PIX Double Busbar

Air Insulated Switchgear up to 17.5 kV

Make the most of your energy™
Your requirements

- Service continuity
- High safety
- Reliability
Our solution

PIX Double Busbar
Air Insulated Switchgear up to 17.5 kV

- Two busbars grant highest level of uninterruptible power supply
- Extensions are made simply, permitting to improve your installation

- Fully tested to all the latest IEC standards
- Highest levels of Internal Arc Classification thanks to the ’safe door’ design
- High-pressure resistant front doors with interlocking flanges on all sides – ’safe door’

- All operations can be carried out directly from the front of the cubicle with the door closed
- Mechanical interlocks and indications fully in line with IEC standards
- The ergonomic interface indicates clearly states of operation and position of the contacts

- Partition construction for side walls makes each cubicle independent from the other, permitting to limit the effect of faults in a function
- The design, manufacturing and testing are carried out according to the ISO 9001 and 9002 standards
- The Rigid cubicle design is ensured by advanced computer modeling techniques
PIX Double Busbar

Uninterruptible power supply
## Contents

### General
- Applications
- Comprehensive solution
- Schneider Electric Services
- Quality, Environment and Maintenance

### Product description
- Description
- Technical characteristics
- Operating conditions & Standards

### Range of functions
- Functions and characteristics
  - Choice of a functional unit
  - Incomer or Feeder
  - Bus coupler
  - Bus section
  - Bus riser
  - Busbar metering and earthing
  - Direct incomer

### Installation
- Accessories and extraction withdrawable parts
- Implementation example of a line-up switchboard
- Connections
Contents

Switchgear / Apparatus and Cubicle equipment 27

Switchgear / Apparatus 28
PIX Double Busbar equipment 28
HVX circuit breaker design 29

Cubicle equipment 30
PIX Double Busbar 30

Protection, monitoring and control 31

Protection relays 32
Protection relay selection guide 32
Sepam protection system 34
MiCOM protection system 36

Control relays 37
GemControl range 37

Arc fault detectors 38
Arc fault detectors selection guide 38
Vamp arc flash range 39

Current Transformers 40
Current Transformers 38
Voltage transformers 40
PIX Double busbar

General
The Air Insulated Switchgear with double busbar, is an indoor metal-enclosed device intended for the MV section of HV/MV substations and high power MV/MV substations.

Air Insulated Switchgear with double busbars offers you:
- Pre-engineered and adaptable solutions tailored to your specific requirements
- Significantly reduced maintenance
- Local support centres throughout the world

Air Insulated Switchgear with double busbars gives you the advantages of:
- Continuity of service for your networks
- Enhanced safety for your staff and operations
- Two busbars grant highest level of uninterruptible power supply
- Extensions are made simply, permitting to improve your installation
- Optimised investment throughout the life of your installation
- The possibility of integrating your medium voltage switchboard in a monitoring and control system

Our Air Insulated Switchgear PIX Double Busbar adapts to all electrical power distribution requirements from 1 to 17.5 kV.
Our Air Insulated Switchgear PIX Double Busbar provides the most efficient means to control and protect a wide range of applications. Thanks to the wide range of functions contained, they can be easily integrated into a monitoring and control system.

To know and manage two increasingly essential requirements for all Medium Voltage networks. Faced with demand for an increasing number of energy production sources and the increasingly significant obligations of network adaptability, operators are looking for more flexible, responsive, scalable and simply reconfigurable solutions ("Smart Grids"). It is fundamental for operators to know, understand and act correctly.

- To know the switchboard status at all times.
- To act with full knowledge of the facts.

Protection and control relays

Sepam
Sepam series 20, series 40, series 60 and series 80 digital protection relays take full advantage of Schneider Electric’s experience in electrical network protection. They provide all the necessary functions:
- Effective fault diagnosis and protection planning
- Accurate measurements and detailed diagnoses
- Integral equipment control
- Local or remote indication and operation

Easy upgrading: addition of communication, digital I/O’s, analog output, or temperature acquisition systems can be added due to its modular design.

MiCOM
MiCOM protection provides the user with a choice of cost-optimised solutions for specific protection requirements within the distribution network. The MiCOM relay series offers comprehensive protective function solutions for all power supply systems as well as for various functional and hardware project stages.

Control relays

GemControl
Smart switchgear management: a basic unit for control, monitoring, measurement, processing and data transmission.

PowerMeter and Circuit Monitor metering units

The PowerLogic PowerMeter replaces a full complement of basic analog meters. This cost-effective, high performance meter provides a full complement of accurate true-rms metering values. The PowerLogic series 3000/4000 Circuit Monitor is designed for critical power users and large energy consumers in order to provide the information needed to confidently enter the evolving world of deregulation. It can be adapted to meter almost any time-of-use or at a real-time.

Vamp arc flash protection

The arc protection unit detects an arc flash in an installation and trips the feeding breaker. Arc flash protection maximises personnel safety and minimises material damage to the installation in the most hazardous power system fault situations.
Installation & Commissioning
Because without these, you increase the risk of start-up delays and premature equipment failure.

Technical training
Having well-trained employees is key to the long-term health of your electrical distribution equipment.

On-demand maintenance
You need to adopt the right best practises and minimise downtime, while working with limited budgetary and maintenance resources.

Modernisation
Ageing, outdated equipment can be modernised, dramatically improving its performance and lifetime, as well as achieving compliance with current regulations.

End-of-life
Dispose of outdated equipment in a way that’s both green and transparent.

Installation assessment
For a comprehensive assessment and a clear analysis of the results.

Maintenance Services Contracts
To prevent such issues, these contracts can focus on predictive and preventive maintenance that is specifically tailored to your site and processes.

Examples of services provided

Warranty extension
A warranty extension will be proposed if your installation is checked by us before being commissioned.

Circuit breaker diagnosis
Throughout the life of the equipment it is possible to carry out routine measurement of its characteristics in order to optimise maintenance. This service may be part of a global installation maintenance contract.

Help with preventive maintenance
A Maintenance & Services guide is available and gives the most important general instructions to:
- Reduce equipment wear and tear (and/or failure)
- Ensure that the equipment is safe during all installation, repair and servicing operations
In the pages of this guide, all the information needed for:
- Operation: on control mechanisms, insulating materials and vents, power circuits, auxiliary circuits
- Recommended frequency for interventions is according to operating conditions: normal, in a corrosive atmosphere, for marine use

End-of-life recycling
Schneider Electric Services has an operational subsidiary allowing you to recycle your medium voltage switchgear.
A major asset

In each of its business units or manufacturing plants, Schneider Electric integrates a functional organisation whose main role is to check quality and monitor compliance with standards. This procedure is:
- Uniform throughout all departments
- Recognised by many customers and approved organisations

But above all, its strict application has allowed us to obtain the recognition of an independent organisation as example: The French Quality Assurance Association (AFAQ).

The quality system for the design and manufacture is certified to be in conformity with the requirements of the ISO 9001: 2008 quality assurance standard.

Strict and systematic checks

During manufacture, each functional unit is subject to systematic, routine testing with the aim of checking the quality and conformity of the following features:
- Measurement of the opening and closing speeds
- Measurement of the operating torque
- Dielectric test
- Testing of the safety systems and interlocks
- Testing of the low voltage components
- Conformity with drawings and diagrams

The results obtained are recorded and approved by the quality control department on the test report of each device.

This, therefore, guarantees product traceability.

