



Factory acceptance test according to KRONES spe- cification

FAT (Factory Acceptance Test)
KRONES machines and lines

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1 Definition of factory acceptance test

A factory acceptance test is the acceptance test of a product at the manufacturer's location. The factory acceptance test is conducted jointly by the purchaser and contractor, or their authorised representatives. The aim is to verify that the machine/line has been assembled correctly in accordance with the specifications and works properly.

The acceptance test includes the following procedures:

- Check for completeness:
The machine or line is checked to ensure all its components are complete.
The test is based on the machine order document and, where appropriate, other changes agreed after the signing of the contract, if incorporated into the contract.
- The following tests can be carried out as part of the factory acceptance test:
 - Mechanical sequences
 - Electrical sequences
 - Software sequences
 - Simulations (e.g. Signals, pump function)
 - Visual tests:
 - Functional test:
The functional test determines if all of the agreed functions are provided and the final label decoration result conforms to the specified requirements. This is particularly important in order to detect damage occurred in house during transport and final assembly for example. The functional test is carried out partly on a random basis (e.g. for CIP programs).
- Completion of the factory acceptance test (FAT)
 - If the tests reveal no or only minor defects, the machine/line can be accepted.
 - If, on the other hand, defects have been identified that impair the function, the factory acceptance test can be carried out again after prior subsequent fulfilment (rectification of defects).
 - Alternatively, the purchaser may, at his own discretion, accept the machine/line in spite of the defects identified.
 - The factory acceptance test is concluded with a final review meeting with the customer during which the customer's further questions and remarks are discussed.
 - The factory acceptance test (FAT) ends with a mutual agreement (customer/supplier) that the machine can be delivered to the operating company.
 - Afterwards, an acceptance report is created which, among others documents possible defects.



It is not mandatory that all machine parts are installed as part of the FAT.

For organisational reasons and due to the complexity of the components, a complete, true-to-original installation of all components according to the customer layout is not possible or not planned. Therefore, specific machine parts are not installed as part of the FAT.

Examples:

- ▶ Machines with stand-alone machine guards, such as Sleevematic, modular labellers
- ▶ Machine parts which are delivered by drop shipping (e.g. tanks)
- ▶ Accessories provided directly in the packaging of the machine/line.
- ▶ If necessary, parts of the installation can be realised provisionally (e.g., connections/hose connections between components/modules).

2 Requirements and basic conditions

2.1 Purchaser and contractor

The purchaser defines the exact scope of the FAT when awarding the contract (e.g. the equipment which is to be subjected to an acceptance test during a test run in set-up speed).

As a rule, the set-up speed does not correspond to the rated speed as no recirculation is intended.

The contractor specifies the quantity and quality of the test material required for the test run and requests the material from the purchaser in good time prior to testing. The purchaser is responsible for assuring the timely delivery of the material to the contractor. If the test material is not delivered on schedule, the FAT may only be possible to a limited extent.

2.2 Standard scope of supply

- The standard scope of supply to be accepted includes the complete equipment that can be defined by the purchaser. If the customer has not made an appropriate selection, reference equipment is used for acceptance. Prerequisite is the provision of appropriate test material. If necessary, the contractor reserves the right to use replacement material.
- If the time schedule permits, additional tests (e.g. change-over to another type) may be carried out within the framework of the standard acceptance test.
- Krones defines the elements of the overall contract to be included in the factory acceptance test. For instance only the machine or, if possible, additional components connected to the machine, such as secondary machines, coding systems, label inspection units, preform feed unit, etc.
- Depending on the technology, certain machine/line components may not be installed for the FAT (e.g. cooler, high-pressure compressor, steaming tunnel for SleeveMatic, Linadry container dryer, homogenizer, tanks, agitators, certain OEM components).
- Some tests, (e.g. shrinking tests) can be carried out in the technical centre if booked in advance.
- Depending on the hall capacity, KRONES reserves the right to perform the factory acceptance test of block-synchronised machine designs without block synchronisation if necessary. To some extent, the use of Krones test racks is possible.
- Depending on the machine/line type, appropriate images/videos can be created as part of the acceptance test if necessary.
- Krones reserves the right to install the OEM machines/process units/components included in the scope of supply only if required from a technical viewpoint. An inspection or assessment of OEM machinery that is not installed is not included.

