



Training program

fpt robots

with KUKA robot controls

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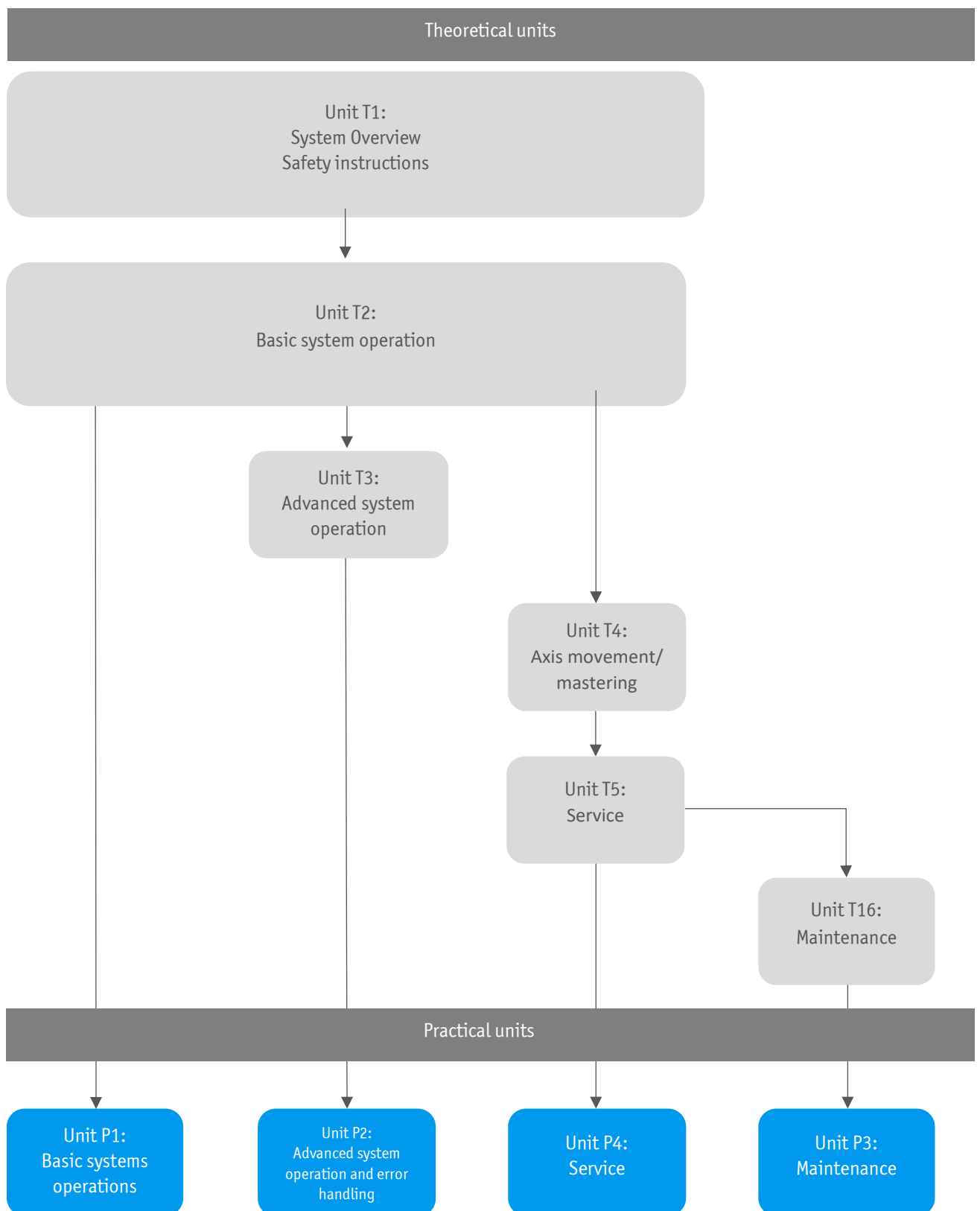
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We have checked the content of this documentation for conformity with the hardware and software described. Nevertheless, discrepancies cannot be precluded, for which reason we are not able to guarantee total conformity. However, the information in this document is checked on a regular basis and necessary corrections will be incorporated in subsequent editions.

Subject to technical alterations without an effect on the function.

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1. Overview



The FPT training program is structured according to standalone training modules which can be combined individually and tailored to the customer-specific requirements.

Interested persons can also attend advanced courses. Please ask your local service representative for further details.

1.1 General requirements

In addition to the requirements specified for each training module, understanding the German or English language is a requirement.

Other languages are available on request, each with the assistance of an interpreter.

1.2 Maximum number of participants

For each theoretical training unit, we suggest the number of participants not to be more than six. The maximum number of participants is limited to **eight** persons.

For each practical training unit the number of participants is limited to **four** persons.

1.3 Requirements to be met by the customer

Training facilities:

- / Room suitable for theoretical units
- / Computer projector

Documentation folder

Training is conducted on the basis of the technical documentation supplied to the customer for the relevant equipment.

This documentation has to be made available by the customer for the duration of the training (in paper form).