Protected environment

Schneider Electric is committed to a long-term environmental approach. All necessary measures have been taken in conjunction with our services, suppliers and subcontractors to ensure that the materials used in the composition of the equipment do not contain any substances prohibited by regulations and directives.

In order to help you protect the environment and relieve you of any concerns in terms of stock or dismantling, Schneider Electric Services offers to take back your equipment at the end of its life.

Our Air Insulated Switchgear PIX Double Busbar is designed with environmental protection in mind:
- The materials used, insulators and conductors are identified, easily separable and recyclable
- The environmental management system adopted by Schneider Electric’s production sites for the manufacture of our Air Insulated Switchgear has been assessed and recognised as conforming to the requirements of the ISO 14001 standard
PIX Double Busbar

Product description
Panel architecture
PIX Double busbar unit consists of all of the equipment in the main circuit (high voltage level) and auxiliary circuits (at low voltage level) which together provide a protection function. Each functional unit combines all of the components which are required to fulfill this function:
- The cubicle, and
- The protection, monitoring and control system (including the withdrawable switching device).

Access to main circuit compartments
Interlock-controlled accessible compartment:
- Withdrawable MV part (circuit breaker) compartment

Tool-based accessible compartments:
- Cable compartment
- Busbar compartment
- Fixed parts compartment

The cubicle
The cubicle is a LSC2B (Loss of Service Continuity Category) type as defined by IEC standard 62271-200; in other words, the medium voltage parts are compartemented using metal partitions (PM class) which are connected to earth and which separate:
- The busbars
- The disconnettors
- The withdrawable part (circuit-breaker, disconnector truck or earthing truck), and
- The MV connections, earthing switch, current transformers and voltage transformers, as required.

PIX Double Busbar guarantees a high level of protection of people; when a compartment containing a main circuit is open, the other compartments and/or functional units may remain energised.

The cubicle
The low voltage auxiliaries and monitoring units are in a control cabinet separated from the medium voltage section.

Six basic cubicle layouts are offered:
- Incomer or feeder with circuit breaker
- Busbar coupler
- Bus section
- Bus riser
- Busbar metering and earthing
- Direct incomer with circuit breaker

The withdrawable part
The withdrawable function gives the ability to disconnect devices.
It includes:
- The circuit breaker or the earthing truck
- Interlocks to fix the withdrawable part either in service or disconnecting position

The protection, monitoring and control system
This includes:
- Sepam or MiCOM protection, monitoring and control unit
- The GemControl monitoring and control unit
- The Vamp arc flash protection system
- Current transformers:
- Voltage Transformers

LSC2B (Loss of Service Continuity IEC 62271-200): this category defines the possibility of keeping other compartments energised (in service) when opening a main circuit compartment.
**Product description**

**Technical characteristics**

**IAC (internal arc fault classification):**
Architecture based on safe access to compartments: protection of operators in the event of internal arcing complies with 5 criteria:
- correctly secured doors and covers do not open
- no fragmentation of the enclosure occurs within the time specified for the arcing test
- does not cause holes in the accessible sides
- do not ignite due to the effect of the hot gases indicators
- the enclosure remains connected to its earthing point

**IAC (Internal Arc Classification):**
A: restricted access to authorised personnel only
F: access to the front side
L: access to the lateral side
R: access to the rear side

**Compartment design**
1. Front Bus Bar compartment
2. Rear Bus Bar compartment
3. Bus Bar disconnectors
4. Withdrawable part: vacuum circuit breaker type HVX
5. Cable compartment
6. Low-voltage cabinet with control device
7. Access cover to cable compartment
8. Earthing switch position indicator
9. Earthing switch
10. Current transformers
11. Metallic shutter

<table>
<thead>
<tr>
<th><strong>Rated voltage</strong></th>
<th><strong>kV</strong></th>
<th><strong>12</strong></th>
<th><strong>17,5</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated frequency withstand voltage</td>
<td>kV</td>
<td>28</td>
<td>38</td>
</tr>
<tr>
<td>Rated impulse withstand voltage (BIL)</td>
<td>kV</td>
<td>75</td>
<td>95</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>Hz</td>
<td>50 / 60</td>
<td>50 / 60</td>
</tr>
<tr>
<td>Rated current FIX Double Busbar</td>
<td>Up to A</td>
<td>3150</td>
<td>3150</td>
</tr>
<tr>
<td>Rated peak current</td>
<td>kA</td>
<td>82</td>
<td>82</td>
</tr>
<tr>
<td>Rated short time current (1s - 3s)</td>
<td>kA</td>
<td>31.5</td>
<td>31.5</td>
</tr>
<tr>
<td>Internal arc fault classification</td>
<td>(kA 1S)</td>
<td>31.5</td>
<td>31.5</td>
</tr>
<tr>
<td></td>
<td>IAC</td>
<td>AFLR</td>
<td></td>
</tr>
<tr>
<td>Loss in service continuity category</td>
<td>LSC2B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP</td>
<td>3X or 4X</td>
<td></td>
</tr>
</tbody>
</table>
Operating conditions

Normal operating conditions, according to the IEC International Standards listed below, for indoor switchgear.

■ Ambient air temperature:
  □ less than or equal to 40°C
  □ less than or equal to 35°C on average over 24 hours
  □ greater than or equal to – 5°C

■ Altitude:
  □ less than or equal to 1000 m
  □ above 1000 m, a derating coefficient is applied (please consult us)

■ Atmosphere:
  no dust, smoke or corrosive or inflammable gas and vapor, or salt

■ Humidity:
  □ average relative humidity over a 24 hour period ≤ 95%
  □ average relative humidity over a 1 month period ≤ 90%
  □ average vapor pressure over a 24 hour period ≤ 2.2 kPa
  □ average vapor pressure over a 1 month period ≤ 1.8 kPa

Specific operating conditions (please consult us)
PIX Double Busbar has been developed to meet the following specific conditions:

■ High ambient temperature (possible derating)
■ Corrosive atmospheres, vibrations, (possible adaptation)

Storage conditions

In order to retain all of the functional unit’s qualities when stored for prolonged periods, we recommend that the equipment is stored in its original packaging, in dry conditions, and sheltered

Standards

PIX Double Busbar meets the following international standards:

■ IEC 62271-1: High-voltage switchgear and controlgear: common specifications
■ IEC 62271-200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kA
■ IEC 62271-100: High-voltage switchgear and controlgear - Alternating current circuit-breakers
■ IEC 62271-103: High-voltage switchgear and controlgear - Switches for rated voltages above 1 kV up to and including 52 kV
■ IEC 62271-101: High-voltage switchgear and controlgear - Alternating current switch-fuse combinations
■ IEC 60282-1: High-voltage fuses - Current-limiting fuses
■ IEC 62271-102: High-voltage switchgear and controlgear - Alternating current disconnectors and earthing switches
■ IEC 60255: Measuring relays and protection equipment - Common requirements
■ IEC 61869-2: Instrument transformers - Current transformers
■ IEC 61869-3: Instrument transformers - Inductive voltage transformers
■ IEC 60044-8: Instrument transformers - Electronic current transformers
■ IEC 62271-105: High-voltage switchgear and controlgear - Alternating current switch-fuse combinations
PIX Double Busbar

Range of functions
**Range of functions**

PIX Double Busbar has a comprehensive range of functions to suit all requirements for a wide range of applications.

**Selection guide:**
The following guide will help you to define the most appropriate protection corresponding to the type of applications you want to energize. The equipments shown below are the main functions.

Additional functions are available upon request to answer specific requirements.

