

## Counter-Rotating Blenders



### I Application

Counter-rotating blenders are used for mixing and homogenizing dispersed products at a controlled temperature with an optimum performance, regardless of the product viscosity. These units are intended primarily for pharmaceutical, cosmetics, food and personal care products industries.

They are ideal for processes which require heating, vacuum, premixing, additions, vigorous agitation, emulsion or dispersion, as well as pressure and temperature. The skid can work at -1 to 0.5 bar and the double jacket - up to 3 bar. The operating temperature is between -7 a 120 °C.

It is possible to control the following parameters: temperature, pressure, pH, weight and viscosity.

The unit is provided with a cleaning system with rotating spray balls in order to be connected to a CIP and SIP cleaning system.

Some examples of products that can be treated with these units are all kinds of creams, gels, sunscreens, depilatories, makeup, deodorants, sauces, pates, pastes, shoe creams, emulsions, paraffin mixtures, wax mixtures, carbopol dispersions, tooth pastes, products intended for drugstores and parapharmacies.

### I Principle of operation

The unit has a sealed tank where mixing takes place by means of an anchor type agitator, a central shaft with counter-rotating blades that move in the opposite direction to the anchor, and an emulsifying disperser located at the bottom of the shaft.

The unit normally operates under vacuum during the entire duration of the mixing process. When the agitation starts, the anchor and the central blades rotate slowly while the bottom mixer is put into operation. Subsequently, the product to be dispersed or emulsified is added and the speed of the blades on the central shaft is increased.

When the mixing is complete, the agitator speed decreases and the bottom mixer is stopped; at the same time the chamber begins to cool down. When the product reaches the desired temperature, any required additives are added to the mixture, typically when cold; depending on the process, the speed of the agitators may be increased slightly. It is possible to recirculate the product and, if necessary, an emulsifier can be added to the process.

The product discharge system can be by gravity or with a pump and, if necessary, using positive pressure.

Finally, the tank is cleaned by the CIP system.



**I Materials**

Parts in contact with the product	AISI 316 (EN 14404)
Other stainless steel parts	AISI 304 (EN 14301)
Interior surface finish	bright polish, Ra ≤ 0.8 µm
Exterior surface finish	bright polish, Ra ≤ 0.8 µm

**I Design and features**

These units are available in 3 arrangements: on support base, on support feet and a metal structure, or on concrete floor, with or without automatic lid lifting. The units with support bases are designed to accept all auxiliary equipment necessary for the unit to operate autonomously.

These units are built to FDA standards.

For good temperature control, the system includes a PT100 or 4-20 mA temperature probe located on one end of the central shaft of the agitator in order to obtain product temperature data. Its reliability is excellent because of its distance from the boiler walls in contact with the hot and cold chamber. It has a second probe located in the heating and cooling chamber to control the latter.

**Boiler**

These units, called MCR, are available in 8 standard models with useful capacities of 50, 150, 200, 500, 1000, 2000, 3000 and 4000 litres.

The boiler varies depending on its useful capacity.

The upper cylindrical part and the conical part on the bottom have capacities ranging between 50 and 500 litres. It has a domed lid with hermetic seal which holds the agitation system.

The units from 1000 to 4000 litres are cylindrical with convex bottom and have a domed lid with hermetic seal that holds the agitation system.

All units are built with an insulated heating and cooling chamber.

Boilers up to 500 litres equipped with a single chamber. In the boilers with capacities greater than 500 litres, the chamber is divided into two, with separate inlets and outlets. In this way, production under half-load conditions is streamlined, steam and cooling savings are achieved, and reliability in the process is increased since there is no overheating at the top of the boiler, where there is no product.

In addition, the interior of the chamber is fitted with a system of channels which forces the flow of steam or water throughout the entire chamber volume.

The insulation consists of a welded chamber filled with insulating material.



### Agitation system

The counter-rotating agitation system consists of two main agitation elements: an anchor with two arms with welded inclined blades -all removable-, rotating in one direction and pushing the material upwards, and a central shaft with inclined blades, which rotates in the opposite direction to the anchor, pushing the product downwards. All the blades have holes to facilitate the flow of the product.

The structure of the anchor is made from hollow tube for easy cleaning and to reduce weight. The two arms are fitted with scrapers that act against the walls and the bottom of the boiler, preventing any of the products being mixed from sticking and eliminating the possibility of overheating of the product on the walls.

The anchor and the central shaft have each an independent geared motor, both of which are driven by a frequency converter to adjust the speed as required at any specific moment in time.

This type of agitator achieves homogeneous mixtures, avoiding the entrainment of air into the product and maintaining a uniform temperature.

### Emulsifier

A high-performance emulsifying disperser is located in the lower part of the boiler and is designed to break up solids and to emulsify and homogenise the mixture.

The standard unit includes INOXPA's model ME-6100 with the adequate power rating for each specific unit type.

### Valves and accessories

The unit comprises the following elements:

On the lid:

- Loading port with lid and sight glass. This lid is opened by means of a hinge. Hermetic sealing is achieved with a silicon gasket and pressure seals. The lid incorporates a sight glass to see inside the boiler.
- A floodlight with sight glass and halogen lamp
- Inlets directed towards the CIP cleaning system
- An overpressure valve and automatic pressure control
- Diaphragm valves with single-acting pneumatic actuator or manual operation, designed to be used on the vacuum connections, filtered venting, recirculation, additive addition, water, control and safety devices.

