



Fibers for Life.

Technical Terms of Delivery

Table of contents

1	General requirements	4
1.1	Offer	4
1.1.1	General	4
1.1.2	Basic contents of the offer	4
1.1.3	Individual prices	4
1.1.4	End of the offer preparation	5
1.1.5	Orders and changes in the order scope	5
1.1.6	Work to be done by the supplier at the customer's premises	5
1.2	Safety regulations	5
1.3	Documentation	5
1.4	Shipping instructions	6
2	Special requirements in the area of mechanical engineering	7
2.1	Drawing instructions	7
2.2	Drives	7
2.3	Force transmission elements	8
2.4	Bearings and Bearing housings	8
2.5	Lubricant technology	8
2.6	Screw / bolt connections	8
2.7	Construction of welding seams	9
2.8	Surface treatment	9
2.9	Labelling of machine components	9
3	General requirements in the area of pneumatics and hydraulics	9
3.1	Pneumatics	9
3.1.1	Safety	9
3.1.2	Plant components	10
3.2	Hydraulics	10
3.2.1	Oil containers	10
3.2.2	Cooling, heating, filtering	11
3.2.3	Filters	11
3.2.4	Pipelines	11
4	Special requirements in the area of electrical engineering	11
4.1	Special requirements	12
4.1.1	Electrical circuit diagrams and documentation	12
4.1.2	Safety	12
4.1.3	Manual operation	12
4.1.4	Faults and diagnoses	12
4.1.5	Control and regulation parameters	12

4.1.6	Housings / control cabinets	12
4.1.7	Control cabinet layout.....	13
4.1.8	Control cabinet wiring.....	13
4.1.9	Installation.....	14
4.1.10	Earthing and EMC	14
4.1.11	Sensors.....	14
4.1.12	Wireless connections and networks	15
4.2	Machines, plants and components	15
4.2.1	General	15
4.2.2	Operating voltage.....	15
4.2.3	Preferred electrical components.....	16
4.2.4	Technical information	16
4.2.5	Drives.....	16
5	Special requirements in the area of automation	17
5.1	General	17
5.2	System Siemens S7	18
5.2.1	System Siemens - control type depending on application.....	18
5.2.2	System Siemens - Operation and monitoring	18
5.2.3	System Siemens - Decentralized peripherals	18
5.2.4	System Siemens – Decentralized guidelines	18
5.3	System Rockwell	19
5.3.1	System Rockwell - Control type depending on application	19
5.3.2	System Rockwell - Operation and monitoring	19
5.3.3	System Rockwell - Decentralized Peripherals	19
5.3.4	System Rockwell - Special Guidelines	19
5.4	Robots.....	20
5.5	Rotary encoder.....	20



Technical Terms of Delivery

Preamble

These technical terms of delivery define the provisions applicable to the delivery of machines, plants, and equipment to J. Rettenmaier & Söhne and its affiliated companies (hereinafter referred to as "JRS" or "Customer").

The main supplier and all subcontractors must comply with JRS's general commercial delivery conditions for the procurement of machines and equipment.

Deviations from the technical specifications in this document may be permitted where necessary. They must be agreed in writing with the respective JRS project engineer, with a copy to the JRS purchasing department.

Plant-specific requirements may apply to individual locations.

1 General requirements

1.1 Offer

1.1.1 General

Price inquiries are prepared by the JRS project engineer and forwarded to potential suppliers. The JRS project engineer prepares the process and machine specifications relevant to JRS for the specific plant and/or machine to be supplied.

All offers must be submitted in writing to the JRS project engineer with reference to the enquiry.

1.1.2 Basic contents of the offer

The entire plant must comply with these technical terms of delivery and the JRS purchasing conditions. The offer must contain the following declaration:

*We agree to accept the JRS technical terms of delivery
for machines, plants, and equipment
as well as the JRS purchasing conditions.*

If this declaration cannot be made, the supplier must indicate the deviations in detail in writing in the offer. Orders / modifications are only considered confirmed if the responsible JRS project engineer or his/her immediate supervisor expressly agrees to the deviations applied for in writing.

The offer must at least contain the following information:

- › Project no. or cost center no. (assigned by the project engineer)
- › Name of the JRS project engineer who drew up the enquiry.
- › Offer number of the supplier and date
- › Binding delivery deadline from receipt of order
- › Special requirements (e.g. for the building, foundation, etc.)
- › Specification of on-site services and deliveries

1.1.3 Individual prices

In the offer, the following items are to be identified separately:

- › Basic price for the machine, plant or equipment
- › Option for special additional equipment
- › Spare parts package, based on the recommended spare parts list
- › Assembly services (daily rate, hourly rate, expenses shown separately)
- › Commissioning and training costs (daily rate, hourly rate, expenses shown separately)
- › Packaging costs insofar as they can be separately identified
- › Shipping costs including transport insurance free factory / plant

- › Warranty conditions taking into account the JRS purchasing conditions
- › Option prices for additional equipment where required

1.1.4 End of the offer preparation

After the preparation of the quotation, all of the drawings, documents and parts provided by JRS must be returned in their entirety.

