

Technical purchasing conditions for machines, installations and devices

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Preliminary remark:

The technical purchase conditions are an integral part of the invitation to tender and the placing of the order. Deviations from the technical purchase conditions are only permitted in agreement with MANN+HUMMEL.

The lubricants list, lubricant overview list and device selection list (M+H) are an integral part of the technical purchase conditions (Appendix 1, Appendix 2 and Appendix 3) and the placing of the order.

1.0 General guidelines

1.1 Standards and regulations

The applicable regulations and generally acknowledged rules of technology as well as the occupational health & safety and accident prevention regulations of the professional indemnity associations and all applicable environmental protection legislation must be complied with, such as:-

- ⇒ EC Machinery Directive
- ⇒ DIN standards
- ⇒ EN standards
- ⇒ IEC standards
- ⇒ German Association for Electrical, Electronic and Information Technologies (VDE) regulations
- ⇒ Association of German Engineers (VDI) guidelines
- ⇒ Regulations issued by institutions for statutory accident insurance and prevention
- ⇒ GPSG (Geräte- und Produktsicherheitsgesetz / German Equipment and Product Safety Act)
- ⇒ VdS directives (Verband der Schadensversicherer/Association of Indemnity Insurers)
- ⇒ EMC Act
- ⇒ BetrSichV (German Ordinance on Industrial Health and Safety)

The health and safety requirements stipulated in the individual regulations must be adhered to. The conformity / CE mark must be attached permanently to the technical work equipment in a clearly visible location.

An EC declaration of conformity including a risk assessment, the certification of the German Regulation for the Prevention of Industrial Accidents (BGV A3) and AWF file are to be delivered as part of the documentation (to be observed also if placing on the market and reconstructing used machines that have undergone "considerable alterations").

In the case of several installations that belong together (machines) from different suppliers, the general contractor must supply the overall conformity of the entire installation/machine.

We would prefer you to use the components on the device selection lists – any deviations must be approved by M+H.

We would prefer you to use the components on the lubricants list and lubricant overview list – any deviations must be approved by M+H.

1.2 Colour scheme for machines and installations

If nothing else is specified, the following shall apply:

1.2.1 When purchasing new machines and installations

Body of the machine:	Grey-white	RAL 9002
	Light grey	RAL 7035
Orifices, bases etc.:	Basalt grey	RAL 7012
Switch and control cabinets, terminal boxes:	Gentian blue	RAL 5010
Tempering and preheating units:		
Marking:	Pure white	RAL 9010
Safety equipment, hand rails, impact protection, trolleys:	Traffic yellow	RAL 1023
Protective grate	Anthracite grey	RAL 7016
Protective grate frame	Traffic yellow	RAL 1023
Conveyor belts:	Light blue	RAL 5012
Podium, stages	Pigeon blue	RAL 5014

1.2.2 for machines and installations in the inventory

Body of the machine:	Light green	RAL 6027
Switch and control cabinets, terminal boxes:	Gentian blue	RAL 5010
Tempering and preheating units:		
Marking:	Pure white	RAL 9010
Safety equipment, hand rails, impact protection, trolleys:	Rape yellow	RAL 1021
Protective grate	Anthracite grey	RAL 7016
Protective grate frame	Rape yellow	RAL 1021
Conveyor belts:	Light blue	RAL 5012
Furnaces:	Grey-white	RAL 9002
Slide assembly:	Green blue	RAL 5001

1.2.3 Pipes

The paint should be labelled according to flow medium and direction in accordance with DIN 2403/2404. Insulated pipes should be marked with printed labels.

1.3 Documents for approval

Before the start of production of the machines, the following documents must be presented for checking: 1 copy

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- ⇒ Schematic diagrams, part lists, layout of mounting plates, location plan of the substation, terminal boxes and operating devices for electrics, hydraulics and pneumatics.
- ⇒ Floor and foundation plans (areas to be left clear for maintenance should be indicated)
- ⇒ Connection and consumption values.
- ⇒ The necessary lubricants should be chosen from the M+H lubricant list (Appendix 1 and Appendix 2) and submitted at the offer stage.
- ⇒ Lubricant requirement values.
- ⇒ A complete set of drawings, including the workpiece-dependent tensioning devices, appliances, tools and other equipment designed by the supplier.
- ⇒ You may only proceed with the production of the machine once the documents have been approved by M+H.
- ⇒ At least 2 weeks will be required before the documents are approved.
- ⇒ An offer regarding any necessary replacement parts that are to be stored on M+H premises should be provided well in advance of delivery of the machine.

The test does not include a functional or safety test!

The approval does not relieve the contractor of his or her responsibility to carry out the work correctly and appropriately. The test and release are the responsibility of the appropriate Authorised Department.

