



# PIX-H

**Metal-clad switchgear up to 17.5kV**



for high rated applications

**Technical  
Specifications**



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# Technical description

The PIX metal-clad switchboards are extensible on both sides and consist of modular functional units, linked by a busbar, and connected to the substation earth via an earthing bus.

The cubicles are subdivided by metal partitions into four separate compartments, including a low voltage compartment for the control and monitoring equipment.

The three Medium Voltage compartments; bus bar, equipment & cables, are fitted with an overpressure release system, oriented towards the top of the unit.

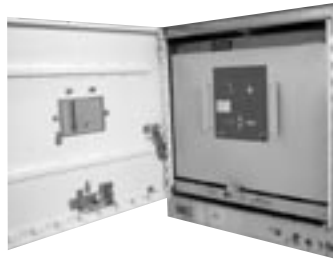
## Main module compartment

Closed off by a door, this compartment contains:

- > A withdrawable module, fitted with a circuit breaker, which has two positions, "plugged in" or "disconnected/test".

All operations of the withdrawable module and its associated equipment can be carried out with the compartment door closed.

Withdrawable modules of the same type are interchangeable.



*Main module compartment.*

The connection between the withdrawable module, the busbar and the cable branches is made by means of withdrawable silver plated contacts.

A 64-pin plug (Max.) connects the auxiliary circuits of the withdrawable module to the low voltage compartment.

- > For personnel safety, there are metallic shutters (1), installed in front of the spouts of the fixed "plug-in" contacts (2), which prevent access to the primary circuit, thus ensuring a protection when the withdrawable module is either in the "disconnected/test" position or removed from the compartment.

Once the withdrawable module has been removed, each shutter can be padlocked individually.

With the interlocking shutters, the independant opening of the upper or lower shutter is only possible using a special tool (optionally supplied).

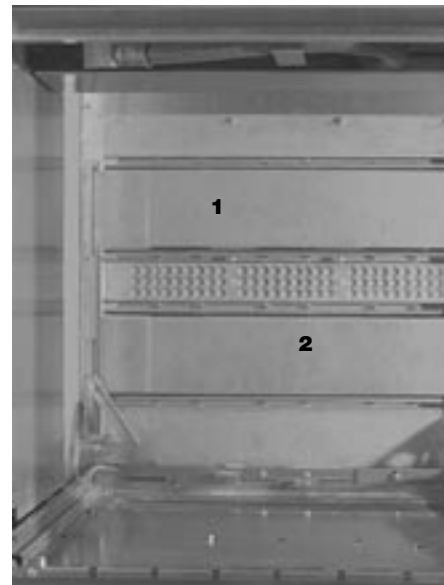
- > An earthing device for the removable module, to the IEC standards, ensures earthing continuity during removal, either through rullers or through an optional plug.

An inspection window on the door, allows the position of the withdrawable module to be clearly seen within the compartment. Its position is also shown on the mimic diagram on the DCX control unit.

The PIX system also offers, amongst the range of withdrawable modules, the functions of disconnecting link, voltage transformers and busbar earthing switch.

This compartment is fitted with mechanical locking devices in accordance with IEC standards, which are necessary to avoid any unsafe operations.

(For details, see the chapter on locks).



*Main module compartment.*

### Cable compartment

The cable compartment is normally closed with a bolted panel.



*Cable compartment.*

As an option, and depending on the installation of switchboard chosen, the rear panel can be made removable, to further improve access (on request).

This compartment contains:

- > The connections to the power cables, up to 10 x 630 mm<sup>2</sup> per phase, with a choice of bottom plate (for details, see chapter on cable connections).
- > The cable earthing switch is operated from the front of the cubicle by means of a removable lever.
- > Current transformers, with DIN dimensions, are fitted at the rear of the cubicle.
- > The voltage transformers, fitted at the front of the compartment, are either fixed - with or without fuses, or removable with fuses.
- > A metallic cable duct, located on the left-hand lateral part, guides the low voltage conductors into the control/command compartment safely.



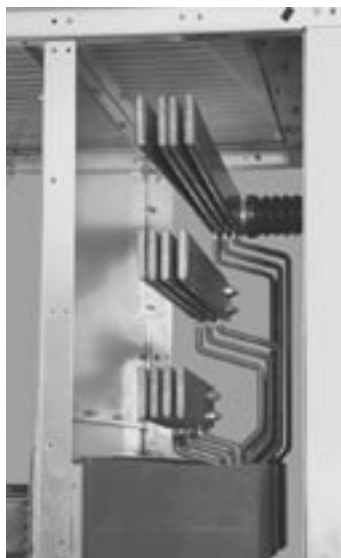
*Cable compartment.*

At the front, upper section of this compartment, is the access to the earthing switch controls, along with its mimic diagram and VPIS type voltage indicators (IEC 61958). VDS type voltage indicators (IEC 61234-5) can be offered as an option.

