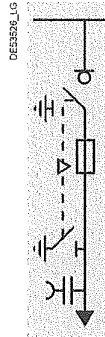


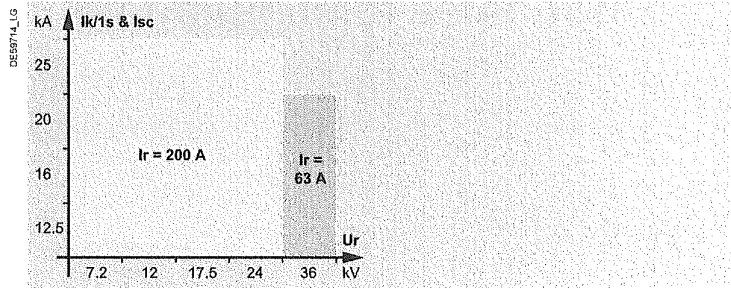
Functional units selection

Protection Fuse-switch

PM
Fused-switch unit



Electrical characteristics



Basic equipment:

- switch and earthing switch
- three-phase busbars
- CIT operating mechanism
- voltage presence indicator
- connection pads for dry-type cables
- downstream earthing switch 2 kA rms making capacity
- equipment for three UTE (for SM6-24) or DIN striker fuses
- 150 W heating element for SM6-36
- LSC2A

Version:

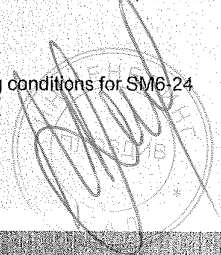
- CI1 operating mechanism
- CI2 operating mechanism for SM6-36

Option:

- motor for operating mechanism
- motor option with severe and communication
- auxiliary contacts
- digital ammeter
- key-type interlocks
- mechanical indication system for blown fuses
- 1250 A three-phase upper busbars
- 630 A cable connection by the top (no internal arc withstand if selected)
- UTE (for SM6-24) or DIN striker fuses
- visibility of main contacts
- pressure indicator device
- 630 A three-phase upper busbars for severe operating conditions for SM6-24
- enlarged low-voltage control cabinet for SM6-24
- 50 W heating element for SM6-24
- release units for SM6-36
- thermal monitoring
- arc detection

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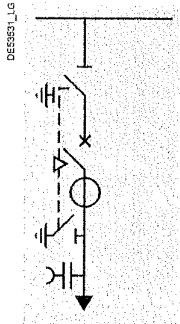


Functional units selection

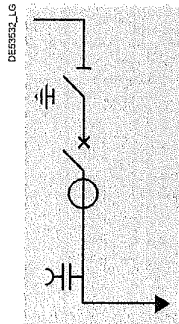
Protection

SF6 type circuit breaker

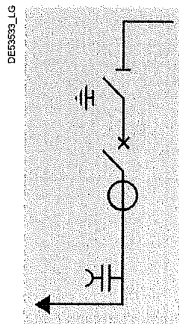
DM1-A
Single-isolation disconnectable CB unit



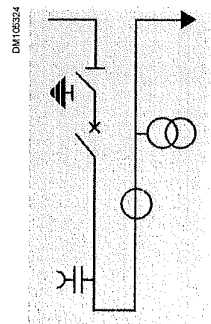
DM1-D
Single-isolation disconnectable CB unit
Outgoing line on right



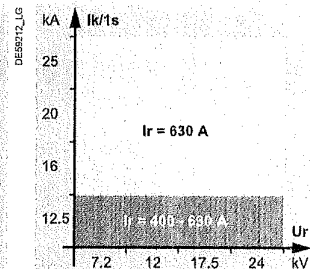
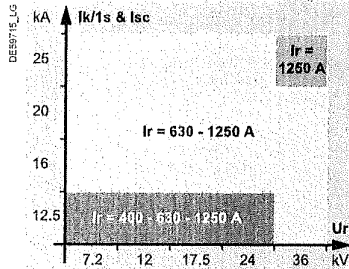
DM1-D
Single-isolation disconnectable CB unit
Outgoing line on left



DM1-M
Single-isolation, disconnectable CB and measurement unit
Outgoing line on right



Electrical characteristics



Basic equipment:

- SF1 disconnectable circuit breaker
- disconnector and earthing switch
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnector operating mechanism CS
- voltage presence indicator
- three CTs (DM1-M: please consult us)
- auxiliary contacts on circuit breaker
- mechanical interlocking between circuit breaker and disconnector
- 150 W heating element for SM6-36
- LSC2A
- connection pads for dry-type cables
- downstream earthing switch 2 kA rms making capacity at 630 A and 25 kA rms making capacity at 1250 A
- three-phase bottom busbars

Version:

- LPCT (only with Sepam series 20, 40, 60, 80)
- SFset circuit breaker disconnectable (only for 400-630 A performances and SM6-24)
- SF1 circuit breaker disconnectable (only for 400-630 A performances and SM6-24)

Option:

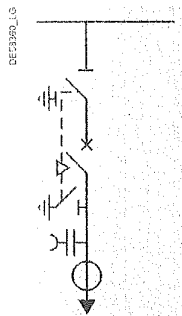
- **cubicle:**
 - 1250 A three-phase upper busbars at Ir 630 A
 - 630 A cable connection by the top (no internal arc withstand if selected)
 - 630 A three-phase upper busbars for severe operating conditions for SM6-24
 - enlarged low-voltage control cabinet for SM6-24
 - 50 W heating element for SM6-24
 - connection pads for two dry-type single-core cables for SM6-36
- auxiliary contacts on the disconnector
- protection using Sepam programmable electronic unit
- three voltage transformers
- key-type interlocks
- surge arresters
- 630 A busbars earthing switch cabinet for SM6-24 (not available for internal arc IEC62271-200)
- arc detection
- thermal monitoring
- arc detection
- thermal monitoring

Functional units selection

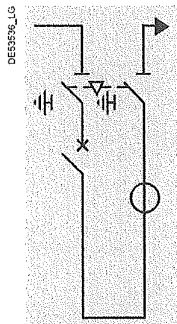
Protection

SF6 type circuit breaker

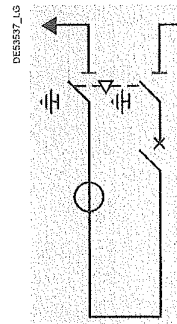
DM1-S
Single-isolation disconnectable CB unit with independent protection



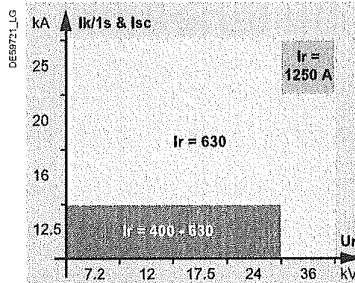
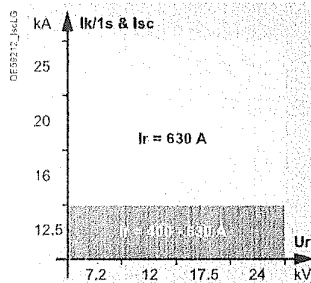
DM2
Double-isolation disconnectable CB unit
Outgoing line on right



DM2
Double-isolation disconnectable CB unit
Outgoing line on left



Electrical characteristics



Basic equipment:

- SF1 disconnectable circuit breaker
- disconnecter and earthing switch
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnecter operating mechanism CS
- auxiliary contacts on circuit breaker
- mechanical interlocking between circuit breaker and disconnecter
- LSC2A

- VIP relay
- three CR sensors for VIP relay protection
- voltage presence indicator
- connection pads for dry-type cables
- downstream earthing switch 2 kA rms making capacity

- three CTs
- 150 W heating element for SM6-36

Version:

- Sepam series 10 with auxiliary supply and three CR sensors

Option:

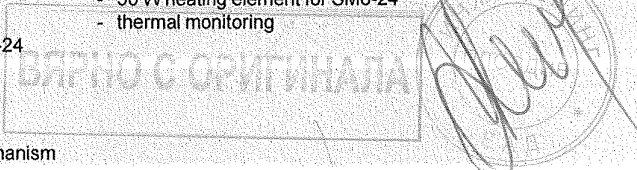
- **cubicle:**
- key-type interlocks
- arc detection

- **cubicle:**
- protection using Sepam programmable electronic unit
- auxiliary contacts on disconnectors
- 2 voltage transformers phase-to-phase or 3 voltage transformers phase-to-earth

- 1250 A three-phase upper busbars at Ir 630 A
- 630 A three-phase upper busbars for severe operating conditions for SM6-24
- enlarged low-voltage control cabinet for SM6-24

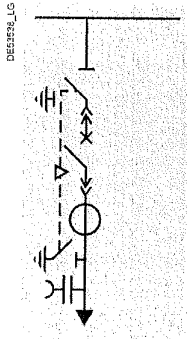
- 630 A cable connection by the top (no internal arc withstand if selected)
- 50 W heating element for SM6-24
- thermal monitoring

- **circuit breaker:**
- motor for operating mechanism
- release units (coil)
- operation counter on manual operating mechanism



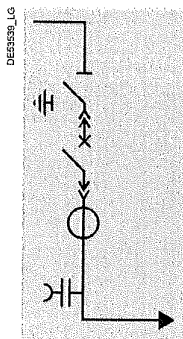
DM1-W

Withdrawable single-isolation
circuit breaker unit

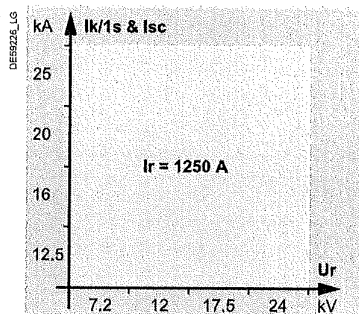
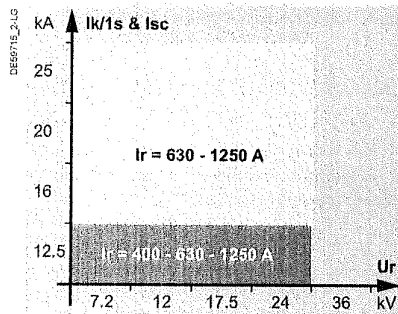


DM1-Z

Withdrawable single-isolation CB unit
Outgoing line on right



Electrical characteristics



Basic equipment:

- SF6 withdrawable circuit breaker
- disconnector and earthing switch
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnector operating mechanism CS
- voltage presence indicator
- three CTs
- auxiliary contacts on circuit breaker
- LSC2A
- mechanical interlocking between circuit breaker and disconnector

- earthing switch operating mechanism CC
- connection pads for dry-type cables
- downstream earthing switch 25 kArms making capacity
- three-phase busbars

Version:

- LPCT (only with Sepam series 20, 40, 60 and 80)

Option:

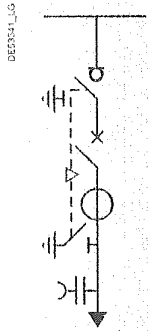
- **cubicle:**
 - auxiliary contacts on the disconnector
 - protection using Sepam programmable electronic unit
 - key-type interlocks
 - three voltage transformers for SM6-24
 - connection enclosure for cabling from above for SM6-24
 - 50 W heating element for SM6-24
 - enlarged low-voltage control cabinet for SM6-24
 - thermal monitoring
 - 1250 A three-phase upper busbars at Ir 630 A
 - 630 A three-phase upper busbars for severe operating conditions for SM6-24
 - surge arresters (only for 630 A and SM6-24)
- **circuit breaker:**
 - motor for operating mechanism
 - release units (coil)
 - operation counter on manual operating mechanism
 - arc detection

Functional units selection

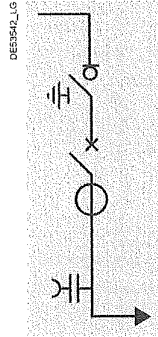
Protection

Vacuum type circuit breaker

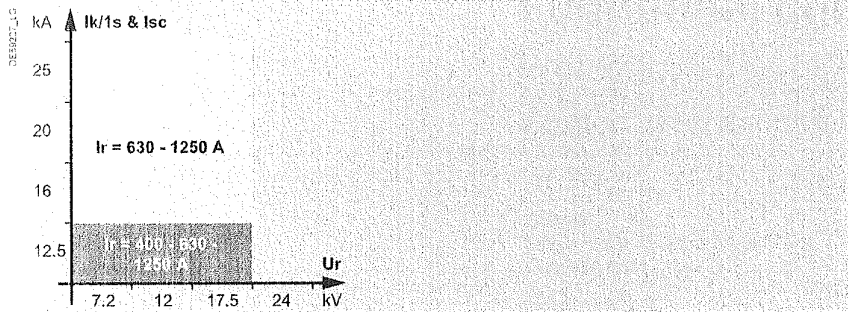
DMV-A
Single-isolation circuit breaker unit



DMV-D
Single-isolation circuit breaker unit
Outgoing line on right



Electrical characteristics



Basic equipment:

- Evolis circuit breaker frontal
- switch and earthing switch for 400 - 630 A
- disconnector and earthing switch for 1250 A
- three-phase busbars
- circuit breaker operating mechanism P2
- disconnector and switch operating mechanism CIT
- voltage presence indicator
- auxiliary contacts on circuit breaker
- LSC2A
- three CTs
- Sepam series 20 programmable electronic unit
- connection pads for dry-type cables
- downstream earthing switch 25 kA rms making capacity

Option:

- **cubicle:**
 - auxiliary contacts on the disconnector
 - three voltage transformers
 - key-type interlocks
 - 50 W heating element
 - 1250 A three-phase upper busbars at Ir 630 A
 - 630 A three-phase upper busbars for severe operating conditions
 - enlarged low-voltage control cabinet
 - thermal monitoring
 - arc detection
- **circuit breaker:**
 - motor for operating mechanism
 - release units (coil)
 - operation counter on manual operating mechanism
- **other**
 - Sepam relays

ВАЖНО С ОПРИГНАЛА



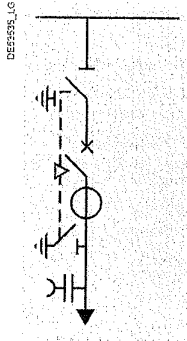
Functional units selection

Protection

Vacuum type circuit breaker

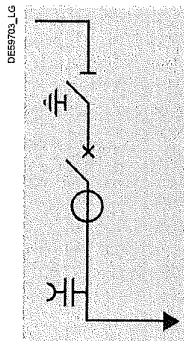
DMVL-A

Single-isolation disconnectable circuit breaker unit

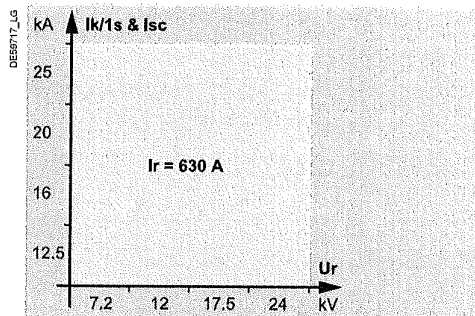
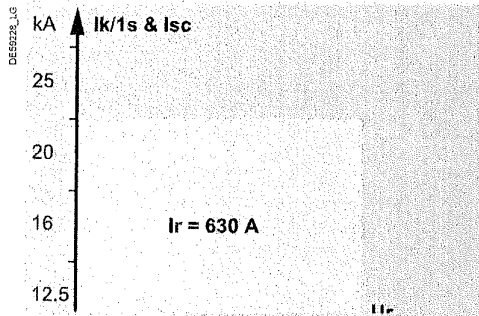


DMVL-D

Single-isolation disconnectable circuit breaker unit
Outgoing line on right



Electrical characteristics



Basic equipment:

- Evolis circuit breaker lateral disconnectable
- disconnecter and earthing switch
- mechanical interlocking between circuit breaker and disconnecter
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnecter operating mechanism CS
- voltage presence indicator
- auxiliary contacts on circuit breaker
- 3 CTs
- connection pads for dry-type cables
- LSC2A

- downstream earthing switch 2 kA rms making capacity

Option:

- **cubicle:**
 - auxiliary contacts on the disconnecter
 - three voltage transformers
 - key-type interlocks
 - 50 W heating element
 - 1250 A three-phase upper busbars at I_r 630 A
 - 630 A three-phase upper busbars for severe operating conditions
 - enlarged low-voltage control cabinet
 - Sepam relay protection
 - surge arresters
 - thermal monitoring
 - arc detection
- **circuit breaker:**
 - motor for operating mechanism
 - release units (coil)
 - operation counter on manual operating mechanism

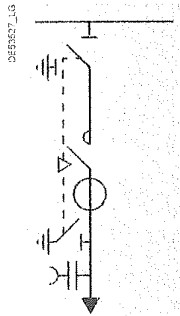
Functional units selection

Protection

Contactor (Direct Motor Starter) for SM6-24

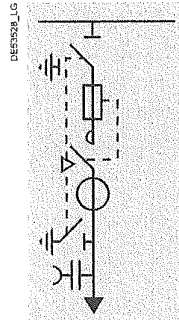
CVM

Disconnectable contactor unit

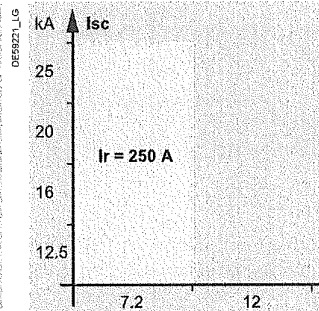
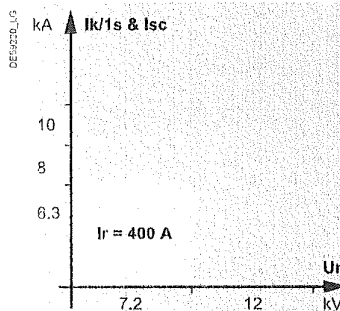


CVM

Disconnectable contactor unit with fuses



Electrical characteristics



Basic equipment:

- vacuum contactor
- disconnector and earthing switch
- three-phase busbars
- contactor operating mechanism with magnetic holding or contactor with mechanical latching
- disconnector operating mechanism CS
- one to three current transformers
- auxiliary contacts on contactor
- connection pads for dry-type cables
- voltage presence indicator
- downstream earthing switch 2 kA rms making capacity
- operation counter on contactor
- enlarged low-voltage control cabinet
- mechanical interlocking between contactor and disconnector/earthing switch
- LSC2A

- equipment for three DIN striker fuses
- mechanical indication system for blown fuses
- auxiliary contact for blown fuses

Version:

- LPCT (only with Sepam series 20, 40, 60, 80)

Option:

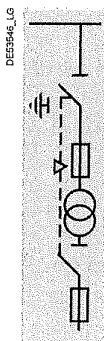
- **cubicle:**
 - thermal monitoring
 - arc detection
 - auxiliary contacts on the disconnector
 - protection using Sepam programmable electronic unit
 - one to three voltage transformers
 - key-type interlocks
 - 50 W heating element
 - 1250 A three-phase upper busbars
 - 630 A three-phase upper busbars for severe operating conditions
- **contactor:**
 - mechanical interlocking

- DIN striker fuses

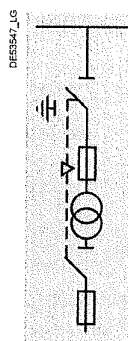
Functional units selection

Metering

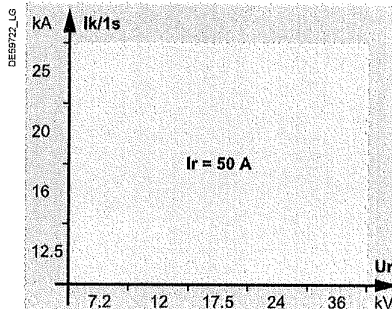
CM
Voltage transformers unit for network
with earthed neutral system



CM2
Voltage transformers unit for network
with insulated neutral system



Electrical characteristics



Basic equipment:

- disconnector and earthing switch
- three-phase busbars
- operating mechanism CS
- LV circuit isolation switch
- LV fuses
- three 6.3 A UTE or DIN type fuses
- 150 W heating element for SM6-36
- LSC2A

• three-voltage transformers
(phase-to-earth)

• two voltage transformers
(phase-to-phase)

Option:

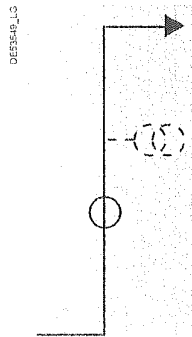
- auxiliary contacts
- mechanical signalling for blown fuses
- auxiliary contact for blown fuses for SM6-24
- 1250 A three-phase upper busbars
- 630 A cable connection by the top (no internal arc withstand if selected)
- 50 W heating element for SM6-24
- 630 A three-phase upper busbars for severe operating conditions for SM6-24
- enlarged low-voltage control cabinet for SM6-24
- arc detection

ВЪРНО С ОРГИНАЛА

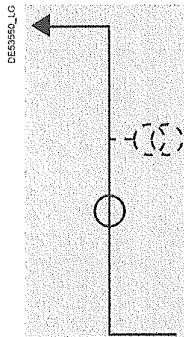
Functional units selection

Metering

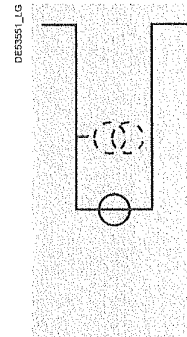
GBC-A
Current and/or voltage measurements unit
Outgoing line on right



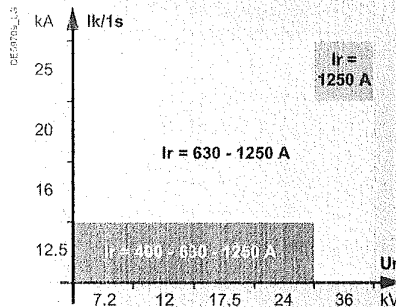
GBC-A
Current and/or voltage measurements unit
Outgoing line on left



GBC-B
Current and/or voltage measurements unit



Electrical characteristics



Basic equipment:

- one to three CTs for SM6-24
- three CTs for SM6-36
- connection bars
- three-phase busbars
- 150 W heating element for SM6-36
- LSC1

Option:

- 1250 A three-phase upper busbars at I_r 630 A for SM6-24
- enlarged low-voltage control cabinet for SM6-24
- three voltage transformers (phase-to-earth) or two voltage transformers (phase-to-phase) for SM6-24
- 50 W heating element for SM6-24
- 630A cable connection by the top for SM6-36 (no internal arc withstand if selected)
- arc detection

ВАРИАНТ С ОРИГИНАЛА



Functional units selection

Other functions

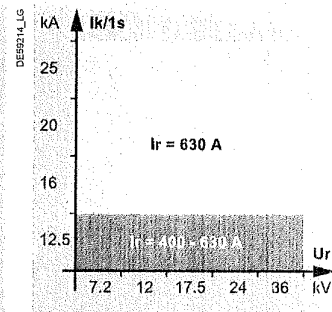
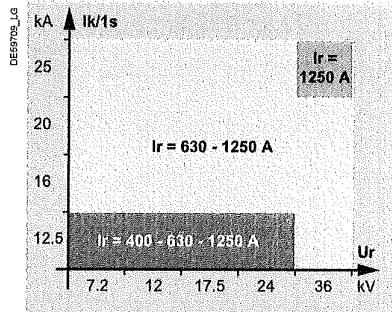
GBM
Connection unit
Outgoing line right or left



GIM
Intermediate bus unit



Electrical characteristics



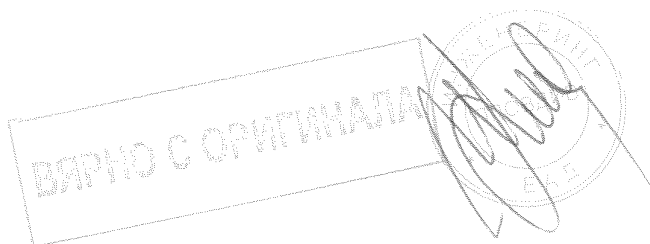
Basic equipment:

- connection bars
- three-phase busbars for outgoing lines right or left
- 150 W heating element for SM6-36
- LSC1

- metallic envelop

Option:

- 1250 A three-phase upper busbars at I_r 630 A
- enlarged low-voltage control cabinet for SM6-24
- 630A cable connection by the top for SM6-36 (no internal arc withstand if selected)
- arc detection



Functional units selection

Other functions (extension unit)

GEM
Extension unit
VM6/SM6 -24

DES936_LG

GFM
Extension unit
Fluokit SM6 -24

DES936_LG

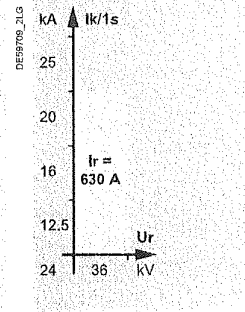
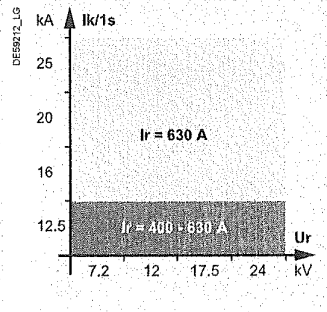
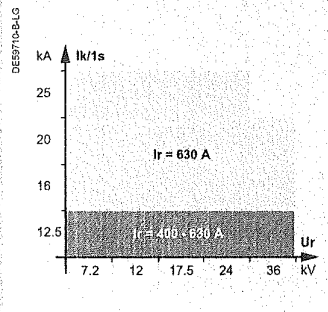
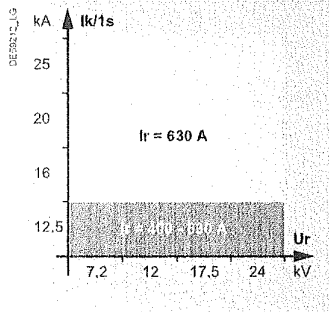
GUM
Extension unit
Unifluorc/SM6 -24

DES936_LG

GMM
Extension unit
Modularc/SM6 -36

DES936_LG

Electrical characteristics



Basic equipment:

- metallic envelop
- three-phase busbars

- metallic envelop
- three-phase busbars

- metallic envelop
- three-phase busbars

- metallic envelop
- three-phase busbars

Option:

- LV-continuity

- LV-continuity

- LV-continuity

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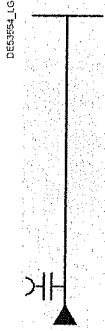
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ВЕРНО С ОРИГИНАЛА

[Circular stamp and signature]

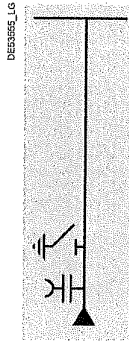
GAM2

Incoming-cable-connection unit

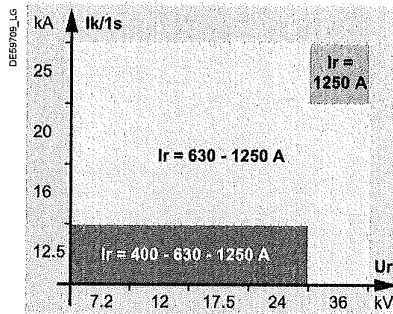
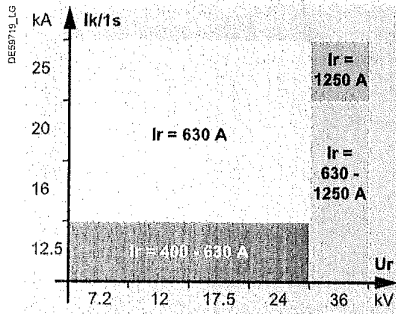


GAM

Incoming-cable-connection unit



Electrical characteristics



Basic equipment:

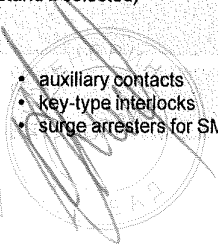
- three-phase busbars
- voltage presence indicator
- connection pads for dry-type cables
- connection bars
- 150 W heating element for SM6-36
- LSC1

- downstream earthing switch 25 kA rms making capacity
- operating mechanism CC for SM6-24
- operating mechanism CS for SM6-36

Option:

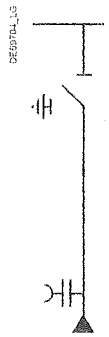
- earth fault indicator
- digital ammeter
- 1250 A three-phase upper busbars at Ir 630 A
- enlarged low-voltage control cabinet for SM6-24
- 630 A cable connection by the top (no internal arc withstand if selected)
- 50 W heating element for SM6-24
- arc detection
- surge arresters for SM6-36
- auxiliary contacts
- key-type interlocks
- surge arresters for SM6-24

ВЕРНО С ОРИГИНАЛОМ

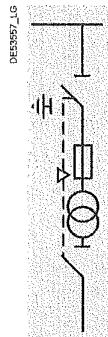


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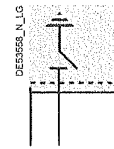
SM
Disconnector unit



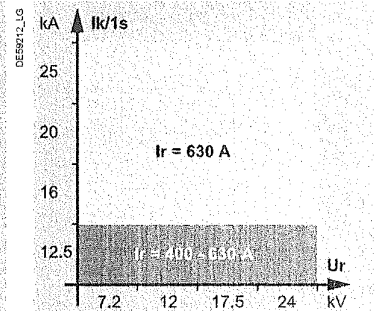
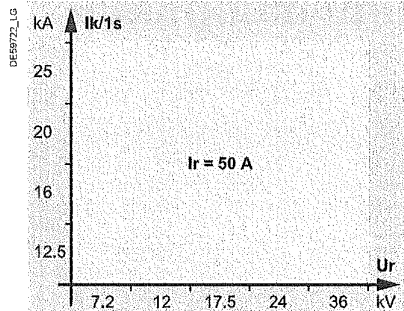
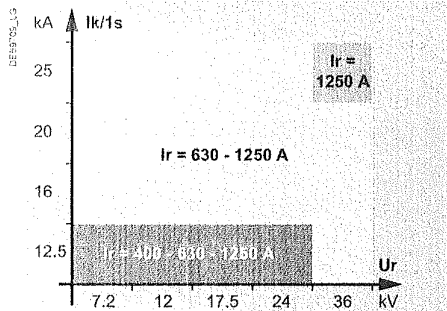
TM
MV/LV transformer unit for auxiliaries



EMB
Busbars earthing switch enclosure



Electrical characteristics



Basic equipment:

- disconnector and earthing switch
- three-phase busbars
- operating mechanism CS
- 150 W heating element for SM6-36
- LSC2A

- connection pads for dry-type cables
- voltage presence indicator

- two 6.3 A fuses, UTE (for SM6-24) or DIN type
- LV circuit isolating switch
- one voltage transformer (phase-to-phase)

- earthing switch
- connection bars three phase
- operating mechanism CIT
- installation on 630 A IM 375 mm or DM1-A units (not available for internal arc IEC 62271-200)
- require a key-type interlocks adapted to the switchboard network

Option:

- auxiliary contacts
- key-type interlocks
- 1250 A three-phase upper busbars at Ir 630 A
- 630 A cable connection by the top (no internal arc withstand if selected)
- enlarged low-voltage control cabinet for SM6-24
- 50 W heating element for SM6-24
- 630 A three-phase upper busbars for severe operating conditions for SM6-24
- arc detection

- digital ammeter for SM6-24
- surge arrester for SM6-36
- thermal monitoring

- mechanical signalling for blown fuses
- auxiliary contact for blown fuses for SM6-24

- auxiliary contacts

ВЕРНО С ОРИГИНАЛА

Operating mechanisms

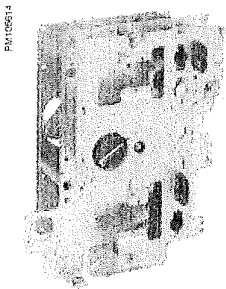
The control devices required for the unit operating mechanisms are centralised on the front panel. The different types of operating mechanism are presented in the table opposite.

Operating speeds do not depend on the operator, except for the CS.

| Units | Type of operating mechanism | | | | | | |
|--|--|-----|------------------|----|-----------------|----|----|
| | Switch-disconnector / downstream earthing switch | | | | Circuit breaker | | |
| | CIT | C11 | C12 | CS | CC | RI | P2 |
| IM, IMB, IMM | ■ | □ | □ | | | | |
| IMC | ■ | □ | □ | | | | |
| PM | ■ | □ | □ ⁽¹⁾ | | | | |
| QM | | ■ | □ | | | | |
| QMC, QMB | | ■ | □ | | | | |
| CM, CM2, CVM | | | | ■ | | | |
| DM1-A, DM1-D, DM1-M, DM1-S, DM1-Z, DM2, DMVL-A, DMVL-D | | | | ■ | | ■ | |
| DM1-A ⁽²⁾ , DM1-W | | | | ■ | ■ | ■ | |
| DMV-A, DMV-D | ■ | | | | | | ■ |
| NSM-cables, NSM-busbars | | | ■ | | | | |
| GAM 24 kV | | | | | ■ | | |
| SM, TM, GAM 36 kV | | | | ■ | | | |
| EMB | ■ | | | | | | |

■ Provided as standard
 □ Other possibility
 (1) Only SM6-36
 (2) 1250 A version

| | CIT | | C11 | | C12 | | | CS | |
|---|-----------------------------------|------------|--|-------------|---|-------------|-------------|--------------|------------|
| Unit applications | Load-break switch Fused switch | | Load-break switch Fuse switch combination | | Load-break switch Fuse switch combination | | | Disconnecter | |
| Main circuit switch | Closing | Opening | Closing | Opening | Mechanism charging | Closing | Opening | Closing | Opening |
| Manual operating mode | Hand lever | Hand lever | Hand lever | Push button | Hand lever | Push button | Push button | Hand lever | Hand lever |
| Electrical operating mode (option) | Motor | Motor | Motor | Coil | Motor | Coil | Coil | N/A | N/A |
| Speed of operation | 1 to 2 s | 1 to 2 s | 4 to 7 s | 35 ms | 4 to 7 s | 55 ms | 35 ms | N/A | N/A |
| Network applications | Remote control network management | | Remote control transformer protection | | Remote control network management, need of quick reconfiguration (generator source, loop) | | | N/A | |
| Earthing switch | Closing | Opening | Closing | Opening | N/A | Closing | Opening | Closing | Opening |
| Manual operating mode | Hand lever | Hand lever | Hand lever | Hand lever | Hand lever | Hand lever | Hand lever | Hand lever | Hand lever |

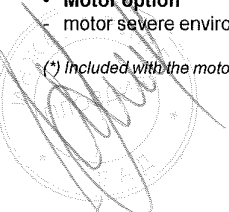


Double-function operating mechanism CIT

- **Switch function**
Independent-operation opening or closing by lever or motor.
- **Earthing-switch function**
Independent-operation opening or closing by lever.
Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.
- **Auxiliary contacts**
 - switch (2 O + 2 C) *
 - switch (2 O + 3 C) and earthing switch (1 O + 1 C),
 - switch (1 C) and earthing switch (1 O + 1 C) if motor option.
- **Mechanical indications**
Fuses blown in unit PM.
- **Motor option**
 - motor severe environment and communication

(* Included with the motor option)

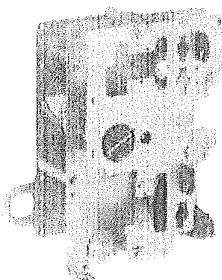
ВЕРНО С ОРИГИНАЛОМ



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Operating mechanisms

PM105/15



Double-function operating mechanism CI1

- **Switch function**
 - independent-operation closing by lever or motor.

Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.

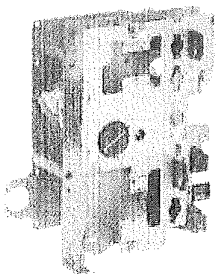
 - independent-operation opening by push-button (O) or trip units.
- **Earthing-switch function**

Independent-operation closing and opening by lever.

Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.
- **Auxiliary contacts**
 - switch (2 O + 2 C) *
 - switch (2 O + 3 C) and earthing switch (1 O + 1 C),
 - switch (1 C) and earthing switch (1 O + 1 C) if motor option,
 - fuses blown (1 C).
- **Mechanical indications**

Fuses blown in units QM.
- **Opening releases**
 - shunt trip.
- **Motor option**
 - standard or severe environment and communication

PM105/16



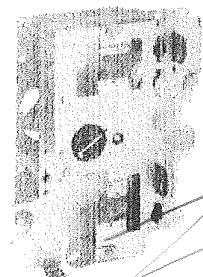
Double-function operating mechanism CI2

- **Switch function**
 - independent-operation closing in two steps:
 - 1 - operating mechanism recharging by lever or motor,
 - 2 - stored energy released by push-button (I) or trip unit.
 - independent-operation opening by push-button (O) or trip unit.
- **Earthing-switch function**

Independent-operation closing and opening by lever.

Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.
- **Auxiliary contacts**
 - switch (2 O + 2 C) *
 - switch (2 O + 3 C) and earthing switch (1 O + 1 C),
 - switch (1 C) and earthing switch (1 O + 1 C) if motor option.
- **Opening release shunt trip**
- **Closing release shunt trip**
- **Motor option**
 - standard or severe environment and communication

PM105/17



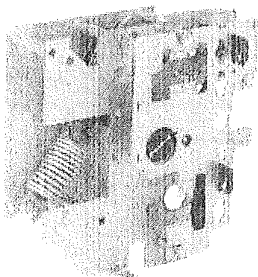
Double-function operating mechanism CS

- **Disconnecter and earth switch functions**

Dependent-operation opening and closing by lever.
- **Auxiliary contacts**
 - disconnecter (2 O + 2 C) for units DM1-A, DM1-D, DM1-W, DM2, DMVL-A, DMVL-D, CVM,
 - disconnecter (2 O + 3 C) and earthing switch (1 O + 1 C) for units DM1-A, DM1-D, DM1-W, DM2, DMVL-A, DMVL-D, CVM,
 - disconnecter (1 O + 2 C) for units CM, CM2, TM, DM1-A, DM1-D, DM2, DMVL-A, DMVL-D, CVM.
- **Mechanical indications**

Fuses blown in units CM, CM2 and TM.

PM105/18



Single-function operating mechanism CC

- **Earthing switch function**

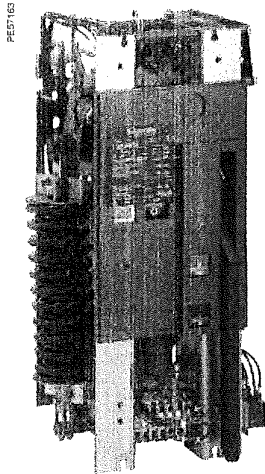
Independent-operation opening and closing by lever.

Operating energy is provided by a compressed spring which, when released, provokes opening or closing of the contacts.
- **Auxiliary contacts**

Earthing switch (1 O + 1 C).

(*) Included with the motor option.

Operating mechanisms



Single-function operating mechanism for the SF circuit breakers 24 kV and 36 kV and Evolis 24 kV lateral

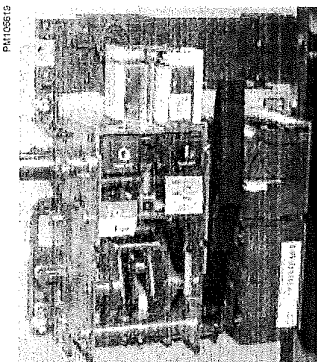
- **Circuit-breaker function**
 - independent-operation closing in two steps.

First operating mechanism recharge by motor or lever, then release of the stored energy by push-button (I) or trip unit.

 - independent-operation opening by push-button (O) or trip units.
- **Auxiliary contacts**
 - circuit breaker (4 O + 4 C),
 - mechanism charged (1 C).
- **Mechanical indications**

Operation counter.
- **Opening releases**
 - Mitop (low energy),
 - shunt trip,
 - undervoltage.
- **Closing release**
 - shunt trip
- **Motor option** (option and installation at a later date possible).

| Possible combinations between opening releases | | | | | | | | | | |
|--|--------------|---|---|---|---|--------------|---|---|---|---|
| Release type | SF1 | | | | | SF'sat | | | | |
| | Combinations | | | | | Combinations | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 |
| Mitop (low energy) | ■ | ■ | ■ | | | | ■ | ■ | ■ | |
| Shunt trip | | | ■ | | ■ | ■ | | ■ | | |
| Undervoltage | | | | ■ | | ■ | ■ | | | ■ |



P2 stored energy operating mechanism for the Evolis circuit breaker 17.5 kV frontal

- **Circuit-breaker function**
 - independent-switching operating closing in two steps.

First operating mechanism recharge by motor or lever, then release of the stored energy by push-button (I) or trip unit.

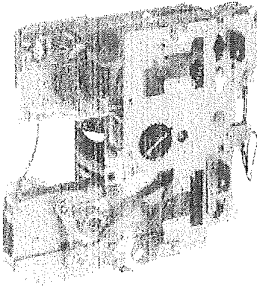
 - independent-operation opening by push-button (O) or trip units.
 - spring energy release.
- **Auxiliary contacts**
 - circuit breaker (4 O + 4 C),
 - mechanism charged (1 C).
- **Mechanical indications**

Operation counter.
- **Opening releases**
 - Mitop (low energy),
 - shunt trip.
- **Closing release**
 - shunt trip
- **Motor option** (option and installation at a later date possible).

ВЯТНО С ОРИГИНАЛА

Auxiliaries

PN102820



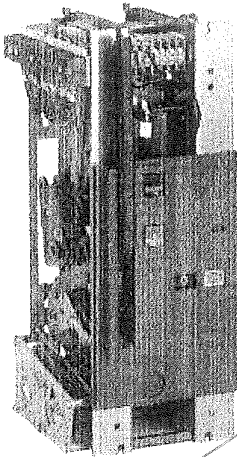
Motor option and releases for switch-units

The operating mechanisms CIT, CI1 and CI2 may be motorised.

| U _{in} | | D/C | | | | | AC (50/60 Hz) | |
|----------------------------|------|------------|-----|-----|-----|-----|---------------|-----|
| Power supply | (V) | 24 | 48 | 110 | 125 | 220 | 120 | 230 |
| Motor option | (W) | 200 | | | | | | |
| | (VA) | | | | | | 200 | |
| Operating time for CIT | | 1 to 2 (s) | | | | | 1 to 2 (s) | |
| Charging time for CI1, CI2 | | 4 to 7 (s) | | | | | 4 to 7 (s) | |
| Opening releases | | | | | | | | |
| Shunt trip | (W) | 200 | 250 | 300 | 300 | 300 | | |
| | (VA) | | | | | | 400 | 750 |
| Response time | (ms) | 35 | | | | | 35 | |
| Undervoltage | | | | | | | | |
| Pick-up | (W) | 160 | | | | | | |
| | (VA) | | | | | | 280 | 550 |
| Hold | (W) | 4 | | | | | | |
| | (VA) | | | | | | 50 | 40 |
| Response time | (ms) | 45 | | | | | 45 | |
| Closing release | | | | | | | | |
| Shunt trip | (W) | 200 | 250 | 300 | 300 | 300 | | |
| | (VA) | | | | | | 400 | 750 |
| Response time | (ms) | 55 | | | | | 55 | |

* Please consult us for other frequencies.

PE27184



Motor option and releases for SF6 type circuit breakers and Evolis 24 kV lateral

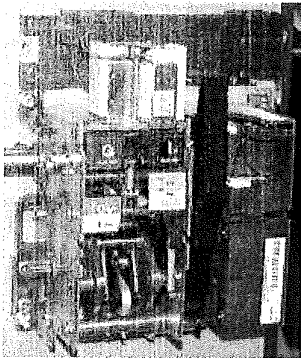
Operating mechanism RI may be equipped with the motor option for the recharging function.

| U _{in} | | D/C | | | | | AC (50/60 Hz) | |
|--------------------|------|-----|----|-----|-----|-----|---------------|-----|
| Power supply | (V) | 24 | 48 | 110 | 125 | 220 | 120 | 230 |
| Motor option | (W) | 300 | | | | | | |
| | (VA) | | | | | | 380 | |
| Charging time | (s) | 15 | | | | | 15 | |
| Opening releases | | | | | | | | |
| Mitop (low energy) | (W) | 3 | | | | | | |
| Response time | (ms) | 30 | | | | | 30 | |
| Shunt trip | (W) | 85 | | | | | | |
| | (VA) | | | | | | 180 | |
| Response time | (ms) | 45 | | | | | 45 | |
| Undervoltage | | | | | | | | |
| Pick-up | (W) | 160 | | | | | | |
| | (VA) | | | | | | 280 | 550 |
| Hold | (W) | 10 | | | | | | |
| | (VA) | | | | | | 50 | 40 |
| Response time | (ms) | 55 | | | | | 55 | |
| Closing release | | | | | | | | |
| Shunt trip | (W) | 85 | | | | | | |
| | (VA) | | | | | | 180 | |
| Response time | (ms) | 65 | | | | | 65 | |

* Please consult us for other frequencies.

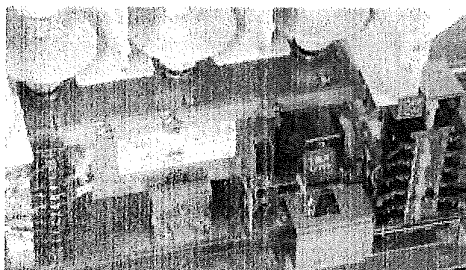
ВНИМАНИЕ С ОРИГИНАЛА

Auxiliaries



Motor option and releases for Evolis circuit breakers 17.5 kV frontal

| Charging motor and associated mechanism (P2) | | | | | |
|--|----------------|---|-------|---------|---------|
| Power supply | (Vac 50/60 Hz) | 24/30 | 48/60 | 100/130 | 200/240 |
| | (Vdc) | 24/30 | 48/60 | 100/125 | 200/250 |
| Threshold | | 0.85 to 1.1 Ur | | | |
| Consumption | (VA or W) | 180 | | | |
| Motor overcurrent | | 2 to 3 Ir during 0.1 s | | | |
| Charging time | | 6 s max. | | | |
| Switching rate | | 3 cycles per minute max. | | | |
| CH contact | | 10 A 240 V | | | |
| Opening release (MITOP low energy) | | | | | |
| Power supply | | Direct current | | | |
| Threshold | | 0.6 A < I < 3 A | | | |
| Response time to the circuit breaker at Ur | | 50 ms (protection relay setting) | | | |
| Opening release (MX) | | | | | |
| Power supply | (Vac 50/60 Hz) | 24 | 48 | 100/130 | 200/250 |
| | (Vdc) | 24/30 | 48/60 | 100/130 | 200/250 |
| Threshold | | 0.7 to 1.1 Ur | | | |
| Consumption | (VA or W) | Pick-up: 200 (during 200 ms) Hold: 4.5 | | | |
| Response time to the circuit breaker at Ur | | 50 ms ± 10 | | | |
| Closing release (MF) | | | | | |
| Power supply | (Vac 50/60 Hz) | 24 | 48 | 100/130 | 200/250 |
| | (Vdc) | 24/30 | 48/60 | 100/130 | 200/250 |
| Threshold | | 0.85 to 1.1 Ur | | | |
| Consumption | (VA or W) | Pick-up: 200 (during 200 ms) Hold: 4.5 | | | |



Auxiliary contacts for vacuum contactor

The auxiliary contacts are of the changeover type with a common point.

The following are available:

- 3 NO + 3 NC for the electrically held version (option 3 NO & 3 NC additional auxiliary contacts),
- 5 NO + 6 NC for the mechanically latched version as standard.

| Characteristics | | |
|-------------------|---------|----------------------------|
| Operating voltage | Minimum | 48 V |
| | Maximum | 480 V |
| Rated current | | 10 A |
| Breaking capacity | Vdc | 60 W (L/R 150 ms) |
| | Vac | 700 VA (power factor 0.35) |

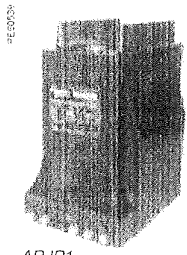
| Open release characteristics | | | |
|------------------------------|-------|-------|-------|
| Power supply (Vdc) | 48 | 125 | 250 |
| Consumption (W) | 470 | 680 | 640 |
| Response time (ms) | 20-40 | 20-41 | 20-40 |

ВЯРНО С ОРВИТНАЛА

Current transformers for SM6-24

Synthesis table by unit

| | TC | GRG | CVB | DM1-A | DM1-D DMV-L-D DMV-N | DM1-W | DM2 | GRG-A GRG-B | DMV-L-A DMV-L | DMV-A DMV-D | IMG | DM1-A DM1-D | DM1-W DM1-Z | GRG-A GRG-B | DMV-A DMV-D | |
|--------|----|-----|-----|-------|---------------------------|-------|-----|----------------|------------------|----------------|--------|----------------|----------------|----------------|----------------|--|
| TC | | | | 630 A | | | | | | | 1250 A | | | | | |
| ARJP1 | ■ | | ■ | | | | | | | | | | | | | |
| ARM3 | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | |
| ARJP2 | | | | | | | | | | ■ | ■ | | | | | |
| ARJP3 | | | | | | | | | | | | ■ | ■ | ■ | ■ | |
| CLP2 | | | | | ■ | | | | | | | | | | | |
| TLP130 | | | ■ | ■ | | ■ | | | | | | | | | | |
| ARM4 | | | | (*) | | | | (*) | | | | | | | | |



ARJP1

Transformer ARJP1/N2F

- characteristics according to IEC standard 61869-2
- single primary winding
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

| | | | | | | | | |
|----------------------------|-----|-------------------|-----|----|----|-----|-----|-----|
| IIn (A) | 10 | 20 | 30 | 50 | 75 | 100 | 150 | 200 |
| Ith (kA) | 1.2 | 2.4 | 3.6 | 6 | 10 | 10 | 10 | 10 |
| t (s) | 1 | | | | | | | |
| Measurement and protection | 5 A | 15 VA - class 0.5 | | | | | | |
| | 5 A | 2.5 VA - 5P20 | | | | | | |



ARJP1

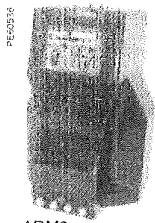
Transformer ARJP1/N2F

- characteristics according to IEC standard 61869-2
- single primary winding
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

| | | | | |
|----------------------------|-----|-------------------|-----|-----|
| IIn (A) | 50 | 100 | 150 | 200 |
| Ith (kA) | 6 | 10 | | |
| t (s) | 1 | | | |
| Measurement and protection | 5 A | 15 VA - class 0.5 | | |
| | 5 A | 2.5 VA - 5P20 | | |

Note: please consult us for other characteristics.



ARM3

Transformer ARM3/N2F

- characteristics according to IEC standard 61869-2
- double primary winding
- single secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

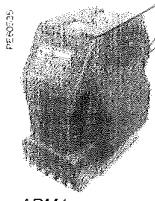
| | | | | | | |
|----------------------------|-------|--------------------|----------|-------------|----------|---------|
| IIn (A) | 10/20 | 20/40 | 50/100 | 100/200 | 200/400 | 300/600 |
| Ith (kA) | 5 | 12.5 | 12.5/21* | 12.5/25* | 12.5/25* | 25 |
| t (s) | 1 | 0.8 | 1 | | | |
| Measurement and protection | 5 A | 7.5 VA - class 0.5 | | | | |
| | 1 A | 1 VA - 10P30 | | | | |
| | 5 A | 5 VA - 5P10 | | 5 VA - 5P15 | | |

* For 5 A protection

- characteristics according to IEC standard 61869-2
- double primary winding
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

| | | | | |
|----------------------------|--------|-------------------|---------|---------------|
| IIn (A) | 50/100 | 100/200 | 200/400 | 300/600 |
| Ith (kA) | 14.5 | 25 | 25 | 25 |
| t (s) | 1 | | | |
| Measurement and protection | 5 A | 30 VA - class 0.5 | | |
| | 5 A | 5 VA - 5P15 | | 7.5 VA - 5P15 |
| | 5 A | 7.5 VA - 5P10 | | 15 VA - 5P10 |



ARM4

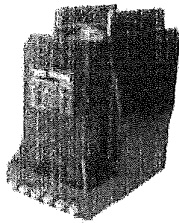
Transformer ARM4

- characteristics according to IEC standard 61869-2
- single or double primary winding
- up to 3 secondary windings (for measure and/or for protection)
- rated highest voltage 7,2 - 12 - 17,5 - 24kV
- rated primary current up to 630A (for SM6 cubicles)
- secondary currents 5A or 1A
- version with one secondary winding: ARM4/N1F
- version with two secondary windings: ARM4/N2F
- version with three secondary windings: ARM4/N3F (*)

(*) Consult us

Current transformers for SM6-24

PE5638



ARJP2

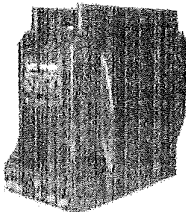
Transformer ARJP2/N2F

- characteristics according to IEC standard 61869-2
- single primary winding
- double secondary winding for measurement and protection.

