Version 11

# Ropeway Training Center
# Course program

# Contents

# Foreword

Dear ropeway installation operator,

The highest safety, constant availability and the best comfort are characteristic features of Doppelmayr ropeway installations. In order that this may continue, well trained personnel on the system are required.

The Ropeway Training Center is the leading global training center for providing ropeway installation knowledge.

Together with our partner companies, we have put together a comprehensive training program which covers all areas of ropeway engineering. We are happy to tailor the courses to your needs.

If you have any special requirements we can work out an individual training program.

We would be delighted to welcome you and your team onto our courses and look forward to the exciting and interesting days ahead. We wish every participant the greatest success.

The Doppelmayr Team

↗ Competent staff produce lower operating costs

**View and book all training courses online**

You can find the complete training program online and also book your selected dates.
**service.doppelmayr.com**

# Training in the Ropeway Training Center Dornbirn, on site or at your local branch

Doppelmayr are happy to support you in your staff development and offer courses for the various types of ropeway installation at the Ropeway Training Center Dornbirn in Austria, at your installation, or at your local branch.

The choice is yours! In Dornbirn there is a fully equipped Ropeway Training Centre available for training. At your site we can use the training container or work directly on the installation. Your local branch will be happy to supply information on the local training facilities.

Advantage of Ropeway Training Center Dornbirn:
The participants make direct contact with the Doppelmayr team and get to know the staff in the Customer Support department. They have the opportunity of speaking directly with the Doppelmayr engineers. In addition, a highlight of the course is a visit to the workshops and production facilities.

**NEW!**
Ropeway Training Center in Dornbirn, Bildgasse 12

# Training syllabus and overview

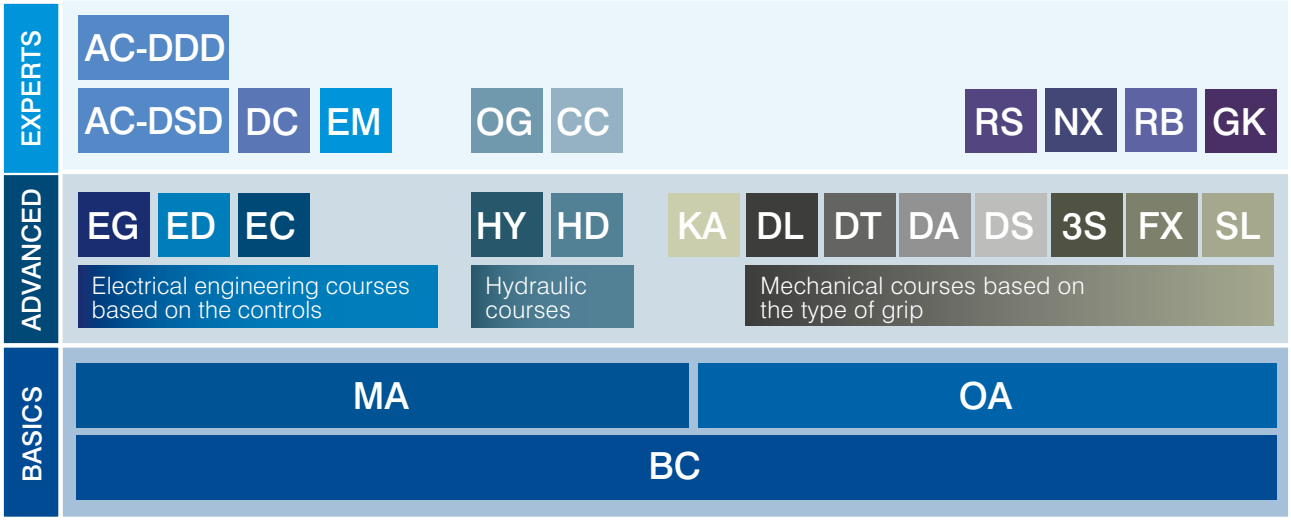
We offer courses at different levels of ability. The courses can be taken individually or in succession. The training program for your staff depends on their learning objectives and existing knowledge. Individual features can be added to a standard course or tailor-made courses can be put together.

The "BASICS" courses should be taken by all staff working on the ropeway installation. The "ADVANCED" courses are required for all staff who operate the installation or who carry out services. The "EXPERT" courses are designed to give additional detailed information.

In these courses we differentiate between "electrical engineering", "hydraulic", and "mechanical" content. Many members of staff have expertise in several areas. You can build on these as necessary.

The trainers are experienced engineers and technicians from different departments of the Doppelmayr/Garaventa Group, external experts, or experienced operations managers.

If you have questions about the course content, please speak to the Training department. We would be happy to advise you.




- **BC** Basics
- **MA** Maintenance instructions
- **OA** Operating instructions
- **EG** Basic electrical engineering
- **ED** Electrical Engineering (E-Technik) Doppelmayr PSS 3000
- **EC** Electrical Engineering (E-Technik) Doppelmayr Connect
- **HY** Hydraulics and valves
- **HD** Drives and hydraulics for advanced participants
- **KA** OMEGA IV cabin maintenance
- **DL** Mechanics of ropeways with D grips
- **DT** Mechanics of ropeway installations with DT grips
- **DA** Mechanics of ropeway installations with A grips
- **DS** Mechanics of ropeway installations with DS grips
- **3S** Mechanics of 3S ropeways
- **FX** Mechanics of fixed grip ropeway installations
- **SL** Mechanics and electrical engineering for surface lifts
- **AC-DDD** AC drives, DSD, frequency converters
- **AC-DSD** AC drives, DDD, frequency converters
- **DC** ABB power converter, DCS 800 series
- **EM** Service and operation of drive machines
- **OG** Condition monitoring, lubricants, oil analysis, gearbox
- **CC** Combustion engines
- **RS** Function and servicing of ropes
- **NX** RPD Nexo rope position monitoring
- **RB** RPD rope position monitoring
- **GK** Surveys of ropeway installations

# Courses, information, and basic program

The motivation for taking part in training courses covers a wide range – new employees or existing employees working on new installations, changes in duties, skill sets or areas of responsibility, a need to brush up knowledge or purely out of interest. Your personnel are always in the best possible hands when attending our courses, not only in terms of achieving learning objectives but also when it comes to hospitality and support during the training period. For details of how the training courses are organized, please refer to the respective course program.

