|  |
| --- |
| Machine / Equipment Registration |
| Name of Machine / Equipment: |
| Serial Number: |
| Country of Origin: |
| Manufacturer: |
| Telephone: |
| E-mail: |

|  |
| --- |
| Technician Responsible for Tryout |
| Name: |
| Area: |
| Telephone: |
| E-mail: |
| Tryout Date: |

| **Checkpoint** | **Yes** | **Partially** | **No** | **N/A** | | **RACI (Responsible/Accountable/Contributor/Inform)** | **Comments / Actions** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. **Manufacturing: Inspection Points in accordance with TST 000138** | | | | | | | | |
| * 1. **UTILITIES / INPUTS** | | | | | | | | |
| * + 1. Is the supplied machine/equipment adequate to the utilities table available in the item 3.4 of the TST 000138? |  |  |  |  |  | |  | |
| 1. **Mechanical Installations / Lubrication** | | | | | | | | |
| * 1. **MATERIALS AND BRANDS APPROVED BY EMBRACO** |  |  |  |  | |  |  | |
| * + 1. Is the list of installed materials and brands in accordance with the table in the item 6.2 of TST 000138? Note: Any and all nonconformities shall be reported. |  |  |  |  | |  |  | |
| * + 1. In this machine/equipment, is there any mechanical component or lubricant obsolete or in the stage of obsolescence, recognized by the Manufacturers? |  |  |  |  | |  |  | |
| * + 1. In this machine/equipment, is there the need to install oil collection pans in order to avoid spillage or dripping on the floor? Note: Mainly when used in machine tools (machining) and presses. |  |  |  |  | |  |  | |
| * 1. **CONSTRUCTIVE GUIDELINES** |  |  |  |  | |  |  | |
| * + 1. Are there smooth and flat places to fasten (by magnet) the accelerometer on the rotating bearings of machine/equipment with criticality "A"? Note: Check with MAINTENANCE ENGINEERING what the criticality of the equipment being supplied is. |  |  |  |  | |  |  | |
| * + 1. Do the protective shields contain inspection windows, above the rotating bearings, in order to collect vibration data? |  |  |  |  | |  |  | |
| * + 1. Do the protections of couplings contain inspection window for monitoring by stroboscope? Note: The three items above refer to constructive requirements that meet the predictive maintenance practices performed by EMBRACO. |  |  |  |  | |  |  | |
| * + 1. Are all threads of bolts and nuts used in this machine/equipment metric? Note: screws, nuts and washers should preferably meet internal standards or DIN standards. Threads in inches are not permitted. |  |  |  |  | |  |  | |
| * + 1. Are auxiliary devices for assembly/disassembly and transportation provided for every machine/equipment (ex: eyelets)? |  |  |  |  | |  |  | |
| * + 1. Is there a need of providing special tools to assist in the maintenance of the machine/equipment? Note: If so, they must be provided by the manufacturer. |  |  |  |  | |  |  | |
| * + 1. Are flanges, seals, bushings, etc. being supplied with threaded holes to assist in disassembly? |  |  |  |  | |  |  | |
| * + 1. Do the guides and rails for the machine/equipment’s sliding displacement systems (rails, tables) have automatic lubrication points (centered) and protections (ex: telescopic, folding, scrapers, etc.)? |  |  |  |  | |  |  | |
| * + 1. Does the machine/equipment have protection components and guides for electrical cables and hydraulic hoses, pneumatic, cable conveyor or carriage type? |  |  |  |  | |  |  | |
| * + 1. Are the filters installed, in the hydraulic reservoir, in such a way that it is easy for replacement, without the need to remove the oil? |  |  |  |  | |  |  | |
| * + 1. Does the lubrication system have indicators for saturated filter, minimum level oil replenishment and lack of oil? |  |  |  |  | |  |  | |
| * + 1. Do the components of the lubrication system have identification according to the schema, with platelets of aluminum, riveted or bolted to the machine? |  |  |  |  | |  |  | |
| * + 1. Are the components’ technical and commercial specification fully described on the lubrication schema and on the parts list? |  |  |  |  | |  |  | |
| * + 1. Are all lubrication points in the machine/equipment identified by markings according to DIN 51502, which indicates the type of lubricant to be used? |  |  |  |  | |  |  | |
| * + 1. To facilitate cleaning, were the reservoirs constructed in such a way that the fluid outlet be by the bottom and this inclined toward the outlet? |  |  |  |  | |  |  | |
| * + 1. Do all hydraulic and oil cooling reservoirs contain openings to aid in internal cleanings? |  |  |  |  | |  |  | |
| * + 1. Does the machine/equipment have automatic centralized lubrication? |  |  |  |  | |  |  | |
| 1. **HYDRAULIC INSTALLATION**   **Note: This topic covers only hydraulic oil installations.** | | | | | | | | |
