StrikoMelter

StrikoWestofen°
Group

STRIKO FURNACE K300 / 1994
FR - Ref. No: 4897-CM

Functional Description

Serial number

Project number

Customer

Language

English

Furnace type

MB 1 1500 / 750 eg

Flow diagram

MBAGR0019

NOTE:
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July 20, 2021

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Foreword

This manual may not be passed on to third parties and those who do so are liable for damages.

We reserve the right to make technical modifications to the illustrations and data in this manual if they are necessary to improve the furnace.

This manual must be available at the plant in a suitable location near the furnace to guarantee immediate access should questions arise. The manual is valid for the furnace named above. The series number must correspond with the name plate on the furnace.

The operator must add instructions to comply with existing national regulations on accident prevention and environmental protection. In addition to observing the instructions in the manual and the binding accident prevention regulations valid in the country and the place of use, the operator must observe the recognized technical rules for safe and correct work.

All persons responsible for tasks involving the furnace, e.g. in operation, maintenance and repair, must read and follow the manual.

All data and information in this manual is based on the experience and findings of Striko Westofen GmbH, and printed to the best of our knowledge and in good conscience.

StrikoWestofen GmbH is liable for errors or omissions laid down as warranty obligations in the sales contract only. All other claims are excluded. Further claims for damages are excluded, regardless of the legal argument on which such claims are based.

No liability or warranty claims will be accepted:

- if the information and instructions in this manual were not followed
- if the furnace, including accessory devices, was incorrectly operated, or if the prescribed operating sequence was not followed
- if the furnace is used for a purpose for which it is not intended
- if safety equipment is not used, or fully/partially decommissioned
- if the function is modified in any way without written consent of StrikoWestofen GmbH
- if the relevant safety regulations are not observed
- if the furnace, including accessory devices is not correctly maintained (both with regard to the timing and the method) (this also includes the use of spare parts)

Wearing parts are not covered by the StrikoWestofen GmbH warranty

Only spare parts approved by StrikoWestofen GmbH may be used when replacing parts. Failure to do so voids all liability and warranty claims.

Furnace programs

There are three different furnace programs:

Holding/melting program

This program is the actual program for production. When this program is running, the bath temperature is kept to the preset set-point by means of a PID closed loop controller.

Sintering program

This program is only run after a new refractory lining has been installed in the furnace and the furnace is cold. To start the sintering process, turn the "Holding burners ON" switch to the "ON" position and

select the sintering program in the visualisation device (OP 17, Panel PC ect). The instructions for the sintering process must be strictly adhered to.

Heat-up program

This program is used only in connection with a cold furnace Where the furnace has been switched OFF for some time) or on a furnace where the temperature in the holding chamber has dropped below 400°C (752°F). To start the heat-up program, turn the "Holding burner(s) ON" switch to the "ON" position and select the Heat-up program in the visualisation device (OP 17, Panel PC ect). The instructions for the heat-up procedure must be strictly adhered to.

Temperature measuring points

The furnace is equipped with several temperature measuring points. Each measuring consists of a type K thermocouple (NiCr-Ni 0-1200°C). The thermocouple is connected to the analogue input of the PLC by means of a thermocouple cable (NiCr-Ni) and (NiCr-Ni) terminals.

Bath thermocouple

This thermocouple is used to regulate the temperature of the molten metal. During the holding/melting operation, the temperature is controlled by means of a PID closed loop controller. If the furnace is not equipped with a thermocouple in the ceiling, the temperature during heat-up operation is controlled by means of a 2-point controller.

Ceiling thermocouple

This thermocouple is used during sintering and heat-up. It is used in conjunction with a 2-point controller. During holding/melting operation, the thermocouple at the ceiling acts as a temperature monitor for the molten metal temperature. If the maximum permissible limit is exceeded, the holding burner(s) is/are switched off.

Melting chamber thermocouple

This thermocouple is used during sintering and heat up. It is used in conjunction with a 2-point controller. This thermocouple acts as a temperature monitor during the melting operation. If the maximum permissible temperature is exceeded, the melting burners are turned back to step 1(Low Fire). If this temperature limit is exceeded for a prolonged period of time, the melting burners are shut down completely.

Waste gas thermocouple

This thermocouple is used to start the charging process if no laser shaft scanner is present. If the set-point for the start charging procedure has been exceeded and charging unit is not in automatic mode, the melting burners are shut down. If the maximum permissible temperature is exceeded (eg. the charging unit is in automatic and there is NO material in the charging unit to be charged) the melting burners are turned back to step 1 (Low Fire). If the temperature set-point is exceeded for a prolonged period of time, the melting burners are shut down completely

Temperature limiter for the bath chamber (Ceiling)

The bath chamber is equipped temperature limiter in accordance to DIN 3440 which checks that the temperature in the chamber dosn't exceed the pre-set value .

If the temperature in the bath chamber reaches an inadmissible temperature (>= 1050°C) all burners are switched off (the switching contact in the temperature limiter locks off mechanically). The fault has to be reset on the limiter manually by the operator or service personnel. The fault is displayed in the operating panel and the red signal light is on.

The fault trips additionally the critical fault relay, which in turn can be evaluated by the customer (eg a signal to the doorman) As reference the second thermocouple from the double thermocouple is used

for the temperature in the bath chamber. The occurrence of this fault requires acute action, because there is a danger that the metal bath" freezes ".

Possible causes could be:

- Temperature on the bath chamber ceiling is => 1050°C
- The thermo-couple is defect or has a short circuit
- The plug for the thermo-couple is not connected

Holding burner (gas-fuelled)

The furnace may be equipped with one or more holding burners. Holding burners are used to maintain a certain bath temperature, based on the bath temperature set-point that can be adjusted in the visualisation device, to ensure that the metal remains molten. Type WH furnaces are equipped with an additional system monitoring the temperature at the holding chamber ceiling. When the pre-programmed limit temperature of 1050° C is reached, the holding burners are switched off and have to be reset manually (WARNING - MOLTEN METAL CAN FREEZE). The molten metal is held in the bath chamber and is ready to be used.

If there are more then one holding burner installed, they operate parallel. Each holding burner is however separately monitored and controlled by an automatic gas burner control unit. If one burner fails, the other burner continues to hold the molten metal at the desired temperature. The holding burners are ignited directly by means of an ignition electrode powered from an ignition transformer. The flame is monitored by means of an ionisation electrode. During heat-up and sintering mode, the holding burners are controlled by a 2-point controller and operated at level 1 (Low Fire). In holding mode, the burners are always operated at level 2 (High Fire). In this mode, they are controlled by a PID controller with pulse width modulation.

The gas/air mixture required for the combustion process is fed to the burners from the air fan and an electro-mechanical gas regulator, the gas flow is controlled by a gas-flow ratio controller and a gas solenoid valve. The gas-flow ratio controller opens and closes in conjunction to the air pressure that is measured at its control input. All burners in StrikoWestofen units are forced-air burners.

To ensure constant air supply to the burners, the unit is equipped with a fan. The three-phase motor driving the fan starts directly, but, if the unit with power P1 >= 4 KW, the drive system starts over a soft-starter.

Operating mode "Holding" is selected manually in the control panel by starting the holding/melting program, and the "Holding burner ON" switch at the control panel is set to the position "ON".

The furnace cannot be set to holding mode, if one of the following has occurred:

- Emergency-stop has been activated
- Control voltage must be switched on
- No controller request from the holding chamber's burner controller
- Switch "Holding burner ON" set to the "OFF" position
- Motor protector for the fan has tripped
- The holding chamber gas burner(s) controller should not have a fault
- Fault signal "Air pressure switch has not switched off"
- Fault signal "Min. air pressure not reached" should not be active
- Fault signal "Over temperature at ceiling" should not be active
- Fault signal "Gas pressure below min. limit" should not be active
- Fault signal "Gas pressure exceeds max. limit" should not be active
- Gas leakage test system on gas supply is not ready
- Fault signal "Thermostat protection for the fan is triggered" should not be active

If all above conditions are met, the system checks whether preliminary flushing of the furnace chamber is required.

Preliminary flushing of the holding burner

Preliminary flushing is carried out, if one of the following has occurred:

- When the burner controller requests a start after a fault on the bath thermocouple
- Any fault on the holding burners
- Return of power after power failure
- When the burner controller requests a start after a fault on the ceiling thermocouple

Preliminary flushing is not required, if the following parts are fulfilled:

- The temperature in the bath chamber is above the specific ignition temperature of the fuel
- One or more holding burners are already in operation

If preliminary flushing is activated, the fan is started. As soon as the pressure set at the air pressure switch is reached, the air flap controller is started.

Air flap control

When the preliminary flushing program is started, the air flap opens. As soon as the air flap has reached position "air flap open", the flushing timer starts. When the flushing process is completed, the air flap is closed. When the air flap has reached the "closed" position, a start signal is sent to the gas burner control unit, which starts the burner program. The start-up procedure for the air flap after completion of the flushing program is initiated as soon as the gas burner control unit has transmitted the flame signal to the control system. When the melting/holding program is run, the air flap returns to position "open". In sintering and heat-up mode, the air flap is in middle position.

Note:

The flap positions "open", "closed" and "mid-position" are determined by the respective spindle limit switches located on the drive shaft of the servo motor. The limit switches for positions "closed" and "open" are non-floating changeover switches. The limit switch for the mid-position is a floating normally open switch.

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When the air flap has returned to position "closed", after the preliminary flushing is completed, a release signal is sent to the gas burner control unit, which then starts its program:

- A self-test is initiated
- after completion of the self-test, the ignition transformer is powered (leading to an ignition spark)
- the gas line is opened at the same time
- The gas-air mixture is fed to the burner, where it is ignited
- After a certain time (ignition time), the ignition transformer is switched off
- When the flame is stable, a signal is sent back to the automatic burner control unit (via the ionisation electrode)
- The gas burner control unit transmits the flame signal to the PLC control system

If no flame signal is generated during the safety period (i.e. period from "Ignition transformer ON" to the formation of a stable flame), the gas burner system is automatically shut down, as a fault is assumed. After such a shutdown on fault, maximum 2 automatic release procedures of the gas burner system are initiated by the PLC. If the burner fails to start after the 2th automatic release, it is shut down and a burner failure signal is issued.
After acknowledgement of the message by pressing the "Reset" push button, the programme is restarted.

Holding burner(s) controller

There are two different ways to control the holding burners and these differentiate in: The PI controller is used to control the bath temperature during holding/melting mode. In sintering and heat-up mode, a 2-point controller is used, as the response time of the PI controller is too slow.

General

The capacity of gas and oil burners cannot be regulated constantly between 0 and 100% performance rate. Therefore, a pulse width modulation is used in the burner controller. In other words, the continuous controller output is converted to a switch-on period for the burner. This method has two distinct advantages over continuous burner regulation:

- The burner can be constantly operated at full capacity. The entire convection heat of the burner can be utilised. The energy consumption is less than that of a power-reduced burner.

Operation of PI controller with pulse width modulation

The PI controller includes the components nominal value, actual component, P component (proportional component), I component (integral component), disturbance (effect of the additional required power for melting) and a switch output.
A constant controller output is calculated by adding components P, I and disturbance. The constant controller output is then converted into a pulse-pause ratio that determines the burner operation and directly affects the switching output.

P component

The P component is based on the proportional gain adjustable at the controller and control deviation (difference between nominal and actual value). The proportional gain is here entered in %. The P component is adjusted by a preset value per 1°C control deviation. Example: If a proportional gain of 5% is entered, 100% P component is reached, if the control deviation is 20°C. Per 1°C control deviation, the controller output is increased or lowered by 5%, depending on whether the control deviation is positive or negative. If the set value is too high, the controller tends to oscillate.

I component

The I component is calculated from the integration time and the control deviation. The integration time is the period required to complete a control increment of the P component at a control deviation of 1°C.

Example:

PV - 5%

TI - 10800s

Bath nominal - 720°C

Bath actual - 719°C

If the actual value of the bath temperature were to remain at 719°C for the duration of 10800 seconds, the controller output would be increased by 5%. If the temperature would remain constant for half the above period, the increase would be 2.5%. At a time of 10800 seconds and a control deviation of 10°C, the value would be 50%. The I component is permanently saved and is only adjusted indirectly by changes to the time and the control deviation. If the set integration time is too short, the controller circuit might begin to oscillate.

Disturbance "melting"

If the melting burners are switched on, a disturbance is added to the controller output. We recommend determining this value by means of a series of tests, as it varies considerably, depending on the actual furnace size. If the bath temperature drops after the melting burner has been switched on, the value must be increased. If the bath temperature increases after the melting burner has been switched on, the value must be reduced.

Control loop update and pulse width modulation

The control loop is updated every 2 seconds. The pulse width modulation works at a cycle rate of 600 seconds. During a cycle, the burner, if settled, is switched on and off once.
If the constant controller output requires 30% burner output, this means that the burner is switched on for 180 seconds and switched off for 420 seconds.

Additional settings

Integral value for start (adjustable)

In order to ensure that the control system does not have to complete a full transient cycle each time, operators have the option to pre-set st art I. Start I corresponds to the output requi red to maintain a constant furnace temperature. This value must be adjusted in the course of the commissioning of the unit. The standard value corresponds to the ratio of the ene rgy consumption for holding operation and the burner capacity.

Example:

Burner output - 400 kW

Energy consumption in holding mode - 60 kWh

I start [%] = (100 x Energy consumption in holding mode) / (Burner output x 1hour)

I start [%] = (100 x 60kWh) / (400kW x 1h)

I start [%] = 15%

Manual burner output control

If either the bath or ceiling thermocouple are defective, the holding burners are not controlled by the temperature control system but light according to a fixed power value set in the control panel . The set power value corresponds to the switch-on time of the b urner, expressed in percentages of 600 seconds. The value is calculated similarly to the start integral value. In man ual mode, the furna ce chamber is always flushed, as the re is no temperature return. Therefore the power value must be greater than the value for start I.

Melting burner (gas-fuelled)

Furnace units are equip ped with one or more melting burners. Melting burners are used to melt th e metal in the furnace shaft. The metal i s filled into the shaft in the form of bl ocks are as recycled material. The molten metal subsequently flows from the melting chamber to the holding chamber. If there is more then one m elting burner installed, they operate parallel to ea ch other. Each burner is however monitored separately and controlled by an automatic gas burner control unit. If on e burner fails, the other burners ensure that the melting temperature is maintained in the chamber. The melting burners can be operated in two power levels (High Fire and Low Fire) and are ignited dire ctly by an ignition electrode powered from an ig nition transformer. The fla me is m onitored by means of a n ionisation electrode.

In heat-up and sintering modes, the holding burners are operated at level 1 (Low Fire). During melting mode, all melting burners are run at lev el 1 (Low Fire) or 2 (High Fire), depending on requirements. The gas/air mixture needed in the co mbustion process is fed to the burne rs from the combustion air fan and an electromechanical annular gas regulator, while the gas supply is controlled by a gas-flow ratio controller and a gas solenoid valve. The gas-flow ratio controller opens and closes in the supply line, depending on the air pressure measured at its control input. The temperature is monitored in the melting chamber and the extracto r hood. If a fix ed-programmed limit value is reached, the melting burner(s) are shut down from level 2 (High Fire) (100% melting capacity) to level 1 (Low Fire) (70% melting capacity).

To ensure constant air supply to the b urners, the unit is equipped with a fan. The three-phase motor driving the fan starts directly, but, if the unit with power P1 >= 4 KW, the drive system starts over a soft-starter.

The melting mode is selected manually by pre ssing the button s "Melting O N" and "Meltin g step II selected" or "Free melting selected".

The furnace cannot be set to melting mode, if one of the following has occurred:

- Emergency-stop has been activated
- Control voltage must be switched on
- No melting program has been selected (e.g. "Melting OFF")

- The bath has reached the maximum filling level (signal)
- Melting chamber door has to be closed
- Fault signal indicating an error in the temperature controller of the melting chamber
- Fault signal indicating an error in the temperature controller of the waste gas system
- Motor protector for the fan has tripped
- Fault signal from the gas burner control unit of the melting burner(s)
- Fault signal "Air pressure switch has not switched off"
- Fault signal "Min. air pressure not reached" should not be active
- Fault signal "Gas pressure below min. limit" should not be active
- Fault signal "Gas pressure exceeds max. limit" should not be active
- The filling time has been exceeded
- The maximum waste gas temperature should not be exceeded
- Fault signal "Wire break at bath filling level electrodes"
- Gas leakage test system on gas supply is not ready
- Shaft cover is not open
- Fault signal "Molten metal has reached alarm filling level"
- Fault signal "Thermostat protection for the fan is triggered" should not be active

If all above conditions are met, the system checks whether preliminary flushing of the furnace chamber is required.

Preliminary flushing of the melting burner

Preliminary flushing is required, if one of the following has occurred:

- Controller request after a fault on the melting chamber thermocouple
- Melting burner fault
- Return of power after power failure

Preliminary flushing is not required, if the following parts are fulfilled:

- The temperature in the melting chamber is above the specific ignition temperature of the fuel
- One or more holding or melting burners are already in operation

If preliminary flushing is activated, the fan is started. As soon as the pressure set at the air pressure switch is reached, the air flap control is switched on.

Air flap control

When the preliminary flushing program is started, the air flap opens. As soon as the air flap has reached position "air flap open", the flushing timer starts. When the flushing process is completed, the air flap is closed. When the air flap has reached the "closed" position, a start signal is sent to the gas burner control unit, which starts the burner program. The start-up procedure for the air flap after completion of the flushing program is initiated as soon as the gas burner control unit has transmitted the flame signal to the control system. When the melting/holding program is run, the air flap returns to position "open". In sintering and heat-up mode, the air flap is in middle position.

Note:

The trip cam of the spindle limit switch for the "mid-position" is designed in such a way that the limit switch is tripped when the flap is moved from "mid-position" to "open".
If the closing process is initiated after the above nominal value is reached, the limit switch for "mid-position" is temporarily deactivated and then tripped again so that a switching process takes place. It has thus a pre-defined position. The flap positions "open", "closed" and "mid-position" are determined by the respective spindle limit switches located on the drive shaft of the servo motor. The limit switches for positions "closed" and "open" are non-floating changeover switches. The limit switch for the mid-position is a floating normally open switch.

The trip cam of the spindle limit switch for "mid-position" is designed in such a way that the limit switch is tripped when the flap is moved from position 1 to position 2.
If the closing process is initiated after the above nominal value is reached, the limit switch for "mid-

position" is temporarily deactivated and then tripped again so that a switching process takes place. It has thus a pre-defined position. The individual positions 0, 1 and 2 are determined by the respective spindle limit switches located on the drive shaft of the servomotor. In position 0, the air flap is closed, in position 2, it is opened. Position 1 is the mid-position between closed and open. The limit switches for position 1 and 2 are non-floating changeover switches. The limit switch for position 1 is a floating normally open contact. The signals "Air flap open" and "Air flap closed" must be generated by means of these changeover switches.

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When the air flap has returned to position "closed", after the preliminary flushing is completed, a release signal is sent to the gas burner control unit, which then starts its program:

- A self-test is initiated
- after completion of the self-test, the ignition transformer is powered (leading to an ignition spark)
- the gas line is opened at the same time
- The gas-air mixture is fed to the burner, where it is ignited
- After a certain time (ignition time), the ignition transformer is switched off
- When the flame is stable, a signal is sent back to the automatic burner control unit (via the ionisation electrode)
- The gas burner control unit transmits the flame signal to the PLC control system

If no flame signal is generated during the safety period (i.e. period from "Ignition transformer ON" to the formation of a stable flame), the gas burner system is automatically shut down, as a fault is assumed. After such a shutdown on fault, maximum 2 automatic release procedures of the gas burner system are initiated by the PLC. If the burner fails to start after the 2th automatic release, it is shut down and a burner failure signal is issued.
After acknowledgement of the message by pressing the "Reset" push button, the programme is restarted.

Pre-selection of melting mode

To start the unit in melting mode, press the illuminated push button "Melting ON". To terminate the melting mode, press push button "Melting OFF".

The furnace cannot be set to melting mode, if one of the following has occurred:

- Emergency-stop has been activated
- Control voltage must be switched on
- Melting OFF push button hasn't been pressed
- Fault signal "Wire break at melting chamber thermocouple" should not be active
- Fault signal "Wire break at waste gas thermocouple" should not be active
- Fault signal "Wire break at bath thermocouple" should not be active
- Fault signal "Error in bath temperature controller" should not be active
- Fault signal "Error in melting chamber temperature controller" should not be active
- Fault signal "Error in waste gas temperature controller" should not be active

If one of the above events occurs, melting mode is immediately terminated. If no melting burner is switched on within two hours after selecting melting mode, the mode is terminated.

Pre-selection of level 2 (High Fire) melting mode

When the furnace is set to level 2 (High Fire) melting mode, the air flap of the melting burner is moved from position 0 to position 2. If the upper limit value for the melting chamber temperature or the upper limit level for the waste gas temperature is reached, the air flap position returns automatically from position 2 (High Fire) to position 1(Low Fire). When the two actual temperatures are below the upper limit values, the air flap returns to position 2.

Melting level 2 (High Fire) can only be started, if the following conditions are met:

- Melting level 2 (High Fire) must be selected manually by pressing the illuminated push button "Melting step II"
- The furnace must be set to melting mode by pressing the illuminated push button "Melting ON"
- The upper limit value for melting chamber temperature may not be exceeded, and
- The upper limit value for waste gas temperature should not be exceeded

It is possible to switch between melting level 2 (High Fire) and melting level 1 (Low Fire). If the furnace is set to melting mode, and melting level 2 (High Fire) is not selected, the air flaps are moved from position 0 to position 1.

Cleaning - free melting

The free melting mode allows you to clean the melting chamber. To activate this operating mode, press "Free melting" push button. To start the cleaning process, switch on the melting burners. If the melting burners are inadvertently switched off, e.g. because the furnace is full, the cleaning process is interrupted. When the melting burners are switched on again, free melting is resumed.

The furnace cannot be set to free melting mode, if one of the following has occurred:

- Emergency-stop has been activated
- Control voltage must be switched on
- Melting mode is selected
- Wire break on bath thermocouple
- Melting OFF button has been pressed
- Fault signal "Wire break on melting chamber thermocouple" should not be active
- Fault signal "Wire break at waste gas thermocouple" should not be active
- Fault signal "Wire break at bath thermocouple" should not be active
- Fault signal "Error in bath temperature controller" should not be active
- Fault signal "Error in melting chamber temperature controller" should not be active
- Fault signal "Error in waste gas temperature controller" should not be active

If one of the above events occurs, or if none of the melting burners has been running for two hours, the free melting mode is terminated.

In this operating mode, the air flap of the melting burner is opened to level 2 (High Fire).

Air fan

The air fan supplies the air required for the production of the gas-air mixture to the burners so that a stable flame is generated. Generally, the fan is started by means of motor soft-start. Small models might allow for direct starting of the fan.

The fan cannot start, if one of the following has occurred:

- Emergency-stop has been activated
- Control voltage must be switched on
- "Holding burner ON" switch is turned "OFF"
- Fault signal "Motor protection switch of fan has tripped" should not be active
- Fault signal "Thermostat protector for the fan has tripped" should not be active

If all above conditions are met, the fan is automatically switched on, providing that

- A start burner request has been received, or
- The sintering programme has been selected, or
- The heat-up programme has been selected, or
- The gas leakage test system on the supply requires a leakage test, or

When the fan is switched on, a timer is started. After the pre-set time has lapsed, the pre-set value for minimum air pressure must be reached; otherwise the, fault "Air pressure below set value" is issued. When the fan is switched off, another timer is started. After the pre-set time has lapsed, the actual pressure must be below the minimum air pressure value; otherwise the, fault "Air pressure switch has

not switched off" is issued. The fan is switched off with a delay of 3 seconds after the signal has been removed.