On the side of the heating and cooling chamber:

- Inlets to and outlets from the chamber to connect ancillary services.
- Safety valves
- PT100 temperature sensor

On the bottom part of the tank:

- The valve on the bottom of the mixing vessel with a single-acting pneumatic actuator to discharge the product.
- A second valve on the bottom of the mixing vessel for suction-assisted loading of solids or liquids.
- Emulsifying disperser type ME-6100.

The connections of ancillary services for the heating and cooling chamber are mounted with flat flanges in accordance with DIN2633 PN16.

### Discharge and transfer systems

Depending on the product, discharging and transferring the product can be achieved using either a vacuum or a pump.

If necessary, a recirculation system can be included. It is also possible to install an in-line emulsifier if the product requires it.



**Command and control system**

The unit is provided with a control and power panel independently of the control area which includes a touch screen and has a restricted programming and access system.

The pneumatic control system is installed in a separate panel with banks of solenoid valves. This system activates the production programmes which, in turn, control the process valves and ancillary services.

All the elements are mounted in IP-65 protection against dust and water.

**I Options**

**Weighing system**

The equipment can be provided with a weighing system with load cells and a weight terminal with the possibility of programming. In this way, besides controlling the product in the interior of the boiler at any time, it is possible to control the addition and removal of product.

**Cleaning system**

Cleaning can be done manually or by CIP and SIP. For this, a system of rotating spray balls is incorporated into the system. For its operation it is necessary to connect the unit to a central CIP system for automatic cleaning.

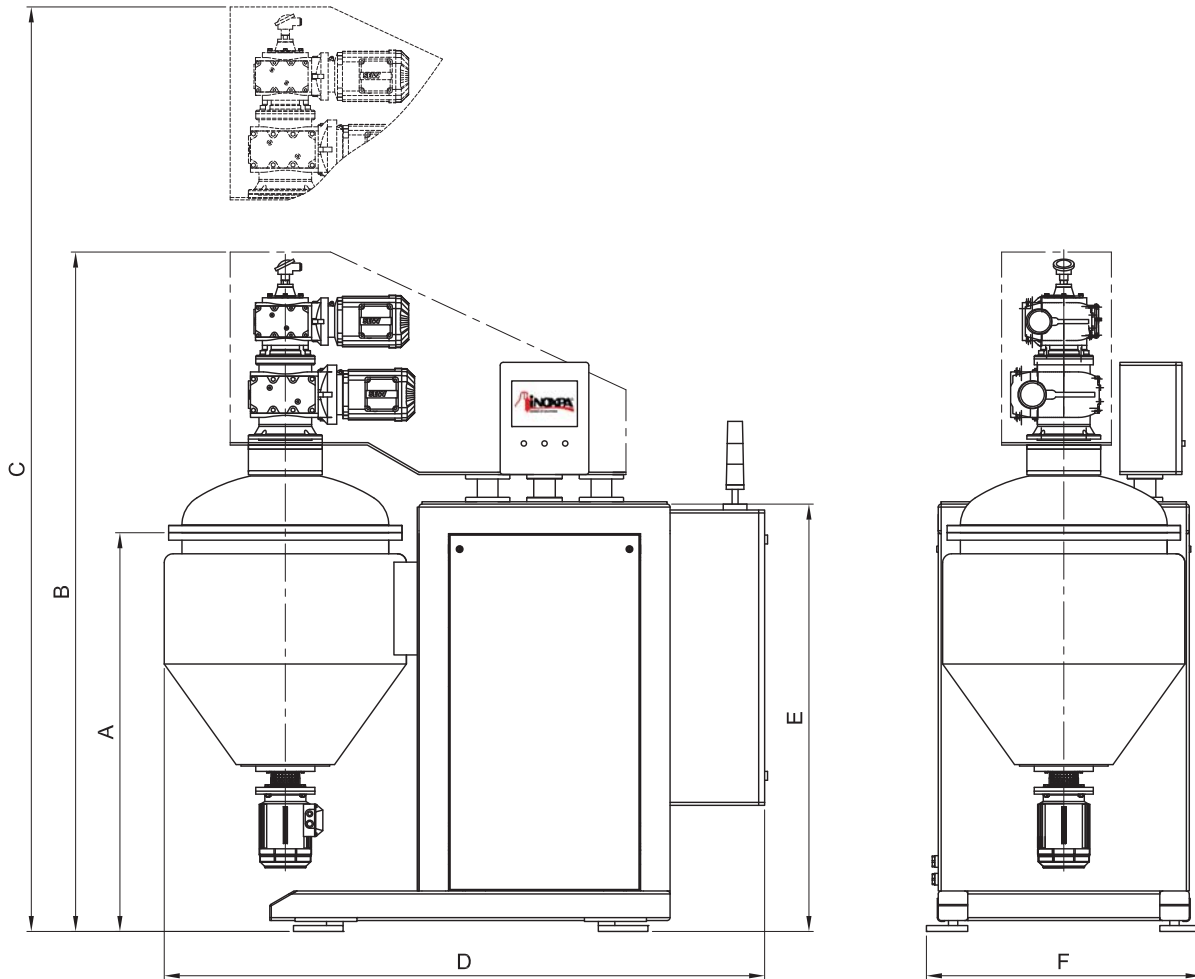
**Support system and lid lifting system for different models**