### Lunch

The group goes together to a nearby restaurant. The meal times can be used for discussion between participants, with Doppelmayr technicians, customer service staff, and instructors.

### Course days - afternoons, evening meals

The training in the afternoon (up to about 5.00 pm) takes place in the same way as in the morning. After the training a visit is arranged to a ropeway installation (under the supervision of the operations manager) or a Doppelmayr facility, such as the electrical engineering workshop, Hohe Brücke plant, or the assembly shop. After this we go together to a nearby restaurant.

New staff or staff who are working with new installations; changes to areas of activity, abilities, or responsibility; a necessary refresher; or pure interest – there are various reasons why training may be desired.

Your staff are in good hands during our training courses both regarding the achievement of the learning objectives as well as supervision and guidance during the course time. You can see details of the training in each of the course programs.

### Training days - morning

The training day begins at 08.30 am (course program is mandatory in each case). The instructors are experienced Doppelmayr staff, external instructors, staff from suppliers, or experienced operations managers. The courses are conducted in our training rooms and in our workshops. Depending on the instructor, subject matter, and learning objectives, courses switch between these facilities in order to give practical instruction without forgetting the theory. Breaks and snacks are provided.

### Arrival

All the accommodation is organized by us. Your staff arrive in Vorarlberg, check-in directly in the hotel (arrival before the first day of the course) or come direct to the training rooms (arrival on the first day of the course). Should you send your team by train (to Dornbirn), we would be happy to pick them up.

### Departure

Guests who came in their own cars leave directly from the training room. Guests who came by air or train are taken back to the respective airport or train station.












# Training container

A large proportion of the training courses can also take place on site using the training container, which can be equipped to cater for specific needs. The advantage: no interference with the existing installation. The training container is provided on loan and can be shipped quickly and easily.


**Frequency converter (8)**

The AC course can take place using the container on site.

**Hydraulic unit for brakes (4)**

Demonstration of and exercises with the functioning of the hydraulic unit, opening and closing of the brakes and valve adjustment.

**Service brake (6) and emergency brake (7)**

Adjustment and disassembly according to the operation and maintenance instructions.

**Grips (3)**

Depending on your installation type we provide the correct grip type including tools and assembly devices. The participants practice grip dismantling and reassembly and carry out pull tests.


### Control system including drive (1) and return machinery (1A)

We provide the training container with the control system Doppelmayr Connect or PSS 3000. The participants perform practical exercises including troubleshooting and reading circuit diagrams.

### Rope tensioning system (2)

This training unit simulates the rope tensioning system and is used to perform practical exercises such as cylinder relocation.

### Container (9)

The container is a commercially available 20ft high cube shipping container which can be shipped quickly and easily. For optimum access to the teaching equipment, it can be opened at the front and on the side. The equipment can be lifted out and positioned on the floor in front of the container by means of a forklift truck, and put into operation right away.

### Grip force tester (5)

Demonstration and sensor adjustment of the grip force testing equipment.

# **BC** Basics

The overall learning objective of this course is the safe operation and correct maintenance of a ropeway. It is aimed at the operating and service personnel and comprises a theoretical part and hands-on exercises from practice. The optimum group size is between five and ten participants.

**Duration**:
The total duration of the course will be determined individually before the course according to the selected modules. Depending on the availability of the ropeway installation and the options, you should schedule eight to sixteen days for this course. More time might be required depending on the characteristics of your ropeway.

**After the course:**
For a more thorough training on maintenance, consider the MA Maintenance Assistance and the OA Operation Advisory course or one of our courses on specific assembly groups.

| | |
|---|---|
| **Location**: | Training room (theory) and your installation (practice) |
| **Please bring**: | Work clothes, protective equipment |
| **Requirements**: | See course description |
| **Duration**: | Depending on the requirements |
| **Date**: | On request |

COURSE DATA:
service.doppelmayr.com

## Theory

### Part 1 – Operation

Safety in passenger transport
Operating modes, operating concept
Operation with the main drive, deactivation concept
Filling the carriers onto the line and carrier parking
Special operating modes, Opening and closing equipment for carriers, Behaviour in case of unusual events (storm, lightning stroke, etc.)
Communication within the team
Loading gate, loading conveyor (for chairlifts)

### Part 2 – Safety devices

Aim and purpose of the safety devices
Switches, actuation of grip gauges, causes and interpretation of the shutdown
Simulation of general shutdowns – interpretation

### Part 3 – General checks and inspections

Aim and purpose
Periodic inspections in accordance with the operation and maintenance manual
Functional checks

### Part 4 – Operation and maintenance manual, documentation

How to use the operation and maintenance manual
Daily operations log, documentation, inspection and repair report, Operating instructions
Electrotechnical description

### Part 5 – Tests with and without load

Aim and purpose of the load tests

### Part 6 – Introduction to maintenance

Information on risks and hazards related to maintenance, Visual rope inspection, Simple maintenance procedures, Replacement criteria

## Practice

### Part 1 – General

Filling the carriers onto the line and carrier parking
Function tests, test run, first and last daily run
Special operating modes, Behaviour in case of unusual events, Passenger information
Marking of defective carriers
Overview of electrical engineering structure: power supply, emergency power supply, AC or DC
Remote maintenance system

### Part 2 – Tasks during the operation

Test runs during operation, inspection rounds Drive system and station, unusual noises, vibrations etc.
Documentation of operation data using the provided form, Daily operations log
Transfer of important information to the operating personnel of the next day
Observation of passenger flow and visible areas
Arrangement of the loading point

### Part 3 – On installations with Connect controls

Central desktop control panel
Touchscreen
Electronic manuals and circuit diagrams
Mobile application with tablet
Data recording for statistical evaluation
Pre-recorded announcements
RFID carrier detection in the station for data collection
Line illumination using LED technology
Availability of spare parts – Ropeway Assistant

### Part 4 – Safety devices

Position, aim and purpose of the devices
Switches, actuation of grip gauges, causes and interpretation of a shutdown
Setting of grip gauges using templates, comparison with reference data sheet

### Part 5 – Tests with and without load

Aim and purpose of the tests
Operation with the emergency drive with and without load
Pressure measurements in the hydraulic system of the emergency drive
Load tests, stress tests, interpretation of the braking curve
Interpretation of the indicated values, torque and armature current
Testing the anti-collision system
Releasing and fixing the bullwheel coupling

### Part 6 – Introduction to maintenance

Setting and readjusting the service and emergency brakes
Grip maintenance, assembly report
Carrying out the visual rope inspection
Simple maintenance procedures
Replacement criteria

# **MA** Maintenance instructions

The overall objective of the assistance is the safe maintenance of the ropeway. It is aimed at the maintenance staff of your installation. The optimum group size is five to ten persons.

