APPLICATION NOTE

Motor Starting and Protection solutions for Ventilation systems in Greenhouse horticulture

IEC

Grow healthy and tasty crops with our broad range of scalable Motor Starting and Protection solutions for full-speed motor control of your Ventilation systems.

What is a Ventilation system?
Greenhouse horticulture needs dedicated ventilation control to maintain an optimal growing environment while improving the overall efficiency of the plants. The ventilation system is responsible for air circulation and carbon dioxide replenishment. Poor air circulation would otherwise reduce plant activity and could lead to problems with humidity and disease management.

Why you need Motor Starting & Protection solutions for Ventilation systems
Poor air quality and temperature inside greenhouses can cause significant damage to crops and even lead to their complete loss. To ensure the right environmental conditions continue to be provided, the ventilation system must always be up and running. ABB scalable motor starting and protection solutions ensure complete flexibility in choosing the right starter for full-speed motor control of the Ventilation System.

Main benefits

Continuous Operation
Ensure continuous operation and keep your ventilation systems up and running in any condition thanks to reliable ABB products and coordinated solutions.

Compact and Easy to install
Save up to 50% space in the control panel thanks to narrower electronic compact starters and AF contactors while saving time during the installation phase by using our ready-made starter connection kits.

Integrated advanced control & protection
ABB advanced solutions ensure precise, flexible control and measurement of all parameters while providing maximum reliability and protection and driving an intelligent data hub for predictive maintenance and asset management.

Energy efficient system
Make your ventilation starter panel energy-efficient thanks to AF technology, which ensures an 80% reduction in contactor coil consumption, less heat dissipation and reduced temperature rise, thereby allowing installation density in the panel to be increased.

Controlled Environment Agriculture

Controlled Environment Agriculture (CEA) combines engineering, plant science and computer-managed greenhouse control technologies to optimize plant growing systems, plant quality and production efficiency.

CEA provides protection and maintains optimal growing conditions throughout crop development. Production takes place within an enclosed growing structure such as a greenhouse or building.
Plants are often grown using hydroponic methods to supply the root zone with the proper amounts of water and nutrients. CEA optimizes the use of resources such as water, energy, space, capital and labor. The most relevant variables controllable through CEA are:

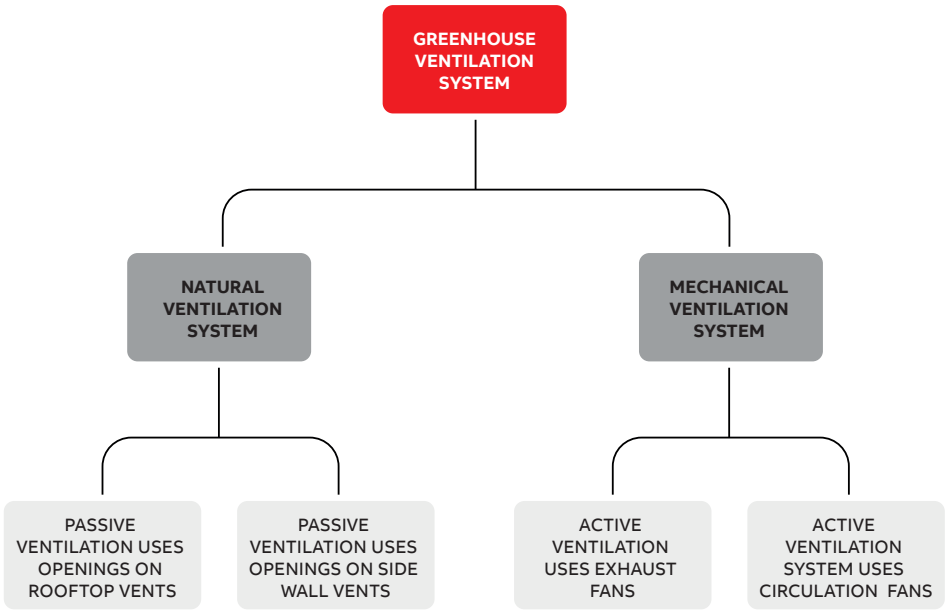
- **Nutrients and Irrigation**
- **Temperature and humidity**
- **CO_2 supply**
- **Light**
  (intensity, spectrum, duration and intervals)