Details of the interlocks are given in the next chapter.

### Busbar compartment

Located in the upper, rear of the unit, this compartment is accessible via the top or front panel of the cubicle, after removing the partitions, which separate it from the switchgear compartment.



*Busbar compartment*

The bus bar consists of flat copper with rounded edges. The rated current will determine the number of bars to be mounted in parallel.

The bus bar is linked and supported by solid connections to the spouts.

Optionally, this compartment can be fitted with:

- > Segregations made of insulating materials, resistant to pressure, mounted between each cubicle.

On request:

- > Encapsulation of the bus bars and branch connections.
- > Fixed voltage transformers, without fuses.
- > An earthing switch.



*LV compartment standard.*

### Low voltage compartment

This compartment contains all the secondary circuit functions for control, measurement, protection, monitoring, communication and other associated systems.

This independent compartment, is a separate assembly, supplied fully assembled and tested.

## Locks

The operation of PIX is designed to be completely safe. All the operations listed below are carried out from the front panel, with the door and panels closed.

- > Connect or disconnect the withdrawable module.
- > Re-load the spring mechanism.
- > Mechanically close or open the circuit breaker or switch-disconnector.

- > Open or close the earthing switch. Access to the withdrawable module compartment requires the use of a specialised handle and on option a key.

The interlocks were designed with this operational ideology in mind and add to the security of the system by making it impossible to make unsafe operations.



Actions	Status of elements involved	
	Basic locking devices	Optional locking devices
Plugging in the module	<ul style="list-style-type: none"> <li>- LV socket connected</li> <li>- Circuit breaker open</li> <li>- Earthing switch open</li> </ul>	<ul style="list-style-type: none"> <li>- Module compartment access door closed</li> </ul>
Closing the circuit breaker	<ul style="list-style-type: none"> <li>- Module completely plugged in, or plugged out/test position</li> <li>- Plug-in lever removed</li> </ul>	
Closing the earthing switch	<ul style="list-style-type: none"> <li>- Module in plugged out/test position or removed</li> </ul>	
Access to the cable compartment		<ul style="list-style-type: none"> <li>- Earthing switch closed (NAV)</li> </ul>
Opening of the earthing switch		<ul style="list-style-type: none"> <li>- Cable compartment panel closed (NAV)</li> </ul>
Access to the withdrawable module compartment	(Reminder: requires the use of a specific handle on option)	<ul style="list-style-type: none"> <li>- Module in disconnected plugged-out/test</li> </ul>
Partial re-opening of the earthing switch for cable testing		<ul style="list-style-type: none"> <li>- Is not possible to put the panel again when earthing switch is in this position (NAV)</li> </ul>
Opening of the shutters		<ul style="list-style-type: none"> <li>- By the withdrawable module action</li> <li>- With specific tool.</li> </ul>
Opening of the secondaries of VT's	Withdrawable VT's in plug-in position (NAV)	

## Other safety equipment

	Basic locking devices	Optional locking devices
Locking device using padlocks	<ul style="list-style-type: none"> <li>- Shutters</li> <li>- Earthing switch access (in open or closed position)</li> <li>- No access to operate the drawout module</li> <li>- Circuit breaker "on/off" buttons</li> </ul>	
Locking device using fixed locks		<ul style="list-style-type: none"> <li>- The door of the withdrawable module</li> <li>- Earthing switch, either in open or closed position</li> <li>- Module in plugged out position</li> </ul>
Locking device by electromagnetic coil		<ul style="list-style-type: none"> <li>- Earthing switch, positions</li> <li>- Disconnect link module (UTX) (NAV)</li> <li>- Busbar earthing switch positions</li> </ul>



# Standards

## Safety has been certified by testing

PIX cubicles have been designed to meet the requirements of International standards (IEC) and validated by type tests, carried out by independent laboratories.



