

Operational Availability

The definition and position
of Uptime as a Service Feature

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Executive summary

The role of EOS is to ensure system availability. In more detail: to ensure the agreed percentage of operating availability time of the machine for usage without defects based on EOS machine type, EOS standard material & processes → the EOS Quality Triangle.

EOS clearly takes the position that an operational availability is not a system feature, but a service feature which needs certain pre-conditions to be established. This framework is subject to be applied on EOS core systems without peripherals.

This white paper is for you, if you

- are on your way into industrial AM production
- looking for a solution that is ensuring factory efficiency
- want to rely on a stable production with an EOS expert at your side



EOS grants system availability for systems being under Warranty or under Service Premium Contract, being in the triangle of quality environment, with an on-site technician or a dedicated residential technician.

Based on the downtime calculation defined in **VDI 3423** guideline 'Technical availability for machines and production lines', EOS recommends a more detailed breakdown of times. This creates a clear understanding and is enabling a more efficient translation of data at the set review periods. Below is the definition for machine availability and times established by EOS.



Distinction of responsibilities

VDI 3423 – Availability of machines

Definition of times

Time period under consideration
(e.g. entire year, month, shift, warranty period)

Occupied time T_B
(scheduled machine utilisation, e.g. according to production scheme)

Unscheduled time (e.g.
Sundays and holidays)

Utilisation
time T_N

Organisational
downtime T_O

Technical
downtime T_T

Preventive
maintenance
time T_W

Unoccupied
time

Test time T_C

Customer
responsibility

EOS
responsibility

According to **VDI 3423**, downtime of the core equipment is calculated. Operational availability should then be $100 - A_T \geq 95 \%$ *

Technical downtime quotient is calculated:

$$A_T = \frac{T_T}{T_B - T_W}$$

AT = Technical Downtime quotient:

- (TT) Technical downtime
- (Tw) Preventive maintenance time
- (TB) Occupied time (planned)

TT – Technical downtime:

Starts counting from received disturbance message by the SUPPLIER during regular working hours, otherwise it will be counted for the ordinary working hours of the next normal working day.

TB – Occupied time:

This is the stipulated time frame of the equipment's production time. Occupational time is calculated according to the following formula:

Shifts: working hours (X) number of shifts (X)
number of working days (in the time frame)

TW – Preventive maintenance time:

All time planned maintenance such as Preventative Maintenance, Daily Maintenance, Overhauls or Daily Surveillance Programs.

*example; applicable for EOS M290 core system

Specified prerequisites are key for success



To analyze the time availability of the individual system performance, a prerequisite is for an automated method of machine technical availability to be generated together with a defined process of, initial presentation, qualification of problem, further actions, resolution, logging data and storing end data.

Definition of Technical Downtime (TT)

- Start (T1) – Qualified person from customer to report a problem with the presentation of a predefined set of information and for it to be accepted by a qualified person from EOS.
- End (T1) – When the system is handed back after problem resolution, a report is to be produced by a qualified person from EOS and to be accepted by a qualified person from customer. The time stamp is to be stated on the engineers report and signed by both parties.
- Uptime data based on the EOS assessment will be logged by EOS technician and stored at EOS and an agreed location within customer. Any difference to the customer data collection for availability assessment will be reviewed at the set review periods.
- Log book to be kept at system for reference at bi-weekly and monthly reviews, (customer technician and EOS technician). The frequency of reviews will be assessed bi-annually.

What is required for an operational availability commitment

- Establish regular reviews between customer and EOS and provide resource being capable to review logged data
- Qualified information for trouble-shooting: Provide necessary system logs and failure reports for failure diagnosis
- Allow remote-access for the covered Systems → remote guided troubleshooting (not permanent, case by case requirement)
- The definition of system condition "productive"; e.g. successful completion of reference job that has been defined with the customer
- Optimal environmental, service and maintenance conditions.
- Meaning: System installed according to EOS machine installation procedure.
- System IQ certified
- Repair and maintenances carried out by EOS.
- Customer personnel qualified by EOS and in future compliance with DIN35255
- Lead time for logistics : $\leq 48h$

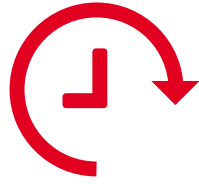


What is NOT included in down-time

- Production times that do not lead to expected quality results
- Additional set-up times due to job interruption
- Shortcomings in handling, programming and operating
- Shortcomings due to delayed reporting of faults and irregularities
- Regular system maintenance and cleaning by purchaser and EOS
- Repairs carried out by customer
- Times of system not able to produce before reporting to EOS
- Downtime caused due to peripherals and non EOS systems
- Preventive repairs during system idle
- Quality results are not part of the agreement, as long as a reference job is ok



The automated method for collecting machine availability is based on this availability definition and needs to be agreed on before implementation.





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Angelika Cortazzo is a highly experienced Service Business Manager with a demonstrated history of over 20 years working in the machinery industry from the scratch. In this environment, she built up deep knowledge in business process, operations management, business analytics, and management.

Based on her strong background as sales professional graduated from Bayerische Akademie fuer Aussenwirtschaft, Angelika has been working in the field of automotive and IT—amongst others for the largest supplier of manufacturing systems and related services in the global semiconductor industry—before she joined EOS.

Leveraging best known methods from the industry, she is transferring proven service models into the innovative field of 3D digital manufacturing solutions. In her role as Business Manager Global Service at EOS, she is focusing on customized service concepts for our large industry customers to accompany them into AM production.

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