

## Technical Data

### Radiation Protection Cabinet

Height (with underframe)	2640 mm (8.66 ft)
Width (with underframe)	2390 mm (7.84 ft)
Depth (upper roof edge)	3750 mm (12.30 ft)
Depth (underframe)	2590 mm (8.49 ft)

### Control Cabinet

Width	1000 mm (39.37 inch)
Depth	600 mm (23.62 inch)
Height	1200 mm (47.24 inch)

**Total weight:** approx. 6000 kg (13,200 lbs)

**Maximum part dimensions:** 1000 mm x 400 mm x 300 mm (39.37" x 15.74" x 11.81")

**Maximum part weight:** 25 kg (55 lbs)

### Transport Methods

- Radiation protection cabinet complete with control cabinet and high voltage generator by fork lift trucks
- Control desk (on pallet) by fork lift trucks

### Options Available

- Monitors
- Beam shader
- ISDN-router for remote maintenance
- Prefilters
- Pallet conveyor
- Evacuation belt
- Custom features on request

### Connection Values

Voltage supply: 3N PE 400/230V 50 Hz, 50A, TN-S or TN-C-S power connection  
 Consumption: approx. 10 kW  
 Peak value: 30 kW

Grounding: Separate grounding for X-ray and high voltage generator (< 2 Ω) with at least 6 mm<sup>2</sup>

Air pressure: Connection ¼ "; min. 6 Bar  
 Consumption: 10 NI / min

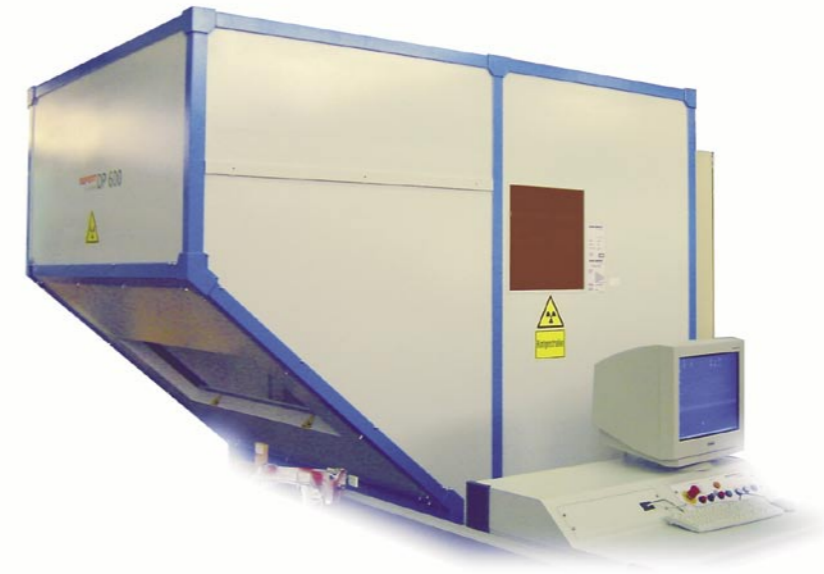
### National and International Regulations

The DP 600 ROB construction fulfills, among others, the following national and international regulations and standards:

- ISO 9001
- UVV
- VBG 4
- CFR 1020.40
- CE conformity
- VDE 0100
- DIN EN 60204 (VDE 0113)
- DIN EN 954-1
- DIN EN 60529 / IEC 529
- DIN 54113
- R6V of 1987 (extended to up-to-date version)

# SEIFERT DP 600 ROB

## Radioscopic Inspection System



## Extensive engineering and application know-how come together

The DP 600 ROB X-ray system performs fully automated inspection on the production line for a diverse range of aluminium cast parts. The performance level of this X-ray robot system lies particularly in its very high speed with fully automatic inspection and part changes, combined with a compact design. The use of a 6-axis robot as a workpiece manipulator ensures maximum flexibility for possible inspection geometry. The examined parts are firmly clamped according to shape or by force (gripper jaws) from recorded workpiece beam-transparencies.

The system concept of the DP 600 ROB enables both manual and connected automatic loading and unloading. The ergonomic arrangement of the workpiece holders for the loading/unloading process simplifies manual loading for the operator and enables easy loading with handling equipment (robot).

### Features

- High speed inspection and part changing
- High positioning accuracy and speed of optimized courses of motion
- High inspection security by fully automatic X-ray with the SABA 3000 P automatic error detection system
- Shading-free radiography in all inspection positions by grip arm principle
- 'Accept' part marking with industrial compliant stamping mechanism
- Small utility space by compact design
- High availability and low maintenance costs
- Easily serviceable structure by large service door
- Manufactured in accordance with (CE) ISO 9001 certified quality management
- High safety standard in accordance with German X-ray Regulations (R6V), DIN 54113 and EU guidelines

GE imagination at work



## The DP 600 ROB X-ray system in the inspection sequence



Cabinet with ABB robot



Cabinet with Kuka robot

The DP 600 ROB Radioscopic X-ray system is intended for manual or automatic loading as well as connection with the user-side production line. The workpieces to be inspected are sent through the X-ray system conveyor (e.g. rotation plate), clocked by a worker or handling equipment reproducibly. The workpieces are taken up by the file places of the conveyance and further-clocked for the input area of the X-ray cabinet. Subsequently, the robot grips the workpieces to be inspected and transports these to the inspection area between the X-ray tube and the imaging system. The DP 600 ROB can be equipped with almost any commercial robot system.

