FORCAM FORCE™ SAAS


# FORCAM FORCE SAAS - Machine Connection

## Version 2106.11.15

*Product Description*

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# Introduction

This document describes the scope of functions and added value of FORCAM FORCE SAAS - Machine Connection.
The FORCAM FORCE SAAS machine connection is preconfigured. This allows machines to be connected to the system quickly and easily. It is also possible to connect additional machines at any time.
The documentation and the basic structure are designed as a "ready to run" standard product that enables the customer to perform a largely independent rollout in production. A quick-start guide ("FORCAM FORCE SAAS Quick Start Guide") provided in the scope of delivery can be used to guide and facilitate the customer's installation with machine connection.

# Glossary

| Term | Description | Notes |
|---|---|---|
| **Shopfloor Terminal (SFT)** | Browser-enabled hardware on the machine for interaction initiated by the worker. It is supplied by the customer. | See System requirements |
| **Subscription license** | License model in which software usage rights are obtained by the customer in a subscription/rental plan from FORCAM. The reference criteria for licensing are the number of workplace packages and the scope of functions used. | The billing is done annually in advance through a fee. |
| **Operating state** | Machine state in production (**running**) or stoppage (**not running**), with reason for the cause. | |
| **Office client** | Web application for displaying manufacturing data as reports, visualizations and dashboards | |
| **FORCAM I/O Controller** | Device to be installed in a control cabinet for tapping the electrical machine signals | For rail mounting, refer to the "FORCAM FORCE SAAS Quick Start Guide" |
| **EDGE Gateway** | Device that connects the production network (LAN) to the Internet | FORCAM I/O controllers send data to this device for normalization/standardization and eventual transfer to the cloud. |
| **Workplace** | A workplace corresponds to a machine, in this case in a 1:1 relationship. | |

# Scope of functions

The standard FORCAM FORCE SAAS scope of functions is comprised of the items listed below.

## Software and hardware

- FORCAM FORCE SAAS subscription licenses according to the sales plan in the offer
- Includes all software licenses for server operation (operating systems for server and client computers, database licenses such as MS SQL, as well as third-party software), unless they have been explicitly identified in the sales listing of the offer.
- The hardware specified in the offer is supplied as standard. They are the corresponding number of FORCAM I/O controllers and the EDGE Gateway.

## Machine connection

The machine connection is standardized in FORCAM FORCE SAAS. There are four digital signals in the standard (**machine on**, **automatic ON/OFF**, **machine producing**, **machine stoppage**). Fewer signals can be used, depending on the customer's requirements.
The customer is responsible for the machine-side connection including that of the supplied I/O controller to the production network (LAN/Ethernet). The corresponding manual "FORCAM FORCE SAAS Quick Start" is included in the scope of delivery. Additionally, reference is made to the obligations for compliance.

## System architecture

- Software instance in the Cloud, managed by FORCAM
- The data collection and communication system **EDGE Gateway** on customer site, managed by FORCAM
- FORCAM I/O Controller on customer site
- Shopfloor Terminal (hardware provided by customer, see “System requirements” in the annex)

