

***Hennecke description of day tanks and metering
equipment used in conjunction with Rotamats
supplied to Trane (Vidalia, GA)
2013-09-16***

Tank Station for Coil and Fan Door Production – Item “B”

ITEM NO. DESCRIPTION

201 Tank station, capacity 250 l, operation pressure 10 bar

Useful capacity 230 l; double-walled for temperature control with unpressurized water; outer wall, lid and inner shell made of mild steel, as a modular unit, consisting of:

- 1 tank rack with integral, retractable leakage collecting basin (stainless steel) and fork lifter fittings
- 1 decentralized tank control
- 1 temperature control unit TS6, mounted on the tank platform; with heating (6 kW) and cooling system for cooling by means of cooling water of about 14 °C per integrated chiller unit as noted herein
- 1 standard stirrer incl. gear motor 0.25 kW / 51 Hz
- 1 filling level probe, installed in the tank lid
principle of measurement: guided microwave, for a continuous filling level measurement, display via the machine control panel
- 1 additional measuring probe, installed in the tank lid, as overflowing prevention system (super max. contact)
- 1 conditioning unit with reducing valve and installation material, for dry compressed air or nitrogen
- 1 safety valve for components, 10 bar fixed-setting
- 1 safety valve for temperature control water, 3 bar fixed-setting
- 1 shut-off valve in the suction line to the metering machine
- 1 opening (DN 100) for manual refilling
- 1 drain valve for tank emptying
- 1 pipe connector (15 x 1.5 mm) for releasing the tank pre-pressure

Note: These fumes need to be exhausted by the customer's exhaust system or discharged to the outside.

Tank design in compliance with the European Pressure Equipment Directive 97/23/EG and the AD-2000 Technical Rules; incl. CE certificate of conformity for the pressure vessel, issued by the vessel manufacturer.

202

Tank station, capacity 250 l, operation pressure 4 bar

Useful capacity 230 l; double-walled for temperature control with unpressurized water; outer wall, lid and inner shell made of mild steel, as a modular unit, consisting of:

- 1 tank rack with integral, retractable leakage collecting basin (stainless steel) and fork lifter fittings
- 1 decentralized tank control
- 1 temperature control unit TS6, mounted on the tank platform; with heating (6 kW) and cooling system for cooling by means of cooling water of about 14 °C per integrated chiller unit noted herein
- 1 standard stirrer incl. gear motor 0.25 kW / 51 Hz
- 1 filling level probe, installed in the tank lid
principle of measurement: guided microwave, for a continuous filling level measurement, display via the machine control panel
- 1 additional measuring probe, installed in the tank lid, as overfilling prevention system (super max. contact)
- 1 conditioning unit with reducing valve and installation material, for dry compressed air or nitrogen
- 1 safety valve for components, 4 bar fixed-setting
- 1 safety valve for temperature control water, 3 bar fixed-setting
- 1 shut-off valve in the suction line to the metering machine
- 1 opening (DN 100) for manual refilling
- 1 drain valve for tank emptying
- 1 pipe connector (15 x 1.5 mm) for releasing the tank pre-pressure

Note: These fumes need to be exhausted by the customer's exhaust system or discharged to the outside.

Tank design in compliance with the European Pressure Equipment Directive 97/23/EG and the AD-2000 Technical Rules; incl. CE certificate of conformity for the pressure vessel, issued by the vessel manufacturer.

203 **Tank insulation sheathing for 250 l work tank**

Consisting of Aluminium, mineral wool mats and galvanized steel sheet cover.

