OPERATING INSTRUCTIONS

Horizontal Peeler Centrifuge
HZ 160/5 Si

Revision:	0
Sales Order Number:	37000860
Serial Number:	60001537, 60001550, 60001551
Purchase Order Number:	043642–1/200EBO

This document must be studied carefully before installation and commissioning of the equipment!

Chapter 1 through 6 of this document were already included with the Installation Information. Within the scope of the order handling, however, additional and more concrete information may have been added. We therefore recommend that you read through these chapters in detail again.

2 Description of the Horizontal Peeler Centrifuge

The horizontal peeler centrifuge is a filtration centrifuge of batchwise operation for the dehydration and washing of solid−liquid mixtures with fine and medium−size particles of free flowing consistency.

It is distinguished by its batchwise operation, high adaptation to varying product requirements, short optimizing phases of the processing operation, uniform cake washing, gentle product treatment and a complete product discharge.

2.1 Mechanical Design

The horizontal peeler centrifuge of ANDRITZ KMPT GmbH is featuring a clear distinction between the process area/clean room and the drive unit. Any contamination of the product by the utilities of the drive unit is almost completely eliminated.

2.1.1 Design of the Process Area

The process area of a horizontal peeler centrifuge comprises essentially the cantilever mounted screen basket, the feed pipe with the feed distributor, the wash device, the peeling device, the solids outlet and the process housing (see Fig. 1).

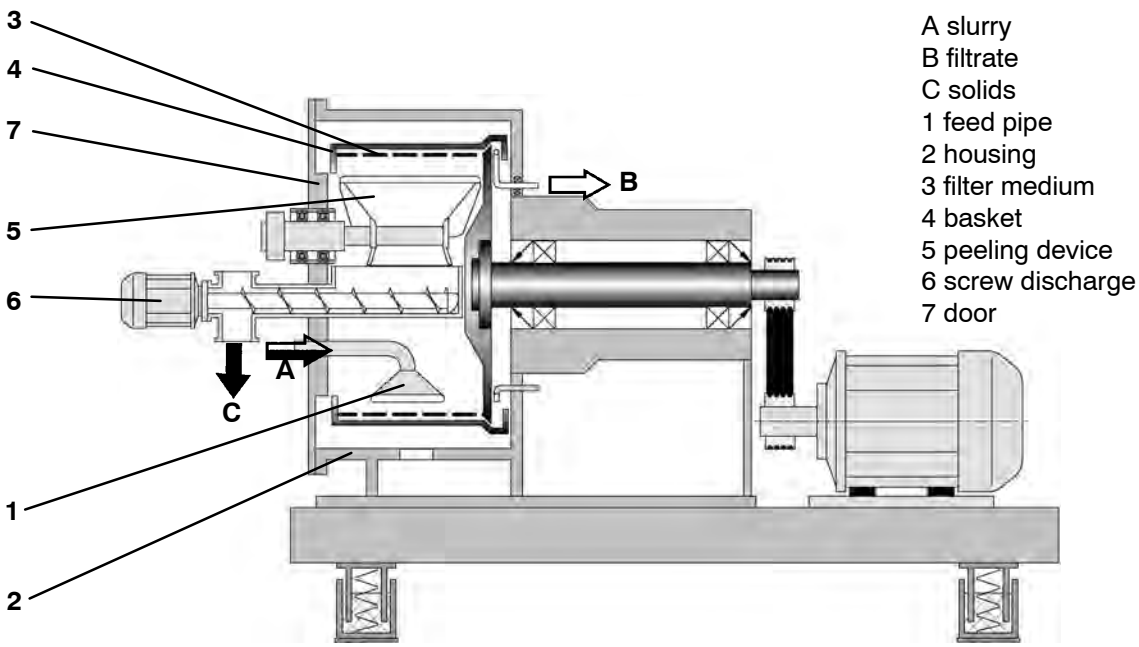


Fig. 1: Process Area of a horizontal peeler centrifuge

The filter medium is installed inside of the cantilever mounted screen basket.

2.1.2 Design of the Drive Unit

The drive unit consists essentially of the rotor drive and the rotor shaft with the bearing.

The rotor shaft is supported in roller bearings. The sealing of the drive unit against the process area is guaranteed at the rotor shaft either by lip seal which can be loaded by seal gas, or by a mechanical seal.

The horizontal peeler centrifuge is installed on damping elements which will convey a minimum of residual dynamic forces only into the place of installation; for this reason a few adaptations only will be required for incorporating the peeler centrifuge into the plant.

2.2 Processing

In the horizontal peeler centrifuge of batchwise operation the solid−liquid−mixture to be separated will be processed by the operations of distribution, main filtration, intermediate dewatering, washing, final dewatering and solids discharge. The operations are processed in the horizontal peeler centrifuge successively and at the same place (see Fig. 2 and 3).