1.1.5 Orders and changes in the order scope

Orders, additions, and/or changes to orders are generally only created by the JRS purchasing department. Declarations of intent to purchase and changes to orders that have already been placed are only effective if they are submitted by the JRS purchasing department.

If there are changes in a current order with impact on the costs, the supplier of the machine, plant or equipment must submit a written offer to the JRS project engineer. In the offer, any impacts on the prices or delivery deadlines must be presented.

After a successful examination and approval of the suggested changes by the JRS project engineer, the JRS purchasing department will prepare a reorder or an order change.

The acknowledgement of an order must be received as soon as possible by the JRS purchasing department with a copy to the JRS project engineer. The order acknowledgement which accompanies the order must be signed by the supplier and returned no later than 3 weeks after receipt of order.

1.1.6 Work to be done by the supplier at the customer's premises

For any service, assembly or commissioning work associated with the delivery of a machine, plant or equipment, the supplier is obligated to comply with the plant-specific safety and administrative regulations. The information must be acknowledged through a signature of the responsible employee.

During delivery and assembly, the supplier must ensure through appropriate supervision that the machine, plant, and/or equipment is set up properly. Welding, cutting, and soldering work is strictly prohibited unless work approval has been granted by a responsible JRS employee. Work approval is always and exclusively granted in writing.

1.2 Safety regulations

The machines, plants and equipment must comply with the requirements regarding occupational safety in their current version. All binding standards must be observed and are to be understood as minimum requirements. It is the supplier's responsibility to comply with the currently valid versions of laws, regulations, and standards.

1.3 Documentation

All documentation for the machine, plant, and/or equipment must be provided in German. This also applies explicitly to all information signs affixed to the machine. For deliveries to foreign plants, the documentation must be provided in the local language or in English (as determined by the JRS project engineer).

Upon delivery or at the latest five working days before commissioning, a complete set of up-to-date documentation in paper form, as well as a digital version on CD-ROM or USB stick (data format PDF or Word), must be handed over to the JRS project engineer.

The following documents must be submitted, where applicable:

- › General operating instructions
- › Maintenance handbook
- › Overview drawing of the machine, plant and/or equipment
- › Electrical circuit diagram with parts lists
- › Pneumatic circuit diagram with parts lists
- › Hydraulic circuit diagram with parts lists
- › Spare parts and fastening parts diagrams with parts lists
- › PLC program with program printouts (process control system)
- › Functional plans
- › Data carrier with the control software including the source code
- › Flow charts and sequential function chart
- › Spare parts lists with original manufacturer name and original order no.
- › Risk analyses
- › Documentation of the individual components

After commissioning and final acceptance of the machine, plant, and/or equipment, the aforementioned documents must be updated in full within 30 days and sent to the JRS project engineer in duplicate in paper form and once in digital form on CD-ROM or USB stick.

1.4 Shipping instructions

For delivery free factory / plant, all parts must be adequately secured, packaged and labelled.

For deliveries of the machine, plant and/or equipment from the place of dispatch (FOB), the following shipping instructions must be complied with:

- › JRS is to be notified by the supplier at least one week before dispatch with regard to information on weight, dimensions and the anticipated number and type of containers or trucks.
- › All deliveries and separate partial deliveries are to be clearly labelled with the JRS project no. and/or order no.
- › Special transport instructions and/or loading and unloading instructions must be communicated to the carrier or handling personnel or clearly marked on the delivery goods.

JRS will charge the supplier for all freight and consequential costs incurred as a result of violations of the shipping instructions.

If due to a delayed delivery an air transport becomes necessary, the supplier must bear the necessary additional costs in advance.

2 Special requirements in the area of mechanical engineering

With the delivery of machines, plants and/or equipment, the respective current regulations and standards are to be complied with. Any deviations of the following listed specifications in quality and execution may only be done after express written permission from the JRS planning engineer.

If you have any questions, please contact the responsible purchaser or project engineer.

2.1 Drawing instructions

All documentation for the delivered machine, plant, and/or equipment, including notes on drawings and parts lists, must be written in German. For deliveries to foreign plants, the documentation must be in the local language or in English (as determined by the JRS project engineer).

