



**MasterGrid**  
AlwaysOn



# MasterGrid Training Center

Training catalogue 2023

 **MasterGrid**  
Training Center

**Qualiopi**   
processus certifié

 **RÉPUBLIQUE FRANÇAISE**

La certification qualité a été délivrée au titre de la catégorie d'action suivante :  
- Actions de formation

# Summary

Training catalogue on the high voltage products



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# Introduction

For more than 50 years, the MasterGrid teams have offered a wide range of training courses covering the equipment of high voltage electrical substations, air-insulated circuit breakers, metal enclosed substations, hydraulic circuits, SF6 certification.

Our training is provided by qualified experts trained on substation equipment from different brands : Merlin Gerin, Schneider Electric HV, Vatech and others.

Our courses are aimed at all professional actors in the field of electricity such as technicians, foremen, engineers, etc. They can be provided in French, English or Spanish.

## Our objective ?

Preparing actors in the world of electricity for the challenges they may face in their daily work.

## Our trainings cover four essential themes :

- Operation and maintenance of high voltage substations
- Maintenance of circuit breakers equipped with hydraulic or mechanical control mechanism
- Upgrading of circuit breakers
- SF6 gas handling

Each training comprises a theoretical part and hands-on.

Our training can be conducted in the MasterGrid Training Center in Grenoble, with a dedicated classroom and workshop with real size equipment.

These trainings can also be provided on site.

Our training activity is registered under number 84380740338 with the prefecture of the Auvergne Rhône Alpes region. This registration does not constitute State approval and is based on quality standards (ISO 9001, ISO 14001 and ISO 45001).



Bezeichnung: M&P - P2  
Hersteller: M&P - P2  
Beschreibung: ...  
Anwendung: ...  
Material: ...



# Word of the President

Welcome to MasterGrid, expert in supporting electrical systems from low to extra-high voltage equipment.

We are convinced that the transmission of knowledge is the keystone of the performance of organizations and of their development over time.

On the strength of our long experience as a manufacturer Merlin Gerin, we imagine, on a daily basis and in close collaboration with our customers, solutions to improve the performance of high voltage equipment in operation, to extend their lifespan and to minimize their environmental impact.

The training of our employees, and of our customers, in the operation and maintenance of our equipment, constitutes, in this respect, a central element of the transmission of know-how and technical skills.

Our training center, the MasterGrid Training Center, has been completely redesigned to offer training with modern educational tools.

The existing equipment on our site, as well as a wide range of equipment, give considerable importance to practice.

Our qualifications also enable us to issue the mandatory certificates for handling SF<sub>6</sub> gas.

We will be happy to welcome you and share our passion, our technical expertise, and our knowledge of the equipment with you.

Best regards.

**Ludovic Vallon**



# Access map



2 rue de la Néva  
38 000 Grenoble, France



Training offer

**Operation and maintenance of metal enclosed substations (GIS)**

- p.06** Presentation of the metal enclosed substations
- p.07** Operation and maintenance of metal enclosed substations (GIS) with hydraulic control mechanism  
Merlin Gerin, Vatech - Intermediate
- p.08** Operation and maintenance of metal enclosed substations (GIS) with hydraulic control mechanism  
Merlin Gerin, Vatech - Advanced
- p.09** Operation and maintenance of metal enclosed substations (GIS) with mechanical control mechanism  
Merlin Gerin, Vatech - Intermediate
- p.10** Operation and maintenance of metal enclosed substations (GIS) with mechanical control mechanism  
Merlin Gerin, Vatech - Advanced



# Presentation of the metal enclosed substations (GIS)

The training will focus on one of the GIS products of the Merlin Gerin, Vatech Brand.

 4 to 8 people

 2 days

 Basics

Ref : GIS-F All (FR or EN or ES)

Presentation of the switchgear :  
Main technical features and general principles of maintenance.

**Training Method** : 80% theory, 20% presentation of the equipment. Exercices, vidéos, etc.

## Training Contents

### 1. General presentation of a metal enclosed substation (GIS)

Technical and electrical features | Compartment pressure | Partitioning | Operation of the density switches | Operation of the couplers and bursting discs | Circuit breaker (breaking chamber-hydraulic and spring control mechanism) | Earthing switches | Disconnectors | Busbars and insulators | Connectors | Cable boxes | Transformers connection | Air/SF6 bushings | Instruments transformers

### 2. SF6 gas

Generalities and regulation | Environment and safety

### 3. Main maintenance principles

Scheduled maintenance | Tooling and spare parts

### 4. Presentation of the switchgear at our training center

Identification of the components | Presentation of the different technologies



#### Audience :

This training is aimed at any maintenance operator, foreman, engineer intervening in the operation of high voltage substations.

