



8 Technical data

This chapter outlines values and information that restrict intended use.

The units of measurement are metric.

8.1 Media requirements



NOTICE!

Incorrect media

Damage to property due to the use of media that does not meet the required parameters.

This may result in damage to the machine or the surrounding area.

- Only use media that meet the required parameters.
- In particular, the pressure must not be higher than is indicated in the table at any time.

8.1.1 Supply media

The table applies only to the media used in the machine. **Disregard** all other media.

Medium	Pressure	Temperature	Quality
CO ₂	<ul style="list-style-type: none">■ 0.5 bar above product pressure■ Maximum 3.2 bar(g), variable	-	Purity according to DIN ISO 8573-1: <ul style="list-style-type: none">■ Quality class 2.3.1 (oil-free, dry)■ Sterile filtered (0.2 µm)
Sterile air	Maximum 3.2 bar(g), variable	-	
Control air	6.0 + 1 bar (over)	-	Purity according to DIN ISO 8573-1: <ul style="list-style-type: none">■ Quality class 2.3.1 (oil-free, dry)
Cold water for lubrication on the plate chain conveyor	<ul style="list-style-type: none">■ On normal keg systems: 4.0 bar(g)■ On large systems: 5.0 bar(g)	-	<ul style="list-style-type: none">■ pH value: < 9.5■ Iron content: < 0.3 mg/l■ Manganese content: < 0.3 mg/l



Medium	Pressure	Temperature	Quality
Cold water for keg cleaning	<ul style="list-style-type: none"> ■ 2.2 ±0.2 bar(g) ■ Maximum 3.2 bar(g) 	-	<ul style="list-style-type: none"> ■ Chlorine content: maximum 70 ppm ■ pH value: 6.5 to 8.5 ■ Electrical conductivity at 25°C: < 1000 µS/cm ■ Water hardness: 5.0 to 7.0 °dH ■ Iron content: < 0.02 mg/l ■ Water supplies conform to Council Directive 98/83/EEC relating to the quality of water intended for human consumption
Hot water for keg cleaning		Minimum 83°C	
Pure steam	1.7 bar(g), variable	~130°C	<ul style="list-style-type: none"> ■ Saturated steam ■ Perfect for culinary use ■ Particle filtered (3 µm)
Hot steam (as heating medium)	4 to 8 bar(g)	152°C to 175°C	<ul style="list-style-type: none"> ■ Saturated steam ■ pH value at 25°C: 6.0 to 9.5 ■ Electrical conductivity at 25°C: < 50 µS/cm ■ Maximum 30 ppm chlorine
Hot steam (as heating medium)	Customer-specific	Customer-specific	<ul style="list-style-type: none"> ■ Maximum 30 ppm chlorine ■ pH value: 6.5 to 9.5 ■ Oxygen at 100 µS/cm: < 0.2 mg/l ■ Oxygen at 1000 µS/cm: < 0.05 mg/l
Caustic for CIP cleaning	<ul style="list-style-type: none"> ■ 2.5 to 3.0 bar(g) ■ Maximum 3.2 bar(g) 	85 °C	<ul style="list-style-type: none"> ■ No coarse impurities ■ Material compatibility for stainless steel (1.4301) and EPDM guaranteed
Acid for CIP cleaning		30°C to 85°C	
Hot water for CIP cleaning		85 °C	
Caustic for keg cleaning		85 °C	
Acid for keg cleaning		30°C to 85°C	



8.1.2 Requirements for the product

Product pressure

The product pressure must be adapted according to the required filling time. The required filling time determines the maximum filling speed. The maximum filling speed, the fitting type of the keg in use and the filling system result in the following minimum product pressures for the main filling phase.

Maximum filling speed	Filling system with product flow speed control*			Filling system with orifice control**
	1.5 l/s	2.2 l/s	2.5 l/s	2.0 l/s
Minimum product pressure at the filling head during the main filling phase (i.e. in the fast filling phase) plus saturation pressure	<ul style="list-style-type: none"> ■ Flat fitting: 1.7 bar(g) ■ Well-type fitting: 2.0 bar(g) 	<ul style="list-style-type: none"> ■ Flat fitting: 2.2 bar(g) ■ Well-type fitting: 2.8 bar(g) 	<ul style="list-style-type: none"> ■ Flat fitting: 2.5 bar(g) ■ Well-type fitting: 3.6 bar(g) 	1.2 bar(g)
Typical product temperature	+1 to +6°C			
Typical CO ₂ content in product	5 to 6 g/l			
Typical product pressure at the machine transfer point in front of the DFC valve	<ul style="list-style-type: none"> ■ Flat fitting: 3.0 bar(g) ■ Well-type fitting: 3.3 bar(g) 	<ul style="list-style-type: none"> ■ Flat fitting: 3.5 bar(g) ■ Well-type fitting: 4.1 bar(g) 	<ul style="list-style-type: none"> ■ Flat fitting: 3.8 bar(g) ■ Well-type fitting: 4.9 bar(g) 	2.5 ± 0.1 bar(g)

The maximum product pressure on a filling system with product flow speed control is 5 bar(g).