The gas leakage test system in the gas supply line

The gas leakage test system in the gas supply line is used to test the main gas valve (solenoid valve) in the supply line, the burner gas valves (solenoid valves) and the piping between these valves for leakage. The system tests the entire gas piping from the main gas valve downstream.

The gas leakage test is completed by means of a gas leakage tester and a pressure switch, which is installed between the main gas valve and the burner valve. The test device communicates with the furnaces programmable control system. The electrical circuit includes a switch contact located in front of the main gas valve, which shuts down the main gas supply in the event of a fault or emergency.

The main gas valve upstream from the gas leakage test device opens and the pipelines are filled with gas. Subsequently, the main gas valve is closed. The test device measure the gas pressure during the pre-set test time. If a drop in pressure is detected, the gas leakage test system signals a fault on valve 1.

After the test, a burner valve is opened so that the gas system is ventilated. Subsequently, the burner valve is then closed. During the pre-set test time, the test device measure the gas pressure. If an increase in pressure is detected, the gas leakage test system signals a fault. This signal is transferred to the PLC and displayed in the control panel .

For detailed information on the test functions of the gas leakage test device, please refer to the operating instructions supplied by the manufacturer. The gas leakage test in the gas supply system can be combined with gas leakage tests on the burner.

A test request is required when:

- The locking switch is turned to position "Holding burner ON"
- After a power failure in the unit
- After resetting an emergency-stop situation
- After resetting a gas overpressure fault
- After resetting a gas under pressure fault

Shaft cover

The extractor hood is equipped with a shaft cover. The cover is operated by means of an electric motor and closes the melting shaft off when the furnace is in holding mode in order to prevent heat loss that would otherwise occur due to the partial vacuum in the waste gas system. On the control panel, users can select the function that the shaft cover opens and closes automatically.

Manual operation

The shaft cover cannot be operated, if one of the following has occurred:

- Emergency-stop has been activated
- Control voltage must be switched on
- Motor protector is tripped
- Charging container must be in it's initial position
- The watchdog monitoring system tripped
- Hand/auto charging unit select switch not in position "Hand".
- The emergency end position should not be reached
- Hand crank should not be inserted in the motor

If none of the above occurred, the shaft cover can be opened by pressing push button "Open shaft cover". The movement is immediately halted, when the push button is released or when the cover has reached end position "Shaft cover opened" (limit switch). To close the cover, press push button "Close shaft cover". The movement is immediately halted, when the push button is released or when the cover has reached end position "Shaft cover closed" (limit switch).

Automatic operation

At the control panel , select automatic mode. When this mode is selected in conjunction with automatic mode for charging, the shaft cover is opened, as soon as a melting programme is pre-selected. When the melting process is started, the shaft cover is automatically closed. The opening and closing of the cover is controlled by a pre-set time element. If the runtime set in the time element is exceeded, the movement is halted. Message "Runtime exceeded" can be acknowledged by pressing the "Reset" push button.

If the charging operation is set to automatic, while automatic mode has not been pre-selected for the shaft cover at the control panel , the shaft cover is automatically opened. In this case, is must however be closed manually.

The shaft cover cannot be operated, if one of the following has occurred:

- Emergency-stop has been activated
- Control voltage must be switched on
- Motor protector is tripped
- Charging container must be in it's initial position
- The watchdog monitoring system tripped
- Hand/auto charging unit select switch not in position "Auto".
- The emergency end position should not be reached
- Hand crank should not be inserted in the motor

If the charging container reaches the limit switch "Stop, if waste gas door is not open", the shaft cover must be opened. This applies in both automatic and manual charging mode. The upward movement of the charging container is halted until the shaft cover is fully opened.

Note:

The limit switches for open and closed are located inside the gear motor housing. The shaft cover can also be operated by means of the hand crank. If the crank is inserted, the electrical drive system is disabled. This safety locking device is wired in series with an overload protector (bimetal) that is integrated into the motor and is triggered, if the motor is overheating. Also connected in series to the above contact are the emergency limit switches for open and closed.

Maintenance platform of charging unit

The charging unit is equipped with a maintenance platform for the cleaning of the shaft above the melting chamber. It is also used in connection with maintenance work at the exhaust hood door.

The maintenance platform can also be operated by means of a hand crank. The limit switch issues a signal when the end position "Working platform open" is reached.

The platform cannot be operated, if one of the following occurred:

- Emergency-stop activated
- Control voltage must be switched on
- Charging container has to be at lower end position
- Motor protector for the maintenance platform has tripped
- The emergency end position should not be reached

If none of the above occurred, the platform can be opened by pressing push button "Open working platform". The movement is immediately halted, when the push button is released or when the platform has reached end position "Working platform open" (limit switch). To close the platform, press push button "Close working platform". The movement is immediately halted, when the push button is released or when the platform has reached end position "Working platform closed" (limit switch).

Waste gas door

The extractor hood is mounted on top of the melting shaft. All fumes and waste gases produced in the furnace are collected there and fed to the exhaust pipe. The hood features an opening through which the melting shaft can be filled with metal. During the charging process, the sliding door of the extractor

hood is opened. The waste gas door can be set to the desired operating mode by means of the "Hand/auto charging unit" locking switch, which is also used to set the unit into the respective charging mode. Both end positions of the door are limited and detected by limit switches, which issue the respective signal.

Waste gas door run manually

The waste gas door cannot be operated, if one of the following occurred:

- Emergency-stop has been activated
- Control voltage must be switched on
- Motor protector is tripped
- Maximum runtime is exceeded
- Charging mode selected at the "Hand/auto" switch (locking switch) on the charging unit
- Hand crank should not be inserted in the motor

To open the door, press the "Open waste gas door" push button. The door opens as long as the push button is pressed and is stopped when it reaches the end position "Door open" To close the door, press the second push button. The door closes as long as the push button is pressed and is stopped when it reaches the end position "Door closed". The door can however only be closed, if the charging container has triggered the limit switch "Charging container in initial position". The opening and closing of the door is controlled by a pre-set time element. If the runtime set in the time element is exceeded, its movement is halted. Message "Runtime exceeded" is displayed and can be acknowledged by pressing the "Reset" push button.

Automatic waste gas door

The waste gas door cannot be operated in automatic mode, if one of the following occurred:

- Emergency-stop has been activated
- Control voltage must be switched on
- Motor protector of the waste gas door has tripped
- Emergency-stop activated
- Maximum runtime is exceeded
- Automatic mode is not pre-selected at the "Hand/auto" switch (locking switch)
- Automatic charging not possible, as certain conditions are not met (for details, please refer to chapter "Charging")
- Hand crank should not be inserted in the motor

If the set waste gas temperature is reached, the waste gas door is automatically opened. The door must reach the end position "Waste gas door open" before the time set at the "Runtime monitoring" element has lapsed. Otherwise, the opening movement is halted. Message "Runtime exceeded" can be acknowledged by pressing the "Reset" push button. The closing movement is started, when the charging container is lowered and reaches the charging unit limit switch for "Query waste gas door". The door must reach the end position "Waste gas door closed" before the time set at the "Runtime monitoring" element has lapsed. Otherwise, the closing movement is halted.

Note:

The limit switches at both end positions (waste gas door open or closed respectively) are implemented as external floating switches. The two limit switches are mounted in a shared housing.

The waste gas door can also be operated by means of the hand crank. If the crank is inserted, the electrical drive system is disabled. This safety locking device is wired in series with an overload protector (bimetal) that is integrated into the motor.

Charging unit

The charging unit is used to transfer the aluminium alloy to be melted into the melting shaft of the furnace. The material is initially collected in a charging container. The charging container is then transferred to the receptacle of the charging unit. The charging support frame features two chains that

are driven via a drive shaft by a three-phase gear motor. These chains are attached to the receptacle so that the charging container can be moved in a vertical direction to the top of the melting shaft where its content is filled into the shaft.

The material dropped into the melting shaft is jammed in the upper section of the shaft where it is pre-heated by the fumes produced by the burners. Subsequently, the metal falls to the base of the melting shaft near the melting burners where it is molten. In manual mode, i.e. if the locking switch for charging is in position "Hand", the charging unit is operated by pressing the push buttons "Charging unit up" and "Charging unit down". In automatic mode, i.e. if the locking switch for charging is in position "Auto", the charging unit is started by pressing the illuminated push button "Auto start ingots" or "Auto start returns" respectively.

For each pre-selected option, the operator can set a nominal waste gas value at which the charging unit starts an automatic cycle in the cycle after the cycle initiated by activating one of the auto start options. The automatic cycle is terminated, when the limit switch "Charging container in initial position" is reached.

The charging unit is monitored by a torque monitoring system to ensure that the unit is not damaged by an overloaded or jammed charging container.

Manual operation

The charging unit cannot be operated manually, if one of the following occurred:

- Emergency-stop has been activated
- Control voltage must be switched on
- Safety door must be closed
- Motor protector for the charging unit has tripped
- Melting chamber door has to be closed
- Manual charging mode not pre-selected at the "Hand/auto charging unit" switch (locking switch)
- Melting burners have to be running
- The bath has reached the maximum filling level (signal)
- Wire break at bath filling level sensing electrodes
- Charging container must be locked
- Ladder of the charging unit is not closed
- Torque exceeding max. torque set at the torque monitoring system
- Maintenance platform is not open
- Impact protection on the charging chute is activated
- Safety chain monitoring system is triggered
- Emergency end position in the respective direction of movement is tripped

If none of the above events occurred, the charging container is lifted from its lower end position as soon as push button "Charging unit up" is pressed. The waste gas door must be opened manually before the charging container reaches the limit switch "Stop, if waste gas door is not open". If the waste gas door is fully opened, the charging container is lifted to its upper end position where it triggers the upper limit switch. As soon as the container has been emptied, it can be lowered again by pressing push button "Charging unit down". The container is automatically halted when it reaches the lower limit switch. The charging container is lifted and lowered in jog mode.

Automatic operation

In automatic mode, the charging unit operation is controlled by the waste gas temperature. If the waste gas temperature reaches the value set at the waste gas temperature controller, the charging container drive is started and the container is lifted.

The charging unit cannot be operated in automatic mode, if one of the following occurred:

- Emergency-stop has been activated
- Control voltage must be switched on
- Safety door must be closed
- Emergency-stop locking switch activated

- Motor protector for the charging unit has tripped
- Melting chamber door has to be closed
- Automatic charging mode is not pre-selected at the "Hand/auto charging unit" switch (locking switch)
- Melting burners have to be running
- Waste gas door must be closed
- If unit is not in automatic mode: shaft cover is not open
- Charging container is not in its lower end position
- Wire break at one of the bath filling level sensing electrodes
- Signal "Max. filling level of metal bath should not be reached"
- Fault signal "Melt reached alarm filling level"
- Charging container must be locked
- Ladder of the charging unit is not closed
- Torque exceeding max. torque set at the torque monitoring system
- Maintenance platform is not open
- Impact protection on the charging chute is activated
- Safety chain monitoring system is triggered
- Emergency end position in the respective direction of movement is tripped

If none of the above occurred, and

if the value (for ing ots or recycling respectively) set for the waste ga s temperature controller is reached,

the lifting process is started.

If one of the above events occurs during the lifting procedure, the current charging cycle is completed before the charging unit is shut down. The waste gas door must be open before the charging container reaches the limit switch "Stop, if waste gas door is not open". Otherwise, the charging container is temporarily halted, until the waste gas door is fully opened. When the container has reached its upper end position, a time element limiting the dwell time of the container is started. When the set time has lapsed, the container is automati cally lowered. If, while travelling downwards, the container reaches the limit switch "Stop, if waste gas door is not open", the closing of the waste gas door is initiated.

- Impact protection on the charging chute is activated

The door is automatically moved to the end position. If the furnace is being filled when it is in melting mode, a time element is initiated when the waste gas temperature reaches the set value. After the set time has lapsed, and if the operator has not pre-selected "Automatic charging start", signal "Charging time exceeded" is issued and the melting burners are shut down. Signal "Charging time exceeded" can be reset by pressing the "Automatic charging start" push button. After the system has been reset, the unit is automatically set to melting mode. If, during a charging cycle, the maximum melt level is reached, or if a melting bu rner fault occurs, the cycle should be interrupted but completed. The next charging process should however only be possible after the melting burner fault has been repaired and/or the level of the melt has been lowered.

Note:

If the limit switch at the ch arging chute is triggered while the charging container is being lowered, a fault signal is issued. The charging unit starts the lowering movement of the container, as if the limit switch "Charging container in upper end position" had been triggered. The fault can only be acknowledged, if the charging container is in its initial position.

If the limit switch " Upper emergency end position" is triggered while the charging container is being lifted, a fault signal is issued. The charging unit starts the lowering movement of the container, as if the limit switch "Charging container in upper end position" had been triggered.

If the limit switch "Lo wer emergency end position" is triggered, the charging container can only be lifted manually.

Unit Start-up (summary instructions)

General

The start-up procedure described in this chapter is applicable to units that have been properly commissioned.

In other words:

- Sintering is completed and the unit is heated to operating temperature
- All basic settings including limit temperatures for the waste gas and the bath temperature must be entered
- All components in the unit must be tested and ready for operation
- Operating staff is fully familiar with all instructions regarding safety, maintenance and cleaning of the unit

In order to ensure that the unit can be started without any difficulties, all error and fault messages shown at the operating device should be dealt with. For details on possible causes for errors and faults and measures to eliminate the respective causes are set out in chapter "Operating and error messages".

Requirements for start-up

Check the unit according to the checklist below and adjust its settings, where necessary. In this context, the term "control desk" is used in a broad sense and refers to all control elements and devices of the unit, whereby some devices might be located at the switch cabinet door:

- Carry out a visual inspection of the unit, and repair all damages
- Test all thermal elements for proper installation and check whether the temperatures shown at the control panel are acceptable
- Check the bath level sensing electrodes for proper installation and length
- If the charging container is not in its initial position (lower end position), move it to this position. To do this, close the guard door of the charging unit. Press key "Charging unit down"; the charging container is lowered to its end position. The respective key is located on the control desk or integrated into the charging unit. The "Hand/auto charging unit" select switch must be set to "Hand"
- Close the waste gas door by pressing key "Close waste gas door". The respective key is located at the control desk. This is only possible if the "Hand/auto charging unit" select switch is set to "Hand"
- Check the tap valve for correct installation and tightness.
- Close the bath chamber door by pressing key "Close bath chamber door". This key is located directly beside the bath chamber door.
- Open the shaft cover by pressing key "Open shaft cover. The respective key is located at the control desk. If you wish to run the furnace in automatic charging mode, the shaft cover is opened automatically the moment you set the charging unit into automatic mode and start the melting burner
- Close the door at the ladder of the charging unit.
- Open the maintenance platform of the charging unit by pressing key "Open working platform". The respective key is located at the control desk
- Close the guard door of the charging unit

Melting

After the furnace has been returned to its initial position, the melting operation can be started:

- Place a full container into the charging unit
- Set the charging unit select switch to "Auto"
- Press key "Auto start ingots" or "Auto start recycling", depending on the material to be filled
- Press key "Melting ON" at the control desk to start the melting burners. The melting burners are being started

- Close the guard door
- In order to run the furnace at full melting capacity, press key "Melting level 2 (High Fire)" at the control desk.
- When the set waste gas temperature is reached, the charging cycle is started
- If the charging unit is in its initial position, charge it with a new charging container and press key "Auto start pig" or "Auto start recycling" respectively
- The charging cycle is repeated each time the set waste gas temperature is reached

If the set waste gas temperature is reached

and provided that the charging u nit is in automatic mode, the me lting burners are shut down and message "Charging time e xceeded" is displayed. As soon a s one of the two auto start keys of the charging unit is p ressed, the melting burners are switched on again and the melting o peration is continued.

Pouring of melt

Melt can be poured at any time from the furna ce by opening the tap valve. To do this, flip over th e mechanical locking mechanism of the valve and abruptly lift the weight so that the valve is open. While the melt pours out, turn the tap valve t o the side, clean it and apply a smoothing agent suitable for aluminium. Subsequently, close the ta p valve in one decisive movement, rotate the val ve by 9 0 degrees by turning the knurled disk so that the valve fits into the slot.

Cleaning

During melting operation, the furnace must be cleaned latest every eight hours. In order to clean the melting chamber, you must first empty the shaft. To do this, switch off the melting burners by pressing key "Melting OFF". Then press key "Free melting", which also shuts down the charging unit. The shaft and melting chamber are now heated up so that all re sidual metal is melted and collects at the base. The free melting process is timer-controlled and is thus terminated automatically after a set time has lapsed. The melting and holding chambers can now be cleaned with conventional cleaning tools.

User instructions and status messages

100 Sinter- or heat-up program has ended !

The sintering or heat-up p rogramme is completed, and the furnace programme "Holding/melting" can be selected.

101 Close the door on the ladder to the working platform !

Close charging unit! A sa fety door tha t is p art of the la dder unit of the charging unit is open. The charging unit can thus not be started. It is al so not possible to tilt the furn ace, and the maintenance platform of the charging unit is locked with an electrical mechanism.

103 Charging time exceeded !

If the set tem perature value of the wast e gas is reached, or if the shaft scanner has signalled "Shaft free", the furnace must be filled manually or automatic filling must be started. If filling does not commence, the melting b urners are shut down. Pr ess key "Auto start" to restart the burners an d continue the melting operation.

104 Lock the charger bins doors !

This message indicates th at the cha rging container is not locke d. To start an d operate the cha rging unit, the container must however be locked.

105 Check the "Chargers upper" limit switch !

When lifted, the ch arging unit did not reach the upper end p osition (runtime monitoring). Check the drive system of the charging container and the limit switch settings at the upper end position. Also test the limit switch function.

110 Close the safety doors on the charger !

Automatic or manual charging is only possible, if the safety door is closed.

111 Open the working platform on the charger !

Automatic or manual filling can only be started, if the working platform is open.

112 Move the charger to its basic position !

Automatic operation is currently not possible, as a basic requirement is n ot met. Set sys-tem to manual mode, move charging unit to its initial posit ion, ensure that all requirements for operation are met and restart the charging unit.

113 Close waste gas door !

The unit can only be started in automatic mode, if the waste gas door is closed.

114 Start melting burners !

The melting burner(s) must be on bef ore the char ging unit ca n be started i n automatic mode or operated in manual mode.

115 Open waste gas hoods door !

While the charging unit is being lifted, the waste gas door is opened. In this case, it was not opened at the correct time. If the unit is in manual mode, manually open the waste gas door.

If the unit is in automatic mode, check the following:

- Cable drive on the waste gas door
- Limit switch settings at the waste gas door position "Waste gas door opened"

116 Open shaft cover !

You have selected "Melting" or "Free melting" but failed to first open the shaft cover!

130 Sinter program activated !

Do not open any furnace doors while the sintering programme is running, as this could lead to serious damage to the fireproof lining! The sinte ring program is timed and will be automatically stopped when completed.

131 Heat-up program activated !

Do not open any furnace doors while the heat-up programme is running, as this could lead to serious damage to the fireproof lining! Th e heat-up program is timed and will be automatically stopped when completed.

132 Maximum metal level in the melting chamber has been reached !

At max. filling level in the metal bath, melting and fi lling the shaft is not possib le. If a filling cycle has started, this runs through to the end and then stops. If the melting burn ers and the ch arging unit selections are still pre-selected after metal has been removed from the f urnace, they will run automatically as previously.

160 Monitoring 'Operating signal ABC's' is bridged !

The signal for monitoring the operation of the burne r control unit can b e blocked in the A dvanced screen - 'switching' Options' (with appropriate permissions) for 10 minutes.

This feature is specifically designed for setting the starting load of a burner.

Priority 1 fault messages

1002 Holding burner 1 is "OUT" !

This fault message is issued, if the burner failed to start after 3 attempts. The respective burner is not being restarted until the fault is reset.

Check:

- Ignition transformer
- Gas supply
- Ignition electrode
- Ionisation electrode
- Start signal from PLC to automatic burner control unit
- Start signal from automatic burner control unit to ignition transformer and gas supply valve (solenoid valve)
- Initial gas/air volume in burner head

1003 Melting burner 1 is "OUT" !

This fault message is issued, if the burner failed to start after 3 attempts. The respective burner is not being restarted until the fault is reset.

Check:

- Ignition transformer
- Gas supply
- Ignition electrode
- Ionisation electrode
- Start signal from PLC to automatic burner control unit
- Start signal from automatic burner control unit to ignition transformer and gas supply valve (solenoid valve)
- Initial gas/air volume in burner head

1005 Fault from the GTC from the main gas supply !

A leak ha s been detected downstream from the main gas valve, or one of the sole noid valves is defective. The entire burner control unit is shut down.

Test the following sections for gas leakage:

- Flexible hose at furnace fulcrum
- Screwed connections of the gas system between the valves located at the outer ends of the pipeline section to be tested
- Two solenoid valves operated according to the gas pressure curve
- Settings and function of the pressure switch located between the two solenoid valves

1006 Air pressure switch doesn't switch "OFF" !

The fan is not started. After a set time has lapsed, the system checks whether the air pressure switch has been triggered (switched off). The entire burner control unit is shut down.

Check:

- Wiring to control system

- Is the switching contact at pressure switch jammed or otherwise defective?

1010 Emergency stop has been pressed !

All burners and drives are immediately shut down. The indicator lamp remains powered. To restart the machine, unlock the emergency-stop switch and press the illuminated "Reset" key to reset the fault.

1011 Fuse has tripped !

All burners and drives are immediately shut down. Eliminate the short-circuit or overload. To restart the machine, reset the triggered automatic cut-out and press the "Reset" key.

1012 Motor protector for the fan has tripped !

The Motor protector has been triggered. The furnace might become seriously damaged by frozen molten metal! The entire burner unit is shut down.

Check:

- Do the settings of the Motor protector correspond with rated motor current?
- Is there a mechanical fault in the unit driven by the motor?
- Is there any strange noise when the motor is running?
- Is the motor covered in dust?

1016 No service or fault signal from ABC HB 1 detected !

The operation of the burner control unit is checked from the PLC

If the PLC has made a request to the burner control unit, the operating signal response must be made within a specified monitoring period.

If no reply message, a lockout takes place with an appropriate message on the control panel.

Check:

- Is a digital output on the PLC defect?
- Is the relais for the enable signal on the burner control unit defect?
- Is the burner control unit switched off?
- Is the relais between the burner control unit and the PLC defect?
- Is a digital input on the PLC defect?

1017 Operating signal 'ABC in Servive' HB 1 failed !

The operation of the burner control unit is checked from the PLC

If the PLC has made a request to the burner control unit, the operating signal response must be made within a specified monitoring period.

If no reply message, a lockout takes place with an appropriate message on the control panel.

Check:

- Is a digital output on the PLC defect?
- Is the relais for the enable signal on the burner control unit defect?
- Is the burner control unit switched off?
- Is the relais between the burner control unit and the PLC defect?
- Is a digital input on the PLC defect?

