	kg
Jp reduced to motor shaft,	681,2 / 469,6	kgm² 50/60 Hz
Bowl: D:		
Bowl liquid volume:	72	litres
Min./Max. discharge volume:	10/30	litres
Sludge volume, efficient/total:	36/36	litres
Max. density feed/sediment:	1100/1279	kg/m³
Bowl weight:	1105	kg
Jp reduced to motor shaft,	660,6 / 458,7	kgm² 50/60 Hz

2.6 Product description C / BM / BB / H / W / 818 HGV

Alfa Laval ref. 580391, rev. 5(spec. 881210-01-05/6)

Application:

Dairy, BB: bactofuge, BM: bactofuge, H: hot milk, W: whey, C: cold milk, WD: whey

Technical design:

Variable discharge system (OWMC)
Water cooled jacket
Hermetic design

Designed in accordance with directives and standards:

98/37/EC	Machinery directive
89/336 EEC	EMC directive
73/23/EEC	Low voltage directive
EC 1935/2004	materials and product intended to come in contact with foodftuff.

Operational limits:

Hydraulic capacity: 60 m³/h (BB:, High Flow),
45 m³/h (BB:, Standard),
65 m³/h (C / H / W:),
BM: 35 m³/h

Feed temperature: 0°C to +100°C, for mechanical reason

Ambient temperature: +5°C to +45°C

Discharge intervals: 1-60 min

Maximum discharge volume: 17 liters.

Maximum discharge volume in cleaning cycles: 35 litre discharges allowed in cleaning cycles
(max 10 discharges / day.)

Only land based installations permitted.

Bowl must be kept filled during stopping sequence.

Risk for corrosion and erosion have to be investigated in each case.

2.6.1 Technical data C / BM / BB / H / W / 818 HGV

Alfa Laval ref. 565387, rev. 4(spec. 881210-01-05/6)

Bowl speed, synchronous	4607 / 4604	r/min 54 / 65 Hz
Lubricating oil volume	12,5	liters
Motor speed, synchronous	1620 / 1950	r/min 54 / 65 Hz
Gear ratio	91:32 / 85:36	54 / 65 Hz
The motor is fed from the frequency converter		
Hydraulic cap. C / H/W:	65	m^3/h
Hydraulic cap. BB: (high flow)	60	m^3/h
Hydraulic cap. BB: (standard)	45	m^3/h
Hydraulic capacity, BM:	35	m^3/h
Discharge volume	17 / 35	liters (Min./Max.)
Discharge interval	1 / 60	minutes (Min./Max.)
Ambient temperature	+ 5 to + 45	°C
Feed temperature	0 to + 100	°C min./max.
Max. density of operating liquid	1000	kg/m^3
Motor power	37	kW
Power consumption	15 / 28,5	kW (idling / at max. capacity)
Start time	12 / 15	minutes (Min./Max.)
Stopping time with brake	30 / 30	minutes (Min./Max.)
Stopping time without brake	80	minutes (average)
Max. running time without flow, bowl empty / filled	60 / 60	minutes
Sound power	9,35	Bel(A)
Sound pressure level	76,5	dB(A)
Vibration level max.	7,1 / 9	mm/s (new sep./sep. in use)
Alarm levels for vibration monitor, connection 750, 1st / 2nd	6 / 8	mm/s
Weight of separator	2075	kg (without motor)
Motor weight	290	kg
Max. bowl inner diameter	644	mm
Bowl body material	AL 111 2398-02	

Bowl BB: 818:

Bowl liquid volume	63	liters
Sludge volume, efficient / total	17 / 17	liters
Max. density feed / sediment	1100 / 1464	kg/m^3
Bowl weight	1175	kg
Jp reduced to motor shaft	697,5 / 480,8	kgm^2 54 / 65 Hz

Bowl C / H / W 818

Bowl liquid volume	66	liters
Sludge volume, efficient / total	17 / 17	liters
Max. density feed / sediment	1100 / 1481	kg/m^3
Bowl weight	1155	kg
Jp reduced to motor shaft	691,4 / 476,6	kgm^2 54 / 65 Hz

BowlBM: 818

Bowl liquid volume	63	liters
Sludge volume, efficient / total	1,75 / 17	liters

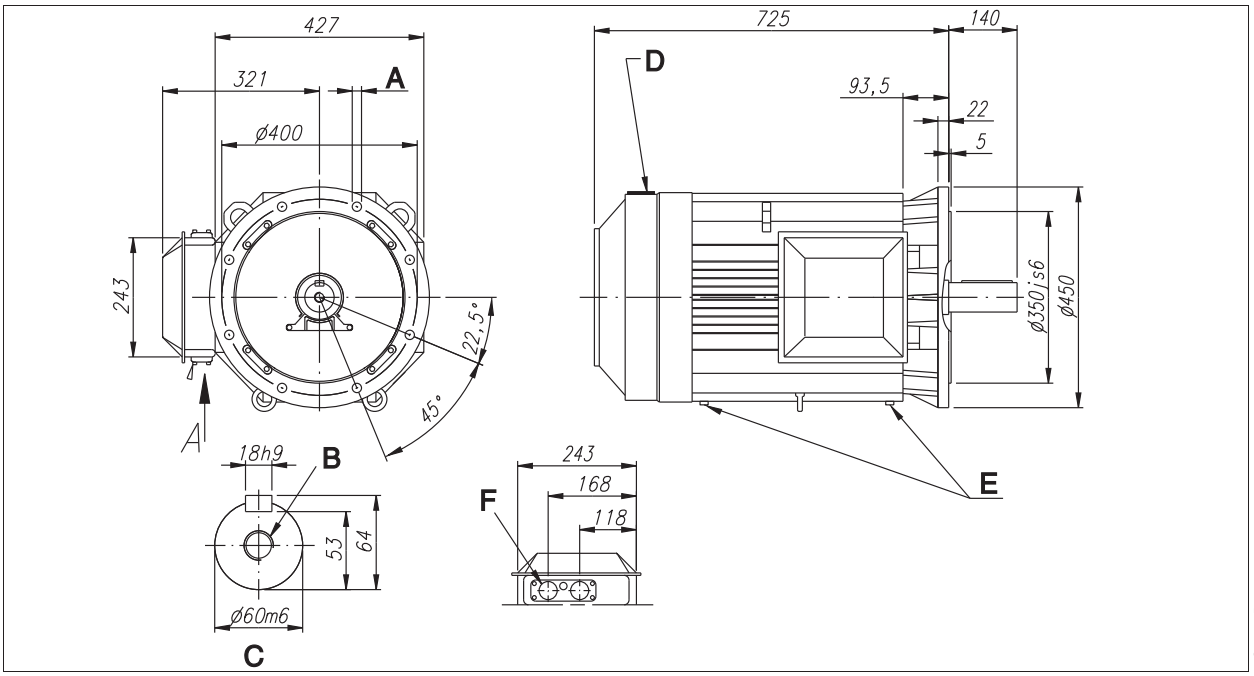
Max. density feed / sediment	1100 / 2915	kg/m^3
Bowl weight	1175	kg
Jp reduced to motor shaft	699,0 / 481,9	kgm² 54 / 65 Hz
BowlWD: 818		
Bowl liquid volume	70	liters
Sludge volume, efficient / total	17 / 17	liters
Max. density feed / sediment	1100 / 1481	kg/m^3
Bowl weight	1120	kg
Jp reduced to motor shaft	681,2 / 469,6	kgm² 54 / 65 Hz

There are no other materials than stainless steel in contact with process fluid except for sealings and gaskets.

2.7 Electric motors

2.7.1 Frequency drive (standard) (718, 714, 614, 518, 818, 618)

Alfa Laval ref. 566300, rev. 12



A. 8 holes, Ø19
B. M20 x 42 deep
C. Shaft dimensions
D. Metal plate with relubrication information.
E. Drain holes with closable plastic plugs (IP 55 with open plugs) according to variant code +066. For horizontal mounting IM 3061, the motor has to be mounted with the drain holes facing downwards.
F. Flange FL 13 with 2xM40+1xM16

Stainless steel grease nipples acc. to variant code +798

Manufacturer	ABB Motors
Manufacturers drawing	Cat. BA/M3000 GB 01-2002
Standards	IEC 34-series, 72-1, 85
Size	IEC 225 M
Type	M3AA 225 SMA 4 B5
Weight	215 kg
Poles	4
Bearings	D-end 6313/C3 N-end 6212/C3
Method of cooling	IC 411 (IEC 34-6)
Insulation class	F
Specification	Totally enclosed 3-phase standard motor for frequency converter drive.
Vibration level	Balanced with half key, quality grade N according to ISO 2373 (max. 2,8 mm/s RMS)
Lubrication	The motor is equipped with grease nipples. Relubrication information is to be found on a separate plate on the motor frame and in the table on page 38.
Thermistor trip. temp.	150 °C
Noise level	Mean sound pressure level is 66 dB(A) at 50 Hz and 70 dB(A) at 60 Hz. Tolerance +3 dB(A).

Type of mounting (IEC 34-7)		Degree of protection (IEC 34-5)
 G05541	IM 3061	IP 23

Relubrication instructions

Mounting	Frequency Hz	Intervals in hours at ambient temperature of max. 40 °C		Grease quantity, grams per bearing		Type of grease
		D-end [1]	N-end [1]	D-end [1]	N-end [2]	
IM 3001	50	8000	8000	50	50	7)
	60					
	70					

[5] D-end = driving end [6] N-end = non driving end

The following high performance grease can be used: [7]	
– Esso	Unirex N2, N3 or S2 (lithium complex base)
– Mobil	Mobilith SHC 100 (lithium complex base)
– Shell	Albida EMS 2 (lithium complex base)
– SKF	LGHQ 3 (lithium complex base)
– Klüber	Klüberplex BEM 41-132 (special lithium base)
– FAG	Arcanol TEMP90 (calsium polyurea base)
– FAG	Arcanol TEMP110 (lithium complex base)

NOTE

For complete information about motor variants, please contact your Tetra Pak representative.

NOTE

Motor for 18,5 kW wound as motor for 22 kW.

Motor for 25 kW and 30 kW wound as motor for 37 kW.

Individual serial number shall always be stamped on rating plate according variant code +003

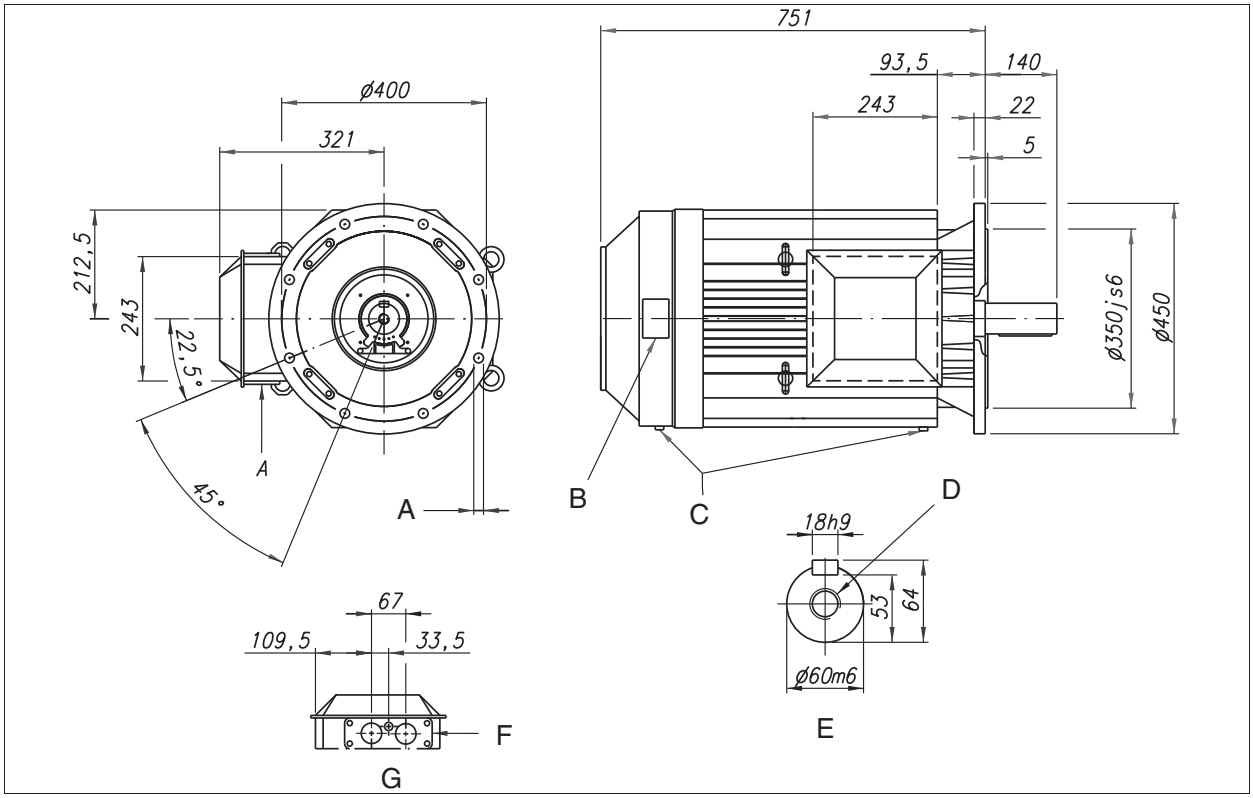
Voltage restrictions for motor winding insulation and variant codes

Voltage restrictions for motors with standard insulation system	
Voltage rise time (us)	Max allowed peak voltage (V)
< 0,1	850
< 0,2	1000
< 0,4	1130
< 0,6	1250
< 0,8	1350

Voltage restrictions for motors with reinforced insulation system acc. to variant code +405	
Voltage rise time (us)	Max allowed peak voltage (V)
< 0,1	850
< 0,2	1300
< 0,4	1500
< 0,5	1600
< 0,6	1700
< 0,7	1800

2.7.2 CT-motor (614 and 714)

Alfa Laval ref. 567623, rev. 5



A. 8 holes, Ø19.

B. Plate with relubrication instructions.

C. Drain holes with closable plastic plugs (IP55 with open plugs). For horizontal mounting IM 3061, the motor has to be mounted with drain holes facing downwards.

D. M20 x 42 deep.

E. Shaft dimensions.

F. Extra large terminal box with flange FL21 with 2xM40+1xM16.

G. View A

Stainless steel grease nipples acc. to variant code +798

Manufacturer	ABB Motors
Manufacturers drawing	Cat. BA/M2AA GB-99-10
Standards	IEC 34-series, 72-1, 85
Size	IEC 225 M
Type	M3AA 225SMD 4 B5
Weight	295 kg
Poles	4
Bearings	D-end 6313/C3 ND-end 6212/C3
Method of cooling	IC 411 (IEC 34-6)
Insulation class	F
Specification	Totally enclosed 3-phase CT-motor for star delta starting [3].
Noise level	Mean sound pressure level 66 dB(A) at 50 Hz and 70 dB(A) at 60 Hz. Tolerance +3 dB(A).
Vibration level	Balanced with half key quality grade R (reduced) according to ISO 2373 (max. 1,12 mm/s RMS)
Lubrication	The motor is equipped with grease nipples. Relubrication information to be found on separate plate on the motor frame and in the table “ ” on page 41.
Note!	Motor rated 18,5 kW wound as motor rated 22 kW.
Thermistor tripping temperature	190 °C

Type of mounting (IEC 34-7)		Degree of protection (IEC 34-5)
 G05415	IM 3061	IP 55

Relubrication instructions

Lubricate at first start until grease is forced out of the outlet. Clean the nipples!

Lubricate when running with bearing grease.

Quantity per bearing	Service	Lubr. interval
50 g	8 h	12 month
	24 h	12 month

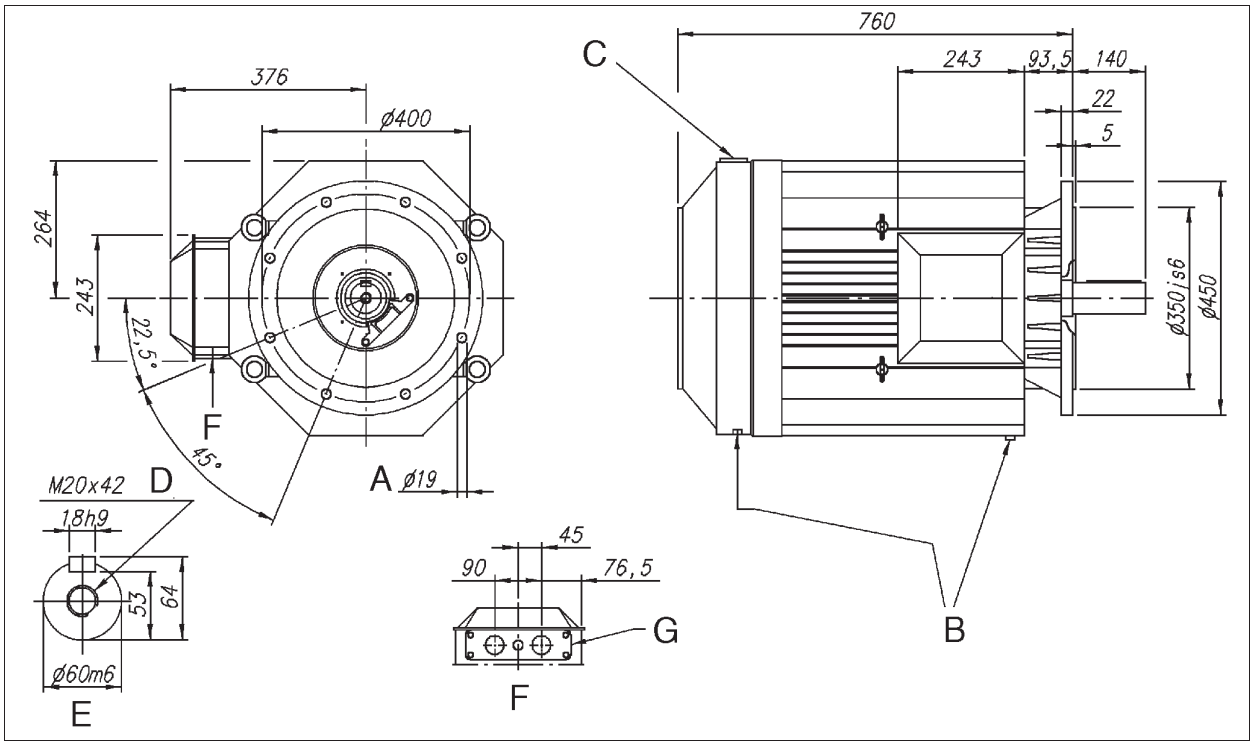
The following high performance grease can be used.
Esso - Unirex N2, N3 or S2 (lithium complex base)
Mobil - Mobilith SHC 100 (lithium complex base)
Shell - Albida EMS 2 (lithium complex base)
SKF - LGHQ 3 (lithium complex base)
Kluber - Kluberplex BEM 41-132 (special complex base)
FAG - Arcanol TEMP90 (calsium polyurea base)
FAG - Arcanol TEMP110 (lithium complex base)

NOTE

For complete information about motor variants, please contact your Tetra Pak representative.

2.7.3 CT-motor (718, 518, 618,)

Alfa Laval ref. 568009, rev. 3



A. 8 holes, Ø19
B. Plate with relubrication information
C. Drain holes with closable plastic plugs (IP 55 with open plugs) For horizontal mounting IM 3001, the motor has to be mounted with the drain holes facing downwards
D. M20 x 42 deep
E. Shaft dimensions
F. View
G. Extra large terminal box with flange FL 21 with 2xM63+1xM16

Stainless steel grease nipples acc. to variant code +798

Type of mounting (IEC 34-7)		Degree of protection (IEC 34-5)
	IM 3001	IP 55

Manufacturer	ABB Motors
Manufacturers drawing	Cat. BA/M2AA GB99-10
Standards	IEC 34-series, 72-1, 85
Size	IEC 250 M
Type	M3AA 250 SMC 4 B5
Weight	395 kg
Poles	4
Bearings	D-end 6313/C3. N-end 6212/C3
Method of cooling	IC 411 (IEC 34-6)
Insulation class	F
Noise level	Mean sound pressure level 66dB(A) at 50 Hz and 70 dB(A) at 60 Hz. Tol. +3dB(A)
Specification	Totally enclosed 3-phase CT-motor for star delta starting.
Vibration level	Balanced with half key, quality grade N according to ISO 2373 max. 1,12 mm/s RMS
Lubrication	The motor is equipped with grease nipples. Relubrication information is to be found on a separate plate on the motor frame and in the table on page: 38

Relubrication instructions

LUBRICATE at first start until grease is forced out of the outlet. Clean the nipples!

LUBRICATE when running with bearing grease.

Quantity per bearing	Service	Lubrication interval
50 g	8 h	12 month
	24 h	12 month

Type of grease

– Shell Albida EMS 2

Any compatible grease would be suitable.

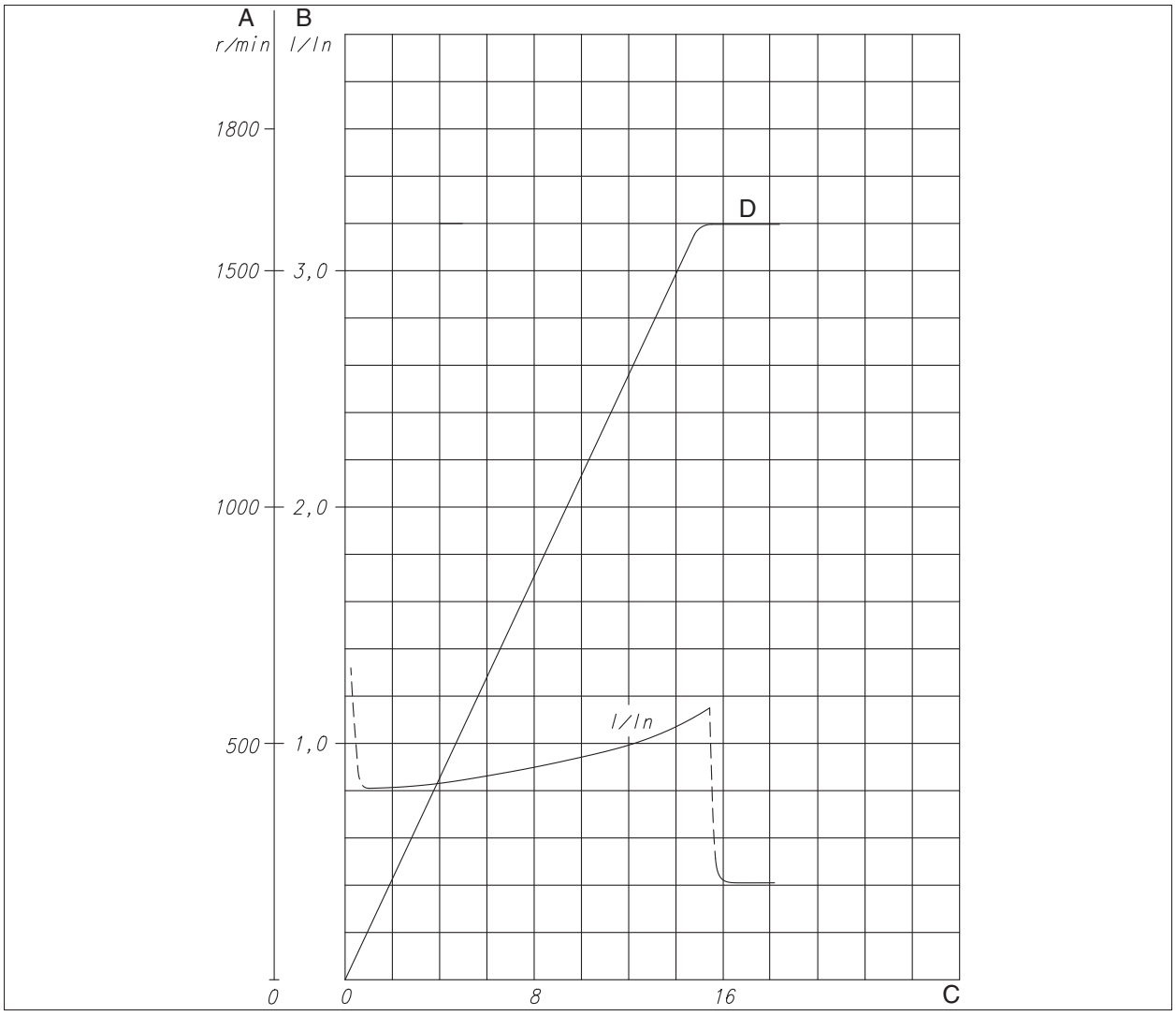
NOTE

For complete information about motor variants, please contact your Tetra Pak representative.

2.8 Motor drive data

2.8.1 ABB standard motor BM / WD 818HGV-14C, BB/ WD 818HGV-34C, H / W / C / WD 818HGV-74C Frequency drive (37 kW)

Alfa Laval ref. 574466, rev. 0



Current and speed curves at start with frequency converter.
Calculated curves. Acceleration time 15 minutes.

A Speed
B Current
C Time, minutes
D Motor speed

Cables and fuses (recommendations)

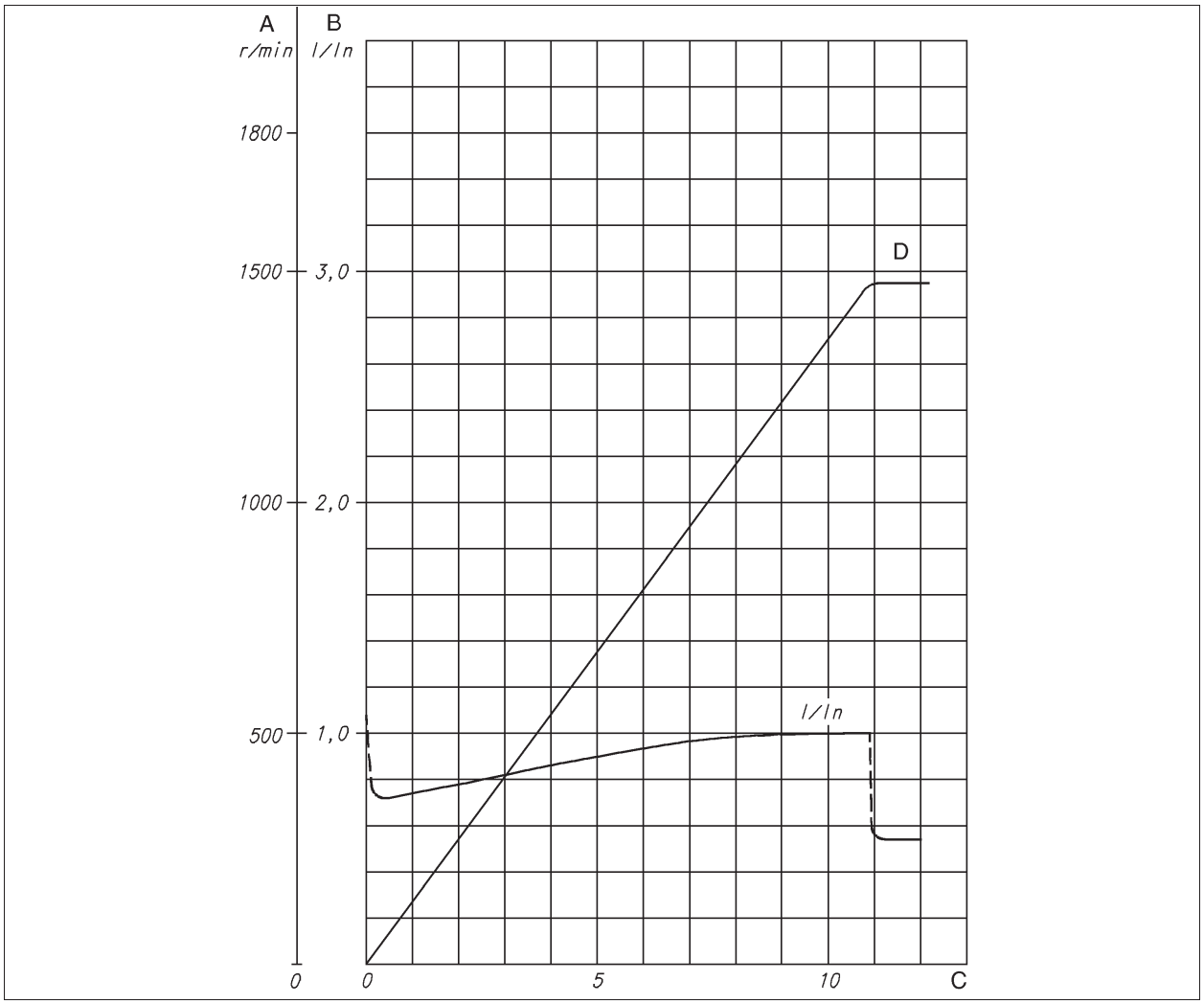
Voltage	Rated current	Cable size (copper) mm^2		Fuse (mains)
V	A	motor	mains	A
230	118	35	50	125
400	68	16	25	80
440	61	16	25	80
500	55	10	16	63
575	48	10	16	50
690	40	10	16	50

Note:
The motor and the mains cables must be diMensioned according to local safety regulations.
Shielded symmetrical motor cable is recommended.

Machine idling power consumption = 15 kW (motor input)								
Moment of inertia 86 kgm^2 (bowl)								
Bowl speed max. 4607 r/min. Motor synchronous speed 1620 r/min								
Motor AL No.	Output, kW	Manu-facturer	Type	No. of poles	Speed 50 Hz, r/min	Efficiency, η, %	Power factor, cos φ	Rated torque, M_η, Nm
566300	37	ABB	M3AA 225 SMA	4	1598	93,5	0,84	240

2.8.2 A 614HGV-14C, D/ WD 614HGV-34C, C / H / W / 614HGV-74C Frequency drive

Alfa Laval ref. 574384, rev. 0



Current and speed curves at start with frequency converter.
Calculated curves. Acceleration time 11 minutes.

A Speed
B Current
C Time, minutes
D Motor speed

Cables and fuses (recommendations)

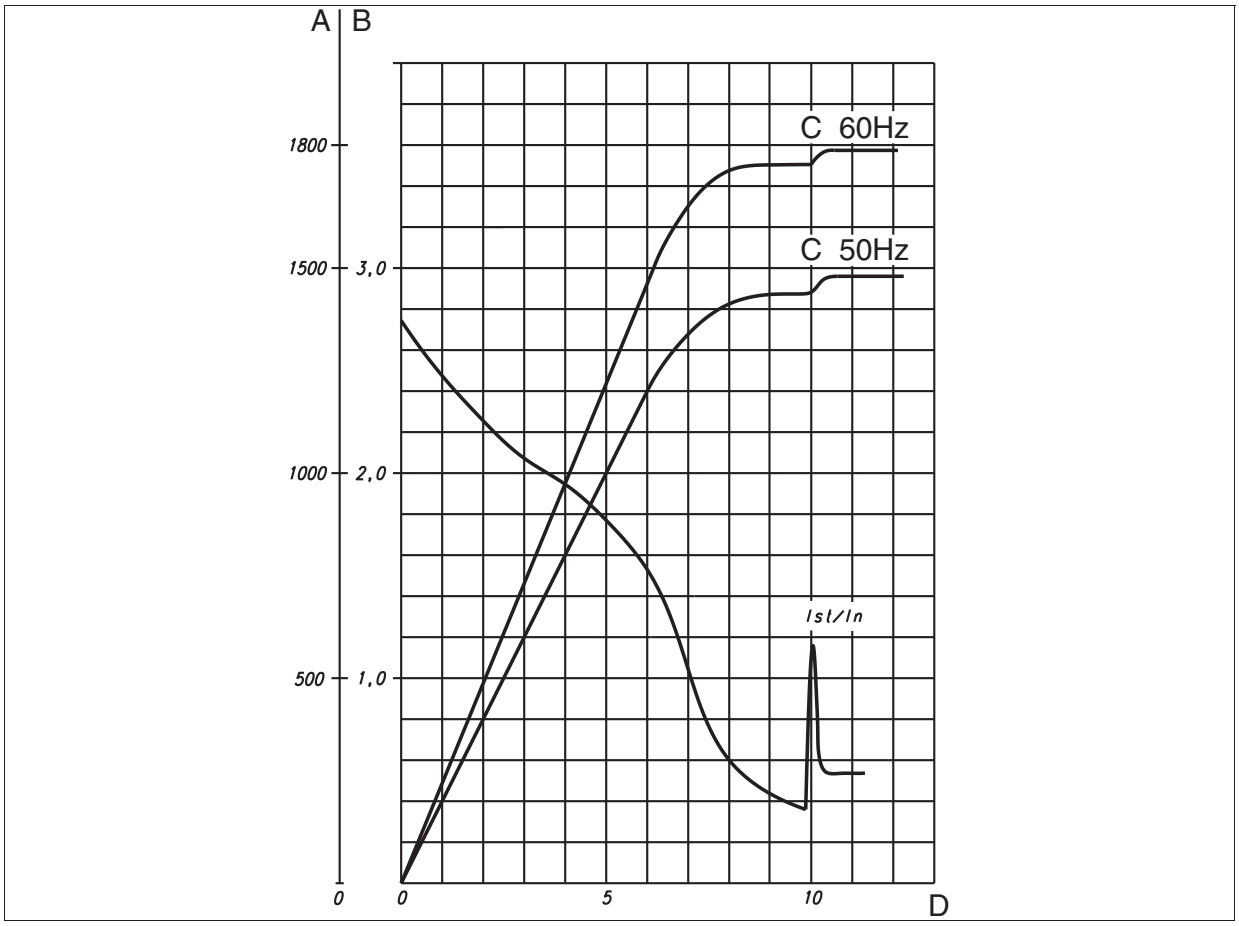
Voltage	Rated current	Cable size (copper) mm^2		Fuse (mains)
V	A	motor	mains	A
230	73	16	25	80
400	41	6	10	50
440	36	6	10	40
500	33	4	10	40
575	29	4	6	32
690	24	2,5	4	25

Note:
The motor and the mains cables must be dimensioned acc. to local safety regulations. Shielded symmetrical motor cable is recommended.

Machine idling power consumption = 6 kW (motor input)								
Moment of inertia 25,87 kgm^2 (bowl)								
Bowl speed max. 4265 r/min. Motor synchronous speed 1500 r/min								
Motor AL No.	Output, kW	Manu-facturer	Type	No. of poles	Speed 50 Hz, r/min	Efficiency, η, %	Power factor, cos φ	Rated torque, M_n, Nm
566300	18,5	ABB	M3AA 225 SMA	4	1480	93,7	0,75	119

2.8.3 A 614HGV-14C, C / H / W
614HGV-74C, D/ WD
614HGV-34/74C
CT-motor

Alfa Laval ref. 571979, rev. 1



Current and speed curves at Y/D-starting
Current curves at 380V 50Hz

A. Speed (r/min)
B. Current (Ist/In)
C. Motor speed
D. Time (minutes)

Motor AL. No.	Output (kW)	Manu-facturer	Type	Number of poles	Speed 50 Hz (r/min)	Speed 60 Hz (r/min)	Efficiency η (%)	Power factor (cos φ)	Starting torque M_y (Nm)
567623	18,5	ABB	M3AA 225	4	1480	1783	93	0,86	130

Machine Idling power, consumption (motor input) 6 kW

Moment of inertia. (bowl spindle) 25,87 kgm^2

Bowl speed, max. 4265 r/min.
Motor synchronous speed 1500 or 1800 r/min)

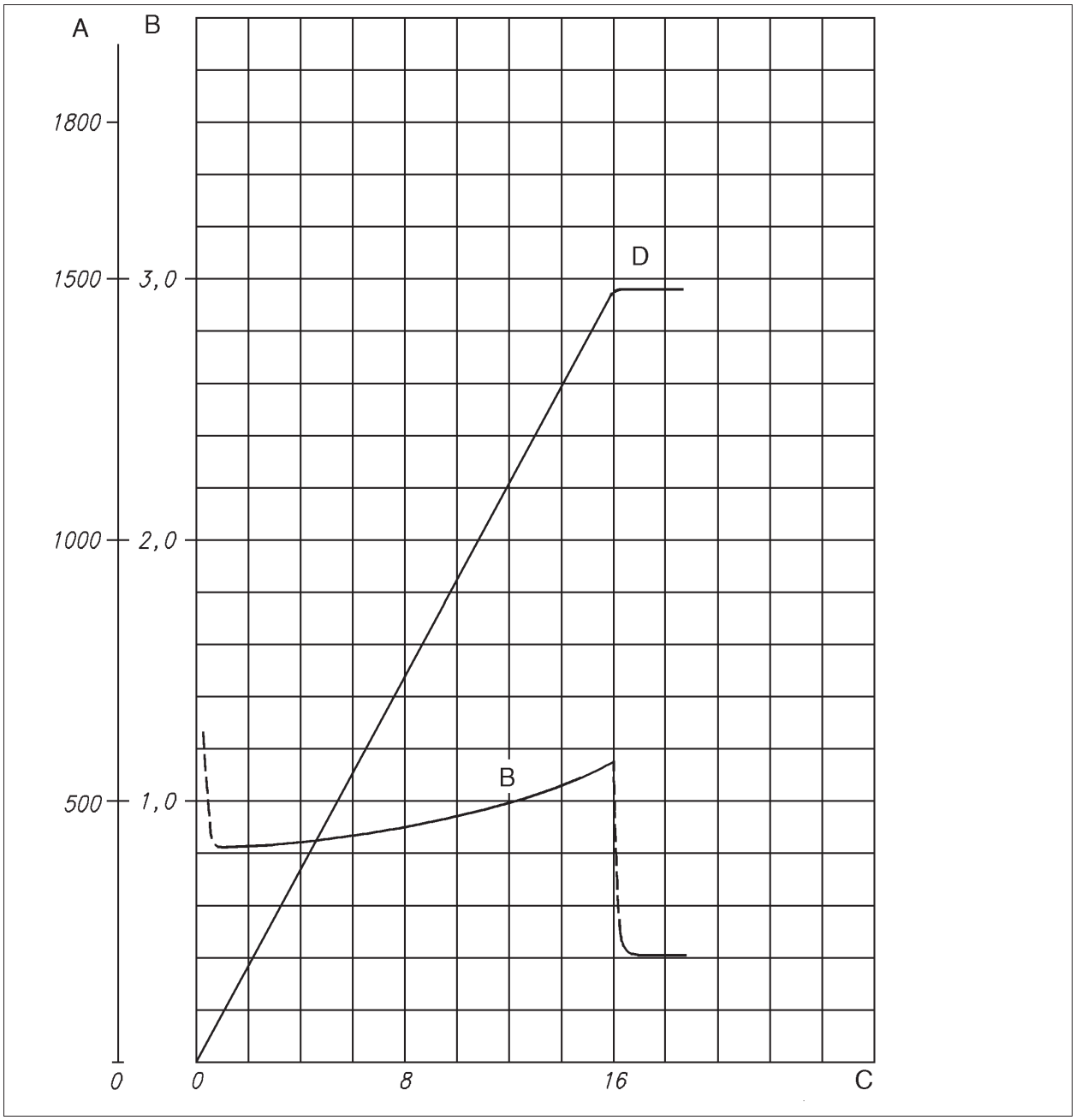
Cables and fuses

Voltage (V)	Rated current (A)	Fuse (A)	Cable area (mm^2 Cu)	Cable area (mm^2 Al)
220	60	100	35	50
380	35	63	16	25
415	32	50	16	16
440	30	50	16	16
575	23	40	10	16
660	20	32	10	10

Note! Recommended cable area is valid for a max. ambient temperature of 25 °C and with the cables freely installed. See also local codes.

2.8.4 A / BM 714HGV-14C, BB / D 714HGV-34C, C / H / W 714HGV-74C Frequency drive

Alfa Laval ref. 574394, rev. 0



Current and speed curves at start with frequency converter.
Calculated curves. Acceleration time 16 minutes.

A Speed
B Current
C Time, minutes
D Motor speed

Cables and fuses (recommendations)

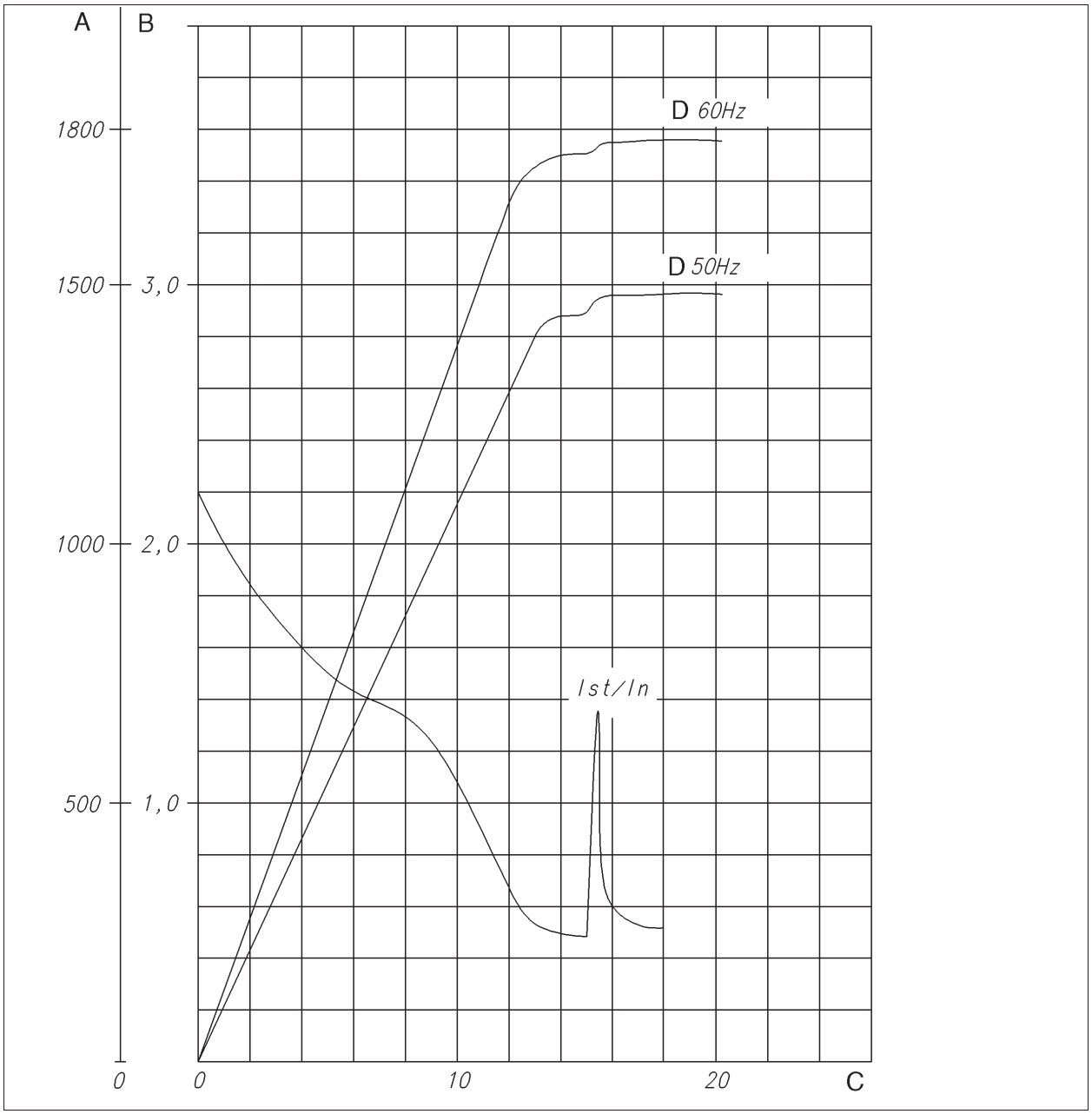
Voltage	*Rated current*	*Cable size (copper) mm²*		*Fuse (mains)*
V	*A*	*motor*	*mains*	*A*
230	*83*	*25*	*35*	*100*
400	*46*	*10*	*16*	*63*
440	*40*	*6*	*10*	*50*
500	*37*	*6*	*10*	*50*
575	*32*	*4*	*10*	*40*
690	*27*	*4*	*6*	*32*

Note:
The motor and the mains cables must be dimensioned acc. to local safety regulations. Shielded symmetrical motor cable is recommended.