Remote-Access

Over the duration of theoretical units the system has to be available via remote desktop for demonstration purposes. Production can continue as usual, with minor interruptions due to presentations of the system and its interface to the attendees.

System availability

Unless agreed differently the robot system has to be fully operational and available for training purposes during every practical training unit. No production has to take place during this time.

1.4 Training documentation

The manuals used in the training are part of a system. They are available in printed and electronic form. These are to be provided for the training period.

1.5 Completion of a course

Every course is completed with a final exam.

Every participant receives a certificate confirming attendance or successful attendance, as applicable.

2. Theoretical training units

2.1 Unit T1: System overview and safety instructions – Duration: 4 h

Objectives	Familiarization with the system and its function Knowing the sources of hazards and the safety instructions for working with the system
Target group	All persons with direct contact with the FPT robot system
Requirements	Basic understanding of the customer-specific process (palletizing, machine feeding, ...)
Contents	<ul style="list-style-type: none">/ Structure of the robot system/ Function of the customer-specific process/ Safety instructions for working with the robot system/ Demonstrating the points of danger on the robot and the modules/ Test operation with safety doors open (setup mode), function of the confirmation button/ Existing safety elements (emergency stop button, light guard, muting function, roller switch, door switch)/ Function of the modules/ Particular aspects in handling the modules used/ Structure and contents of the documentation

2.2 Unit T2: Basic system operation – Duration: 4 h

Objectives	Acquiring all the necessary skills to be able to operate the FPT robot cell.
Target group	Operators
Requirements	<ul style="list-style-type: none">/ Training unit T1 attended/ Basic understanding of the customer-specific process (palletizing, machine feeding,...)
Contents	<ul style="list-style-type: none">/ Overview of the controls and indicators of a typical FPT robot cell/ Introduction into the FPT user interface/ Typical operator actions: Starting up/shutting down the robot cell, Preparing (setting up)/starting/stopping/resuming/aborting (system reset) a production job/ Eliminating process-related malfunctions (minor problems that may occur during normal production operations)/ Recognizing and diagnosing alarms on the control panel and technically correct action/ Changing the operating mode (manual/automatic mode)/ Using the manual functions of the modules in manual mode:/ Actuator control, home position travels, maintenance positions

2.3 Unit T3: Advanced system operation – Duration: 4 h

Objectives	Advanced skills in using the robot system, learning advanced operating functions for alarm diagnosis, optimization and error handling.
Target group	Advanced operators, maintenance personnel
Requirements	<ul style="list-style-type: none">/ Sound school education (basic mathematical-geometrical understanding)/ Training units T1 and T2 attended
Contents	<ul style="list-style-type: none">/ Introduction into the user interface of FlexOp in expert mode (advanced user):<ul style="list-style-type: none">- Advanced parameters- Advanced diagnostics (logfile, key figures)/ Introduction into the control elements of the KRC user interface:<ul style="list-style-type: none">- Changing between user interface and FlexOP- Structure of the user interface- Program selection & deselection- Screen windows (inputs/outputs, actual position)- Handling the KRC messages- KRC operating modes (keylock switch & operating mode table, function of the SoftPLC)- Function of the confirmation buttons

2.4 Unit T4: Axis movement/mastering – Duration: 4 h

Objectives	Advanced skills in using the robot system Learning advanced operating functions for error handling and maintenance (manual processes, re-teaching, axis mastering, ...)
Target group	Advanced operators, setters, maintenance personnel
Requirements	<ul style="list-style-type: none">/ Sound school education (basic mathematical-geometrical understanding)/ Training units T1 and T2 attended/ Own axis calibration set
Contents	<p>Introduction into the control elements of the KRC user interface:</p> <ul style="list-style-type: none">/ Changing between user interface and FlexOP/ Structure of the user interface/ Program selection & deselection/ Screen windows (inputs/outputs, actual position)/ Handling the KRC messages/ KRC operating modes (keylock switch & operating mode table, function of the SoftPLC)/ Function of the confirmation buttons <p>Manual operation of robot axes, clearing the axes:</p> <ul style="list-style-type: none">/ Basic knowledge of various coordinate systems and their use in the controller/ Work envelope monitoring <p>Performing simple start-up tasks:</p> <ul style="list-style-type: none">/ Initial calibration using the EMT/ Tool & base measurements <p>Verification and correction of target positions by executing teach programs</p>

2.5 Unit T5: Service – Duration: 4h

Objectives	Acquiring basic skills for proper maintenance of the components.
Target group	Setters, maintenance personnel
Requirements	<ul style="list-style-type: none">/ Training units 1, 2 and 4 attended/ Optional training unit T3 attended/ Good overall knowledge of
Contents	<ul style="list-style-type: none">/ Function of the system and modules/ Structure and contents of the maintenance documentation/ Using the spare parts and wear parts list/ Using the maintenance schedule/ Using the service manuals/ System components/ Visual examination of moving energy chains/ Overview of the pneumatic layout and parts/ Pneumatic default settings/ Examination of drive trains (belt tension, toothed rack lash, greasing)/ Practical exercise/ Preemptive service and maintenance protocol