Ventilation systems in Greenhouse Horticulture

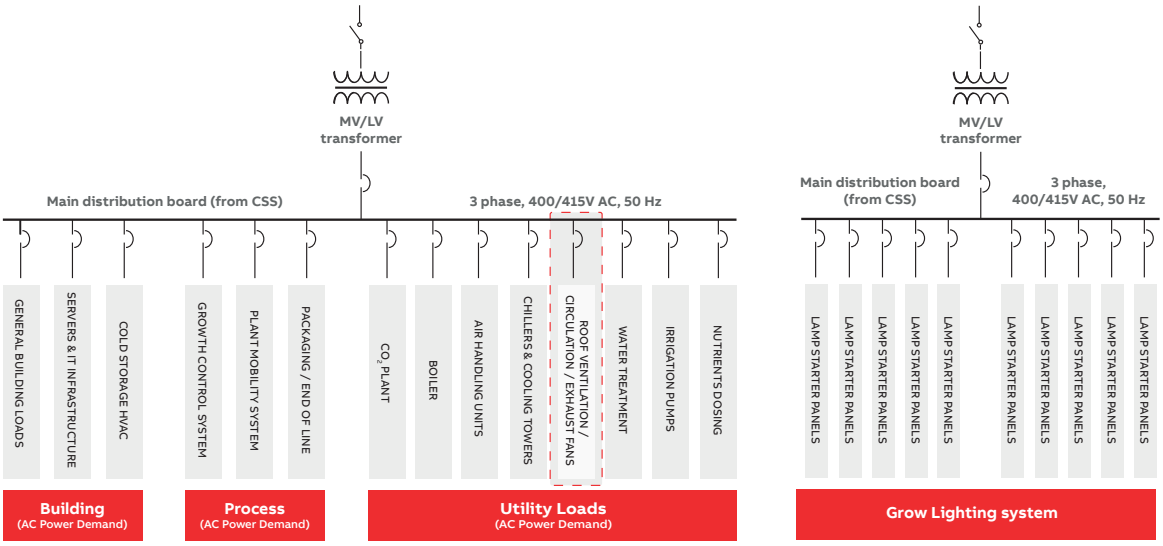
Good ventilation is critical in maintaining an optimal growing environment and improving the overall efficiency of a greenhouse. It is important for air circulation and carbon dioxide replenishment, while poor air circulation reduces plant activity and can lead to problems with humidity and disease management.

There are 2 main types of ventilation systems in greenhouse horticulture:

- **Passive ventilation**, which uses vents on the rooftop or sides to naturally draw air through the greenhouse.
- **Active ventilation**, which uses equipment to force air into or out of the structure. Fans are the key method for actively venting a greenhouse.



A typical electrical distribution system in a greenhouse

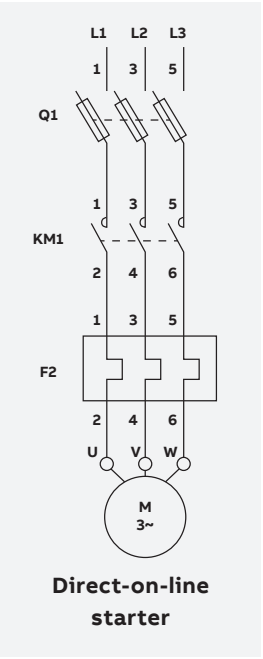


Current rating and starter type

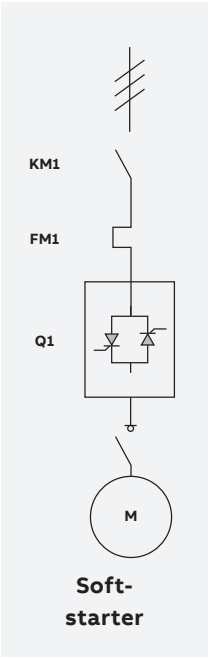
The typical fan rating of a ventilation system is below 16A. In this case, ABB recommends a Direct-online starter & Softstarter if the fans are designed for full-speed running, considering the constant airflow inside the greenhouse.

If adjustable airflow pressure is required inside the greenhouse, then a variable frequency drive is recommended for accurate control of the speed of the inlet and outlet fans.