Specifications must comply with the International System of Units (SI). A JRS project number must be specified in the label field for all documentation. The supplier will receive this number from the responsible JRS project engineer upon request.

CAD drawings must be in AutoCAD format (dwg and/or dxf). The drawings of machines, plants, and/or equipment must consist of:

- › A general drawing (machine images or set up plan for several machines) which represents the final state of the machine, plants and/or equipment to scale. The drawing must have at least two views - top view and side view.
- › Drawings of assemblies and subassemblies must be assigned a position number, which can be found in the overall drawing.
- › Detailed drawings for spare and wear parts:
The detailed drawings, including all drawings of spare and wear parts, must contain all dimensions and tolerance specifications, as well as material, surface, and heat treatment specifications required for the manufacture of parts.
- › Parts lists:
For all machines and assembly group drawings, parts lists are to be prepared.
For purchased parts the parts lists must contain the original part number (order no.) as well as the names of the manufacturers or suppliers.

For release of the design by the customer:

Before the production start, the design must be submitted to and approved by the respective JRS project engineer.

With delivery of individual parts according to JRS drawings with increased quality requirements, test protocols according to EN 10204-3.1B are to be attached which verify the required quality with regard to hardness, surface quality and dimensional accuracy (tolerances). With deliveries of complete assembly groups, this also applies for the parts which are labelled correspondingly on the individual parts drawing.

Drawing remarks: Test protocols according to EN10204-3.1B (Material certificate, dimensional accuracy, surface quality and hardness) are to be provided.

2.2 Drives

The following brands are preferred for drives. Deviations must be approved in writing by the JRS project engineer.

All electric motor drives of a machine having a switching rate ≤ 10 switching operation per hour as well as a duty cycle of $> 80\%$, are to be supplied in IE 2 (IE3) quality.

The applicable guidelines Regulation (EU) No. 4/2014, DIN EN 60034-30-1 (VDE 0530-30-1 for efficiency classes for electric motors) must be observed.

Drive type:	Manufacturer:	Model:
Example		
General drive motor	SEW, Nord and Siemens	For shaft mounted motors TORQ LOCK must be chosen as shaft-hub connection

All conventional motors and drive motors are always to be planned in an upright position if possible.

2.3 Force transmission elements

Drive type:	Manufacturer:	Model:
Example		
V-belt pulleys	Samiflex	Shaft-hub connection exclusively with Taperlock
Clutches	Rexnord	Type OMEGA
Fan belts / V-belts	Optibelt	Red Power or comparable quality
Chains	IWIS	

2.4 Bearings and Bearing housings

Drive type:	Manufacturer	Model:
	SKF, FAG, INA, NTN-SNR	Preferably clamp ring bearing

The bearing must be designed for a service life of at least 80,000 operating hours.

2.5 Lubricant technology

All bearings on a machine that are not equipped with lifetime lubrication and therefore need to be relubricated at certain intervals must be accessed via lubrication lines that converge at a central point (in consultation with the JRS project engineer).

2.6 Screw / bolt connections

All screw connections must be at least grade 8.8 galvanized and secured with a Schnorr lock. Connections subject to dynamic stress must be secured with at least grade 10.9 galvanized screws with a Schnorr lock, preferably with NORD LOCK, and in the case of through-bolts, additionally with a self-locking nut.

In addition to the general requirements, the special delivery specifications for components must be taken into account.

2.7 Construction of welding seams

- › Welding seams may not be sanded / polished.
- › Welded parts of VA must be glass bead-blasted and acid-cleaned.
- › Larger welded parts must be stress free annealed.

2.8 Surface treatment

All components made of standard steel are to be galvanized or painted depending on the requirements (in consultation with the project engineer).

Components that are to be painted must be blasted, primed, and coated with a top coat; alternatively, they may also be powder coated. RAL colors are to be selected in consultation with the respective project engineer.

2.9 Labelling of machine components

All machine components which are produced according to JRS drawings are to be labelled permanently with the drawing number.

3 General requirements in the area of pneumatics and hydraulics

With the delivery of machines, plants and/or equipment with electrical equipment, the respective current regulations and standards are to be complied with. Any deviations of the following listed specifications in quality and execution may only be done after express written permission from the JRS planning engineer.

If you have any questions, please contact the responsible purchaser or project engineer.

3.1 Pneumatics

The pneumatic cycles must be designed that they work at an operating pressure of 4.8-5.2 bar. The standard pressure in the JRS plants is up to 5.2 bar gauge pressure. The use of boosters for pressure increases is generally not allowed. The control voltage for pneumatic magnet valves is always 24 V (DC) direct current.

