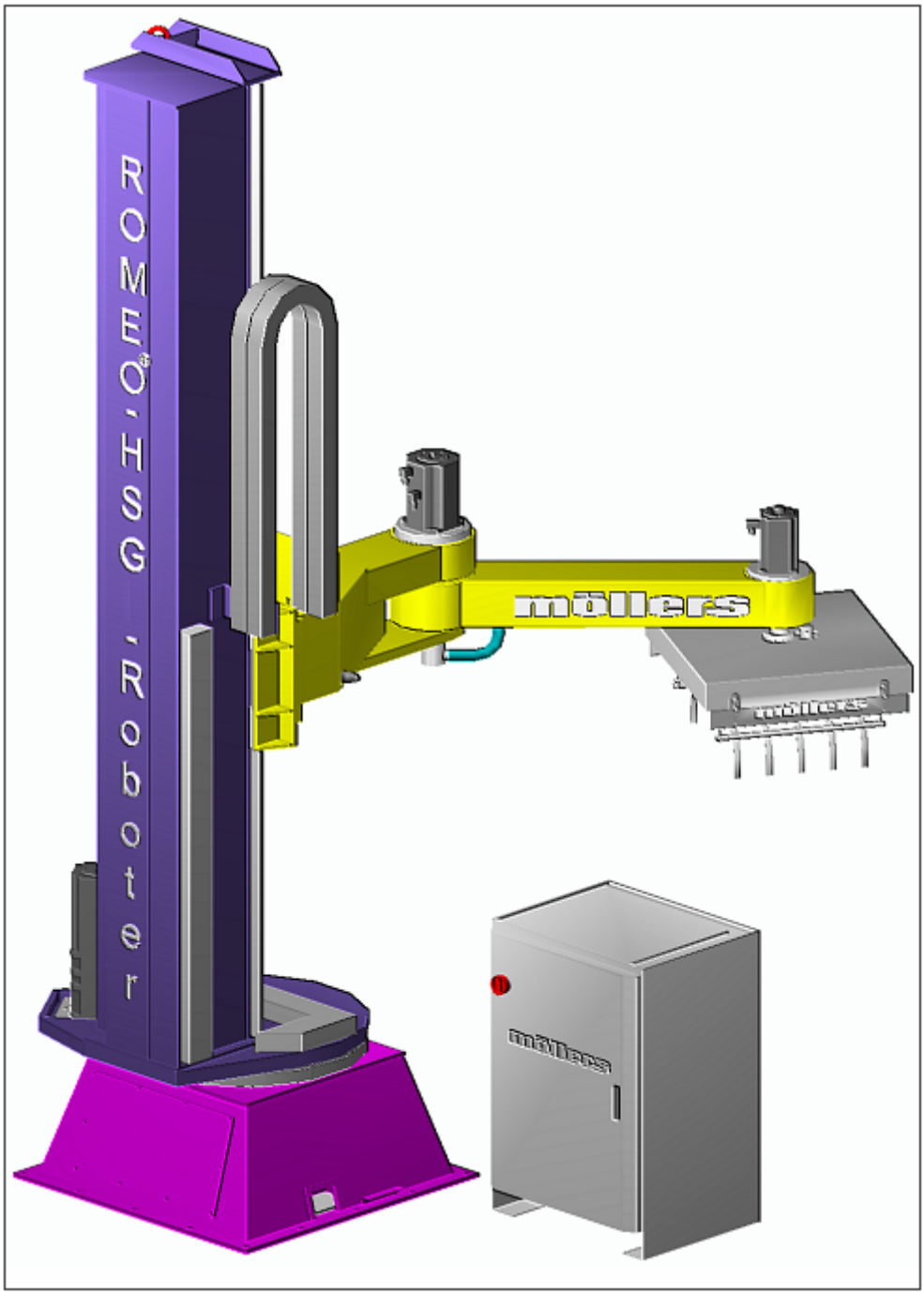

ROMEO®

Handling and Order-picking robot Type HSG2

möllers

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1. SYSTEM DESCRIPTION

1.1 General

The Romeo® HSG2 unit is a four-axis industrial robot featuring the following kinematic structure R-S-R-R (R = rotational axis; S = linear stroke axis).
Its primary uses will be found in:

- Handling
- Palletizing
- De-palletizing
- Sorting
- Order picking

The Romeo® HSG2 will always be able to move its full 50 kg rated payload at maximum arm extension and at maximum design velocity and acceleration. The intelligent controls built into the Romeo® system optimize motions to match the load being handled.