1026 Wire break on the bath levels electrode !

The sensing electrodes for the bath filling level cannot be removed without disconnecting the power adapter. This adapter includes two additional lines, which shot-circuit the electrode through a relay contact located in the switching system. If such a short-circuit occurs, the control system signals that there is a wire break at the electrodes. The melting burners are shut down.

Check:

- Is the connector on the filling level electrode in the bath properly connected?
- Connection between the electrodes and the switching system

1030 Minimum air pressure hasn't been reached !

After the fan has been started, a pressure switch checks whether the combustion air pressure is sufficient. In the event of this fault, there is a risk of damage from hardening melt. The entire burner unit is temporarily disabled.

Check:

- Air filter of the combustion air fan for dirt
- Wiring between the pressure switch and the PLC input
- Compensator between fan and pipeline system
- Pressure switch settings
- Function of pressure switch

1032 Wire break on the thermo-couple in the waste gas system !

The melting burners are shut down. Melting cannot be restarted until the fault is rectified!

Check:

- Connector on the thermocouple
- Wiring between thermocouple and terminal box at the furnace for scorching or mechanical damage
- Thermocouple for damage

1034 Wire break on the thermo-couple from the melting bath !

The bath temperature control system is set to emergency operation in order to prevent the molten metal from solidifying (Freezing). If there is a working thermocouple in the furnace chamber (e.g. at the ceiling), the nominal value at this point is used as the reference temperature for the control. If there is no working thermocouple in the furnace chamber, the temperature control system is set to manual mode. The set switch-on time of the burner for manual operation applies. The defective thermocouple for the molten metal should be replaced without delay, as proper production is not possible in emergency mode.

Check:

- Connector on the thermocouple
- Wiring between thermocouple and terminal box at the furnace for scorching or mechanical damage
- Check the protective graphite tube or the steel pipe of thermocouple for damage

1035 Wire break on the thermo-couple on the ceiling !

This fault does not affect the production. However, sintering and warming up are not possible. The temperature at the ceiling is not monitored.

Check:

- Connector on the thermocouple
- Wiring between thermocouple and terminal box at the furnace for scorching or mechanical damage
- Check the protective graphite tube or the steel pipe of thermocouple for damage

1036 Melting bath temperature less than 650 °C !

The temperature of the melt is near the freeze-up point of the metal, and below the specific ignition point of natural gas liquefied gas. Prior to each burner start-up, the furnace chamber is ventilated with cold air. Immediately eliminate the cause for this problem.

Possible causes:

- Are there any other faults?
- Is the nominal temperature in the 'Melt bath' menu at the control panel set to > 650°C?
- Is the melt bath thermocouple positioned correctly and does it work properly?
- Are all furnace doors closed?
- Is the holding burner on?
- Is the burner output OK (see flow diagram)?
- Is there dross on the melt surface?

1037 Wire break on the thermo-couple in the melting chamber !

The melting burners are shut down. Sintering and warming up are not possible. Melting operation can only be resumed after the fault has been rectified.

Check:

- Connector on the thermocouple
- Wiring between thermocouple and terminal box at the furnace for scorching or mechanical damage
- Check the protective graphite tube or the steel pipe of thermocouple for damage

1041 No furnace program selected !

Both the holding burners and the melting burners cannot be started. Risk of hardening of the melt! At the control panel , pre-select the furnace program you wish to run.

1042 The selected melting chamber temp. isn't within the tolerance !

The nominal melt temperature set in the control panel is too low! There is a risk that the furnace might freeze. If you wish to apply the low nominal temperature, ensure that there is no metal in the furnace.

1060 Watchdog air butterfly valve opened holding burner 1 !

This fault is displayed if the air flap sh ould open and the "Air flap open " limit switch is not actuated within the monitoring time set. This message does not affect the function of the plant. However, the cause, e.g. a defective limit switch, can prev ent the burner starting an d should be rectified immediately.

1061 Watchdog air butterfly valve closed holding burner 1 !

This fault is displayed if the air flap should close and the "Air flap closed" limit switch is not actuated within the monitoring time set. This message does not affect the function of the plant. However, the cause, e.g. a defective limit switch, can prev ent the burner starting an d should be rectified immediately.

1062 Limit switch failure, air butterfly valve on holding burner 1 !

This message is displayed if the limit switches of the air flap signal either:

- Open and closed signals come simultaneously
- Closed and step 1 signal simultaneously
- Open and closed signals don't come simultaneously

1070 Neither holding nor melting selected !

The burners cannot be started, as both the holding burners and the melting burners are deselected. If the holding burners are deselected while there is melt in the furnace, there is a risk of freezing-up of the metal, leading to serious damage to the fireproof furnace lining!

1074 Lower temperature in the melting bath without HB is selected !

If option "Temperature reduction in melt" is pre-selected, the furnace is set to holding mode at a reduced set temperature. This is however only possible, if holding mode is pre-selected! If the holding burners are deselected while there is melt in the furnace, there is a risk of freezing-up of the metal, leading to serious damage to the fireproof furnace lining!

1081 Gas pressure below min. limit !

If this fault occurs while there is molten metal in the furnace, there is a risk of the metal freezing, leading to serious damage to the fireproof furnace lining! The fault must thus be rectified without delay!

Check:

- Pressure in on-site gas supply system
- Pressure switch settings (see plant flow diagram)
- Wiring between the pressure switch and the PLC input
- Function of pressure switch

1083 Gas pressure exceeds max. limit !

Check:

- Pressure in on-site gas supply system
- Pressure switch settings (see plant flow diagram)
- Wiring between the pressure switch and the PLC input
- Function of pressure switch

1090 Fault from the temperature controller in melting chamber !

The actual temperature remains unchanged for a prolonged period of time, or jumps by more than 50 degrees up or down. The control system is automatically set to emergency mode, as described for message no. 29. Sintering and warming up are not possible.

Possible causes:

- Short-circuit at thermocouple
- Wire break at thermocouple
- Defective analogue input assembly in PLC
- Defective thermocouple cable

1091 Fault from the temperature controller for the ceiling !

The actual temperature remains unchanged for a prolonged period of time, or jumps by more than 50 degrees up or down. The melt temperature control system continues to operate. Sintering and warming up are not possible.

Possible causes:

- Short-circuit at thermocouple
- Wire break at thermocouple
- Defective analogue input assembly in PLC
- Defective thermocouple cable

1092 Fault from the temperature controller for the waste gas !

The actual temperature remains unchanged for a prolonged period of time, or jumps by more than 50 degrees up or down. The melting burners are shut down.

Possible causes:

- Short-circuit at thermocouple
- Wire break at thermocouple
- Defective analogue input assembly in PLC
- Defective thermocouple cable

1093 Fault from the temperature controller in melting chamber !

The actual temperature remains unchanged for a prolonged period of time, or jumps by more than 50 degrees up or down. The melting burners are shut down. Sintering and warming up are not possible.

Possible causes:

- Short-circuit at thermocouple
- Wire break at thermocouple
- Defective analogue input assembly in PLC
- Defective thermocouple cable

1103 Thermo protector for the fan has tripped !

The motor is overheating. The entire burner unit is shut down.

Check:

- Motor load (measure current and compare with rated current indicated on the type plate)
- Motor housing for dirt (preventing cooling air circulation)
- Is there any strange noise when the motor is running?

1116 Alarm level is reached in the melting chamber !

The alarm filling level electrodes have been triggered. Melting operation is shut down. There is a risk that the furnace might overflow. Immediately remove molten metal from the furnace! Melting operation cannot be selected until the problem has been rectified.

Check:

- Length of filling level sensing electrodes
- Alarm electrodes condition
- Wiring to the PLC

Priority 2 fault messages

2000 Motor protector for the shaft cover has tripped !

When this Motor protector has been triggered, the shaft cover can only be operated manually. Move the shaft cover to position "open". If it is in this position, the unit can be operated in holding mode, although at reduced efficiency.

Check:

- Do the settings of the Motor protector correspond with rated motor current?
- Is there a mechanical fault in the unit driven by the motor?
- Is there any strange noise when the motor is running?
- Is the motor covered in dust?

2001 Motor protector for the waste gas door has tripped !

When this Motor protector has been triggered, the charging unit can only be operated manually. By opening the waste gas door, the furnace can be manually filled. When the waste gas door is opened, the unit can be operated in holding mode, although at reduced efficiency.

Check:

- Do the settings of the Motor protector correspond with rated motor current?
- Is there a mechanical fault in the unit driven by the motor?
- Is there any strange noise when the motor is running?
- Is the motor covered in dust?

2003 Over heating on the ceiling !

The holding burners are shut down until the actual temperature at the ceiling is again below the maximum temperature. This fault might occur, if the melt temperature has been increased and the melt is heated for a prolonged period of time.

Ensure that:

- Holding burners are operated at the capacity indicated in the flow diagram
- Thermocouple is positioned in such a way that its tip protrudes by approx. 5 cm from the ceiling
- Thermocouple is in proper working order and shows no signs of damage

2004 Limit switch on chargers chute has been activated !

The safety flap at the filling chute has been activated. The shaft is blocked or the overfilled!

Possible causes:

- Nominal waste gas value not adjusted to suit filled material
- Insufficient draught in extractor hood
- Too frequent filling in manual mode
- Poor transfer of bulky material to the bottom of the melting shaft

2005 "Running time watchdog" for raising the charger is overrun !

The monitored runtime starts when the charging unit begins to move upwards. It must reach its upper end position within the set period of time. If this is not the case, the movement is halted.

Possible causes:

- Incorrect limit switch position
- Charging unit is not running smoothly
- Hydraulic fluid too cold (in hydraulic charging units only)
- Charging unit overloaded

2010 "Running time watchdog" for lowering the charger is overrun !

The monitored runtime starts when the charging unit begins to be lowered. It must reach its lower end position within the set period of time. If this is not the case, the movement is halted.

Possible causes:

- Charging unit is not running smoothly
- Hydraulic fluid too cold

2012 Motor protector for the charger has tripped !

When this Motor protector has been triggered, the charging container cannot be operated. Eliminate the cause of the fault and reset the protective motor switch.

Check:

- Do the settings of the Motor protector correspond with rated motor current?
- Is there a mechanical fault in the unit driven by the motor?
- Is there any strange noise when the motor is running?
- Is the motor covered in dust?
- Is the charging container overloaded?

2013 "Torque watchdog" on the charger has tripped !

The charging unit cannot be operated until the fault is reset.

There are three set values for the torque monitoring:

Set value 1: value applied from "Start filling" to the beginning of the curve

Set value 2: value ap plied from the beginning of t he curve to "Charging container in upper end position"

Set value 3: value applied from "Charging container in upper end position" to "Charging container in initial position"

Generally, the torque monitoring system tends to be triggered, if the charging container is mechanically blocked or overloaded.

2015 "Running time watchdog" for the waste gas door is overrun !

The charging unit and the waste gas hoods door are disabled.

Check:

- Cable drive on the waste gas door. Is the cable slipping on the pulley?
- Are the limit switches reached and properly activated?

2016 "Running time watchdog" for the shaft cover is overrun !

The charging unit and the shaft cover are disabled.

Check:

- Is the chain defective?
- Are the limit switches reached and properly activated?
- Is the shaft cover blocked by an obstacle?

2017 Over heating in the melting chamber !

The melting burners go back to level 1 (Low Fire).

Ensure that:

- Melting burners are operated at the capacity indicated in the flow diagram
- Thermocouple is positioned in such a way that its tip is flush with the ceiling surface
- Thermocouple is in proper working order
- Protective tubes on the thermocouple are not damaged

2020 Chargers upper emergency stop has been activated !

The charging container reached its upper end position without sending the respective signal! Check upper limit switch.

2021 Chargers lower emergency stop has been activated !

The charging container reached its lower end position without sending the respective signal! Check upper limit switch.

2022 Fault from the chargers safety chains !

The charging unit is disabled. The drive chain of the charging unit must be tightened or replaced.

2031 Hand crank safety switch on the shaft cover is activated !

The gear system allows for manual operation with crank. If the crank is inserted, the internal position switch is triggered. The position switch is wired in series with a bimetal overload protector, preventing the motor from overheating, and with two emergency limit switches.

2032 Hand crank safety switch on the waste gas door is activated !

The gear system allows for manual operation with crank. If the crank is inserted, the internal position switch is triggered. The position switch is wired in series with a bimetal overload protector, preventing the motor from overheating, and with two emergency limit switches.

Priority 3 fault messages

3000 Fault at melting burner 1 !

This fault is automatically reset five times. If the burner fails to start after five attempts, it is shut down.

Check:

- Ignition transformer
- Gas supply
- Ignition electrode
- Ionisation electrode
- Start signal from PLC to automatic burner control unit
- Start signal from automatic burner control unit to ignition transformer and gas supply valve (solenoid valve)
- Initial gas/air volume in burner head

3002 Fault at holding burner 1 !

This fault is automatically reset five times. If the burner fails to start after five attempts, it is shut down.

Check:

- Ignition transformer
- Gas supply
- Ignition electrode
- Ionisation electrode
- Start signal from PLC to automatic burner control unit
- Start signal from automatic burner control unit to ignition transformer and gas supply valve (solenoid valve)
- Initial gas/air volume in burner head

3003 Holding bath chamber door is open longer than 10 minutes !

The door has remained open for more than 10 minutes, resulting in considerable heat loss! Close the door.

3007 Waste gas system is overheating !

The melting burners are set to level 1 (Low Fire). If the waste gas temperature does not drop below the max. permissible value, the melting burners are shut down. When the waste gas temperature is again within the permissible range, the melting burners are set to level 2 (High Fire).

Ensure that:

Melting shaft is properly filled

Flue draught is sufficient to extract fumes, causing a heat accumulation in the extractor hood

3010 Sintern/Heat-up without holding burner "ON" selected !

If furnace programme "Sintering" or "heat-up" is selected at the control panel , the holding burner must also be switched on at the locking switch "Holding burner ON/OFF".

3011 Sintern/Heat-up and melting burner "ON" selected !

If furnace programme "Sintering" or "heat-up" is selected at the co ntrol panel , ensure that the illuminated keys "Melting step I selected" and "Melting step II selected" are not pressed.

3017 Lower temp. in the melting bath and melting is selected !

If option "Temperature re duction in melt" is pre-se lected, the furna ce is set to holding m ode at a reduced set temperature. In this mode, melting operation is not possible!

3022 Limit switch test 'Waste gas door open?' CHECK !

The monitored runtime starts when the charging unit begins to be moved downwards. The limit switch for "Query waste ga s door" must be rea ched within the set runtime. If this is not the case, the movement is halted.

Possible causes:

- Charging unit is not running smoothly
- Incorrect limit switch position
- Limit switch defective

3030 Watchdog air butterfly valve opened on melting burner 1 !

This fault is displayed if the air flap sh ould open and the "Air flap open " limit switch is not actuated within the monitoring time set. This message does not affect the function of the plant. However, the cause, e.g. a defective limit switch, can prev ent the burner starting an d should be rectified immediately.

3031 Watchdog air butterfly valve closed on melting burner 1 !

This fault is displayed if the air flap should close and the "Air flap closed" limit switch is not actuated within the monitoring time set. This message does not affect the function of the plant. However, the cause, e.g. a defective limit switch, can prev ent the burner starting an d should be rectified immediately.

3032 Limit switch failure, air butterfly valve on melting burner 1 !

This message is displayed if the limit switches of the air flap signal either:

- Open and closed signals come simultaneously
- Closed and step 1 signal simultaneously
- Open and closed signals don't come simultaneously

3056 Chargers limit switch in the wrong position !

This message is displayed if the limit switches of the charging machine signal either:

- Upper limit position and "lower limit position" limit switches have signals simultaneously
- Upper limit position and "exhaust hood door query" limit switches have signals simultaneously
- Lower limit position and step 1 "exhaust hood door query" limit switches have signals simultaneously

3060 No service or fault signal from ABC MB 1 detected!

The operation of the burner control unit is checked from the PLC

If the PLC has made a request to the burner control unit, the operating signal response must be made within a specified monitoring period.

If no reply message, a lockout takes place with an appropriate message on the control panel.

Check:

- Is a digital output on the PLC defect?
- Is the relais for the enable signal on the burner control unit defect?
- Is the burner control unit switched off?
- Is the relais between the burner control unit and the PLC defect?
- Is a digital input on the PLC defect?

3061 Operating signal 'ABC in Service' MB 1 failed!

The operation of the burner control unit is checked from the PLC

If the PLC has made a request to the burner control unit, the operating signal response must be made within a specified monitoring period.

If no reply message, a lockout takes place with an appropriate message on the control panel.

Check:

- Is a digital output on the PLC defect?
- Is the relais for the enable signal on the burner control unit defect?
- Is the burner control unit switched off?
- Is the relais between the burner control unit and the PLC defect?
- Is a digital input on the PLC defect?

3090 Gas flow reading Holding Burner 1 failed !

The gas consumption of the burner is calculated using the ratio of operating time / gas consumption. The $1m^3$-impulse from the gas meter is used to determined daily consumption. If during the measurement, a Burner fault occurs, the measurement cycle is aborted and the system can continue to operate as usual.

Check:

- Is the signal from the gas meter getting through?
- Is there a fault from the holding burner?
- Is there a fault from a burner control unit?
- Is there a fault from the gas tightness controller?

Technology/ Installation	DATA SHEET HEATING GAS Auftrag	StrikoWestofen Group

Furnace typ:	MB 1 1250/750 G-eg	Client:	STRIKODYNARAD	Order No.:	S
Document No.:	TD-AD00515-2-A	Flowdiagram.:	MBAGR0023-1-	Operator:	ME	Serial No.:	1
Provided:	ULO	Examined:		Release:		Project No.:	PB
Kind of gas:	Erdgas	Calorific value:	10 kWh /m³(Vn)	8600 kcal /m³(Vn)	MJ/m³(Vn)

Gas submission GV	Pos. No.	Set	Nominal	Unit	Remarks
Connection cross section	1	1 1/2"		Zoll	DN 40
max. gas volume	1	72,5		m³ / h	
Incoming pressure gas	1	690		hPa	Staudruck p max. stat. bei V = 0
Incoming pressure gas	1	690		hPa	Fliessdruck p max. stat. bei V max.
Setting of pressure switch max.	3	120		hPa	
Setting of pressure switch min.	3	50		hPa	
Trip set point	7	120		hPa	
Gas pressure outlet	8	70-100		hPa	
Discharge pressure	10	120		hPa	

Holdingburner GW1	Pos. No.	Step 1 Set	Step 1 nom	Unit	Stufe 2 Soll	Stufe 2 Ist	Unit	Remarks
Start pressure air VAG	2			hPa	1,5		hPa	
Incoming pressure air VAG	2			hPa	40		hPa	
Incoming pressure gas VAG	2			hPa	45,5		hPa	
Outgoing pressure gas VAG	2			hPa	40		hPa	
Air pressure at burner	4			hPa	17		hPa	
Gas pressure at burnerr	4			hPa	16,6		hPa	
Throughput gas	4	15,75		m³ / h	22,5		m³ / h	
Throughput air	4	158,76		m³ / h	226,8		m³ / h	
Burner capacity	4	157,5		kW	225		kW	BIO 125 RB 100/35
Burner brick diameter	4			mm	93		mm	
Throttle orifice diameter	4			mm	41,1		mm	

Holdingburner GW2	Pos. No.	Step 1 Set	Step 1 nom	Unit	Stufe 2 Soll	Stufe 2 Ist	Unit	Remarks
Start pressure air VAG				hPa			hPa	
Incoming pressure air VAG				hPa			hPa	
Incoming pressure gas VAG				hPa			hPa	
Outgoing pressure gas VAG				hPa			hPa	
Air pressure at burner				hPa			hPa	
Gas pressure at burnerr				hPa			hPa	
Throughput gas				m³ / h			m³ / h	
Throughput air				m³ / h			m³ / h	
Burner capacity				kW			kW	
Burner brick diameter				mm			mm	
Throttle orifice diameter				mm			mm	

Technology/ Installation	DATA SHEET HEATING GAS Auftrag	StrikoWestofen Group

Furnace typ:	MB 1 1250/750 G-eg	**Client:**	STRIKODYNARAD	**Order No.:**	S
Document No.:	TD-AD00515-2-A	**Flowdiagram.:**	MBAGR0023-1-	**Operator:**	ME	**Serial No.:**	F
Provided:	ULO	**Examined:**		**Release:**		**Project No.:**	PB
Kind of gas:	Erdgas	**Calorific value:**	10 kWh /m³(Vn)	8600 kcal /m³(Vn)	MJ/m³(Vn)		

Meltingburner GS1	Pos. No.	Step 1 Set	Step 1 nom	Unit	Stufe 2 Soll	Stufe 2 ist	Unit	Remarks
Start pressure air VAG	2			hPa	1,5		hPa	
Incoming pressure air VAG	2			hPa	40		hPa	
Incoming pressure gas VAG	2			hPa	45,4		hPa	
Outgoing pressure gas VAG	2			hPa	40		hPa	
Air pressure at burner	4			hPa	28		hPa	
Gas pressure at burnerr	4			hPa	22,4		hPa	
Throughput gas	4	35		m³ / h	50		m³ / h	
Throughput air	4	352,8		m³ / h	504		m³ / h	
Burner capacity	4	350		kW	500		kW	ZIO 165 RB 100/35
Burner brick diameter	4			mm	139		mm	
Throttle orifice diameter	4			mm	69,1		mm	

Meltingburner GS2	Pos. No.	Step 1 Set	Step 1 nom	Unit	Stufe 2 Soll	Stufe 2 ist	Unit	Remarks
Start pressure air VAG				hPa			hPa	
Incoming pressure air VAG				hPa			hPa	
Incoming pressure gas VAG				hPa			hPa	
Outgoing pressure gas VAG				hPa			hPa	
Air pressure at burner				hPa			hPa	
Gas pressure at burnerr				hPa			hPa	
Throughput gas				m³ / h			m³ / h	
Throughput air				m³ / h			m³ / h	
Burner capacity				kW			kW	
Burner brick diameter				mm			mm	
Throttle orifice diameter				mm			mm	

Meltingburner GS3	Pos. No.	Step 1 Set	Step 1 nom	Unit	Stufe 2 Soll	Stufe 2 ist	Unit	Remarks
Start pressure air VAG				hPa			hPa	
Incoming pressure air VAG				hPa			hPa	
Incoming pressure gas VAG				hPa			hPa	
Outgoing pressure gas VAG				hPa			hPa	
Air pressure at burner				hPa			hPa	
Gas pressure at burnerr				hPa			hPa	
Throughput gas				m³ / h			m³ / h	
Throughput air				m³ / h			m³ / h	
Burner capacity				kW			kW	
Burner brick diameter				mm			mm	
Throttle orifice diameter				mm			mm	

Technology/ Installation	DATA SHEET HEATING GAS Auftrag	StrikoWestofen Group

Furnace typ:	MB 1 1250/750 G-eg		Client:	STRIKODYNARAD	Order No.: S
Document No.:	TD-AD00515-2-A	Flowdiagram.: MBAGR0023-1-	Operator:	ME	Serial No.: F
Provided:	ULO	Examined:	Release:		Project No.: PB
Kind of gas:	Erdgas		Calorific value:	10 kWh /m³(Vn)	8600 kcal /m³(Vn) MJ/m³(Vn)

Negative pressure (mid of waste gas hood)