#### Prerequisite :

Basics in electromechanics.

#### Objectives :

At the end of the training, the trainee will know the fundamentals of metal enclosed substations.

#### Evaluation method :

A MCQ is submitted to the trainees at the end of the training to evaluate their knowledge.

Contact : [training.center@mastergrid.com](mailto:training.center@mastergrid.com)  
Our training catalogue is also available on :  
[www.mastergrid.com](http://www.mastergrid.com)

# Operation and maintenance of the GIS substations with hydraulic control mechanism - Intermediate

The training will focus on one of the following products from Merlin Gerin, Vatech : GIS with hydraulic control mechanism – H7, H9, H10, H9S, TH7, HB7, HB9, HB10.

 3 to 6 people

 2 days

 Intermediate

Ref : GIS-P/Hh (FR or EN or ES)

Improve one's technical skills to be able to ensure operation and maintenance of metal enclosed substations in full safety.

**Training Method** : 40% theory, 60% hands-on. Exercices, videos, etc.

## Training Contents

### 1. Structure and technical features

Structure of a GIS | Electrical and technical features | Partitioning

### 2. SF6 gas

Generalities and regulation | Environment and safety | Tightness and moisture measurement | Pressure and density switches

### 3. Design and operation of a metal enclosed substation

Circuit breaker (breaking chamber, hydraulic control mechanism) | Earthing switches / disconnectors | Instrument transformers | Insulators, busbars and connectors

### 4. Maintenance program

Preventive maintenance of the compartments and of the circuit breaker | Tooling

### 5. Operation

Local and remote operation | Locking | Interpretation of the alarms | Lockout

### 6. Hands-on

Use of a SF6 gas recovery cart | Tightness control | Operation times of the circuit breaker | Gas analysis | Testing of the density switches



#### Audience :

This training is aimed at any maintenance operator, foreman, engineer intervening in the operation of high voltage substations.

#### Prerequisite :

Trainees must master the basics of maintenance : structure of switchgear and risks linked to safety.

#### Objectives :

At the end of the training, the trainee will be able to perform basic scheduled maintenance operations with the appropriate tools, he will be able to interpret the data (times of CB and gas analysis).

#### Evaluation method :

A MCQ is submitted to the trainees at the end of the training to evaluate their knowledge. Hands-on is evaluated during the training.


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# Operation and maintenance of the GIS substations with hydraulic control mechanism – Advanced

The training will focus on one of the following products from Merlin Gerin, Vatech : GIS with hydraulic control mechanism – H7, H9, H10, H9S, TH7, HB7, HB9, HB10.

 3 to 6 people

 3-4 days

 Advanced

Ref : GIS-M/Hh (FR or EN or ES)

Get better technical skills and deep knowledge to ensure effective operation and maintenance of the switchgear.

**Training Method** : 30% theory, 70% hands-on.  
Exercices, videos, etc.

## Training Contents

### 1. Reminder of the technical features

Refresher of the intermediate level training on operation and maintenance of GIS.

### 2. Maintenance program

Topping-up, SF6 gas recovery and treatment | Preventive and curative maintenance of the control mechanisms | Replacement of simple components

### 3. Operation

Interlocking philosophy | Manual and emergency operations | Lockout | Alarms | Study of single-line diagrams, study of footprint

### 4. Hands-on

Topping-up | Use of a SF6 recovery cart | Control of tightness | Replacement of simple components | Troubleshooting | Gas analysis | Contact resistance measurement | Circuit breaker operating times



### Audience :

This training is aimed at any maintenance operator, foreman, engineer intervening in the operation of high voltage substations.

### Prerequisite :

Trainees with advanced level. The trainee must be able to recognize the technical features and master the risks linked to safety. He must be able to answer to technical questions and must be certified according to the European regulation related to SF6 Handling.

### Objectives :

At the end of the training, the trainee will be able to carry out periodical maintenance operations with the appropriate tools, he will be able to interpret the data (operating times of the circuit breaker and gas analysis).

### Evaluation method :

A MCQ is submitted to the trainees at the end of the training to evaluate their knowledge. Hands-on is evaluated during the training.

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# Operation and maintenance of the GIS substations with mechanical control mechanism – Intermediate

The training will focus on one of the following products from the GIS with mechanical control mechanism range : HB9m (8DN9-0), HB10m (8DQ1-0), TH7m.