Machine idling power consumption = 9 kW (motor input)								
Moment of inertia 25,87 kgm² (bowl)								
Bowl speed max. 5120 r/min. Motor synchronous speed 1500 r/min								
Motor AL No.	*Output, kW*	*Manu-facturer*	*Type*	*No. of poles*	*Speed 50 Hz, r/min*	*Efficiency, η, %*	*Power factor, cos φ*	*Rated torque, M_n, Nm*
566300	*22*	*ABB*	*M3AA 225 SMA*	*4*	*1490*	*89*	*0,75*	*140*

2.8.5 A / BM 714HGV-14C, BB / D 714HGV-34C, C / H / W 714HGV-74C CT-motor

Alfa Laval ref. 571978, rev. 0



Current and speed curves at Y/D-starting.
Calculated curves at 380v 50 Hz
I st / In = starting current/rated motor current

A Speed
B Current, I st/In
C Time, minutes
D Motor speed

Cables and fuses (recommendations)

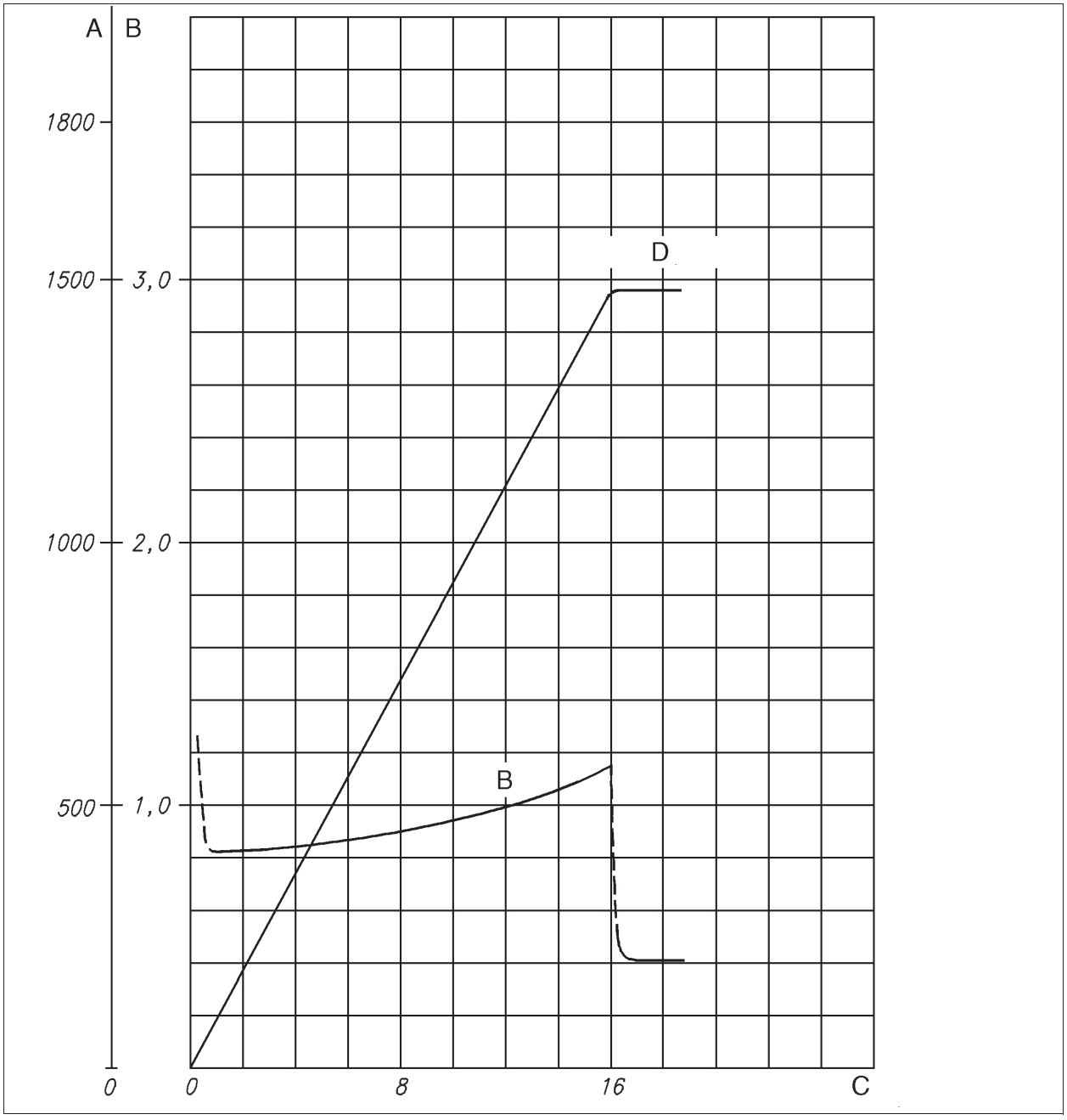
Voltage	Rated current	Cable size (copper) mm^2		Fuse (mains)
V	A	cu	Al	A
220	71	35	50	100
380	41	16	25	63
415	38	16	16	50
440	36	16	16	50
500	31	10	16	40
575	27	10	16	40
660	24	10	10	32

Note:
Recommended cable area is valid for a max. ambient temperature of 25 °C and with the cables freely installed. See also local codes.

Machine idling power consumption = 9 kW (motor input)									
Moment of inertia 25,87 kgm^2 (bowl)									
Bowl speed max. 5120 r/min. Motor synchronous speed 1500 r/min or 1800 r/min									
Motor AL No.	Output, kW	Manu-facturer	Type	No. of poles	Speed 50 Hz, r/min	Speed 60 Hz, r/min	Efficiency, η, %	Power factor, cos φ	Rated torque, M_n, Nm
567623	22	ABB	M3AA 225 5MD	4	1476	1780	93	0,87	130

2.8.6 C / H /W / 518HGV-74C, WD 518HGV-34/74C Frequency drive

Alfa Laval ref. 574399 rev. 0



Current and speed curves at start with frequency converter.
Calculated curves. Acceleration time 16 minutes.

A Speed
B Current
C Time, minutes
D Motor speed

Cables and fuses (recommendations)

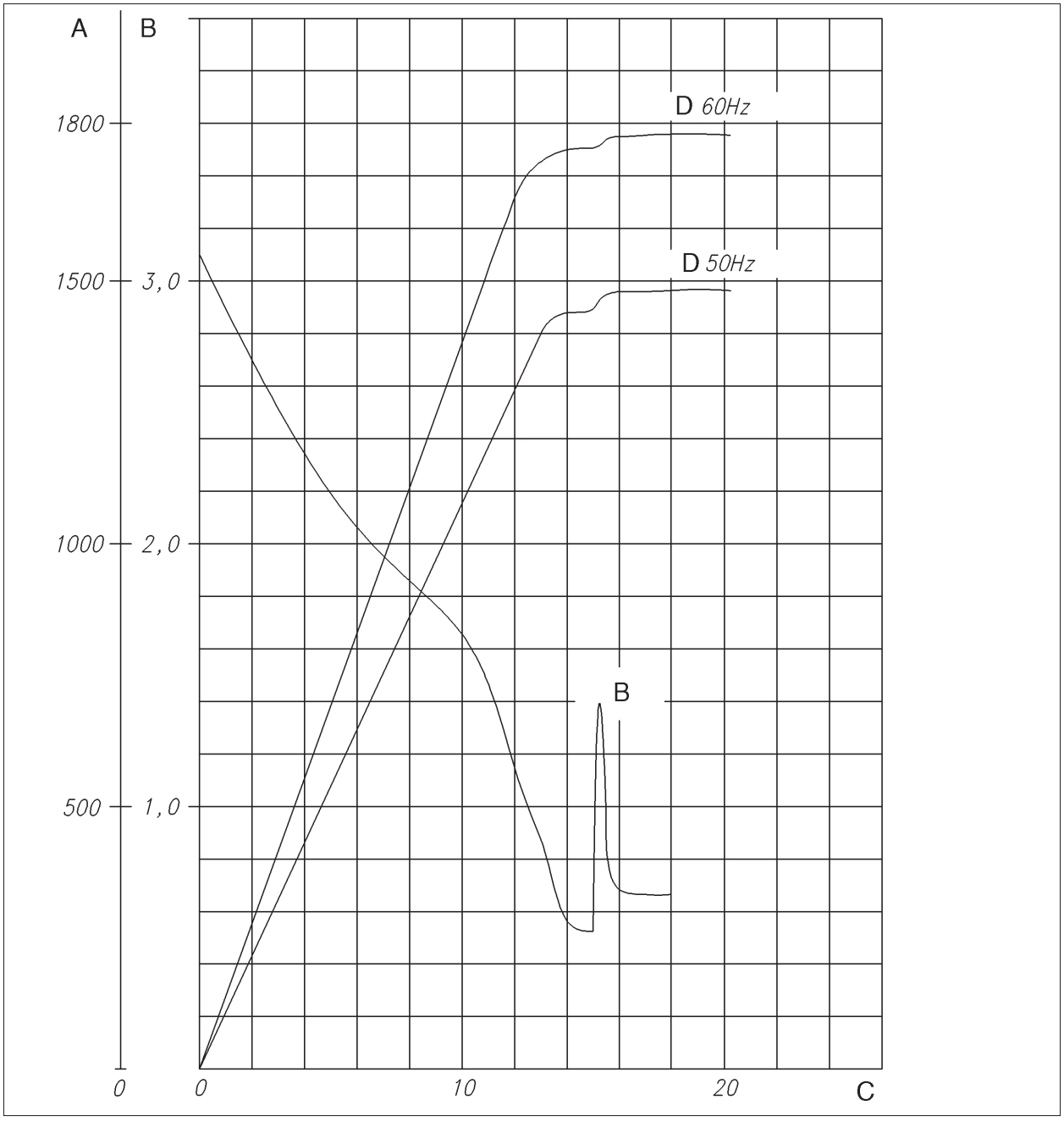
Voltage	*Rated current*	*Cable size (copper) mm²*		*Fuse (mains)*
V	*A*	*motor*	*mains*	*A*
230	*83*	*25*	*35*	*100*
400	*46*	*10*	*16*	*63*
440	*40*	*6*	*10*	*50*
500	*37*	*6*	*10*	*50*
575	*32*	*4*	*10*	*40*
690	*27*	*4*	*6*	*32*

Note:
The motor and the mains cables must be dimensioned acc. to local safety regulations. Shielded symmetrical motor cable is recommended.

Machine idling power consumption = 12 kW (motor input)								
Moment of inertia 85,7 kgm² (bowl)								
Bowl speed max. 3955 r/min. Motor synchronous speed 1500 r/min								
Motor AL No.	*Output, kW*	*Manu-facturer*	*Type*	*No. of poles*	*Speed 50 Hz, r/min*	*Efficiency, η, %*	*Power factor, cos φ*	*Rated torque, M_n, Nm*
566300	*22*	*ABB*	*M3AA 225 SMA*	*4*	*1490*	*89*	*0,75*	*140*

2.8.7 C / H /W / WD 518HGV-74C, WD 518HGV-34/74C CT-Motor

Alfa Laval ref. 571980, rev. 0



Current and speed curves at Y/D-starting.
Calculated curves at 380v 50 Hz

A Speed
B Current, I st/In
C Time, minutes
D Motor speed

Cables and fuses (recommendations)

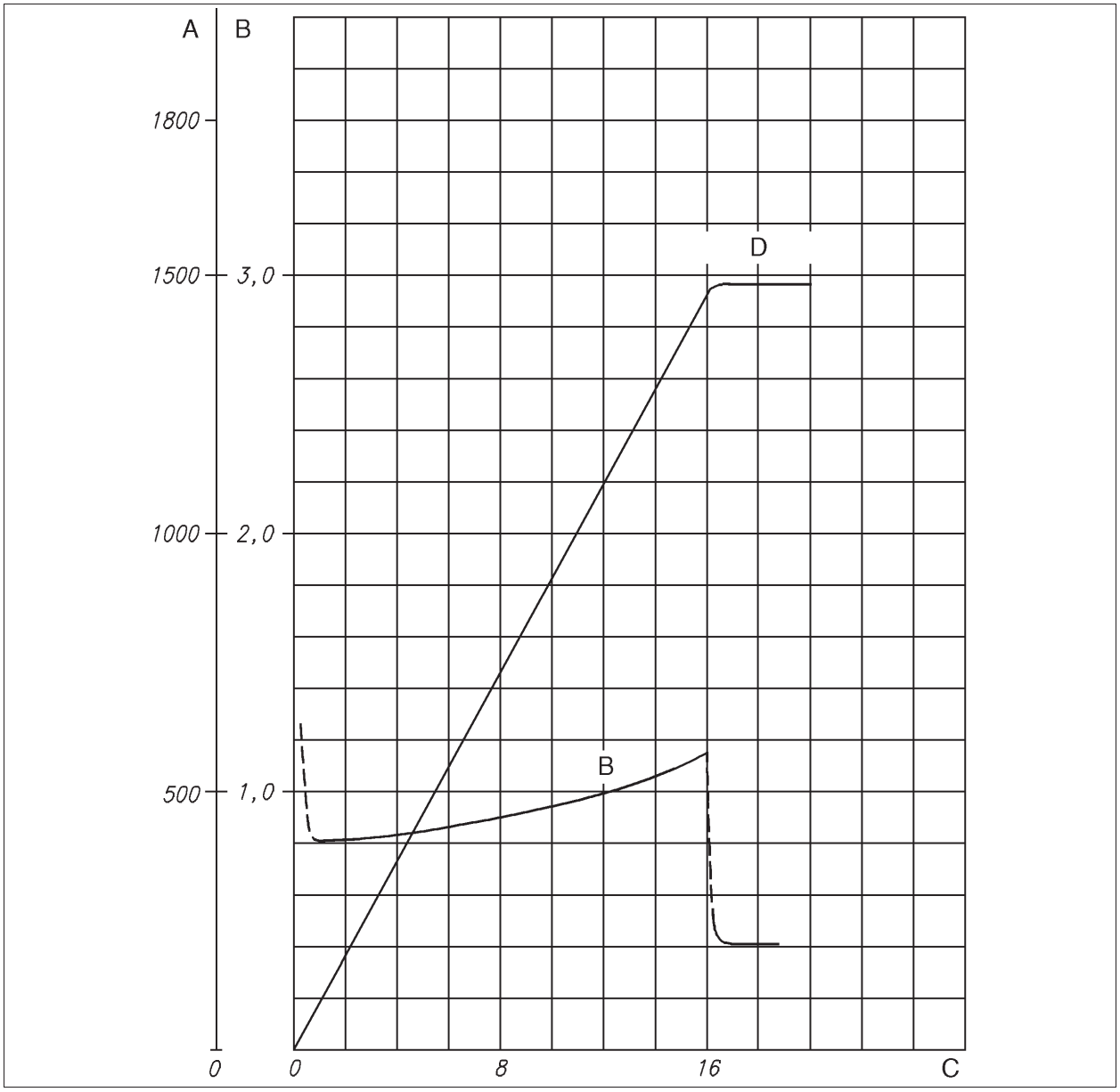
Voltage	Rated current	Cable size (copper) mm^2		Fuse (mains)
V	A	Cu	Al	A
220	76	70	95	160
380	44	35	50	100
415	40	25	35	80
440	38	25	35	80
500	34	16	25	63
575	30	16	25	63
660	25	10	16	50

Note:
Recommended cable area is valid for a max. ambient temperature of 25 °C and with the cables freely installed. See also local codes.

Machine idling power consumption = 9 kW (motor input)									
Moment of inertia 85,7 kgm^2 (bowl spindle)									
Bowl speed max. 5120 r/min. Motor synchronous speed 1500 r/min or 1800 r/min									
Motor AL No.	Output, kW	Manu-facturer	Type	No. of poles	Speed 50 Hz, r/min	Speed 60 Hz, r/min	Efficiency, η, %	Power factor, cos φ	Rated torque, M_n, Nm
568009	22	ABB	M3AA 225 SMC	4	1485	1785	94	0,81	140

2.8.8 D 618HGV-74C and D 718HGV-34C Frequency drive (37 kW)

Alfa Laval ref. 574485, rev. 0



Current and speed curves at start with frequency converter.
Calculated curves. Acceleration time 16 minutes.

A Speed
B Current
C Time, minutes
D Motor speed

Cables and fuses (recommendations)

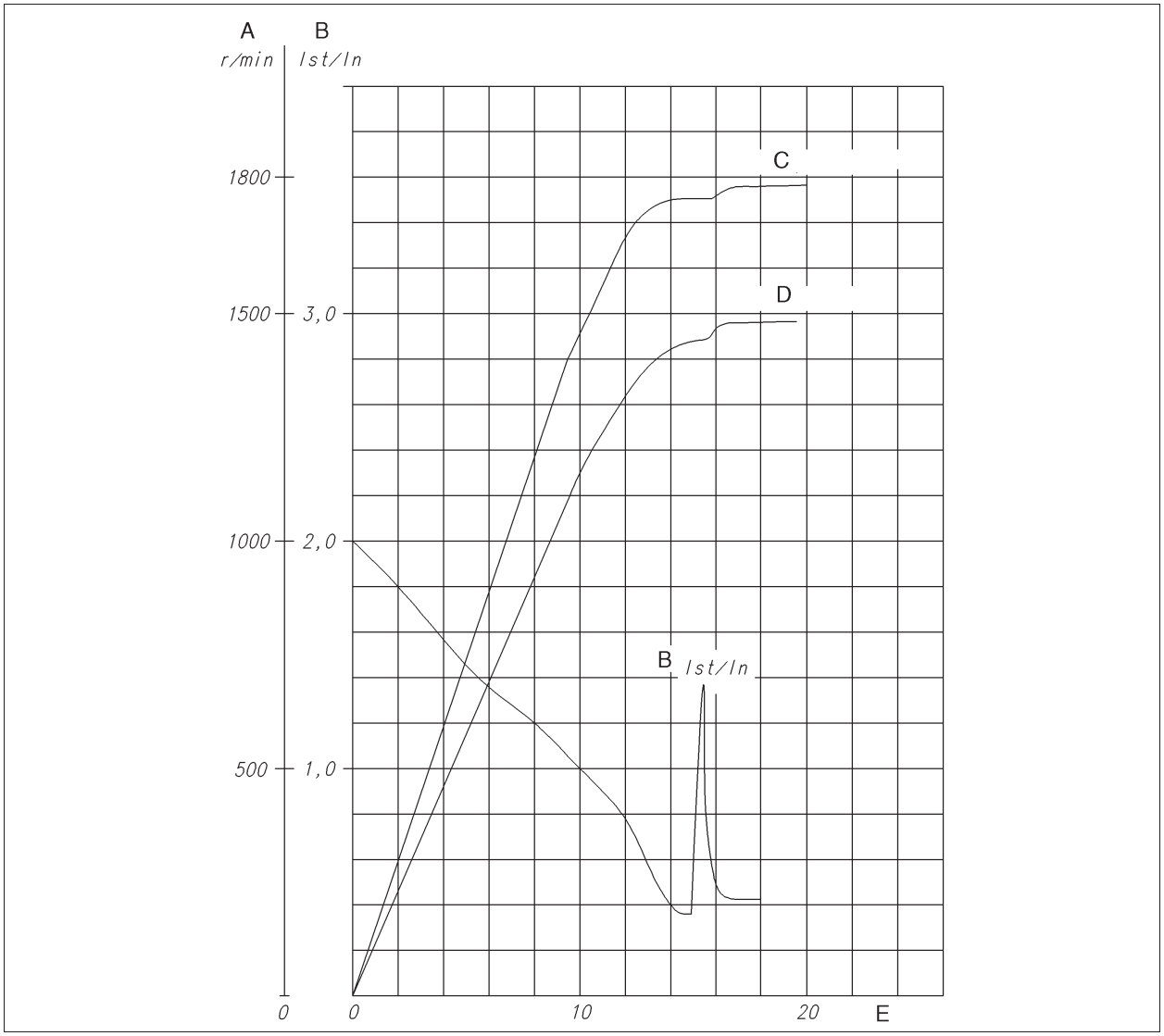
Voltage	*Rated current*	*Cable size (copper) mm²*		*Fuse (mains)*
V	*A*	*motor*	*mains*	*A*
230	*118*	*35*	*50*	*125*
400	*68*	*16*	*25*	*80*
440	*61*	*16*	*25*	*80*
500	*55*	*10*	*16*	*63*
575	*48*	*10*	*16*	*50*
690	*40*	*10*	*16*	*50*

Note:
The motor and the mains cables must be diMensioned acc. to local safety regulations. Shielded symmetrical motor cable is recommended.

Machine idling power consumption = 12 kW (motor input)								
Moment of inertia 85,7 kgm² (bowl)								
Bowl speed max. 3955 r/min. Motor synchronous speed 1500 r/min								
Motor AL No.	*Output, kW*	*Manu-facturer*	*Type*	*No. of poles*	*Speed 50 Hz, r/min*	*Efficiency, η, %*	*Power factor, cos φ*	*Rated torque, M_n, Nm*
566300	*37*	*ABB*	*M3AA 225 SMA*	*4*	*1480*	*93,5*	*0,84*	*240*

2.8.9 D 618HGV-74C and D/ WD/ 718HGV-34C CT-Motor (37 kW)

Alfa Laval ref. 571982, rev. 0



A Speed *Current and speed curves at Y/D starting*
B Current
C Motor speed 60 Hz *Calculated curves at 380V 50 Hz*
D Motor speed 50 Hz
E. Time (minutes)

Cable and fuses (recommendations)

Voltage V	*Rated current A*	*Fuse A_{min}*	*Cable, Cu min. mm^2*	*Cable, Al min. mm^2*
220	*119*	*160*	*70*	*95*
380	*69*	*100*	*35*	*50*
415	*63*	*80*	*25*	*35*
440	*60*	*80*	*25*	*35*
500	*52*	*80*	*25*	*35*
575	*46*	*63*	*16*	*25*
660	*40*	*63*	*16*	*25*

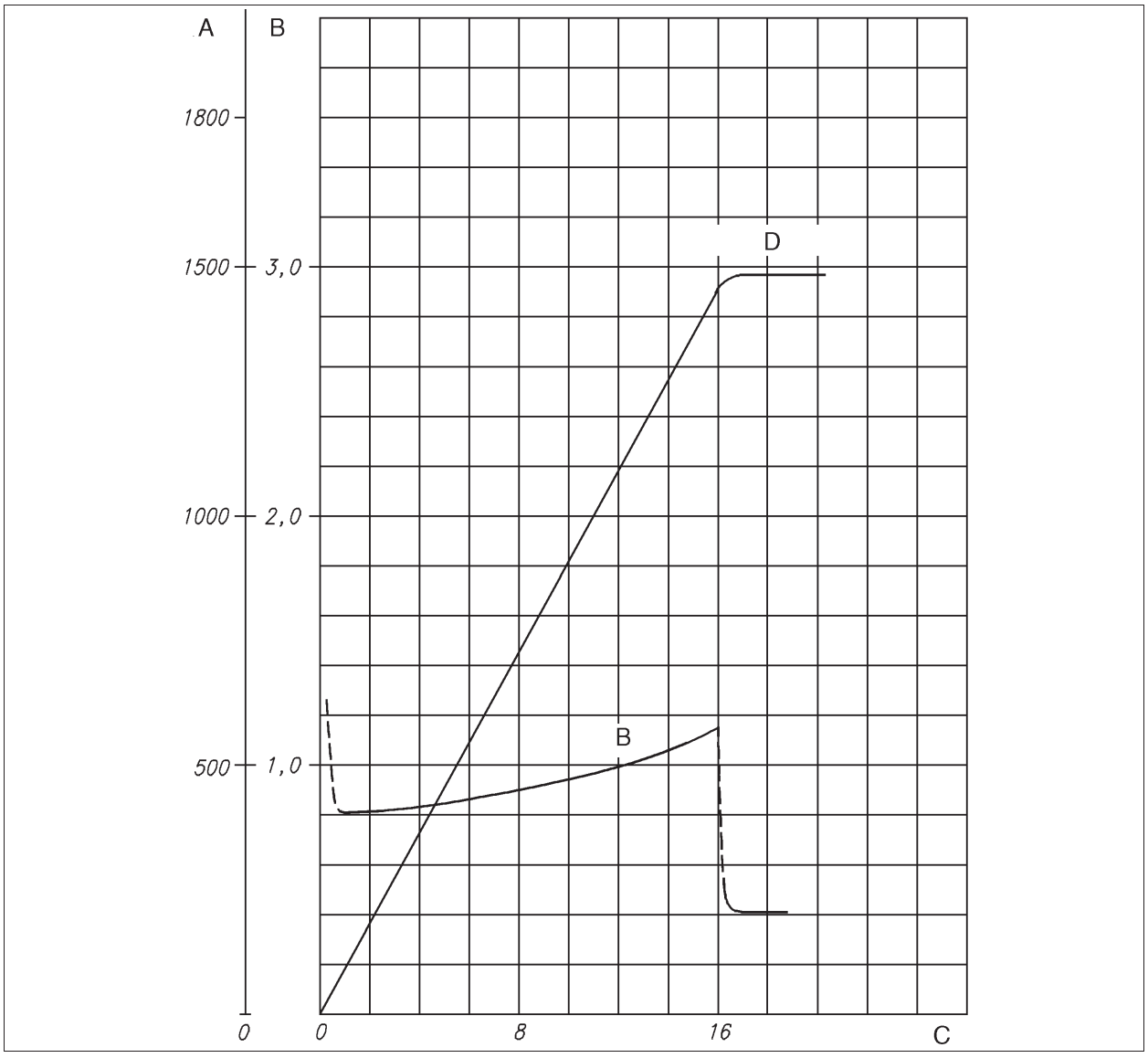
Note:

Recommended cable area is valid for a max. ambient temperature of 25 °C and with the cables freely installed. See also local codes.

Machine idling power consumption = 12 kW (motor input)									
Moment of inertia 86,44 kgm^2 (bowl spindle)									
Bowl speed max. 4265 r/min (motor synchronous speed 1500 or 1800 r/min)									
Motor AL-no	*kW*	*Manufact*	*Type*	*No. of poles*	*r/min 50 Hz*	*r/min 60 Hz*	*Efficiency, η %*	*Power fact. cos φ*	*Starting torque, Ms (Y) Nm*
568009	*37*	*ABB*	*M3AA 225 SMC*	*4*	*1470*	*1775*	*94*	*0,87*	*210*

2.8.10 BM 618HGV-14C, C / F / H / W 618HGV-74C, BB 618HGV-34C, WD 618HGV-34/74C and H / W / C 718HGV-74C Frequency drive (25 kW)

Alfa Laval ref. 574624, rev. 0



Current and speed curves at start with frequency converter.
Calculated curves. Acceleration time 16 minutes.

A Speed
B Current
C Time, minutes
D Motor speed

Cables and fuses (recommendations)

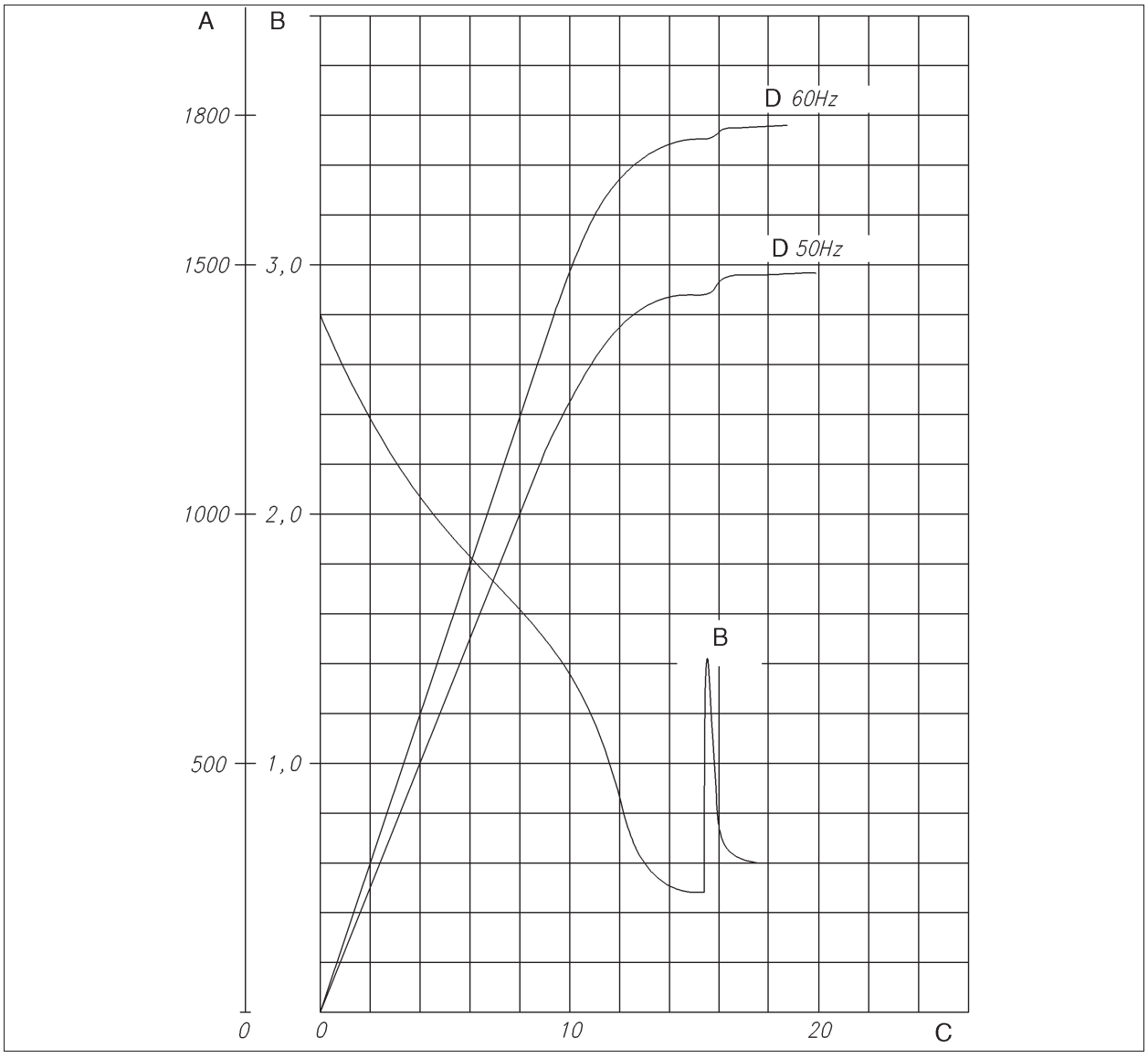
Voltage	*Rated current*	*Cable size (copper) mm²*		*Fuse (mains)*
V	*A*	*motor*	*mains*	*A*
230	*90*	*25*	*35*	*100*
400	*50*	*10*	*16*	*63*
440	*44*	*10*	*10*	*50*
500	*40*	*6*	*10*	*50*
575	*35*	*6*	*10*	*40*
690	*29*	*4*	*6*	*32*

Note:
The motor and the mains cables must be diMensioned acc. to local safety regulations. Shielded symmetrical motor cable is recommended.

Machine idling power consumption = 12 kW (motor input)								
Moment of inertia 86 kgm² (bowl)								
Bowl speed max. 4265 r/min. Motor synchronous speed 1500 r/min								
Motor AL No.	*Output, kW*	*Manu-facturer*	*Type*	*No. of poles*	*Speed 50 Hz, r/min*	*Efficiency, η, %*	*Power factor, cos φ*	*Rated torque, M_n, Nm*
566300	*25*	*ABB*	*M3AA 225 SMA*	*4*	*1485*	*93,7*	*0,77*	*161*

2.8.11 BM 618HGV-14C, C / F / H / W, 618HGV-74C, BB 618HGV-34C, WD 618HGV-34/74C, and H / W / C/ WD/ 718HGV-74C CT-Motor (25 kW)

Alfa Laval ref. 571981, rev. 0



Current and speed curves at Y/D-starting.
Calculated curves at 380v 50 Hz

A Speed
B Current, I st/In
C Time, minutes
D Motor speed

Cables and fuses (recommendations)

Voltage	Rated current	Cable size (copper) mm^2		Fuse
V	A	Cu	Al	A
220	85	70	95	160
380	49	35	50	100
415	45	25	35	80
440	42	25	35	80
500	37	16	25	63
575	32	16	25	63
660	28	10	16	50

Note:
Recommended cable area is valid for a max. ambient temperature of 25 °C and with the cables freely installed. See also local codes.

Machine idling power consumption = 15 kW (motor input)									
Moment of inertia 85,5 kgm^2 (bowl)									
Bowl speed max. 4265 r/min. Motor synchronous speed 1500 r/min or 1800 r/min									
Motor AL No.	Output, kW	Manu-facturer	Type	No. of poles	Speed 50 Hz, r/min	Speed 60 Hz, r/min	Efficiency, η, %	Power factor, cos φ	Rated torque, M_n, Nm
568009	25	ABB	M3AA 225 SMC	4	1480	1785	94	0,83	140

2.9 Foundations

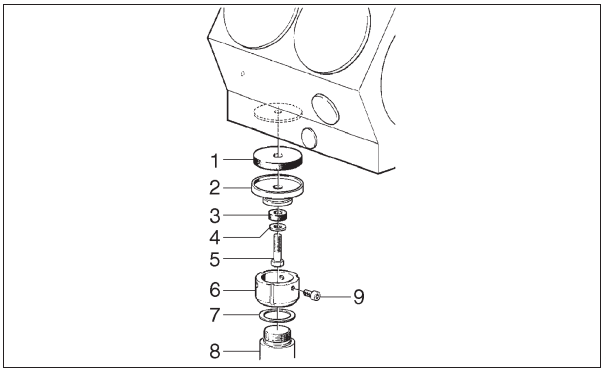
NOTE

When lifting a separator it must always be **hung securely**.

Specification

- The separator should be installed at floor level, see chapter “2.11 Foundation drawing” for measures and how to pour the foundation plate in concrete.
- The separator must be installed on a strong and rigid foundation to reduce the influence of vibrations from adjacent machinery.

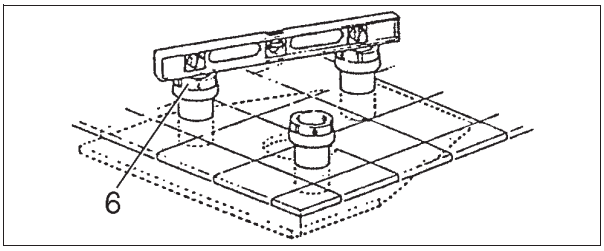
At delivery the parts 1-5 are fitted on the separator. The screw (5) is locked with Loctite 243 and tightened with **40 Nm**.



1. *Rubber cushion*
2. *Frame foot*
3. *Rectangular ring*
4. *Washer*
5. *Screw*
6. *Holder*
7. *Adjusting washer*
8. *Foot on foundation plate*
9. *Set screw*

Proceed in the following way when mounting the separator onto the feet of the foundation plate (8):

1. Level against the upper face of the three holders (6). Screw the holders to compensate for inclination, if any. Any gap between a holder and a foundation foot (8) must be eliminated by adding one or more adjusting washers (7).



Level against the upper face of the holders (6)

2. Lower the separator into the three holders.
3. Tighten the set screws (9), first by hand (or by a hand tool, if necessary) until all of them are in contact with the frame feet (2).

   Then tighten the set screws with **100 Nm**.

> **NOTE**
>
> Tighten the set screws before mounting the bowl or cyclone.

4. Mount the bowl and check that the frame is horizontal by means of a level placed on the outer frame rim.

   Make a new adjustment if necessary.

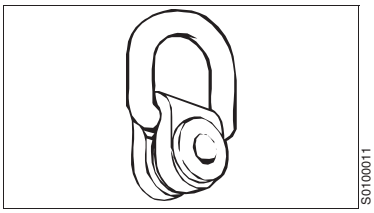
Further information can be found in chapter “2.12 Basic size drawings” on page 74.

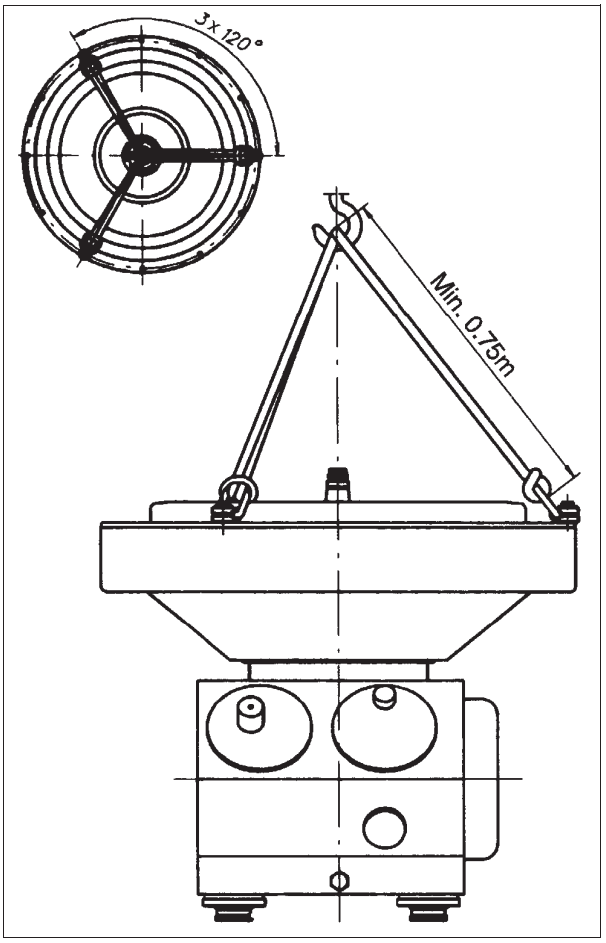
2.10 Lifting instructions

2.10.1 Separator

Alfa Laval ref. 557183, rev. 1 / 557187, rev. 1

Attach three endless slings or cables to the lifting eyes (the screws must be tightened with spanner).





Length of each sling must be **min. 1,5 m** in circumference.

NOTE

Machine weight without frame hood and bowl is approx. **1000 kg (614, 714) and 1200 kg (518, 618, 718, 818).**

Do not lift the separator unless the inlet/outlet frame hood, cyclone, motor protecting cap and bowl have been removed.

WARNING

Crush hazards

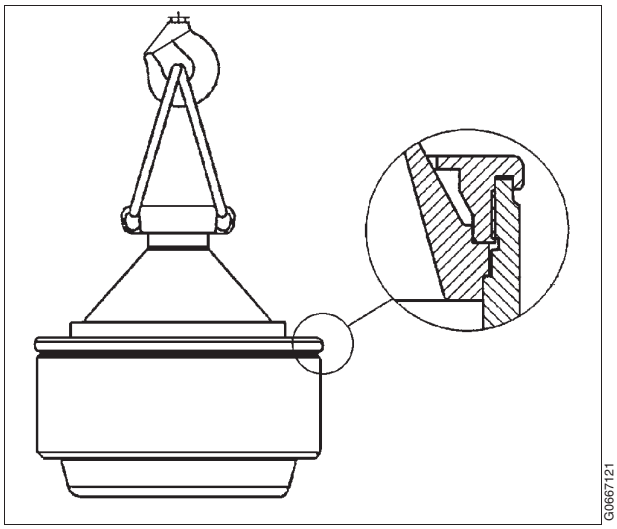
Use only the three **special lifting eyes** for lifting the machine, and follow lifting instructions. Do **not** work under hanging load.

A falling separator can cause accidents resulting in serious injury to persons and damage to equipment.

2.10.2 Bowl

This instruction describes how to lift a complete bowl, which normally is done only during a transport of the separator.

When lifting the bowl, use the special lifting tool fastened on the bowl hood.



NOTE

Check that the lock ring is properly tightened.

Weight to lift is approx. **600 kg (614, 714) and 1100 kg (518, 618, 718, 818)**.

When lifting the bowl out of the separator frame, the cap nut fixing the bowl to the bowl spindle and the screws fixing the bowl body to the operating water device must first be removed.

2.10.3 Other parts

The frame hood and the heavy bowl parts must be lifted by means of a hoist. Position the hoist exactly above the bowl centre. Use endless lifting straps and a lifting hook with safety catch.

Special tools from the tool kit must be used for dismantling and assembly. The special tools are specified in the *Spare Parts Catalogue* and are shown as illustrations together with the dismantling/assembly instructions.

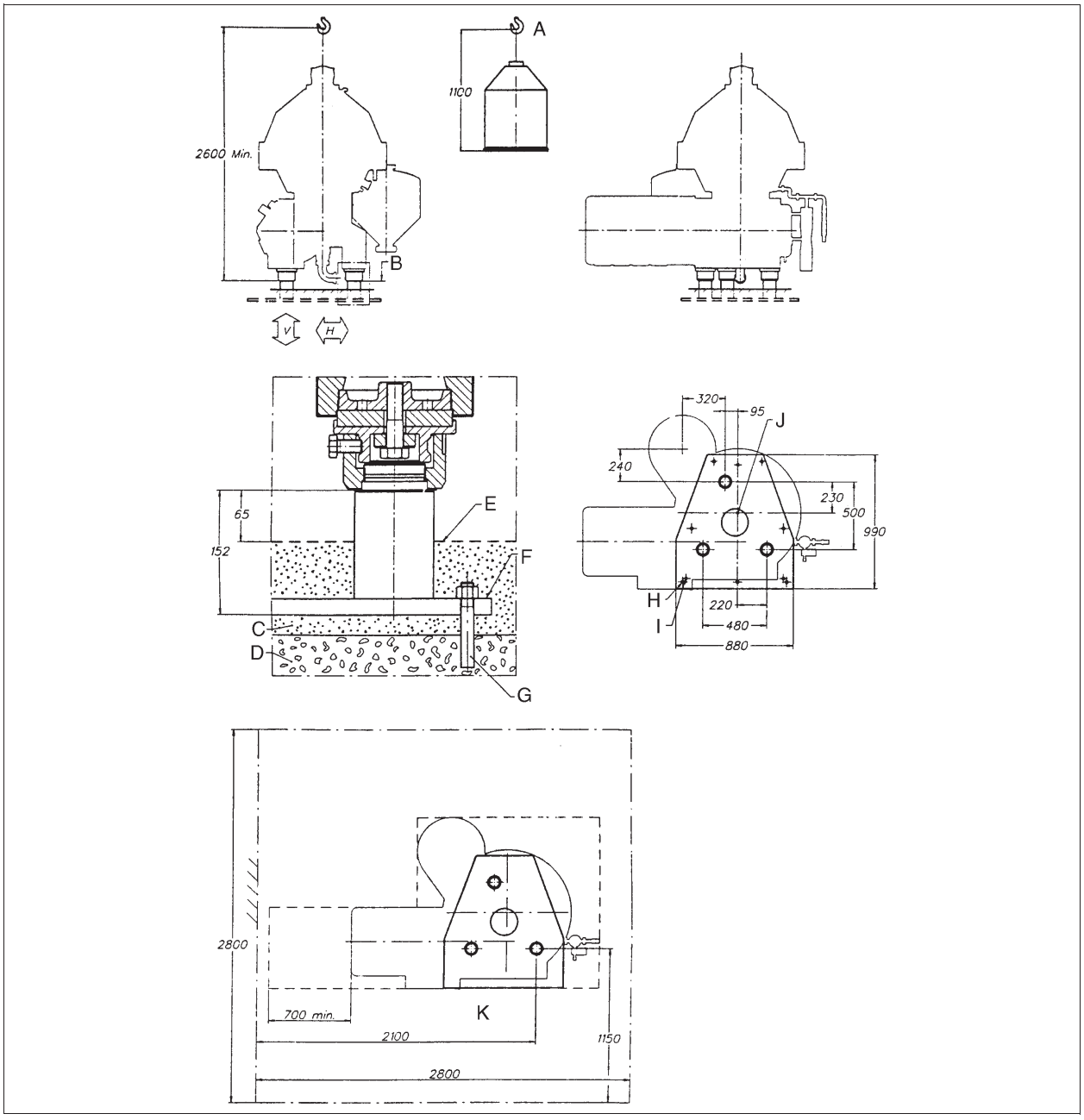
NOTE

When lifting parts without weight specifications, always use lifting straps with the capacity of at least **500 kg**.