All types of pneumatic control systems require the approval of the JRS project engineer. The use of purely pneumatic controls is not allowed. Electrical control systems are generally to be used.

3.1.1 Safety

Complex machines, plants and/or facilities with compressed air supply have to be equipped with a maintenance device combination composed of:

- › On-off valve
- › Filter regulator valve with manometer
- › (Oiler) upon request
- › On-off valve with solenoid 24 V (DC)
- › Soft start valve

- › Branching module with pressure switch
- › Mounting bracket
- › Flow sensor

This maintenance equipment combination must allow the entire compressed air supply to the machine, plant, and/or equipment to be completely shut off. The pneumatic system must be designed in such a way that there is no danger when switching it on or off or when the power supply fails and is restored.

All compressed air tanks and pressure compensation tanks must be manufactured and labelled in accordance with the currently applicable regulations.

If exceeding the operating pressures could lead to dangerous situations and/or damage, overpressure and underpressure protection devices that are secured against misuse must be installed.

3.1.2 Plant components

In the JRS plants, preferably components from the manufacturer Festo are used.

3.2 Hydraulics

3.2.1 Oil containers

The **container** must be able to hold the entire oil volume existent in the system. For heat dissipation and air elimination, the container must be as large as possible. In addition to the calculated nominal size an air cushion of 10% to 15% has to be scheduled which can take up fluctuations of the oil level, etc. The container must be designed with lateral cleaning openings (manholes).

For the **removal** of ageing products and contamination, the container floor must be sloped and at the deepest point there should be a discharge valve.

Suction and return pipelines must be separated from each other. Both pipelines end well below the lowest oil level. In order to avoid the suction or stirring up of the sediment, however, a distance of 2 to 3 times the pipe diameter should be maintained to the floor. Dust and return pipelines are to be tapered at their ends. The recommended flow velocities of approx. 1-2 m/s are also to be taken into account in the dimensioning.

Suction and return areas must be separated with a metal sheet which is placed directly on the floor and is as high as the oil level.

Container cover

The design is dependent on the superstructure. If the pump, for example, is installed below the oil level, the pump cover must be separated from the container cover. When installing drive groups, the cover is to be designed stable and free of vibration. When installing controllers, a leakage oil rim / lip is to be provided.

Cleaning openings

All containers have to be equipped with laterally aligned cleaning openings (manholes) through which all parts of the container can be reached and cleaned.

Filler plug / ventilation filters

Filling of the oil container is to be done using a filler screen or even better using a special filter aggregate. For this purpose, a pluggable G ½ "IT screw connection with pipelines right up to the container floor is to be installed into the cover. Also in the return areas, a pluggable G ½ "IT screw connection with pipelines right up to the container floor is to be installed. Level indicators

via level pipes or oil level eyes, as well as additional electric float switches, must be installed in the unit in such a way that they are resistant to shock and vibration.

Ground clearance

For better cooling as well as to simplify oil discharge and transportation, an adequate floor space of 150 mm is to be provided.

3.2.2 Cooling, heating, filtering

These auxiliary devices are to be provided optionally if they are not already part of the plant.

If you have any questions, please contact the responsible purchaser or project engineer.

3.2.3 Filters

The oil transported from the pump or pumps must be processed through a pressure filter before it arrives at the valves. The filter unit must meet the requirements of the valves.

3.2.4 Pipelines

The connection of the unit's pipes to the machine must be carried out by trained hydraulic engineers. All pipes must be installed carefully, accurately, and without tension in accordance with the screw connection manufacturer's installation instructions. The pipes used must be held in place by precisely fitting clamps that do not exert any unnecessary stress. The piping must be short and as straight as possible. The use of unnecessary angles and bends should be avoided; where possible, pipe bends or pipes bent on suitable machines should be used. The number of screw connections must be kept as low as possible.

The pipe's inner cross-sections must be selected so that flow losses and pressure losses are minimized. Hoses must be used to dampen vibrations and noise when connecting spatially unfavorable or moving connections. The pressure rating and nominal diameters according to the manufacturer's specifications are decisive for the selection. When installing hose lines, bending radii, movement clearance, etc. must be taken into account. Only coded hydraulic hoses from Hansa-Flex or Pirtek may be installed.

4 Special requirements in the area of electrical engineering

With the delivery of machines, plants and/or equipment with electrical equipment, the respective current regulations and standards are to be complied with. Any deviations of the following listed specifications in quality and execution may only be done after express written permission from the JRS planning engineer.

If you have any questions, please contact the responsible purchaser or project engineer.