Model	Support system				Lid lifting system (Opcional)
	One support base	Two support bases	On a structure	On legs	
MCR50	X		X	X	X
MCR150	X		X	X	X
MCR200	X		X	X	X
MCR500	X		X	X	X
MCR1000		X	X	X	X
MCR2000		X	X	X	X
MCR3000		X	X	X	X
MCR4000		X	X	X	X



I General dimensions

Unit with one support base



Model	Useful Volume (lts)	Dimensions (mm)						Anchor		Central Axis		Mixer	
		A	B	C	D	E	F	Power (kW)	Speed (rpm max.)	Power (kW)	Speed (rpm max.)	Power (kW)	Speed (rpm)
MCR50	50	1350	2100	2700	1830	1450	930	1.1	15 – 38	1.5	48 – 119	2,2	3000
MCR150	150	1350	2150	3000	1930	1450	930	1.1	15 – 38	1.5	35 – 86	4	3000
MCR200	200	1350	2300	3130	2030	1450	930	1.1	15 – 37	1.5	29 – 73	7.5	3000
MCR500	500	2300	3500	4400	2800	2350	1350	2.2	12 – 30	3	32 – 79	7.5	3000



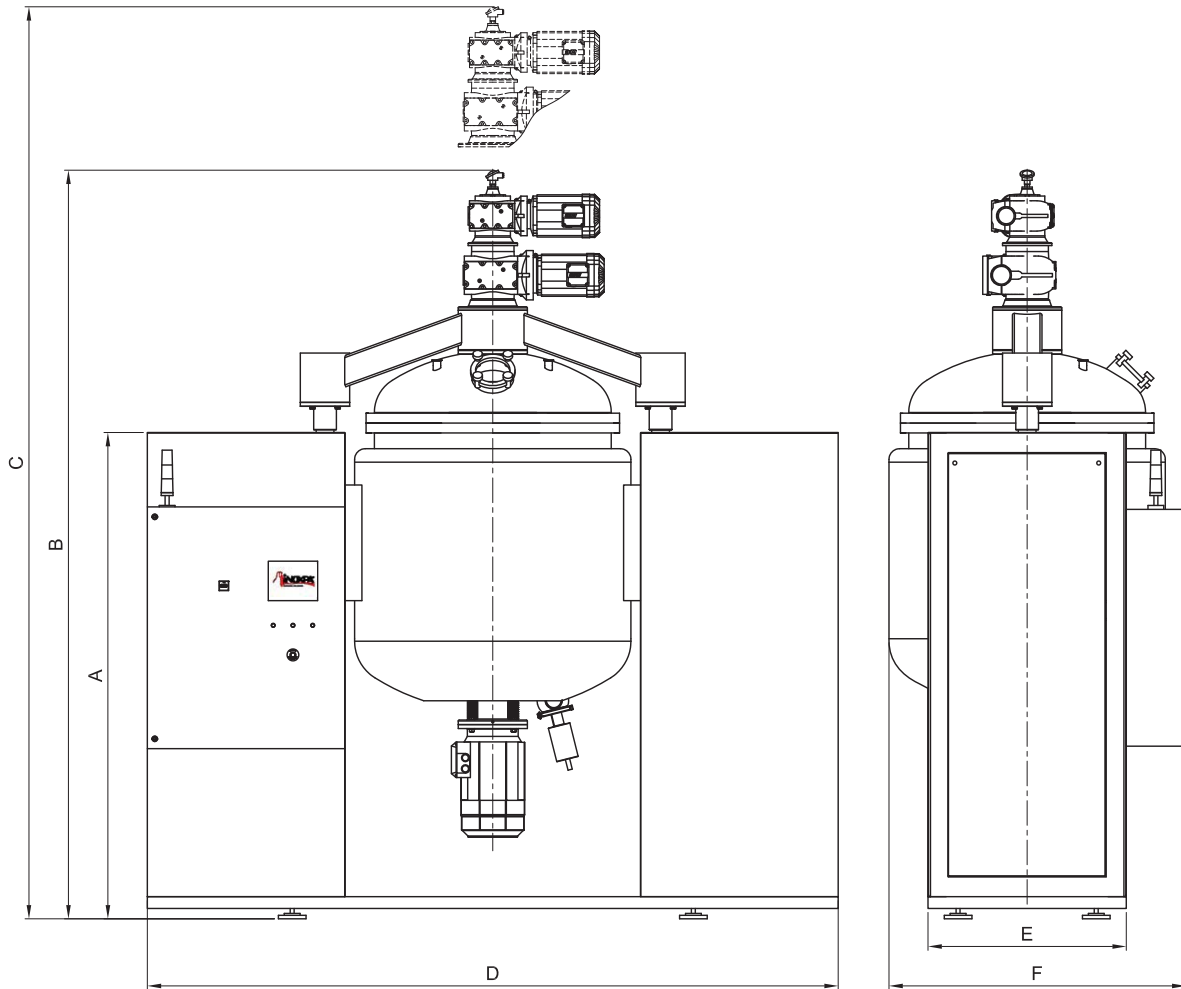
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**I General dimensions**