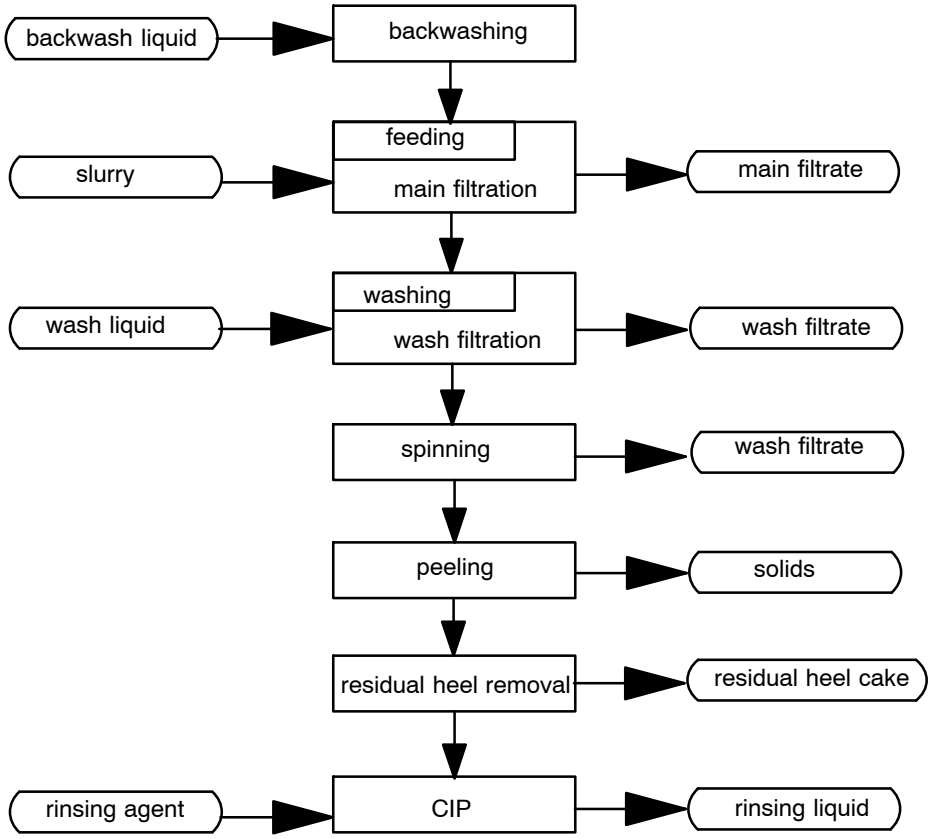


Fig. 2: Processing operations in a horizontal peeler centrifuge

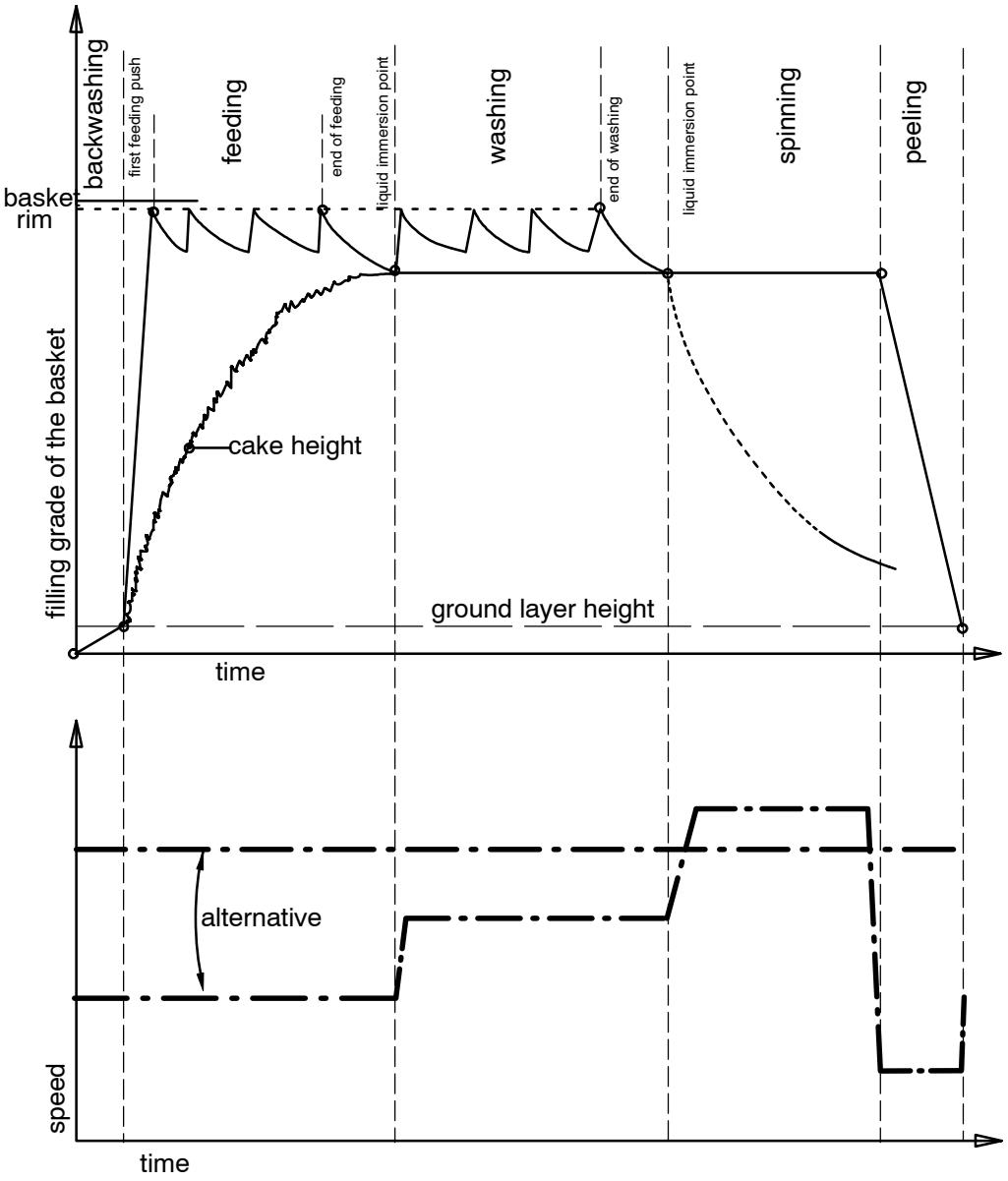


Fig. 3: Ongoing process with liquid levels, cake thickness and speeds

2.2.1 Backwashing (only in machines with siphon basket)

When a residual heel is left in the siphon basket, the residual heel can be backwashed the next feed step (see Fig. 2 and 3). For this purpose a suitable liquid will rinse the residual heel counter to the filtration flow direction in order to avoid or at least delay obstruction of the heel. Contamination and fine particles in the fine capillary tubes of the heel cake will be dislodged by this backwash operation.

2.2.2 Feeding

The slurry is filled uniformly in several steps through a feed distributor into a screen or a siphon basket rotating at high speed (see Fig. 2 and 3). The slurry is accelerated in the screen basket up to circumferential speed. The solids settle to form the filter cake. Due to the centrifugal force, in siphon centrifuges by additional pressure difference, the liquids are filtering through the filter cake. The filtrate leaves the process area through the housing. The slurry feeding is continued till the requested thickness of the filter cake is reached.