4.1 Special requirements

4.1.1 Electrical circuit diagrams and documentation

The file name for each circuit diagram is to be coordinated with JRS and retained if there are changes.

- › All electrical circuit diagrams shall be created, as far as possible, using the systems Engineering Base by Aucotec or AutoCAD. Alternately, if another system is used to create circuit diagrams, it is mandatory to provide DXF files.
- › The circuit diagram must in any event also be available as a PDF file.
- › All circuit diagram documentation must be supplied in German on A4 paper, and all electronic data must be supplied on CD, DVD, or USB stick. For deliveries to foreign plants, the documentation must be in the local language or in English (as specified by the JRS project engineer).
- › For all machines, plants, and/or equipment with electronic control, a functional plan must be available.
- › All operating resources used must be documented in parts lists with the manufacturer's name, item number, and unique operating resource identification.

4.1.2 Safety

- › If a power failure occurs no matter what the reason (pneumatic/hydraulic/electrical), it must be guaranteed that there is no hazard to employees.
- › Damage to the machine, plant and/or equipment as well as the products being processed must be excluded.

When the power supply returns, there must not be an automatic restart of the equipment.

The safety standards EN ISO 13849-1 and EN IEC 62061 are to be complied with.

4.1.3 Manual operation

- › For maintenance, repair and adjustment work, manual operation must be available.
- › Manual operation is to be interlocked in such a way that any damage to the machine is impossible.
- › During manual operation, it must be possible to place the machine in the „basic position“.

4.1.4 Faults and diagnoses

- › Faults must be displayed in plain text in the respective national language, if possible with a diagnostic display and advice.

4.1.5 Control and regulation parameters

- › If necessary, the control system must be designed in such a way that setting parameters can be protected by passwords.

4.1.6 Housings / control cabinets

- › All housing and control cabinets and components used must meet the current valid VDE and DIN specifications.
- › The control cabinets are to be supplied in the colour RAL 7035.
- › A space reserve of at least 25% should generally be provided.

- › During implementation, it must be ensured that operation is possible at ambient temperatures of up to -10°C .
- › A corresponding regulated control cabinet heating is to be provided.

4.1.7 Control cabinet layout

Transformers and power supply units must always have an additional power reserve of 30%.

- › In the control circuits, electronically-switched power supplies must be used.
- › Devices are to be arranged in such a way that the warming and influence also on nearby components remains in limits. The plants are to be designed in such a way that the function is still ensured even at an ambient temperature of $+40^{\circ}\text{C}$.
- › In switchgear, care must be taken to ensure that the heat loss caused by the electrical equipment is dissipated effectively.
- › Each control cabinet which is equipped with frequency converters must have filter ventilation and the associated exit filter.
- › Protection class: according to IP 54 when setting up in or next to the plant and in closed switch rooms.
- › Cabinets and spaces must offer reasonable protection against environmental effects.
- › Devices are to be arranged in such a way that all devices and connection faces are easily accessible when the door is opened.
- › The cable inlet must always be placed below.
- › Housings and control cabinets with a volume of more than 0.5 m^3 must have interior lighting which is switched on via an integrated sensor.
- › At least one cabinet light is to be supplied per cabinet or per section where cabinets are mounted together.
- › A CEE 7/7 socket (230 V, AC) must be provided in every control cabinet in which components may need to be parameterized or monitored using a laptop. All sockets in the control cabinet must be protected by an RCD (30 mA residual current device) and a 6 A circuit breaker.
- › Cabinets which are not designed for wall mounting or housed in closed switch rooms are to be provided with a base having a minimum height of 100 mm.
- › All components are to be permanently labelled according to the corresponding circuit diagram.
- › The device labelling or sign must be mounted so that it is easy to see.
- › Each control cabinet must be clearly and unmistakably labelled on the outside.

4.1.8 Control cabinet wiring

Wiring in accordance with DIN EN 60204-1 (VDE0113-1)

Colour:	Use:
Red	Control circuits (alternating current)
Dark blue	Control circuits (direct current)
Black	Main circuit (load circuit)
Orange	Interlocking circuits (Circuits before main switch)
Light blue	Neutral conductor (if present)
Green/Yellow	Protective ground wire
Brown	Signal line