 3 to 6 people

 5 days

 Intermediate

Ref : GIS-P/Hm (FR or EN or ES)

Improve one's technical skills to be able to ensure operation and maintenance of metal enclosed substations in full safety.

**Training Method** : 40% theory, 60% hands-on. Exercices, videos, etc.

## Training Contents

### 1. Structure and technical features

Structure of a GIS | Electrical and technical features | Partitioning

### 2. SF6 gas

Generalities and regulation | Environment and safety | Tightness and moisture measurement | Pressure and density switches

### 3. Design and operation of a GIS

Circuit breaker (breaking chamber, mechanical control mechanism) | Earthing switches / disconnectors (lines), instrument transformers | Insulators, busbars and connectors

### 4. Maintenance program

Preventive maintenance of the compartments and of the circuit breaker | Tooling

### 5. Operation

Local and remote operation and locking | Interpretation of the alarms | Lockout procedures

### 6. Hands-on

Use of the SF6 filling device | Maintenance operation on the switchgear | Tightness control | Circuit breaker operation times | Gas analysis | Testing of the density switches



### Audience :

This training is aimed at any HV maintenance operator, foreman, engineer with experience on the concerned equipment.

### Prerequisite :

Trainees must master the basics of maintenance : structure of switchgear and risks linked to safety, they must be able to answer to technical questions.

### Objectives :

At the end of the training, the trainee will be able to carry out periodical maintenance operations with the appropriate tools, he will be able to interpret the data (operating times of the circuit breaker and gas analysis).

### Evaluation method :

A MCQ is submitted to the trainees at the end of the training to evaluate their knowledge.

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# Operation and maintenance of the GIS substations with mechanical control mechanism – Advanced

The training will focus on one of the following products from the GIS range with mechanical control mechanism : HB9m (8DN9-0), HB10m (8DQ1-0), TH7m.

 3 to 6 people

 3-4 days

 Advanced

Ref : GIS-M/Hm (FR or EN or ES)

Get better technical skills and deep knowledge to ensure effective operation and maintenance of the switchgear.

**Training method** : 30% theory, 70% hands-on.  
Exercices, videos, etc.

## Training Contents

### 1. Reminder of the technical features

Refresher of the intermediate level training on operation and maintenance of GIS.

### 2. Maintenance program

Topping-up, SF6 gas recovery and treatment | Preventive and curative maintenance of the control mechanisms | Replacement of simple components

### 3. Operation

Interlocking philosophy | Manual and emergency operations | Lockout | Study of single-line diagrams, study of footprint

### 4. Hands-on

Topping-up | Use of a SF6 recovery cart | Control of tightness | Replacement of simple components | Troubleshooting | Gas analysis | Contact resistance measurement | CB operation times



### Audience :

This training is aimed at any HV maintenance operator, foreman, engineer with experience on the concerned equipment.

### Prerequisite :

Trainees with intermediate level. The trainee must be able to recognize the technical features and master the risks linked to safety. He must be able to answer to technical questions and must be certified according to the European regulation related to SF6 Handling.

### Objectives :

At the end of the training, the trainee will be able to carry out periodical maintenance operations with the appropriate tools, he will be able to interpret the data (operating times of the circuit breaker and gas analysis).

### Evaluation method :

A MCQ is submitted to the trainees at the end of the training to evaluate their knowledge. Hands-on is evaluated during the training.

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Training offer

**Operation and maintenance of high voltage air insulated circuit breakers**

- p. 12** Operation and maintenance of high voltage air insulated circuit breakers  
FA TYPE - Merlin Gerin - Intermediate
- p. 13** Operation and maintenance of high voltage air insulated circuit breakers  
FA TYPE - Merlin Gerin - Advanced
- p. 14** Operation and maintenance of high voltage air insulated circuit breakers  
SB6 TYPE - Merlin Gerin - Vatech - Intermediate

# Operation and maintenance of high voltage air insulated circuit breakers – FA TYPE – Intermediate

The training will focus on one the following AIS circuit breaker products from the FA range (hydraulic control mechanism) from Merlin Gerin : PFA1, FA1, FA2, GFA1, FA2A, FAT 7.3, GFA2 ou FA4.

 3 to 6 people

 3 days

 Intermediate

Ref : AIS-P/FA (FR or EN or ES)

Improve one's technical skills to be able to ensure operation and maintenance of air insulated circuit breakers in full safety.

