

2017 Catalog

Motorpact™

MV motor starter
with vacuum contactor up to 7.2 kV

Medium Voltage Distribution



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The expert's choice for medium voltage motor control



PEE0523

Safety 

Reliability 

Easy to use 

A Motorpact controller for any job

Motorpact motor control centres are designed to tackle your toughest power and process control challenges. They meld quality construction, pioneering design, and outstanding performance in a complete soft starting, soft stopping, and motor management system for applications up to 4200 kW at 7.2 kV.

PM10831



Motorpact: a superior solution for motor control

- Quality of construction
- Integrated design
- Outstanding performance

Increased worker safety

- Interlock prevents interior access when energized
- Two position disconnecter earths line side MV compartment components prior to MV access
- Internal arc classified to Type AFLR

Enhanced reliability

- Molded housings, conductor castings mean fewer bolted connections and parts
- Robust 3 mm construction
- One design complies with all relevant IEC and NEMA/UL standards

Easy to use

- Eye-level control / metering components
- Easily accessible cable terminations
- Disconnecter and earthing switch position viewing windows
- Front or rear access available

Integrate your Motorpact controllers with our MCSet switchgear and a complete range of value-added products from Schneider Electric, to create your own complete electrical distribution solution.

General

General

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Motorpact units are suitable for all MV motor applications in markets such as oil & gas, mining, water, pulp and paper, for starting: pumps, fans, compressors, chillers, conveyors,...

Motorpact, an innovative range

Motor starters up to 4200 kW

Designed and manufactured to tackle the toughest power and process control challenges, Motorpact MV motor starters provide unmatched performance, high reliability, low maintenance and exclusive technologies that ensure sequential operation for access to MV compartments.

Motorpact units can be configured as motor starters, capacitor feeders, or transformer feeders.

PM105400



PM105401



Motorpact motor starters provide a wide range of applications including reduced voltage starting:

- **FVNR:** Full Voltage Non Reversing asynchronous motor starter
- **FVR:** Full Voltage Reversing asynchronous motor starter
- **2S2W:** 2 Speed 2 Winding full voltage non reversing asynchronous motor starter
- **S1W:** 2 Speed 1 Winding full voltage non reversing asynchronous motor starter. This configuration can also be applied as a Star delta starter
- **RVSS:** SoftStart asynchronous motor starter
- **S3:** Sequential SmartStart reduced voltage non reversing asynchronous motor starter. A redundant S3 (RS3) is available with an optional maintenance cubicle
- **S3-Drive:** Sequential SmartStart configuration for use with variable speed drives for sharing one VSD with multiple motors starter. A redundant RS3-Drive is available with an optional maintenance cubicle for applications with a redundant VSD
- **Stand-alone RVSS:** Reduced Voltage non reversing asynchronous motor starter
- **RVAT:** Auto-Transformer asynchronous motor starter

PE57903EN



(*) Document not for use in North America

Services provided: Help with preventive maintenance

Motorpact Maintenance & Services Guide is available (*) and gives the most important general instructions for:

- Reducing equipment wear and tear (and/or failure)
- Ensuring that the equipment is safe during all installation, repair and servicing operations

In the pages of this guide, all the information needed for:

- Operations on: switchgear, removable devices, control mechanisms, insulating materials and vents, power circuits and control, and indication auxiliaries
- Recommended frequency according to operating conditions: normal, in a corrosive atmosphere, for Marine environment use.

PE56733



PM105402

Protected environment

Schneider Electric is committed to a long-term environmental approach.

All the necessary measures have been taken in conjunction with our services, suppliers and subcontractors to ensure that the materials used in the composition of Motorpact equipment do not contain any substances prohibited by the regulations and directives.

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

Motorpact has been designed with environmental protection in mind:

- The materials used, insulators and conductors are identified, easily separable and recyclable,
- The environmental management system adopted by Schneider Electric's production sites for the manufacture of Motorpact has been assessed and recognised as conforming to the requirements of the ISO 14001 standard

Motorpact: The value of innovative design

Schneider Electric solutions are designed to save engineering time and to provide adequate protection and operation of the different systems.

Motorpact MV motor starters integrate innovative solutions designed around proven technologies:

- High performance digital protection and control
- Maintenance free disconnecter
- Internal arc withstand capability
- Thermal diagnosis system,...

Optional equipment and applications are available for specific requirements (*)



Schneider Electric certified quality

In each of its units, Schneider Electric integrates a functional organization whose main mission is to check quality and monitor compliance with IEC and/or NEMA standards. This procedure is uniform throughout all departments and recognized by many customers and approved organizations

The global Motorpact quality system design and manufacture, is certified in conformity with requirements in the ISO 9001: 2008 quality assurance standards.

Safety

- Fully tested for internal arc resistance in all MV compartments
- Fully safe compartmented design prevents inadvertent access to MV compartments
- Viewing window provides visible disconnecter earthed position from the front of the equipment indicating safe isolation of the starter from the busbars
- Cable earthing switch with making capacity
- Closed door operation
- Simple interlocks prevent inadvertent operating sequence

Reliability

- Simple architecture with a line disconnecter, which reduces the number of parts and provides simple and robust interlocks
- Multifunctional cast components minimizes parts, consequently reduces maintenance and heat loss
- Pre-engineered solutions with low power current transducer (LPCT) and Sepam digital relay provide proven designs for the full range of motor applications
- Separate LV cabinet enhances electromagnetic compatibility (EMC) and wire management

Maintainability

- All necessary maintainable motor starter components accessible without the need of de-energizing the complete switchboard
- Maintenance free vacuum contactor
- High endurance maintenance free line disconnecter
- Thermal diagnosis system for predictive maintenance
- Few spare parts

Compactness and flexibility

- Compact footprint of 375 mm width
- One design allows front, rear, top and bottom cable entries
- Simple and compact transition cubicles allow extension to other Schneider Electric equipment
- Ideal for retrofit applications



Motorpact: A comprehensive solution

Motorpact MV motor starters provide the most efficient means to control and protect a wide range of applications.

Protection and control relays

Sepam

Sepam series 20, series 40, series 60 and series 80 digital protection relays take full advantage of Schneider Electric's experience in electrical network protection.

They provide all the necessary functions:

- Effective fault diagnosis and protection planning
- Accurate measurements and detailed diagnosis
- Integral equipment control
- Local or remote indication and operation.
- Easy upgrading: addition of communication, digital I/O's, analog output, or temperature acquisition systems can be added due to its modular design

MiCOM

MiCOM protection provides the user with a choice of cost-optimised solutions for specific protection requirements within the distribution network.

The MiCOM relay series offers comprehensive protective function solutions for all power supply systems as well as for various functional and hardware project stages.

Control relays: GemControl

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

PowerMeter and Circuit Monitor metering units

The PowerLogic PowerMeter replaces a whole set of basic analogue meters.

This cost-effective, high-performance meter provides a full range of accurate true-rms metering values.

The PowerLogic series 3000/4000 Circuit Monitor is designed for critical power users and large energy consumers, to provide the information needed to confidently enter the evolving world of deregulation.

It can be adapted to meter almost any time-of-use or real-time rate.

PE60300



Sepam range

PM102888



MiCOM range

PE90347



GemControl front panel

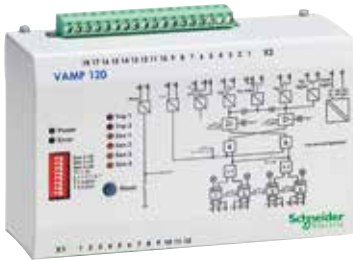
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PowerLogic range

Motorpact: A comprehensive solution

PEB0501



Vamp 120

Vamp arc flash protection

The arc protection unit detects an arc flash in an installation and trips the feeding breaker.

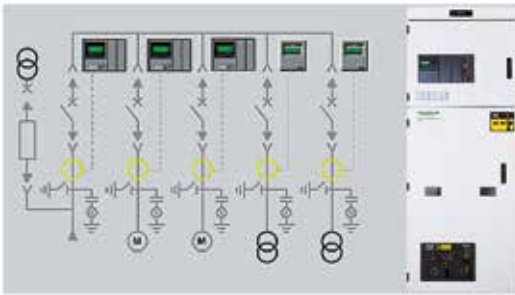
Arc flash protection maximizes personnel safety and minimizes material damage to the installation in the most hazardous power system fault situations.

Monitoring and control

It can be easily:

- Integrated into an existing monitoring and control system: Sepam digital relay or PowerMeter/Circuit Monitor metering device through a standard protocol (Modbus)
- Integrated into a SMS PowerLogic electrical installation monitoring system

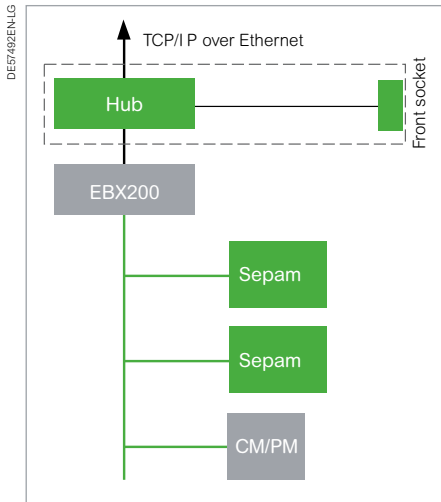
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Easy upgrading

Communication, digital I/O's, analogue output and temperature acquisition systems can be added due to its modular design.

Web Remote Monitoring



Motorpact switchboard

Simple choice

A simple choice between WRM-1 and WRM-2 service levels allows you to easily order your Web Remote Monitoring Motorpact switchboard. A customised level is also available.

Web Remote Monitoring Motorpact control centre comes equipped with a web server including web pages dedicated to power equipment data.

Easy commissioning

Web Remote Monitoring equipment is delivered ready to connect and commission. A Quick Start guide, packaged with your switchboard, provides three easy-to-follow steps.

Functionalities provided

Function	Description	WRM-1	WRM-2
Instantaneous readings	Displays automatically updated meter values	•	•
Circuit summary	Displays the RMS current 3-phase average (A), the real power (kW), the power factor, the circuit breaker status (if applicable), etc.	•	•
Load current summary	Displays the current RMS value for each phase (A), for all circuits	•	•
Demand current summary	Displays the average demand current value for each phase (A), for all circuits	•	•
Power summary	Displays the present demand (kW), the peak demand (kW) and the times and dates of the records	•	•
Energy summary	Displays the energy (kWh) the reactive energy (kvarh), and the times and dates of the records	•	•
Instantaneous readings, all devices / Basic historical data logging, energy and trending	Displays automatically updated meter values for all the communicating devices in the equipment		•
Log displays	Displays data as time curves, or tables		•
Export of data tables	Allows data tables to be exported in a standard Windows format		•



Presentation

Presentation

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Motorpact is composed of modular indoor single tier cubicles.

Each motor starter or transformer feeder consists of single or multiple section equipment close coupled to the main incoming switchgear.

Description of the basic cubicle

Stand-alone motor starter equipment can be provided with an incoming cable cubicle.

Each motor starter or transformer feeder consists of four parts separated by metal sheets or isolating parts and an operating panel (special sections are required for reduced voltage starters).

Sepam

Busbars compartment

A horizontal main bus allows easy extension of the switchboard.

Line disconnecter

A two position (closed or earthed) air break disconnecter, safely isolates the load compartment from the busbars.

Load compartment

It includes:

- A removable vacuum contactor
- 1 or 2 fuses per phase
- A set of current sensors
- A cable earthing switch (optional)
- Cable connection facilities (top or bottom)

Optionally, the load compartment can contain:

- A control power transformer (CPT)
- A voltage transformer (VT)
- A voltage presence indication system (VPIS)
- A power factor correction capacitor
- A thermal sensor Easergy TH110

Low voltage cabinet

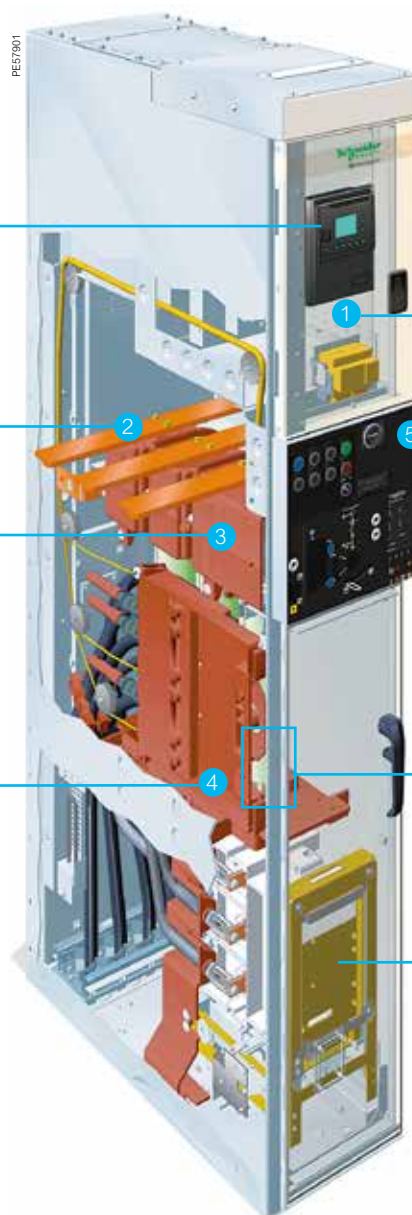
- Adequate space is provided for all necessary protection and control devices such as Sepam protection relay, PowerMeter or Circuit Monitor metering unit, auxiliary relays, etc.
- For access to the main busbars from the front of the switchboard, a removable panel at the bottom of the LV cabinet is provided.

Operating panel

- Contains all necessary devices to operate the line disconnecter and the cable earthing switch
- Pushbuttons control the electrically held contactor and long life LED lights provide contactor status indication

MV fuses

Vacuum contactor





Motor starter ratings

Installation	Indoor type	
Maximum rated voltage	7.2 kV	
Rated Insulation level	Impulse withstand voltage (1.2/50 μ s, peak value)	60 kV
	Power frequency withstand voltage (1 min)	20 kV
Maximum rated short time withstand current (busbars)	50 kA 3 s*	
Rated frequency	50 / 60 Hz	
Maximum busbars rating	<ul style="list-style-type: none"> • 2500 A • 3150 A* 	
Degree of protection	Enclosure	IP3X, IP4X, IPX1, IPX2
	Between compartments	IP2XC 200/400 A, IP2X 450 A

* for stand-alone applications or when lined up with LF circuit breaker MCset switchgear

Fused contactor ratings

Technology	Vacuum type	
Rated operational current	200/400/450 A	
Rated short circuit breaking capacity (HRC fuses)	50 kA	
Rated switching frequency	1200/hour	
Category of use	AC3 & AC4	
Type of HRC coordination	Class C	
Mechanism	<ul style="list-style-type: none"> • Mechanically latched • Electrically held 	
Electrical endurance (AC3)	250 000 operations	
Mechanical life	Mechanically latched type	250 000 operations
	Electrically held type	2 500 000 operations

Internal arc withstand according to IEC 62271-200, app. A

Internal arc withstand (4 sides)	• 25 kA - 1 s
	• 40 kA - 0.5 s
	• 50 kA - 0.25 s

Rated operational power (values given for combination with HRC fuses)

Network characteristics	<ul style="list-style-type: none"> • Power factor (cos φ) of 0.92 • Efficiency 0.94 	
Motor characteristics	Starting current	6 x In
	Starting time	5 s
	Number of starts per hour	6

Technical characteristics

		Rated voltage		
		3.3	5.5	6.6
Rated operational current 200 A	Motor power with 315 A single fuse (kW)	950	1500	1800
	Transformer power with 315 A single fuse (kVA)	1000	1600	2000
Rated operational current 400 A	Motor power with 315 A single fuse (kW)	950	1600	1900
	Motor power with 315 A double fuses (kW)	1900	3000	3800
	Transformer power with 315 A double fuses (kVA)	1900	3000	3800
Rated operational current 450 A	Motor power with 315 A single fuse (kW)	950	1600	1900
	Motor power with 315 A double fuses (kW)	2100	3500	4200
	Transformer power with 315 A double fuses (kVA)	2100	3500	4200
Rated capacitor switching				
Maximum capacitor (kVar)		2000	2000	2000

Normal operating conditions, according to IEC 62271-1 for indoor switchgear

Motorpact normal operating conditions

Ambient air temperature	<ul style="list-style-type: none"> • $\leq 40^{\circ}\text{C}$ • $\leq 35^{\circ}\text{C}$ on average over 24 hours • $\geq -5^{\circ}\text{C}$
Altitude	<ul style="list-style-type: none"> • ≤ 1000 m • Above 1000 m, a derating coefficient is applied (please consult us)
Humidity	<ul style="list-style-type: none"> • Average relative humidity over a 24 hour period, $\leq 95\%$ • Average relative humidity over a 1 month period, $\leq 90\%$ • Average vapor pressure over a 24 hour period, ≤ 2.2 kPa • Average vapor pressure over a 1 month period, ≤ 1.8 kPa

Specific operating conditions (please consult us)

Motorpact has been developed to meet the following specific conditions:

- Earthquake withstand application (spectrum required)
- Temperature (above 50°C and 450 Ampere applications)
- Specific atmosphere
- Marine applications

Storage conditions

We recommend that the units are stored in their original packaging, in dry conditions sheltered from the sun and rain at a temperature between -25°C and $+55^{\circ}\text{C}$.

Standards

Motorpact meets IEC standards

IEC 62271-1	High-voltage switchgear and controlgear – Part 1: Common specifications
IEC 62271-200	AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
IEC 62271-106	Alternating current contactors, contactor-based controllers and motorstarters
IEC 60282-1	High voltage fuses: limiting fuses
IEC 62271-102	Alternating current disconnectors and earthing switches
IEC 60044-1	Instrument transformers - Part 1: current transformers
IEC 60044-2	Instrument transformers - Part 2: inductive voltage transformers
IEC 60044-8	Instrument transformers - Part 8: electronic current transformers
IEC 61958	High-voltage prefabricated switchgear and controlgear assemblies - Voltage Presence Indicating Systems
IEC 60076-11	Dry-type transformers

Other specifications

IACS	International Association of Classification Societies
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PE96584



PM105406



Marine application

Derived from standard Motorpact, a Marine version has been developed to meet specific conditions when used on ships, offshore platforms,....:

- Vibrations/shocks
- Inclination
- Damp heat
- etc.

Motorpact is particularly adapted and its characteristics meet Marine requirements:

- Compartmented cubicle (LSC2A type)
- Front access
- Withdrawable contactor
- Sepam protection and control chain
- Internal arc withstand
- Thermal diagnosis

Marine technical characteristics

Rated voltage (kV)		7.2
Rated insulation level (kV)	Lightening impulse withstand voltage 1.2/50 ms (kV peak)	60
	Power frequency withstand - 1 min (kV rms)	20
Rated frequency (Hz)		50/60
Rated operational current (A)		200/400
Rated short time withstand current (kA)		50 kA 3 s
		630/1250
Rated busbar currents (A)		2500
		3150
Temperature rise (°C) (no derating at 50°C ambient)		55
Earthing switch fault making current (kA peak) available (cable protected by current limiting fuses)		14
		<ul style="list-style-type: none"> • 25 kA - 1 s • 40 kA - 0.5 s • 50 kA - 0.25 s
Standard altitude rating		1000 metres

Note: 450 Amp not available in marine configurations.

Marine certifications

Motorpact Marine is approved by:

- Lloyds Register (LR)
- Det Norske Veritas (DNV)
- Bureau Veritas (BV)
- American Bureau of Shipping (ABS)

PM105404



LR Type Approval Certificate

PM105403



American Bureau of Shipping

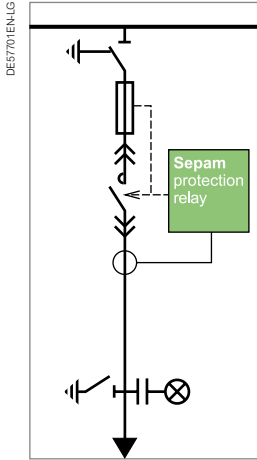
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PE96989



Motorpact: A comprehensive solution



FVNR

Full Voltage Non Reversing asynchronous* motor starter

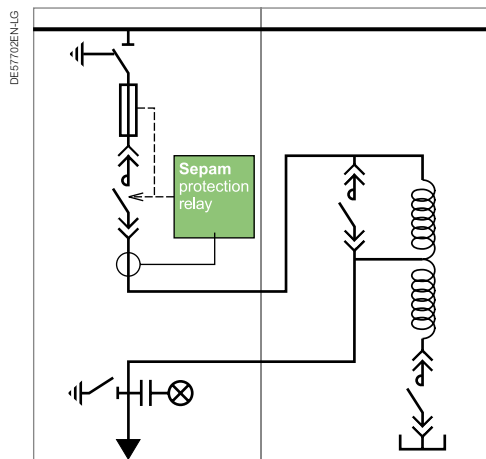
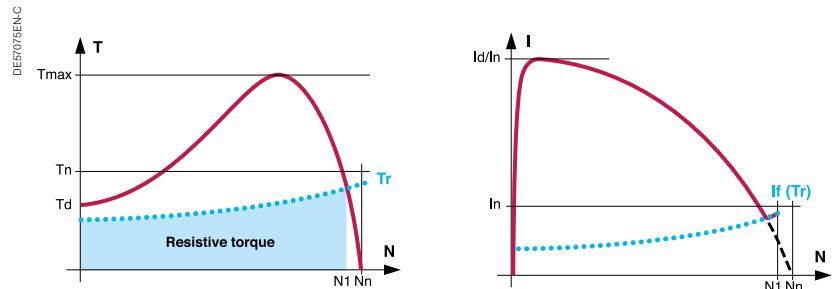
Full Voltage Non Reversing motor starter

A simple and reliable solution, that provides the maximum starting torque allowed by the motor, suitable for most applications.

Since it draws high inrush current (typically 600% of full load motor current), it can be used when there are no motor, machine or network restrictions.

For the following applications reduced voltage starting should be used:

- when maximum starting torque can result in a sudden start of the machine and can cause undesirable mechanical constraints
- when high inrush current during starting can cause the system line voltage to drop to unacceptable levels and result in potential equipment damage or can cause network instability



RVAT

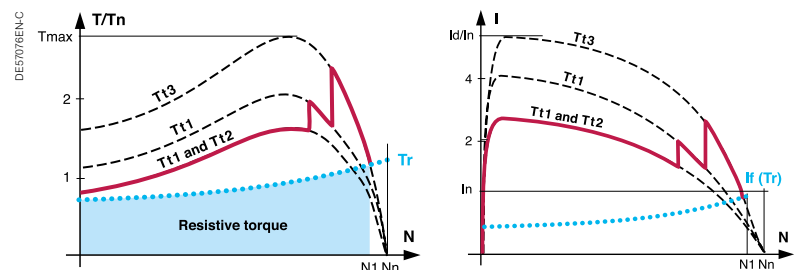
Auto-transformer asynchronous* motor starter

Reduced Voltage Auto-Transformer motor starter

It is used when the network cannot withstand high inrush current.

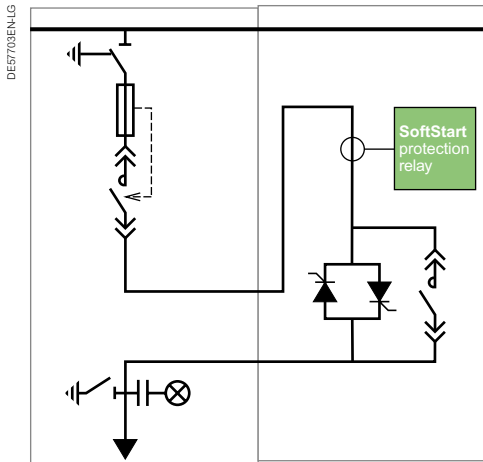
An auto-transformer motor starter provides reduced voltage to the motor terminals during starting, with a three phase auto-transformer.

It reduces the line current and provides the right starting torque.



* For synchronous motors, please consult us
For selection of motor starter type, see the Application guide ref. AMTED303042EN

Motorpact: A comprehensive solution



RVSS

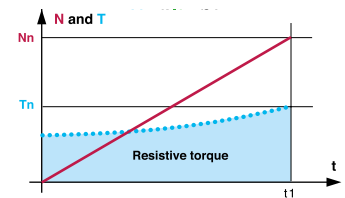
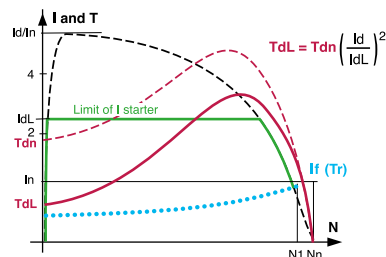
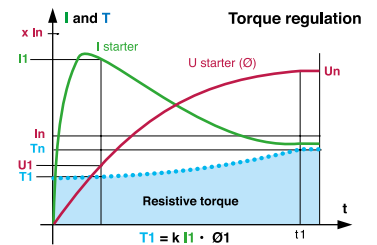
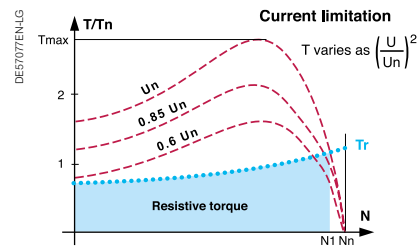
SoftStart asynchronous* motor starter

Reduced Voltage SoftStart motor starter

SoftStart motor starter provides smooth, stepless acceleration and deceleration regardless of the load.

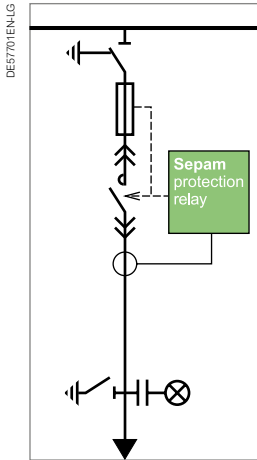
This starting method lowers the starting current of the motor, reduces electrical stresses on the network and the motor.

It reduces peak starting torque stresses on both the motor and mechanical load components, thereby providing longer service life and less downtime.



