Identification

E.g. PP 140/85 – tempering furnace, capacity in litres/shortened max. temperature

Marketing text (intended for presentation in a catalogue, on the web etc.)

PP tempering furnace up to 650 / 850 °C

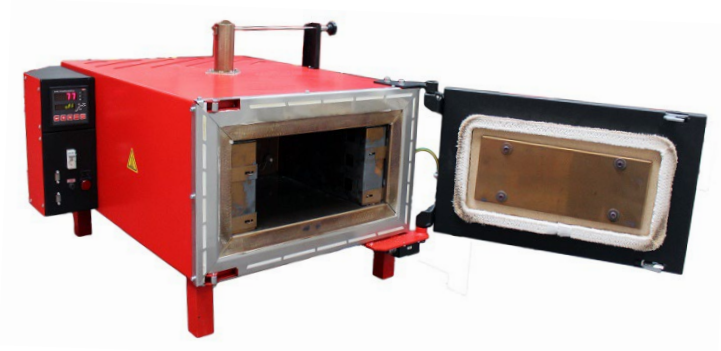
The smallest furnace with air circulation that is suitable even for temperatures below 600 °C

Uniform heating of the charge thanks to horizontal internal atmosphere circulation – this is the greatest advantage of the tempering furnaces. The precision of the temperature distribution, its guided increase and decrease and controlled cooling (for an additional cost) will, when used together, give you complete control over the process taking place within the furnace's chamber.

PP furnaces are regularly used in industry, and so they are truly robust and sturdy, and the smaller volume furnaces are also very compact and space-saving. Ideal for Ideal for sub-industrial plants and laboratory. If you treat them with at least a little respect, they will stick around with you for quite a long time.

PP 140/65, PP 20/65 professional photographs





Charge treatment technology

(PS = partially suitable)

- High-temperature tempering
- Low-temperature tempering
- Tempering of tool steels with a protective atmosphere (in the semi-gastight version)
- Annealing
- Solution annealing
- Annealing for relieving stress
- Soft annealing
- Recrystallisation annealing
- Heat treatment of metal materials
- Artificial ageing
- Heating and drying
- Preheating
- Material testing
- Curing
- Enamel firing
- Incineration, combustion, annealing loss (PS)
- Sintering (PS)

Structural benefits of the furnace

Stainless steel or refractory circulation insert for the furnace with a long-term service life, mechanical durability and corrosion resistant, horizontal circulation of the internal atmosphere ensuring the uniform distribution of temperatures in the furnace interior and high-quality insulation material resulting in low operational costs for the furnace.

Sales arguments

- Easy to install, easy to control
- Custom adjustments
- Delivery times within 6 weeks
- Low noise
- 24-month warranty
- Immediate technical support
- Forced air circulation
- Superb conduction of heat into the charge
- Even temperature distribution
- Mechanical durability
- Industrial robustness

Product URL on web

http://www.lac.cz/cs/pece-a-susarny/popousteci-pec-pp

Business arguments

Mostly fiber insulation is used for internal space insulation; all the exposed surfaces of the insulation are covered with sheet metal so as to avoid its damage during charge handling (wool does not damage the charge), (bottom, back, sides and door). This design improves the furnace's dynamic properties and reduces power consumption during cyclic furnace operation.

If the furnace is operated for a long period at a temperature close to the maximum permitted value, the higher heating of the furnace casing may occur. Insulation in the furnace (its thickness as well as materials used) is selected as a compromise between losses resulting from insulation penetration and losses caused by insulation accumulation. The furnace is optimized for a cycle of charge processing with a duration of approximately 6–12 hours; in the case of thicker insulation, the power consumption necessary for accumulation in the insulation would be increased excessively and the period for reaching the required furnace temperature would be extended, which would result in the extension of the period for which the furnace operates at full power input. The consequent difference in furnace losses in the stabilized condition would reduce the total power consumption only after the mentioned 12 hours of holding at a high temperature.

Frame

The furnace frame is made of constructional steel and provided with a surface finish with RAL 3020 red paint. The door casing, electric equipment cover and control panel are coated with RAL 9005 black paint. The surface finish is identical to the previous types. The PP 270 and PP 540 types have a part for electric installation consisting of a box made of bent sheet metal provided with a surface finish with RAL 9005 black paint screwed to the furnace frame. The other types have the electric installation positioned in the back part of the furnace. It forms a part of the frame.