2.11 Foundation drawing

2.11.1 614 / 714

Alfa Laval ref. 553751, rev. 3



Installation according to stated foundation forces

A. Min. lifting capacity required when doing service: 1500 kg
Max. height of largest component incl. lifting tool Recommended speed for lifting:
– Low speed 0,5–1,5 m/min
– High speed 2–6 m/min
B. Horizontal max. deviation 0,4°
C. Expanding concrete
D. Structural concrete
E. Floor level
F. Foundation plate
G. Anchor bolts
H. 7 holes Ø20 for anchorage
I. 3 holes M20 for horizontal adjustment
J. Centre of separator bowl
K. Service side

Recommended free floor space for unloading when doing service

No fixed installations within this area

Vertical dynamic forces
±25 kN/foot (Static forces are excluded)

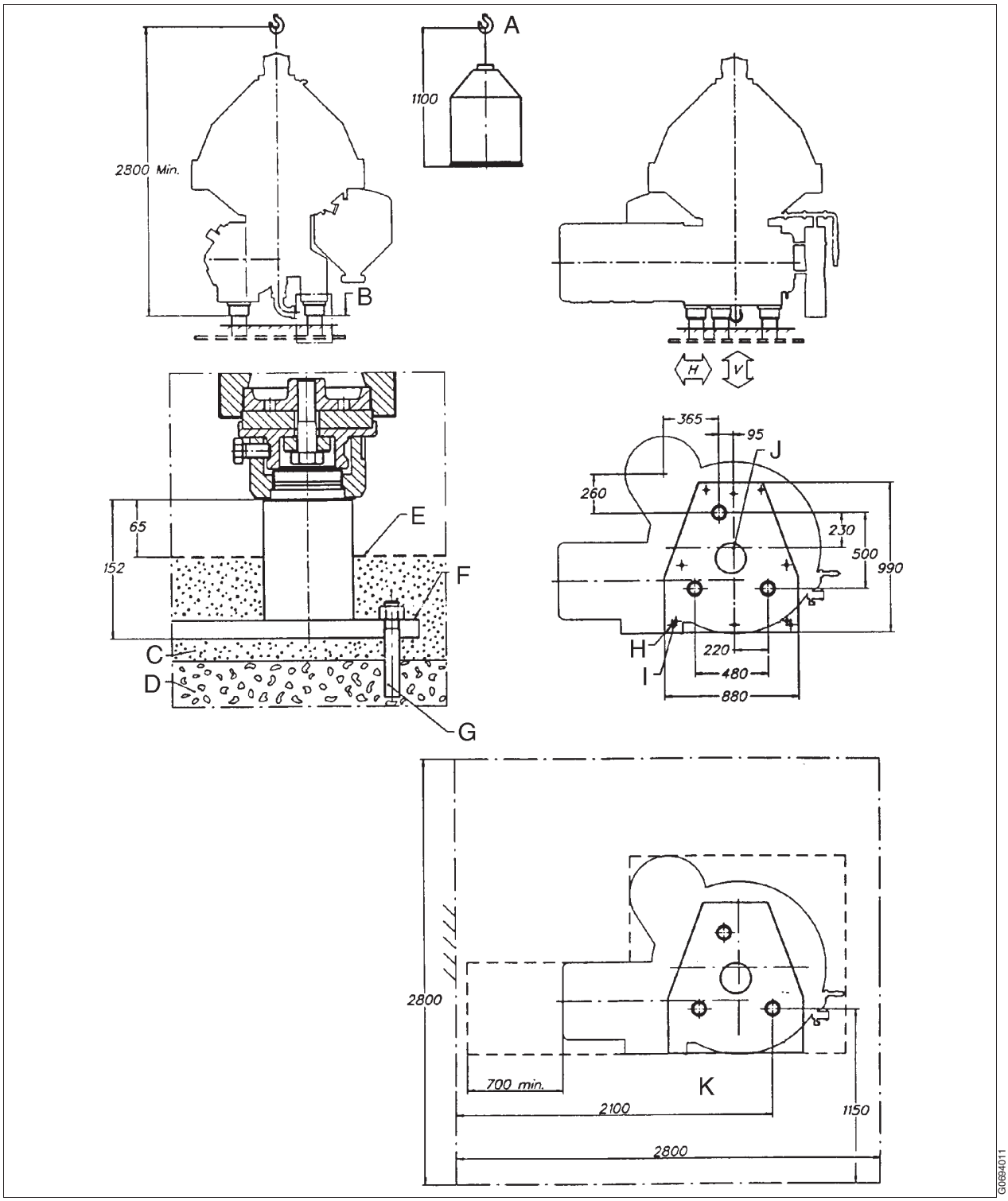
Horizontal dynamic forces
±25 kN/foot (Static forces are excluded)

Total vertical dynamic instantaneous foundation forces (sum of all feet) ±25 kN (Static forces are excluded)

Total horizontal dynamic instantaneous foundation forces (sum of all feet) ±25 kN (Static forces are excluded)

2.11.2 518 / 618 / 718 / 818

Alfa Laval ref. 553747, rev. 4



A. Min lifting capacity required when doing service: 1500 kg
Max height of largest component incl. lifting tool Recommended speed for lifting:
– Low speed 0,5–1,5 m/min
– High speed 2–6 m/min
B. Horizontal max. deviation 0,4°
C. Expanding concrete
D. Structural concrete
E. Floor level
F. Foundation plate
G. Anchor bolts
H. 7 holes Ø20 for anchorage
I. 3 holes M20 for horizontal adjustment
J. Centre of separator bowl
K. Service side

Recommended free floor space for unloading when doing service

No fixed installations within this area

Vertical dynamic forces ±30 kN/foot (Static forces ore excluded)

Horizontal dynamic forces ±30 kN/foot (Static forces are excluded)

Total vertical dynamic instantaneous foundation forces (sum of all feet) ±30 kN (Static forces are excluded)

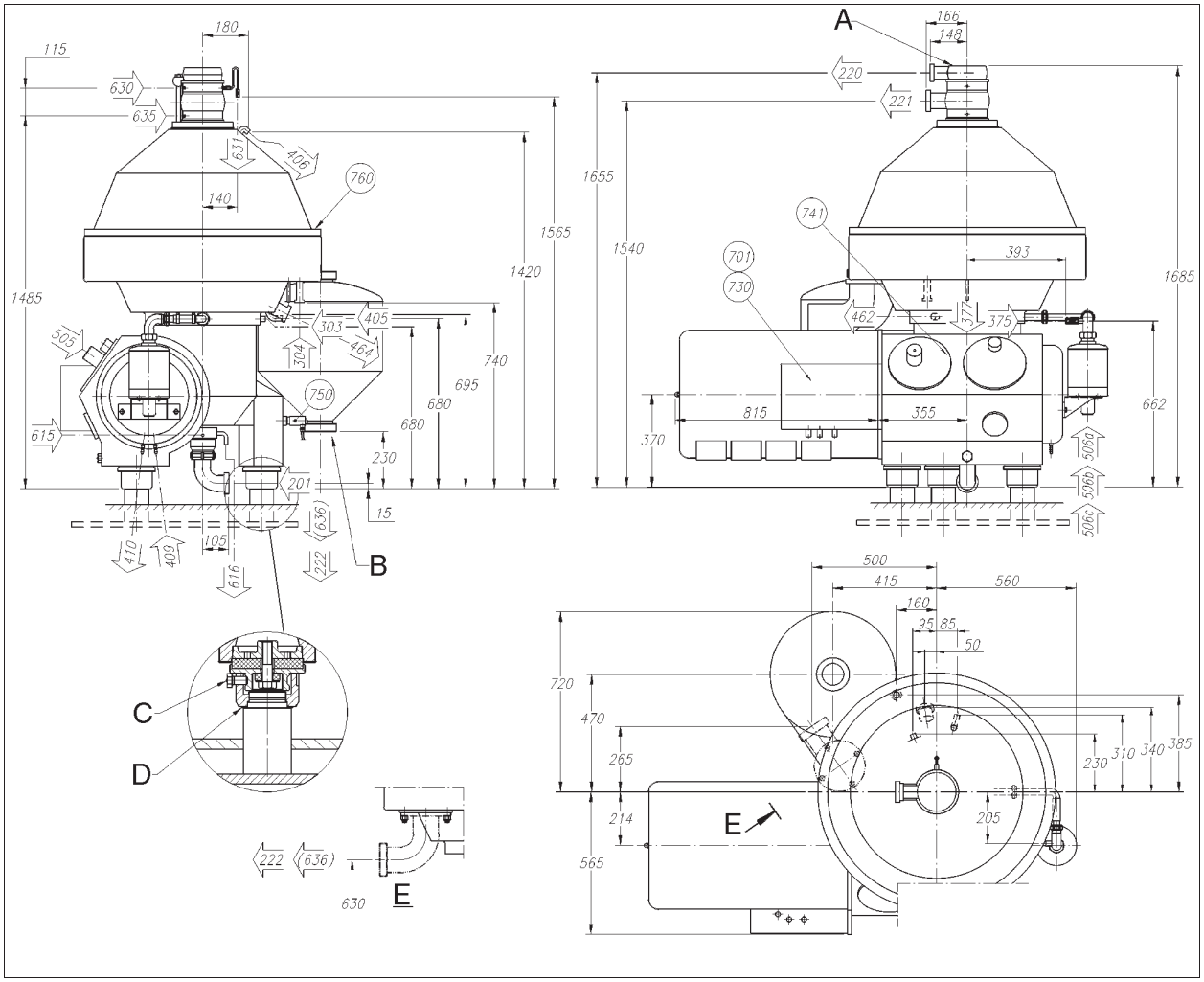
Total horizontal dynamic instantaneous foundation forces (sum of all feet) ±30 kN (Static forces are excluded)

2.12 Basic size drawings

2.12.1 A / 614 and A / BM / 714

SMS couplings

Alfa Laval ref. 562207, rev. 1



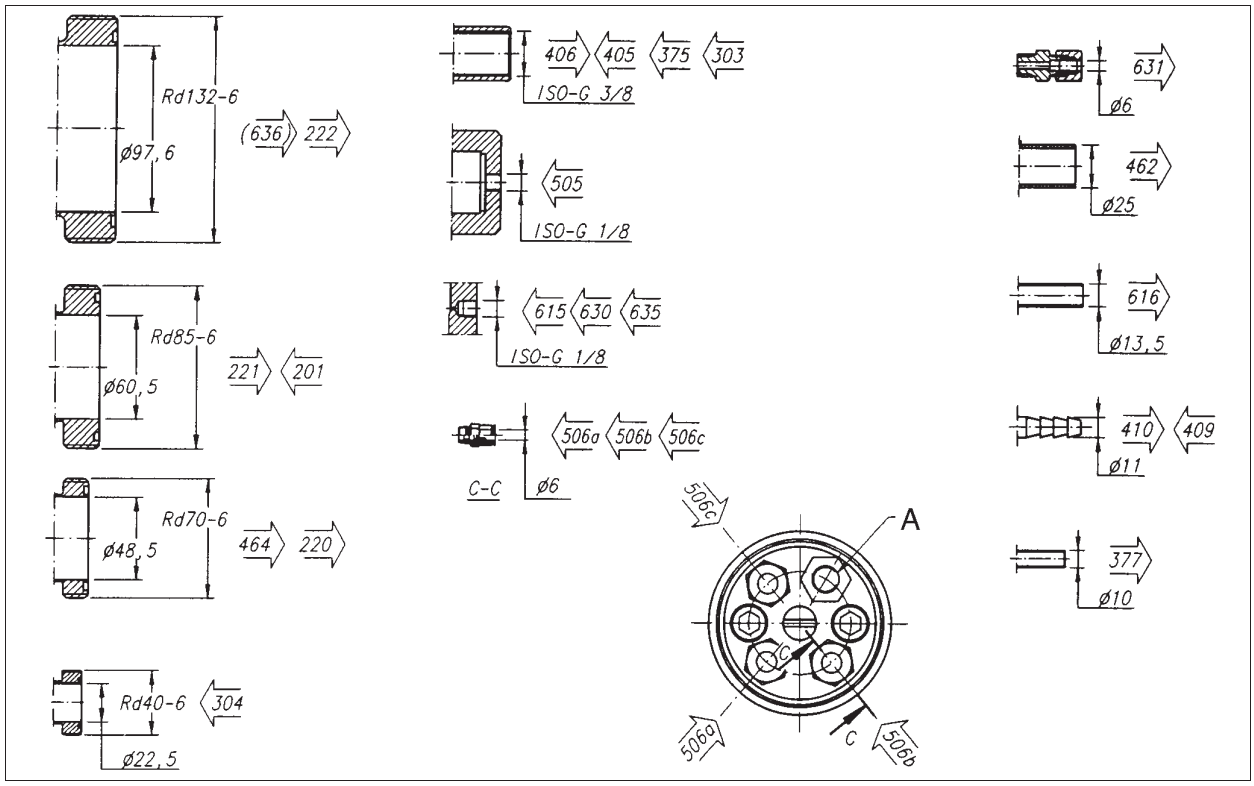
A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

Connection 220 and 221 turnable 360°.

All connections to be installed non-loaded and flexible

Data for connections, see “2.13 Connection lists” on page 108.

Connections

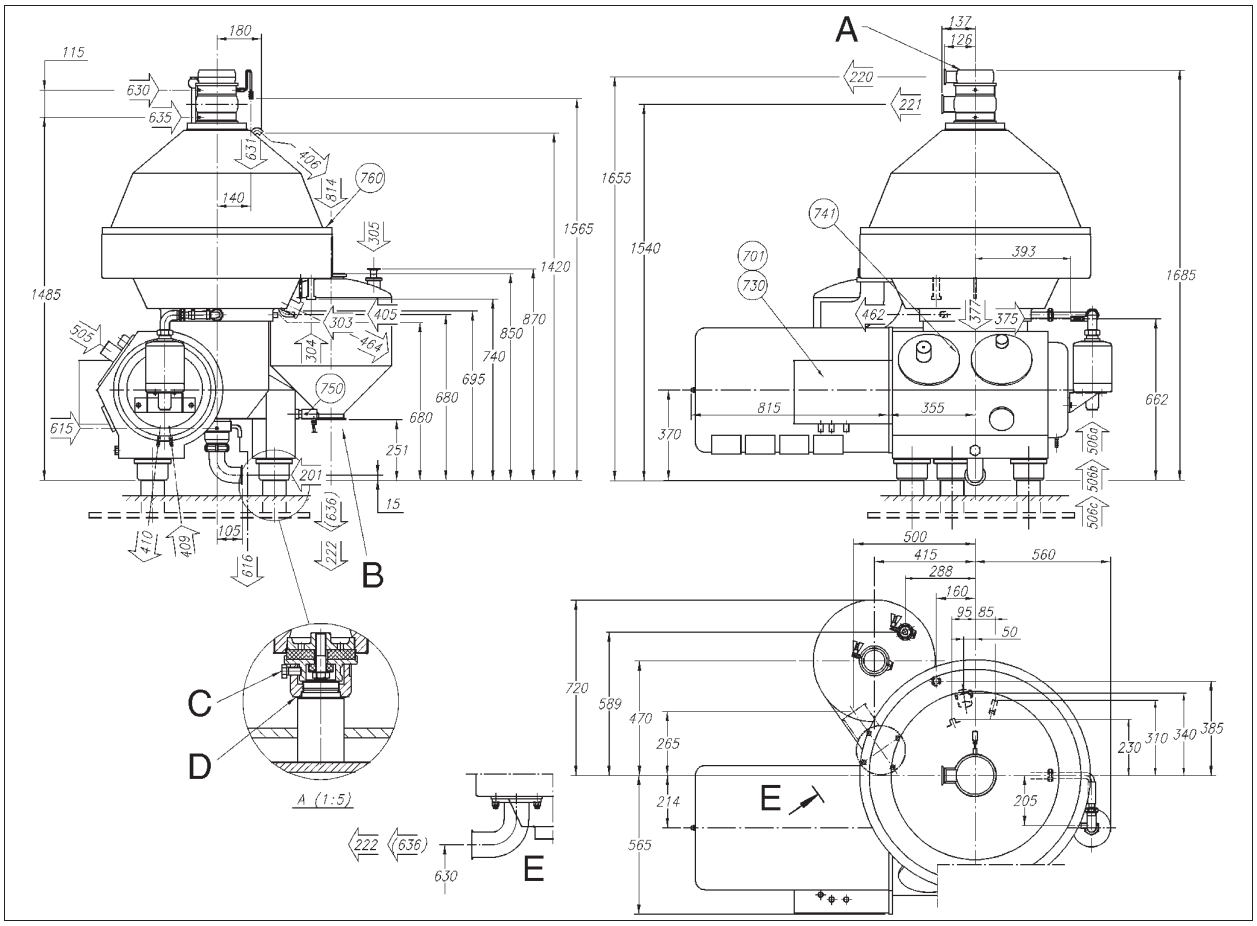


A. Needle valve

2.12.2 A / 614 and A / BM/ 714

Clamp couplings

Alfa Laval ref. 562219, rev. 3



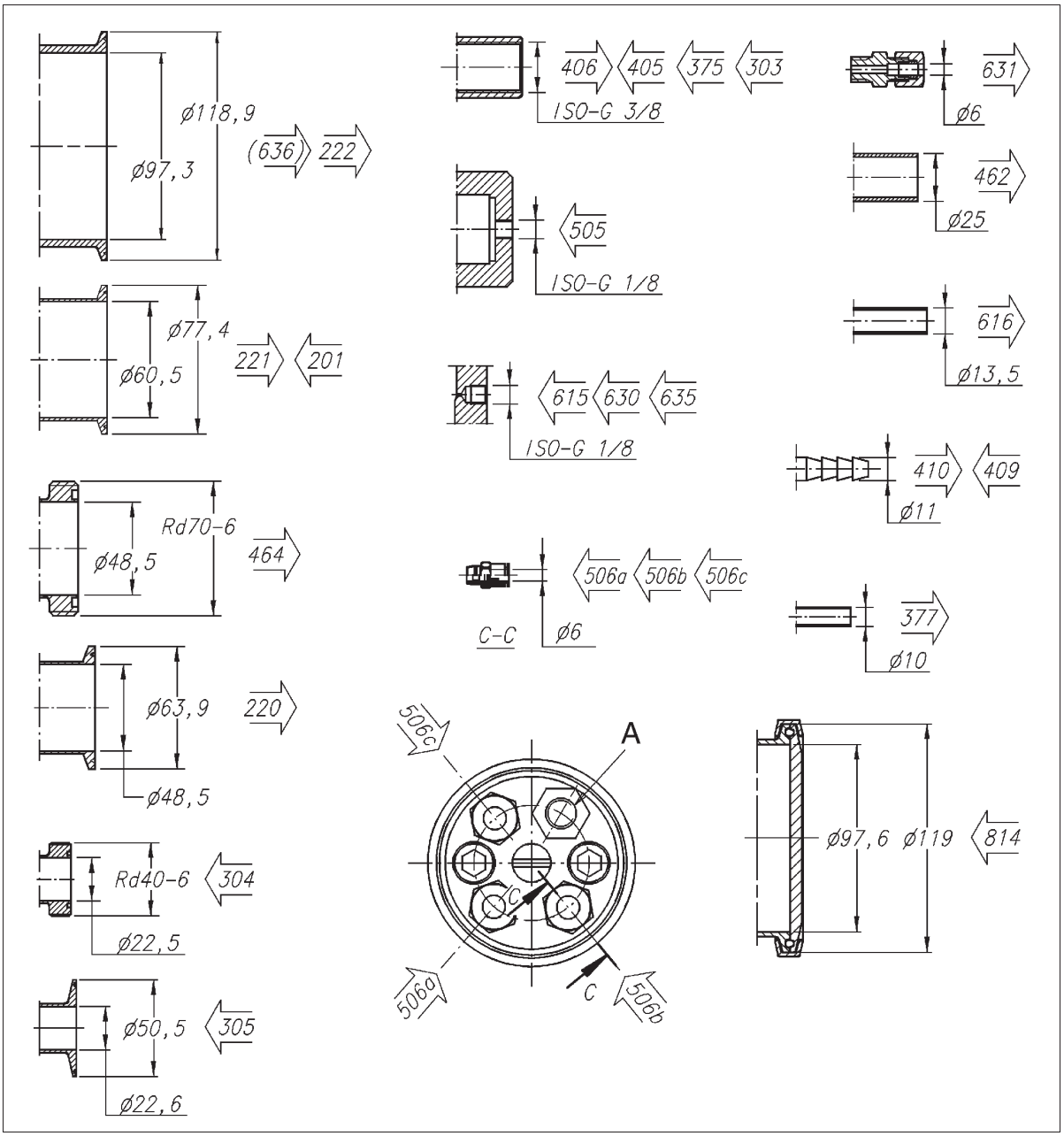
A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

Connection 220 and 221 turnable 360°.

All connections to be installed non-loaded and flexible

Data for connections, see “2.13 Connection lists” on page 108.

Connections

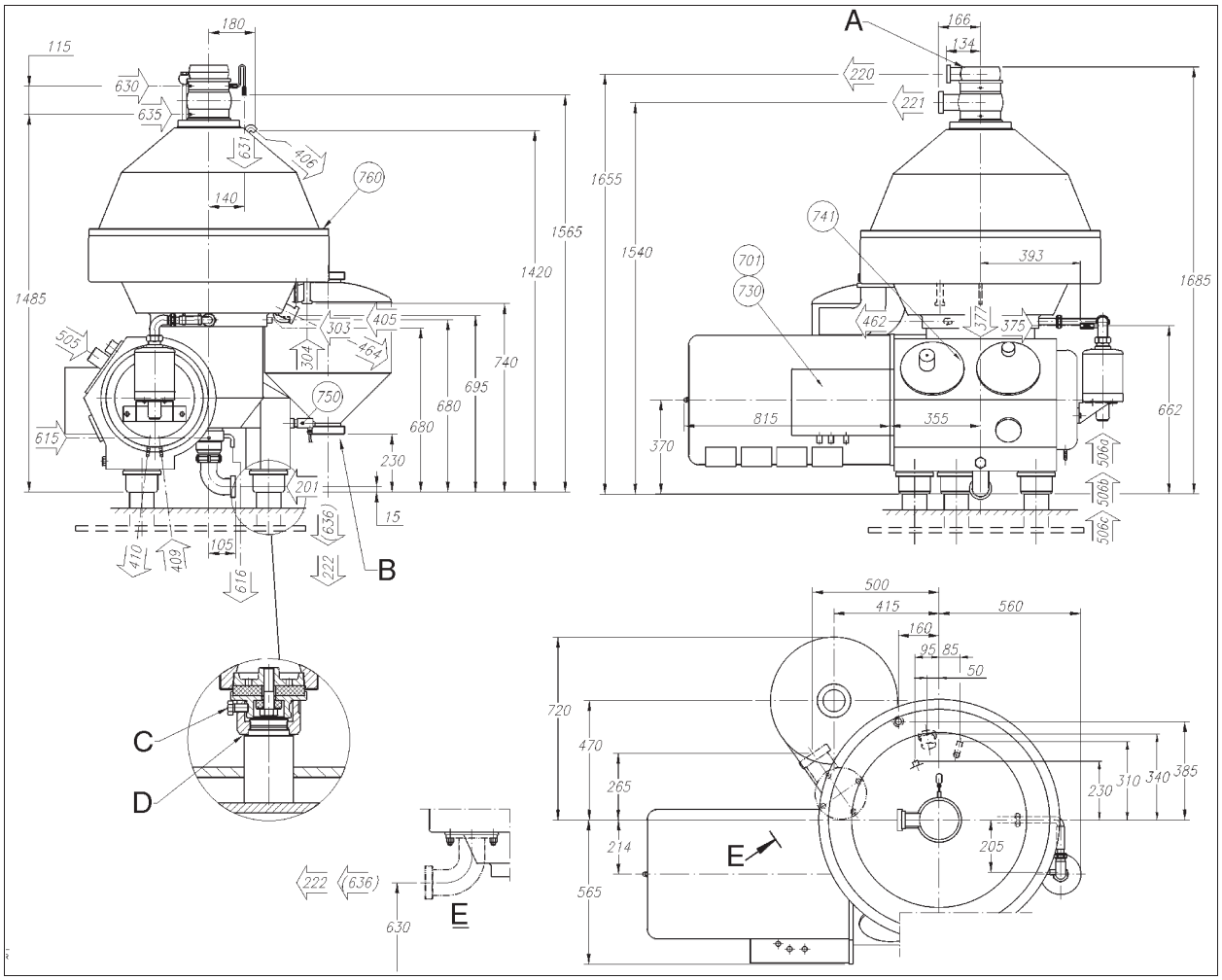


A. Needle valve

2.12.3 C / H/ W / WD 614 and C / H/ W / 714

SMS couplings

Alfa Laval ref. 562071, rev. 1



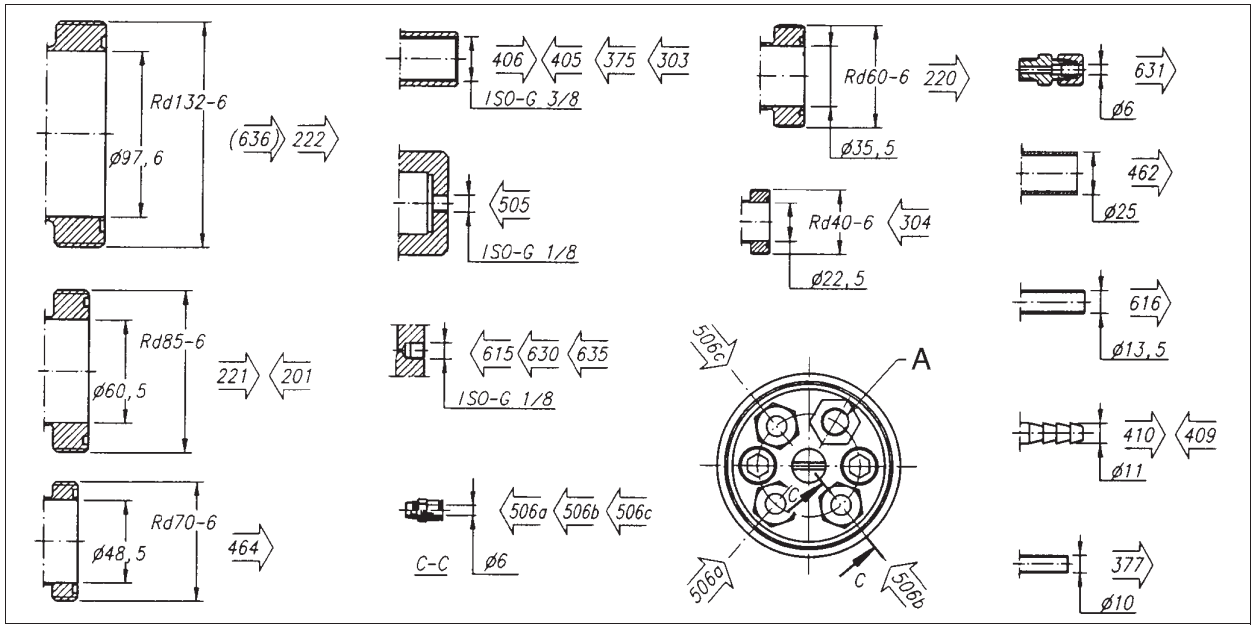
A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

Connection 220 and 221 turnable 360°.

All connections to be installed non-loaded and flexible

Data for connections, see “2.13 Connection lists” on page 108.

Connections

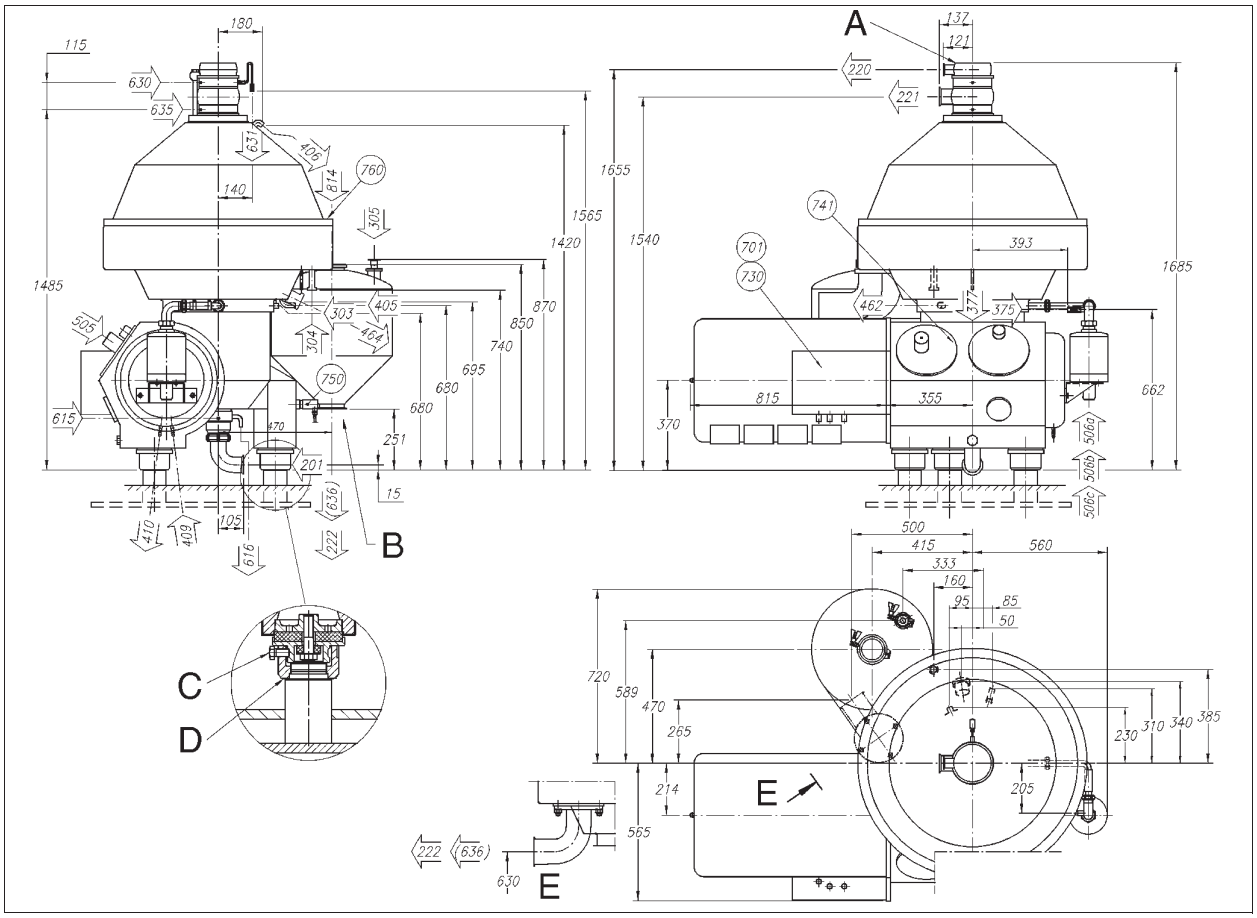


A. Needle valve

2.12.4 C / H / W /WD / 614 and C /H / W / 714

Clamp couplings

Alfa Laval ref. 562218, rev. 4



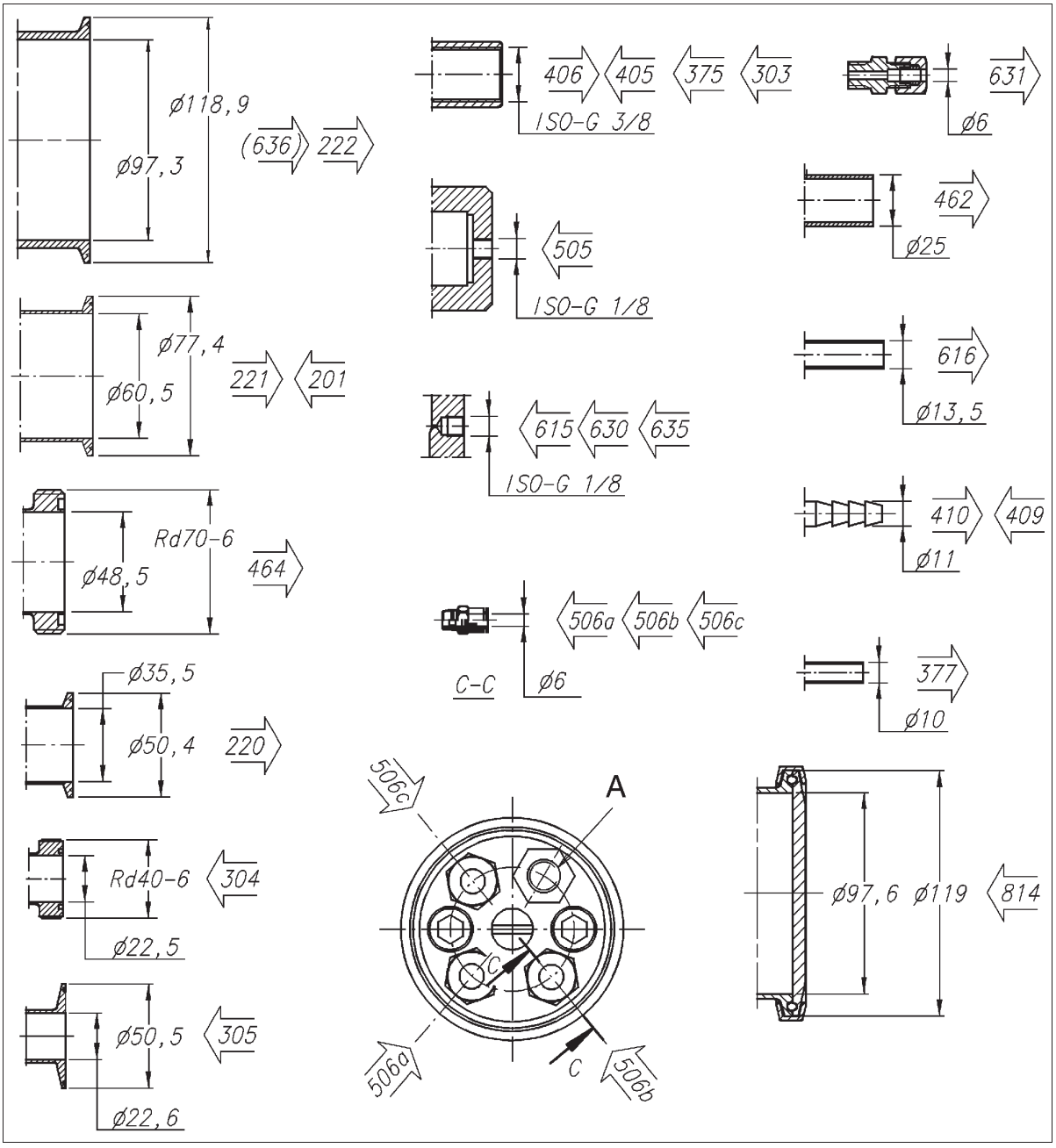
A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

Connection 220 and 221 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections, see “2.13 Connection lists” on page 108.

Connections

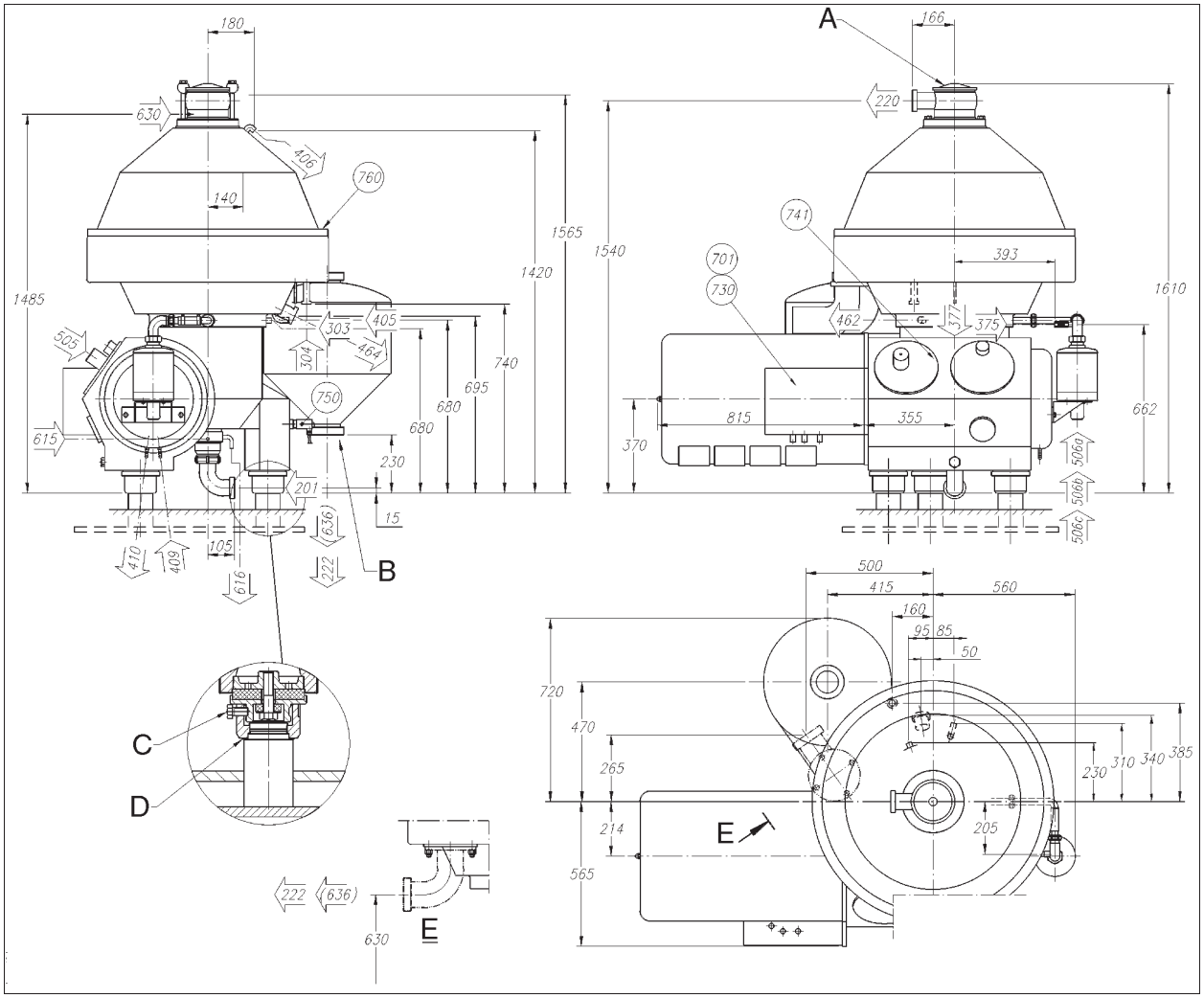


A. Needle valve

2.12.5 BB / D / 714

SMS couplings

Alfa Laval ref. 562220, rev. 1



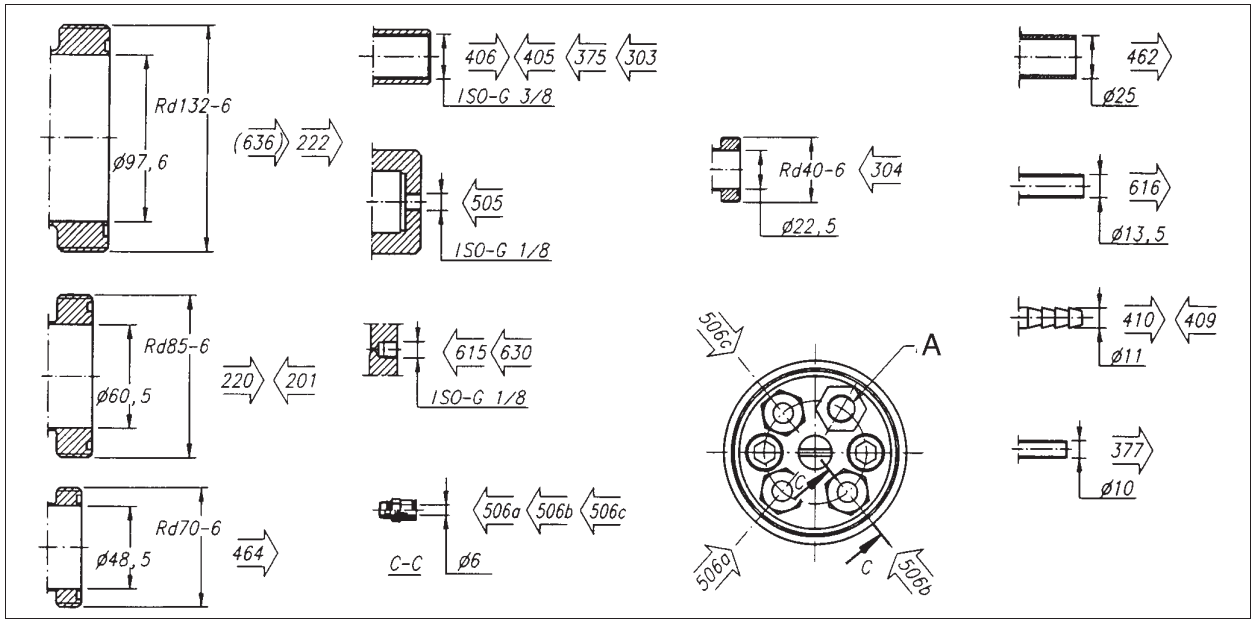
A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

Connection 220 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections, see “2.13 Connection lists” on page 108.

Connections

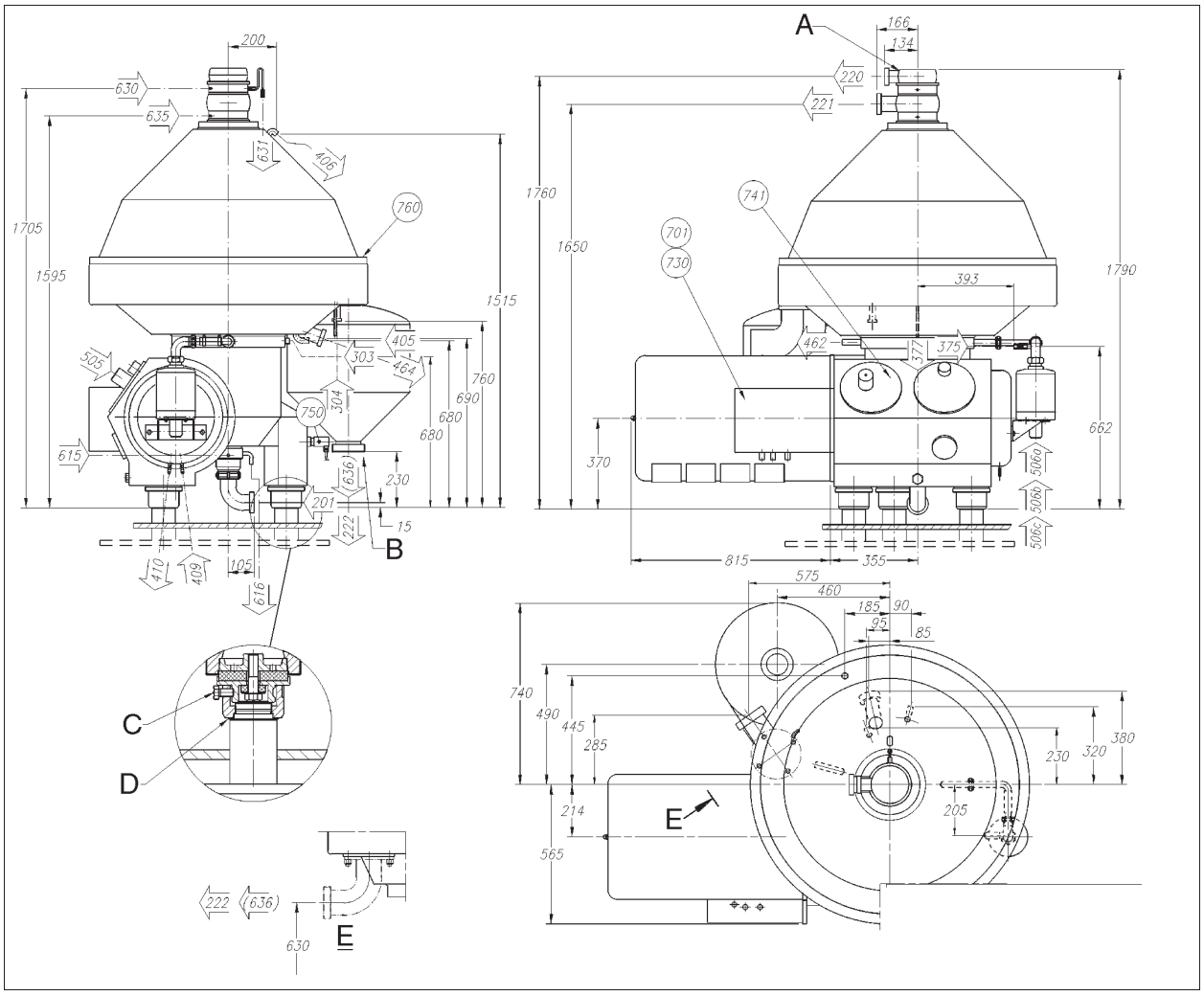


A. A.Naaldventiel

2.12.6 C / H / W / WD / 518 and C / H/ W / WD / 618

SMS couplings

Alfa Laval ref. 562224, rev. 1



A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

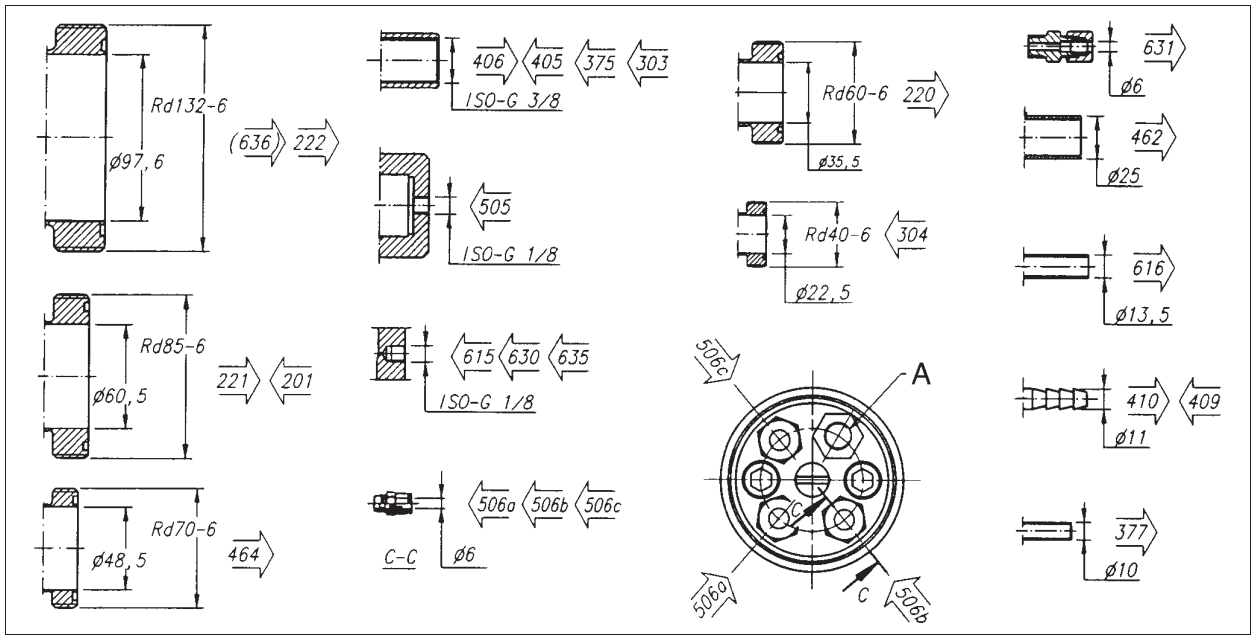
Connection 220 and 221 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections, see “2.13 Connection lists” on page 108.