**Training Method** : 50% theory, 50% hands-on.  
Exercices, videos, etc.

## Training Contents

### 1. Structure and technical features

Study of the main components of the circuit breaker

### 2. SF6 gas

Generalities and regulation | Environment and safety | Tightness control and moisture measurement | Pressure and density switches

### 3. Design and operation of the circuit breakers

Principle of operation | Detailed description of the hydraulic control mechanism | Breaking chamber | Technical steps

### 4. Operation

Local and remote operation | Locking | Interpretation of the alarms | Study of electrical diagrams

### 5. Maintenance program

Preventive maintenance of the circuit breaker

### 6. Hands-on

Use of the SF6 filling device | Maintenance of the hydraulic control mechanism and bleeding | Tightness control of the circuit breaker | Circuit breaker operation times | Gas analysis



#### Audience :

This training is aimed any person intervening on air insulated high voltage circuit breakers : maintenance team, foreman, technical support, engineers, etc.

#### Prerequisite :

Trainees must master the basics of maintenance : recognize the technology and structure of the equipment and master the risks linked to safety. They must be able to answer to technical questions.

#### Objectives :

At the end of the training, the trainee will be able to perform scheduled maintenance operations with the appropriate tools, he will be able to interpret the data (times of CB and gas analysis).

#### Evaluation method :

A MCQ is submitted to the trainees at the end of the training and hands-on is evaluated during the training.

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# Operation and maintenance of high voltage air insulated circuit breakers – FA TYPE – Advanced

The training will focus on one the following AIS circuit breaker products from the FA range (hydraulic control mechanism) from Merlin Gerin : PFA1, FA1, FA2, GFA1, FA2A, FAT 7.3, GFA2 ou FA4.

 3 to 6 people

 4 days

 Advanced

Ref : AIS-M/FA (FR or EN or ES)

Improve one's technical skills to be able to ensure operation and maintenance of air insulated circuit breakers in full safety.

**Training Method** : 30% theory, 70% hands-on. Exercises, videos, etc.

## Training contents

### 1. Reminder of the technical features

Refresher of the intermediate training on operation and maintenance of « vintage » air insulated circuit breaker.

### 2. Maintenance program

Topping-up operation, SF<sub>6</sub> recovery operations and treatments | Circuit breaker operation time testing and synchronization | Operation of the density switches

### 3. Technical improvement

Circuit breaker evolution | Evolution of the driving mechanisms | Compliance of the equipment with the European regulation

### 4. Practical exercises

Testing of the circuit breaker operation times and synchronization | Bleeding | Troubleshooting | Replacement of a capacitor according to the circuit breaker | Replacement of hydraulic components



### Audience :

This training is aimed at any HV maintenance operator, foreman, engineer with experience on the concerned equipment.

### Prerequisite :

Trainees with intermediate level. The trainee must be able to recognize the technical features and master the risks linked to safety. He must be able to answer to technical questions and must be certified according to the European regulation related to SF<sub>6</sub> Handling.

### Objectives :

At the end of the training, the trainee will be able to carry out complete scheduled maintenance operations with the appropriate tools, he will be able to interpret the data (operating times of the circuit breaker and gas analysis).

### Evaluation method :

A MCQ is submitted to the trainees at the end of the training to evaluate their knowledge. Hands-on is evaluated during the training.

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# Operation and maintenance of high voltage air insulated circuit breakers – SB6 TYPE – Intermediate

The training will focus on one the following AIS circuit breaker products of SB6 type (mechanical control mechanism ) from Merlin Gerin and Vatech range : SB6-72, SB6-U72, SB6-U100 ou SB6-245 (SF6 dynamic).

 3 to 6 people

 2 days

 Intermediate

Ref : AIS-P/SB (FR or EN or ES)

Get better technical skills and deep knowledge to ensure effective operation and maintenance of the circuit breakers in full safety.

**Training Method** : 50% theory, 50% hands-on.  
Exercices, videos, etc.

## Training contents

### 1. Structure and technical features

Study of the main components of the circuit breaker

### 2. SF6 gas

Generalities and regulation | Environment and safety | Tightness and moisture measurement | Pressure and density switches

### 3. Design and operation of the circuit breakers

Principle of operation | Detailed description of the mechanical control mechanism | Breaking chamber | Technical steps

### 4. Operation

Local and remote operation and locking | Interpretation of the alarms | Study of electrical diagrams

### 5. Maintenance program

Preventive maintenance of the circuit breaker

### 6. Hands-on

SF6 gas topping-up | Periodical maintenance of a circuit breaker | Tightness control | Operating times of the circuit breaker | Gas analysis



### Audience :

This training is aimed any person intervening on air insulated high voltage circuit breakers : maintenance team, foreman, technical support, engineers, etc.