IEC Reference	Description
IEC 62271-200	- Metal enclosed switchgear and control gear, from 1 kV to 52 kV
IEC 60694	- Common standards for HV equipment
IEC 62271-100	- HV AC Circuit breakers
IEC 62271-102	- AC disconnector and earthing switch
IEC 61958	- Voltage presence indicator system
IEC 61234-5	- Voltage detector system
IEC 60529	- Degree of protection of the enclosures

## Operating conditions

Operating conditions for interior use, in accordance with IEC 60694	
Ambient temperature:	<ul style="list-style-type: none"><li>- + 40°C</li><li>- maxi + 55°C with corresponding under-rating current</li><li>- + 35°C on average over a 24 hour period</li><li>- - 5°C minimum</li></ul>
Ambient air:	<ul style="list-style-type: none"><li>- No impurities due to dust, flammable/corrosive gases &amp; vapours, smoke or salt.</li></ul>
Humidity:	<ul style="list-style-type: none"><li>- Average relative humidity over a 24 hour period: 95%</li><li>- Average steam pressure over a 24 hour period: Max. 2.2 kPa</li><li>- Average relative humidity over a 1 month period: 90%</li><li>- Average steam pressure over a 1 month period: Max. 1.8 kPa</li></ul>
Altitude:	<ul style="list-style-type: none"><li>- Up to 1,000 m above sea level, corresponding to atmospheric conditions of: 1013 hPa, + 20 °C, 11g/m3 water.</li><li>- Above 1,000 m, a derating factor is applied, please contact us for details.</li></ul>
Vibration:	<ul style="list-style-type: none"><li>- Negligible</li><li>- For particular conditions, please contact us.</li></ul>

### Protection degree

Standard degree of protection of the external enclosure: <b>IP 3X</b> Optionally, there is the possibility of various IP, ratings in accordance with the table below.	Meaning for the protection of equipment		Meaning for the protection of people
Elements of code <b>IP</b>	<b>1<sup>st</sup> element</b>	<b>2<sup>nd</sup> element</b>	<b>Additional element</b>
Protection against access to the dangerous parts by means of tools	2    >=12.5 mm 3    >=2.5 mm 4    >=1 mm X    Not defined		Not used element covered by 1 <sup>st</sup> element
Protection against water ingress with harmful effects		0    Not protected 1    Vertical dripping water 2    Dripping water with 15° inclinaison X    Not defined	
			C    D=2.5 mm L=10 mm D    D=1 mm L=100 mm X    Not defined



# PIX in detail



>> MMI standard

- 1 LV compartment standard
- 2 Circuit breaker
- 3 Switchgear compartment door
- 4 Earthing switch operating mechanism
- 5 Voltage presence indicator
- 6 E.S. mimic digram
- 7 Cable compartment panel
- 8 Voltage transformer
- 9 Current transformer
- 10 Cable connection
- 11 Earthing switch
- 12 Metal shutter for cable
- 13 Spouts
- 14 Metal shutter for busbar
- 15 Busbar





# Technical data

## Functional unit

Designation		PIX H 12	PIX H 17
Reference standards		IEC 62271-200	IEC 62271-200
Rated voltage (kV)	kV rms	12	17.5
Power frequency withstand voltage 50 Hz 1 min to earth and between phases on the isolating distance			
	kV rms	28 / 38 (42)	38 (42)
	kV rms	32 / 45	45
Impulse withstand voltage 1,2 / 50 micro sec to earth and between phases on the isolating distance			
	kV peak	75 / 95	95
	kV peak	85 / 100	110
Rated frequency	Hz	50 / 60	50 / 60
Short time current			
	1 sec withstand	kA rms	50
	3 sec withstand	kA rms	50
	Peak withstand	kA rms	125*
Rated current			
	Busbar with natural ventilation	A	Up to 3150
	Busbar with assisted ventilation	A	Up to 5000
	Functions CB with natural ventilation	A rms	Up to 3150
	Functions CB with assisted ventilation	A rms	Up to 5000
Internal arc withstand	kA	Up to 50 kA - 1 sec	Up to 50 kA - 1sec
Earthing switch making capacity	kA peak	125	125
Earthing switch endurance			
	number of making operation	2	2
	mechanical (C/O)	1000	1000
Degree of protection*			
	external enclosure standard	IP 4X	IP 4X
	open door without withdrawable module	IP 2X	IP 2X
Approximate heat dissipation			
Functions CB Ir=800 A	W	650	650
Force on floor (without cubicle weight)			
Functions CB	daN	750	750

\* Higher values on request.