4.1.9 Installation

- › Power, control, bus lines are to be run separated from each other using separating web or a shield tube and must meet the current valid VDE and DIN regulations.
- › In all cable routings, a power reserve of at least 25% must be available.
- › All lines are to be labelled on both sides corresponding to the circuit diagram. With several overlapping controls, a mix-up must be avoided.
- › Weather-resistant signs for the labelling of the cables are to be used.
- › All external plant components are to be labelled according to the corresponding circuit diagram.
- › Routing materials are to be supplied in a corrosion-resistant, metallic version, incl. all mounting elements for cable placement / fastening.
- › All cable trays are to be chosen in a closed version.
- › With horizontal routing, cable trays are to be used; with vertical routing, always use riser conduits.
- › Corners and edges within the cable lines are to be supplied with edge protection in order to protect the lines.
- › Cable line routing after consultation.
- › With all the cable feed-throughs created through the installation in wall and ceilings, expert fire insulation is to be produced.
- › The standard „safety of machinery - electrical equipment of machines - Part 1”, DIN EN 60204-1 (VDE 0113-1), must be complied with.
- › Special attention should be given to the regulations for „protection against fire where risks of fire exist“, VDE 0100-482.

4.1.10 Earthing and EMC

- › The lines must run from connection to connection without interruption.
- › Cable lines are to be earthed without exception. The central grounding point will be provided by the customer.
- › All cable glands are to be used as plastic or EMC screw connections according to their function.
- › All EMC guidelines must be observed accordingly.
- › The following VDE guidelines are to be observed:
 - DIN VDE 0100: Installation systems with rated voltages up to 1000 V,
 - o DIN VDE 0100-410: Protective measures - Protection against electrical shock.
 - o DIN VDE 0100-444: Protective measures - Protection against interference voltages and electromagnetic interference.
 - o DIN VDE 0100-540: Selection and installation of electrical equipment - Earthing systems and protective conductors.
 - DIN VDE 0151: Materials and minimum dimensions of earth electrodes with regard to corrosion
 - DIN VDE 800-2-310: Telecommunications equipotential bonding equipment in buildings and other structures.

4.1.11 Sensors

- › All sensors must be operated at a nominal voltage of 24V DC. This voltage must be generated by the supplier using electronic switching power supplies.

- › All sensors must be designed to be plug-in. Plugs or couplings of size M12x1 with the appropriate connection cables are to be used. This does not apply to safety engineering and ATEX area.
- › Roller belts must either be equipped with contact rollers with inductive proximity switches or with optical sensors (no light barriers). If for technical reasons, a light barrier must be installed, this must be provided with a stable mechanical protection.

4.1.12 Wireless connections and networks

- › Wireless connections such as WLAN, Bluetooth or similar may only be used after consultation with JRS.
- › Ethernet TCP/IP addresses or similar addresses such as Ether-CAD and Profinet must be agreed in advance with JRS.

4.2 Machines, plants and components

In the following section, the components to be used will be specified. Deviations are basically possible but must be authorised by the responsible JRS project engineer in writing.

4.2.1 General

In order to achieve uniformity in the brands and types of components, JRS reserves the right to finally select the types.

4.2.2 Operating voltage

In the German JRS plants, the following applies:

- › For motors < 11 KW 380/400 V AC/50 Hz
- › For motors > bzw. = 11 KW 690 V AC/50 Hz
- › For control voltage, 24 V direct current (DC) is always to be used.

In the foreign plants, the primary voltages generally used in the country are to be taken into account. Information on this can be obtained upon request from the JRS project engineer.

For control voltage, 24 V direct current (DC) is always to be used.

4.2.3 Preferred electrical components

Parts:	Company – Type
Control cabinets	Rittal
Power contactors	Siemens Sirius
Thermistor motor protection	Siemens 3RN20131BA30
Contactor and auxiliary relays	Siemens Sirius
Switches, step switches, indicator lights, emergency stop, illuminated keys, etc.	Schneider Electric Harmony Style 5
Circuit breakers up to 7.5 KW	
Circuit breakers from 11 KW	
Only 3 pole circuit breakers are to be used.	Siemens Sirius Schneider Electric NSX
Circuit breakers	ABL Sursum / ABB
Auxiliary relays	Phoenix Contact / Finder
Serial terminals	Phoenix Contact ST
Disconnecter	Schneider Electric Compact NS
Level sensors	Rotary paddle detector, UWT (ATEX) Vibration limit switch, E+H
Light barriers	Sick
Inductive or capacitive proximity switches	IFM-Electronic / Schneider Electric 24V DC
Frequency converter up to 45KW as 3 x 400 V	
Frequency converter from 55KW as 3 x 690 V (if this voltage exists, clarification with JRS required)	SEW Eurodrive – Movitrac advanced MCX91A or Allen Bradley PF753
Process measurement (pressure, flow, etc.)	Endress & Hauser with Hart-Protokoll or 4-20mA
Safety relays (emergency stops, light grids, safety doors)	Fa. Siemens Type 3SK or Fa. Pilz PNOZ
Safety controls	Fa. Pilz PNOZ-Multi, PSS4000, Fa. Rockwell Guard-Logix, Compact Guard
Decentralized I/O systems for control cabinets according to type of control	Fa. Siemens ET200SP Fa. Rockwell 1734-Point I/O

4.2.4 Technical information

- › Rotating field of the work network: Clockwise rotating field
- › Medium voltage of the work network: Rotary current 20kV, 50Hz.
- › Low voltage of the work network: Rotary current 400V / 690V (AC), 50Hz.
- › Single phase alternating current of the work network: 230V (AC), 50Hz.