Short-time withstand current I_{th} (kA)

| | | | | | | |
|----------------------------|-----|-----------------|-----------------|-----------------|-----------------|-----------------|
| I _n (A) | 50 | 100 | 200 | 400 | 600 | |
| I _{th} (kA) | 25 | | | | | |
| t (s) | 1 | | | | | |
| Measurement and protection | 5 A | 10 VA class 0.5 | 15 VA class 0.5 | 15 VA class 0.5 | 15 VA class 0.5 | 20 VA class 0.5 |
| | 5 A | 2.5 VA 5P20 | 2.5 VA 5P20 | 5 VA 5P20 | 5 VA 5P20 | 7.5 VA 5P20 |

PE5637



ARJP3

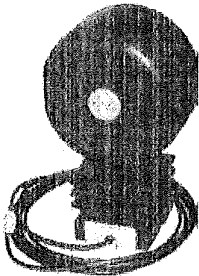
Transformer ARJP3/N2F

- characteristics according to IEC standard 61869-2
- single primary winding
- double secondary winding for measurement and protection.

Short-time withstand current I_{th} (kA)

| | | |
|----------------------------|------|-------------------|
| I _n (A) | 1000 | 1250 |
| I _{th} (kA) | 25 | |
| t (s) | 1 | |
| Measurement and protection | 1 A | 30 VA - class 0.5 |
| | 1 A | 10 VA - 5P20 |
| Measurement and protection | 5 A | 30 VA - class 0.5 |
| | 5 A | 10 VA - 5P20 |

PE5667

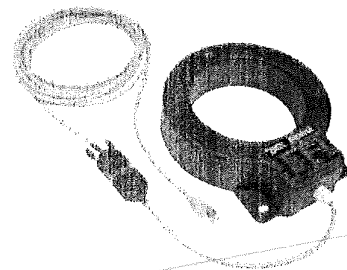


Low Power Current Transformer (LPCT) CLP2

- characteristics according to IEC standard 60044-8
- large primary current range
- direct output voltage for measurement and protection
- RJ45-8 pts secondary connector
- insulation level 24 kV.

| | |
|-----------------------------------|-----------|
| Minimum rated primary current | 5 A |
| Rated nominal primary current | 100 A |
| Rated extended primary current | 1250 A |
| Rated nominal secondary output | 22.5 mV |
| Accuracy class for measurement | 0.5 |
| Accuracy class for protection | 5P |
| Accuracy limit factor | 400 |
| Rated short time thermal current | 40 kA 1 s |
| Highest voltage (U _m) | 24 kV |
| Rated power-frequency withstand | 50 kV |

PE5712



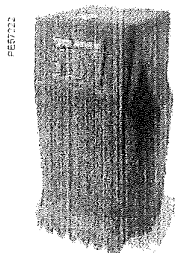
Low Power Current Transformer (LPCT) TLP130

- characteristics according to IEC standard 60044-8
- large primary current range
- direct output voltage for measurement and protection
- RJ45-8 pts secondary connector
- insulation level 0.72 kV
- internal diameter 130 mm.

| | |
|-----------------------------------|-----------|
| Minimum rated primary current | 5 A |
| Rated nominal primary current | 100 A |
| Rated extended primary current | 1250 A |
| Rated nominal secondary output | 22.5 mV |
| Accuracy class for measurement | 0.5 |
| Accuracy class for protection | 5P |
| Accuracy limit factor | 250 |
| Rated short time thermal current | 25 kA 1 s |
| Highest voltage (U _m) | 0.72 kV |
| Rated power-frequency withstand | 3 kV |

ВАРКУ С ОРИГИНАЛА

Current transformers for SM6-36



Current transformer ARM6T

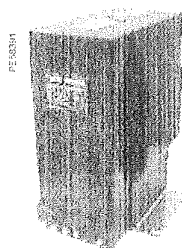
For units DM1-A, DM1-D, SM6-36, DM2, IMC, GBC-A, GBC-B

Transformer ARM6T/N1 or N2

- characteristics according to IEC standard 61869-2
- double primary winding
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

| | | | | | | | |
|----------------------------|---------|----------------------------|---------|---------|---------|---------|-------------------|
| I _{1n} (A) | 50-100 | 75-150 | 100-200 | 150-300 | 200-400 | 300/600 | 1000/1250 |
| I _{th} (kA) | 16 - 20 | | | | | | 25 |
| t (s) | 1 | | | | | | 1 |
| Measurement and protection | 5 A | 7.5 VA - 15 VA - class 0.5 | | | | | 30 VA - class 0.5 |
| | 5 A | 2.5 VA - 5 VA - 5P20 | | | | | 10 VA - 5P20 |



Current transformer ARM9T

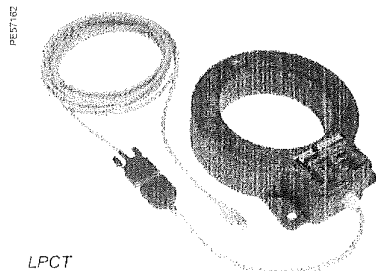
For units DM1-A, DM1-D, DM2

Transformer ARM9T

- characteristics according to IEC standard 61869-2
- double primary winding
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

| | | |
|----------------------------|-----------|---|
| I _{1n} (A) | 1000/1250 | |
| I _{th} (kA) | 40 | |
| t (s) | 1 | |
| Measurement and protection | 5 A | 30 VA - class 0.5 - F _s < 10 |
| | 5 A | 10 VA - 5P20 |



LPCT

Low Power Current Transformer (LPCT) for units DM1-A, SM6-36

Transformer TLP 130, TLP 190

- characteristics according to IEC standard 60044-8
- large primary current range
- direct output voltage for measurement and protection
- RJ45-8 pts secondary connector
- insulation level 0.72 kV
- internal diameter 130 or 190 mm
- in SM6-36, TLP 130 can be used for 630 A, TLP 190 can be used up to 1250 A.

| | TLP 130 | TLP 190 |
|-----------------------------------|-----------------|-----------------|
| Minimum rated primary current | 5 A | 5 A |
| Rated extended primary current | 1250 A | 2500 A |
| Secondary output | 22.5 mV - 100 A | 22.5 mV - 100 A |
| Accuracy class for measurement | 0.5 | 0.5 |
| Accuracy class for protection | 5P | 5P |
| Accuracy limit factor | 250 | 400 |
| Rated short time thermal current | 25 kA 1 s | 40 kA 1 s |
| Highest voltage (U _m) | 0.72 kV | 0.72 kV |
| Rated power-frequency withstand | 3 kV | 3 kV |

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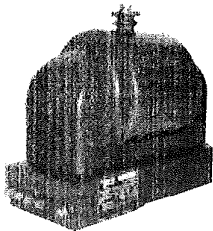
ВЯРНО С ОРИГИНАЛА
 [Circular stamp with text: ТОВ "СМ-ЕЛЕКТРО", АД, БУЛГАРИЯ]

Voltage transformers for SM6-24

Synthesis table by unit

| Unit | DM1-K | DM1 | QVM | DM1-A | DM1-D DMVL-D | DM1-W | DM2 | QBC-A DM1M | QBC-B | DMVL-A | DMVA | DMV-D | DM2 | DM |
|-----------|-------|-----|-----|-------|-----------------|-------|-----|---------------|-------|--------|------|-------|-----|----|
| VRQ2-n/S1 | | ■ | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| VRFR-n/S1 | | | ■ | | | | | | | | ■ | ■ | | |
| VRC2/S1 | | | | | | | | ■ | ■ | | | | ■ | |
| VRM3-n/S2 | | | | | | | | ■ | ■ | | | | | |
| VCT24 | | | | | | | | | | | | | | ■ |
| VRC1/S1 | | | ■ | | | | | | | | | | | |

PE6026



VRQ2

Transformer VRQ2n/S1 (phase-to-earth) 50 or 60 Hz

- characteristics according to IEC standard 61869-3.

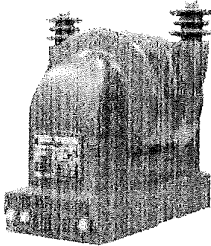
| | | | | |
|--|--------|-------|----------|-------|
| Rated voltage (kV) | 24 | | | |
| Primary voltage (kV) | 10/√3 | 15/√3 | 15-20/√3 | 20/√3 |
| Secondary voltage (V) | 100/√3 | | | |
| Thermal power (VA) | 250 | | | |
| Accuracy class | 0.5 | | | |
| Rated output for single primary winding (VA) | 30 | 30 | | 30 |
| Rated output for double primary winding (VA) | | | 30-50 | |

Transformer VRFR-n/S1 (phase-to-earth) 50 or 60 Hz

- characteristics according to IEC standard 61869-3.

| | | |
|--|--------|-------|
| Rated voltage (kV) | 17.5 | |
| Primary voltage (kV) | 10/√3 | 15/√3 |
| Secondary voltage (V) | 100/√3 | |
| Thermal power (VA) | 250 | |
| Accuracy class | 0.5 | |
| Rated output for single primary winding (VA) | 30 | |

PE6027



VRC2

Transformer VRC2/S1 (phase-to-phase) 50 or 60 Hz

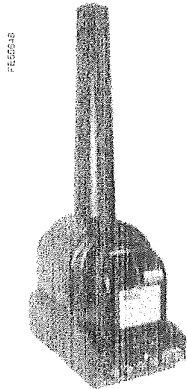
- characteristics according to IEC standard 61869-3.

| | | | |
|--|-----|----|----|
| Rated voltage (kV) | 24 | | |
| Primary voltage (kV) | 10 | 15 | 20 |
| Secondary voltage (V) | 100 | | |
| Thermal power (VA) | 500 | | |
| Accuracy class | 0.5 | | |
| Rated output for single primary winding (VA) | 50 | | |

ВІДНО С ОРИГІНАЛА

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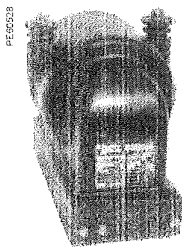
Voltage transformers for SM6-24



Transformer VRM3-n/S2 (phase-to-earth and protected by fuses 0.3 A) 50 or 60 Hz

- characteristics according to IEC standard 61869-3.

| | | | | |
|------------------|--------------------------------------|----------------|-------|-------|
| | Rated voltage (kV) | 12 | 17.5 | 24 |
| | Primary voltage (kV) | 10/√3 | 15/√3 | 20/√3 |
| | Secondary voltage (V) | 100/√3 - 100/3 | | |
| | Thermal power (VA) | 200 | | |
| First secondary | Accuracy class | 0.5 | | |
| | Rated output for single primary (VA) | 30-50 | | |
| | Thermal power (VA) | 100 | | |
| Second secondary | Accuracy class | 3P | | |
| | Rated output | 50 | | |

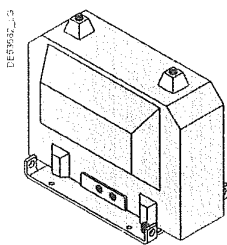


Transformer VRC1/S1 (phase-to-phase)
 50 or 60 Hz

- characteristics according to IEC standard 61869-3.

| | | | | | |
|--|-----|-----|-----|-----|-----|
| Rated voltage (kV) | 7.2 | | | | |
| Primary voltage (kV) | 3.3 | 5 | 5.5 | 6 | 6.6 |
| Secondary voltage (V) | 110 | 100 | 110 | 100 | 110 |
| Thermal power (VA) | 300 | | | | |
| Accuracy class | 0.5 | | | | |
| Rated output for single primary winding (VA) | 100 | | | | |

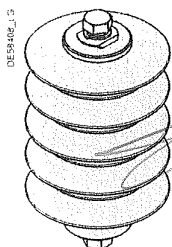
VRC1



Transformer VCT24 (phase-to-phase)
 50 or 60 Hz

| | | | |
|-----------------------|------|------|------|
| Rated voltage (kV) | 24 | | |
| Primary voltage (kV) | 10 | 15 | 20 |
| Secondary voltage (V) | 220 | | |
| Output (VA) | 2500 | 2500 | 2500 |
| | | 4000 | 4000 |

*Note: the above mentioned voltage transformers are grounded neutral.
 For other characteristics, please consult us.*



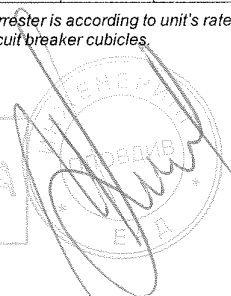
Surge arresters

For units IM500, DM1-A, DM1-W, GAM, DMV-A*, DMVL-A

| | | | | | |
|---------|---------|----|----|------|----|
| In (A) | 400/630 | | | | |
| Un (kV) | 7.2 | 10 | 12 | 17.5 | 24 |

*Note: the rated voltage of the surge arrester is according to unit's rated voltage.
 (*) limited up to 17.5 kV for DMV-A circuit breaker cubicles.*

ВЯРНО С ОРГИНАЛА



Voltage transformers for SM6-36

PE5723



Voltage transformer VRF3

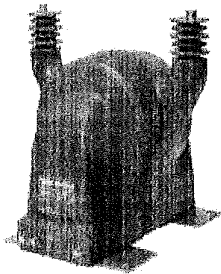
For units CM, GBC-A, GBC-B

Transformer VRF3n/S2 (phase-to-earth)

- single primary winding
- single secondary
- characteristics according to IEC standard 61869-3

| | | |
|--|---------------|--------------------------------|
| Rated voltage (kV) | 36 | |
| Primary voltage (kV) | $30\sqrt{3}$ | $33\sqrt{3}$ |
| Secondary voltage (V) | $100\sqrt{3}$ | $100\sqrt{3}$ or $110\sqrt{3}$ |
| Thermal power (VA) | 450 | |
| Accuracy class | 0.5 | 3P |
| Rated output for single primary winding (VA) | 30-50 | 30 |

PE5724



Voltage transformer VRC3

For units CM2

Transformer VRC3/S1 (phase-to-phase)

- single primary winding
- single secondary
- characteristics according to IEC standard 61869-3

| | | |
|--|--------|------------|
| Rated voltage (kV) | 36 | |
| Primary voltage (kV) | 30 | 33 |
| Secondary voltage (V) | 100 | 100 or 110 |
| Thermal power (VA) | 700 | |
| Accuracy class | 0.5 | |
| Rated output for single primary winding (VA) | 50-100 | |

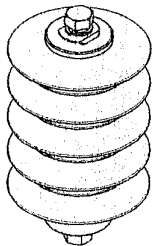
For units TM

Transformer VRC3/S1 (phase-to-phase)

- single primary winding
- single secondary
- characteristics according to IEC standard 61869-3

| | |
|-----------------------|------|
| Rated voltage (kV) | 36 |
| Primary voltage (kV) | 30 |
| Secondary voltage (V) | 220 |
| Thermal power (VA) | 1000 |

DE6846_LG



Surge arresters

For units IM, DM1-A, SM, GAM2

| | |
|---------|-----|
| In (A) | 630 |
| Un (kV) | 36 |

ВЕРНО С ОРКЪВНАТА

Signature

Motors protection units

Characteristics of the functional units

The current rating of fuses installed in units depends on:

- motor current rating I_n
- starting current I_d
- frequency of starts.

The fuses rating is calculated such that a current equal to twice the starting current does not blow the fuse within period equal to the starting time.

The adjacent table indicated the ratings which should be used, based on the following assumptions:

- direct on-line startup
- $I_d/I_n \leq 6$
- $pf = 0.8$ ($P \leq 500$ kW) or 0.9 ($P > 500$ kW)
- $\eta = 0.9$ ($P \leq 500$ kW) or 0.94 ($P > 500$ kW).

The indicated values are for Fusarc fuses (to DIN standard 43-625).

Example:

Consider a 950 kW motor at 5 kV.

$$I_n = \frac{P}{\sqrt{3} \cdot U \cdot \eta \cdot pf} = 130 \text{ A}$$

$$I_d = 6 \times I_n = 780 \text{ A}$$

Then select the next higher value, i.e. 790 A.
For six 5-second starts per hour, select fuses rated 200 A.

Note: the same motor could not be protected for 12 starts per hour since the maximum service voltage for the required 250 A rated fuses is 3.3 kV.

Selection of fuses for CVM units

| Service voltage (kV) | Starting current (A) | Rated operational current (continuous duty) (A) | Starting time (s) | | | | | | | |
|----------------------|----------------------|---|---------------------------|-----|-----|-----|-----|-----|-----|-----|
| | | | 15 | | 30 | | 60 | | | |
| | | | Number of starts per hour | | | | | | | |
| | | | 3 | | 6 | | 3 | | 6 | |
| 3.3 | $I_d = 6 \times I_e$ | I_e | | | | | | | | |
| | 1100 | 183 | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| | 942 | 157 | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| | 785 | 131 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 250 |
| 6.6 | 628 | 105 | 160 | 160 | 160 | 200 | 200 | 200 | 200 | |
| | 565 | 94 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | |
| | 502 | 84 | 125 | 160 | 160 | 160 | 160 | 160 | 160 | |
| | 439 | 73 | 125 | 125 | 125 | 160 | 160 | 160 | 160 | |
| | 377 | 63 | 100 | 125 | 100 | 125 | 125 | 125 | 160 | |
| | 314 | 52 | 100 | 100 | 100 | 100 | 100 | 100 | 125 | |
| | 251 | 42 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| | 188 | 31 | 80 | 100 | 100 | 100 | 100 | 100 | 100 | |
| | 126 | 21 | 50 | 50 | 63 | 80 | 80 | 80 | 80 | 80 |

Fuse selection method:

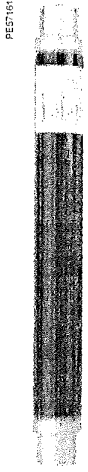
- if $I_d \geq 6 \times I_e$, use I_d to select the fuses
- if $I_d < 6 \times I_e$, use I_e to select the fuses.

Note:

Fuses are 292 mm long (Fusarc fuses).
Fuses are only for short circuit protection.
For 250 A fuses, it is necessary to delay the opening of the contactor.

ВЕРНО С ОРИГИНАЛОМ

Protection of transformers



Fuse ratings for SM6 protection units such as PM, QM, QMB and QMC depend, among other things, on the following criteria:

- service voltage
- transformer rating
- fuse technology (manufacturer)

Different types of fuses with medium loaded striker may be installed:

- Solefuse fuses as per standard UTE NCF 64.210
- Fusarc CF fuses as per IEC 60.282.1 recommendation and dimensions are related to DIN 43.625 standard.

For fuse-switch combination unit type QM, QMB, QMC, refer only to the selection table and reference list of fuses. For all other type of fuses, consult us.

Example: for the protection of a 400 kVA transformer at 10 kV, select either Solefuse fuses rated 43 A or Fusarc CF fuses rated 50 A.

Fuse selection table

The color code is linked to the rated voltage of the fuse
 Rating in A - no overload at $-5^{\circ}\text{C} < t < 40^{\circ}\text{C}$, ≤ 1000 m altitude.
 ⚠ Please consult us for overloads and operation over 40°C for France Transfo oil immersed type transformers.

| Type of fuse | Service voltage (kV) | Transformer rating (kVA) | | | | | | | | | | | | | | | Rated voltage (kV) | |
|--|----------------------|--------------------------|------|------|------|------|------|------|------|------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|------|
| | | 25 | 50 | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | | 2000 |
| Table 1: Solefuse fuses (UTE NCF standard 64.210) | | | | | | | | | | | | | | | | | | |
| 5.5 | 6.3 | 16 | 31.5 | 31.5 | 63 | 63 | 63 | 63 | 63 | 63 | | | | | | | | 7.2 |
| 10 | 6.3 | 6.3 | 16 | 16 | 31.5 | 31.5 | 31.5 | 63 | 63 | 63 | 63 | | | | | | | |
| 15 | 6.3 | 6.3 | 16 | 16 | 16 | 16 | 16 | 43 | 43 | 43 | 43 | 43 | 63 | | | | | |
| 20 | 6.3 | 6.3 | 6.3 | 6.3 | 16 | 16 | 16 | 16 | 16 | 43 | 43 | 43 | 43 | 63 | | | | 24 |
| Table 2: Solefuse fuses (UTE NCF standard 64.200) | | | | | | | | | | | | | | | | | | |
| 3.3 | 16 | 16 | 31.5 | 31.5 | 31.5 | 63 | 63 | 100 | 100 | | | | | | | | | 7.2 |
| 5.5 | 6.3 | 16 | 16 | 31.5 | 31.5 | 63 | 63 | 63 | 80 | 80 | 100 | 125 | | | | | | |
| 6.6 | 6.3 | 16 | 16 | 16 | 31.5 | 31.5 | 43 | 43 | 63 | 80 | 100 | 125 | 125 | | | | | |
| 10 | 6.3 | 6.3 | 16 | 16 | 16 | 31.5 | 31.5 | 31.5 | 43 | 43 | 63 | 80 | 80 | 100 | | | | 12 |
| 13.8 | 6.3 | 6.3 | 6.3 | 16 | 16 | 16 | 16 | 31.5 | 31.5 | 31.5 | 43 | 63 | 63 | 80 | | | | 17.5 |
| 15 | 6.3 | 6.3 | 16 | 16 | 16 | 16 | 16 | 31.5 | 31.5 | 31.5 | 43 | 43 | 63 | 80 | | | | |
| 20 | 6.3 | 6.3 | 6.3 | 6.3 | 16 | 16 | 16 | 16 | 16 | 31.5 | 31.5 | 31.5 | 43 | 43 | 63 | | | 24 |
| 22 | 6.3 | 6.3 | 6.3 | 6.3 | 16 | 16 | 16 | 16 | 16 | 31.5 | 31.5 | 31.5 | 43 | 43 | 63 | | | |
| Table 3: SIBA fuses (general case for QM, QMB and QMC cubicle according to IEC 62271-105) | | | | | | | | | | | | | | | | | | |
| 3.3 | 16 | 25 | 40 | 50 | 50 | 80 | 80 | 100 | 125 | 125 | 160 ⁽¹⁾ | 200 ⁽¹⁾ | | | | | | 7.2 |
| 5 | 10 | 16 | 31.5 | 40 | 40 | 50 | 63 | 80 | 80 | 125 | 125 | 160 ⁽¹⁾ | | | | | | |
| 5.5 | 10 | 16 | 31.5 | 31.5 | 40 | 50 | 50 | 63 | 80 | 100 | 125 | 125 | 160 ⁽¹⁾ | 160 ⁽¹⁾ | | | | |
| 6 | 10 | 16 | 25 | 31.5 | 40 | 50 | 50 | 63 | 80 | 80 | 125 | 125 | 160 ⁽¹⁾ | 160 ⁽¹⁾ | | | | |
| 6.6 | 10 | 16 | 25 | 31.5 | 40 | 50 | 50 | 63 | 80 | 80 | 100 | 125 | 125 | 160 ⁽¹⁾ | | | | |
| 10 | 6.3 | 10 | 16 | 20 | 25 | 31.5 | 40 | 50 | 50 | 63 | 80 | 80 | 100 | 100 | 125 ⁽¹⁾ | 200 ⁽¹⁾ | | 12 |
| 11 | 6.3 | 10 | 16 | 20 | 25 | 31.5 | 40 | 50 | 50 | 63 | 80 | 100 | 100 | 100 | 125 ⁽¹⁾ | 160 ⁽¹⁾ | | |
| 13.8 | 6.3 | 10 | 16 | 16 | 20 | 25 | 31.5 | 31.5 | 40 | 50 | 50 | 63 | 80 | 80 | 100 ⁽¹⁾ | 125 ⁽¹⁾ | 125 ⁽¹⁾ | 17.5 |
| 15 | 6.3 | 10 | 10 | 16 | 16 | 20 | 25 | 31.5 | 40 | 50 | 50 | 63 | 80 | 80 | 100 ⁽¹⁾ | 125 ⁽¹⁾ | 125 ⁽¹⁾ | |
| 20 | 6.3 | 6.3 | 10 | 10 | 16 | 16 | 25 | 25 | 31.5 | 40 | 40 | 50 | 50 | 63 | 80 | 100 ⁽¹⁾ | 125 ⁽¹⁾ | 24 |
| 22 | 6.3 | 6.3 | 10 | 10 | 10 | 16 | 20 | 25 | 25 | 31.5 | 40 | 40 | 50 | 50 | 80 | 80 | 100 ⁽¹⁾ | |
| Table 4: SIBA fuses for oil immersed transformers (2) | | | | | | | | | | | | | | | | | | |
| 30 | | | | | 10 | 10 | 16 | 20 | 25 | 31.5 | 31.5 | 50 | 50 | 63 | 63 | | | 36 |
| 31.5 | | | | | 10 | 10 | 16 | 20 | 25 | 25 | 31.5 | 50 | 50 | 63 | 63 | | | |
| 33 | | | | | 6.3 | 10 | 16 | 20 | 25 | 25 | 31.5 | 40 | 50 | 50 | 63 | | | |
| 34.5 | | | | | 6.3 | 10 | 16 | 20 | 25 | 25 | 31.5 | 40 | 50 | 50 | 63 | | | |
| Table 5: SIBA fuses for oil immersed gas transformers (2) | | | | | | | | | | | | | | | | | | |
| 30 | | | | | 10 | 10 | 16 | 20 | 25 | 31.5 | 31.5 | 40 | 40 | 50 | 63 | | | 36 |
| 31.5 | | | | | 10 | 10 | 16 | 20 | 25 | 31.5 | 31.5 | 40 | 40 | 50 | 63 | | | |
| 33 | | | | | 10 | 10 | 16 | 20 | 25 | 25 | 31.5 | 31.5 | 40 | 40 | 50 | | | |
| 34.5 | | | | | 10 | 10 | 16 | 20 | 25 | 25 | 31.5 | 31.5 | 40 | 40 | 50 | | | |

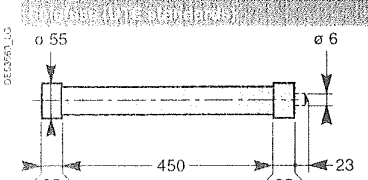
(1) SIBA fuses

(2) This selection table has been prepared according to the technical characteristics of France Transfo. The characteristics of transformers and fuses may change according to manufactures and standards.