	Melting shaft full	Melting shaft empty	Remarks
All burners off	Pa at °C	Pa at °C	
Holding burner on	Pa at °C	Pa at °C	
Meltingburner Step 1	Pa at °C	Pa at °C	
Meltingburner Step 2	Pa at °C	Pa at °C	

Temperature – Wast gas settings in °C

Step1	Step 2	Step 3	Step 4	Step 5

Temperature – limits in °C

bath:	760	Melting room:	950	Roof holding room:	1050	Waste gas:	450
max. setpoint:		in production max. achieved:		max. achieved:		max. achieved:	

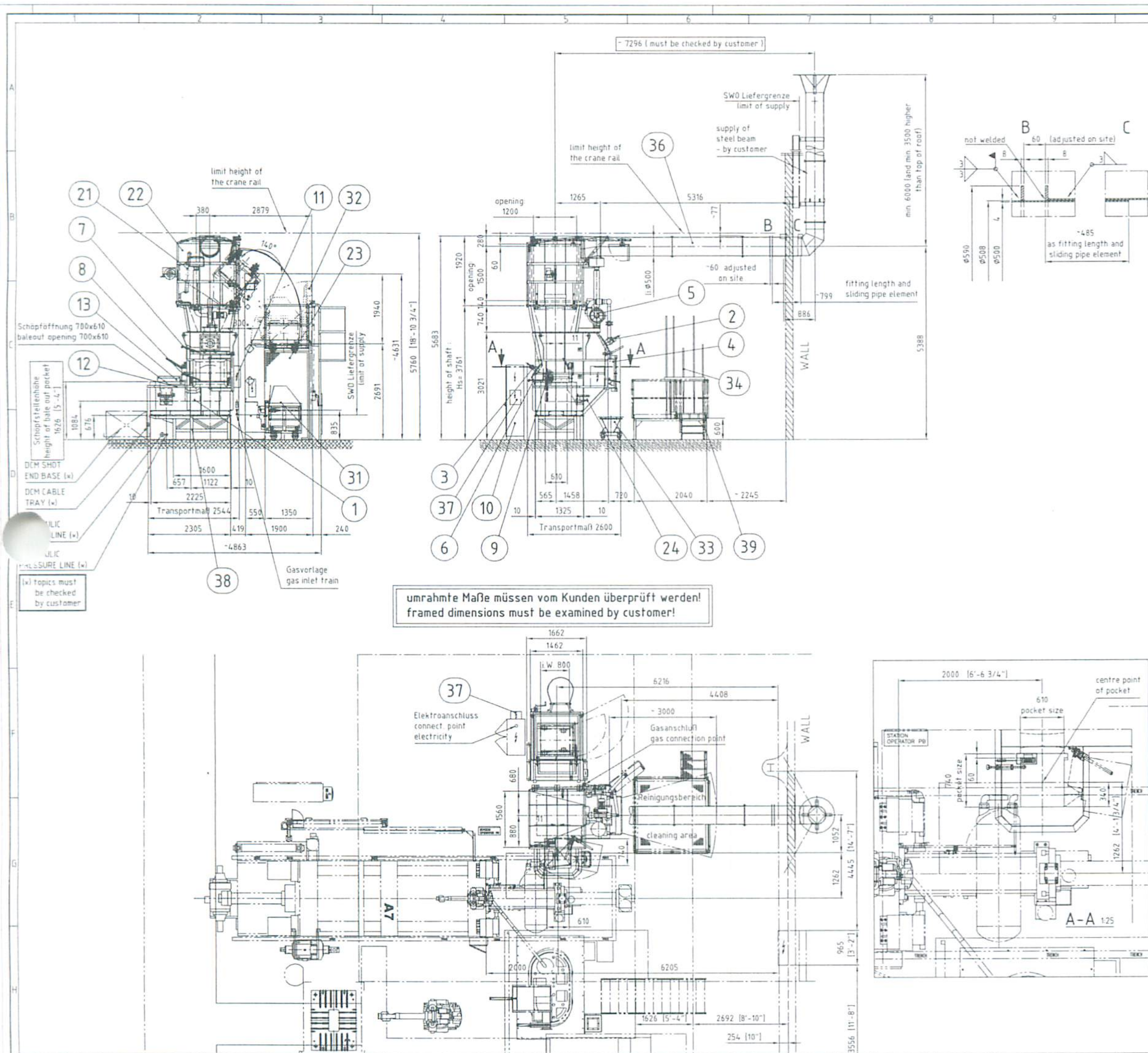
Charging unit:

Motor rated current as per type shield:	Amp.		V		Hz
Current consume at max. charging:	straight "UP"	Amp.	Setting torque control:	straight "UP"	Amp.
	curve	Amp.		curve	Amp.
	straight"DOWN"	Amp.		straight"DOWN	Amp.

Working platform:

Motor rated current as per type shield:	Amp.	V	Hz
Max. current consume:	Amp.		

Filled out by: ULO Date: 24.11.2011
Copy to customer: Date:



Kamin nach örtlichen Bauvorschriften errichten und so weit über Dach führen, daß Abgase einwandfrei abgeführt werden. Zugbedarf, gemessen Mitte Haube, in jedem Betriebszustand zwischen min. 10 Pa. und max. 20 Pa. erforderlich. Hallenunterdruck darf diese Werte nicht beeinflussen. Das Abgassystem ist so zu erstellen bzw. so zu regeln, daß keine Energie aus dem Ofen abgesaugt wird.

Kaminkräfte über geeignete Maßnahmen in Dachkonstruktion einleiten, in die Haubenkonstruktion dürfen keine Kräfte gelangen. Dachabdichtung durch Kunden, entsprechend Feuerschutzvorschriften.

Der Aufstellungsplatz der Ofenanlage muß plan, waagerecht und für die Belastung von ca. 320 N/cm² geeignet sein.

Nur die von STRIKOWESTOFEN und dem Kunden genehmigten und mit dem letzten Datum und Index versehenen Ausführungsunterlagen haben Gültigkeit.

The chimney has to be erected acc. to local building regulations. Under every working condition a draught of min. 10 Pa. and max. 20 Pa. measured in the middle of the waste gas hood is necessary. The underpressure of the building must not influence these values. The waste gas system has to be installed so that no energy is exhausted from the furnace interior, e.g. exhaust fan.

Suitable steps have to be taken to pass the tensile stress of the chimney over to the roof construction, no stress is allowed to pass over to the furnace hood. Sealing of the roof to be done by the customer, acc. to local fire precaution and safety regulations.

The floor where the furnace is erected, has to be level and suitable for a load of approx. 320 N/cm²

Valid only are descriptions and drawings with the latest update and index approved and accepted by STRIKOWESTOFEN and the customer.

genehmigt/approval:
SWO: ____________
Kunde/customer: ____________

Pos.	Anz.	Benennung	description
39	1	Reinigungsbühne (bauseits)	cleaning platform (by cutomer)
38	1	Ofenunterbau	furnace base
37	1	Bedienpult Beschickung	operator panel charging unit
36	1	Abgassystem	chimney system
34	1	Reinigungswerkzeug	cleaning tool
33	1	Krätzewagen (bauseits)	dross car (by customer)
32	1	Arbeits- und Servicebühne - manuell	working and service platform - manuel
31	1	Beschickungswagen BW-G2	charging truck BW-G2
		optionales Zubehör	optional accessories

Pos.	Anz.	Benennung	description
24	1	Restentleerungsventil	drain valve
23	1	Beschickungsanlage K-S500	charging unit K-S500
22	1	Abgashaube mit Schiebetür u. Temp.-Messstelle	waste gas hood (slid. door, temp meas.)
21	1	Schachtabdeckung	baffle
		Grund - Zubehör	basic - accessories

Pos.	Anz.	Benennung	description
13	1	Schöpftaschendeckel	removable lid
12	1	Schöpftasche	bale out pocket
11	1	Temp.Messstelle - Decke	temp.measuring - ceiling
10	1	Schaltschrank B=1000 H=2100 T=500	control cabinet
9	1	Maximalbadstand-Überwachung	indic. for max. metal level
8	1	Temp.Messstelle - Decke	temp.measuring - ceiling
7	1	Temp.Messstelle-Schmelzraum	temp.measuring-liquid chamber
6	1	Temp.Messstelle-Bad	temp. measuring liquid metal
5	1	Ventilator mit Schalldämpfer	fan with silencer
4	1	Klappschwenktür mit Hitzeschutzschild	cleaning door with guard plate
3	1	Warmhaltebrenner	holding burner
2	1	Schmelzbrenner	melting burner
1	1	Ofenkörper	furance shell

Nr.	Datum	Änderung	Bearb.	Geprüft	Freigabe
C	19.08.2011	Charging unit actualized	ULO	MSC	
B	01.08.2011	Height of dip and the die cast machine changed	ULO	MSC	

Schutzvermerk ISO 16016:2000-05_de
Copyright ISO 16016:2000-05_en
Werkstückkanten ISO 13715

F11270
Kunde: STRIKODYNARAD / USA
Endempf.: MERIDIAN /CDN

VORABZUG
Preliminary

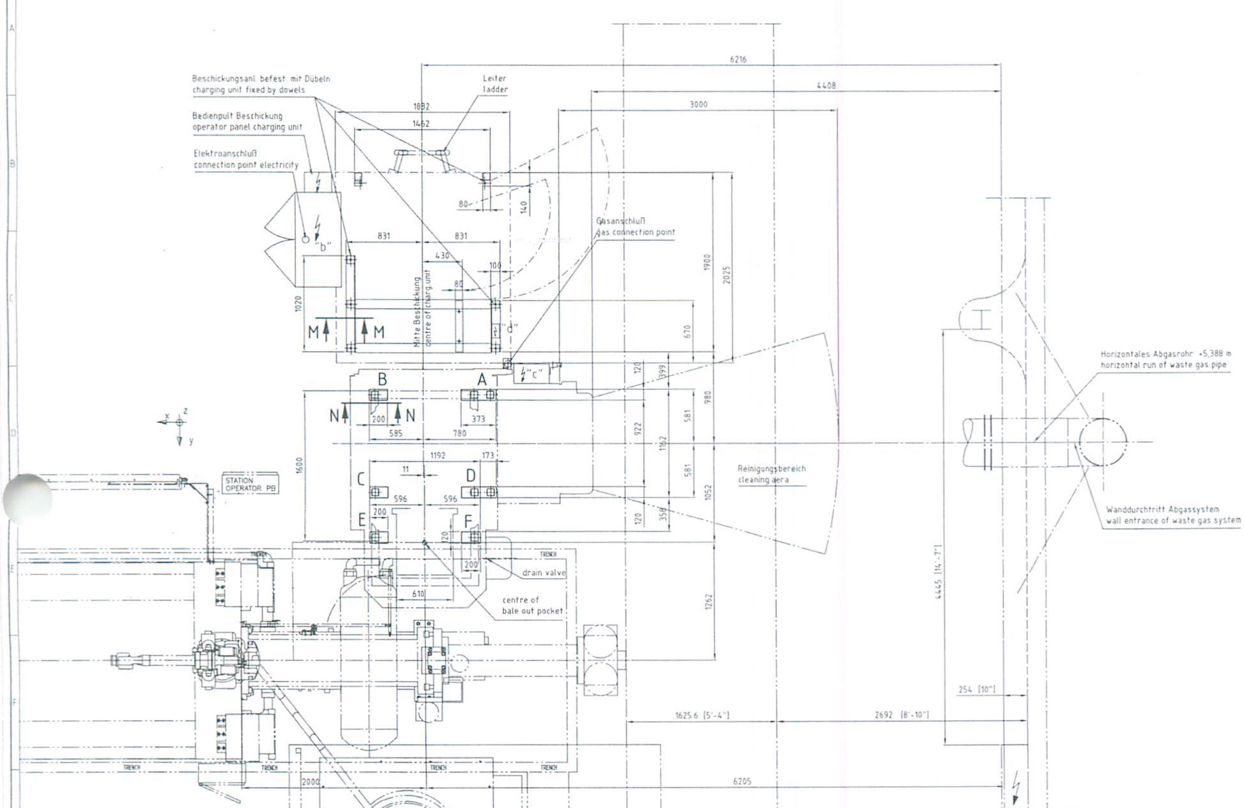
StrikoWestofen® Group

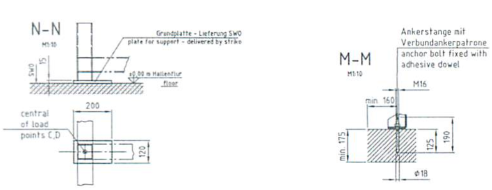
Maßstab 1:50

Aufstellungsplan
MB 1-1250/750 G-eg - spez
Layout

MBAGG0039 Bl. 1 C

Ursprung: MBAGG0035
Ersatz für:
Ersetzt durch:





Befestigung Beschickung
fastening charging unit

K-500 (mit Bühne) für BW 2
Eigengewicht Beschickung
ca. 2000 kg
zuzügl. Zuladung: 500 kg

K-500 (with platf.) for BW 2
net weigt charging unit
approx. 2000 kg
plus charging bin and material: 500 kg

Energiezuleitung zu den Punkten a-d bauseits.
spezifische Daten der bauseitigen Energiezuführungsleitungen siehe Fließplan

a = Gas

b = E-Zuleitung für Gesamt-Anschlußleistung 11 kVA

Auslegung entsprechend den örtlichen Vorschriften vornehmen. Desgleichen gilt für die Absicherung der Anlage und Einhaltung der Schutzmaßnahmen. Hierbei Kabeltyp, Querschnitt und Umgebungstemperatur beachten.

Verbindungskabel vom:
Klemmenkasten Beschickung "d" zum Schaltschrank "b" und vom Klemmenkasten Ofenkörper "c" zum Schaltschrank "b" hierfür bauseits Leitungswege installieren.

Der Aufstellungsplatz der Ofenanlage muß plan, waagerecht und für die Belastung von ca. 320 N/cm² geeignet sein.

Betongüte und Bewehrung/Verankerung unter Berücksichtigung der Belastungsangaben bauseits festgelegt und ausgeführt. Die Befestigung der Beschickungsanlage erfolgt mittels Klebedübel M16 während der Montage.
Im Bereich der Dübel ist eine Betondicke von 175 mm, B25 erforderlich (siehe Auflageflächen).

power feeds to the points a-d by customer
specific data of energy supply pipes according to the valid flow diagram

a = gas

b = electric wiring for total power connection 11 kVA

Execution according to local regulation rules. Local safety regulations and labor safety regulations have to be observed. Please to pay regard to type of cable, cross section of cable, laying of cable and surrounding temperature.

Electric wiring from:
terminal box charging unit "d" to electric panel "b" and from terminal box furnace "c" to electric panel "b". cable ducts to be installed by customer.

The floor where the furnace is erected, has to be level and suitable for a load of approx. 320 N/cm².

Grade of concrete and anchoring of steel plates have to be determinated by customer under consideration of the given load data. The charging unit must be anchored to the ground with adhesive dowels during erection. Quality of concrete min. B25, 175 thickness.

Befestigung Ofen / fastening furnace

Ofengewicht ohne Flüssigmetall : 16650 kg
Ofengewicht mit Flüssigmetall : 18250 kg

Furance weight without fluid metal : 16650 kg
Furance weight with fluid metal : 18250 kg

Detail: Lastpunkte / load points A;B;C;D;E;F

Fundamentlasten [kN] / foundaion loads [kN]

Lastpkt./ found. point	Vz	
A	50	Aufstellfläche im Bereich der Punkte A - F muß plan und höhengleich sein. floor at the load points A to F must be level and even
B	28	
C	60	
D	110	
E	20	
F	20	

zugehoriger Aufstellungsplan:
MBAGG0039-1-
accessory layout drawing:
MBAGG0039-1-

genehmigt/approval:
SWO: ____________
Kunde/customer: ____________

Nr.	Datum	Änderung	Bearb.	Geprüft	Freigabe

Schutzvermerk ISO 16016:2000-05_de
Copyright ISO 16016:2000-05_en
Werkstückkanten ISO 13715
Allgemeintoleranzen für Schweisskonstruktionen ISO 13920 - BF
Schweissnahtvorbereitung DIN EN 29692
Alle nicht bemaßten Kehlnähte: a≤4 mm
Für alle Kehlnähte
13/DIN EN 25817-BK/
Rostgrad ISO 8501 - 1A
Werkstoff Schraubenverbindung: min. 8.8/8
Tol. Schweißen DIN EN ISO 9013 - 231
Allgemeintoleranzen DIN ISO 2768 -m
Form-u. Lagetoleranzen DIN ISO 2768-K

VORABZUG
preliminary

	Tag	Name
Bearbeiter	27.05.2011	ULO
Geprüft	19.08.2011	MSC
Freigabe		

F11002
Kunde: STRIKODYNARAD / USA
Endempf.: MERIDIAN /CDN
Artikel:
Energie:

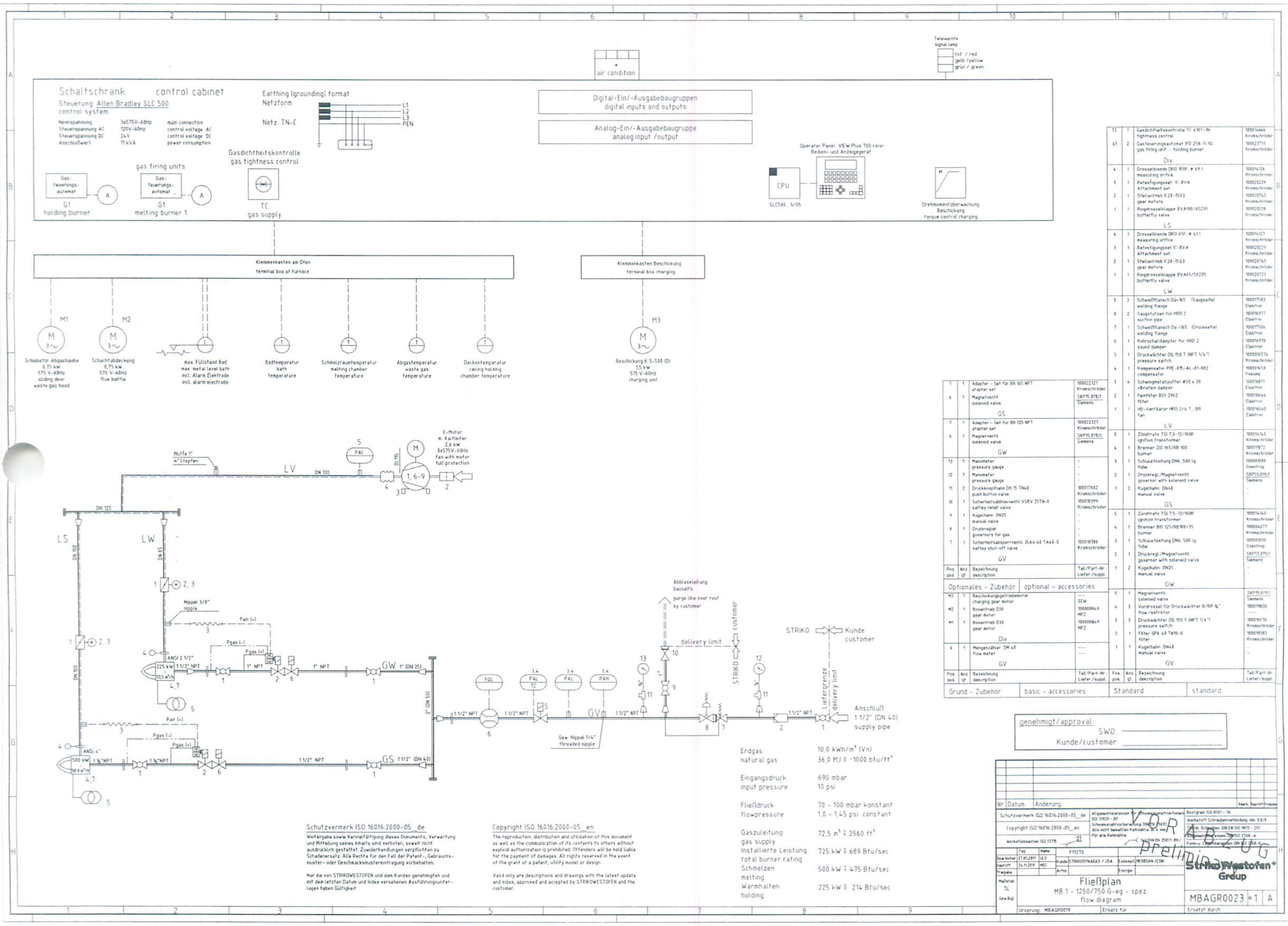
StrikoWestofen® Group

Maßstab 1:50
Gew.(kg) 0

Fundamentplan
MB 1-1250/750 G-eg
foundation plan

MBAGL0022 Bl. 1 A

Ursprung: MBAGL0017
Ersatz für:
Ersetzt durch:


Schaltschrank control cabinet
Steuerung Allen Bradley SLC 500
control system
Earthing (grounding) format
Netzform
Netz TN-C
L1
L2
L3
PEN
Gasdichtheitskontrolle
gas tightness control
gas firing units
G1
holding burner
G1
melting burner 1
TC
gas supply
air condition
Digital-Ein/-Ausgabebaugruppen
digital inputs and outputs
Analog-Ein/-Ausgabebaugruppe
analog input /output
CPU
Operator Panel VIEW Plus 700 color
Bedien- und Anzeigegerät
Drehmomentüberwachung
Beschickung
torque control charging
Klemmenkasten am Ofen
terminal box at furnace
Klemmenkasten Beschickung
terminal box charging
M1
M2
M3
LV
DN 100
DN 125
LS
LW
GW 1" (DN 25)
GS 1 1/2" (DN 40)
1 1/2" NPT
GV
Gew. Nippel 1/4"
threaded nipple
STRIKO
Kunde
customer
delivery limit
Liefergrenze
Anschluß
1 1/2" (DN 40)
supply pipe
Erdgas
natural gas
10,0 kWh/m³ (Vn)
36,0 MJ ≡ ~1000 btu/ft³
Eingangsdruck
input pressure
690 mbar
10 psi
Fließdruck
flowpressure
70 - 100 mbar konstant
1,0 - 1,45 psi constant
Gaszuleitung
gas supply
72,5 m³ ≡ 2560 ft³
Installierte Leistung
total burner rating
725 kW ≡ 689 Btu/sec
Schmelzen
melting
500 kW ≡ 475 Btu/sec
Warmhalten
holding
225 kW ≡ 214 Btu/sec
Optionales - Zubehör
optional - accessories
Grund - Zubehör
basic - accessories
Standard
standard
Pos. pos.
Anz. qt
Bezeichnung description
Teil/Part-Nr. Liefer./suppl.
genehmigt/approval:
SWO:
Kunde/customer:
Nr. Datum Änderung
Schutzvermerk ISO 16016:2000-05_de
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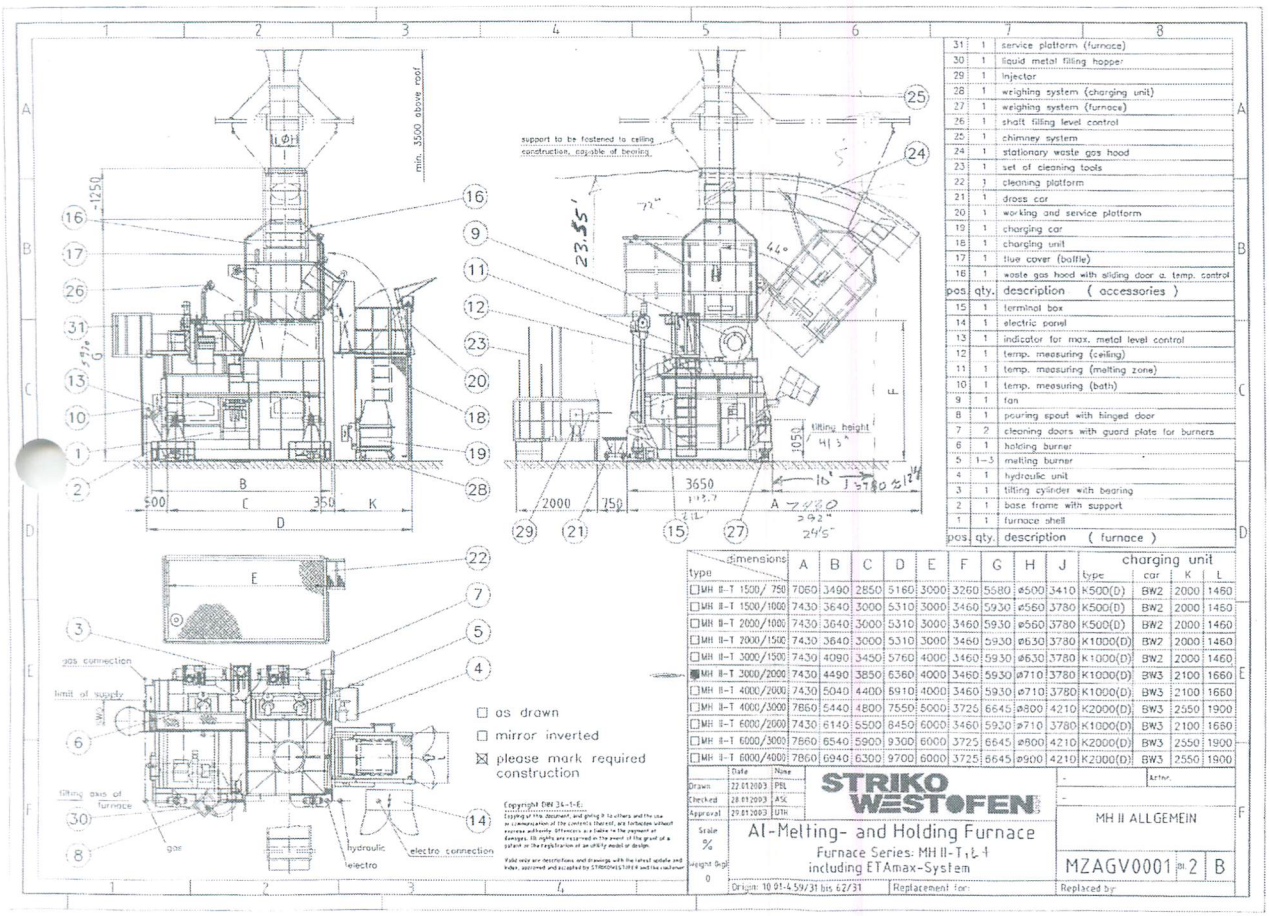
F11270
Bearbeiter 27.05.2011 ULO
Geprüft 24.11.2011 MSC
Kunde STRIKODYNARAD / USA
Endempf. MERIDIAN /CDN
VORABZUG
Preliminary
StrikoWestofen Group
Fließplan
MB 1 - 1250/750 G-eg - spez.
flow diagram
MBAGR0023
1
A
Ursprung: MBAGR0019
Ersatz für:
Ersetzt durch



pos.	qty.	description (accessories)
31	1	service platform (furnace)
30	1	liquid metal filling hopper
29	1	injector
28	1	weighing system (charging unit)
27	1	weighing system (furnace)
26	1	shaft filling level control
25	1	chimney system
24	1	stationary waste gas hood
23	1	set of cleaning tools
22	1	cleaning platform
21	1	dross car
20	1	working and service platform
19	1	charging car
18	1	charging unit
17	1	flue cover (baffle)
16	1	waste gas hood with sliding door a. temp. control
15	1	terminal box
14	1	electric panel
13	1	indicator for max. metal level control
12	1	temp. measuring (ceiling)
11	1	temp. measuring (melting zone)
10	1	temp. measuring (bath)
9	1	fan
8	1	pouring spout with hinged door
7	2	cleaning doors with guard plate for burners
6	1	holding burner
5	1–3	melting burner
4	1	hydraulic unit
3	1	tilting cylinder with bearing
2	1	base frame with support
1	1	furnace shell

pos.	qty.	description (furnace)

type	dimensions A	B	C	D	E	F	G	H	J	charging unit type	car	K	L
☐MH II–T 1500/ 750	7060	3490	2850	5160	3000	3260	5580	ø500	3410	K500(D)	BW2	2000	1460
☐MH II–T 1500/1000	7430	3640	3000	5310	3000	3460	5930	ø560	3780	K500(D)	BW2	2000	1460
☐MH II–T 2000/1000	7430	3640	3000	5310	3000	3460	5930	ø560	3780	K500(D)	BW2	2000	1460
☐MH II–T 2000/1500	7430	3640	3000	5310	3000	3460	5930	ø630	3780	K1000(D)	BW2	2000	1460
☐MH II–T 3000/1500	7430	4090	3450	5760	4000	3460	5930	ø630	3780	K1000(D)	BW2	2000	1460
■MH II–T 3000/2000	7430	4490	3850	6360	4000	3460	5930	ø710	3780	K1000(D)	BW3	2100	1660
☐MH II–T 4000/2000	7430	5040	4400	6910	4000	3460	5930	ø710	3780	K1000(D)	BW3	2100	1660
☐MH II–T 4000/3000	7860	5440	4800	7550	5000	3725	6645	ø800	4210	K2000(D)	BW3	2550	1900
☐MH II–T 6000/2000	7430	6140	5500	8450	6000	3460	5930	ø710	3780	K1000(D)	BW3	2100	1660
☐MH II–T 6000/3000	7860	6540	5900	9300	6000	3725	6645	ø800	4210	K2000(D)	BW3	2550	1900
☐MH II–T 6000/4000	7860	6940	6300	9700	6000	3725	6645	ø900	4210	K2000(D)	BW3	2550	1900

	Date	Name
Drawn	22.012003	PBL
Checked	28.012003	ASL
Approval	29.012003	UTH

STRIKO WESTOFEN

Al-Melting- and Holding Furnace
Furnace Series: MH II-T, L 4
including ETAmax-System

MH II ALLGEMEIN

MZAGV0001 Bl. 2 B

Scale %
Weight Gr.
0

Origin: 10 01-4 59/31 bis 62/31

Replacement for:

Replaced by:

StrikoWestofen°
Group

Operating Manual
(Übersetzung vom Original)

StrikoWestofen Group°
Fritz-Kotz-Straße 2 - 4
D-51674 Wiehl-Bomig

Phone:	+49 (0) 22 61 / 70 91 - 0
Fax:	+49 (0) 22 61 / 70 91 - 107
E-mail:	info@strikowestofen.com
Phone hotline:	+49 (0) 22 61 / 70 91 - 129
Fax hotline:	+49 (0) 22 61 / 76478

Product:	Al- Melting and holding furnace
Type:	MB 1 1250/750 G-eg
Serial number:	
Customer´s order no.:	
Year of construction:	2011
Ordered by:	StrikoDynarad Corporation 501 E.Roosevelt Avenue 49464 Zeeland, Michigan USA
Operator:	

StrikoWestofen Group

Operating Manual
(Übersetzung vom Original)

Contents

Operating Manual
(Übersetzung vom Original)

1. Foreword

The illustrations and information provided in this operating manual remain subject to any technical modifications, which may become necessary in the interest of improving the furnace plant.

The operator must ensure that this operating manual is available at a suitable location in the vicinity of the furnace plant in order to guarantee direct access, should any questions arise. This operating manual applies for the above stated furnace system, whereby the serial number stated in this manual must correspond to the number specified on the nameplate of the furnace plant.

The operator is required to extend the contents of the operating manual to include instructions based on prevailing national regulations relating to accident prevention and the protection of the environment. In addition to the operating manual and the binding accident-prevention regulations, which apply in the country of use and the site of operation, the operator is also to observe the recognized technical standards relating to safe and appropriate working practices.

This operating manual is to be read and applied by all persons deployed to carry out work with/on the furnace plant, e.g. in the areas of operation, servicing and maintenance.

All data and information in this operating manual are provided according to the best information of **StrikoWestofen Group°** according to the experience and information acquired by the company to date.

Operating Manual
(Übersetzung vom Original)

Foreword

StrikoWestofen Group° shall be liable for any errors and omissions with the scope of the warranty obligations entered into under the contract of sale, to the exclusions of any further claims. No claims for damages shall be assertible beyond this scope of liability, whatever the legal basis of such claims.

A liability or warranty shall be excluded:

- if the information and instructions given in this operating manual are not observed
- if the furnace plant, including appurtenant facilities, is operated incorrectly or handled in a manner contrary to the specified
- if the furnace plant is employed for a purpose other than the intended use
- if safety devices fail to be used or are partially or fully shut down
- in the event of any functional modifications being carried out without the written permission of **StrikoWestofen Group°**
- if the applicable safety regulations are not observed
- if the furnace plant, including the appurtenant facilities, is serviced in an inappropriate manner (with regards to both servicing intervals and servicing procedures) (inappropriate servicing also includes the use of incorrect replacement parts

StrikoWestofen Group°'s warranty does not cover parts, which are subject to wear.

When replacing parts, only parts approved by **StrikoWestofen Group°** are to be used. Liability and warranty coverage shall lapse in the event of failure to observe this requirement.

Foreword

This furnace plant is designed as specified in our confirmation of order. Any modifications and additions, which may arise in the course of executing the order, shall be mutually agreed and documented in writing.

In particular, the scope of design regulations includes the ISO, EN, DIN, VDE and accident-prevention regulations, which relate to the subject of the contract of sale, as applicable in Germany at the time of acceptance of the order.

Official requirements and regulations of the operating company have been taken into consideration in accordance with the terms of the contract, except where such regulations conflict with aspects relating to the furnace plant.

The order shall be deemed to have been duly executed upon undersigning of the acceptance report, notwithstanding our warranty.

2. Transport and commissioning

Contents

Transport and commissioning

2.1. Dispatch

For dispatch the furnace plant is dismantled into its components. The equivalent dimensions and the weight of the components are listed in the accompanying papers.

2.2. Transport

Arriving at customer's site

On arrival of the consignment, it is recommended to check the entire delivery for completeness and any damage, which may have occurred in transit. This can be carried out by reference to the enclosed delivery note and the accompanying documents. As a general rule, any complaints will be considered only if submitted to the transport company or **StrikoWestofen Group°** on the date of arrival of the plant.

Please consult us before arranging for any items to be returned. Never return damaged items to our company unless requested to do so.

The operating company is further obliged to observe the relevant environmental protection and disposal regulations (packaging, oil changing, cleaning agents etc.).

Means of transportation

Transport the furnace using means of transportation in accordance with the locally prevailing conditions.

Use only suitable transport vehicles/lifting devices with adequate load bearing capacity!

When using cables and/or lifting tackle, avoid sensitive parts of the furnace and covers or protect by means of elastic supports.

Always transport control cabinets with the rear panels facing the stacker.

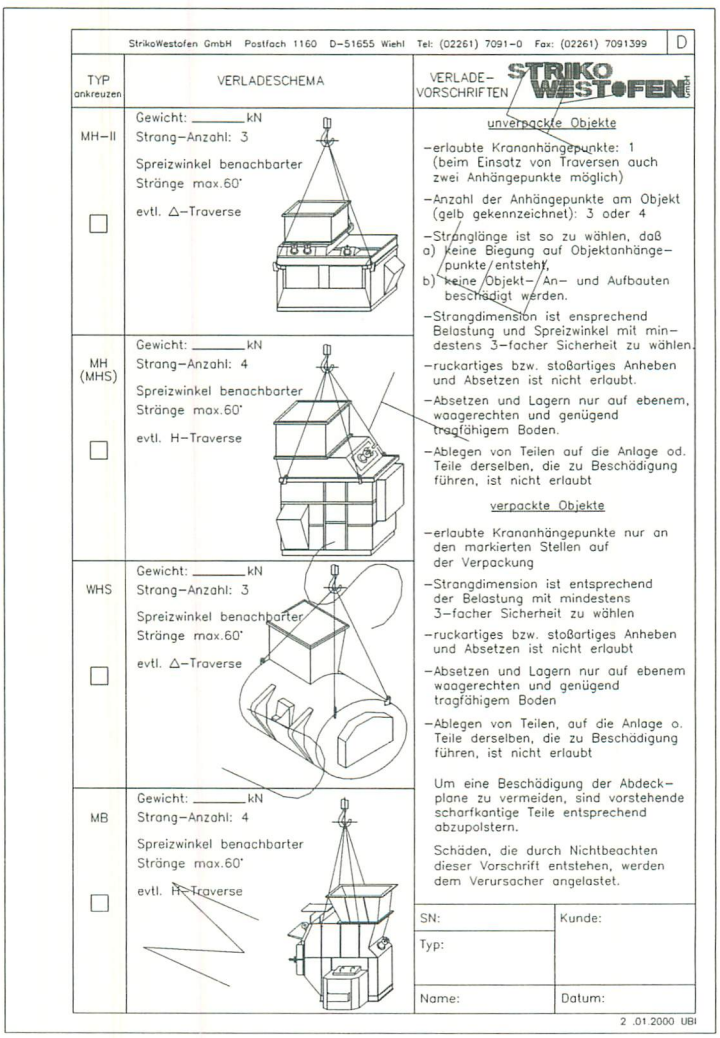
Appoint a duly qualified person to direct the lifting process!

Operating Manual
(Übersetzung vom Original)

Transport and commissioning

The furnace plant and plant components are only to be transported by attaching lifting gear to the transport eyes!
The lifting gear must be firmly secured.

For further information on transport of the furnace plant and components see enclosed sketch for loading and the loading regulations. A corresponding leaflet with hints is attached to the furnace.



StrikoWestofen GmbH Postfach 1160 D-51655 Wiehl Tel: (02261) 7091-0 Fax: (02261) 7091399 D

TYP ankreuzen	VERLADESCHEMA	VERLADE-VORSCHRIFTEN STRIKO WESTOFEN GmbH
MH-II ☐	Gewicht: _____kN Strang-Anzahl: 3 Spreizwinkel benachbarter Stränge max.60° evtl. Δ-Traverse	unverpackte Objekte -erlaubte Kranan hängepunkte: 1 (beim Einsatz von Traversen auch zwei Anhängepunkte möglich) -Anzahl der Anhängepunkte am Objekt (gelb gekennzeichnet): 3 oder 4 -Stranglänge ist so zu wählen, daß a) keine Biegung auf Objektanhänge-punkte entsteht, b) keine Objekt- An- und Aufbauten beschädigt werden. -Strangdimension ist ensprechend Belastung und Spreizwinkel mit min-destens 3-facher Sicherheit zu wählen. -ruckartiges bzw. stoßartiges Anheben und Absetzen ist nicht erlaubt. -Absetzen und Lagern nur auf ebenem, waagerechten und genügend tragfähigem Boden. -Ablegen von Teilen auf die Anlage od. Teile derselben, die zu Beschädigung führen, ist nicht erlaubt
MH (MHS) ☐	Gewicht: _____kN Strang-Anzahl: 4 Spreizwinkel benachbarter Stränge max.60° evtl. H-Traverse	
WHS ☐	Gewicht: _____kN Strang-Anzahl: 3 Spreizwinkel benachbarter Stränge max.60° evtl. Δ-Traverse	verpackte Objekte -erlaubte Kranan hängepunkte nur an den markierten Stellen auf der Verpackung -Strangdimension ist entsprechend der Belastung mit mindestens 3-facher Sicherheit zu wählen -ruckartiges bzw. stoßartiges Anheben und Absetzen ist nicht erlaubt -Absetzen und Lagern nur auf ebenem waagerechten und genügend tragfähigem Boden -Ablegen von Teilen, auf die Anlage o. Teile derselben, die zu Beschädigung führen, ist nicht erlaubt Um eine Beschädigung der Abdeck-plane zu vermeiden, sind vorstehende scharfkantige Teile entsprechend abzupolstern. Schäden, die durch Nichtbeachten dieser Vorschrift entstehen, werden dem Verursacher angelastet.
MB ☐	Gewicht: _____kN Strang-Anzahl: 4 Spreizwinkel benachbarter Stränge max.60° evtl. H-Traverse	

SN:	Kunde:
Typ:	
Name:	Datum:

2 .01.2000 UBI

Transport and commissioning

Means of transportation

In order to ensure correct transportation with lifting gear, the furnace must be lifted evenly!

Before or directly after completion of the loading work, the furnace plant is to be fitted with recommended/supplied devices to prevent unintentional shifting!

A corresponding warning notice is to be attached!

The applicable accident-prevention regulations are to be observed!

2.3. Installation

Any packing material (wooden boards/foils) is to be removed. The protective covers are to be removed. Check the furnace components for any concealed damage caused in transit, which may initially have been overseen. Notify the forwarding agent of any established damage forthwith.

In order to ensure correct functioning, the furnace plant must be leveled!

In order to ensure adequate stability, all furnace components must be anchored at the stipulated fixing points.

In order to ensure correct operation of the furnace plant, all parts must be correctly installed and all conditions fulfilled.

Before starting up the furnace plant, the transport locking devices are to be duly removed!

Parts, which require to be removed for transportation purposes, are to be carefully refitted and secured before starting up the furnace plant!

The protective covers are then to be refitted in the correct manner.

Transport and commissioning

The following are to be noted when installing the furnace:

- Maximum dimensional deviations for the furnace and its components,
- Adequate length of the supply cables and pipes on the furnace
- Adequate accessibility for maintenance and cleaning.

Supply lines and control lines within the furnace plat are to be installed in conduits or ducts in accordance with the general and specific conditions and.

The rotational directions of the individual motors are to be checked prior to carrying out general functional testing of the furnace.

General function testing is to begin with comprehensive testing of all manual functions before running the furnace plant in automatic mode.

2.4. Connection and commissioning

Electrical connections

Cabling
See enclosed electric circuit diagram (terminal and cabling diagram).

Mains switch

The mains switch is located on the front. The nameplate on the control cabinet contains information on the correct operating voltage and maximum.
Should you have any questions concerning the current requirements, please contact **StrikoWestofen Group°**.

All mains disconnection switches must be locked in OFF position when carrying out work on the furnace.

Main supply conductor

Connect a supply conductor to all supply terminals in the control cabinet. Please refer to the electric circuit diagram with regard to the appropriate cross-section and backup fusing.
Connect the cable for the external signal in accordance with the electric circuit diagram.

Transport and commissioning

Do not switch on the current until the furnace plant is in a safe operational condition. If an engineer from **StrikoWestofen Group**° is present during commissioning, do not switch on the furnace plant until the engineer has done a second cable test before the power-up test is started.
If no engineer from **StrikoWestofen Group**° is to be present during commissioning, do not switch on the furnace plant until all exposed cables have been covered and the furnace plant is in a completely safe operational condition for the power-up test.

2.5. Sintering and heating up

Moisture may accumulate in the furnace lining prior to using the furnace for the first time or after complete relining of the furnace or after repair of the furnace lining.
The furnace should therefore be sintered prior to use.

2.5.1. General information on sintering

Following relining after a drying period of 24 hours and temperatures higher than 15°C the sintering process can be started according to sintering curve. When the air is very humid or the refractory lining has become wet, a longer pre-drying process is necessary.

If the outside temperatures fall below °C, it has to be taken care that the refractory lining is in a non-frost condition.

The water drainage outlets are to be opened at sintering start. The sintering process dries the front materials. The residual moisture in the layers behind the front material is only emitted in the course of subsequent operation however.
During sintering the shaft opening has to be covered with a temporary makeshift cover from ceramic fiber matting.

After sintering, before start of melting or filling with liquid metal the furnace inside has to be visually checked. Stress cracks may be visible in the lining. They result from the varying expansion of the refractory lining and are not dangerous as long as they are not located the bath area. Open joints of more than 1 mm width in the bath area have to be cleaned while the furnace is cold before start-up and have to be filled with **StrikoWestofen Group°**-refractory concrete. Consultation with **StrikoWestofen Group°** is necessary.

The water drainage outlets have to be closed before start of production.

When the furnace is sintered without a **StrikoWestofen Group°** specialist is at site, a protocol of the temperatures has to be written (temperatures and times).

If the sintering process is controlled by PLC, the temperature is controlled according to the adequate sintering curve.

Should the temperature be unable to follow the specified curve due to a plant malfunction, the sintering process is to be restarted at the currently indicated temperatures.

The furnace can be put into operation immediately after sintering and visual check.
If the furnace is put back into operation after a longer shutdown period and the refractory lining is still dry, a new sintering process is not necessary. If the refractory lining is damp or the outside temperature is below °C, a new sintering process has to be started.

If necessary, **StrikoWestofen Group°** is to be consulted.

Transport and commissioning

Sintering

Sintering furnaces of type MH II, WHS-T, N, T, MH, MHS, MB

When sintering these types of furnaces it is necessary to control the holding chamber and the melting chamber separately.

The sintering is started in the bath area with the holding burner. The holding burner is set on partial load.

With furnaces **type MH II, WHS-T, N, T** the temperature in the holding chamber is controlled via the roof thermocouple. The tip of the thermocouple must protrude approx. 20-30 mm into the furnace chamber.

With furnaces **type MH, MHS, MB** the thermocouple for the holding chamber is lead via the sidewall underneath the melting ramp into the holding chamber. For sintering it must protrude approx. 20-30 mm into the furnace chamber.

For furnaces **type MB** the lid of the bale-out pocket has to be closed and the refractory material around the lid has to be covered with insulating mats.

When the max. holding temperature in the holding chamber is reached during sintering, the melting burners are activated, holding the burner capacity as low as possible. Starting at the actual temperature, the melting chamber has to be heated up and the temperatures held according to the sintering curve. The melting room temperature is measured by the melting room thermocouple. The melting room thermocouple is used to control the melting room temperature. For this the graphite protection tube of the thermocouple has to be removed and the tip of the thermocouple has to protrude approx. 20-30 mm into the furnace chamber.
Once the holding time has elapsed, the melting process can begin, with due regard to the general specifications

Transport and commissioning

Sintering repaired furnace plants

Following the installation of refractory repair material up to max. 500kg and a drying period of 24 hours at a temperature of higher than 15°C the furnace can be heated up according to the sintering and heating up instructions. After this process has ended, the furnace can be heated up for production.

When more than 500kg repair material has been used or < 500kg have been brought into the furnace in a concentrated area, a sintering and heating up according to the sintering and heating up instructions are necessary.

Modifications have to be approved by **StrikoWestofen Group°**.

2.5.2. Heating up

The heating up is done according to the sintering (as described under 2.5.1. Sintering).
The temperatures to be held can be seen in the heating up diagram.

Heating up after a longer shut-down period

Before the furnace is put back into operation, the plat has to be heated up according to the heating up instructions.