Recommended starter for ventilation system control



Direct-on-line starter



Soft-starter

Starter panel design parameters:

- Motor rated voltage
- Motor rated current
- Utilization category (AC-3/3e)
- Maximum operating current
- Starting torque depending on fan type
- Acceleration time (starting time)
- Control voltage
- Ambient temperature
- Altitude
- Enclosure type
- Starter type
- Operations - Auto / Manual & Local / Remote
- Digital connectivity (control/monitor).

Main protection functions:

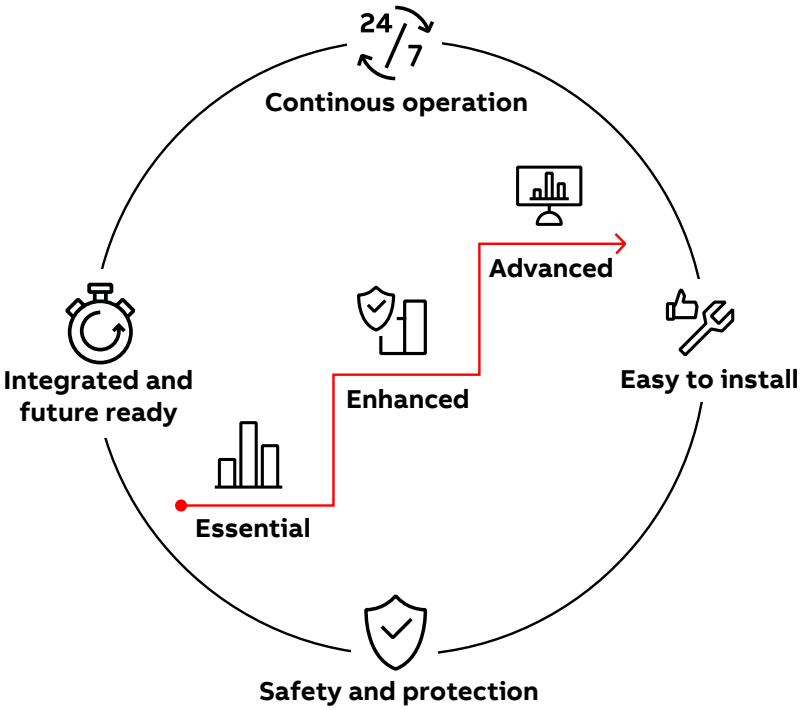
- Short-circuit protection
- Overload protection (with adjustable current setting)
- Voltage level monitoring
- Phase loss & phase sequence – for correct fan running management
- Earth fault protection.

Secondary protection functions:

- Jammed fan – by locked rotor protection
- Broken belt detection – by an undercurrent
- Thermistor motor protection - for monitoring the winding temperature.
- Digital connectivity (control, energy measurements, etc...)
- Safety relays (if required, based on the design).

Motor Starting and Protection solutions for Ventilation systems in Greenhouse horticulture

Discover our Motor Starting and Protection solutions for Ventilation Systems in greenhouses. They always ensure the right environment for flourishing plants.



Essential Solution | Get the essentials right with fast and reliable installations
The Essential Solution ensures that combinations of core power devices function in a coordinated way, thereby guaranteeing continuous operation and ease of installation. In addition, the Essential Solution typically covers the requirements of stand-alone machinery like pumps, compressors, fans, etc.

Enhanced Solution | Get going with our robust protection offering featuring enhanced safety, control and monitoring functions
The Enhanced Solution provides enhanced control, safety and monitoring functions for applications in the discrete automation field. The Enhanced Solution for Ventilation Systems in Greenhouse horticulture includes additional protection functions such as temperature monitoring, a thermistor motor protection relay, under or over voltage monitoring relay, safety relays and more besides. We can address any other requirements to suit end-user requests.

Advanced Solution | Get ahead with smart data and predictive applications to keep your plant running
The Advanced Solution for Ventilation Systems includes integrated and future-ready motor protection, flexible motor control, fault diagnostics, maintenance schedules and supports all major communication protocols.

The table below provides an overview of the possible functions in the different solution offerings for ventilation systems in Greenhouse horticulture.