Connections

SMS couplings

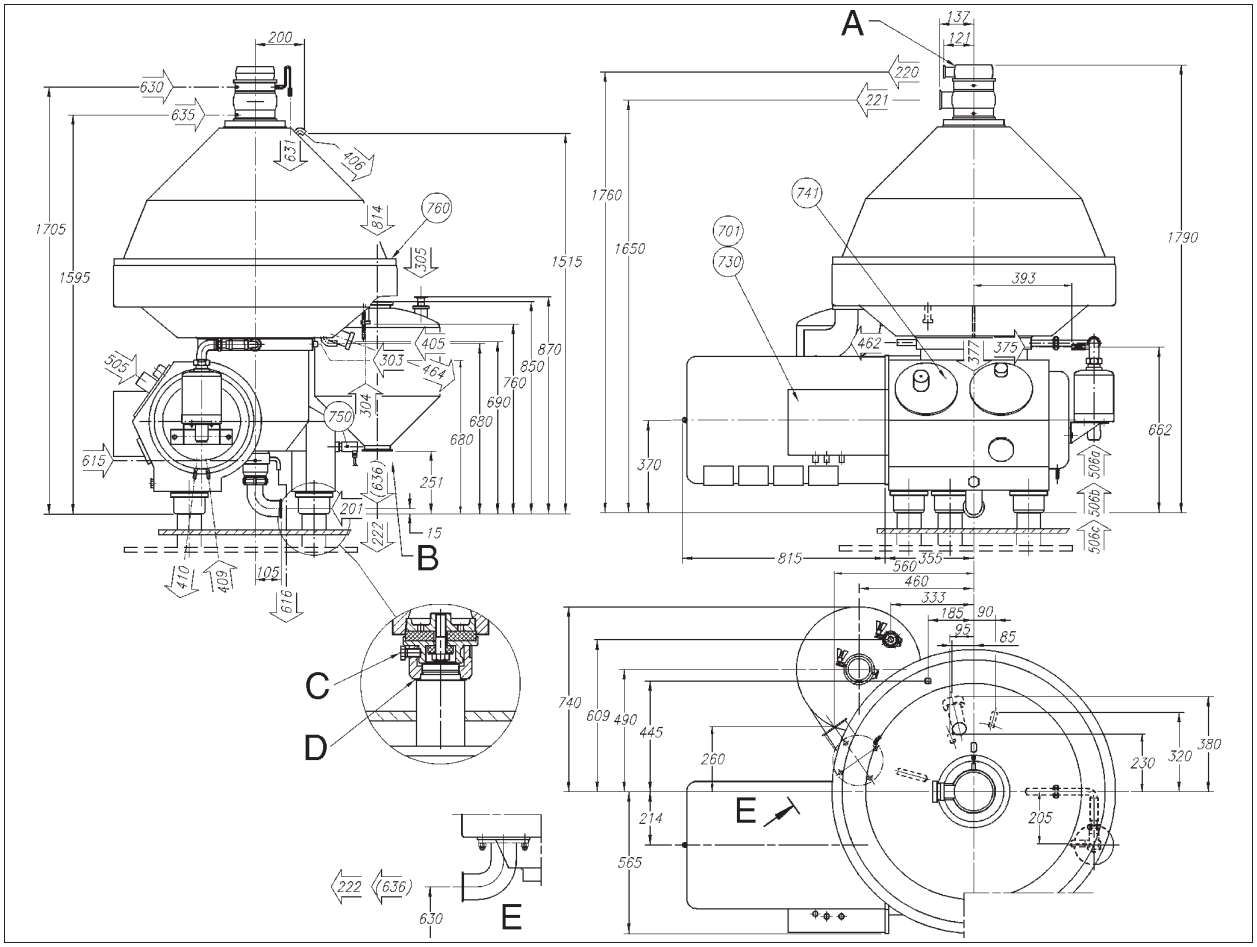


A. Needle valve

2.12.7 C / H / W / WD / 518

Clamp couplings

Alfa Laval ref. 562226, rev. 3



A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

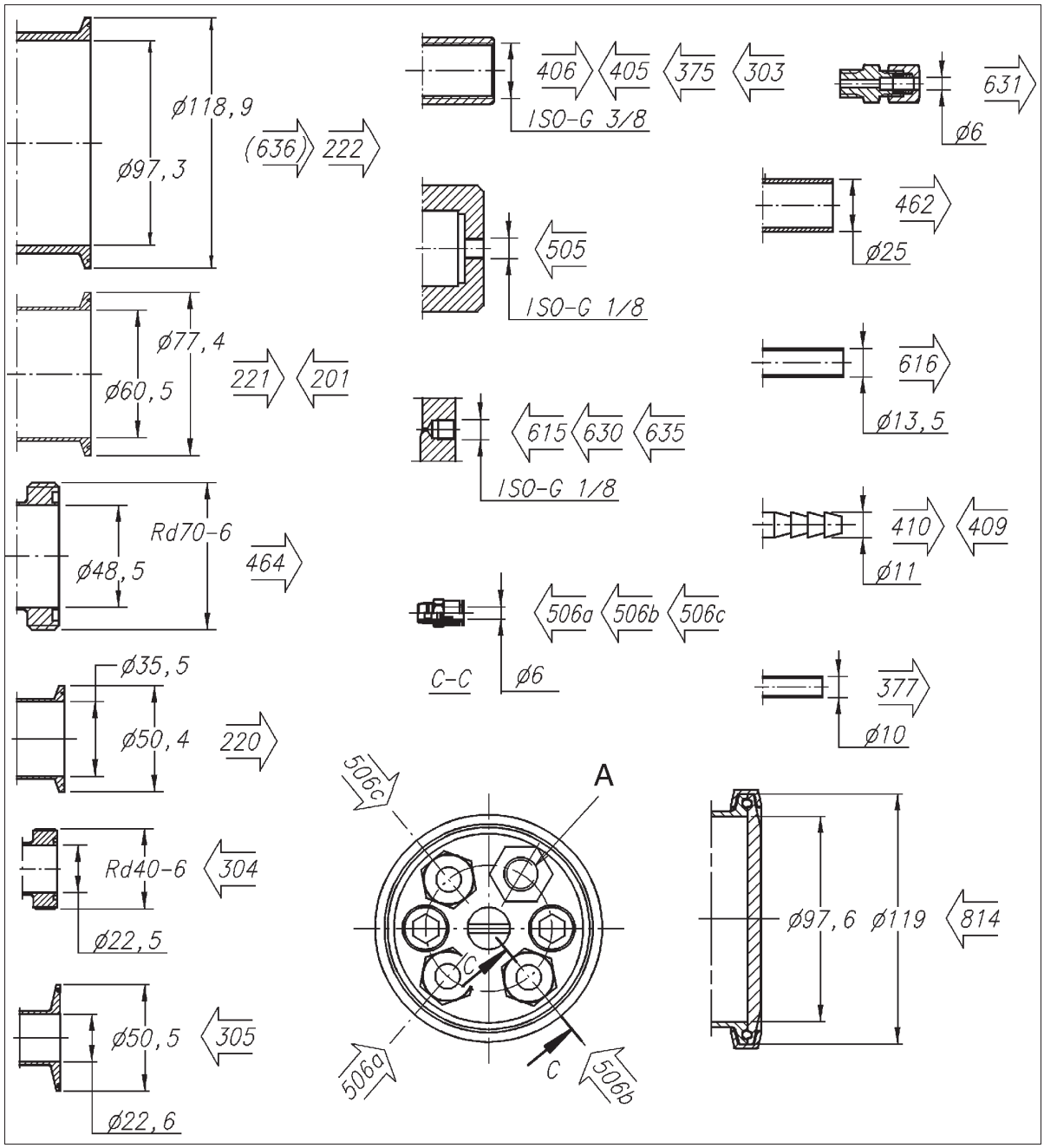
Connection 221 and 220 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections: See “2.13 Connection lists” on page 108.

Connections

Clamp couplings

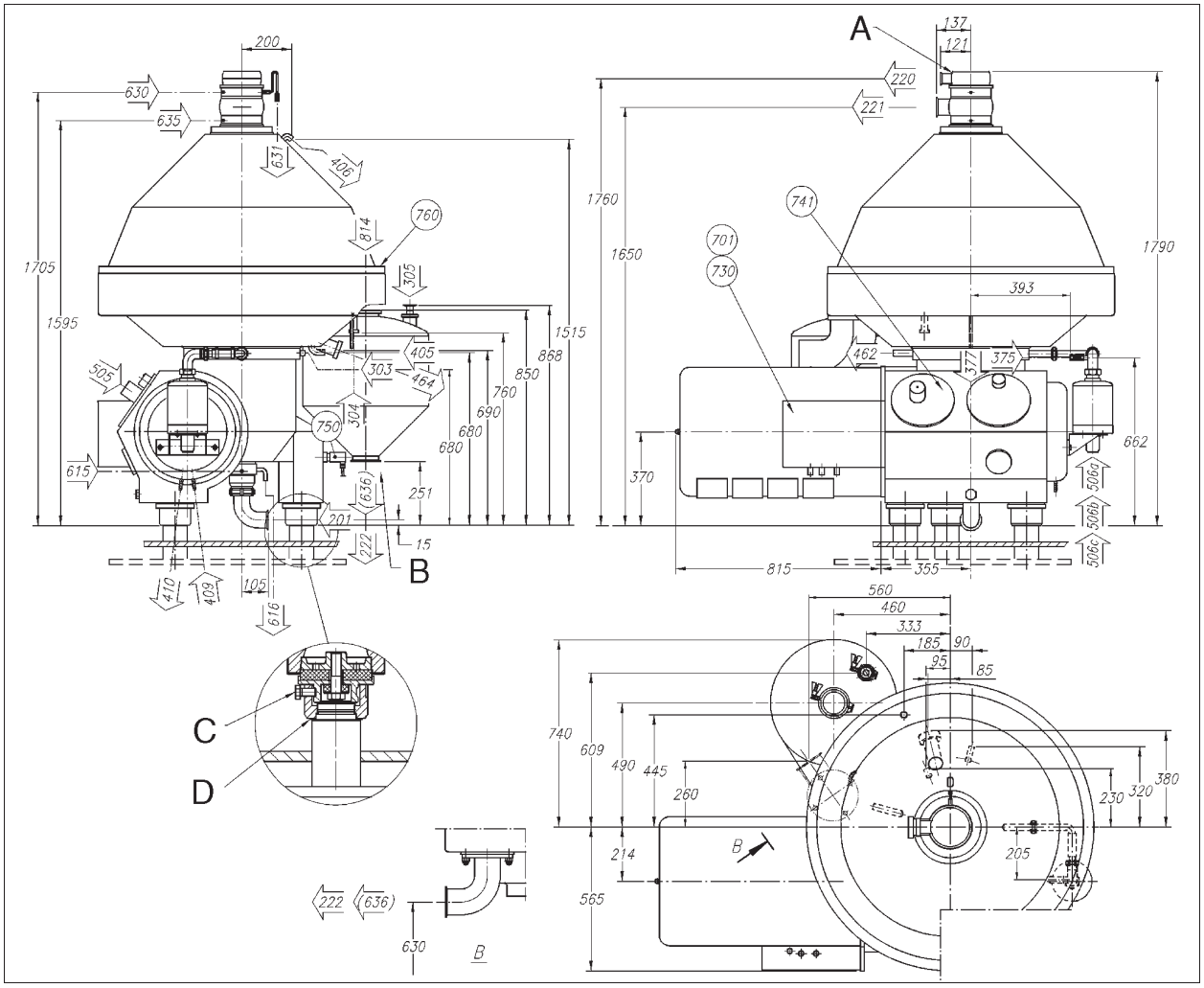


A. Needle valve

2.12.8 C / H / W / WD / 618

Clamp coupling

Alfa Laval ref. 575682, rev. 0



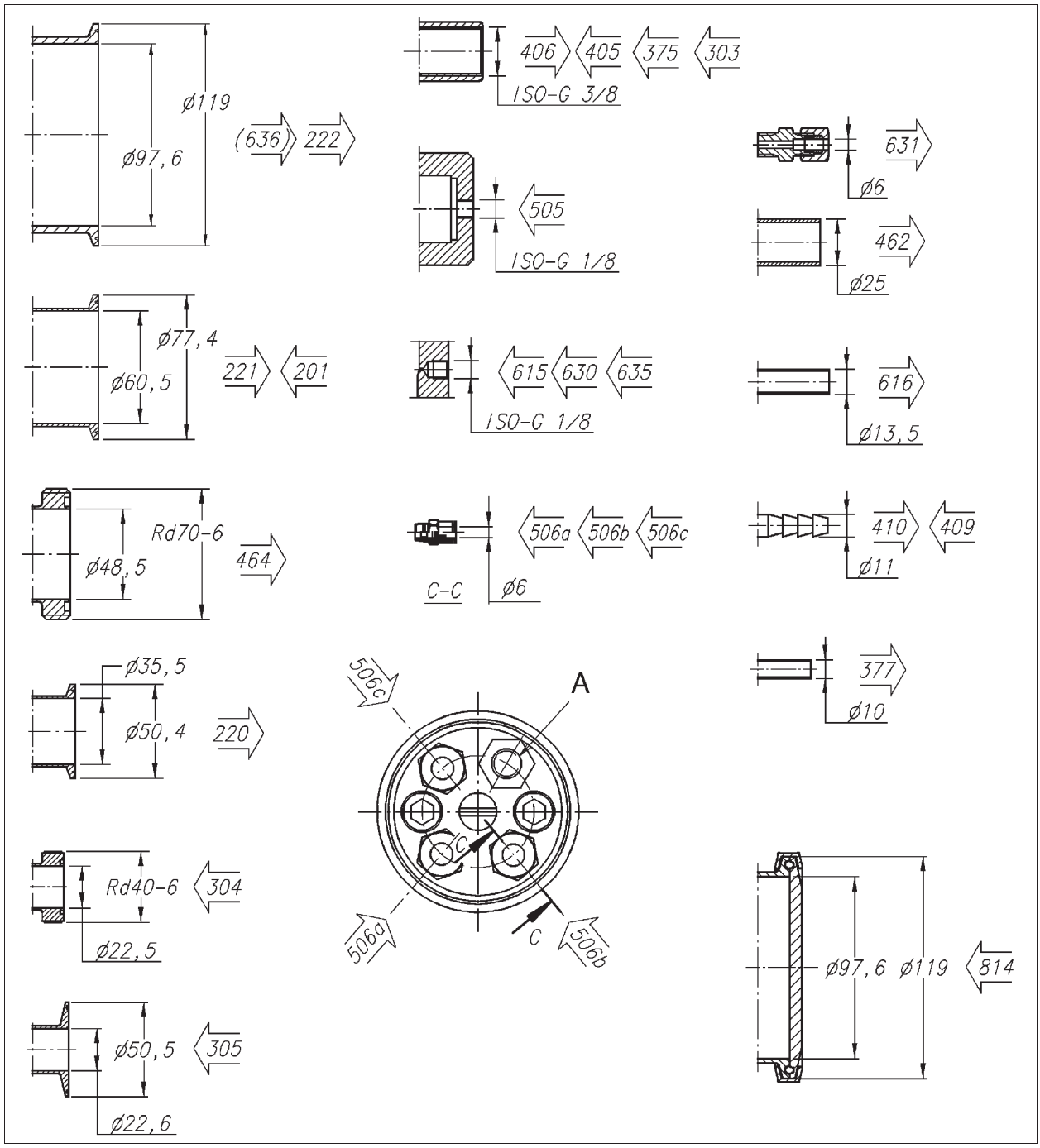
A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot

Connection 220 and 221 turnable 360°.

All connections to be installed non-loaded and flexible

Data for connections, see “2.13 Connection lists” on page 108.

Connections

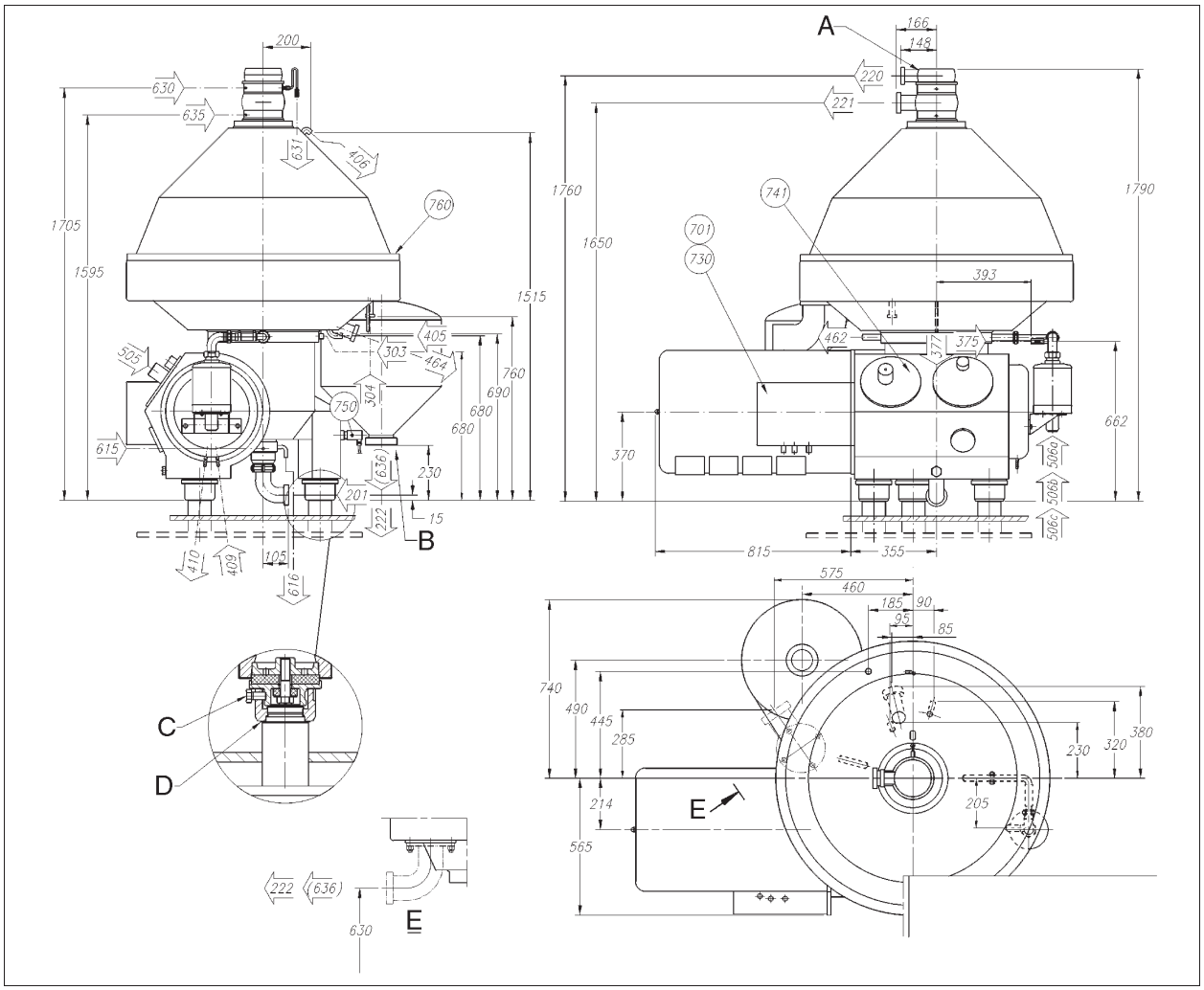


A. Needle valve

2.12.9 BM / F / 618 and BM / 818

SMS couplings

Alfa Laval ref. 562228, rev. 2



A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

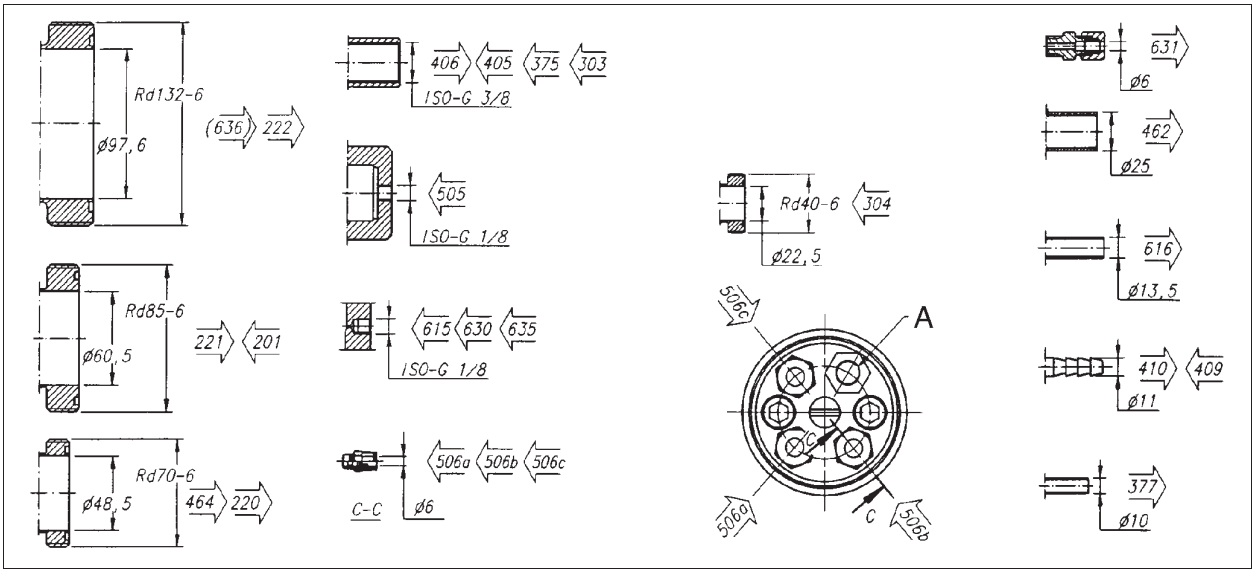
Connection 221 and 220 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections: See “2.13 Connection lists” on page 108.

Connections

SMS couplings

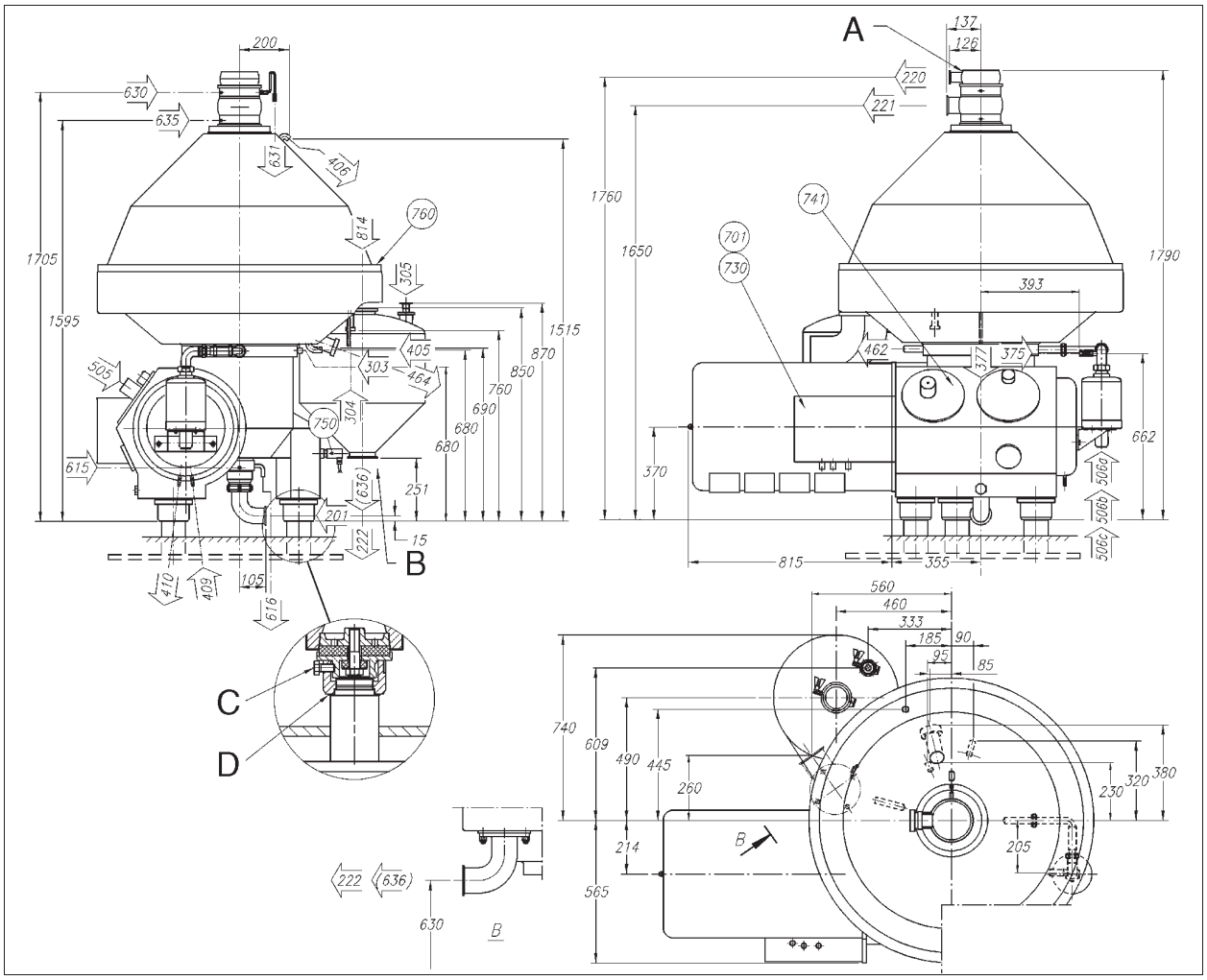


A. Needle valve

2.12.10 BM / FM / 618 and BM/ 818

Clamp couplings

Alfa Laval ref. 575683, rev. 0



A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot

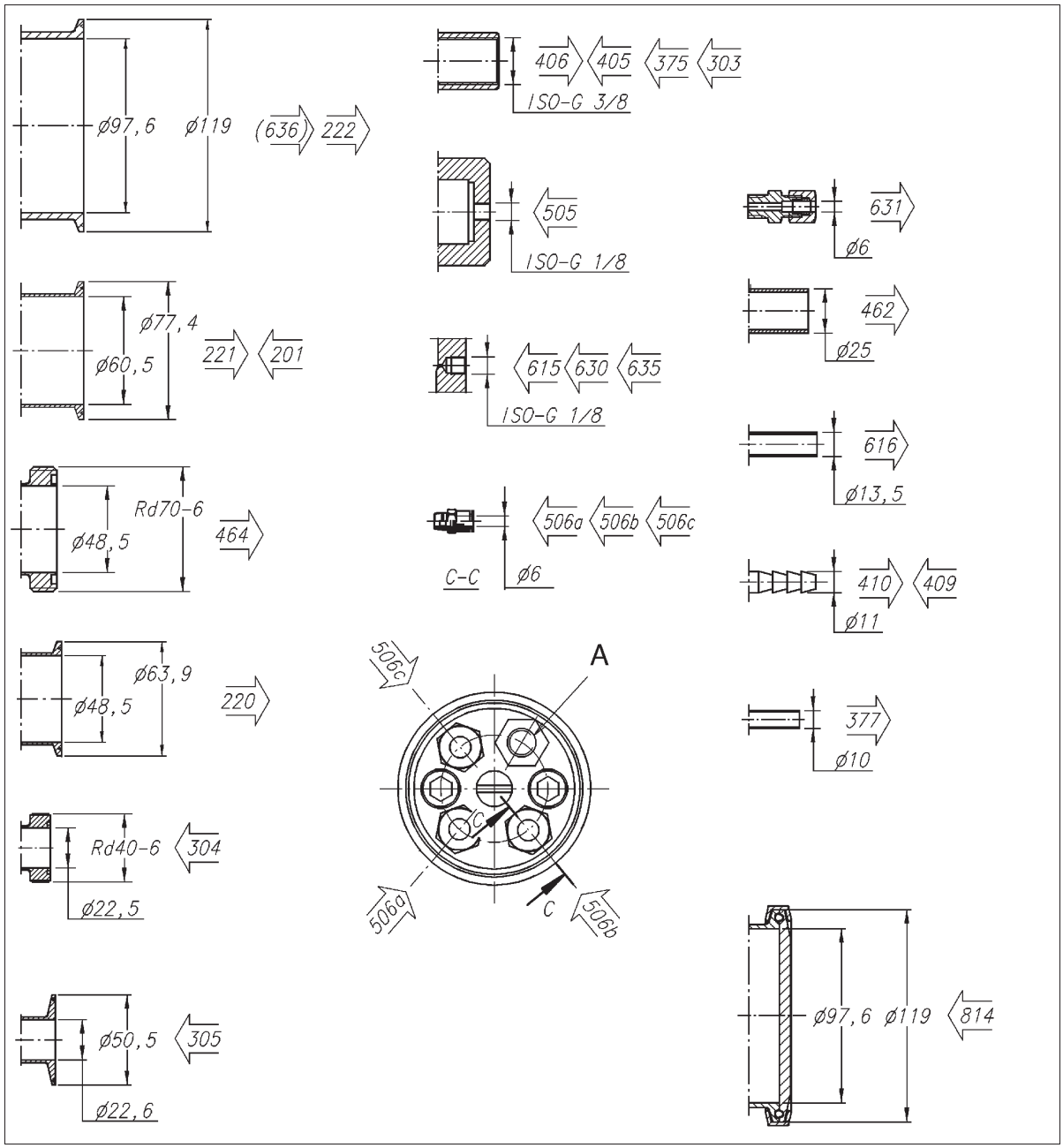
Connection 221 and 220 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections: See “2.13 Connection lists” on page 108.

Connections

Clamp coupling

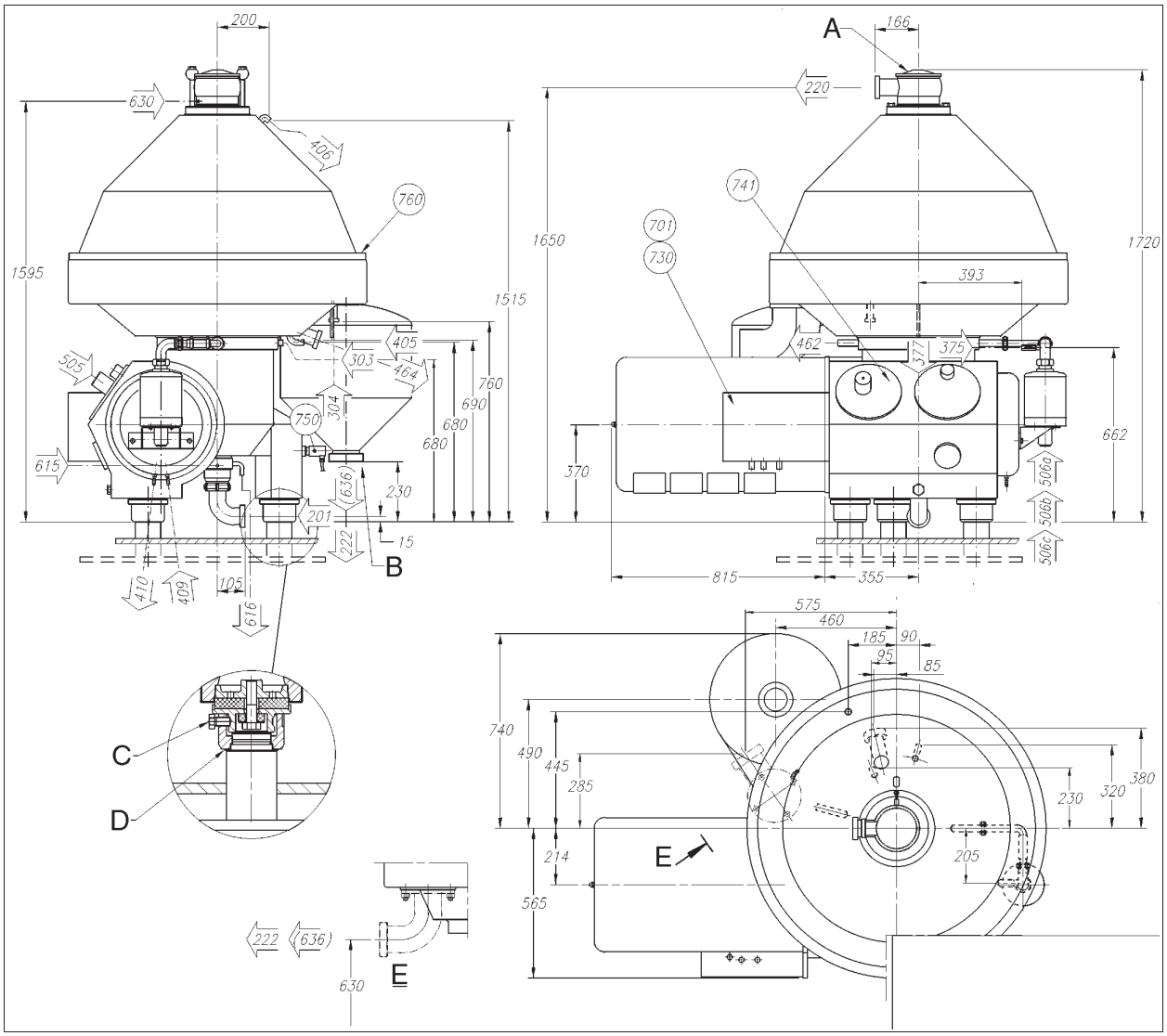


A. Needle valve

2.12.11 BB / D / 618 and BB / 818

Standard, SMS couplings

Alfa Laval ref. 562227, rev. 1



A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

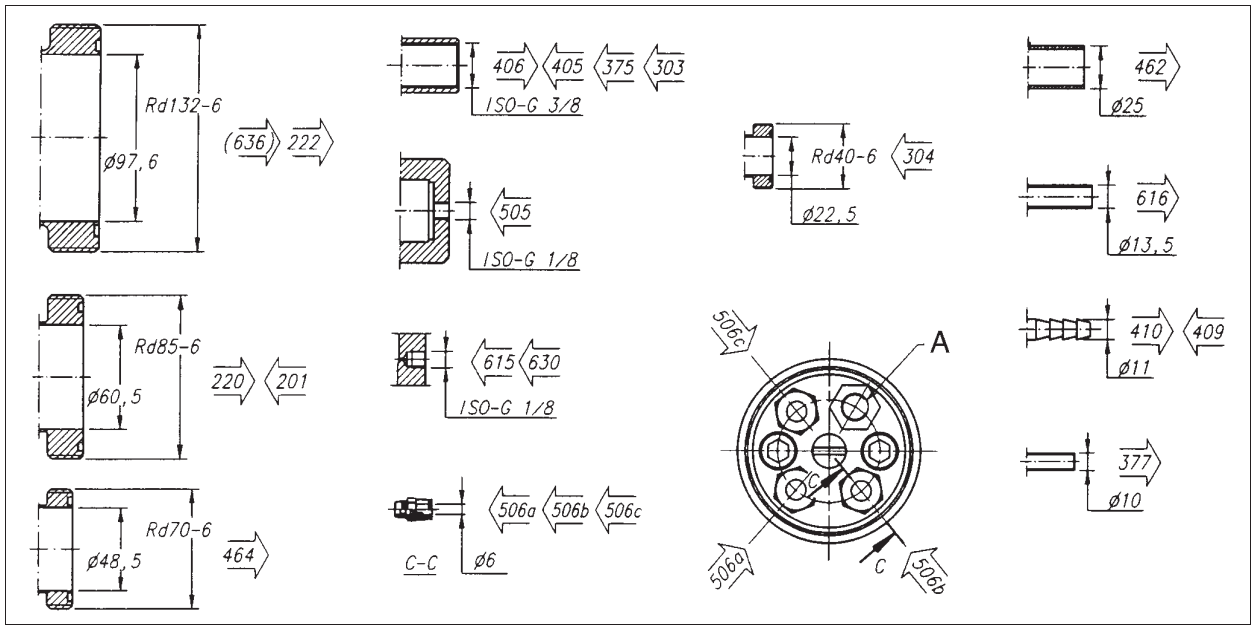
Connection 220 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections: See “2.13 Connection lists” on page 108.

Connections

SMS couplings

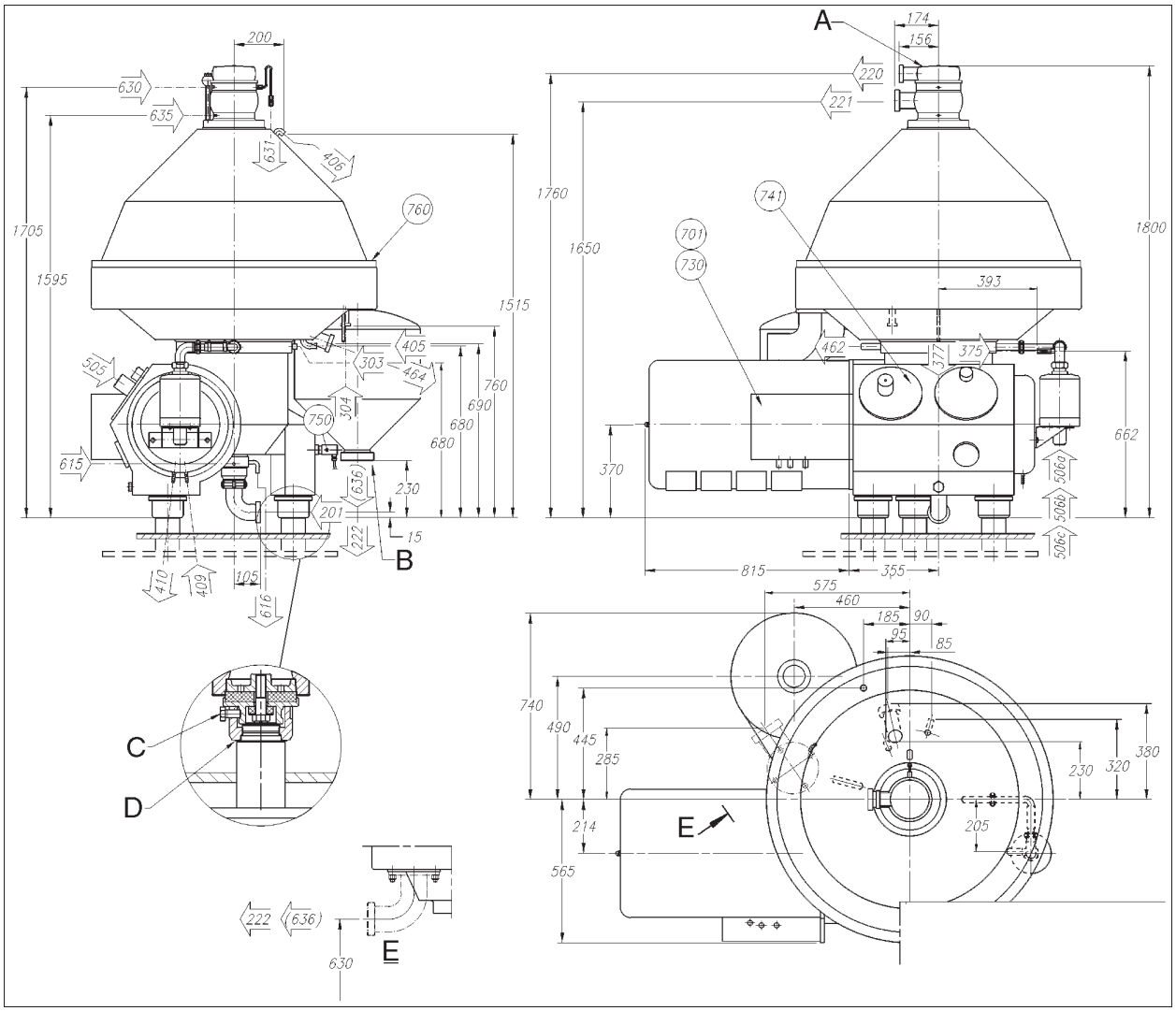


A. Needle valve

2.12.12 C /H / W / 718 and, C / H / W / / WD 818

SMS couplings

Alfa Laval ref. 562230, rev. 2



A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

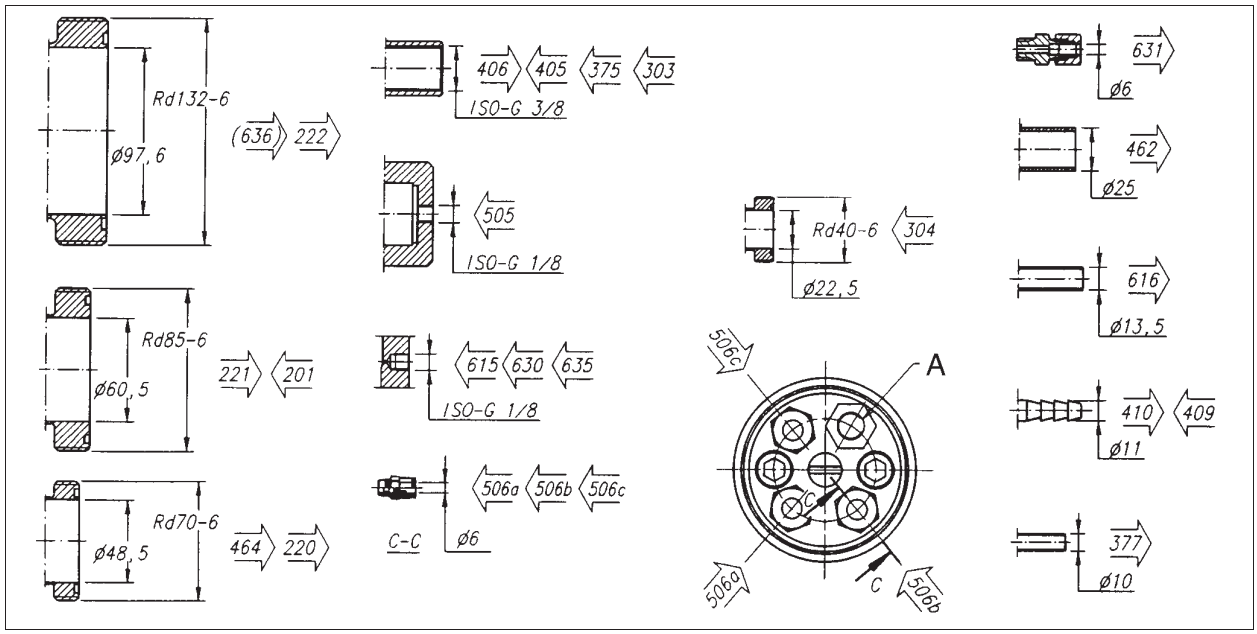
Connection 220 and 221 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections, see “2.13 Connection lists” on page 108.