### Function and characteristics

#### Choice of functional Unit

#### Single line diagrams

<table>
<thead>
<tr>
<th>Function</th>
<th>Incomer or Feeder</th>
<th>Busbar coupler (1)</th>
<th>Bus section (2)</th>
<th>Bus riser (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device</td>
<td>Vacuum Circuit Breaker HVX</td>
<td>Vacuum Circuit Breaker HVX</td>
<td>Vacuum Circuit Breaker HVX</td>
<td>Withdrawable metering unit MTX (3)</td>
</tr>
</tbody>
</table>

**Single line diagrams**

- **FBB** = front busbar
- **RBB** = rear busbar
- (1) Available with busbar disconnector
- (2) Front or rear busbar
- (3) Optional

---

NRJED313574EN 17
## Range of functions

### Incomer or Feeder

<table>
<thead>
<tr>
<th>CB</th>
<th>Up to 1250 A</th>
<th>From 1250 to 2500 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB 12</td>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
</tr>
<tr>
<td>CB 17</td>
<td><img src="image3.png" alt="Diagram" /></td>
<td><img src="image4.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

### Function and characteristics

#### MV devices
1. Front Bus Bar compartment
2. Rear Bus Bar compartment
3. Main switching device
4. MV connections by cables accessible from the rear face
5. Earthing switch
6. Current transformers
7. Voltage transformers, with fuses

#### LV control cabinet
8. Low voltage auxiliaries and protection, monitoring and control unit are in a control cabinet which is separated from the medium voltage part

### Rated values

<table>
<thead>
<tr>
<th></th>
<th>CB 12</th>
<th>CB 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>12 kV</td>
<td>17.5 kV</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Rated peak current</td>
<td>82 kA</td>
<td>82 kA</td>
</tr>
<tr>
<td>Rated short time current (3s)</td>
<td>31.5 kA</td>
<td>31.5 kA</td>
</tr>
<tr>
<td>Busbar current</td>
<td>up to 1250 A</td>
<td>up to 3150 A</td>
</tr>
<tr>
<td>Short circuit current</td>
<td>up to 31.5 kA</td>
<td>up to 31.5 kA</td>
</tr>
<tr>
<td>Rated current Width 600 mm</td>
<td>A up to 1250 from 1250 to 2500</td>
<td></td>
</tr>
<tr>
<td>Width 1000 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions H mm</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td>D mm</td>
<td>2310</td>
<td>2310</td>
</tr>
<tr>
<td>W mm</td>
<td>600 / 1000</td>
<td>600 / 1000</td>
</tr>
<tr>
<td>Approximate mass Width 600 mm kg</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Width 1000 mm kg</td>
<td>1500</td>
<td>1500</td>
</tr>
</tbody>
</table>
## Functions and characteristics

### Bus coupler

### Range of functions

- **BC CB**
  - Up to 1250 A
  - From 1250 to 3150 A

### Functions and characteristics

#### Bus coupler

- **DM102891**
  - **FBB**
  - **RBB**

### Rated voltage

- **BC CB 12**: 12 kV
- **BC CB 17**: 17,5 kV

### Rated frequency

- **50 / 60 Hz**

### Rated peak current

- **82 kA**

### Rated short time current (3s)

- **31,5 kA**

### Busbar current

- Up to 1250 A
- From 1250 to 3150 A

### Dimensions

- **H**: 2500 mm
- **D**: 2310 mm
- **W**: 600 / 1000 mm

### Approximate mass

- Width 600 mm: 1200 kg
- Width 1000 mm: 1500 kg

### MV devices

1. Front Bus Bar compartment
2. Rear Bus Bar compartment
3. Main switching device
4. Current transformers

### LV control cabinet

5. Low voltage auxiliaries and protection, monitoring and control unit are in a control cabinet which is separated from the medium voltage part

### Table: Rated current

<table>
<thead>
<tr>
<th>BC CB 12</th>
<th>BC CB 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated current</td>
<td>Width 600 mm</td>
</tr>
<tr>
<td>Dimensions</td>
<td>H</td>
</tr>
<tr>
<td>Approximate mass</td>
<td>Width 600 mm</td>
</tr>
</tbody>
</table>
Function and characteristics
Bus section

Range of functions

BS 12
Up to 1250 A

BS 17
From 1250 to 3150 A

Rated voltage

kV
12
17,5

Rated frequency
Hz
50 / 60

Rated peak current
kA
82

Rated short time current (3s)
kA
31,5

Busbar current
A
Up to 3150

Up to 3150

Rated current
A
up to 1250
from 1250 to 3150

Width 600 mm
A

Width 1000 mm

Width 600 mm

Width 1000 mm

Dimensions

mm

H
2500

D
2310

W
600 / 1000

Approximate mass
kg

Width 600 mm
1200

Width 1000 mm
1500

The function is available either on front or on rear busbar

MV devices
1. Front Bus Bar compartment
2. Rear Bus Bar compartment
3. Main switching device
4. Earthing switch
5. Current transformers

LV control cabinet
6. Low voltage auxiliaries and protection, monitoring and control unit are in a control cabinet which is separated from the medium voltage part.
Range of functions

**Bus riser**

**Functions and characteristics**

- **RMT**
  - Up to 1250 A
  - From 1250 to 3150 A

---

**Rated voltage**

<table>
<thead>
<tr>
<th>Type</th>
<th>RMT 12</th>
<th>RMT 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>kV</td>
<td>12</td>
<td>17,5</td>
</tr>
</tbody>
</table>

**Rated frequency**

| Hz       | 50 / 60 |

**Rated peak current**

| kA       | 82      |

**Rated short time current (3s)**

| kA       | 31,5    |

**Busbar current**

| A        | Up to 1250 A from 1250 to 3150 A |

**Rated current**

<table>
<thead>
<tr>
<th>Width 600 mm</th>
<th>A</th>
<th>Width 1000 mm A</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>2500</td>
<td>D</td>
</tr>
<tr>
<td>W</td>
<td>600 / 1000</td>
<td></td>
</tr>
</tbody>
</table>

**Dimensions**

<table>
<thead>
<tr>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
</tr>
<tr>
<td>D</td>
</tr>
<tr>
<td>W</td>
</tr>
</tbody>
</table>

**Approximate mass**

<table>
<thead>
<tr>
<th>kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width 600 mm</td>
</tr>
<tr>
<td>Width 1000 mm</td>
</tr>
</tbody>
</table>

---

The function is available either on front or on rear busbar

**MV devices**

1. Front Bus Bar compartment
2. Rear Bus Bar compartment
3. Withdrawable metering unit (option)

**LV control cabinet**

9. Low voltage auxiliaries and protection, monitoring and control unit are in a control cabinet which is separated from the medium voltage part
Functions and characteristics
Busbar metering & earthing

Range of functions

MV devices
1 Front Bus Bar compartment
2 Rear Bus Bar compartment
3 Withdrawable metering unit
5 Earthing switches

LV control cabinet
8 Low voltage auxiliaries and protection, monitoring and control unit are in a control cabinet which is separated from the medium voltage part

<table>
<thead>
<tr>
<th></th>
<th>MT 12</th>
<th>MT 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>kV</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>H mm</td>
<td>2500</td>
</tr>
<tr>
<td></td>
<td>D mm</td>
<td>2310</td>
</tr>
<tr>
<td></td>
<td>W mm</td>
<td>800</td>
</tr>
<tr>
<td>Approximate mass</td>
<td>Width 800 mm kg</td>
<td>1200</td>
</tr>
</tbody>
</table>
**Functions and characteristics**