Your employees will be supported in the regular maintenance works. They carry out maintenance on their own while the attendant is present. In case of uncertainties or doubts, the attendant will intervene and correct the team. The attendant will also address issues specifically required by the team. The works are preferably carried out in conjunction with the service works of our service team.

**Location**: Your installation

**Please bring**: Work clothing, protective equipment

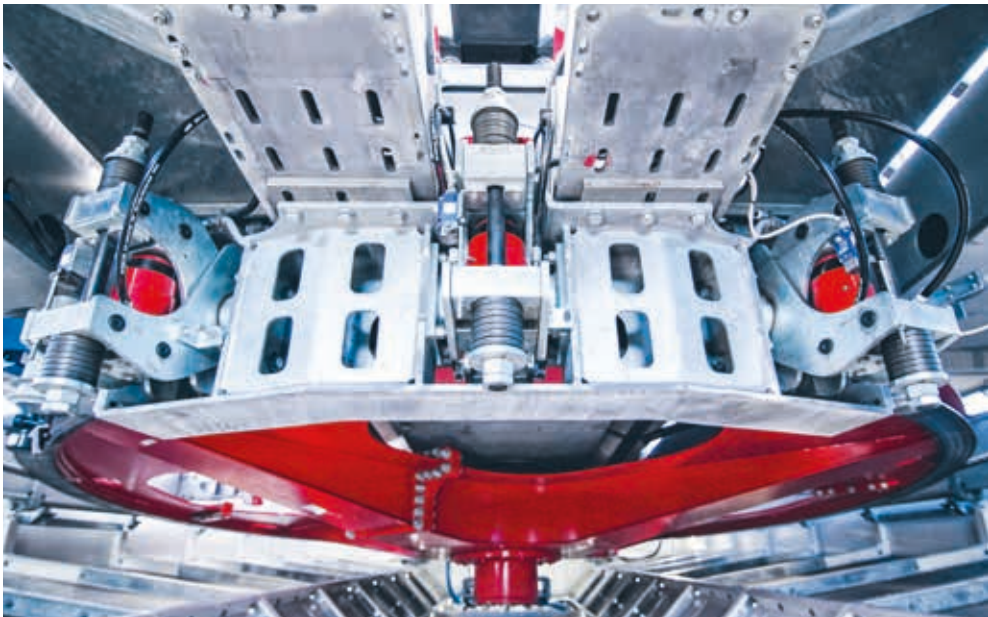
**Requirements**: See course description

**Duration**: Depending on the requirements

**Date**: On request

**Duration of the assistance:**
The duration of the assistance can be selected freely but should be based on the modules selected and the intended maintenance plan. The Doppelmayr Customer Support team would be glad to help you with the planning.

COURSE DATA:
service.doppelmayr.com



## Modules

- Sheave assembly maintenance
  Visual inspection of the components, lifting off the rope, replacing the sheaves, lubrication, checking the rope guidance, assessment of the wear criteria, adjustment of the safety devices, documentation

- Sheave maintenance
  Bearing replacement, replacing the rubber liners, criteria for replacement

- Replacing the rubber bullwheel liner
  Milling and removing the old rubber liner, pressing in the new liner without twisting using the correct tools, documentation

- Inspection of the bullwheel chain coupling
  Loosening and inserting the chain, lubrication, checking the alignment of the chain wheels, assessment of wear

- Brake maintenance
  Replacing the brake pads, cleaning the components, visual inspection of the components according to the maintenance manual, venting the brake systems, embedding the brake liners, checking the correct functioning, documentation

- Checking the alignment of the drive system
  Correct measuring of the alignment between the motor and gearbox or between the motors

- Maintenance of hydraulic systems and rope tensioning unit
  Operation of the hydraulic systems, visual inspection of the hydraulic systems, checking and readjusting the running wheels and guide rollers of the tension carriage, relocating the tension carriage, documentation

- Inspection of the grip opening/closing equipment
  Position and twisting of the rope in the stations, position of all rails of the grip opening/closing equipment, position of the safety devices in the grip opening/closing equipment, correct handling of the measuring gauges, documentation

- Maintenance of the station equipment for detachable ropeways (excluding grip opening/closing equipment)
  Inspection, replacement and correct tensioning of V-belts for PTO drives and tyre conveyors, rope lifting in the station, calibration of the grip force testing unit, inspection, maintenance, correct lubrication and replacement of clutches for carrier spacing regulation, opening, closing and locking rails for carrier doors, bubbles and restraining bars in the stations

- Grip maintenance
  Demounting, stripping down and cleaning the components, visual inspection of the components, replacing wear parts, lubrication and assembly of the components, checking the grip force and pull force, documentation

- Lubrication
  Lubrication at all lubricating points of the ropeway, use of the correct lubricants, correct proportioning of lubricants to prevent damage

- Care and restoration of polycarbonate / polyacrylics
  Proper treatment of synthetic surfaces on bubbles, cabin windows and station cladding

# **OA** Operation instructions

The overall objective of the advisory is safe operation of the ropeway. It is aimed at the operating personnel of your installation. The supervisors are experienced ropeway operations managers.

**Group size:**
Based on the requirements and planned operation management; maximum one shift at a time. Prerequisites: The ropeway can be in public operation. The employees must be trained with regard to behavior in case of emergency. They must have undergone a safety training course. The team must be able to operate the ropeway, to be precise, in accordance with the learning objectives as described in the course "BC Basic".

**Duration of the advisory:**
The length of the operation advisory can be selected freely. This should be done depending on the special features of the ropeway. Decisive is, for example, if the ropeway is operated in several shifts and how many teams are intended in total.