1.4 Documentation

The following documents should be provided in **German**:

	1 copy (paper format)	2 copies (paper format)	CD/USB stick
The following information must appear on each individual documentation sheet: ⇒ M+H machine description ⇒ M+H machine no. (5-digit or 6-digit) ⇒ M+H installation no. (5-digit or 6-digit) This information is disclosed by M+H.		X	
Instructions for use with functional description and functional diagram of the whole installation.		X	X
Declaration of conformity and risk assessment (with hazard identification and analysis of hazardous situations).		X	
Installation layout with location plan of all terminal and switch boxes as well as interfaces for power connections.		X	X
Foundation plan and installation layout, as a "dwg" file or, in exceptional cases, as a "dxf" file. The file must also contain, on one layer, a simplified diagram of the installation. Files should be given to VL.	X		X
Transportation and assembly instructions: (indicate transportation device on the machine). Transfer of these documents no later than 1 week before delivery of the machine.	X		

	1 copy (paper format)	2 copies (paper format)	CD/USB stick
If an installation is integrated into a production line, the connection of the machines should be included in the documentation by the manufacturer.		X	X
Maintenance and lubrication instructions: You should provide a general layout drawing(s) on which a link to the individual maintenance points can be made. Necessary information: ⇒ Location of lubrication points ⇒ Number of lubrication points ⇒ Quantity of lubricant per lubrication point ⇒ Lubricant classification number in accordance with M+H standard ⇒ Lubricating interval		X	X
Inspection lists subdivided according to mechanics, hydraulics, pneumatics, electrics and electronics with work contents related to ⇒ the tasks to be carried out ⇒ Cycle of the tasks, during which the guidelines and specifications indicated in 1.1 should be observed.		X	X
Inspection lists: If physical values (pressure, temperature, stroke etc.) are calculated in machines/installations, then respective inspection possibilities (calibration or functional tests) should be specified, provided they are of importance to the process. This includes the further processing of output signals (e.g. software) right through to the display of the values. The check extends to the sensor, the processing system that is connected downstream right through to the display instrument, and is also carried out electronically. For screw connections that require special attention, the starting torques must always be provided on the maintenance and inspection lists.		X	X
Wearing parts and replacement parts lists with details from the original manufacturer about the brand, order, price and delivery time (own and third party products), and priority grading. The serial number should also be indicated on replacement parts lists for transmission motors, rotary tables and linear axes.		X	X
Machinery data sheet (AWF machine card) in file format. File is provided by M+H.		X	X
Type approval or ownership declaration for collecting trays in accordance with the German Act on Managing Water Resources including identification on the object and with a certificate of manufacturer capability.		X	X

	1 copy (paper format)	2 copies (paper format)	CD/USB stick
<p>Contents of schematic diagrams</p> <p>Electrics:</p> <ul style="list-style-type: none"> ⇒ Layout must be page and current path oriented ⇒ Continuous function chart ⇒ Circuit diagram with details of the total connected load and of the pre-fuse, parts lists, configuration plan and plan of terminals ⇒ Layout of plan drawings: page number, identifying letters, path number or input-output number. e.g.: Proximity switch indicated in circuit diagram on Sheet 10 and message sent to input 31.5 → Designation: 10B315 <p>Pneumatics:</p> <ul style="list-style-type: none"> ⇒ Continuous function chart ⇒ Piping plan with details of the hourly air consumption rate and the connection cross-section ⇒ Parts lists <p>Hydraulics:</p> <ul style="list-style-type: none"> ⇒ Continuous function chart ⇒ Piping plan ⇒ Parts lists <p>Parts lists should be arranged alphanumerically according to the device description; all devices should be listed individually with clear manufacturer information such as original description and manufacturer order number.</p>		X	X
Complete overview plan of sensors and actuators (so that devices can be found if there is a fault).		X	X
When using compact devices for feedback control and control technology, internal wiring connection diagrams, manuals and device manuals including a list of parameters should be included in the delivery.		X	
The list of parameters for individual components such as frequency converters and servo drives should be provided as a project file. (if possible integrated into the S7 project).			X
The PLC control software with imagery should be supplied on a USB stick or CD.			X

	1 copy (paper format)	2 copies (paper format)	CD/USB stick
Test certificates must be provided for safety devices. The acceptance records must also be included. A list of the safety-engineering electrical and mechanical equipment should be provided.		X	X
The test record completed in accordance with DIN EN 60204-1 should be included (BGV A3).		X	X
Proof should be provided for the switch cabinet to certify that it has been constructed in accordance with DIN EN 61439, VDE 0660-600.		X	
Licences for operating systems, displays and other software	X		
Generate a program flowchart in compliance with DIN 66001 or a functional diagram for the installation. Pseudocode, block diagram, status diagram or structured flowchart in compliance with DIN 66261.		X	X
A statutory stress analysis should be provided for hoists or similar. Test manuals should be included.		X	X
A set of installation guidelines and a bootable CD should be created for every PC.			X

- ⇒ The connected loads for all types of energy are to be provided when the order is placed.

When abandoning the installation, a valid set of documentation and software should be left on the installation, this also applies for alteration or repair works. If unnecessary downtime occurs due to a lack of documentation, M+H is authorised to refer this to the system manufacturer.

The numerically ordered documentation is part of the scope of delivery of the machine. An incomplete delivery with regard to the contractual agreement means M+H is entitled, without influencing the conditions, to make an appropriate alteration to the agreed purchase price.

1.5 Implementation rules for electrical, pneumatic and hydraulic control systems

The electrical control equipment should to be labelled with a legible, durable machine identification plate.