**Direct incomer**

The function is available either on front or on rear busbar

**MV devices**

1. Front Bus Bar compartment
2. Rear Bus Bar compartment
3. Main switching device
4. MV connections by cables accessible from the rear face
5. Earthing switch
6. Current transformers

**LV control cabinet**

7. Low voltage auxiliaries and protection, monitoring and control unit are in a control cabinet which is separated from the medium voltage part

---

**Range of functions**

**Direct incomer**

**DI 12** | **DI 17**
---|---
Rated voltage | kV | 12 | 17,5
Rated frequency | Hz | 50 / 60
Rated peak current | kA | 82
Rated short time current (3s) | kA | 31.5
Busbar current | A | Up to 3150
Short circuit current | kA | up to 31,5

**Rated current**

<table>
<thead>
<tr>
<th>Width 600 mm</th>
<th>Width 1000 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>up to 1250</td>
</tr>
</tbody>
</table>

**Dimensions**

<table>
<thead>
<tr>
<th>H</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>2500</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>2310</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>W</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 / 1000</td>
<td></td>
</tr>
</tbody>
</table>

**Approximate mass**

<table>
<thead>
<tr>
<th>Width 600 mm</th>
<th>Width 1000 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg</td>
<td>1200</td>
</tr>
</tbody>
</table>
Range of functions

Installation
Accessories and extraction withdrawable parts

- Door locking key
  - DM102171
- Handle switching compartment for 1000 mm cubicle
  - DM102177
- Earthing switch operating lever
  - DM102176
  - DM102884
- Plug in handle for withdrawable device
  - DM102178
- Circuit breaker mechanism rewinding handle
  - DM102175
- Busbar disconnector handle
  - DM102174
- Maintenance trolley
  - DM102188

For 1000 mm cubicle
For 600 mm cubicle
Range of functions

Installation

Implementation example of a line-up switchboard

Min. 800

Feeder 600 mm

Feeder 600 mm

Feeder 600 mm

Direct incomer FBB 1000 mm

Direct incomer RBB 1000 mm

Metering & busbar earthing 800 mm

Bus coupler 1000 mm

Feeder 600 mm

Min. 100

FBB: Front Busbar

RBB: Rear Busbar

NRJED313574EN
Range of functions

Installation
Connections

PIX Double Busbar - width 600 mm

![View A](image1)

![View B](image2)

PIX Double Busbar - width 1000 mm

Standard cable connection:
maximum size and number per phase

<table>
<thead>
<tr>
<th>12 / 17.5 kV</th>
<th>Cable max. (no. / size) (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incomers feeders 600 mm</td>
<td>max. 3 x 630 mm²</td>
</tr>
<tr>
<td>Direct Incomers 1000 mm</td>
<td>max. 4 x 630 mm² 4 x 1000 mm²</td>
</tr>
</tbody>
</table>

(1) Cable size is the cross sectional area in mm² based on a single core cable.
PIX Double Busbar

Switchgear / Apparatus and Cubicle equipment
**Busbar disconnector**

- Busbar disconnector TRI
  - No load operation only
  - Up to 2500A rated current

**Injection / Earthing truck**

- It enables the earthing of busbar or cables. It can also be used to make voltage injection, for instance to test cables. 
- It is installed instead of the circuit breaker and has the same interlock capabilities.

**Disconnector truck**

- The disconnector truck provides a direct conductive link between busbar and cable compartment. 
- It is installed instead of the circuit breaker and has the same interlock capabilities.

**Metering device**

- Withdrawable metering unit enables to measure busbar voltage
  - MTX compact drawout VT module

**Circuit breaker**

- A circuit breaker is a safety device enabling the switching and protection of electrical distribution networks. Installed in the PIX Double Busbar cubicle, it protects all components situated downstream during a short-circuit.
  - Breaking in vacuum
  - HVX
 HVX is our latest range of vacuum circuit breakers. It offers a proven state-of-the-art design to meet your specifications for power switching devices in air-insulated switchgear up to 17.5 kV. HVX brings a valuable solution to your project. Thanks to its improved contact design, our interrupters provide unrivalled performance for their reduced size.

Operating mechanisms have been simplified to increase reliability and give extended life with very low maintenance. Instead of the traditional spring operating mechanism, HVX implemented a singleshaft system with only one torsion spring, reducing the number of parts and increasing the reliability.

Application
HVX is designed to suit all types of applications (utilities, power generation, O&G, industry, etc.) and to perform all switching conditions of transformers, generators, capacitor banks and motors.

Flexibility
HVX is available in a range of standard, fixed or withdrawable configurations, with plug-in (finger or tulip type) or bolted connections.

HVX can be integrated in our medium voltage switchboard PIX or can be offered with a pre-engineered power module which incorporates a chassis with metal shutters, earthing switch, mechanical interlocks, multi-functional bushings and various electrical options to facilitate switchboard integration.

Standard
HVX has been fully tested according to IEC 62271-100 at 50 Hz and 60 Hz and the latest GOST standards. The highest level of the above mentioned standards has been passed including M2, E2, C2.

HVX has also been certified to ANSI C37.013 for generator circuit breaker applications up to 50 kA (31.5 kA maximum for PIX Double busbar).

### Electrical characteristics according to IEC 62271-100

<table>
<thead>
<tr>
<th>For the cubicles</th>
<th>PIX 12</th>
<th>PIX 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit breaker designation</td>
<td>PIX 12</td>
<td>PIX 17</td>
</tr>
<tr>
<td>Rated voltage Ur</td>
<td>kV</td>
<td>12</td>
</tr>
<tr>
<td>Rated breaking capacity</td>
<td>kA rms</td>
<td>up to 31.5</td>
</tr>
<tr>
<td>Short circuit current</td>
<td>A</td>
<td>25</td>
</tr>
<tr>
<td>Cable charging current</td>
<td>A</td>
<td>10</td>
</tr>
<tr>
<td>Line charging current</td>
<td>A</td>
<td>400</td>
</tr>
<tr>
<td>Single capacitor bank</td>
<td>A</td>
<td>10</td>
</tr>
<tr>
<td>No load transformer</td>
<td>kA peak</td>
<td>82</td>
</tr>
<tr>
<td>Rated making capacity</td>
<td>ms</td>
<td>35 - 53</td>
</tr>
<tr>
<td>Opening</td>
<td>ms</td>
<td>55 - 62</td>
</tr>
<tr>
<td>Closing</td>
<td>ms</td>
<td>2 - 15</td>
</tr>
<tr>
<td>Arcing</td>
<td>ms</td>
<td>45 - 63</td>
</tr>
<tr>
<td>Rated operating sequence</td>
<td>O-3 min-CO-3 min-CO</td>
<td></td>
</tr>
<tr>
<td>CO-15 s-CO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O-0.3 s-CO-3 min-CO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O-0.3 s-CO-15 s-CO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endurance</td>
<td>Mechanical (C/O) for switching chamber</td>
<td>30000</td>
</tr>
<tr>
<td>Electrical (C/O at Ir up to 3150 A)</td>
<td>10000</td>
<td></td>
</tr>
<tr>
<td>Mechanical (C/O) for mechanism</td>
<td>10000</td>
<td></td>
</tr>
</tbody>
</table>
## Cubicle equipment
### PIX Double Busbar