* For synchronous motors, please consult us
For selection of motor starter type, see the Application guide ref. AMTED303042EN

Motorpact: A comprehensive solution



Transformer feeder

Transformer feeder is a cost-effective solution to include auxiliary transformer feeder in a Motorpact assembly. It can be used as a fused contactor feeder with Sepam transformer relay, or as a fused switch.

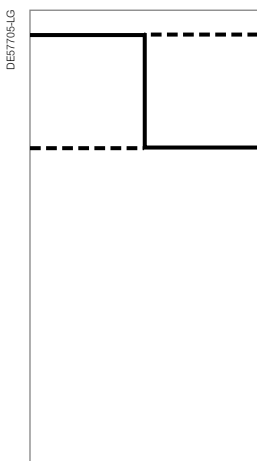
This solution for a transformer feeder within a motor starter assembly, provides the operator consistency in the operation of the equipment, as well as providing standardisation of features and controls in the Motorpact range.



Incoming cubicle for stand-alone application

An auxiliary cubicle for incoming cable connections for stand-alone motor control applications.

- Available up to 3150 A
- Bottom cable entry is available in the 500 mm cubicle
- Busduct, top and bottom cable entry is available in the 750 mm cubicle
- Optional voltage presence indicator system (VPIS)



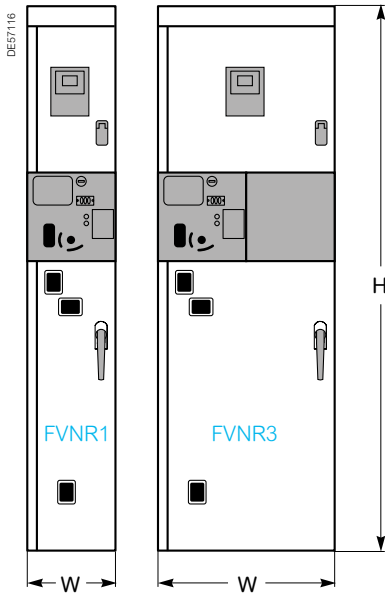
MCset transition cubicle for lined up application

An auxiliary cubicle to allow transition to the MCset switchgear, at either end. Available up to 4000 A.

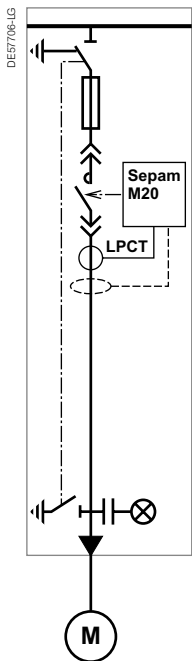
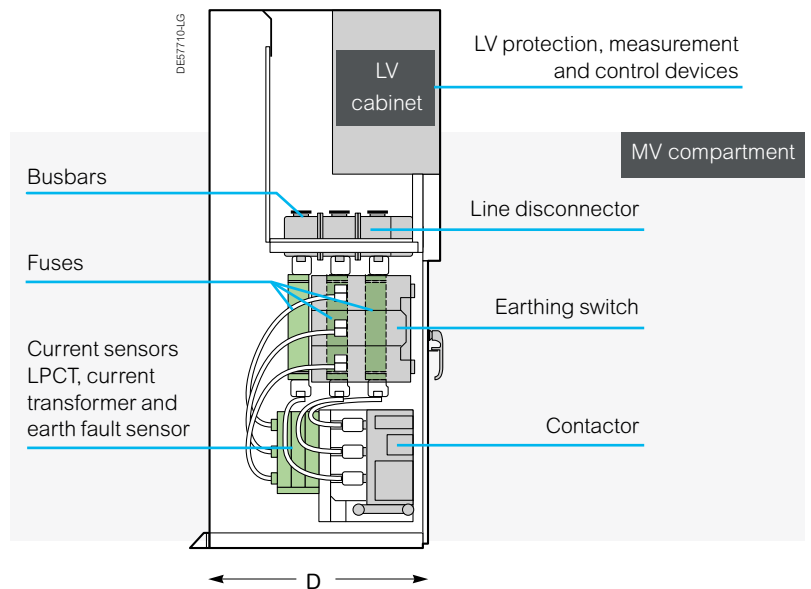
FVNR

Full voltage non reversing asynchronous motor starter

Front view



Side view FVNR1 and FVNR3



Characteristics	FVNR
Maximum rated voltage	7.2 kV
Maximum power at 6.6 kV (p.f.: 0.88, h: 0.95)	4200 kW
Impulse withstand voltage (1.2/50 μ s, peak value)	60 kV
Power frequency withstand voltage (1 min)	20 kV
Rated short time withstand current (busbars)	<ul style="list-style-type: none"> • 25 kA 3 s • 31.5 kA 3 s • 40 kA 3 s • 50 kA 3 s*
Rated frequency	50/60 Hz
Rated operational current	200/400/450 A
Busbars ratings	<ul style="list-style-type: none"> • 630 A • 1250 A • 2500 A • 3150 A*
Category of use	AC3/AC4
Cable connections	<ul style="list-style-type: none"> • Single or three core • Maximum: 1 x 240 mm² or 2 x 120 mm² • Bottom or top

* For stand-alone applications or when lined up with LF circuit breaker MCset switchgear

Dimensions & Weight		FVNR1	FVNR3
Dimensions	H	2300 mm	2300 mm
	W	375 mm	750 mm
	D	950 mm	950 mm
Approximate weight		475 kg	650 kg

FVNR

Full voltage non reversing asynchronous motor starter

Composition of FVNR motor starter

Basic equipment

Cubicle

- 1 IP3X enclosure
- 1 line disconnecter
- 1 electrically held vacuum contactor
- 3 or 6 HRC fuses
- 1 set of busbars
- 1 three core LPCT
- Auxiliary contacts
- Provision for padlocks
- 1 contactor position indicator window

Low voltage control

- 1 Sepam M20 motor protection relay
- "Start" & "Stop" pushbuttons
- "Run" & "Stopped" pilot lights

Options and accessories

Starter options

- Thermal diagnosis system
- internal arc withstand
- Cable earthing switch including:
 - mechanical position indicator
 - auxiliary contacts
 - padlock provision
- Blown fuse indicator
- IP4X, IPX1 and IPX2 enclosures
- One fused 3-phase voltage transformer
- Power factor correction capacitor (FVNR3)
- Mechanically latched vacuum contactor (includes release coil)
- 1 disconnecter/ load compartment back light
- Key interlocks
- Encapsulated busbars
- 1 fused control power transformer (CPT)
- Additional CT's or ZSCT (zero sequence current transformer)
- 1 set of 3 surge arrestors
- Voltage presence indicator system (VPIS)
- Heating resistor
- Mechanical operation counter
- Running time meter

Control options

- Sepam series 40 or series 80 protection relay
- Web Remote Monitoring option
- 1 Sepam 100 MI control and indication
- Local remote switch (not needed in case of Sepam 100MI)

Sepam accessories

- Additional logic I/O module
- Modbus communication interface
- Motor temperature sensor acquisition module
- Analog output module

FVNR

Full voltage non reversing asynchronous motor starter

Operation and interlocking

FVNR cubicle

The disconnecter mechanism incorporates the necessary interlocks (mechanical and/or electrical) to prevent access to the load compartment with the contactor energized. All interlocking requires three simultaneous operations to defeat any function without the destruction of parts.

Interlocking

- Prevents disconnecter closure (normal operations) if:
 - The contactor is closed
 - The load compartment door is open
 - The contactor is not in the fully connected position
 - The cable earthing switch is closed, if so equipped
- Prevents closure of the contactor if the Blown Fuse Indication system has not been reset
- Prevents unlatching the load compartment door when the disconnecter is closed
- Prevents access to the contactor/cable compartment unless:
 - The contactor is open and the disconnecter is earthed
 - The earthing switch is closed, if so equipped (Provision to operate the earthing switch with door open for cable testing is provided)
 - The operating handle has been removed
- Allows for a test position which meets the following criteria:
 - The front door has been opened for access
 - The disconnecter is open and earthed and can not be closed
 - The contactor is in the fully connected position and can be operated
 - The control power transformer has been isolated from the test control power

All interlocks do not require adjustments over the life of the equipment.

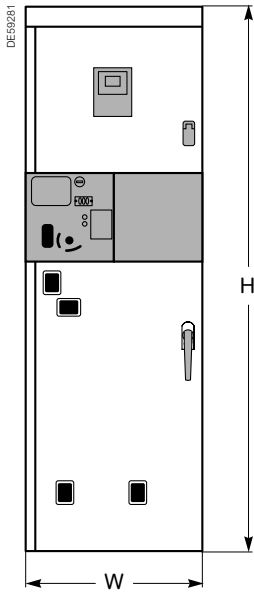
Padlocks and key interlocks

	Padlocks	Key interlocks
Disconnecter	C + O	O or O & C
Cable earthing switch	C + O	O or C

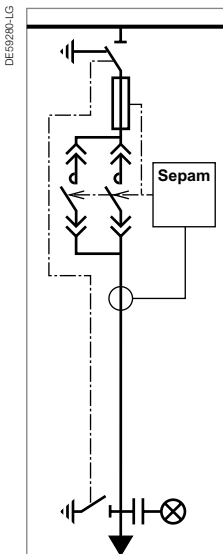
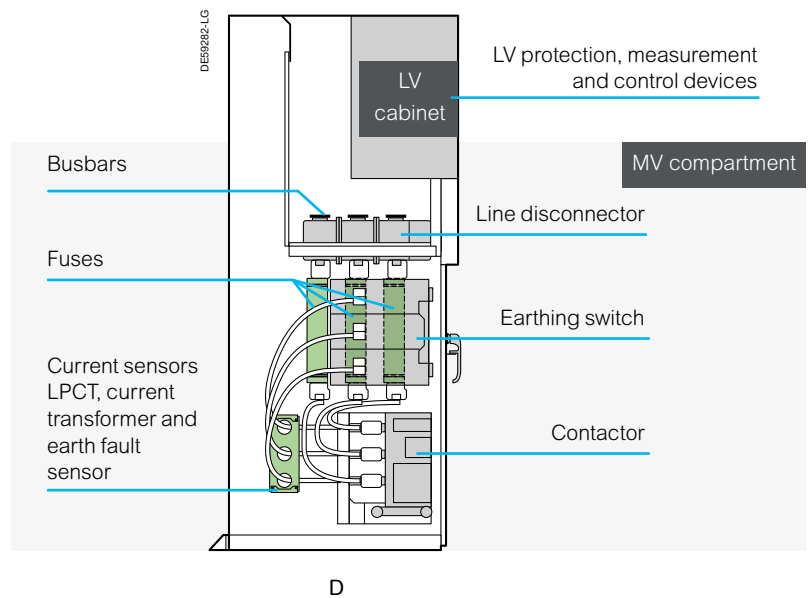
FVR

Full voltage reversing asynchronous motor starter

Front view



Side view



Characteristics	FVR
Maximum rated voltage	7.2 kV
Maximum power at 6.6 kV (p.f.: 0.88, η : 0.95)	4200 kW
Impulse withstand voltage (1.2/50 μ s, peak value)	60 kV
Power frequency withstand voltage (1 min)	20 kV
Rated short time withstand current (busbars)	<ul style="list-style-type: none"> • 25 kA 3 s • 31.5 kA 3 s • 40 kA 3 s • 50 kA 3 s*
Rated frequency	50/60 Hz
Rated operational current	200/400/450 A
Busbars ratings	<ul style="list-style-type: none"> • 630 A • 1250 A • 2500 A • 3150 A*
Category of use	AC3/AC4
Cable connections	<ul style="list-style-type: none"> • Single or three core • Maximum: <ul style="list-style-type: none"> 1 x 240 mm² or 2 x 120 mm² • Bottom or top

* For stand-alone applications or when lined up with LF circuit breaker MCset switchgear

Dimensions & Weight	FVR	
Dimensions	H	2300 mm
	W	750 mm
	D	950 mm
Approximate weight	710 kg	

FVR

Full voltage reversing asynchronous motor starter

Composition of FVR motor starter

Basic equipment

Cubicle

- 1 IP3X enclosure
- 1 line disconnecter
- 2 electrically held vacuum contactor (1 forward, 1 reverse)
- 3 or 6 HRC fuses
- 1 set of busbars
- 1 three core LPCT
- Auxiliary contacts
- Provision for padlocks
- 2 contactor position indicator windows

Low voltage control

- 1 Sepam M20 motor protection relay
- “Start” & “Stop” pushbuttons
- “Run” & “Stopped” pilot lights

Options and accessories

Module options

- Thermal diagnosis system
- internal arc withstand
- Cable earthing switch including:
 - mechanical position indicator
 - auxiliary contacts
 - padlock provision
- 1 three core LPCT
- Blown fuse indicator
- IP4X, IPX1 and IPX2 enclosures
- Power factor correction capacitor (FVNR3)
- Mechanically latched vacuum contactor (includes release coil)
- 1 disconnecter/ load compartment back light
- Key interlocks
- Encapsulated busbars
- Additional CT's or ZSCT (zero sequence current transformer)
- 1 set of 3 surge arrestors
- Voltage presence indicator system (VPIS)
- Heating resistor
- Mechanical operation counter
- Running time meter

Control options

- Sepam series 40 or series 80 protection relay
- Web Remote Monitoring option
- 1 Sepam 100 MI control and indication
- Local remote switch (not needed in case of Sepam 100MI)

Sepam accessories

- Additional logic I/O module
- Modbus communication interface
- Motor temperature sensor acquisition module
- Analog output module

FVR

Full voltage reversing asynchronous motor starter

Operation and interlocking

FVR cubicle

The disconnecter mechanism incorporates the necessary interlocks (mechanical and/or electrical) to prevent access to the load compartment with the contactor energized. All interlocking requires three simultaneous operations to defeat any function without the destruction of parts.

Interlocking

- Prevents disconnecter closure (normal operations) if:
 - The contactor is closed
 - The load compartment door is open
 - The contactor is not in the fully connected position
 - The cable earthing switch is closed, if so equipped
- Prevents closure of the contactor if the Blown Fuse Indication system has not been reset
- Prevents unlatching the load compartment door when the disconnecter is closed
- Prevents access to the contactor/cable compartment unless:
 - Any contactor is open and the disconnecter is earthed
 - The earthing switch is closed, if so equipped (Provision to operate the earthing switch with door open for cable testing is provided)
 - The operating handle has been removed
- Allows for a test position which meets the following criteria:
 - The front door has been opened for access
 - The disconnecter is open and earthed and can not be closed
 - The contactor is in the fully connected position and can be operated
 - The control power transformer has been isolated from the test control power

All interlocks do not require adjustments over the life of the equipment.

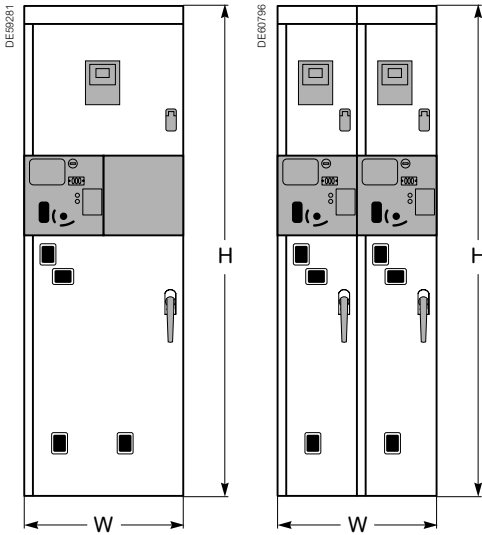
Padlocks and key interlocks

	Padlocks	Key interlocks
Disconnecter	C + O	O or O & C
Cable earthing switch	C + O	O or C
By-pass contactor		O

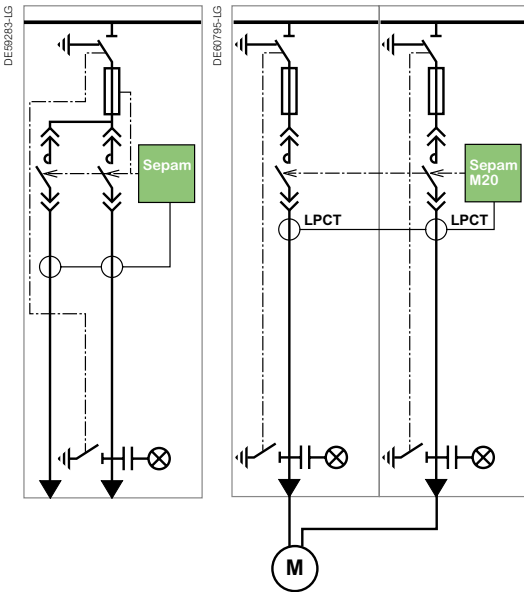
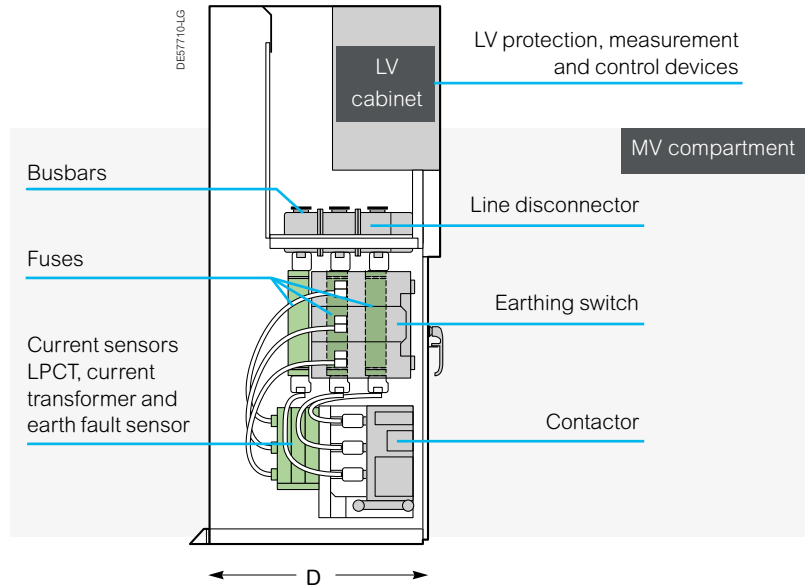
2S2W: 2 Speed 2 Winding

Full voltage non reversing asynchronous motor starter

Front view



Side view



Characteristics	2S2W
Maximum rated voltage	7.2 kV
Maximum power at 6.6 kV (p.f.: 0.88, h: 0.95)	4200 kW
Impulse withstand voltage (1.2/50 μ s, peak value)	60 kV
Power frequency withstand voltage (1 min)	20 kV
Rated short time withstand current (busbars)	<ul style="list-style-type: none"> • 25 kA 3 s • 31.5 kA 3 s • 40 kA 3 s • 50 kA 3 s*
Rated frequency	50/60 Hz
Rated operational current	200/400/450 A
Busbars ratings	<ul style="list-style-type: none"> • 630 A • 1250 A • 2500 A • 3150 A*
Category of use	AC3/AC4
Cable connections	<ul style="list-style-type: none"> • Single or three core • Maximum: <ul style="list-style-type: none"> 1 x 240 mm² or 2 x 120 mm² • Bottom or top

* For stand-alone applications or when lined up with LF circuit breaker MCset switchgear

Dimensions & Weight		
Dimensions	H	2300 mm
	W	750 mm
	D	950 mm
Approximate weight		710 kg

2S2W: 2 Speed 2 Winding

Full voltage non reversing asynchronous motor starter

Composition of 2S2W motor starter

Basic equipment

Cubicle

- 1 IP3X enclosure
- 1 line disconnecter
- 1 electrically held vacuum contactor
- 3 or 6 HRC fuses
- 1 set of busbars
- 1 three core LPCT
- Auxiliary contacts
- Provision for padlocks
- 1 contactor position indicator window

Low voltage control

- 1 Sepam M20 motor protection relay
- "Start" & "Stop" pushbuttons
- "Run" & "Stopped" pilot lights

Options and accessories

Starter options

- Thermal diagnosis system
- internal arc withstand
- Cable earthing switch including:
 - mechanical position indicator
 - auxiliary contacts
 - padlock provision
- Blown fuse indicator
- IP4X, IPX1 and IPX2 enclosures
- One fused 3-phase voltage transformer
- Power factor correction capacitor (FVNR3)
- Mechanically latched vacuum contactor (includes release coil)
- 1 disconnecter/ load compartment back light
- Key interlocks
- Encapsulated busbars
- 1 fused control power transformer (CPT)
- Additional CT's or ZSCT (zero sequence current transformer)
- 1 set of 3 surge arrestors
- Voltage presence indicator system (VPIS)
- Heating resistor
- Mechanical operation counter
- Running time meter

Control options

- Sepam series 40 or series 80 protection relay
- Web Remote Monitoring option
- 1 Sepam 100 MI control and indication
- Local remote switch (not needed in case of Sepam 100MI)

Sepam accessories

- Additional logic I/O module
- Modbus communication interface
- Motor temperature sensor acquisition module
- Analog output module

2S2W: 2 Speed 2 Winding

Full voltage non reversing asynchronous motor starter

Operation and interlocking

The disconnecter mechanism incorporates the necessary interlocks (mechanical and/or electrical) to prevent access to the load compartment with the contactor energized. All interlocking requires three simultaneous operations to defeat any function without the destruction of parts.

Interlocking

- Prevents disconnecter closure (normal operations) if:
 - The contactor is closed
 - The load compartment door is open
 - The contactor is not in the fully connected position
 - The cable earthing switch is closed, if so equipped
- Prevents closure of the contactor if the Blown Fuse Indication system has not been reset
- Prevents unlatching the load compartment door when the disconnecter is closed
- Prevents access to the contactor/cable compartment unless:
 - The contactor is open and the disconnecter is earthed
 - The earthing switch is closed, if so equipped (Provision to operate the earthing switch with door open for cable testing is provided)
 - The operating handle has been removed
- Allows for a test position which meets the following criteria:
 - The front door has been opened for access
 - The disconnecter is open and earthed and can not be closed
 - The contactor is in the fully connected position and can be operated
 - The control power transformer has been isolated from the test control power

All interlocks do not require adjustments over the life of the equipment.

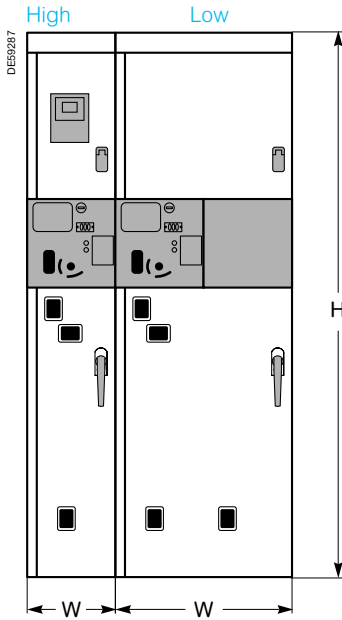
Padlocks and key interlocks

	Padlocks	Key interlocks
Disconnecter	C + O	O or O & C
Cable earthing switch	C + O	O or C

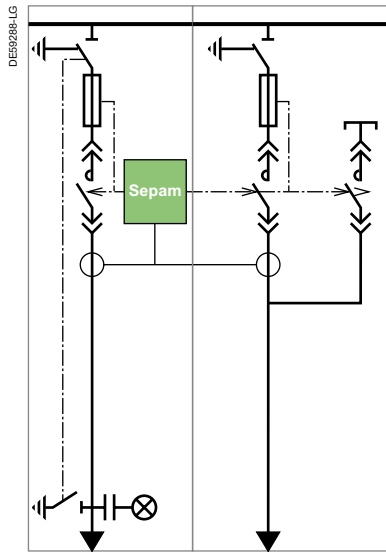
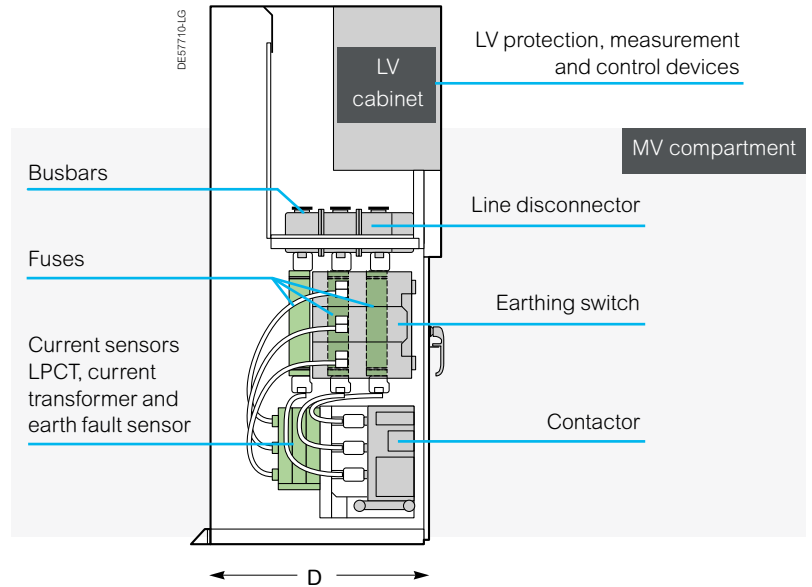
2S1W: 2 Speed 1 Winding

Full voltage non reversing asynchronous motor starter

Front view



Side view



Characteristics	2S1W
Maximum rated voltage	7.2 kV
Maximum power at 6.6 kV (p.f.: 0.88, η: 0.95)	4200 kW
Impulse withstand voltage (1.2/50 μs, peak value)	60 kV
Power frequency withstand voltage (1 min)	20 kV
Rated short time withstand current (busbars)	<ul style="list-style-type: none"> • 25 kA 3 s • 31.5 kA 3 s • 40 kA 3 s • 50 kA 3 s*
Rated frequency	50/60 Hz
Rated operational current	200/400/450 A
Busbars ratings	<ul style="list-style-type: none"> • 630 A • 1250 A • 2500 A • 3150 A*
Category of use	AC3/AC4
Cable connections	<ul style="list-style-type: none"> • Single or three core • Maximum: 1 x 240 mm² or 2 x 120 mm² • Bottom or top

* For stand-alone applications or when lined up with LF circuit breaker MCset switchgear

Dimensions & Weight	2S1W		
Dimensions	H	2300 mm	2300 mm
	W	375 mm	750 mm
	D	950 mm	950 mm
Approximate weight		475 kg	710 kg

2S1W: 2 Speed 1 Winding

Full voltage non reversing asynchronous motor starter

Composition of 2S1W motor starter

Basic equipment

Main cubicle (High speed)

- 1 IP3X enclosure
- 1 line disconnecter
- 1 electrically held vacuum contactor (high speed contactor)
- 3 or 6 HRC fuses
- 1 set of busbars
- Auxiliary contacts
- Provision for padlocks
- 1 contactor position indicator window
- 1 three core LPCT

Low speed cubicle

- 1 IP3X enclosure
- 1 line disconnecter
- 2 electrically held vacuum contactors (1 forward, 1 reverse)
- 3 or 6 HRC fuses
- 1 set of busbars
- Auxiliary contacts
- Provision for padlocks
- 2 contactor position indicator windows
- 1 Sepam M20 motor protection relay
- 1 three core LPCT

Low voltage control

- 1 Sepam series 20 protection relay
- Fast and Slow pushbuttons
- 2 red pilot lights
- 1 green pilot light
- 1 stop pushbutton

Options and accessories

Module options

- internal arc withstand
- Cable earthing switch including:
 - mechanical position indicator
 - auxiliary contacts
 - padlock provision
- 1 three core LPCT
- Blown fuse indicator
- IP4X, IPX1 and IPX2 enclosures
- Power factor correction capacitor (FVNR3)
- Mechanically latched vacuum contactor (includes release coil)
- 1 disconnecter/ load compartment back light
- Key interlocks
- Encapsulated busbars
- Additional CT's or ZSCT (zero sequence current transformer)
- 1 set of 3 surge arrestors
- Voltage presence indicator system (VPIS)
- Heating resistor
- Mechanical operation counter
- Running time meter

Control options

- Sepam series 40 or series 80 protection relay
- Web Remote Monitoring option
- 1 Sepam 100 MI control and indication
- Local remote switch (not needed in case of Sepam 100MI)

Sepam accessories

- Additional logic I/O module
- Modbus communication interface
- Motor temperature sensor acquisition module
- Analog output module

2S1W: 2 Speed 1 Winding

Full voltage non reversing asynchronous motor starter

Operation and interlocking

Main cubicle (high speed)

See FVNR cubicle

Low speed cubicle

Prevent access to the load compartment with the contactors energized. All interlocking requires three simultaneous operations to defeat any function without the destruction of parts.