Furnace structure

The interior of the furnace is fitted with circulation lining on the sides and back, the bottom and door of the furnace are covered with sheet metal; this part is made of stainless material (for temperatures of 650 °C) or refractory material (for temperatures of 850 °C). The rear part of the furnace where the electric installation is positioned is ventilated; it is covered with a double leaf door with switchboard locks on the PP 270 – PP 750 types, and in the case of the other types, it is covered with a face panel with switchboard locks. All of the furnaces are fitted with 130 mm high legs which allow furnace installation on a stand, or using universal feet. Except for the PP 20 model which is supplied only in the table version, the stand is supplied as a standard part with the furnace. The height of the stand is different for individual models so that the height of the loading edge will always be 900 mm above the floor. A stand with different dimensions can be delivered as an optional part as requested by the customer for a surcharge. The furnaces are fitted with a ventilation chimney with a manually controlled flap.

Door

It is mounted on hinges. In its standard version, it opens to the right. The door can be locked in the closed position with a single-handed closure or clamps (PP 270 – PP 750).

Insulation and interior equipment of the furnaces with max. temperatures of 650 °C

The furnace bottom is insulated with calcium-silicate boards. This design ensures the high load bearing capacity of the bottom while retaining good insulation properties. The other surfaces (sides, back and ceiling) are insulated with ceramic fiber insulation, all of them (including the bottom) are covered with stainless-steel sheet metal and, moreover, circulation inserts are installed on the sides and back. The door is insulated with ceramics fiber insulation which is compact, ensures no fibers are released from it (compact plate) and it is partially covered with a stainless sheet steel. All of the models have an entrance portal covered with a stainless-steel frame.

Insulation and interior equipment of the furnaces with max. temperatures of 850 °C

The bottom of the furnace is insulated with light-weight bricks. This design ensures the high load bearing capacity of the bottom while retaining good insulation properties. The side and back walls are insulated with more layers of ceramic fiber insulation and micro-porous insulation layer, all of them (including bottom) are covered with refractory sheet metal and, moreover, circulation inserts are installed on the sides and back. The door is insulated with ceramics fiber insulation which is compact, no fibers are released from it (compact plate) and it is partially covered with refractory sheet steel. All of the models have an entrance portal covered with a stainless-steel frame.

Loading frame and shelves

The shelves are made of bent sheet metal which is either stainless or refractory; they are perforated in order to ensure high-quality internal circulation. They are positioned so as the working space will be divided into sections of the same height. The shelves are not pulled up to the back wall, but a gap of 20–50 mm is left between them and back wall in order to allow air circulation in the furnace. The shelves of the PP 40 and PP 70 models are suspended directly on the circulation insert of the furnace. The PP 140 – PP 750 models are supplied together with a self-supporting loading frame, including shelves in the quantity specified in the table. The shelves for the PP 20 model can be supplied if requested so by the customer for a surcharge.

Heating

The furnaces are designed for 650 °C or 850 °C for all capacities. All of the models for 650 °C are fitted with heaters on the side walls. All of the models for 850 °C are fitted with spirals installed in heating panels. All of the models for all temperatures have the heating system positioned on the sides of the furnace behind the circulation insert which prevents the accidental contact of the operator with the heating elements.

Fan unit

The fan is located in the rear part of the furnace with a horizontally positioned shaft axis. The motor with fan is mounted on dampening blocks. Internal atmosphere of the furnace is driven with the fan through the heating elements with the circulation inserts in the furnace operating area where it is drawn through a hole in the rear wall back.

Electric equipment design

All of the electric components except for the controller are positioned in the back part of the furnace and are separated from the working area with an insulation wall. Access is provided through a removable cover in the back wall or through a double leaf door. The power supply cable, main switch, circuit breaker, and fuse and LED lamp indicating a fan motor FAULT are positioned in the back part on the furnace side with the controller. The furnace door is fitted with a safety limit switch. The heating system and fan are turned off when the furnace opens. The PP 20 furnaces (all temperatures) are equipped with a flexible cord and a socket as standard parts. The other models are fitted with a 3 m long power supply cable with CEE socket as standard parts.