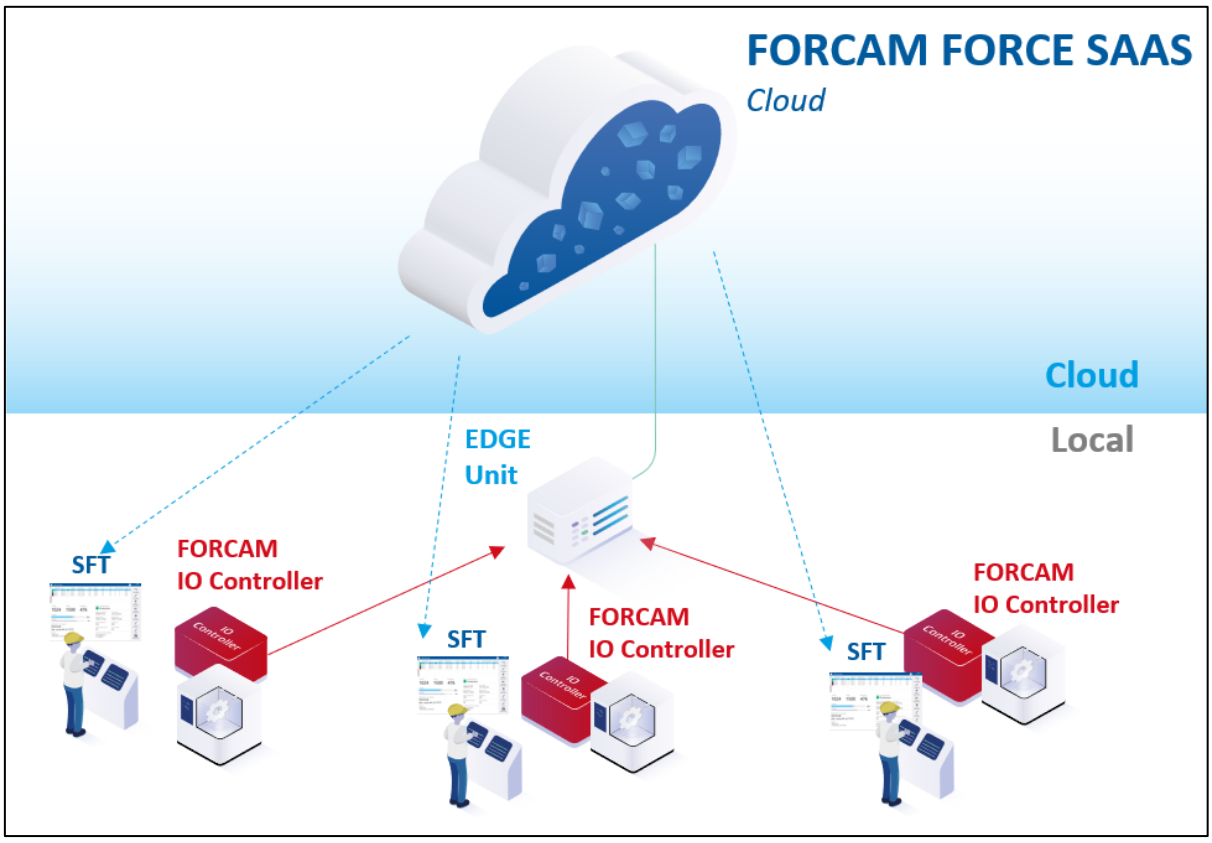


**Fig. 1: System architecture of FORCAM FORCE SAAS**

# Hardware scope of delivery

### FORCAM I/O Controller

The FORCAM I/O Controller is used to tap the machine signals and transform them into network information. This information is transmitted to the EDGE Gateway for further processing. The FORCAM I/O Controller must be connected to the machine and to an existing network connection by the customer. In this context, reference is made to the obligations for compliance in the annex. Connection instructions are included (see "FORCAM FORCE SAAS Quick Start Guide").

### EDGE Gateway

- The Gateway is supplied by FORCAM with a default installation and must be configured by the customer into the production network by following the provided "FORCAM FORCE SAAS Quick Start Guide"
- The installation (network & power supply) must be done by the customer

# Software scope of delivery

The system is delivered pre-configured and includes the following components:

### Access to Shopfloor Terminals via a link

- A web interface enables employees to access the shopfloor terminals at the respective machine.
- A browser is all that is needed to view it (see system requirements in the annex). The relevant end devices are not included in the scope of delivery (see system requirements in the annex) and are provided by the customer.
- The shopfloor terminals are delivered with a basic configuration for the machine workplaces.
- There is no customization possible in the SaaS implementation model.

### Access to Office Client via a link

- The system will provide the reports, dashboards and visualizations mentioned in chapter **Performance analysis**. It is possible to customize them and to adapt them to the company's own specifications, for example.
- A browser is all that is needed to view it (see system requirements in the annex). The relevant end devices are not included in the scope of delivery.