Unit with two support bases



Model	Useful Volume (lts)	Dimensions (mm)						Anchor		Central Axis		Mixer	
		A	B	C	D	E	F	Power (kW)	Speed (rpm max.)	Power (kW)	Speed (rpm max.)	Power (kW)	Speed (rpm)
MCR1000	1000	2400	3700	4800	3500	1000	1500	3	8 – 19	4	32 – 79	18.5	3000
MCR2000	2000	2800	4200	5500	3500	1200	1700	4	8 – 20	7.5	23 – 57	18.5	3000
MCR3000	3000	3000	4500	6000	4000	1200	1800	5.5	6.5 – 16	9.2	20 – 50	22	1500
MCR4000	4000	3000	4700	6200	4000	1500	2000	11	5 – 13	15	20 – 50	22	1500



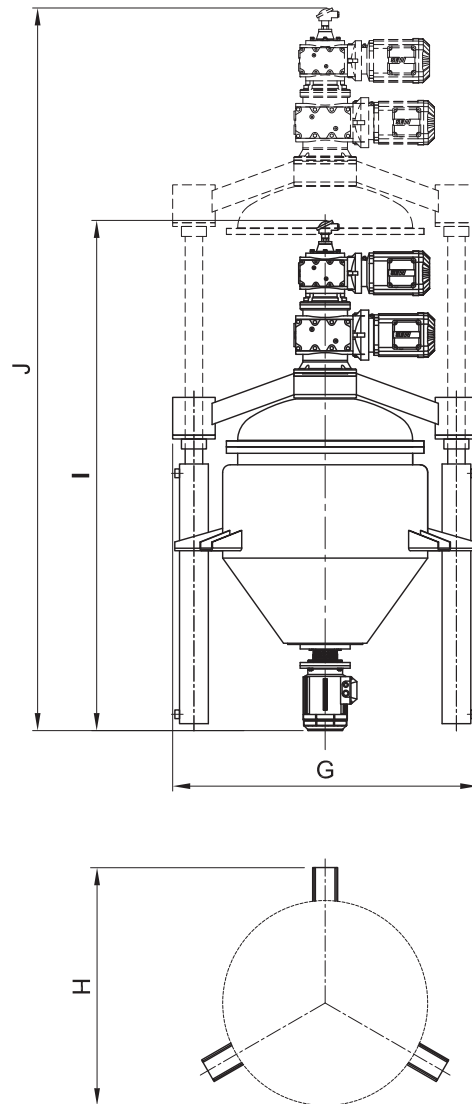
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**I General dimensions**

Unit with lid lifting system



Model	Useful Volume (lts)	Dimensions (mm)				Anchor		Central Axis		Mixer	
		G	H	I	J	Power (kW)	Speed (rpm max.)	Power (kW)	Speed (rpm max.)	Power (kW)	Speed (rpm)
MCR50	50	1050	800	2200	2800	1.1	15 – 38	1.5	48 – 119	2,2	3000
MCR150	150	1150	900	2800	3650	1.1	15 – 38	1.5	35 – 86	4	3000
MCR200	200	1250	1000	3000	3850	1.1	15 – 37	1.5	29 – 73	7.5	3000
MCR500	500	1650	1300	3300	4200	2.2	12 – 30	3	32 – 79	7.5	3000



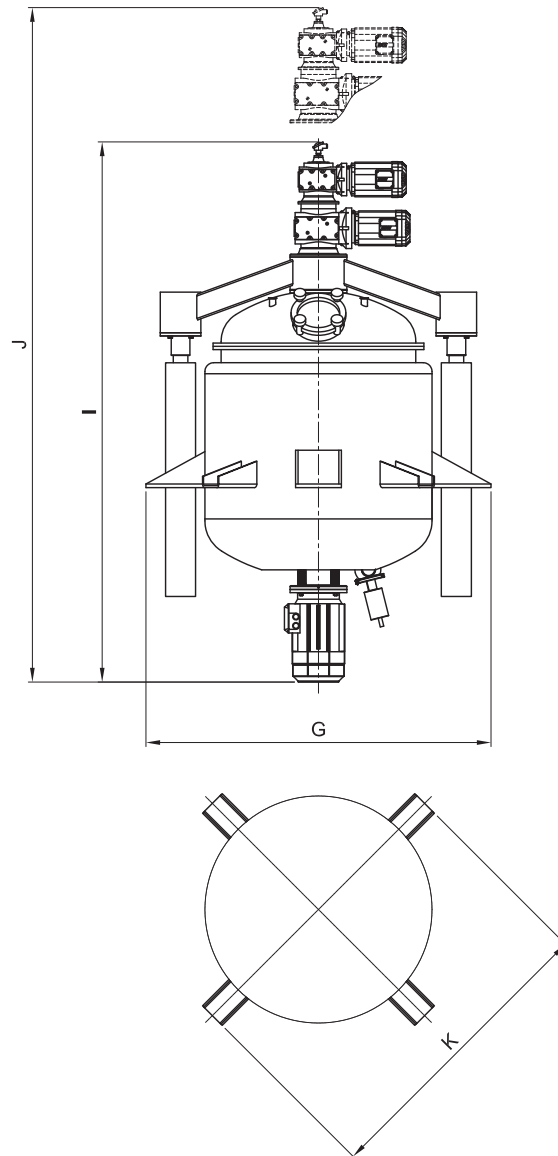
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I General dimensions