The following information is required:

- ⇒ CE mark
- ⇒ Manufacturer/supplier
- ⇒ Classification
- ⇒ Factory no./serial no.
- ⇒ Weight
- ⇒ Circuit diagram no.
- ⇒ Rated voltage of main circuits
- ⇒ Rated voltage of control circuits
- ⇒ Type of current (number of phases - frequency)
- ⇒ Full load flow

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- ⇒ Short circuit disconnect threshold, over-current safeguard (min.)
- ⇒ Test mark: e.g. DIN EN 61439, DIN EN 60204-1

No hydraulic or pneumatic components may be installed in electrical device installation spaces.

Switch cabinet doors (mechanical and electrical) should have a maximum width of 800 mm and a maximum height of 2 m. Aperture angle of doors should be 180°, upright and adjacent cabinet doors should be able to overlap. These pieces of equipment should be installed 400 mm off the ground.

The space to be left free depends on the size of the mounting plates:

Up to 0.3 m²	≥	40%
0.3 to 1.0 m²	≥	30%
Greater than 1.0 m²	≥	20%

One large switch cabinet is preferable to several small cabinets stacked on top of one another.

Cables must not be fed into the switch cabinet from above.

The switch cabinet, terminal boxes, devices and installation should have an IP rating of at least IP 54. When installing control devices and terminal boxes on the machine, you should ensure good accessibility for any maintenance/repair work that needs to be carried out.

Terminal boxes should be labelled on the outside.

The switch cabinet, main switch, operating elements and light grid (electro-sensitive protection system) must not protrude beyond the machine frame, otherwise you will need to provide impact protection.

All speed controllers should be installed in the switch cabinet.

In order to determine the maximum temperature for the switch cabinet, you should observe the category temperatures according to VDE and manufacturer specifications for electrical equipment.

If the switch cabinet needs to be cooled, a fan, air conditioning system or heat exchanger from Rittal should be used. The air supply from the fan, heat exchanger and air conditioning system should be equipped with a filter.

A service socket outlet with the voltage outflow should be built into the switch cabinet **in front of** the main switch. The necessary equipment should be installed directly next to the feed-in.

A light with the voltage outflow should be built into the switch cabinet **in front of** the main switch; the light should switch off as the cabinet doors are closed. Alternatively, a torch can be stored in the switch cabinet.

The light test function should be installed. All operational and signal lamps should be turned off when a machine is disconnected.

Upright cabinets should be equipped with a folding table for the programming device.

An appropriately sized pocket should be fitted for the circuit diagram.

A signal lamp pillar, by Werma, with green (automatic operation), yellow (personnel required) and red (fault) should be installed. (Same order as traffic lights)

As a matter of principle, each machine or installation should be equipped with a PLC and a control panel (visualisation) from Siemens. The choice of device should be agreed with M+H before the project planning and construction of the installation.

PLC control systems must be expandable and have a reserve of approx. 20%.

According to M+H's specifications, a clock timer, elapsed time indicator and the necessary piece counter must be integrated into the PLC.

Host system interfaces should be clarified on a case-by-case basis.

The signal exchange of linked installations should be clarified with M+H; preferably, signals should be exchanged via Profibus, Profinet or MPI bus. The emergency stop link-up should be implemented in accordance with M & H.

All faults must be displayed and saved until they are acknowledged. The faults should be encoded except for at the input/output level. The identification of the equipment and the operation variables should be entered in the fault description text.

If an installation experiences faults following power cuts, a UPS should be used.

For all drives that are operated using a frequency converter, the temperature of the motor should be monitored. Performance and monitoring should be screened and must be connected with separated cables.

As a matter of principle, dragline-compatible cables must be used for moving circuits. The bending radii should be observed:

Use highly flexible, trailing cables in the cable carrier.

Use Robotron cables in rotating areas (e.g. swivelling control panel).

As a matter of principle, worn parts should be used for moving servo circuits.

The safety circuits should be produced in at least category 3 in accordance with DIN EN 954-1.

In collecting trays for tank farms or similar, a floating switch or Liquiphant (fill level measuring device) or capacitive sensor for notifying the central control and communication system should be installed.

All electrical, hydraulic and pneumatic equipment outside of the switch cabinet must be durably labelled with the equipment description (identical to the schematic diagram); oil-resistant labels should be used. Labels in the pneumatic/hydraulic/electrical plans must be identical. These labels should be attached to the feed cables close to the bush and on the cable connection. Ensure that the labels are arranged correctly in relation to the components (left to right or top to bottom).

The equipment and its place of installation should be indicated in the switch cabinet.

Cut out cable ties flush to the surface (use wire cutter without bevel).

2.0 Electrical equipment

2.1 Hardware

Cam switches, temperature regulation, routing, analogue processing and other special applications should be integrated into the PLC control system.

The MPI address 0 should be kept free for the programming device.

If the switch cabinet is installed on a stage or a distance away from the installation, then a service socket outlet with voltage outflow should be installed in the control cabinet in front of the main switch and an MPI socket outlet should also be integrated.

Shock-proof socket outlets on the machine that can be used with the switch cabinet door closed are to be protected with a 30mA earth leakage/miniature circuit breaker.

All programs should be stored in non-volatile memory space in the CPU. The MMC memory card should be large enough for the complete project to be saved. After a general reset and once the memory has been inserted, the control system must boot automatically.

