



# Training programme for FPT plants and technologies

## **Original operating manual**

The German version of this document is the original manual.

## **Translation of the original operating manual**

All versions of this document which are not in German are translations of the original manual.

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It may be possible to execute further functions that are not described in this documentation. However, there is no entitlement to these functions in the case of a replacement or in the event of service work.

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 complete conformity. However, the information in this documentation 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 SCHEMATIC OVERVIEW OF THE TRAINING PROGRAMME

User groups Notes and descriptions of the required qualification of the user groups can be found in chapter "1-3 Safety" in the documentation for the FPT robot cell and/or automation system.

Training modules \ User groups	Cleaning staff	Operators Users	Setters Experts	Maintenance staff	Service staff	Application programmers
(T1010) Safety briefing	●	●	●	●	●	●
(T1011) Plant overview	○	●	●	●	●	●
(T1020) Operation 1: Basics		●	●	●	●	●
(T1021) Operation 2: Advanced		○	●		●	○
(T1030) Facility 1: Basics			●	●	●	●
(T1031) Facility 2: Advanced			○		○	○
(T1040) Icon programming 1: Basics			○		○	●
(T1041) Icon Programming 2: Advanced						○
(T1050) Maintenance 1: Basics				●	●	
(T1051) Maintenance 2: Advanced				○	○	
(T1060) Plant service 1: Basics					●	
(T1061) Plant service 2: Advanced					○	

- Required training section for the respective employee
- Optional training section for the respective employee

Figure 1: Programme overview

## 2 GENERAL INFORMATION

### 2.1 Contents

The content of the individual modules is described in the module overview in *chapter 3*. The specified training contents relate to the latest version of the FPT user interface.

### 2.2 Languages

An understanding of German or English as well as the available languages for operation and the documentation is required. Other languages are available with the assistance of an interpreter on request.

### 2.3 Number of participants

For the training modules, we recommend a maximum class size of four participants.

### 2.4 Training venue

Plant-specific training can only be carried out at the respective automation system or robot cell. General training courses on how to use the user interface (without project-specific features) can be held at the FPT Robotik GmbH & Co. KG training centre.

### 2.5 Requirements for the training venue

To be provided by the customer:

- /// Suitable room for the theoretical training sections
- /// Projector

### 2.6 System availability

Unless otherwise agreed, the FPT robot cell and/or automation system must be fully operational for the entire duration of the training. No live operation can take place during this time.

### 2.7 Entry requirements for each training module

Each training module has its own prerequisites, which are listed in the individual descriptions.

### 2.8 Technical requirements

When using a simulation programme (FlexOPSim) in a training course, the participant needs a laptop with a Windows operating system.

## 2.9 Training documents

The training is carried out on the basis of the technical documentation supplied to the customer with the plant. This documentation is available in printed and electronic form. It must be made available for the training period.

## 2.10 Implementation

The training is conducted alternately in theory and practice. Depending on the level of knowledge of the participants, one part may predominate. The training is divided into teaching units (TU). A teaching unit is 45 minutes, and a training day consists of a maximum of eight teaching units.

## 2.11 Seminar conclusion

Each training course or workshop can be concluded with a final test. At the end of the seminar, each participant receives a certificate attesting to their participation.

## 2.12 Individual workshops

We help you implement individual training modules based on your needs. Send us an enquiry and we will provide you with a quotation for this.

## 3 OVERVIEW OF THE TRAINING MODULES

### 3.1 T1010 Safety instruction

Objectives	Pointing out and recognising sources of danger and safety regulations
Target group	All persons who come into direct contact with the FPT robot cells and automation systems
Requirements	/// None
Contents	<ul style="list-style-type: none"> <li>/// Safety instructions</li> <li>/// Disclaimer</li> <li>/// Important notes, Safety symbols</li> <li>/// General safety regulations</li> <li>/// Danger area</li> <li>/// How safety devices work</li> <li>/// Dealing with safety equipment</li> <li>/// Information on installations, extensions and conversions</li> <li>/// Manipulation of safety devices</li> <li>/// Safety devices on the control panel</li> <li>/// Important notes on operation</li> </ul>
Implementation date	Before start of production
Maximum number of participants	4 persons
Duration	2-4 teaching units

## 3.2 T1011 Plant overview

Objectives	Design of FPT robot cells and automation systems; identification and recognition of system-specific sources of danger
Target group	All persons who come into direct contact with the FPT robot cells and automation systems
Requirements	/// Basic understanding of technology
Contents	<ul style="list-style-type: none"> <li>/// Structure and content of the documentation</li> <li>/// Design of the robot system or automation system</li> <li>/// Designations and names of the plant (type plate, etc.)</li> <li>/// How the customised process works</li> <li>/// Operating devices and panels</li> <li>/// Safety instructions when handling the robot system</li> <li>/// Pointing out the danger spots of the robot</li> <li>/// Pointing out the danger spots of the assemblies</li> <li>/// Existing safety elements (emergency stop button, light grid, muting function, roller switch, door switch)</li> </ul>
Implementation date	Before start of production
Maximum number of participants	4 persons
Duration	2-6 teaching units