Connections

SMS couplings

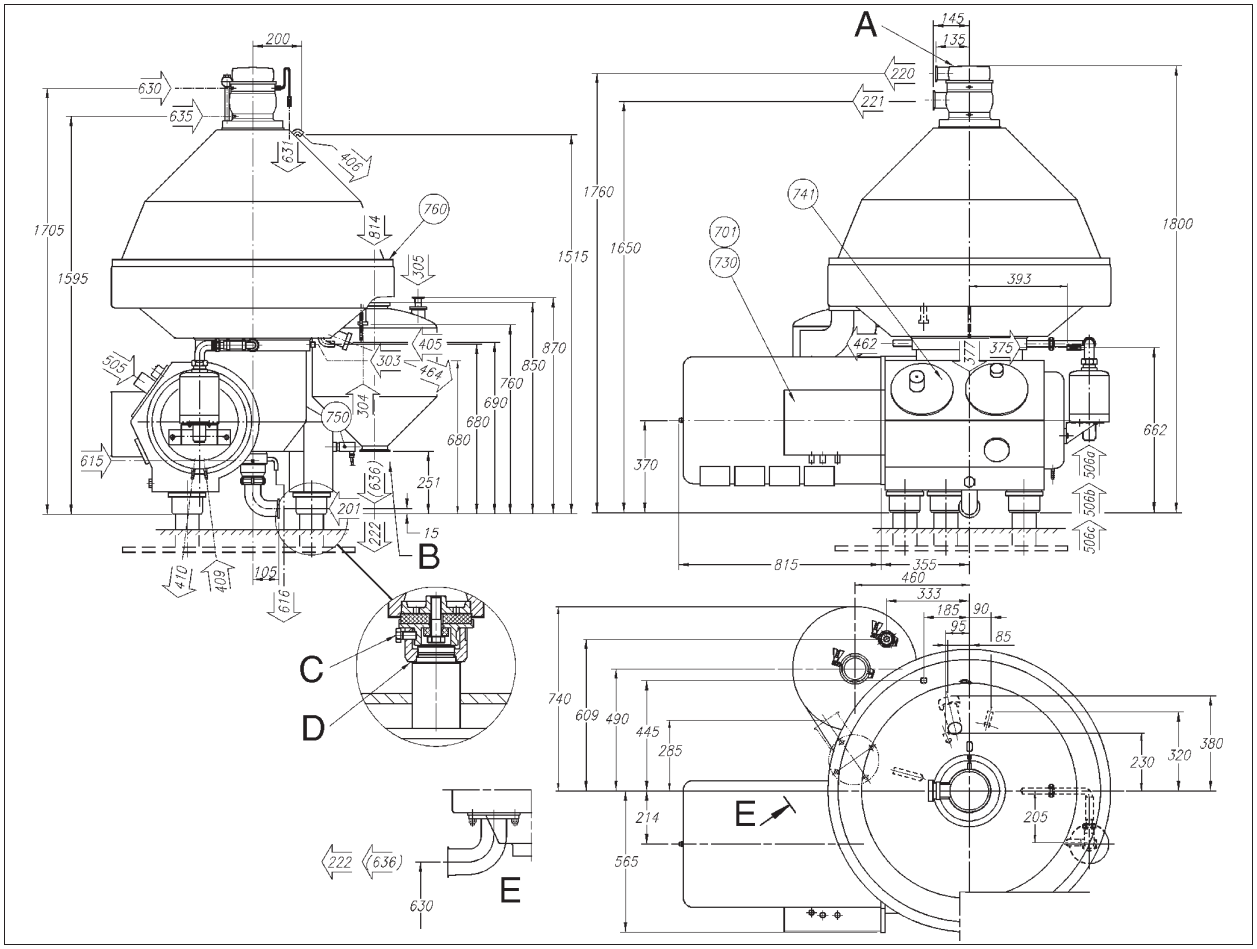


A. Needle valve

2.12.13 C / H / W / 718

Clamp couplings

Alfa Laval ref. 562231, rev. 4



A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

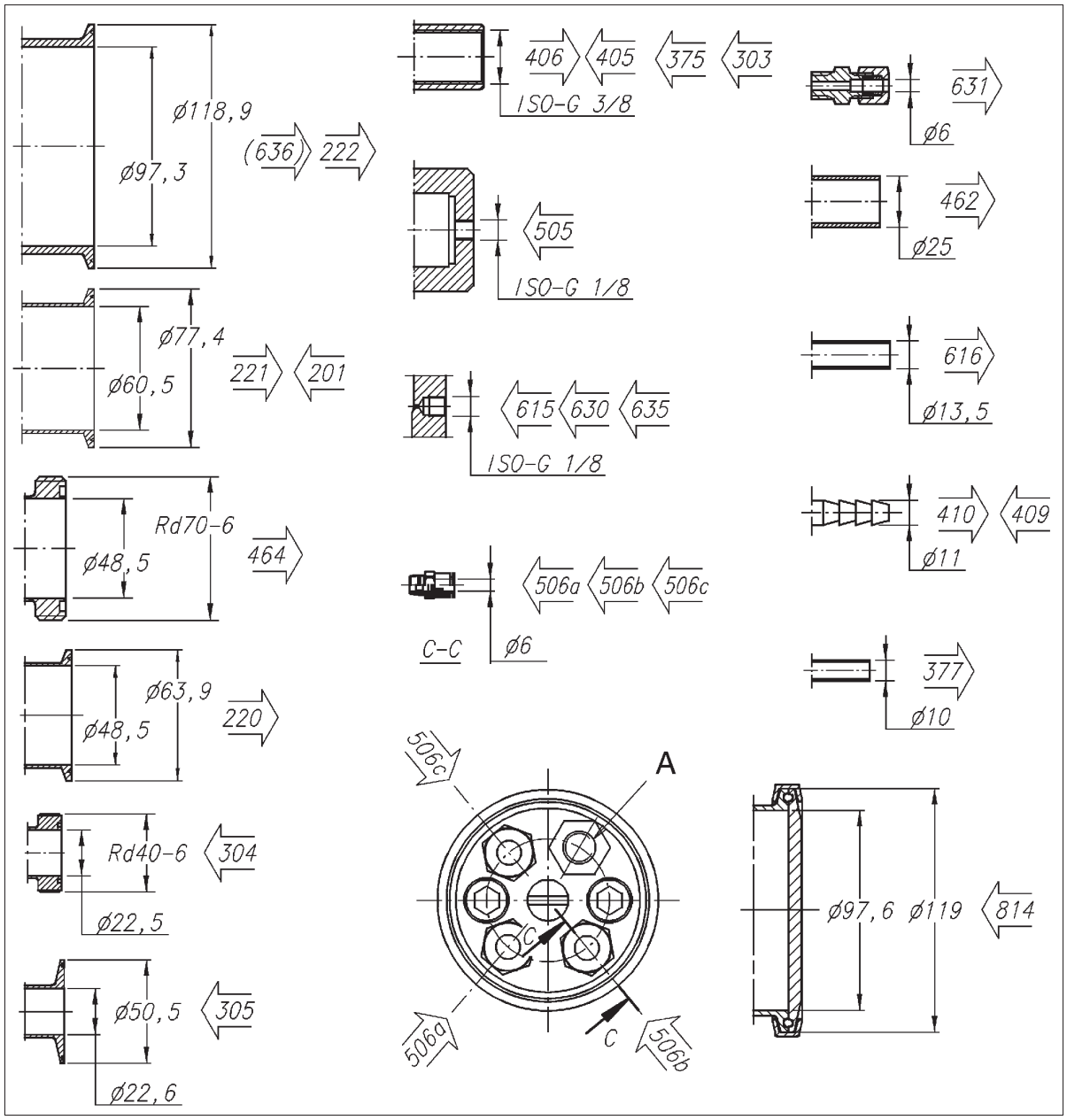
Connection 220 and 221 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections, see “2.13 Connection lists” on page 108.

Connections

Clamp couplings

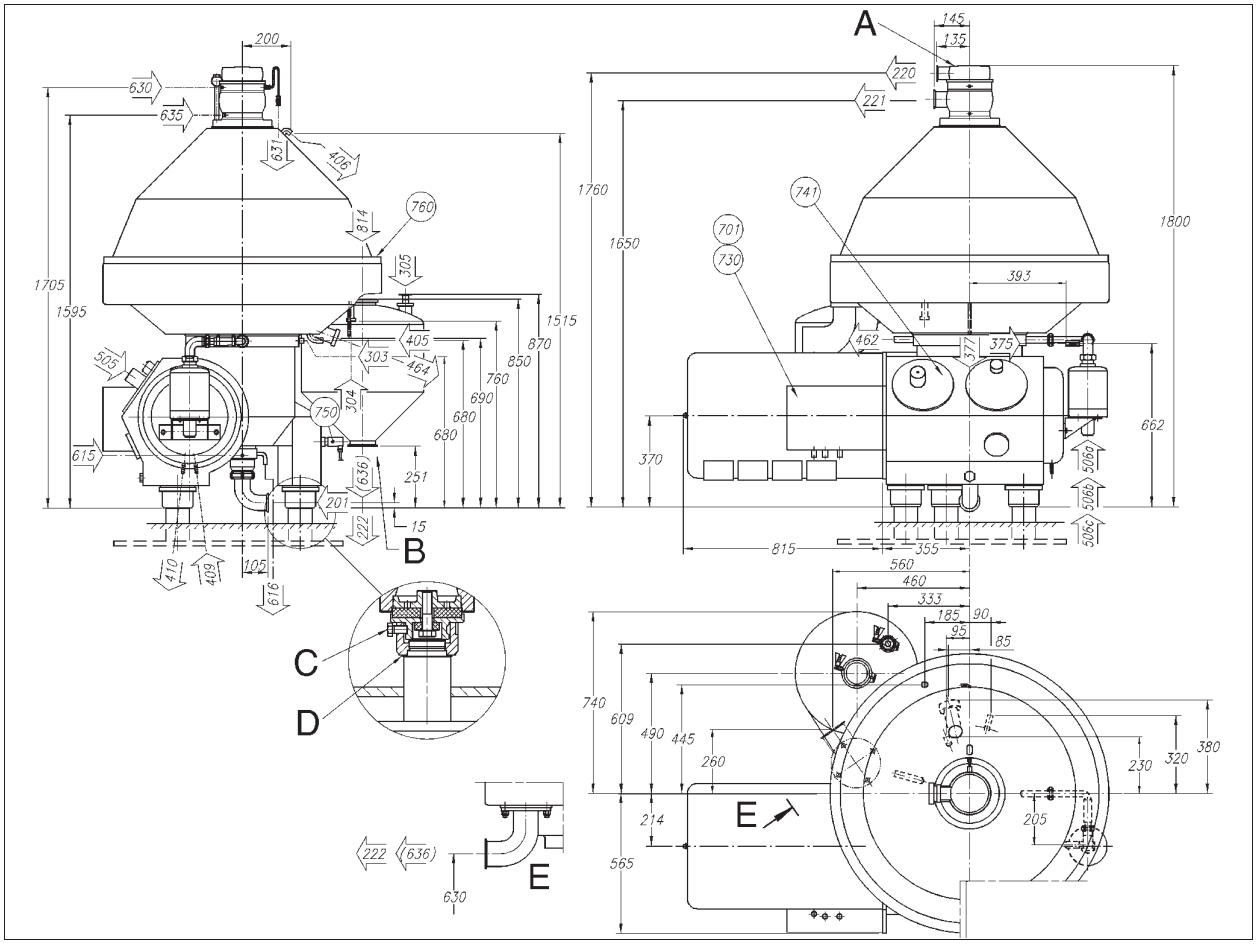


A. Needle valve

2.12.14 C / H / W / 818

Clamp couplings

Alfa Laval ref. 575706, rev. 1



A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot

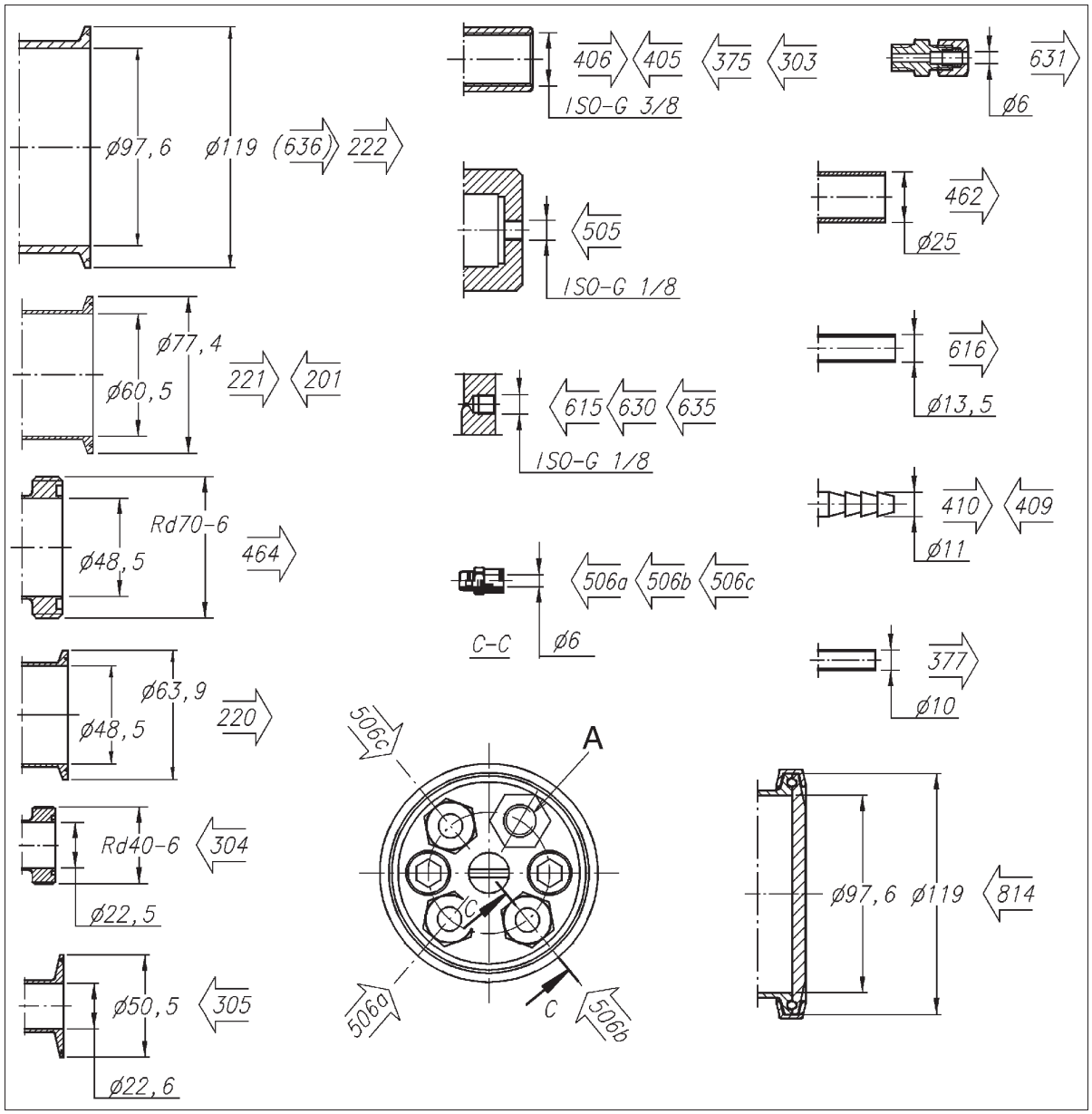
Connection 220 and 221 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections, see “2.13 Connection lists” on page 108.

Connections

Clamp couplings

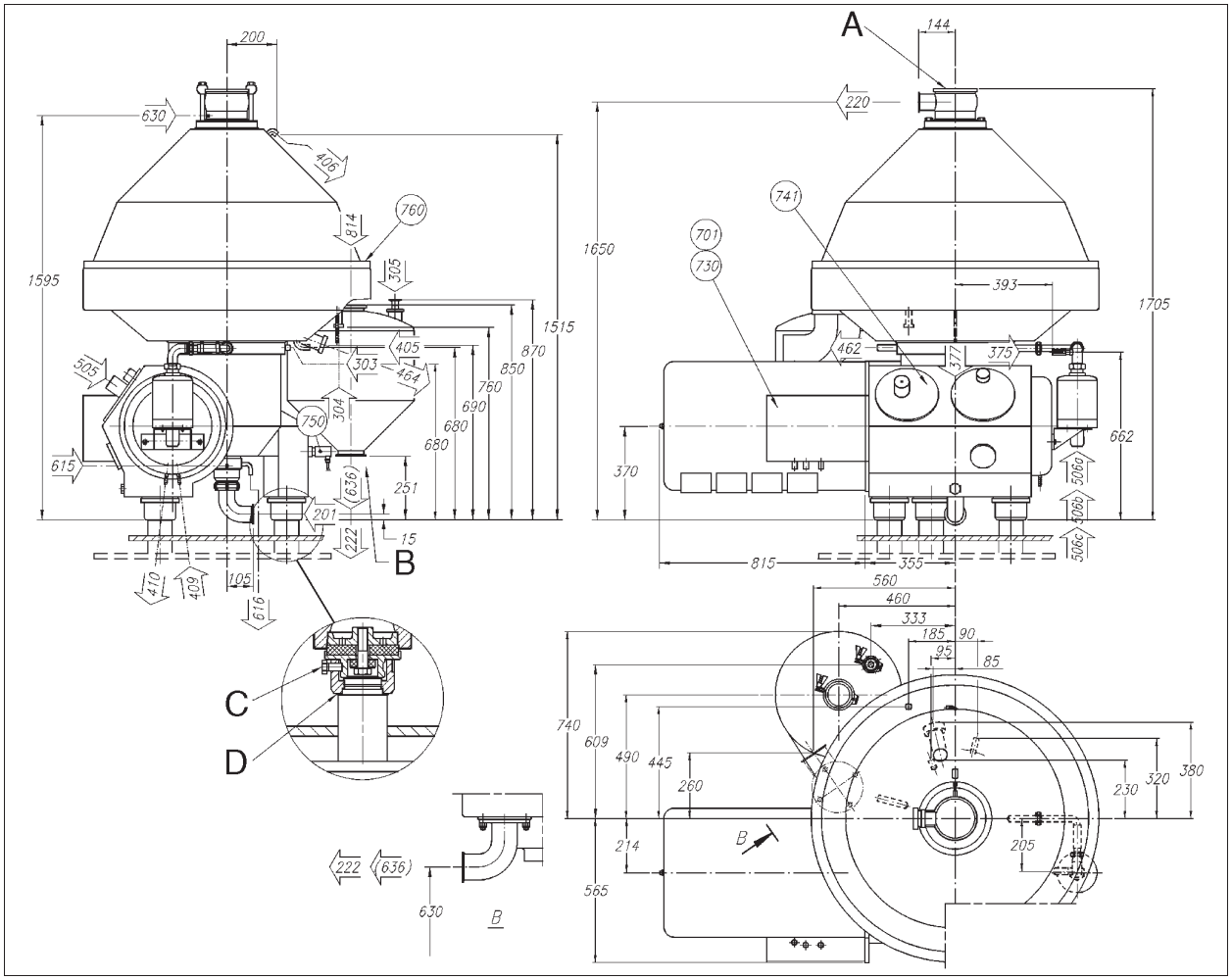


A. Needle valve

2.12.15 BB / 818, (high flow)

Clamp couplings

Alfa Laval ref. 575705, rev. 0



A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

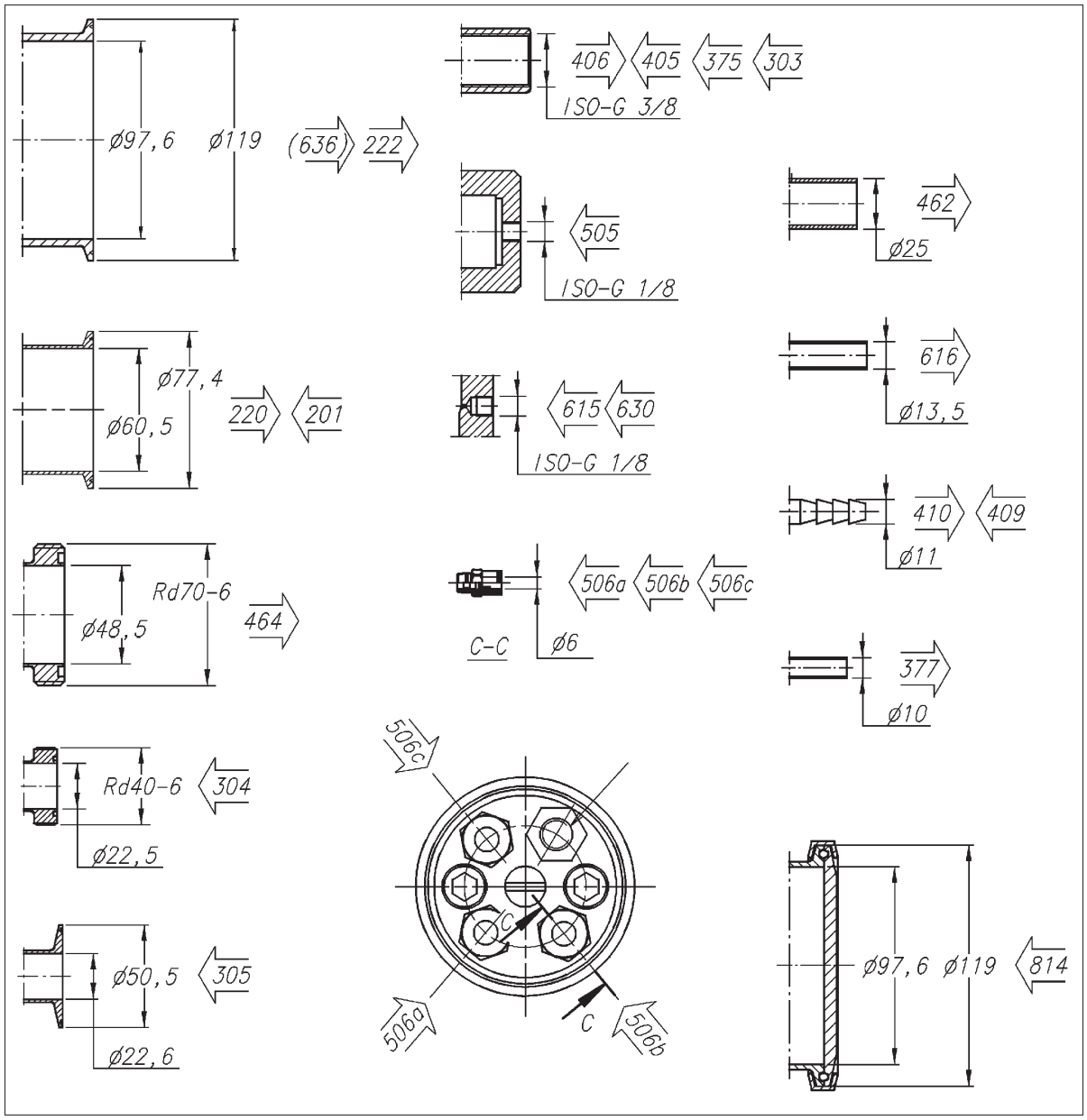
Connection 220 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections, see “2.13 Connection lists” on page 108.

Connections

Clamp couplings

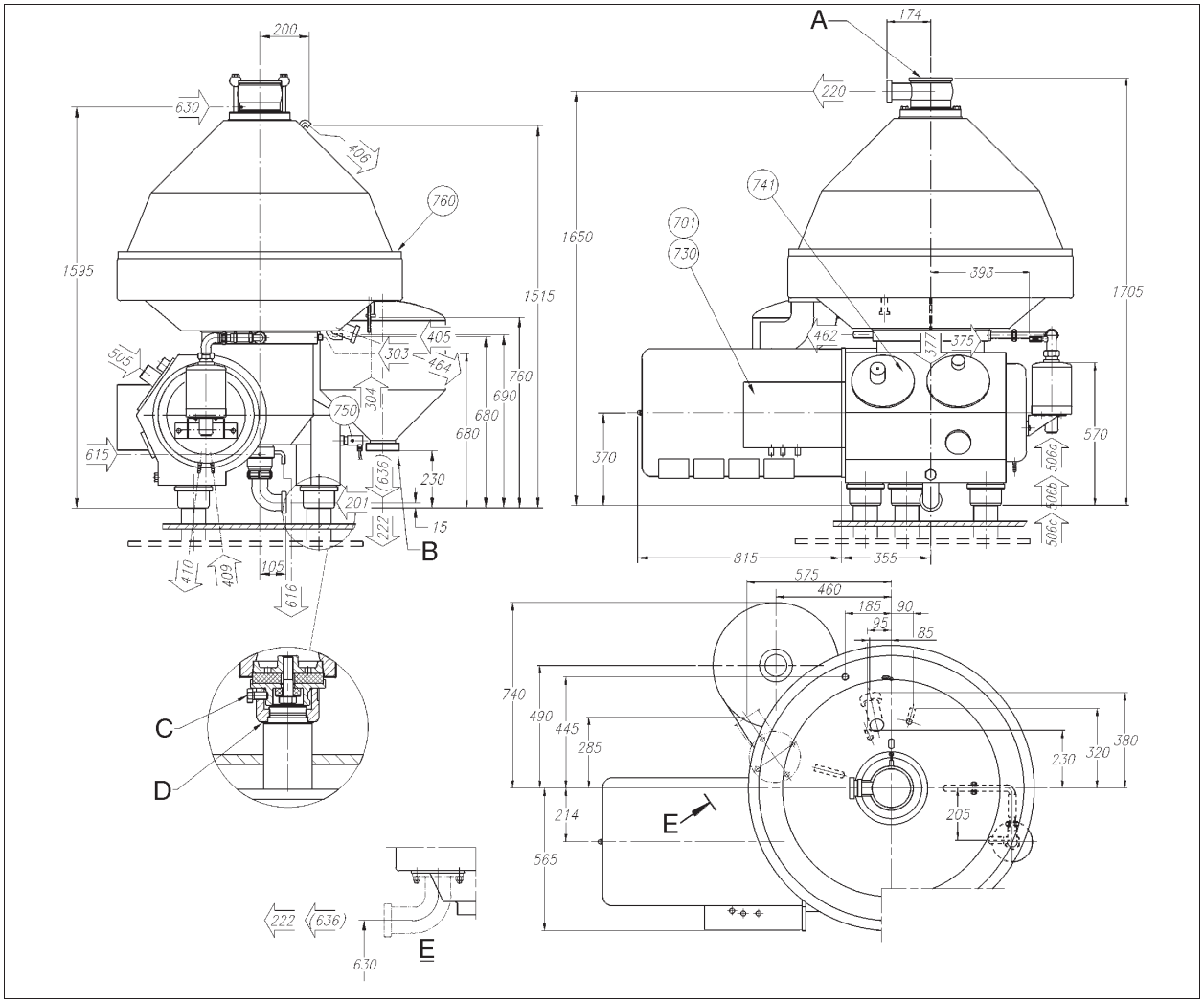


A. Needle valve

2.12.16 D 718 and BB 818

SMS couplings

Alfa Laval ref. 565380, rev. 1



A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

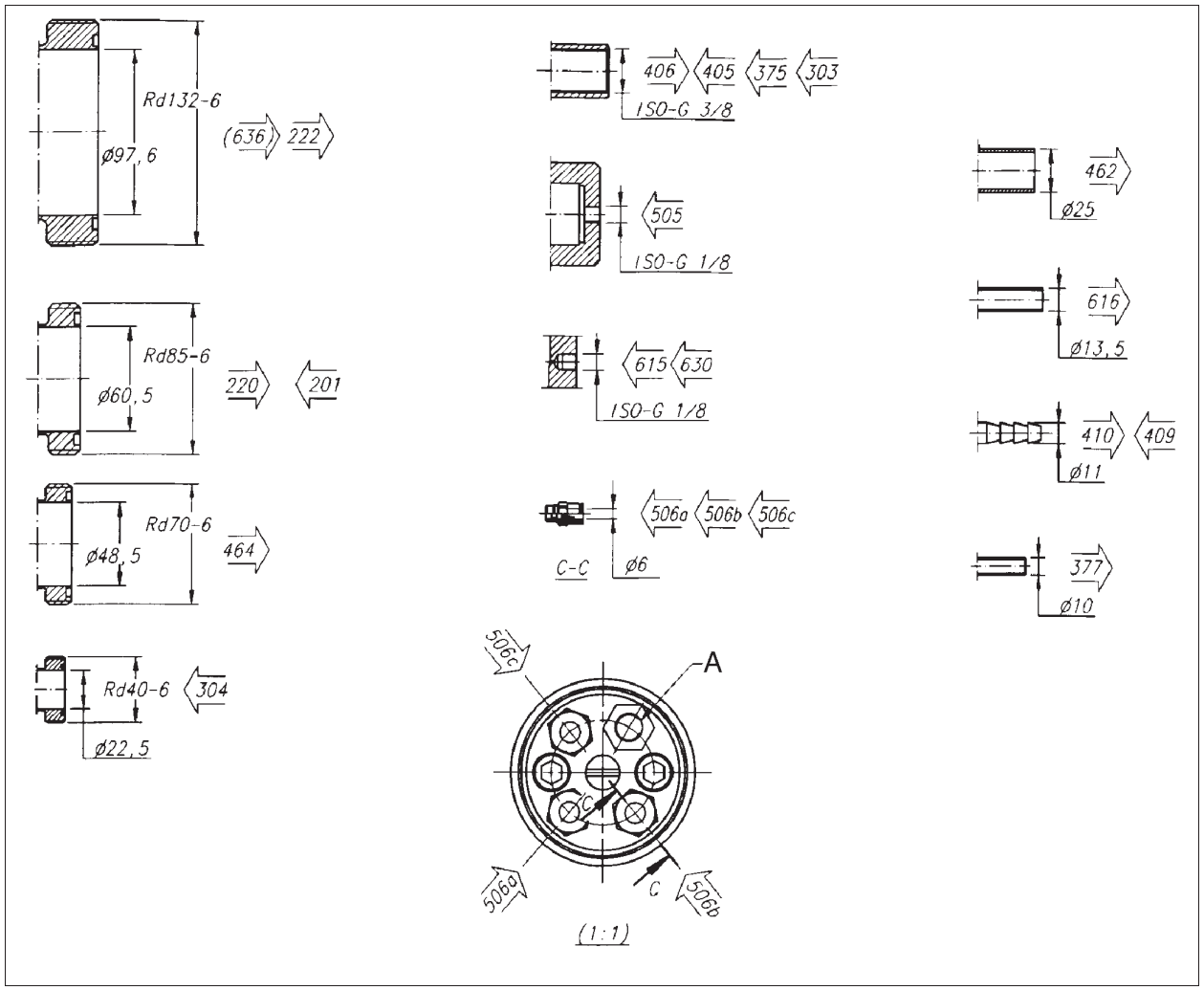
Connection 220 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections, see “2.13 Connection lists” on page 108.

Connections

SMS couplings

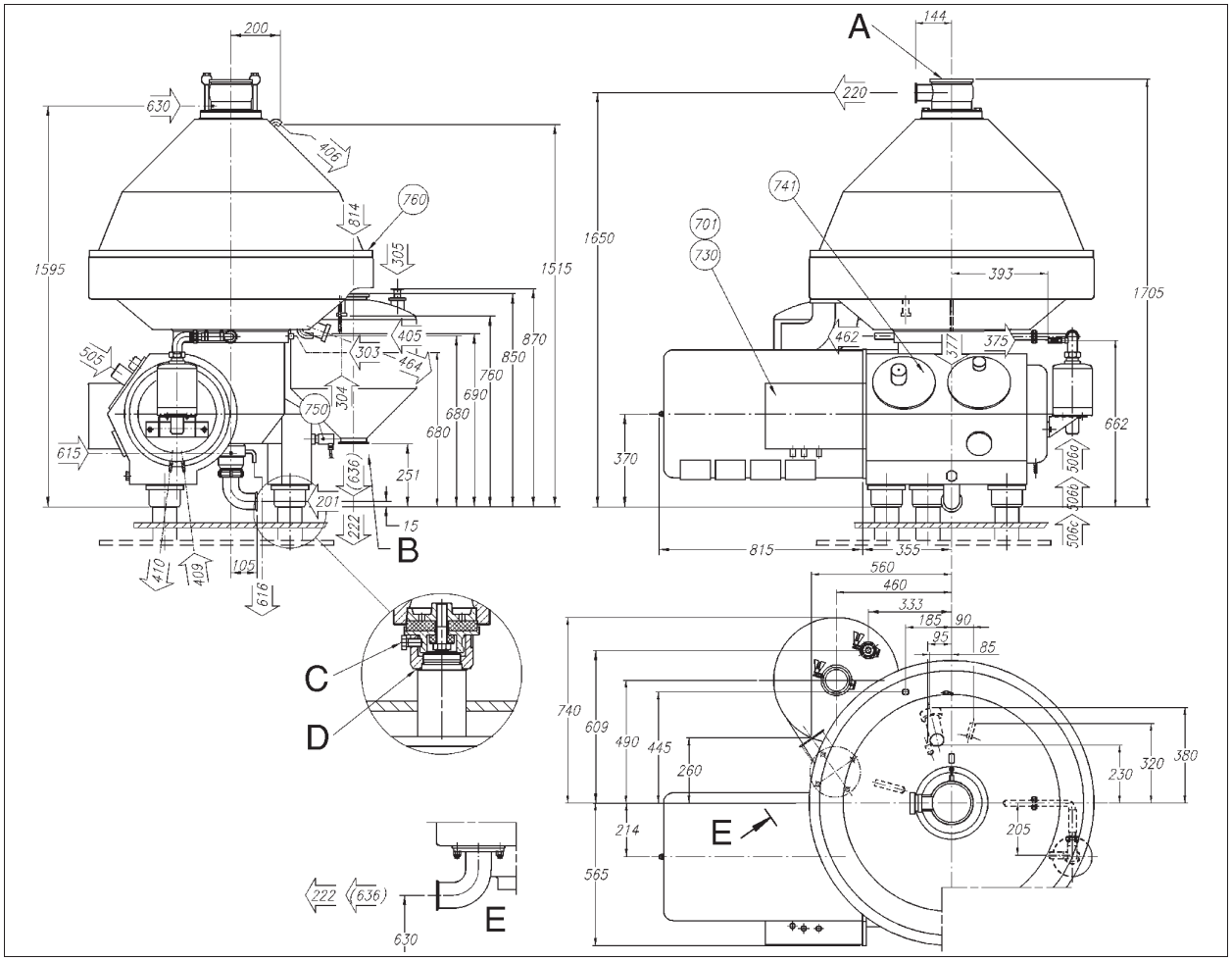


A. Needle valve

2.12.17 D / 718

Clamp couplings

Alfa Laval ref. 578813, rev. 1



A. Maximum horizontal displacement at the outlet connections during operation ±20 mm
B. Maximum vertical displacement at the cyclone connection during operation ±10 mm
C. Tightening torque 100 Nm
D. Adjusting washers, max. 4 pcs/foot
E. Alternative execution

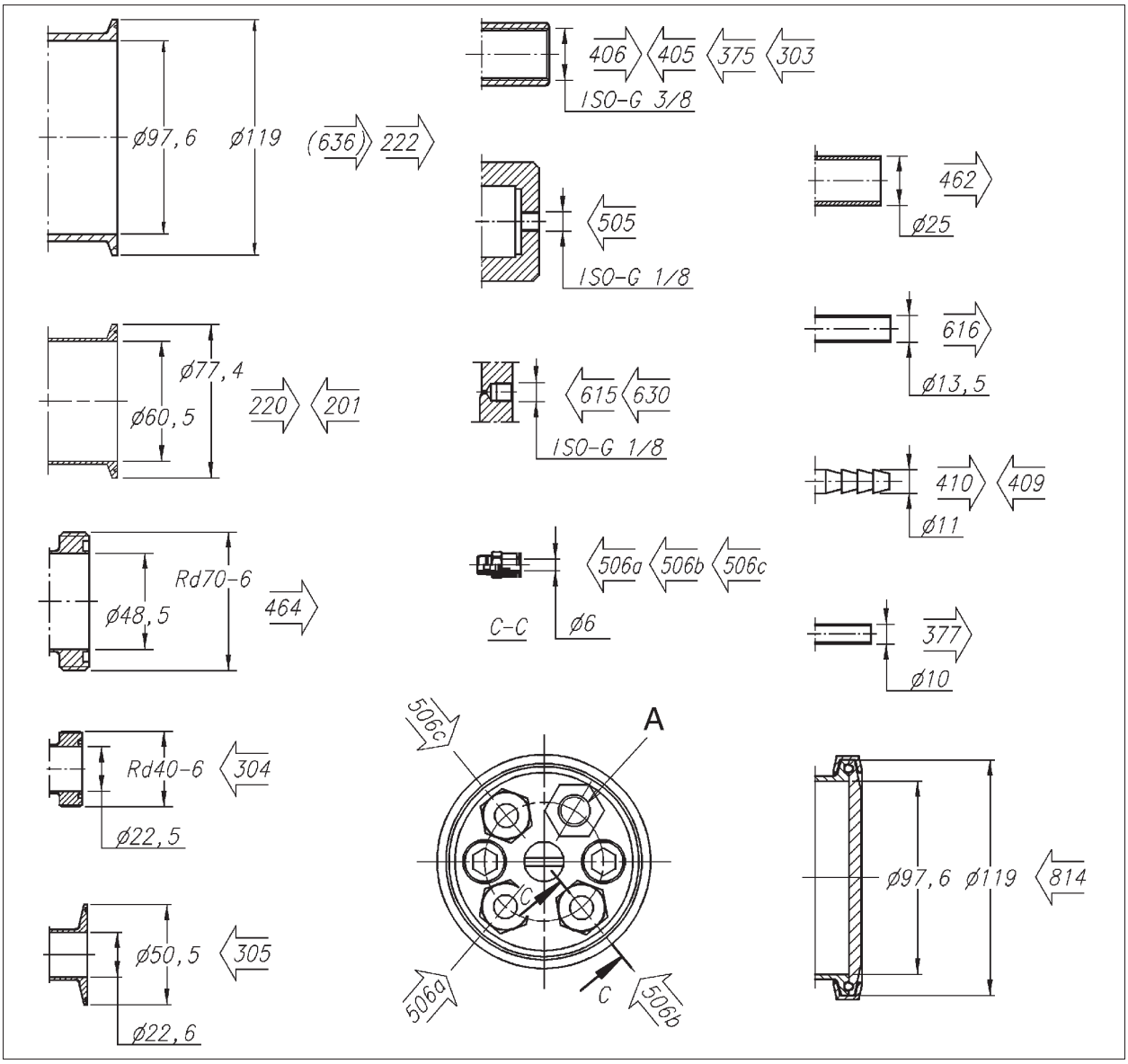
Connection 220 turnable 360°.

All connections to be installed non-loaded and flexible.

Data for connections, see “2.13 Connection lists” on page 108.

Connections

Clamp couplings



A. Needle valve

2.13 Connection lists

2.13.1 518, 614, 714, 718 models; A / B / C / D / H / M / W / WD / WM

Alfa Laval ref. 562178, rev. 4

Connection No.	Description	Requirements / limits
201	Inlet for process liquid • Pressure	 Max 600 kPa
220	Light phase outlet • Back pressure	 0 – 700 kPa
221	Heavy phase outlet	0 – 600 kPa
222	Outlet for solid phase • Discharge interval	 Max. 60 disch/h The outlet from the cyclone should be installed in such a way that the cyclone can not be filled with sludge
303	Flushing under the bowl Normally used only in the discharge sequence and / or for cleaning • Pressure • Pressure (recommended) • Flow (momentary at rec. pressure) • Consumption	 100 – 600 kPa 300 kPa 460 litres/h 0 - 6 litres / discharge
304	Flushing in sediment outlet • Consumption • Pressure	 0 - 25 litres / discharge 400 – 700 kPa
305	Flushing in cyclone cyclone (only applicable for cyclone with clamp connection with spray ball) normally used only in the discharge sequence and/ or for cleaning • Pressure • Flow at 100 kPa • Flow at 200 kPa • Flow at 300 kPa	 100-300 kPa 4 m^3/h 5,5 m^3/h 6,5 m^3/h

Connection No.	Description	Requirements / limits
375	Inlet for operating liquid • Pressure • Capacity • Quality requirements • Pipe dimension	 40 – 80 kPa Min. 5 litres/min see “4.1.1 Operating water” on page 185. Min. 10 x 1 mm
377	Outlet for operating liquid	
405	Inlet for cooling liquid, frame part • Consumption • Pressure • Quality requirements	 100 litres/h Max. 50 kPa See “4.1.1 Operating water” on page 185
406	Outlet for cooling liquid, frame parts	No back pressure allowed
409	Inlet for liquid to oil cooler • Consumption • Pressure • Quality requirements	 80 – 100 litres/h Max. 50 kPa see “4.1.1 Operating water” on page 185
410	Outlet for liquid to oil cooler	
462	Drain of frame top part, lower	
464	Drain of frame top part	
505	Inlet for compressed air to brake • Pressure • Compressed air, demands and quality	 400 ± 50 kPa see “4.1.2 Compressed air” on page 186
506 a	Inlet for compressed air to OWMC • Pressure • Quality requirements	 300 – 700 kPa see “4.1.2 Compressed air” on page 186
506 b	Inlet for control of small discharge • Pressure • Quality requirements	 350 – 700 kPa see “4.1.2 Compressed air” on page 186
506 c	Inlet for control of large discharge • Pressure • Quality requirements	 350 – 700 kPa see “4.1.2 Compressed air” on page 186

Connection No.	Description	Requirements / limits
615	Inlet for sealing liquid • Consumption • Quality requirements	 60 – 80 litres/h see “4.1.1 Operating water” on page 185
616	Outlet for sealing liquid	Free outlet, without water trap
630	Inlet for sealing liquid • Consumption • Quality requirements	 60 – 80 litres/h see “Operating water” on page 185
631	Outlet for sealing liquid	
635	Inlet for sealing liquid • Consumption • Quality requirements	 60 – 80 litres/h see “4.1.1 Operating water” on page 185
(636)	Outlet for sealing liquid	
701	Motor for separator Technical data: Max. deviation from nominal frequency	 see “Motor drive data” on page 44. ± 5%
730	Temperature sensor for motor winding Type: PTC thermistor Technical data:	 Contact the supplier representative.
741 a	Speed sensor for motor shaft (option) Electrical data: Type: Inductive proximity switch, NAMUR type For technical data: Connection: Supply voltage, nominal Output current: • With sensor activated (near metal) • With sensor not activated (far from metal) Number of pulses per revolution The secondary switching device for speed indicating and alarm functions must be capable of handling pulses with a duration of 0,5 ms	 Contact the supplier representative. see “Interconnection diagram” on page 128 8 V less than 1 mA, (typical 0,7 mA) greater than 3 mA, (typical 6 mA) 4

Connection No.	Description	Requirements / limits
741 b	Speed sensor for motor shaft (option) Electrical data: Type: Inductive proximity switch, PNP type For technical data: Supply voltage Output current Connection	 Contact the supplier representative. 10 - 30 V **DC** Max. 200 mA “2.14 Interconnection diagram” on page 128
750	Vibration sensor Type: Vibration velocity transducer For technical data: Contact the supplier representative. Signal output at 80 Hz $R_L \geq 1$ Mohm Frequency range	 100 mV / mm / s 10 – 2000 Hz
760	Cover interlocking switch Type: Double, two-way microswitch	
814	Inspection cover (not applicable for outlet pipes) - Delivered with a blind flange mounted	

WARNING

Disintegration hazard

Pressure in connections 405 and 406 must not be higher than 50 kPa. Risk for deformation of frame hood and consequent contact with rotating parts.

2.13.2 618 & 714 models; BB / DM

Alfa Laval ref. 562179, rev. 1

Connection No.	Description	Requirements / limits
201	Inlet for process • Pressure	 Max 600 kPa
220	Outlet clarified liquid • Back pressure	 0 – 700 kPa
222	Outlet for solid phase • Discharge interval	 Max. 60 disch/h The outlet from the cyclone should be installed in such a way that the cyclone can not be filled with sludge
303	Flushing under the bowl Normally used only in the discharge sequence and / or for cleaning • Pressure • Pressure (recommended) • Flow (momentary at rec. pressure) • Consumption	 100 – 600 kPa 300 kPa 460 litres/h 0 - 6 litres / discharge
304	Flushing in sediment outlet • Consumption • Pressure	 0 - 25 litres / discharge 400 – 700 kPa
375	Inlet for operating liquid • Pressure • Capacity • Quality requirements • Pipe length via a check valve • Pipe dimension	 40 – 80 kPa Min. 5 litres/min see “4.1.1 Operating water” on page 185 Max. 30 m Min. 10 x 1 mm
377	Outlet for operating liquid	
405	Inlet for cooling liquid, frame part • Consumption • Pressure • Quality requirements	 100 litres/h Max. 50 kPa See “4.1.1 Operating water” on page 185
406	Outtlet for cooling liquid, frame parts	No back pressure allowed

Connection No.	Description	Requirements / limits
409	Inlet for liquid to oil cooler • Consumption • Pressure • Quality requirements	80 – 100 litres/h Max. 50 kPa see “4.1.1 Operating water” on page 185
410	Outlet for liquid to oil cooler	
462	Drain of frame top part, lower	
464	Drain of frame top part	
505	Inlet for compressed air to brake • Pressure • Compressed air, demands and quality	400 ± 50 kPa see “4.1.2 Compressed air” on page 186
506 a	Inlet for compressed air to OWMC • Pressure • Quality requirements	300 – 700 kPa see “4.1.2 Compressed air” on page 186
506 b	Inlet for control of small discharge • Pressure • Quality requirements	350 – 700 kPa see “4.1.2 Compressed air” on page 186
506 c	Inlet for control of large discharge • Pressure • Quality requirements	350 – 700 kPa see “4.1.2 Compressed air” on page 186
615	Inlet for sealing liquid • Consumption • Quality requirements	60 – 80 litres/h see “4.1.1 Operating water” on page 185
616	Outlet for sealing liquid	Free outlet, without water trap
630	Inlet for sealing liquid • Consumption • Quality requirements	60 – 80 litres/h see “4.1.1 Operating water” on page 185
631	Outlet for sealing liquid	
635	Inlet for sealing liquid • Consumption • Quality requirements	60 – 80 litres/h see “4.1.1 Operating water” on page 185
(636)	Outlet for sealing liquid	

Connection No.	Description	Requirements / limits
701	Motor for separator Technical data: Max. deviation from nominal frequency	 see “2.8 Motor drive data” on page 44 ± 5%
730	Temperature sensor for motor winding Type: PTC thermistor Technical data:	 Contact the supplier representative.
741 a	Speed sensor for motor shaft Electrical data: Type: Inductive proximity switch, NAMUR type For technical data: Connection: Supply voltage, nominal Output current: • With sensor activated (near metal) • With sensor not activated (far from metal) Number of pulses per revolution The secondary switching device for speed indicating and alarm functions must be capable of handling pulses with a duration of 0,5 ms	 Contact the supplier representative. see “2.14 Interconnection diagram” on page 128 8 V less than 1 mA, (typical 0,7 mA) greater than 3 mA, (typical 6 mA) 4
741 b	Speed sensor for motor shaft Electrical data: Type: Inductive proximity switch, PNP type For technical data: Supply voltage Output current Connection	 Contact the supplier representative. 10 - 30 V **DC** Max. 200 mA “2.14 Interconnection diagram” on page 128

Connection No.	Description	Requirements / limits
750	Vibration sensor Type: Vibration velocity transducer For technical data: Contact the supplier representative. Signal output at 80 Hz $R_L \geq 1$ Mohm Frequency range	 100 mV / mm / s 10 – 2000 Hz
760	Cover interlocking switch Type: Double, two-way microswitch	

WARNING

Disintegration hazard

Pressure in connections 405 and 406 must not be higher than 50 kPa. Risk for deformation of frame hood and consequent contact with rotating parts.