If the refractory lining is damp or the temperature is below 0°C, the furnace has to be sintered again according to the sintering instructions

Transport and commissioning

2.6. Commissioning of burner on furnace

Start fan

Set the max. air flow per burner via the air flaps by measuring the pressure loss at measuring points provided above the burners, according to flow diagram

Set gas pressure at burner gas connection (if necessary correct via adjusting cock). When using oil burners, check oil pressure.

Set and check the switching points of the pressure switches.

Carry out an O_2- content check at the end of the flame and/or a flue gas measurement.

Broad, bright yellow and smokeless flame =

- Neutral furnace atmosphere,
- Or slightly reducing ≈ 1,05.

Pronounced yellow flame with smoke formation =

- Reduced furnace atmosphere.
- Too much fuel is being burned.
- Incorrect flame appearance

Bluish-green flame =

- Oxidizing furnace atmosphere.
- Excessive air consumption.
- Incorrect flame appearance.

The burners must always be set according to the specific gross calorific values (CO und CO_2).

Transport and commissioning

The local official regulations are to be observed.

We recommend initial setting by **StrikoWestofen Group°**-specialist personnel.

In order to ensure economical and trouble-free operation we recommend concluding a service agreement with **StrikoWestofen Group°**.

When the melting process is stopped, the melting shaft is filled once more with melting charge and the melting burners are then shut down automatically.

3. Description of functions

Contents

Description of functions

3.1. The furnace plant as a whole

The furnace plant comprises the following components:

- Melting shaft with ETAmax®
- Furnace – melting area
- Furnace – holding area
- Waste gas hood
- Flue cover (baffle) (optional)
- Bale out pocket (optional)
- Gas conditioning system
- Control cabinet
- Operator panel (optional)
- Hydraulic unit (for tiltable furnaces only)
- Charging system (optional)
- Porous plugs in holding area (optional)

If the furnace is equipped with a charging system, a separate operating manual for the charging system will be included. In connection with a horizontal charging system an atomized charging process (half or fully automatic) is possible (optional).
It is also possible to fill liquid aluminum into the furnace via a separate filling pocket (optional).
The charging material is filled into the melting shaft after opening the charging door of the waste gas hood.

The material slides from the melting shaft through the preheating zone into the melting chamber, where it is melted.

In the preheating zone the charging material is dried and preheated by the waste gases.
This procedure is called the ETAmax®-shaft furnace principle.

Description of functions

The material is melted at the bottom of the melting shaft The required energy is supplied by gas or oil burners, depending on the type of furnace. The number of burners depends on the amount of energy needed for melting and is defined by **StrikoWestofen Group°.**

From the melting shaft the melted metal flows into the holding chamber. The burners installed in the furnace roof produce the necessary heat for superheating and holding of the liquid metal bath. The amount of burners depend of the required amount of heat needed and is determined by **StrikoWestofen Group°**.

Depending on the furnace type the metal can be taken out of the furnace either by using a tapping valve or by tilting of the furnace, or using the bale out pocket.

3.2. Melting shaft with ETAmax®

The melting shaft furnace differs in various aspects to other designs of furnaces. The melting charge, which is fed into the shaft, is preheated by the rising waste gases (recuperative principle).
The preheating process involves an intensive heat transfer from the waste gases to the melting charge. This principle provides the basis for the low energy consumption of the shaft melting furnaces from **StrikoWestofen**.
Any deposits of impurities on the melting charge are combusted in the course of this process, which means that the molten metal bath is free of impurities. When moist melting charges are involved, the preheating process prevents the entrainment of moisture into the liquid metal bath. See here also safety instructions concerning moisture and melt.

After starting the melting burners, one charge of scrap is charged into the shaft. Subsequently the furnace should always be supplied with one charge of ingots and one charge of scrap in alternation, so that the shaft is subsequently filled with a mixture of half ingot stacks, half scrap.

The shaft is not to be filled with small-sized melting charges, as the waste gases will otherwise be blocked in the melting chamber as a result of excessively dense shaft filling. This will cause damage to the refractory lining, the furnace shell and the doors, due to overheating.
Damages caused by this are not covered by the warranty.
Mixing small-sized scrap with coarse (bulky) foundry returns has proven effective.

The shaft has to be kept as full as possible. Only then good energy consumption is possible with low waste gas losses. Also the refractory lining is preserved from mechanical damage.

In automatic charging either the filling level control (optional) or the set waste gas temperature determines when charging is carried out.

During melting operation it is imperative to avoid melting the shaft empty to such an extent that the melting charge is able to drop into the pasty material. Apart from the very poor energy utilization, this will also result in splashes, which will block the burner tunnel (burner malfunctions) and become deposited on the refractory lining, with possible destructive effects.

3.3. Furnace – melting section

The melting charge is melted at the bottom of the melting shaft by means of burners. The operating times and power levels of the burners are controlled according to the shaft filling level, the temperature in the combustion chamber and the temperature of the waste gas. The temperature limit detector of the melting chamber switches the burners off and/or to low load level 1.
The cooled furnace is to be heated up in accordance with the heating up curve included in this operating manual.

Description of functions

3.4. Furnace holding area

The metal to be molten flows from the melting area to the holding area. In furnaces with molten metal charging, the furnace is filled directly in the holding area using a separate filling pocket.

The holding burners create the heat energy necessary for heating the melting bath and keeping it warm.

Measuring the bath fill level

The holding equipment for the bath thermo-element and the max. bath fill level electrodes and alarm electrode are mounted in the cover of the thermal pocket. The thermal pocket measuring devices must be checked regularly to make sure they function properly and have the right settings and to make sure the electrodes are the proper length.
This inspection is the only way to prevent overfilling and molten metal from flowing out uncontrollably!

The electrodes can only be removed once they are unplugged.

The cleaning bracket for the bath fill level electrodes has a fixed device for setting the proper length of the electrodes. The middle alarm electrode must be 20mm shorter than the outer bath fill level electrodes.
The setting gauge is made exclusively for this furnace. It must not be modified or used for other systems.

Failure to comply with these safety instructions can harm persons and the plant!

Mechanical, electrical and electronic modifications to and/ or poor maintenance of the safety equipment is strictly prohibited.

3.5. Take-out of liquid metal

The take-out of liquid metal takes place according to the furnace type:

- Stationary furnaces with tapping valve
- Hydraulic tiltable furnace with pouring spout
- Furnaces with bale-out pocket

3.5.1 Metal take-out via tapping valve

The metal is generally taken out via a tapping valve type I with is installed at the lowest point of the metal bath. It is possible to install two tapping valves at different heights. Then the bottom tapping valve is used for residual discharge only. Variable amounts can be taken out at different times.

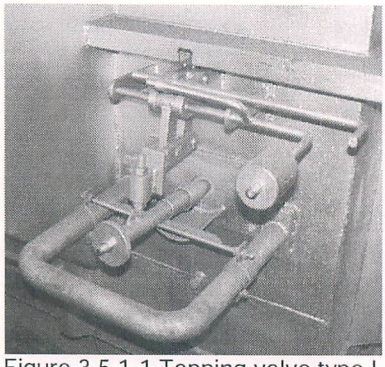


Figure 3.5.1-1 Tapping valve type I

The tapping valve consists of the following components:

- Safety bolt to avoid unintentional operation
- Operating handle with counter weight
- Catch to lock the "open" position"
- Valve plate at furnace
- Valve plug at tapping valve
- Hand wheel to turn the valve plug

Before the tapping valve is operated, the following has to be ensured:

- That a sufficiently large and preheated ladle is prepared and located underneath the tapping valve or a launder system is ready to take over the liquid metal.
- That no metal will get onto the floor, danger of splashes! (if necessary, prepare sand bed!)
- That an emergency valve plug, mounted on a long rod, is always at hand.
-

When only a residual amount of metal (up to approx. 150kg) is to be taken out of the furnace, the valve type II is installed, for residual discharge only.

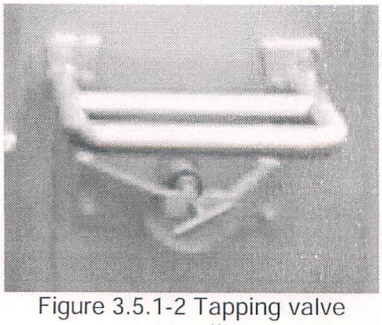


Figure 3.5.1-2 Tapping valve type II

3.5.2 Metal take-out via pouring spout

The metal take-out takes place by tilting of the furnace (hydraulically tiltable furnace series) The pouring spout is constructed either as an opening, covered with lid, or as an opening with door. It is absolutely necessary to avoid excessive tilting. This causes uncontrolled overflow of liquid metal. Damages caused by this are not covered by the warranty.

After the metal take-out has been completed, residual metal has to be removed from the door and/or lid and to be closed immediately. They have to kept clean and fully functional at all times.

3.5.3 Metal take-out via bale-out pocket

For metal take-out the liquid metal is baled-out via a separate bale-out pocket. This can be done either manually or by using appropriate machinery.

After the metal take-out is completed, the lid of the bale-out pocket has to be closed immediately.

Description of functions

3.6. Holding and melting chamber door

Depending on the furnace type the furnace is either equipped with hinged doors or lifting doors.

3.7. Waste gas hood

For the purpose of charging the furnace, the door of the waste gas hood is opened by means of either a gear motor or hydraulically. Should melting charge in the approach path prevent closure of the waste gas hood door, an appropriate message will be displayed at the operator panel.
The end positions of the waste gas hood doors are scanned by limit switches, in addition to which the moving time is set as a safety function. The waste gas hood incorporated the thermocouple to measure the temperature of the waste gases.
The waste gas hoof door can be operated in automatic mode and manually.

3.8. Shaft cover (baffle) (optional)

The shaft cover can be operated manually as well as automatically.

The shaft cover serves to cover the melting shaft in holding mode. Closing the shaft cover reduces the loss of energy, which results from the escape of waste gases.

Description of functions

3.9. Bale-out pocket (optional)

The bale-out pocket is separated from the holding chamber of the furnace by a wall, which has an opening at the bottom. This stops dross from the holding area getting into the bale-out pocket (siphon system) and ensures that only clean metal can be taken out of the bale-out pocket. To ensure this the liquid metal bath must always be above the wall opening. It has to be taken care that the furnace is refilled with liquid metal on time. To ensure good castings quality the walls of the bale-out pocket have to be kept dross-free and free from other adherents.

Also from time to time the oxide film has to be removed from the metal bath level. Only preheated and coated cleaning tools are to be used for this work.

It as to be taken care that no impurities or other parts will get into the bale-out pocket.

To ensure a constant metal temperature and clean metal and also to prevent segregations, it is not allowed to re-melt foundry returns in the bale-out pocket.

3.10. Gas conditioning system

Gas heated furnaces are equipped with a gas conditioning system. Its position is indicated in the general drawing (connection points). Please refer to the flow diagram with regard to the system's design and individual components.
Information on settings and maintenance is to be found in the technical data sheets and component descriptions.

3.11. Control cabinet

The control cabinet contains all the electrical control devices, which are required for the **StrikoWestofen** melting and holding furnace plant.
The front doors incorporate the necessary input and output devices and command buttons for manual and/or automatic operation of the furnace plant.
With regard to the design of the switchgear, see electric wiring diagram and the description of the electrical functions.

These documents are to be kept both in the operating manual and inside the door of the control cabinet. Instructions for the use of the PLC operator program are enclosed with the operating manual if the form of a diskette.

The control system distinguishes between:

- Standby ON/OFF mode
- Standard ON/OFF mode
- Emergency Stop mode

The operating and display devices for the furnace are located in the control cabinet.

3.12. Operating panel (optional)

The location of this panel is shown in the layout plan. It incorporates all the command and indicating devices, which the user requires. Information on the operating panel is to be found in the separate description of electrical functions and the appurtenant front layout drawing.

4. Basic safety instructions

Contents

Basic safety instructions

4.1. Warning signs and symbols

All the components of our plant, which are of relevance to safety, are provided with clear warning and information signs.

The following terminology and signs are employed to indicate dangers in this instruction manual:

This symbol indicates a potentially dangerous situation.

Warning – dangerous electric voltage

Warning – danger of hand injuries

Warning – danger of crushing

Warning – danger of slipping

Warning – danger of falling

Warning – hot surfaces

Warning – suspended loads
Gantry crane

Basic safety instructions

Warning of chemical processes

Warning – risk of explosions – work on gas piping

Warning – potential damage to the environment

Information

Wear safety helmet

Wear heat resistant face protection

Wear eye protection

Wear heat resistant gloves

Wear safety boots

Wear protective cotton clothing

Operating Manual
(Übersetzung vom Original)

Basic safety instructions


Wear protective apron


Disconnect before carrying out work


No access for unauthorized personnel


Don't extinguish fire with water

These symbols resp. hints are used on furnace resp. control cabinet




Failure to observe these warnings may result in serious harm or fatal injury!

Basic safety instructions

Special information
On each entrance to the plant the operator has to place information permanent, good readable signs acc. to the EN 61310-1 with the following text!

No access for unauthorized personnel!

No food, beverages and smoking allowed!

Don't extinguish fire with water!

4.2. Proper use in accordance with the intended purpose

The furnace plant has been built in accordance with current engineering standards and recognized safety rules. Dangers to the life and limb of the user or third parties and/or impairments to the furnace plant or other facilities may nevertheless occur when using the plant.
Use the furnace plant only when in correct working order and only for the intended purpose, always maintaining a due awareness of the safety aspects and potential dangers! In particular, any malfunctions, which might impair safety, are to be eradicated by the operator or third parties.
The furnace is intended solely for use in accordance with the technical data specified in this operating manual. Any other form of use or any use beyond the scope of the specified data shall constitute improper use. The manufacturer/supplier shall not be liable for any damage resulting from improper use. In this case the risk shall be borne by the user alone.

Proper use also includes observance of the operating manual and compliance with the inspection and servicing conditions.

Basic safety instructions

4.3. Organisational measures

The furnace plant's danger zone covers the area in which components move. These components may injure persons or damage objects.

Always keep the operating manual to hand at the place of operation of the furnace plant!

The scope of the operating manual is to be expanded to include instructions, including supervision In addition to the operating manual general, statutory or other binding regulations relating to accident prevention and environmental protection are also to be observed.

Obligations in this context may concern the handling of hazardous substances or the provision/wearing of personal protective equipment or other regulations, for example

All safety and danger signs and information at/on the furnace plant are to be observed and kept complete and in legible state!

All components are to be cleaned and checked for correct operation on regular basis.

The furnace plant is to be checked for externally visible damage and defects at least once per shift!

In the event of any changes to the furnace plant or its operational behavior, which might affect safety, the plant is to be shut down immediately and the malfunction is to be reported to the responsible department/person.

Shut-off-, control- and measuring devices are not to be turned off or interrupted during a temporary shut-down of the furnace plant.

No changes, which might impair safety, are to be carried out to facilities attached to or surrounding the furnace plant without obtaining the manufacturer's permission!

Basic safety instructions

This also applies to the installation and setting of safety devices and to welding on supporting parts.

Safety devices must not be removed or rendered unusable! The operation of the furnace plant is permitted only with the safety devices being complete and fully functionable..

Do not carry out any program modifications (software) on programmable systems!

Replacement parts must comply with the technical requirements by the manufacturer. This is always guaranteed for replacement parts approved by **StrikoWestofen Group°.**

To enable assessment of economic operation and to prevent stoppages, it is expedient to keep a logbook.

Statutory intervals or intervals stipulated in the operating manual are to be observed!

The operating manual includes a list of servicing and inspection intervals. These minimum requirements are to be supplemented by additional stipulations as necessary at the operating company concerned.

Appropriate workshop facilities and equipment are essential for the required maintenance measures.

Work may only be carried out in furnaces, which have cooled down sufficiently to eliminate the likelihood of damage to the health.

Protective measures to prevent electric shock are to be undertaken, when electric current is employed inside the furnace, just as it is to be done when working in containers made of conductive materials.

Basic safety instructions

The furnaces must be provided with non-flammable platforms at all points at which work is carried out when the furnace is in operation and at which flammable gases or hot materials constitute a danger. These platforms must enable personnel to evade darting flames and material, which may shoot out of the furnace.

These platforms must be accessible via non-flammable steps, railings, foot rails or rungs.

Control stands, working routes, escape routes at the furnace must be kept clear at all times.

A risk of explosion and fire applies in the gas conditioning system!

Adjustments and repair work is to be carried out by authorized, duly qualified personnel only.

No persons are to enter the operating zone of the gantry crane! Beware of suspended loads!

The residual and recoverable materials are to be disposed of in accordance with the locally applicable regulations.

In order to prevent injuries e.g. burns caused by splashed liquid material or contusions, the area in the vicinity of the plant is out of bound to all persons apart from the operator.

Hot gases may be emitted when the covers are raised. Danger of burning!

It is of vital importance that the furnace is not overfilled, as this may result in the uncontrolled emission of liquid metal. Any resultant damage or injury will not be covered by the warranty.

The doors and valves are to be closed again after carrying out the necessary work. They are to be kept clean and in safe and reliable working conditions at all times.
Hereunto to be counted in particular the mean of loading (chains, ropes, etc) and the operating systems. The means of loading and their assemblies must be replaced once a year by new ones, depending on their status of wear.

Avoid looking directly into the furnace, particularly the flames of the burners. When carrying out work involving a risk in this respect, protective goggles with tinted safety glass and protective clothing are to be worn to protect of dangerous radiation and deflagrations.

4.4. Selection and qualification of personnel; fundamental duties

The furnace is to be started, operated and shut down by adequately instructed and trained personnel only.

It is thus urgently recommended to arrange for at least one operator and one electrician/electronics engineer per shift to receive training from our **StrikoWestofen** specialist personnel, prior to starting up the plant for the first time.

Work on electric equipment of the furnace plant is to be carried out only by a qualified electrician or by duly instructed personnel under the supervision and direction of a qualified electrician, in accordance with standard electrical engineering regulations. Protection devices are not to be removed or altered in their function.

The employees are to observe this operating manual.

The personnel deployed to work on the furnace must read and understand the operating manual, particularly the section containing the safety instructions, prior to the commencing work. It is too late to do this in the course of work. This applies in particular to personnel who are only occasionally deployed to work on the furnace plant, e.g. for setting up and maintenance work.

Basic safety instructions

Operating personnel with inadequate reading and/or writing skills are not suitable.

The operating personnel must not have long hair or wear loose clothing or jewellery, including rings. A risk of injury applies here as a result of personnel becoming caught up or drawn into the equipment.

Personnel undergoing training, familiarization or instruction and general trainees are to work on the furnace plant only under the supervision of an experienced person! The minimum age stipulated by law is to be observed! Juveniles are not to be assigned to work in furnaces.

Meters and displays of permanent installed measuring and inspection devices must be positioned so as to eliminate any danger to the employees responsible for monitoring the facilities, e.g. as a result of harmful gases.

Protective breathing equipment must be worn whenever carrying out work, which involves a risk of breathing in harmful gases. An adequate number of protective breathing devices must be quickly accessible and ready for use.

Safety boots must also be worn in the cold furnace

The personnel working with the furnace has to inform the supervisor immediately of any occurring irregularities during operation of the furnace.

Basic safety instructions

Personal protective equipment
The operating personnel are to wear the following items of personal protective equipment when working with or on the furnace plant:

Safety helmet
Head protection must be worn whenever carrying out work on or in the furnace.

Face protection in a self-extinguishing material, e.g. polycarbonate, fitted to a fiberglass helmet as to protect the face and the chin.

Heat-resistant protective gloves

Safety boots
To protect the legs and feet from burning foundry men's boots with high legs, over which foundry men's trousers or at least foundry men's gaiters are to be worn. Safety boots are also to be worn in cold furnaces

Wear protective aprons

Protective cotton clothing (flame resistant)
Protective cotton clothing consisting of flame resistant material and chemical impregnation (with buttons or Velcro fastener) must be worn whenever carrying out work, which involves a risk of burns.

Basic safety instructions

4.5. Additional instructions for the operating company

The operating company is to draw up operating instructions on the basis of the operating manual supplied by the manufacturer and is to issue these instructions to its employees before they are deployed to work on the furnace plant. The operating company is to advise its employees as to the obligation to comply with these instructions at least once every six months.

The operating company must observe all the stipulated requirements to attain the highest possible level of safety for the operating personnel and, whenever appropriate, comply with special national and/or local requirements.

The instructions and/or operating manual is/are to be drafted in a language, which is comprehensible to every employee.

The operating company is clearly to define the areas of responsibility among the personnel for operating, setting-up, servicing and repairing the plant and is to assign the post of "plant controller", whereby the "plant controller" is to be authorized to reject instructions from third parties which are contrary to safety requirements!

The operating company is to ensure that only duly authorized personnel work on or at the furnace!

The personnel's working practices are to be checked on an occasional basis at least, in order to verify that the personnel are duly aware of safety and danger aspects and observe the operating manual! This also applies to the personnel deployed to operate cranes and floor-based trucks.

According to the operational requirements, but once annually at least, the operating company is to ensure that the furnace plant and its protective devices and safety measures are checked for safe working order by an expert, to be appointed by the company, whereby the expert is to record the results of these checks in the test log book or machine file.

In particular all the loaded and-or mechanically movable components must be evaluated carefully

Basic safety instructions

The following items of equipment must be available in the vicinity of the plant for emergencies:

1. Protective breathing equipment
2. First Aid equipment
3. Fire extinguishers suitable for the materials to be processed.

The locations of and operation instructions for fire extinguishers are to be indicated in accordance with the available facilities for fire alarms and fire fighting!

The operating company is to ensure that the employees involved with operation of the furnace are acquainted with the use of protective breathing equipment.

Fires and extinguishing operations

It is forbidden to use water to extinguish fires!

Only suitable extinguishing agents are to be used!

No liquids are to be allowed to enter the liquid metal bath!

Always keep an adequate quantity of dry covering salt available in the vicinity of the furnace!

The following has to be provided by the operating company:

1. Personal protective equipment
2. Protective headwear
3. Protective screens (shields)

To avid the negligent use of personal protective equipment, the operating company is to provide organizational warnings instructions and to apply safety signs.
The operating company has to ensure that, in the event of irregularities in operation of the furnace plant, a check will be carried out to verify whether a defect is involved and that operation of the furnace plant will be suspended until any established defect is remedied.

Basic safety instructions

4.6. Safety instructions relating to specific operational phases

A trial run is always to be carried out before starting up the furnace plant. Correct operation of the furnace plant is to be verified in the course of the trial run.

The national regulations are to be observed!

Deposits of dirt are always to be removed. Keeping the furnace plant clean improves its operational safety and reliability.
See also "Servicing and cleaning".

4.6.1. Start-up

Before starting up the plant, the operating manual must be studied and the operating personnel must be instructed by duly qualified specialists.

Before switching on/starting the plant, ensure that no one can be endangered by the starting furnace plant!

As a fundamental rule, no changes or adjustments should be carried out on the plant, as this will impair safety.

StrikoWestofen GmbH will accept no responsibility for any direct or indirect damage or injury resulting from incorrect handling, servicing or repair of the furnace plant.

The sequences for switching the furnace plant on and off are to be observed as stipulated in the operating manual.
Carry out functional trials of the plant's individual units. Ensure that no persons are located in the unit's effective operating areas during these trials.

When malfunctions become apparent or error messages are displayed, these may only be eradicated and/or acknowledged by a competent person (e.g. foreman).
The limit switches are to be tested in inching mode. The relevant items of equipment are to be run over the switches.