Measuring and control

The temperature in the furnace is detected with a thermocouple of the “K” type. The Ht205 controller is used for furnace control and it is positioned on the furnace's left-hand side in the standard design. The furnaces are not fitted with a limit unit; they are fitted with SSR contactless (proximity) semi-conductor switching relays.

Standard furnace equipment

- Ht205 controller (30 programmes with 15 steps each)
- 2 stainless steel or refractory shelves (except for the PP 20)
- Manually controlled ventilation flap for cooling the furnace's operational space
- Contactless switching relay for noise-free operation
- Limit switch for safe opening of the furnace
- Door manually opening towards the right-hand side
- Stand (except for the PP 20 table version)

Optional accessories available for an additional cost

- Ht200 controller (30 programmes with 25 steps each, USB interface)
- Protective atmosphere supply (manually or automatically controlled gas intake) in accordance with the Inlet datasheet OBCH-OD-inlet-EN
- Semi-gastight furnace version (cannot be combined with the automatic ventilation flap) in accordance with the semi-gastight PP datasheet OBCH-OD semi-gastight-PP-EN
- Tree-channel digital temperature recorder
- Automatic ventilation flap for cooling the furnace’s operational space (only with the Ht205/Ht200 controller)
- Optimisation of the temperature field for compliance with DIN 17052-1 ΔT 10 °C in the internal usable space (in an empty furnace at Tmax, a grommet for thermocouples is required), including measurement protocol
- Measuring loop calibration
- EIA-485 interface
- LAN interface (only with the Ht205/Ht200 controller)
- HtMonit EV set (contains interface + software)
- Controlled overpressure forced cooling (cannot be combined with the semi-gastight furnace version, cannot be made for furnace volumes up to and including 20 l due to the size of the forced cooling fan, only with the Ht205/Ht200 controller)

- Uncontrolled overpressure forced cooling (cannot be combined with the semi-gastight version, cannot be made for furnace volumes up to and including 20 l due to the size of the forced cooling fan, only with the Ht205/Ht200 controller)

Custom additional components

- Custom stand
- Door opening to the left or upwards (hydraulically controlled, pneumatically controlled)
- Additional shelves
- Operating container for heat treatment with automatic supply of protective atmosphere (instead of shelves)
- One-handed opening (for models PP 20 through PP 140 inclusive, this is standard equipment)

Segment Accessories – 3D Printing

Standard furnace equipment includes: (in addition to the standard PP furnace design)

- Operating container for heat treatment with automatic supply of protective atmosphere (instead of shelves)
- HtMonit EV set (contains LAN interface + software)
- Automatically controlled supply of protective atmosphere for one type of gas (one flow meter)
- Automatically controlled protective atmosphere supply for one type of gas (one flow meter)
- Control thermocouple of the "K" type
- Batch thermocouple of the "K" type
- Switching furnace control between control and charge thermocouple
- Ht700 limit unit with temperature display for furnace overheating protection

Note: When combining accessories (for an additional cost), consult with our technical office.

Warranty

- 24 months

Technical parameters

Order number	LAC type	Tmax**	Recommended operating temperature range	Capacity	External dimensions (w x h x d)	Internal dimensions (w x h x d)	Shelf	Heating power input***	Weight	Protection*	Voltage
		°C		l	mm	mm	ks	kW	kg	A	V
01096311	PP 20/65	650	200-600	20	800x650x1000	300x200x350	-	3,0	130	16/1	230
01096312	PP 40/65	650	200-600	35	850x1450x1050	300x300x400	2	6,0	180	16/3	400
01096313	PP 70/65	650	200-600	70	850x1550x1150	350x400x500	2	8,0	200	20/3	400
01096314	PP 140/65	650	200-600	135	950x1650x1250	450x500x600	2	12,0	250	25/3	400
01096315	PP 270/65	650	200-600	270	1200x1750x1450	600x600x750	2	20,0	580	40/3	400
01096316	PP 540/65	650	200-600	540	1300x1950x1750	750x800x900	2	24,0	850	50/3	400
01096142	PP 750/65	650	200-600	750	1300x1950x2100	750x800x1250	2	36	1000	63/3	400
01096317	PP 20/85	850	300-800	20	850x700x1050	300x200x350	-	3,0	140	16/1	230
01096318	PP 40/85	850	300-800	35	850x1450x1050	300x300x400	2	7,0	200	20/3	400
01096319	PP 70/85	850	300-800	70	900x1550x1150	350x400x500	2	9,0	250	20/3	400
01096320	PP 140/85	850	300-800	135	1000x1650x1250	450x500x600	2	14,0	350	25/3	400
01096321	PP 270/85	850	300-800	270	1200x1750x1650	600x600x750	2	20,0	580	40/3	400
01096322	PP 540/85	850	300-800	540	1350x1950x1800	750x800x900	2	30,0	850	50/3	400
01096143	PP 750/85	850	300-800	750	1350x1950x2100	750x800x1250	2	40	1000	80/3	400