In the inspection area, programmed test positions are passed through and the radioscopic X-ray images are automatically evaluated. For each workpiece, a fully automated inspection decision is made as “accept” (OK) or “reject” (fault). Parts evaluated as “accept” are durably marked by a pneumatic marking mechanism, put on a timed belt conveyor by the X-ray system robot, and supplied to a worker for unloading.

By employing another loading conveyor, an automatic connection to subsequent production

systems is possible (option). Parts evaluated as “reject” are sorted by the X-ray system robot into a grated container (see diagram on next page).

The DP 600 ROB achieves very short total inspection times for each test part by the parallel processing of test positions and image evaluation. As an example, the DP 600 ROB only needs 28 seconds for inspection of a part with 20 test positions based on an average inspection time of 1.1 seconds per position and an average part change time of 6 seconds (manipulation of two parts in parallel):

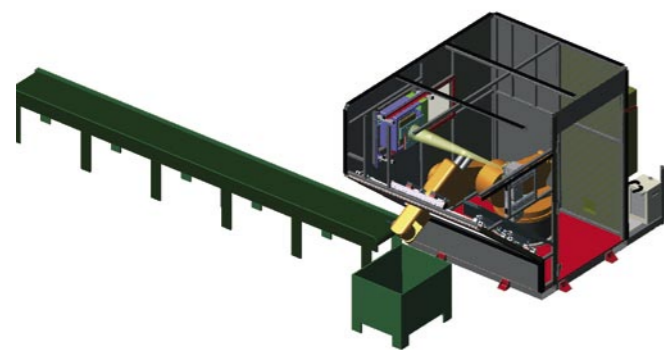
The time/position depends on:

- choice of imaging system (image intensifier / surface detector)
- size of test parts
- shape of test parts
- inspection positions on parts
- choice of assigned robot

The change time depends on:

- loading conveyor system used
- grip position of the robot at the transfer station
- file positions of the robot at the transfer station
- marking equipment and marking positions of accept and reject parts
- unloading conveyor system used

With the DP 600 ROB system, the X-ray tube and the imaging system are arranged to create a horizontal beam direction. Shavings, other processing residues, and fallen workpieces cannot fall on the X-ray tube or imaging system, thereby not obstructing the X-ray procedure. The radiation protection cabinet and the switch gear cabinet stand on a common platform and are transported as a unit. The external dimensions enable transport with truck or container. The DP 600 ROB is delivered completely installed with cables connected on-site. The time required for installation, start-up and relocation is minimal.



## Individual components of DP 600 ROB in the inspection sequence

### X-ray Unit

For acquiring optimum image quality and radiography performance for inspecting light alloy parts, we integrated the ISOVOLT 160 HS X-ray unit into the DP 600 ROB with the ISOVOLT 160 / M2 X-ray tube. Further advantages of the X-ray unit are:

- High radiographic capacity by a high dose rate connected with very little high voltage ripple content (40 kHz technology)
- Excellent reproducibility of X-ray results
- Flicker-free image by high stability of operating values (supported by fast monitoring systems)
- High operator security by integrated safety circuits on the ISOVOLT 160 HS and the entire X-ray system
- Long-life X-ray tube with an automatic, real-time controlled tube training program and two redundant switchable focal spots on the X-ray tube

### Imaging System

The DP 600 ROB contains the DIGILUX 512H imaging system with a high-quality surface detector using amorphous silicon technology. Alternatively, a VISTALUX 9/3-CCD radiograph intensifier TV system can also be employed. The radioscopic image is displayed on a 22" UXGA monitor or an optional 19" TFT monitor.

### Radiation Protection Cabinet

In dimensioning and equipment, the radiation protection cabinet is a fully-protected system in accordance with current German X-ray Regulations (RöV). The structure of the DP 600 ROB is designed to be very user-friendly with its service door. The service door is equipped with force-lock safety switches in accordance with VDE 0113 (EN 60204). The safety switches lie in two independent safety circuits (interlock) of the X-ray unit (in accordance with EN 954-1, Safety Class 4). The cabinet's service door can be locked with an integrated safety lock to prevent unauthorized entry. It is also possible for the operator to open the service door from inside at any time using the door's panic lock.

### Operation modes

In “manual” operation mode, the robot axes can be moved with a 3D spatial mouse (joystick for six axes) within the inspection area of the radiation protection cabinet. The X-ray parameters are manually pre-selectable. In “programming” operation mode, the test positions can be stored using the teach-in procedure and the complete program can be run later under automatic operation. Switching operation modes from “automatic” to “manual” and back again is possible at any time. After switching from “manual” back to “automatic,” the robot first starts at home position and repeats the inspection step from where it left “automatic” operation mode.

In “Automatic with SABA” operation mode, inspection is basically done statically (inspection with fixed image). By simultaneous processing and evaluation of radiographs, the accept or reject decision can occur immediately after starting the last test position without time delay and begin the next X-ray process. As a result, the DP 600 ROB minimizes total inspection time between each test part.

### Layout of the DP 600 ROB