Heating is to be controlled with semi-conductor relays (solid-state relays), use a semi-conductor fuse if necessary.

Use a Dold controller to control hot die stamps not operated by central control.

Extend temperature sensors up to the connection point with a sensor cable in the same colour.

Use Phoenix semi-conductor reversing contactors for motor control.

Lay the cable ducts so that they cannot be stepped on or used as climbing aids. The cable duct cover must not point downwards. Cable bushings should be slotted. Provide edge protection for the cable duct edges. Leave spare space in the cable duct.

Use standard components (bus modules, PLC cards, valve clusters, frequency converters etc.) in order to minimise the number of different spare parts and ensure that these can be easily exchanged, even if this leads to oversizing.

2.2 Software

The programming should preferably be carried out in FUP, programming in AWL is only permitted in exceptional cases. If, due to technical reasons, programming has to be carried out in AWL, then only the relevant part of the program should be produced in AWL (e.g. regulation, file transfer etc.).

Programming should only be carried out using Siemens software.

The M+H installation number should be used for the S7 project name (agree with M+H). Networked installations should be grouped in one project.

2.4 Connection to the supply voltage

Connection to the supply voltage via terminal blocks or directly to the manually-operated main switch. Covers should be fixed to the mains connection terminals and load switch terminals to prevent them being touched accidentally. Plastic-sheathed cable should be used for the section of cable from the feed-in terminals to the main switch.

2.5 Control circuits

Control voltage:	230 V AC	Colour - red
Control voltage:	24 V DC	Colour - dark blue
External voltage:	max. 24 V DC	Colour - orange

Maximum permissible external voltage 50 V AC.

Control transformers must have a supply voltage adjustment of $\pm 5\%$ on the front.

Control transformers must firstly be operated with 400 V and should be protected by circuit breakers or motor protection switches.

The secondary protection of control transformers or network devices is to be carried out using a single pole.

Short-circuit protection in compliance with DIN EN 60204-1, VDE 0113-1(01/ 2011) must be ensured (certification required). Pay attention to the length and cross-section of the control cable loop.

Control circuits must be earthed when operated (connection of one control voltage pole to the protective earthing conductor system).

If, due to technical reasons (e.g. electronic circuits), this is not possible, an isolation monitoring device with notification or switch-off should be provided.

Control voltage must be earthed through terminals next to one another, using jumpers (colour: green-yellow). Also, when using PELV and FELV low voltages, the **bodies of all electrical equipment** should be connected to the protective earthing conductor system, enabling electrical conductivity, if they do not correspond to protection class II.

Run control circuits via control transformers in compliance with DIN EN 61558.

In direct voltage circuits, "plus" should be protected.

All protection and relay inductors should be equipped with an appropriate protective circuit.

Solenoid valves should be provided with a valve switching unit (with LED). If necessary, valves should be protected individually.

2.6 Main circuit

Use at least 1.5 mm² single cores for main circuit wiring.

Do not use core cable ends for wiring with terminal blocks with tension spring connectors, if the manufacturer allows this.

Motors should be connected so that they are switchable and should be protected against overload and short circuit. If necessary, coarse and/or group pre-fusing should be used.

If necessary, and as long as the power transmission allows it, motors should be switchable.

Low voltage power fuses should normally be provided for this. Semi-conductor switch elements should be protected using a ring characteristic (quick-acting). Screw protection (only Neozed) is permitted for nominal currents of up to 25 A.

Use fuse switch disconnectors for screw protection.

If hard starting is not possible, motors can be energised directly up to 5.5 kW. For drive motors with only one direction of rotation, a directional arrow should be permanently affixed to the motor or machine.

2.7 Light and socket circuits

Light and socket circuits should be protected by a circuit protection switch.

If circuits are diverted before the main switch, the part of the cable from the diversion right up to the fuse should be short circuit-proof (the cable). After the fuse, the cables should be in separate and appropriately-labelled plastic sheaths.

The terminals and equipment must be protected by a touch-proof cover and should be provided with the instruction "**Caution, still live when main switch is turned off**".

2.8 Device arrangement

The devices should be fixed to a removable mounting plate, which is attached to the rear panel. Safeguards, relays, circuit protection switches and motor protection switches etc. should be mounted on bearing rails in the switch cabinet in accordance with DIN EN 50022.

2.9 Wiring

Only in wiring channels and with flexible wire H07V-K. For all flexible connections inside and outside of the switch cabinet, isolated core cable ends must be used with plastic flanges.

2.9.1 Description of terminals

The terminals and potential terminals must be numbered consecutively. PE and earth terminals should be arranged in order and should be incorporated in the numbering. Connections and counter connections should be labelled identically. Reserve wires should lead to terminals.

2.9.2 Installation

All cables outside of the switch cabinet, most of which are controlled in parallel, must be in metal channels with a removable lid. Fine flexible PU cables should be used for moving circuits. You should use cap screws with strain relief that are made from PVC or metal, according to the material of the casing. In either case, metal counter nuts should be used. Only one cable should be fed in per cable screw, otherwise you should use multi-conductor seals.

2.9.3 Connection of the switch cabinet – installation

Cables must not be fed into the switch cabinet from above.