Spray product

Fitting type	Spray product (Filling system with product speed control)
Flat fitting	27 ml/keg
Well-type fitting	67 ml/keg

Normally, a quantity of up to 5 ml/keg of spray product can be purposefully recaptured for reuse.

**CO₂ loss and O₂ absorption**

	Filling system with product speed control*	Filling system with orifice control**
CO ₂ loss	0 to 0.1 g/l	0 to 0.1 g/l
O ₂ absorption	0 to 0.05 ppm	0 to 0.08 ppm

* On a filling system with product flow speed control, a DFC valve controls the volume flow in the product infeed, and with it, the filling speed.

** On a filling system with orifice control, the valves in the return gas line control the outflowing return gas, and with it, the filling speed.

8.1.3 Compressed air

Provide compressed air in sufficient quantity and at required pressure without quantity and pressure fluctuations.

Compressed air quality classes

Number and class affiliation	1st digit			2nd digit ^{*)}	3rd digit
	Maximum number of particles/m ³ ; particle size d (µm)				
KLASS	0.1 < d ≤ 0.5	0.5 < d ≤ 0.1	1 < d ≤ 5	Pressure dew point (°C) ^{*)}	Residual oil content including mist (mg/m ³)
0	Specified according to application and better than KLASS 1				
1	100	1	0	≤ -70	≤ 0.01
2	100.000	1.000	100	≤ -40	≤ 0.1
3	-	10.000	500	≤ -20	≤ 1
4	-	-	1.000	≤ +3	≤ 5
5	-	-	20.000	≤ +7	-

Quality classes according to DIN standard ISO 8573-1:2001

^{*)} The pressure dew point must be at least 20°C lower than the coldest possible ambient temperature.



8.1.4 Electrical energy

Specification	Value	Unit
Voltage	230 / 400	V
Voltage fluctuation	±5	%
Frequency	50	Hz
Neutral	Yes	

Special regulations

- DIN EN 60204-1
- DIN EN 60439
- VDE 0100
- VGB 4

8.2 Operation

Ratings

See “*P&ID*” of the machine.

8.2.1 Usable kegs

Agreed kegs

Only those kegs that were agreed upon between KHS and the operator may be used. The kegs must meet the basic requirements.

If other kegs are to be used, modifications or new format parts may be necessary. Modifications and new format parts are not part of the scope of delivery of the current system.

Keg requirements

Kegs may only be used when they meet the following requirements.

Possible consequences of using kegs that do not meet the requirements include:

- Faults and reduced machine performance
- Underfilling
- Overfilling

General requirements:

- A specialist must have performed maintenance on the keg in accordance with the specifications of the keg manufacturer.
- The pressures specified by the keg manufacturer must never be exceeded.



- The distance between the rim of the upper flange and the spear surface must not vary by more than 3 mm from the nominal distance.
- The distance between the end of the extractor tube and the keg cup must be 6 mm \pm 1 mm.
- The variation of the longitudinal axis of the spear and the extractor tube to the longitudinal axis of the keg must not exceed 2°.
- The variation of the longitudinal axis of the spear and the extractor tube to the lower keg collar must not exceed 2°. This variation is caused by a deformed stand collar.
- There must be no notches or breaks on the keg collar. Notches or breaks can cause the keg to get stuck in the conveyor system.
- Variation in the roundness of the keg must not exceed \pm 2 mm.
- The variation of the spear center to the center of the keg must not exceed 3 mm.
- The keg volume may be reduced by a maximum of 0.25 l due to dents.

The illustration explains a few of the general requirements.