**HVX drawout circuit breaker module**  
**Characteristics**

For the cubicles		PIX H 12	PIX H 17
Designation		HVX 12	HVX 17
Reference standards		IEC	IEC
Rated voltage	kV	12	17.5
Rated current	A rms	Up to 3150	Up to 3150
Rated breaking capacity			
short circuit current	kA rms	40 / 50	40 / 50
cable charging current	A	25	31.5
line charging current	A	10	10
single capacitor bank	A	400	400
no load transformer	A	10	10
Rated making capacity	kA peak	100 / 125*	100 / 125*
Rated operating time			
opening	ms	40-53	40-53
breaking	ms	55-62	55-62
arcing	ms	2-15	2-15
closing	ms	45-63	45-63
Rated operating sequence		O-3min-CO-3min-CO CO-15s-CO O-0.3s-CO-3min-CO O-0.3s-CO-15s-CO	O-3min-CO-3min-CO CO-15s-CO O-0.3s-CO-3min-CO O-0.3s-CO-15s-CO
Endurance			
mechanical (C/O) for switching chamber		30 000	30 000
mechanical (C/O) for mechanism		10 000	10 000
electrical (C/O at In)		10 000	10 000

\* Higher values on request.

### HVX spring operating mechanism

Designation		FH2-01 (hand) / FK2-01 (motor)	
Reference standards		IEC	IEC
		<b>DC</b>	<b>AC</b>
Rated supply voltage <sup>(1)</sup>	V	24-48-60-110-125-220	120-230
Rated frequency	Hz		50/60
Reset motor			
Voltage variation range	% of Un	85 to 110	85 to 110
Power consumption (maxi)	W / VA	100	100
Starting current	A		
Reset time	s	8-12	8-12
Shunt opening coil			
Voltage variation range	% of Un	70 to 110	70 to 110
Power consumption (maxi)	W / VA	≤ 250	≤ 250
Minimum impulse duration	ms	50	50
Under voltage opening coil			
Voltage range for closing	% of Un	>85	>85
Voltage range for tripping	% of Un	35 to 0	35 to 0
Power consumption (maxi)	W/VA	10	10
Shunt closing coil			
Rated current	% of Un	85 to 110	85 to 110
Power consumption maxi	W/VA	≤250	≤250
CT operated coil			
Rated current	A		0.5 - 1 - 5
Current variation range	% Ir		90 à 110
Auxiliary contacts			
Rated current	A	15	15
Breaking capacity 48V (L/R 10ms)	A	10	-
Breaking capacity 125V (L/R 10ms)	A	3.8	-
Breaking capacity 220V (L/R 10ms)	A	2	-
Breaking capacity 120 or 230 Vdc	A	-	10

(1) No 125 Vdc for reset motor - No 220 Vdc and 120 Vac for under voltage opening coil.

## Equipment

	FH2-01 (hand)		FK2-01 (motor)	
	Basic	Optional	Basic	Optional
Manual opening and closing	●		●	
CB Position indicators	●		●	
Spring charging motor			●	
Spring position indicator	●		●	
Shunt trip coil		●	●	
Second shunt trip coil		●		●
CT operated release		●		●
Undervoltage shunt tripping coil		●		●
Closing coil			●	
Operation counter	●		●	
Anti-pumping relay		●		●
<b>Free auxiliary contacts</b>				
CB position 2NO / 2NC	●		●	
3NO / 4 NC		●	s	●
Spring charged position 2NO / 1NC	●		●	



HVX

### UTX drawout disconnect link module



>> Disconnect link

### Auxiliary contacts for withdrawable module

Position	HVX - UTX - MTX	
	Basic	Optional
Plugged in and test/unplugged		
1 O/C (reverse)	●	
4 O/C (reverse)		
Plugged in		
1 N/C	●	
1 N/C + 1 N/O		●
2 N/C		
Unplugged/test		
1 NC	●	
1 N/C + 1 N/O		●
2 N/C		

### MTX drawout VT's module

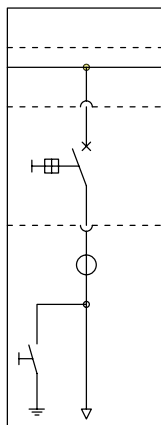


### Auxiliary contacts for earthing switch

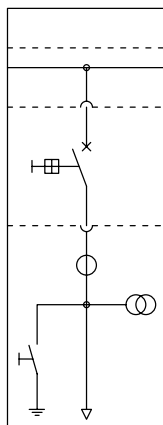
Position	Basic	Optional
Close/Open 1 O/C (reverse)	●	
Closed 3 N/C		●
Opened 3 N/C		●