The main filtration is completed as soon as the slurry liquid disappears in the surface of the filter cake.

2.2.3 Washing

When the filter cake must be washed in order to obtain the desired product purity, it is advisable in general to supply the wash liquid immediately after the liquid immersing point (see Fig. 2 and 3). By a late supply of the wash liquid the filter cake may be deteriorated by cracking or air may be entrapped in the capillary tubes of the filter cake. Since a uniform permeation of the filter cake by wash liquid cannot be guaranteed in this case, the wash efficiency will be reduced in either case.

The wash filtration is completed when the wash liquid disappears in the surface of the filter cake.

2.2.4 Dry−Spinning

The dry−spinning operation starts immediately at the liquid immersing point after the filling resp. after the washing operation (see Fig. 2 and 3). The spinning time depends on the dewatering characteristics of the product and the requested residual moisture. For the dry−spinning operation the basket speed can be increased in order to reduce the required dry−spinning time.

2.2.5 Peeling

As soon as the requested residual moisture is obtained the solids cake is taken−off by advancing the peeler knife (see Fig. 2 and 3).

2.2.6 Removal of the Residual Heel Cake

After a certain number of batches which depends on the product, the residual heel will have to be removed.

For the hydraulic removal of the residual heel cake a total quantity of rinsing liquid of approx. 50 % of the basket volume is supplied through the feed pipe at low speed, and by cycles. The residual heel is raised by the advanced peeler knife and the rinsing liquid. The residual heel cake is peeled−off as sludge by the peeler knife.

For the pneumatic removal of the residual heel cake this one is blown−off by a nozzle set which can be moved−in separately and which is installed at the door. The residual heel cake is removed from the filter medium by compressed air or by pressure gas and is peeled−off by the advanced peeler knife. The pneumatic removal of the heel cake is performed at low speed.

2.2.7 Cleaning in place

The automatic cleaning of the process area is obtained by the operation called cleaning in place (see Fig. 2).

A spray pipe is provided for cleaning the filtrate area and the filtrate area side of the basket. The rear wall is cleaned by the wash liquid through a nozzle head.

A cleaning pipe is provided for the cleaning of the process area and the accessories. The cleaning liquid can be supplied through the feed pipe.

3 Technical Data

3.1 Characteristic Data of the HZ 160/5 Si

Order Data		
Plant/Password	–	
Customer/Purchaser	SNF SAS, F for SNF Flopam Inc., USA	
Centrifuge type	HZ 160/5 Si	
Year of manufacture	2013	
Sales Order No.	37000860	
Serial No.	60001537, 60001550, 60001551	
General Arrangement Drawing		
Drawing Number	47–0050–00.719	
Item Number	7007624	
Number of bill of materials	7007624	
Basket diameter	1 600	mm
Admissible density of the feed charge [1)]	1 250	kg/m^3
Speed, max. adm.	950	rpm
Centrifugal force C at max. adm. speed	805	
Operating speed	950	rpm
Load, max. adm.	1 043	kg
To be completed by Owner		
Tag No.		
Inspection No.		
Site/building		
.....		

1) In filter centrifuges with discontinuous operation the permissible density of the feed charge does not correspond to the density of the fed suspension, instead

a) when the solids form the heavy phase of the suspension:
the pressing density of the filter cake fully saturated with liquid. i.e. the maximum apparent density of the particles as developed in the centrifugal field, wherein the pore volume of the filter cake is completely filled with liquid.

b) when the suspension liquid forms the heavy phase of the suspension:
the density of the suspension liquid.

3.2 Fields of Application

The machine HZ 160/5 Si under serial No. 60001537, 60001550, 60001551 is suitable exclusively for the separation of the products specified on the technical data stated on the type plate. The material of construction of the centrifuge is selected considering the properties of the processed product (in particular corrosion).

The operating conditions like humidity and temperature can also be of effect on the operation of the machine. Considerable changes of these values must be advised to the manufacturer.

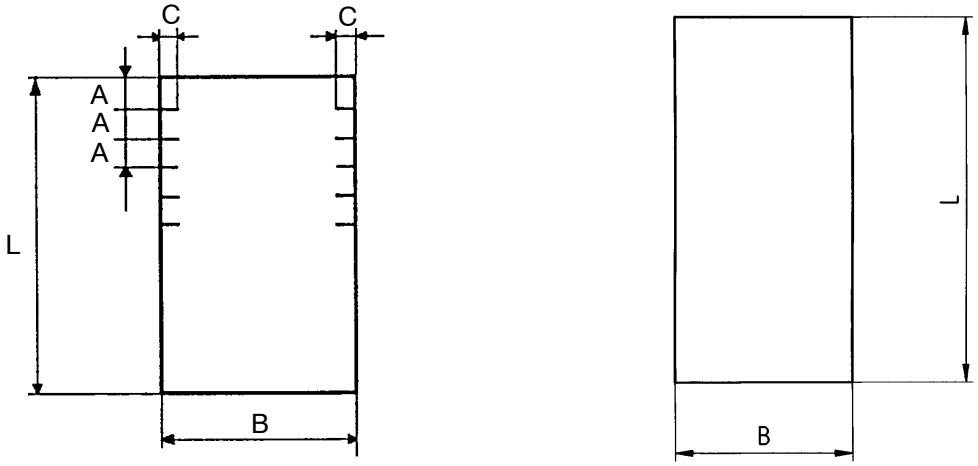
Any and all other use is not permissible. The manufacturer will not be liable for damages resulting therefrom but the risk is at the sole responsibility of the owner.

These data must be changed only after approval by the manufacturer and revision of the supplier certificate.