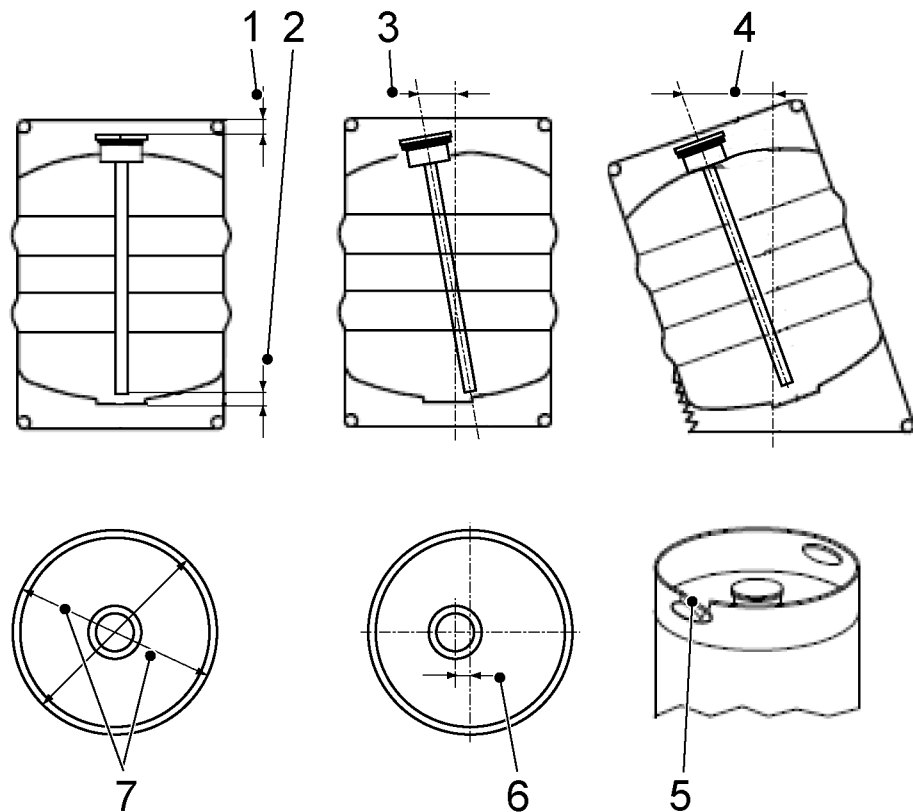


Figure 125: Requirements for usable kegs

- 1 The distance between the rim of the upper flange and the spear surface
- 2 The distance between the end of the extractor tube and the keg cup
- 3 The variation of the longitudinal axis of the spear and the extractor tube to the longitudinal axis of the keg
- 4 The variation of the longitudinal axis of the spear and the extractor tube to the lower keg collar
- 5 Notches or breaks on the keg collar
- 6 Variation of the spear center to the center of the keg
- 7 Variation in roundness

Conveyor requirements

- If polyurethane kegs are used, the conveyor system must be equipped with chain lubrication.

Polyurethane kegs, kegs with rubber collars and kegs with plastic collars often have an open-pored surface, which has an effect on the conveyor system similar to that of an eraser. The conveyor must be lubricated by the operator with a lubricant containing soap, since otherwise the kegs can get stuck.



Requirements when using external washers

- The stand collar of the kegs must have sufficiently large drain holes on the side.

If these holes are too small, the kegs may spread cleaning media to the external washer when the kegs are transported there with the stand collars up.