### 3.3 T1020 Operation 1: Basics

Objectives	Learning the necessary operating skills
Target group	Operator/user, setter/expert; maintenance and service staff, application programmer
Requirements	<ul style="list-style-type: none"> <li>/// Training units: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety briefing</li> <li><input checked="" type="checkbox"/> Plant overview</li> </ul> </li> <li>/// Basic understanding of technology</li> </ul>
Contents	<ul style="list-style-type: none"> <li>/// Overview of the operating elements of FPT robot cells and automation systems</li> <li>/// Operating actions: FPT robot cells and automation systems (start up/shut down)</li> <li>/// How the customised process works</li> <li>/// Operation of the plant (control panels and how they work)</li> <li>/// Introduction to the FPT user interface</li> <li>/// How the assemblies used work</li> <li>/// Operation in automatic mode</li> <li>/// Operation in manual mode</li> <li>/// Operation in production (preparation/start/stop/abort)</li> <li>/// Remedying process-related faults that may occur during normal live operation</li> </ul>
Implementation date	Before start of production
Maximum number of participants	4 persons
Duration	4-8 teaching units

## 3.4 T1021 Operation 2: Advanced

Objectives	Acquire the skills for advanced operating
Target group	Optional operator/user, setter/expert, maintenance staff and application programmer
Requirements	<ul style="list-style-type: none"> <li>/// Training units: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety briefing</li> <li><input checked="" type="checkbox"/> Plant overview</li> <li><input checked="" type="checkbox"/> Operation basics</li> </ul> </li> </ul>
Contents	<p>Introduction to the FPT user interface controls for advanced users:</p> <ul style="list-style-type: none"> <li>/// Refresher on the how the customised process works</li> <li>/// Special features, setting options for the customised process</li> <li>/// Communication and its interfaces with other trades</li> <li>/// Special features in handling the assemblies used</li> <li>/// Message diagnosis and advanced troubleshooting</li> <li>/// Applying the manual functions of the assemblies in manual mode: Actuator control and sensor diagnostics</li> <li>/// Function of the enabling buttons</li> <li>/// Diagnostic reporting options (KRC-Diag)</li> </ul>
Implementation date	During the start of production
Maximum number of participants	4 persons
Duration	4-8 teaching units

## 3.5 T1030 Set-up 1: Basics

Objective	Learning about set-up functions as well as extended diagnostic options
Target group	Setter/expert, maintenance and service staff, application programmer
Requirements	<ul style="list-style-type: none"> <li>/// Basic mathematical and geometric understanding</li> <li>/// Training units: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety briefing</li> <li><input checked="" type="checkbox"/> Plant overview</li> <li><input checked="" type="checkbox"/> Operation basics</li> </ul> </li> </ul>
Contents	<ul style="list-style-type: none"> <li>/// Manual operation with open safety guards (set-up mode)</li> <li>/// Teaching the basic knowledge of different coordinate systems and their use in the control system</li> <li>/// Manual movement of the robot axes and freeing the axes: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Freeing the robot, axes individually</li> <li><input checked="" type="checkbox"/> Freeing the robot with linear movements</li> <li><input checked="" type="checkbox"/> Freeing workspace monitoring</li> <li><input checked="" type="checkbox"/> Simple commissioning tasks</li> <li><input checked="" type="checkbox"/> Free-turning device</li> </ul> </li> <li>/// TeachIn <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Selecting, starting and running teach programmes</li> <li><input checked="" type="checkbox"/> Tool &amp; base measurements</li> <li><input checked="" type="checkbox"/> Checking and correcting target positions by running TeachIn programmes</li> </ul> </li> </ul>
Implementation date	Before the start of production or with the first inspection/maintenance (maintenance and service staff)
Maximum number of participants	4 persons
Duration	2-6 teaching units

## 3.6 T1031 Set-up 2: Advanced

Objectives	Acquiring advanced skills to set up safely
Target group	Application programmer Optional: Setter/expert and maintenance staff
Requirements	<ul style="list-style-type: none"> <li>/// Training units: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety briefing</li> <li><input checked="" type="checkbox"/> Plant overview</li> <li><input checked="" type="checkbox"/> Operation basics</li> <li><input checked="" type="checkbox"/> Set-up basics</li> </ul> </li> </ul>
Contents	<ul style="list-style-type: none"> <li>/// Adjustment with a suitable adjustment set</li> <li>/// Extended diagnostic options (log files, key figures, etc.)</li> </ul> <p>Introduction to further operating elements of the FPT user interface:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Switching between FPT user interface and KUKA HMI</li> <li><input checked="" type="checkbox"/> Structure of the HMI</li> <li><input checked="" type="checkbox"/> Programme selection and deselection</li> <li><input checked="" type="checkbox"/> Display window (inputs/outputs, actual position, variables, etc.)</li> </ul>
Implementation date	Before start of production
Maximum number of participants	4 persons
Duration	2-6 teaching units