2.3 Time schedule, duration

- The factory acceptance test is usually conducted at an agreed day in a period between 08:00 a.m. and 04:00 p.m.. Deviations from this time frame are possible based on an individual arrangement and in compliance with working time legislation.
- The total duration of the acceptance in the production hall usually does not exceed 4 hours per machine, but may take longer under certain conditions and by arrangement.

2.4 Deviations from the standard

- Deviations from the scheduled test sequence or the scope of testing are only permitted with the consent of both parties.
- Malfunctions (e.g. containers toppling over on the bottle conveyor), shall not result in failure of the FAT.
- The FAT does not include functional testing of the secondary machinery provided by the customer.
- Label decoration faults due to the test material not conforming to the specifications are not subject to assessment. It is generally permissible for the machine manufacturer to furnish proof of such faults by performing test runs with proper test material.
- Requested changes to the contractually specified scope of supply shall not automatically result in the repetition of the FAT. In this case, KRONES reserves the right to check which additional costs may arise and if a repetition of the FAT may be necessary.
- A non-critical deviation in the accuracy away from the agreed limit values (e.g. labelling inaccuracy) shall not result in a failure of the FAT. The machine manufacturer must instead verify the agreed limit values during the course of the site acceptance test at the customer's location.
- All of the deviations must be documented with a description of the remedy for eliminating the deviation.
- All of the deviations must be released both by the purchaser and by the contractor.

2.5 Miscellaneous

- Taking your own pictures inside the assembly hall is only allowed if the contractor agrees to it.
- Inspection of the risk analysis
The purchaser is generally entitled to access the machine's risk assessment. This will be presented in German on request, but will not be issued. The request to view the risk analysis must be made in writing at least two weeks before the FAT is carried out.

3 Sequence and test contents

3.1 General procedure

The following describes the general procedure of a factory acceptance test.

- Introduction:
 - Presentation of the participants (provided that the customer is present)
 - Discussion of the agenda
- Inspection of the machine/line
 - Brief instruction on the machine/line and its method of operation
 - Explanation of any existing customised designs
- Static test
 - Review of the machine layout drawing
 - If provided: Joint inspection and assessment of the test material (preforms, containers, packs, labels, etc.) with regard to processability and possible manufacturing faults which might influence the test result.
 - Checking that the scope of delivery agreed in this contract is complete, considering the installed scope.
 - Random checking various components against the contractual specifications (such as manufacturers of purchased parts) or special requirements (special customer requests) regarding the design of the individual components.
 - Checking that the machine design complies with the order document, e.g. machine size, pitch, running direction, layout configuration, dimensions.
 - Random checking that the required certificates are provided in compliance with the country-specific legal guidelines (e.g. CE marking of machines installed in Europe).
- Dynamic test
 - Test run/test runs of the machine/line (depending on the technology with/without production).
 - For machines with various equipments: Execution of an equipment change-over provided that this is possible within the time listed under 2.3 Time schedule, duration [▶ 5].
Usually only examples of equipment change-overs can be shown.
 - Checking the machine's interfaces with secondary machinery or with existing line components.
 - Checking the safety devices (e.g. machine guards, EMERGENCY STOP switches, light curtains, points of danger).
- Final review meeting:
 - Final daily review meeting:
If the factory acceptance tests last several days, each day must end with a final daily review meeting during which the test points covered are summarised.
 - Concluding final review meeting:
The factory acceptance test is concluded with a final review meeting with the customer during which the customer's further questions and remarks are discussed.



Additional, technological-specific components of the factory acceptance test are described in the following chapters.