- Prevents disconnector closure (normal operations) if:
 - The contactors are closed
 - The load compartment door is open
 - The contactors are not in the fully connected position
 - The cable earthing switch is closed, if so equipped
- Prevents closure of the contactor if the Blown Fuse Indication system has not been reset
- Prevents unlatching the load compartment door when the disconnector is closed
- Prevents access to the contactor/cable compartment unless:
 - Any contactor is open and the disconnector is earthed
 - The earthing switch is closed, if so equipped (provision to operate the earthing switch with door open for the operating handle has been removed)
- Allows for a test position which meets the following criteria:
 - The front door has been opened for access
 - The disconnector is open and earthed and can not be closed
 - The contactor is in the fully connected position and can be operated
 - The control power transformer has been isolated from the test control power

All interlocks do not require adjustments over the life of the equipment.

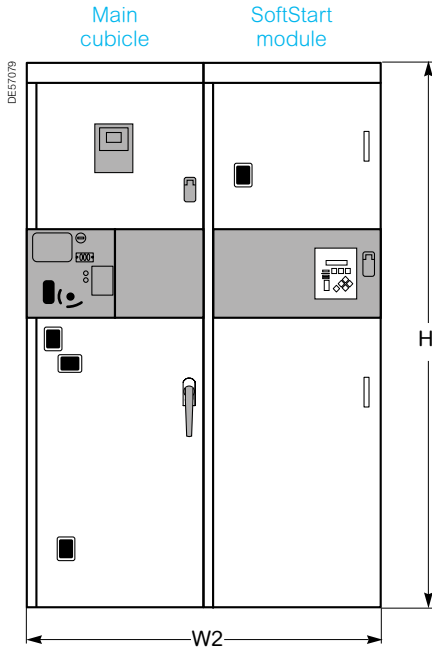
Padlocks and key interlocks

	Padlocks	Key interlocks
Disconnecter	C + O	O or O & C
Cable earthing switch	C + O	O or C
By-pass contactor		O

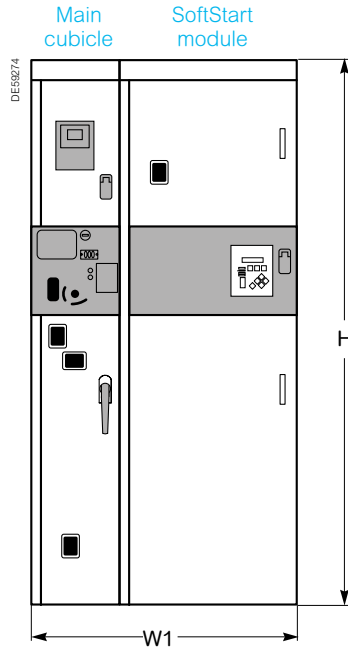
RVSS

SoftStart asynchronous motor starter

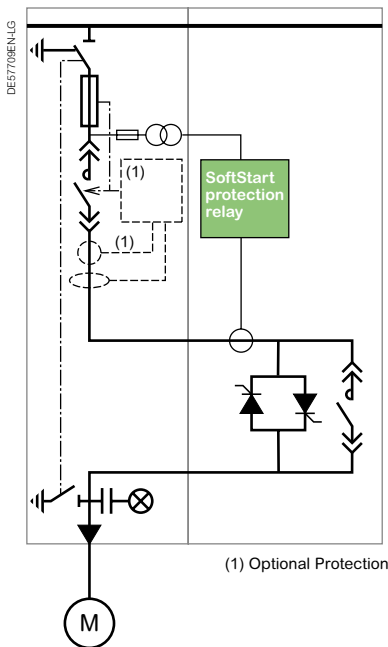
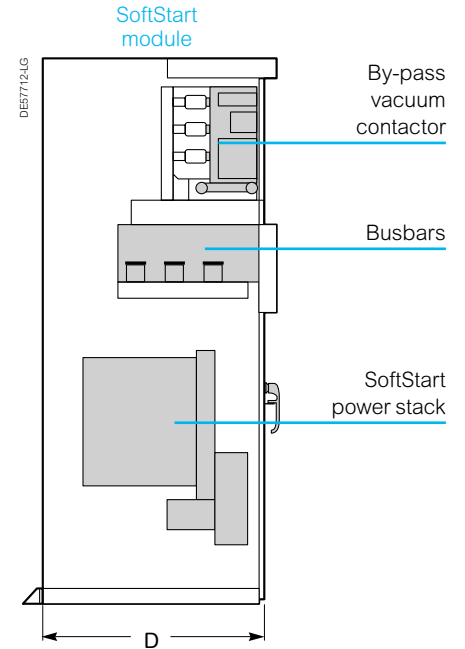
Front view with capacitor module



Front view



Side view



Characteristics	RVSS
-----------------	------

Rated current	200/400 A
---------------	-----------

Dimensions & Weight	2S1W
---------------------	------

Dimensions	H	2300 mm
	W1	1125 mm
	W2 with capacitor module	1500 mm
	D	950 mm
Approximate weight	1095 kg	

Composition of RVSS motor starter

The RVSS motor starter is composed of a main cubicle identical to FVNR unit and SoftStart module.

Basic equipment

Main cubicle

- 1 IP3X enclosure
- 1 line disconnecter
- 2 electrically held vacuum contactor
- 3 or 6 HRC fuses
- 1 set of busbars
- Auxiliary contacts
- Provision for padlocks
- 1 contactor position indicator window
- 1 voltage transformer
- 1 fused control power transformer 750 VA

SoftStart module

- 1 IP3X enclosure
- 1 electrically held vacuum contactor (by-pass contactor)
- 1 SCR (Thyristor) power module
- Voltage measurement
- 1 set of current sensors
- 1 microprocessor-based protection and control system
- Motor temperature sensor inputs (option)

Low voltage control

- "Start" & "Stop" pushbuttons
- "Run" & "Stopped" pilot lights

Options and accessories

Module options

- Thermal diagnosis system
- internal arc withstand
- Cable earthing switch including:
 - mechanical position indicator
 - auxiliary contacts
 - padlock provision
- Mechanical position indicator
- Auxiliary contacts
- Padlock provision
- 1 three core LPCT
- Blown fuse indicator
- IP4X, IPX1 and IPX2 enclosures Power factor correction capacitor (FVNR3)
- Mechanically latched vacuum contactor (includes release coil)
- 1 disconnecter/ load compartment back light
- Key interlocks
- Encapsulated busbars
- Additional CT's or ZSCT (zero sequence current transformer)
- 1 set of 3 surge arrestors
- Voltage presence indicator system (VPIS)
- Heating resistor
- Mechanical operation counter running time meter

Control options

- Sepam series 20, series 40 or series 80 protection relay
- Web Remote Monitoring option
- 1 Sepam 100 MI control and indication
- Local remote switch (not needed in case of Sepam 100MI)

Sepam accessories

- Additional logic I/O module
- Modbus communication interface
- Motor temperature sensor acquisition module
- Analog output module

RVSS

SoftStart asynchronous motor starter

Operation and interlocking

Main cubicle (high speed)

See FVNR cubicle

SoftStart module

The disconnecter mechanism in the main cubicle incorporates the necessary interlocks to prevent access to the load compartment with the contactor energized. The disconnecter mechanism is key interlocked with the SoftStart module to prevent access to the medium voltage components:

- SoftStart
- By-pass contactor
- Communication board

On SoftStart module the doors are interlocked to prevent locking the unit without all of them being closed.

Power to the SoftStart module comes from the adjacent main cubicle.

When the motor has started, the by-pass contactor is closed.

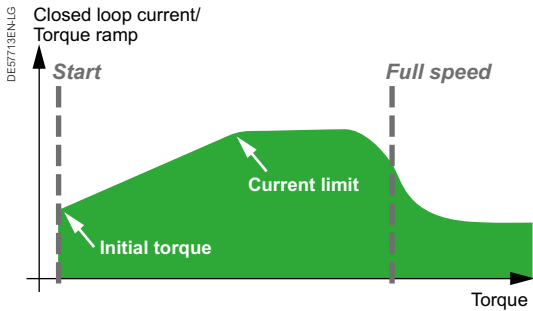
The by-pass contactor can be opened to provide a soft deceleration of the motor.

Padlocks and key interlocks

	Padlocks	Key interlocks
Disconnecter	C + O	O or O & C
Cable earthing switch	C + O	O or C
By-pass contactor		O

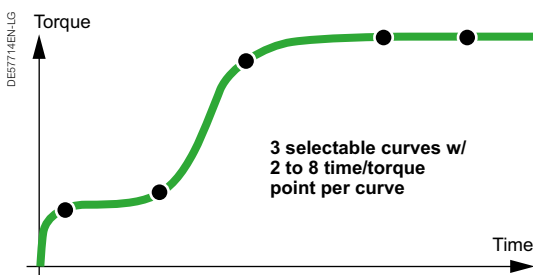
RVSS

SoftStart asynchronous motor starter



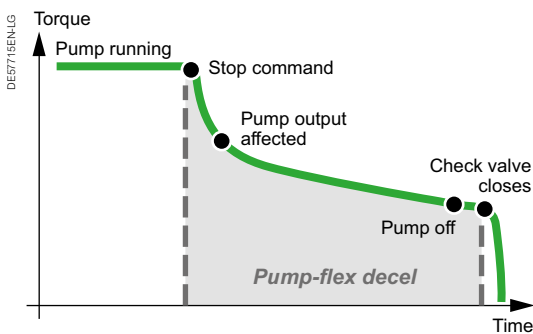
Pumps, fans, blowers and conveyors

- Closed Loop Torque
 - uses PID (proportional, integral, derivative) algorithms
 - ideal for deep well pumps
 - ideal for systems where loads change from start to start
- Linear Speed Ramping:
 - achieved by adding tachometer feedback signal from the motor.



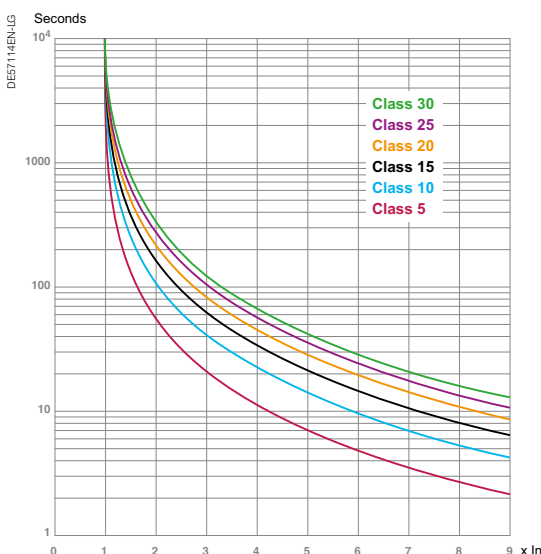
Custom acceleration curves

- Programmed to match pump and hydraulic conditions
- Up to eight time and torque points for smooth acceleration of pumps without surges or undue motor thermal stress
- Three selectable and programmable custom curves for changing load/pump conditions or different processes



Pump-decel

- Gradual reduction in output torque of the pump motor when a stop signal is initiated
- When the motor output reaches a point where the check valve can be safely and gently closed, the decel circuit automatically turns off
- Eliminate damage due to “water hammer”
- With DOL motor starters, torque is lost instantly when the starter is turned off
 - Fluid flowing through the system, and associated kinetic energy, immediately reverses. To prevent reverse flow, a check valve closes trapping kinetic energy in the piping system and creating a shock wave (water hammer).
 - Gradual reduction in motor torque using decel control dissipates the pump output pressure slowly during the stopping process. Check valves close gently and the other system components (pipes, valves, flanges, couplings and hangers) are not subjected to the shock.



Process machinery

- Jog function can be used to apply just enough voltage/torque to rotate the motor shaft without accelerating to full speed
- Dual ramps allow for different load conditions and ramping requirements
 - programmable overload class 5 - 30
 - as an example class 30 for starting and class 10 for running

RVSS

SoftStart asynchronous motor starter



Main features

Characteristics

Overload capacity	<ul style="list-style-type: none"> • 125% - continuous • 500% - 60 seconds • 600% - 30 seconds • 850% - 1 cycle (internal electronic shear pin)
Frequency	50 or 60 Hz \pm 5 Hz
Power circuit	6, 12 or 18 SCRs (Thyristors)
SCR (Thyristor) PIV rating	<ul style="list-style-type: none"> • 3.3 kV - 13000 • 6.6 kV - 19500
Phase insensitivity	User selectable - Phase sequence detection
Transient voltage protection	RC snubber dv/dt networks (1 per SCR (Thyristor) pair)
Control power	2 or 3 wire 110 Vac CPTs are supplied on all standard units
Auxiliary contacts	<ul style="list-style-type: none"> • Multiple changeover contacts rated 5 A - 250 Vac max. • 8 fully programmable relays (including fail-safe operation) • 5 dedicated relays (fault, at-speed, etc.)

Motor protection

Two stage electronic Overload curves	<ul style="list-style-type: none"> • Start: Class 5 to 30 • Run: Class 5 to 30 (when at speed detected)
Overload reset	Manual (Default) or automatic
Retentive thermal memory	Overload circuit retains thermal condition of the motor without control power Real time clock adjusts for "off time".
Dynamic reset capacity	No overload reset until thermal capacity is sufficient to restart motor Starter monitors, learns and retains thermal data from successful starts
Phase current imbalance protection	<ul style="list-style-type: none"> • Imbalance trip level: 5-30% current between any 2 phases • Imbalance trip delay: 1-20 seconds
Overcurrent protection (Electronic shear pin)	<ul style="list-style-type: none"> • Trip level: 100-300% I_n • Trip delay: 1-20 seconds
Load loss protection	<ul style="list-style-type: none"> • Undercurrent trip level: 10-90% I_n • Undercurrent trip delay: 1-60 seconds
Coast down (Back spin) Lockout timer	Coast down time: 1-60 minutes
Starts per hour lockout timer	<ul style="list-style-type: none"> • Range: 1-6 successful starts per hour • Time between starts: 1-60 minutes

RVSS

SoftStart asynchronous motor starter

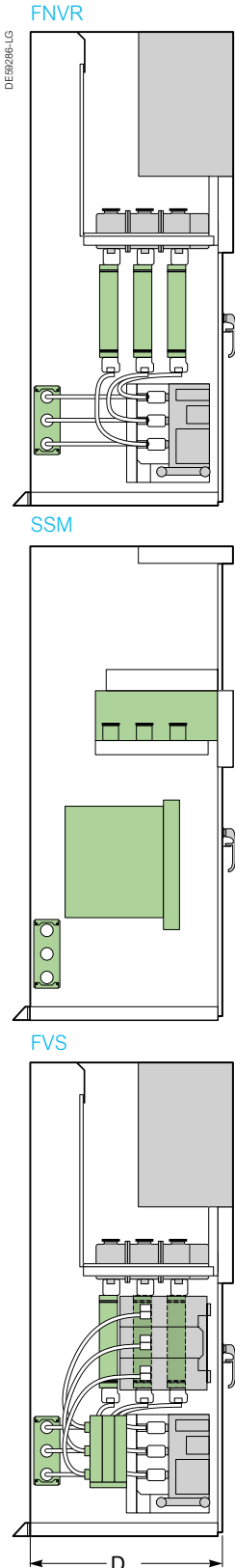
Main features

Programmable outputs	
Type/Rating	Changeover contacts: 5 A 240 Vac
Run indication	Programmable
At speed indication	Programmable
Acceleration adjustments	<ul style="list-style-type: none"> • Programmable ramp types: Voltage or current ramp (VR or CR) • Starting torque: 0-100% of line voltage (VR) or 0-600% of motor In (CR) • Ramp time: 1 – 120 seconds • Current limit: 200 – 600% (VR or CR)
Dual ramp settings	<ul style="list-style-type: none"> • 4 options: VR1+VR2; VR1+CR2; CR1+CR2; CR1+VR2 • Dual ramp control : Ramp 1 = Default Ramp 2 = Selectable via dry contact
Deceleration adjustments	<ul style="list-style-type: none"> • Begin decel level: 0-100%Un • Stop level: 0-100% less than begin decel level • Decel time: 1 – 60 seconds
Jog settings	Voltage jog: 5–75%
Kick start settings	<ul style="list-style-type: none"> • Kick voltage: 10–100% or off • Kick time: 0.1–2 seconds
Fault display	Shorted SCR (Thyristor), phase loss, shunt trip, phase imbalance trip, overload, overtemp, overcurrent, short circuit, load loss, undervoltage or any trip
Lockout display	Coast down time, starts per hour, time between starts, and any lockout
Event history	
Up to 60 events	Data includes cause of event, time, date, voltage, power factor, and current for each phase, and ground fault current at time of event
Metering functions	
Motor load	Percent of In
Current data	A, B, C phase current, average current, ground fault (option)
Thermal data	Remaining thermal register; thermal capacity to start
Start data	Average start time and start current, measured capacity to start, time since last start
Resistance temperature detector data	Temperature readings from up to 12 RTDs (6 stators)
Voltage metering	kW, kVAR, PF, kWh
Serial communications	
Protocol	Modbus® RTU
Signal	RS-485, RS-422, or RS-232
Network	Up to 247 devices per node
Functionality	Full operation, status view, and programming via communications port

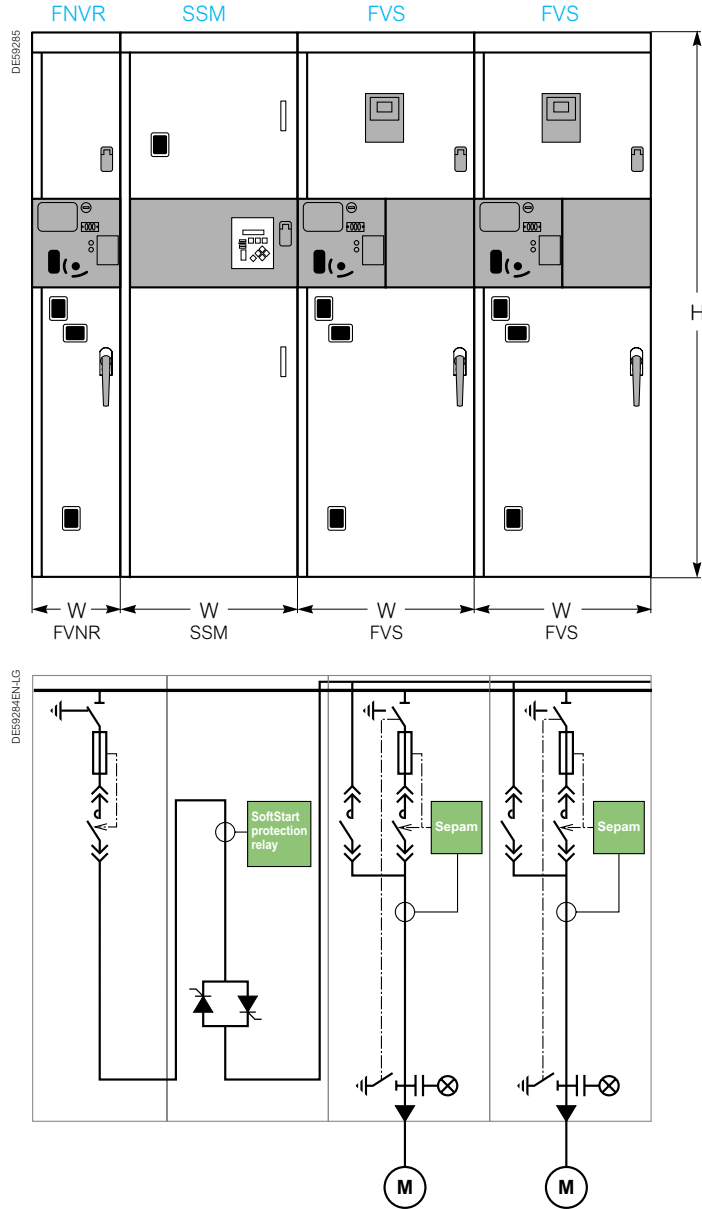
S3: Sequential smartstart

Reduced voltage non reversing asynchronous motor starter

Side view



Front view



Characteristics	S3
-----------------	----

Rated current	200/400 A
---------------	-----------

Dimensions & Weight	S3
---------------------	----

Dimensions	H	2300 mm
	W-FVNR	375 mm
	W-SSM	750 mm
	W-FVS	750 mm
Approximate weight	D	950 mm
	FVNR	475 kg
	SSM	620 kg
	FVS	710 kg

S3: Sequential smartstart

Reduced voltage non reversing asynchronous motor starter

Composition of S3 motor starter

The S3 motor solution is composed of FVNR main cubicle, a SoftStart module and multiple FVS cubicles.

Basic equipment

Main cubicle

- 1 IP3X enclosure
- 1 line disconnecter
- 1 electrically held vacuum contactor
- 3 or 6 HRC fuses
- 1 set of busbars
- Auxiliary contacts
- Provision for padlocks
- 1 contactor position indicator window
- 1 voltage transformer
- 1 fused control power transformer 750 VA

FVS module

- 1 IP3X enclosure
- 1 line disconnecter
- 2 electrically held vacuum contactors: 1 run contactor / 1 start contactor
- 3 or 6 HRC fuses
- 2 sets of busbars: 1 full voltage / 1 reduced voltage
- Auxiliary contacts
- Provision for padlocks
- 2 contactor position indicator windows
- 1 Sepam M20 motor protection relay
- 1 three core LPCT

SoftStart module (SSM)

- 1 IP3X enclosure
- 1 SCR (Thyristor) power module
- 1 set of current sensors
- Microprocessor-based protection and control system
- Motor temperature sensor inputs (option)

Low voltage control

- "Start" & "Stop" pushbuttons
- "Run" & "Stopped" pilot lights

Options and accessories

Module options

- Thermal diagnosis system on FVS
- internal arc withstand
- Cable earthing switch including:
 - mechanical position indicator
 - auxiliary contacts
 - padlock provision
- 1 three core LPCT
- Blown fuse indicator
- IP4X, IPX1 and IPX2 enclosures
- Power factor correction capacitor (FVNR3)
- RS3 redundant configuration
- RS3 dual disconnect cubicle
- Mechanically latched vacuum contactor (includes release coil)
- 1 disconnecter/ load compartment back light
- Key interlocks
- Encapsulated busbars
- Additional CT's or ZSCT (zero sequence current transformer)
- 1 set of 3 surge arrestors
- Voltage presence indicator system (VPIS)
- Heating resistor
- Mechanical operation counter
- Running time meter

Control options

- Sepam series 40 or series 80 protection relay
- Web Remote Monitoring option
- 1 Sepam 100 MI control and indication
- Local remote switch (not needed in case of Sepam 100MI)

Sepam options

- Additional logic I/O module
- Modbus communication interface
- Motor temperature sensor acquisition module
- Analog output module
- PLC for sequential (cascade) starting

S3: Sequential smartstart

Reduced voltage non reversing asynchronous motor starter

Padlocks and key interlocks

	Padlocks	Key interlocks
Disconnecter	C + O	O or O & C
Cable earthing switch	C + O	O or C
By-pass contactor		O

Operation and interlocking

Main cubicle

See FVNR cubicle

FVS module

The disconnecter mechanism incorporates the necessary interlocks (mechanical and/or electrical) to prevent access to the load compartment with the contactors energized. All interlocking requires three simultaneous operations to defeat any function without the destruction of parts.