4.2.5 Drives

- › All drives must correspond at least to the insulation category „F“.
- › Drives from 11 kW must be operational with a voltage of 690 V (AC).
- › Motors from 11 kW that are not load-dependent must be equipped with 1 PTC thermistor (150 °C) for each winding.
- › Motors from 55 kW that are load-dependent controlled must be equipped with 1 PTC thermistor (150°C) for each winding and 1 PT100 sensor for the winding temperature. The cables (strands) for motor monitoring (thermistor, PT100) must be long enough to be wired in a separate connection box provided by the customer.

- › Motors that are operated with a frequency converter must always be equipped with 1 PTC thermistor (150°C) and must meet the requirements for operation with a converter. If the motor is operated below 25 Hz, an external fan must always be provided. Limit class B according to EN55011 must be observed!

5 Special requirements in the area of automation

In the following, "HMI" always refers to the HMI that is responsible for controlling the entire system.

5.1 General

- › Only Siemens S7 and Rockwell Logix family PLC systems may be used. Other PLC systems are not permitted.
- › The file name or project name must be agreed with JRS and retained for all changes.
- › All program documentation must be written in German. For deliveries to foreign plants, the documentation must be provided in the local language or in English (as specified by the JRS project engineer).
- › All programs must be delivered with network comments, cross-reference lists, hardware configuration files, manufacturer-specific files, etc.
- › Setup data for programmable devices such as frequency converters, servo drives, and measuring devices must be provided with the corresponding programming platform.
- › The operating language (including plain text displays) on all operating interfaces must be in German or the local language (as specified by the JRS project engineer).
- › All documentation must be saved in its entirety on CD, DVD, or USB stick and handed over upon acceptance.
- › The entire program must not have password protection or other encryption, i.e., all components necessary for operation must be readable and modifiable. An exception applies to purchased components that are equipped with know-how protection by the manufacturer.
- › Programs must be stored in the CPU in a manner that is secure against network failure.
- › All conditions that lead to production or program interruption or machine shutdown must be displayed in a clearly defined manner so that troubleshooting is possible even without a programming device (e.g., plain text display "Switch Sxx.x not approached").
- › When using network technology, the IP addresses are determined exclusively by JRS and must be requested prior to commissioning or delivery.
- › If remote access to the control system is to be provided at a later date, this must be requested before delivery of the machine.
- › The control unit must have a fault and warning message archive that can be exported via USB stick.
- › The control unit must be equipped with a recipe management system that can be preselected both from the control unit and from a process control system.
- › The following operating modes must be provided:
 - Setup preselected (variable name "EV")
 - Typing preselected (variable name "TV")
 - Automatic mode preselected (variable name „AV“)
 - Automatic mode active (variable name „A“)

- › In "EV" operating mode, it must be possible to control all functions manually. Any machine damage must be locked by the software. The reason for the locking must be issued as a warning message.
- › In "TV" mode, it must be possible to run through all processes in single-step mode (without cycle time interruptions). The number of steps in TV mode should be selected appropriately depending on the process.
- › In "AV" mode, it is possible to switch the system to automatic mode when the system is in its home position (defined position).
- › In operating mode "A," the affected function must stop immediately in the event of a fault. The other functions must come to a stop at a defined position so that restarting is possible without any problems.
- › A return to home position must be provided by means of a button. After successful return to home position, automatic start must be possible without any further intervention.

5.2 System Siemens S7

5.2.1 System Siemens - control type depending on application

- › S7-300 (only with CPU 312C, 313C, 314C 2DP, 315-2DP, 316-2DP, 318-2DP)
- › S7-400 (only with CPU 412-2DP, 414-2DP, 416-2DP)
- › S7-1500 (all CPUs)
- › The use of other types is only allowed after consultation and express written permission.
- › When using the CPU interface for other device components via MPI (e.g. other controllers, operator panels etc.), these must be connected to the CPU using a double connector (e.g., Siemens 6ES7 972-0BB41-0XA0) to enable connection for programming.
- › When networking controllers, Ethernet / Profinet is always preferable. Profibus is not desirable.