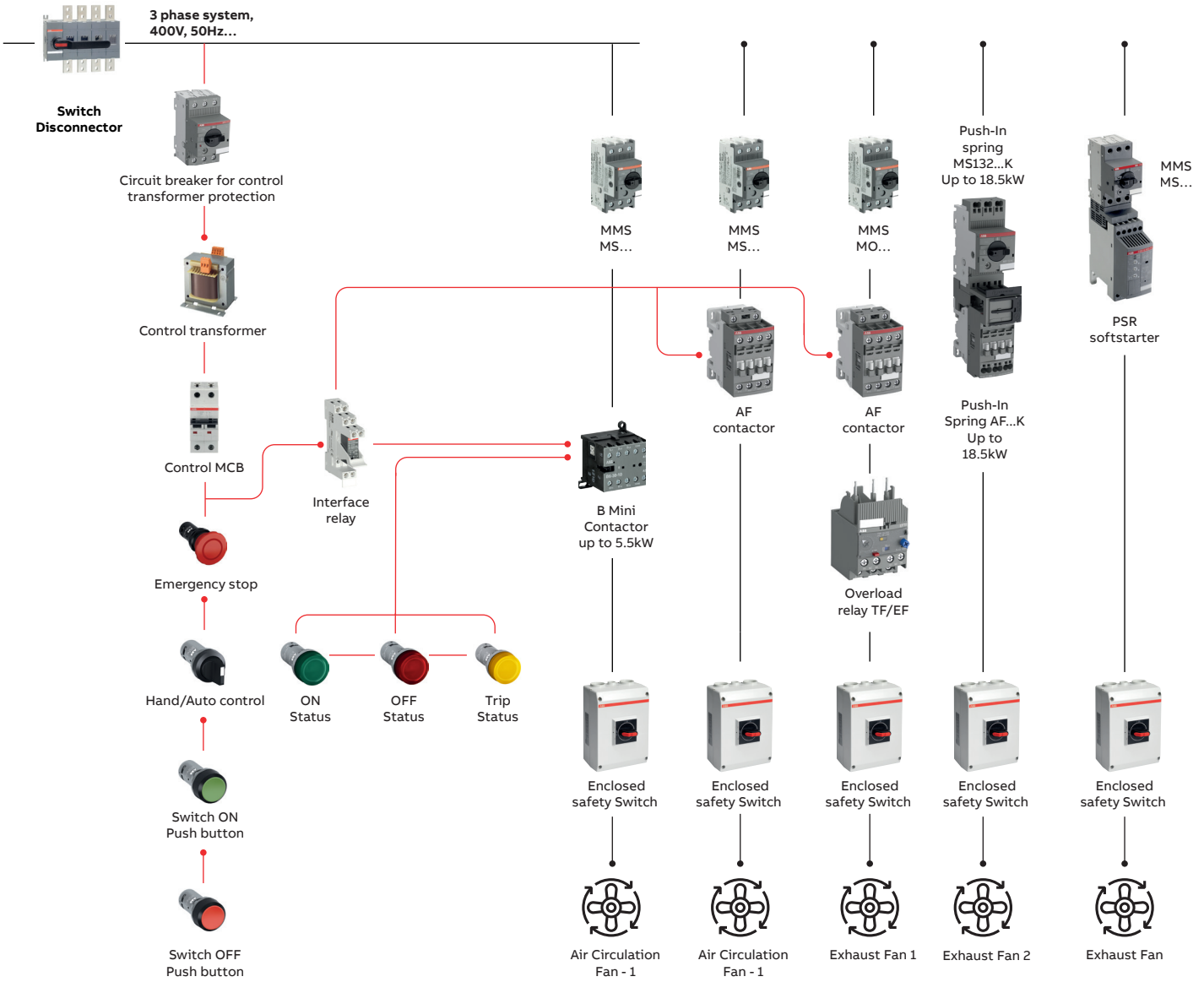
Solution level	Basic protection functions	Monitoring of additional protection functions	Digital connectivity and cloud monitoring
Essential	●		
Enhanced	●	●	
Advanced	●	●	●

ESSENTIAL

The ABB Essential fan starter solution

Fuseless protection with MMS
for motor rating 0.06 kW up to 45 kW

Softstarter with MMS for motor rating 1.5 kW up to 45 kW



The table provides an overview of the difference between the combination products offered in Essential solutions for ventilation systems in greenhouses.