**After the advisory:**
The decision whether the employees and which of them can be deployed for the planned tasks is the sole responsibility of the operations manager in charge. Follow-on or in-depth training courses can be booked according to the task areas of the individual employees.

| | |
|---|---|
| **Location**: | Your installation |
| **Please bring**: | Work clothing, protective equipment |
| **Requirements**: | See course description |
| **Duration**: | Depending on the requirements, 5 to 30 days |
| **Date**: | On request |

COURSE DATA:
service.doppelmayr.com

**Modules**

- Support of the team during the inspection of brakes, drive, anti-collision system, path measuring unit, carrier spacing unit, grip force testing unit and other daily operational checks and the test runs.
- Support during practice of operation with the emergency drive and the exercises for abseiling of passengers. Helpful information regarding natural hazards, safety instructions, passenger flow and general measures for the protection of the employees.
- Tips regarding the manning of the stations, communication and suitable means of communication, crank telephone, radio, signals and signaling system. Suitable measures to prevent misunderstandings.
- Basic instructions on how to carry out maintenance works and document them.

# **EG** Basic electrical engineering

This course explains the fundamentals of electrical engineering for ropeways. This basic knowledge is required for the electrical engineering courses ED and EC.

**Location**: Dornbirn, Austria

**Please bring**: No special equipment required

**Requirements**: None

**Duration**: 3 days

COURSE DATA:
service.doppelmayr.com

**Course Content**

- Electrical power
- Voltage – current – resistance
- Conductors – semiconductors – insulators
- Direct current
- Alternating current – three phase – frequency
- The dangers of electricity – first aid – safety rules
- Safety measures, circuit breakers
- Energy storage: batteries, capacitors (charging)
- Lightning protection
- Doppelmayr Connect
  Electrical components and their functions, electrical symbols, circuit diagrams, junction diagrams and parts lists, sensor and actor technology
- Doppelmayr Control System PSS 3000
  Electrical components and their functions, electrical symbols, circuit diagrams, junction diagrams and parts lists
- Handling measuring devices
- Physical units
- Principle of an electrical circuit
- Ohm's law
- Kirchhoff's law
- Series connection and parallel connection
- Layout of simple circuits
- Electrical components in the control cabinet

# **ED** Electrical Engineering Doppelmayr PSS 3000

This course is aimed at electrical technicians working on ropeway installations with the Doppelmayr control system PSS 3000. Non-electrical technicians can take part provided they have completed the course “EG Basic Electrical Engineering”

**Location**: Dornbirn, Austria

**Please bring**: No special equipment required

**Requirements**: Knowledge of fundamentals as described in the course “EG Basic Electrical Engineering”

**Duration**: 2.5 days

**Course Content**

- Safety circuits
- Signal transmission
- Start-up conditions
- Brake control for stepped and modulated brakes
- Drive control for DC and AC drives
- Distance measurement by means of impulses
- Carrier spacing monitoring
- Anti-collision system
- Carrier marking CIS
- Grip force tester, theory and calibration
- PSS 3000
- Practical exercises

COURSE DATA:
service.doppelmayr.com

# **EC** Electrical Engineering Doppelmayr Connect

This course is aimed at electrical technicians working on ropeway installations with the Doppelmayr Connect control system. Non-electrical technicians can also take part, provided that they have completed the course “EG Basic Electrical Engineering”.

**Location**: Dornbirn, Austria

**Please bring**: No special equipment required

**Requirements**: Knowledge of fundamentals as described in the course “EG Basic Electrical Engineering”

**Duration**: 3.5 days


**Course Content**

- Operating concept
- Visualization
  - Notification Center
  - Solution Center
  - WLAN and tablet
- Deactivation concept
- Remote maintenance - IT security
- Data transmission, bus system
- Brake concept and safety circuits
- Brake control for stepped and modulated brakes
- Control for hydraulic rope tensioning
- Control for main drive
- Control for emergency drive
- Control for conveyors in the stations
- Anti-collision system and carrier spacing monitoring
- Grip force tester, theory and calibration
- Cabin door and restraining bar monitoring
- RFID carrier identification
- Fire mode
- Practical exercises
- PSS 4000
- Using the operation and maintenance manual

# **EM** Service and operation of drive machines

The course is organized for maintenance technicians and specialists from ropeway operating companies in collaboration with the company SPM Instruments Int. GmbH. Participants gain an overview of the early warning signs of equipment failure and of which measured values, such as vibrations and temperature, can be used for diagnostics.

SPM Instruments Int. GmbH. is an authorized distributor for ABB motors and ELIN motors, and specializes in the inspection, maintenance, repair and recommissioning of electric motors. Thanks to their many years of experience, this company's experts can provide helpful tips for avoiding failures. The course content relating to SPM monitoring is provided by one of our specialists and an expert from SPM Instruments Int. GmbH. Please also note the course "OG Condition Monitoring, Lubricants, Oil Analysis, Gear Units", which covers similar topics.

**Location**: Dornbirn, Austria

**Please bring**: No special equipment required

**Requirements**: Basic knowledge of electrical engineering

**Duration**: 2 days

**Course Content – Part 1**

- Basics
  Maintenance concepts, design and function of AC and DC machines, collector and carbon brushes, measuring methods and limit values, step-by-step description of a full machine service

- Practical exercises
  Measurement of insulation resistance and winding resistance, surge voltage measurement on a DC machine, measurement of collector concentricity on a DC machine, vibration measurement, laser optical alignment

**Course Content – Part 2**

- SPM monitoring
  Basics of shock impulse monitoring with the SPM system, how measurements are to be taken and at what intervals, practical exercises on a motor and on our test rig

COURSE DATA:
service.doppelmayr.com

# **DC** ABB power converter, DCS 800 series


Doppelmayr, in conjunction with ABB, arrange power converter courses for electricians who work in ropeway companies. ABB supplies rectifiers and DC motors for Doppelmayr ropeway installations. This course explains the operating principle of rectifiers in this series.

**Location**: Dornbirn, Austria

**Please bring**: No special equipment required

**Requirements**: Solid electrical engineering knowledge

**Duration**: 2 days

COURSE DATA:
service.doppelmayr.com

**Course Content**

- GS as drive parts, general power converter
- 2Q/4Q motorized/generator
- From AC to DC, firing angle
- Network configurations and filter options
- Signal preparation and I/Os
- Fault analyses Fxxx, Axxx
- GS motor – handling and service

# **AC-DDD** AC drives, DDD, frequency converters

This course is aimed at electricians in ropeway companies. This course explains the operating principle of AC drives, in particular the DDD Doppelmayr Direct Drive. You will learn how this technology is used by Doppelmayr.