3.3 Basket and Filtration

Basket			
	Drawing No.	47–1750–01.705	
	Item No.	7007803	
	Basket Serial No.	37792, 37793, 37794	
	Inside diameter	1 600	mm
	Inside length	1 000	mm
	Basket rim diameter	1 200	mm
	Basket shell wall thickness	24	mm
	Nominal volume	880	dm^3
	Gross volume	824	dm^3
	Weight	3 100	kg
	Filtering surface	5.0	m^2
	Moment of inertia (unloaded basket)	1 630	kg m^2
	Moment of inertia (loaded basket)	2 200	kg m^2
	Max. adm. speed for basket	950	rpm
	Centrifugal force at max. adm. speed	805	g
	Unbalance load in the basket for limit 2 (shut-down) at an operating speed of 950 rpm	11	kg
Filter Cloth			
	Type	Braid mesh PZ	
	Mesh width	40	µm
	Air permeability	–	l/dm2/ min

Dimensions of the filter cloth	*Metal cloth*	*Plastic / Textile cloth*
Ordering width of filter cloth	1 050	1 050 mm
Ordering length of filter cloth	2 x 2 630	2 x 2 630 mm
Finished width of filter cloth B	1 010	1 050 mm
Finished length of filter cloth L	2 x 2 600	2 x 2 600 mm
Overlapping	115	115 mm
Cut depth C	16	– mm
Cutting space A	150	– mm



Metal cloth

Plastic / Textile cloth

Fig. 4: Dimensions of the filter cloth

3.3.1 Correlation between basket speed and centrifugal force C

The following illustrates the dependence of rotation speed and centrifugal force C in a centrifuge with a basket diameter of 1 600 mm.

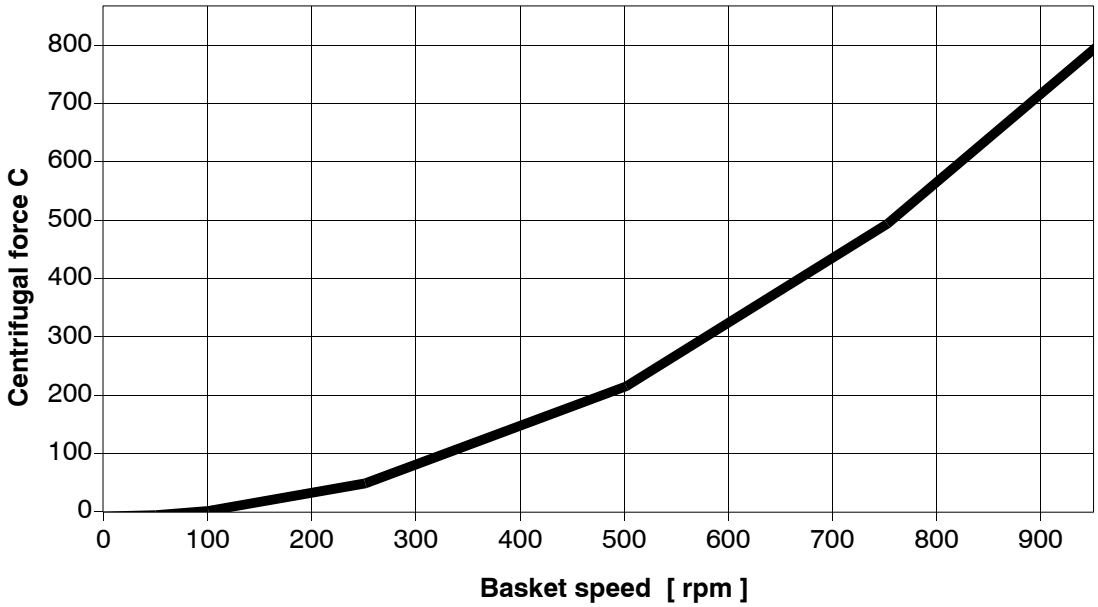


Fig. 5: Basket speed and Centrifugal force C for a centrifuge with basket diameter of 1 600 mm

The centrifugal force C can be calculated in dependence of the basket speed of rotation and the basket diameter as follows:

Centrifugal force C = n^2 * d / 1800 where n = basket revolutions per minute (rpm)
d = basket diameter in m

The basket rotation speed can be calculated in dependence of the centrifugal force C and the basket diameter as follows:

n = square root of (1800 * C / d) where n = basket revolutions per minute (rpm)
d = basket diameter in m

3.3.2 Technical Data for dismantling and re–assembly of the basket

Material of basket	**1.4404**
Dismantling of basket	
Expanding pressure of basket hub, max. adm.	1 100 bar
Re–assembly of basket	
Thrust pressure of rotary piston press	up to 640 bar (according to friction conditions)
Expanding pressure of basket hub	950 bar
Pressure fit stroke	5.4 mm

The above given data are only valid for a mounting temperature of approx. 20 °C!

3.4 Drive

3.4.1 Main drive

Drive motor		
Type	NEMA, 447T	
Protection	IP55	
Ex proof.	Class I, Division II, C & D (NEC 500)	
Power	150	HP
Electric connection	460	V, 3 ph
Frequency	60	Hz
Nominal speed at 60 Hz	1 800	rpm
Frequency converter for drive motor		
Frequency range	3.5 – 60	Hz
V–belt drive		
Pulley active diameter d_{a1} (motor end)	295	mm
Pulley active diameter d_{a2} (drive end)	560	mm
Ratio of reduction d_{a2}/d_{a1}	1.9 : 1	
V–belt (see Fig. 6)		
Type	5V	
Number	8	
Active length $\mathbf{L_w}$	4 064	mm
Test force **f** each V–belt	75	N
Pressing in depth $\mathbf{E_a}$	39	mm
when fitting the first time	31	mm
Force of stringer **T**	510	N
when fitting the first time	660	N
Axial force $\mathbf{S_a}$	8 200	N
when fitting the first time	11 000	N
Center distance **e**	1 354	mm
Speed pick–up 1		
Type	1 x proximity switches installed at bearing housing	
Number of pulses per one rotation of rotor	8	
Speed pick–up 2		
Type	1 x proximity switches installed at motor pulley	
Number of pulses per one rotation of motor	4	