5.2.2 System Siemens - Operation and monitoring

- › Operator and monitoring panels must be made by Siemens.
- › Currently available appliances from Siemens must be used, approved by JRS.
- › Connection via Profibus, MPI or Ethernet
- › Colour display types are preferred.
- › Programming only with current software by Siemens; all necessary files and licenses have to be supplied.

5.2.3 System Siemens - Decentralized peripherals

- › For connection of the individual components via Profinet the corresponding configuration files must be available on a data medium to be submitted. A connection via Profibus DP is not desirable.

5.2.4 System Siemens – Decentralized guidelines

- › Programming must be done in Siemens Step 7, latest version of TIA portal or S7 for Windows (IBH-Softec) and be 100% compatible with Siemens.
- › All Step7 and TIA Portal guidelines must be observed. Feasibility and FUP must be ensured where reasonable and technically possible.
- › **All operands** must be listed with symbol names (max. 24 characters, no umlauts) and comments (max. 80 characters).

- › On the TIA portal, the language switch should be used if documentation is not exclusively in German or English.
- › Data bits, data bytes, data words and data double words etc. are to be documented in the corresponding data modules in the variable tables with the symbol names and comments.
- › When using instance data blocks, the same numbers are to be assigned as for the corresponding functional module, e.g. FB 100 → DB 100.
- › Functional modules are only to be programmed using local data which must be documented accordingly.
- › Each module must be labelled with a description, library number, name, family, author and version.
- › Plant components (e.g. drives, plant parts etc.) are to be programmed with the associated sensors and actuators together in a module.
- › Modules may not contain more than 1000 instructions.

5.3 System Rockwell

5.3.1 System Rockwell - Control type depending on application

- › Control Logix CPU 1756-L81E, L82E, L83E, L84E, L85E from Firmware V33
- › Control Logix CPU 1756-L81ES, L82ES, L83ES, L84ES from Firmware V33
- › Use of other types only after consultation and written approval.

5.3.2 System Rockwell - Operation and monitoring

- › Panel View version depending on display type
- › Connection via Ethernet IP
- › Colour display types are preferred.
- › Programming with PanelBuilder32 or RSVIEW; all necessary files and licenses must be included in the delivery.
- › For large systems and higher-level process control systems, the Wonderware “Intouch” system in the version current at the time of delivery shall be used for visualization. All necessary files and licenses shall be supplied.
- › When using visualization in a Control Logix, a second 1756 ENBT must always be installed to ensure separation of the IO area from the rest of the network, as this is connected to the company network.

5.3.3 System Rockwell - Decentralized Peripherals

- › For connection of the individual components to 1756 ENBT and 1734-AENTR-Point-IO via Ethernet IP, the corresponding configuration files must be available on a data medium to be submitted.
- › A separate Ethernet IP is always to be set up for the IO area via a configurable switch (IGMP snooping) when HMI and IO cannot be set up with separate networks.

5.3.4 System Rockwell - Special Guidelines

- › Programming must be done exclusively with Studio5000 V33.
- › All Studio5000 guidelines are to be complied with.
- › All variables must be documented with unique, meaningful symbol names and comments.

- › Functional modules that are used multiple times in the program must be programmed exclusively as add-on instructions (AOI) with local variables, which must be documented accordingly.
- › Each add-on instruction (AOI) must be provided with a description, name, author and version.
- › The complete programs and all subprograms must be structured in a logical manner so that system components can be hidden at any time.
- › Plant components (e.g. drives, plant parts etc.) are to be cohesively programmed with the associated sensors and actuators in a routine insofar as this is sensible and not time-critical (plant part program).
- › A continuous task must be avoided.
- › The program should be optimized so that cycle times are as short as possible.

5.4 Robots

- › All robot programs must be preselected and started using central recipe management on the HMI.
- › In general, after the robot has been shut down (e.g. emergency stop or power failure, etc.), all signals required to restart the robot must come from the control system. Use of the robot panel is only permitted for the “teaching” of new products.
- › It must be possible to automatically return to the home position from any position. It must be possible to initiate the return to home position by pressing a single button on the HMI.
- › Collision monitoring must be provided.
- › Tool monitoring must be provided.
- › In addition to the robot's automatic programs, a repair position must be provided as a separate program. This position must be accessible via the HMI in EV mode of the plant.

5.5 Rotary encoder

- › Reference marks for calibrating the position sensor must be attached to all rotary encoders (e.g. position of rotary table). The sensor must be calibrated on the HMI without additional software. A detailed procedure for this must be provided to JRS in writing, both in German and, for deliveries to foreign plants, additionally in the local language or in English.