**Location**: Dornbirn, Austria

**Please bring**: No special equipment

**Requirements**: Solid electrical engineering knowledge

**Duration**: 2 days

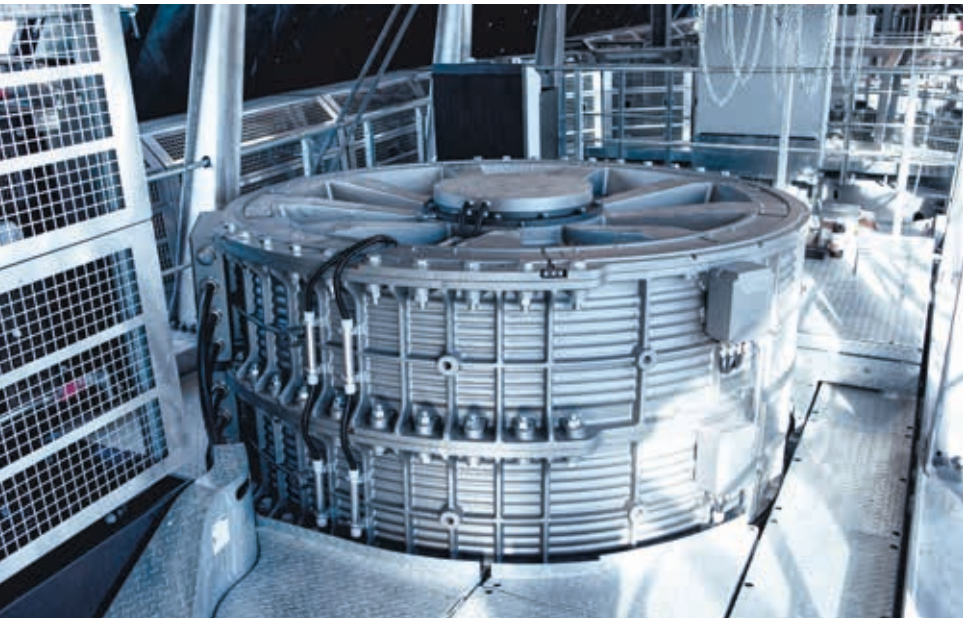
COURSE DATA:
service.doppelmayr.com

**Course Content – Part 1, Mechanics**

- Basic principles, balance weights, brake concept, product training on service and emergency brakes, bullwheels with bearing assembly and coupling, grease and lubrication, cooling unit

**Course Content – Part 2, Electrical Engineering**

- Electromagnetic compatibility
- Redundancy concept including module and fan replacement
- Preventive maintenance
- Converter module main drive, ABB ACS880, structure, function, and operation
- Signal preparation and I/Os
- Frequency converter auxiliary drives ABB ACS580
- Structure of the power cabinets
- Safety devices, such as emergency drive, rope position, and axle monitoring
- Encoder
- Standard AC drives
- Description of the most important parameters - help with diagnosis
- Practical exercises and operation of the devices
- Storage of replacement devices



# **AC-DSD** AC drives, DSD, frequency converters

This course is aimed at electricians in ropeway companies. This course explains the operating principle of AC drives, in particular the DSD Doppelmayr Sector Drive. You will learn how this technology is used by Doppelmayr.

**Location**: Dornbirn, Austria

**Please bring**: No special equipment

**Requirements**: Solid electrical engineering knowledge

**Duration**: 2 days

COURSE DATA:
service.doppelmayr.com

**Course Content – Part 1, Mechanics**

- Basic principles, balance weights, brake concept, product training on service and emergency brakes, bullwheels with bearing assembly and coupling, grease and lubrication, gearbox, safety devices for drives

**Course Content – Part 2, Electrical Engineering**

- Electromagnetic compatibility
- Redundancy concept, module and fan replacement
- Preventive maintenance
- Converter modules main drive, Vacon NX, structure, function and operation
- Structure of the power cabinets
- Safety devices such as maintenance switch, emergency drive, rope position and bearing monitoring, axle monitoring
- Encoder
- Use by DSD
- Standard AC drives
- Description of the most important parameters, help with diagnosis
- I/O cards with NX (programing)
- Explanation of DriveSync
- Practical exercises and operation of the devices
- Storage of replacement devices

# **HY** Hydraulics and valves

This course is suitable for all operation and maintenance personnel on all ropeway types. Participants acquire the basic knowledge required for the course “HD Advanced Course in Drives and Hydraulics”.

**Location**: Dornbirn, Austria

**Please bring**: No special equipment required

**Requirements**: None

**Duration**: 3 days

COURSE DATA:
service.doppelmayr.com

**Course Content**

- What is hydraulics?
  The basic physics behind hydraulics
  Hydrodynamics, transmission of forces, law of hydraulic flow, fluid flow
- Hydraulic components 1
  Pumps, motors, cylinders
- Hydraulic components 2
  Pressure valves, control valves, flow valves
- Hydraulic accessories
- Symbols according to DIN ISO 1219
- Basic hydraulic circuits
  Function, design, systematic troubleshooting

# **HD** Drives and hydraulics for advanced participants

Building on from the fundamental principles of hydraulics, Doppelmayr offers the Advanced Course in Drives and Hydraulics for operation and maintenance personnel on the ropeway types fixed-grip and detachable ropeways, 3S ropeways and reversible aerial tramways with Doppelmayr equipment. This course can be followed by type-specific courses (DL, DT, DA, DS, 3S FX or SL).

**Location**: Dornbirn, Austria

**Please bring**: No special equipment required

**Requirements**: Basic knowledge of hydraulics, an ideal prerequisite is the Doppelmayr course "HY Hydraulics and Valves"

**Duration**: 2.5 days

**Course Content – Part 1**

- Drives, bullwheels, rope tensioning
  Product training on service and emergency brakes of all years of construction, bullwheels with bearings and couplings, universal shafts, gearboxes, safety devices for drives, grease

**Course Content – Part 2**

- Hydraulics
  Reading complex hydraulic circuit diagrams, hydraulic units of different years of construction, troubleshooting on practice units, assessment of oil quality, filtration

COURSE DATA:
service.doppelmayr.com

# **OG** Condition monitoring, lubricants, oil analysis, gearbox

This course deals with the technology, functioning, maintenance and service of Doppelmayr Direct Drives. It is organized in collaboration with ABB. The basic functioning of the drives will be explained along with electrical and mechanical engineering fundamentals.