If the switch cabinet and the machine are not bolted together, the connections to the installation should be contamination-protected and made via a Harting connector using a terminal block or similar (e.g. Han E AV). The individual plugs should be encoded. A plug cabinet should be constructed.

You should ensure that the EMC Directive is adhered to.

3.0 Mechanical equipment

3.1 General requirements

3.1.1 Purchased parts

All purchased parts (such as couplings, brakes etc.) should not be altered before use and must correspond to the applicable EC Machinery Directives.

3.1.2 Drives/overload protection

Drives should be provided with an overload safety device with a fixed locking point.

3.1.3 Ergonomic configuration

As part of configuration, consideration should be given to the expertise of industrial science (DIN 33 400, DIN 33402/DIN EN ISO 6385, DIN EN ISO14738 etc.),

3.1.4 Transport

You should take note of the fact that, when delivered, the machine can only be offloaded with a fork-lift truck (max. 2.5 t capacity and fork length of max. 1000 mm). This is why you should ensure that, if using a crane to carry out loading, the machine is fixed on pallets or timber beams.

3.2 Machine components and building specifications

Standard and standardised components should generally be used for these components.

3.2.1 Belts and chains

Re-tightening options must be available.

If possible, automatic chain tightening boxes from the company Murtfeldt should be used.

3.2.2 Guide tracks

Track ways should be provided with commercially available strippers.

3.2.3 Screws

Metric threads should be used.

3.2.4 Parallel pins

Generally, cylinder bolts with a pull-off screw thread should be provided.

3.2.5 Lubrication (central lubrication)

Lubrication plans should be produced for lubricants in accordance with ISO/DIN 8659.

3.2.5.1 Lubricants

Only lubricants from the M+H lubricant list (Appendix 1 + 2) should be used (lubricant list is part of the order placing process).

3.2.5.2 Central lubrication

For central lubrication, only devices from the companies Wörner, Vogel, Delimon and Vögele should be used.

3.2.5.3 Automated lubricant supply

If the mechanics of the machine mean that a lubricant feeding device is necessary, this should preferably be provided where possible as a fully automatic system incorporating electrical monitoring of the lubricant distribution.

The individual devices must be permanently labelled in compliance with the lubrication plan.

3.2.5.4 Labelling lubrication points

All lubrication points should be labelled on the machine; labels should include the type of lubricant and the M+H hallmark.

The adhesive labels are provided by M+H on request.

3.2.5.5 Lubricating nipple

If you do not wish to miss out individual lubrication points, then flat lubrication points such as M4 (M6 x 1) or M1 (M8 x 1.25) should be used.

3.2.6 Pumps

Pumps (immersion pumps) from KSB should be used.

3.2.7 Cooling units

Cooling devices in accordance with DIN 8975 (CFC-free)

3.2.8 Lines for cooling or tempering devices

The pipes in cooling devices or tempering units must be isolated.

3.2.9 Closing maintenance doors

Locking of maintenance doors should be carried out either using a rotary handle or using a 7 mm square socket key. Use safety limit switch protection in hazardous areas.

3.2.10 Three-phase motors

Only 3-phase motors with a thermostat relay or high-temperature conductor should be used.

3.2.11 Ventilation and extraction systems

For ventilation and exhaust systems, standardised nominal diameters should be used.

4.0 Pneumatic equipment

4.1 Components and specifications

4.1.1 All pneumatic and electro-pneumatic components must comply with the EC Machinery Directive.

4.1.2 For **pressure switches** and electrically-operated valves, the switching status should be displayed visually (by an LED).

4.1.3 Mains power supply

For assembly machines, the compressed air supply should usually lead from the top of the machine to the subsequent connection via hose at the power receptacles.

A shutoff valve that has the possibility of ventilating the device must always be used for the connection to the compressed air system.

If necessary, a sequence valve should be provided for soft start.

For air conditioning, a maintenance system with filter and regulator must always be connected downstream.

You should aim to achieve a maximum operating pressure of 6 bars. If you require higher pressures, consultation is necessary.

The pneumatic installation should be driven with dry air; this means no oiler should be used. If necessary, it should be possible to top up oil under pressure. Filters and oilers using a metal protective cage.

In purely pneumatic control systems, control and activity networks should be controlled separately and should be adjustable.

4.1.4 Piping and fittings

The piping should be suitably designed for the pressure/environmental conditions and external mechanical loads.

4.1.5 Choice of device

You should always use **ISO valves** and **standard cylinders**.

If technically possible, double-action cylinders should be produced.

Measurement device scales must be adjusted to the statutory units according to DIN 1301.

Devices made by Festo, Bosch or Herion should be used for all functions. Only in justified exceptional cases and in agreement with M+H may other suitable brands be used.

Lubricated-for-life cylinders and valves should be used.

4.1.6 Safety devices

For pneumatic devices which are similar to a compactor, the following should be provided:

- | | |
|----|---|
| a) | Safety control (from HERION) |
| b) | Safety device to prevent falling |
| c) | Option for measuring overshoot |

5.0 Hydraulic equipment

5.1 Components and specifications

5.1.1 Hydraulic unit

The oil tank should be dimensioned to ensure that the temperature of the oil does not exceed 60 °C. If necessary, coolers, heating or storage should be provided. Oil systems should be fitted with appropriate filters.