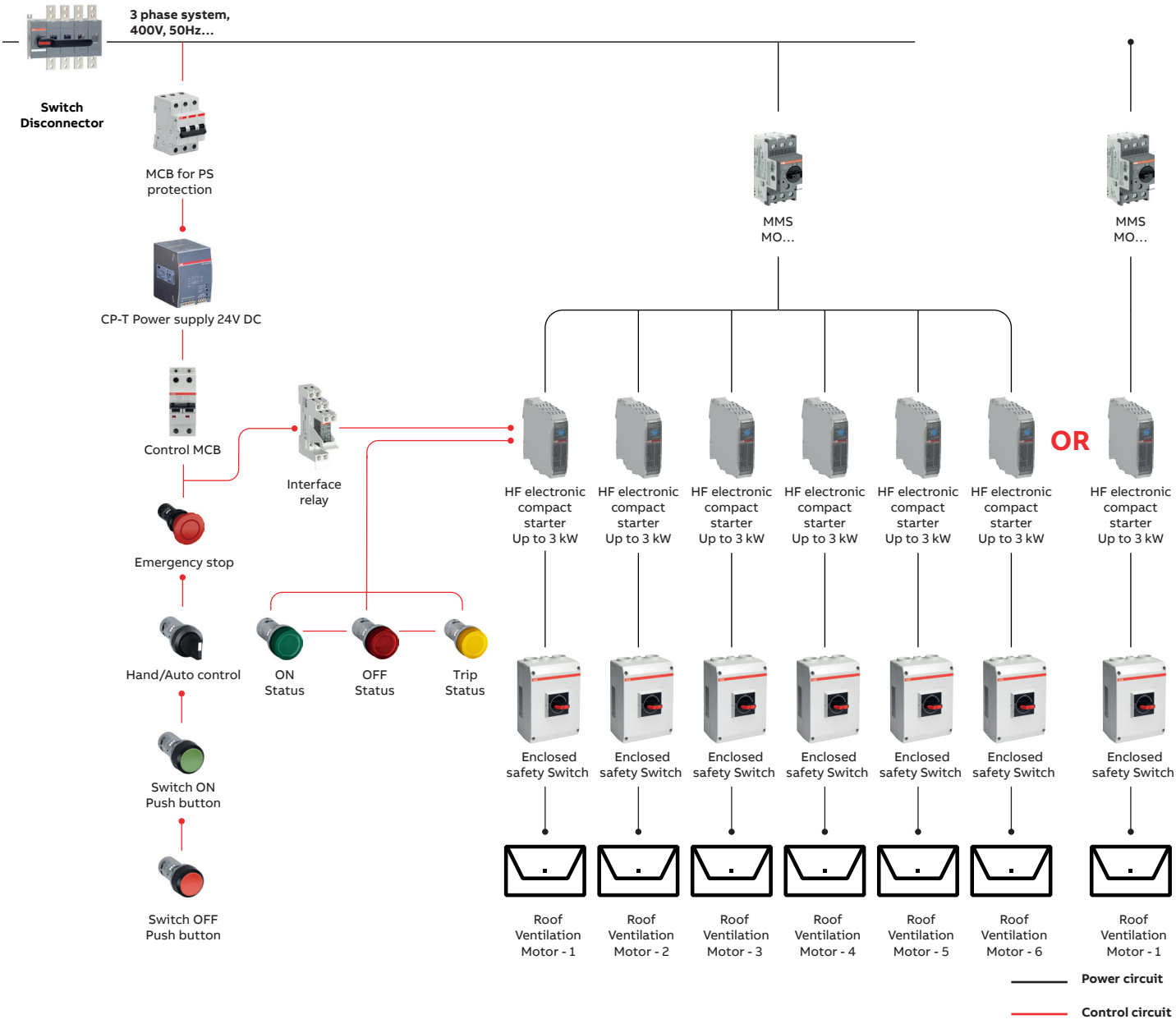
Product combination	Motor rating supports	Key Differentiator
B Mini contactor	up to 5.5 kW	For efficiency and spacing saving
Contractor + MMS (Push-In Spring)	up to 18.5 kW	For reliable connection, faster, easier wiring. Vibration proof
Contactor + MMS (screw version)	up to 45 kW	For standard offerings
PSR + MMS (Softstarter)	up to 45 kW	For Smooth starting and stopping

Note:
The enclosed safety switch will be located close to the motor, to isolate the power supply and to ensure safety during fan maintenance for a person working close to that fan.