Participants gain an insight into the way in which experts work in the case of oil analyses and gearbox inspections, and find out who they can contact if in doubt. The theoretical principles are illustrated with the help of clear examples from practice. This course is organized in collaboration with the company Oildoc and the David Wimmer firm of consulting engineers.

**Location**: Dornbirn, Austria

**Please bring**: Work overall and work gloves are recommended (soiling)

**Requirements**: Basic knowledge of lubricants and ropeway gearboxes

**Duration**: 2.5 days

COURSE DATA:
service.doppelmayr.com

## Course Content – Part 1

- **Condition monitoring using oil analysis**
  Lubrication fundamentals, routine checks and special analyses, scope of inspection
- **How lubrication works**
  Fundamental principles of lubricating film formation, hydrodynamics, hydrostatics, elastohydrodynamic lubrication, key parameters of a lubricant
- **Lubricant fundamentals**
  Introduction, comparison of mineral oils and synthetic oils and their uses, gearbox oils, requirements to be met by lubricants for gear units, manufacturer's approvals, special gearbox oils, additives as ingredients of lubricants for specific applications
- **Taking samples**
  Where, when, how often, containers and equipment, examples, sample form and information on the sample
- **Lubricant in practical use**
  Lubricant aging, changes, causes of contamination, ingress of other oil, mixing
- **Oil analysis – testing methods**
  Methods used to determine wear, contamination, oil condition, relevance and applications of the most important methods
- **Basic principles for evaluation of the analysis results**
  Basic procedure, limit values and trend assessment
- **Oil analysis in practice I**
  Role and properties of gearbox oils, standardized oil types and their applications
- **Oil analysis in practice II**
  Role and properties of hydraulic oils, standardized oil types and their applications
- **Oil analysis in practice III**
  Role and properties of lubricants for combustion engines, specifications and OEM approvals, limit values, trend analysis
- **Lubricating grease and condition monitoring**
  Lubricating grease and lubricating oil – the difference, condition monitoring using grease analysis – testing methods, evaluation of lab reports

## Course Content – Part 2

- **Gearbox technology for ropeways**
  Maintenance and preventive measures, gearbox lubrication and lubricants as gearbox design criterion and as source of information
- **Operations-dependent and plannable maintenance time frame**
  through constant monitoring of operating parameters
- **Recording and evaluating the signal chain**
  Plain text recommendations
- **Endoscopy**
  Quality of equipment, experience of personnel and top-level evaluation of results
- **Gearbox inspection: possibilities and limits**
  Periodic inspections, endoscopy, condition monitoring, various damage scenarios

# **CC** Combustion engines

This course deals with the technology, functioning, maintenance and service of the most common combustion engines used on Doppelmayr ropeways. It focuses in particular on Cummins and Caterpillar engines. The basic functioning of the various combustion engines will be explained along with electrical and mechanical engineering fundamentals.

**Location**: Dornbirn, Austria

**Please bring**: No special equipment required

**Requirements**: None

**Duration**: 0.5 day

COURSE DATA:
service.doppelmayr.com


3K
KITZSTEINHORN
K-ONNECTION

# **GK** Surveys of ropeway installations

The course gives operations managers a comprehensive overview of the state of the art in surveying and looks, in particular, at aspects that are specific to ropeways. Subjects covered include surveying fundamentals, different measuring methods and action required as a consequence of the measurements obtained in the case of landslides, permafrost and undercutting. Well-known experts from the surveying offices AVT Imst, DI Fleischmann Hallein/ Salzburg and AVD Dornbirn contribute to the course.

**Location**: Dornbirn, Austria

**Please bring**: No special equipment required

**Requirements**: Basic knowledge of ropeway engineering

**Duration**: 2 days

COURSE DATA:
service.doppelmayr.com

## Course Content

### Fundamentals

- Terminology
- Reference systems, scales
- Measuring methods, measuring instruments, accuracies
- The “cadastre” – concept, history
- Country-specific standards
- Results

### The cadastre

- Fundamentals, projection systems, Survey Act, forest registry, forest clearance permit
- Law and land register (Austria, Germany, Switzerland)
- Cadastral map
- Boundary negotiation, boundary disputes (plot boundary, cadastral community boundaries, national boundary, etc.)
- Easements
- Supervisory authority (district administrative authority, province, ministry)

### Project engineering and building survey

- Land and terrain survey for ropeway project engineering purposes
- Stakeout of the projected locations for structures, pegs, report
- Additional stabilization of measuring points
- Alignment of foundations, steelwork (entrance beams, supports, mushroom-shaped drive station)
- Alignment of ropeway installation (stations, sheave assemblies)
- Control survey (initial survey and follow-up survey) of completed structures

### Operations-related survey and special features

- Design of suitable measuring points
- Ground movements, subsidence, slope discontinuity, geology, permafrost
- Ski trail planning, trail lengths
- Ground compensation
- GIS
- Snow management
- Effects of solar radiation on towers
- Additional benefits of geodata (geology, geomorphology, etc.)
- Geodetic monitoring
- Wear (sheave assembly)
- Inclination of sheave assembly to compensate for subsidence

# **RS** Function and servicingof ropes

For advanced maintenance technicians and specialists in ropeway operating companies, this course offers in-depth insights into the function, inspection and maintenance of the steel ropes used on ropeways.

**Location**: Dornbirn, Austria
Romanshorn, Switzerland

**Please bring**: ID card or passport,
no special equipment required

**Requirements**: Basic knowledge of the structure and function of steel ropes

**Duration**: 2.5 days

COURSE DATA:
service.doppelmayr.com

**Course Content**

- From wire to rope – rope manufacture at Teufelberger
- Technical fundamentals, structure and function of steel ropes (Teufelberger)
- Difference between DSB wire rope requirements and EN 12927
- Rope installation, rope splice, rope maintenance (Fatzer)
- Visit to the Fatzer rope manufacturing facility
- Test rig and testing lab at Fatzer: practical work on the moving rope, rope maintenance, influence of shear force on wire
- Rope testing – Equipment for electromagnetic testing/visual inspection (Rotec)
- Rope damage, damage assessment, workshop, rope repair (Fatzer)
- What does it take to obtain a durable splice? Measures, splice damage, splice lubrication (Pedrics)

# **RB** RPD rope position monitoring

Ideal for the operation and maintenance personnel on ropeways with RPD system. Participants learn the fundamentals and are shown how the system works as well as how it is operated and maintained on the basis of practical examples.