3.2 Stretch blow moulders

(blocked, unblocked)

The following points are deviating or have to be considered in addition to the points described in the chapter 3.1 General procedure [▶ 7]:

If a Krones preform feed system (Contifeed) is included in the scope of supply (no third-party preform feed system), it is usually used for the machine acceptance test. Under certain circumstances, however, a comparable Krones-owned in-house system can also be used.

Static test

- Checking that the machine design complies with the order document, e.g. machine pitch, process type and further equipments (quick-change systems, mould-change robot, special customer requests, etc.)
- When the customer is present, a type change-over can be shown by way of example. This includes the installation and removal of a mould at a blowing station and the installation and removal of a heating mandrel and a protective plate on the heating module of the machine.

Dynamic test

- Only empty containers are produced.
- A short production of containers including the presentation of the general machine control takes place. Afterwards, the produced containers can be submitted to visual inspection and to inspection for haptics.
- Furthermore, containers are produced for a duration of a minimum of 15 minutes.
- Re-verification of the achieved container specifications is not carried out during the machine acceptance test. However, visual samples can be produced and provided to take them along on request.

Bloc-specific information

- KRONES reserves the right to carry out the factory acceptance test of blocked machine designs in an unblocked state or to use KRONES own test racks.
- Filling only with non-carbonated, cold water

3.3 Filling and capping machines

The following points are deviating or have to be considered in addition to the points described in the chapter 3.1 General procedure [▶ 7]:

- All of the electrical safety devices are checked in the safety program.
- For warranty reasons, OEM can seamers with various diameters can only be demonstrated with the equipment set up at the factory.
- Customer-specific containers are filled with non-carbonated cold water at the factory. The fill level or the fill contents can therefore deviate from the final values.
- Due to temporary infeed and discharge conveyors, only a limited number of containers (about 10-20 containers) can be filled and capped.
- As provisional conveyors at the machine infeed and discharge are not lubricated for operation, this can have adverse effects on container handling (scratches, damage to the containers, etc.).
- Guidance and handling parts have been preset and aligned for the factory acceptance test. Fine adjustment of customer object handling (bottle, can, cap, etc.) is done on site. Damage to and scratches on customer objects can therefore not be ruled out during the demonstration of the factory acceptance test.

3.4 Labellers

The following points are deviating or have to be considered in addition to the points described in the chapter 3.1 General procedure [▶ 7]:

Static test

- Checking that the machine design complies with the order document, e.g. machine size, pitch, running direction, layout configuration, number of labelling stations and dimensions.

Dynamic test

- Machine test run without production at nominal speed, simulation of machine malfunctions, alarms and resetting/acknowledging the alarm.
- Machine test run with production at set-up speed (duration depending on the test set-up options) and simulation of an EMERGENCY STOP followed by a restart.
- Joint assessment of the label decoration result* with regard to machine function, label position (application height and label orientation) and label decoration quality.

*) The shrinking tunnels of sleeve applicators are usually not installed in the test set-up. The expected shrinking result can be checked in a separate shrink test at the Krones technical centre.

3.5 Inspectors

The following points are deviating or have to be considered in addition to the points described in the chapter 3.1 General procedure [▶ 7]:

3.5.1 K735/K774 Linatronic

- Machine test run without production at set-up speed, simulation of machine malfunctions, alarms and resetting/acknowledging the alarm.
- Machine test run with production at set-up speed (duration depending on the test set-up options) and simulation of an EMERGENCY STOP followed by a restart.
- Reconfiguration of machines with multiple configuration variants.

3.5.2 K731/K761/K778 Checkmat

- Machine test run without production at set-up/nominal speed of lead machine, simulation of machine malfunctions, alarms and resetting/acknowledging the alarm.
- Functional verification by performing short test runs (approx. 10 containers/3 packs each) with the agreed equipment.
- Reconfiguration of machines with multiple configuration variants.

3.5.3 K752 Integrated Checkmat

- Lead machine test run without production at nominal speed, simulation of machine malfunctions, alarms and resetting/acknowledging the alarm.
- Functional verification by performing short test runs (approx. 10 customer objects each) with the agreed equipment.
- Equipment change-over for machines with several equipment variants, provided this is possible in one day.