Unit with lid lifting system



Model	Useful Volume (lts)	Dimensions (mm)				Anchor		Central Axis		Mixer	
		G	I	J	K	Power (kW)	Speed (rpm max.)	Power (kW)	Speed (rpm max.)	Power (kW)	Speed (rpm)
MCR1000	1000	2000	3500	4600	1800	3	8 – 19	4	32 – 79	18.5	3000
MCR2000	2000	2200	4000	5300	2000	4	8 – 20	7.5	23 – 57	18.5	3000
MCR3000	3000	2400	4400	5900	2200	5.5	6.5 – 16	9.2	20 – 50	22	1500
MCR4000	4000	2600	4700	6200	2400	11	5 – 13	15	20 – 50	22	1500



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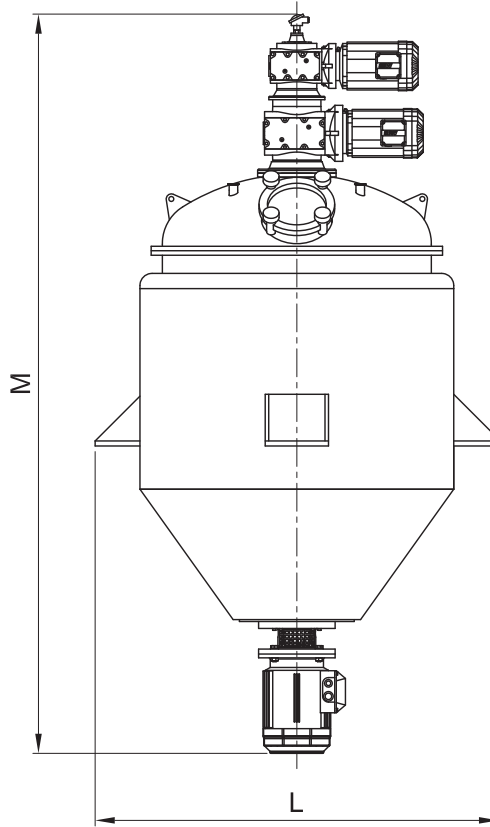


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**I General dimensions**

Unit without lid lifting system



Model	Useful Volume (ltr)	Dimensions (mm)		Anchor		Central Axis		Mixer	
		L	M	Power (kW)	Speed (rpm max.)	Power (kW)	Speed (rpm max.)	Power (kW)	Speed (rpm)
MCR50	50	800	1450	1.1	15 – 38	1.5	48 – 119	2.2	3000
MCR150	150	900	1850	1.1	15 – 38	1.5	35 - 86	4	3000
MCR200	200	1000	2000	1.1	15 – 37	1.5	29 – 73	7.5	3000
MCR500	500	1200	3000	2.2	12 – 30	3	32 – 79	7.5	3000



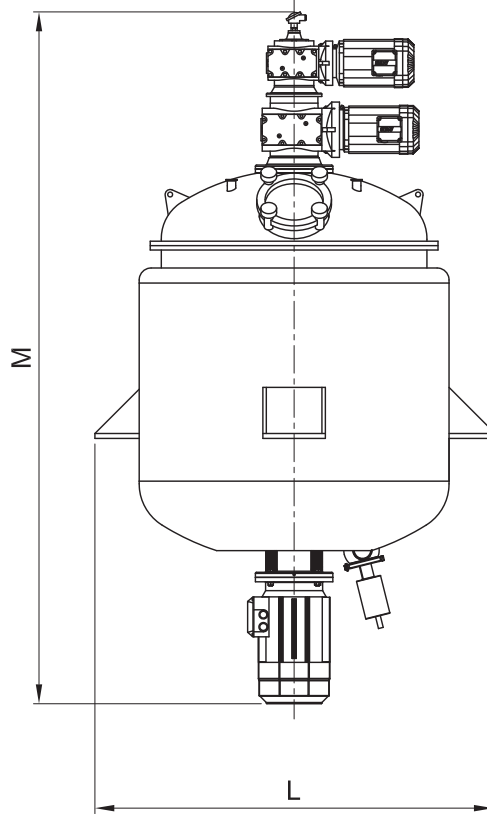
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**I General dimensions**