The correctness of the limit switch signals must be recorded and checked in the controller.

Check moving parts/furnace parts for correct rotational and running direction by entering the appropriate command and/or using measuring instruments.

Following a relining the furnace or the furnace area concerned is to be heated up to operating temperature in accordance with the enclosed sintering instructions.

Following an inoperative period, the furnace has to be heated up to operating temperature according to the enclosed heating-up instructions.

4.6.2. During operation

Before starting the furnace plant, please make sure that the furnace is in operational condition. During operating the plant has to be operated according to the operating manual.

Under no circumstances any changes are to be carried out to the safety devices.

Exercise care when handling heated parts and work with the liquid melt, as a danger of burning applies; wear protective clothing.

Should operating fluid leak from a unit, the leak has to be sealed immediately and missing fluid has to be replaced. Otherwise the risk of an accident will increase substantially.

All components are to be kept in a safe and fully operational condition at all times. The official and corporate regulations are to be observed at all times.
Hereunto to be counted in particular the mechanically movable components and the operating equipments.

The operational area of the drives has to be secured.
All access doors and cleaning openings are to be closed securely and kept close during operation.

Basic safety instructions

No persons are to be located within the operating area of the charging facilities during operation.

It is forbidden to transport persons on the charging facilities.

The "Emergency Stop" function is to be released by authorized personnel only, using a key-operated switch. The system is then switched on in "Standard" mode.
Do not shut down or remove extraction and venting devices while the furnace is in operation!

Furnace – melting section:

The material to be melted by means of the melting burners is to be loaded into the furnace with the aid of the charging device.

In order to protect the refractory lining of the shaft, first pour one charge of scrap material into the empty shaft. An empty shaft should not be charged with ingot stacks, as the impact of the ingot stack may cause damage to the refractory lining.

When only doughy material remains n the shaft, further charging is nit permitted, until the shaft has melted clear. Splashing material constitutes a danger here, it may also result in burner malfunctions and lead to brakings on the refractory lining.

When carrying out manual or automatic charging, it is to be ensured that there is adequate space for the charging material in the shaft, so as to avoid the charging bin being lowered onto melting material, which is still located in the shaft. The warranty does not cover damages caused in this manner.

The melting area and the lower area of the melting shaft are to be melted clear and cleaned once per shift.

Basic safety instructions

When the maximum bath level is reached in the holding area, the melting burners are shut down – but not with furnaces with a degassing pocket. This prevents overfilling of the furnace. This safety function must not be altered, as liquid metal may otherwise issue from the furnace. This constitutes a danger of life and limb.

The warranty does not cover damage or injury resulting from issuing liquid metal.

Function of cleaning doors during melting:

For safety reasons the cleaning door of the melting chamber must be closed during melting operation. If it is opened, the melting burners will be shut down. The cleaning door of the holding chamber can be opened without the melting burners being shut down, however.

4.6.3. Removal of molten metal and re-filling

The removal of liquid metal and the refilling with liquid metal is only to be done by duly qualified personnel, wearing protective clothing.

During removal of liquid metal and charging with liquid metal the work area is to be kept free of unauthorized personnel and objects.

Only the operating personnel wearing protective clothing are allowed within the vicinity of the furnace.

No liquid metal must be allowed to get onto the floor in the removal/Re-filling area (danger of splashing). If appropriate, a sand bed has to be provided.

Only suitable transport devices – heated to the liquid metal temperature, such as **StrikoWestofen** transport ladles or drums are to be employed for the purposes of metal collection and transportation.

Basic safety instructions

There is an acute danger of burns, when liquid metal is removed or the furnace is charged with liquid metal!

Shutdown

The furnace plant has to be disconnected from the electric power when shut down.
The fuel supply line has to be shut off.

The plant has to be secured so as to ensure that it cannot be started up again by an unauthorized person.

The furnace should remain "in operation" at all times. Should it nevertheless prove imperative to shut down the furnace, for whatever reason, it has to be emptied completely and cleaned thoroughly.

Under no circumstances must the metal be allowed to solidify in the furnace!!!

The refractory material and/or the ceramic sealing elements may then incur damages or be destroyed, as the material will be subject to high levels of stress while the metal changes its state of aggregation. The furnace may leak if the sealing elements are damaged.
In the event of any malfunctions in the heating process, which cannot be eradicated in the short term, the furnace is to be emptied as quickly as possible.

The furnace openings are to be kept closed during the cooling process in order to avoid thermal shocks, which may damage the lining.

The cooling rate must not exceed 30C°/h.

If necessary, the burners should be switched on repeatedly for brief periods during the cooling process. Keep the furnace doors closed!

Basic safety instructions

4.6.4. Repair and servicing work

When repair work is to be carried out, it is to be ensured that the furnace is in inoperative mode and that the specialist personnel deployed to carry out the repair work is not endangered in any way.
It is to be ensured that no functions of any safety device are impaired in the course of any repair work.

Repair work during furnace operation is absolutely forbidden.

Cleaning work and changing of units or components must be carried out in accordance with the operating manual.

If necessary, the plant is to be shut down for the duration of the repair and servicing work and secured to prevent unauthorized activation. Lifting doors are additionally to be secured against lowering.

The ladders and platforms are to be used by authorized personnel for servicing only. They are only to be accessed when it has been ensured that the plant cannot be started up for the duration of the servicing work.

When using fluxes to treat the furnace always spray the injector until it is empty, as otherwise the remaining salt will become baked hard, rendering the injector unusable.

In the case of furnaces with tapping valve, it has to be ensured that the liquid metal bath level is kept sufficiently high to prevent any dross from floating into the tapping valve. Danger of stopping up!

Flux qualities, number of applications, quantities etc. are to be determined in consultation with your flux supplier. Fluxes must not attack the refractory lining.

Basic safety instructions

The bath level electrodes must always be kept in fully operational condition otherwise – in case of furnaces without degassing pocket – there is the danger of liquid metal running uncontrolled out of the furnace.

The surfaces of flooring and pathways are to be designed so as to avoid any risk of slipping and are to be kept in this state by maintenance and cleaning.

Ladders and platforms are to be kept in good working order via maintenance and cleaning.

Maintenance and servicing work on and in the furnace plant, such as e.g..

- Work in gas endangered areas;
- Work on gas piping;
- Welding in narrow spaces;
- Welding, flame cutting and grinding work
- Cleaning of waste gas systems;
- Work in access channels or in narrow spaces

Have to be carried out by duly trained and qualified personnel only, who are aware of the possible risks. In such cases a second person has to be at site and both persons have to be in contact during the whole procedure. These maintenance and service works ask for a special permission are to be carried out according to the appropriate safety regulations.

Setting and maintenance work is to be carried out with appropriate tools in good working order.

If the demounting of safety devices is necessary in order to carry out maintenance or repair work, they have to be reinstalled right after completion of the work and have to be checked for functioning

Basic safety instructions

4.6.5. Moisture and melt

Water reacts explosively with liquid metals! (vaporization)

With liquid aluminum the following reactions are released when it comes into contact with water, all of these reactions result in dangerous consequences.

Explosive reaction
Firstly water expands quickly when it changes from liquid into steamy condition, causing steam explosions.

Next aluminum replaces in a reduction reaction the hydrogen in the water molecules and releases the hydrogen. Finally this released hydrogen ignites explosively when it comes in contact with atmospherically oxygen.

No water is allowed to come into contact with the melt!

Preheat all tools
All tools, e.g. scoops, skimmer, scrapers and sludge-scraper, which come into contact with the melt, have to be pre-melted up 200°C to remove all residual moisture.

The handles of such tools must be massive or have venting boreholes. Hollow handles might store moisture inside, which can cause seam explosions. All tools which are coated with water soluble safety coatings must be dried thoroughly.
Before use the tools must be coated.

All components, materials and auxiliary equipment, which come into contact with the melt, must be free of moisture, grease and oil!

Basic safety instructions

Splashes on normal concrete floors must be avoided. The heat of the melt can displace explosively the molecular water of the concrete. If splashes get on the concrete floor they have to be removed immediately.

4.6.6. Oil, greases and other chemical substances

When using oil, greases and other chemical substances, the safety regulations for these products have to be observed!

Attention when using process chemicals!
It has to be secured that the used process chemicals are compatible. If possible or anticipated reactions are known, precautions for seprations of these chemicals must be taken.

4.7. Notice for special dangers

This list cannot be complete!

When charging by hand, the hot waste gas hood constitutes an acute risk of burning! It is compulsory to wear the personal protective equipment.

The furnace plant may only be operated if provided with adequate lighting in compliance with the local regulations.

Mobile platforms may only be used after securing to prevent them from rolling away.

The set limit values of the furnace are not to be altered without written permission of the manufacturer!

Basic safety instructions

It is forbidden to introduce flammable or explosive materials into the furnace. Such materials constitute a danger of life and limb.

The materials used for the furnaces are free of danger for life and safety, if handled workmanlike and professionally.

Safety symbols and safety signals, information and warning equipment are not to be removed, set out of function or mounted some place else.

Changes on energy separation devices are not allowed. The Emergency-OFF devices on the furnace must be visible, fully functionable and reachable at all times

4.7.1. Electric energy

Only use original fuses of the stipulated amperage. Shut down the furnace plant immediately in the event of any defects in the electrical energy supply!

Where stipulated, parts of the furnace plant on which servicing, inspection or repair work is carried out must be disconnected from the electric power supply. First check that the disconnected parts are dead, then earth them, short-circuit the components, e.g. capacitors, by means of an earth rod and insulate the neighboring parts!

When work requires to be carried out on live parts, a second person is to be on hand who can actuate the Emergency Stop switch or the mains switch to disconnect the voltage supply in the event of an emergency. The work area is to be cordoned off with a red and white chain and a warning sign. Use only insulated tools!

The electric equipment of the furnace plant is to be inspected/tested on a regular basis. Any defects, such as loose connections or scorched cables, must be eradicated immediately.

4.7.2. Hydraulic, pneumatic equipment

Work on hydraulic and pneumatic equipment is only to be done by duly trained and authorized personnel!
All piping, hosing and screwed connections have to be checked for leakage and detectable damages regularly!
Damages have to be eradicated immediately. Spurting oil may cause injuries and burnings!

Piping and pressure piping which have to be opened (hydraulic, pneumatic) have to be made pressureless before starting to work!
Hydraulic- and pneumatic piping have to be installed and mounted workmanlike! Connections must not be confused! Mountings and fittings, length and quality of piping must meet the requested requirements.

Exchange of piping
The time for usability for hose piping should not exceed 6 years, including a storage in stock of maximum 2 years.
As an exception the time of usability may be determined according to experiences and tests made, especially considering the operating conditions.
Deviations from the above mentioned time of usability have to be written down in the operating manual, always considering the instructions given by the supplier.
Even if hose piping is stored professionally and handled workmenlike, the piping is sensitive to ageing. This limits their storage time and their usability.

The hydraulic unit must be equipped with a pressure control, e.g. with a pressure control valve (DBV).

5. Operation

Contents

Operation

5.1. General information on operation

The furnace plant may only be switched on be duly instructed personnel who have read and understood this operating manual.

The furnace is to be operated only, when all protective devices are in place and fully operational.

Operation

5.2. Functional description

6. Faults

Contents

Faults

6.1. General

Faults are to be eradicated by duly trained and authorized personnel only.

Thermocouples

A breakage or short-circuit of the thermocouples will be indicated by the temperature controller. When installing the thermocouple in the roof, ensure that the depth to which the thermocouple is inserted into the roof remains the same. If the thermocouple is drawn back too far into the roof insulation, its temperature reading will be too low, which may be dangerous. After installation, the thermocouple should therefore be secured with a weld point between thermocouple and flange, to prevent displacement.

Procedure in case of fault

Fault occurs:

- **Fault message is displayed**
- **Flashing lamp**

Fault analysis:

- **Note fault indication on clear text display**
- **Inspect plant**

Eradicate fault:

Acknowledge error:

- **Press "Clear fault" button on operator panel**

Faults

6.2. Fault, cause and remedies

Faults and suggestions for remedy of the faults are displayed in clear text in the display of the control panel.

Eliminate faults, whereby you can refer to the hints given in the display of the control panel.

For faults of the optional units, e.g. the charging equipment, see the referring pages of the enclosed operation manuals.

Service and cleaning

Furnace – holding area

The **holding chamber** has to be cleaned once a shift, depending to the degree of soiling and dross formation. n:

If an injector is available, fill with approx. 0.5kg of cleaning fluxes and spray walls, floor and roof.
If no injector is available, apply fluxes evenly with a shovel.

Close doors and switch on holding burner for approx. 5 minutes.

After switching off the burners and opening the doors, use cleaning tools to remove deposits and baked-on materials from walls, roof and floor.
Use dross rake to remove all dross and impurities from the furnace holding area through the cleaning door.

Any firm solid deposits must be treated with an appropriate flux.

The metal bath should be cleaned when the dross layer attains a thickness of approx. 10 mm
Cleaning should be carried out with a bath level as high as possible. Apply approx. 0.5kg of dross melt-out flux per tonne of bath content evenly on the surface of the bath, using a shovel (the appropriate quantity depends on the degree of soiling of the molten bath, and a larger quantity may be required). Use dross rake to stir the flux down to the bottom of the molten bath. Close doors and switch on holding burner for approx. 5 minutes.
After switching off the burner and opening the doors, draw all the dross off the surface of the bath and walls and remove from the furnace.

The use of excessive amounts of fluxes and/or other chemical agents in **StrikoWestofen** furnaces may lead to premature destruction of the furnace lining. The warranty does not cover damage of this type.

Service and cleaning

Avoid damaging the refractory lining with cleaning tools.

The burners and the burner tunnel are to be kept free of soiling at all times.

If the furnace is to be shut down, it has to be emptied completely and cleaned thoroughly.

The protective tube of the thermocouple is to be cleaned daily with a flat iron rod, and a protective coating has to be applied, if necessary, then lowered carefully into the metal bath.

The furnace body and the refractory lining have to be checked for damages frequently.

Cleaning holding chamber

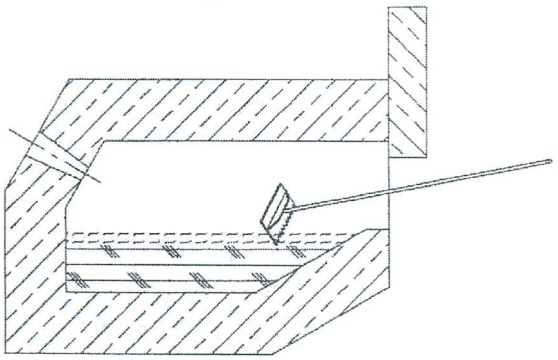


Figure 7.2-3 Cleaning of the holding area

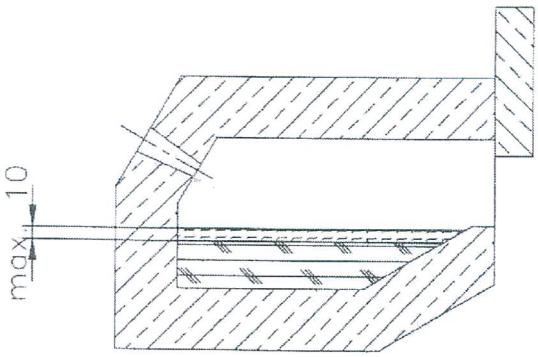


Figure 7.2-4 Cleaning of the metal bath

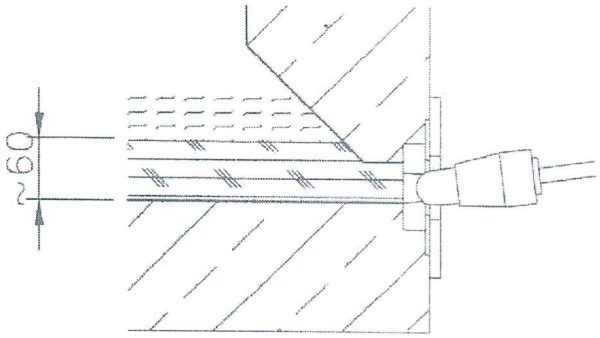


Figure 7.2-5 min. bath level at tapping valve

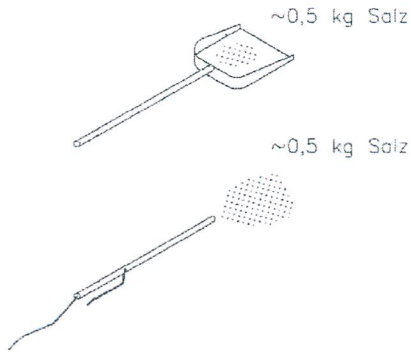


Figure 7.2-6 Cleaning flux

Service and cleaning

Figure 7.2-7 Cleaning of thermocouple

Service and control intervals

Servicing interval (operating hours)	**Component**	**Work to be carried out**
Weekly	flame surveillance	Shut-off of the burners via gas Stop valve resp. oil stop valve. The furnace control must indicate fault flame surveillance.
	furnace plant	Visual check in case of damage, or wear out or loosening parts or drive elements.
Monthly	electrodes	Clean ignition and ionization electrodes.
¼-yearly	fan	Check fan according to its mounting and operating manual.
	burner parts	Visual check of burner parts inside the furnace: burner tunnel/brick*, cone and visible inner parts. Visual check of burner housing, check burner flange for overheating caused by leakage due to damage or shifting**.

Service and cleaning

Servicing interval (operating hours)	**Component**	**Work to be carried out**
¼-yearly	Gas containing parts	Check of all gas containing parts on gas tightness and perfect function via a gas tightness control (optional). Defects and faults are to be eradicated immediately (furnace has to be shot off until the faults are eradicated).
	Protective, control and measuring equipment	Check of all functions, suitability, efficiency and calibration. If necessary that parts have to be recalibrated, serviced or changed. Check the function, suitability, efficiency and calibration. If necessary, reset, perform maintenance work or repair.
	Bath area	The check has to be done via touch control (see here functional specification).
½-yearly	Furnace plant	Readjust furnace plant. Remove dust from control cabinet etc.
	Contacts	Clean contacts by using special cleaner (see also description of components).
	Pressure switches	Check and re-adjust pressure switches. Adjust plant
	Filter	Clean and/or change filters (air-, oil and/or gas filters) (see also description of components).
½ -yearly	Burners	Check burners for visible damages.

Service and cleaning

Servicing interval (operating hours)	**Component**	**Work to be carried out**
Yearly	Burners	Function, sight and safety check according to the description of components. Shut-off gas supply, close ball valve. Switch gas-firing unit off (all-polo) and clean burner. Check burner, burner pipe, ceramic pipe, insulating pipe, burner tunnel/ brick.
	Electrodes	Visual check of electrodes, if necessary change electrodes and sealings.
	Waste gases Hoist chains and rope drives	Carry out waste gas analysis The loading means must be replaced by new ones

After service of burners:
Check air and gas pressure. Compare the set pressure values with the commissioning protocol. Measure ionization current. Carry out waste gas analysis. Check piping on tightness

* **Damaged burner tunnel/brick:**
The burner tunnel/brick is made of refractory material. Cracks in the refractory material are unavoidable and normal. Danger occurs when the flames flash back or when parts of the refractory material break off. Regular checks avoid such damages

** **Defect sealing between burner and furnace:**
This will become visible through when the steel shell of the furnace is discolored or scorched in the burner area. The burners should be screwed tight to the furnace, if necessary, the sealing has to be replaced.

Service and cleaning

This damage should be eliminated as soon as possible. Damages to the furnace shell cause larger leakages. This damage will be made worse, when the burner brick is damaged. A damaged burner brick must be replaced as soon as possible.

For optional components e.g. the charging unit please see the appropriate section of the enclosed additional operating manual .

7.3. Decommissioning and scrapping

Decommissioning

Dismantling of the individual plant units may only be carried out by personnel who are qualified to carry out such work.

For dismantling the furnace has to be fully disconnected from the electric power in the correct manner. All cable connections between the control cabinet and the furnace plant must be removed.

All other terminals and connections between the furnace plant and the factory building or other groups of machinery are to be removed.

Scrapping

If the furnace plant is to be scrapped at the end of its service life, a qualified company is to be commissioned to carry out this work.

The individual components are to be sorted into:

- Steel scrap
- Non-ferrous metal scrap
- Oil contaminated parts (e.g. gear boxes)
- Electrical scrap
- Plastics

8. Spare parts

For spare parts see the order-related offer from the supplier

Spare parts are handled as follows:

Only original spare parts delivered and approved by **StrikoWestofen** are covered by the warranty**.**
We draw your explicit attention to the fact, that spare parts and accessories not delivered by us, are not checked and approved by us. The installation and use of such products may under certain conditions have negative influence on the constructive quality of the furnace plant and may be harmful to the active and/or passive safety of the furnace plant. For damages caused by use of non-authorized spare parts and accessories, any liability and warranty of **StrikoWestofen Group°** is excluded.

Our sales department will work out a detailed spare part quotation, whenever requested. For the correct handling of your spare part order we kindly ask for the following information:

1. Customer name
2. Furnace type and serial number (see here nameplate on furnace)
3. Name of the required part
4. Wanted amount
5. Wanted way of shipment

Only complete information of all data ensures a fast and correct settlement of your order. Please send all spare part orders to the address written below.

We cannot assume any liability for any printing mistakes. The statements in this operation manual have been made to the best of our knowledge and conscience. A liability cannot be derived from it.