3.5.4 K704 Sekamat


- Machine test run without production at set-up speed, simulation of machine malfunctions, alarms and resetting/acknowledging the alarm.
- Functional verification by performing short test runs (approx. 10 containers each) with the agreed equipment.
- Reconfiguration of machines with multiple configuration variants.

3.5.5 K709 Cantronic

- Machine test run without production at set-up speed, simulation of machine malfunctions, alarms and resetting/acknowledging the alarm.
- Functional verification by performing short test runs (approx. 10 containers each) with the agreed equipment.
- Reconfiguration of machines with multiple configuration variants.

3.5.6 K719/K759 Toptronic, K775 Rotocheck

- Machine test run without production at nominal speed, simulation of machine malfunctions, alarms and resetting/acknowledging the alarm.



Sequence and test contents

- Machine test run with production at set-up speed (duration depending on the test set-up options) and simulation of an EMERGENCY STOP followed by a restart.
- Equipment change-over for machines with several equipment variants, provided this is possible in one day.

3.6 Packers and palletisers

The following points are deviating or have to be considered in addition to the points described in the chapter 3.1 General procedure [▶ 7]:

- Electronic safety components are installed provisionally.
- For a standard FAT, no container feeds are installed in the packer for non-returnables in front of the machine and shrinking tunnel.
- No top discharge will be installed for the Pressant Universal 1A-0143 sweep-off depalletiser.
- For palletisers with a top feed, this is provided at ground level. These components are only delivered onto the installation site and installed there.

Dynamic test

- Machine test run without production at nominal speed, simulation of machine malfunctions, alarms and resetting/acknowledging the alarm.
- Test run of the machine with production in set-up speed and simulation of an EMERGENCY STOP with subsequent restart. The possible duration is limited by the circumstances of the test set-up. Without special measures resulting in additional costs, these are approx. 2 layers at the palletiser, 6 packs in the packer for non-returnables and approximately one block length in the packer for non-returnables.
- Joint assessment of the result in terms of machine function and quality.

3.7 Process technology systems

The following points are deviating or have to be considered in addition to the points described in the chapter 3.1 General procedure [▶ 7]:

- Explanation of the process technology, electrical and mechanical functions based on the piping and instrumentation diagram (P&ID)
- Visual inspection of the control cabinets

3.8 Washers

The following acceptance test stages are distinguished for the acceptance test in the Flensburg plant:

1. Acceptance test stage 1: Inspection of the current status
 - This applies to all machine types.
 - Inspection of the machine/module in the current assembly condition.
2. Acceptance test stage 2: Acceptance test after definition of the test run
3. Acceptance test stage 3: Acceptance test according to customer definition
 - A specification of the customer acceptance test stage 3 must be defined for the order notification so that the throughput and planned times can be taken into account accordingly.

Note:

Mechanical components

- Machines are fully equipped, if necessary modularly equipped.

Electrical System

- Machines are fully wired, if necessary modularly wired and tested.

Comment

- Machines are not fully operable, the function can only partially be checked.

The following section describes the sequence of the acceptance test according to test run definition (acceptance test stage 2) for the individual machine types.

3.8.1 Single-end machine type E2

Mechanical components

- Test run with sample bottles. All settings are preset as far as possible.
- The chain has been threaded and all bottle carriers are mounted.

Electrical System

- Machine is wired and connected as far as possible.
- Software and hardware check is performed on the machine.
- All functions (as far as possible) are tested and the components are preset.

Comment

- No water test run. The jetting system is pre-set with test prods.
- Depending on the scope of supply, a dosing pump, a fume/H₂ extraction system and a label press must be provided for the customer acceptance test in addition to the mounted components.
- The above mentioned indications might differ due to a special ingress and the transport situation.

3.8.2 Single-end washer type E3 and E4, one-piece

Mechanical components

- Test run with sample bottles.
- The chain is installed and the test is carried out with a part of the bottle carriers.