Unit without lid lifting system



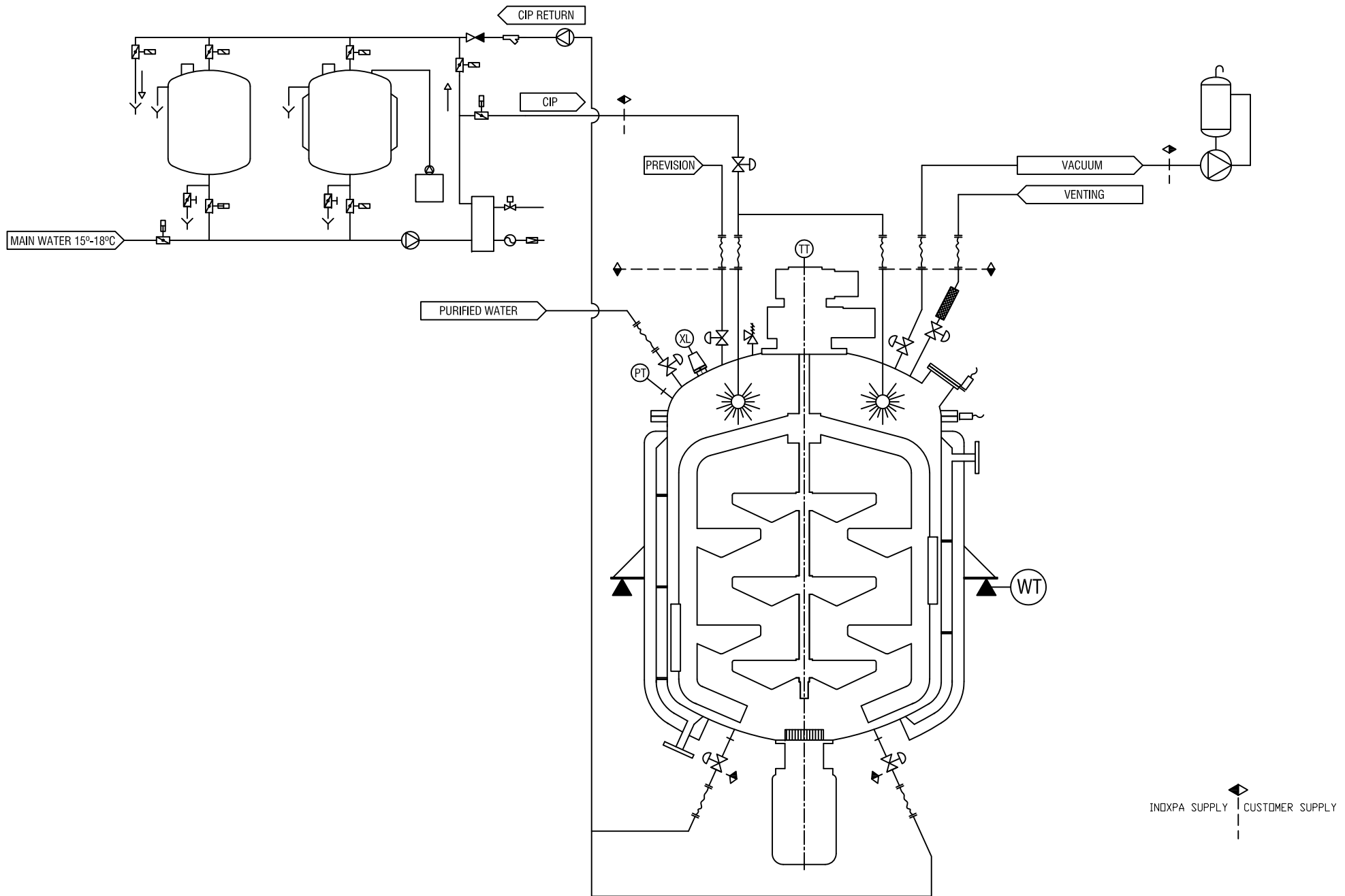
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		L	M	Power (kW)	Speed (rpm max.)	Power (kW)	Speed (rpm max.)	Power (kW)	Speed (rpm)
MCR1000	1000	1800	3200	3	8 – 19	4	32 – 79	18.5	3000
MCR2000	2000	2000	3800	4	8 – 20	7.5	23 - 57	18.5	3000
MCR3000	3000	2200	4150	5.5	6.5 – 16	9.2	20 – 50	22	1500
MCR4000	4000	2400	4450	11	5 – 13	15	20 – 50	22	1500