<table>
<thead>
<tr>
<th>Equipment</th>
<th>CB</th>
<th>BC</th>
<th>CB</th>
<th>BS</th>
<th>BR</th>
<th>MT</th>
<th>DI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Switchgear</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circuit-breaker</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Contactor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuse switch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disconnector truck</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td></td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Earthing truck</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Metering truck</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Racking position indication contact to</td>
<td>2 NO + 2 NC</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>the withdrawable part</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Padlocking of isolating shutters</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td></td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>for the withdrawable parts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locking of withdrawable part/cable</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>compartment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disabling of circuit-breaker operating</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td></td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>mechanism</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage presence indicator or Voltage</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td></td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>detection system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locking of mechanical racking of the</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>withdrawable part (padlock)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locking of mechanical racking of the</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>withdrawable part (keylock)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locking of the electromagnetic racking</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>of the withdrawable part</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Earthing switch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earthing switch</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Earthing switch position indication</td>
<td>4 NO + 4 NC</td>
<td>□ (1)</td>
<td>□ (1)</td>
<td>□ (1)</td>
<td>□ (1)</td>
<td>□ (1)</td>
<td>□ (1)</td>
</tr>
<tr>
<td>contacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earthing switch position key locking</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Electromagnetic earthing switch position</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>locking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Transformers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage Transformers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1 per phase)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without fuse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase-phase</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Phase-earth</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>With plug-in fuses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase-phase</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Phase-earth</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Fuse melting indication contact</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>1 NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Transformer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single set</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>3 CT’s</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Connections</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection with cable terminal height</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>&gt; 600 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection from top bar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection by cable from the top</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Connection by cable from the bottom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cubicle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection index (R)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Enclosure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compartment (4)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Anti-arcing protection (2)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>25 kA - 1 s</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>35.1 kA - 1 s</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Thermal diagnosis system (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lightning arrester</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td><strong>Busbars</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1250 A / 2500 A / 3150 A (R)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Exposed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LV control cabinet key locking</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>LV control cabinet lighting</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Anti-condensation heating element</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

■: basic equipment.
□: option.

(1) Basic equipment with earthing switch option.

(2) According to the room in which the PIX switchboard is installed, you can choose exhaust tunnel or deflector.

(3) Connection of 1 or 2 cables per phase.

(4) Compartment protection.

(5) Consult us.

---

NRJED313574EN
PIX Double Busbar

Protection, Monitoring and Control
## Protection relays

### Functions
Provides protection of network for each application: Substations (incomer or feeder type) / Transformers / Motors / Generators / Busbars / Capacitors
Each relay series offers all of the functions required for:
- Effective protection of life and property
- Accurate measurements and detailed diagnosis
- Integral equipment control
- Local or remote indications and operation

### Self power / Auxiliary supply
<table>
<thead>
<tr>
<th>Sepam series 10</th>
<th>MiCOM Px10</th>
<th>Sepam series 20</th>
<th>Sepam series 40</th>
<th>MiCOM Px20</th>
<th>Sepam series 60</th>
</tr>
</thead>
</table>
| Auxiliary supply | • Auxiliary supply  
• Self or Dual supply | Auxiliary supply | Auxiliary supply | Auxiliary supply | Auxiliary supply |

### Protection
<table>
<thead>
<tr>
<th>Sepam series 10</th>
<th>MiCOM Px10</th>
<th>Sepam series 20</th>
<th>Sepam series 40</th>
<th>MiCOM Px20</th>
<th>Sepam series 60</th>
</tr>
</thead>
</table>
| Current (1 or 5A) | Current (1 or 5A)  
• Voltage | • Current (1 or 5A)  
• Voltage | • Current (1 or 5A)  
• Voltage | • Current (1 or 5A)  
• Voltage | • Current (1 or 5A or LPCT)  
• Voltage |

### Display
<table>
<thead>
<tr>
<th>Sepam series 10</th>
<th>MiCOM Px10</th>
<th>Sepam series 20</th>
<th>Sepam series 40</th>
<th>MiCOM Px20</th>
<th>Sepam series 60</th>
</tr>
</thead>
</table>
| Standard UMI | Standard UMI  
• Remote UM | • Standard UMI  
• Remote UM | • Standard UMI  
• Remote UM | Standard UMI | • Standard UMI  
• Remote UM  
• Mimic based UMI |

### Other characteristics

### Input / Output (up to)
<table>
<thead>
<tr>
<th>Sepam series 10</th>
<th>MiCOM Px10</th>
<th>Sepam series 20</th>
<th>Sepam series 40</th>
<th>MiCOM Px20</th>
<th>Sepam series 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 / 7</td>
<td>6 / 6</td>
<td>10 / 8</td>
<td>10 / 8</td>
<td>7 / 8</td>
<td>28 / 16</td>
</tr>
</tbody>
</table>

### I/O terminals
<table>
<thead>
<tr>
<th>Sepam series 10</th>
<th>MiCOM Px10</th>
<th>Sepam series 20</th>
<th>Sepam series 40</th>
<th>MiCOM Px20</th>
<th>Sepam series 60</th>
</tr>
</thead>
</table>
| Screw type | Screw type  
• Ring lug | • Screw type  
• Ring lug | • Screw type  
• Ring lug | Ring lug | • Screw type  
• Ring lug |

### Temperature sensor (up to)
<table>
<thead>
<tr>
<th>Sepam series 10</th>
<th>MiCOM Px10</th>
<th>Sepam series 20</th>
<th>Sepam series 40</th>
<th>MiCOM Px20</th>
<th>Sepam series 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>8 to 16</td>
<td>10 (motor)</td>
<td>8 to 16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Communication protocol
<table>
<thead>
<tr>
<th>Sepam series 10</th>
<th>MiCOM Px10</th>
<th>Sepam series 20</th>
<th>Sepam series 40</th>
<th>MiCOM Px20</th>
<th>Sepam series 60</th>
</tr>
</thead>
</table>
| • Modbus RTU  
• IEC 60870-5-103 | • Modbus RTU  
• IEC 60870-5-103 | • Modbus RTU  
• IEC 60870-5-103  
• DNP3  
• Modbus TCP/IP  
• IEC 61850  
No GOOSE | • Modbus RTU  
• IEC 60870-5-103  
• DNP3  
• Modbus TCP/IP  
• IEC 61850  
No GOOSE  
• RSTP* | • Modbus RTU  
• IEC 60870-5-103  
• DNP3  
• Modbus TCP/IP  
• IEC 61850  
Standard GOOSE  
• RSTP* |

### Logic equations
<table>
<thead>
<tr>
<th>Sepam series 10</th>
<th>MiCOM Px10</th>
<th>Sepam series 20</th>
<th>Sepam series 40</th>
<th>MiCOM Px20</th>
<th>Sepam series 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensive logic equations</td>
<td>Basic logic equations</td>
<td>Comprehensive logic equations</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Safety characteristics
<table>
<thead>
<tr>
<th>Sepam series 10</th>
<th>MiCOM Px10</th>
<th>Sepam series 20</th>
<th>Sepam series 40</th>
<th>MiCOM Px20</th>
<th>Sepam series 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 61508-SIL2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Ethernet high availability communication
## Protection relays

**Protection relays selection guide**

<table>
<thead>
<tr>
<th>Sepam series 80</th>
<th>MiCOM Px30</th>
<th>MiCOM Px40</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="https://example.com" alt="Image" /></td>
<td><img src="https://example.com" alt="Image" /></td>
<td><img src="https://example.com" alt="Image" /></td>
</tr>
</tbody>
</table>