Interlocking

- Prevents disconnecter closure (normal operations) if:
 - The contactors are closed
 - The load compartment door is open
 - The contactors are not in the fully connected position
 - The cable earthing switch is closed, if so equipped
- Prevents closure of the contactor if the Blown Fuse Indication system has not been reset
- Prevents unlatching the load compartment door when the disconnecter is closed
- Prevents access to the contactor/cable compartment unless:
 - Any contactor is open and the disconnecter is earthed,
 - The earthing switch is closed, if so equipped (provision to operate the earthing switch with door open for cable testing is provided)
 - The operating handle has been removed
- Allows for a test position which meets the following criteria:
 - The front door has been opened for access
 - The disconnecter is open and earthed and can not be closed
 - The contactor is in the fully connected position and can be operated
 - The control power transformer has been isolated from the test control power

All interlocks do not require adjustments over the life of the equipment / When the motor has started, the run contactor is closed / The run contactor can be opened to provide a soft deceleration of the motor.

SoftStart module

The disconnecter mechanism in the main cubicle incorporates the necessary interlocks to prevent access to the load compartment with the contactor energized. The disconnecter mechanism is key interlocked with the SoftStart module to prevent access to the medium voltage components:

- SoftStart
- Communication board

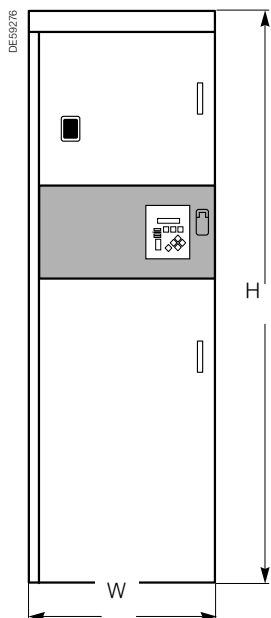
On SoftStart module, the doors are interlocked to prevent locking the unit without all of them being closed.

Power to the SoftStart module comes from the adjacent main cubicle.

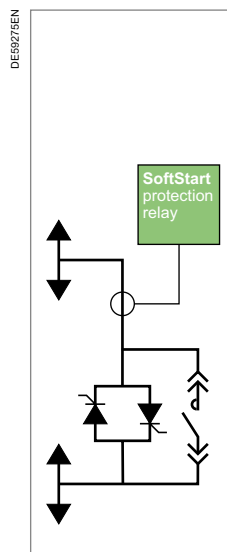
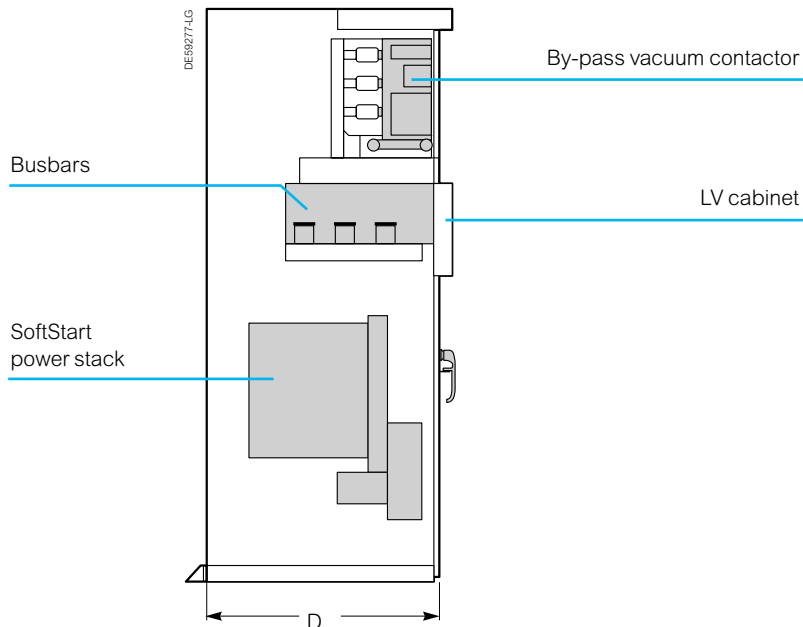
Stand-alone RVSS

Reduced voltage non reversing asynchronous motor starter

Front view - SoftStart module



Side view - SoftStart module



Characteristics		RVSS
Maximum rated voltage		7.2 kV
Maximum power at 6.6 kV (p.f.: 0.88, η : 0.95)		4200 kW
Impulse withstand voltage (1.2/50 μ s, peak value)		60 kV
Power frequency withstand voltage (1 min)		20 kV
Rated frequency		50/60 Hz
Rated operational current		200/400 A
Category of use		AC3/AC4
Cable connections	Incoming	<ul style="list-style-type: none"> • Single or three core • Maximum: 1 x 240 mm² or 2 x 120 mm² • Bottom or top
	Outgoing	<ul style="list-style-type: none"> • Single or three core • Maximum: 1 x 240 mm² or 2 x 120 mm² • Bottom or top

Dimensions & Weight		RVSS
Dimensions	H	2300 mm
	W	750 mm
	D	950 mm
Approximate weight		620 kg

Stand-alone RVSS

Reduced voltage non reversing asynchronous motor starter

Composition of Stand-alone RVSS motor starter

Basic equipment

Main cubicle (high speed)

- 1 IP3X enclosure
- 1 bypass contactor
- 1 SCR (Thyristor) power module
- 1 set of current sensors
- 1 microprocessor-based protection and control system
- 1 set of customer incoming cable connections
- 1 set of customer outgoing cable connections window
- 1 three core LPCT

Low voltage control

- HMI keypad with display

Options and accessories

Module options

- Mechanical position indicator
- Auxiliary contacts
- IP4X, IPX1 and IPX2 enclosures
- Key interlocks
- Encapsulated busbars
- ZSCT (zero sequence current transformer)
- 1 set of 3 surge arrestors
- Voltage presence indicator system (VPIS)
- Heating resistor
- Mechanical operation counter

Control options

- Earth fault module
- RTD motor temperature sensor inputs module
- "Start" & "Stop" pushbuttons

Operation and interlocking

Stand-alone SoftStart module

The Stand-alone SoftStarter allows for installation of the unit close to the process. This solution provides for easy retrofitting into existing systems where a direct on line motor starter exists. The design permits cable entry/exit from top, bottom or both.

The required 3 phase fuse protected power for starting and measurement needs to be provided from the upstream switchboard.

A minimum 750 VA control power at 110/120 VAC needs to be provided.

The Stand-alone RVSS is key interlocked with the upstream contactor.

Access to MV compartments is prevented by the key from the upstream contactor cubicle.

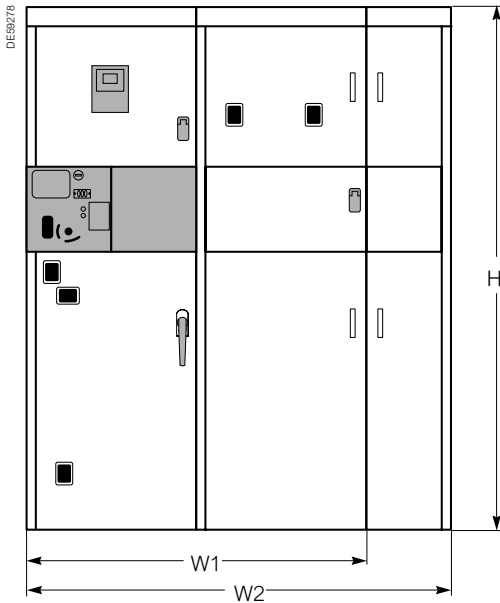
On SoftStart module the doors are interlocked to prevent locking the unit without all the doors being closed.

RVAT

Auto-transformer asynchronous motor starter

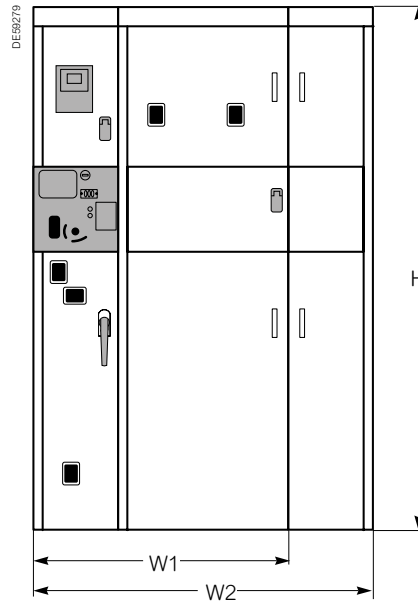
Front view

Main cubicle
Auto-transformer module (ATM2)



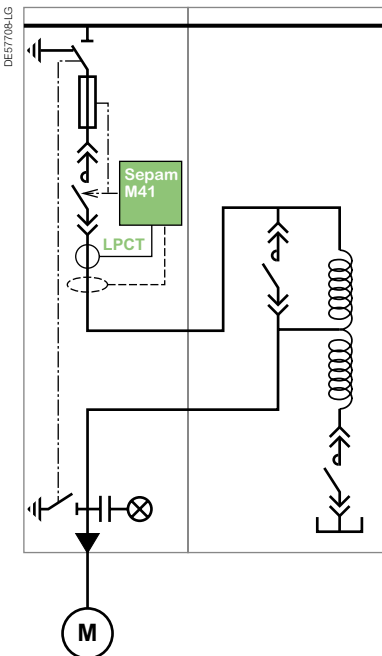
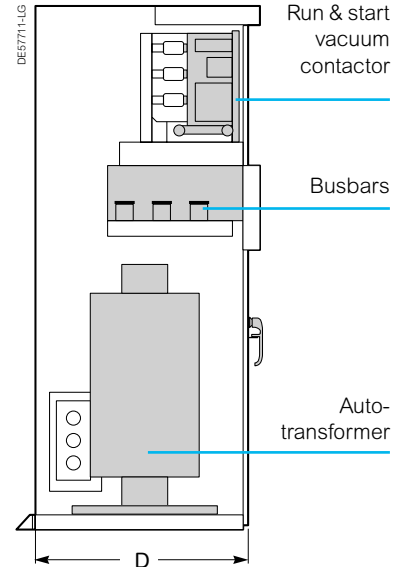
Front view

Main cubicle
Auto-transformer module (ATM1)



Side view

Auto-transformer module



Dimensions & Weight		ATM2	ATM1
Dimensions	H	2300 mm	2300 mm
	W1	1875 mm	1500 mm
	W2 with capacitor module	2250 mm	1875 mm
	D	950 mm	950 mm
Approximate weight (Auto-transformer weight to be added)		1360 kg	1200 kg

The auto-transformer is designed according to the motor requirements:

Nominal power	<input type="text"/>
Service voltage	<input type="text"/>
Nominal current	<input type="text"/>
Frequency	<input type="text"/>
Starting current	<input type="text"/>
Starting time (motor)	<input type="text"/>
Starting time (motor + auto-transformer)	<input type="text"/>
Number of starts/hour	<input type="text"/>
Number of consecutive starts	<input type="text"/>

RVAT

Auto-transformer asynchronous motor starter

Composition of RVAT motor starter

The RVAT motor starter is composed of a main cubicle similar to FVNR unit and auto-transformer module.

Basic equipment

Main cubicle

- 1 IP3X enclosure
- 1 line disconnecter
- 1 electrically held vacuum contactor
- 3 or 6 HRC fuses
- 1 set of busbars
- 1 three core LPCT
- Auxiliary contacts
- Provision for padlocks
- 2 contactor position indicator windows

Auto-transformer module

- 1 electrically held vacuum contactor (Run contactor)
- 1 vacuum contactor, mechanically interlocked with the Run contactor (Start contactor)
- 1 IP3X enclosure
- 1 auto-transformer
- Provision for LPCT (true current measurement)

Low voltage control

- 1 Sepam M41 protection relay including starting automation
- "Start" & "Stop" pushbuttons
- "Run" & "Stopped" pilot lights

Options and accessories

Starter options

- Thermal diagnosis system
- internal arc withstand
- Cable earthing switch including:
 - mechanical position indicator
 - auxiliary contacts
 - padlock provision
- Blown fuse indicator
- IP4X, IPX1 and IPX2 enclosures
- Power factor correction capacitor (FVNR3)
- Mechanically latched vacuum contactor (includes release coil)
- 1 disconnecter/ load compartment back light
- Key interlocks
- Encapsulated busbars
- 1 fused control power transformer (CPT)
- Additional CT's or ZSCT (zero sequence current transformer)
- 1 set of 3 surge arrestors
- Voltage presence indicator system (VPIS)
- Heating resistor
- Mechanical operation counter
- Running time meter
- Contactor position indicator windows for auto-transformer module

Control options

- Sepam series 40 or series 80 protection relay
- Web Remote Monitoring option
- 1 Sepam 100 MI control and indication
- Local remote switch (not needed in case of Sepam 100MI)

Sepam accessories

- Additional logic I/O module
- Modbus communication interface
- Motor temperature sensor acquisition module
- Analog output module

RVAT

Auto-transformer asynchronous motor starter

Operation and interlocking

Main cubicle

See FVNR cubicle

Auto-transformer module

The disconnecter mechanism in the main cubicle incorporates the necessary interlocks to prevent access to the load compartment with the contactor energized.

The disconnecter mechanism is key interlocked with the auto-transformer module to prevent access to the medium voltage components:

- Auto-transformer
- Start contactor
- Run contactor

The start and run contactors are mechanically and electrically interlocked to prevent simultaneous closure.

On auto-transformer modules the doors are interlocked to prevent closing the disconnecter without all of them being closed.

Power to the Start and Run contactors comes from the adjacent main cubicle.

The power from the Run contactor is then routed back to the load terminal box in the main cubicle.

The auto-transformer is of a roll in design such that it can be handled separately making it easier to handle, position and install the module.

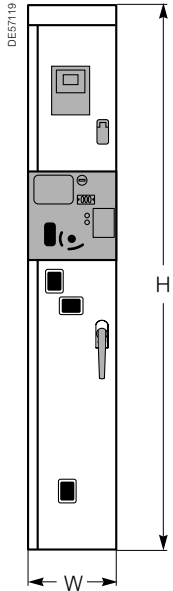
The module is available with a main bus compartment to allow easy extension to the switchboard. Extension may be an FVNR, RVSS or another RVAT unit.

Padlocks and key interlocks

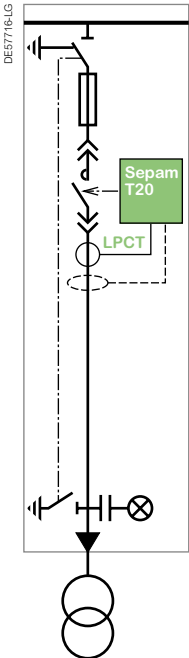
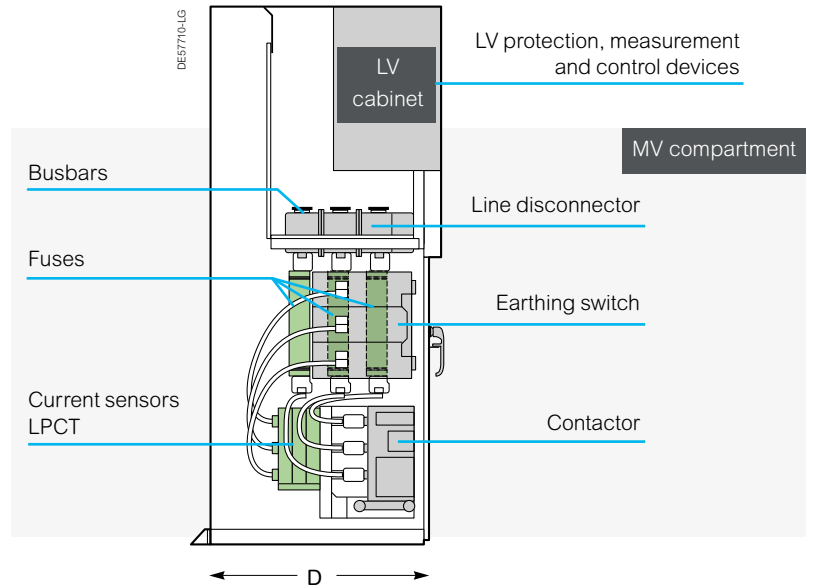
	Padlocks	Key interlocks
Disconnecter	C + O	O or O & C
Cable earthing switch	C + O	O or C
Run contactor		O
Start contactor		C

Transformer feeder

Front view



Side view



Characteristics	Transformer feeder
Maximum rated voltage	7.2 kV
Impulse withstand voltage (1.2/50 μ s, peak value)	60 kV
Power frequency withstand voltage (1 min)	20 kV
Rated short time withstand current (busbars)	<ul style="list-style-type: none"> • 25 kA 3 s • 31.5 kA 3 s • 40 kA 3 s • 50 kA 3 s*
Rated frequency	50/60 Hz
Rated operational current	200/400/450 A
Busbars ratings	<ul style="list-style-type: none"> • 630 A • 1250 A • 2500 A • 3150 A*

* For stand-alone applications or when lined up with LF circuit breaker MCset switchgear

Dimensions & Weight	Transformer feeder
Dimensions	H 2300 mm
	W 375 mm
	D 950 mm
Approximate weight	475 kg

Composition of the transformer feeder

Basic equipment

Cubicle

- 1 IP3X enclosure
- 1 line disconnecter
- 1 electrically held vacuum contactor
- 3 or 6 HRC fuses
- 1 set of busbars
- 1 three core LPCT
- Auxiliary contacts
- Provision for padlocks
- 1 contactor position indicator window

Low voltage control

- 1 Sepam T20 transformer protection relay
- "On" & "Off" pushbuttons
- "On" & "Off" pilot lights

Options and accessories

Starter options

- Thermal diagnosis system
- internal arc withstand
- Cable earthing switch including:
 - mechanical position indicator
 - auxiliary contacts
 - padlock provision
- Blown fuse indicator
- IP4X, IPX1 and IPX2 enclosures
- Power factor correction capacitor (FVNR3)
- Mechanically latched vacuum contactor (includes release coil)
- 1 disconnecter/ load compartment back light
- Key interlocks
- Encapsulated busbars
- 1 fused control power transformer (CPT)
- Additional CT's or ZSCT (zero sequence current transformer)
- 1 set of 3 surge arrestors
- Voltage presence indicator system (VPIS)
- Heating resistor
- Mechanical operation counter
- Running time meter
- Contactor position indicator windows for auto-transformer module

Control options

- Sepam series 40 or series 80 protection relay
- Web Remote Monitoring option
- 1 Sepam 100 MI control and indication
- Local remote switch (not needed in case of Sepam 100MI)

Sepam accessories

- Additional logic I/O module
- Modbus communication interface
- Motor temperature sensor acquisition module
- Analog output module

Transformer feeder

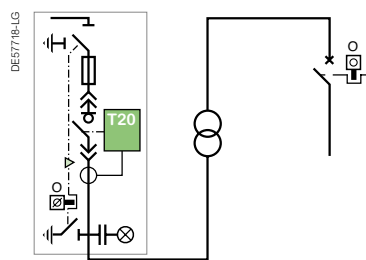
Operation and interlocking

Main cubicle

See FVNR cubicle

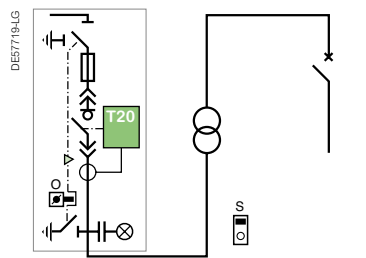
Basic transformer key interlocks

A1 type



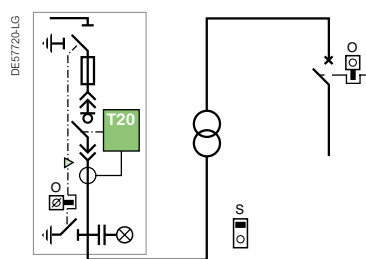
To prevent closing the earthing switch on a transformer feeder unless the LV circuit breaker has been opened first and locked in the open or disconnected position.

C1 type



To prevent access to the transformer if the earthing switch of the feeder has not been closed first.

C4 type



To prevent closing the earthing switch on a transformer feeder unless the LV circuit breaker has been opened first and locked in the open or disconnected position and to prevent access to the transformer if the earthing switch of the feeder has not been closed first.

Legend:

DE56491EN no key free key captive key

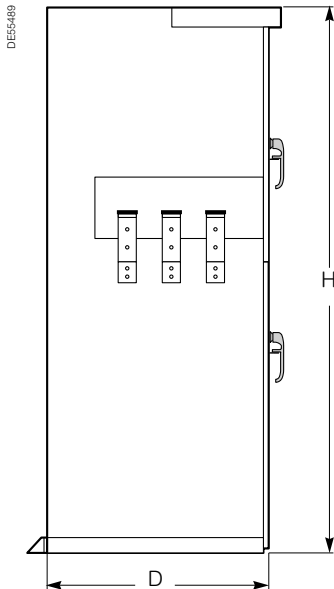
Padlocks and key interlocks

	Padlocks	Key interlocks
Disconnecter	C + O	O or O & C
Cable earthing switch	C + O	O or C

Incoming cubicle

Transition to MCset functional units

Side view



Incoming cubicle

Characteristics		Incoming cubicle	
Panel width		500 mm	750 mm
Maximum rated voltage		7.2 kV	7.2 kV
Impulse withstand voltage (1.2/50 μs, peak value)		60 kV	60 kV
Power frequency withstand voltage (1 min)		20 kV	20 kV
Busbars ratings		<ul style="list-style-type: none"> • 630 A • 1250 A • 2500 A • 3150 A 	<ul style="list-style-type: none"> • 630 A • 1250 A • 2500 A • 3150 A
		• Bottom	• Top or bottom
Cables	Single core	<ul style="list-style-type: none"> • 6 x 400 mm² • 4 x 500 mm² 	<ul style="list-style-type: none"> • 6 x 400 mm² • 4 x 500 mm²
	Three core	6 x 240 mm ²	6 x 240 mm ²
Busducts			Top

Dimensions & Weight		Incoming cubicle	
Dimensions	H	2300 mm	2300 mm
	W	500 mm	750 mm
	D	950 mm	950 mm
Approximate weight		350 kg	900 kg

Composition of the incoming cubicle

Basic equipment

- Thermal diagnosis system
- internal arc withstand
- Provision for cable connections:
 - Single or three core
 - Bottom or top connection

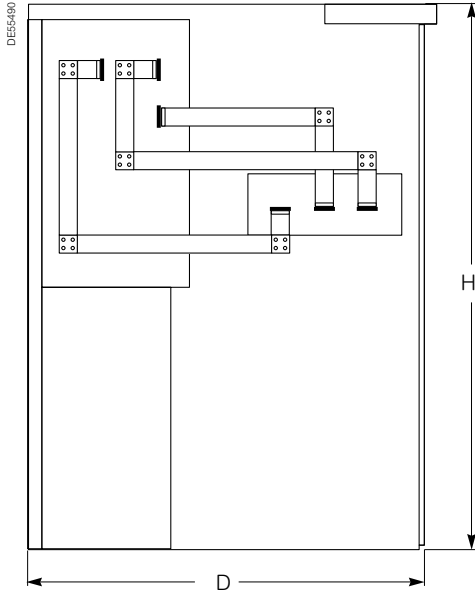
Options

- internal arc withstand
- IP4X, IPX1 and IPX2 enclosures
- Encapsulated busbars

Incoming cubicle

Transition to MCset and PIX standard functional units

Side view



Transition cubicle

Characteristics	Transition cubicle to MCset
Maximum rated voltage	7.2 kV
Impulse withstand voltage (1.2/50 μ s, peak value)	60 kV
Power frequency withstand voltage (1 min)	20 kV
Busbars ratings	<ul style="list-style-type: none"> • 630 A • 1250 A • 2500 A • 3150 A

Dimensions & Weight	Transition cubicle to MCset	
Dimensions	H	2300 mm
	W	375 mm
	D	1550 mm
Approximate weight	Consult us	

Composition of the transition cubicle

Basic equipment

- 1 IP3X enclosure
- 1 set of busbars in separate compartment
- 1 removable front panel

Options

- Internal arc withstand
- IP4X, IPX1 and IPX2 enclosures
- Encapsulated busbars

The MCset cubicle

The cubicle is of LSC2B (Loss of Service Continuity Category) type as defined by IEC standard 62271-200, in other words the medium voltage parts are compartmented using metal partitions (PM class) which are connected to earth and which separate:

- the busbars
- the withdrawable part (circuit breaker, fuse-contactor, disconnecter truck or earthing truck)
- MV connections, earthing switch, current sensors and voltage transformers as required.

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

The low voltage auxiliaries and monitoring unit are in a cabinet separated from the medium voltage section. Five basic cubicle layouts are offered:

- incomer or feeder: **AD**
- line up bussection: **CL - GL**
- busbar metering and earthing: **TT**
- switch-fuse feeder: **DI**

AD and CL cubicles are withdrawable.



Make-up a Motorpact-MCset switchboard

MCset switchboard is made-up of several interconnected functional units.

By using a transition functional unit, it's easy to connect a MCset switchboard with a Motorpact switchboard.

For details, see MCset catalogue, ref. DEAI02.

Electrical characteristics

The values below are given for normal operating conditions as defined in IEC 62271-200 and IEC 62271-1.

Rated voltage					
			(kV)	7.2	12
Rated insulation level					
Power frequency withstand voltage 50 Hz - 1 min (rms kV)				20	28
Lightning impulse withstand voltage 1.2/50 ms (kV peak)				60	75
Nominal current and maximum short time withstand current ⁽¹⁾					
Functional unit with circuit breaker	Short time withstand current	I _{th} max.	(kA/3 s)	<ul style="list-style-type: none"> • 25 • 31.5 • 40 	<ul style="list-style-type: none"> • 25 • 31.5 • 40
			(kA/3 s) ⁽⁷⁾	50	50
	Rated current	I _n max. busbar	(A)	4000	4000
			I _n CB	(A)	<ul style="list-style-type: none"> • 1250 • 2500 • 3150 • 4000^{(2) (5)}
Functional unit with fuse-contactor ⁽³⁾	Short time withstand current	I _{th} max.	(kA)	50 ⁽⁴⁾	50 ^{(4) (6)}
	Rated current	I _n max.	(A)	250	200 ⁽⁶⁾
Functional unit with switch-fuse (DI cubicle)	Short time withstand current	I _{th} max.	(kA)	50 ⁽⁴⁾	50 ⁽⁴⁾
	Rated current	I _n max. ≤	(A)	200	200
Internal arc withstand (maximum value)					
			(kA/0.25 s)	50	50

(1) For functional units equipped with circuit breakers or fuse-contacts, the breaking capacity is equal to the short time withstand current. In all cases, the device peak making capacity is equal to 2.5 times the short time withstand current.