204 **Circulating pump**

For feeding the PUR component from the work tank through the heat exchanger and back, capacity about 20 l/min; upright version, completely piped, incl. the required extension of the electr. control system with magnetic coupling, i.e. no shaft seal and no leakage

205 **Heat exchanger, BG 4**

Mounted firmly on the tank station, with rigid tubing

Equipment for 1 component:

- 1 heat exchanger BG 4, plate heat exchanger made of stainless steel; heating / cooling capacity per pass approx. 16 kW at a cooling water temperature of 15 °C and the component in the heat exchanger being cooled down from 28 °C to 20 °C. Please refer to Item #202 for temperature control unit.
- 1 piping system for the installation of the heat exchanger into the component return line, incl. the required valves
- 1 assembly set for connecting cooling water supply and recirculation

206 **System for automatic transfer from the tank farm**

For the automatic refilling of the work tank by means of a pneumatically operated shut-off valve, control via the filling level probe located in the tank with freely selectable switching points for the min. and max. filling levels as well as via the tank overfilling prevention system with super max. contact; including:

- 1 pneumatically operated shut-off valve with limit switch monitoring
- all fittings required for compressed air
- extension of control system (PLC) of metering machine

Chiller

One (1) appropriately sized chiller unit is supplied for temperature control of the tanks. The chiller is packaged in a sheet metal enclosure and includes all motor starters, controls and gauges. The condenser of the chiller is air-cooled assuming a maximum temperature of air is 85°F. On-site chiller mechanical and electrical interconnect (including materials for same) is not included within this proposal.

Metering Machine for Coil and Fan Door Production – Item “B”

ITEM NO.

DESCRIPTION

301

PUR - High pressure reaction casting machine HK 270
TL/MX

Max. output quantity at volumetric formulation ratio A:B = 1:1

about 500 cm³ of mixture per second with 50 Hz
(about 600 cm³ of mixture per second with 60 Hz)

In the following text the data referring to an electr. system with a frequency of 60 Hz are stated in brackets.

The HK machine is mainly composed of the following assemblies:

- 1 metering unit for Polyol, with:
 - 1 metering pump HL 12, corrosion-resistant, max. delivery rate 250 (300) cm³/sec
 - 1 threephase motor 7.5 kW / 1500 min⁻¹ (9 kW / 1800 min⁻¹)
 - 1 edge filter, corrosion-resistant design, on the suction side
 - 1 electronic pressure switch with digital display incl. min. monitoring, on the suction side
 - 1 electronic pressure switch with digital display incl. min./max. monitoring, on the delivery side
 - 1 safety valve, made of special steel

- 1 metering unit for Isocyanate, with:
 - 1 metering pump HL 12, corrosion-resistant, max. delivery rate 250 (300) cm³/sec
 - 1 threephase motor 7.5 kW / 1500 min⁻¹ (9 kW / 1800 min⁻¹)
 - 1 edge filter, corrosion-resistant design, on the suction side
 - 1 electronic pressure switch with digital display incl. min. monitoring, on the suction side
 - 1 electronic pressure switch with digital display incl. min./max. monitoring, on the delivery side
 - 1 safety valve, made of special steel

- 1 low pressure recirculation system for a cycling recirculation of the components at low pressure

- 1 machine support with removable, large-surface leakage troughs

- 1 mixhead of MX type, with
 - 2 adjustable injectors
 - 1 control piston
 - 1 hydraulically switched, adjustable throttling sleeve
 - 1 cleaning piston
 - 1 removable outlet pipe
- 1 hydraulic unit with pressure accumulator, valves and accessories (complying with the European Pressure Equipment Directive)
- 4 m of flexible lines to the mixhead

302 **Pipe connection to dry part cabinet production**

Complete set with feed and return lines as well as the necessary screw connections, without fixtures.

303 **Pipe insulation**

All pipes will be insulated with Armaflex (or similar) insulation.

304 **Hydraulic accumulator (5 liter)**

For MX cleaning time smaller than 3 sec.

305 **Oil cooler for hydraulic system (water-cooled)**

Recommended for cleaning intervals smaller than 25 sec.

306 **Automatic multi-point pump adjustment device**

For the automatic adjustment of the recipe for HK machines with a drive capacity of the motor to be controlled of up to 7.5 kW.

With speed controller for the drive motor of one metering pump; with frequency converter, extraneous ventilation for the drive motor and compl. electr. control system.

In the control a value for the requested quantity of the corresponding component can be entered for each metering program. Upon selection of the program the corresponding speed is adjusted on the motor of the Isocyanate pump by means of the frequency controller.