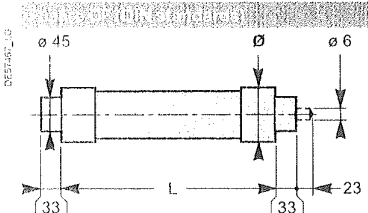
Protection of transformers

Characteristics of the functional units

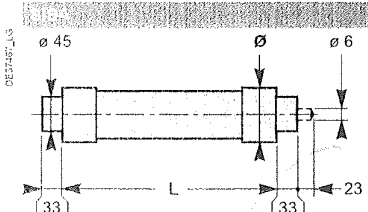
Fuses dimensions



| Ur (kV) | Ir (A) | L (mm) | Ø (mm) | Weight (kg) |
|---------|------------|--------|--------|-------------|
| 7.2 | 6.3 to 125 | 450 | 55 | 2 |
| 12 | 100 | 450 | 55 | 2 |
| 17.5 | 80 | 450 | 55 | 2 |
| 24 | 6.3 to 63 | 450 | 55 | 2 |

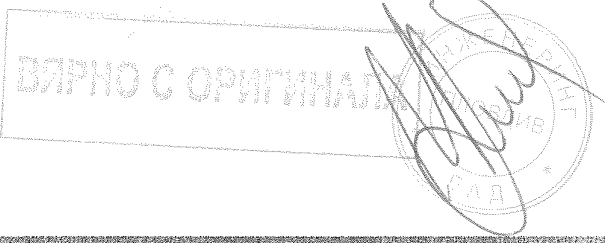


| Ur (kV) | Ir (A) | L (mm) | Ø (mm) | Weight (kg) |
|---------|--------|--------|--------|-------------|
| 7.2 | 125 | 292 | 86 | 3.3 |
| 12 | 6.3 | 292 | 50.5 | 1.2 |
| | 10 | 292 | 50.5 | 1.2 |
| | 16 | 292 | 50.5 | 1.2 |
| | 20 | 292 | 50.5 | 1.2 |
| | 25 | 292 | 57 | 1.5 |
| | 31.5 | 292 | 57 | 1.5 |
| | 40 | 292 | 57 | 1.5 |
| | 50 | 292 | 78.5 | 2.6 |
| | 63 | 292 | 78.5 | 2.8 |
| | 80 | 292 | 78.5 | 2.8 |
| 24 | 6.3 | 442 | 50.5 | 1.6 |
| | 10 | 442 | 50.5 | 1.6 |
| | 16 | 442 | 50.5 | 1.6 |
| | 20 | 442 | 50.5 | 1.6 |
| | 25 | 442 | 57 | 2.2 |
| | 31.5 | 442 | 57 | 2.2 |
| | 40 | 442 | 57 | 2.2 |
| | 50 | 442 | 78.5 | 4.1 |
| | 63 | 442 | 78.5 | 4.1 |
| | 80 | 442 | 86 | 5.3 |
| 36 | 10 | 537 | 50.5 | 1.8 |
| | 16 | 537 | 50.5 | 1.8 |
| | 25 | 537 | 57 | 2.6 |
| | 31.5 | 537 | 78.5 | 4.7 |
| | 40 | 537 | 78.5 | 4.7 |
| | 50 | 537 | 86 | 6.4 |
| | 63 | 537 | 86 | 6.4 |



| Ur (kV) | Ir (A) | L (mm) | Ø (mm) | Weight (kg) |
|---------|--------|--------|--------|-------------|
| 7.2 | 160 | 292 | 85 | 3.8 |
| | 200 | 292 | 85 | 5.4 |
| | 125 | 292 | 67 | 2 |
| 12 | 160 | 292 | 85 | 3.8 |
| | 200 | 292 | 85 | 3.8 |
| | 17.5 | 125 | 442 | 85 |
| 24 | 100 | 442 | 85 | 5.4 |
| | 125 | 442 | 85 | 5.4 |

ВЯРНО С ОРИГИНАЛА



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Characteristics of the functional units

Switch units

- the switch can be closed only if the earthing switch is open and the access panel is in position.
- the earthing switch can be closed only if the switch is open.
- the access panel for connections can be opened only if the earthing switch is closed.
- the switch is locked in the open position when the access panel is removed. The earthing switch may be operated for tests.

Circuit-breaker units

- the disconnecter(s) can be closed only if the circuit breaker is open and the front panel is locked (interlock type 50).
- the earth switch(es) can be closed only if the disconnecter(s) is/are open.
- the access panel for connections can be opened only if:
 - the circuit breaker is locked open,
 - the disconnecter(s) is/are open,
 - the earth switch(es) is/are closed.

Note: it is possible to lock the disconnecter(s) in the open position for no-load operations with the circuit breaker.

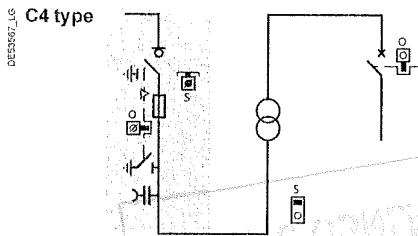
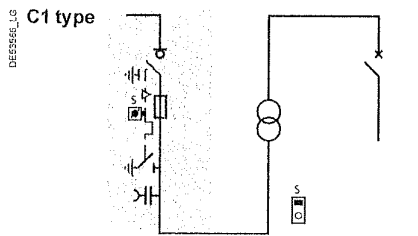
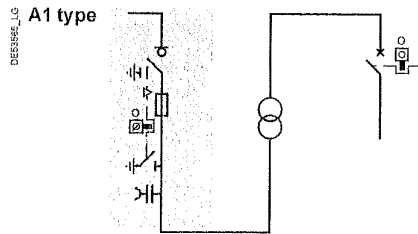
Functional interlocks

These comply with IEC recommendation 62271-200 and EDF specification HN 64-S-41 (for 24 kV).

In addition to the functional interlocks, each disconnecter and switch include:

- built-in padlocking capacities (padlocks not supplied)
- four knock-outs that may be used for keylocks (supplied on request) for mechanism locking functions.

| Units | Interlock | | | | | | | | | | | |
|--|-----------|----|----|----|----|----|----|----|----|----|----|----|
| | A1 | C1 | C4 | A3 | A4 | A5 | 50 | 52 | P1 | P2 | P3 | P5 |
| IM, IMB, IMC, IMM | | | | | | | | | | | | |
| PM, QM, QMB, QMC, | | | | | | | | | | | | |
| DM1-A, DM1-D, DM1-W, DM1-Z, DM1-S, DMV-A, DMV-D, DMVL-A, DMVL-D | | | | | | | | | | | | |
| CVM | | | | | | | | | | | | |
| NSM | | | | | | | | | | | | |
| GAM | | | | | | | | | | | | |
| SM | | | | | | | | | | | | |
| DM2 | | | | | | | | | | | | |
| DM1-M | | | | | | | | | | | | |



Key-type interlocks

Outgoing units

- Aim:
- to prevent the closing of the earthing switch on a transformer protection unit unless the LV circuit breaker is locked in "open" or "disconnected" position.

- to prevent the access to the transformer if the earthing switch for transformer protection has not first been closed.

- to prevent the closing of the earthing switch on a transformer protection unit unless the LV circuit breaker is locked in "open" or "disconnected" position.
- to prevent the access to the transformer if the earthing switch for transformer protection has not first been closed.

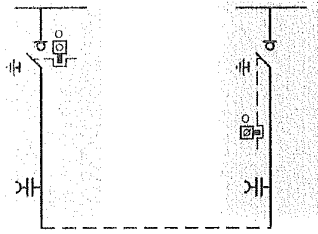
Legend for key-type interlocks:

- 114 -

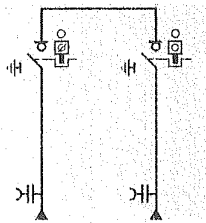
Interlocks

Characteristics of the functional units

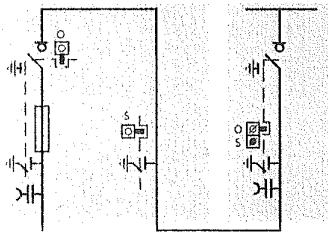
A3 type



A4 type



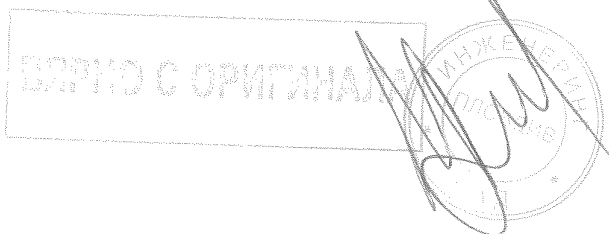
A5 type



Ring units

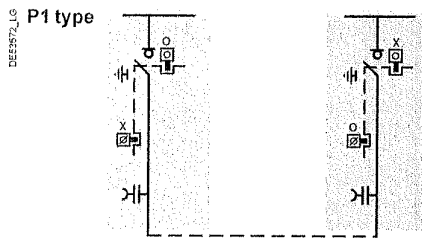
Aim:

- to prevent the closing of the earthing switch of a load-side cubicle unless the line-side switch is locked "open".
- to prevent the simultaneous closing of two switches.
- to prevent the closing of the earthing switch of the casing unit unless the downstream and the upstream switches are locked in the "open" position.

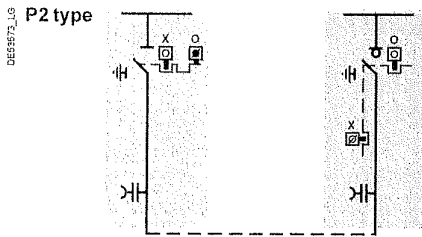


Legend for key-type interlocks:
 no key free key captive key panel or door

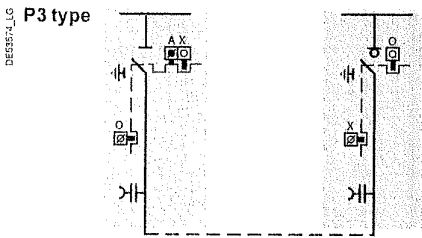
Characteristics of the functional units



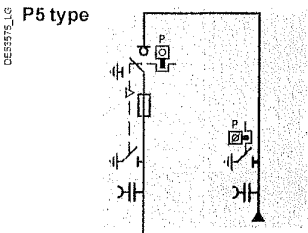
- to prevent the closing of an earthing switch if the switch of the other unit has not been locked in the "open" position.



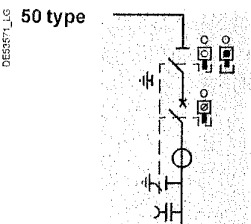
- to prevent on-load operation of the disconnector unless the switch is locked "open"
- to prevent the closing of the earthing switches unless the disconnector and the switch are locked "open".



- to prevent on-load operation of the disconnector unless the switch is locked "open"
- to prevent the closing of the earthing switches with the unit energised, unless the disconnector and the switch are locked "open"
- to allow off-load operation of the switch.



- to prevent the closing of the earthing switch of the incoming unit unless the disconnector and the switch is locked "open".



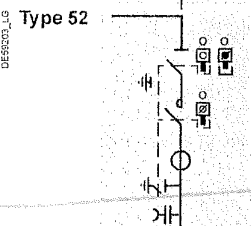
Functional interlocks

Prevents

- on-load switching of the disconnectors.

Allows

- off-load operation of the circuit breaker with the disconnectors open (double isolation).
- off-load operation of the circuit breaker with the disconnector open (single isolation).



Prevents

- on-load switching of the disconnectors.

Allows

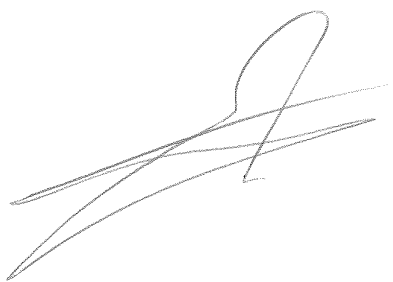
- off-load operation of the contactor with the disconnectors open (double isolation).
- off-load operation of the contactor with the disconnector open (single isolation).

Legend for key-type interlocks:

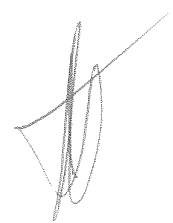
- no key
- free key
- captive key
- panel or door

ВЯРНО С ОРИГИНАЛА

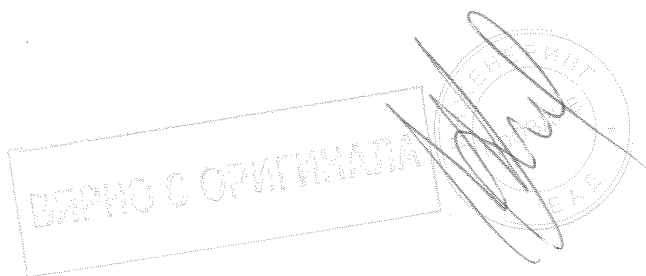
AM720246EN



ВЕРНО С ОРИГИНАЛА



Protection, monitoring and control



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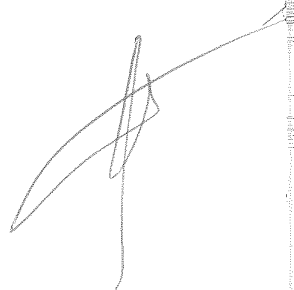
Protection, monitoring and control

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| Sepam selection guide | 80 |
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| Sepam series 10 with CRa/CRb sensors | 86 |
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ВЯРНО С ОРИГИНАЛА



Protection

Sepam selection guide

The Sepam range of protection and metering is designed for the operation of machines and electrical distribution networks of industrial installations and utility substations for all levels of voltage. It consists of complete, simple and reliable solutions, suited to following five families: Sepam series 10, 20, 40, 60 and 80.

A range adapted at your application

- Protection of substation (incoming, outgoing line and busbars).
- Protection of transformers.
- Protection of motors, and generators.

Simplicity

Easy to install

- Light, compact base unit.
- Optional modules fitted on a DIN rail, connected using prefabricated cords.
- User friendly and powerful PC parameter and protection setting software to utilize all of Sepam's possibilities.

User-friendly

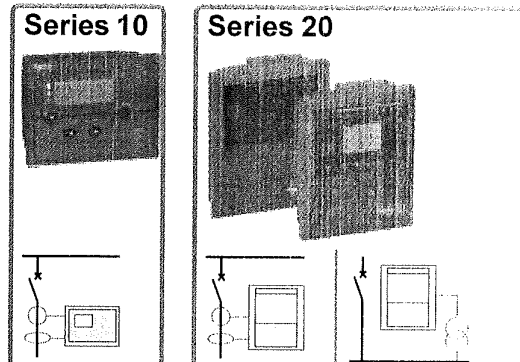
- Intuitive User Machine Interface, with direct data access.
- Local operating data in the user's language.

Accurate measurement and detailed diagnosis

- Measuring all necessary electrical values.
- Monitoring switchgear status: sensors and trip circuit, mechanical switchgear status.
- Disturbance recording.
- Sepam self-diagnosis and watchdog.

Flexibility and evolutivity

- Enhanced by optional modules to evolve in step with your installation.
- Possible to add optional modules at any time.
- Simple to connect and commission via a parameter setting procedure.



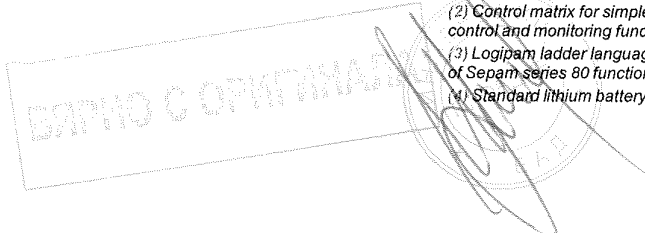
| Series 10 | | | | Series 20 | | | |
|--------------------------------------|-----------------------------------|--|-----------------|-----------|--|---|---|
| Protections | | | | | | | |
| Current | ■ | | ■ | ■ | | | |
| Voltage | | | | | ■ | ■ | |
| Frequency | | | | | | ■ | ■ |
| Specifics | Phase and earth fault overcurrent | | Breaker failure | | Disconnection by rate of change of frequency | | |
| Applications | | | | | | | |
| Substation | 10A, 10B | | S20 S24 | | | | |
| Busbar | | | | | B21 B22 | | |
| Transformer | 10A, 10B | | T20 T24 | | | | |
| Motor | | | M20 | | | | |
| Generator | | | | | | | |
| Capacitor | | | | | | | |
| Characteristics | | | | | | | |
| Logic inputs | 4 | | 0 to 10 | | 0 to 10 | | |
| Logic outputs | 7 | | 4 to 8 | | 4 to 8 | | |
| Temperature sensors | | | 0 to 8 | | 0 to 8 | | |
| Channel | | | | | | | |
| Current | 3I + Io | | 3I + Io | | | | |
| Voltage | | | | | 3V + Vo | | |
| LPCT (1) | | | ■ | | | | |
| Communication ports | 1 | | 1 to 2 | | 1 to 2 | | |
| IEC61850 Protocol | | | ■ | | ■ | | |
| Control | | | | | | | |
| Matrix (2) | | | ■ | | ■ | | |
| Logic equation editor | | | | | | | |
| Logipam (3) | | | | | | | |
| Other | | | | | | | |
| Backup battery | Lithium battery (4) | | | | | | |
| Front memory cartridge with settings | | | | | | | |

(1) LPCT: low-power current transformer complying with standard IEC 60044-8.

(2) Control matrix for simple assignment of information from the protection, control and monitoring functions.

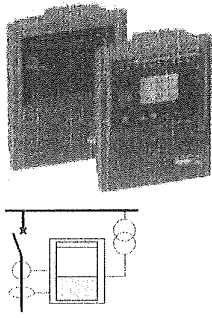
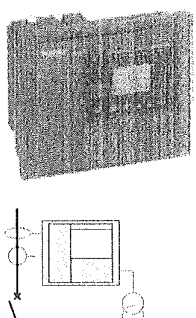
(3) Logipam ladder language (PC programming environment) to make full use of Sepam series 80 functions.

(4) Standard lithium battery 1/2 AA format, 3.6 V, front face exchangeable.



Protection

Sepam selection guide

| Series 40 | | | | Series 60 | | | |
|---|-------------------------------------|-------------------------------------|---|---|-------------------------------------|---|-------------------------------------|
|  | | | |  | | | |
| Protections | | | | | | | |
| Current | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Voltage | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Frequency | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Specifics | | Directional earth fault | Directional earth fault and phase overcurrent | | Directional earth fault | Directional earth fault and phase overcurrent | |
| Applications | | | | | | | |
| Substation | S40 | S41, S43 | S42 | S60 | | S62 | |
| Busbar | | | | | | | |
| Transformer | T40 | | T42 | T60 | | T62 | |
| Motor | | M41 | | | M61 | | |
| Generator | G40 | | | G60 | | G62 | |
| Capacitor | | | | C60 | | | |
| Characteristics | | | | | | | |
| Logic inputs | 0 to 10 | | | 0 to 28 | | | |
| Logic outputs | 4 to 8 | | | 4 to 16 | | | |
| Temperature sensors | 0 to 16 | | | 0 to 16 | | | |
| Channel | | | | | | | |
| Current | 3 I + I ₀ | | | 3 I + I ₀ | | | |
| Voltage | 3V, 2U + V ₀ | | | 3V, 2U + V ₀ or V _{nt} | | | |
| LPCT ⁽¹⁾ | <input checked="" type="checkbox"/> | | | <input checked="" type="checkbox"/> | | | |
| Communication ports | 1 to 2 | | | 1 to 2 | | | |
| IEC61850 Protocol | <input checked="" type="checkbox"/> | | | <input checked="" type="checkbox"/> | | | |
| Control | | | | | | | |
| Matrix ⁽²⁾ | <input checked="" type="checkbox"/> | | | <input checked="" type="checkbox"/> | | | |
| Logic equation editor | <input checked="" type="checkbox"/> | | | <input checked="" type="checkbox"/> | | | |
| Logipam ⁽³⁾ | | | | | | | |
| Other | | | | | | | |
| Backup battery | 48 hours | | | Lithium battery ⁽⁴⁾ | | | |
| Front memory cartridge with settings | | | | <input checked="" type="checkbox"/> | | | |

⁽¹⁾ LPCT: low-power current transformer complying with standard IEC 60044-8.

⁽²⁾ Control matrix for simple assignment of information from the protection, control and monitoring functions.

⁽³⁾ Logipam ladder language (PC programming environment) to make full use of Sepam series 80 functions.

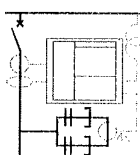
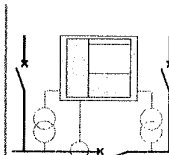
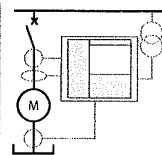
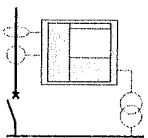
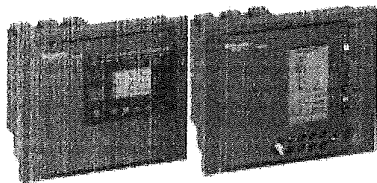
⁽⁴⁾ Standard lithium battery 1/2 AA format, 3.6 V, front face exchangeable.

ВЕРНО С ОРИГИНАЛОМ

Protection

Sepam selection guide

Series 80



| Protections | | | | |
|--------------------------------------|--------------------------------|-------------------------|--|--|
| Current | ■ | ■ | ■ | ■ |
| Voltage | ■ | ■ | ■ | ■ |
| Frequency | ■ | ■ | ■ | ■ |
| Specifics | | Directional earth fault | Directional earth fault and phase overcurrent | Disconnection by rate of change of frequency |
| | | | Transformer & transformer-machine unit differential | Machine differential |
| | | | Voltage and frequency protection for 2 sets of busbars | Capacitor-bank unbalance |
| Applications | | | | |
| Substation | S80 | S81 | S82 | S84 |
| Busbar | B80 | | | |
| Transformer | | T81 | T82 | |
| Motor | | M81 | | |
| Generator | | | G82 | |
| Capacitor | | | | C86 |
| Characteristics | | | | |
| Logic inputs | 0 to 42 | | 0 to 42 | |
| Logic outputs | 5 to 23 | | 5 to 23 | |
| Temperature sensors | 0 to 16 | | 0 to 16 | |
| Channel | | | | |
| Current | 3I + 2 x Io | | 2 x 3I + 2 x Io | |
| Voltage | 3V + Vo | | 2 x 3V + 2 x Vo | |
| LPCT ⁽¹⁾ | ■ | | ■ | |
| Communication ports | 2 to 4 | | 2 to 4 | |
| IEC61850 Protocol | ■ | | ■ | |
| Control | | | | |
| Matrix ⁽²⁾ | ■ | | ■ | |
| Logic equation editor | ■ | | ■ | |
| Logipam ⁽³⁾ | ■ | | ■ | |
| Other | | | | |
| Backup battery | Lithium battery ⁽⁴⁾ | | Lithium battery ⁽⁴⁾ | |
| Front memory cartridge with settings | ■ | | ■ | |

(1) LPCT: low-power current transformer complying with standard IEC 60044-8.

(2) Control matrix for simple assignment of information from the protection, control and monitoring functions.

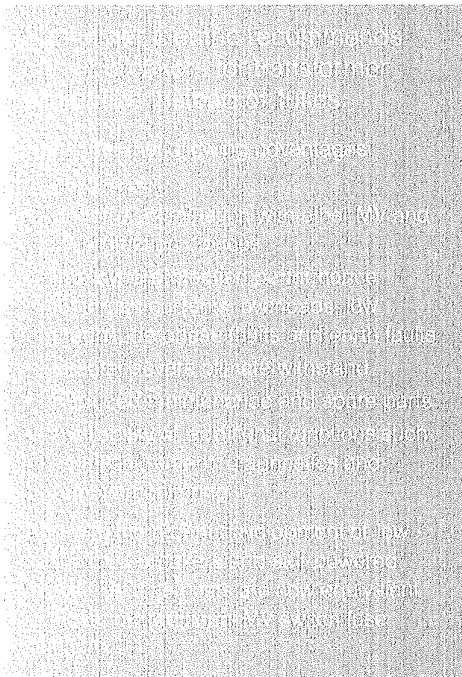
(3) Logipam ladder language (PC programming environment) to make full use of Sepam series 80 functions.

(4) Standard lithium battery 1/2 AA format, 3.6 V, front face exchangeable.

ВАРИАНТ С ОПРИМАННЯМИ

Protection

VIP 40 and VIP 45 relays



Application

- Entry level MV/LV transformer protection
- Dependent-time phase overcurrent tripping curve dedicated to MV/LV transformer protection
- Definite-time earth fault protection
- Phase current and peak demand current measurement

Main features

Self-powered operation

- Energised by the CTs: no auxiliary power needed

Complete pre-tested protection system

- Functional block ready to be integrated

Designed for SM6 to protect transformers

- Designed for D02N 200 A and D01N 100 A circuit breakers to replace fuse-switch solutions
- Setting is as simple as fuse selection
- Maximum setting possibilities consistent with circuit breaker characteristics

Phase overcurrent protection

- Tripping curve optimised for MV/LV transformer protection
- Protection against overloads and secondary and primary short-circuits
- Second harmonic restraint filtering
- Only one setting ($I >$)
- Discrimination with LV circuit breakers or LV fuses
- Compliant with TFL (Time Fuse Link) operating criteria

Earth fault protection

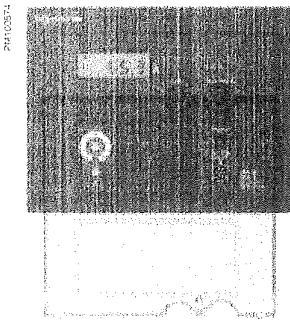
- Definite-time tripping curve
- Settings: $I_0 >$ (phase current sum method) and $t_0 >$
- Second harmonic restraint element

Measurement

- Load current on each phase
- Peak demand current.