**Protection can vary depending on the accessories added (for an additional cost).*
***T max is the maximum temperature at which the furnace cannot be operated for a long period of time*
****The power input for the fan motor in the PP 20 models is 0.25 kW. For the PP 40 – PP 140 models and for the PP 270/65, it is 0.37 kW for all temperatures. For the PP 270/85 and PP 540 – PP 750 models, it is 1.1 kW for all temperatures.*
Subject to technical changes.

LAC type	Max. load capacity of shelves (kg)	Max. load capacity of bottom (kg)
PP 20	-	30
PP 40	15	50
PP 70	25	80
PP 140	40	150
PP 270	75	240
PP 540	100	500
PP 750	100	500

Change index

Change index	Change/revision made by	Change/revision description and numbers of the changed sections/pages	Date, Signature	Change approved by Date, signature
3	Žilka	Change of the controller	31. 10. 2007	Neugebauer
4	Žilka	Extension to the temperature of 450 °C	2. 2008	Anderle
5	Furchová	Changes of external dimensions, identification of models in the fan unit and door insulation sections. Other changes in the furnace insulation and furnace benefits. Photographs added.	17. 12. 2008	Žilka
6	Furchová	Change of the warranty period to 12 months.	16. 2. 2009	Žilka
7	Horáková	Fibrous insulation covering. Different designs of insulation according to temperatures	10. 3. 2009	Žilka
8	Horáková	Business argumentation section added. Change of external dimensions for temperatures of 650ºC	19. 10. 2009	Diblík
9	Horáková	Description of fan power input under the parameter table modified.	7. 5. 2010	Kokta
10	Horáková	Change of the temperature distribution data.	20. 8. 2010	Anderle
11	Horáková	Temperatures of 450 °C and 650 °C merged in the "insulation" section, change for temperatures of 850 °C, changes in the "Fan unit" and "Business argumentation" sections	25. 5. 2011	Diblík
12	Horáková	Change of the warranty period to 24 months	16. 4. 2012	Diblík
13	Herůfek	Change of the optimisation of the temperature field for compliance with DIN for accessories supplied for a surcharge	13. 8. 2012	Diblík
14	Horáková	Modification of formatting, modification of the standard furnace version, optional accessories available for additional costs and custom additional components section added	10. 12. 2012	Holuša
15	Herůfek	Table of storehouse numbers for gastight versions added	19. 6. 2013	Holuša
16	Horáková	Custom additional components section modified	27.6.2013	Diblík
17	Horáková	Information of the semi-gastight version added in the optional accessories available for additional costs section	11.2.2014	Jonáš
18	Horáková	Change of the HtIndustry (HT205) controller identification, standard equipment, custom additional components and business argumentation sections modified	16.3.2016	Názler
19	Horáková	Modification of the external furnace dimensions.	24.3.2016	Názler
20	Merta	Detailed update of contents	30.6.2018	Názler
21	Merta	Change Order Numbers, Table Update Sheet Stocks with Overpressure Forced Cooling, Change of Optional Accessories (Temperature recorder)	31.1.2019	Názler
22	Merta	Increasing the load capacity of shelves and bottom. Optimization including measurement protocol, overpressure cooling is not possible for volumes of 20 l and less. New stock numbers of furnaces. Same controller for all temperatures. Additional items for 3D printing, adjusted weight PP 70/65 (45) and PP 140/65 (45).	1. 6. 2021	Názler
23	Merta	Cancellation of the variant to a temperature of 450 ° C for all cubatures. New volume PP 750/65 and 85.	1.6.2022	Anderle