### Machine data collection

- The machine data collection is the active component in FORCAM FORCE SAAS for capturing machine-based signals.
- The FORCAM I/O Controller is delivered pre-configured. FORCAM performs the software-side pre-parameterization of the machines to be connected based on the customer data sheet "FORCAM FORCE SAAS - Machine List" which is filled out by the customer. Customers can also do this themselves if they wish.
- The necessary signals (**machine switched on**, **automatic ON/OFF**, **machine producing**, **machine stopped**) are provided by the customer by connecting the machine controller to the production network (or by connecting an I/O controller to the machine and to the network). Any services for preparing the signals on the machine side as well as the resulting costs are not included in the scope of functions provided by FORCAM FORCE SAAS.

### Master data configuration

- FORCAM handles the pre-parameterization of the necessary master data in the system. This includes shifts, workplaces, workplace hierarchies (plant, area, department), time bases, operating states and status details. Workplaces and hierarchies are preset based on the customer data sheet "FORCAM FORCE SAAS - Machine List" filled in out by the customer. Shifts, operational states and status details as well as range of workplace hierarchies (such as descriptions and groupings) can be changed by the customer as needed after the initial implementation.
- The system's processing logic is predefined.

ⓘ Instructions on how to customize shifts, operating states and status details can be found in the provided "Manual - FORCAM FORCE SAAS".

# FORCAM FORCE SAAS (MDC) - Module overview

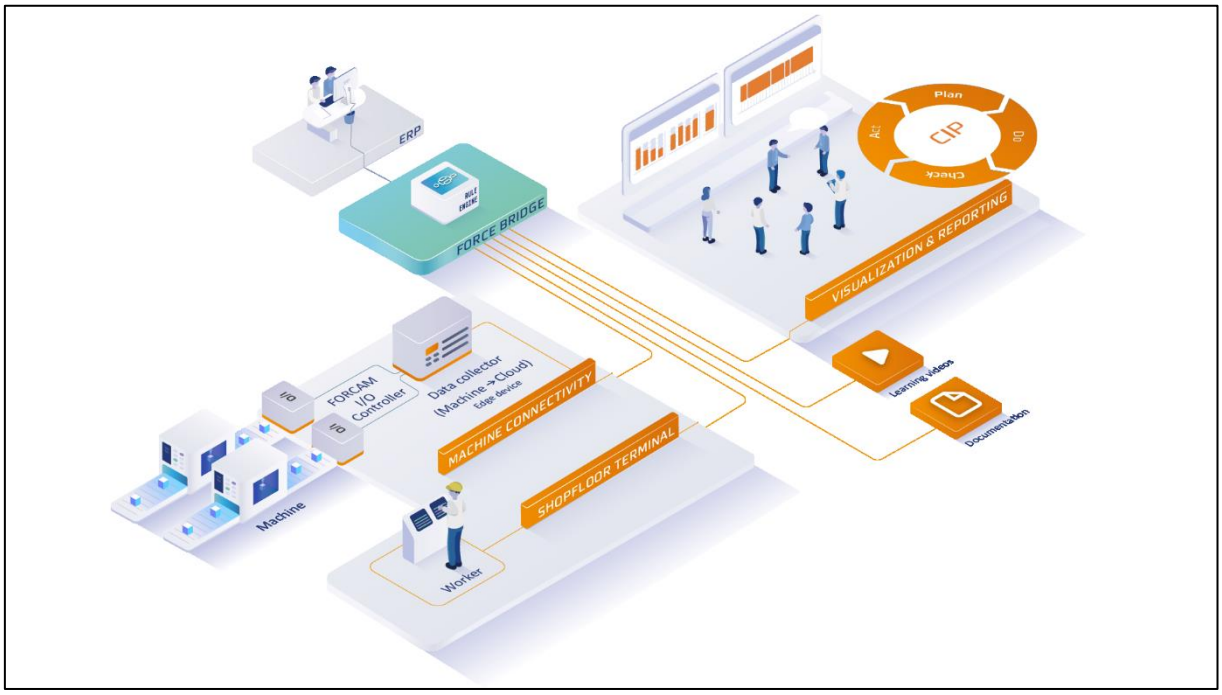


**Fig. 2: Module overview of FORCAM FORCE SAAS**

**The machine data collection (MDC)** in FORCAM FORCE SAAS provides data and information about the current state of a workplace (machine or plant). The MDC recording enables analyzing developments and trends in a differentiated way and comparing different workplaces with each other.
The worker at the machine is able to qualify undefined stoppages by the actual reason. The supervisor/foreman can also still make corrections. Together with the shift maintenance (nominal state), the actual machine availability can be determined objectively.