## 3.7

## T1040 Icon programming 1: Basics

Objectives	Learning the necessary knowledge for programming own functional workflows
Target group	Application programmer
Requirements	<p>/// Training units:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety briefing</li> <li><input checked="" type="checkbox"/> Plant overview</li> <li><input checked="" type="checkbox"/> Operation basics</li> <li><input checked="" type="checkbox"/> Set-up basics</li> </ul>
Contents	<p>/// Introduction to the creation of simple productive programmes with FPT user interface:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Overview of the existing function modules (icons)</li> <li><input checked="" type="checkbox"/> Parameterisation of the function modules (icons)</li> <li><input checked="" type="checkbox"/> Creation of messages in the icon (waiting and error messages)</li> <li><input checked="" type="checkbox"/> Jump to active message and interpretation of target and actual state</li> <li><input checked="" type="checkbox"/> Creation of simple robot programmes</li> <li><input checked="" type="checkbox"/> Creation of subroutines and branched workflows</li> <li><input checked="" type="checkbox"/> Saving and loading programmes</li> <li><input checked="" type="checkbox"/> Controlling the periphery and using I/O signals</li> <li><input checked="" type="checkbox"/> Robot configuration (travel ranges, axis limit switches, tool/base, I/O configuration)</li> <li><input checked="" type="checkbox"/> Creating a simple basic position drive</li> <li><input checked="" type="checkbox"/> Integrating teach points</li> <li><input checked="" type="checkbox"/> Approaching teach positions (LIN and PTP)</li> </ul>
Training tool	FlexOPSim (for programme preparation on the PC) 10 days free training licence
Implementation date	During the commissioning phase of the automation system or in the FPT training centre
Maximum number of participants	4 persons (if there are more than 2 participants, the practical part can alternate between offline and plant programming)
Duration	16 teaching units

## 3.8 T1041 Icon programming 2: Advanced

Objectives	Acquiring advanced knowledge of programming
Target group	Application programmer
Requirements	<ul style="list-style-type: none"> <li>/// Training units: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety briefing</li> <li><input checked="" type="checkbox"/> Plant overview</li> <li><input checked="" type="checkbox"/> Operation basics</li> <li><input checked="" type="checkbox"/> Set-up basics</li> <li><input checked="" type="checkbox"/> Icon programming basics</li> </ul> </li> </ul>
Contents	<ul style="list-style-type: none"> <li>/// Creation of productive programmes with FPT user interface: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Parts and sample trays</li> <li><input checked="" type="checkbox"/> Asynchronous workflows</li> <li><input checked="" type="checkbox"/> Use and programming of the simulation mode</li> <li><input checked="" type="checkbox"/> Use and programming of monitoring (permanent or icon-based)</li> <li><input checked="" type="checkbox"/> Setting up and using workspaces</li> <li><input checked="" type="checkbox"/> Function of advance pointer and query in advance explained</li> <li><input checked="" type="checkbox"/> Use of triggers and avoidance of advance stops during programming</li> <li><input checked="" type="checkbox"/> Creation of the system configuration (system-specific parameters, enabling functions, loading and saving system configurations)</li> <li><input checked="" type="checkbox"/> Explanation of the function and import of system updates</li> <li><input checked="" type="checkbox"/> Assigning user rights and passwords</li> <li><input checked="" type="checkbox"/> Use of flags</li> <li><input checked="" type="checkbox"/> Use of counters and timers</li> <li><input checked="" type="checkbox"/> Programming of error messages</li> <li><input checked="" type="checkbox"/> Forwarding of I/O signals</li> <li><input checked="" type="checkbox"/> Strategies for programming basic position workflows (evaluation of analogue values, query of workspaces, workspaces around points, freeing the robot)</li> </ul> </li> </ul>
Training tool	FlexOPSim (for programme preparation on the PC) 10 days free training licence
Implementation date	During the commissioning phase of the automation system or in the FPT training centre
Maximum number of participants	4 persons (if there are more than 2 participants, the practical part can alternate between offline and plant programming)
Duration	16 teaching units