**Location**: Dornbirn, Austria

**Please bring**: No special equipment required

**Requirements**: Knowledge of fundamentals as described in the course “EG Basic Electrical Engineering”

**Duration**: 1 day

**Course Content**

- Fundamentals and functions of the RPD system
- Switch setting
- Demonstration on the presentation stand
- Operation of the control system

COURSE DATA:
service.doppelmayr.com

# **NX** RPD Nexo rope position monitoring

This course is aimed at the operation and maintenance personnel on ropeways with the RPD Nexo system. Participants learn the fundamentals and are shown how the system works, is operated and maintained.

**Location**: Dornbirn, Austria

**Please bring**: No special equipment required

**Requirements**: Knowledge of fundamentals as described in the course “EG Basic Electrical Engineering”

**Duration**: 1 day

**Course Content**

- Fundamentals and functions of the RPD Nexo system
- Switch setting
- Demonstration on the presentation stand
- Operation of the control system including diagnostic functions

COURSE DATA:
service.doppelmayr.com


250 kg

# **DL** Mechanics of ropeways with D grips

This course is directed at the operation and maintenance personnel working on D-Line generation ropeway installations. It provides basic knowledge for the operation and maintenance of this lift type: fundamentals, function, wear reduction, maintenance tips, experience.
This course can be combined with the “HD Advanced Course in Drives and Hydraulics” that takes place immediately before it.

**Location**: Dornbirn, Austria

**Please bring**: Work overall, work gloves recommended (soiling)

**Requirements**: None

**Duration**: 2 days

COURSE DATA:
service.doppelmayr.com

**Course Content – Part 1**

- Line equipment
  Sheave assemblies, line structures, rope, interaction of the assembly groups

**Course Content – Part 2**

- Carriers with D grips
  D grip, practical exercises, chairs, hangers, cabins

**Course Content – Part 3**

- Station equipment for installations with D grips
  Operation sequence in the stations, opening and closing line, tire conveyors, safety devices, grip force tester, anti-collision system, carrier spacing, opening and closing of carrier doors, bubbles and restraining bars

# **DT** Mechanics of ropeway installations with DT grips

This course is directed at the operation and maintenance personnel on detachable ropeways with DT grips. It provides basic knowledge for the operation and maintenance of this lift type: fundamentals, function, wear reduction, maintenance tips, experience.
This course can be combined with the “HD Advanced Course in Drives and Hydraulics” that takes place immediately before it.

**Location**: Dornbirn, Austria

**Please bring**: Work overall, work gloves recommended (soiling)

**Requirements**: None

**Duration**: 2 days

COURSE DATA:
service.doppelmayr.com

**Course Content – Part 1**

- Line equipment
  Sheave assemblies, line structures, rope, interaction of the assembly groups

**Course Content – Part 2**

- Carriers with DT grips
  DT grip, practical exercises, chairs, hangers, cabins

**Course Content – Part 3**

- Station equipment for installations with DT grips
  Operation sequence in the stations, opening and closing line for DT grips, tire conveyors, safety devices, grip force tester, anti-collision system, carrier spacing, opening and closing of carrier doors, bubbles and restraining bars

# **DA** Mechanics of ropeway installations with A grips


This course is directed at operation and maintenance personnel on detachable ropeways with A grips. Participants acquire basic knowledge for the operation and maintenance of this lift type: fundamentals, function, wear reduction, maintenance tips, experience. This course can be combined with the “HD Advanced Course in Drives and Hydraulics” that takes place immediately before it.

**Location**: Dornbirn, Austria

**Please bring**: Work overall and work gloves recommended (soiling)

**Requirements**: None

**Duration**: 2 days

COURSE DATA:
service.doppelmayr.com

**Course Content – Part 1**

- Line equipment
  Sheave assemblies, line structures, rope, interaction of the assemblies

**Course Content – Part 2**

- Carriers with A grips
  A grips, practical exercises, chairs, hangers, cabins

**Course Content – Part 3**

- Station equipment for installations with A grips
  Operation sequence in stations, opening and closing line for A grips, tire conveyors, safety devices, grip force tester, anti-collision system, carrier spacing, opening and closing of carrier doors, bubbles and restraining bars

# **DS** Mechanics of ropeway installations with DS grips

This course is directed at operation and maintenance personnel on detachable ropeways with DS grips. Participants acquire basic knowledge for the operation and maintenance of this lift type: fundamentals, function, wear reduction, maintenance tips, experience.
This course can be combined with the “HD Advanced Course in Drives and Hydraulics”, takes place immediately before it.

**Location**: Dornbirn, Austria

**Please bring**: Work overall and work gloves recommended (soiling)

**Requirements**: None

**Duration**: 2 days

COURSE DATA:
service.doppelmayr.com

**Course Content – Part 1**

- Line equipment
  Sheave assemblies, line structures, rope, interaction of the assembly groups

**Course Content – Part 2**

- Carriers with DS grips
  DS grip, practical exercises, chairs hangers, cabins

**Course Content – Part 3**

- Station equipment for installations with DS grips
  Operation sequence in stations, opening and closing line for DS grips, tire conveyors, safety devices, grip force tester, anti-collision system, carrier spacing, opening and closing of carrier doors, bubbles and restraining bars

# **3S** Mechanics of 3S ropeways

This course is directed at operation and maintenance personnel on 3S ropeways. Participants acquire basic knowledge for the operation and maintenance of this ropeway type: fundamentals, function, wear reduction, maintenance tips, experience.
This course can be combined with the “HD Advanced Course in Drives and Hydraulics” that takes place immediately before it.