8.2.2 CombiKeg

8.2.2.1 Machine data

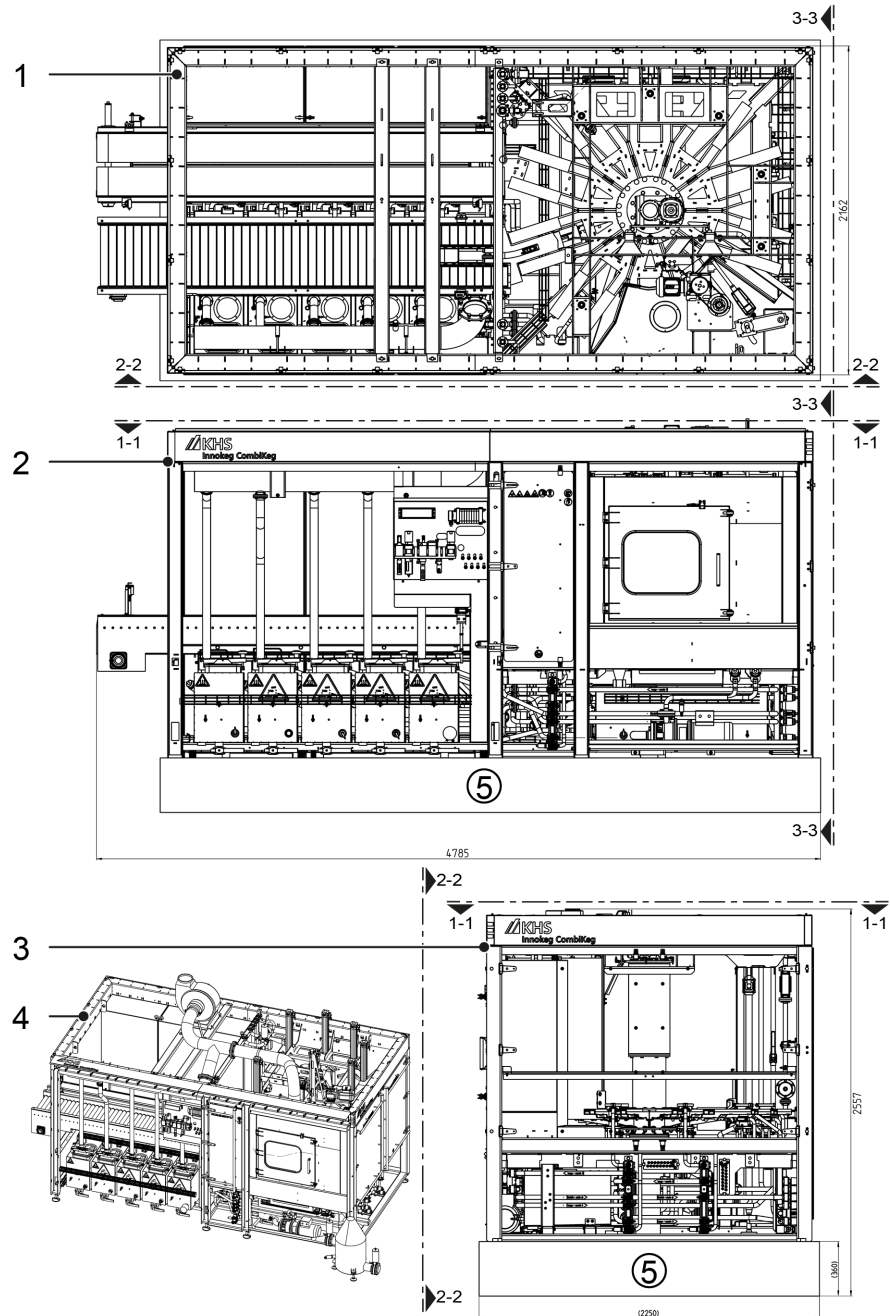


Figure 126: Dimensions of CombiKeg R5 with driven infeed roller conveyor and 5 detergent tanks

- 1 Top view
- 2 Side view
- 3 Front view
- 4 Isometry
- 5 Casing/wooden pallet (for transport)

**Dimensions**

Specification	Value	Unit
Machine frame length	4271	mm
Overall length (including conveyor overhang)	4785	mm
Machine frame width	2162	mm
Transport width	2250	mm
Transport height	2557	mm

Contents

Specification	Value	Unit
Detergent tank	120	l
External washer detergent tank	165	l

Weight

Specification	Value	Unit
Machine empty	3800	kg
Machine with full tanks	4600	kg
Detergent pump for detergent tank	30	kg
Detergent pump for external washer	60	kg

**Requirements**

The product pressure must be adapted according to the required filling time.

	DFC product flow speed control			Orifice control
	1.5 l/s	2.2 l/s	2.5 l/s	
Maximum filling speed	1.5 l/s	2.2 l/s	2.5 l/s	2.0 l/s
Minimum product pressure for flat-fitting spear (plus saturation pressure)	1.7 bar(g)	2.2 bar(g)	2.5 bar(g)	1.2 bar(g)
Minimum product pressure for well-type spear (plus saturation pressure)	2.0 bar(g)	2.8 bar(g)	3.6 bar(g)	
Typical product temperature	+1°C to +8°C			+1°C to +8°C
Typical CO ₂ content in product	5 g/l to 6 g/l			5 g/l to 6 g/l
Typical product pressure for flat-fitting spear	3.0 bar(g)	3.5 bar(g)	3.8 bar(g)	2.5 ± 0.1 bar(g)
Typical product pressure for well-type spear	3.3 bar(g)	4.1 bar(g)	4.9 bar(g)	

The maximum beer pressure when using DFC is 5 bar(g).

8.2.2.2 Equipping the machine**Detergent tank**

Specification	Value	Unit
External washer	165	l
Acid	120	l
Caustic 1	120	l
Caustic 2	120	l
Hot water	120	l
Mixed water	120	l



Treatment heads

Specification	Value	Unit
Cleaning heads	5	units
Filling heads	1	unit

8.2.2.3 Foundation and pedestal foot diagram

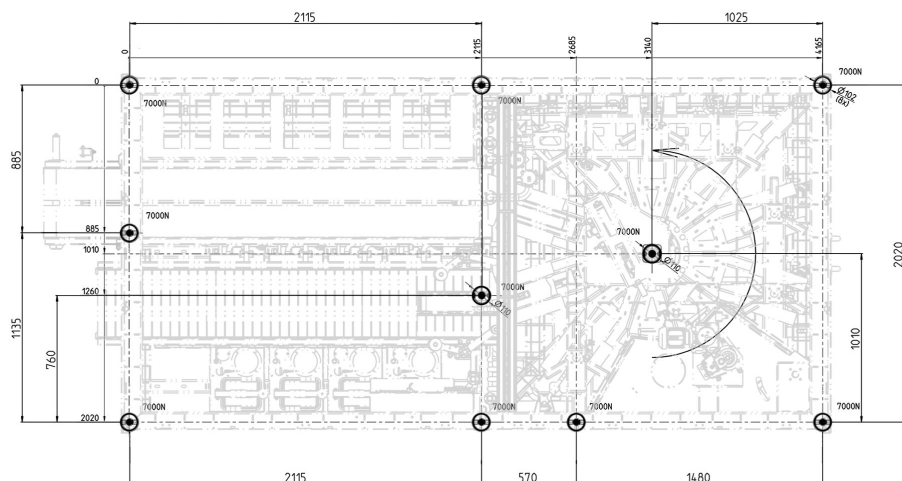


Figure 127: Foundation and pedestal foot diagram with point load specifications

Maximum point load of 7000 N on each of the 10 machine feet.