### Prerequisite :

Trainees must master the basics of maintenance : recognize the technology and structure of the equipment and master the risks linked to safety. They must be able to answer to technical questions.

### Objectives :

At the end of the training, the trainee will be able to perform scheduled maintenance operations with the appropriate tools, he will be able to interpret the data (times of CB and gas analysis).

### Evaluation method :

A MCQ is submitted to the trainees at the end of the training and hands-on is evaluated during the training.

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Training offer

## Hydraulic maintenance of high voltage circuit breakers

**p. 16** Hydraulic maintenance of high voltage circuit breakers  
Air insulated and GIS - Intermediate

**p. 17** Hydraulic maintenance of high voltage circuit breakers  
Air insulated and GIS - Advanced

# Hydraulic maintenance of air insulated and GIS circuit breakers – Intermediate

The training will focus on the control mechanisms of different Merlin Gerin AIS and GIS circuit breakers equipped with hydraulic systems.

 2 to 4 people

 3 days

 Intermediate

Ref : HYD-P All (FR or EN or ES)

Study the different types of hydraulic control mechanisms, know the role of each components and associated maintenance.

**Training Method** : 50% theory, 50% hands-on.  
Exercices, videos, etc.

## Training contents

### 1. Theory

Presentation of the different types of control mechanisms | Study of main components and hydraulic phenomena

### 2. Operation of hydraulic control mechanisms

Generation and management of pressure | Safety systems | Power group

### 3. Reading of hydraulic diagrams

Study of the different diagrams | Understanding of the operation

### 4. Maintenance program

Preventive maintenance of the control mechanism.

### 5. Hands-on

Bleeding of different types of hydraulic control mechanisms | Replacement of simple components



#### **Audience :**

This training is aimed any person intervening on high voltage circuit breakers in contact with the concerned equipment : maintenance team, foreman, technical support, engineers, etc.

#### **Prerequisite :**

Trainees must master the basics of maintenance : recognize the technology and structure of the equipment and master the risks linked to safety. They must be able to answer to technical questions.

#### **Objectives :**

At the end of the training, the trainee will be able to perform scheduled maintenance operations on any type of hydraulic control mechanism.

#### **Evaluation method :**

A MCQ is submitted to the trainees at the end of the training and hands-on is evaluated during the training.

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# Hydraulic maintenance of air insulated and GIS circuit breakers – Advanced

The training will focus on the control mechanisms of different Merlin Gerin AIS and GIS circuit breakers equipped with hydraulic systems.

 2 to 4 people

 3 days

 Advanced

Ref : HYD-M All (FR or EN or ES)

Know how to carry out troubleshooting and perform curative maintenance operations.

**Training Method** : 50% theory, 50% hands-on.  
Exercices, videos, etc.

## Training contents

### 1. Reminder of the technical features

Refresher of the intermediate level of the training on hydraulic maintenance of HV circuit breakers.

### 2. Technical steps

Upgrading of the hydraulic control mechanism.

### 3. Maintenance program

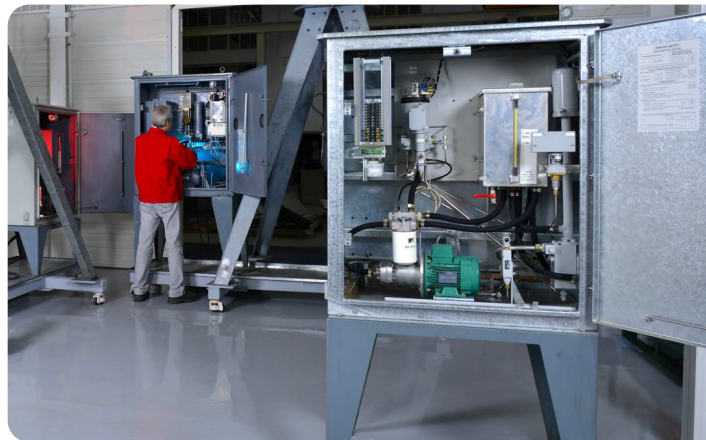
Curative maintenance of the control mechanism | Tooling

### 4. Principle of troubleshooting

Troubleshooting methodology.

### 5. Hands-on

Bleeding of different types of hydraulic control mechanisms | Inspection | Upgrading (replacement of the accumulator, of the coil and hydraulic elements) | Troubleshooting | Complete functional tests



### Audience :

This training is aimed at any HV maintenance operator, foreman, engineer with experience on the concerned equipment.

### Prerequisite :

Trainees with intermediate level. The trainee must be able to recognize the technical features and master the risks linked to safety. He must be able to answer to technical questions and must be certified according to the European regulation related to SF<sub>6</sub> Handling.