### Functions

<table>
<thead>
<tr>
<th>Sepam series 80</th>
<th>MiCOM Px30</th>
<th>MiCOM Px40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepam series 10</td>
<td>IEC 60870-5-103</td>
<td>IEC 60870-5-103</td>
</tr>
<tr>
<td>Protection relays</td>
<td>Modbus RTU</td>
<td>Modbus RTU</td>
</tr>
<tr>
<td>Ethernet high availability communication</td>
<td>DNP3</td>
<td>DNP3</td>
</tr>
<tr>
<td>IEC and specific country standards</td>
<td>IEC 61850 with GOOSE</td>
<td>IEC 61850 with GOOSE</td>
</tr>
<tr>
<td>Logic equations</td>
<td>RSTP / SHP / DHP*</td>
<td>RSTP / SHP / DHP*</td>
</tr>
</tbody>
</table>

### Self power / Auxiliary supply

<table>
<thead>
<tr>
<th>Sepam series 80</th>
<th>MiCOM Px30</th>
<th>MiCOM Px40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary supply</td>
<td>Auxiliary supply</td>
<td>Auxiliary supply</td>
</tr>
</tbody>
</table>

### Protection

<table>
<thead>
<tr>
<th>Sepam series 80</th>
<th>MiCOM Px30</th>
<th>MiCOM Px40</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Current (1 or 5A or LPCT)</td>
<td>• Current (1 or 5A)</td>
<td>• Current (1 or 5A)</td>
</tr>
<tr>
<td>• Voltage</td>
<td>• Voltage</td>
<td>• Voltage</td>
</tr>
<tr>
<td>- Phase &amp; Earth basic - Directional - Synchro-check - Differential</td>
<td>- Phase &amp; Earth basic - Directional - Synchro-check - Differential</td>
<td>- Phase &amp; Earth basic - Directional - Synchro-check - Differential</td>
</tr>
<tr>
<td>Display</td>
<td>Display</td>
<td>Display</td>
</tr>
<tr>
<td>• Standard UMI</td>
<td>• Standard UMI</td>
<td>• Standard UMI</td>
</tr>
<tr>
<td>• Remote UM</td>
<td>• Remote UM</td>
<td>• Remote UM</td>
</tr>
<tr>
<td>• Mimic based UMI</td>
<td>• Mimic based UMI</td>
<td>• Mimic based UMI</td>
</tr>
</tbody>
</table>

### Other characteristics

<table>
<thead>
<tr>
<th>Sepam series 80</th>
<th>MiCOM Px30</th>
<th>MiCOM Px40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removable S/W cartridge</td>
<td>Removable S/W cartridge</td>
<td>Removable S/W cartridge</td>
</tr>
</tbody>
</table>

### Input / Output (up to)

<table>
<thead>
<tr>
<th>Sepam series 80</th>
<th>MiCOM Px30</th>
<th>MiCOM Px40</th>
</tr>
</thead>
<tbody>
<tr>
<td>42 / 23</td>
<td>50 / 26</td>
<td>32 / 32</td>
</tr>
</tbody>
</table>

### I/O terminals

<table>
<thead>
<tr>
<th>Sepam series 80</th>
<th>MiCOM Px30</th>
<th>MiCOM Px40</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Screw type</td>
<td>• Screw type</td>
<td>• Screw type</td>
</tr>
<tr>
<td>• Ring lug</td>
<td>• Ring lug</td>
<td>• Ring lug</td>
</tr>
</tbody>
</table>

### Temperature sensor (up to)

<table>
<thead>
<tr>
<th>Sepam series 80</th>
<th>MiCOM Px30</th>
<th>MiCOM Px40</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 to 16</td>
<td>1/9/10</td>
<td>10</td>
</tr>
</tbody>
</table>

### Communication protocol

<table>
<thead>
<tr>
<th>Sepam series 80</th>
<th>MiCOM Px30</th>
<th>MiCOM Px40</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Modbus RTU</td>
<td>• Modbus RTU</td>
<td>• Modbus RTU</td>
</tr>
<tr>
<td>• IEC 60870-5-103</td>
<td>• IEC 60870-5-103</td>
<td>• IEC 60870-5-103</td>
</tr>
<tr>
<td>• DNP3</td>
<td>• DNP3</td>
<td>• DNP3</td>
</tr>
<tr>
<td>• Modbus TCP/IP</td>
<td>• Modbus TCP/IP</td>
<td>• Modbus TCP/IP</td>
</tr>
<tr>
<td>• IEC 61850</td>
<td>• IEC 61850</td>
<td>• IEC 61850</td>
</tr>
<tr>
<td>Customised GOOSE</td>
<td>Customised GOOSE</td>
<td>Customised GOOSE</td>
</tr>
<tr>
<td>• RSTP*</td>
<td>• RSTP / SHP / DHP*</td>
<td>• RSTP / SHP / DHP*</td>
</tr>
</tbody>
</table>

### Logic equations

<table>
<thead>
<tr>
<th>Sepam series 80</th>
<th>MiCOM Px30</th>
<th>MiCOM Px40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control logic by ladder diagram</td>
<td>Comprehensive logic equations</td>
<td>Comprehensive logic equations</td>
</tr>
</tbody>
</table>

### Safety characteristics

<table>
<thead>
<tr>
<th>Sepam series 80</th>
<th>MiCOM Px30</th>
<th>MiCOM Px40</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 61508 - SIL2</td>
<td>IEC and specific country standards (UL, CSA, GOST...)</td>
<td>IEC and specific country standards (GOST...)</td>
</tr>
</tbody>
</table>

### Benefits

- **Sepam**
  - Hardware modularity and common hardware modules
  - Large range of auxiliary power
  - ROHS compliant and conformal coated components

- **MiCOM**
  - Complete and comprehensive product offer
  - Full IEC 61850 solution with GOOSE
  - All-in-the-box solution

---

NRJED313574EN
Protection relays
Sepam protection system

Sepam: protection digital relays
Sepam is a range of digital monitoring protection and control units. Sepam is at the centre of the protection, monitoring and control system for the MCSet functional units: all of the necessary protection, metering, control, monitoring and signalling functions are performed by Sepam.

The Sepam range is defined to provide an optimal solution for each application, and includes, for example:
- Sepam S, substation incomer and feeder
- Sepam B, bus sectioning
- Sepam T, transformer feeder
- Sepam M, motor feeder
- Sepam G, generator feeder
- Sepam C, capacitor feeder

The Sepam range consists of the Sepam series 20, series 40, series 60 and series 80, a range of modular protection relays to adapt precisely to your needs.

Protection chain
The Sepam protection units, combined with innovative current sensors, provide a comprehensive measurement, protection and energy management chain.*

A high performance, economical solution
The modular Sepam offer provides a cost effective solution tailored to every requirement.

Easy to order and install
All of the components in the protection chain are referenced and can be delivered very quickly.

The power of a multi-functional digital unit
Sepam is more than a simple protection relay, it is truly multi-functional unit offering, in particular:
- Circuit breaker diagnosis functions (switching counter and time, rearming time, cumulated broken A²)
- Direct circuit breaker control of whatever type of release unit
- Remote equipment operation using the most standard communication protocols

(*) Please check in the Sepam catalogue the sensor to use in the Sepam catalogue.

Protection, Monitoring & Control

Each functional unit can be equipped with a comprehensive protection, monitoring and control system consisting of:
- Instrument transformers(*) to measure the necessary electrical values (phase current, residual current, voltages, etc.)
- Protection relays, providing functions adapted to the part of the network to be protected
- Metering equipment, to inform operators
- Low voltage relaying, i.e. to provide control of the breaking device (contactor and circuit breaker) of the withdrawable part
- Various auxiliaries: secondary circuit test units, etc.