2.13.3 618 models; C / B / F / H / W / WD

Alfa Laval ref. 575684, rev. 1

Connection No	Description	Requirements / limits
201	Inlet for process liquid • Pressure	 Max 600 kPa
220	Light phase outlet • Back pressure	 0 – 700 kPa
221	Heavy phase outlet • Back pressure	 0 – 600 kPa
222	Outlet for solid phase • Discharge interval	 Max. 60 disch/h The outlet from the cyclone should be installed in such a way that the cyclone can not be filled with sludge
303	Flushing under the bowl Normally used only in the discharge sequence and / or for cleaning • Pressure • Pressure (recommended) • Flow (momentary at rec. pressure) • Consumption	 100 – 600 kPa 300 kPa 460 litres/h 0 - 6 litres / discharge
304	Flushing in sediment outlet • Consumption • Pressure	 Ca 25 litres / discharge 400 – 700 kPa
305	Flushing in cyclone (not applicable for outlet pipes or cyclone with SMS connections) Normally used only in the discharge sequence and/or for cleaning • Pressure • Flow at 100 kPa • Flow at 200 kPa • Flow at 300 kPa	 100-300 kPa 4 m^3/h 5,5 m^3/h 6,5 m^3/h
375	Inlet for operating liquid • Pressure • Capacity • Quality requirements • Pipe dimension	 40 – 80 kPa Min. 5 litres/min see “4.1.1 Operating water” on page 185 Min. 10 x 1 mm

Connection No	Description	Requirements / limits
377	Outlet for operating liquid	
405	Inlet for cooling liquid, frame part • Consumption • Pressure • Quality requirements	100 litres/h Max. 50 kPa See “4.1.1 Operating water” on page 185
406	Outlet for cooling liquid, frame parts	No back pressure allowed
409	Inlet for liquid to oil cooler • Consumption • Pressure • Quality requirements	80 – 100 litres/h Max. 50 kPa see “4.1.1 Operating water” on page 185
410	Outlet for liquid to oil cooler	
462	Drain of frame top part, lower	
464	Drain of frame top part	
505	Inlet for compressed air to brake • Pressure • Compressed air, demands and quality	400 ± 50 kPa see “4.1.2 Compressed air” on page 186
506a	Inlet for compressed air to OWMC • Pressure • Quality requirements	300 – 700 kPa see “4.1.2 Compressed air” on page 186
506b	Inlet for control of small discharge • Pressure • Quality requirements	350 – 700 kPa see “4.1.2 Compressed air” on page 186
506c	Inlet for control of large discharge • Pressure • Quality requirements	350 – 700 kPa see “4.1.2 Compressed air” on page 186
615	Inlet for sealing liquid • Consumption • Quality requirements	60 – 80 litres/h see “4.1.1 Operating water” on page 185
616	Outlet for sealing liquid	Free outlet, without water trap

Connection No	Description	Requirements / limits
630	Inlet for sealing liquid • Consumption • Quality requirements	60 – 80 litres/h see “4.1.1 Operating water” on page 185
631	Outlet for sealing liquid	
635	Inlet for sealing liquid • Consumption • Quality requirements	60 – 80 litres/h see “4.1.1 Operating water” on page 185
(636)	Outlet for sealing liquid	
701	Motor for separator Technical data: Max. deviation from nominal frequency	see “2.8 Motor drive data” on page 44 ± 5%
730	Temperature sensor for motor winding Type: PTC thermistor Technical data:	see “2.8 Motor drive data” on page 44
741a	Speed sensor for motor shaft (option) Electrical data: Type: Inductive proximity switch, NAMUR type For technical data: Connection: Supply voltage, nominal Output current: • With sensor activated (near metal) • With sensor not activated (far from metal) Number of pulses per revolution The secondary switching device for speed indicating and alarm functions must be capable of handling pulses with a duration of 0,5 ms	Contact the supplier representative. see “2.14 Interconnection diagram” on page 128 8 V less than 1 mA, (typical 0,7 mA) greater than 3 mA, (typical 6 mA) 4

Connection No	Description	Requirements / limits
741b	Speed sensor for motor shaft (option) Electrical data: Type: Inductive proximity switch, PNP type For technical data: Supply voltage Output current Connection	 Contact the supplier representative. 10 - 30 V **DC** Max. 200 mA “2.14 Interconnection diagram” on page 128
750	Vibration sensor (option) Type: Vibration velocity transducer For technical data: Signal output at 80 Hz $R_L \geq 1$ Mohm Frequency range	 Contact the supplier representative. 100 mV / mm / s 10 – 2000 Hz
760	Cover interlocking switch (option) Type: Double, two-way microswitch	
814	Inspection cover (not applicable for outlet pipes)	Delivered with a blind flange mounted.

2.13.4 818 model; BB

Alfa Laval ref. 575686, rev. 2

Connection No.	Description	Requirements / limits
201	Inlet for process liquid • Pressure	 Max 700 kPa
220	Outlet clarified liquid • Back pressure	 0 – 700 kPa
221	Heavy phase outlet (twin phase sep. only)	0 – 600 kPa
222	Outlet for solid phase • Discharge interval • The outlet from the cyclone should be installed in such a way that the cyclone can not be filled with sludge	 Max. 60 disch/h
303	Flushing under the bowl Normally used only in the discharge sequence and / or for cleaning • Pressure • Pressure (recommended) • Flow (momentary at rec. pressure) • Consumption	 100 – 600 kPa 300 kPa 460 litres/h 0 - 6 litres / discharge
304	Flushing in sediment outlet • Consumption • Pressure	 Ca 25 litres / discharge 400 – 700 kPa
305	Flushing in cyclone (only applicable for cyclone with clamp connection with spray ball) Normally used only in the discharge sequence and/ or for cleaning.	
	• Pressure	100-300 kPa
	• Flow at 100 kPa	4 m^3/h
	• Flow at 200 kPa	5,5 m^3/h
	• Pressure 300 kPa	6,5 m^3/h
375	Inlet for operating liquid • Pressure • Capacity • Quality requirements • Pipe length via a check valve • Pipe dimension	 40 – 80 kPa Min. 5 litres/min see “4.1.1 Operating water” on page 185 Max. 30 m Min. 10 x 1 mm

Connection No.	Description	Requirements / limits
377	Outlet for operating liquid	
405	Inlet for cooling liquid, frame part • Consumption • Pressure • Quality requirements	100 litres/h Max. 50 kPa See “4.1.1 Operating water” on page 185
406	Outlet for cooling liquid, frame parts	No back pressure allowed
409	Inlet for liquid to oil cooler • Consumption • Pressure • Quality requirements	80 – 100 litres/h Max. 50 kPa see “4.1.1 Operating water” on page 185
410	Outlet for liquid to oil cooler	
462	Drain of frame top part, lower	
464	Drain of frame top part	
505	Inlet for compressed air to brake • Pressure • Compressed air, demands and quality	400 ± 50 kPa see “4.1.2 Compressed air” on page 186
506a	Inlet for compressed air to OWMC • Pressure • Quality requirements	300 – 700 kPa see “4.1.2 Compressed air” on page 186
506b	Inlet for control of small discharge • Pressure • Quality requirements	350 – 700 kPa see “4.1.2 Compressed air” on page 186
506c	Inlet for control of large discharge • Pressure • Quality requirements	350 – 700 kPa see “4.1.2 Compressed air” on page 186
615	Inlet for sealing liquid • Consumption • Quality requirements	60 – 80 litres/h see “4.1.1 Operating water” on page 185
616	Outlet for sealing liquid	Free outlet, without water trap

Connection No.	Description	Requirements / limits
630	Inlet for sealing liquid • Consumption • Quality requirements	 60 – 80 litres/h See “4.1.1 Operating water” on page 185
(636)	Outlet for sealing liquid	
701	Motor for separator Technical data: • Max. deviation from nominal frequency	 See “2.8 Motor drive data” on page 44 ± 5%
730	Temperature sensor for motor winding Type: Technical data:	 PTC thermistor See “2.8 Motor drive data” on page 44 or contact the supplier representative.
741a	Speed sensor for motor shaft Electrical data: Type: Inductive proximity switch, NAMUR type For technical data see separate document. Connection: Supply voltage, nominal: Output current: • With sensor activated (near metal). • With sensor not activated (far from metal) Number of pulses per revolution: The secondary switching device for speed indicating and alarm functions must be capable of handling pulses with a duration of 0,5 ms.	 Contact the supplier representative. see “2.14 Interconnection diagram” on page 128 8 V Less than 1 mA, (typical 0,7 mA) Greater than 3 mA, (typical 6 mA) 4

Connection No.	Description	Requirements / limits
741b	Speed sensor for motor shaft (option) Electrical data:	
	Type: Inductive proximity switch, PNP type For technical data see separate document. Supply voltage Output current Connection	 Contact the supplier representative. 10 - 30 V **DC** Max. 200 mA “2.14 Interconnection diagram” on page 128
750	Vibration sensor Type: Vibration velocity transducer Technical data: See separate document Signal output at 80 Hz $R_L \geq 1$ Mohm Frequency range	 Contact the supplier representative. 100 mV / mm / s 10 – 2000 Hz
760	Cover interlocking switch Type: Double, two-way microswitch	
814	Inspection cover Delivered with a blind flange mounted.	(not applicable for outlet pipes) (not applicable for outlet pipes)

2.13.5 818 models; C / H / W / WD

Alfa Laval ref. 575685, rev. 0

Connection No.	Description	Requirements / limits
201	Inlet for process liquid • Pressure	 Max 700 kPa
220	Light phase outlet • Back pressure	 0 – 700 kPa
221	Heavy phase outlet	0 – 600 kPa
222	Outlet for solid phase • Discharge interval	 Max. 60 disch/h The outlet from the cyclone should be installed in such a way that the cyclone can not be filled with sludge
303	Flushing under the bowl Normally used only in the discharge sequence and / or for cleaning • Pressure • Pressure (recommended) • Flow (momentary at rec. pressure) • Consumption	 100 – 600 kPa 300 kPa 460 litres/h 0 - 6 litres / discharge
304	Flushing in sediment outlet • Consumption • Pressure	 Ca 25 litres / discharge 400 – 700 kPa
305	Flushing in cyclone (not applicable for outlet pipes or cyclone with SMS connections) Normally used only in the discharge sequence and/or for cleaning • Pressure • Flow at 100 kPa • Flow at 200 kPa • Flow at 300 kPa	 100-300 kPa 4 m^3/h 5,5 m^3/h 6,5 m^3/h
375	Inlet for operating liquid • Pressure • Capacity • Quality requirements • Pipe length via a check valve • Pipe dimension	 40 – 80 kPa Min. 5 litres/min see “4.1.1 Operating water” on page 185 Max. 30 m Min. 10 x 1 mm
377	Outlet for operating liquid	

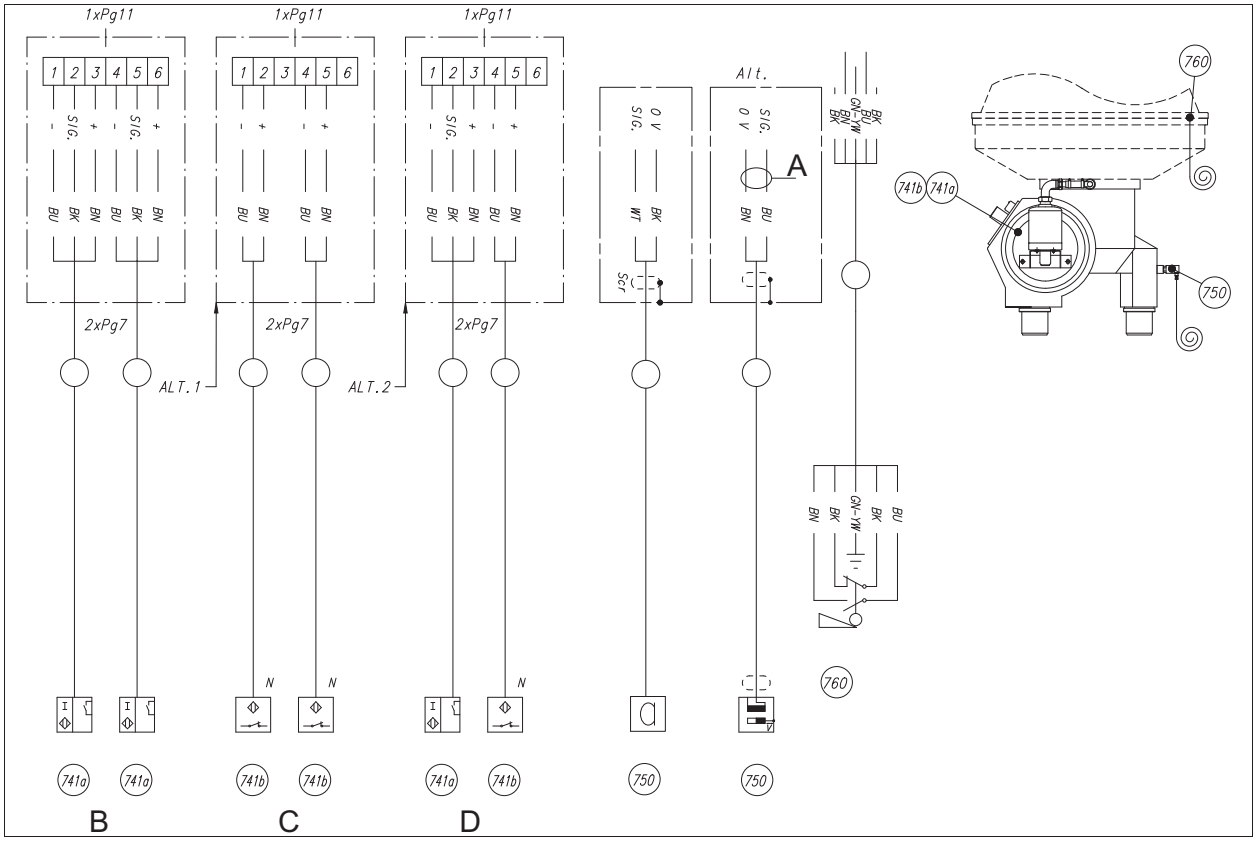
Connection No.	Description	Requirements / limits
405	Inlet for cooling liquid, frame part • Consumption • Pressure • Quality requirements	100 litres/h Max. 50 kPa See “4.1.1 Operating water” on page 185
406	Outlet for cooling liquid, frame parts	No back pressure allowed
409	Inlet for liquid to oil cooler • Consumption • Pressure • Quality requirements	80 – 100 litres/h Max. 50 kPa see “4.1.1 Operating water” on page 185
410	Outlet for liquid to oil cooler	
462	Drain of frame top part, lower	
464	Drain of frame top part	
505	Inlet for compressed air to brake • Pressure • Compressed air, demands and quality	400 ± 50 kPa see “4.1.2 Compressed air” on page 186
506a	Inlet for compressed air to OWMC • Pressure • Quality requirements	300 – 700 kPa see “4.1.2 Compressed air” on page 186
506b	Inlet for control of small discharge • Pressure • Quality requirements	350 – 700 kPa see “4.1.2 Compressed air” on page 186
506c	Inlet for control of large discharge • Pressure • Quality requirements	350 – 700 kPa see “4.1.2 Compressed air” on page 186
615	Inlet for sealing liquid • Consumption • Quality requirements	60 – 80 litres/h see “4.1.1 Operating water” on page 185
616	Outlet for sealing liquid	Free outlet, without water trap
630	Inlet for sealing liquid • Consumption • Quality requirements	60 – 80 litres/h see “4.1.1 Operating water” on page 185

Connection No.	Description	Requirements / limits
631	Outlet for sealing liquid	
635	Inlet for sealing liquid • Consumption • Quality requirements	60 – 80 litres/h see “4.1.1 Operating water” on page 185
(636)	Outlet for sealing liquid	
701	Motor for separator Technical data: Max. deviation from nominal frequency	see “2.8 Motor drive data” on page 44 ± 5%
730	Temperature sensor for motor winding Type: PTC thermistor Technical data:	 Contact the supplier representative.
741a	Speed sensor for motor shaft (option) Electrical data: Type: Inductive proximity switch, NAMUR type For technical data: Connection: Supply voltage, nominal Output current: • With sensor activated (near metal) • With sensor not activated (far from metal) Number of pulses per revolution The secondary switching device for speed indicating and alarm functions must be capable of handling pulses with a duration of 0,5 ms	 Contact the supplier representative. see “2.14 Interconnection diagram” on page 128 8 V less than 1 mA, (typical 0,7 mA) greater than 3 mA, (typical 6 mA) 4
741b	Speed sensor for motor shaft (option) Electrical data: Type: Inductive proximity switch, PNP type For technical data: Supply voltage Output current Connection	 Contact the supplier representative. 10 - 30 V **DC** Max. 200 mA “2.14 Interconnection diagram” on page 128

Connection No.	Description	Requirements / limits
750	Vibration sensor (option) Type: Vibration velocity transducer For technical data: Signal output at 80 Hz $R_L \geq 1$ Mohm Frequency range	 Contact the supplier representative. 100 mV / mm / s 10 – 2000 Hz
760	Cover interlocking switch (option) Type: Double, two-way microswitch	
814	Inspection cover (not applicable for outlet pipes)	Delivered with a blind flange mounted.

2.14 Interconnection diagram

Alfa Laval ref. 562208, rev. 3

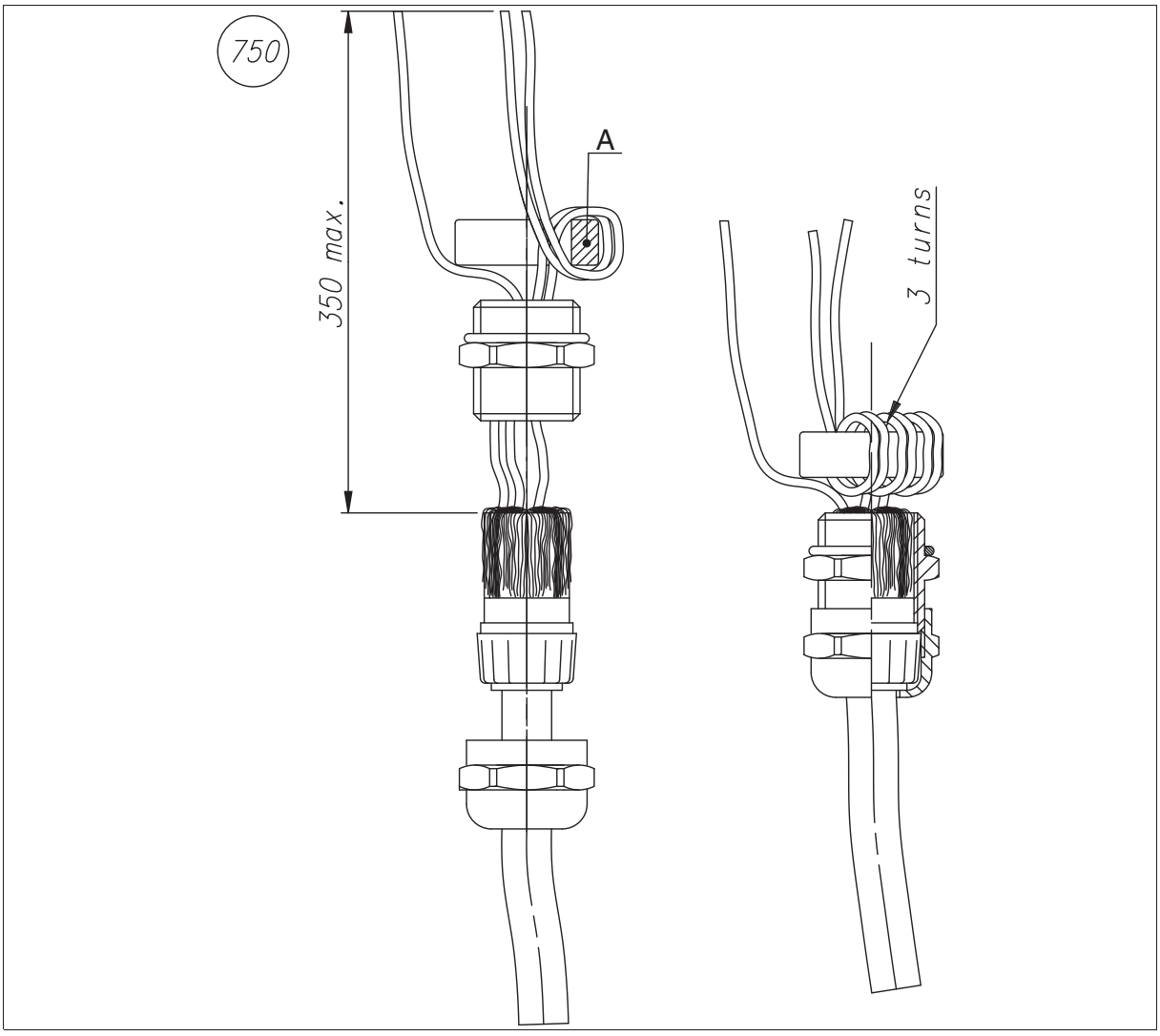


Wire colour codes:
BK = Black.
BN = Brown.
BU = Blue.
GN-YW = Green-yellow.
BK-YW = Black-yellow.
YW = Yellow.
WT = White.
RD = Red.
Scr = Screen.
Trans = Transparent.
SIG = Signal.

741a.Speed sensor (motor shaft speed), NAMUR or PNP type.
741b.Speed sensor (motor shaft speed), NAMUR or PNP type.
750. Vibration sensor.
750. Vibration sensor (Alt.).
760. Interlocking switch (frame top part).
Normally open when cover not fitted.

A. Ferrite core.
B. PNP.
C. NAMUR.
D. PNP/ NAMUR.

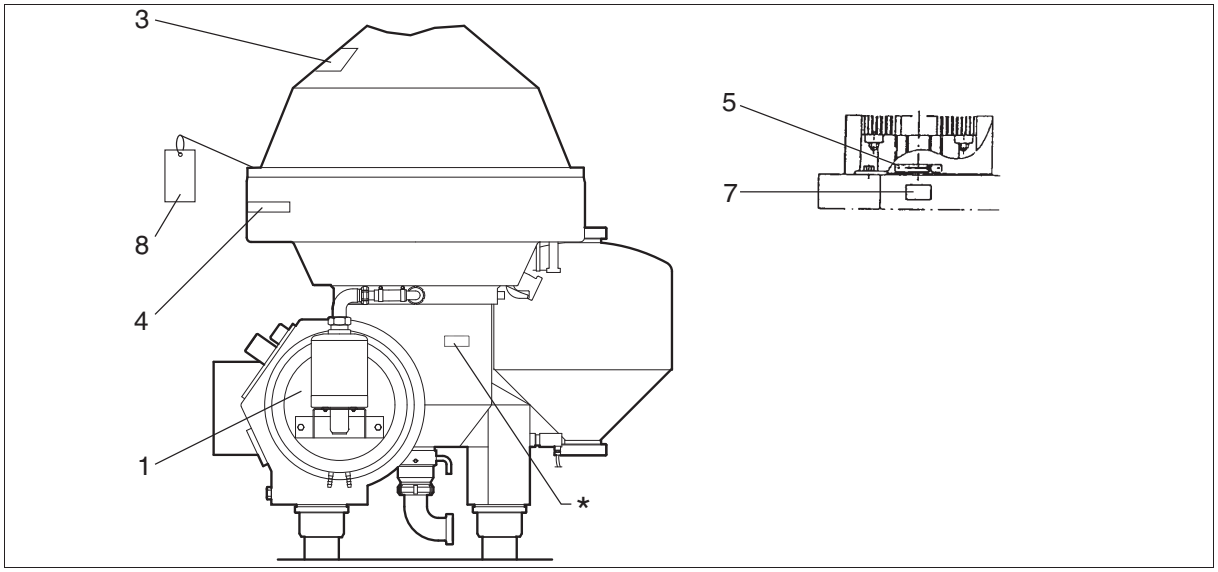
Ferrite core



A.Ferrite core

2.15 Identification and safety signs on the machine

Alfa Laval ref. 553766, rev. 2



1. Machine plate

Separator

Manufacturing serial No / Year

Product No

Machine top part

Outlet

Bowl

Machine bottom part

Max. speed (bowl)

Direction of rotation (bowl)

Speed motor shaft

El. current frequency

Recommended motor power

Max. density of feed

Max. density of sediment

Max. density of operating liquid

Process temperature min./max.

3. Safety label

S00690N1

Text on label:

WARNING

Read the instruction manuals **before** installation, operation and maintenance. Consider inspection intervals.

Failure to strictly follow instructions can lead to fatal injury.

If excessive vibration occurs, **stop** separator and **keep bowl filled** with liquid during rundown.

Out of balance vibration will become worse if bowl is not full.

Separator must **stop rotating** before **any** dismantling work is started.

4. Name plate

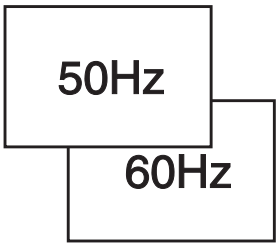
S0063221

5. Arrow

Indicating direction of rotation.

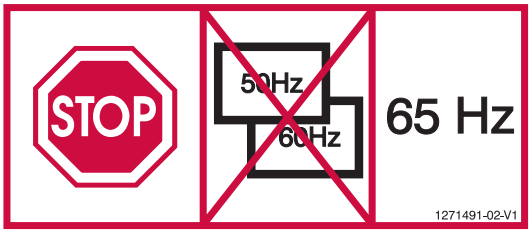
S0068811

7. Power supply frequency, all separators except BM/BB/C/H/W/818



S0063111

Power supply frequency, BM/BB/C/H/W/818 (spec. 881210-01-04)



S0145721

Power supply frequency BM/BB/C/H/W/818

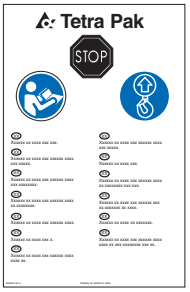
WARNING

Disintegration hazard

This machine must never be operated with high bowl speed that is greater than 4607 r/min.

8. Stop, follow the lifting instruction.

This transport label is not permanently fixed to the separator.



S0069141

*** Space reserved for plate indicating representative**

3 Interface description

3.1 Interface description, standard motor, frequency drive

Alfa Laval ref. 575659, rev. 0

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This document gives information, requirements and recommendations about operational procedures and signal processing for safe and reliable operation of the separator. It is intended to be used for designing auxiliary equipment and control system for the separator.

3.1.1 References

This Interface Description is one complementary document to the separator. Other such documents that contain necessary information and are referred to here are:

- Interconnection Diagram
- Connection List
- Technical Data
- Motor Drive Data

Standards referred to are:

- EN 418 Safety of machinery - Emergency stop equipment, functional aspects - Principles of design
- EN 1037 Safety of machinery - Prevention of unexpected start-up

3.1.2 Definitions

For the purpose of this document, the following definitions apply:

- **Set frequency:** The frequency that is intended to be used when using a frequency control drive in V/Hz mode. Shall be "Set frequency" specified in Technical Data.
- **Set speed:** The speed that is intended to be used when using a frequency control drive in speed mode. Shall be "Set bowl speed" specified in Technical Data.

3.1.3 Goal

Information and instructions given in this document aim at preventing situations such as the following:

Situation	Effect
Unbalance caused by uneven sediment accumulation in the bowl	Too high stress on bowl and bearing system which might cause harm.
Too high bowl speed.	Too high stress on bowl which might cause harm.
Access to moving parts.	Can cause injury to person who accidentally touches these parts.
Insufficient cleaning of separator.	Unsatisfactory product quality.
Bowl leakage.	Product losses.

Control and supervision can be more or less comprehensive depending on the type of used control equipment. When a simple control unit is used it would be impossible or too expensive to include many of the functions specified here while these functions could be included at nearly no extra cost when a more advanced control unit is used. For this reasons functions that are indispensable or needed for safety reasons to protect the machine and/or personnel are denoted with *shall* while other functions are denoted with *should.*

3.1.4 Description of separator modes

For control purposes the operation of the separator should be divided into different modes.

The normally used modes are described below but other modes might exist.

It is assumed that:

- The separator is correctly assembled.
- All connections are made according to Connection List, Interconnection Diagram, Motor Drive Data and Interface Description.
- The separator control system is activated.

If above conditions are not fulfilled the separator is not ready for operation.

STAND STILL means:

- The power to the separator motor is off.
- The bowl is not rotating.

STARTING means:

- The power to the separator motor is on.
- The bowl is rotating and accelerating.

RUNNING means:

- The power to the separator motor is on.
- The bowl is rotating at set speed.
- *RUNNING* is a collective denomination for a number of sub modes which e.g. can be:
  - *STAND BY*: Separator is in a waiting mode and not producing.
  - *PRODUCTION*: Separator is fed with product and producing.
  - *CLEANING*: Separator is fed with cleaning liquids with the intention to clean the separator.

STOPPING means:

- The power to the separator motor is off.
- The bowl is rotating and decelerating.
- *STOPPING* is a collective denomination for a number of sub modes which e.g. can be:
  - *NORMAL STOP*: A manually or automatically initiated stop.
  - *SAFETY STOP*: An automatically initiated stop at too high vibrations.
  - *EMERGENCY STOP*: A manually initiated stop at emergency situations. This stop will be in effect until it is manually reset.

3.1.5 Handling of connection interfaces

Electrical connections

701 Separator motor.

The separator is equipped with a 3-phase standard motor. The motor is fed from a frequency converter. The frequency converter must have over speed alarm function that stops the separator if the bowl speed exceeds the set speed more than 5%.

The frequency converter should be equipped in such a way that the motor could be used for braking by using a brake module with brake resistors. The stopping time must not be adjusted to be faster than the starting time (see Motor Drive Data). The frequency converter shall have a system that cuts the power to the motor if the frequency exceeds the values given in Technical Data.

There shall be an emergency stop circuit designed according to EN 418 and a power isolation device according to EN 1037.

There shall be a start button close to the separator that shall be used for first start after assembly of the separator.
There should be a counter to count number of running hours.

730 Temperature sensors, motor winding.

The separator motor is equipped with three thermistor sensors, one in each winding. The sensors are connected in series and shall be connected to a thermistor relay that gives a signal when the temperature exceeds the tripping level (see Connection list).

Signal processing in *STAND STILL* and *STOPPING*:

- The signal should trigger an alarm and interlock start.

Signal processing in any other mode:

- The signal shall trigger turn over to *NORMAL STOP*.

741a Speed sensor

A proximity sensor of inductive type Namur or PNP standard is giving a number of pulses per revolution of the motor shaft (see Connection List). The bowl speed is gear ratio (see Technical Data) multiplied by the speed of the motor shaft.

741b Speed sensor (option)

The bracket for the speed sensor and the junction box are prepared for an extra speed sensor if needed.

Signal processing in *STARTING*:

- The separator should be stopped automatically according to *NORMAL STOP* procedure and an alarm should be given when the accumulated time for acceleration is longer than the maximum time specified in Technical Data. An abnormal start time indicates some malfunction of the separator equipment and should be investigated.
- If the speed exceeds "Max. bowl speed" in Technical Data the separator shall be stopped automatically by *NORMAL STOP* and a high speed alarm shall be given.
- The speed monitoring system shall be checked continuously (e.g. by checking that pulses are coming). In case of failure indication the separator shall be stopped automatically by *NORMAL STOP* with a timer controlled stop sequence and an alarm for speed monitoring system failure shall be given.
- The acceleration should be supervised to ensure that a certain speed (e.g. 100 r/min) has been reached within a certain time (e.g. 30 seconds).

Signal processing in *RUNNING*:

- If the speed exceeds "Max. bowl speed" in Technical Data the separator shall be stopped automatically by *NORMAL STOP* and a high speed alarm shall be given.
- If the speed falls more than 5% below the set speed for a period longer than 1 minute, a low speed alarm should be given. Low speed indicates some malfunction of the separator equipment and shall be investigated.
- The speed monitoring system shall be checked continuously (e.g. by checking that pulses are coming). In case of a failure indication an alarm for speed monitoring system failure shall be given. If there is a risk of too high speed the separator shall be stopped by *NORMAL STOP*.

Signal processing in *STOPPING*:

- *STAND STILL* shall be indicated when no pulses are detected within 30 seconds.
- Stopping the separator when alarm for speed monitoring system failure is active, shall cause a timer controlled stop. (See "Stopping time" in Technical Data.)

750 Unbalance sensor

For indication of any abnormal unbalance and to be able to perform appropriate countermeasures, the separator has been equipped with a vibration velocity transducer on the separator frame. The signal from the transducer shall be monitored and two alarm levels according to the vibration alarm levels in Technical Data should be set. The vibration level shall be high for 3 seconds to generate an alarm. The first level is only used to generate an alarm while the second level shall stop the machine.

The vibration monitor shall include self check function to be performed at least at initiation of *STARTING*.
If vibrations exceed the second alarm level the separator shall be stopped the quickest way possible and it shall not been restarted until the reasons for the vibrations have been found and measures to remove them have been taken.

Signal processing in *STARTING*:

- If vibrations exceed the second alarm level the separator shall be stopped automatically by *SAFETY STOP*.
- For bowl speed exceeding 600 r/min vibration monitoring shall be blocked.
- If the self check system triggers, an alarm shall be given and an automatic stop by *NORMAL STOP* shall be initiated.

Signal processing in *RUNNING*:

- If vibrations exceed the first alarm level an alarm should be given. Vibrations of this magnitude will reduce the expected life time of the bearings and should therefore be eliminated.
- If vibrations exceed the second alarm level the separator shall be stopped automatically by *SAFETY STOP*.
- Vibration monitoring shall be blocked for 5 seconds from initiation of a discharge.

If the self check system triggers, an alarm shall be given.Signal processing in *STOPPING*:

- For bowl speed below 1100 r/min vibration monitoring shall be blocked.
- If the self check system triggers, an alarm shall be given.

Signal processing in *NORMAL STOP*:

- If vibrations exceed the second level the system shall turn over automatically to *SAFETY STOP*.

760 Cover interlocking switch (optional)

The separator is equipped with an interlocking switch to detect if the cover is mounted.

Signal processing at *STAND STILL*:

- The circuit is closed when the cover of the separator is mounted.
- The interlocking switch should be connected in such a way that starting of the motor is prevented when the separator cover is not mounted.

Signal processing in *STARTING* and *RUNNING*:

- If the circuit is broken the separator should be stopped automatically by *NORMAL STOP*. This is to minimise the risk of having access to moving parts.

3.1.6 Fluid connections

Complementary information is given in the document Connection List.

201 Inlet

Processing in *STAND STILL:*

- Shall be closed.

Processing in *STARTING:*

- Should be closed. Bowl will be open and empty or closed and filled depending on if start is done from *STAND STILL* or *STOPPING*.

Processing in *RUNNING:*

- Could be closed or open.
- Shall be open at discharges.

Processing in *CLEANING*:

- A sequence of cleaning liquids should be fed to the separator. The flow rate should be as high as possible and preferably not less than the production flow rate.

Processing in *NORMAL STOP* or *EMERGENCY STOP:*

- Could be closed or open but the bowl should be filled unless the stop is initiated in *STARTING*.

Processing in *SAFETY STOP:*

- Could be closed or open but the bowl shall be filled unless the stop is initiated in *STARTING*.

220, 221 (not applicable for D:) and 222 Outlets

Processing in *STAND STILL:*

- Could be closed or open.

Processing in other modes:

- Shall be open.

303 and 304 Flushing connections

Processing in *RUNNING:*

- Could be used at any time but is normally used only in connection with discharges and in many cases only at discharges in *CLEANING*.
- When flushing is used it should not be on continuously but in short pulses. It is possible to flush at all connections at the same time but it is an advantage if each connection can be controlled individually as flushing time then can be adapted to actual requirements.
- When flushing is used at discharges, a normal procedure is to make a short flush (e.g. 3 seconds) before the discharge to wet the surfaces. Then wait until the discharged material has left the sludge drain (e.g. 20 seconds) and then make a new flush (e.g. 10 seconds).
- Flushing can be done with water or CIP-liquids.

Processing in other modes:

- Flushing should not be used.

375 Inlet for discharge and make-up liquid

Processing in all modes:

- Shall be on when the speed of the bowl is more than 3000 r/min.
- It is recommended to supervise the supply pressure. If pressure is too low (see Connection List), start should be interlocked and if it happens in *PRODUCTION* or *CLEANING* turn over to *STAND BY* should take place.
- If bowl is running at set speed without feed flow for a long time it might be overheated if cooling is not on. For that reason a time limitation is given in Technical Data for running without feed flow. If cooling media supply is supervised no such limitation is needed.
- When coming from *PRODUCTION* a discharge shall be initiated to remove sediments from bowl to avoid problems due to solidification.

Signal processing in *PRODUCTION*:

- Automatic discharges shall be initiated by timer. Activate input 506b or 506c for 5 seconds, see Connection list.

Signal processing in *CLEANING*:

- Automatic discharges shall be initiated by timer. Activate input 506b or 506c for 5 seconds, see Connection list.

Signal processing in *NORMAL STOP*:

- Discharges should not be made.

Signal processing in *SAFETY STOP* and *EMERGENCY STOP*:

- Discharges shall not be made.

405 Inlet for cooling of frame parts

Processing:

- Should be on in all modes except *STAND STILL*.
- If bowl is running at set speed without feed flow for a long time it might be overheated if cooling is not on. For that reason a time limitation is given in Technical Data for running without feed flow. If cooling media supply is supervised no such limitation is needed.

409 Inlet for cooling

Processing in *STAND STILL*:

- Shall be closed.

Processing in all other modes:

- Shall be open.

615, 630 and 635 (not applicable for D:) Inlet sealing liquid

Processing in *STAND STILL:*

- Shall be closed.

Processing in *STARTING*:

- Shall be open.

Processing in all other modes:

- Shall be open when running without flow.

3.1.7 Pneumatic connections

Compressed air for OWMC

The separator is equipped with an Operating Water Module Compact. The OWMC is equipped with following connections.

506a Inlet for compressed air to OWMC

506b Inlet for activating a small discharge

506c Inlet for activating a large discharge

See connection list for inlet pressures.

Signal processing in *RUNNING*:

- A discharge is activated by open inlet 506b or 506c for 5 seconds.
- After a discharge has been triggered the motor current or bowl speed should be monitored to indicate if there comes a current peak or a sudden drop in speed. The absence of such indication means that the discharge has failed and corrective action should be taken (e.g. trigger a new discharge). Absence of a discharge may result in problems due to solidification of the sediment. That the current returns to original value after discharge could also be supervised. If current is much higher after the discharge this might be an indication that the bowl has not closed properly after the discharge.
- For service purposes there should be a counter to count number of discharges.

Signal processing in *STAND BY:*

- When coming from *PRODUCTION* a discharge shall be initiated to remove sediments from bowl to avoid problems due to solidification.

Signal processing in *PRODUCTION*:

- Automatic discharges shall be initiated by timer.

Signal processing in *CLEANING*:

- Automatic discharges shall be initiated by timer.

Signal processing in *NORMAL STOP:*

- Discharges should not be made.

Signal processing in *SAFETY STOP* and *EMERGENCY STOP:*

- Discharges shall not be made.

3.2 Interface description, CT-motor

Alfa Laval ref. 575677, rev. 0

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This document gives information, requirements and recommendations about operational procedures and signal processing for safe and reliable operation of the separator. It is intended to be used for designing auxiliary equipment and control system for the separator.

3.2.1 References

This Interface Description is one complementary document to the separator. Other such documents that contain necessary information and are referred to here are:

- Interconnection Diagram
- Connection List
- Technical Data
- Motor Drive Data

Standards referred to are:

- EN 418 Safety of machinery - Emergency stop equipment, functional aspects - Principles of design
- EN 1037 Safety of machinery - Prevention of unexpected start-up

3.2.2 Definitions

For the purpose of this document, the following definitions apply:

- **Set frequency:** The frequency that is intended to be used when using a frequency control drive in V/Hz mode. Shall be "Set frequency" specified in Technical Data.
- **Set speed:** The speed that is intended to be used when using a frequency control drive in speed mode. Shall be "Set bowl speed" specified in Technical Data.

3.2.3 Goal

Information and instructions given in this document aim at preventing situations such as the following:

Situation	Effect
Unbalance caused by uneven sediment accumulation in the bowl	Too high stress on bowl and bearing system which might cause harm.
Too high bowl speed.	Too high stress on bowl which might cause harm.
Access to moving parts.	Can cause injury to person who accidentally touches these parts.
Insufficient cleaning of separator.	Unsatisfactory product quality.
Bowl leakage.	Product losses.

Control and supervision can be more or less comprehensive depending on the type of used control equipment. When a simple control unit is used it would be impossible or too expensive to include many of the functions specified here while these functions could be included at nearly no extra cost when a more advanced control unit is used. For this reasons functions that are indispensable or needed for safety reasons to protect the machine and/or personnel are denoted with *shall* while other functions are denoted with *should.*

3.2.4 Description of separator modes

For control purposes the operation of the separator should be divided into different modes.

The normally used modes are described below but other modes might exist.

It is assumed that:

- The separator is correctly assembled.
- All connections are made according to Connection List, Interconnection Diagram, Motor Drive Data and Interface Description.
- The separator control system is activated.

If above conditions are not fulfilled the separator is not ready for operation.

STAND STILL means:

- The power to the separator motor is off.
- The bowl is not rotating.

STARTING means:

- The power to the separator motor is on.
- The bowl is rotating and accelerating.

RUNNING means:

- The power to the separator motor is on.
- The bowl is rotating at set speed.
- *RUNNING* is a collective denomination for a number of sub modes which e.g. can be:
  - *STAND BY*: Separator is in a waiting mode and not producing.
  - *PRODUCTION*: Separator is fed with product and producing.
  - *CLEANING*: Separator is fed with cleaning liquids with the intention to clean the separator.

STOPPING means:

- The power to the separator motor is off.
- The bowl is rotating and decelerating.
- *STOPPING* is a collective denomination for a number of sub modes which e.g. can be:
  - *NORMAL STOP*: A manually or automatically initiated stop.
  - *SAFETY STOP*: An automatically initiated stop at too high vibrations.
  - *EMERGENCY STOP*: A manually initiated stop at emergency situations. This stop will be in effect until it is manually reset.

3.2.5 Handling of connection interfaces

Electrical connections

701 Separator motor.

The separator is equipped with Y-D started motor. The motor is of control torque type and built for extended starting time. The starting equipment shall be dimensioned for twice the rated current of the motor. The purpose for this is to prevent overheating during start. The overload relay shall only be connected in the D-line.

There shall be an emergency stop circuit designed according to EN 418 and a power isolation device according to EN 1037.

There shall be a start button close to the separator that shall be used for first start after assembly of the separator.
There should be a counter to count number of running hours.

730 Temperature sensors, motor winding.

The separator motor is equipped with three thermistor sensors, one in each winding. The sensors are connected in series and shall be connected to a thermistor relay that gives a signal when the temperature exceeds the tripping level (see Connection list).

Signal processing in *STAND STILL* and *STOPPING*:

- The signal should trigger an alarm and interlock start.

