



3. HYDRAULIC UNIT AND CYLINDERS

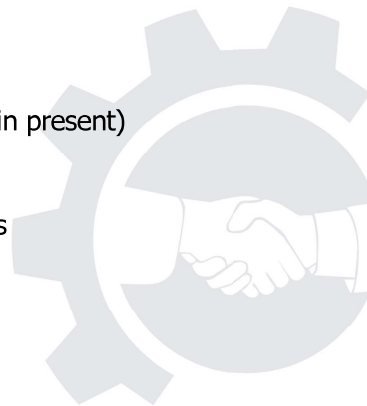
It is particularly important to achieve following cycles with variable speed:

3.1. Hydraulic unit

Must be foreseen to grant a gradual start-up and stoppage of the transfer and lifting/lowering movements, which prevent excessive stresses on the mechanical system, guarantees a linear conveyance of Billets through the furnace and avoids damages to the refractory lining caused by vibrations

Furnace must be equipped with a hydraulic unit including:

- Blade pumps with motor for lifting and translation movements
- Filters with valve and clogging indicator
- Max pressure valves
- Oil filters
- Heat exchanger
- Thermostatic valves
- Pressure gauge
- Oil pneumatic receiver
- **5.5 Kw Heater**
- Electric panel
- Blade pumps with motor for doors cylinders (in present)
- Blade pumps with motor for oil conditioning
- Blade pumps with motor for Kick-off cylinders
- Blade pumps with motor for Kick-in cylinders
- Proportional valves
- Control distributor for various cylinders
- Oil tank



The cylinders foreseen have following approximate characteristics:

3.2. Discharging 500 mm width doors lifting

- N° 2 cylinders having following main characteristics:

- bore diam. 63 mm
- stem diam. 35 mm
- stroke 450 mm
- working pressure: 60 bar

3.3.Charging door lifting

- N° 1 cylinder having following main characteristics:
- bore diam. 63 mm
- stem diam. 35 mm
- stroke 450 mm
- working pressure: 60 bar

3.4.Hearth lifting

- n° 1 cylinder having following main characteristics:
- bore diam. 320 mm
- stem diam. 180 mm
- stroke 750 mm
- working pressure: 150 bar

3.5.Hearth translation

- n° 1 cylinder having following main characteristics:
- bore diam. 160 mm
- stem diam. 100 mm
- stroke 300 mm

3.6.Kick-off lifting

- n° 2 cylinder having following main characteristics:
- bore diam. 125 mm
- stem diam. 80 mm
- stroke 250 mm

3.7.Kick-off translation



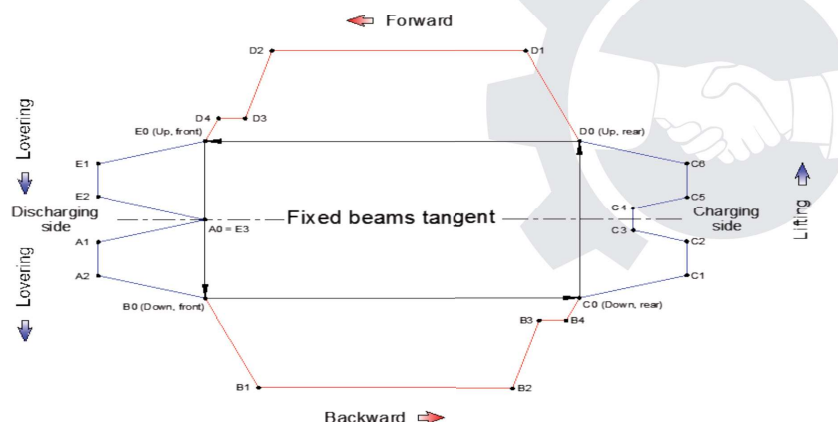


- n° 2 cylinder having following main characteristics:
- bore diam. 80 mm
- stem diam. 50 mm
- stroke 1300 mm

3.8. Kick-in

- n° 2 cylinders having following main characteristics:
- bore diam. 80 mm
- stem diam. 50 mm
- stroke 500 mm

All above data are to be better dimensioned during final engineering of furnace!