(*) Please check the sensor to use in the Sepam catalogue.

Protection relay metering equipment.
Switchgear (circuit breaker and contactor).
Instrument transformers.

Reability
- Over 30 years of experience in multi-function digital protection relays
- Over 600,000 Sepam units in service in more than 90 countries

Quality
- Design quality is based on dependability studies and the strict definition of environmental constraints: temperature, pollution, EMC, dielectric strength, etc.
- All Sepam series 20,40,60 and 80 boards and electronic components are industrially conformally coated. This manufacturing allows Sepam to be used in the most severe industrial environments, including off-shore oil rigs and chemical factories (IEC 60068-2-60 and EIA 364-65A IIIA)
- Quality manufacturing based on procurement agreements with suppliers and inspection throughout all of the manufacturing phases

Simplicity of use
- Local operation facilitated by the ergonomic User Machine Interface informing the operator fully and clearly in his own language
- Ease-of-setup thanks to the flexibility and user-friendliness of the parameters setup software
The Sepam range of protection relays is designed for the operation of machines and electrical distribution networks of industrial installations and utility substations at all voltage levels - To cover all needs, from the simplest to the most complete.

Sepam range includes 3 families:
- Sepam series 20, for usual applications.
- Sepam series 40, series 60, for demanding applications.
- Sepam series 80, for custom applications.

Sepam complies with IEC 61850 (series 20, 40, 60, 80).

**Sepam multifunction protection relays**

A range of solutions adapted to your application
- Substation protection (incomers, feeders, busbars)
- Transformer protection
- Motor and generator protection

All of the necessary functions for your application
- Effective protection of people and property
- Accurate measurements and detailed diagnosis
- Integral equipment control
- Local or remote indication and operation

Flexibility and upgrading capability
To adapt to as many situations as possible and to allow for future installation upgrades, optional modules may be added to Sepam at any time for new functions.

**Sepam 100 additional units**

Sepam 100 units round off the Sepam range and can be installed either separately or combined with Sepam series 20, series 40, series 60 and series 80 units.

Sepam 100 has several variants:
- Sepam 100 MI has local breaking device control and signalling modules (many different line diagram types are available)
- Sepam 100 LA contains self-powering protection (back-up protection without auxiliary power supply)

**Sepam series 80 modular architecture**

1 - Base unit, with two types of User Machine Interfaces (UMI):
- Integrated mimic-based UMI
- Integrated or remote advanced UMI

2 - Parameters and protection settings saved on a removable memory cartridge

3 - 42 logic inputs and 23 relay outputs, including 5 outputs on the base unit, plus 3 optional modules, each providing 14 inputs and 6 outputs

4 - 2 independent Modbus communication ports:
- Connection of each port to 1 or 2 S-LAN and/or E-LAN networks
- Modbus, Modbus TCP/IP, IEC60870-5-103, DNP3 and IEC 61850 communication protocols
- GOOSE messages and TCP/IP redundancy
- RS485 (2 or 4 wire) or fibre-optic network

5 - Temperature data from 16 sensors: Pt100, Ni100, or Ni120

6 - 1 analogue output: 0-1 mA, 0-10 mA, 4-20 mA or 0-20 mA

7 - Synchro-check module

8 - Software tools:
- Sepam parameter and protection setting and control function customisation
- Programming of specific functions (Logipam)
- Recovery and display of disturbance recording data
- Local or remote operation via a communication network
MiCOM protection provides the user with a choice of cost-optimised solutions for specific protection requirements within the distribution network. The MiCOM relay series offers comprehensive protective function solutions for all power supply systems, as well as for the various functional and hardware project stages.

MiCOM complies with IEC 61850

**MiCOM protection relays**

With their modular design, the MiCOM device platforms provide the user with multifunctional equipment that can act as:

- Grid protection equipment, and
- Combined protection and control systems
- MiCOM devices integrate most standard communication protocols used in station control systems and SCADA systems
- Due to the continuous further development of these products, compatibility with technical progress in the field of switchgear and controlgear communication is ensured

**MiCOM offers varying levels of functionality and hardware**

- **Series 10** is designed for universal overcurrent protection for the primary or back-up protection on LV or MV systems
- **Series 20** fulfills the basic requirements of industrial, utility and building applications, providing simplicity and ease of use in a wide range of installations
- **Series 30** is designed to meet the rigorous requirements of MV & HV applications with particular focus on feeder and transformer protection and control
- **Series 40** fulfills the protection requirements for a wide market of utility and industrial systems and offers a complete range of protection functions
Protection, Monitoring & Control

GemControl is a modular unit for control, monitoring, measurement, processing and data transmission. To know the switchboard status at all times and to act with full knowledge of the facts, GemControl maximises smart switchgear management.

GemControl advantages

- **Safe operation**
  Robust standard PLC software (IEC 61131-3). Direct motor control of all devices without intermediate relays.

- **Scalable concept for simple or complex applications**
  All possibilities are covered, from the stand-alone replacement of conventional electrical push-buttons, position indicators, local/remote key switches and metering instruments in low voltage cabinets to smart interfacing between switchgear panels and substation control systems (SCADA).

- **Incomparable flexibility**
  In all phases of design, parameter setting, operation and upgrading of the installation. Expandable for future needs.

- **Reliability**
  Type tested according to IEC 255-6 or EN 60255-6. Transferable back-up memory (GemStick).

GemControl equipped Switchgear ensures the highest availability of your electrical network. By closely monitoring the health and status of actual conditions in real time, GemControl will flag any unusual or detrimental conditions, helping you to plan effectively and efficiently.

The robust, innovative, intelligent modules are linked together to provide, control, monitoring, measurement and metering of all parameters. The monitored data can be used locally and individually, or linked into a complete Smart Grid automation solution.

GemControl

The world’s first universal Switchgear Controller for all MV applications, designed for Smart Grid ready applications.

- Optimised Switchgear and network performance.
- Extended life, minimal maintenance required.
- Modular, tailored to any application.
- Complementary to a free choice of protection devices.
- Low Cost of Ownership (reduced CAPEX and OPEX).
- Direct control and switchgear monitoring (no interposing devices).
## Arc fault detectors

### Vamp 120

- **Protection, Monitoring & Control (PE90501)**

### Vamp 121

- **Protection, Monitoring & Control (PE90502)**

### Vamp 221 (+I/O units)*

- **Protection, Monitoring & Control (PE90503)**

## Functions

The arc protection unit detects an arc flash in an installation and trips the feeding breaker. An arc flash protection maximises personnel safety and minimises material damage caused by arc faults.

### System features

- Typical operation on light only principle
- Input for current criteria for I> and L> operation
- Integrated 19 - 256 V AC/DC aux. supply
- Optimised for wind power and other small applications
- Up to 4 arc or smoke sensors
- Selective trip for 2 zones and possibility for generator set emergency trip (separate contact)
- Operation time 7 ms (including the output relay)
- Non-volatile trip status
- NO and NC trip outputs (Zone 1)
- Self-supervision
- Straightforward installation
- Cost efficient solution

### Sensors

- **Point sensor - surface**
  - Arc detection from two compartments simultaneously
  - Self-monitored
  - Cable length adjustable from 6 m to 20 m down

- **Point sensor - pipe**
  - Self-monitored
  - Cable length adjustable from 6 m to 20 m down

- **Portable sensor**
  - Snap-in connection to I/O unit
  - Enhanced work safety

### IEC standards

- **IEC standards**

### Benefits

- Personnel safety
- Reduces production losses
- Extended switchgear life cycle
- Reduced insurance costs
- Low investment costs and fast installation
- Reliable operation

---

* I/O units: 4 references available (VAM 3L, VAM 10L/1D, VAM 12L/1D, VAM 4C/CD). The choice is to be made according to the needs concerning the type and number of sensors. Please contact us.
The arc protection unit detects an arc flash in an installation and trips the feeding breaker. An arc flash protection system maximises personnel safety and minimises material damage caused by arc faults.