(2) With fan.

(3) Lightning impulse dielectric withstand voltage = 60 kV peak.

(4) Limited by fuses.

(5) With LF circuit breaker (with Evolis circuit breaker, consult us).

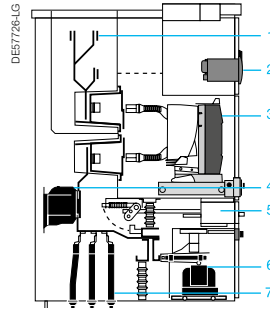
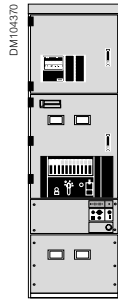
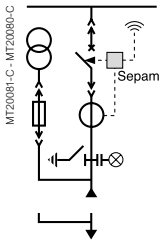
(6) With Rollarc contactor.

(7) Limited to 1 s for I_n circuit breaker: 1250 A.

MCset functional unit

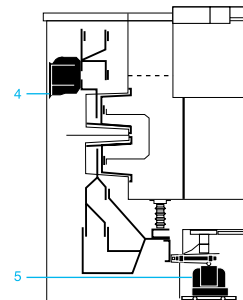
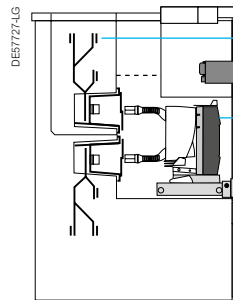
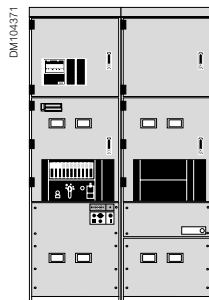
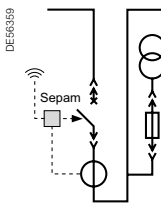
The MCset range includes 13 functional units, based on 5 functions.

Incomer / Feeder



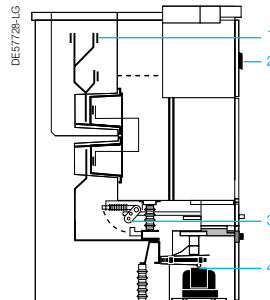
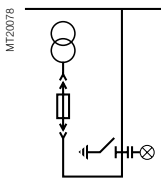
1. Busbar
2. LV cabinet
3. Circuit breaker
4. Current sensors
5. Earthing switch
6. Voltage transformer
7. MV connectors

Line-up bus sectioning



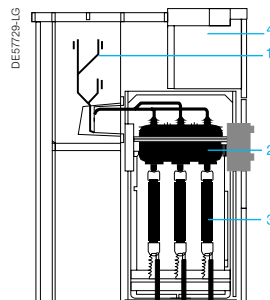
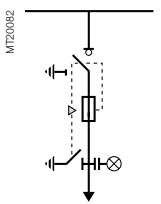
1. Busbar
2. LV cabinet
3. Circuit breaker
4. Current sensors
5. Voltage transformers

Metering and busbar earthing



1. Busbar
2. LV cabinet
3. Earthing switch
4. Voltage transformers

Switch fuse feeder



1. Busbar
2. Load interrupter
3. MV fuses
4. LV cabinet

Description

Description

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General characteristics

Motorpact is composed of modular cubicles, single tiers, indoor construction.

Each transformer or motor starter consists in a single or multiple section line up close coupled to the main incomer switchgear.

Degree of protection

- IP3X outside the enclosure (optional 4X)
- IP2XC inside the enclosure
- IPX1 and IPX2 are optional

Tunnel

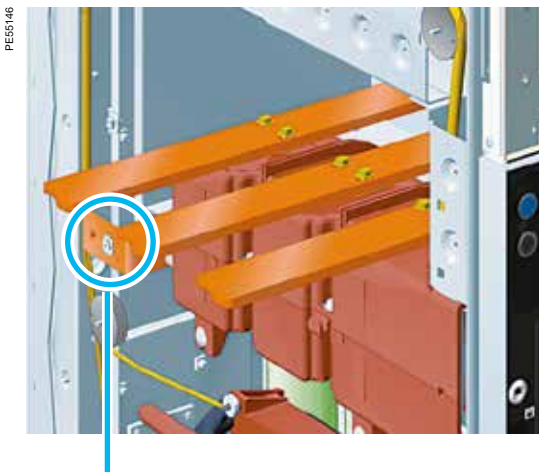
A tunnel of 457 mm is installed:

- When the rating current of the busbars is higher than 2500 A
- When the cubicle is internal arc type and the ceiling is lower than 4 m

Anti corrosion protection and finishing

To ensure that the equipment performs under severe climatic it is finished as follows:

1. All non-painted steel parts are zinc plated
2. All painted steel parts are cleaned and a zinc-phosphate pre-treatment applied prior to paint application
3. Paint colour is RAL9002 white frosted TGIC polyester powder, applied electrostatically through air. Following paint application, parts are baked to produce a hard durable finish. The average thickness of the paint film is 50 microns
Paint film is uniform in color and free from blisters, sags, flaking and peeling.
4. Adequacy of paint finish to inhibit the buildup of rust on ferrous metal materials are periodically tested and evaluated



Earthing conductor interconnection

Earthing conductor

Copper earthing conductor is continuous and extends from one end of the motor starter switchboard to the other through each vertical section.

Each section is supplied with an internal earthing conductor of 6 x 50 mm.

The earthing conductor connections are designed for easy future extension.

Loss of service continuity cubicle classification

Loss of service continuity class (LSC)

Motorpact complies with the definition of LSC2A:

Thus provides a fully safe access to the contactor compartment, knowing that maintenance operation:

- The downstream cables to feed motor are not energized and can be earthed
- The upstream fuse contacts are earthed and segregated from the busbars through the disconnecter

The design is based on «safe compartment access».

Several classes of service continuity during maintenance are defined:

- **LSC 2A**
Safe access to compartment:
 - With power flow in busbars and the other units
 - MV cables must be earthed
- **LSC 2B**
Safe access to compartment:
 - With power flow in busbars and the other units
 - MV cable in separate compartment
 - Cable of unit under maintenance can remain energized
- **LSC 1**
Metal enclosed cubicle not of LSC2 class.

Partition class of compartment accessible for maintenance

Motorpact complies with Partition Class PI

(earthing switches being shutters for the line and load sides of the equipment)

- **Partition Class I or M**
Class defining whether metallic or non-metallic material for separation to live parts is used.
- **Partition Class PM**
All partitions and shutters of safe access compartment shall be metallic with some current carrying capacity
- **Partition Class PI**
- Partitions or shutters may be partially or totally of insulating material
- A shutter can be defined as moving contact of a disconnecter to engage fixed contacts, to a position where it becomes a part of the enclosure or partition shielding the fixed contacts

Internal arc withstand classification IAC AFLR

Installation in a room must be in accordance with the ceiling height

- Ceiling height between 2.8 and 4 meters, it is possible to install a tunnel above the switchboard, in order to channel off the hot gas (due to the effects of internal arcing) and to avoid the gases moving towards any present operators
- Ceiling height over 4 meters, the tunnel is not compulsory.

Motorpact internal arc withstand is designed to protect operators in the case of an internal arc and is Internal Arc Classified (IAC).

Successfully tested in conformity with IEC 60271-200 standard, appendix A.

Accessibility is Type A permitting access from the Front side, Lateral side and Rear side (AFLR).

Motorpact is designed to offer a high level of safety by minimizing the effects of internal arcing by:

- Using metallic flaps on top of the equipment to limit overpressure in the compartments and to direct the hot gases to the outside, minimizing operator hazards
- designing multifunctional parts to reduce connections and hardware.
- using non-flammable materials used in the cubicle
- utilization of concentric compression connections on all flexible bus connections

The line disconnecter provides isolation between the busbars compartment and the load compartment.

Maintenance free line disconnecter

Location

It is situated in the main enclosure at the upper part of the load compartment, and is manually operated from the front of the cubicle.

Description

The disconnecter has two positions:

- Connected (closed)
- Earthed (disconnected)

The disconnecter is a non-load break device capable of interrupting the magnetizing current of the control power transformer (5000 operations without maintenance).

The disconnecter contacts are readily visible. An optional light is available.

The internal degree of protection is IP2XC.

The load side terminals are integrated into a single multifunctional unit that also integrates the fuse holders (single or double fuses).

The disconnecter mechanism incorporates the necessary interlocks to prevent access to the multifunctional compartment with the contactor energized.

Interlocking requires 3 hands to defeat any function.

The disconnecter operating mechanism has a pad lockable feature for both the open and closed positions.

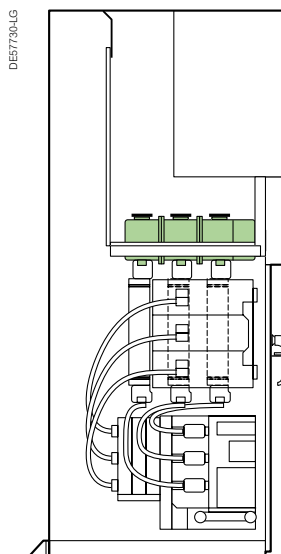
Options

- Key interlocks : Two key interlocks are available:
 - One with a removable key when the disconnecter is locked in the open position,
 - One with a removable key when the disconnecter is locked in the open position
 - Or with a removable key when the disconnecter is in closed position.
- Disconnecter position contact back light

Auxiliary contacts

- 1 set of 4 form C* auxiliary contacts is available for external uses
 - 1 in the earthed position (disconnecter open)
 - 1 in the connected position (disconnecter closed)
- 1 set of 4 form C* auxiliary contacts is available as an option

* Common point changeover type contacts

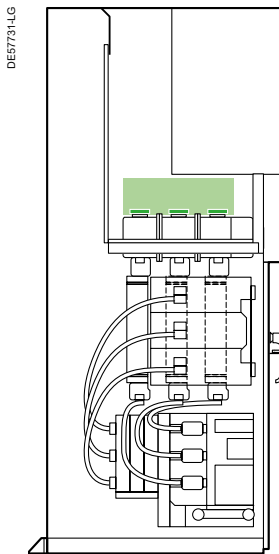


Characteristics

Rating		400 Amperes
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)

Busbars compartment

Busbars



Location

The busbars are mounted directly on the disconnecter under the LV cabinet.

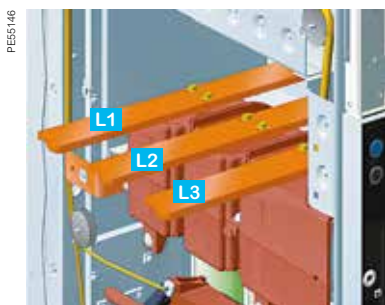
Description

The busbars is mounted in the horizontal position. Barriers are provided to isolate the compartment from the rest of the individual vertical section.

Busbars rated current

When the cubicles are part of a main switchboard, the busbars rated current is of the same current rating as the main switchboard.

When Motorpact is used as stand-alone equipment, the current rating of the busbars must be greater than the total of the individual currents of each motor starter.



Phasing relationship

Rating (A)	Short time withstand current		
	3 s	3 s	3 s
	Up to 31.5 kA	40 kA	50 kA*
630	•		
1250	•	•	•
2500	•	•	•
3150*	•	•	•

* For stand-alone applications or when lined up with LF circuit breaker MCset switchgear.

Design of the busbars

The busbars is connected directly on the disconnecter terminals. The connection to the main circuit breaker switchboard is done through a transition cubicle and solid copper busbars links.

Option

Encapsulated busbars.

Access

- **Front access only:**
For periodic busbars maintenance, access is provided through a removable access cover at the bottom of the LV cabinet.
- **Front and rear access:**
If rear access is available, busbars maintenance can also be performed from the rear of the cubicle by removing the enclosure cover and the busbars access barrier.

Busbars compartment

Easergy T110 Thermal monitoring

New!

Key benefits

- Battery free
- Wireless communications
- High performances
- In contact measuring point
- Easy installation
- Compact footprint
- Remote monitoring and alarming

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

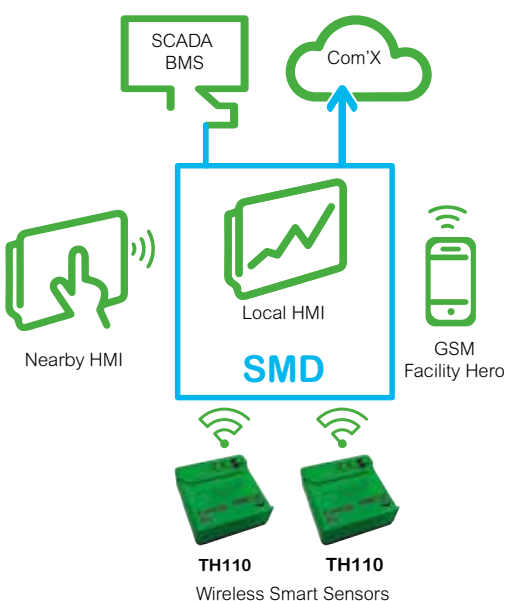


Substation Monitoring Device

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.



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

Load compartment

Vacuum contactor

The vacuum contactor is used as a:

- **Main contactor**
in all the motor starters and the transformer feeder
- **Start and Run contactor**
in the RVAT motor starter
- **By-pass contactor**
in the RVSS motor starter

Main fused contactor

Main contactor controls the motor or the transformer feeder. It can be electrically held or mechanically latched (optional). It is combined with fuses for high level short-circuit protection.

It is controlled:

- Locally
- Remotely

Description

The vacuum contactors comply with IEC 62271-106 standard. They comprise:

- 3 vacuum interrupters (breaking)
- An electromagnetic control unit that can be:
 - electrically held
 - mechanically latched (optional)
- A contactor position indicator
- A mechanical operation counter (option),
- Auxiliary contacts,
- A extraction rail system to remove the contactor.

Location

It is situated below the power fuses, and mounted on rails, in order to be easily removable.

Auxiliary contactors

RVAT Start contactor

Use: an electrically held contactor to connect the auto-transformer in Y during the first step of the starting time.

RVAT Run contactor

Use: an electrically held contactor to by pass the auto-transformer after the motor has reached operating speed.

For RVAT, the Main and the Run contactors are switched automatically by the control logic.

RVSS By-pass contactor

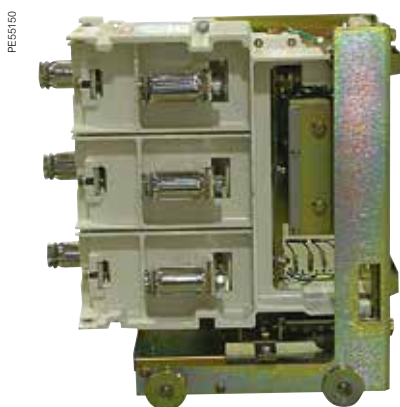
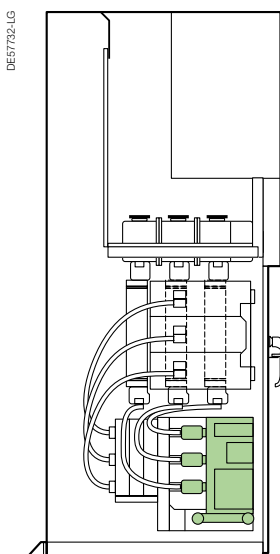
Use: an electrically held contactor to by pass the SoftStart after the motor has reached operating speed.

For RVSS, an integral digital controller controls both the Main and the By-pass contactors.

Location

Start, Run and By-pass contactors are installed on rails in the upper compartment of the auto-transformer or SoftStart module.

All these contactors are interchangeable with each other and with the Main contactor.



Load compartment

Vacuum contactor

Vacuum contactor characteristics

Control			
Supply voltage	Vdc	100/125	240/250
	Vac	115/120	230/240
Possible variations:		+10% -15%	
Consumption	Closing is achieved via the closing coils. The holding coils are inserted in the circuit at the end of the closing.		
		Closing	Holding
	100-110 V	670 VA 80 ms	85 VA

Electrical characteristics		
Rated voltage	7.2 kV	
Rated current	200/400/450 A	
Category of use	AC3/AC4	
Rated short circuit breaking capacity (without fuse)	6.3 kA	
Electrical endurance	250 000 operations	
Mechanical life	Mechanically latched type	250 000 operations
	Electrically held type	2 500 000 operations
Chopping current (Avg.RMS)	0.5 A	
Rated switching frequency	<ul style="list-style-type: none"> • 1200/hour • 300/hour for mechanically latched version 	
Maximum closing time	80 ms or less	
Maximum opening time	<ul style="list-style-type: none"> • 30 ms or less • 300 ms or less (delayed) 	

PE55151



Auxiliary contacts

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 (optional 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

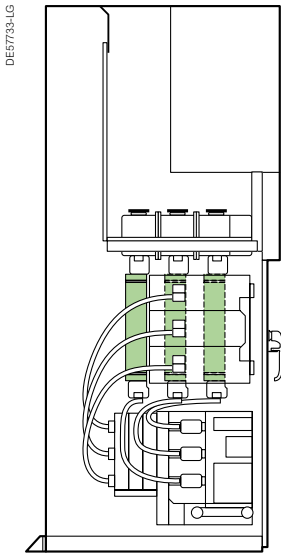
Options	
Mechanical operation counter	
Mechanically latched contactor (including open release). The open release allows opening of the contactor when mechanically latched. It is supplied with:	
<ul style="list-style-type: none"> • Mechanical position indicator • Padlock provision: closed position • 1 key interlock: open or closed position (optional) • 1 emergency mechanical trip pushbutton 	

Load compartment

MV fuses

MV power fuses are used for short circuit current protection.

Sepam series 20, 40 or 80 digital relay provides fine protection, and metering and control of the motor or transformer.



MV fuses

Characteristics

Fuses comply with IEC 60282.1 and DIN 43625 standards, with high breaking capacity.

High fault current limitation reduces electrodynamic stresses on the load-side components (contactor, cables, CT's, etc).

A blown fuse indicator is provided to open the three poles of the contactor, in case of single phase or two-phase fault.

Maximum service voltage	7.2 kV
Maximum fuse rating	2 x 315 A
Breaking capacity	50 kA

Motor application

Quantity and rated current of the fuses

Select from the table page 88.

It is essential to verify, specially in case of rating change (change in motor power for instance), that dimensioning rules are satisfied.

Dimensioning rules

Accumulation of starting sequences

The "check-point" current ($2 \times I_d$) must be lower than the minimum clearing current (I_3) of the fuse.

Saturation of sensors

- In order to be sure that fault currents will be "seen" by the fuses, the "accuracy limit current" of the sensors must be higher than the minimum clearing current (I_3) of the fuse
- In order to insure the correct functioning of the thermal image protection of the Sepam relay, the sensor rating must be lower than 3 times the normal motor current

Corollary: do not over-rate the sensors.

Transformer application

Quantity and rated current of the fuses

See table page 88.

Load compartment

Current sensors

The LPCT is the standard current sensor for Motorpact.

It consists of a three core voltage current sensor which complies with the IEC 60044-8 standard.

One sensor covers all the applications.

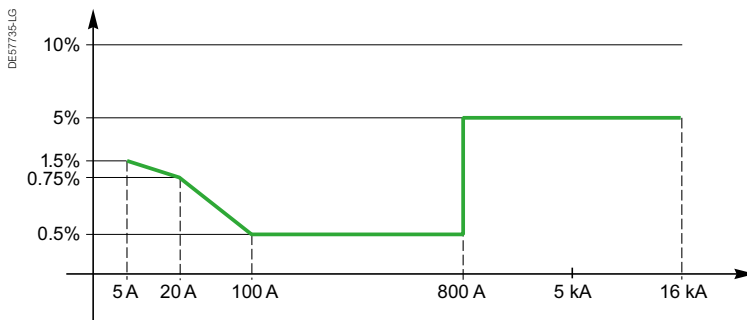
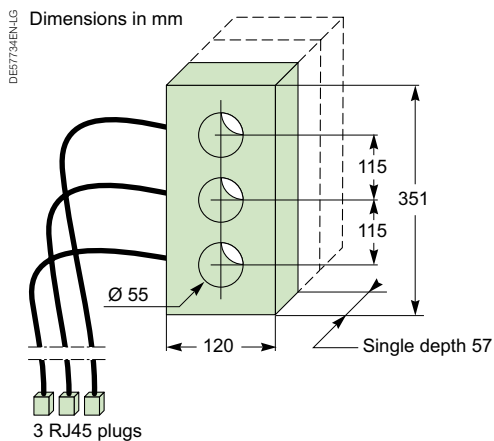
CLV1 low power current transducer (LPCT)

The LPCT is compatible with Sepam series 20, series 40 or series 80 digital relays and provide the required performance for the protection and measuring functions of transformer and motor applications.

Due to its linearity, a single LPCT covers the entire operating range.

If the motor changes, only the setting of the Sepam protection relay has to be modified (see also rule on previous page).

Characteristics	
Rated primary current	100 A
Rated extended primary current	800 A
Rated secondary output	22.5 mV
Accuracy class for measuring	0.5%
Accuracy limit factor	160
Accuracy class for protection	5P
Burden	u 2 kΩ
Rated continuous thermal current	800 A
Thermal current surge	5 kA/10 s
Rated short-time thermal current	16 kA
Highest voltage for equipment	0.72 kV
Rated power frequency withstand voltage	3 kV
Service conditions	- 25°C, indoor



Accuracy template

Due to its linearity, a single LPCT covers the entire operating range.

Location

It is located on the CT and load terminal assembly providing the required support and ensuring dielectric withstand.

Wiring and cables

Each cable is 5 meters long and is embedded in the LPCT enclosure.

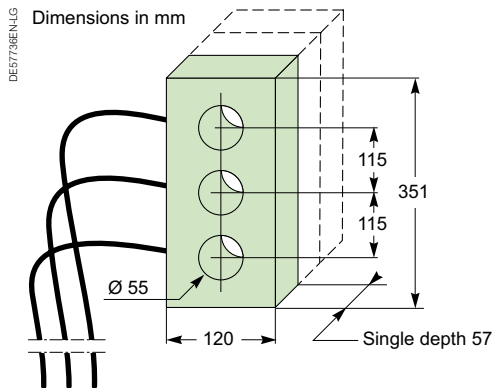
The 3 RJ45 plugs are equipped with color coded terminals that mate up to color coded sockets on the Sepam eliminating possible connection errors.

Load compartment

Current sensors

Alternatively, Motorpact can be supplied with a three core phase CT.

This CT is optimised for Sepam digital relays and will provide performance and protection for the system.



Phase current transformer

Accuracy ratings

Rated current	Single depth 57 mm	Double depth 114 mm
30 A/1 A		2.5 VA 10P5 or 2.5 VA cl. 3
30 A/5 A		5 VA 10P5 or 5 VA cl. 3
50 A/1 A		5 VA 10P5 or 5 VA cl. 3
50 A/5 A		5 VA 10P5 or 5 VA cl. 3
100 A/1 A	2.5 VA 5P5 or 2.5 VA cl. 1	
100 A/5 A	5 VA 5P5 or 5 VA cl. 1	
150 A/1 A	2.5 VA 5P5 or 10 VA cl.1 or 2.5 VA cl. 0.5	
150 A/5 A	5 VA 5P5 or 2.5 VA cl. 0.5	
200 A/1 A	2.5 VA 5P5 or 5 VA cl. 0.5	
200 A/5 A	5 VA 5P5 or 2.5 VA cl. 0.5	
250 A/1 A	2.5 VA 5P5 or 10 VA cl. 0.5	
250 A/5 A	5 VA 5P5 or 2.5 VA cl. 0.5	
300 A/1 A	2.5 VA 5P5 or 15 VA cl. 0.5	
300 A/5 A	5 VA 5P5 or 5 VA cl. 0.5	
400 A/1 A	2.5 VA 5P5 or 30 VA cl. 0.5	
400 A/5 A	5 VA 5P5 or 10 VA cl. 0.5	

For all other needs, please consult us.

It is essential to verify, specially in case of rating change (change in motor power for instance), that dimensioning rules are satisfied. See page 66.

All CT's comply with measuring and protection requirements:

- Single depth: 57 mm
- Double depth: 114 mm

Note:

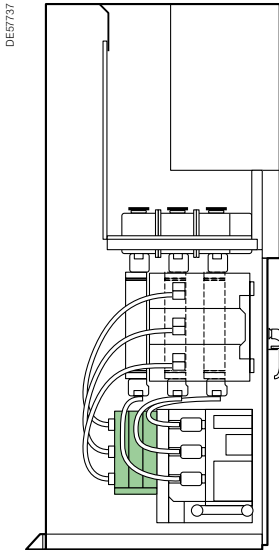
for rated currents lower than 75 A, the best solution is to use the LPCT (see previous page).

Location

It is located on the CT and load terminal assembly providing the required support and ensuring all dielectric withstand.

Load compartment

Current sensors



Zero sequence current transformer

Three types of zero sequence current transformer (ZSCT) may be used:

Internally mounted zero sequence CT

Use

The internally mounted zero sequence current transformer is used for earth fault protection when the expected value of the fault current is higher than 50 A (direct earthing system).

Location and size

The internally mounted zero sequence current transformer is installed with the LPCT or CT. Its depth is a single depth (57 mm).

Internally mounted CSH 280 core balance CT

Use

CSH core balance CTs, provide more sensitive protection by direct measurement of earth fault currents.

Specifically designed for the Sepam range, they can be directly connected to the Sepam "residual current" input.

Location and size

The internally mounted CSH 280 core balance CT is installed with the LPCT or CT. Its depth is a single depth (57 mm).

Externally mounted CSH 120 and CSH 200 core balance CTs

Use

Same use as CSH 280.