### Objectives :

At the end of the training, the trainee will be able to carry out curative maintenance operations on the control mechanism with the appropriate tools, he will be able to troubleshoot simple defaults and will be able to carry out the functional tests on the circuit breaker.

### Evaluation method :

A MCQ is submitted to the trainees at the end of the training to evaluate their knowledge. Hands-on is evaluated during the training.

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Training offer

**Upgrading of air insulated circuit breakers**

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Upgrading of air insulated circuit breakers  
OP range – Expert

p. **20**

Upgrading of air insulated circuit breakers  
FA Hydraulic range – Expert

# Upgrading of air insulated circuit breakers "oil"

## OP range – Expert

The training will focus on one of the circuit breakers from the OP range : OP 6.2/6.3.

 3 to 6 people

 4 days

 Expert

Ref : AIS-E/MO (FR or EN or ES)

Gain better technical skills to carry out the upgrading and sealing of the oil circuit breakers in compliance with the manufacturer's quality procedures.

**Training Method** : 30% theory, 70% hands-on. Exercises, videos, etc.

### Training contents

#### 1. Reminder of the technical features of oil circuit breakers

Structure of the circuit breaker | Detailed description of the pole | Technical steps

#### 2. Operation principle of the hydraulic control mechanism

General presentation of the control mechanism | Study of the hydraulic diagram

#### 3. Presentation of the circuit breaker

Presentation of the technical steps | Detailed description of the breaking chamber, column, casing

#### 4. Upgrading program

Study of the upgrading procedure | Site preparation | Specific tools

#### 5. Hands-on

Disassembly, upgrading and reassembly of the pole | Bleeding of the hydraulic circuits of the control mechanism

#### 6. Tests and controls

Functional testing of the circuit breaker



#### Audience :

This training is aimed at any HV maintenance operator with experience on the concerned equipment.

#### Prerequisite :

Trainees must be able to carry out the disassembly of the breaker and curative maintenance operations.

#### Objectives :

At the end of the training, the trainee will be able to carry out the upgrading of the circuit breaker in full safety, ensure tightness and conformity.

#### Evaluation method :

A MCQ is submitted to the trainees at the end of the training to evaluate their knowledge. Hands-on is evaluated during the training.


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# Upgrading of air insulated circuit breakers

## FA Hydraulic range – Expert

The training will focus on one of the circuit breakers of the FA Hydraulic range : FA1, GFA1, FA2, FA2A, FAT 7.3, GFA2 or FA4.

 2 to 5 people

 To be defined

 Expert

Ref : AIS-E/FA (FR or EN or ES)

Gain better technical skills to carry out the upgrading and sealing of the SF6 circuit breakers in compliance with to the manufacturer's quality procedures.

**Training Method** : 30% theory, 70% hands-on.  
Exercices, videos, etc.

### Training contents

#### 1. Reminder of the technical features of SF6 circuit breakers

Structure of the circuit breaker | Detailed description of the pole | Technical steps

#### 2. Operation principle of the hydraulic control mechanism

General presentation of the control mechanism | Study of the hydraulic diagram

#### 3. Presentation of the circuit breaker

Presentation of the technical steps | Detailed description of the breaking chamber, column, casing

#### 4. Overhauling program

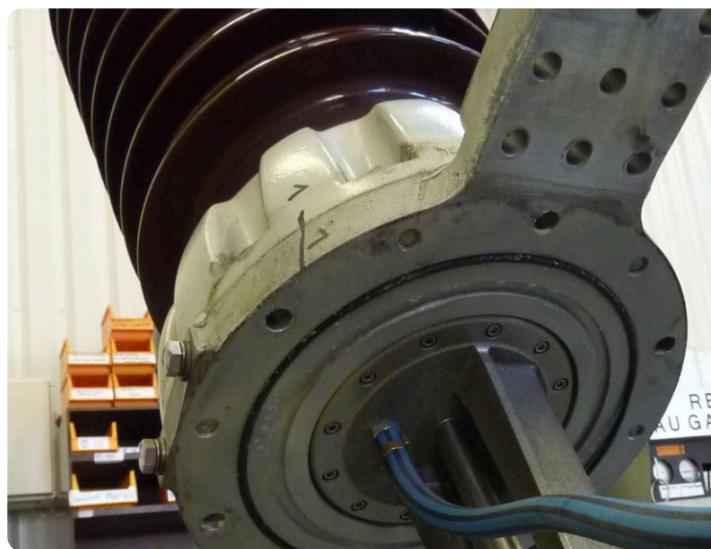
Study of the upgrading procedure | Site preparation | Specific tools | SF6 treatment

#### 5. Hands-on

Disassembly, upgrading and reassembly of the pole | Bleeding of the hydraulic circuits of the control mechanism

#### 6. Tests and controls

Functional testing of the circuit breaker



#### Audience :

This training is aimed at any HV maintenance operator with experience on the concerned equipment.