| * 1. **MATERIALS AND BRANDS APPROVED BY EMBRACO** |  |  |  |  | |  |  | |
| * + 1. Is the list of materials and brands in accordance with the table in the item 6.3 of TST 000138? Note: Any nonconformity must to be reported. |  |  |  |  | |  |  | |
| * + 1. Does this machine/equipment have any obsolete hydraulic component or in the obsolescence phase, recognized by their manufacturers? |  |  |  |  | |  |  | |
| * 1. **CONSTRUCTIVE GUIDELINES** |  |  |  |  | |  |  | |
| * + 1. Is viscosity class ISO VG 68 preferable hydraulic oil being used in the hydraulic systems? |  |  |  |  | |  |  | |
| * + 1. Is the interconnection of the motor-pump system with the hydraulic circuit through a flexible component? |  |  |  |  | |  |  | |
| * + 1. Is the oil reservoir in compliance with the following requirements?   a) must not to be installed inside the machine’s body and base structure.  b) Must be sealed and be equipped with:   * A visual level indicator; * A minimum level electrical or mechanical controller; * Filling aperture not less than 50 mm in diameter; * Temperature indicator; * Have at least one opening for cleaning. If it has internal divisions, have one for each division; * Be at least 150 mm away from the floor;   c) Steps should be taken to avoid that oil spills occurring during maintenance and/or in leaks fall on the floor or return to the reservoir.  d) In the case of a submerged pump, its replacement must be possible without requiring the depletion of the reservoir. |  |  |  |  | |  |  | |
| * + 1. Every hydraulic unit that heats up above 60º C must contain fin heat exchangers. Is this being considered in this equipment? |  |  |  |  | |  |  | |
| * + 1. The valves should preferably be mounted close together, by stage, on the same base, in modules and next to the actuators. Is this being considered in this machine/equipment? |  |  |  |  | |  |  | |
| * + 1. Do the filters have a visual, mechanical or electrical indicator of the oil impurity degree and are they in an easily accessible place for cleaning and change? |  |  |  |  | |  |  | |
| * + 1. Are all components such as valves, cylinders, etc., identified according to the schema, the closest possible, with platelets of aluminum, riveted or bolted to the equipment? |  |  |  |  | |  |  | |
| * + 1. Are the component’s technical and commercial specification fully described in the hydraulic circuit diagrams and parts list? |  |  |  |  | |  |  | |
| * + 1. Were pressure test points installed in the hydraulic circuit after the valves and on the pump? |  |  |  |  | |  |  | |
| 1. **PNEUMATIC INSTALLATION** | | | | | | | | |
| * 1. **MATERIALS AND BRANDS APPROVED BY EMBRACO** |  |  |  |  | |  |  | |
| * + 1. Is the list of installed materials and brands in accordance with the table in the item 6.4 of TST 000138? Note: Any nonconformity must to be reported. |  |  |  |  | |  |  | |
| * + 1. Does this equipment have any obsolete pneumatic component or in the obsolescence phase, recognized by their Manufacturers? |  |  |  |  | |  |  | |
| * 1. **CONSTRUCTIVE GUIDELINES** |  |  |  |  | |  |  | |
| * + 1. Do all pneumatic equipments have a feed line with a maintenance unit? Is this unit installed in an easily accessible and visible place? |  |  |  |  | |  |  | |
| * + 1. Always where the purpose of a pneumatic device is for fastening parts, it must be ensured that they cannot come off in case of air leaks or pressure variation in the supply line or power outage. Are these conditions being respected? |  |  |  |  | |  |  | |
| * + 1. Are all components such as valves, cylinders, etc., identified according to the schema, the closest possible, with platelets of aluminum, riveted or bolted to the machine/equipment? |  |  |  |  | |  |  | |
| * + 1. Are the component’s technical and commercial specification fully described in the pneumatic circuit diagrams and parts list? |  |  |  |  | |  |  | |
| 1. **ELECTRICAL / ELECTRONIC / INSTRUMENTATION / INDUSTRIAL INFORMATION TECHNOLOGY INSTALLATION** | | | | | | | | |
| * 1. **MATERIALS AND BRANDS APPROVED BY EMBRACO** |  |  |  |  | |  | |  |
| * + 1. Is the list of installed materials and brands in accordance with table in the item 6.5 of TST 000138? Note: Any nonconformity must to be reported. |  |  |  |  | |  | |  |
| * + 1. Does this machine/equipment have any obsolete component or in the obsolescence phase, recognized by their manufacturers? |  |  |  |  | |  | |  |
| * 1. **ELECTRIC MOTORS - TECHNICAL SPECIFICATIONS** |  |  |  |  | |  | |  |
| * + 1. Are the brands of motors used in accordance with table in item 6.5 of TST 000138?? Note: Any and all nonconformity must to be reported. |  |  |  |  | |  | |  |