8.2.2.4 Supply data

Operating voltage

Specification	Value	Unit
Voltage	230 / 400	V
Voltage fluctuation	+6 ... 10	%
Frequency	50	Hz
Frequency fluctuation	±2	%
Phases	L1, L2, L3	-
Neutral	N	-
Protective conductor	PU	-

**Control power**

Voltage of input circuits	24 V DC, $\pm 10\%$, ripple $< 2\%$
Voltage of output circuits	24 V DC, $\pm 10\%$, ripple $< 2\%$
Break voltage	230 V AC

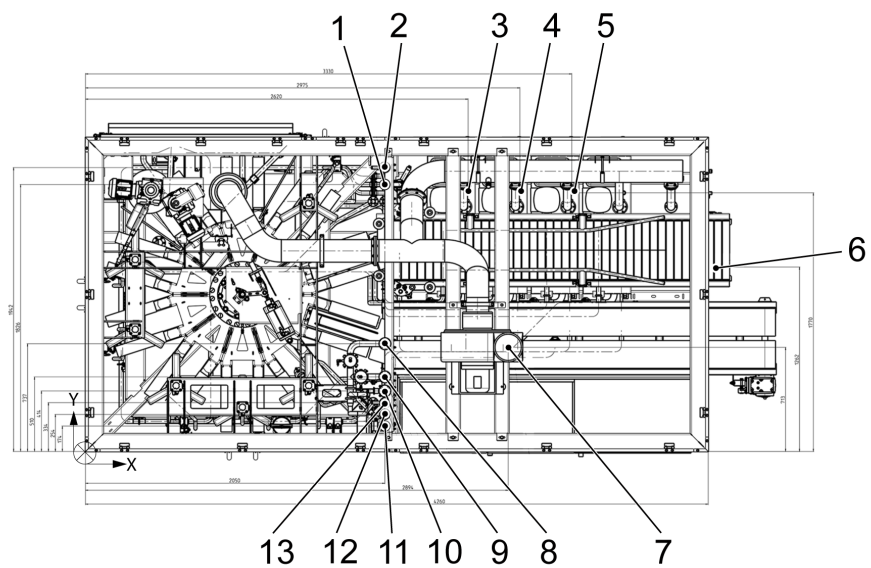
8.2.2.5 Connection plan

Figure 128: Connection plan for media connections

**Information on the table**

The dimensions (X distance, Y distance and Z distance) given in the table relate to an axis system. The zero point for these dimensions is at the corner of the machine frame (indicated by a circle at the bottom left of the illustration).

The heights (Z distance) are measured from the surface on which the machine is installed (hall floor or machine base).

Connection overview

Item	Connector	X distance (in mm)	Y distance (in mm)	Z distance (in mm)	Connection (nominal width or thread size)
1	Cold water	2050	1826	approx. 924	DN 25
2	Sterile air	2050	1942	approx. 924	DN 25
3	Caustic 2	2975	1770	approx. 692	Thread 1/2"
4	Acid	2620	1770	approx. 692	Thread 1/2"
5	Caustic 1	3300	1770	approx. 692	Thread 1/2"
6	Air control	4260	1262	approx. 484	DN 25
7	Extractor	2894	713	approx. 2775	DN 200
8	FOB/CIP	2050	737	approx. 924	DN 25
9	Return gas	2050	510	approx. 924	DN 25
10	Pure steam	2050	414	approx. 924	DN 40
11	Product	2050	174	approx. 2207	DN 25



Item	Connector	X distance (in mm)	Y distance (in mm)	Z distance (in mm)	Connection (nominal width or thread size)
12	CO ₂	2050	254	approx. 924	DN 25
13	Hot water	2050	334	approx. 924	DN 25