Electrical System

- Machine is wired and connected as far as possible.
- Software and hardware check is performed on the control cabinet.
- All functions (as far as possible) are tested and the components are preset.

Comment

- No water test run. The jetting system is pre-set with test prods.

- Depending on the scope of supply, a dosing pump, a bottle carrier, a fume/H₂ extraction system and a label press must be provided for the customer acceptance test in addition to the mounted components.
- The above mentioned indications might differ due to a special ingress and the transport situation.

3.8.3 Single-end washer type E3 and E4, multi-part

Mechanical components

- Test run with sample bottles.
- Chain has been installed. The test is carried out with a part of the bottle carriers.
- The chain is removed again for transport as it consists of several parts.

Electrical System

- Machine is pre-installed in modules in the factory.
- Software and hardware check is performed on the control cabinet.
- The I/O test is carried out at each machine module
- All functions (as far as possible) are tested and the components are preset.
- For individual functions, the situations must be simulated.

Comment

- No water test run. The jetting system is pre-set with test prods.
- Depending on the scope of supply, a dosing pump, a bottle carrier, a fume/H₂ extraction system and a label press must be provided for the customer acceptance test in addition to the mounted components.
- The above mentioned indications might differ due to a special ingress and the transport situation.

3.8.4 Double-end machines, all types

Mechanical components

- Test run with sample bottles.
- Chain has been installed. The test is carried out with a part of the bottle carriers.
- Because of the multiple parts, the chain is disassembled before transport.

Electrical System

- Machine is pre-installed in modules in the factory.
- Software and hardware check is performed on the control cabinet.
- The I/O test is carried out at each machine module.
- All functions (as far as possible) are tested and the components are preset.
- For individual functions, the situations must be simulated.

Comment

- No water test run. The jetting system is pre-set with test prods.
- Depending on the scope of supply, a dosing pump, a bottle carrier, a fume/H₂ extraction system and a label press must be provided for the customer acceptance test in addition to the mounted components.
- The above mentioned indications might differ due to a special ingress and the transport situation.

3.8.5 R Lavatec rinser

Mechanical components

- Test run with sample bottles.
- The chain has been threaded and all bottle carriers are mounted.

Electrical System

- Machine is wired and connected as far as possible.
- Software and hardware check is performed on the machine.
- All functions (as far as possible) are tested and the components are preset.

Comment

- No water test run. The jetting system is pre-set with test prods.
- Depending on the scope of supply, a dosing pump, a bottle carrier, a fume/H₂ extraction system and a label press must be provided for the customer acceptance test in addition to the mounted components.
- The above mentioned indications might differ due to a special ingress and the transport situation.

3.8.6 KGW Linajet

Mechanical components

- Complete test run with water and sample containers. All possible settings are carried out. Pumps are tested and jetting systems are preset.

Electrical System

- Machine is completely wired and connected.
- Software and hardware check is performed on the machine.
- All functions are tested and the components are preset.

3.8.7 KGW Linajet Pro

Mechanical components

- Complete test run with water and sample containers. All possible settings are carried out. Pumps are tested and jetting systems are preset.

Electrical System

- Machine is completely wired and connected.
- Software and hardware check is performed on the machine.
- All functions are tested and the components are preset.

3.9 Product treatment machines

The following acceptance test stages are distinguished for the acceptance test in the Flensburg plant:

1. Acceptance test stage 1: Inspection of the current status
 - This applies to all machine types.
 - Inspection of the machine/module in the current assembly condition.
2. Acceptance test stage 2: Acceptance test after definition of the test run
3. Acceptance test stage 3: Acceptance test according to customer definition
 - A specification of the customer acceptance test stage 3 must be defined for the order notification so that the throughput and planned times can be taken into account accordingly.

Note:

Mechanical components

- Machines are fully equipped, if necessary modularly equipped. Assembly limits are defined by the external dimensions (container-compatible).

Comment

- Machines are not operable for a test run, the functions cannot be checked.