In the interest of economical engineering and maximum flexural and torsional strength, all the major axes employ modular designs and are finely tuned one to another. The result is high natural frequency and good dynamic properties at excellent vibration stiffness. All the drives are designed for little or no play and all are driven by brushless AC servo motors featuring plug connectors.

The control and power electronics which make up the control system for each robot are located together in a single switchgear cabinet. Whenever additional peripherals are to be integrated into the system, their power electronics and line supply module can be installed in an add-on cubicle.
The system complies with the safety requirements set down in the EU Machinery Directive and other applicable standards (including EN 775).

The connecting cables between the robot and the controller contain all the relevant energy supply and signal lines and are of the plug-in type. A pressure tubing for generation of big depression can be integrated too.

The cables connecting the robot and its controls include all the lines necessary for media supply and signals and are attached to the robot using plug connectors. A special hose to handle high vacuum volumes can, if desired, also be integrated into the system.

1.2 Mechanical Design

A fixed pedestal serves as the base for the Romeo® HSG2; rotational axis 1 – ROTATE MAST – is located here. Joined with it is a slewing plate carrying the translatory axis 2 – MAST STROKE. Attached to translatory axis 2 is axis 3 – ROTATE ARM.

Combined with these three basic axes is axis 4 – ROTATE GRIPPER – which is used to align and orient tool systems specific to a particular product. The TCP (**T**ool **C**enter **P**oint), used as the zero reference point for tool orientation, is located at its mounting flange.

Invoking suitable combinations of motions, the three basic axes are capable of accessing any Cartesian coordinate within the workspace, based on a cylindrical coordinate system. It is possible either to have the robot controls optimize movement automatically or to program the approach to specified points manually using a teach-in routine.

All the axes are powered by transistor-driven, low-inertia AC servomotors. The brakes and resolver are built into the motors to save space.

The robot's operating range is defined in all the axes using limit switches implemented in the software. The working ranges for axes 1, 2 and 3 are also limited by mechanical stops.
A shock absorber system is integrated into axis 2.

1.3 Installation

The robot is set up on the factory floor, prepared in advance by the customer, and secured with lag screws.

IMPORTANT

When preparing the factory floor or casting a foundation the quality of the concrete must comply with the applicable building codes (≥ B25 as per DIN 1045); the subsoil or subfloor must exhibit sufficient load-bearing capacity. It is necessary to ensure that the surface is sufficiently smooth and level.

The anchor sleeves for the lag screws must be installed carefully to ensure that the forces generated during operation will be transferred to the floor.

1.4 Transport

The robot must be secured against tipping and shifting during transportation. It must be kept in its transportation position until it is secured to the foundation. Only approved cranes and tackle with adequate carrying capacities may be used to move the robot.

The robot must be put into its **transportation position** any time it is moved.
The following axis settings are to be maintained **without fail**:

Axis	Setting
A1	0°
A2	0mm (zero point)
A3	127°
A4	as desired

2. TECHNICAL SPECIFICATION

2.1 Velocities and acceleration rates

Axis	Max. velocitiy	Max. acceleration
A1	127 °/s	α_1 = 4.43 Rad/s^2
A2	1.5 m/s	a_2 = 3.0 m/s^2
A3	133 °/s	α_3 = 4.64 Rad/s^2
A4	180 °/s	α_4 = 4.64 Rad/s^2

2.2 General technical Data

	Value or data
Number of servomotor-driven axes	4
Repetition accuracy	± 0.5 mm at maximum arm extension
Weight (without payload)	approx. 1250 kg
Rated payload	50 kg
Drive system	Electro-mechanical, with transistor-controlled AC servomotors
Major dimensions	See Figures 1 and 2
Noise emissions	< 75 dB (A) outside the working space
Installation location	**MUST BE ANCHORED TO THE FLOOR!** (permissible tilt ≤ 3°)
Ambient temperature during operation	283 K to 328 K (+10°C to +55°C)
Ambient temperature during shipping and storage	233 K to 333 K (-40°C to +60°C)
Workspace volume	approx. 22 m³
Protective finish	RAL shade 1016 (sulfur yellow), synthetic resin paint
Protective rating for robot electrical system	≥ IP 54