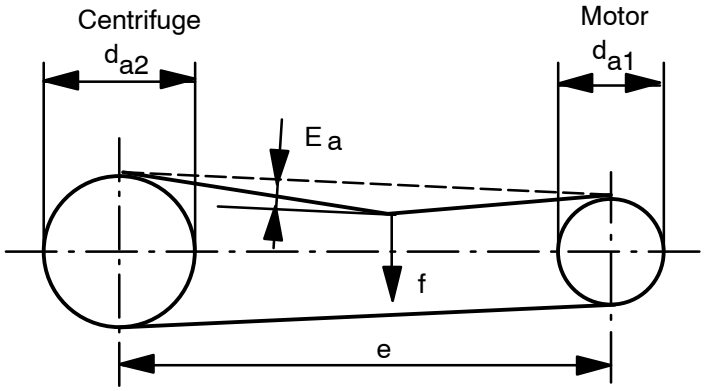


Fig. 6: Belt drive

3.4.2 Screw drive

Drive motor		
	Type	NEMA, 184TC
	Protection	IP55
	Ex proof.	Class I, Division II, C & D (NEC 500)
	Power	5 HP
	Electric connection	460 V, 3 ph
	Frequency	60 Hz
	Nominal speed at 60 Hz	1 800 rpm
Reduction gear		
	Type	KHF57
	Ratio of reduction	13.25 : 1
	Amount of oil filling	3.1 l
	Type of oil	synthetic oil CLP HC 220
	First oil filling	Mobil SHC 630
Resulting speed of screw		
	Speed of screw	approx. 130 rpm
Speed pick–up		
	Type	1 x proximity switches installed at front side of screw housing
	Number of pulses per one rotation of screw	1

3.5 Additional Devices

Hydraulics		
	Hydraulic power pack	
	Working pressure	50 bar
	Type of hydraulic fluid	ISO46 (HLP46)
	Adm. temperature of hydraulic fluid	10 – 65 °C
	Diaphragm accumulator	
	Setting at works (overpressure)	< 2 bar
	Initial gaspressure p_0	30 bar
	Gas filling	nitrogen
	Drive motor	
	Type	NEMA, 184TC
	Protection	IP55
	Ex proof.	Class I, Division II, C & D (NEC 500)
	Power	3 HP
	Electric connection	460 V, 3 ph
	Frequency	60 Hz
	Nominal speed at 60 Hz	1 800 rpm
	Hydraulic control valves	
	Type	el.–hydr. way valves 4WE6
	Nominal size	6
	Number of valves	5
	El. characteristics of solenoids	24 V DC IP65
	Ex–proof.	Class I, Division II, C & D (NEC 500) Class II, Division II, E, F & G (NEC 500)
Lubricating oil unit		
	Operating pressure	8 bar
	Oil quantity front bearing	0.5 lpm (0.13 gpm)
	Oil quantity rear bearing	0.3 lpm (0.08 gpm)
	Type of hydraulic fluid	ISO46 (HLP46)
	Adm. temperature of hydraulic fluid	10 – 65 °C
	Drive motor	
	Type	NEMA
	Protection	IP55
	Ex proof.	Class I, Division II, C & D (NEC 500)
	Power	1 HP
	Electric connection	460 V, 3 ph
	Frequency	60 Hz
	Nominal speed at 60 Hz	1 800 rpm

Gas supply for seal purge panel	
Installed components	– shut–off valve (manual) – shut–off valve (controlled) – pressure regulator with gauge (4 x) – flow indicator (4 x) – one way flow control valve (4 x)
Valve (controlled)	24 V DC IP65
Ex–proof.	Class I, Division II, C & D (NEC 500)

3.6 Materials of construction

Housing (shell)		
	solid: St 52–3	Lining (2mm): 1.4404
Back wall		
	solid: St 52–3	Lining (2mm): 1.4404
Door		
	solid: St 52–3	Lining (2mm): 1.4404
Shaft		
	1.7225.05 (42CrMo4V)	
Basket		
	Basket hub	1.4404
	Basket shell	1.4404
	Basket rim	1.4404
	Rim of the siphon chamber	1.4404
	Lining/coating of basket	–
Filtration		
	Filter mesh	1.4401
	Backup screen	1.4435
	Keeper plate	–
Product–wetted accessories		
	Feed pipe	1.4404
	Discharge knife	Stellite 6
	Screw conveyor	1.4404
	Further equipment	1.4404
Gasket and seals		
	Static sealings	in contact with product: FEP encapsulated, PTFE no contact with product: FPM, NBR
	Dynamic sealings	in contact with product: PTFE graphit no contact with product: PTFE graphit
Painting of parts not in contact with product (SS parts are not painted)		**Thickness**
	Primer	SikaCor EG–Phosphat (epoxy resin) 60 µm
	Intermediate coat	SikaCor EG–Phosphat (epoxy resin) 60 µm
	Top coat	Sika Permacor 2330 (acrylic polyurethane) 60 µm
	Colour of top coat	RAL 5015 (sky blue)

3.7 General Information

Equipment			
	Machine type	HZ 160/5 Si	
	Brake	via motor	
	Product feed	Feed pipe	
	Product discharge	Discharge by screw Ø348	mm
	Filtrate discharge	Siphon skimming pipe	
	Vapor return	–	
	Door locking	electric	
	Door clamping	–	
	Idle run power, max. approx.	15	kW
	Rotor running down (without braking), ca.	60	min
	Ex–proof of all electric utilities	yes	
	Siphon pipe, working position A	30	mm
Pressure			
	Design pressure for the process area (over-pressure)	0.04	bar
	Operation pressure in the process area during normal operation (overpressure)	0	bar
	Operation pressure in the process area during heel cake removal (overpressure)	0	bar
Temperatures			
	Adm. ambient temperature	0 – 40	°C
	Design temperature	0 – 50	°C
	Adm. temperature of the processed product	0 – 35	°C
	Transport Temperature, min.	> 0	°C
	Storage Temperature, min.	> –5	°C
	Storage conditions	Conservation	
	Bearing temperature, max.	95	°C
	Adm. temperature of hydraulic fluid	10 – 65	°C
Air sound levels			
	Pressure sound level according to machinery directive	< 85	dB(A)
Peeling			
	Max. discharge speed	950	rpm
	Recommended peeling time (peeling time = movement time of peeler from OUT to IN)	60–300	sec
	Max. adm. peeling time	5	min
Residual heel cake thickness			
	Minimum residual heel cake thickness = space between peeler knife and filter cloth	10	mm