8.2.2.6 Connection plan for pipelines

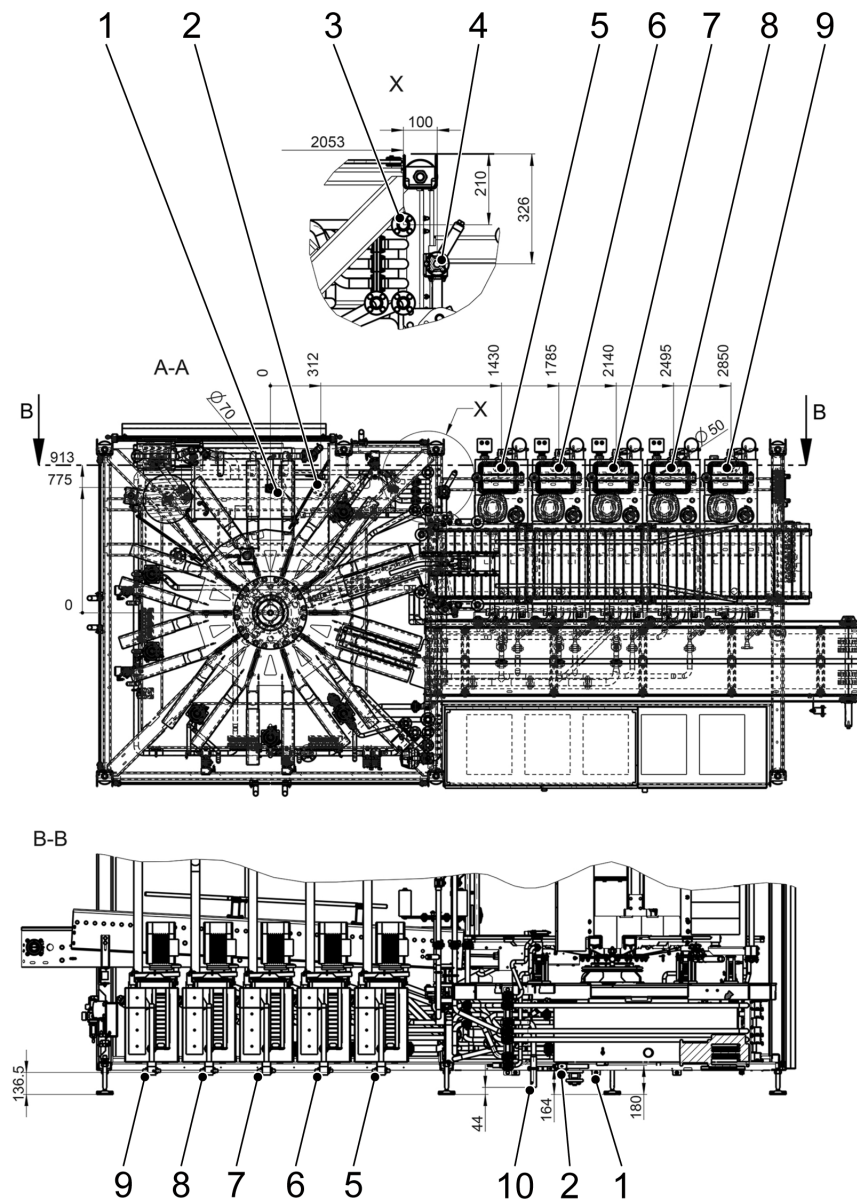


Figure 129: Connection plan for pipelines

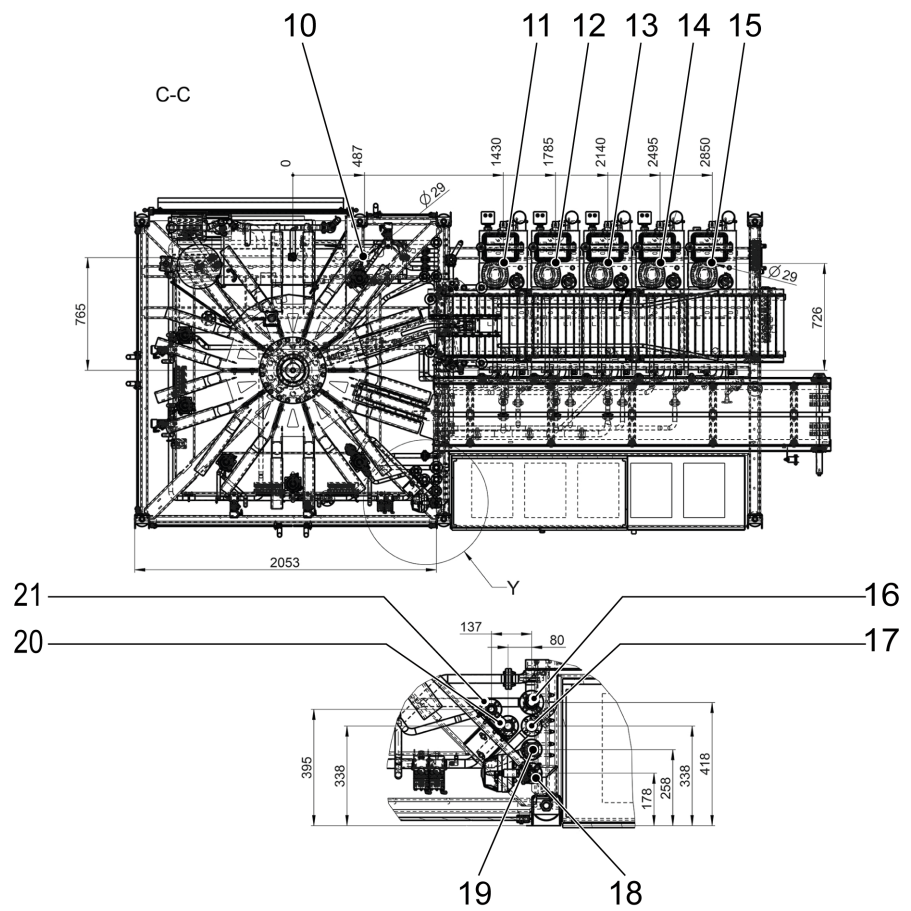


Figure 130: Connection plan for pipelines



Item	Description	Height of connection from installation surface
1	External washer overflow	180 mm
2	External washer tank drain	164 mm
3	Sterile air connection Nominal width: 25 mm	924 mm
4	Cold water supply connection Nominal width: 25 mm	924 mm
5	Acid drain	136.5 mm
6	Caustic 2 drain	136.5 mm
7	Caustic 1 drain	136.5 mm
8	Mixed water drain	136.5 mm
9	Hot water drain	136.5 mm
10	Machine drain	44 mm
11	Acid overflow	180 mm
12	Caustic 2 overflow	180 mm
13	Caustic 1 overflow	180 mm
14	Mixed water overflow	180 mm
15	Hot water overflow	180 mm
16	Pure steam supply connection Nominal width: 40 mm	924 mm
17	Hot water supply connection Nominal width: 25 mm	924 mm
18	Product pipe Nominal width: 25 mm	2207 mm
19	CO ₂ supply Nominal width: 25 mm	924 mm
20	CO ₂ return gas pipe Nominal width: 25 mm	924 mm
21	CIP return Nominal width: 25 mm	924 mm



8.2.3 Noise emissions

8.2.3.1 Information on noise emissions

Operating conditions and specific noise-related characteristics.	Nominal throughput: see technical specifications The noise emission levels may increase or decrease according to changes in operating conditions or specific characteristics.
Specified noise emission level dyads in accordance with ISO 4871	
A-weighted emission sound pressure level L_{pA} in dB at workplaces	75-82
K_{pA} uncertainty	+/- 2
C-weighted peak emission sound pressure level L_{pCpeak} in dB at workplaces	Does not exceed 130
K_{pCpeak} uncertainty	+/- 2
A-weighted acoustic power L_{WA} in dB	Not specified due to very large machine dimensions
K_{wA} uncertainty	./.
Basic standards EN ISO 11204 or EN ISO 3744, accuracy class 2 were used to determine the levels in accordance with EN 415-9.	
Emission data sheets are available on request containing tables showing the noise emissions at each of the measurement points and a sketch of the machine indicating the locations of these measurement points.	

8.2.3.2 Noise Reduction/Acoustics Requirements

The machines to be delivered comply with advanced noise reduction techniques tried and tested in the beverage industry in effect at the time of order placement.

The emission levels at the workstations of the line are not only dependent on the emissions of the particular machines but also on the interrelationship of the sources of noise within the room layout, outside noises (neighboring systems, ventilation, etc.), and the room's acoustics.