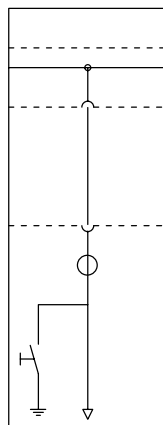
# Product range



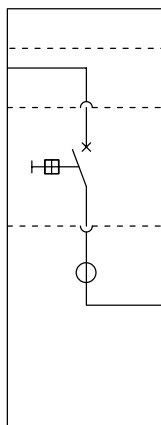
Incoming/Outgoing  
with circuit breaker



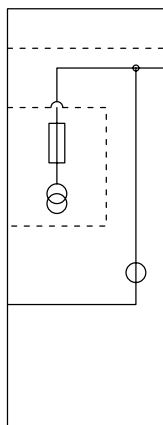
Incoming/Outgoing  
with circuit breaker  
+ fixed VT's



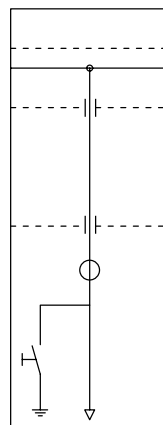
Outgoing with discon-  
nect link



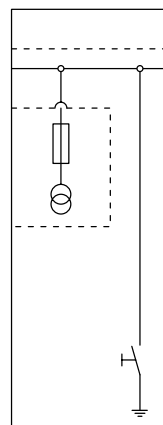
Bus section with  
circuit breaker



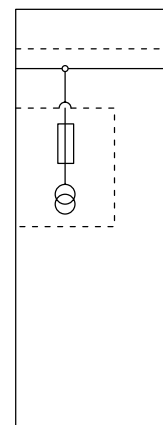
Bus riser with  
transformers



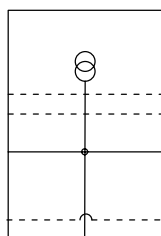
Direct incoming



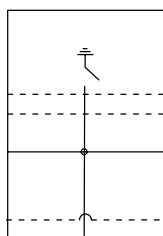
Busbar voltage  
metering with  
earthing switch



Busbar voltage  
metering



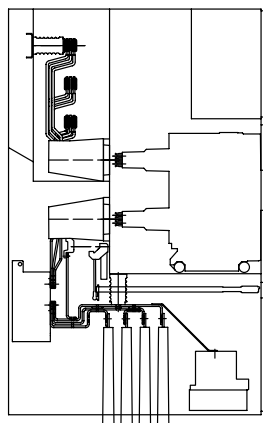
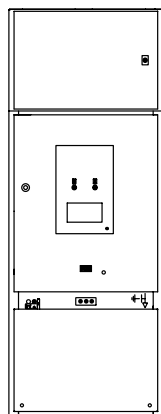
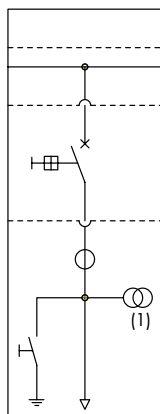
Busbar with voltage  
transformer on the  
top



Busbar with  
earthing switch on  
the top



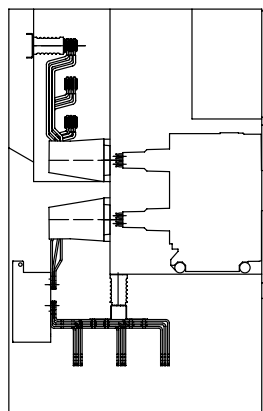
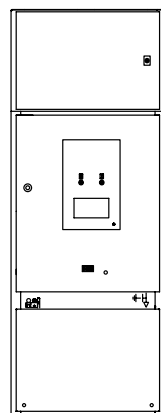
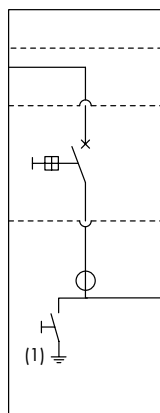
## Equipment range



> Incoming or outgoing unit with circuit breaker.