3.8 Installation Details

General Arrangement Drawing: 47–0050–00.719

3.8.1 Weights

Weights, approx.		
Shipping weight (centrifuge without foundation block)	13 000	kg
Operating weight (shipping weight and max. load)	14 000	kg
Weight of centrifuge with foundation block and drive	36 500	kg
Weight of foundation block	22 000	kg
Basket	3 100	kg
Lifting tool	430	kg
Drive, cpl.	1 500	kg
Drive motor	950	kg
Swivel arm of large peeler	350	kg

3.8.2 Dimensions

Dimensions of machine without accessoires, approx.		
Length	4 050	mm
Width	2 350	mm
Height	2 300	mm
Dimensions of foundation block, approx.		
Length	3 700	mm
Width	3 200	mm
Height	840	mm
Required space for installation and operation of the machine and for maintenance work , approx.		
Length	7 500	mm
Width	5 900	mm
Height	4 500	mm

3.8.3 Place of installation of the machine (Rigid foundation, building)

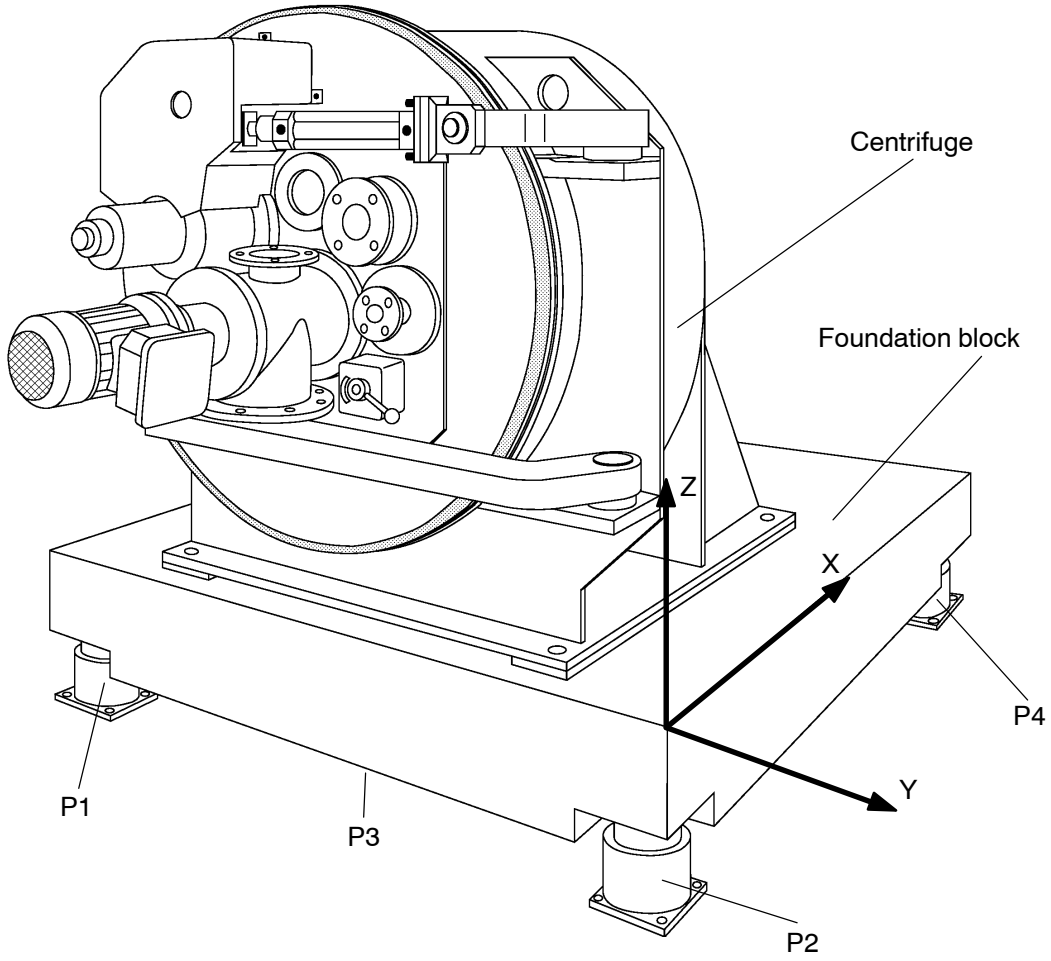


Fig. 7: Position of the spring damping elements

Elastic Installation			
Spring element type, front left	P1	2055693	
Spring element type, front right	P2	2055693	
Spring element type, rear left	P3	2055687	
Spring element type, rear right	P4	2055687	
Adm. ambient temperature for Visco material inside spring elements		0–40	°C
Data sheet of spring elements		see chap. 9.15	
Static forces to the place of installation for each spring damping element, approx.			
vertical Z–direction, front left	P1	97 000	N
vertical Z–direction, front right	P2	103 000	N
vertical Z–direction, rear left	P3	77 000	N
vertical Z–direction, rear right	P4	82 000	N
Natural frequency of the unit installed on the spring damping elements, approx.			
frequency		123	rpm

Dynamic residual interfering forces to the place of installation for each spring damping element, approx.		
at operating speed		
horizontal X–direction	± 1 700	N
horizontal Y–direction	± 1 700	N
vertical Z–direction	± 13 000	N
at resonance passage (natural frequency)		
horizontal X–direction	± 2 600	N
horizontal Y–direction	± 2 600	N
vertical Z–direction	± 19 000	N
Max. vibration strokes, approx.		
horizontal X–direction	± 5.0	mm
horizontal Y–direction	± 5.0	mm
vertical Z–direction	± 3.0	mm
Place of installation		
see chapter 5.6 for further information about the place of installation		

The transmission of the dynamic forces to the individual supporting points P1 to P4 is not synchronous!

3.8.4 Foundation block (steel reinforced concrete block)

Dimensions and shape of the foundation block		
see General Arrangement Drawing 47–0050–00.719		
Weight of the foundation block		
Weight	22 000	kg
Loads on the foundation block, approx.		
static load	142 500	N
dynamic load (at normal speed and max. 5% of the load weight as active unbalance)	365 000	N
Making of steel foundation block (reinforced concrete block)		
see chapter 5.8 for instructions of making steel reinforced concrete block		

3.9 Connection list

The following connections can be found at the centrifuge. Please refer also to the General Arrangement Drawing 47−0050−00.719.