The temperature of the oil should be monitored. Provide a suitable oil collecting tank – manufactured and approved in compliance with the German Federal Water Act.

5.1.2 Piping and fittings

Piping should be designed according to pressure, environmental conditions and external mechanical loads (high pressure hoses, tubes). All connections should be designed so that they can be removed. The piping should be laid to be vibration-proof. All work units should be provided with an easily accessible measurement connection.

5.1.3 Choice of device

You should always use **ISO valves** and **standard cylinders**.

With regards to the choice of device, established systems by Rexroth, Bosch, Herion and Vickers should preferably be used. Measurement device scales must be adjusted to the statutory units according to DIN 1301.

If lockable switch organs are provided, they must be equipped with a BKS lock, S-6929 H 2 A type, and an H 2 key.

MANN+HUMMEL oil filters should preferably be used.

Air accumulators should be designed with a safety shut-off block with cleanout.

Electrical valve connections should be designed so that they can be plugged in using plug DIN 43 650 / ISO 4400, and have electrical status indication.

5.1.4 Safety

A certified pressure limitation valve should be incorporated to prevent the whole installation from exceeding the maximum permissible pressure level. The hydraulic system must have unpressurised circulation.

Ensure compliance with the safety regulations for hydraulic hoses, BGR237 (previously: ZH 1/74).

5.1.5 All hydraulic components must correspond to the EC Machinery Directives.

6.0 Energy media

Compressed air:	6.0 bars,	PN 16 fittings
Natural gas:	80 mbars,	PN 10/16 fittings
Returned coolant:	2.5 bar,	PN fittings 10/16, max. temperature 25 °C
	Max. pressure drop in machine	1 bar.

6.1 Special instructions

6.1.1 Natural gas analysis

Analyses of natural gas can be provided upon request.

6.1.2 Gas and water supply fittings

Fittings and other parts for gas and water supply must be recognised by the German Technical and Scientific Association for Gas and Water.

6.1.3 Burner start-up/gas permeability check

For automatic burner start-up, an automatic check for gas permeability should be provided.

6.1.4 Gas and oil burner brand

For gas and oil burners, only the brand "Weißhaupt" should be used.

7.0 Safety equipment

7.1 Occupational health and safety

7.1.1 Regulations regarding technical work equipment

The regulations of the (safety) features and equipment that are applicable for the ordered work equipment, e.g. occupational health & safety and accident prevention regulations, the German Equipment Safety Act with appropriate regulations, the VDI 2854 for automated manufacturing systems and the requirements of the German Ordinance on Industrial Safety and Health must be applied in full. DIN EN ISO 13857, DIN 31 001 part 1 and DIN EN 294 or 349 must be observed for the safety margins.

7.1.2 Noise protection

It must be ensured that all machines, installations and devices operate quietly.

7.1.2.1 Permissible overall noise pressure level

The noise pressure level of a machine, device or installation, which is operated in an enclosed space (production hall), may not exceed 78 dB(A) at nominal load or when operating 1 m away from the edge of the machine and at 1 – 1.5 m above the operating floor. No impact sounds should occur. If these are unavoidable, the basic noise level may only still be 75 dB(A). The requirements of guideline 2003/10/EC should be taken into account.

7.1.2.2 Measuring the noise pressure level

The noise emission should, according to DIN 45 635, Part 1/ISO 3744, be determined in accordance with accuracy class 2 and should be presented in a measurement report pursuant to Section 9 of the abovementioned regulation. This measurement report forms part of the delivery.

For installations that are erected outside of a factory building, the noise pressure level should be provided at the tendering stage.

7.1.3 Pressure devices, pressure tanks, pressure pipes, gas high-pressure pipes

Named devices, installations or units should be designed in accordance with the requirements of the German Ordinance on Industrial Safety and Health and related regulations, e.g. the German Pressure Equipment Regulation. All necessary documents such as the confirmation of a pressure test, acceptance report before commissioning and certification of type approval all form part of the delivery. For installations requiring supervision, a safety-engineering assessment with a recommendation regarding the test intervals for the overall installation and for individual parts of the installation should be provided for the recurrent tests in accordance with §15 of the German Ordinance on Industrial Safety and Health.

8.0 Environmental protection/limit values

8.1 Environmental protection

Machines, installations and devices which, in accordance with their intended use, are covered by the scope of the German Closed Substance Cycle Waste Management Act, the scope of the German Federal Immission Control Act and of the German Act on Managing Water Resources, must comply with the current respective requirements of this legislation.

Rubbish, waste water and energy consumption should be kept to a minimum.

All machines, installations and devices must comply with the current respective requirements of all environmental laws and local regulations.

8.2 Directive regarding hazardous materials (German Hazardous Materials Ordinance)

The use of hazardous materials is only permitted in cases in which a lowest risk test is carried out and hazardous materials are substituted within the scope of the German Hazardous Materials Ordinance. Statutory bans on the use of a material (e.g. §15 ff of the German Hazardous Materials Ordinance) must be observed.

Labelling/packaging must comply with the Hazardous Materials Ordinance or the Hazardous Goods Ordinance for Road and Rail (Gefahrgutverordnung Straße und Eisenbahn).