4. WATER COOLING SYSTEM

Cooling of refrigerated parts of the furnace is effected through two independent circuits:

4.1. Supply of soft water:

- Charging rollers way: abt 12 m3/h of soft water
- Discharging rollers way: abt 18 m3/h of soft water
- TVCC: abt 0,5 m3/h of soft water
- Kick-off and sensor probes : abt 10 m3/h of soft water
- Charging stopper: abt 2 m3/h of soft water

4.2. Supply of industrial water:

- Seal hearth joints: abt 30 m3/h of industrial filtered water
- Hydraulic unit exchanger: abt 5 m3/h of indirect water

Above flows are calculated with a temperature difference of max 22 °C between water inlet/outlet. (for skids cooling)

Soft water must have hardness inferior than 30 French degrees (temporary plus permanent). Permanent hardness (sulphate, chloride, and nitrate) must be not superior to 12 French degrees.

In order to be sure that each device is correctly and regularly fed of necessary water flow, installation of flow indicators is necessary, with electric emergency signal in case of water lack.

4.3. SUGGESTED MAIN CHARACTERISTICS OF WATER

4.3.1. Direct water cooling - open circuit

- Type filtered water
- Entry pressure 3- 4 bar
- Exit pressure 0 bar
- Discharging level, respect workshop level about - 4.000 mm
- Entry temperature about 35°C



➤ Temperature increasing max Delta T	about 20°C
➤ PH	7- 9
➤ Total hardness (as CaCO ₃)	50-300 mg/l
➤ Total alkalinity	150-500 mg/l
➤ Specific conductivity	about 1.000 uScm-1
➤ Chlorides (as Cl)	about 100 mg/l
➤ Sulfates (as SO ₄)	about 200 mg/l
➤ Fe total (as Fe)	about 2 mg/l
➤ Silicates(as SiO ₂)	about 100 mg/l
➤ Total dissolved solids	about 1.000 mg/l
➤ Total suspended solids	about 80 mg/l
➤ Suspended solids – particles dimensions	about 200 um
➤ Oil	about 8 mg/l
➤ Recycle flow	about 25 m ³ /h

4.3.2. Indirect water cooling – closed circuit

○ Type	water industrial treated
○ Entry pressure	4 bar
○ Exit pressure	1,5 bar
○ Entry temperature	about 35°C
○ Temperature increasing normal Delta T	about 10 °C
○ Temperature increasing max Delta T	about 22 °C
○ pH	7-8
○ Total hardness (as CaCO ₃)	30- 200 mg/l
○ Total alkalinity	100- 200 mg/l
○ Thermal conductivity	about 1.000 uScm-1
○ Chlorides (as Cl)	about 50 mg/l
○ Sulfates (as SO ₄)	about 50 mg/l
○ Fe total (as Fe)	about 0,5 mg/l
○ Silicates(as SiO ₂)	about 30 mg/l
○ Total dissolved solids	about 600 mg/l



- Double cross limit system
- Furnace pressure regulation
- Combustion air pressure regulation
- Recuperator protection system
- Safety and alarm equipment
- Recording
- Control board
- Oxygen control
- NO_x, SO₂ and particulate on line measurement

More precisely:

5.2. Temperature control

Following instruments are foreseen for each unit:

- N° 2 T/c Pt Pt 10%, Rh. double element "S" type, L-800 mm (for control and recording)
- N° 1 microprocessor controller configured for temperature control:
- N° 1 drive unit, torque 5 Kgm, mounted and connected to butterfly valve (following item)
- N° 1 butterfly valve for preheated combustion air up to 500°C