Pos.	Description	Standards	Connecting dimensions	Remarks
N1	Solids discharge	ANSI RF	14” 150 lbs	
N2	Feed pipe inlet	ANSI RF	5” 150 lbs	
N4	Blind cover			
N5	Feed controller	Type: TFKR (thermal, mechanic)		
N5.1	Gas supply for sealing at feed controller			→ N41
N6	Heel cake removal		Pipe Ø28X1.5	
N6.1	Blind plug			
N7	Sight glass		Ø140	
N7.1	Sight glass rinsing	ASA	1/4−18 NPT male thread	
N9.1 N9.2 N9.3 N9.4	Centrifuge inside rinsing, 4 nozzles	ASA	1/2−14 NPT female thread	N9.4 with additional piping for hose DN16 or pipe Ø18x1.5 mm
N10	Siphon skimming pipe (Filtrate outlet)	ANSI RF	3” 150 lbs	
N11	Back rinsing pipe	ANSI RF	3” 150 lbs	
N12	Venting	ANSI RF	3” 150 lbs	
N15	Sight glass for siphon skimming pipe		Ø125	
N16	Inspection cover at screw discharge			
N18	Rinsing of back wall	ANSI RF	1” 150 lbs	
N19	Inspection cover with rinsing of basket shell	ANSI RF	1 1/2” 150 lbs	
N20	Filtrate overflow	ANSI RF	8” 150 lbs	
N28	Compressed air for pneumatic control box	ASA	3/8 – 18 NPT female thread	
N30	Supply of oil for front bearing lubrication			connected to oil lube unit
N31	Supply of oil for rear bearing lubrication			
N32	Return of oil from bearing lubrication			
N34	Gas supply for shaft sealing			→ N41
N35	Gas supply for bearing sealing at basket side			→ N41

Pos.	Description	Standards	Connecting dimensions	Remarks
N36	Vent / Leckage outlet of seal chamber		Pipe Ø10	remains open; installation of leckage pot is recommended
N37	Rinsing for pre–sealing chamber	ISO 228	G 1/4 female thread	closed by plug
N38	Gas supply for bearing sealing at drive side			→ N41
N41	Gas supply for sealing purge unit	Push–in fitting	for pneumatic hose Ø10mm	Supplies gas to N34 + N35 + N38

Each flange is provided with a number of bolt holes which can be divided by four. The bolt holes are arranged symmetrically to the two main axes in such a way that holes do not coincide with the axes.

3.10 Utility Schedule

3.10.1 Power supply

Power supply	
• for control unit:	115 V AC, 60Hz, 1 phase
• for frequency converter:	460 V AC, 60Hz, 3 phases

3.10.2 Flow rates

Flow rates are partly process dependent.

Pos.	Description	Medium	Pressure (Overpressure)		Flowrate		Remarks
			max.	at operation (recommend.)	max.	at operation (recommend.)	
N2	Feed pipe	Suspension	0.5 bar	0.2–0.5 bar	max: 1 800 l/min	by customer	Pressure corresponds to a water column of 5m
		Wash liquid	0.5 bar	0.2–0.5 bar	max: 1 200 l/min	by customer	
N5.1	Gas supply for sealing at feed controller	Nitrogen	1 bar	0.1 bar	–	–	
N6	Heel cake removal	Nitrogen	10 bar	6 bar	360 Nm^3/h	240 Nm^3/h	see chapter 6.5.5
N7.1	Sight glass rinsing	Water	3–4 bar	2 bar	0.3 m^3/h	0.3 m^3/h	
N9.1 N9.2 N9.3 N9.4	Centrifuge inside rinsing	Water	2 bar	2 bar	3 m^3/h	3 m^3/h	for each connection
N11	Back rinsing pipe	Water	1 bar	0.5 bar			see chapter 6.5.4
N18	Rinsing of back wall	Water	2 bar	2 bar	4.2 m^3/h	4.2 m^3/h	
N19	Rinsing of basket shell	Water	2 bar	2 bar	4.5 m^3/h	4.5 m^3/h	
N28	Compressed air for pneumatic control box	Compressed air	6 bar	6 bar 90 lb/in^2	3.5 Nm^3/h	3.5 Nm^3/h	

Pos.	Description	Medium	Pressure (Overpressure)		Flowrate		Remarks
			max.	at operation (recommend.)	max.	at operation (recommend.)	
N34	Gas supply for shaft sealing	Air / nitrogen	0.7 bar	0.5 bar	1 Nm^3/h	0.35–0.5 Nm^3/h	*) **)
N35	Gas supply for bearing sealing at basket side	Air / nitrogen	0.7 bar	0.5 bar	1 Nm^3/h	0.35–0.5 Nm^3/h	*)
N38	Gas supply for bearing sealing at drive side	Air / nitrogen	0.7 bar	0.5 bar	1 Nm^3/h	0.35–0.5 Nm^3/h	*) **)
N41	Gas supply for sealing purge unit	Air / nitrogen	10 bar	2.5 – 6 bar	3 Nm^3/h	1–1.5 Nm^3/h	total amount for N5.1 + N34, N35 + N38
Nxx	Inertizing: Flushing	Nitrogen	–	–	50 Nm^3/h	15–50 Nm^3/h	total amount: 18 Nm^3 ***)
	Permanent inertizing	Nitrogen	0.1 bar	0.1 bar	10 Nm^3/h	0–10 Nm^3/h	

*) Open fully all flow control valves which are installed at the centrifuge and then also open fully all flow control valves which are installed at the rectangular flow meters. Then set the pressure regulator to the given pressure and afterwards adjust the flow by the flow control valves installed at the rectangular flow meters till the given flow is obtained.