## Added value

- The actual time availability of a workplace (machine or plant) is shown objectively and transparently.
- The frequency and duration of the various operating states and their causes provide important information for optimizing production and maintenance.
- The current operating states of all workplaces (machines or systems) can be seen at a glance.
- Based on machine availability, stoppage and maintenance times can be determined and optimized.
- Objective calculation of machine hourly rates based on real data.

## FORCAM FORCE™ Machine Connectivity (MDC)


The FORCAM FORCE™ **Machine Connectivity** captures the machine/plant signals and derives one of the following operating states:

- **Plant is running** (production)
- **Plant is not running** (stoppage) with reason (cause)
- **No connection** (operating state unknown/no network connection)

## Rule Engine


The **Rule Engine** is the central component from the FORCAM FORCE™ IIoT platform on which the offered SaaS solution is based. It is responsible for the plausibility check of the machine states using the manufacturing data model (logic). This is done based on the use case-specific booking logic. The booking logic for FORCAM FORCE SAAS is predefined.

## Shopfloor Terminal


The **Shopfloor Terminal** is used for visualizing and specifying or qualifying the operating states. It is the link between the machine data collection and the worker at the machine.

### Shopfloor Terminal functions

- Occurred operating states are mapped chronologically up to the current time and can be displayed corresponding to shifts when a shift system is set. A standardized shift model is preconfigured in the base configuration.
- Workers can specify the operating state **undefined stoppage** via the Shopfloor Terminal by specifying a status detail. Operating states are preconfigured in the basic configuration.
- The **setup** operating state has a unique position: Setup is activated via the Shopfloor Terminal and remains active until it is deactivated again at the terminal. During setup, the system completely suppresses the recorded machine states.
- An online report and the list of past operating states are displayed in the Shopfloor Terminal **Machine Data Collection**.

ⓘ Instructions on how to configure operating states, shift models and reports can be found in the provided "Manual - FORCAM FORCE SAAS".