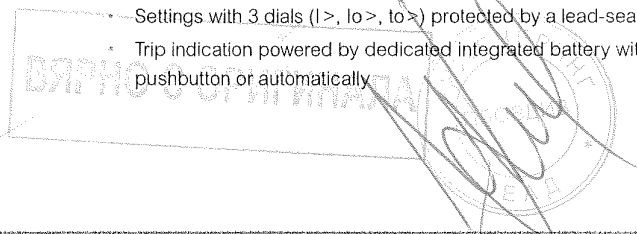
Front panel and settings

- Current measurements displayed on a 3-digit LCD
- Settings with 3 dials ($I >$, $I_0 >$, $t_0 >$) protected by a lead-sealable cover
- Trip indication powered by dedicated integrated battery with reset by pushbutton or automatically

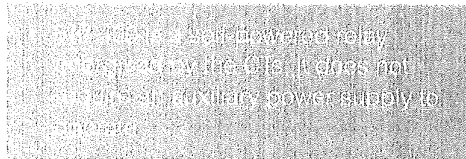


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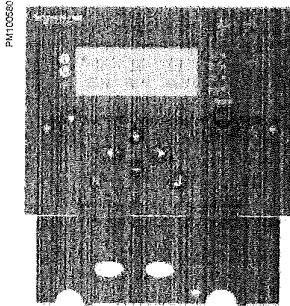


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Applications

- MV distribution substation infeed or feeder protection relay
- MV/LV transformer protection.



Main features

VIP 400: Self-powered protection relay

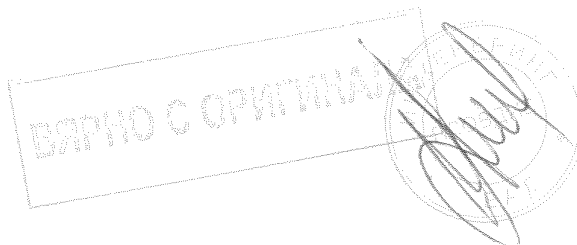
This version is energised by the current transformers (CTs). It does not require an auxiliary power supply to operate.

- Overcurrent and earth fault protection
- Thermal overload protection
- Current measurement functions

Protection and sensor for VIP 4xx

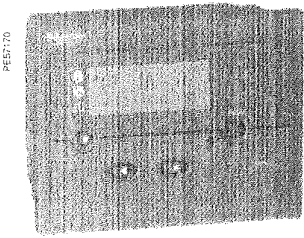
- New sensor dedicated for VIP 4xx

| | | |
|------------------------------------|----------------------|------------------------------|
| Rated voltage | Ur | 0.72 kV |
| Insulation voltage | Ud | 3 kV - 1 min. |
| Rated short-time withstand current | I _{th} (kA) | 25 |
| Withstand time | t (s) | 3 |
| Rated primary current | I _{1n} | CGA: 0-200 A CGB: 0-630 A |
| Secondary voltage | V _s | 22.5 mV at 100 A |
| Rated burden | | < 2 kΩ |
| Measurement protection | Accuracy class | CI 1.0 5P30 |



Protection

Sepam series 10 with CRa/CRb sensors



Sepam series 10

Sepam series 10 with CRa/CRb sensors for transformer protection

Integrated in the DM1-S cubicle for SM6-24 with CRa and CRb sensors and DM1-A cubicle for SM6-36 with normal CT's

Sepam series 10 monitors phase and/or earth-fault currents.

Two models meet a wide range of different needs:

- **10B:** Sepam series 10B protects against overloads, phase-to-phase faults and earth faults.
- **10A:** Sepam series 10A provides the same functions as model B, but with a communication port, more inputs and outputs, and additional protection and monitoring functions.

Setting of Sepam series 10 for DM1-S 24 kV

I_s: the phase operating current is adjusted directly in accordance with the transformer rating and the operating voltage.

I₀: the earth current threshold is adjusted according to the network characteristics.

Setting values of the I_s phase operating current

| Operating voltage (kV) | Transformer rating (MVA) | | | | | | | | | | | | | | | | | | | | |
|------------------------|--------------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|--|--|
| | 60 | 75 | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3000 | 3500 | | |
| 3 | | 19 | 24 | 31 | 38 | 48 | 61 | 77 | 96 | 121 | 154 | 192 | 241 | 306 | 386 | 488 | 615 | | | | |
| 3.3 | | | 22 | 28 | 35 | 44 | 55 | 70 | 87 | 110 | 140 | 175 | 219 | 280 | 350 | 440 | 550 | | | | |
| 4.2 | | | | 22 | 27 | 34 | 43 | 55 | 69 | 87 | 110 | 137 | 172 | 216 | 275 | 345 | 435 | | | | |
| 5.5 | | | | | 21 | 26 | 33 | 42 | 52 | 66 | 84 | 105 | 131 | 168 | 210 | 265 | 335 | | | | |
| 6 | | | | | 19 | 24 | 30 | 38 | 48 | 61 | 77 | 96 | 120 | 154 | 192 | 241 | 306 | | | | |
| 6.6 | | | | | | 22 | 28 | 35 | 44 | 55 | 70 | 87 | 109 | 140 | 175 | 219 | 280 | | | | |
| 10 | | | | | | | 23 | 29 | 36 | 46 | 58 | 72 | 92 | 115 | 144 | 173 | | | | | |
| 11 | | | | | | | 21 | 26 | 33 | 42 | 52 | 66 | 84 | 105 | 131 | 157 | 184 | | | | |
| 13.8 | | | | | | | | 21 | 26 | 33 | 42 | 52 | 67 | 84 | 105 | 126 | 146 | | | | |
| 15 | | | | | | | | 19 | 24 | 31 | 38 | 48 | 62 | 77 | 96 | 115 | 135 | | | | |
| 20 | | | | | | | | | | 23 | 29 | 36 | 46 | 58 | 72 | 87 | 101 | | | | |
| 22 | | | | | | | | | | | 21 | 26 | 33 | 42 | 52 | 66 | 79 | 92 | | | |

Sensors types legend

CRa 200/1 CRb 1250/1

ВЯРНО С ОРИГИНАЛА

Protection

Protection and sensor selection table

General common selection of protection units

| Protection type | Code | Protection units | | | | | | |
|-----------------------------------|-----------|------------------|-----------|-----------|-----------|-----------|-------|-------|
| | | Sepam | | | | | VIP | |
| | | series 10 | series 20 | series 40 | series 60 | series 80 | 40/45 | 400 |
| Three-phase overcurrent | 50 - 51 | ■ | ■ | ■ | ■ | ■ | ■ (2) | ■ (1) |
| Zero-sequence overcurrent | 50N - 51N | ■ | ■ | ■ | ■ | ■ | ■ (3) | ■ (1) |
| Directional zero-sequence current | 67N | | | ■ | ■ | ■ | | |
| Undervoltage | 27 | | | ■ | ■ | ■ | | |
| Overvoltage | 59 | | | ■ | ■ | ■ | | |
| Thermal image | 49 | ■ | ■ | ■ | ■ | ■ | | |
| Zero-sequence overvoltage | 59N | | | ■ | ■ | ■ | | |
| Negative sequence overcurrent | 46 | | ■ | ■ | ■ | ■ | | |
| Long start-up and rotor blocking | 51LR | | ■ | ■ | ■ | ■ | | |
| Maximum number of start-ups | 66 | | ■ | ■ | ■ | ■ | | |
| Single-phase undercurrent | 37 | | ■ | ■ | ■ | ■ | | |
| Communication | | ■ | ■ | ■ | ■ | ■ | | |

(1) DT, EI, SI, VI and RI trip curves.

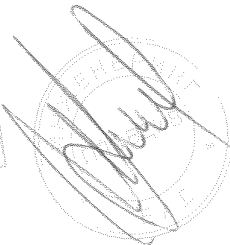
(2) Inverse curve suited to transformer protection.

(3) DT trip curve.

Current sensor for Sepam series 10 for SM6-24

| Type | Dimensions (mm) | | | Weight (kg) | Ratio of transformation | Class of precision | | Sepam 10 |
|------|-----------------|---------------|----------------------------------|-------------|-------------------------|---------------------------|---------------------------|----------|
| | External ∅ | Internal ∅ | Thickness (without fastening) | | | | | |
| CRa | 143.5 | 81 | 37.5 | 2.18 | 1/200 | ± 2% from 10 A to 100 A | On load 5.7 Ω (cal. x 1) | ■ |
| | | | | | | ± 1% from 100 A to 1600 A | | |
| | | | | | | ± 1% from 10 A to 10 kA | On load 0.67 Ω (cal. x 4) | |
| CRb | 143.5 | 81 | 37.5 | 1.26 | 1/1250 | ± 1% from 10 A to 11 kA | On load 5.7 Ω (cal. x 1) | ■ |
| | | | | | | | | |
| | | | | | | ± 1% from 10 A to 25 kA | On load 0.67 Ω (cal. x 4) | |

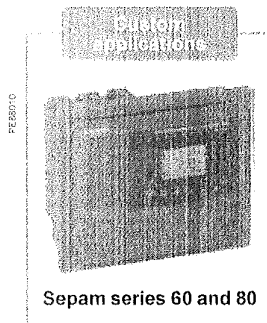
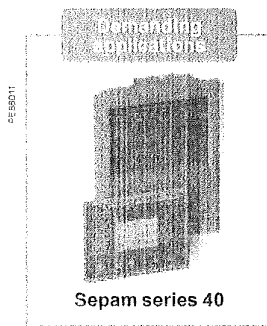
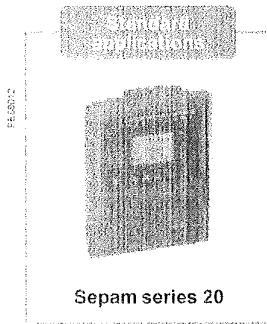
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Protection

LPCT protection chain



TLP130, TLP190, CLP2 sensors for Sepam series 20, 40, 60, 80 protection units

LPCT sensors are voltage-output current sensors (Low Power Current Transformer) compliant with the IEC 60044-8 standard. These sensors are designed to measure rated current between 5 A and 630 A, with a ratio of 100 A / 22.5 mV.

Sepam series 20, 40, 60 and 80 protection units are at the heart of the LPCT protection chain.

Sepam series 20, 40, 60 and 80 performs the following functions:

- acquisition of phase currents measured by the LPCT sensors
- utilization of measurements by the protection functions
- tripping of the breaking device in case of fault detection.

Advantages

- **Consistent protection chain with the same sensor measures phase currents from 5 A to 630 A**

• Simple to install and implement:

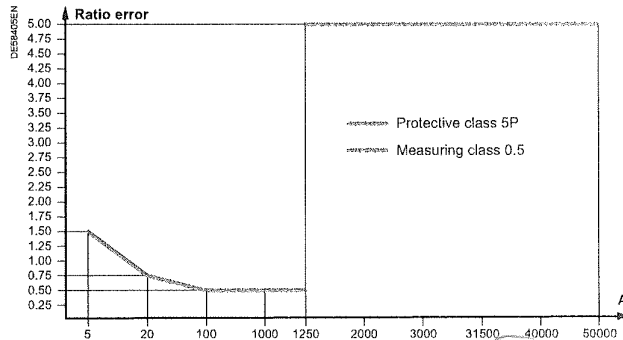
- installation of LPCT sensors
 - TLP130 and TLP190 are installed around MV cable
 - CLP2 is installed on the MV circuit
- LPCT connected directly to Sepam series 20, 40, 60 and 80
- accessories available to test the LPCT protection chain by secondary current injection.

• LPCTs range of use

LPCT measuring and protection function guaranteeing the accuracy up to the short-time current.

Following the range of use of LPCT:

- from 5 A up to 1250 A respecting the error limits imposed by the accuracy class 0.5
- from 1250 A up to 50 kA respecting the error limits imposed by the accuracy class 5P.



• **Optimized integration of functions:**

- measurement of phase rated currents as of 25 A that is set by micro-switch
- monitoring of LPCT sensor by Sepam series 20, 40, 60 and 80 (detection of phase loss).

Connections

1. LPCT sensor, equipped with a shielded cable fitted with an RJ45 connector to be connected directly to the card

2. Sepam series 20, 40, 60 and 80 protection unit

3. Card interface that adapts the voltage delivered by the LPCT sensors, with microswitch setting of rated current.

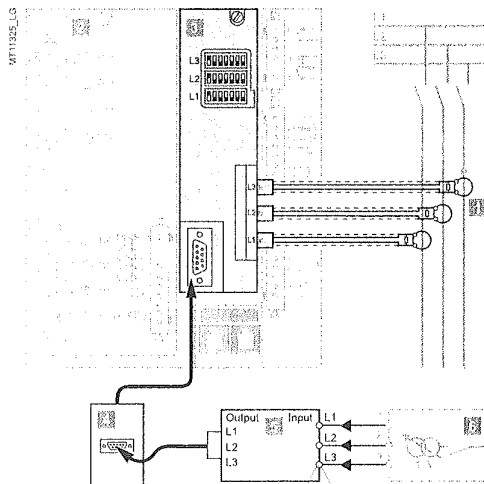
- CCA671 card for series 60 and 80
- CCA670 card for series 20 and 40.

Testing and injection

1. CCA613 remote test plug, flush-mounted in front panel of cubicle, equipped with a 3-m cord to be connected to the CCA670 connector test socket (9-pin Sub D)

2. ACE917 injection interface, used to test the LPCT protection chain with a standard injection box

3. Standard 1A injection box.



-130-

Fault passage indicators

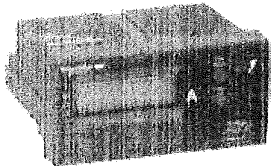
Flair 21D, 22D and 23DM

Flair 21D, 22D, 23DM is a family of DIN format fault passage indicators. They are small in size, self-powered and adapt automatically to the network.

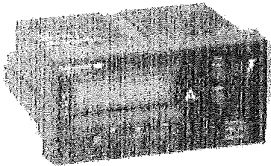
These devices use cutting-edge technology to detect earth faults on underground MV networks with isolated, resistor-earthed or directly earthed neutral and overcurrents on all networks.

- Self-powered, the fault current passage detection and indication system operates continuously
- Adjustment-free, they are immediately operational (numerous manual adjustments are however possible)
- Compact, their DIN format easily fits in MV cubicles
- Smart, they offer an ammeter/digital maximeter function
- Comprehensive, the Flair 23DM version incorporates a highly sophisticated voltage presence/absence relay function with RJ45 Modbus communication

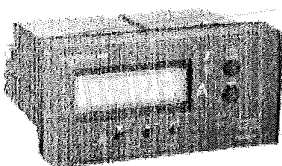
PE2763



PE2774



EM26855



Applications and main features

The Flair range increases your power availability by providing indicators suitable for fault locating and MV network load management.

- Indication of phase-phase and phase-earth faults
- Display of settings
- Indication of the faulty phase
- Display of the load current including peak demand and frequency
- Fault passage indication and voltage detection combination (Flair 23DM)
- RJ45 communication (Flair 23DM only).

These fault passage indicators are reliable and easy to use.

- Automatic setting on the site
- Fault indication with LED or outdoor lamp
- 15-year battery life for Flair 22D
- More accurate fault detection if Flair 22D or 23DM is connected to voltage presence indication system (VPIS) voltage output
- Can be factory-mounted in SM6 cubicles or added on the site
- Easy on-site addition without removing MV cables using split-type current sensor.

Fault detection functions

Overcurrent detection

- Automatic mode for adjustment-free calibration of detection thresholds
- Manual mode for special override settings:
 - Flair 21D: 4 detection thresholds from 200 A to 800 A, in 200 A increments, selectable via microswitches
 - Flair 22D and Flair 23DM: 8 detection thresholds from 100 A to 800 A, in 50 A increments, configurable via the front panel keypad.
- Fault acknowledge time:
 - Flair 21D: 40 ms
 - Flair 22D and Flair 23DM (configurable via the front panel keypad):
 - Type A from 40 to 100 ms in 20 ms increments
 - Type B from 100 to 300 ms in 50 ms increments.

Earth fault detection

The detector checks the 3 phases for current variations (di/dt). A time delay of 70 s is applied for fault confirmation by the upstream protective device.

- Automatic mode for adjustment-free calibration of detection thresholds
- Manual mode for special override settings:
 - Flair 21D: 6 detection thresholds from 40 to 160 A, via microswitches
 - Flair 22D and Flair 23DM (configurable via the front panel keypad):
 - Type A from 20 to 200 A, in 10 A increments
 - Type B from 5 to 30 A in 5 A increments and 30 to 200 A in 10 A.
- Inrush function: prevents unnecessary detection in the event of load switch-on. Incorporates a 3 s time delay for fault filtering at network power up. The Inrush function can be disabled via configuration on Flair 22D and 23DM.

Fault indication function

Signalling

As soon as a fault is confirmed, the indication device is activated.

- Fault indication via a red LED on the front panel
- Indication of the faulty phase (earth fault) on LCD display
- Optional remoting of indication to external flashing lamp
- Activation of a contact for retransmission to the SCADA system.

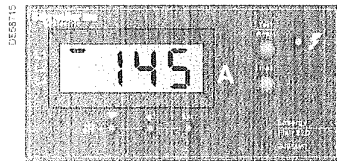
Indication reset

- Automatic reset upon load current recovery (configurable time delay on Flair 22D and Flair 23DM)
- Manual reset via front panel button
- Reset via external Reset input
- Reset by time delay: fixed (4 hr) for Flair 21D and adjustable using front panel keypad (2 hr to 16 hr) for Flair 22D and Flair 23DM.

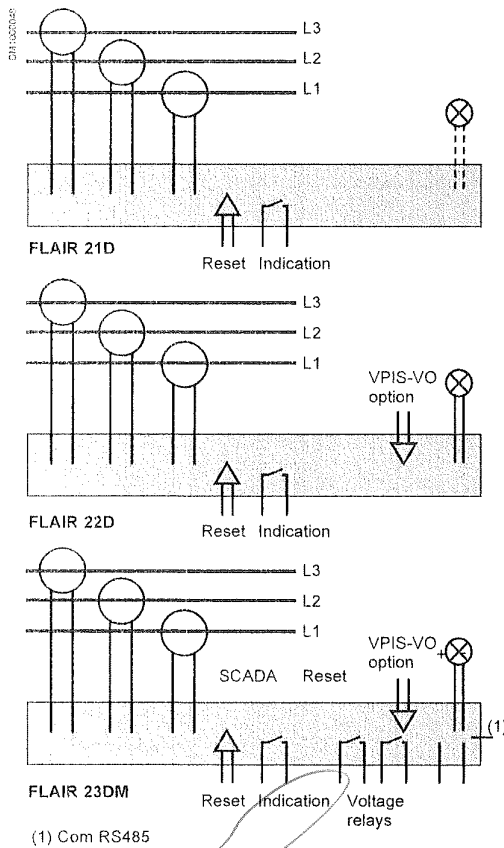
Fault passage indicators

Flair 21D, 22D and 23DM

The Flair 21D, 22D, 23DM range uses an integrated detection system composed of indicators and dedicated CTs. Integrated sensors are normally placed around the bushings. Split CTs can be placed around cables for retrofit purposes.



Connection diagrams



Display principle

- The load current is displayed continuously
- When a fault is detected, the faulty phase is indicated
- Use the buttons on the front panel to scroll through settings and measurements.

Selection table

| | | Flair | | |
|------------------------------|---------------------------|-----------|-----------|------------|
| | | Flair 21D | Flair 22D | Flair 23DM |
| Power supply | Self-powered | ■ | ■ | ■ |
| | Dual-powered | | ■ (1) | ■ |
| Detection | Overcurrent | | ■ | ■ |
| | Earth-fault | | ■ | ■ |
| Display (4 digit LCD) | Ammeter | | ■ | ■ |
| | Maximeter | | ■ | ■ |
| | SCADA interface (relay) | | ■ | ■ |
| | External lamp | | ■ | ■ |
| | External reset | | ■ | ■ |
| Communication | Extended setting (keypad) | | ■ | ■ |
| | 2-voltage output relays | | | ■ |
| | Serial communication port | | | ■ |

(1) By lithium battery

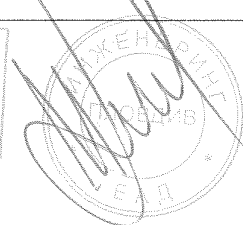
Characteristics per product

| Model | Description |
|---|---|
| Fault passage indicator with single power supply (self-powered) | |
| Flair 21D | Detector with autonomous power supply |
| | External indicator lamp output powered by battery (BVP) |
| Fault passage indicator with dual power supply | |
| Flair 22D | Detector with autonomous power supply and lithium battery |
| | External indicator lamp output powered by the Flair (BVE) |
| | Zero sequence CT option (type B setup) |
| | Interface with VPIS-VO possible to confirm the fault by voltage absence |
| Fault passage indicator with dual power supply and voltage presence/absence | |
| Flair 23DM | Detector with 24-48 Vdc external and autonomous power supply |
| | External indicator lamp output powered by the Flair (BVE) |
| | Zero sequence CT option (type B or C setup) |
| | Voltage presence and absence detector (same as for VD23) |
| | Interface with VPIS-VO needed for the voltage presence |

Standard applications

| | |
|------------|---|
| Flair 21D | Maintenance-free, adjustment-free fault detector |
| Flair 22D | Fault detector for networks with very low load current (< 2 A) with possibility of manual adjustments |
| Flair 23DM | Adapted to Feeder Automation. Forwarding of current measurement, fault passage indication and voltage outage information to the SCADA via a serial communication port. Combination fault passage indicator and voltage detector, ideal for use with an Automatic Transfer System |

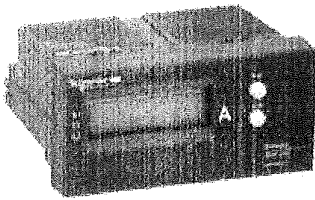
ВЯРНО С ОРИГИНАЛА



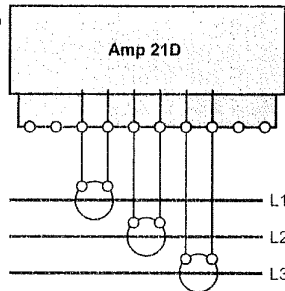
Ammeter

- At the leading edge of technology, Amp 21D is suitable for Medium Voltage network load management.
- Self-powered, it ensures a permanent display of currents.
- Compact and in DIN format, it fits naturally into MV cubicles.
- Cost efficient, it uses the CT optimised for Fault Passage Indicator.
- Performant, it displays phase current and maximum of current.

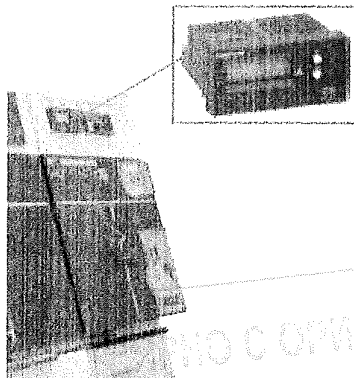
PE5726



DE8462_LG



PM10587



The SM6 can integrate ammeter Amp 21D on all incoming cubicles and the fuse-switch cubicles

Functions

- Display of 3 phase current: I1, I2, I3. Range: 3 A to 630 A
- Display of 3 phase current maximeter: I1, I2, I3. Range: 3 to 630 A.

Display principle

- Load currents are permanently displayed
 - continuous scrolling of L1, then L2, then L3.
- Maximeter
 - access to maximeter display by pressing a dedicated push button
 - continuous scrolling of M1, then M2, then M3
 - reset of all maximeter by pressing a combination of two push buttons.

Connections, assembly

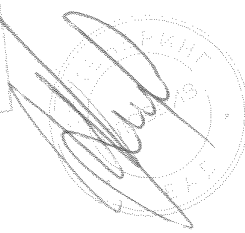
Small size enclosure

- DIN format: 93 x 45 mm
- Secured, extraction-proof mounting
- Terminal connections.

Current sensors

- Split core CT for mounting on MV cables.

| Technical data | | |
|--------------------|--------------------------|-----------------------------|
| Application | | |
| Frequency | | 50 Hz and 60 Hz |
| Load current | Minimum current | ≥ 3 A |
| Measurement | | |
| Range | Phase current | 3 to 630 A (resolution 1 A) |
| | Accuracy (I < 630 A) | ± (2% + 2 digit) |
| Reset of maximeter | Manual from device | Yes |
| Power supply | | |
| Self power | From the current sensors | I load ≥ 3 A |
| Battery | | No |
| Auxiliary supply | | No |
| Display | | |
| | Display | 4 digits LCD |
| | Current per phase | Yes (resolution 1A) |
| | Maximeter per phase | Yes |
| Sensors | | |
| | Phase CTs | 3 split core CT |
| Miscellaneous | | |
| | Test | Yes |



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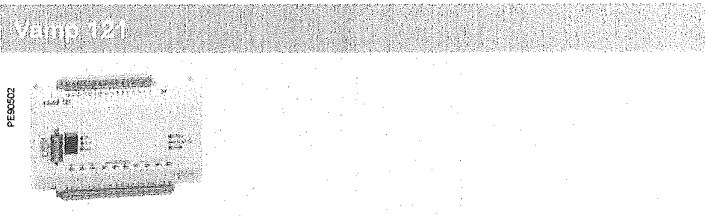


Protection, monitoring and control

Function

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.



Key features

- Operation on light only
- Up to 10 arc or smoke sensors
- Single trip contact
- Straightforward installation
- Operation time 9 ms (including the output relay)
- Cost efficient solution
- Self-supervision
- Binary input for blocking or resetting the unit (programmable)
- Possibility for double arc channel activation trip criteria
- BIO light transfer possibility to other Vamp device

Options

Vamp 121 - 212

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

Self-supervised

- Self-monitored
- Cable length adjustable from 6 m to 20 m down

Available sensor

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

Standards

IEC

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

ВЕРНО С ОРИГИНАЛА



The SC 110 is an intelligent electronic device designed to control and monitor all the components involved in the electrical control of core units. It performs all the necessary functions for remote control:

- electrical interlocking
- electrical locking
- electrical supervision
- remote control (local or local operation)
- built-in electrical interlocks and safety interlocking functions. The SC 110 is a compact device with 120 pins.