Technical work equipment should be constructed in such a way that there are no health hazards for the people and the permissible MAK, TRK and BAT limit values are not exceeded.

The products provided to us should contain no carcinogenic, mutagenic or teratogenic substances in accordance with TRGS (Technical Rules for Hazardous Substances) 500. Equally, there should be no toxic substances in terms of the list of hazardous substances and preparations in accordance with § 4a of the German Hazardous Materials Ordinance.

For all delivered products (substances), an up-to-date EC safety data sheet should be included in the delivery. In case of amendments and/or updates, an appropriate data sheet should be supplied.

8.3 Installations that are subject to licensing and/or registration

For installations that are subject to licensing or registration, as soon as the planning phase has been completed all documents that have to be presented to the authorities must be provided to the department of environmental protection with copies if necessary.

9.0 Training

A briefing and training of the operating and maintenance personnel should be carried out by the supplier, time and place should be clarified during contract negotiations.

The briefing should be documented, a copy of which is to be delivered to the client.

10.0 Appendices

Appendix 1

10.1 Lubricants list

Conditions for the use of lubricants on machines, installations and devices





10.1.1 The lubricant types listed in the table should be provided for the use of lubricating and hydraulics oils and/or for the grease lubrication of machines and installations. They should be stated in the lubrication and maintenance plan.













10.1.2 Products not included in the range of lubricants may only be used once formal approval has been obtained. If, due to tribological/tribotechnical reasons, a special requirement cannot be met by this range of lubricants, written justification for the lubricant that is to be used instead, including technical data, should be provided in good time.

10.1.3 If units are filled by you, they must only be filled using our standard lubricants to ensure complete miscibility with the products used by us.

10.1.4 The lubrication points and/or oil tanks should be provided with the required labels. The labels are provided upon request.

10.1.5 Lubricant range:

Classification	Lubricant with characteristic values	
	Machine oil 10	Hydraulic oil in accordance with DIN 51524: H-LP 10 Lubricating oil in accordance with DIN 51502: C-LP 10
	Machine oil 68	Lubricating oil in accordance with DIN 51502: C-LP 68
	Slideway oil 68	Lubricating oil (track lubricating oil) in accordance with DIN 51502: CG-LP 68
	Slideway oil 220	Lubricating oil (track lubricating oil) in accordance with DIN 51502: CG-LP 220

Classification	Lubricant with characteristic values	
	Gear oil L-CC 100	Gear oil in accordance with DIN 51519: C-LP 100; SAE 80 DIN 51512
	Gear oil L-CC 220	Gear oil in accordance with DIN 51519: C-LP 220; SAE 90 DIN 51512
	Gear oil L-CC 460	Gear oil in accordance with DIN 51519: C-LP 460; SAE 140 DIN 51512
	Hydraulic oil 22, also replaces 	Hydraulic oil in accordance with DIN 51524: H-LP 22
	Hydraulic oil 32, also replaces 	Hydraulic oil in accordance with DIN 51524: H-LP 32
	Hydraulic oil 46, also replaces 	Hydraulic oil in accordance with DIN 51524: H-LP 46
	Compressor oil L-DD 150	Compressor oil in accordance with DIN 51506: VD-L 150
	HD universal multi-range engine oil SAE-15 W40	Classification in accordance with API: SE-CD
	2 EP lithium grease	Lubricating grease group in accordance with DIN 51502: KF 2 K

Appendix 2

10.2 Lubricant overview list (excerpt)

Material no.	M+H no.	Supplier Name	Kinematic viscosity At 40 °C, in accordance with DIN 51562 mm ² /s	Supplier
19 202 09 012	12	Renolin B3 HLP ISO VG 10	10	Fuchs
19 202 09 016	16	Renolin B20 HLP ISO VG 68	67	Fuchs
19 202 09 021	21	Renep C GLP 68	67	Fuchs
19 202 09 023	23	Renep C GLP 220	220	Fuchs
19 202 09 034	34	Renolin CLP 100	95	Fuchs
19 202 09 036	36	Renolin CLP 220	220	Fuchs
19 202 09 038	38	Renolin CLP 460	460	Fuchs
19 202 09 081	13 and 81	Renolin B5 HLP ISO VG 22	22	Fuchs
19 202 09 082	14 and 82	Renolin B110 HLP ISO VG 32	32	Fuchs
19 202 09 083	15 and 83	Renolin B15 HLP ISO VG 46	46	Fuchs
19 202 09 114	114	Renolin 150 VDL	150	Fuchs
19 202 09 129	129	Titan Universal HD 15 W40	105	Fuchs
19 203 09 266	266	Renolit FEP 2	-	Fuchs
W2 942 01 000	none	Fin Super + Teflon	-	Interflon
W2 942 01 001	none	Fin Grease + Teflon	-	Interflon
W2 942 01 002	none	Fin Grease OG	-	Interflon
W2 942 01 003	none	Fin Grease HTG	-	Interflon
W2 942 01 004	none	Fin Grease MP2/3	-	Interflon
W2 942 01 005	none	Fin Grease MP 00	-	Interflon

Appendix 3

10.3 Device selection list

If devices not included in the device selection list are used, approval should be obtained from MANN+HUMMEL.