2.3 Dimensions and slewing angles

(See also Figures 1 and 2)

	Value
Minimum workspace radius	800 mm
Maximum workspace radius	1850 mm
Slewing angle A1	± 170°
Slewing angle A3	+127° / -131°
Slewing angle A4	± 170°
Minimum pick-up height	500 mm

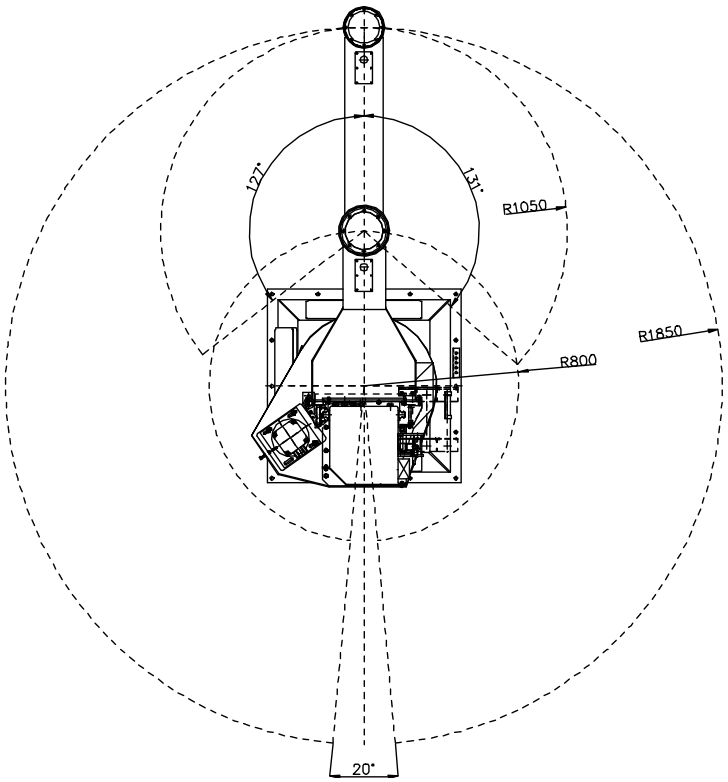

Figure 1: Example ROMEO® HSG2, top view

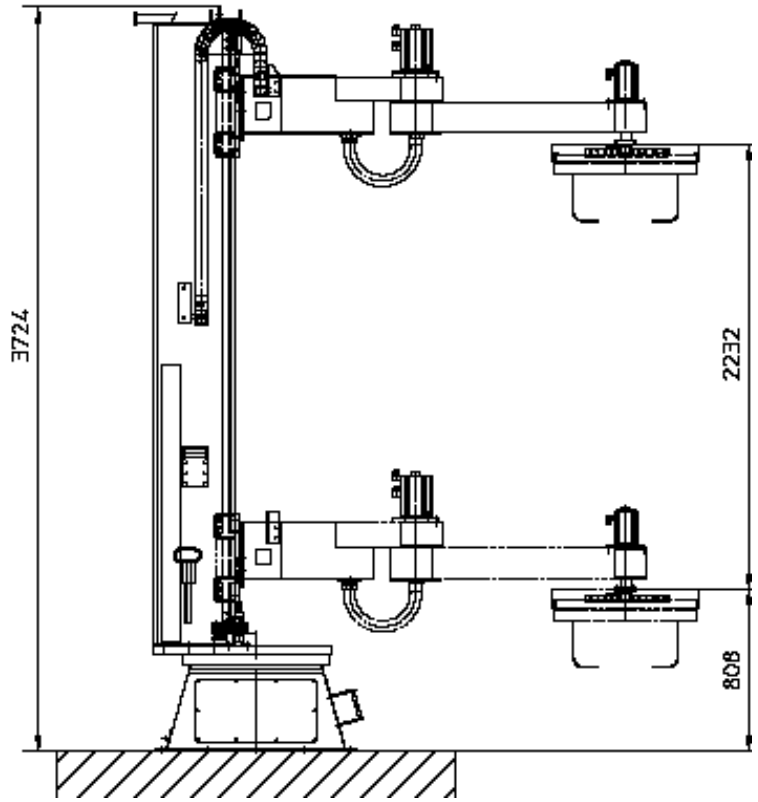

Figure 2: Example ROMEO® HSG2, side view

3. SOFTWARE AND CONTROLS

The control concept implemented in the Romeo® system is based on a PC and provides open connectivity for all standard field bus systems. Consequently the system, in addition to the robot control function proper, offers every alternative for expanding functional capabilities: process visualization, robot diagnosis, diagnosis at the peripherals, sensor integration and compiling production statistics from the manufacturing operations – this control system makes it all possible. The Windows XP graphic