A line comprised of several machines equipped with preferably controlled, interconnecting conveying facilities is able to comply with advanced noise reduction techniques tried and tested in practical operation only if the future operator makes low-noise dimensioning of machines and conveying segments possible and provides a sound-insulated room.

Room soundproofing is achieved by installing an effective sound-absorbing ceiling (high-pitch sound absorbers) in conjunction with sound absorbing wall paneling (particularly behind the machine operators).

Key room acoustics parameters are the reverberation time and the average decrease in sound intensity. According to the state of the art, the reverberation period must be 0.5 to 0.8 seconds in octave bands of between 500 Hz and 4 kHz, depending on the size of the room, and the average decrease in sound intensity should amount to at least 4.5 dB(A) each time the distance is doubled.

The emission sound level in the work area is measured in dB(A) at a distance of 1 meter from the outside edge of the machine and at a height of 1.6 meters above floor level (ear level) of a standing machine operator. If an operating face is installed (e.g. in front of the filler or bottle washer), then the arithmetic average measured at three measurement points along the operating face applies for the sound level in the work area. Floor spaces limited towards the back (e.g. platforms or catwalks) must therefore be at least 1.3 meters wide.

If the future operating company intends to provide machines or line components himself, he must ensure that these components also comply with the advanced rules of noise reduction and safety technology tried and tested in practice.

Project planning shall be carried out chiefly with regard to the required line capacity, installed on the floor space provided by the customer.

It may therefore also be necessary to take additional secondary noise-reduction measures even after the acoustic requirements to be met on the part of the operator have been implemented.

8.3 Servicing

8.3.1 Information on lubricant identifiers



NOTICE!

Risk of damage by using the wrong lubricant.

Selecting the wrong lubricant causes damage to system components.

Use only the lubricants as indicated in the lubrication plan.



The lubricants in the lubrication plan and lubrication table are labeled with a symbol and a brief description in accordance with DIN 51502.