The following section describes the sequence of the acceptance test according to test run definition (acceptance test stage 2) for the individual machine types.

3.9.1 LinaFlex pasteuriser multi-part

Mechanical components

- Infeed and discharge fully equipped without electrical pre-installation.
- Modules fully equipped without electrical pre-installation.
- Add-on parts depending on the delivery or packaging limits.
- The pasteuriser has not been not fully assembled, it is inspected in the ready-to-ship condition.

Electrical System

- The machine is not wired.
- Software and hardware check is performed on the control cabinet.
- All functions (as far as possible) are tested and the components are preset.
- For individual functions, the situations must be simulated.

3.9.2 LinaCool cooler, multi-part

Mechanical components

- Infeed and discharge fully equipped without electrical pre-installation.
- Modules fully equipped without electrical pre-installation.
- Add-on parts depending on the delivery or packaging limits.
- The cooler has not been fully assembled, it is inspected in the ready-to-ship condition.

Electrical system

- The machine is not wired.
- Software and hardware check is performed on the control cabinet.
- All functions (as far as possible) are tested and the components are preset.
- For individual functions, the situations must be simulated.

3.9.3 LinaTherm heater, one-piece

Mechanical components

- Fully equipped including full electrical installation (exception: stand-alone modules).

Electrical System

- Electrical test run on the machine, setting of all electrical components (as far as possible).

Comment

- No water test run, machine is connected, control cabinet on the machine.
- If stand-alone control cabinets are used, there is no test run on the machine, connection lines are returned to the machine.

3.9.4 LinaFlex Compact pasteuriser, one-piece

Mechanical components

- Fully equipped including full electrical installation (exception: stand-alone modules).

Electrical System

- Electrical test run on the machine, setting of all electrical components (as far as possible).

Comment

- No water test run, machine is connected, control cabinet on the machine.

- If stand-alone control cabinets are used, there is no test run on the machine, connection lines are returned to the machine.

3.9.5 Vapo Chill, multi-part

Mechanical components

- Components fully equipped without electrical pre-installation.
- The add-on parts are mounted according to the delivery or packaging status of the machine. The cooling tower has not been fully assembled, it is inspected in the ready-to-ship condition.

Electrical System

- No electrical installation is provided on the machine.
- Software and hardware check is performed on the control cabinet.
- All functions are tested and the components are preset.
- For individual functions, the situations must be simulated.

3.10 Modules of Recycling Solutions

For the modules of Recycling Solutions, only an inspection of the current state is possible.

4 Options for the FAT

The following options are possible for carrying out the FAT:

- Remote FAT according to Krones specification
The remote FAT is carried out according to a fixed sequence (standard agenda) and live camera guide on the machine and is transmitted via an appropriate online tool. The duration is approximately 2 to 3 hours. At the end of the remote FAT, a discussion of open issues is planned.
- Remote FAT according to customer specification
The remote FAT is carried out with live camera guide and is transmitted via an appropriate online tool. The scope of functions depends on the customer specifications.
- Video recording
Here, it is possible that KRONES makes a video (duration approx. 2-3 minutes) of the machine acceptance test. The video shows images of the machine taken from different angles during production.
- Photography
Krones documents the machine acceptance with additional photos
- Video recording and photo recordings including a conversion
Machine acceptance, additionally documented by video and photo recording, including a conversion
- FAT according to Krones standard
Machine acceptance test with customer, according to KRONES specifications and standard specifications.
In order to fulfil the agreed acceptance criteria during the acceptance of a work, compliance with the procedure and inspection content is a prerequisite.
- FAT according to customer specification
Machine acceptance with the customer present, according to customer specification

Additional costs may arise depending on the selected option/s.

Glossary

Dynamic test

Test steps which are carried out during FAT while the machine/line is in operation.

FAT

The factory acceptance test is a acceptance milestone where the main functionalities of the scope of supply are tested based on the mutually agreed requirements specification and test scenarios.

Static test

Test steps which are carried out during FAT with the machine/line at a standstill.