## 3.9 T1050 Maintenance 1: Basics

Objectives	Teaching the basics of inspection and maintenance
Target group	Maintenance and service staff
Requirements	<ul style="list-style-type: none"> <li>/// Training units: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety briefing</li> <li><input checked="" type="checkbox"/> Plant overview</li> <li><input checked="" type="checkbox"/> Operation basics</li> <li><input checked="" type="checkbox"/> Advanced operation</li> <li><input checked="" type="checkbox"/> Set-up basics</li> </ul> </li> <li>/// Knowledge or training in the field of mechanics/electrics</li> </ul>
Contents	<ul style="list-style-type: none"> <li>/// Overview of the plant and assemblies</li> <li>/// Use of the plant documentation (maintenance and service)</li> <li>/// Overview of system components</li> <li>/// Overview of the maintenance plan</li> <li>/// Use of the spare and wear parts list</li> <li>/// Review of the electrical plans</li> <li>/// Review of the pneumatic plans and description of the components</li> <li>/// Documentation of basic pneumatic settings</li> <li>/// Exemplary performance of inspection work (inspection of the plant)</li> <li>/// Cleaning the plant</li> <li>/// Establishment of documentation</li> </ul>
Implementation date	Before the start of production or with the first inspection/maintenance
Maximum number of participants	4 persons
Duration	8 teaching units

## 3.10

## T1051 Maintenance 2: Advanced

Objectives	Teaching advanced inspection and maintenance skills
Target group	Maintenance and service staff
Requirements	<ul style="list-style-type: none"> <li>/// Training units: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety briefing</li> <li><input checked="" type="checkbox"/> Plant overview</li> <li><input checked="" type="checkbox"/> Operation basics</li> <li><input checked="" type="checkbox"/> Advanced operation</li> <li><input checked="" type="checkbox"/> Set-up basics</li> <li><input checked="" type="checkbox"/> Maintenance basics</li> </ul> </li> <li>/// Knowledge or training in the field of mechanics/electrics</li> </ul>
Contents	<ul style="list-style-type: none"> <li>/// Exemplary performance of maintenance work (cleaning and lubrication work)</li> <li>/// Use of the maintenance plan and/or maintenance log</li> <li>/// Visual inspection of moving power supplies</li> <li>/// Checking drive trains (belt tension, rack play, etc.)</li> </ul>
Implementation date	Before the start of production or with the first inspection/maintenance
Maximum number of participants	4 persons
Duration	6-12 teaching units

## 3.11 T1060 Plant service 1: Basics

Objectives	Teaching the basics of servicing
Target group	Maintenance staff
Requirements	<ul style="list-style-type: none"> <li>/// Training units: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety briefing</li> <li><input checked="" type="checkbox"/> Plant overview</li> <li><input checked="" type="checkbox"/> Operation basics</li> <li><input checked="" type="checkbox"/> Advanced operation</li> <li><input checked="" type="checkbox"/> Set-up basics</li> <li><input checked="" type="checkbox"/> Maintenance basics</li> </ul> </li> <li>/// Knowledge or training in the field of mechanics/electrics</li> </ul>
Contents	<ul style="list-style-type: none"> <li>/// Plant sensors - Setting and function</li> <li>/// How the individual components of the control hardware work</li> <li>/// How the individual components of the drive system work</li> <li>/// Troubleshooting</li> <li>/// Complex fault analysis</li> <li>/// Elimination of faults (pneumatics - electrics - control)</li> </ul>
Implementation date	Before starting the plant and/or with the first inspection/maintenance
Maximum number of participants	4 persons
Duration	8 teaching units

## 3.12 T1061 Plant service 2: Advanced

Objectives	Teaching advanced service skills
Target group	Maintenance staff
Requirements	<ul style="list-style-type: none"> <li>/// Training units: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety briefing</li> <li><input checked="" type="checkbox"/> Plant overview</li> <li><input checked="" type="checkbox"/> Operation basics</li> <li><input checked="" type="checkbox"/> Advanced operation</li> <li><input checked="" type="checkbox"/> Set-up basics</li> <li><input checked="" type="checkbox"/> Maintenance basics</li> <li><input checked="" type="checkbox"/> Plant service basics</li> </ul> </li> <li>/// Knowledge or training in the field of mechanics/electrics</li> </ul>
Contents	<ul style="list-style-type: none"> <li>/// Carrying out exemplary repairs: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Removal of carriages</li> <li><input checked="" type="checkbox"/> Timing belt replacement</li> <li><input checked="" type="checkbox"/> Replacement of motor unit incl. drive shaft</li> <li><input checked="" type="checkbox"/> Replacement of complete cable sets</li> <li><input checked="" type="checkbox"/> Replacement of external energy supply system</li> </ul> </li> <li>/// Gripper replacement and repair</li> <li>/// Repair of individual assemblies</li> <li>/// Freeing after crash</li> <li>/// Generation and production of control images</li> </ul>
Implementation date	Before starting the plant and/or with the first inspection/maintenance
Maximum number of participants	4 persons
Duration	6-12 teaching units