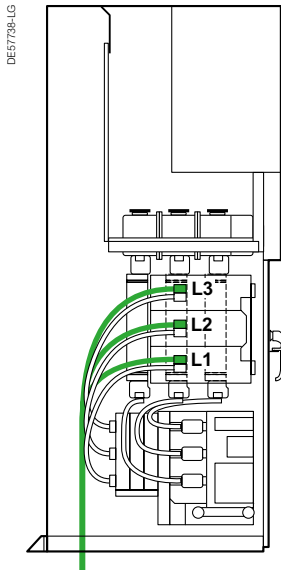
They are installed in the cable tray under the cubicle around the cable.

- CSH 120 - 120 mm internal diameter core balance CT
- CSH 200 - 200 mm internal diameter core balance CT

A hole would need to be drilled on site to pass the wires.

Load compartment

Cable connection



Phasing relationship

Cable connection

Capability

- Up to 2 x 120 mm² or 1 x 240 mm² single or three core dry cables
- Screened and non-screened cable
- Armoured or non-armoured cable

Location

Cable termination pads are located on the left side of the main contactor FVNR unit for all applications including auto-transformers and SoftStarts. They are situated 310 mm from the front of the cubicle to allow for easy access during installation and maintenance. The cable termination pads are suitable for:

- 1 cable max. 240 mm² or
- 2 cables max. 120 mm²

Equipment cable access

FVNR

Cable termination pads are designed for easy accessible from the front of the cubicle.

Cables can exit as follows:

Cable type 7.2 kV max.	Utility space	Access			
		Front and rear		Front only	
		Top	Bottom	Top	Bottom
Single core		•	•	•	•
Three core		•	•	•	
Single core	•	•	•	•	•
Three core	•	•	•	•	•

Incoming line

Cable termination pads are designed to be easily accessible from the front of the cubicle.

Cables can exit as follows:

Incoming cubicle width	Utility space	Access			
		Front and rear		Front only	
		Top	Bottom	Top	Bottom
500 mm			•		•
750 mm		•	•	•	•

Load compartment

Cable connection

Load termination pads

Load termination pads are provided with a two hole configuration permitting the use of virtually any one or two hole cable connecting lug. To prevent single hole cable lugs from rotating, provision is provided to clamp the cable.

An earth busbar is provided for termination of the cable screen.

Floor plates are available to prevent the ingress of dust and vermin.

A dielectric barrier (Formex) is provided over the cable termination pads.

When rear access is available, removable rear covers provide simple and easy cable termination. In addition, a removable top entry cover at the rear section of each FVNR cubicle provides a full height cable pull area.



Front access



Rear access



Floor cable entry

Load compartment

Optional equipment



Cable earthing switch

Use

The cable earthing switch earths the outgoing cables and allows to discharge them.

Location

It is situated on the load side of the contactor.

Description

Electrical characteristics

Earthing switch making capacity	14 kA peak
No load operations according to IEC standard	1000

Direct visual indication of the position of the device on the front face

Auxiliary contacts

2 NO and 2 NC auxiliary contacts are available in open and closed position

Interlocking

The earthing switch is mechanically interlocked with the disconnecter and the MV front door.

As an option: a key interlock is available in closed or open position.

Earthing switch is provided with padlock provision in open and closed positions.

An optional key interlock blocks access to the operating handle thus locking the earthing switch in either the open or closed position.



Voltage Presence Indicator System (VPIS)

Use

This device enables to check the presence (or absence) of voltage in the cables.

It is in accordance with IEC 61958.

Location

The sensors are located on the cable termination box, indicators on the front face.

Heater resistor

Use

Heaters are required to prevent condensation when the cubicle is installed in a humid atmosphere or is de-energized for extended periods of time.

Description

One heater resistor 50 W/230 Vac.

The heater resistor is controlled by a miniature circuit breaker.

The heater is switched off when the contactor is energized.

Load compartment

Optional equipment

PE56158



Control Power Transformer (CPT)

Use

To supply power to the closing coil of the contactor, two solutions can be used:

- An external DC or AC auxiliary
- An internal supply. A control power transformer (CPT) can be provided and installed into the cubicle.

The CPT is used to close (inrush current) and to electrically hold the contactor.

If the contactor is mechanically latched, the CPT is used only to close the contactor.

Generally a reliable auxiliary supply is utilized in the release circuit of the contactor.

Characteristics

The CPT is protected with two MV fuses and the secondary by a miniature circuit breaker.

Electrical interlocking is provided in the CPT secondary to disconnect the load of the CPT before opening the disconnect. This prevents the possibility of backfeeding the CPT.

Two types of CPT are available:

- VRCR 200 VA capable of supplying one contactor and associated auxiliaries
- CPT 300 VA capable of supplying all contactors and associated auxiliaries in reduced voltage motor starting applications
- CPT 750 VA supplied as standard in RVSS. Optional for other applications
- CPT 2000 VA optional when additional power is required for downstream components

Primary CPT MV fuses are connected to the load side of the main fuses.

Type: Ferraz

- < 5.5 kV 20 mm diameter and 127 mm length
- > 5.5 kV 20 mm diameter and 190 mm length

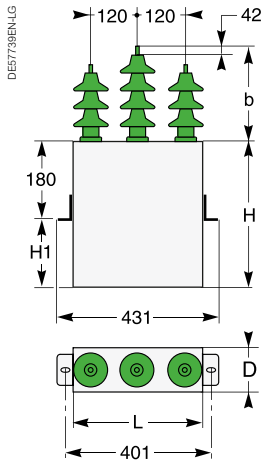
Location

CPT is placed under the contactor on the floor of the cubicle.

The CPT fuses and holders are accessible from the front for easy fuse replacement.

Load compartment

Optional equipment



Three-phase Propivar capacitor

Power Factor Correction capacitor

Three phase capacitors: without internal fuses

Possible for FVNR3 cubicle (750 mm width).

Network voltage (V)	6600	6300	6000	5500
---------------------	------	------	------	------

Capacitor voltage (V)	6600	6300	6000	5500
-----------------------	------	------	------	------

Power (kvar)	Dimensions (mm)					Weight (kg)			
	H	L	D	b	H1				
50	45	40	35	300	347	190	135	120	20
100	90	80	70	300	347	190	135	120	28
150	135	120	105	400	347	190	135	220	35
200	180	160	140	500	347	190	135	320	44
250	225	200	175	810	347	165	135	630	49
300	270	240	210	700	347	190	135	520	58
350	315	280	245	700	347	190	135	520	64
400	360	320	280	810	347	190	135	630	73
450	405	360	315	810	347	190	135	630	79

These capacitors could be available in stock: please consult us

Options

Temperature class -25 / +55°C

Clamping for 1 cable connection

Clamping for 2 cables connection

Load compartment

Optional equipment

Thermal diagnosis system is used to reduce maintenance costs in MV substations.

It continuously monitors temperature rise using optical fibres and sensors installed at the heart of the sensitive areas.

The sensors are located on cable connections and on top MV fuse holders.

Thermal diagnosis system

Presentation

Thermal diagnosis is based on the principle of temperature measurement of energized circuits. By using optical fibres, the system doesn't introduce any risks in terms of insulation.

It provides:

- Permanent monitoring of the temperature rise in power circuits at the connections,
- Tripping of a "pre-alarm", then an "alarm" by activating dry contact outputs,
- Indication of the zone and circuit involved.

The standard solution is composed of the MDT module and two probes as described hereunder.

Probes CFO733

The optical fibre probes are factory-built assemblies comprising:

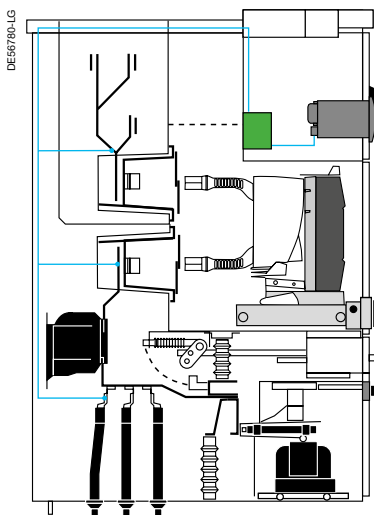
- 3 sensors attached to the power circuit
- The optical connections
- A connector linked to the module

This connector incorporates the opto-electrical conversion unit thus eliminating any optical connections when assembling.

MDT107 module

The MDT107 electronic module is mounted in the low voltage compartment of the cubicle. It provides the following functions:

- Monitoring of temperature rise in 2 zones,
- Triggering of the pre-alarm,
- Triggering of the alarm,
- Self-monitoring of the module,
- Self monitoring of the temperature probes.



Optical fibre probes CF0733

Maximum equipment voltage	17.5 kV
Rated power frequency voltage	<ul style="list-style-type: none"> • 38 kV 1 min • 42 kV 1 min
Impulse voltage	95 kV
Maximum fibre / sensor temperature	120°C

MDT106 module

Temperature rise adjustment	To be defined				
Possibility of adjusting the ambient temperature correction					
Maximum absolute threshold value	<ul style="list-style-type: none"> • Pre-alarm = 115°C • Alarm = 120°C 				
Multi9 profile width	10.5 cm				
Module power	24/250 Vdc, 110/240 Vac				
	<table border="1"> <tr> <td>Voltage</td> <td> <ul style="list-style-type: none"> • 24, 48, 127, 220 Vdc • 110 to 240 Vac </td> </tr> </table>	Voltage	<ul style="list-style-type: none"> • 24, 48, 127, 220 Vdc • 110 to 240 Vac 		
Voltage	<ul style="list-style-type: none"> • 24, 48, 127, 220 Vdc • 110 to 240 Vac 				
Dry contact	<table border="1"> <tr> <td>Current</td> <td> <ul style="list-style-type: none"> • 5 A permanent (pre-alarm) • 8 A permanent (alarm) </td> </tr> </table>	Current	<ul style="list-style-type: none"> • 5 A permanent (pre-alarm) • 8 A permanent (alarm) 		
Current	<ul style="list-style-type: none"> • 5 A permanent (pre-alarm) • 8 A permanent (alarm) 				
	<table border="1"> <tr> <td>Vdc</td> <td>< 1.2 W (standby) - < 3.4 W (max.)</td> </tr> <tr> <td>Vac</td> <td>< 4.4 VA (standby) - < 6.6 VA (max.)</td> </tr> </table>	Vdc	< 1.2 W (standby) - < 3.4 W (max.)	Vac	< 4.4 VA (standby) - < 6.6 VA (max.)
Vdc	< 1.2 W (standby) - < 3.4 W (max.)				
Vac	< 4.4 VA (standby) - < 6.6 VA (max.)				
Consumption (standby-max.)					

Operating panel



The operating front panel comprises different control and indicating elements:

- Control "Run" and "Stop" pushbuttons
- Indicating lights

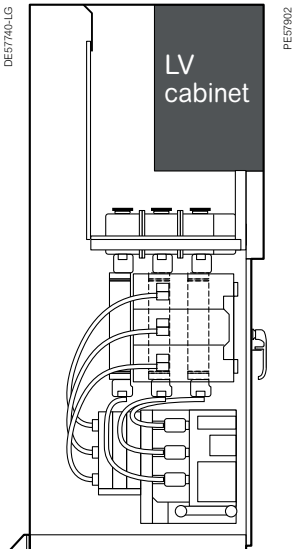
Both can be replaced by an optional Sepam 100 MI control and indication device.

- Local-remote switch (optional),
- Mimic diagram,
- Operating sequence,
- Open closed indicator,
- Running time meter (optional), as well as voltage presence indication system

The operating front panel allows control, interlocking and padlocking:

- Earthing switch operator
- Earthing switch key interlock
- Disconnect operator
- Disconnect key interlock
- Disconnect padlock provision
- Earthing switch padlock provision

Available is a back light with a push to view feature for viewing the disconnect and earthing switch status.



Use

To install all local protection and control LV equipment.

Structure

The low voltage cabinet is separated from the MV compartment by earthed metal barriers.

A hinged door is situated at the upper front of the enclosure and above the busbars compartment.

Relays and local control devices are flush mounted on the LV cabinet door.

Terminals, miniature circuit breaker, auxiliary relays are fixed on DIN rails inside the cabinet.

Underneath the LV cabinet, in front of the busbars compartment a fix escutcheon gets pushbuttons, lamps, voltage presence indicator system, and a mechanical position disconnector indicator.



LV cabinet

Sepam protection system

Each Motorpact unit is equipped with a comprehensive protection, control and monitoring system comprising:

- Instrument transformers to measure the necessary electrical values (phase current, residual current, voltages, etc.),
- Sepam protection relay adapted to the application
- Metering equipment
- Low voltage auxiliary relays

Sepam digital protection relay

Sepam is at the heart of the protection chain. It carries out all the necessary protection, control, monitoring and signalling functions and provides an optimal solution for each application:

- **Sepam T:** transformer feeder
- **Sepam M:** motor starter
- **Sepam B or S:** for busbars, substation and capacitor application

Sepam series 20, series 40, series 60 and series 80: A modular solution

To satisfy increasing numbers of applications, and allow the installation to be upgraded:

- Basic, advanced or mimic - based User-Machine Interface. The advanced UMI with graphic LCD screen and keypad, can be remotely located
- Functional enhancement by optional modules:
 - 42 logic inputs and 23 relay outputs with 3 optional modules,
 - Modbus communication network connection interface
 - 8 to 16 temperature probes acquisition module
 - Analog output (4-20 mA)
 - Synchro-check module

Simplicity and performance

Easy to install

Optional modules common for all Sepam and easy to implement.

Assisted commissioning

- Pre-defined functions commissioned by a simple parameter setting
- User-friendly and powerful PC software for parameter and protection setting

User-friendly

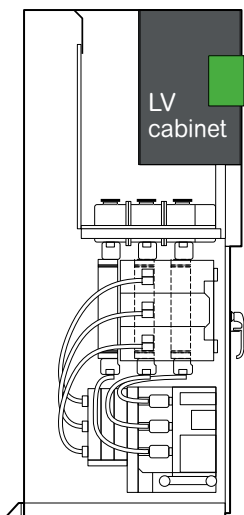
- Intuitive User Machine Interface with direct data access
- Local operating data in the user's language

Protection in Motorpact units

The basic equipment of each Motorpact unit comprises an adapted protection system.

Motorpact unit	Standard	Optional
FVNR	Sepam M20	Sepam M40 or M60 or M80
RVAT	Sepam M41	Sepam M40 or M60 or M80
RVSS	SoftStart relay	Sepam M40 or M60 or M80
Transformer feeder	Sepam T20	Sepam T40 or T60 or T80

For any other types of Sepam relay, please consult us.



Sepam range

The Sepam range of protection relays is designed for the operation of machines and electrical distribution networks of industrial installations and utility substations at all levels of voltage.

To cover all needs, from the simplest to the most complete, Sepam is compliant with IEC 61850 (series 20, 40, 60, 80).



LV cabinet

Sepam protection system

Local / remote control device

Sepam series 80 modular architecture

Logic inputs / outputs

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

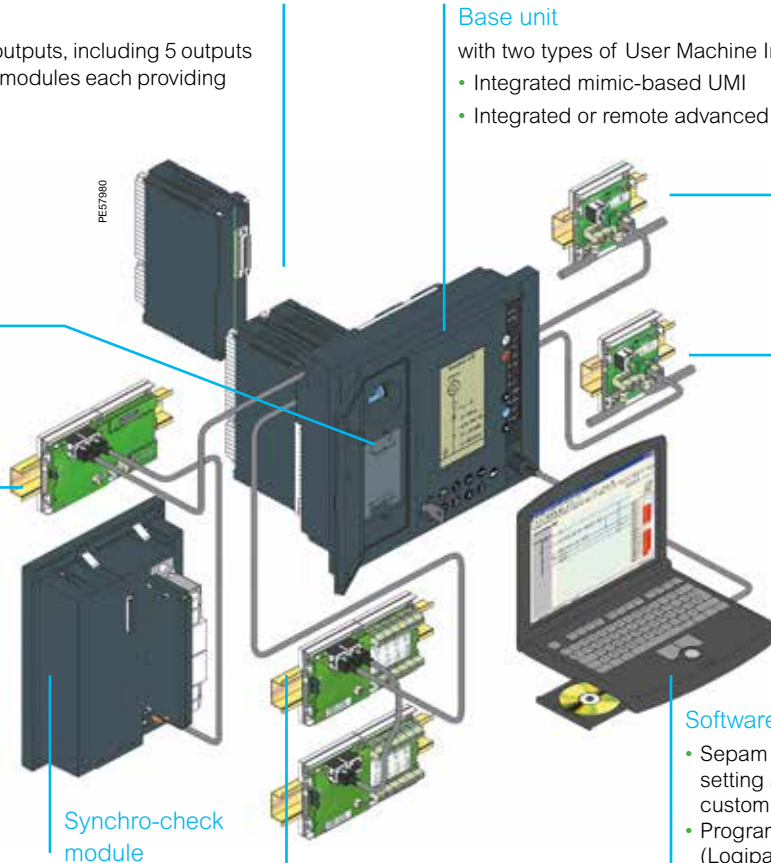
Memory

Parameters and protection settings saved on removable memory cartridge.

Analogue output

1 analogue output:

- 0-1 mA
- 0-10 mA
- 4-20 mA
- or 0-20 mA



Base unit

with two types of User Machine Interfaces (UMI):

- Integrated mimic-based UMI
- Integrated or remote advanced UMI

Communication ports

2 independent communication ports:

- Connection of each port to 1 or 2 S-LAN and/or E-LAN networks
- Modbus, Modbus TCP/IP, IEC 60870-5-103, DNP3 and IEC 61850 communication protocols
- GOOSE messages and TCP/IP redundancy
- RS485(2 or 4 wire) or fibre-optic network

Software tools:

- Sepam parameter and protection setting and control function customization
- Programming of specific functions (Logipam)
- Recovery and display of disturbance recording data
- Local or remote operation via a communication network

Sensors

Temperature data from 16 sensors: Pt100, Ni100, or Ni120.

Local/remote control device

A local / remote control of the contactor can be used.

Two possibilities:

- Sepam 100 MI integrated solution
- Basic solution



Sepam 100 MI

Sepam 100 MI is a local breaking device control and signalling module. The front of Sepam 100 MI includes the following mimic:

- Red and green indicator units used to make up mimic diagrams representing the cubicle electrical diagram
- A red vertical bar representing "device closed"
- A green horizontal bar representing "device open"
- A local or remote control selector switch (CLR)
- A breaking device open control pushbutton (KD2), active in local or remote mode
- A breaking device close control pushbutton (KD1), active only in local position

Sepam 100 MI can be installed either separately or combined Sepam series 20, series 40 or series 80.

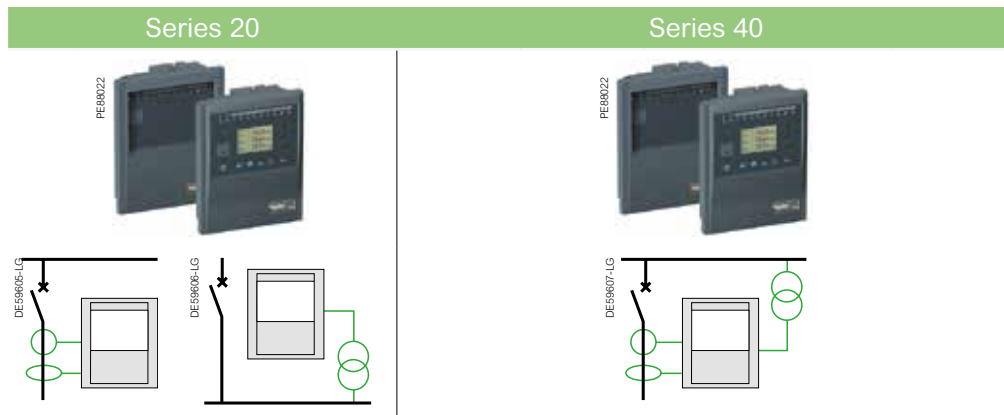
Location

It is mounted on the LV cabinet door.

LV cabinet

Sepam protection system

Selection guide - Series 20 & 40



Application		Series 20		Series 40					
Substation		S20	S24	S40 / S50 ⁽³⁾	S41 / S51 ⁽³⁾	S42 / S52 ⁽³⁾	S43 / S53 ⁽³⁾	S44 / S54 ⁽³⁾	
Busbar				B21	B22				
Transformer		T20	T24	T40 / T50 ⁽⁴⁾		T42 / T52 ⁽⁴⁾			
Motor		M20		M40	M41				
Generator				G40					
Capacitor									
Protection									
Current		•	•			•	•	•	
Voltage				•	•	•		•	
Frequency				•	•	•		•	
Specifics			Breaker failure		Disconnection by rate of change of frequency		Directional earth fault	Directional earth fault and phase overcurrent	Directional earth fault
Characteristics									
Logic inputs		0 to 10		0 to 10		0 to 10			
Logic outputs		4 to 8		4 to 8		4 to 8			
Temperature sensors		0 to 8		0 to 8		0 to 16			
Channel	Current	3I + I _o				3I + I _o			
	Voltage			3V + V _o		3V, 2U + V _o			
	LPCT ⁽¹⁾	•				•			
Communication ports		1 to 2		1 to 2		1 to 2			
IEC61850 Protocol		•		•		•			
	Redundancy					•			
Control	GOOSE message								
	Matrix ⁽²⁾	•		•		•			
	Logic equation editor					•			
	Logipam	Logipam ladder language (see Series 40)		Logipam ladder language (PC programming environment) to make full use of Sepam series 80 functions					
	Backup battery			48 hours - Standard lithium battery 1/2 AA format, 3.6 V, front face exchangeable.					
Other	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⁾ S5X applications are identical to S4X applications with the following additional functions:

- Earth fault and phase overcurrent cold load pick-up
- Broken wire detection
- Fault locator

⁽⁴⁾ T5X applications are identical to T4X applications with the following additional functions:

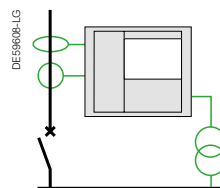
- Earth fault and phase overcurrent cold load pick-up
- Broken wire detection

LV cabinet

Sepam protection system

Selection guide - Series 60

Series 60



Application			
Substation	S60	S24	S62
Busbar			
Transformer	T60		T62
Motor		M61	
Generator	G60		G62
Capacitor	C60		
Protection			
Current	•	•	•
Voltage	•	•	•
Frequency	•	•	•
Specifics		Directional earth fault	Directional earth fault and phase overcurrent
Characteristics			
Logic inputs		0 to 28	
Logic outputs		4 to 1	
Temperature sensors		0 to 16	
Channel	Current	3I + Io	
	Voltage	3V, 2U + Vo or Vnt	
	LPCT ⁽¹⁾	•	
Communication ports		1 to 2	
IEC61850 Protocol		•	
Control	Redundancy	•	
	GOOSE message	•	
	Matrix ⁽²⁾	•	
Other	Logic equation editor		
	Logipam	Logipam ladder language (PC programming environment) to make full use of Sepam series 80 functions	
	Backup battery	Standard lithium battery 1/2 AA format, 3.6 V, front face exchangeable	
	Front memory cartridge with settings	•	

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

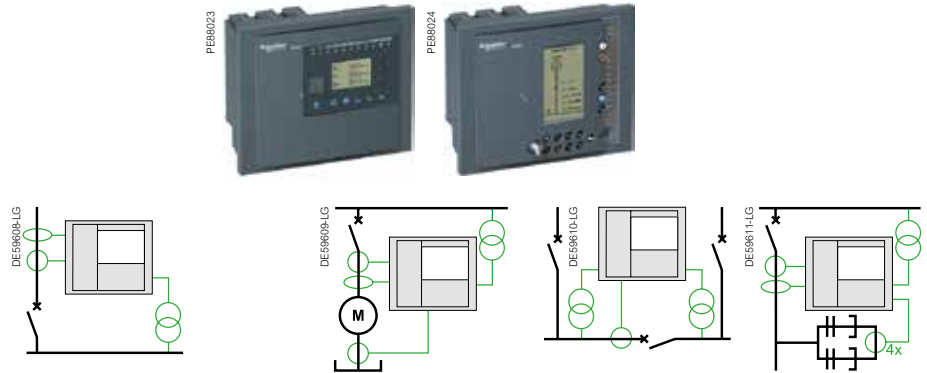
⁽²⁾ Control matrix for simple assignment of information from the protection, control and monitoring functions.

LV cabinet

Sepam protection system

Selection guide - Series 80

Series 80



Application								
Substation	S80	S81	S82	S84				
Busbar	B80						B83	
Transformer		T81	T82	T87				
Motor		M81			M88	M87		
Generator			G82		G88	G87		
Capacitor								C86
Protection								
Current	•	•	•	•	•	•	•	•
Voltage	•	•	•	•	•	•	•	•
Frequency	•	•	•	•	•	•	•	•
Specifics		Direct. earth fault	Direct. earth fault & phase overcurr.	Disconnec. by rate of change of frequency	Transformer & transformer-machine unit differential	Machine differential	Voltage & frequency protection for 2 sets of busbars	Capacitor-bank unbalance
Characteristics								
Logic inputs		0 to 42			0 to 42		0 to 42	
Logic outputs		5 to 23			5 to 23		5 to 23	
Temperature sensors		0 to 16			0 to 16		0 to 16	
Channel	Current	3I + 2 x Io			2 x 3I + 2 x Io		3I + Io	
	Voltage	3V + Vo			3V + Vo		2 x 3V + 2 x Vo	
	LPCT ⁽¹⁾	•			•		•	
Communication ports		2 to 4			2 to 4		2 to 4	
IEC61850 Protocol		•			•		•	
Control	Redundancy	•			•		•	
	GOOSE message	•			•		•	
	Matrix ⁽²⁾	•			•		•	
Other	Logic equation editor	•			•		•	
	Logipam	•			•		•	
	Backup battery	48 hours - Standard lithium battery 1/2 AA format, 3.6 V, front face exchangeable.						
	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.

LV cabinet

Vamp arc flash protection

The arc protection unit detects an arc flash in an installation and trips the feeding breaker.