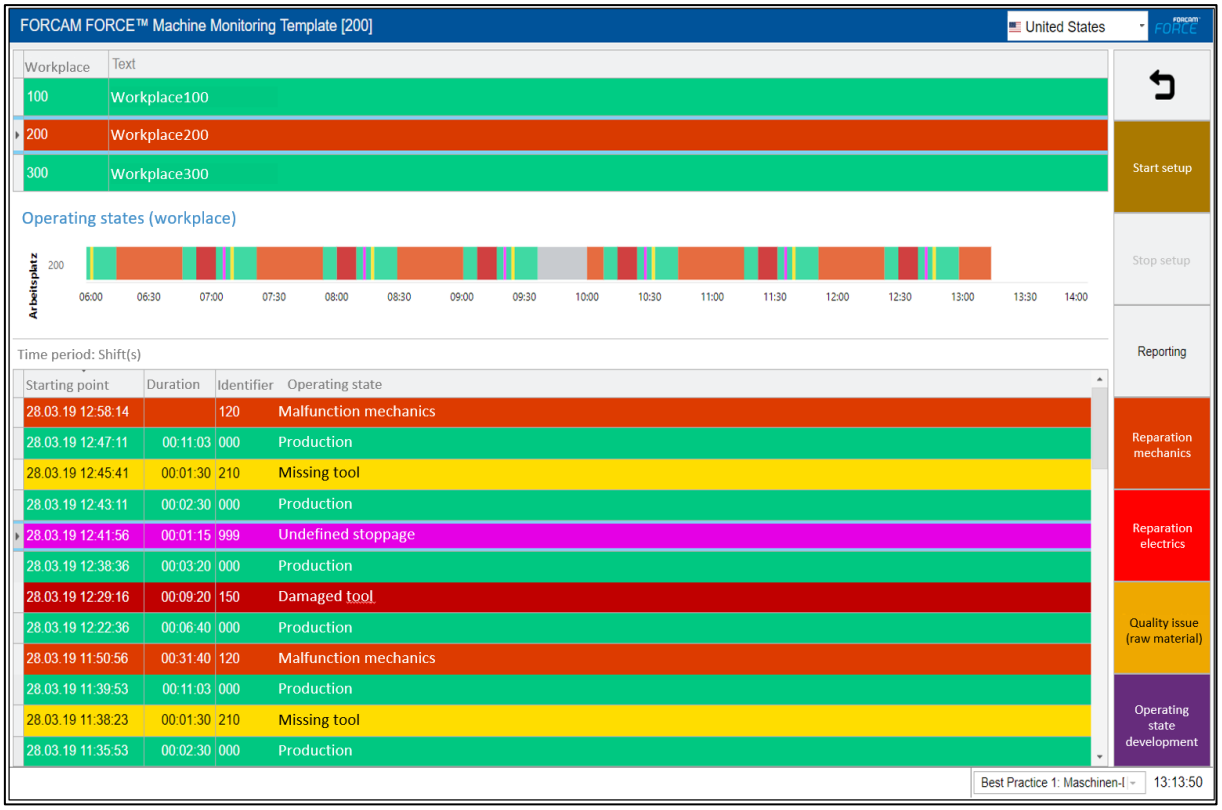


**Fig. 3: Shopfloor Terminal start page**

The figure above shows a sample terminal with configured buttons that the worker can use, for example, to make bookings or change statuses.
The actual delivery may differ from this example.

### Reporting processes and functions

The browser-based Shopfloor Terminal enables the user to perform the following functional processes:

- Start setup
- End setup
- Call up selected reports
- Change or qualify operating conditions (e.g., **undefined stoppage** to a specific malfunction such as **mechanical malfunction**)

## Performance analysis


The FORCAM Performance Analysis application consists of reporting, visualization and dashboard.
The basic configuration is part of the scope of supply and can be customized by the customer.

The following reports are available for evaluating the machine data collection:

- Operating state timeline (workplace)
- Operating state log (workplace)
- Messages
- Availability (overall view)
- Operating state class report (workplace)
- Operating state class development (workplace)
- Operating state report (workplace)
- Operating state development (workplace)
- Hit list operating states (workplace)
- Scheduled operating time
- Shift schedule
- Malfunction reason history

The following dashboards are preconfigured:

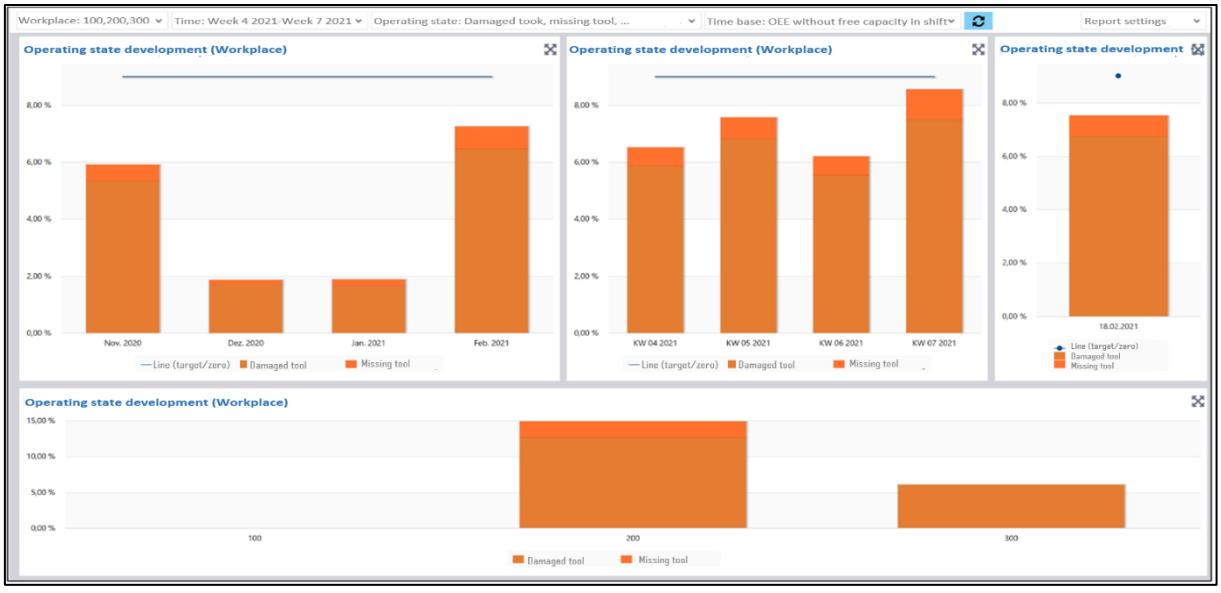


**Fig. 4: Stoppage development displayed in a dashboard with multiple reports**

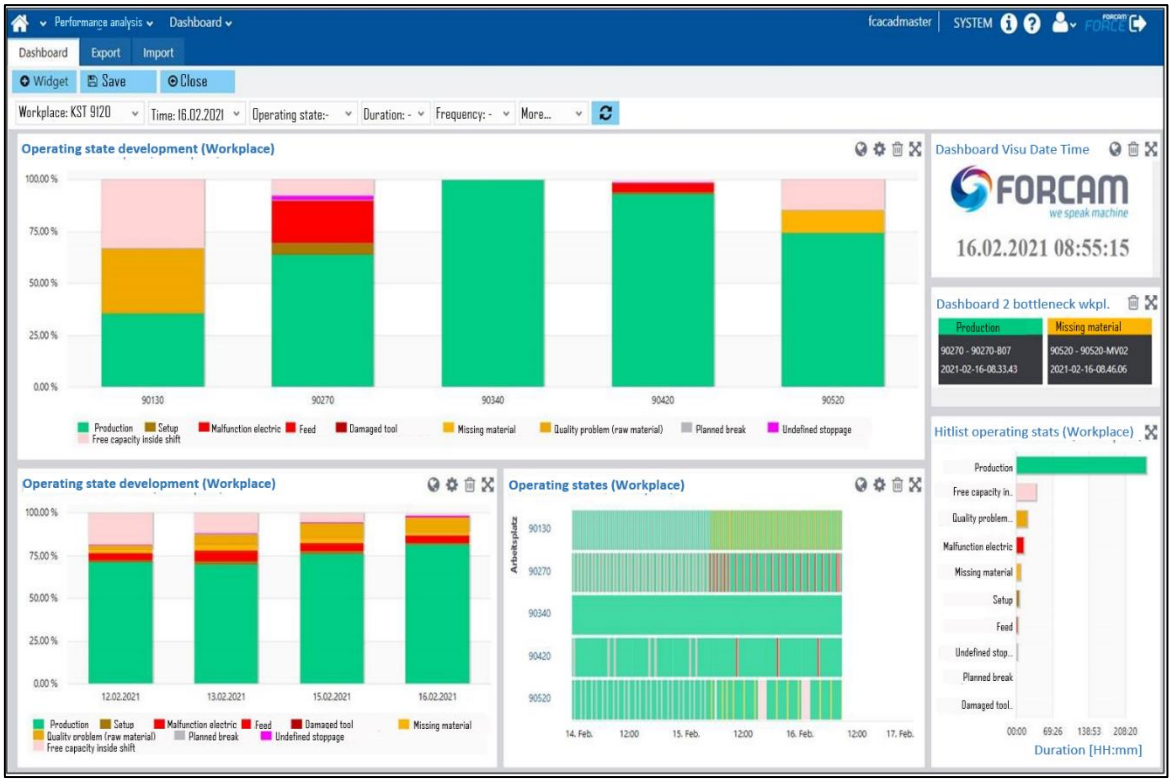


**Fig. 5: Dashboard displaying operating states**

The following visualization is preconfigured:

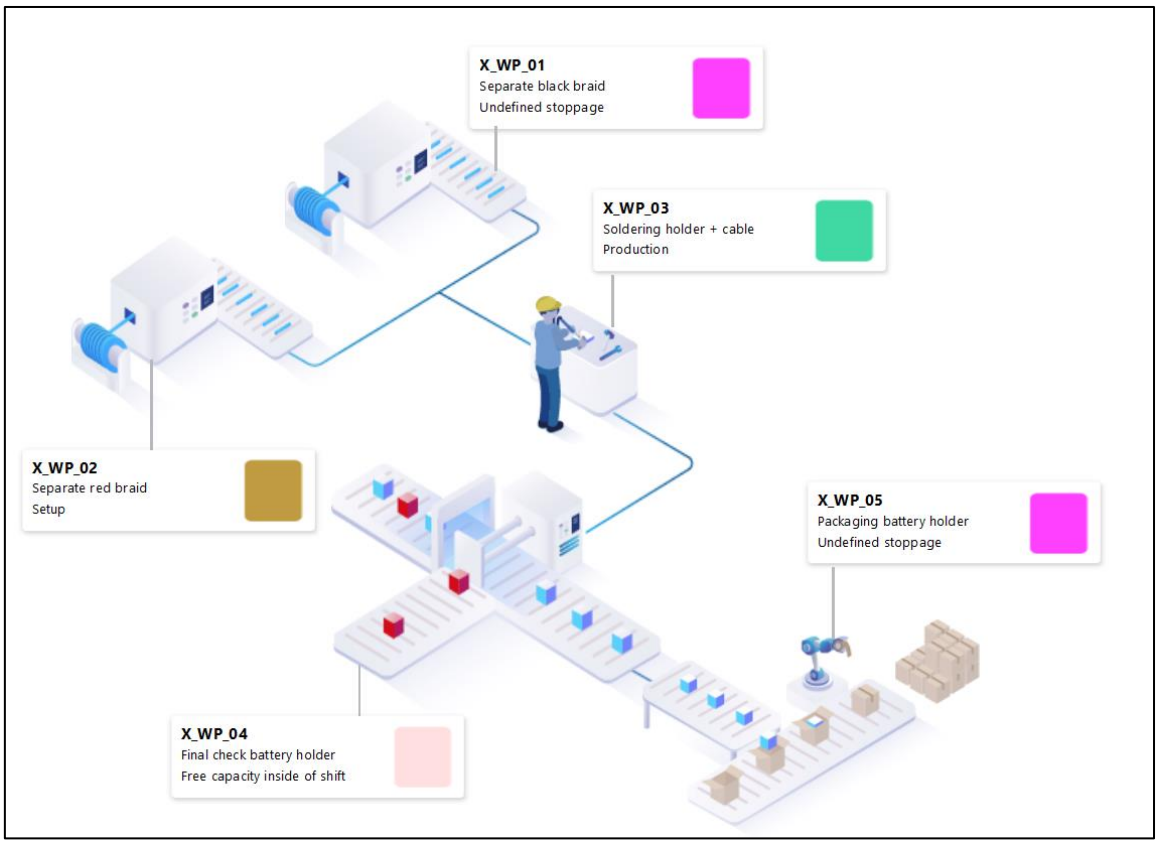


**Fig. 6: Visualization showing production facilities with workplaces**

# Annex

## Service and support

- (See also **FORCAM Special Terms and Conditions for SaaS**)
- FORCAM provides 24/7 support via a ticket system. Upon delivery, the customer receives the necessary access for this purpose.
- FORCAM pledges to comply with the Service Level Agreement (SLA) specified in the General Terms and Conditions with regard to service availability and support. The standard subscription contains the **BASIC** support plan.
- In accordance with the GTC, FORCAM shall be responsible for the operation of the services in the cloud and pledges to comply with the SLAs regulated in the general terms and conditions regarding the availability of the services up to the transfer point.
- The transfer point is when the data center is transferred to the Internet.
- The responsibility for the Internet traffic and the SLA, relating to Internet access, lies with the customer's Internet provider. From the point of transfer, FORCAM assumes no liability whatsoever in the event of network failure.
- The customer is responsible for a suitable and secure Internet access.
- FORCAM may make updates to the service at any time as part of the service operation. These will be announced and generally conducted as part of scheduled maintenance periods.
- Within the scope of operation, FORCAM ensures sufficient protection of the data and the services, performs backups, monitoring and appropriate notification (alerting).
- Customers shall not be entitled to any software customization of the service.

## Customer compliance obligations and limitations

Deviations from the defined agreements regarding the services to be provided will have a bearing on costs beyond the scope of the SaaS offering.
FORCAM retains the right to pass on any additional costs incurred for services and subsequent orders to the customer in accordance with the FORCAM price list, as well as to charge such costs after the order has been placed and the services have been rendered.

- The customer shall be responsible for installing the FORCAM I/O Controller in the control cabinet of the respective machine and for connecting it to the power supply (by skilled personnel, e.g. industrial electronics engineers).
- The customer shall provide the digital signals to be connected to the FORCAM I/O Controller and shall connect them (by skilled personnel) to the FORCAM I/O Controller based on the connection instructions provided. Any necessary coordination with the manufacturer of the machine is the responsibility of the customer.
- The local IT infrastructure must be provided by the customer (Internet up to the network connection on the machine). A LAN connection is required (RJ-45, 100 MBit). One network connection is required per machine. An existing and occupied connection can be used without any extension, as the FORCAM I/O Controller with 2 RJ-45 ports includes a network bridge.