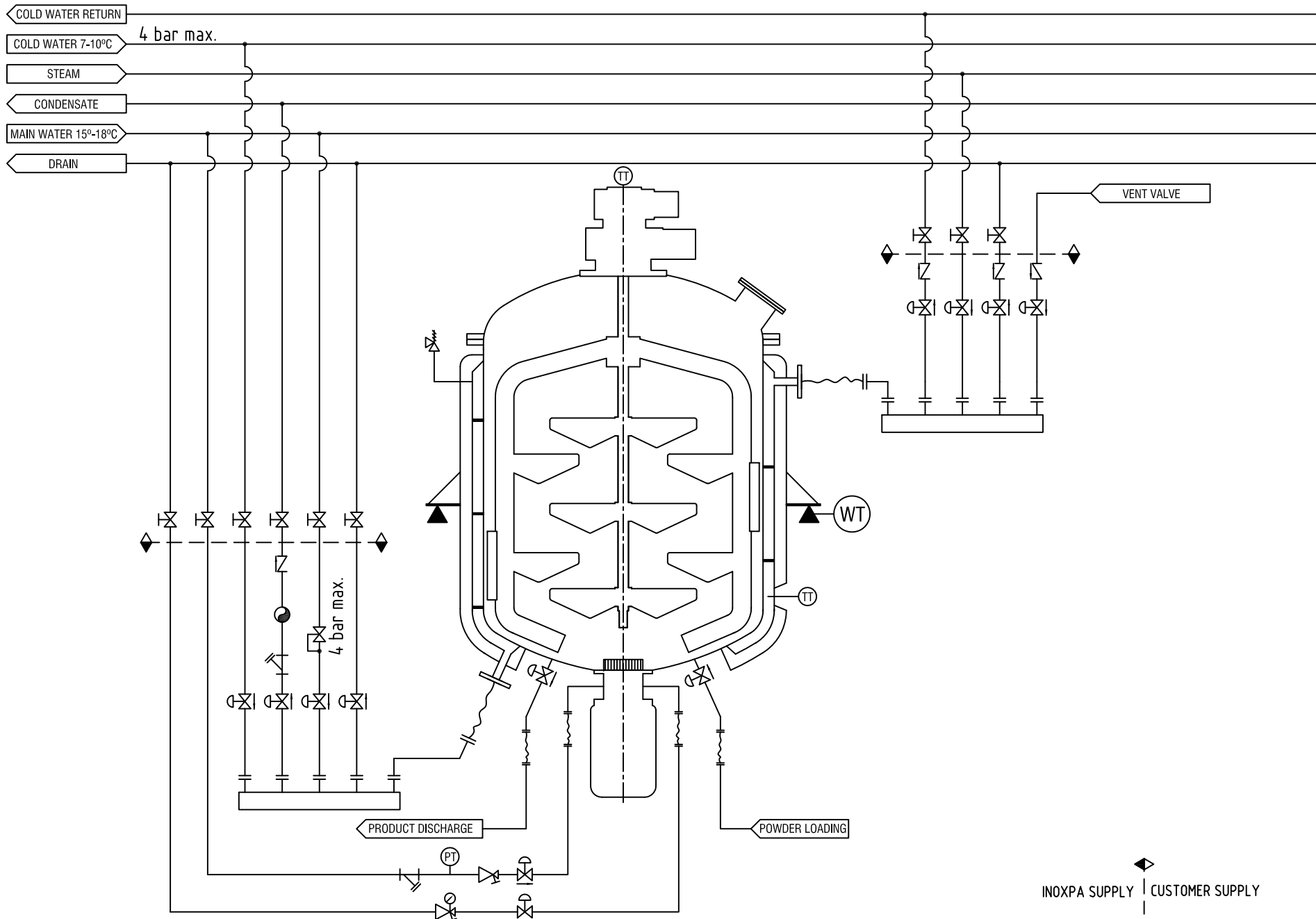
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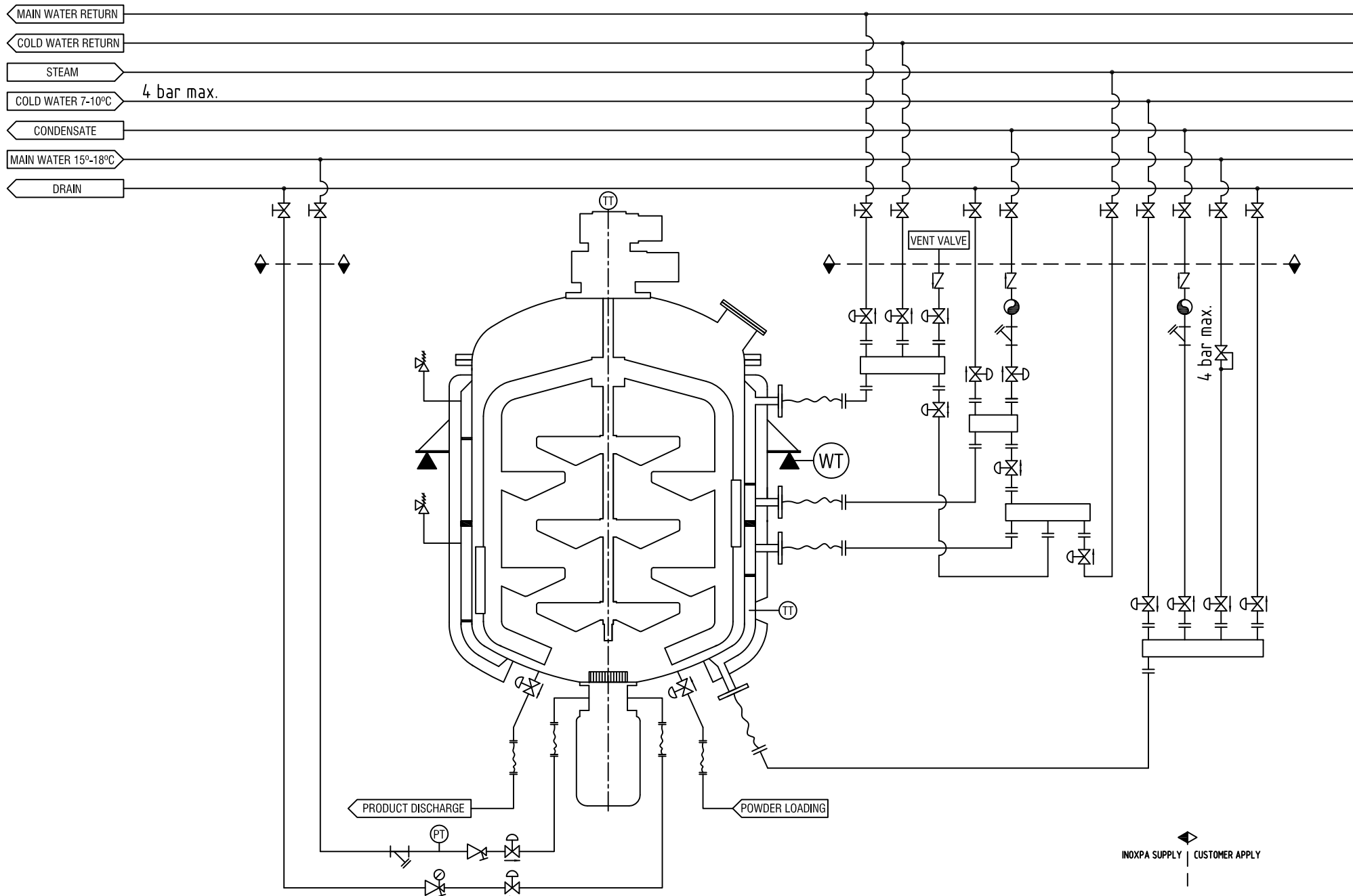
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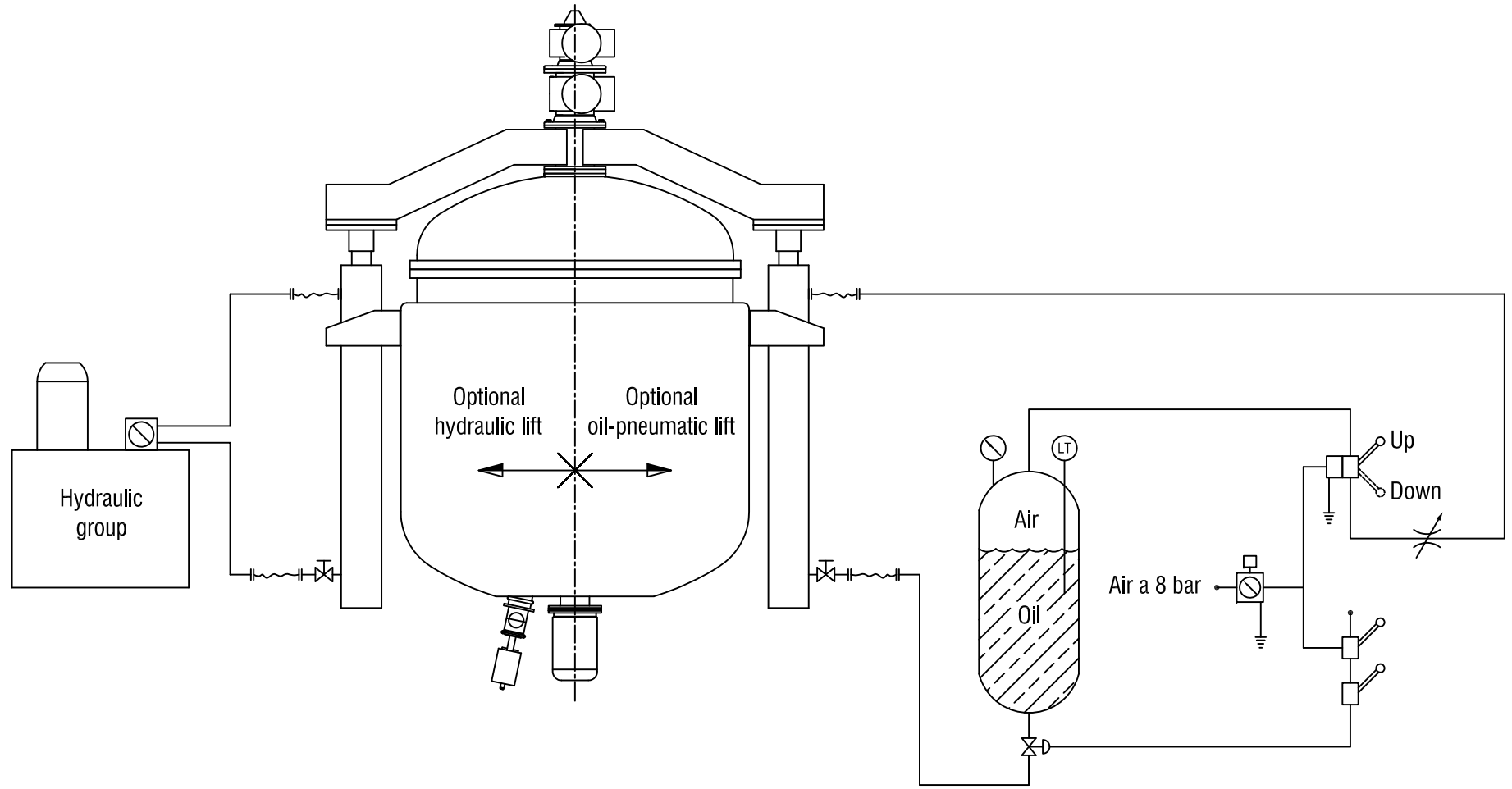
## COUNTER-ROTATING BLENDER PROCESS



AUXILIARY SERVICES FOR THE COUNTER-ROTATING BLENDER TANK WITH HEATING JACKET



## AUXILIARY SERVICES FOR THE COUNTER-ROTATING BLENDER TANK WITH DOUBLE HEATING JACKET



2 OPTIONS OF THE LID LIFTING SYSTEM