| * + 1. Are the AC motors, with squirrel cage rotor according to the following specifications?  1. Execution and constructed according to ABNT NBR 7094/IEC 34; 2. Performance category: High performance according to ABNT NBR 7094/IEC 34; 3. Insulation class: minimum B, according to ABNT NBR 7094/IEC 34; 4. Protection class: depending on the application IP 54 or IP 55 according ABNT NBR 6146/IEC 34, with the following options:  * Sealed condensation water output drains; * Cable glands in the terminal box; * Connecting screw of the ground wire; * Terminal blocks; * When necessary must be protected against explosive gases or liquids; * Monitoring PTC temperature (in special cases). |  |  |  |  | |  | |  |
| * + 1. Are the DC motors according to the following specifications?  1. Execution in accordance with IEC 34, IEC 72, VDE 0530; 2. Constructed according to ABNT NBR 5031/IEC 34; 3. Insulation class: F, used according to class B (VDE 0530); 4. Protection class: IP 54 or IP 55 according to ABNT NBR 6146/IEC 34, with the following options:  * Sealed condensation water output drains; * Cable glands in the terminal box; * Connecting screw of the ground wire; * Terminal blocks; * When necessary must be protected against explosive gases or liquids; * Monitoring PTC temperature (in special cases).   Note: Specified on TST 000138 that these motors must only be applied in exceptional cases and by obtaining authorization from the maintenance area leadership involved. Check if this occurred. |  |  |  |  | |  | |  |
| * + 1. Do the AC motors, with squirrel cage rotor meet the following requirements?  1. Motors up to 5.5 kW (7.5 HP) inclusive, with the option of the following connection groups:  * 220/380 V; * **220/480 V**; (Exceptionally for Embraco Mexico) * 380/660 V; * 220/380/440/760 V;  1. Motors above 5.5 kW (7.5 HP) should be connected only on 380/660 V;   Note: motors above 5.5 kW should not have direct start.   1. All motors must be commanded by contactors and/or electronic drives and still have individual protection against overload, short circuit and phase failure; 2. Indicate the rotation direction in which the engine must be operated in relation to the application; 3. The motor terminal boxes must be installed on the machine/equipment in such a way to allow free access to them; 4. All motors must be equipped with terminal boxes fitted with terminal blocks. Loose conductors are not accepted; 5. Engines must contain identification plate according to IEC 34; 6. For starts in star/delta, the conjugates must be analyzed, case by case. |  |  |  |  | |  | |  |
| * + 1. The equipment / machine is being supplied with control voltage of 24V DC (direct current). |  |  |  |  | |  | |  |
| * 1. **GUIDELINES REGARDING INDUSTRIAL INFORMATION TECHNOLOGY (Ask for IT help in order to Technical Validation)** |  |  |  |  | |  | |  |
| * + 1. Hardware/Software for PCs and Data Collection (Protocols) if available on this machine/equipment, please refer to chapter 4 of the TST 000138 starting from item 4.4.3 and report the results in this checklist. |  |  |  |  | |  | |  |
| * + 1. Do PLCs, CNCs and Robots have 20% of **I/O** available as a technical reserve? |  |  |  |  | |  | |  |
| * + 1. Do PLCs, CNCs and Robots have 20% of available **memory** as a technical reserve? |  |  |  |  | |  | |  |
| * + 1. Do PLCs, CNCs and Robots have at least one available Ethernet communications port to enable remote maintenance and facilitate connectivity with MES (Manufacture Execution System)? |  |  |  |  | |  | |  |
| * + 1. Do the control panel external I/O points where the PLC/CNC CPU is located use distributed I/O technology? |  |  |  |  | |  | |  |
| * 1. **CONSTRUCTIVE GUIDELINES** |  |  |  |  | |  | |  |
| * + 1. Is the wiring composed of flexible cables with thermoplastic PVC insulation for 750V control and 0.6/1 kV power? |  |  |  |  | |  | |  |
| * + 1. Evaluate the wiring colors according to the chapter 4.4.4 of TST 000138   Note: Identify the phase sequence in the supply conductor points, whose sequence is always clockwise. |  |  |  |  | |  | |  |
| * + 1. Are the single-phase plugs used to connect the "programming cases" according to the NFT standard and properly identified? Note: The incorrect connection sequence Neutral-Phase-Ground can cause the burnout of the communication ports of the PLCs, CNCs and Programming Cases by return current. |  |  |  |  | |  | |  |