5.3. Combustion air/Natural gas ratio

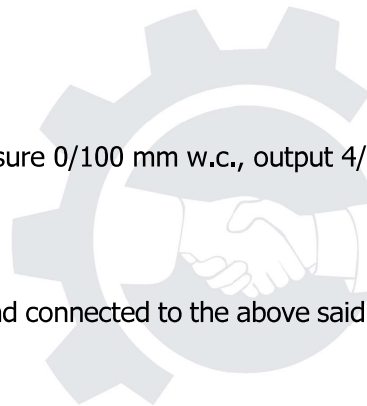
Following instruments are foreseen for each unit:

- N° 1 NG gas flow transmitter for differential pressure 0/100 mm w.c., output 4/20 mA
- N° 1 orifice plate for NG gas AISI 304
- N° 1 butterfly gas flow control valve
- N° 1 drive unit, torque 5 kgm-45 sec, mounted and connected to the above said butterfly valve

5.4. Furnace pressure control

Following instruments are foreseen :

- N° 1 furnace pressure transmitter range +/- 5 mm w.c., output 4/20 mA





- N° 1 manifold unit in FE 37
- N° 1 electric actuator for connection with exhaust gas damper, torque 30 kgm

5.5. Combustion air pressure regulation

Following instruments are foreseen:

- N° 1 combustion air pressure transmitter range 0-1000 mm w.c., output 0-20 mA
- N° 1 manifold unit Fe37 or equivalent valves system
- N° 1 microprocessor controller, configured for combustion air pressure control
- N° 1 inverter to control the Combustion Air Fan

5.6. Recuperator protection

Following instruments are foreseen:

- N° 1 fumes before preheater temperature controller microprocessor type
- N° 1 thermocouple Cr-Al double element L=800 mm "K" type, for fumes temperature measurement before
 - recuperator
- N° 1 drive unit, torque 3 Kgm, connected and assembled with butterfly valve (following item)
- N° 1 butterfly valve for cold air inlet DN200 PN6

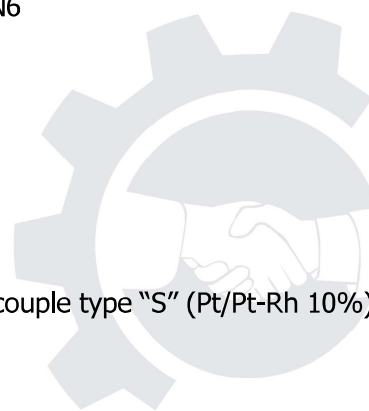
5.7. Safety equipment

Provided for:

5.7.1. Temperature control

The temperature of the area is controlled by thermocouple type "S" (Pt/Pt-Rh 10%). For thermo-couple the following alarms are generated:

- Thermocouple breaking alarm
- High temperature alarm
- Max temperature alarm, with closing at minimum of the involved area (closing of all adjustment valves of the concerned area).



The signal of the thermocouple (automatic or manual) is sent to the temperature adjustment device. The set point of the temperature adjustment device is set by the operator by means of the supervisor.

There's the possibility to program automatic reductions of the temperature set points (by values preset from supervisor).

This procedure can be employed when switching off the furnace and/or in case of prolonged production stop (e.g. in case of clogging in the mill).

There's the possibility to program automatic increases of the temperature set points (by values preset from supervisor).

This procedure can be used when warming up the furnace.

The output of the temperature adjustment device after being processed by a logic bloc called "Double Cross limit" controls, in sequence, the SET-POINT of the flow regulation device of the combustion air and the SET- POINT of the flow gas regulation device.

5.7.2. Combustion air/fuel ratio

The measures of flow combustion air and flows are performed by a measurement diaphragm/valves and by the related flow transmitter.

The measurement of flow combustion air is corrected according to the temperature of fluid to the main collector, set after the recuperator.

The output of the flow combustion air regulation device is sent to the servo-motor that starts to related adjustment valve.

The indication of the position of the adjustment valve for combustion air is available.,

The output of the flow gases adjustment device is sent to the servo-motor that starts the related adjustment valve.

The indication of the position of the adjustment valve for gases is available.

The combustion ratio between combustion air and gas can be preset by the operator, for each individual area. The system foresees the indication and the recording of flow combustion air and natural gas .