- The customer must have a dedicated static IP address through which its production network can be reached on the Internet. If necessary, this must be requested from the Internet provider.
- It is not possible to connect the FORCAM I/O Controller via W-LAN, especially considering the poor signal quality of W-LAN in production environments.
- A network security (firewall) must be provided by the customer. FORCAM ensures the security of the EDGE gateway.
- Access to the EDGE Gateway from the Internet must be guaranteed 24/7 without interruption.
- The customer is responsible for a suitable and secure connection to the Internet.
- The customer is responsible for ensuring the necessary IT system requirements for the use of the system (e.g. necessary port access).
- The customer is responsible for building up knowledge on how to operate the system. FORCAM provides appropriate documentation and videos in the scope of delivery.

## Services not included

- The supply of hardware which is not explicitly listed in the scope of delivery or in the sales summary. The same applies to hardware which is necessary for the operation of FORCAM FORCE SAAS (e.g. for SFT and Office Clients, ethernet converters etc.).
- If necessary, upgrading the machines in terms of providing specific machine signals
- Any training and instruction measures that are not explicitly listed in the offer documentation
- Documentation material beyond the normal scope of the product
- Providing and configuring interfaces to third-party software, which are not explicitly listed in the offer documentation or in the service description.
- Providing software licenses which are not explicitly listed in the offer documentation or in the service description

## System requirements for SFTs and Office Client

### Hardware and operating system

- PC, touch PC, notebook or tablet
- Windows 10

### Production network

- 100 Mbit LAN/Ethernet with RJ-45 connections
- A network adapter per machine (already existing and occupied connection can be used without extension, as the FORCAM I/O Controller with 2 RJ-45 ports includes a network bridge)
- Internet connection with at least 16 Mbit

### Supported browsers

- Google Chrome
- Microsoft Edge with Chromium Engine

## Customer preparation for final commissioning

### Directly on the machines

- Providing the required hardware for the SFTs (see system requirements)
- Installing the FORCAM I/O Controller in the control cabinet of the respective machine and connecting it to the power supply system
- Preparing the signals on the machine side for connecting the I/O controller
- Connecting the I/O controllers and SFTs to the network

### Office or IT room

- Installing the EDGE Gateway in IT room. Connecting to the power grid as well as connecting to the production network and the Internet