user interface made by Microsoft, running on the VxWorks real-time operating system, is just as easy to use, after a brief familiarization period, as the PC in your office!

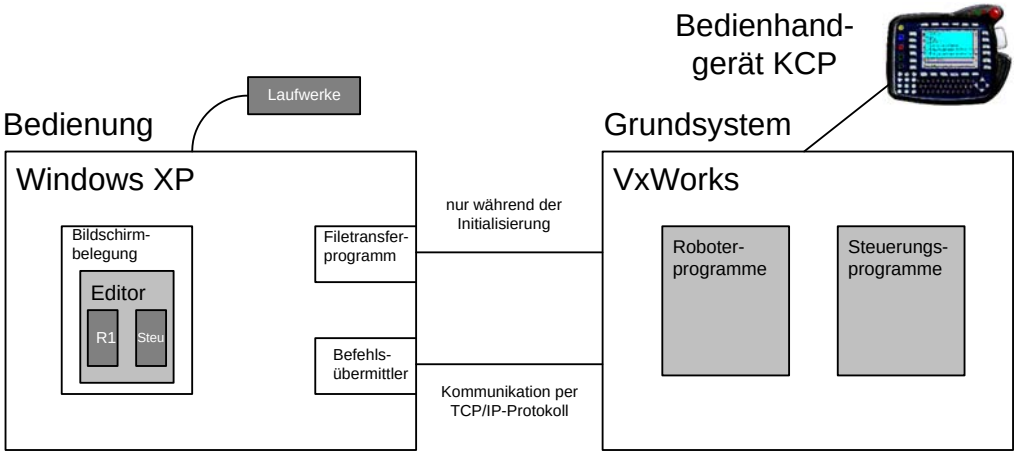

Figure 3: Example Software concept

Standard data storage components such as a 3½" floppy disk drive, CD-ROM reader and hard disk drive ensure smooth data transfer at all times.

Using the KCP hand-held command module makes for quick and uncomplicated operation of the system as a whole, right at the working point, without having to run back and forth to the switchgear cabinet; all the switches are integrated into the control bar.

In addition, pre-configured forms and entry fields as well as clearly arranged blocks of functions enhance convenience considerably.

Moreover, it is possible to switch – online – among more than ten languages, guaranteeing smooth communications between the operator and the controls.