**Location**: Dornbirn, Austria

**Please bring**: Work overall, work gloves, safety shoes

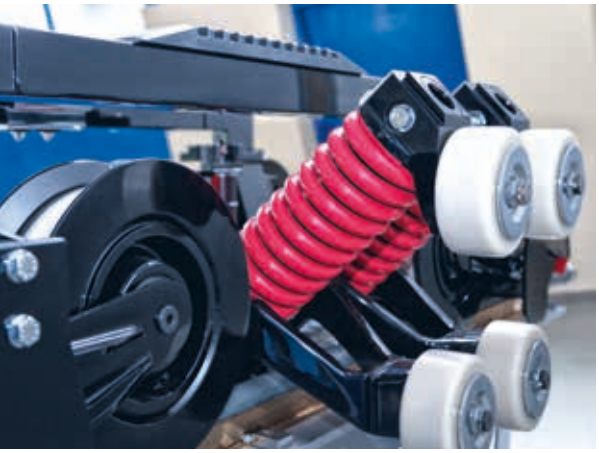
**Requirements**: None

**Duration**: 2.5 days

**Course Content**

- Carrier, carriage, detachable grip, practical exercises
- Station equipment
- Track ropes, haul rope, track rope relocation process
- Rope saddles, haul rope sheaves
- Slack carriers for haul rope, relocation process

COURSE DATA:
service.doppelmayr.com



# **FX** Mechanics of fixed grip ropeway installations

This course is directed at operation and maintenance personnel on fixed-grip ropeways. Participants acquire basic knowledge for the operation and maintenance of this lift type: fundamentals, function, wear reduction, maintenance tips, experience.
This course can be combined with the “HD Advanced Course in Drives and Hydraulics” that takes place immediately before it.

**Location**: Dornbirn, Austria

**Please bring**: Work overall, work gloves recommended (soiling)

**Requirements**: None

**Duration**: 1 day

**Course Content**

- Line equipment
  Sheave assemblies, line structures, rope, interaction of the assembly groups
- Carriers
  Fixed grips, chairs, hangers, cabins (if necessary), practical exercises

COURSE DATA:
service.doppelmayr.com

# **SL** Mechanics and electrical engineering for surface lifts

This course is directed at operation and maintenance personnel on surface lifts. Participants acquire basic knowledge for the operation and maintenance of this lift type from Doppelmayr experts: fundamentals, function, wear reduction, maintenance tips, experience.

**Location**: Dornbirn, Austria

**Please bring**: Work overall and work gloves recommended (soiling)

**Requirements**: None

**Duration**: 2 days

COURSE DATA:
service.doppelmayr.com

**Course Content**

- Ropes, grips for surface lifts, towing outfits
- Line equipment, tensioning devices, drives
- Function tests, electrical engineering for surface lifts

# **KA** OMEGA IV
# cabin Maintenance

This course is directed at the operation and maintenance personnel on lifts with OMEGA IV cabins. Participants acquire knowledge required for the operation and maintenance of this cabin type: fundamentals, functions, maintenance, inspection and experience from the world of practice.

**Location**: Upon agreement

**Please bring**: Safety shoes, work clothing, passport

**Requirements**: None

**Duration**: 1.5 days

COURSE DATA:
service.doppelmayr.com

**Cource Content**

- Fundamentals

  Safety components and functions in the cabin, maintenance in accordance with maintenance checklist, replacement of spare parts such as window panes, flip-out and hopper windows, cabin bumpers, opening lever and push-pull cable. Door mechanism, platforms and cabin guide, seat benches, ski protection glazing. Cleaning and care of cabins.

- Practical exercises

  Fitting and removal of suspension rods, door adjustment and checking the door closing force, adjustment of the door opener and checking the door lock, inspection in accordance with instructions, procedure following exceptional occurrences

# Costs

**Attendance fee for courses in the Ropeway Training Center Dornbirn**

EUR 412 per person per day (excl. 20% VAT, w/o accommodation/breakfast, subject to change). The attendance fee covers the instructors, all course and working documents, snacks during breaks, lunch and dinner, and the transportation required for the course. Transfers to and from the airport will be charged according to the costs incurred.

**Accommodation**

You will be accommodated at a three-star hotel in Bregenz or Dornbirn. The price per night with breakfast is EUR 86 (excl. 20% VAT, subject to change). Please pay for any extras, such as parking, minibar, telephone, internet, etc., when checking out of the hotel. For further information, do not hesitate to contact us.

**Cancellation conditions for courses**

The cancellation charge for the seminar is 50% of the costs up to 7 days prior to course start and 100% of the costs thereafter.

**Billing**

The seminar fees and hotel costs are payable on receipt of the invoice.

**Costs for courses on site**

Courses are tailored to the respective learning objectives and requirements. Costs will be billed on the basis of the cost estimate. The costs for courses on site cover the following: course costs per person and day or course costs per day; travel and accommodation costs for trainers and guest speakers; transport and loan charge for the container if booked; where applicable, costs of seminar rooms and translators.

**Important: subsidies**

Subsidies may be available in your own country or grants from the EU to finance the course costs, subject to specific conditions. Please contact the appropriate agencies for further information.

# General Information

**Instructors**

The instructors are engineers and technicians from different specialist areas within the Doppelmayr/ Garaventa Group or external experts. As well as presenting the technical content of courses, they are also willing to discuss topics and questions raised by the participants.

**Minimum number of participants and course cancellations**

Minimum number of participants: 8. Courses will be cancelled if fewer than 8 people register for them. For this reason, please check whether the course will be taking place before purchasing flight tickets, etc. and before setting out on your journey.

**Registration and queries**

Please register online via our website at **service.doppelmayr.com/training/courses** or by email to training@doppelmayr.com. Registrations are requested no later than 14 days before the start of the course. Confirmation of registration will be sent by return.

**Covid-19 (Corona Virus)**

All Trainings are held accordingly to the Austrian government regulations and recommendations in the respective applicable version. Details are matched with the Austrian Chamber of Commerce (WKO). Doppelmayr provides all means to put health protection into practice.

**Ropeway installation number and job descriptions**

Please state the job descriptions of the participants and the installation number of the ropeway on which they work. This will enable our instructors to prepare themselves in accordance with your requirements.

**Website**

Please refer to our website for course details and the latest information on our courses.
**service.doppelmayr.com/training/courses**

**Note**

Responsibility for ropeway operations lies with the respective operator. Doppelmayr Seilbahnen GmbH accepts no liability whatsoever as a result of the training program and the information provided therein, insofar as no intent or gross negligence exists on the part of Doppelmayr Seilbahnen GmbH. The respective national statutory requirements are to be complied with and are not the subject of this training program.

**We look forward to your participation!**

COMPETENCE ON SITE

# Your contacts

All training courses and dates are listed and can be booked online at **service.doppelmayr.com**. In case of questions regarding the courses in Dornbirn or on site, please contact the Ropeway Training Center or your local branch office.

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CABLE CAR

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