Arc flash protection maximises personnel safety and minimises material damage to the installation in the most hazardous power system fault situations. Minimised damage also means a limited need for repair work and enables rapid restoration of the power supply.

**Vamp advantages**

- **Personnel Safety**
  A fast and reliable arc protection unit may save human lives in the event of an arc fault occurring in the switchgear during work in or near an installation.

- **Reduces production losses**
  The shorter the operating time of the arc flash protection unit, the smaller will be the damage caused by the arc fault and the shorter the possible power outage.

- **Extended switchgear life cycle**
  A modern arc protection unit increases the life-cycle expectancy of switchgear installations, so that decisions to invest in new switchgear installations can be postponed and money can be saved by re-Vamping existing switchgear systems.

- **Reduced insurance costs**
  The faster and better the protection system of a power installation, the more generous will be the terms and costs of insurance.

- **Low investment costs and fast installation**
  A comprehensive arc protection system is characterised by low investment costs and fast installation and commissioning times. One successful operation of the arc flash protection units provides an immediate investment payoff.

- **Reliable operation**
  Operation is based on the appearance of light or alternatively on the appearance of light and current from an external device. Immune to nuisance trippings due to dual tripping criteria: light and current.

**Schneider Electric AIS switchgears**

**Internal arc compliancy**

**Internal arc version**

Our Air Insulated Switchgear is designed to withstand and protect operators in the case of failure due to an internal arc. Our Air Insulated Switchgear have been successfully type tested. Our Air Insulated Switchgear provides several options to install an internal arc switchboard.

- **4-sided internal arc protection**
  In the case of a switchboard installed in the middle of a room, internal arc protection on 4 sides is necessary in order to protect an operator who goes behind the cubicle.

- **Internal arcing detector (option)**
  Our Air Insulated Switchgear has 2 systems that can detect internal arcing and switch off the power supply to limit the fault duration.
  - **Electromagnetic detector**
    This system employs a positive security electromechanical tripping circuit, positioned on the cubicle’s flaps. This set transmits the information to the Sepam to give the opening order to the circuit breaker located upstream of the fault.
  - **Vamp arc flash protection**
    The arc protection unit detects an arc flash in an installation and trips the feeding breaker. Arc flash protection improves personnel safety and minimises material damage to the installation in the most hazardous power system fault situations.
**Current transformers**

**For PIX Double Busbar**

**Rated voltage up to 17.5 kV**

*For other ratings please consult us.*

**Conventional DIN 42600 type Current Transformers**

Conventional Current Transformers are used to provide power to metering, measuring or control devices. They measure the value of primary current from 10 A to 2500 A.

Schneider Electric has drawn up a list of Current Transformers which are appropriate for use with digital protection devices in order to make it easier to determine accuracy characteristics.

**For AD12 or AD14 at 800 A**

- Double primary current, double secondary current for measurement or protection
- Frequency 50-60 Hz

<table>
<thead>
<tr>
<th>T1n (A)</th>
<th>50-100</th>
<th>75-150</th>
<th>100-200</th>
<th>150-300</th>
<th>200-400</th>
<th>250-500</th>
<th>600</th>
<th>750</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ith (kA)</td>
<td>40</td>
<td>40</td>
<td>31.5-40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>t (s)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Measurement* cl.0.5</td>
<td>2.5-5 VA</td>
<td>2.5-5 VA</td>
<td>2.5-5 VA</td>
<td>2.5-5 VA</td>
<td>7-15 VA</td>
<td>10-20 VA</td>
<td>10-20 VA</td>
<td>20 VA</td>
</tr>
<tr>
<td>Protection*</td>
<td>5P20</td>
<td>5P20</td>
<td>5P20</td>
<td>5P20</td>
<td>5P20</td>
<td>5P20</td>
<td>5P20</td>
<td>5P20</td>
</tr>
</tbody>
</table>

**For AD13 at 1250 A**

- Single primary current, double secondary current for measurement or protection
- Frequency 50-60 Hz

<table>
<thead>
<tr>
<th>T1n (A)</th>
<th>1000</th>
<th>1250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ith (kA)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>t (s)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Measurement* cl.0.5</td>
<td>30 VA</td>
<td>30 VA</td>
</tr>
<tr>
<td>Protection*</td>
<td>5P20</td>
<td>30 VA</td>
</tr>
</tbody>
</table>

**For AD15 at 2500 A**

- Single primary current, double secondary current for measurement or protection
- Frequency 50-60 Hz

<table>
<thead>
<tr>
<th>T1n (A)</th>
<th>1500</th>
<th>2000</th>
<th>2500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ith (kA)</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>t (s)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Measurement* cl.0.5</td>
<td>30 VA</td>
<td>30 VA</td>
<td>30 VA</td>
</tr>
<tr>
<td>Protection*</td>
<td>5P20</td>
<td>15 VA</td>
<td>15 VA</td>
</tr>
</tbody>
</table>

* The secondary current for measuring and protection can be 1 A or 5 A.
Protection, Monitoring & Control

**Voltage transformers**

For PIX Double Busbar

**Rated voltage up to 17.5 kV**

For other ratings please consult us.

These supply power to:
- Measuring, metering and monitoring devices
- Relays or protective devices

The energised part is entirely encapsulated in an epoxy resin, which provides both electrical insulation and excellent mechanical strength.

They include the following models:
- With one insulated MV terminal, for connection between neutral and phase conductors in three-phase systems
- With two insulated MV terminals, for connection between phase conductors

**Voltage Transformers type phase-earth**

Transformer VDF11 or VDF12
- Phase-earth
- Frequency 50-60 Hz

<table>
<thead>
<tr>
<th>Primary voltage (kV)</th>
<th>3/√3</th>
<th>3.3/√3</th>
<th>5.5/√3</th>
<th>6/√3</th>
<th>6.6/√3</th>
<th>10/√3</th>
<th>11/√3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st secondary voltage (V)</td>
<td>100/√3</td>
<td>110/√3</td>
<td>110/√3</td>
<td>100/√3</td>
<td>110/√3</td>
<td>100/√3</td>
<td>110/√3</td>
</tr>
<tr>
<td>2nd secondary voltage (V)</td>
<td>100/3</td>
<td>110/3</td>
<td>110/3</td>
<td>100/3</td>
<td>110/3</td>
<td>100/3</td>
<td>110/3</td>
</tr>
<tr>
<td>1st secondary accuracy class (VA)</td>
<td>30-50 VA cl.0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd secondary accuracy class (VA)</td>
<td>50 VA 3P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Voltage Transformers type phase-phase**

Transformer VDC12
- Phase-phase
- Frequency 50-60 Hz

<table>
<thead>
<tr>
<th>Primary voltage (kV)</th>
<th>3.3</th>
<th>5.5</th>
<th>6.6</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary voltage (V)</td>
<td>110</td>
<td>110</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>Accuracy class (VA)</td>
<td>50 VA cl.0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.

Design: Sonovision
Photos: Schneider Electric Industries SAS
Printed: Altavia - St Etienne - Made in France