On request:

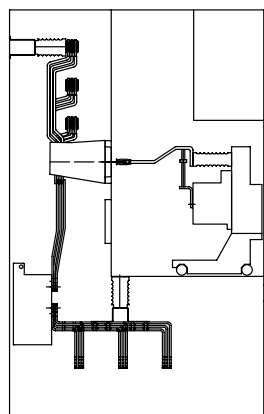
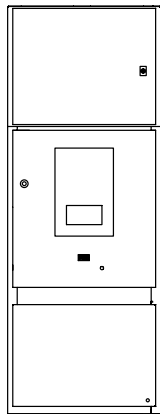
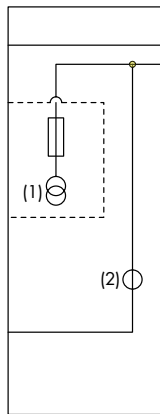
- Fixed VT's with fuses
- Fixed VT's without fuses<sup>(1)</sup>
- Withdrawable cable VT's with removable fuses (please contact us).



> Bus section unit with circuit breaker.

On request:

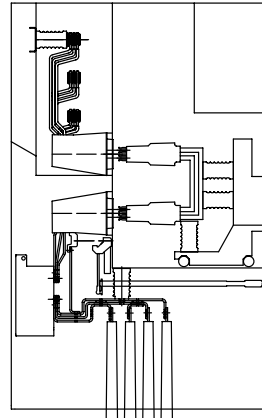
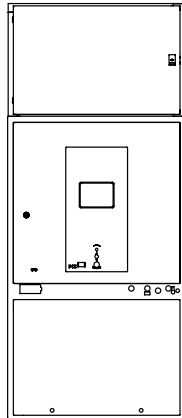
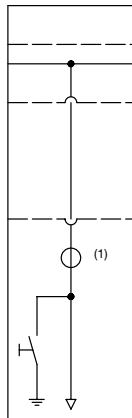
- Busbar earthing switch<sup>(1)</sup>



> Bus riser unit.

On request:

- Withdrawable VT's module with or without fuses <sup>(1)</sup>.
- Current transformers <sup>(2)</sup>

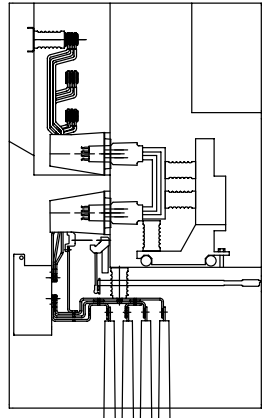
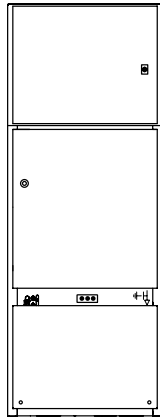
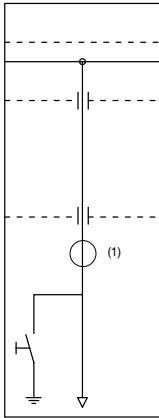


> Bus riser disconnect link.

On request:

- Current transformers <sup>(1)</sup>

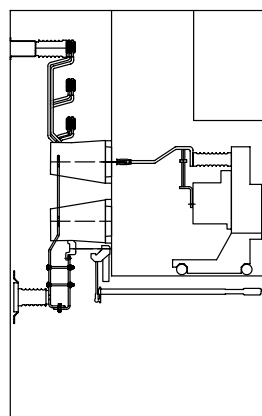
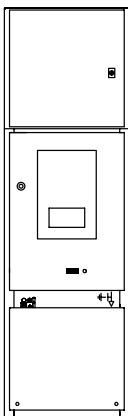
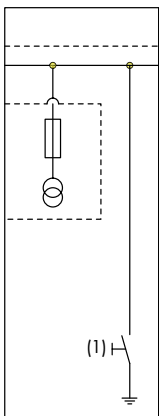




> Direct incoming unit.

On request:

- Fixed VT's with fuses
- Fixed VT's without fuses
- Current transformers <sup>(1)</sup>
- Withdrawable cable VT's with removable fuses (please contact us).



> Busbar voltage metering

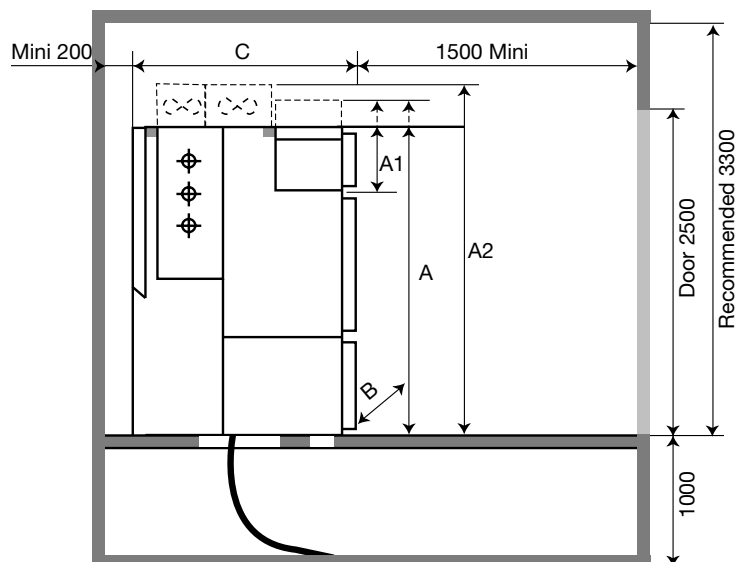
On request:

- Busbar earthing switch <sup>(1)</sup>

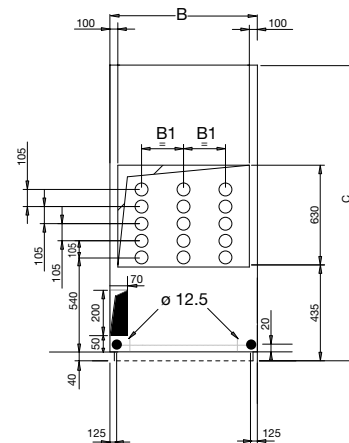


# Dimensions and layout

## PIX H 12 / 17.5 kV



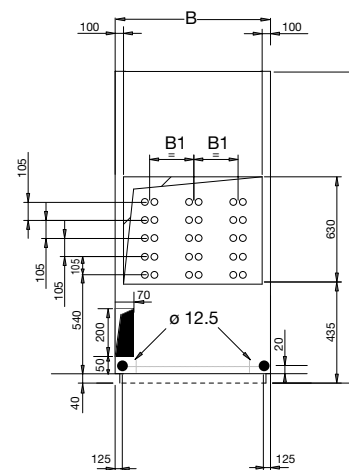
Width 800 mm  
B1 = 210



Functions		PIX H 12 and 17.5 kV up to 50 kA 5000A
	I <sub>cc</sub> (kA)	50
	I <sub>n</sub> (A)	B (width)
Incoming or outgoing		
CB	≤2500	800
Disconnect link		
Bus section	3150	1000
	4000	1000
	5000	1000
Direct incoming	≤2500	800
Bus riser		
	3150	1000
	4000	1000
	5000	1000
Busbar voltage metering		800
End panel		140

Dimensions in mm. - (1) Depth 1590 for 2 CT/phase.