2.6 Unit T6: Maintenance – Duration ca. 4h

Objectives	Acquiring advanced skills for proper maintenance and troubleshooting for electrical and mechanical components.
Target group	Maintenance personnel
Requirements	<ul style="list-style-type: none">/ Training units T1, T2, T4 and T5 attended/ Optionally training unit T3 attended/ Qualified mechanical and/or electrical
Contents	<ul style="list-style-type: none">/ Sensor setup and function/ Review of the electrical diagrams and descriptions of the electrical components/ Function of the individual components of the computer hardware and the drive system/ Maintenance work on the control cabinet/ Quick fault detection/ Review of the pneumatic diagrams and descriptions of the mechanical components/ Performing sample repair jobs: Dismounting guide carriages, replacing toothed belts, replacing the motor unit incl. drive shaft, replacing complete cable assemblies and the external power supply/ Mechanical maintenance work on the gantry robot (adjusting the belt tension, adjusting the toothed rack play, lubrication, ...)

Depending on the size of the system this unit is required between 1 and 3 times to cover all the aspects.

3. Practical training units

3.1 Unit P1: Basic system operation – Duration ca. 4h

Objectives	Practical training for the units T1 & T2. Acquiring all the necessary skills to be able to perform the basic operations to operate the FPT robot cell.
Target group	Operators
Requirements	<ul style="list-style-type: none">/ Training unit T1 and T2 attended/ Basic understanding of the customer-specific process (palletizing, machine feeding,...)
Contents	<ul style="list-style-type: none">/ Overview of the controls and indicators of a typical FPT robot cell/ Introduction into the FPT user interface/ Typical operator actions: Starting up/shutting down the robot cell, Preparing (setting up)/starting/stopping/resuming/aborting (system reset) a production job/ Eliminating process-related malfunctions (minor problems that may occur during normal production operations) like acknowledging and processing process related information messages/ Recognizing and diagnosing alarms on the control panel and technically correct action/ Changing the operating mode (manual/automatic mode)/ Using the manual functions of the modules in manual mode/ Actuator control, home position travels, maintenance positions

3.2 Unit P2: Advanced system operation and error handling – Duration 4h

Objectives	Practical training exercise for the training unit T3, Advanced skills in using the robot system, learning advanced operating functions for alarm diagnosis, optimization and error handling.
Target group	Advanced operators, maintenance personnel
Requirements	<ul style="list-style-type: none">/ Sound school education (basic mathematical-geometrical understanding)/ Training units T1, T2 and P1 attended
Contents	<p>Introduction into the user interface of FlexOp in expert mode (advanced user):</p> <ul style="list-style-type: none">/ Advanced parameters/ Advanced diagnostics (logfile, key figures) <p>Introduction into the control elements of the KRC user interface:</p> <ul style="list-style-type: none">/ Changing between user interface and FlexOP/ Structure of the user interface/ Program selection & deselection/ Screen windows (inputs/outputs, actual position)/ Handling the KRC messages/ KRC operating modes (keylock switch & operating mode table, function of the SoftPLC)/ Function of the confirmation buttons

3.3 Unit P3: Service – Duration 4h

Objectives	Practical training unit for unit T5. Acquiring basic skills for proper service of the components.
Target group	Setters, maintenance personnel
Requirements	<ul style="list-style-type: none">/ Training units T1, T2 and T4 attended/ Optional training unit T3 attended/ Good overall knowledge of mechanics
Contents	<ul style="list-style-type: none">/ Function of the system and modules/ Practical example off using the maintenance documentation, including<ul style="list-style-type: none">- Using the spare parts and wear parts list- Using the maintenance schedule- Using the service manuals/ System components and exemplary check of their manuals./ Visual examination of moving energy chains/ Overview of the pneumatic layout and parts/ Pneumatic default settings/ Examination of drive trains (belt tension, toothed rack lash, greasing), not including actual maintenance/ Preemptive service and maintenance protocol

3.4 Unit P4: Maintenance – Duration 4h

Objectives	Practical training unit for unit T6. Acquiring advanced skills for proper maintenance and troubleshooting for electrical and mechanical components.
Target group	Maintenance personnel
Requirements	<ul style="list-style-type: none">/ Training units T1, T2, T4, T5, P3 attended/ Optionally training unit 3 attended/ Qualified mechanical and/or electrical
Contents	<ul style="list-style-type: none">/ Sensor setup and function/ Review of the electrical diagrams and descriptions of the electrical components/ Function of the individual components of the computer hardware and the drive system/ Maintenance work on the control cabinet/ Quick fault detection/ Review of the pneumatic diagrams and descriptions of the mechanical components/ Performing sample repair jobs: Dismounting guide carriages, replacing toothed belts, replacing the motor unit incl. drive shaft, replacing complete cable assemblies and the external power supply/ Mechanical maintenance work on the gantry robot (adjusting the belt tension, adjusting the toothed rack play, lubrication, ...)/ All maintenance work will only be conducted if the contractor is actually required to perform these actions

Depending on the size of the system this unit is required between 1 and 3 times to cover all the aspects.