SC110 universal intelligent controller

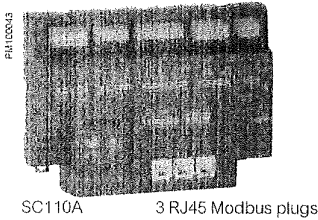
SC110 is a compact device with digital inputs and outputs to monitor all the components associated with the electrical operation of the core unit: MCH, MX, XF, auxiliary contacts. It can be associated with a control panel (SC-MI).

Switchgear control functions

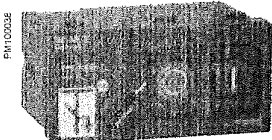
- Coil and motor operation
- Information on switch status: main switch, earthing switch
- Built-in electrical interlocks: anti-pumping and anti-reflex functions
- External interlocking feature
- Lockout of electrical operation after tripping (option)
- Modbus communication for remote control via data transmission

Switchgear monitoring

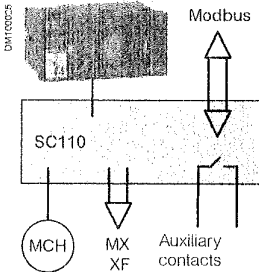
- Diagnosis information: motor consumption, etc.
- Switch auxiliary contacts status
- Logging of time-stamped events
- Modbus communication for remote indication of monitoring information



SC110A 3 RJ45 Modbus plugs



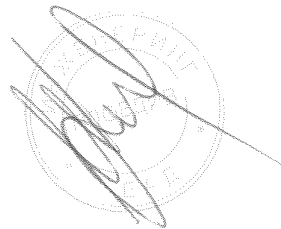
SC-MI control panel



The SC 110 is installed in the Low Voltage cabinet of the functional unit. It controls and monitors all the auxiliary contacts needed for electrical operation.

| SC110 types | SC110A | SC110B |
|-----------------------------|--------|--------|
| 24-60 Vdc | • | |
| 110 Vdc/Vac - 240Vac/250Vdc | | • |
| Network communication | • | • |

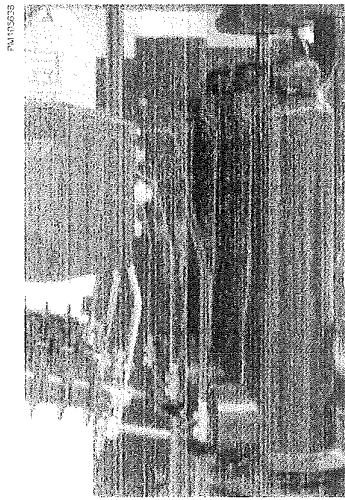
| SC-MI control panels | SC-MI10 | SC-MI11 |
|----------------------|---------|---------|
| On/Off pushbuttons | • | • |
| Remote/local switch | | • |



Signature

Control

Thermal monitoring Easergy TH110



Continuous Thermal Monitoring

The power connections in the Medium Voltage products are one of the most critical points of the substations especially for those made on site like:

- MV Cable connections

Loose and faulty connections cause an increase of resistance in localized points that will lead to thermal runaway until the complete failure of the connections.

Preventive maintenance can be complicated in severe operating conditions also due to limited accessibility and visibility of the contacts.

The continuous thermal monitoring is the most appropriate way to early detect a compromised connection.

Easergy TH110 Thermal Sensor

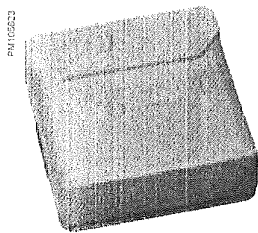
Easergy TH110 is part of the **new generation of wireless smart sensors** ensuring the continuous thermal monitoring of all the critical connections made on field allowing to:

- Prevent unscheduled downtimes
- Increase operators and equipments safety
- Optimize and predictive maintenance

Thanks to its very **compact footprint** and its **wireless communication**, Easergy TH110 allows an easy and widespread installation in every possible critical points without impacting the performance of the MV Switchgears.

By using **Zigbee Green Power** communication protocol, Easergy Th110 ensure a reliable and robust communication that can be used to create interoperable solutions evolving in the Industrial **Internet of Things** (IIoT) age.

Easergy TH110 is **self powered** by the network current and it can ensure **high performances** providing accurate thermal monitoring being in **direct contact** with the measured point.



Easergy TH110

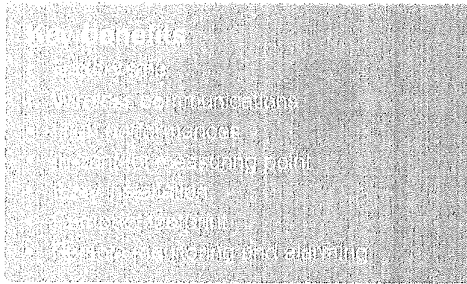
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ВАРНО С ОРИГИНАЛА

ВЪВЕДЕНИЕ
 ОБЩИ
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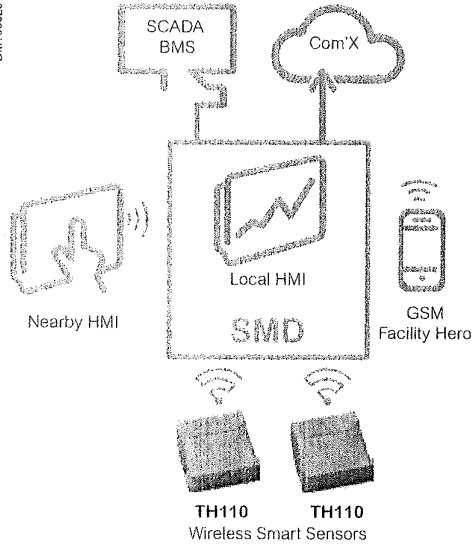
Substation Monitoring Device

Easergy TH110 is **connected** to the Substation Monitoring Device (SMD) that harvest the data for local signaling, data analyses and nearby control.

Specific **monitoring algorithms** allow to detect drifts from the threshold based on the specific installation characteristics also in regards of the variable loads or abnormal behaviors coming from phases comparison.

The **remote monitoring and alarming** ensure full peace of mind thanks to remote connection for SCADA or Services, access to Cloud-based Apps and digital services and alarming through SMS or Facility Hero mobile App.

DM105320



Characteristics

| | |
|----------------------------|---|
| Power supply | Self powered. Energy harvested from power circuit. |
| Minimum activation current | 5 A |
| Accuracy | +/- 1°C |
| Range | -25 °C / +115°C |
| Wireless communication | ZigBee Green Power 2,4 GHz |
| Dimension - Weight | 31 x 31 x 13 mm - 15 g |

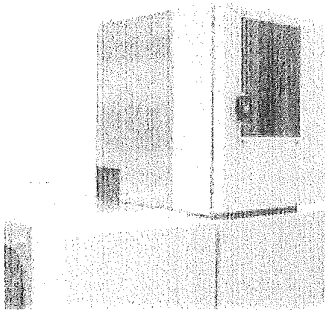
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Control

Easergy T200 S for SM6-24

PE 5074



Easergy T200 S for SM6-24: remote control interface in LV control cabinet

Easergy T200 S for NSM cubicle

Easergy T200 S is a simplified MV substation control unit for secondary distribution networks enabling remote control of one or two MV substation switches. T200 S, a version of the T200 unit, is integrated in the SM6 cubicle LV control cabinet.

It is limited to control 2 switches. It is intended for remote control applications for source transfer switching and back up generator set switching in NSM cubicle.

Easergy T200 S a multifunctional "plug and play" interface which integrates all functions required for remote monitoring and control of MV substations:

- Acquisition of various data types: switch position, fault detectors, current values, etc.
- Transmission of opening and closing orders to the switches
- Exchange with the control center.

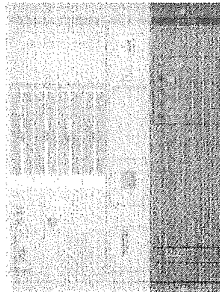
Particularly used during network incidents, Easergy T200 S has proven its reliability and availability to be able to operate the switchgear at all times. It is easy to implement and operate.

PE 5071



Control command

PE 5073



Back up power supply

Functional unit dedicated to Medium Voltage applications

Easergy T200 S is installed in the low voltage control cabinet of NSM cubicles for remote control of one or two switches.

Easergy notably enables source transfer switching between two switches. It has a simple panel for local operation to manage electrical controls (local/remote switch) and to display switchgear status information.

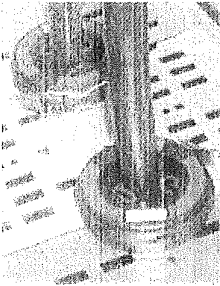
It integrates a fault current detector (overcurrent and zero sequence current) with detection thresholds configurable channel by channel (threshold and fault duration).

"Plug and play" and secure

Integrated in the low voltage control cabinet of an MV-equipped cubicle, it is ready to connect to the data transmission system.

Easergy T200 S has been subject to severe tests on its resistance to MV electrical constraints. A back-up power supply guarantees several hours continuity of service for the electronic devices, motorization and MV switchgear. Current transformers are of split core type for easier installation.

PE 5073



Split core CTs

Compatible with all SCADA remote control systems

Easergy T200 S supplies the following standard protocols:

- Modbus serial and IP
- DPN3 serial and IP
- IEC 870-5-101/104.

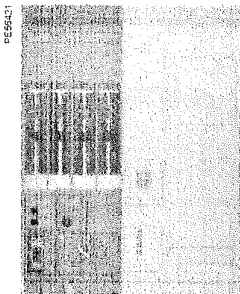
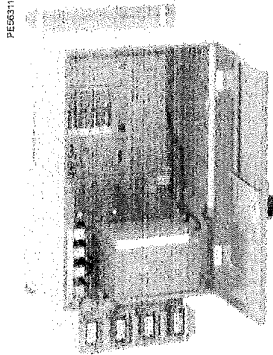
Data transmission system standards are: RS232, RS485, PSTN, FSK, FFSK, GSM/GPRS.

Other systems are available on request, the radio frequency emitter/receiver is not supplied.

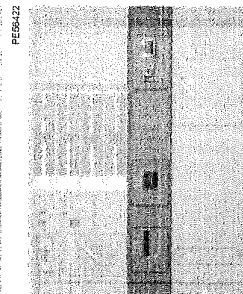
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Control

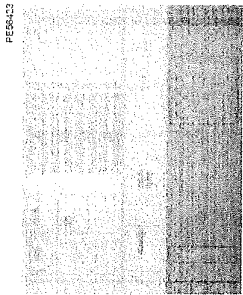
Easergy T200 I



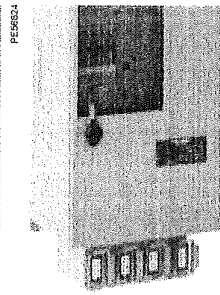
Local information and control



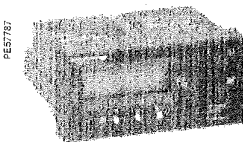
Monitoring and control



Back up power supply



Polarized connectors



VD23

Easergy T200 I: an interface designed for control and monitoring of MV networks

Easergy T200 I is a "plug and play" or multifunction interface that integrates all the functional units necessary for remote supervision and control of the SM6:

- Acquisition of the different types of information: switch position, fault detectors, current values...
- Transmission of switch open/close orders
- Exchanges with the control center.

Required particularly during outages in the network, Easergy T200 I is of proven reliability and availability, being able to ensure switchgear operation at any moment. It is simple to set up and to operate.

Functional unit designed for the Medium Voltage network

- Easergy T200 I is designed to be connected directly to the MV switchgear, without requiring a special converter.
- It has a simple front plate for local operation, which allows management of electrical rating mechanisms (local/remote switch) and display of information concerning switchgear status.
- It has an integrated MV network fault current detection system (overcurrent and zero sequence) with detection set points that can be configured channel by channel (current value and fault current duration).

Medium Voltage switchgear operating guarantee

- Easergy T200 I has undergone severe MV electrical stress withstand tests.
- It is a backed up power supply which guarantees continuity of service for several hours in case of loss of the auxiliary source, and supplies power to the Easergy T200 I and the MV switchgear motor mechanisms.
- **Ready to plug**
 - Easergy T200 I is delivered with a kit that makes it easy to connect the motor mechanisms and collect measurements.
 - the connectors are polarized to avoid any errors during installation or maintenance interventions.
 - current measurement acquisition sensors are of the split type, to facilitate their installation.
 - works with 24 Vdc and 48 Vdc motor units.

Compatible with all SCADA remote control systems

Easergy T200 I supplies the following standard protocols:

- Modbus serial and IP
- DPN3 serial and IP
- IEC 870-5-101/104.

Data transmission system standards are: RS232, RS485, PSTN, FSK, FFSK, GSM/GPRS.

Other systems are available on request, the radio frequency emitter/receiver is not supplied.

Voltage detection relay

VD23 provides accurate information of presence or absence of voltage. Associated with VPIS-Voltage Output, VD23 is typically used in critical power and safety applications.

Various combinations of voltage detection are possible:

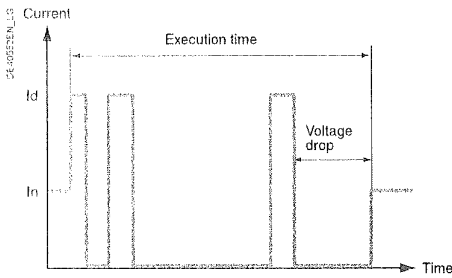
- 3 Ph-N and residual voltage: V1 + V2 + V3 + V0
- 3 Ph-N or Ph-Ph voltage: V1 + V2 + V3 or U12 + U13 + U23
- 1 Ph-N or Ph-Ph or residual voltage: V1, V2, V3, U12, U13, U23, V0.

VD23 can display the MV network voltage (in % of service voltage), activate the relay output R1 to monitor a loss of voltage on 1 phase at least and active the relay output R2 to monitor a presence of voltage on 1 phase at least.

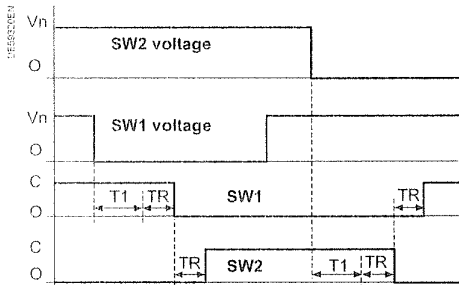
- Auxiliary power supply: from 24 to 48 Vdc
- Assembly: compact DIN format, mounted in the same place as fault passage indicator (format DIN, integrated in switchgear), terminal connexion fitted with VPIS-Voltage Output
- **Compatible with all neutral earthing systems.**

Control

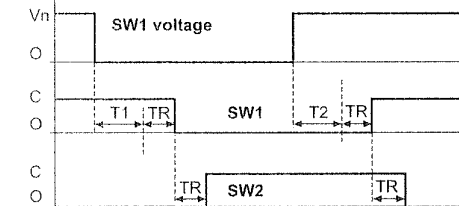
Automation systems



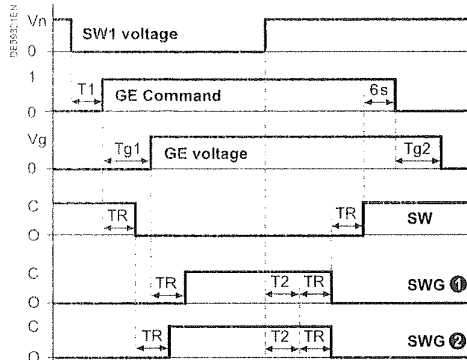
- Configurable parameters:
- Number of faults: from 1 to 4
 - Execution time: from 20 s to 4 mins configurable in 5 s steps
 - Automation system valid/invalid.



Network ATS - Semi-Auto Mode
(without paralleling upon automatic return)
TR: switch response time



Network ATS - Auto Mode SW1
(with paralleling upon automatic return)
TR: switch response time



Generator ATS - Auto SW mode
(Without paralleling upon Auto return)
TR: Switch response time
Tg1: Generator starting time (maximum 60 s)
Tg2: Generator stopping time
Case ①: Generator channel closing after Generator power on (configurable option)
Case ②: Generator channel closing after Generator start-up command (configurable option)

Easergy T200 automation systems are factory predefined. No on-site programming is required.

- The automation systems can be switched on and off from the local operator panel and disabled using the configurator.
- The automation system counts the number of times a fault current followed by a voltage loss is detected. It sends an open order if:
 - the switch is closed
 - the fault has disappeared
 - the MV supply is absent.

Sectionaliser (SEC)

The sectionaliser automation system opens the switch after a predefined number of faults (1 to 4) during the voltage dip in the reclosing cycle of the top circuit breaker.

- The automation system counts the number of times a fault current followed by a voltage loss is detected. It sends an open order if:
 - the switch is closed
 - the fault has disappeared
 - the MV supply is absent.

■ The automation system is reset at the end of the execution time delay.

ATS automatic transfer system (source changeover)

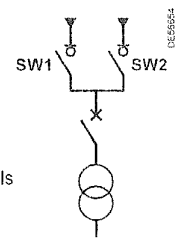
The automatic transfer system performs automatic control and management of sources in the MV secondary distribution network.

Two possible versions for ATS:

Network ATS version: control of two MV network channels. The network ATS automatic transfer system requires use of the VD23 relay for detection of voltage presence/absence.

Generator ATS version: control of one network channel and one generating set channel (not available on T200 E).

Note: ATS automatic transfer system is available only on channels 1 and 2 of each CONTROL module. Generator ATS automatic transfer system is available only on the first CONTROL module (channels 1 to 4).



Operating modes

The operating mode is selected from the T200 Web server.

Mode SW1→SW2 or SW2→SW1 (or SW→SWG if Generator ATS): Automatic transfer system executes only one changeover from the priority channel to the backup channel. Automatic transfer system then remains on that channel.

Semi-Auto mode SW1↔SW2 (or SW↔SWG if Generator ATS): In the event of a voltage loss on the active channel, automatic transfer system switches to the other channel after a time delay T1. Automatic transfer system executes no return, except in case of voltage loss on the new active channel.

Auto SW1 or Auto SW2 mode (or Auto SW if Generator ATS): After a changeover, return to the priority channel occurs if the MV voltage on that channel is restored. The channel that has priority can be defined according to the state of a dedicated digital input.

Changeover sequences:

Network ATS: in the event of voltage loss on the normal channel, changeover involves opening the normal channel after time delay T1 and then closing the backup channel.

Note: in "Auto" mode, the sequence of return to the normal channel depends on configuration of the "Paralleling upon auto return" option (see below).

Generator ATS: in the event of voltage loss on the network channel, changeover involves sending the order for opening the network channel and at the same time the Generator start-up order, after time delay T1.

The remainder of the changeover sequence depends on the management of Generator channel closing (configurable option):

- Case of Generator channel closing after start-up order: After the Generator start-up order, the closing order is given to the Generator channel, without waiting until the Generator is actually started.
- Case of Generator closing after Generator power on:

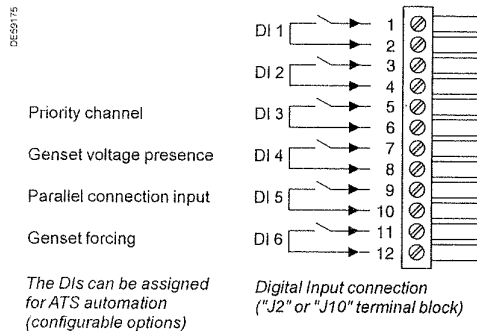
The Generator channel closing order is sent only when Generator voltage is detected.

Control

Automation systems

Configurable parameters:

- Automatic transfer system ON/OFF
- Operating mode: Semi-Auto, Auto SW1, Auto SW2, SW1 → SW2, SW2 → SW1
- T1: 0 ms to 2 min. in increments of 100 ms
- T2: 0 s to 30 min. in increments of 5 s
- Disabling/enabling transfer upon fault detection:
- Choice of voltage presence detection: DI4 or VD23
- Channel connected to generator: SW1 or SW2
- Type of automatic transfer system: Network ATS or Generator ATS
- Manual control enabled/disabled if ATS in operation
- Paralleling enabled/disabled in auto and/or manual mode
- Choice of type of changeover to Generator: immediately or after detection of Generator power on



Paralleling upon Auto return

A software-configurable option allows the automatic transfer system to disable or enable paralleling of the channels upon automatic return to the main channel (in "Auto" mode).

Enabling of paralleling must be confirmed by the activation of a dedicated digital input.

Paralleling disabled: Auto return to the priority channel involves opening the backup channel and, when it is open, closing the priority channel.

Paralleling enabled: Auto return to the priority channel involves first closing the priority channel and, when it is closed, opening the backup channel.

Changeover conditions

Changeover takes place if the following conditions are met:

- Automatic transfer system in operation
- SW1 open and SW2 closed or SW1 closed and SW2 open
- Absence of fault current on the two channels (only if locking by fault detection option activated)
- "Transfer locking" absent
- "Earthing switch" absent on the two channels
- MV voltage absent on the active channel
- MV voltage present on the other channel.

Return to the main channel for the "Auto" modes occurs if:

- The priority channel is open
- The MV voltage on the priority channel is present during time delay T2.

Generating set connections

Relays are installed in factory in the T200 enclosure to provide interfacing with the generating set (Generator ATS version only). Connection should be performed as follows (see diagram opposite):

- **Voltage:** contact closed if Generator started, to be wired on the two available terminals (do not wire if detection of power on is performed by a relay VD23)
- **Start-up:** Generator start-up order, to be wired on terminals C and B
- **Stop:** Generator stoppage order, to be wired on terminals D and B.

Detection of voltage presence

Voltage presence on a channel managing the Generator can be executed by two processes:

- Either by a dedicated "Voltage" digital input
- Or by voltage relay VD23 (via cubicle cable).

Override setting on generator (Generator ATS only)

For routine test or reduced pricing requirements, it is possible to perform override setting of operation on the generator manually, remotely (from the supervisor) or locally (activation by a dedicated digital input).

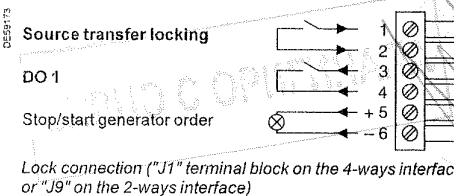
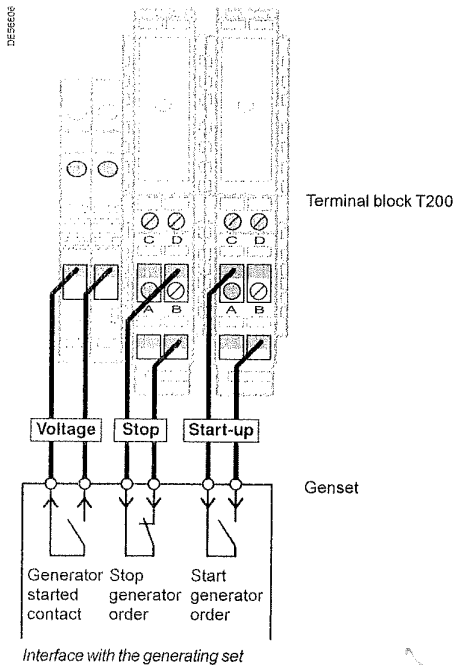
When the override setting is terminated, the automatic transfer system places itself back in the initial mode, i.e. in the mode that was active before the override setting (ON or OFF). During override setting, the automatic transfer system is set to "ON" for channels 1 and 2.

Source transfer locking

A dedicated digital input allows changeover to be locked if a problem occurs on one of the devices related to the changeover. This input is generally connected to the downstream circuit breaker. Local and remote controls are no longer possible in this case.

Specific Generator-related management

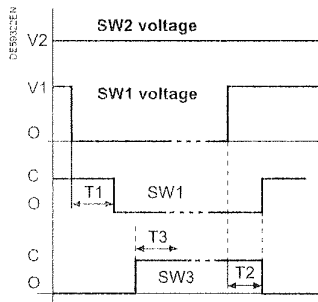
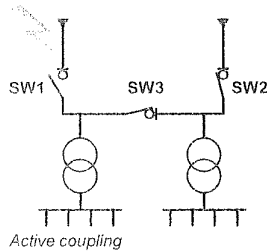
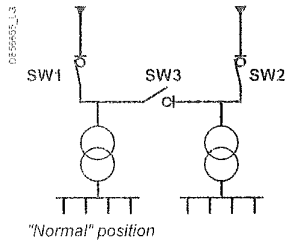
- Upon transfer to the Generator, if the latter doesn't start, the automatic transfer system waits for a period of 60 s at most before stopping changeover, then:
 - in SW → SWG mode: the automatic transfer system is locked and must be reset (on the Control panel) to restart the device.
 - in SW ↔ SWG mode or in Auto mode: the automatic transfer system remains operational.
- If voltage returns to the network channel, the automatic transfer system requests return to the network channel.
- When the automatic transfer system is configured with auto return on the network channel, Generator stoppage is requested 6 s after the changeover sequence is completed.



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Control

Automation systems



Configurable parameters:

- Operating mode: Standard/locking upon voltage loss
- Automatic return: SW1/SW2
- Automation system: on/off
- Delay before switching
- Delay before return
- T1: 100 ms to 60 s in 100 ms steps
- T2: 5 s to 300 s in 1 s steps
- Interlock delay on voltage loss
- T3: 100 ms to 3 s in 100 ms steps
- Motorisation type: command time
- Manual control: enabled/disabled in local and remote modes if automation system in operation
- Paralleling: enabled/disabled in auto and (or) manual modes
- Transfer locking upon fault detection.

Bus tie coupling (BTA) with T200 I

The BTA (Bus Tie Automatism) is an automation system for switching sources between two incoming lines (SW1 and SW2) and a busbar coupling switch (SW3). It must be used in conjunction with VD23 type voltage presence detectors and the fault current detection function on the busbar incoming lines.