#### Prerequisite :

Trainees must be able to carry out the disassembly of the breaker and curative maintenance operations, he must be certified according to the SF6 European regulation.

#### Objectives :

At the end of the training, the trainee will be able to carry out the upgrading of the circuit breaker in full safety, ensure tightness and conformity.

#### Evaluation method :

Depending on customer.

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## Training offer SF6 gas handling


- p.22** Training and certification according to the mandatory European regulation about SF6 gas handling  
Training on handling of SF6 gas contained in High Voltage equipment - Certification
- p.23** Refresher training and certification according to the mandatory European regulation about SF6 gas handling  
Training on handling of SF6 gas contained in High Voltage equipment - Certification
- p.24** Handling and treatment of SF6 gas specific to the metal enclosed substations - Vintage and present ranges  
SF6 Switchgear - Merlin Gerin - Vatech and others - Advanced



# Training and certification according to the mandatory European regulation about SF6 gas handling

Certifying training will focus on handling of SF6 gas contained in High Voltage equipment (HV/MV) in accordance with regulations in force.

 3 to 6 people

 2 days + 1/2 day for certification

 Certification

Ref : SF6-C Init (FR or EN or ES)

Training and exams for the mandatory European regulation for any SF6 gas handling.

**Training Method** : 50% theory, 50% hands-on. Exercices, videos, etc.

## Training contents

Complying with the European Regulation UE 2015/2066.

### 1. General characteristics of SF6 gas

Presentation of the European regulation on fluorinated gases | Physical and chemical characteristics | Effects of the internal arc

### 2. Role SF6 gas in the high voltage equipment

Presentation of the equipment | Examples of applications | Substitutes to SF6 gas

### 3. SF6 and environmental issues

Emissions and greenhouse effect | European union agreements | Kyoto protocol

### 4. Regulations

IEC standards (60376-60480-62271) | Storage, labelling and transportation of SF6 gas

### 5. SF6 gas analysis

Moisture | Pressure control | SF6 gas decomposition | Monitoring devices

### 6. Hands-on

Tightness control | Neutralisation of SF6 decomposition sub-products | SF6 gas topping-up | SF6 recovery | Reports | Gas analysis



#### Audience :

This training is aimed any person intervening on High Voltage equipment containing SF6 gas.

#### Prerequisite :

The trainee is or will be handling SF6 gas in its professional context.

#### Objectives :

At the end of the training, the trainee will take the theoretical and practical exams in order to be certified according to the European Regulation regarding handling of SF6 gas.

The MasterGrid Training Center is an approved examination center to issue legal certificates (Decree of March 20, 2020 - Publication in the Official Journal of 09/24/2020).

At the end of the 5 years of validity of the certification, do not hesitate to contact us to organize a refresher course.

#### Assessment method (at the end of the session) :

Certifying assessment via an MCQ-type questionnaire (approx. 45 min) and simulations with practical work (approx. 1h30).

Contact : [training.center@mastergrid.com](mailto:training.center@mastergrid.com)  
Our training catalogue is also available on :  
[www.mastergrid.com](http://www.mastergrid.com)



# Refresher and renewal of the certification according to the mandatory European regulation about SF6 gas

Certifying training will focus on handling of SF6 gas contained in High Voltage equipment (HV/MV) in accordance with regulations in force.



3 to 6 people



1,5 days + 1/2 day for certification



Certification

Ref : SF6-C Recy (FR or EN or ES)

Training and exams for the mandatory European regulation for any SF6 gas handling.

**Training Method** : 50% theory, 50% hands-on.  
Exercices, videos, etc.

## Training contents

Complying with the European Regulation UE 2015/2066.

### 1. General characteristics of SF6 gas

Presentation of the European regulation on fluorinated gases | Physical and chemical characteristics | Effects of the internal arc

### 2. Role SF6 gas in the High Voltage equipment

Presentation of the equipment | Examples of applications | Substitutes to SF6 gas

### 3. SF6 and environmental issues

Emissions and greenhouse effect | European union agreements | Kyoto protocol

### 4. Regulations

IEC standards (60376-60480-62271) | Storage, labelling and transportation of SF6 gas

### 5. SF6 gas analysis

Moisture | Pressure control | SF6 gas decomposition | Monitoring devices

### 6. Hands-on

Tightness control | Neutralisation of SF6 decomposition sub-products | SF6 gas topping-up | SF6 recovery | Reports | Gas analysis



### Audience :

This course is intended for all certified professionals, working on MV/HV equipment, at the end of the validity of the certification (5 years).