ESSENTIAL

The ABB Essential Solution for opening and closing a roof ventilation system

Fuseless protection with MMS



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ENHANCED

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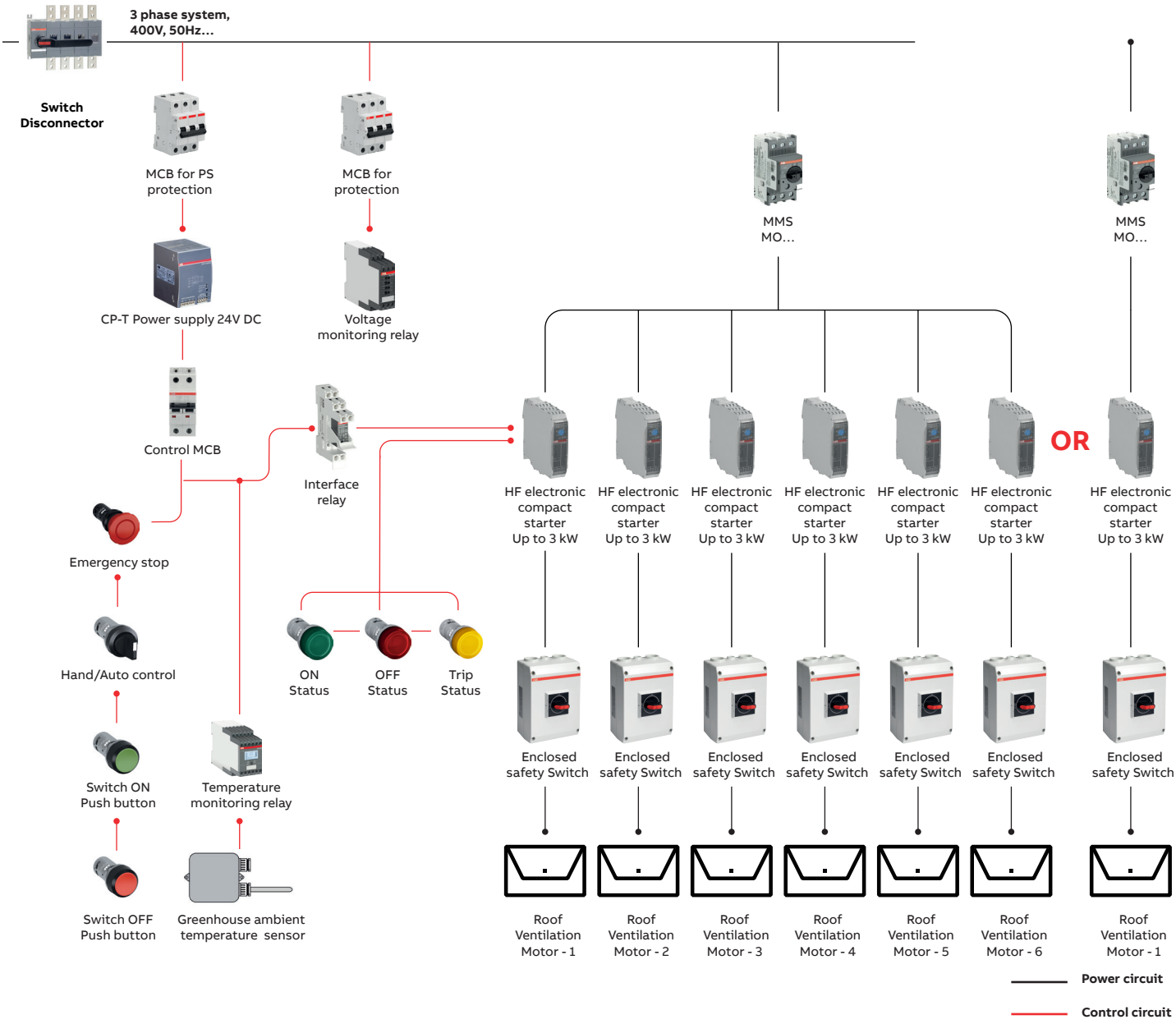
The ABB Enhanced solution for opening and closing a roof ventilation system