Operating mode

Two operating modes can be configured:

- Standard mode: If the voltage is lost on one busbar, the automation system opens the incoming line (SW1 or SW2) and closes the coupling switch SW3. Coupling is conditional upon the absence of a fault current on the main source.
- Interlock on loss of voltage after switching mode: After execution of the automation system in standard mode, the voltage presence is checked for a configurable period. If the voltage is lost during this period, the coupling switch SW3 is opened and the automation system interlocked.

Coupling sequence

- Coupling takes place if the following conditions are met:
 - the automation system is switched on
 - the switches on incoming channels SW1 and SW2 are closed
 - the earthing switches SW1, SW2 and SW3 are open
 - there is no voltage on an incoming line SW1 or SW2
 - there is no fault current detection on SW1 and SW2
 - there is no transfer interlock
 - voltage is present on the other incoming line.
- The coupling sequence in standard mode is as follows:
 - opening of the de-energised incoming line switch after a delay T1
 - closing of the coupling switch SW3.
- The coupling sequence in "Interlock on loss of voltage after coupling" mode is completed as follows:
 - monitoring of the voltage stability for a delay T3
 - opening of the coupling switch SW3 if this condition is not met
 - locking of BTA automation system.
- The system returns to standard mode after coupling if:
 - the "return to SW1 or SW2" option is activated
 - voltage on the channel has been normal for a delay T2
 - the automation system is activated
 - the automation system is not locked
 - there is no coupling interlock.

Coupling interlock

A dedicated digital input allows changeover to be locked if a problem occurs on one of the devices related to the changeover. This input is generally connected to the downstream circuit breaker. Local and remote controls are no longer possible in this case.

Locking the automation system

The BTA automation system is locked if one of the following conditions is met during the coupling process:

- Failure of a command to open or close a switch
- Indication that an earthing switch has closed
- Appearance of a fault current
- Switch power supply fault
- Appearance of the coupling interlock
- Manual or remote ON/OFF command from the automation system.

Paralleling upon Auto return

A software-configurable option allows the automation system to disable or enable paralleling of the channels upon automatic return to the main channel (in "Auto" mode). Enabling of paralleling must be confirmed by the activation of a dedicated digital input.

- **If paralleling is disabled:** Auto return to the normal channel involves opening the coupling channel (SW3) and, when it is open, closing the normal channel.
- **If paralleling is enabled:** Auto return to the normal channel involves first closing the normal channel and, when it is closed, opening the coupling channel (SW3).

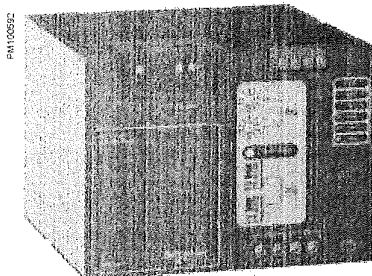
-142-

Control

PS100 high-availability power supply

Backup solution for MV switchgear power needs in the event of micro outages and power interruptions.

- Easy maintenance with only one battery
- Remote battery monitoring
- High level of insulation to protect the electronic devices in severe MV environments
- End-of-life alarm possible via Modbus communication
- Compliant with standards IEC 60255-5 (10 kV level).



PS100

PS100 backup power supply for MV substations

Applications

The power supply unit supplies backup operating power for:

- MV switchgear motor mechanisms and circuit breaker coils
- Transmission equipment (e.g. radio)
- Control units such as RTU or Automatic Transfer System
- Protection relays, Fault Passage Indicators and others electronic devices.

High availability power supply

A battery ensures uninterrupted operation of the whole substation in the event of loss of the main supply. The backup power supply unit:

- Includes a regulated and temperature-compensated charger
- Stops the battery before deep discharge
- Carries out a battery check every 12 hours
- Measures battery ageing
- Forwards monitoring information via a Modbus communication port and output relays.

Benefits

Only one battery

Traditional backup power supplies require a set of 2 or 4 batteries to produce 24 V or 48 V, with complicated replacement and adjustment of the battery pack.

The PS100 needs only one battery, simplifying replacement.

The battery is a standard sealed lead-acid 12 V battery with a 10-year service. It can be purchased easily, anywhere in the world.

Improved availability of MV/LV substations

The PS100 is designed to ride through power network interruptions of up to 48 hours. It is associated with a battery selected to meet the required backup time.

The PS100 protects and optimises the battery with state-of-the-art monitoring. A Modbus communication port forwards monitoring data to allow optimised maintenance operations. Perfect integration with the Easergy range to control and monitor your distribution network.

Additional energy backup

The PS100 stops supplying power and reserves an "additional energy backup" to restart the installation after an extended power interruption.

The "additional energy backup" can be enabled with a local pushbutton to provide energy for restarting the protection relays and operating the MV switchgear.

Withstands severe substation environments

The PS100 includes 10 kV insulation, electronic protection against overvoltage and overloads, and automatic restart after a fault.

Main features

- DIN rail mounting for easy integration in any LV cabinet or MV/LV substation
- 2 power supply outputs:
 - 12 Vdc - 18 W continuous - 100 W 20 s (for modem, radio, RTU, etc.)
 - 48 Vdc or 24 Vdc - 300 W/1 minute (for switchgear operating mechanism motors) and 90 W/ continuous for protection relays, electronic devices, etc.
- RJ45 Modbus communication port
- 2 output relays (AC supply ON, Battery ON)
- Diagnosis with LEDs
- 1 sealed lead-acid 12 V battery with a 10-year service life (from 7 Ah to 40 Ah)
- Power supply paralleling available with a 2nd PS100
- -40°C to +70°C operating temperature.

Range

- | | |
|-------------|---|
| • PS100-48V | 48 Vdc power supply and battery charger |
| • PS100-24V | 24 Vdc power supply and battery charger |
| • Bat24AH | 24 Ah long life battery |
| • Bat38AH | 38 Ah long life battery. |



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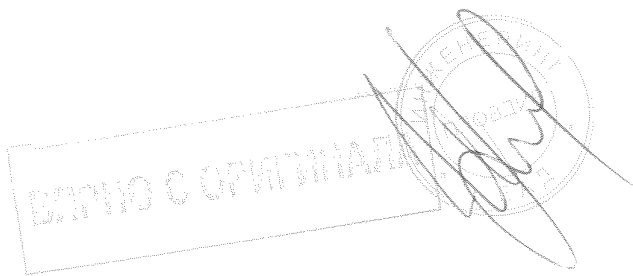
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Connections

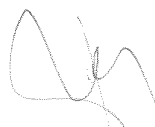


Signature

Connections

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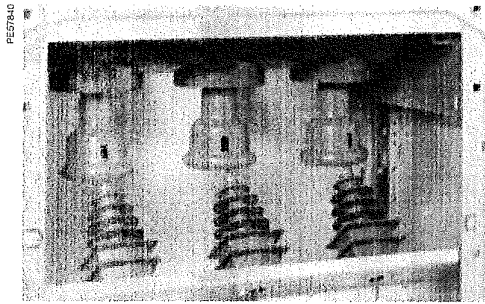


ВЯРНО С ОРИГИНАЛОМ



Connections with dry-type cables for SM6-24

Selection table



The ageing resistance of the equipment in an MV/LV substation depends on three key factors:

- the need to make connections correctly**
 New cold fitted connection technologies offer ease of installation that favours resistance over time. Their design enables operation in polluted environments under severe conditions.
- the impact of the relative humidity factor**
 The inclusion of a heating element is essential in climates with high humidity levels and with high temperature differentials.
- ventilation control**
 The dimension of the grills must be appropriate for the power dissipated in the substation. They must only traverse the transformer area.

Network cables are connected:

- on the switch terminals
- on the lower fuse holders
- on the circuit breaker's connectors.

The bimetallic cable end terminals are:

- round connection and shank for cables $\leq 240 \text{ mm}^2$
- square connection round shank for cables $> 240 \text{ mm}^2$ only.

Crimping of cable end terminals to cables must be carried out by stamping.

The end connectors are of cold fitted type

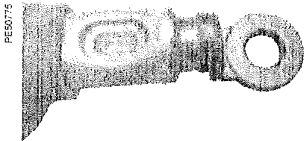
Schneider Electric's experience has led it to favour this technology wherever possible for better resistance over time.

The maximum admissible cable cross section:

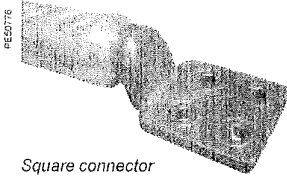
- 630 mm^2 for 1250 A incomer and feeder cubicles
- 240 mm^2 for 400-630 A incomer and feeder cubicles
- 120 mm^2 for contactor cubicles
- 95 mm^2 for transformer protection cubicles with fuses.

Access to the compartment is interlocked with the closing of the earthing disconnector. The reduced cubicle depth makes it easier to connect all phases.

A 12 mm \varnothing pin integrated with the field distributor enables the cable end terminal to be positioned and attached with one hand. Use a torque wrench set to 50 mN.



Round connector



Square connector

Dry-type single-core cable

Short inner end, cold fitted

| Voltage | Cable end terminal type | X-section mm^2 | Supplier | Number of cables | Comments |
|-----------------------------|-------------------------|------------------------------------|---|--|--|
| 3 to 24 kV 400 A - 630 A | Round connector | 50 to 240 mm^2 | All cold fitted cable end suppliers: Silec, 3M, Pirelli, Raychem, etc. | 1 or 2 per phase | For larger x-sections, more cables and other types of cable end terminals, please consult us |
| 3 to 24 kV 1250 A | Round connector | 50 to 630 mm^2 | All cold fitted cable end suppliers: Silec, 3M, Pirelli, Raychem, etc. | 1 or 2 per phase $\leq 400 \text{ mm}^2$ | For larger x-sections, more cables and other types of cable end terminals, please consult us |
| | Square connector | $> 300 \text{ mm}^2$ admissible | | 400 $< 1 \leq 630 \text{ mm}^2$ per phase | |

Three core, dry cable

Short inner end, cold fitted

| Voltage | Cable end terminal type | X-section mm^2 | Supplier | Number of cables | Comments |
|-----------------------------|-------------------------|-------------------------|---|------------------|--|
| 3 to 24 kV 400 A - 630 A | Round connector | 50 to 240 mm^2 | All cold fitted cable end suppliers: Silec, 3M, Pirelli, Raychem, etc. | 1 per phase | For larger x-sections, more cables and other types of cable end terminals, please consult us |
| 3 to 24 kV 1250 A | Round connector | 50 to 630 mm^2 | All cold fitted cable end suppliers: Silec, 3M, Pirelli, Raychem, etc. | 1 per phase | For larger x-sections, more cables and other types of cable end terminals, please consult us |

Note:

- The cable end terminals, covered by a field distributor, can be square.
- PM/QM type cubicle, round end connections $\varnothing 30 \text{ mm}$ max.

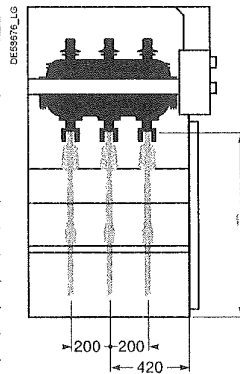
Cable-connection from below for SM6-24

Cable positions

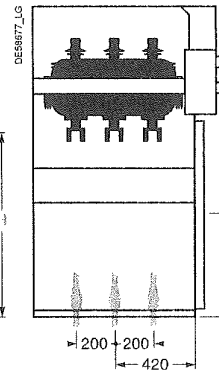
Cable-connection height H measured from floor (mm)

| | 630 A | 1250 A |
|-----------------------------|-------|--------|
| IM, NSM-cables, NSM-busbars | 945 | 945 |
| SM | 945 | 945 |
| IMC | 400 | |
| PM, QM | 400 | |
| QMC | 400 | |
| CVM | 430 | |
| DM1-A | 430 | 320 |
| DMVL-A | 430 | |
| DM1-W | 370 | 320 |
| GAM2 | 760 | |
| GAM | 470 | 620 |
| DMV-A | 320 | 313 |
| DM1-S | 543 | |

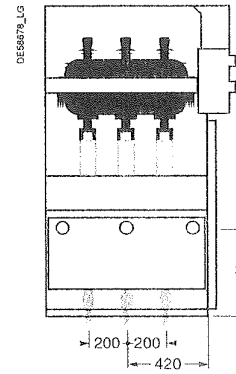
IM, NSM-cables, NSM-busbars, SM



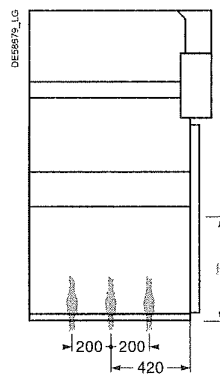
IMC, PM, QM, QMC



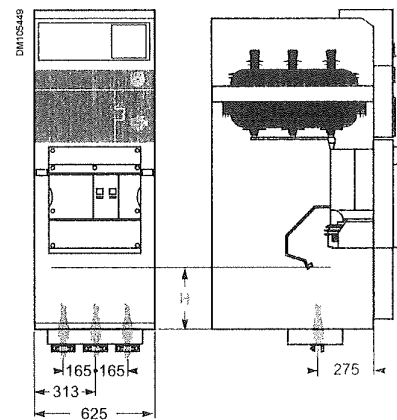
CVM



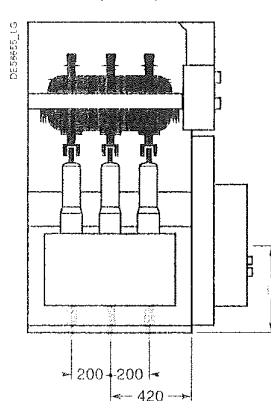
GAM, GAM2



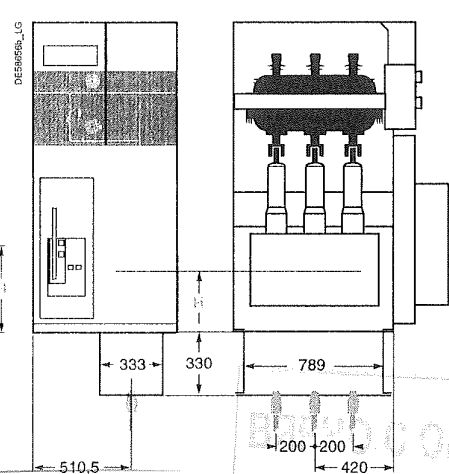
DMV-A (630 A)



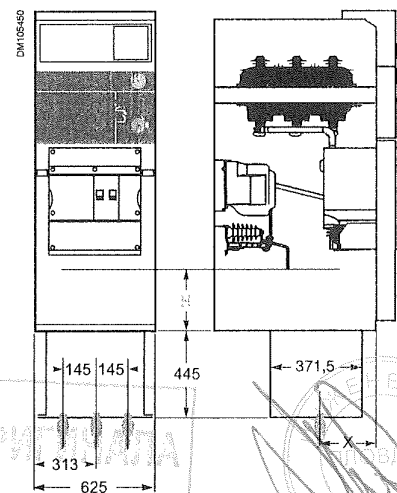
DM1-A, DM1-S, DMVL-A
DM1-W (630 A)



DM1-A, DM1-W (1250 A)



DMV-A (1250 A)

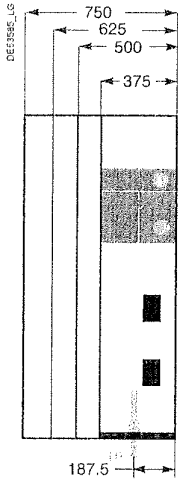


- X = 330 : 1 single-core cable
- X = 268 : 2 single-core cables
- X = 299 : Three-core cable

Cable-connection from below for SM6-24

Trenches depth

For internal arc 12.5 kA 1s, IAC: A-FL



Cabling from below

- **Through trenches:** the trench depth P is given in the table opposite for commonly used dry single-core cables type (for tri-core cables consult us).
- **With stands:** to reduce P or eliminate trenches altogether by placing the units on 400 mm concrete footings.
- **With floor void:** the trench depth P is given in the table opposite for commonly used types of cables.

| Single-core cables | | Units until 630 A | | | | | Cable types | | |
|------------------------------------|---------------------|---------------------------------|---------------------------------------|---------|-------|-----------------|-------------|----------------------|-----------|
| Cable x-section (mm ²) | Bending radius (mm) | IM, SM, NSM-cables, NSM-busbars | IMC, DM1-A, DM1-W, DM1-S, DMVL-A, GAM | GRM CVM | DMV-A | PM, CM, OMC (1) | SM, GAM | DM1-A (2), DM1-W (2) | DMV-A (3) |
| Depth P (mm) all orientations | | | | | | | | | |
| | | P1 | P2 | P2 | P2 | P3 | P4 | P5 | P6 |
| 50 | 370 | 140 | 400 | 400 | 500 | 350 | | | |
| 70 | 400 | 150 | 430 | 430 | 530 | 350 | | | |
| 95 | 440 | 160 | 470 | 470 | 570 | 350 | | | |
| 120 | 470 | 200 | 500 | 500 | 600 | | | | |
| 150 | 500 | 220 | 550 | | 650 | | | | |
| 185 | 540 | 270 | 670 | | 770 | | | | |
| 240 | 590 | 330 | 730 | | 830 | | | | |
| 400 | 800 | | | | | | 1000 | 1350 | 1450 |
| 630 | 940 | | | | | | 1000 | 1350 | 1450 |

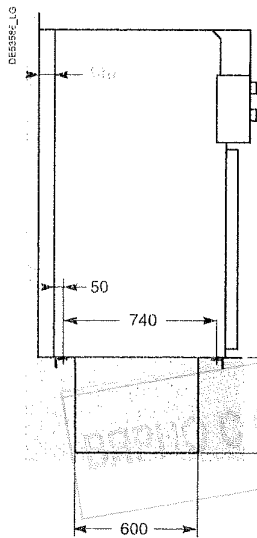
- (1) Must be installed with a 100 mm depth metal pan.
 (2) Must be installed with a 350 mm depth metal pan, in a floor void.
 (3) Mounting with a 445 mm depth metal pan compulsory in a floor void.

Note: the unit and the cables requiring the greatest depth must be taken into account when determining the depth P or single-trench installations. In double-trench installations, depth P must be taken into account for each type of unit and cable orientations.

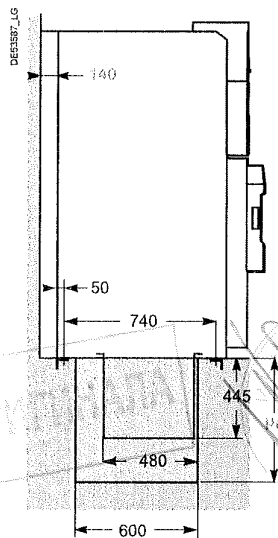
Cable trench drawings

1250 A units (represented without switchboard side panels)

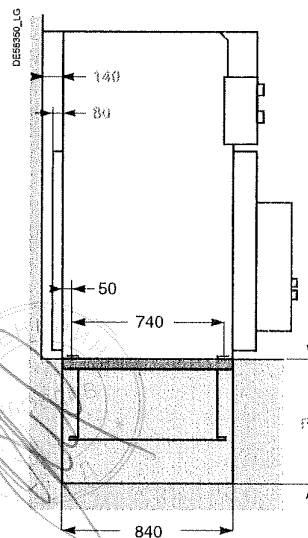
SM, GAM
 For single and tri-core cables



DMV-A
 For single and tri-core cables

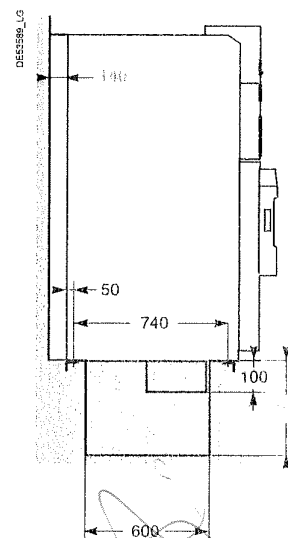


DM1-A, DM1-W
 For single-core cables



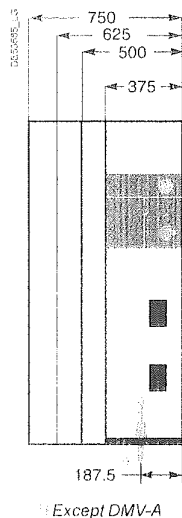
630 A units

DMV-A
 For single cables



Cable-connection from below for SM6-24

Trenches depth



For internal arc 12.5 kA 1s,
IAC: A-FLR, 16 and 20 kA 1s, IAC: A-FL/A-FLR

Cabling from below

- **Through trenches:** the trench depth P is given in the following table for usual dry single-core cables type (for tri-core cables consult us).
- **With stands:** to reduce depth P or avoid trenches, by placing the units on 400 mm concrete footings.
- **With floor void:** the trench depth is given in the following table for usual types of cables.

| IAC | All cubicles except | | Other cubicles | | | DM1A, DM1S, DM1W, DMVLA | | SM, GAM | DM1A, DMV-A, DM1-W | |
|---------------------------------------|----------------------------------|----------|----------------|------------|----------|--|--|-------------|--------------------|--|
| | 12.5 kA/1s | 16 kA/1s | 12-16 kA/1s | 12.5 kA/1s | 16 kA/1s | 12.5 kA/1s | 16 kA/1s | 12-16 kA/1s | 12-16 kA/1s | |
| | Depth P (mm) | | | | | | | | | |
| Cable section (mm²) | Depth P (mm) | | | | | | | | | |
| S < 120 | 330 | 550 | 550 | 330 | 550 | 330 | 550 | - | - | |
| 120 < S < 240 | 330 | 550 | 800 | - | - | 330; cables coming other side of the circuit breaker | 450; cables coming under the circuit breaker | 550 | - | |
| S > 400 | - | - | - | - | - | - | - | 1000 | 1400 | |

Cable trench drawings

1250 A units (represented without switchboard side panels)

SM, GAM

For single and tri-core cables

DMV-A

For single and tri-core cables

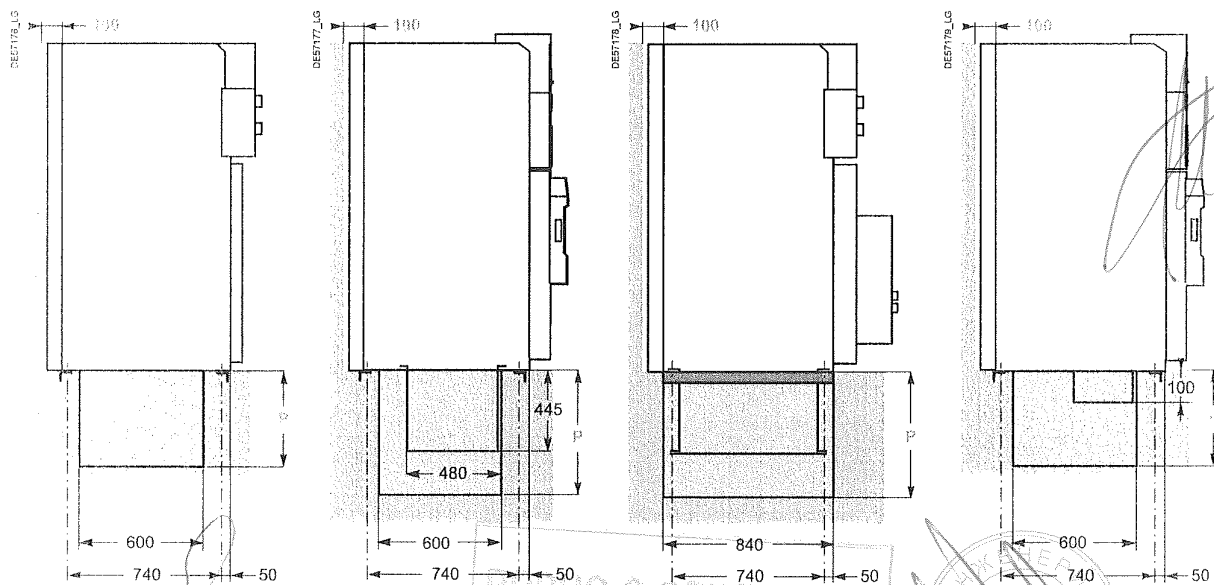
DM1-A, DM1-W

For single-core cables

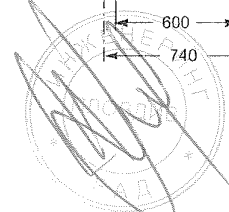
630 A units

DMV-A

For single cables



ВАЖНО С ОРЪГИНАЛА



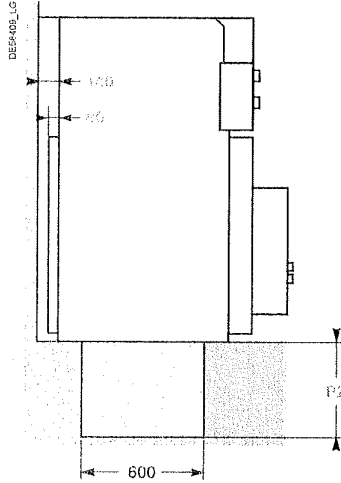
Cable-connection from below for SM6-24

Trench diagrams example

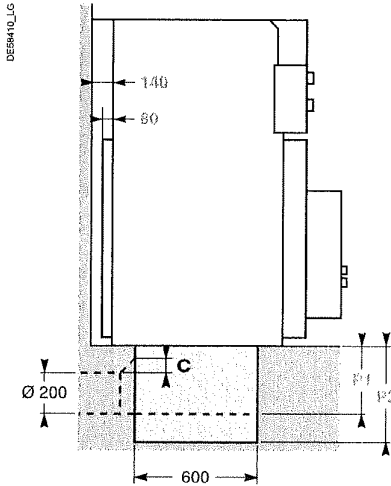
For internal arc 12.5 kA 1s,
IAC: A-FL

Units represented without switchboard side panels

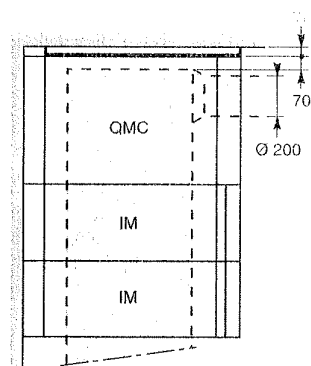
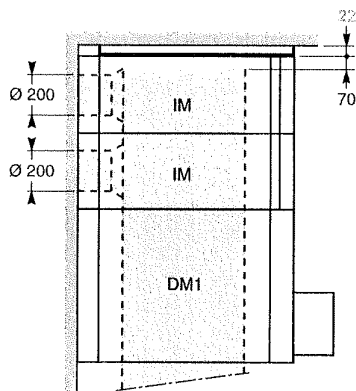
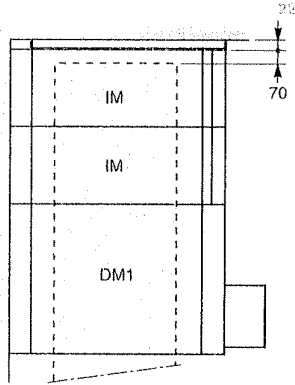
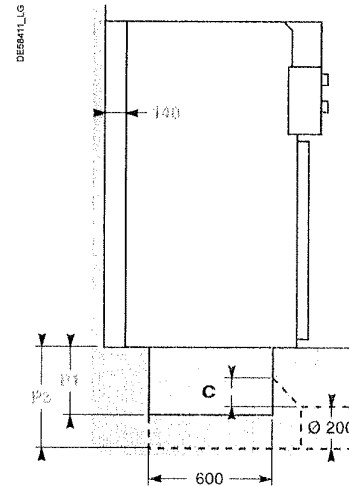
630 A units
Cable entry or exit
through right or left side



630 A units
Rear entry or exit
with conduits



630 A units
Front entry or exit
with conduits



Required dimensions (mm)

Note 1: for connection with conduits, the bevel (C) must correspond to the following trench dimensions: P1 = 75 mm or P2/P3 = 150 mm.
Note 2: please refer to chapter "Layout examples" for a site application.