Address

StrikoWestofen Group°
Fritz Kotz Straße 4
D-51674 Wiehl-Bomig

Phone: +49 (0) 2261 / 7091-0
Fax: +49 (0) 2261 / 7091-107
E-mail: info@strikowestofen.com

Spare parts

9. Technical data

Technical data

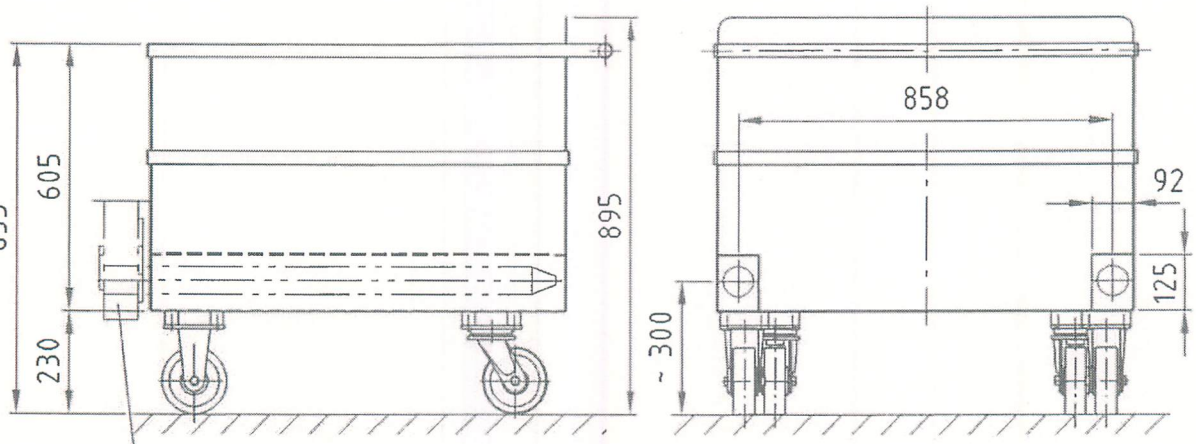
Capacity		1250	kg
max. melting rate		750	kg/h
max. bath temperature		760	°C (bath)
Fuel	natural gas		
	Hu =	10,0	kWh/m³ (Vn)
	Hu =		kWh/m³ (Vn)
Total burner rating:		72,5	m³/h
Installed burner capacity		725	kW
Electric power consumption		11	kVA
Supply voltage	3 x 575V - 60Hz		
AC	120V		60Hz
DC	24V		

10. Drawings

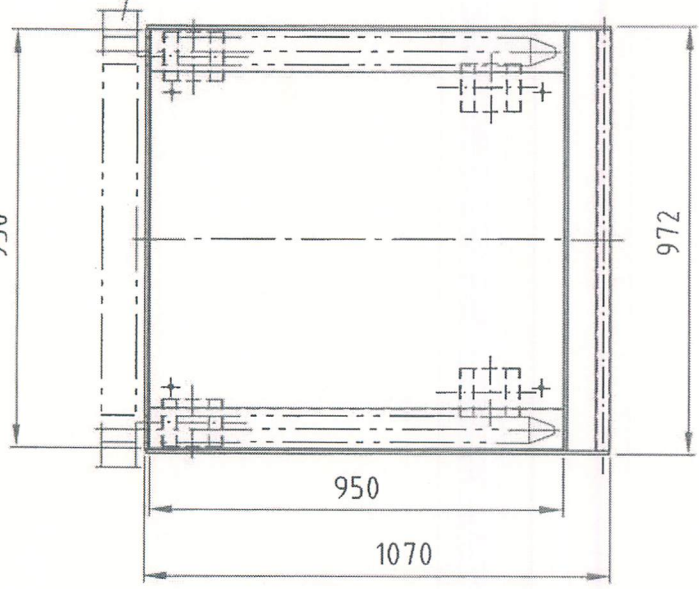
Drawings	
Drawing	**Drawing no.**
General arrangement drawing	MBAGG0039-1
Foundation drawing	MBAGL0022-1
Flow diagram with data sheets	MBAGR0023-1
Hydraulic diagram	-

11. Description of components

Description of components			
Item	Description	installed yes	installed no
1	Gas filter GFK	☒	☐
2	Gas pressure switch DG	☒	☐
3	Solenoid valve SKP15-SKP55	☒	☐
4	Gas tightness control TC	☒	☐
5	Gas meter DM	☐	☒
6	Gas governor with solenoid valve VAG	☐	☒
7	Gas burner BIO, ZIO	☒	☐
8	Ignition transformer TGI	☒	☐
9	Gear motor IC	☒	☐
10	Gas firing unit IFD	☒	☐
11	Tapping valve	☒	☐
12	Operator panel View plus 700	☒	☐
13	Gear motor MFZ	☒	☐
14	Fan	☒	☐
15	SEW-gear/-motor	☐	☒
16	Hydraulic unit	☐	☒
17	Actuator for solenoid valve SKP55	☒	☐
18	Acutator for solenoid valve SKP15	☒	☐
19	Safety relief valve/ shut-off valve JSAV/VSBV	☒	☐
20	Push button valve DH	☒	☐
21		☐	☐
22		☐	☐
23		☐	☐
24		☐	☐
25		☐	☐
26		☐	☐
27		☐	☐
28		☐	☐
29		☐	☐
30		☐	☐



Tragrahmen Beschickung
Frame charging unit



Volumen / Volume (m^3)	0,52
Gewicht / weight (kg)	134
für Beschickung / for charging unit	K 500 – K 2000

	Tag	Name
Bearbeiter	14.05.2003	PBL
Geprüft	06.06.2003	ASC
Freigabe	06.06.2003	UTH

STRIKO WESTOFEN GmbH

Artnr.

-

BESCHICKUNG ALLG.

Maßstab 1:15

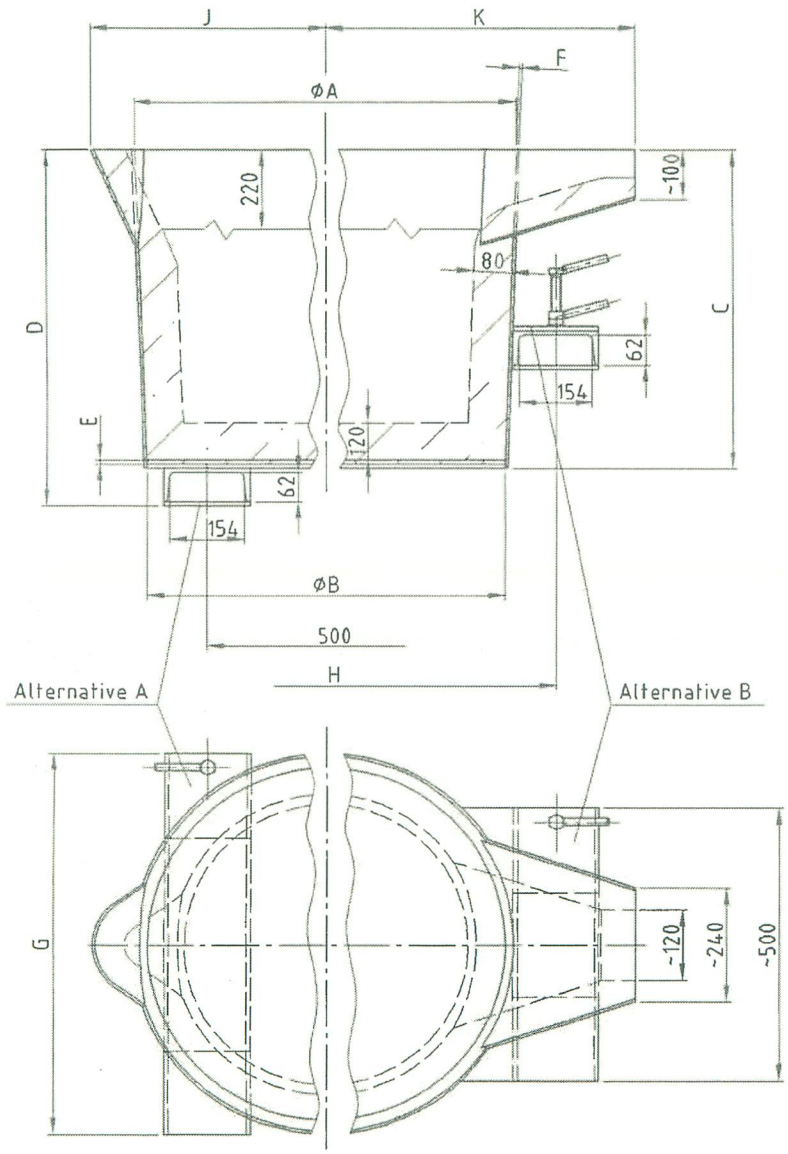
Gew.(kg) 134

Beschickungswagen

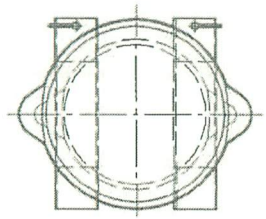
BW-G 3 - 950/950/600 mm - allseitig geschlossen
charging car (closed)

BSAGV0003 | Bl. 1 | A

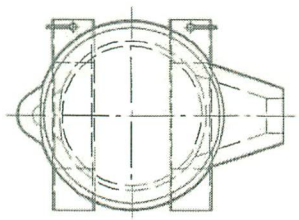
Ursprung: 26.01-1.103/42 D | Ersatz für: | Ersetzt durch:



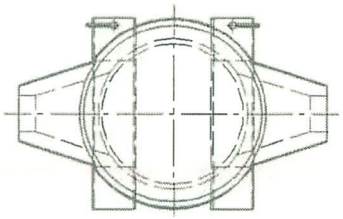
☐ Type 1 with Alternative A



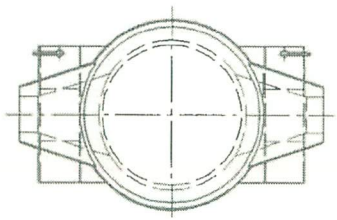
☐ Type 2 with Alternative A



☐ Type 3 with Alternative A



☐ Type 3 with Alternative B



☒ please mark required construction

Ladle type
for example LST 500-A-1

dimensions / (kg) Capacity	A	B	C	D	E	F	G=A	H	J	K	~ weight (kg) Steel construction	refractory
☐ LST 300	800	749	778	858	8	6	800	960	492	700	180	380
☐ LST 500	930	879	828	908	12	8	930	1095	562	765	280	510
☐ LST 750	1000	917	966	1046	12	10	1000	1150	634	800	375	750
☐ LST 1000	1080	1000	1035	1115	12	10	1080	1230	675	840	430	1000

	Date	Name
Drawn	22.09.2004	PBL
Checked	24.11.2004	HTH
Approval	24.11.2004	USO

STRIKO WESTOFEN GmbH

Scale %
Weight (kg) 0

Ladle for fork lift transport for Al
type LST 300 - 1000

Origin: 19.01-5.020/31 D E | Replacement for: | Replaced by:

-
Artnr
-
PFANNEN

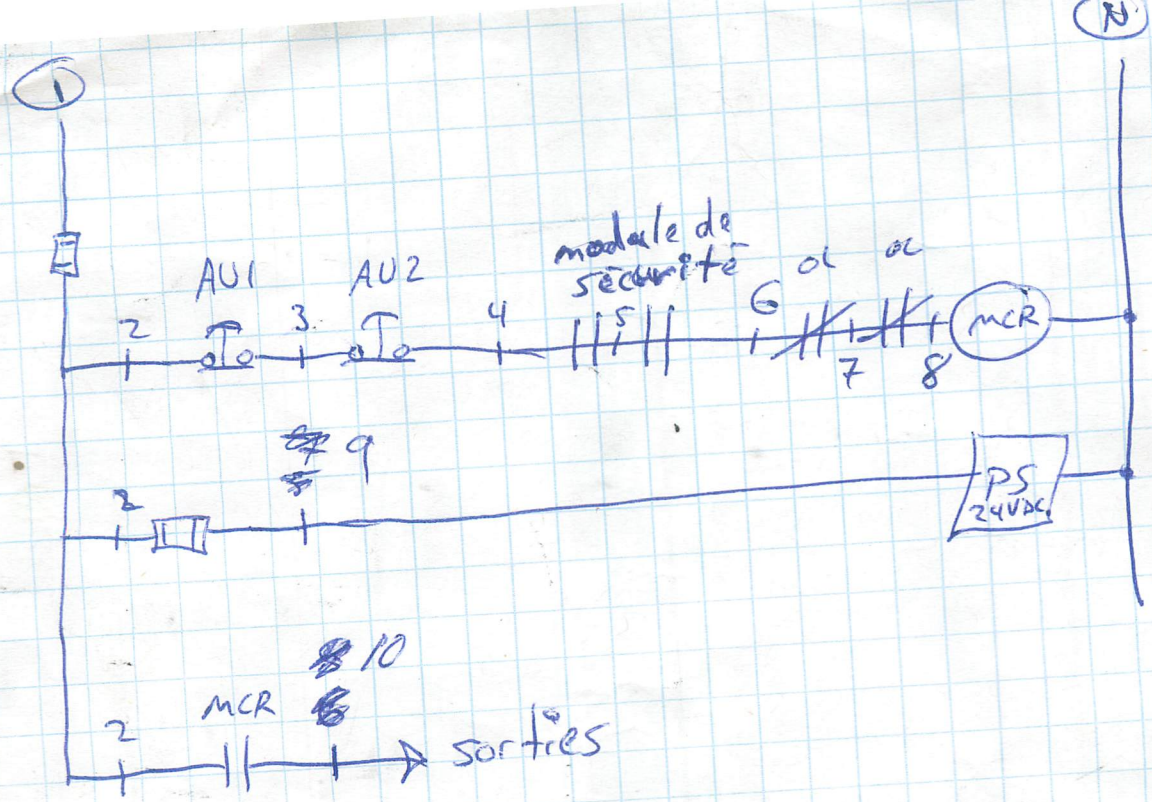
MTPFV0001 | Bl. 2 | B

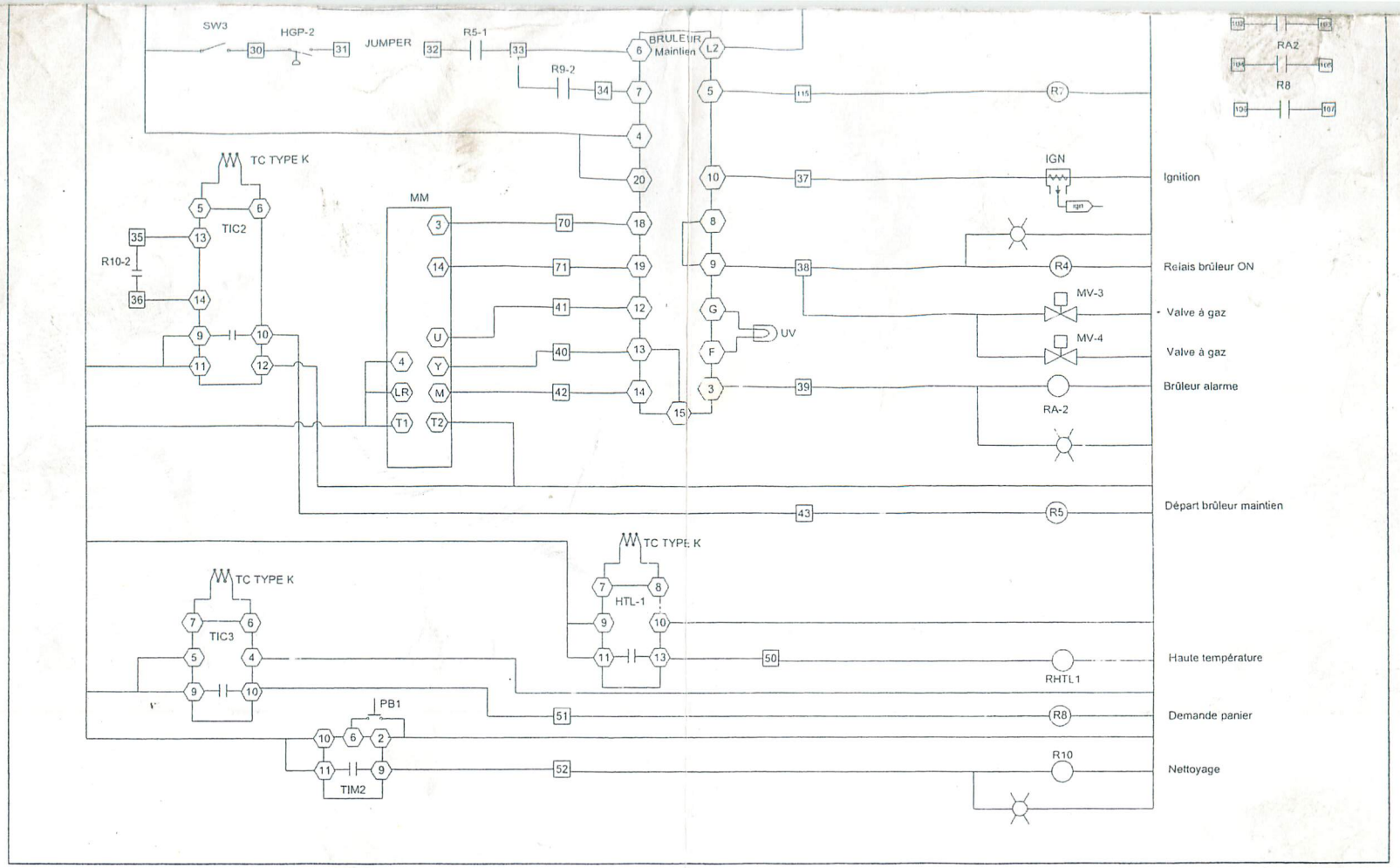
Entrées / Sorties
ÉLÉVATEUR FOUR 4924

	Entrées 0.	#Fils		Sorties 100.	#Fils
00	MASTER CONTROL RELAY (MCR)	000	00	MANUEL (LUM)	10000
01	MANUEL (BP)	001	01	AUTO (LUM)	10001
02	AUTO (BP)	002	02	ÉLÉVATEUR MONTER (C1)	10002
03	ÉLÉVATEUR MONTER (BP)	003	03	ÉLÉVATEUR DESCENDRE (C1-1)	10003
04	ÉLÉVATEUR DESCENDRE (BP)	004	04	HOTTE OUVRIR (C2)	10004
05	HOTTE OUVRIR (BP)	005	05	HOTTE FERMER (C2-1)	10005
06	HOTTE FERMER (BP)	006	06	PANIER VIDE (STROBE)	10006
07	SÉCURITÉ PORTE ET PASSERELLE OK (MODULE)	007	07	LIBRE	10007
08	DEMANDE DE CHARGEMENT (CT)	008			
09	CHARIOT MAL PLACÉ (PH.S)	009			
10	LIBRE	010			
11	LIBRE	011			

Entrées / Sorties
ÉLÉVATEUR FOUR 4924

	Entrées 1.	#Fils		Sorties 101.	#Fils
00	ÉLÉVATEUR EN BAS (LS)	100	00	LIBRE	10100
01	ÉLÉVATEUR AU MILIEU EN MONTANT (LS)	101	01	LIBRE	10101
02	ÉLÉVATEUR AU MILIEU EN DESCENDANT (LS)	102	02	LIBRE	10102
03	ÉLÉVATEUR EN HAUT (LS)	103	03	LIBRE	10103
04	HOTTE FERMÉE (LS_NF)	104	04	LIBRE	10104
05	HOTTE OUVERTE (LS_NF)	105	05	LIBRE	10105
06	LIBRE	106	06	LIBRE	10106
07	LIBRE	107	07	LIBRE	10107
08	LIBRE	108			
09	LIBRE	109			
10	LIBRE	110			
11	LIBRE	111			

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HGP-2
30
31
JUMPER
32
R5-1
33
R9-2
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BRULEUR
Maintien
6
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115
R7
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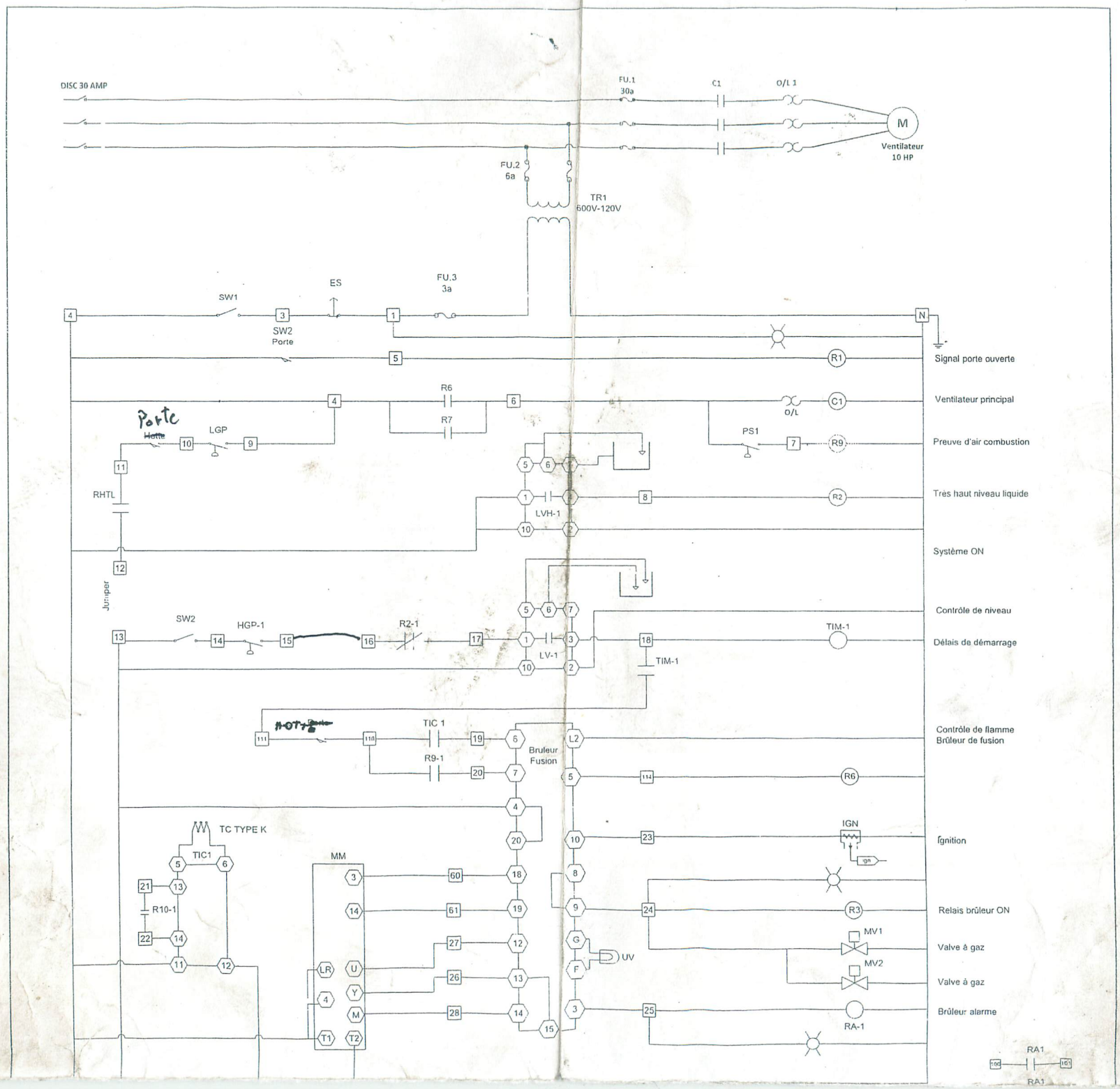
20
10
37
IGN
Ignition
TC TYPE K
5
6
TIC2
35
13
R10-2
36
14
MM
3
70
18
8
14
71
19
9
38
R4
Relais brûleur ON
41
12
G
MV-3
Valve à gaz
U
UV
9
10
40
13
F
MV-4
Valve à gaz
11
12
4
Y
LR
M
42
14
3
39
Brûleur alarme
RA-2
T1
T2
15
43
R5
Départ brûleur maintien
TC TYPE K
TC TYPE K
7
8
HTL-1
7
6
TIC3
9
10
5
4
11
13
50
RHTL1
Haute température
9
10
PB1
51
R8
Demande panier
10
6
2
11
9
52
R10
Nettoyage
TIM2
RA2
R8


DISC 30 AMP
FU.1
30a
C1
O/L 1
M
Ventilateur
10 HP
FU.2
6a
TR1
600V-120V
FU.3
3a
ES
SW1
SW2
Porte
N
R1
Signal porte ouverte
R6
R7
C1
O/L
Ventilateur principal
Porte
Hotte
LGP
PS1
R9
Preuve d'air combustion
RHTL
LVH-1
R2
Très haut niveau liquide
Système ON
Jumper
SW2
HGP-1
R2-1
LV-1
TIM-1
Contrôle de niveau
Délais de démarrage
TIC 1
R9-1
Bruleur
Fusion
Contrôle de flamme
Brûleur de fusion
TC TYPE K
TIC1
R10-1
MM
IGN
Ignition
R3
Relais brûleur ON
MV1
Valve à gaz
MV2
Valve à gaz
UV
RA-1
Brûleur alarme
RA1
RA1