Signal processing in any other mode:
The signal shall trigger turn over to *NORMAL STOP*.

741a Speed sensor

A proximity sensor of inductive type Namur or PNP standard is giving a number of pulses per revolution of the motor shaft (see Connection List). The bowl speed is gear ratio (see Technical Data) multiplied by the speed of the motor shaft.

741b Speed sensor (option)

The bracket for the speed sensor and the junction box are prepared for an extra speed sensor if needed.

Signal processing in *STARTING*:

When 93% of the synchronous speed is reached the Y-D starting equipment should switch over to D.

- The separator should be stopped automatically according to *NORMAL STOP* procedure and an alarm should be given when the accumulated time for acceleration is longer than the maximum time specified in Technical Data. An abnormal start time indicates some malfunction of the separator equipment and should be investigated.
- If the speed exceeds "Max. bowl speed" in Technical Data the separator shall be stopped automatically by *NORMAL STOP* and a high speed alarm shall be given.
- The speed monitoring system shall be checked continuously (e.g. by checking that pulses are coming). In case of failure indication the separator shall be stopped automatically by *NORMAL STOP* with a timer controlled stop sequence and an alarm for speed monitoring system failure shall be given.
- The acceleration should be supervised to ensure that a certain speed (e.g. 100 r/min) has been reached within a certain time (e.g. 30 seconds).

Signal processing in *RUNNING*:

- If the speed exceeds "Max. bowl speed" in Technical Data the separator shall be stopped automatically by *NORMAL STOP* and a high speed alarm shall be given.
- If the speed falls more than 5% below the set speed for a period longer than 1 minute, a low speed alarm should be given. Low speed indicates some malfunction of the separator equipment and shall be investigated.
- The speed monitoring system shall be checked continuously (e.g. by checking that pulses are coming). In case of a failure indication an alarm for speed monitoring system failure shall be given. If there is a risk of too high speed the separator shall be stopped by *NORMAL STOP*.

Signal processing in *STOPPING*:

- *STAND STILL* shall be indicated when no pulses are detected within 30 seconds.
- Stopping the separator when alarm for speed monitoring system failure is active, shall cause a timer controlled stop. (See "Stopping time" in Technical Data.)

750 Unbalance sensor

For indication of any abnormal unbalance and to be able to perform appropriate countermeasures, the separator has been equipped with a vibration velocity transducer on the separator frame. The signal from the transducer shall be monitored and two alarm levels according to the vibration alarm levels in Technical Data should be set. The vibration level shall be high for 3 seconds to generate an alarm. The first level is only used to generate an alarm while the second level shall stop the machine.

The vibration monitor shall include self check function to be performed at least at initiation of *STARTING*.
If vibrations exceed the second alarm level the separator shall be stopped the quickest way possible and it shall not been restarted until the reasons for the vibrations have been found and measures to remove them have been taken.

Signal processing in *STARTING*:

- If vibrations exceed the second alarm level the separator shall be stopped automatically by *SAFETY STOP*.
- For bowl speed exceeding 600 r/min vibration monitoring shall be blocked.
- If the self check system triggers, an alarm shall be given and an automatic stop by *NORMAL STOP* shall be initiated.

Signal processing in *RUNNING*:

- If vibrations exceed the first alarm level an alarm should be given. Vibrations of this magnitude will reduce the expected life time of the bearings and should therefore be eliminated.
- If vibrations exceed the second alarm level the separator shall be stopped automatically by *SAFETY STOP*.
- Vibration monitoring shall be blocked for 5 seconds from initiation of a discharge.

If the self check system triggers, an alarm shall be given.Signal processing in *STOPPING*:

- For bowl speed below 1100 r/min vibration monitoring shall be blocked.
- If the self check system triggers, an alarm shall be given.

Signal processing in *NORMAL STOP*:

- If vibrations exceed the second level the system shall turn over automatically to *SAFETY STOP*.

760 Cover interlocking switch (optional)

The separator is equipped with an interlocking switch to detect if the cover is mounted.

Signal processing at *STAND STILL*:

- The circuit is closed when the cover of the separator is mounted.
- The interlocking switch should be connected in such a way that starting of the motor is prevented when the separator cover is not mounted.

Signal processing in *STARTING* and *RUNNING*:

- If the circuit is broken the separator should be stopped automatically by *NORMAL STOP*. This is to minimise the risk of having access to moving parts.

3.2.6 Fluid connections

Complementary information is given in the document Connection List.

201 Inlet

Processing in *STAND STILL:*

- Shall be closed.

Processing in *STARTING:*

- Should be closed. Bowl will be open and empty or closed and filled depending on if start is done from *STAND STILL* or *STOPPING*.

Processing in *RUNNING:*

- Could be closed or open.
- Shall be open at discharges.

Processing in *CLEANING*:

- A sequence of cleaning liquids should be fed to the separator. The flow rate should be as high as possible and preferably not less than the production flow rate.

Processing in *NORMAL STOP* or *EMERGENCY STOP:*

- Could be closed or open but the bowl should be filled unless the stop is initiated in *STARTING*.

Processing in *SAFETY STOP:*

- Could be closed or open but the bowl shall be filled unless the stop is initiated in *STARTING*.

220, 221 (not applicable for D: or BB:) and 222 Outlets

Processing in *STAND STILL:*

- Could be closed or open.

Processing in other modes:

- Shall be open.

303 and 304 Flushing connections

Processing in *RUNNING:*

- Could be used at any time but is normally used only in connection with discharges and in many cases only at discharges in *CLEANING*.
- When flushing is used it should not be on continuously but in short pulses. It is possible to flush at all connections at the same time but it is an advantage if each connection can be controlled individually as flushing time then can be adapted to actual requirements.
- When flushing is used at discharges, a normal procedure is to make a short flush (e.g. 3 seconds) before the discharge to wet the surfaces. Then wait until the discharged material has left the sludge drain (e.g. 20 seconds) and then make a new flush (e.g. 10 seconds).
- Flushing can be done with water or CIP-liquids.

Processing in other modes:

- Flushing should not be used.

375 Inlet for discharge and make-up liquid

Processing in all modes:

- Shall be on when the speed of the bowl is more than 3000 r/min.
- It is recommended to supervise the supply pressure. If pressure is too low (see Connection List), start should be interlocked and if it happens in *PRODUCTION* or *CLEANING* turn over to *STAND BY* should take place.
- If bowl is running at set speed without feed flow for a long time it might be overheated if cooling is not on. For that reason a time limitation is given in Technical Data for running without feed flow. If cooling media supply is supervised no such limitation is needed.
- When coming from *PRODUCTION* a discharge shall be initiated to remove sediments from bowl to avoid problems due to solidification.

Signal processing in *PRODUCTION*:

- Automatic discharges shall be initiated by timer. Activate input 506b or 506c for 5 seconds, see Connection list.

Signal processing in *CLEANING*:

- Automatic discharges shall be initiated by timer. Activate input 506b or 506c for 5 seconds, see Connection list.

Signal processing in *NORMAL STOP*:

- Discharges should not be made.

Signal processing in *SAFETY STOP* and *EMERGENCY STOP*:

- Discharges shall not be made.

405 Inlet for cooling of frame parts

Processing:

- Should be on in all modes except *STAND STILL*.
- If bowl is running at set speed without feed flow for a long time it might be overheated if cooling is not on. For that reason a time limitation is given in Technical Data for running without feed flow. If cooling media supply is supervised no such limitation is needed.

409 Inlet for cooling

Processing in *STAND STILL*:

- Shall be closed.

Processing in all other modes:

- Shall be open.

615, 630 and 635 (not applicable for D: or BB:) Inlet sealing liquid

Processing in *STAND STILL:*

- Shall be closed.

Processing in *STARTING*:

- Shall be open.

Processing in all other modes:

- Shall be open when running without flow.

3.2.7 Pneumatic connections

Compressed air for OWMC

The separator is equipped with an Operating Water Module Compact. The OWMC is equipped with following connections.

506a Inlet for compressed air to OWMC

506b Inlet for activating a small discharge

506c Inlet for activating a large discharge

See connection list for inlet pressures.

Signal processing in *RUNNING*:

- A discharge is activated by open inlet 506b or 506c for 5 seconds.
- After a discharge has been triggered the motor current or bowl speed should be monitored to indicate if there comes a current peak or a sudden drop in speed. The absence of such indication means that the discharge has failed and corrective action should be taken (e.g. trigger a new discharge). Absence of a discharge may result in problems due to solidification of the sediment. That the current returns to original value after discharge could also be supervised. If current is much higher after the discharge this might be an indication that the bowl has not closed properly after the discharge.
- For service purposes there should be a counter to count number of discharges.

Signal processing in *STAND BY:*

- When coming from *PRODUCTION* a discharge shall be initiated to remove sediments from bowl to avoid problems due to solidification.

Signal processing in *PRODUCTION*:

- Automatic discharges shall be initiated by timer.

Signal processing in *CLEANING*:

- Automatic discharges shall be initiated by timer.

Signal processing in *NORMAL STOP:*

- Discharges should not be made.

Signal processing in *SAFETY STOP* and *EMERGENCY STOP:*

- Discharges shall not be made.

3.3 Interface description, standard motor, frequency drive

Alfa Laval ref. 562168, rev. 0

3.3.1 General

This document describes limitations and conditions for safe control, monitoring and reliable operation. Further information is found in “2.13 Connection lists” on page 108. The document contains definitions, requirements (normative) and recommendations (informative) at the end of the document a function graph with running limitations.

3.3.2 Definitions

”Stand still” means:

- The separator is correctly assembled.
- All connections are made according to Connection List, Interconnection Diagram, Motor Drive Data and Interface Description.
- The electrical power to the separator control system is on or off.

”Start mode” means:

- Start to be initiated from position close to separator (not remotely).
- The electrical power to the separator motor is on.
- The acceleration must be supervised to ensure that a certain speed has been reached within a certain time.

”Running mode” means:

- ”Running mode” is in effect 1 minute after the time 98% of synchronous speed has been reached.
- The feed to the separator is on or off.

”Stop mode” means:

- The electrical power to the separator motor is off.
- ”Stop mode” is in effect until the separator has stopped completely.

”Normal stop” means:

- Stopping of the separator, manually or automatically, at any time with or without brake applied.
- The bowl shall be kept filled.
- Sludge discharge must not be made.

”Safety stop” means:

A stop due to unsafe conditions (e.g. vibrations) automatically initiated by the control system. The separator shall be automatically stopped in the quickest and safest way possible. Comply with following conditions:

- The bowl shall be kept filled.
- Sludge discharge must not be made.
- The separator shall not be restarted before the reason for the ”Safety stop” has been investigated and action has been taken.

”Emergency stop” means:

A manually initiated stop due to emergency.

Actions:

- Same as for ”Safety stop” but with consideration to what is described in EN 418.

3.3.3 Requirements (normative)

506 Air connection for OWMC (operating water module)

The separator is equipped with a pneumatic controlled operating water module.

When compressed air is supplied to connection 506a, the discharge can be initiated from the control system via two pneumatic inputs (valves), one input for the small discharge, connection 506b and one for the large discharge, connection 506c. Allowed pressures to each connection, see “2.13 Connection lists” on page 108.

The volume of the large discharge should be adjusted first by adding various inlet pressure to connection 506a. When the large discharge volume has been set, the small discharge volume can be adjusted with the needle valve (**8**) fitted on the OWMC-unit.

Activating time for the control inputs shall be min. 5 seconds in the discharge sequence.

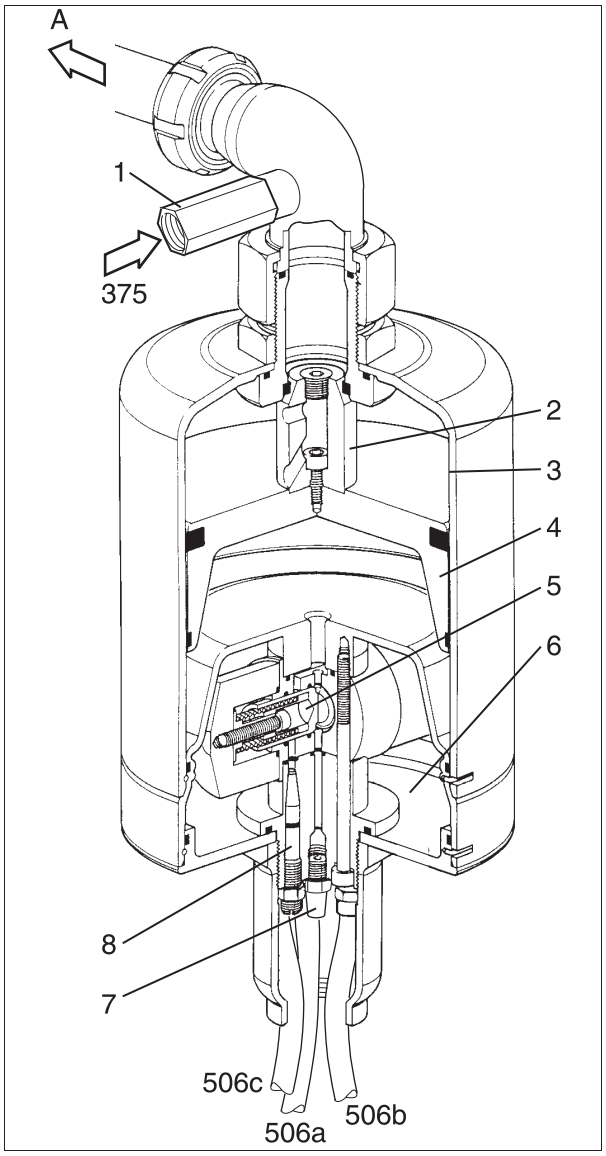
701 Separator motor

The separator is equipped with a 3-phase standard motor. The motor is fed from a frequency converter.

The frequency converter must have overspeed alarm function which stops the separator if the speed exceeds the nominal synchronous speed more than 5%.

730 Motor temperature sensor

The separator motor is equipped with three thermistor sensors, one in each winding. The sensors are connected in series and should be connected to a thermistor relay that trips and interlocks the frequency converter and initiates a Normal Stop without brake when the temperature exceeds the tripping level, see Motor Drive Data.



8. Needle valve
(All numbers are explained in the Operator’s Manual.)

741a Speed sensor

Proximity sensor of inductive type PNP or NAMUR standard giving number of pulses per revolution of the motor shaft. See “2.13 Connection lists” on page 108 .The bowl speed is gear ratio (see “2.5.1 Technical data C/ H /W /D /WD/ 718HGV” on page 31) multiplied by the speed of the motor shaft.

741b Speed sensor (option)

The bracket for the speed sensor and the junction box is prepared for an extra speed sensor, if needed.

Signal processing in ”Start mode”:

- The separator shall be stopped automatically according to ”Normal stop” procedure, and a low speed alarm shall be given when the accumulated time for acceleration is longer than the maximum time specified in “2.5.1 Technical data C/ H /W /D /WD/ 718HGV” on page 31. An abnormal start time indicates some malfunction of the separator equipment and should be investigated.
- If the speed exceeds the nominal synchronous speed with more than 5%, the separator shall be stopped automatically according to ”Normal stop” procedure, and a high speed alarm shall be given. Excessive bowl speeds generate stress levels to the material that can be damaging.
- In case of sudden lack of pulses from the speed sensor, the separator shall be stopped automatically according to ”Safety stop” procedure with a timer controlled stop sequence, and an alarm for speed sensor failure shall be given.

Signal processing in ”Running mode”:

The running speed is obtained when the 98% of the synchronous speed has been reached.

- If the speed exceeds the nominal synchronous speed with more than 5%, the separator shall be stopped automatically according to ”Safety stop” procedure, and a high speed alarm shall be given. Excessive bowl speeds generate stress levels to the material that can be damaging.
- If the speed falls more than 5% below the synchronous speed for a period longer than 1 minute, a low speed alarm shall be given. Low speed indicates some malfunction of the separator equipment and should be investigated.
- In case of sudden lack of pulses from the speed sensor an alarm for speed sensor failure shall be given.

750 Unbalance sensor

For indication of any abnormal unbalance and to be able to perform appropriate countermeasures, the separator has been equipped with a vibration velocity transducer on the separator frame. The signal from the transducer shall be monitored, and two alarm levels according to the vibration alarm levels in “2.5.1 Technical data C/ H /W /D /WD/ 718HGV” on page 31 shall be set.

The vibration monitor shall include a safety, self check function to be performed at initiation of ”Start mode”, ”Running mode” and ”Stop mode”. That means that if any part of the complete Unbalance Sensor System fails an alarm shall be given and action must be taken.

Signal processing in ”Start mode”:

- If vibrations exceed the second alarm level, the separator shall be stopped automatically according to ”Safety stop” procedure. Vibrations of this magnitude might generate severe damages and the cause must be eliminated immediately.
- For bowl speeds in the span 600 to 1000 r/min vibration monitoring must be blocked. This is to eliminate alarm triggering from (normal) vibrations when the speed passes the critical speed.
- If the self check system triggers, an alarm shall be given and an automatic stop according to ”Safety stop” procedure should be initiated.

Signal processing in ”Running mode”:

- If vibrations exceed the first alarm level, an alarm shall be given. Vibrations of this magnitude will reduce the expected life time of the bearings and should therefore be eliminated.
- If vibrations exceed the second alarm level, the separator shall be stopped automatically according to ”Safety stop” procedure. Vibrations of this magnitude might generate severe damages, and the cause must be eliminated immediately.
- Vibration monitoring shall be blocked for 5 seconds from initiation of a discharge. Unwanted alarms are in this way eliminated as high vibrations during discharge are normal.

Signal processing in ”Stop mode”:

- If the self check system triggers, an alarm shall be given, and an automatic stop according to ”Safety stop” procedure should be initiated.

3.3.4 Recommendations (informative)

760 Cover interlocking switch

The separator is equipped with an interlocking switch to detect if the cover is mounted.

Signal processing during ”Stand still”:

- The circuit is closed when the cover of the separator is mounted.
- The interlocking switch should be connected in such a way that starting of the motor (”Start mode”) is prevented when the separator cover is not mounted.

Signal processing in ”Running mode”:

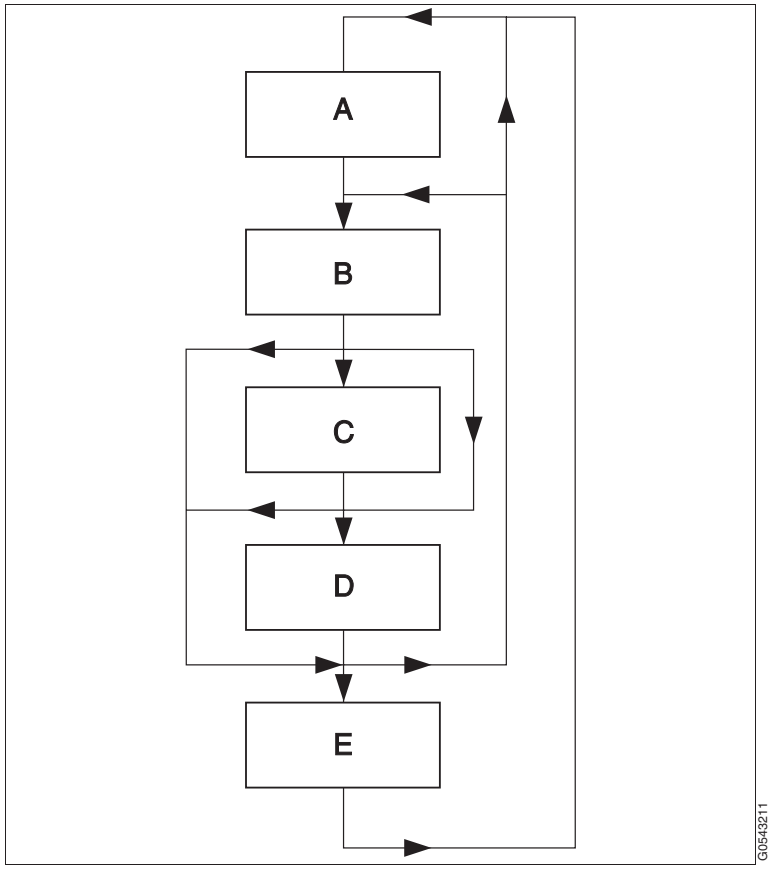
- If the circuit is broken, an alarm should be given. This is to minimise the risk of having access to moving parts.

Discharge system

Signal processing in ”Running mode”:

At indication of the absence of a discharge the operator or the control system must initiate a new discharge and corrective action must be taken. The occurrence of a discharge can for instance be monitored with the aid of a system for checking the rise of separator motor electrical current. Absence of a discharge may result in problems due to solidification of the sludge.

3.3.5 Function graph and running limitations



A. Stand still (Ready for start)
B. Starting mode
C. Running mode
D. Stop mode
E. Safety or emergency stop

3.4 Interface description, CT-motor,

Alfa Laval ref. 562167, rev. 0

“

3.4.1 General

This document describes limitations and conditions for safe control, monitoring and reliable operation. Further information is found in “2.13 Connection lists” on page 108. The document contains definitions, requirements (normative), recommendations (informative) and at the end of the document a function graph with running limitations.

3.4.2 Definitions

“Stand still” means:

- The separator is correctly assembled.
- All connections are made according to Connection List, Interconnection Diagram, Motor Drive Data and Interface Description.
- The electrical power to the separator control system is on or off.

“Start mode” means:

- Start to be initiated from position close to separator (not remotely).
- The electrical power to the separator motor is on.
- The acceleration must be supervised to ensure that a certain speed has been reached within a certain time.

“Running mode” means:

- “Running mode” is in effect 1 minute after the time 93% of synchronous speed has been reached.
- The feed to the separator is on or off.

Stop mode" means:

- The electrical power to the separator motor is off.
- "Stop mode" is in effect until the separator has stopped completely.

"Normal stop" means:

- Stopping of the separator, manually or automatically, at any time with or without brake applied.
- The bowl shall be kept filled.
- Sludge discharge must not be made.

"Safety stop" means:

A stop due to unsafe conditions (e.g. vibrations) automatically initiated by the control system. The separator shall be automatically stopped in the quickest and safest way possible. Comply with following conditions:

- The bowl shall be kept filled.
- Sludge discharge must not be made.
- The separator shall not be restarted before the reason for the "Safety stop" has been investigated and action has been taken.

"Emergency stop" means:

A manually initiated stop due to emergency.

Actions:

- Same as for "Safety stop" but with consideration to what is described in EN 418.

3.4.3 Requirements (normative)

506 Air connection for OWMC (operating water module)

The separator is equipped with a pneumatic controlled operating water module.

When compressed air is supplied to connection 506a, the discharge can be initiated from the control system via two pneumatic inputs (valves), one input for the small discharge, connection 506b and one for the large discharge, connection 506c.

Allowed pressures to each connection, see “2.13 Connection lists” on page 108.

The volume of the large discharge should be adjusted first by adding various inlet pressure to connection 506a. When the large discharge volume has been set, the small discharge volume can be adjusted with the needle valve (8) fitted on the OWMC-unit.

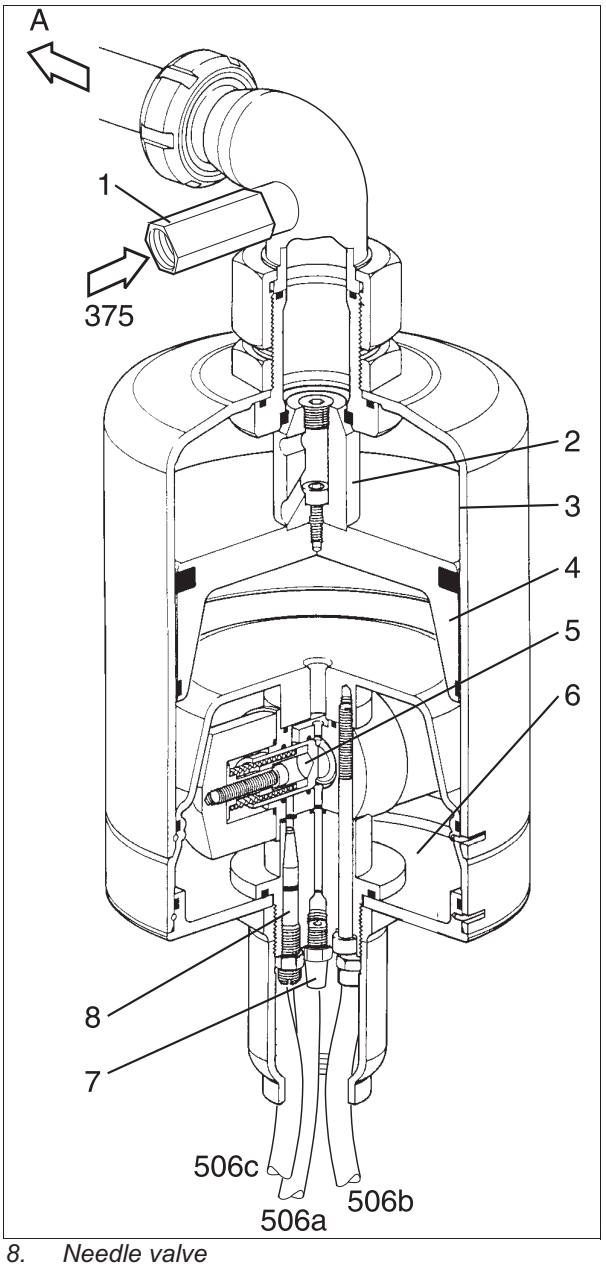
Activating time for the control inputs shall be min. 5 seconds in the discharge sequence.

701 Separator motor

The separator is equipped with a 3-phase Y-D started motor. The motor is of control torque type and built for extended starting time.

The starting equipment shall be dimensioned for twice the rated current of the motor. The purpose for this is to prevent overheating during start. The overload relay shall only be connected in D-line.

730 Motor temperature sensor



8. Needle valve

All positions are explained in the Operator’s Manual

The separator motor is equipped with three thermistor sensors, one in each winding. The sensors are connected in series and should be connected to a thermistor relay that trips and interlocks the starting equipment and initiates a “Normal Stop” without brake when the temperature exceeds the tripping level, see “2.8.9 D 618HGV-74C and D/ WD/ 718HGV-34C CT-Motor (37 kW)” on page 60 and “2.8.11 BM 618HGV-14C, C / F / H / W, 618HGV-74C, BB 618HGV-34C, WD 618HGV-34/74C, and H / W / C/ WD/ 718HGV-74C CT-Motor (25 kW)” on page 64.

741a Speed sensor

Proximity sensor of inductive type PNP or NAMOUR standard giving number of pulses per revolution of the motor shaft. See “2.13 Connection lists” on page 108. The bowl speed is gear ratio (see “2.5.1 Technical data C/ H /W /D /WD/ 718HGV” on page 31) multiplied by the speed of the motor shaft.

741b Speed sensor (option)

The bracket for the speed sensor and the junction box is prepared for an extra speed sensor, if needed.

Signal processing in “Start mode”:

When the speed of 93% of the synchronous speed is reached, the Y-D starting equipment should switch over to D.

- The separator shall be stopped automatically according to “Normal stop” procedure, and a low speed alarm shall be given when the accumulated time for acceleration is longer than the maximum time specified in “2.5.1 Technical data C/ H /W /D /WD/ 718HGV” on page 31. An abnormal start time indicates some malfunction of the separator equipment and should be investigated.
- If the speed exceeds the synchronous speed with more than 5%, the separator shall be stopped automatically according to “Normal stop” procedure, and a high speed alarm shall be given. Excessive bowl speeds generate stress levels to the material that can be damaging.
- In case of sudden lack of pulses from the speed sensor, the separator shall be stopped automatically according to “Safety stop” procedure with a timer controlled stop sequence, and an alarm for speed sensor failure shall be given.

Signal processing in “Running mode”:

The running speed is obtained when 98% of the synchronous speed has been reached.

- If the speed exceeds the nominal synchronous speed with more than 5%, the separator shall be stopped automatically according to “Safety stop” procedure, and a high speed alarm shall be given. Excessive bowl speeds generate stress levels to the material that can be damaging.
- If the speed falls more than 5% below the synchronous speed for a period longer than 1 minute, a low speed alarm shall be given. Low speed indicates some malfunction of the separator equipment and should be investigated.
- In case of sudden lack of pulses from the speed sensor an alarm for speed sensor failure shall be given.

750 Unbalance sensor

For indication of any abnormal unbalance and to be able to perform appropriate countermeasures, the separator has been equipped with a vibration velocity transducer on the separator frame. The signal from the transducer shall be monitored, and two alarm levels according to the vibration alarm levels in “2.5.1 Technical data C/ H /W /D /WD/ 718HGV” on page 31 shall be set.

The vibration monitor shall include a safety, self check function to be performed at initiation of “Start mode”, “Running mode” and “Stop mode”. That means that if any part of the complete Unbalance Sensor System fails, an alarm shall be given and action must be taken.

Signal Processing in “Start mode”:

- If vibrations exceed the second alarm level, the separator shall be stopped automatically according to “Safety stop” procedure. Vibrations of this magnitude might generate severe damages, and the cause must be eliminated immediately.
- For bowl speeds in the span 600 to 1000 r/min vibration monitoring must be blocked. This is to eliminate alarm triggering from (normal) vibrations when the speed passes the critical speed.
- If the self check system triggers, an alarm shall be given and an automatic stop according to “Safety stop” procedure should be initiated.

Signal Processing in “Running mode”:

- If vibrations exceed the first alarm level, an alarm shall be given. Vibrations of this magnitude will reduce the expected life time of the bearings and should therefore be eliminated.
- If vibrations exceed the second alarm level, the separator shall be stopped automatically according to “Safety stop” procedure. Vibrations of this magnitude might generate severe damages, and the cause must be eliminated immediately.
- Vibration monitoring shall be blocked for 5 seconds from initiation of a discharge. Unwanted alarms are in this way eliminated as high vibrations during discharge are normal.

Signal Processing in “Stop mode”:

- If the self check system triggers, an alarm shall be given, and an automatic stop according to “Safety stop” procedure should be initiated.

3.4.4 Recommendations (informative)

760 Cover interlocking switch

The separator is equipped with an interlocking switch to detect if the cover is mounted.

Signal processing during “Stand still”:

- The circuit is closed when the cover of the separator is mounted.
- The interlocking switch should be connected in such a way that starting of the motor (“Start mode”) is prevented when the separator cover is not mounted.

Signal processing in “Running mode”:

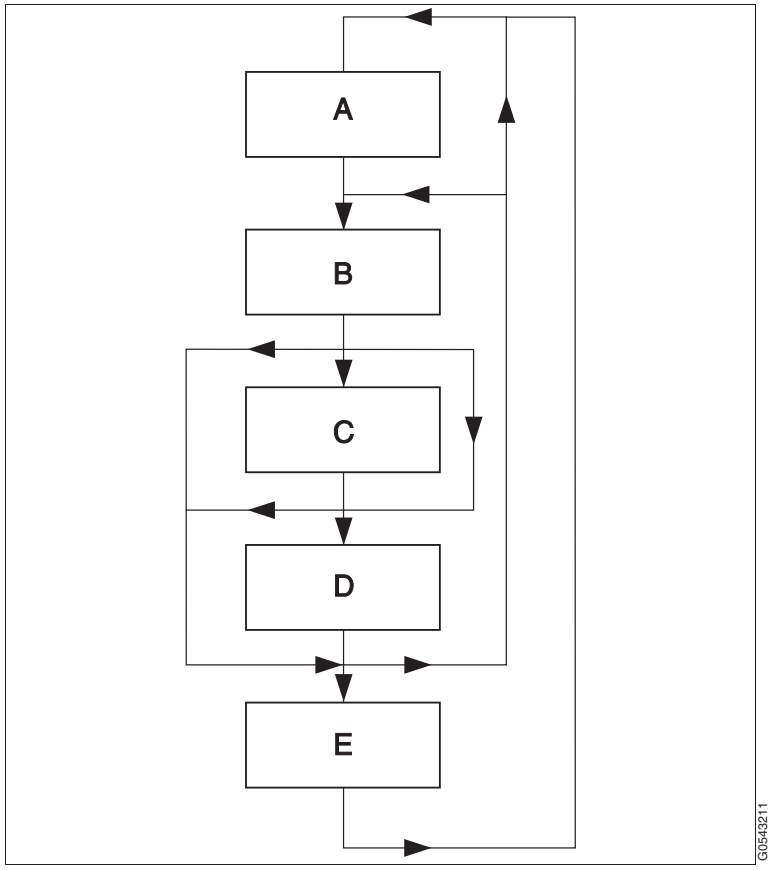
- If the circuit is broken, an alarm should be given. This is to minimise the risk of having access to moving parts.

Discharge system

Signal processing in “Running mode”:

At indication of the absence of a discharge the operator or the control system must initiate a new discharge and corrective action must be taken. The occurrence of a discharge can for instance be monitored with the aid of a system for checking the rise of separator motor electrical current. Absence of a discharge may result in problems due to solidification of the sludge.

3.4.5 Function graph and running limitations



A. Stand still (Ready for start)
B. Starting mode
C. Running mode
D. Stop mode
E. Safety or emergency stop

3.5 Guidelines for frequency converter drives

Alfa Laval ref. 563692, rev. 3

Frequency converter.

For dimensioning and programming of a frequency converter see “3.6 Dimensioning of a frequency converter”:

When choosing the rated power for the converter, regard must be paid to the motor current peaks, which occur during the automatic discharges of centrifuge.

When dimensioning an electrical brake it is essential to be aware of the current of the motor. The current should not exceed the nominal current for the motor.

The start of the centrifuge shall be carried out using a suitably adjusted acceleration ramp. The acceleration period is to be chosen with regard to the moment of inertia of the rotor, and the rated torque of the motor.

The limit of current during start should be below 140 % the rated current for the motor. The main reasons are heat in the motor and the stress on the transmission.

If there are adjustable parameters, which set the level for over speed, it is required, that a password and/or a hardware lock protect the parameter adjustment function. In order to avoid unintentional altering of the parameter settings, two separate operations must be performed before parameter adjustment is enabled. Examples of interlocks are password, hardwiring with jumpers and disconnecting of control panel.

When the frequency converter will be installed in the process area, the code of protection of the enclosure shall be at least IP54. When installed in a special room, an electrical operation area, the enclosure can be of IP20.

The frequency converter is to be set for one direction of rotation only and the motor connected for correct direction of rotation with the use of this setting. The direction is to be found on the machine plate.

The possibility of changing the direction of rotation of the motor through adjustment of the converter should be prevented. It is required that password and/or a hardware lock protect the parameter adjustment function. In order to avoid unintentional altering of direction, two separate operations must be performed before adjustment is enabled. Examples of interlocks are password, hardwiring with jumpers, disconnecting of the control panel.

The frequency converter shall be able to function in such a way that it can 'catch' a rotating load - 'flying start'. If, for example, the centrifuge has stopped because of a power supply failure to the factory, and the operator restarts the centrifuge before it has reached stand still, then the converter must have the capability to synchronise to the present rotor speed and start from there. The acceleration should be in accordance with the pre-set acceleration ramp.

It is recommended to choose a frequency converter with the possibility to monitor the chosen maximum output frequency. If the frequency exceeds the maximum allowable frequency, and then the converter should stop the centrifuge.

Centrifuge.

The rotor must not exceed 'Maximum allowed speed'. Too high rotor speed or frequency shall stop the centrifuge with automatically initiated stop. The stop shall be in effect until it is manually reset.

Maximum allowed speed and if applicable the minimum allowed speed for the rotor could be found in Technical Data for the centrifuge.

To reduce the hazard for overspeed there shall be two systems for supervision of the rotor speed, which are independent from each other.

One system can for example, be the supervision system in the VFD and the other should be the speed supervision of the rotor. When the speed monitoring system is used as a part of an over speed protection system, it shall be designed in accordance with EN 954 Category 3, with continuous checking of the function.

Control systems

The control system of the centrifuge should be connected to the frequency converter so that start and stop of the centrifuge can be initiated from the control panel. Furthermore, the control system should monitor the rotor speed via a speed sensor mounted in the centrifuge. The control system should stop the centrifuge if the speed exceeds or falls below the allowed speed limits, which are stated in the documentation for the corresponding centrifuge.

The emergency stop stop should break the power supply to the frequency converter.

The restart should not be possible during safety stop or emergency stop.

The starting sequence for the centrifuge should be interrupted if the speed supervision system or the frequency supervision system is not in operation.

The electric motor

The nominal frequency for the motor has to preferably be chosen as close as possible to the chosen frequency for the centrifuge. Deviation of more than -20% is not recommended, as the available motor torque is decreased when operating below or above the nominal frequency. A closer description is found in “3.6 Dimensioning of a frequency converter”.

The motor winding is available with standard or reinforced insulation strengthening system, which can be combined with du/dt filter and/or insulated bearings depending on the motor size/type and voltage.

Closer description and choosing criteria can be found in motor and/or frequency converter documentation.

If a standard motor is used, then it is recommended that the motor is equipped with thermistors in the stator windings. The tripping temperature for the thermistors should be the maximum allowable operating temperature for the corresponding insulation class. CT motors used by Alfa Laval are already provided with thermistors in the stator windings - these should therefore be connected to the motor's monitoring equipment when frequency converter drive is used.

The motor cable should be shielded so that approved suppression of electromagnetic radiation can be obtained - as required by the EMC directive or corresponding regulations. The shielding shall be connected to both motor and frequency converter with special cable glands.

Special countermeasures have to be taken regarding cabling and grounding/earthing due to the occurrence of bearing currents in the motor. See the motor manufactures recommendation and installation requirements.

Electrical installation

The installation of the frequency converter shall be in accordance with EC-regulations e.g. EMC Directive. Instructions shall always be supplied together with a frequency converter.

In order to suppress the emitted electromagnetic radiation a correct cabling system shall be used. It consists of symmetric shortest possible power cable equipped with concentric protective copper shield round the phase leads or with concentric Cu/Al-shield round the three symmetrical conductors for protective grounding and the phase leads. The correct supplying cable shall be connected with 360 degrees termination of cable shield at both the motor terminal box end and converter end with shortest possible earth lead to the earthing bolts (PE-terminal) in both ends. Thus unsymmetrical cables can be used up to 10 mm 2 cable size and up to 30 kW motor power, shielded cable is always recommended.

To reduce circuit-bound electrical disturbances to the power supply, the converter shall be supplied with a power supply filter, an RFI-filter.

Attention shall be paid to the motor cable's length, so that tripping-out of the converter because of excessive currents, as well as impaired properties of power supply filter can be avoided. In doubtful cases, the converter's manufacturer should be consulted regarding maximum allowable cable length.

The signal outputs and the control connections of the converter shall conform to the requirements for immunity to electromagnetic disturbances as stated in the EMC directive or corresponding regulations.

SAFETY PRECAUTIONS AND DESIGN REQUIREMENTS

IT IS OF OUTMOST IMPORTANCE THAT THE CENTRIFUGE IS SO DESIGNED AND SAFEGUARDED THAT THE MAXIMUM ALLOWED SPEED FOR THE ROTOR NEVER WILL BE EXCEEDED. OVER SPEED CAN RESULT IN EJECTION OF PARTS. SAFETY-RELATED PARTS SHOULD BE DESIGNED WITH REFERENCE TO EN 954-1.

3.6 Dimensioning of a frequency converter

Alfa Laval ref. 570285, rev. 2

3.6.1 Dimensioning and programming of a frequency converter

Basic requirements for a frequency converter:

Select correct frequency converter for mains supply voltage and frequency.

Select the frequency converter power according to the initial conditions and the specified motor. Check that the converter's rated output current is similar or higher than the motors nominal rated current.

The frequency converter's capability to produce the maximum required current and power (typically during discharge sequences) has to be checked, use values given for "heavy duty" use in manufacturer's catalogue

When controlled braking is required, select the frequency converter with braking functionality, as described in “3.6.5 Braking methods”.

Only frequency converter fulfilling requirements in IEC 61508 part 1"Functional safety of electrical/electronic/programmable electronic safety-related systems", EN 60204-1 "Safety of machinery - Electrical equipment of machines" and EN 61800-3 "EMC Directive" shall be chosen.

For safety precautions of a variable frequency drive see “3.5 Guidelines for frequency converter drives” on page 172.

3.6.2 Selecting the motor with correct voltage and frequency for a variable frequency drive

If the motor with correct voltage and frequency is not already selected or there are several motor alternatives to choose between, the following control calculations for the continuous loadability of the motor should be made, otherwise continue to “3.6.3 Dimensioning of a frequency converter for an actual application” on page 179.

Controlling the loadability of the motor at actual frequency drive

Example:

Power consumption at maximum capacity, found in Technical Data = 35 kW.

There are 2 motors available in centrifuge specification, 37 kW / 400 V / 50 Hz and 42 kW / 400 V / 60 Hz, both fulfilling the above power requirement, control calculation for motor torque has to be made.

The motor with nominal frequency as close as possible to the actual drive frequency should preferably be chosen.

Set frequency acc. to Technical Data = 70 Hz, gives motor relative speed = 70 Hz / 50 Hz = 1,4 for 50 Hz's motor and 70 Hz / 60 Hz ~ 1,2 for 60 Hz's motor.

When validating these relative speeds 1,4 and 1,2 in motor loadability curve, it can be seen that 60 Hz's motor is better alternative with higher T / Tn factor, giving ~ 83% of Tn with 70 Hz set frequency.

Motor with 42 kW / 400 V / 60 Hz is therefore selected.

The motor torque can be calculated from speed and mechanical (output) power:

$T = P / \omega$

T = torque (Nm)

P = power (W)

ω = motor speed (rad/s)

The motor speed is put in the formula in rpm´s instead of rad/s:

$\omega = n \times (2 \times \_ / 60)$

n = actual motor speed (rpm) = relative speed factor x nominal speed

$T = P / \omega = P \times 60 / n \times 2 \times \_\_$

Continuously needed motor torque at maximum capacity = 35000 x 60 / 1,2 x 1780 x 2 x __ = 156 Nm.

During discharges needed motor torque = 70000*) x 60 / 1,2 x 1780 x 2 x __ = 313 Nm.

*) If values for maximum current or power during discharges are not known, multiply value for power consumption at maximum capacity by factor 2 6
estimated power consumption during discharges = 35 kW x 2 = 70 kW = 70000 W

Controlling continuous available motor torque at 70 Hz = (42000 x 60 / 1780 x 2 x _) x 83% = 188 Nm

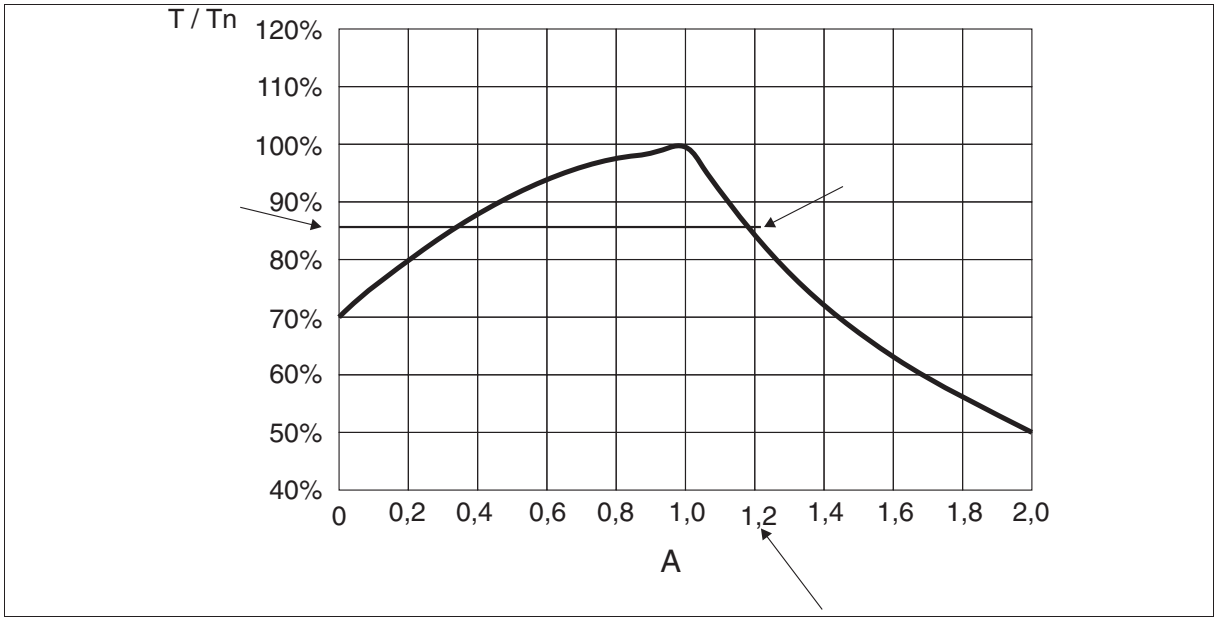
Controlling maximum available motor torque at 70 Hz = 188 x 2,5**) = 470 Nm

**) 2,5 is a factor for the relationship between maximum and nominal motor torque, Tmax/Tn, as found in motor catalogue.

Both values are higher than in centrifuge operation needed torque values.