Device	Prescribed brand	Special requirement
Barcode manual scanner	Intermec	Agree with M+H – H-. Zwirner
Command element signal lamps	Siemens, Moeller	Ø 22, if lockable: Siemens Zeiss Ikon 3600 12K1; Only use LED display lights
Electro-sensitive protection systems (light curtains/light grid)	Sick	
Elapsed time indicator	Hengstler	7-digit, cannot be reset
Burner (gas and oil burner)	Weishaupt	
Bus systems	Profibus made by Siemens	Agree choice of device with M+H
Code reader	Sick, IOSS, Wenglor, Datalogic	
Leak testing device	Tetra Tec Instruments, Bayer, Froehlich, Schreiner	
Electronic power relay	Siemens	
Electronic solenoid valve	see mech. part	with LED display
Limit switches	Siemens, Telemecanique, Klöckner-Moeller, Balluff	Standard casing Switch contact (if possible)
Energy chain	Igus	
Conveyor belts (assembly devices)	Interroll, MTF	
Conveyor belts (injection moulding machine)	Peick	
Gear motors	SEW, Bauer, Flender, Stoeber, Demag, Getriebebau Nord, ABUS, Heynau, Dietz, Danfoss	
Granulate conveyor, dust filter	M+H-Protec	
Main switches	Siemens, Moeller	
Industrial PC		Agree choice of device with M+H
Industrial relays	Siemens, Finder	
Initiators	Balluff, IFM, Turck, Pepperl + Fuchs, SMC, Pulsotronic, IPF	24 V DC PNP shutter 220 V AC 2-wire design with LED display
Camera	Balluff, Cognex, Keyence, Sick	
Chain tensioning devices	Murtfeldt	
Circuit auxiliary contactor	Siemens, Klöckner-Moeller	
Light barrier	Balluff, IFM, Sick, Leuze, Keyence, Wenglor, Pepperl + Fuchs	
Linear conveyor	Weber,	
Machine lighting		In LED technology
Indicator lamp stacks	Werma	Green = Automatic operation Yellow = Personnel required Red = Fault Ø 70 mm in LED technology. Same order as traffic lights

Technical purchasing conditions for machines, installations and devices

Device	Prescribed brand	Special requirement
Motors	SEW, AEG, Siemens, Bosch, Lenze, Dietz, Loher, SIHI-Halberg, ABB, Allweiler, KSB, Wittmann, Hahn-Automation, ADDA	
Motor protection switches	Siemens, Moeller	with bimetal and short circuit quick release
Operator panel	Siemens	Agree choice of device with M+H
Pumps, immersion pumps	KSB, Allweiler	
Series terminals	Phönix, Wago, Weidmüller quick-mounting terminals	Minimum 6Ø screw terminals
Robotics	<u>ABB</u> , Motomann, Sony, <u>Fanuc</u>	
Switch cabinet cooling	Rittal	Filter-free air-conditioning unit or heat exchanger
Key, key switch	From C.Ed. Schulte CES MHE37 type Klöckner-Moeller MS1	
Locks for electrical part	Square socket and two-way keys or SHK 825 made by Häwa or Rittal	
Melting plugs	up to 25 A Neozed D 01/D 02 from 35 A low voltage power fuses	Only for special uses Agree with M+H
Screwdriver	Weber, Bosch-Rexroth	
Servo motors	Siemens, Bosch-Rexroth, Bosch,	
Safety limit switches	Siemens, Balluff	Standard casing IEC 947-5-1 VDE 0660
Safety limit switch with personal protection function	Schmersal	AZ 16 – 02 ZVRK, AZM 170-02 ZRKA, or similar
Safety rail	Schmersal, Mayser	
Safety switching devices	Pilz	
Safety control	Pilz PNOZ multi, Biel & Wiedemann	
Safety control for presses	Herion	
Circuit breakers	Siemens, Moeller, ABB	Casing design N. The auxiliary contact must also switch during manual operation
Earth leakage/miniature circuit breaker	Siemens	5SU1354-6KK16
Circuit breakers for Control circuits	220 V AC Siemens, 24 V DC ETA ESS20.0...	The auxiliary contact must also switch during manual operation
Safety terminals	Phönix, Weidmüller, Wago	With LED or glow lamp display
Sorting chamber	Weber,	
Programmable logic controller	Siemens S7, Series 300 or higher	Devices with a screw connection. Choice of device should be agreed with M+H
Batch counter	Hengstler	
Valves (electrical)		
Valves (hydraulic)	Bosch-Rexroth, Bosch, Herion, Vickers	
Valves (pneumatic)	Festo, Bosch, Herion	
Wiring duct	Tehalit	
Time relays	Siemens, Pilz, Dold,	electronic in the standard casing, no double-wire relay
Central lubrication	Vögele, Wörner, Vogel, Delimon	

Technical purchasing conditions for machines, installations and devices

Device	Prescribed brand	Special requirement
Remote maintenance access via the Internet		Confidential agreement! VPN access. Agree with M+H – H-. Zwirner
Two-hand relay	Pilz	
Cylinder (hydraulic)	Bosch-Rexroth, Bosch, Herion, Vickers, Hänchen	
Cylinder (pneumatic)	Festo, Bosch, Herion	
Cylindrical position switcher	Festo, Bosch, Herion	