Width 1000 mm  
B1 = 254



A : 2330

A1 : 630

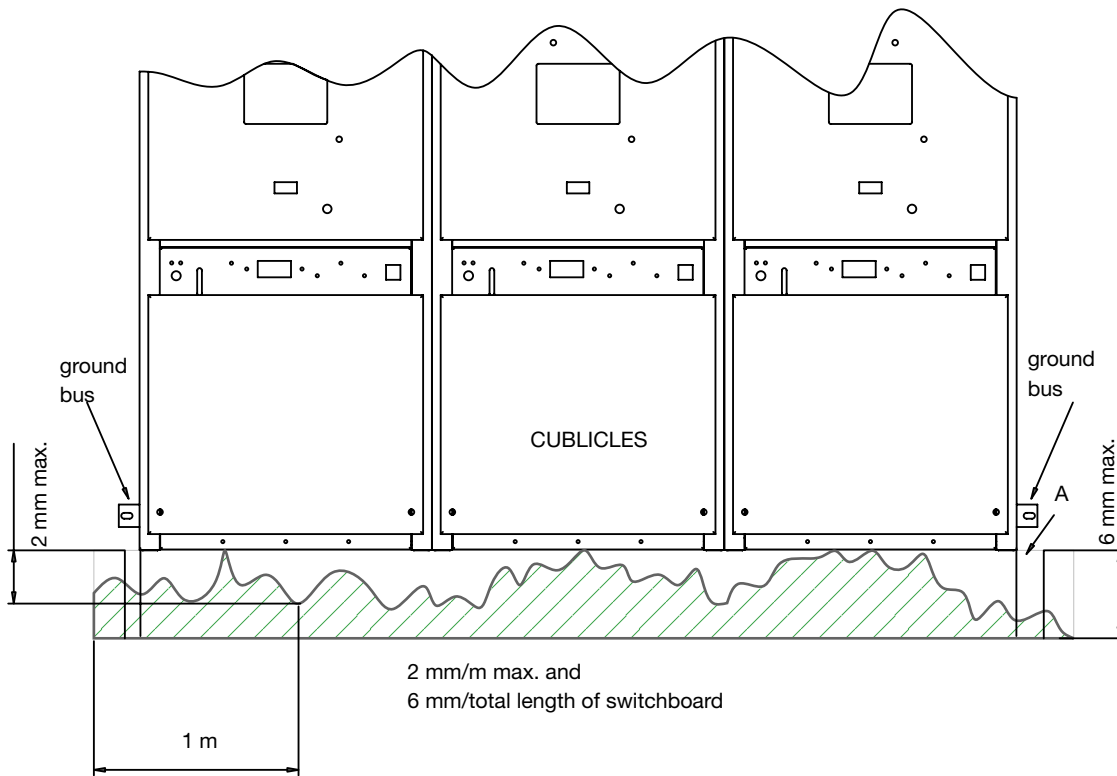
A2 : 2860\*

C : 1490/1590 <sup>(1)</sup>

\* 2860 with forced cooling  
2890 with gas protection deflectors  
3100 with gas absorber or gas  
evacuation tunnel.

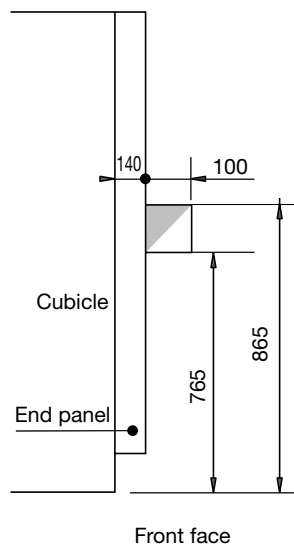


# Floor Plan



## Detail for ground bus

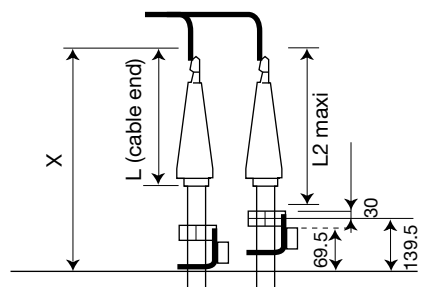
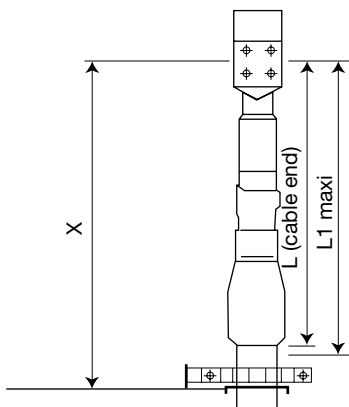
PIX H 12 - 17.5 kV





# Cable connections

The manufacturer's instructions for the ends of the cables must be followed.

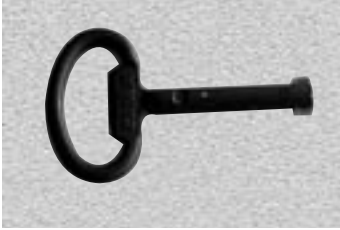


Assembly with DIN clamps

	PIX 12	PIX 17
X	552	552
L1	490	490
L2	370	370



# Accessories



LV door locking key



Handle switching compartment



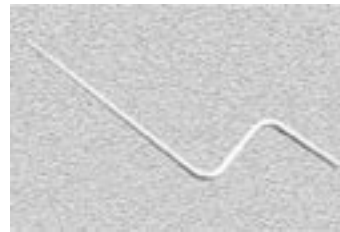
Earthing switch operating lever



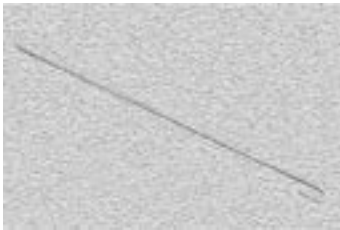
Plug in handle



Handling trolley



Circuit breaker mechanism reset handle



Circuit breaker operating lever



# Delivery - Packaging

## Delivery

The cubicles, which make up the switchboard are delivered individually, ready for assembly. The connection should be carried out on-site.

## Packaging

- For transportation by lorry :  
The product is fixed to a wooden pallet and protected by plastic cover.  
The front panel is protected by polystyrene panels.
- For transportation by sea :  
The product is covered with a plastic heat welded cover, with desiccant materials, then installed into a wooden case.
- For transportation by air :  
The product is covered with a plastic heat welded cover, with desiccant materials, then installed into a wooden case.



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