The motor is correct for the application.

Loadability curve for an electric motor in a frequency converter drive.



T/Tn = Available/nominal motor torque.
Relative speed = Actual drive frequency/motor nominal frequency

3.6.3 Dimensioning of a frequency converter for an actual application

Frequency converter shall be dimensioned regarding to maximum needed power and current, overload capacity,

which usually occurs during discharge sequences for a centrifuge

The relation between the nominal and the actual motor current in field weakening range (above the motors nominal frequency / speed) can approximately be calculated by:

I m = (P load / P n) x I n

I m = actual motor current (A)

P load = actual needed power by driven machine during discharges (W) *)

P n = motor's nominal power (W)

I n = motor's nominal current (A)

*) If values for maximum current or power are not known, multiply value for power consumption at maximum capacity by factor 2 6 estimated power consumption during discharges = 35 kW x 2 = 70 kW = 70000 W

Maximum needed output current (actual motor current during discharges) from the frequency converter =

(70000/ 42000) x 78 = 130 A

The frequency converter with capability for this current shall be chosen.

This current is called for maximum monitored output current, short-term overload current or peak current, and it is usually limited to 150% of nominal output current.

This current is usually limited for a short time only periodically (ex. 1 minute every 5 minutes or 2 seconds every 15 seconds), which should be taking in consideration when deciding discharge intervals and speed regaining time after discharge.

Speed regaining time can also be prolonged by converter's maximum output power, normally limited to 150% of converter's nominal output power.

Control the frequency converter's nominal output current, it should be similar or higher than the motors nominal current, in this case, at least 78 A.

Values to be used when selecting the converter:

Nominal output current D 78 A

Overload current (short time) D 130 A

These values, when looking into manufacturer's catalogues, should give a converter for heavy-duty use of 45 kW.

3.6.4 Programming the frequency converter

Since parameter setup and programming interface are different from manufacturer to another, detailed instructions cannot be given here, only the most important programmable parameters for starting-up and running the centrifuge will be explained!

See frequency converter instruction for use for detailed information

- Enter the motor data from the motor nameplate, including nominal power, voltage, current, speed, frequency and eventually power factor (cosinus φ).

- Optionally and if available, select motor identification run for fine adjustment of the motor data, choose between standard/ extended or reduced. NOTE! During standard/extended identification run the motor will rotate and has to be off-loaded from the centrifuge!
- If available, select the torque control mode (variable or pump/fan characteristics) for controlling of the motor.
- Check and, if necessary, change the direction of rotation of the motor
- Set the minimum motor speed or frequency, should be 0 rpm or 0 Hz respectively
- Set the actual motor speed or set frequency, values given in Technical Data

IT IS OF UTMOST IMPORTANCE THAT THIS SETTING HAS TO BE CHECKED. A FAULTY FREQUENCY SETTING CAN LEAD TO OVERSPEEDING, WHICH MIGHT CAUSE HAZARDS.

- Set the start time, value given in Technical Data or Motor Drive Data.

3.6.5 Braking methods

NOTE! Not to be used in explosive atmospheres!

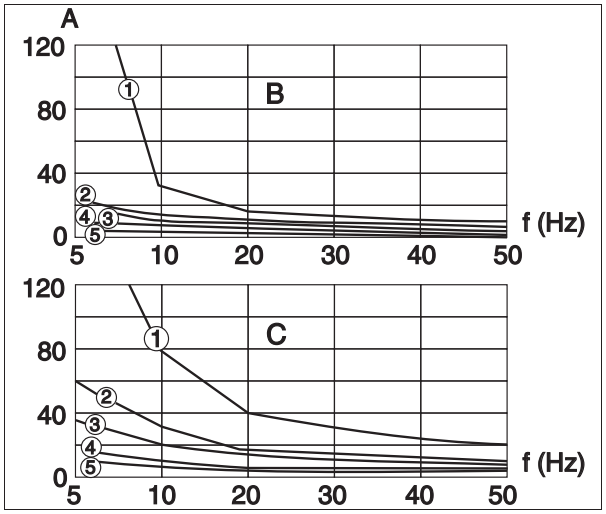
Motor flux braking:

Flux braking is a method based on motor losses. When braking in the drive system is needed, the motor flux and thus also the magnetizing current component used in the motor are increased. The control of flux can be easily achieved through the direct torque control principle (DTC). With DTC the inverter is directly controlled to achieve the desired torque and flux for the motor. During flux braking the motor is under DTC control which guarantees that braking can be made according to the specified speed ramp.

The flux braking method based on DTC enables the motor to shift quickly from braking to motoring power when requested.

In flux braking the increased current means increased losses inside the motor. The braking power is therefore also increased although the braking power delivered to the frequency converter is not increased. The increased current generates increased losses in motor resistances. Typically, in low power motors (below 5 kW) the resistance value of the motor is relatively large in respect to the nominal current of the motor. The higher the power or the voltage of the motor, the less the resistance value of the motor in respect to motor current. In other words, flux braking is most effective in a low power motor.

Rated motor power	
1	2,2 kW
2	16 kW
3	37 kW
4	75 kW
5	250 kW



Percentage of motor braking torque of rated torque as a function of output frequency.
A. Braking torque (%)
B. No flux braking
C. Flux braking

The main benefits of flux braking are:

- No extra components are needed and no extra cost, using DTC control method.
- The motor is controlled during braking.

The main drawbacks of flux braking are:

- Increased thermal stress on the motor if braking is repeated over short periods.
- Braking power is limited by the motor characteristics e.g. resistance value.
- Flux braking is useful mainly in low power motors.
- Not recommended in explosive atmospheres.

Brake chopper and braking resistor:

The braking chopper is an electrical switch that connects the DC bus voltage to a resistor, where the braking energy is converted to heat. During deceleration, the motor changes to generator operation and supplies energy back through the inverter. As brake energy cannot be fed back to the supply via the normal diode bridge, the brake chopper will turn on at a certain level and feed energy out via the brake resistor. Here, the energy is converted to heat and wasted, unless a separate heat recovery system is installed; additional ventilation for the room may be required.

The main benefits of the braking chopper and resistor are:

- Simple electrical construction and well-known technology.
- Low fundamental investment for chopper and resistor.
- The chopper works even if AC supply is lost.

The main drawbacks of the braking chopper and resistor are:

- The braking energy is wasted if the heated air cannot be utilized.
- The braking chopper and resistors require additional space.
- May require extra investments in the cooling and heat recovery system. Braking choppers are typically dimensioned for a certain cycle, e.g. 100% power 1/10 minutes. Longer braking times, require more accurate dimensioning of the braking chopper.

DC braking:

NOTE! Not to be used in explosive atmospheres!

DC braking can be performed with or without a frequency converter. With a frequency converter, a stop command makes the frequency converter switch to supplying the motor with direct current, developing a braking torque. Same effect can also be achieved using the DC brake unit, for dimensioning of the unit see “Calculation of DC-brake unit” on page 184.

The main drawbacks of the DC injection braking are:

- The motor flux control is lost during braking, e.g. no control of adjusted braking time.
- Heat losses in the motor.
- Not recommended in explosive atmospheres.

Regenerative drive - IGBT solution braking:

The IGBT based regeneration is based on the same principles as power transmission within a power network. It has a low amount of supply current harmonics in both, motoring and regeneration, as well as high dynamics during fast power flow changes on the load side. It also offers the possibility to boost the DC voltage higher than the respective incoming AC supply. This can be used to compensate for a weak network or increase the motor's maximum torque capacity in the field weakening area.

The main benefits of the IGTB solution braking are:

- Stable torque even if net voltage is unstable.
- Nominal torque available even in the field weakening area.
- Fast and smooth operation in motoring-regenerating-motoring transition.

The main drawbacks of the IGTB solution drive are:

- Higher investment cost, up to 2 times of a standard frequency converter cost.
- The braking capability is not available during power supply failure.

3.7 Calculation of DC-brake unit

Alfa Laval ref. 565309, rev. 0

The nominal brake current (DC-current) of the brake unit shall be the same as the rated motor current. Rated motor current is taken from the motor drawing or the motor name plate. The DC-brake voltage, USD, is then calculated according to the formula:

USD= DC x 2 x R_f x 1,22 (V) where
IDC = DC-current (A) (= rated motor current)
R_f = phase resistance of the motor winding, (Ω), see motor drawing
1,22 = factor for hot motor winding (75 °C)
2 = two phase windings connected in series.

The nominal RMS-value, UAC, of the DC-brake transformer secondary voltage is then calculated by means of the formula:

UAC=(USD + 2) x 1,17 (V) where 1,17=factor for transforming DC-voltage into AC-voltage and for a compensation of 5% voltage drop in the transformer winding.

The formula takes into consideration that the voltage drop is 2V in the diode rectifier bridge.

The DC-brake transformer is equipped with different secondary voltage tappings, making it possible to adjust the braking current, IDC.

At least following secondary tappings are needed:

- one tapping for calculated nominal UAC,
- one tapping with a step of 0,90 times calculated UAC, and
- two tappings with steps of 1,10 and 1,20 times calculated UAC respectively.

Needed transformer power, PTR, is then calculated by means of following formula:

PTR= UAC x IDC x 0,9 (VA) where 0,9=factor for transforming IDC into AC-current and taking into consideration that the duty type is intermittent.

A suitable diode rectifier bridge is chosen according to following rules: Maximum peak reverse voltage of the diodes at least 5 times maximum UAC with respect to voltage transients and maximum RMS forward current 1,5 times IDC.

4 Demand specification

4.1 Quality requirements

4.1.1 Operating water

Alfa Laval ref. 583409, rev. 0

Operating water is used in the separator for several different functions: e.g. to operate the discharge mechanism, to lubricate and cool mechanical seals.

Poor quality of the operating water may with time cause erosion, corrosion and/or operating problem in the separator and must therefore be treated to meet certain demands.

The following requirements are of fundamental importance

1.1 Turbidity free water, solids content <0,001% by volume
Deposits must not be allowed to form in certain areas in the separator

1.2 Max. particle size 50 μm

2 Total hardness 105-180 mg $CaCO_3$ per litre, which corresponds to 6-10°dH or 7.5-12.5°E
Hard water may with time form deposits in the operating mechanism. The precipitation rate is accelerated with increased operating temperature and low discharge frequency.
These effects become more severe the harder the water is.

3 Chloride content max 100 ppm NaCl (equivalent to 60 mg Cl/l)
Chloride ions contribute to corrosion on the separator surface in contact with the operating water, including the spindle. Corrosion is a process that is accelerated by increased separating temperature, low pH, and high chloride ion concentration.
A chloride concentration above 60 mg/l is not recommended.

4 pH>6
Increased acidity (lower pH) increases the risk for corrosion; this is accelerated by increased temperature and high chloride ion content

NOTE

Alfa Laval accepts no liability for consequences arising from unsatisfactorily purified operating water supplied by the customer.

4.1.2 Compressed air

Alfa Laval ref. 553407, rev. 5

The supply of compressed air to separator discharge system, valve actuators, positioners, instruments etc. must be of such a quality that satisfactory function is ensured for a reasonable time.

To this end three conditions must be fulfilled:

1. Dirt in the form of solid particles down to a size below 10 micron (0,01 mm) must be removed from the air. This is preferably done by means of special filters or reducing valves provided with filters.
2. Oil is always transferred to the compressed air from oil-lubricated compressors and must be removed to the highest possible degree. It constitutes a serious contamination, which it is difficult to remove from the instruments. Special filters or oil separators must, therefore, be provided before the instruments. In small plants, oil-free compressors can be used as an alternative.
3. In the compressed-air system a condensation takes place at various rates, depending on the moisture content at the air inlet, the temperature before and after the compressor, partially lower temperature in any cold zone passed by the pipe (outdoor, cellar etc.) and the like.

   The air must thus be dried with regard to the lowest temperature existing after the drying device, so that condensate in the instruments is avoided. Note that the air will also be cooled through expansion after passing constrictions and nozzles in the instruments, with condensation as a result. In view of the above, the following must be observed:

   At the inlet to an instrument, the dew point of the compressed air should lie at least 10 °C below the lowest ambient temperature. This is usually obtained by using an absorption drier of suitable capacity. If the air contains much water, provide a primary separator before the filter.

Air filters should be placed so as to be easily surveyable and accessible in order to facilitate daily condition checks, and exchange of the filter cartridge.

NOTE

Alfa Laval accepts no liability for consequences arising from unsatisfactorily purified compressed air supplied by the customer.

5 Installation and first start

5.1 Preparations

1. Set up the machine (without frame hood and bowl) according to the installation instructions.
2. Flush the piping thoroughly to remove any residues such as chips, welding beads, etc.

NOTE

All piping must be disconnected from the separator.

3. Check the operating water functions and operating water flow as below.

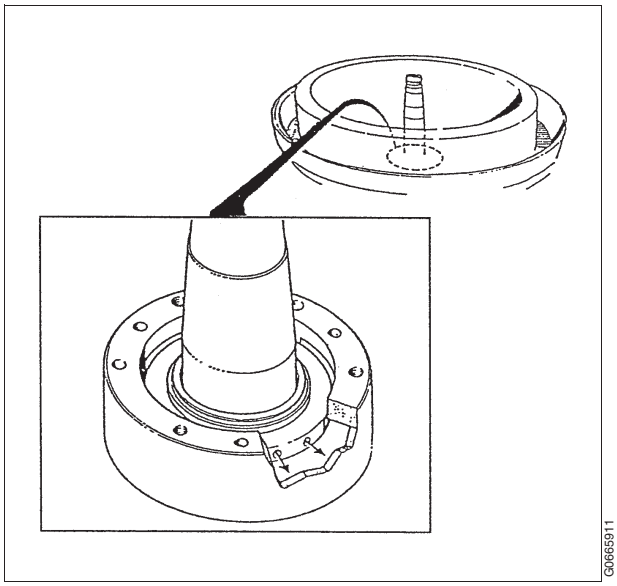
Checking the operating water flow.

When operating water is fed (**375***) water shall squirt out of the holes in weak jets.

During operation there will be no consumption of water when the pressure is lower than 50 kPa (0,5 bar).

At discharge water shall squirt out of the holes in powerful jets.

4. Check that the water flow-rates correspond to data in “2.13 Connection lists” on page 108:
   - Water for lubrication oil cooler **409***.
   - Water for discharge **375***.
   - Water for cooling frame parts **405***.



NOTE

Outlet **464*** must be open. No restrictions allowed.

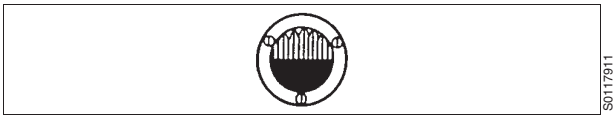
*) Numbers refer to “2.13 Connection lists” on page 108.

5.2 Before first start

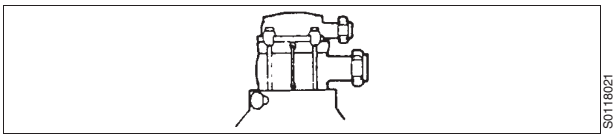
Before first start the following check points must be checked:

- Motors equipped with regreasing nipples: When starting the motor for the first time, or after long storage of the motor, apply the specified quantity of grease until new grease is forced out of the grease outlet. The information can be found in *Lubrication of electric motor* in the *Service & Maintenance Manual.*
- Pour about 13 litres lubricating oil of correct grade into the worm gear housing – see chapter “Lubricants” in the *Service & Maintenance Manual.*

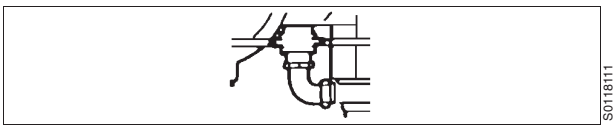
- Check the oil (approx. half way up the sight glass). Be aware of that a very small quantity of oil may remain at the bottom edge of the sight glass even when the gear housing is emptied for oil.



- Assemble the bowl and the inlet and outlet parts as described in the *Service & Maintenance Manual.*
- Make sure that the frame hood bolts have been tightened.



- Make sure that the bolts for centring ring and outlets have been tightened to the correct torque. See the *Service & Maintenance Manual*.
- Make sure that the bolts for the inlet device have been tightened.



- Check that water and air are being supplied to the control panel.

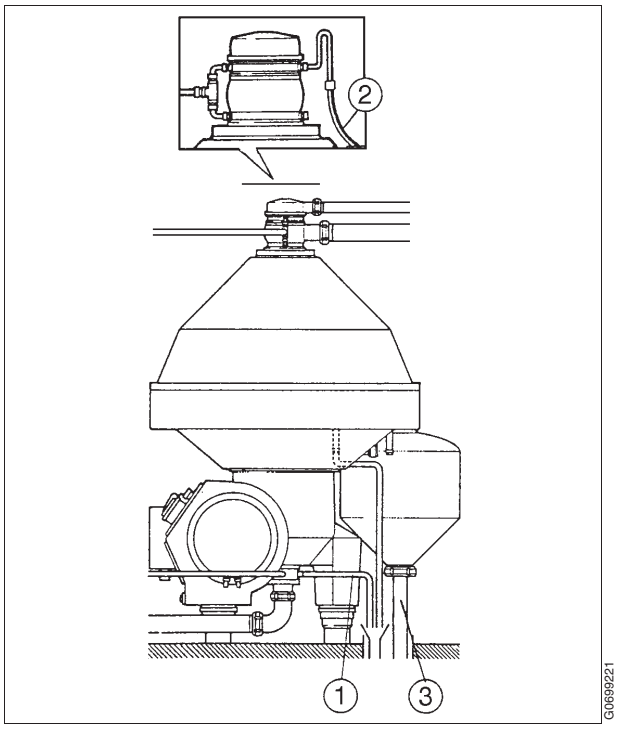
Make sure that cooling water is being supplied to the separator.

Check at

(1) – from inlet device seal

(2) – from outlet upper seals (twin phase separators)

(3) – from outlet bottom seal (at operation).



5.3 First start

- Start the machine
- Check the direction of rotation (see revolution counter).

NOTE

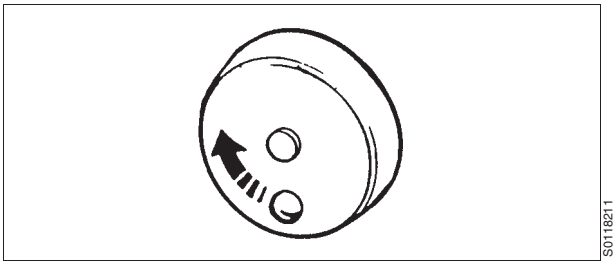
At the switch-over to D the amperage will increase considerably, but will quickly drop towards the idling level provided that the motor is correctly connected. If the amperage remains at the high level, the motor has been wrongly connected. Stop the motor immediately.

- When the bowl has reached running speed, check the revolution counter reading. For speed particulars, see:

  “2.1.1 Technical data A / C/ D/ H/ W / WD / 614HGV” on page 20, “2.2.1 Technical data A / BB / BM /C / D / H/W /714HGV” on page 23, “2.3.1 Technical data C / H / W / WD / 518HGV” on page 26
  “2.4.1 Technical data BB / BM / C / D / F / H / WD /W / 618HGV” on page 28, “2.5.1 Technical data C/ H /W /D /WD/ 718HGV” on page 31, “2.6.1 Technical data C / BM / BB / H / W / 818 HGV” on page 34.

  The bowl is now closed (provided that make-up water has been supplied during the run-up period).

- Make sure that the valves in the outlets are open.



Revolution counter

5.4 Operation

- With the bowl closed, supply water to the bowl (start the feed pump).
- Make sure that the separation inlet pressure is suitable and the throughput correct. Then check outlet pressures, see “Selection of outlet impeller” in *Operator’s Manual*.
- Shut off the cooling water to the axial seals.

NOTE

It is important to have liquid flow through the bowl.

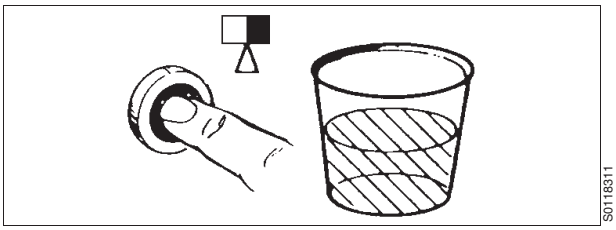
- Check that the bowl is tightly closed – no water in the cyclone outlet.
- Disconnect the pipes for cooling water to the outlet seals. Check for possible leakage from these. Major leaks must not occur. Minor leaks may temporarily be left uncorrected. Some seals need as a rule certain wear-in period.
- Connect the pipes for cooling water.
- Open the cooling water supply again.

5.4.1 Ejection process

WARNING

Liquid ejected at high velocity

Ensure that no sediment discharge takes place when opening cyclone cover. **Wear safety goggles**.



- Disconnect the pipe from the cyclone as well as the sediment cover flushing hose.
- Make the settings of the Operating Water Module to achieve the discharge volumes desired, see chapter “3 Interface description” on page 133.
- Initiate a large discharge. If the bowl opens, closes and the opens again (so-called double discharge), adjust the air pressure until you arrive at the volume desired. Finally adjust the needle valve to achieve a suitable small discharge.
- Secure the cyclone outlet pipe and the sediment cover flushing pipe.

5.4.2 Cleaning

- Carry out the cleaning programme. Check that washing solution is running out of the axial seals.

5.4.3 Separation

- Supply process liquid.
- Check the inlet pressure, see “Selection of outlet impeller” in *Operator’s Manual*.
- Adjust the outlet pressures, see “Selection of outlet impeller” in *Operator’s Manual*.

5.4.4 Operation

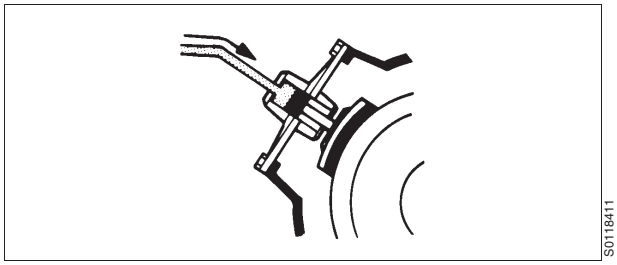
- Check the throughput. Make a final adjustment of inlet and outlet pressures.
- Make sure that no air is being sucked into the feed pipe via e.g.a balance vessel, if fitted. This should always be kept filled. The process liquid should flow evenly in the vessel without bubbling.

After separation is completed, carry out the cleaning programme. Dismantle the bowl and check the cleaning 3 – 4 days after the first operation with product.

5.5 Stopping

The control system actuates the brake when stopping the separator.

Cooling water to the axial seals and air to the brake will be turned off automatically after the bowl has stopped.



WARNING

Entrapment hazard

Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.

The revolution counter indicates separator rotation.

5.6 Selection of outlet impeller (twin phase separators)

5.6.1 Permissible inlet and outlet pressures

614	
Inlet	Recommended inlet pressure: 200 – 400 kPa (2 – 4 bar). Min 200 kPa (2 bar). Max 600 kPa (6 bar).
Outlet	Applies to light and heavy phases. Recommended outlet pressure: 300 – 600 kPa (3 – 6 bar). Max 700 kPa (7 bar).
Exception	At throughputs of up to 25 000 kg/h, the following applies: Recommended outlet pressure: Approx. 600 kPa (6 bar).

714	
Inlet	Recommended inlet pressure: 200 – 400 kPa (2 – 4 bar). Min 200 kPa (2 bar). Max 600 kPa (6 bar).
Outlet	Applies to light and heavy phases. Recommended outlet pressure: 300 –700 kPa (3 – 7 bar). Max 700 kPa (7 bar).
Exception	At throughputs of up to 30 000 kg/h, the following applies: Recommended outlet pressure: Approx. 600 kPa (6 bar).

NOTE

An inlet or outlet pressure that is higher than necessary will lead to higher power consumption and a shorter life for the axial seals.

If a lower inlet pressure or a higher outlet pressure than those stated above is desirable in some particular case, this should be discussed with a supplier representative.

5.6.2 Flow / outlet pressure

Impeller diagram for 614

Flow – outlet pressure. Constant inlet pressure.

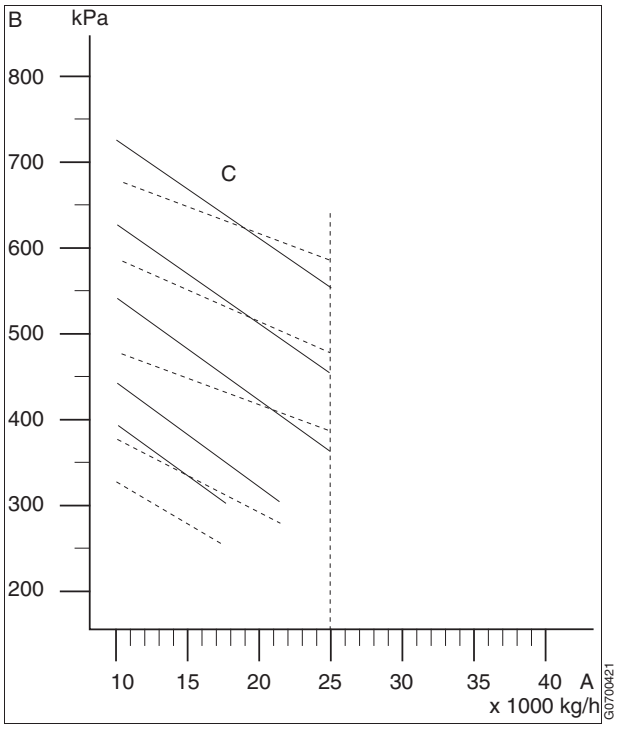
Impeller heavy phase = diameter 140.

Impeller light phase = diameter 120.

The curves have been obtained when operating with water and when 10% of the total flow was taken out as light phase.

– – – – – = light phase

——— = heavy phase



A. Inlet flow
B. Outlet pressure
C. Constant inlet pressure directly before the separator from below: 50, 100, 200, 300 and 400 kPa

Impeller diagram for 714

Flow – outlet pressure. Constant inlet pressure.

Impeller heavy phase = diameter 140.

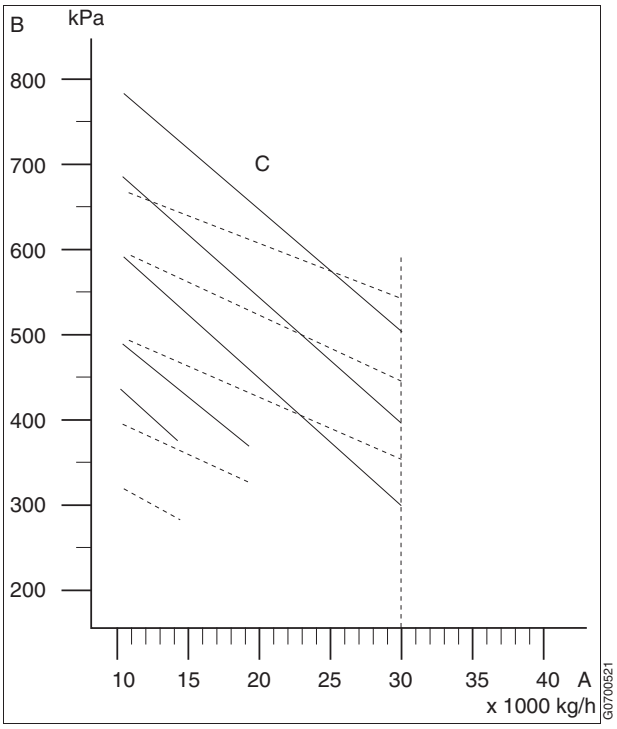
Impeller light phase = diameter 120.

The curves have been obtained when operating with water and when 10% of the total flow was taken out as light phase.

– – – – – = light phase

——— = heavy phase

Selection of outlet impeller



A. Inlet flow
B. Outlet pressure
C. Constant inlet pressure directly ahead of the separator from below: 50, 100, 200, 300 and 400 kPa

5.6.3 Permissible inlet and outlet pressures, BM 618

Inlet	Recommended inlet pressure: 200 – 400 kPa (2 – 4 bar). Min 200 kPa (2 bar). Max. 600 kPa (6 bar).
Outlet	Applies to light and heavy phases. Recommended outlet pressure: 300 – 600 kPa (3 – 6 bar). Max. 600 kPa (6 bar).
Exception	At throughputs of up to 40 000 kg/h, the following applies: Recommended outlet pressure: Approx. 600 kPa (6 bar), which is also the max. value.

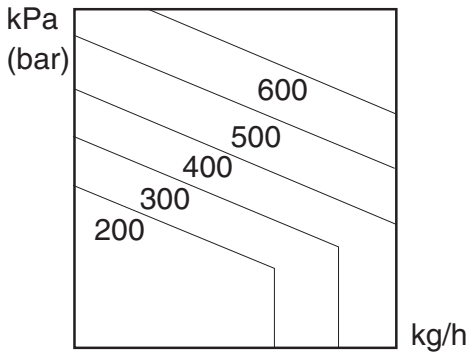
NOTE

An inlet or outlet pressure that is higher than necessary will lead to higher power consumption and a shorter life for the axial seals.

If a lower inlet pressure or a higher outlet pressure than those stated above is desirable in some particular case, this should be discussed with a supplier representative.

Explanation of impeller diagrams that follow

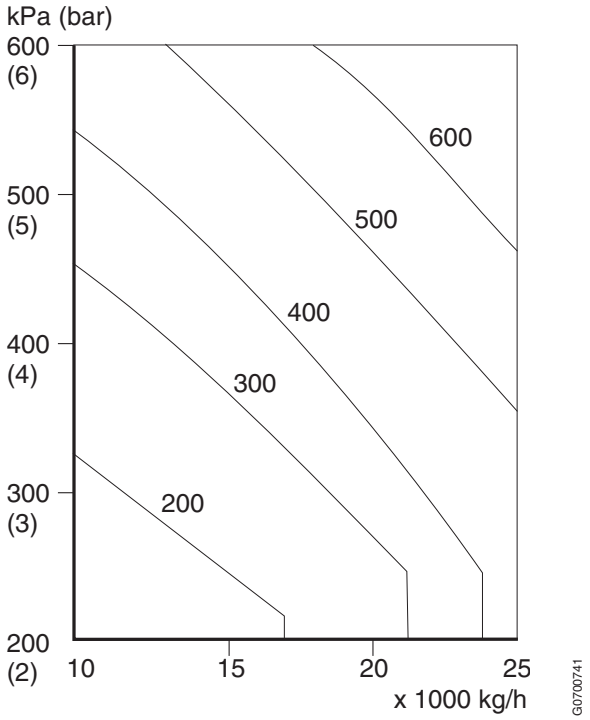
The figures 200, 300, 400, 500 and 600 indicate the inlet pressure directly in front of the separator.



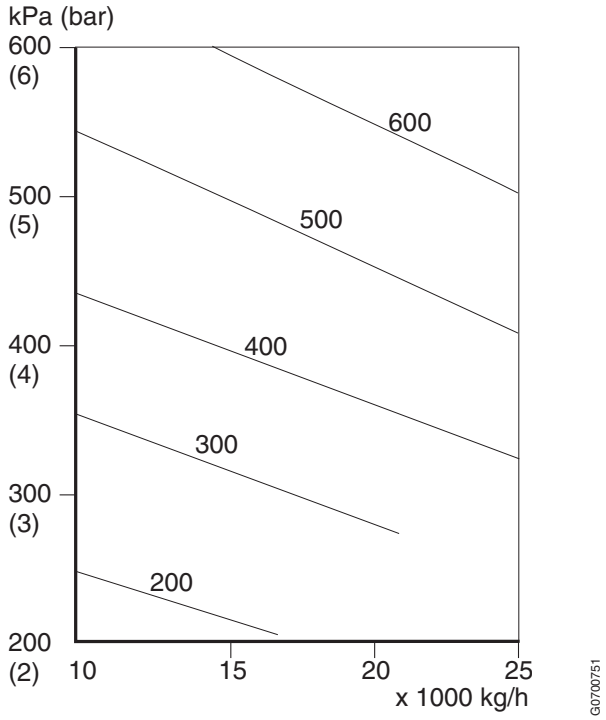
G0700621

The curves that follow have been obtained when operating with water at approx. 25 °C when 3% of the total flow (throughput) was being discharged through the light phase outlet.

Deviations of ± 50 kPa (0,5 bar) from the curves must be regarded as normal.



Impeller 120 mm diameter light phase



Impeller 80 mm diameter heavy phase

5.6.4 Permissible inlet and outlet pressures for C / H 518 / 618 / 718 and H 818

Inlet	Recommended inlet pressure: 200 – 400 kPa (2 – 4 bar). Min. 200 kPa (2 bar). Max. 600 kPa (6 bar).
Outlet	Applies to light and heavy phases. Recommended outlet pressure: 300 – 600 kPa (3 – 6 bar). Back pressure for light phase: 0 - 700 kPa. Outlet pressure for heavy phase: 0 - 600 kPa
Exception	For H 618 at a throughput of up to 40 000 kg/h, the following applies: Recommended outlet pressure: Approx. 600 kPa (6 bar), which is also the max. value.

NOTE

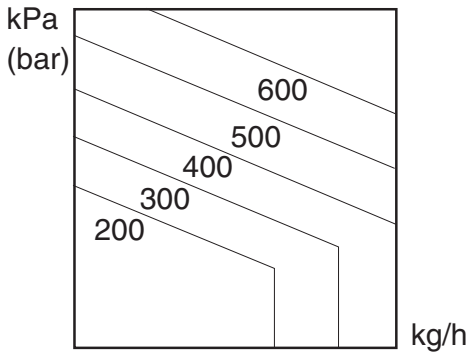
An inlet or outlet pressure that is higher than necessary will lead to higher power consumption and a shorter life for the axial seals.

If a lower inlet pressure or a higher outlet pressure than those stated above is desirable in some particular case, this should be discussed with a supplier representative.

Explanation of impeller diagrams that follow

The figures 200, 300, 400, 500 and 600 indicate the inlet pressure directly in front of the separator.

kPa (bar) indicates the outlet pressure for the heavy phase. The outlet pressure for the light phase is always higher than the outlet pressure for the heavy phase with the exception of the curves for C 518. With nominal throughput for H 518 (25 000 kg/h) and H 618 (30 000 kg/h), the outlet pressure for the light phase is approx. 100 kPa (1 bar) higher than the outlet pressure for the heavy phase.



G0700621

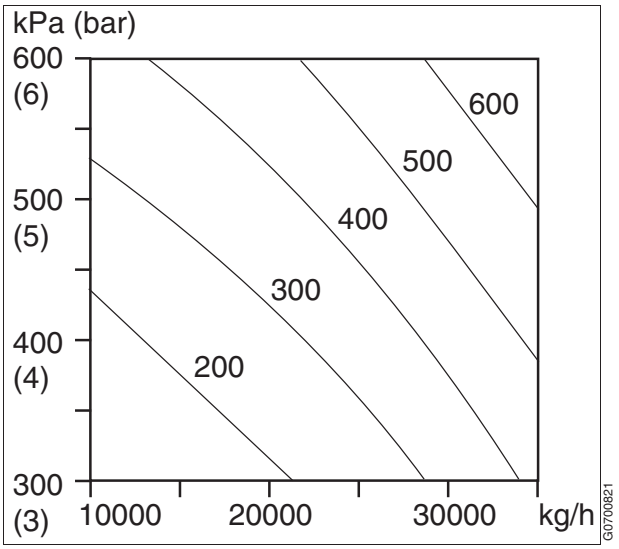
The curves that follow have been obtained when operating with water at approx. 25 °C when 10% of the total flow (throughput) was being discharged through the light phase outlet.

Deviations of ± 50 kPa (0,5 bar) from the curves must be regarded as normal.

C 518

Impeller: 60 mm diameter light phase, 140 mm diameter heavy phase.

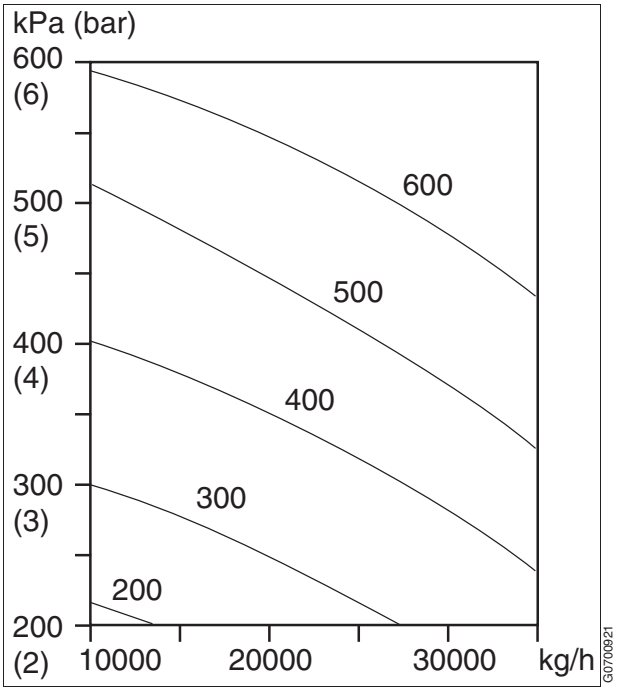
Note: This curve shows **heavy phase** pressure only. Corresponding light phase pressure is given in the curve below.



C 518

Impeller: 60 mm diameter light phase, 140 mm diameter heavy phase.

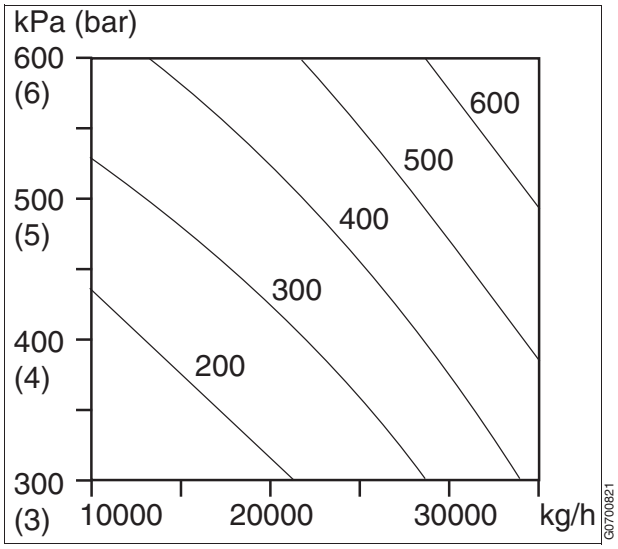
Note: This curve shows **light phase** pressure only.



H 518

Impeller: 120 mm diameter light phase, 140 mm diameter heavy phase.

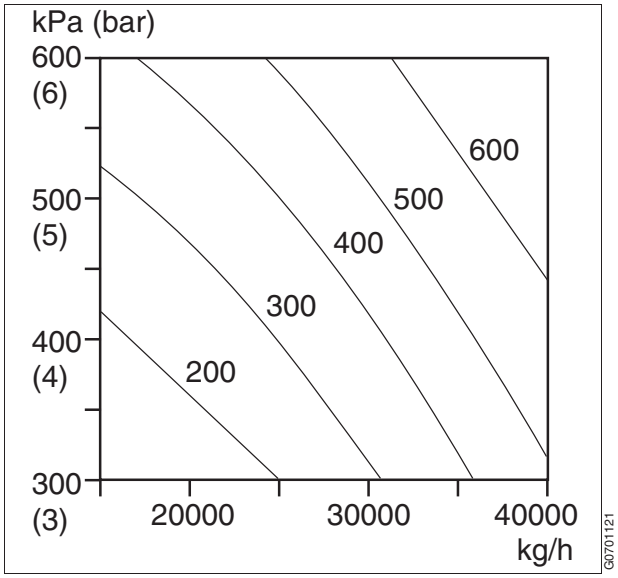
This combination of impellers is included in the delivery.



H 618

Impeller: 120 mm diameter light phase, 140 mm diameter heavy phase.

This combination of impellers is included in the delivery.



H 718

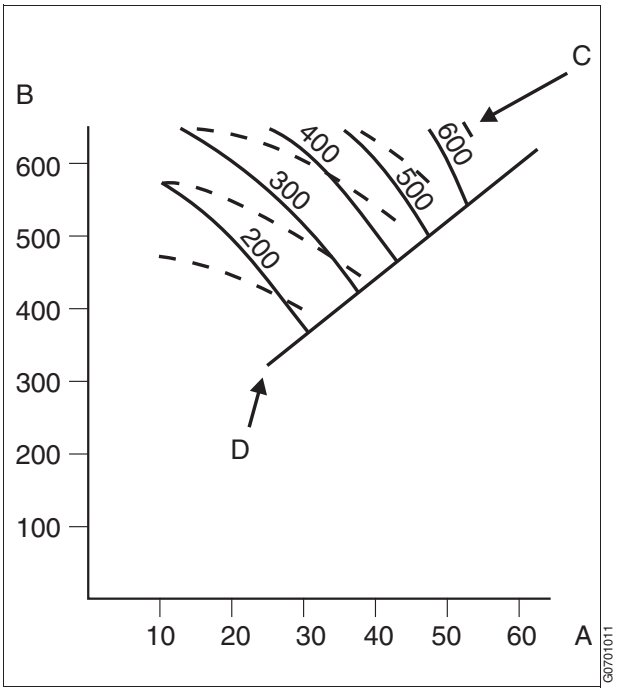
The curves that follow have been obtained when operating with water at approximately 25 °C when 10% of the total flow (throughput) was being discharged through the light phase outlet.

Deviations ±50 kPa (0,5 bar) from the curves must be regarded as normal.

- - - - - Light phase, impeller = Ø 120

——— Heavy phase, impeller = Ø 140

This combination of impellers is included in the delivery.

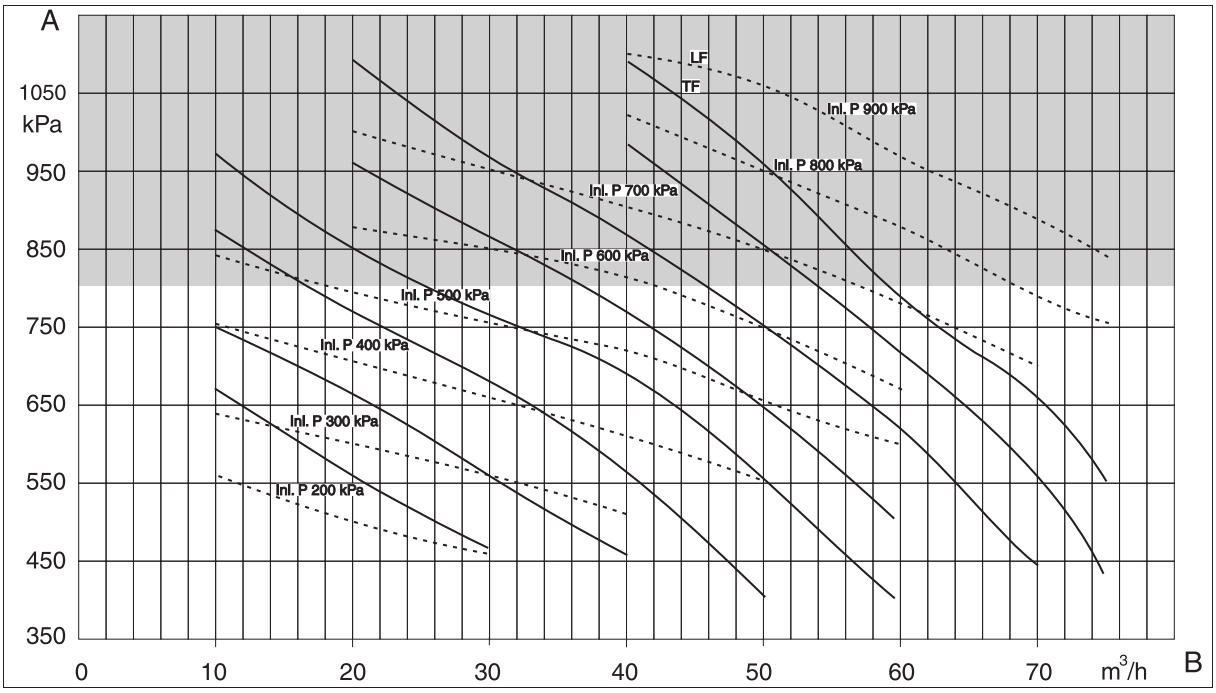


A Flow-rate x 1000 kg/h
B Backpressure kPa
C Constant inlet pressure, kPa
D Minimum inlet pressure to reach flowrate

818 HGV

The curves that follow have been obtained when operating with water at approximately 25 °C when 10% of the total flow (throughput) was being discharged through the light phase outlet.

Deviations ±50 kPa (0,5 bar) from the curves must be regarded as normal.



Pump diagram for outlet 564481-01

A. Counter-pressure

B. Flow

"Inl. P" means Inlet pressure

– – – – – Light phase, impeller = Ø 120

——— Heavy phase, impeller = Ø 140

This combination of impellers is included in the delivery.

The separator should normally not be operated in the shadowed area and preferably in the flow range 30 - 70 m^3/h.

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