**) Setting of limits: F_{min} = 0.1 Nm^3/h, F_{max} = 1 Nm^3/h.

***) The given values for pre–flushing are only for the centrifuge, but not for downstreams and upstreams equipment.

3.11 Basket Calculation

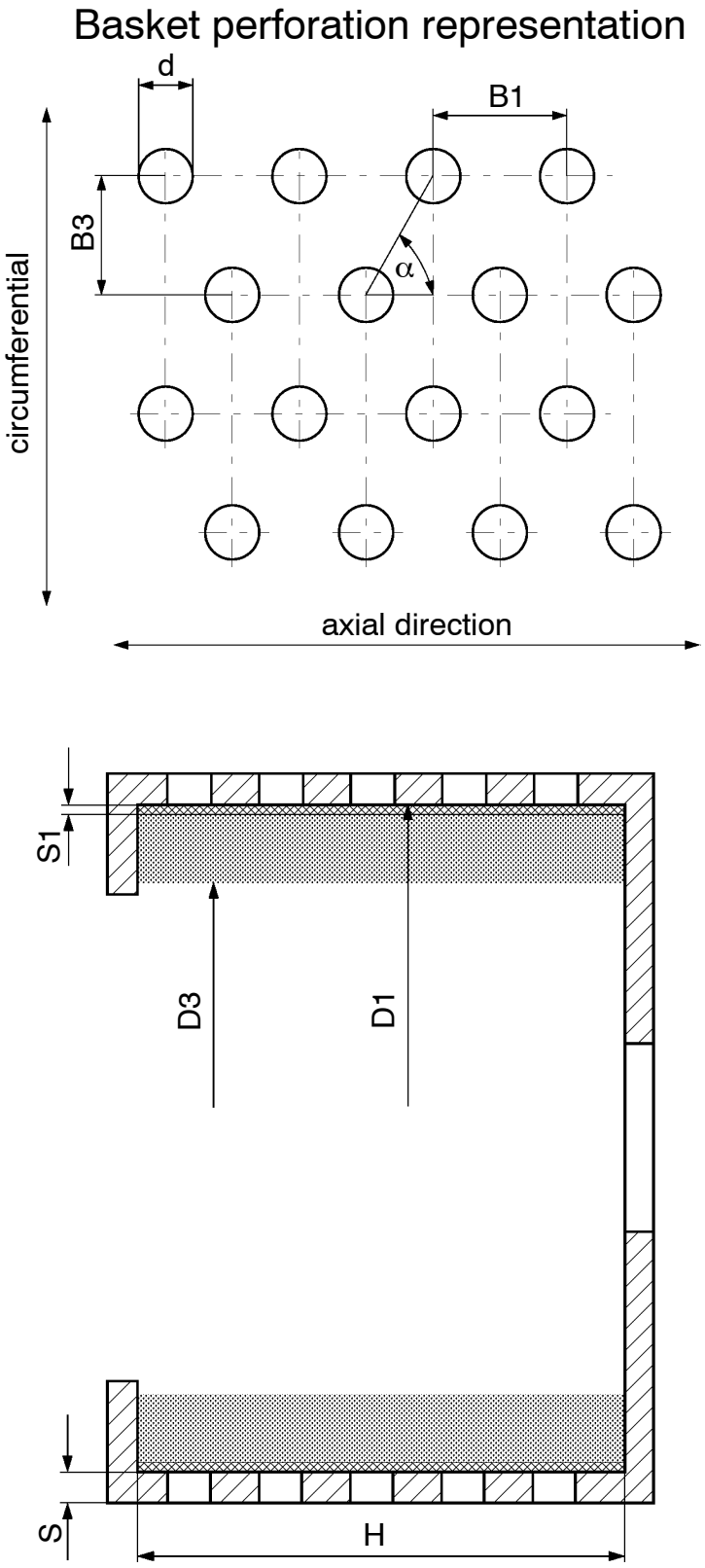


Fig. 8: Dimension Sheet for Basket Calculation

Stress Analysis for Cylindrical Centrifuge Basket according EN 12547

for type HZ / VZ

Order data		Carried out by:	ThiemM
Type:	HZ 160/5,0 Si	Order No.:	37000860
Drawing No.:	47-1750-01.705	Basket No.:	37792, 37793, 37794
Item No.:	7007803	Serial No.:	60001537, -1550, -1551

Basket dimensions			
Inside diameter of basket	D 1 =	1600,0	mm
Thickness of basket shell	S =	24,0	mm
Inside widht of basket	H =	1000,0	mm
Hole rows	Rectangular hole arrangement		
Number of hole rows in circumferential direction	I 1 =	4	
Centre distance of adjacent hole rows in axial direction	B 1 =	360,0	mm
Centre distance of adjacent hole rows in circumferential direction	B 3 =	1275,5	mm
Angle between hole row connections	Alpha =	90,0	Grad
Hole diameter	d =	9,0	mm

Basket insert					Yes	
Insert thickness	S1 =	9,0	mm	Area weigth	G1 =	22,0	kg/m²
Material of basket					1.4404	
Tensile strength	Rm =	520,0	N/mm²	Density	RhoW =	7980	kg/m³
Yield strength	Rp1,0 =	237,1	N/mm²	at temperature	T =	50	°C

Coefficients			
Basket shell	welded (in longitudinal direction)	k1 =	0,90
Welding seam in hole row area			Nein
Perforated basket	Rectangular hole arrangment	k2 =	0,73
	Staggered hole arrangement	k3 =	0,74
	Single hole row	k4 =	0,75
	==>	k =	0,73
Coefficient for density revision		q =	1,00

Product data				Basket speed	n =	950	1/min
Inside diameter	D3 =	1200	mm	Density	Rho FH =	1250	kg/m³
Weigth (homog.)					GFH =	1043,3	kg

Tangential stress			
Due to unloaded basket	Sigma 1 =	71,2	N/mm²
Due to insert	Sigma 2 =	7,9	N/mm²
Due to homogeneous feed	Sigma 4 =	74,1	N/mm²
Total stress	**Sigma T =**	**153,2**	N/mm²

Conditions to EN 12547:	**Sigma T < 0,66*Rp =** 156,5 N/mm²	**==> within tolerance**
	Sigma T < 0,44*Rm = 228,8 N/mm²	**==> within tolerance**