Fuseless protection with MMS

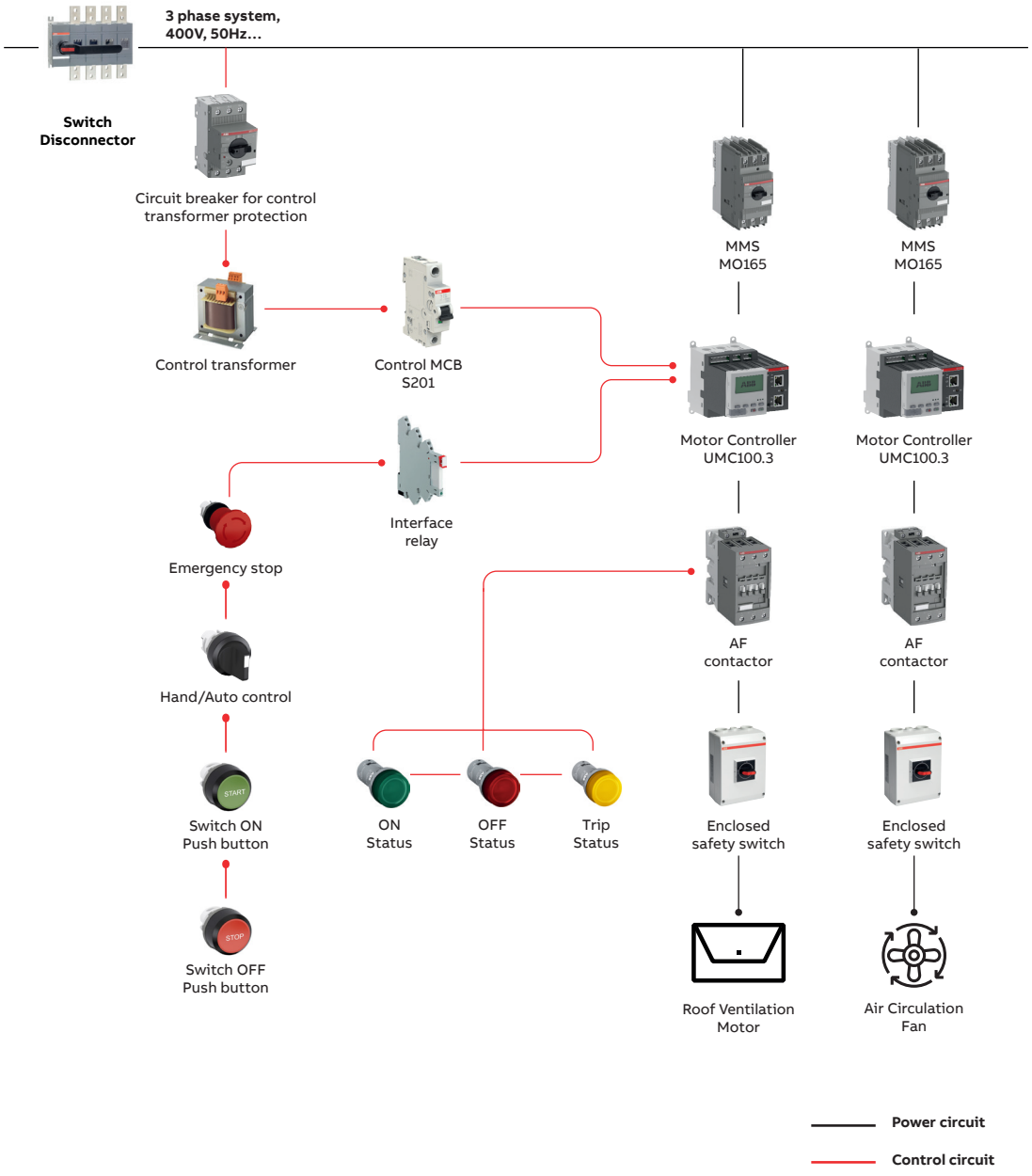


Main benefits of an electronic compact starter for opening and closing a roof ventilation system

- Forward and reverse running, motor protection and emergency stop functions are all included
- Up to 90% space savings – just 22.5 mm wide
- Up to 75% less time spent on wiring and installation
- Wiring error risks are minimized since more functions are built-in
- Solid state bypass supports load-free switching of mechanical contacts, thereby reducing power losses by up to 34%.