An arc flash protection system maximizes personnel safety and minimizes material damage caused by arc faults.

Vamp advantages

Personnel Safety

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

Reduces production losses

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

Extended switchgear life cycle

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

Reduced insurance costs

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

Low investment costs and fast installation

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

Reliable Operation

Operation is based on the appearance of light or alternatively on the appearance of light and current from an external device. Immune to nuisance trippings due to dual tripping criteria; light & current.



Vamp 221



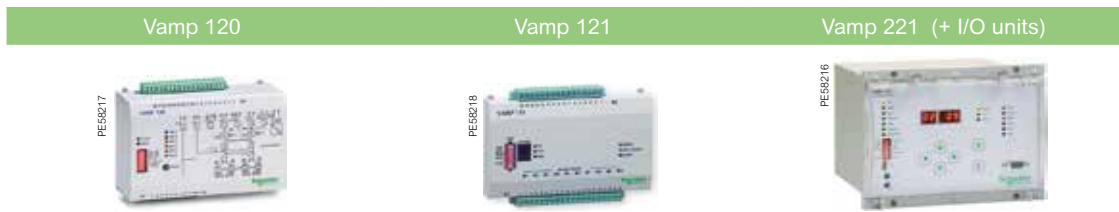
Input/Output units

Arc flash protection maximizes personnel safety and minimizes material damage to the installation in the most hazardous power system fault situations.

Minimized damage also means limited need for repair work and enables rapid restoration of the power supply.

LV cabinet





Vamp arc flash protection



System features





- | | | |
|---|--|---|
| <ul style="list-style-type: none"> • Operation on light only (I > criteria can be supplied from another device) • Integrated 19–256 Vac/dc aux. supply • Optimized for wind power and other small applications • Supports point and/or smoke sensors • Up to 4 sensors • Selective trip for 2 zones and possibility of generator set emergency trip (separate contact) • Operation time 7 ms (including the output relay) • Non-volatile trip status | <ul style="list-style-type: none"> • Operation on light only • Supports point and/or smoke sensors • Up to 10 sensors • Typically trips the incoming feeder • Straightforward installation • Operation time 9 ms (including the output relay) • Cost-effective solution • Self-supervision | <ul style="list-style-type: none"> • Current and light tripping criteria (possibility of tripping by light only) • Operating time 7 ms or less (electromechanical contact) • Accurate location of arc fault utilizing point sensors • Four selective protection zones per central unit • Self-supervision of the entire system • Easy interconnect using VX001 cables • Phase current measuring • Earth fault current measuring • Personal protector option • Panel or rail mount I/O units • Circuit breaker fail protection (CBFP) |
|---|--|---|

Sensors

 <p>PE60543 Point sensor (surface)</p>	<ul style="list-style-type: none"> • Arc detection from two compartments simultaneously • Self-monitored • Cable length adjustable from 6 m or 20 m down
 <p>PE60542 Point sensor (pipe)</p>	<ul style="list-style-type: none"> • Self-monitored • Cable length adjustable from 6 m or 20 m down
 <p>PE60541 Portable sensor</p>	<ul style="list-style-type: none"> • Snap-in connection to I/O unit • Enhanced work safety
 <p>PE60540 Loop sensor (Fibre)</p>	<ul style="list-style-type: none"> • Monitors various compartments • Small bending radius for easy installation

Options

Please check in the Vamp catalogue for reference number

		I/O units (VAM)			
		3L	10L/LD	12L/LD	4C/CD
 <p>PM105408 VAM 3L</p>	 <p>PM105409 VAM 10L/LD</p>	2	2	2	2
Communication port for central unit (Vamp 221) and I/O unit					
Point sensor (surface or pipe)			10	10	
Loop sensor (Fibre)		3			
Portable sensor		1	1	1	
Protection zone supported		1	1	4	4
Current inputs					3
Trip contact		1	1	3	1
 <p>PM105410 VAM 12L/LD</p>	 <p>PM105411 VAM 4C/CD</p>				

LV cabinet

GemControl system & MiCOM protection relays

GemControl provides a central source of control, monitoring and communication in each panel.

PER0343Y3



GemControl system

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

GemControl advantages

- **Safe operation :**
Robust standard PLC software (IEC 61131-3). Direct motor control of all devices without intermediate relays.
- **Scalable concept for simple or complex applications :**
All possibilities are covered, from the stand-alone replacement of conventional electrical push-buttons, position indicators, local/remote key switches and metering instruments in low voltage cabinets to smart interfacing between switchgear panels and substation control systems (SCADA).
- **Incomparable flexibility:**
In all phases of design, parameter setting, operation and upgrading of the installation. Expandable for future needs.
- **Reliability:**
Type tested according to IEC 255-6 or EN 60255-6. Transferable back-up memory (GemStick).

MiCOM protection relays provide the user with a choice of cost-optimised solutions for specific protection requirements within the distribution network.

The MiCOM relay series offers comprehensive protective function solutions for all power supply systems, as well as for the various functional and hardware project stages.

PM102688



MiCOM protection relays

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

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

MiCOM offers varying levels of functionality and hardware:

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

Auto-transformer compartment

Use

This module is always erected on the right side of the main cubicle to compose the auto-transformer starter.

Selection

Two widths of modules are available:

- 1125 mm wide for motor up to 440 kW
- 1500 mm wide for motor lower than 3800 kW

Auto-transformer module

Structure

The main busbars goes through the module in a segregated compartment. It provides an IP2XC protection inside the enclosure.

It splits the module in two parts:

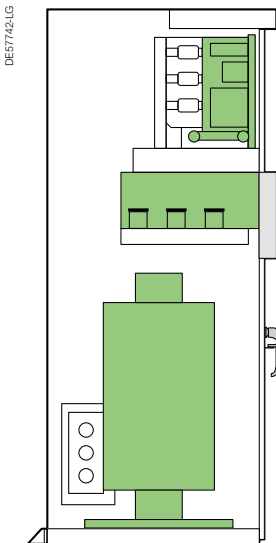
- **The upper part with the two vacuum contactors (start and run)**
The door has two optional windows to see the status of the contactors
- **The lower part with the auto-transformer**
The medium voltage doors are mechanically interlocked with the disconnect of the main cubicle

Dry cables are used to connect the auto-transformer and the contactors to the main cubicle.

Current sensors, earthing switch, voltage presence indication system, customer's terminations are in the main cubicle.

Provision is supplied in the auto-transformer module to install a current transformer for accurate measurement of motor current.

Auto-transformer modules are designed to ship connected to the main cubicle.



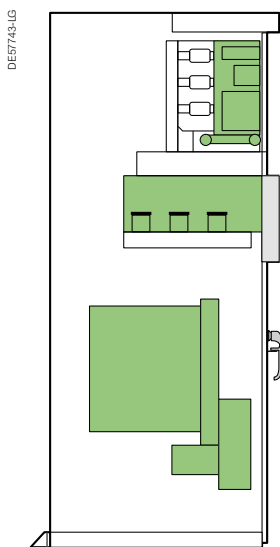
Use

This module is always erected on the right side of the main cubicle to compose the SoftStart motor starter.

Selection

One width of module is available:

- 750 mm wide for rated current up to 400 A



SoftStart module

Structure

The main busbars goes through the module in a segregated compartment.

It splits the module in two parts:

- The upper part with the by-pass vacuum contactor,
- The lower part with the MV SoftStart device.

The upper medium voltage door has an optional window to see the status of the bypass contactor. The medium voltage doors are mechanically interlocked with the disconnecter of the main cubicle.

A low voltage compartment in the centre of the module contains the logic and control of the SoftStarter.

Dry cables are used to connect the SoftStart module to the main cubicle.

Earthing switch, voltage presence indication system, customer's terminations are in the main cubicle.

SoftStart modules are designed to ship connected to the main cubicle.

Keypad interface

Motorpact SoftStart offers keypad display/programming and serial communications. A 2 line x 20 character LCD display with backlight provides easy readout of multiple motor data points.

Motor protection functions

- Over current
- Under current
- Current imbalance
- Two stage overload
- Reset
- Number of starts per hour

Metering functions

- Motor load
- Phase current, average current, earth fault current
- Thermal capacity remaining, thermal capacity to start
- Average start time, current, capacity to start, elapsed time from last start
- Up to 12 RTD's data
- kW, kvar, power factor, kWh

Communication

- Protocol: Modbus
- RS 485

Characteristics

Voltage

2.3 kV - 7.2 kV

Frequency

50 or 60 Hz

Unit overload capacity

- 125 % - Continuous
- 500 % - 60 seconds
- 600 % - 30 seconds

Power ranges

- 3.3 kV to 1900 kW
- 5.5 kV to 3000 kW
- 7.2 kV to 3800 kW

Power circuit

6, 12 or 18 SCRs (Thyristors)

Motor application

Starting current (A) $I_d/I_n = 6$	Normal current (A)	Minimum CT rating (sec. 1 A)	LPCT	Starting time (s)								
				5		10		30				
				Number of starts per hour								
				3		6		3		6		
2400	400	400	Valid with all fuse ratings	2 x 315	2 x 315	2 x 315	2 x 315	2 x 315	2 x 315	2 x 315	2 x 315	
2200	366	400		2 x 315	2 x 315	2 x 315	2 x 315	2 x 315	2 x 315	2 x 315	2 x 315	2 x 315
2000	333	300		2 x 250	2 x 250	2 x 250	2 x 250	2 x 250	2 x 250	2 x 250	2 x 250	2 x 250
1725	288	300		2 x 250	2 x 250	2 x 250	2 x 250	2 x 250	2 x 250	2 x 250	2 x 250	2 x 250
1570	262	300		2 x 200	2 x 200	2 x 200	2 x 200	2 x 200	2 x 200	2 x 200	2 x 200	2 x 250
1415	235	75		1 x 315	1 x 315	1 x 315	1 x 315	1 x 315	1 x 315	1 x 315	1 x 315	2 x 200
1256	209	75		1 x 315	1 x 315	1 x 315	1 x 315	1 x 315	1 x 315	1 x 315	1 x 315	1 x 315
1100	183	75		250	250	250	1 x 315	1 x 315	1 x 315	1 x 315	1 x 315	1 x 315
942	157	75		250	250	250	250	250	250	250	250	250
785	131	75		200	200	200	200	200	200	200	200	250
628	105	75		160	160	160	200	200	200	200	200	200
565	94	75		160	160	160	160	160	160	160	160	160
502	84	75		125	160	160	160	160	160	160	160	160
439	73	75		125	125	125	160	160	160	160	160	160
377	63	75		100	125	100	125	125	125	125	125	160
314	52	30		100	100	100	100	100	100	100	100	125
251	42	30		100	100	100	100	100	100	100	100	100
188	31	30		80	100	100	100	100	100	100	100	100
126	21	30		50	50	63	80	80	80	80	80	80
63	10	30		32	32	32	40	40	40	40	40	40
47	8	30		25	32	32	32	32	32	32	32	32
31	5	30		25	25	25	25	25	25	25	25	25

Note:

- Fuses are 442 mm long
- Fuses are only for short circuit protection
- For starting currents lower than 170 A, we recommend the LPCT

It is necessary to delay the tripping of the contactor

Transformer application

Quantity and rated current for Fusarc fuses

These values are approximate. Please check with the actual characteristics of the transformer to determine the fuse rating.

Service voltage (kV)	Transformer rating (kVA)																
	25	50	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500
3	125	125	125	125	125	125	125	125	125	125	160	200	250	2 x 200	2 x 250		
3.3	125	125	125	125	125	125	125	125	125	125	160	200	250	2 x 200	2 x 250		
5	125	125	125	125	125	125	125	125	125	125	125	125	160	200	250	2 x 200	2 x 250
5.5	125	125	125	125	125	125	125	125	125	125	125	125	160	160	250	2 x 200	2 x 250
6	125	125	125	125	125	125	125	125	125	125	125	125	125	160	200	250	2 x 200
6.6	125	125	125	125	125	125	125	125	125	125	125	125	125	160	200	250	2 x 200

For more information, see Fuses catalogue ref. AC0479EN - ART.72747.

Installation

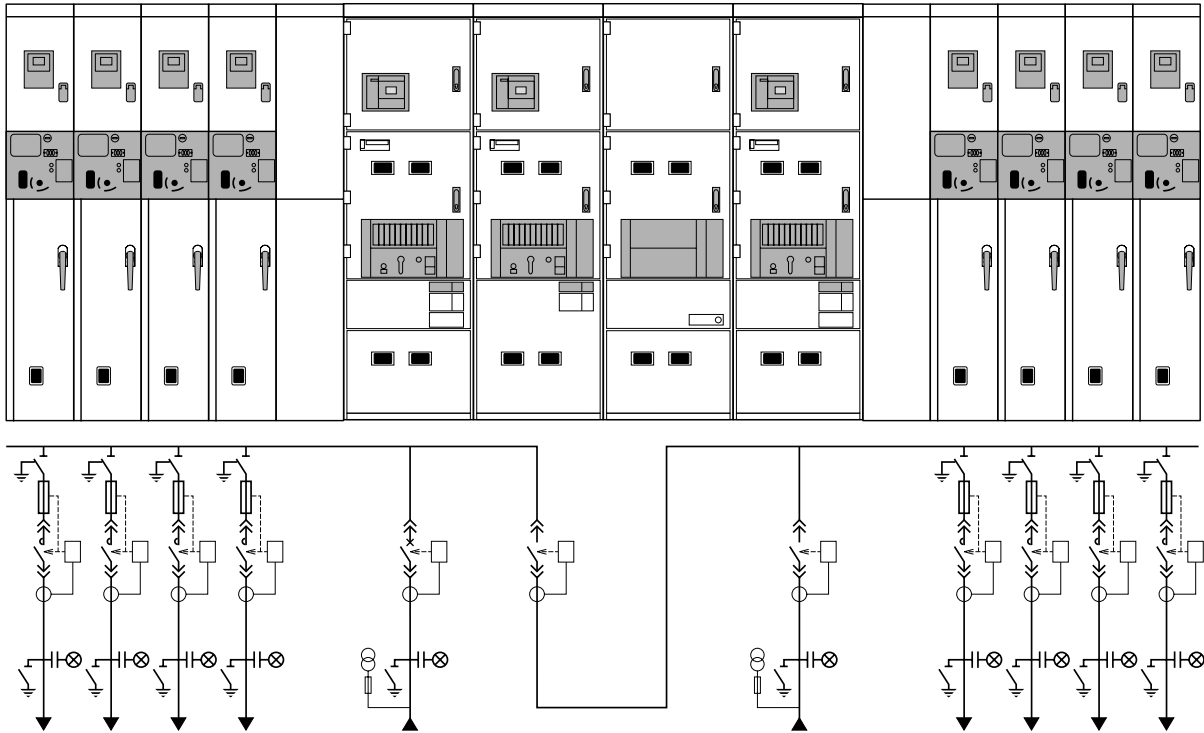
Installation

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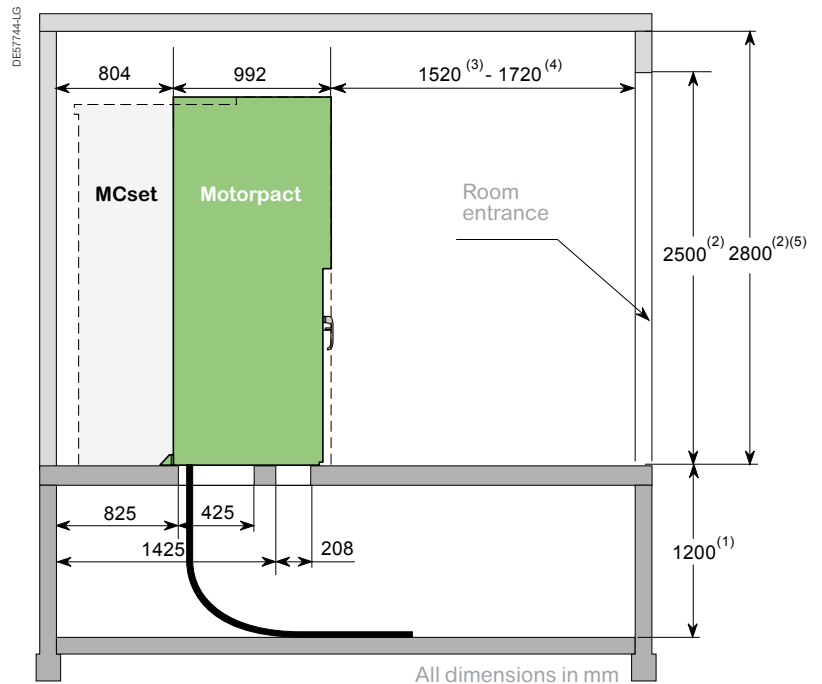
Implementation examples

Lined up switchboard

DE55905-C



Civil engineering with utility space



Notes:

(1) Minimum dimensions to be defined according to the cable bending radius.

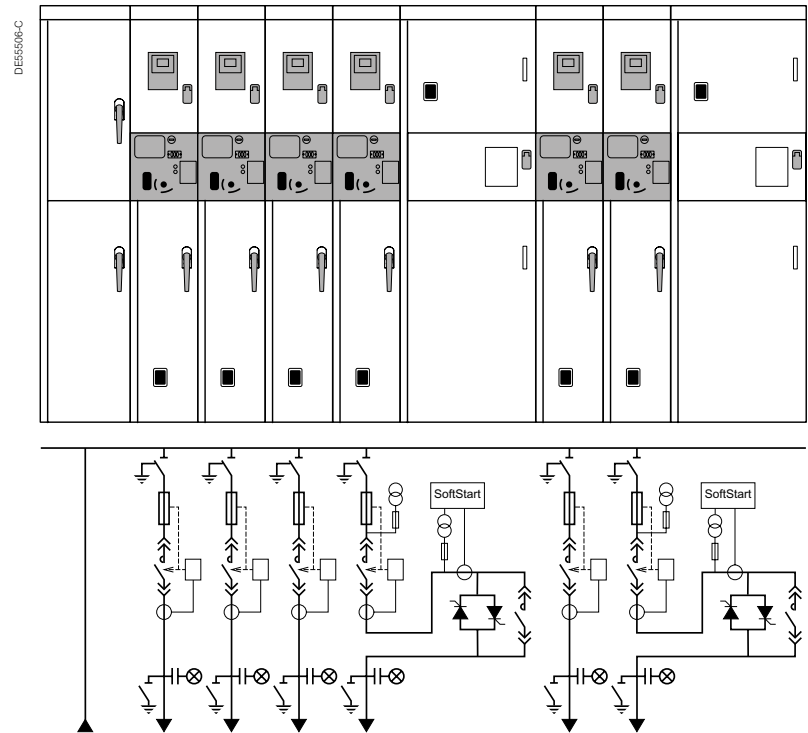
For lined up switchboard with MCset:

- (2) Minimum dimensions to be complied with when installing the MCset switchboard
- (3) Operating distance
- (4) Distance needed to extract a functional unit from the switchboard without moving the other units
- (5) Provide an exhaust tunnel above the switchboard when the room height is less than 4 metres

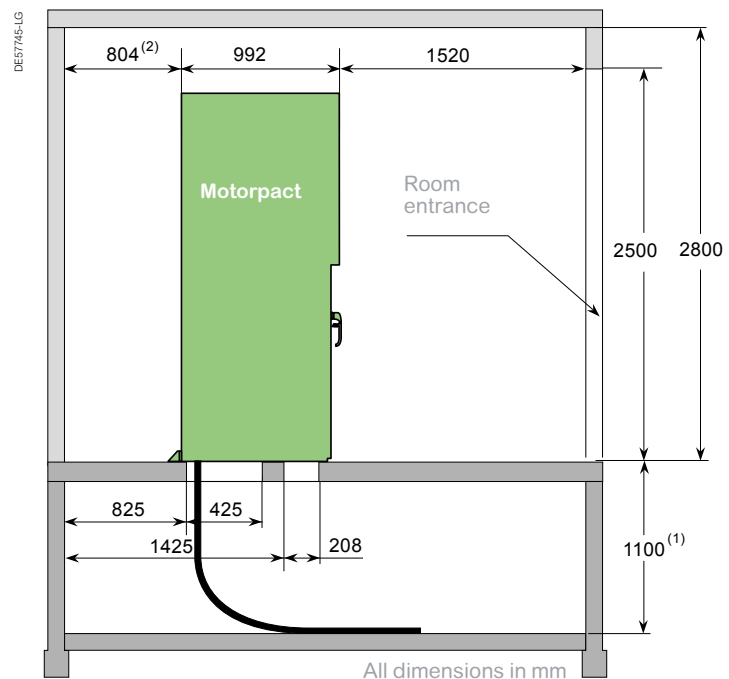
For further information, refer to the civil engineering, user and instruction manual.

Implementation examples

Stand-alone switchboard



Civil engineering with utility space for front and rear access



Notes:

- (1) Minimum dimensions to be defined according to the cable bending radius
- (2) Can be placed against the wall for single core cable applications or for single and three core applications if utility space provides bottom access for three core preparation and installation

For further information, refer to the civil engineering, user and instruction manual.

Schneider Electric services

Schneider Electric services

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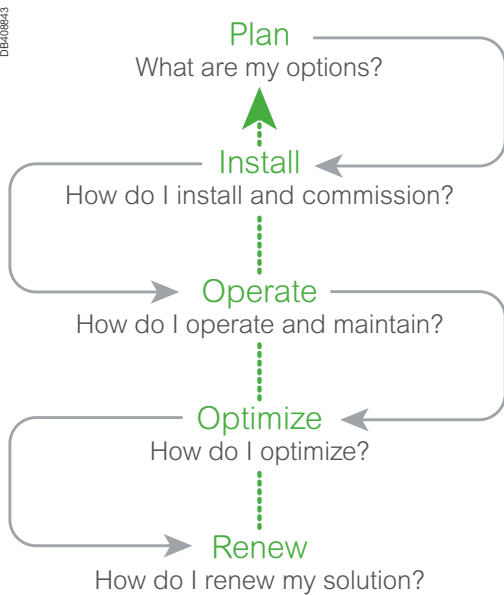
Schneider Electric Services

Peace of mind throughout your installation life cycle

How can you cut costs and improve performance at the same time?

When it comes to your electrical distribution infrastructure, the answer is straight forward - get professional expertise.

Life cycle services



Plan

Schneider Electric helps you to plan the full design and execution of your solution, looking at securing your process and optimising your time:

- **Technical feasibility studies:**
Accompany customer to design solution in his given environment
- **Preliminary design:**
Accelerate turn around time to come to a final solution design

Install

Schneider Electric will help you to install efficient, reliable and safe solutions based on your plans.

- **Project Management:**
Designed to help you complete your projects on time and within budget
- **Commissioning:**
Ensures your actual performance versus design, through on site testing & commissioning, tools & procedures

Operate

Schneider Electric helps you maximise your installation uptime and control your capital expenditures through its services offering.

- **Asset Operation Solutions:**
The information you need to increase safety, enhance installation training performance, and optimise asset maintenance and investment
- **Advantage Service Plans:**
Customised services plans which cover preventive, predictive and corrective maintenance
- **On site Maintenance services:**
Extensive knowledge and experience in electrical distribution maintenance
- **Spare parts management:**
Ensure spare parts availability and optimised maintenance budget of your spare parts
- **Technical Training:**
To build up necessary skills and competencies, in order to properly operate your installations in safety

Optimise

Schneider Electric propose recommendations for improved safety, availability, reliability & quality.

- **MP4 Electrical Assessment:**
Define improvement & risk management program

Schneider Electric Services

Peace of mind throughout your installation life cycle

When it comes to your electrical distribution installation, we can help you:

- Increase productivity, reliability, and safety
- Mitigate risk and limit downtime
- Keep equipment up to date and extend lifespan
- Cut cost and increase savings
- Improve your return on investment

CONTACT US!

www.schneider-electric.com/b2b/en/services/

Renew

Schneider Electric extends the life of your system while providing upgrades.

Schneider Electric offers to take full responsibility for the end-of-life processing of old electrical equipments.

- **ECOFIT™:**
Keep up to date & improve performances of your electrical installations (LV,MV, Protection Relays...)
- **MV product End of life:**
Recycle & recover outdated equipment with end of life services

Frequency of maintenance intervention

Schneider Electric equipment manufacturers recommend a schedule for maintenance activities to extend Electrical Distribution equipment performance over time. Frequencies under normal/healthy operation (minor equipment criticality and optimal environmental conditions) can be generally defined as follows:

Maintenance	Min. freq. ⁽¹⁾	Who		
		Manufacturer	Certified Partner	End user
Exclusive	every 4 years	●		
Advanced	every 2 years	●	●	
Light	every 1 year	●	●	●

(1) Recommended under normal operating conditions (minor equipment criticality and optimal environmental conditions). However, this recommended frequency should be increased according to:
 a) the level of criticality (low, major, critical)
 b) the severity of environment conditions (i.e.corrosive, naval, offshore) following recommendations of Manufacturer's services.

ProDiag Breaker

Diagnosis of MV and LV Circuit Breakers

ProDiag Breaker Objectives

Your priority is to enhance the reliability of your installation:

- To ensure its continuity of service,
- To minimize the time for maintenance & repair
- To perform maintenance

Only on the equipment requiring it and only when necessary (conditional preventive maintenance)

ProDiag Breaker is part of ProDiag preventive maintenance plan.

What is ProDiag Breaker?

ProDiag Breaker is a Schneider Electric diagnosis tool.

ProDiag Breaker compares the mechanical and electrical parameters measured during the full operation of circuit breakers with the data collected from our production facilities. This allows detecting possible failure in advance. It measures, records and displays on a screen the key electrical parameters in MV and LV circuit breakers, relating to opening, closing and springloading operations.

All this data is automatically compared with the criteria for the circuit breaker designated in the software, which indicates which values are within the acceptable range, which are on the limit and which are outside it.

Two tests are always performed on each circuit breakers, one at minimum voltage and one at nominal voltage. A written report is generated and provided by Schneider Electric so that the customer can use it as a tool to define the necessary corrective action (maintenance, repair or replacement).