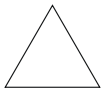
Icons



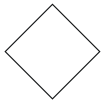
Mineral oils (lubrication oils, special oils)



Non-flammable hydraulic fluids; synthetic or partially synthetic fluids



Mineral oil-based lubrication grease



Synthetic-oil-based lubrication grease

Example



Mineral-oil-based lubrication oil



Synthetic-oil-based lubrication oil



Mineral oil-based lubrication grease



Synthetic-oil-based lubrication grease

8.3.2 Thresholds for surface cleaning

Recommendations for detergent



Recommended values

The following specifications are recommended values from KHS.



Detergent	Maximum concentration [%]	Maximum contact time [min]	Temperature [°C]
NaOH-based alkaline cleaning agent	2	30	80
NaOH and NaOCl-based combined cleaning and disinfection agent (pH > 11)	2	30	60
Acidic, phosphorous-based cleaner	2	20	60–80
Acidic, nitric acid-based cleaner	1	10	60–80
Peracetic acid-based disinfection	0.1	60	20
Sterilization with hot water	-	30	95

The detergent must not attack 1.4301 or higher-quality stainless steel and must be suitable for kegs.

The specification issued by the respective detergent manufacturer must be observed.

Maximum chloride content of the detergent: 70 ppm

Specific water contents must be taken into account and tested for suitability.



Short CIP program

**Delivery times**

The delivery times are dependent on the length of the pipelines.

**Recommended values**

The following specifications are recommended values from KHS.

Run short CIP program:

- In the event of a production interruption lasting more than 4 hours
This requires the product piping to be adequately insulated and the system to be a closed system. If this is not the case, the CIP program must be run even in the case of shorter production interruptions.
- At the start of each shift
- At the end of each shift

No.	Cleaning step	Duration [min]	Detergent pump	CIP
1	Cold water cleaning	3	On	At end of production
2	Cold water removal with hot water (85°C).	2	On	
3	<ul style="list-style-type: none"> ■ Hot water cleaning with hot water (85°C). ■ Individual hot water pulse for valve outlet cleaning. 	20	On	
4	Hot water removal with cold water	3	On	
CIP idle position, continuous operation prior to start of production.				
5	Cold water removal with hot water (85°C).	2	On	Prior to start of production
6	<ul style="list-style-type: none"> ■ Hot water cleaning with hot water (85°C). ■ Individual hot water pulse for valve outlet cleaning. 	10–20	On	
7	Sterile cold water cleaning	3	Off	



Long CIP program with caustic

**Delivery times**

The delivery times are dependent on the length of the pipelines.

**Recommended values**

The following specifications are recommended values from KHS.

Carry out the long CIP program with caustic at least once per week.

No.	Cleaning step	Duration [min]	Detergent pump	CIP
1	Cold water cleaning	3	Off	At end of production
2	Cold water removal with caustic solution (80°C).	2	On	
3	<ul style="list-style-type: none"> ■ Caustic cleaning with caustic solution (80°C). ■ Individual hot water pulse for valve outlet cleaning. 	30	On	
4	Caustic removal with hot water (85°C).	2	On	
5	<ul style="list-style-type: none"> ■ Hot water cleaning with hot water (85°C). ■ Individual hot water pulse for valve outlet cleaning. 	5	On	
6	Hot water removal with cold water.	3	On	
CIP idle position, continuous operation prior to start of production.				
7	Cold water removal with hot water (85°C).	2	On	Prior to start of production
8	Hot water cleaning with hot water (85°C).	20	On	
9	Sterile cold water cleaning	3	Off	

**Long CIP program with acid and caustic****Delivery times**

The delivery times are dependent on the length of the pipelines.

**Recommended values**

The following specifications are recommended values from KHS.

Carry out the long CIP program with acid and caustic at least once per week.

The long CIP program with acid and caustic removes limescale deposits in the piping and valves.

No.	Cleaning step	Duration [min]	Detergent pump	CIP
1	Cold water cleaning	3	Off	At end of production
2	Cold water removal with caustic solution (80°C).	2	On	
3	<ul style="list-style-type: none"> ■ Caustic cleaning with caustic solution (80°C). ■ Individual hot water pulse for valve outlet cleaning. 	30	On	
4	Caustic removal with hot water (85°C).	2	On	
5	Hot water cleaning with hot water (85°C).	2	On	
6	Hot water removal with acid (80°C).	2	On	
7	<ul style="list-style-type: none"> ■ Acid cleaning with acid (80°C). ■ Individual hot water pulse for valve outlet cleaning. 	20	On	
8	Acid removal with hot water (85°C).	2	On	
9	Hot water cleaning with hot water (85°C).	5	On	
10	Hot water removal with cold water.	3		

CIP idle position, continuous operation prior to start of production.



No.	Cleaning step	Duration [min]	Detergent pump	CIP
11	Cold water removal with hot water (85°C).	2	On	Prior to start of production
12	Hot water cleaning with hot water (85°C).	20	On	
13	Sterile cold water cleaning	3	Off	