307 **Magnetic coupling for HL 12-type metering pump**

As leak-proof and maintenance-free sealing for the pump drive shaft by means of hermetically sealed metallic canister between motor and pump part of the coupling

308 **Sensors for the acquisition of process data**

Complete set for 1 component, consisting of:

- 1 flow meter, within the machine
- 1 pressure sensor, installed close to the mixhead
- 1 temperature sensor, installed close to the mixhead

309 **Process data analysis for the HK machine**

The process data analysis comprises:

- Extension of control system - for process data acquisition
- Extension of software - for internal data evaluation

Functions

- Limit value monitoring

At the operating terminal of the control system, the operator can enter set points for flow rate, temperature and pressure.

In addition, it is possible to specify two types of limit values for these set points:

- Warning limit values, indicating that values are outside the tolerance limits. These values do not lead to any interruption of the metering process.
- Alarm limit values, leading to an immediate interruption of the metering process, also before shot release, thus avoiding unnecessary and costly scrap.

A limit value violation is shown in a detailed flow diagram. An additional fault message is displayed in plain text. By means

of a keypress, the operator can access the corresponding setting parameters.

- Oscilloscope function

Graphical trend chart of tank temperature and filling level as well as display of the pressure curve during the last metering operation.

- Shot logging

The following component data are displayed on the screen in the form of a shot log and can be saved on a CF card and/or a network computer; the displayed values comprise all set points and actual values as well as the respective set point/actual deviations:

- flow rates (when opting for "sensors for the acquisition of process data")
- mixing ratio based on 100 parts of component A
- component pressure, on suction and delivery side, measured within the machine
- raw material temperature, measured in the tank
- raw material temperature, measured at the tank outlet
- shot time
- shot weight
- tank filling level

- Shift logging

Shift-related data can also be displayed and/or logged:

- number of metering operations per shift
- number of parts produced per shift
- total number of parts produced
- no. of metering program selected
- recipe name/part name
- mixhead number
- consumption of Polyol and Isocyanate per shift

- Printing of logs/data

The following data can be printed out with an approved printer (when opting for "extension of the process data analysis by one printer"):

- shot log (values of each shot)
- metering log (all shots in a metering package)

- hardcopy of the relevant screens

In the event of a very fast shot sequence of the metering machine, the laser printer must be tested for its suitability with regard to memory capacity.

310 **Hennecke standard interface**

For the connection of a robot or manipulator to a HK-machine.

In total, 16 digital inputs and 8 digital outputs are available. These can e.g. be used for exchanging the following signals via floating contacts:

- Metering machine → Dry part
 - emergency stop
 - error
 - ready for metering
- Dry part → Metering machine
 - emergency stop
 - error
 - no. of metering program
 - start of metering
 - stop of metering
 - request for mixhead cleaning

With this configuration, the metering time is defined by the dry part (moving time of robot or manipulator).

When using the interface, the control box at the mixhead for manually releasing the 99 metering programs is no longer required. For manual test shots, there is a separate control box with 1 program key for starting the test program.

311 **Electr. control for HK-machine with mixhead of MX type**

Consisting of:

- 1 electr. control cabinet with the complete system for machine and mixhead control, incl. monitoring equipment, with:
 - 1 Allen Bradley control system "Compact Logix L31" according to C1 D2 with UL approval
the wires are completely numbered

- 1 HMI operation terminal (human-machine-interface), for entering metering programs and machine parameters and displaying status and error messages in plain text. Type Panel View Plus.
 - 99 foaming programs to be manually released via pushbutton at the mixhead
 - 1 automatic cycle cleaning of mixhead piston and transverse piston, can be preselected if requested
 - 1 intermittent switching system for automatic cycle recirculation of the PU components during pauses; can be preselected if required
 - 1 shot simulation (complete metering program without foaming)
 - 1 acquisition of operation hours
 - 1 shot number acquisition
 - 1 audible and visible collective fault indication
 - 1 service plug
 - 10m connecting cable to the machine (firmly wired)
all used components are flame proof where the environment can contain pentane
- control cabinet design according to VDE regulations

312

Adaptation for 245fa blowing agent

Sealings according to special needs for 245fa.

Static sealings: Viton
Dynamic sealings: EPDM