Evaluation of circuit breakers using ProDiag Breaker includes:

- Evaluation of the operating mechanism
- Measurement and comparison of the actual contact resistance with that specified by the manufacturer
- Measurement and comparison of the insulation resistance
- Evaluation of the general circuit breaker conditions based on the captured data

Moreover, analysis of the ProDiag Breaker time/ travel curve combined with the current curve of the coil and phase contact detects possible faults, such as:

- Worn out latches and operating mechanisms
- Faulty coils
- Mechanical wear and tear and hardening of lubricating grease
- Defective shock absorbers
- Defective simultaneous contact operation (opening/closing)
- Some maintenance programmes involve dismantling the circuit breaker mechanism to check its condition. ProDiag Breaker using signals captured from the circuit breaker operation, reduces maintenance costs compared with programs which check the circuit breakers manually

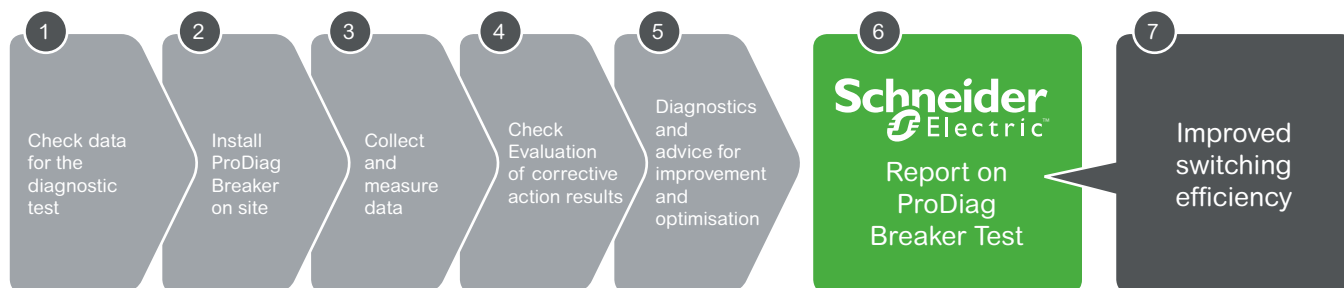


ProDiag Breaker

Diagnosis of MV and LV Circuit Breakers

Where can ProDiag Breaker reduce costs?

- ProDiag Breaker significantly reduces the time taken to identify potential faults in a circuit breaker, using operational analysis rather than inspection and mechanical re-sets
- The software analyses the captured data and identifies the specific problem area
- A device's normal operating life is increased by timely diagnostics of when and what repairs are necessary
- The tool comprises both hardware and software, resulting in a highly efficient predictive maintenance program



Results

ProDiag Breaker provides a report of the complete nature of the circuit breaker, detailing: closing / opening time, contact simultaneity, bounce and resistance, mechanical closing and opening forces.

This report enables any required maintenance to be targeted and time in order to optimize the customer's maintenance plan.

ProDiag Corona

Diagnostics of partial discharges

ProDiag Corona Objectives

Your priority is to have fast Electrical equipment inspection without shutdown

Safety (Human Life and asset)

- Enhance the reliability of your installation
- Optimisation of installation life duration & costs

Risks prevention from:

- Partial discharges and internal arc
- Dielectric degradation
- Electrical Fire

ProDiag Corona diagnostic can be realized on most Medium Voltage equipment on the market equipped with VIS.

What is ProDiag Corona?

ProDiag Corona is a Schneider Electric diagnosis tool.

ProDiag Corona detects partial discharges in Medium Voltage cubicles.

- Partial Discharge occurs across part of the insulation between two conducting electrodes, without completely bridging the gap
- Partial discharge can happen under normal working conditions as a result of insulation breakdown due to premature aging caused by thermal or electrical over-stressing of the high voltage system

ProDiag Corona analyses the primary electrical signal through VIS (Voltage Indicator System) fixed on the switchboards. Measurements are taken by an electronic sensor and the data is transmitted to the ProDiag Corona software in order to evaluate the level of criticality of the controlled equipment.

A written report is generated, which will be handed over by Schneider Electric so that the customer can use it as a tool to define the necessary corrective action, whether maintenance, repair or replacement.

ProDiag Corona is not a certification tool.

ProDiag Corona executes the assessment of the energized equipment, without any shutdown and then without disruption for the users.

This system allows you to control all types of the most common partial discharges:

- Internal partial discharges
- Surface partial discharge
- Corona effect

Where can ProDiag Corona reduce costs?

ProDiag Corona significantly reduces the time taken to identify potential faults in a switch, without electrical shutdown.

A device's normal operating life is increased by timely diagnostics of when and what repairs are necessary. ProDiag Corona is a trouble shooting anticipation tool which can avoid internal arc risks and untimely tripping.

- The tool comprises both hardware and software, resulting in a highly efficient preventive maintenance program

Results

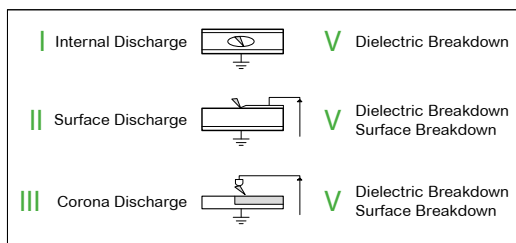
ProDiag Corona provides a report of the complete electrical room, detailing: ventilation, air filtration, due point calculation, level of criticality of each set of equipment, constructor recommendations on any potential maintenance, repair & rehabilitation.

This report enables any required maintenance to be targeted and timed to optimize the customer's maintenance plan.

ProDiag Corona is performed thanks to XDP2 testing equipment from NDB technology.



PE607530



DE607539

ProDiag Fuse

Proprietary and standards diagnostics tools

ProDiag Fuse Objectives

The purpose of ProDiag Fuse (a proprietary hardware-software solution) is to mitigate the risks on MV switchgear and equipment by fuses of faults or drifts causing unwanted effects.

The result of fuse ageing is the destruction of filaments that can lead to thermal runaway, partial damage, complete destruction of MV switchgear and equipment, or even destruction of the electrical room.

Customer needs

Electrical power installations protected by MV switchgear with fuse protection should be regularly checked (for correct assembly, electrical parameters, etc.) to confirm that their characteristics correspond to the original specification. Regular diagnosis of fuse performance (electrical parameters, resistance) according to the manufacturer's recommendations is necessary to secure the ED installation and its service continuity, which are important for customers.

The ProDiag Fuse diagnostic solution can be used on MV switchgear protected by fuses that have not received any maintenance intervention in the last four years (under normal operating conditions, and less if operating in severe environments or depending on their criticality in the installation).

Customer benefits

ProDiag Fuse helps customers visualise, discover, and understand MV switchgear fuse ageing and wear and tear as compared to the original fuse manufacturers' technical specification.

ProDiag Fuse monitors the performance of MV switchgear fuses. Thanks to ProDiag Fuse, maintenance managers can implement, manage, and enrich their maintenance plans. Schneider Electric FSRs conclude their on-site interventions with an exhaustive report on the MV switchgear fuses conformity/non-conformity. If a MV fuse is declared non-conforming, Schneider Electric suggests a corrective plan that includes fuse replacement to regain original performance in safety and service continuity.

Customers can augment their preventive maintenance plans with this corrective action at the most convenient time for each ED device.



Unique value for customer vs standard market tools

Electrical parameter measurements (resistance, etc.) on MV switchgear fuses at customer sites are taken by a test tool and transmitted to the Schneider Electric FSRs' ProDiag Fuse software. Data are compared to those of a fuse manufacturers' technical database.

The aim is to determine whether recorded measurements are within the acceptable range, at the limit, or fall outside it, as criteria for MV switchgear fuse conformity.

As an ED equipment manufacturer, Schneider Electric is uniquely positioned to develop and invest in specific tests tools, proprietary software, and testing methodology to collect reliable measurements from MV switchgears fuses.

ProDiag Fuse measures a larger number of parameters than standard market tools. It delivers best-in-class MV switchgear fuse diagnostics.

Schneider Electric scope: Schneider Electric fuses and main market fuses players.

Order form

Order form

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SoftStart asynchronous motor starter	
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FVR Order form

Full Voltage Reversing asynchronous motor starter

- Only one of the boxes (ticked or filled by the needed value) have to be considered between each horizontal line.
- Green box corresponds to non priced standard features included in the base price.

Basic unit cubicle				Quantity
Rated voltage	3.6 kV	<input type="checkbox"/>	7.2 kV	<input type="checkbox"/>
Rated short time withstand current	25 kA 3 s	<input checked="" type="checkbox"/>	31.5 kA 3 s	<input type="checkbox"/>
	40 kA 3 s	<input type="checkbox"/>	50 kA 3 s	<input type="checkbox"/>
Busbar	Bare		Encapsulated	
Rated current	630 A	<input type="checkbox"/>	1250 A	<input type="checkbox"/>
	2500 A	<input type="checkbox"/>	3150 A	<input type="checkbox"/>
Rated operational current	200 A		400 A	450 A
Degree of protection (housing)	IP2X	<input type="checkbox"/>	IP3X	<input checked="" type="checkbox"/>
	IP4X	<input type="checkbox"/>	IPX1	<input type="checkbox"/>
Maintenance free disconnecter	<input type="checkbox"/>			

Options

Internal arc withstand	25 kA -1 s / 40 kA -0.5 s / 50 kA -0.25 s			
Ceiling height	< 4 m	<input type="checkbox"/>	> 4 m	<input type="checkbox"/>
Thermal diagnosis system	<input type="checkbox"/>			
Cable earthing switch	<input type="checkbox"/>			
Voltage presence indicator system (VPIS)	<input type="checkbox"/>			
Heating element	<input type="checkbox"/>			
Back light (disconnecter contacts & load compartment)	<input type="checkbox"/>			
Key interlockings	<input type="checkbox"/>			
Line disconnecter				2O + 1C
Cable earthing switch				1O or 1C
Power factor correction	Voltage (kV)	<input type="checkbox"/>	Power (kVA)	<input type="checkbox"/>
	(see the list page 74)			

Main fused contactor

Removable vacuum contactor	Electrically held				Basic equipment	
	Mechanically latched				<input type="checkbox"/>	
	Open release				125 Vac	250 Vac
					125 Vdc	250 Vdc
MV fuses	50 A	<input type="checkbox"/>	63 A	<input type="checkbox"/>	80 A	<input type="checkbox"/>
	160 A	<input type="checkbox"/>	200 A	<input type="checkbox"/>	250 A	<input type="checkbox"/>
			2 x 250 A		2 x 315 A	<input type="checkbox"/>
Cable connection	Bottom			Top		
	1 cable/phase (max. 240 mm ²)			2 cables/phase (max. 120 mm ²)		
Blown fuse indicator	<input type="checkbox"/>					

Options

Mechanical operation counter	<input type="checkbox"/>
Surge arrestors (line side)	<input type="checkbox"/>
Fused control power transformer (CPT)	<input type="checkbox"/>
Fused voltage transformer	<input type="checkbox"/>

Protection, metering and control

Sepam digital relay (see Sepam catalogue)	M20	<input checked="" type="checkbox"/>	Other	<input type="checkbox"/>
Web Remote Monitoring option	<input type="checkbox"/>			
Local control	<input type="checkbox"/>			
	2 push buttons, 2 indication lights	<input checked="" type="checkbox"/>	L/R switch	<input type="checkbox"/>
Phase current sensors	5 A CT	<input type="checkbox"/>	1 A CT	<input type="checkbox"/>
	LPCT	<input checked="" type="checkbox"/>		
Zero sequence current sensors	ZSCT	<input type="checkbox"/>	CSH 120	<input type="checkbox"/>
	CSH 200	<input type="checkbox"/>	CSH 280	<input type="checkbox"/>

Sepam options

Additional logic I/O's module	MES114	<input type="checkbox"/>
Analog output module	MSA141	<input type="checkbox"/>
Temperature sensor acquisition module	MET148	<input type="checkbox"/>
Modbus communication interface	ACE949	<input type="checkbox"/>

RVAT Order form

Auto-transformer asynchronous motor starter

- Only one of the boxes (ticked or filled by the needed value) have to be considered between each horizontal line.
- Green box corresponds to non priced standard features included in the base price.

Basic unit cubicle				Quantity
Rated voltage	3.6 kV <input type="checkbox"/>		7.2 kV <input type="checkbox"/>	
Rated short time withstand current				
	25 kA 3 s <input type="checkbox"/>	31.5 kA 3 s <input type="checkbox"/>	40 kA 3 s <input type="checkbox"/>	50 kA 3 s <input type="checkbox"/>
Busbar		Bare <input type="checkbox"/>	Encapsulated <input type="checkbox"/>	
Rated current	630 A <input type="checkbox"/>	1250 A <input type="checkbox"/>	2500 A <input type="checkbox"/>	3150 A <input type="checkbox"/>
Rated operational current		200 A <input type="checkbox"/>	400 A <input type="checkbox"/>	450 A <input type="checkbox"/>
Degree of protection (housing)	IP2X <input type="checkbox"/>	IP3X <input type="checkbox"/>	IP4X <input type="checkbox"/>	IPX1 <input type="checkbox"/>
Maintenance free disconnecter	<input type="checkbox"/>			

Options

Internal arc withstand	25 kA -1 s / 40 kA - 0.5 s / 50 kA -0.25 s <input type="checkbox"/>		
Ceiling height	< 4 m <input type="checkbox"/>	> 4 m <input type="checkbox"/>	
Thermal diagnosis system	<input type="checkbox"/>		
Cable earthing switch	<input type="checkbox"/>		
Voltage presence indicator system (VPIS)	<input type="checkbox"/>		
Heating element	<input type="checkbox"/>		
Back light (disconnecter contacts & load compartment)	<input type="checkbox"/>		
Key interlockings	<input type="checkbox"/>		
Line disconnecter			2O + 1C <input type="checkbox"/>
Cable earthing switch			1O or 1C <input type="checkbox"/>
Power factor correction	Voltage (kV) <input type="checkbox"/>	Power (kVA) <input type="checkbox"/>	
	(see the list page 74)		

Main fused contactor

Removable vacuum contactor					
Electrically held				Basic equipment	
Mechanically latched					
Open release					
			125 Vac <input type="checkbox"/>	250 Vac <input type="checkbox"/>	
		48 Vdc <input type="checkbox"/>	125 Vdc <input type="checkbox"/>	250 Vdc <input type="checkbox"/>	
MV fuses	50 A <input type="checkbox"/>	63 A <input type="checkbox"/>	80 A <input type="checkbox"/>	100 A <input type="checkbox"/>	125 A <input type="checkbox"/>
	160 A <input type="checkbox"/>	200 A <input type="checkbox"/>	250 A <input type="checkbox"/>	2 x 250 A <input type="checkbox"/>	2 x 315 A <input type="checkbox"/>
Cable connection	Bottom <input type="checkbox"/>			Top <input type="checkbox"/>	
	1 cable/phase (max. 240 mm ²) <input type="checkbox"/>			2 cables/phase (max. 120 mm ²) <input type="checkbox"/>	
Blown fuse indicator	<input type="checkbox"/>				

Options

Mechanical operation counter	<input type="checkbox"/>
Surge arrestors (line side)	<input type="checkbox"/>
Fused control power transformer (CPT)	<input type="checkbox"/>
Fused voltage transformer	<input type="checkbox"/>

Auto-transformer module

1 auto-transformer	<input type="checkbox"/>
1 run vacuum contactor (electrically held)	<input type="checkbox"/>
1 start vacuum contactor (electrically held)	<input type="checkbox"/>

Options

Mechanical operation counter	<input type="checkbox"/>
Contact position indication windows	<input type="checkbox"/>

The auto-transformer is designed according to the motor requirements:

Nominal power	<input type="text"/>
Service voltage	<input type="text"/>
Nominal current	<input type="text"/>
Frequency	<input type="text"/>
Starting current	<input type="text"/>
Starting time (motor)	<input type="text"/>
Starting time (motor + auto-transformer)	<input type="text"/>
Number of starts/hour	<input type="text"/>
Number of consecutive starts	<input type="text"/>

Protection, metering and control

Sepam digital relay (see Sepam catalogue)	M41 <input type="checkbox"/>	Other <input type="checkbox"/>
Web Remote Monitoring option	<input type="checkbox"/>	
Local control	<input type="checkbox"/>	
	2 push buttons, 2 indication lights <input type="checkbox"/>	L/R switch <input type="checkbox"/>
Phase current sensors	5 A CT <input type="checkbox"/>	1 A CT <input type="checkbox"/>
Zero sequence current sensors	ZSCT <input type="checkbox"/>	CSH 120 <input type="checkbox"/>
		CSH 200 <input type="checkbox"/>
		CSH 280 <input type="checkbox"/>
		Sepam 100MI <input type="checkbox"/>

Sepam options

Additional logic I/O's module	MES114 <input type="checkbox"/>
Analog output module	MSA141 <input type="checkbox"/>
Temperature sensor acquisition module	MET148 <input type="checkbox"/>
Modbus communication interface	ACE949 <input type="checkbox"/>

RVSS Order form

SoftStart asynchronous motor starter

- Only one of the boxes (ticked or filled by the needed value) have to be considered between each horizontal line.
- Green box corresponds to non priced standard features included in the base price.

Basic unit cubicle				Quantity
Rated voltage	3.6 kV <input type="checkbox"/>		7.2 kV <input type="checkbox"/>	
Rated short time withstand current				
	25 kA 3 s <input checked="" type="checkbox"/>	31.5 kA 3 s <input type="checkbox"/>	40 kA 3 s <input type="checkbox"/>	50 kA 3 s <input type="checkbox"/>
Busbar		Bare <input checked="" type="checkbox"/>	Encapsulated <input type="checkbox"/>	
Rated current	630 A <input type="checkbox"/>	1250 A <input type="checkbox"/>	2500 A <input type="checkbox"/>	3150 A <input type="checkbox"/>
Rated operational current			200 A <input checked="" type="checkbox"/>	400 A <input type="checkbox"/>
Degree of protection (housing)	IP2X <input type="checkbox"/>	IP3X <input checked="" type="checkbox"/>	IP4X <input type="checkbox"/>	IPX1 <input type="checkbox"/>
Maintenance free disconnecter				<input checked="" type="checkbox"/>

Options

Internal arc withstand	25 kA -1 s / 40 kA - 0.5 s / 50 kA -0.25 s		
Ceiling height	< 4 m <input type="checkbox"/>	> 4 m <input type="checkbox"/>	
Thermal diagnosis system	<input type="checkbox"/>		
Cable earthing switch	<input type="checkbox"/>		
Voltage presence indicator system (VPIS)	<input type="checkbox"/>		
Heating element	<input type="checkbox"/>		
Back light (disconnecter contacts & load compartment)	<input type="checkbox"/>		
Key interlockings	<input type="checkbox"/>		
Line disconnecter			2O + 1C <input type="checkbox"/>
Cable earthing switch			1O or 1C <input type="checkbox"/>
Power factor correction	Voltage (kV) <input type="checkbox"/>	Power (kVA) <input type="checkbox"/>	
	(see the list page 74)		

Main fused contactor

Removable vacuum contactor	<input type="checkbox"/>			
Electrically held				Basic equipment <input type="checkbox"/>
Mechanically latched	<input type="checkbox"/>			
Open release			125 Vac <input checked="" type="checkbox"/>	250 Vac <input checked="" type="checkbox"/>
	48 Vdc <input checked="" type="checkbox"/>	125 Vdc <input checked="" type="checkbox"/>	250 Vdc <input checked="" type="checkbox"/>	
MV fuses	50 A <input type="checkbox"/>	63 A <input type="checkbox"/>	80 A <input type="checkbox"/>	100 A <input type="checkbox"/>
	160 A <input type="checkbox"/>	200 A <input type="checkbox"/>	250 A <input type="checkbox"/>	2 x 250 A <input type="checkbox"/>
			2 x 315 A <input type="checkbox"/>	2 x 315 A <input type="checkbox"/>
Cable connection	Bottom <input checked="" type="checkbox"/>		Top <input type="checkbox"/>	
	1 cable/phase (max. 240 mm ²) <input type="checkbox"/>		2 cables/phase (max. 120 mm ²) <input type="checkbox"/>	
Blown fuse indicator	<input type="checkbox"/>			

Options

Mechanical operation counter	<input type="checkbox"/>
Surge arrestors (line side)	<input type="checkbox"/>
Fused control power transformer (CPT)	Basic equipment <input type="checkbox"/>
Fused voltage transformer	Basic equipment <input type="checkbox"/>

Protection, metering and control (optional)

Sepam digital relay (see Sepam catalogue)	<input type="checkbox"/>			
Web Remote Monitoring option	<input type="checkbox"/>			
Local control	<input type="checkbox"/>			
2 push buttons, 2 indication lights	L/R switch <input type="checkbox"/>	Sepam 100MI <input type="checkbox"/>		
Phase current sensors	5 A CT <input type="checkbox"/>	1 A CT <input type="checkbox"/>	LPCT <input checked="" type="checkbox"/>	
Zero sequence current sensors	ZSCT <input type="checkbox"/>	CSH 120 <input type="checkbox"/>	CSH 200 <input type="checkbox"/>	CSH 280 <input type="checkbox"/>

Sepam options

Additional logic I/O's module	MES114 <input type="checkbox"/>
Analog output module	MSA141 <input type="checkbox"/>
Temperature sensor acquisition module	MET148 <input type="checkbox"/>
Modbus communication interface	ACE949 <input type="checkbox"/>

SoftStart module (includes basic protection, metering and control)

1 SoftStart module	<input type="checkbox"/>
1 by-pass vacuum contactor (electrically held)	<input type="checkbox"/>
Voltage measurement	<input type="checkbox"/>
1 set of current sensors	<input type="checkbox"/>

Options

Mechanical operation counter	<input type="checkbox"/>
------------------------------	--------------------------

Transformer feeder Order form

- Only one of the boxes (ticked or filled by the needed value) have to be considered between each horizontal line.
- Green box corresponds to non priced standard features included in the base price.

Basic unit cubicle				Quantity
Rated voltage	3.6 kV <input type="checkbox"/>		7.2 kV <input type="checkbox"/>	
Rated short time withstand current		25 kA 3 s <input checked="" type="checkbox"/>	31.5 kA 3 s <input type="checkbox"/>	40 kA 3 s <input type="checkbox"/>
			50 kA 3 s <input type="checkbox"/>	
Busbar		Bare <input checked="" type="checkbox"/>		Encapsulated <input type="checkbox"/>
Rated current	630 A <input type="checkbox"/>	1250 A <input type="checkbox"/>	2500 A <input type="checkbox"/>	3150 A <input type="checkbox"/>
Rated operational current		200 A <input checked="" type="checkbox"/>	400 A <input type="checkbox"/>	450 A <input type="checkbox"/>
Degree of protection (housing)	IP2X <input type="checkbox"/>	IP3X <input checked="" type="checkbox"/>	IP4X <input type="checkbox"/>	IPX1 <input type="checkbox"/>
Maintenance free disconnecter				<input checked="" type="checkbox"/>

Options

Internal arc withstand	25 kA - 1 s / 40 kA - 0.5 s / 50 kA - 0.25 s	<input type="checkbox"/>
Ceiling height	< 4 m <input type="checkbox"/>	> 4 m <input type="checkbox"/>
Thermal diagnosis system		<input type="checkbox"/>
Cable earthing switch		<input type="checkbox"/>
Voltage presence indicator system (VPIS)		<input type="checkbox"/>
Heating element		<input type="checkbox"/>
Back light (disconnecter contacts & load compartment)		<input type="checkbox"/>
Key interlockings		<input type="checkbox"/>
Line disconnecter		2O + 1C <input type="checkbox"/>
Cable earthing switch		1O or 1C <input type="checkbox"/>
Power factor correction	Voltage (kV) <input type="checkbox"/>	Power (kVA) <input type="checkbox"/>
	(see the list page 74)	

Main fused contactor

Removable vacuum contactor				
	Electrically held		Basic equipment	
	Mechanically latched			<input type="checkbox"/>
	Open release		125 Vac <input checked="" type="checkbox"/>	250 Vac <input type="checkbox"/>
		48 Vdc <input checked="" type="checkbox"/>	125 Vdc <input checked="" type="checkbox"/>	250 Vdc <input type="checkbox"/>
MV fuses	50 A <input type="checkbox"/>	63 A <input type="checkbox"/>	80 A <input type="checkbox"/>	100 A <input type="checkbox"/>
	160 A <input type="checkbox"/>	200 A <input type="checkbox"/>	250 A <input type="checkbox"/>	2 x 250 A <input type="checkbox"/>
Cable connection		Bottom <input checked="" type="checkbox"/>		Top <input type="checkbox"/>
	1 cable/phase (max. 240 mm ²) <input type="checkbox"/>		2 cables/phase (max. 120 mm ²) <input type="checkbox"/>	
Blown fuse indicator				<input type="checkbox"/>

Options

Mechanical operation counter	<input type="checkbox"/>
Surge arrestors (line side)	<input type="checkbox"/>
Fused control power transformer (CPT)	<input type="checkbox"/>
Fused voltage transformer	<input type="checkbox"/>

Protection, metering and control (optional)

Sepam digital relay (see Sepam catalogue)	T20 <input checked="" type="checkbox"/>		Other <input type="checkbox"/>
Web Remote Monitoring option			<input type="checkbox"/>
Local control			
	2 push buttons, 2 indication lights <input checked="" type="checkbox"/>	L/R switch <input type="checkbox"/>	Sepam 100MI <input type="checkbox"/>
Phase current sensors		5 A CT <input type="checkbox"/>	1 A CT <input type="checkbox"/>
			LPCT <input checked="" type="checkbox"/>
Zero sequence current sensors	ZSCT <input type="checkbox"/>	CSH 120 <input type="checkbox"/>	CSH 200 <input type="checkbox"/>
			CSH 280 <input type="checkbox"/>

Sepam options

Additional logic I/O's module	MES114	<input type="checkbox"/>
Analog output module	MSA141	<input type="checkbox"/>
Temperature sensor acquisition module	MET148	<input type="checkbox"/>
Modbus communication interface	ACE949	<input type="checkbox"/>

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18, December, 2017

AMTED302059EN

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ART47999