| * + 1. Do the control cabinets contain the parts below?   a) A polarized plug with 4A protection intended exclusively for programming terminals, installed internally or on the panel.  b) A free space of 15% on the panel’s mounting board;  c) Multiple male and female sockets for cases where there are interconnections between the panel and equipment, as necessary. Note: There must be blocks to prevent plug similarity.  d) The description of the rated current (A), machine/equipment power factor (%), frequency (Hz), number of phases, Power (kW), power supply voltage (V) and consumption (kWh), as necessary. |  |  |  |  | |  | |  |
| * + 1. Are the failure alarms and operation messages where it applies to diagnostic devices (ex.: synoptic, video monitor, terminal operation, etc.) in the language of the country where the machine/equipment will be installed? |  |  |  |  | |  | |  |
| * + 1. Are the connection cables between the machine/equipment and control cabinet properly identified with markers resistant to chemical action due to contact with oils, water and other solvents found in our production process? |  |  |  |  | |  | |  |
| * + 1. Are all wire tips fitted with insulated terminals and identified protected against oil and grease? Are the terminal blocks also identified? |  |  |  |  | |  | |  |
| * + 1. Are all electrical components identified according to the schema and are identifications attached to the wiring? Note: It is important that the identification of the electrical components is in such a way that in case of its replacement the identification remains in place. |  |  |  |  | |  | |  |
| * + 1. The energy inputs are placed so that connections are made at the top of the components? |  |  |  |  | |  | |  |
| * + 1. In busbars and terminal blocks not totally isolated where the tension is higher than 50 Vac, is there a clear polycarbonate protection? Are there holes in these protections so the tips of the multi-test can touch the busbar during the maintenance procedures? |  |  |  |  | |  | |  |
| * + 1. Cables for analog electronic signals, thermocouples and the like must have electromagnetic shielding. Foresee individual channel or duct in the case of extension cables for thermocouples. In this machine/equipment, are these conditions being respected? |  |  |  |  | |  | |  |
| * + 1. The machine/equipment’s power factor with power exceeding 15 kW must be between 0.94 inductive and 0.94 capacitive. Is the power factor for this equipment in accordance? |  |  |  |  | |  | |  |
| * 1. **GROUNDING** |  |  |  |  | |  | |  |
| * + 1. All metal parts belonging or not to the machine/equipment, not normally subjected to circuit current loads, must be connected to the ground through the grounding conductors. These will be connected to the grounding dissipation electrode, which are embedded in the soil, creating a safe ground, "protection". NBR 5410:2004 item 5.1.2.2.3, IEC 60364-5.   The machine/equipment’s connection system must follow the TN-S configuration (separate ground and neutral), a system which is consistent with EMBRACO’s system. NBR 5410 Item 4.2.2.2.1., IEC 60364-5. Are these conditions in accordance for this machine/equipment? |  |  |  |  | |  | |  |
| * 1. **UTILITIES INSTALLATION** |  |  |  |  | |  | |  |
| * + 1. Is the list of installed materials and brands in accordance with the table in the item 6.6 of TST 000138? Note: Any and all nonconformities shall be reported. |  |  |  |  | |  | |  |
| 1. **AUTONOMOUS MAINTENANCE (AM)** | | | | | | | | |
| * 1. **DESIGN TO SUPPORT A.M. ACTIVITIES** |  |  |  |  | |  |  | |
| * + 1. Are the hydraulic and lubricating oil reservoirs in an easily accessible location to allow for rapid replenishment by the operator? |  |  |  |  | |  |  | |
| * + 1. Are the machine/equipment’s lubrication points easily accessible to the operator? |  |  |  |  | |  |  | |
| * + 1. Are the lubricating points installed so as to allow the quick lubrication cycles without the need to remove protections and machine/equipment shutdown? |  |  |  |  | |  |  | |
| * + 1. Are Gages, Displays, Pressostats and other devices for viewing and control in place for easy access to the operator? |  |  |  |  | |  |  | |
| * + 1. Are filter elements that may be part of routine inspection and replacement by the operator in an easily accessible location? |  |  |  |  | |  |  | |
| * + 1. Does the centralized lubrication oil reservoir have a level viewer and is it in a place of easy access to the operator? |  |  |  |  | |  |  | |
| * + 1. Is there a capped test button available to the operator? |  |  |  |  | |  |  | |
| * + 1. Are the machine/equipment’s protections dimensioned so as to avoid sources of debris, especially in places of difficult access? |  |  |  |  | |  |  | |
| * + 1. Does the machine/equipment have protections such as gutter guards to prevent the accumulation of oil (lubricant, hydraulic fluid, coolant) on the factory floor? |  |  |  |  | |  |  | |