ВЕРНО С ОПРИТНАТА

Cable-connection from below for SM6-24

Trench diagrams example

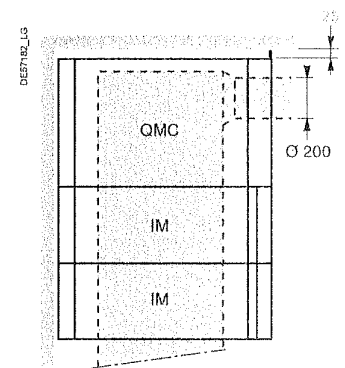
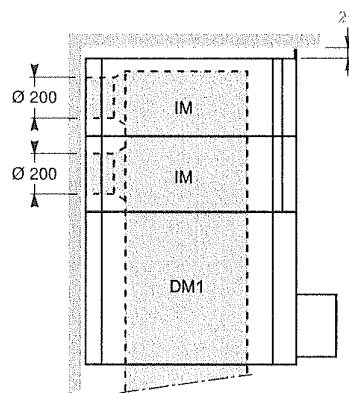
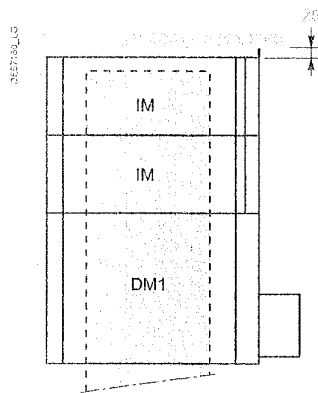
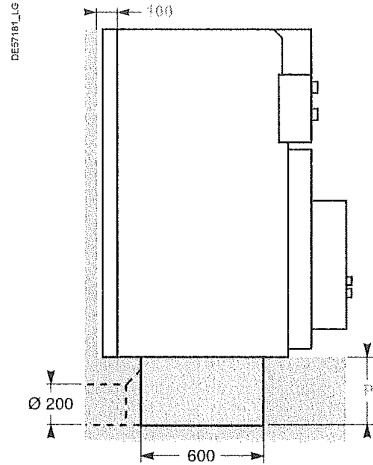
For internal arc 12.5 kA 1s,
IAC: A-FLR, 16 and 20 kA 1s, IAC: A-FL/A-FLR

Units represented without switchboard side panels

630 A units
Cable entry or exit
through right or left side

630 A units
Rear entry or exit
with conduits

630 A units
Front entry or exit
with conduits



Горизонтальные размеры (mm)

ВЯРНО С ОРИГИНАЛА



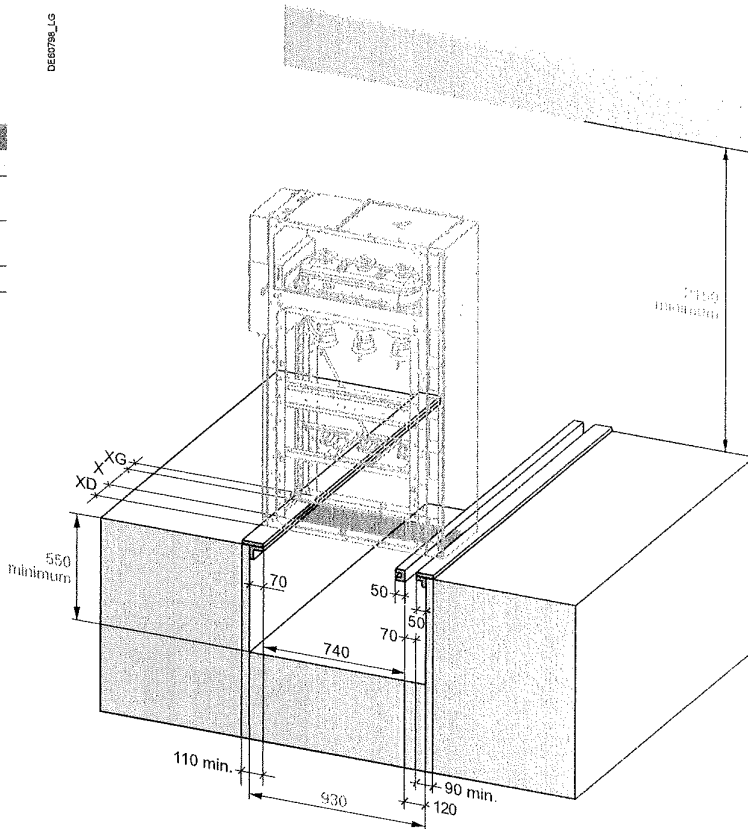
Cable-connection from below for SM6-24

Trench diagrams and floor void drawings example

Installation with floor void for 16 kA 1 s downwards exhaust

- Area free of obstructions:

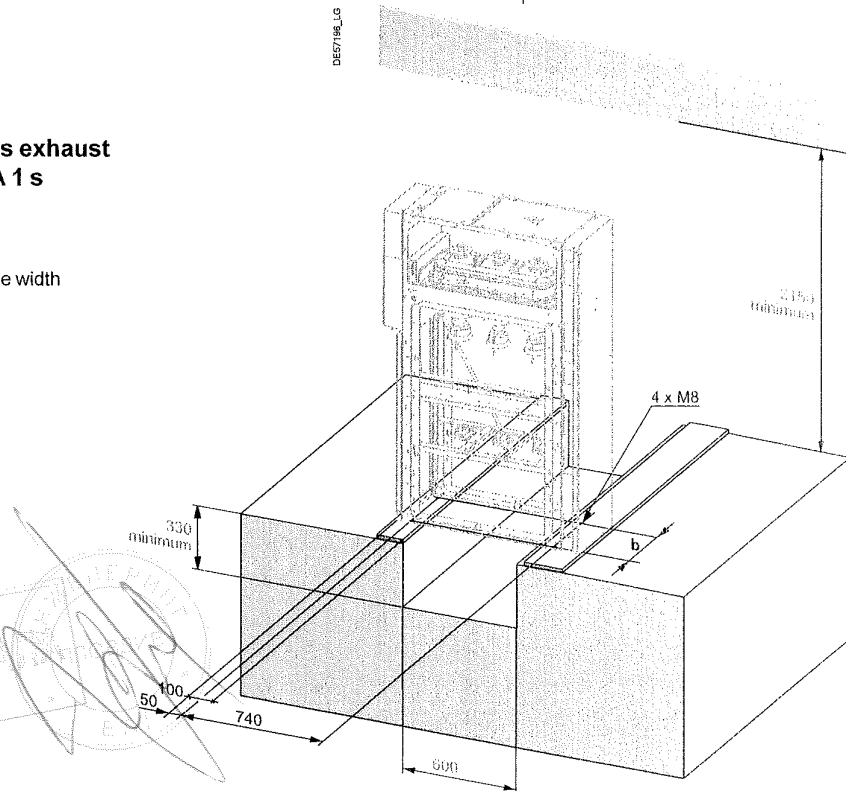
| Width (mm) | Depth (mm) | X (mm) | Y (mm) | Z (mm) |
|------------|------------|--------|--------|--------|
| 375 | All | 57.5 | 260 | 57.5 |
| 500 | GAM | 57.5 | 260 | 182.5 |
| | Other | 182.5 | 260 | 57.5 |
| 625 | QMC | 307.5 | 260 | 57.5 |
| | Other | 57.5 | 510 | 57.5 |
| 750 | All | 432.5 | 260 | 57.5 |



Installation with cable trench for basic 12.5 kA 1 s downwards exhaust for advance 16 kA 1 s and 20 kA 1 s upwards exhaust

- Position of fixing holes b depends on the width of the unit:

| | |
|-----|-----|
| 125 | 95 |
| 375 | 345 |
| 500 | 470 |
| 625 | 595 |
| 750 | 720 |



Connections with dry-type cables for SM6-36

Selection table

| Cable section (mm ²) | Bonding radius (mm) | Depth P (mm) | |
|--|---------------------------|--|-----|
| | | P1 | P2 |
| | | IM, IMC, QM, CM, CM2, PM, DM1-A, GAM, GAM2, SM, TM | |
| 1 x 35 | 525 | 350 | 550 |
| 1 x 50 | 555 | 380 | 580 |
| 1 x 70 | 585 | 410 | 610 |
| 1 x 95 | 600 | 425 | 625 |
| 1 x 120 | 630 | 455 | 655 |
| 1 x 150 | 645 | 470 | 670 |
| 1 x 185 | 675 | 500 | 700 |
| 1 x 240 | 705 | 530 | 730 |

Note: the unit and the cables requiring the greatest depth must be taken into account when determining the depth P for single-trench installations. In double-trench installations must be taken into account to each type of unit and cable orientations.

The ageing resistance of the equipment in an MV/LV substation depends on three key factors:

- the need to make connections correctly
New cold fitted connection technologies offer ease of installation that favours resistance over time. Their design enables operation in polluted environments under severe conditions.
- the impact of the relative humidity factor
The inclusion of a heating element is essential in climates with high humidity levels and with high temperature differentials.
- ventilation control
The dimension of the grills must be appropriate for the power dissipated in the substation. They must only traverse the transformer area.

Network cables are connected:

- on the switch terminals
- on the lower fuse holders
- on the circuit breaker's connectors.

The bimetallic cable end terminals are:

- round connection and shank for cables $\leq 240 \text{ mm}^2$.
Crimping of cable lugs to cables must be carried out by stamping.

The end connectors are of cold fitted type

Schneider Electric's experience has led it to favour this technology wherever possible for better resistance over time.

The maximum admissible copper(*) cable cross section:

- 2 x (1 x 240 mm² per phase) for 1250 A incomer and feeder cubicles
- 240 mm² for 630 A incomer and feeder cubicles
- 95 mm² for transformer protection cubicles with fuses.

Access to the compartment is interlocked with the closing of the earthing disconnector. The reduced cubicle depth makes it easier to connect all phases.

A 12 mm \varnothing pin integrated with the field distributor enables the cable end terminal to be positioned and attached with one hand. Use a torque wrench set to 50 mN.

(*) Consult us for alu cable cross sections

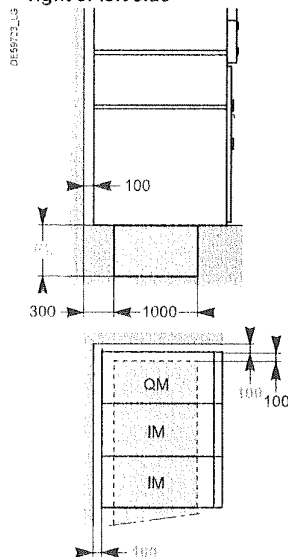
Cabling from below

All units through trenches

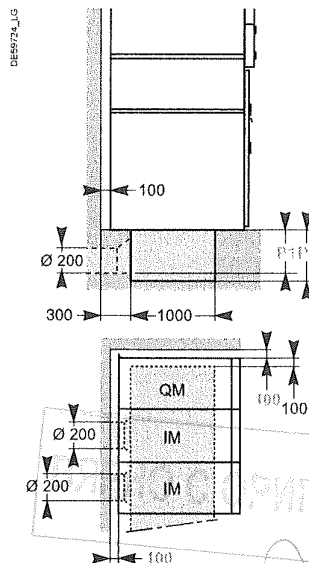
- the trench depth P is given in the table opposite for commonly used types of cables.

Trench diagrams

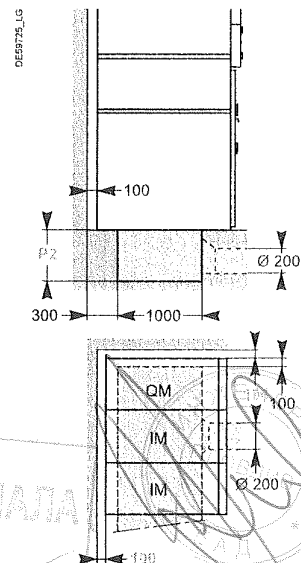
Cable entry or exit through right or left side



Rear entry or exit with conduits



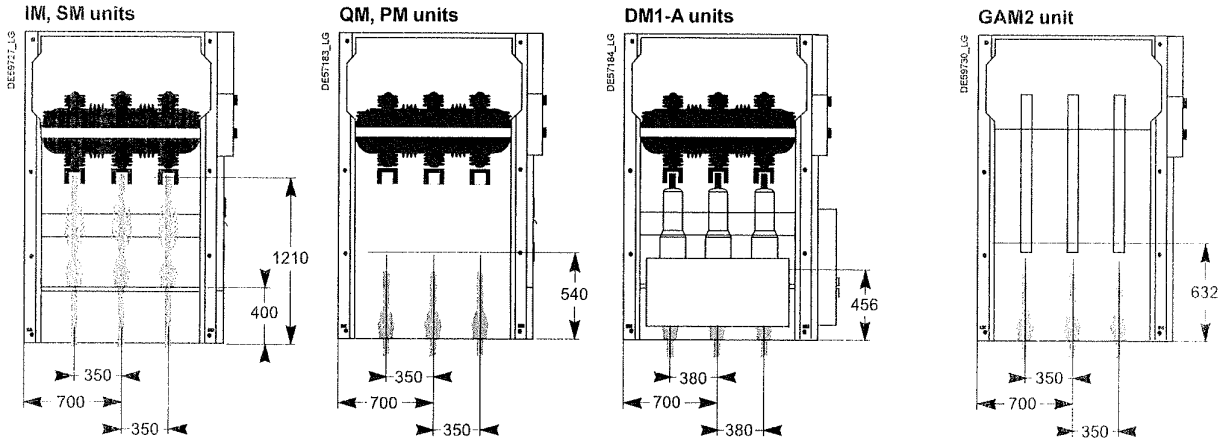
Front entry or exit with conduits



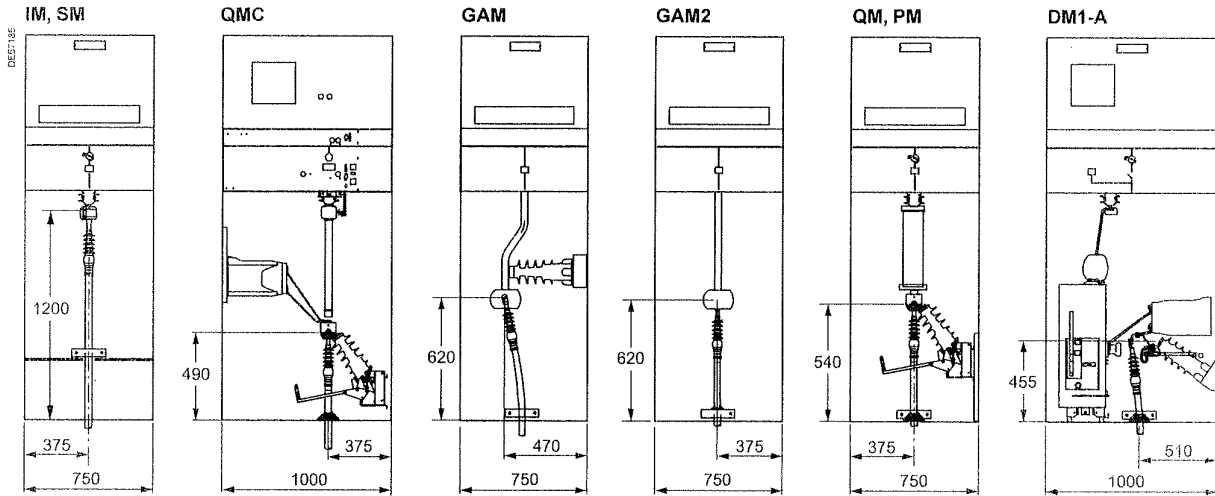
Cable-connection from below for SM6-36

Cable positions

Side view



Front view



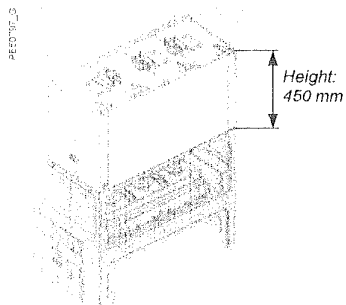
ВАРИАНТ С ОБРАТНЫМ НАПРАВЛЕНИЕМ

СЕРТИФИКАТ

СЕРТИФИКАТ

Handwritten signature

Cabling from above for SM6-24 and SM6-36



Cabling from above

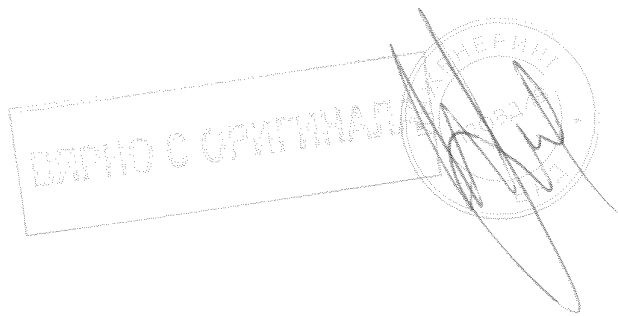
On each 630 A unit of the range, except those including a low-voltage control cabinet and EMB enclosure, the connection is made with dry-type and single-core cables.

Remarks:

- Not available for internal arc IEC 62271-200.
- Not available in 1250 A.

ВЕРНО С ОРИГИНАЛОМ

Installation

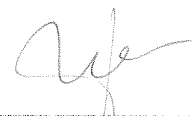
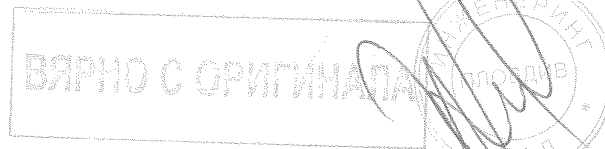
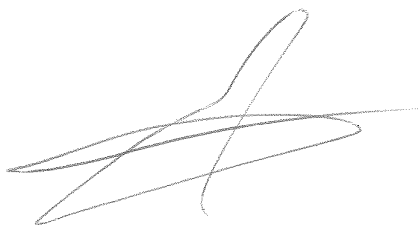


Signature

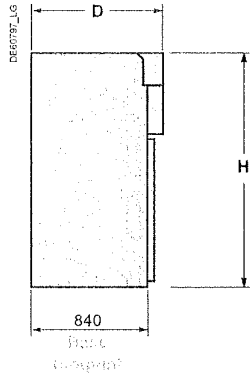
Installation

Contents

| | |
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| Dimensions and weights for SM6-24 | 116 |
| Units dimensions for SM6-24 | 117 |
| Civil engineering for SM6-24 | 121 |
| Layout examples for SM6-24 | 123 |
| Dimensions and weights for SM6-36 | 124 |
| Civil engineering for SM6-36 | 125 |
| Layout examples for SM6-36 | 126 |



Dimensions and weights for SM6-24



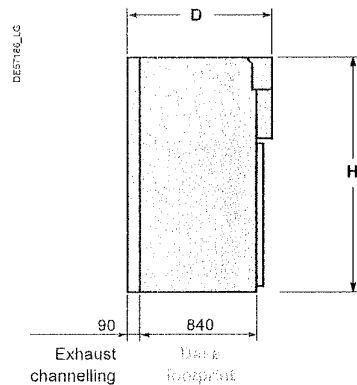
Add to height:

- (1) 450 mm for low-voltage enclosures for control/monitoring and protection functions.
- To ensure uniform presentation, all units (except GIM and GEM) may be equipped with low-voltage enclosures.
- (2) depending on the busbar configuration in the VM6 unit, two types of extension units may be used:
- to extend a VM6 DM12 or DM23 unit, use an extension unit with a depth of 1060 mm
- for all other VM6 units, a depth of 920 mm is required.
- (3) for the 1250 A unit.

Basic internal arc
12.5 kA 1s, IAC: A-FL

Dimensions and weights

| Unit type | Height H (mm) | Width (mm) | Depth D (mm) | Weight (kg) |
|---|---------------------|------------------------|-------------------------|------------------------|
| IM,IMB | 1600 ⁽¹⁾ | 375/500 | 940 | 120/130 |
| IMM | 1600 | 750 | 940 | 340 |
| IMC | 1600 ⁽¹⁾ | 500 | 940 | 200 |
| PM, QM, QMB | 1600 ⁽¹⁾ | 375/500 | 940 | 130/150 |
| QMC | 1600 ⁽¹⁾ | 625 | 940 | 180 |
| CRM, CVM | 2050 | 750 | 940 | 390 |
| DM1-A, DM1-D, DM1-W, DM2, DMVL-A, DMVL-D, DM1-M | 1600 ⁽¹⁾ | 750 | 1220 | 400 |
| DM1-S | 1600 ⁽¹⁾ | 750 | 1220 | 340 |
| DMV-A, DMV-D | 1695 ⁽²⁾ | 625 | 940 | 340 |
| CM | 1600 ⁽¹⁾ | 375 | 940 | 190 |
| CM2 | 1600 ⁽¹⁾ | 500 | 940 | 210 |
| GBC-A, GBC-B | 1600 | 750 | 1020 | 290 |
| NSM-cables, NSM-busbars | 2050 | 750 | 940 | 260 |
| GIM | 1600 | 125 | 840 | 30 |
| GEM ⁽²⁾ | 1600 | 125 | 920/1060 ⁽²⁾ | 30/35 ⁽²⁾ |
| GBM | 1600 | 375 | 940 | 120 |
| GAM2 | 1600 | 375 | 940 | 120 |
| GAM | 1600 | 500 | 1020 | 160 |
| SM | 1600 ⁽¹⁾ | 375/500 ⁽³⁾ | 940 | 120/150 ⁽³⁾ |
| TM | 1600 | 375 | 940 | 200 |
| DM1-A, DM1-D, DM1-W, DM1-Z (1250 A) | 1600 | 750 | 1220 | 420 |



Advance internal arc
12.5 kA 1s, IAC: A-FLR 16 and
20 kA 1s, IAC: A-FL/A-FLR

Dimensions and weights

| Unit type | Height H (mm) | Width (mm) | Depth D (mm) | Weight (kg) |
|---|---------------------|------------------------|-------------------------|----------------|
| IM,IMB | 1600 ⁽¹⁾ | 375/500 | 1030 | 130/140 |
| IMM | 1600 | 750 | 1030 | 340 |
| IMC | 1600 ⁽¹⁾ | 500 | 1030 | 210 |
| PM, QM, QMB | 1600 ⁽¹⁾ | 375/500 | 1030 | 140/160 |
| QMC | 1600 ⁽¹⁾ | 625 | 1030 | 190 |
| CVM | 2050 | 750 | 1030 | 400 |
| DM1-A, DM1-D, DM1-W, DM2, DMVL-A, DMVL-D, DM1-M | 1600 ⁽¹⁾ | 750 | 1230 | 410 |
| DM1-S | 1600 ⁽¹⁾ | 750 | 1230 | 350 |
| DMV-A, DMV-D | 1695 ⁽²⁾ | 625 | 1115 | 350 |
| CM | 1600 ⁽¹⁾ | 375 | 1030 | 200 |
| CM2 | 1600 ⁽¹⁾ | 500 | 1030 | 220 |
| GBC-A, GBC-B | 1600 ⁽¹⁾ | 750 | 1030 | 300 |
| NSM-cables, NSM-busbars | 2050 | 750 | 1030 | 270 |
| GIM | 1600 | 125 | 930 | 40 |
| GEM ⁽²⁾ | 1600 | 125 | 930/1060 ⁽²⁾ | 40/45 |
| GBM | 1600 | 375 | 1030 | 130 |
| GAM2 | 1600 | 375 | 1030 | 130 |
| GAM | 1600 | 500 | 1030 | 170 |
| SM | 1600 ⁽¹⁾ | 375/500 ⁽³⁾ | 1030 | 130/160 |
| TM | 1600 | 375 | 1030 | 210 |
| DM1-A, DM1-D, DM1-W, DM1-Z (1250 A) | 1600 ⁽¹⁾ | 750 | 1230 | 430 |

- (1) Add to height 450 mm for low-voltage enclosures for control/monitoring and protection functions. To ensure uniform presentation, all units (except GIM and GEM) may be equipped with low-voltage enclosures.
- (2) Depending on the busbar configuration in the VM6 unit, two types of extension units may be used:
- to extend a VM6 DM12 or DM23 unit, use an extension unit with a depth of 1060 mm
- for all other VM6 units, a depth of 930 mm is required.
- (3) For the 1250 A unit.