### Prerequisite :

The trainee is or will be handling SF6 gas in its professional context.

### Objectives :

At the end of the training, the trainee will take the theoretical and practical exams in order to be certified according to the European Regulation regarding handling of SF6 gas.

The MasterGrid Training Center is an approved examination center to issue legal certificates (Decree of March 20, 2020 - Publication in the Official Journal of 09/24/2020).

At the end of the 5 years of validity of the certification, do not hesitate to contact us to organize a refresher course.

### Assessment method (at the end of the session) :

Certifying assessment via an MCQ-type questionnaire (approx. 45 min) and simulations with practical work (approx. 1h30).

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# Handling and treatment of SF6 gas applied to metal enclosed substations – Vintage and present ranges

The training will focus on a GIS substation (MV/HV) from the vintage and present range containing SF6 gas, Merlin Gerin – Vatech and MasterGrid.

 2 to 4 people

 3 days

 Advanced

Ref : SF6-M GIS

Control all procedures of SF6 handling and specific treatments operations on compartments.

**Training Method** : 30% theory, 70% hands-on.  
Exercices, videos, etc.

## Training contents

### 1. Purposes of compartment treatment

Issues and impacts on operations

### 2. Specific procedures to the different products

Detailed presentation of manufacturer is procedures

### 3. SF6 gas analysis

The different monitoring devices | Tools

### 4. SF6 gas and safety

IEC legislation and standards | Individual protections  
| Work near pressurized compartments

### 5. Pratical work

Using a recovery cart | Using a vacuum pump |  
Treatment of compartments | Gas quality control |  
Presentation of different connectors



#### Audience :

The course is intended for maintenance operators, technicians and high voltage specialists called upon to work on SF6 operation of a metal-enclosed substation (or GIS).

#### Prerequisite :

The candidate must hold European SF6 certification. He must also have the fundamentals of maintenance of a substation in a metal enclosure (or GIS).

#### Objectives :

At the end of the course, the trainee will be able to perform SF6 filling and recovery operations. He will know all safety rules.

#### Assessment method (at the end of the session) :

Skills assessment via an MCQ type room questionnaire and simulations with practical work during the training.

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Training offer  
**Transformers : technologies, operation, maintenance**

**p.26** Transformers training

# Transformers : technologies, operation, maintenance

The training covers the different technologies of transformers, their operation and their applications, accessories and auxiliaries to provide useful knowledge for operation and maintenance.



3 to 6 people



5 days

Training

Gain a better technical knowledge of transformers, operating theory and practice.

5 days (adjustable according to the need on specific request).

**Method :** theory, exchange on operational practices, in-room quiz.

## Training contents

### 1. Transformers technology

History | Different technologies on the grid between power generation and distribution | Operation principle | Coupling

### 2. Manufacturing and dimensioning

Column or shell-type technology | Windings and modeling

### 3. Systems and accessories

Cooling | Accessories | Auxiliaries | Tap changers | Bushings...

### 4. Installation and commissioning of transformers

Assembly | Filling and treatment | Testing | Inspection | Procedures...

### 5. Preventive and corrective maintenance

Periodicity | Oil treatment | Maintenance procedures...

### 6. Troubleshooting and repair

Winding tests | Type of oil analysis and interpretation | Visual inspection and removal of transformer windings | Work on the active part



#### Audience :

Project manager, technician maintenance, substation operator.

#### Prerequisite :

Basics in electrotechnics.

#### Objectives :

At the end of the training, the trainee will have a better general and applied knowledge of transformers. He will be able to diagnose simple breakdowns and make the right maintenance and operating choices.

#### Assessment method (at the end of the session) :

Skills assessment via an MCQ type room questionnaire and simulations with practical work during the training.

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# Additional information

## **Customized training**

For any question and/or specific need, our team remains at your disposal. We will evaluate together the feasibility of your request and we will accompany you in its realization.

You will find below some examples of our customized trainings :

- Introduction to the world of High Voltage
- Installation of the Eco-joints system for metal enclosed substations
- Protection of electrical networks & Numerical Command Control systems

## **Access times**

You can contact us at this address for the calendar of sessions for the current semester : [training.center@mastergrid.com](mailto:training.center@mastergrid.com)

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