Figure 4: KCP hand-held command module

Figure 5: Robot controls

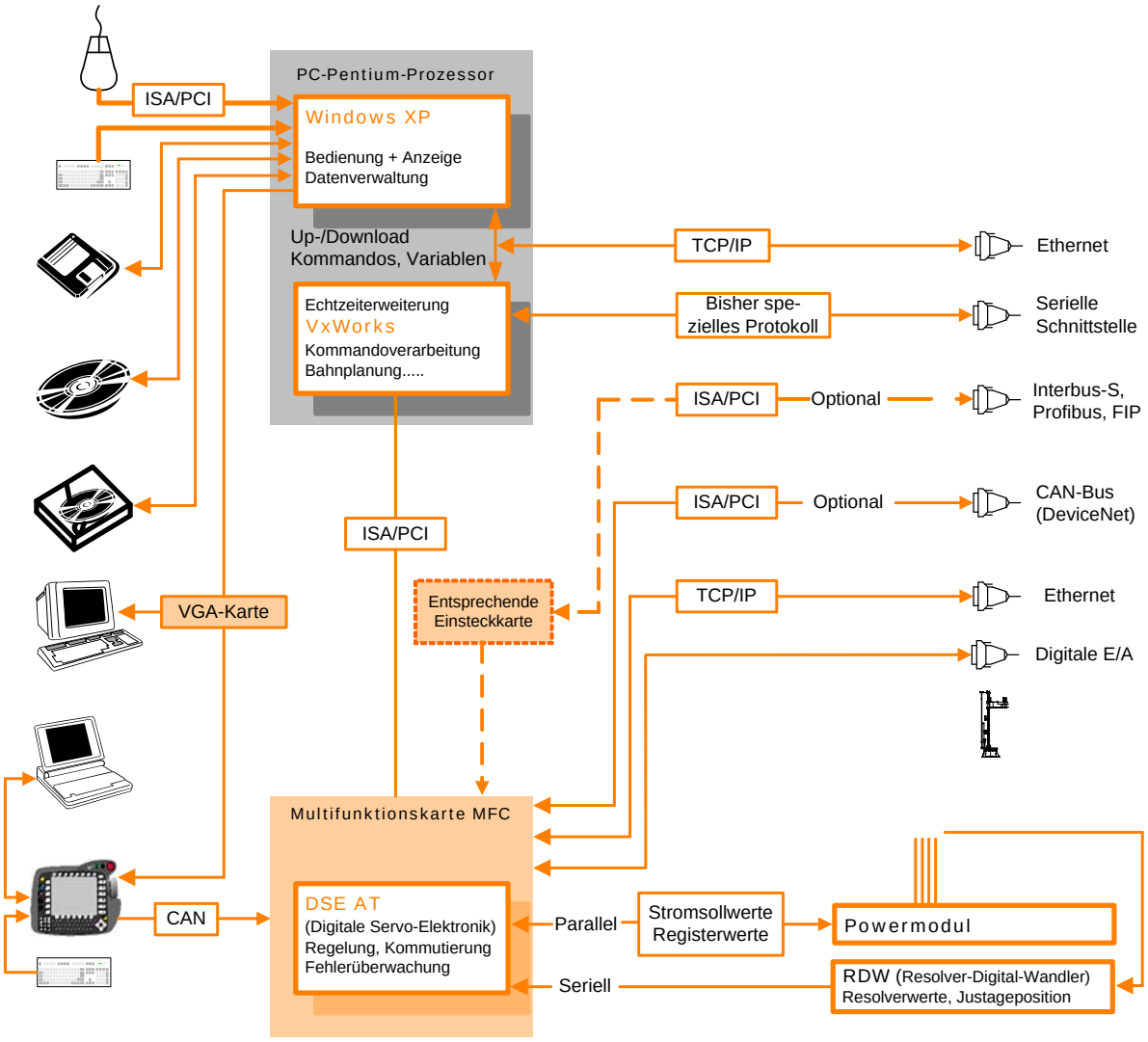

Figure 6: Example Control concept for the Romeo® HSG 1

4. IN SUMMARY

In selecting the newly developed Romeo® HSG2 handling and order-picking robot you obtain, in conjunction with the time-tested robot controls, all the advantages of a mechanical concept tailored to your needs, combined with the functional reliability of a family of controls manufactured in volume. Using Romeo® with other components offered by Möllers automation technology opens the door to a broad range of application possibilities.

NEVER A ROBOT WITHOUT THE TOOLS YOU NEED!

Naturally the Möllers grippers should not go unmentioned in any discussion of the Romeo®. No matter whether you need the tested and patented bag gripper system or any of a multitude of vacuum or clamping manipulators – the Romeo® uses all these systems to move your product gently, reliably and quickly and thus helps you to take full advantage of your realization potentials. Separate information on these handling tools is available.

Finally some headwords showing the advantages of the Romeo®-system in summary:

- ❑ High functional reliability thanks to belt and direct drives powered by AC servomotors
- ❑ Modular design facilitates maintenance
- ❑ Integrated supply lines for energy and media
- ❑ Enhanced system reliability with self-diagnostics capabilities and internal error recognition
- ❑ Ergonomically designed, hand-held command module for ideal, time-saving programming
- ❑ Open system structures for trouble-free expansion
- ❑ Continuous demonstrations and system optimizing in our own test facilities – using your own products, if you wish!

If you have further questions or suggestions, then do not hesitate to get in touch with us at any time.

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