ADVANCED

The ABB Advanced Solution for starting ventilation systems



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Digital offering

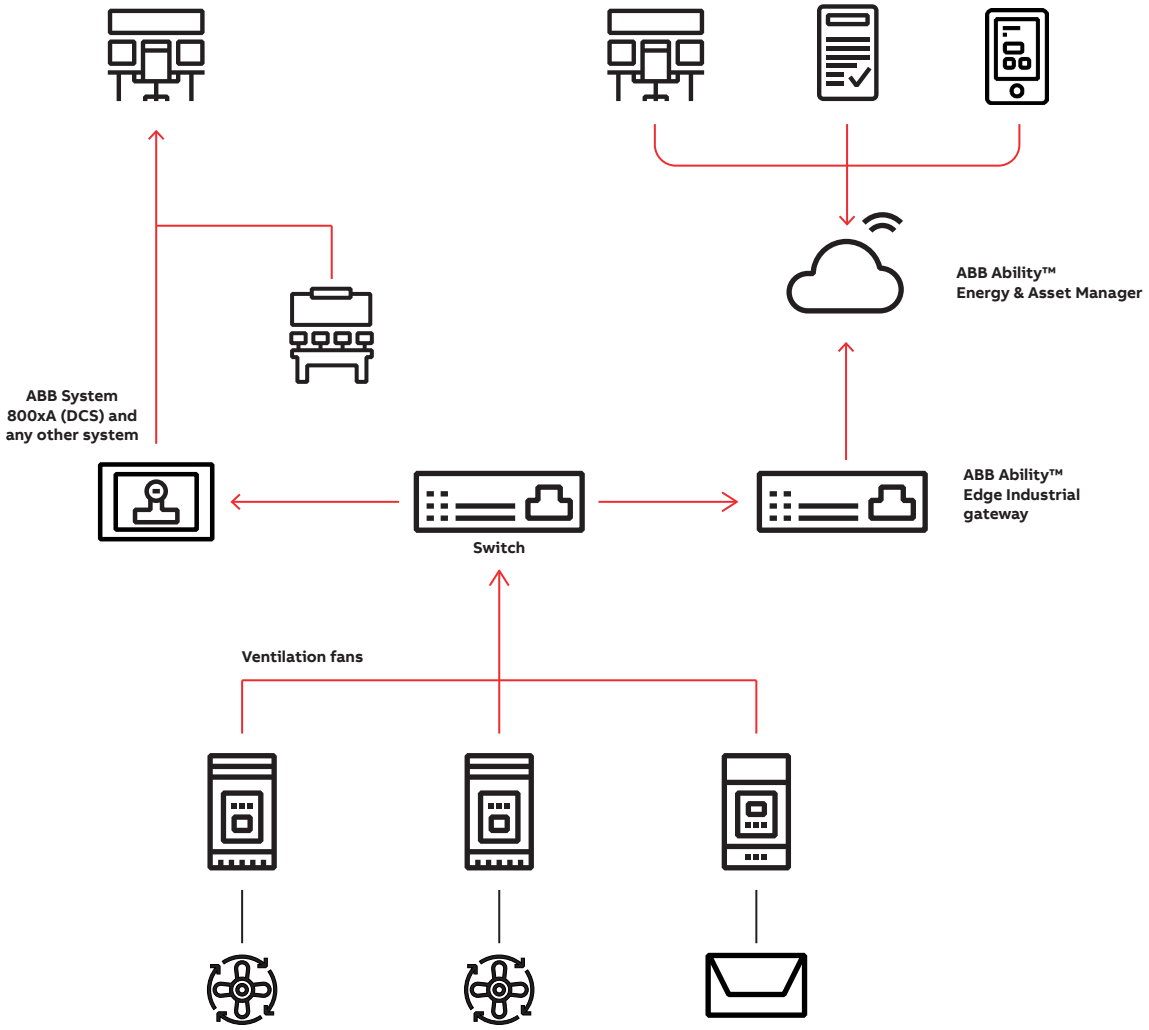
A smart ventilation system in a greenhouse guarantees fresh air quality and maintains the necessary humidity level without requiring on-site supervision.

The ABB Advanced starter solution fully **controls and monitors all the important parameters, thereby** ensuring that optimal temperature and air conditions for the growing plants are always provided.

Flexible remote control and monitoring of ventilation system

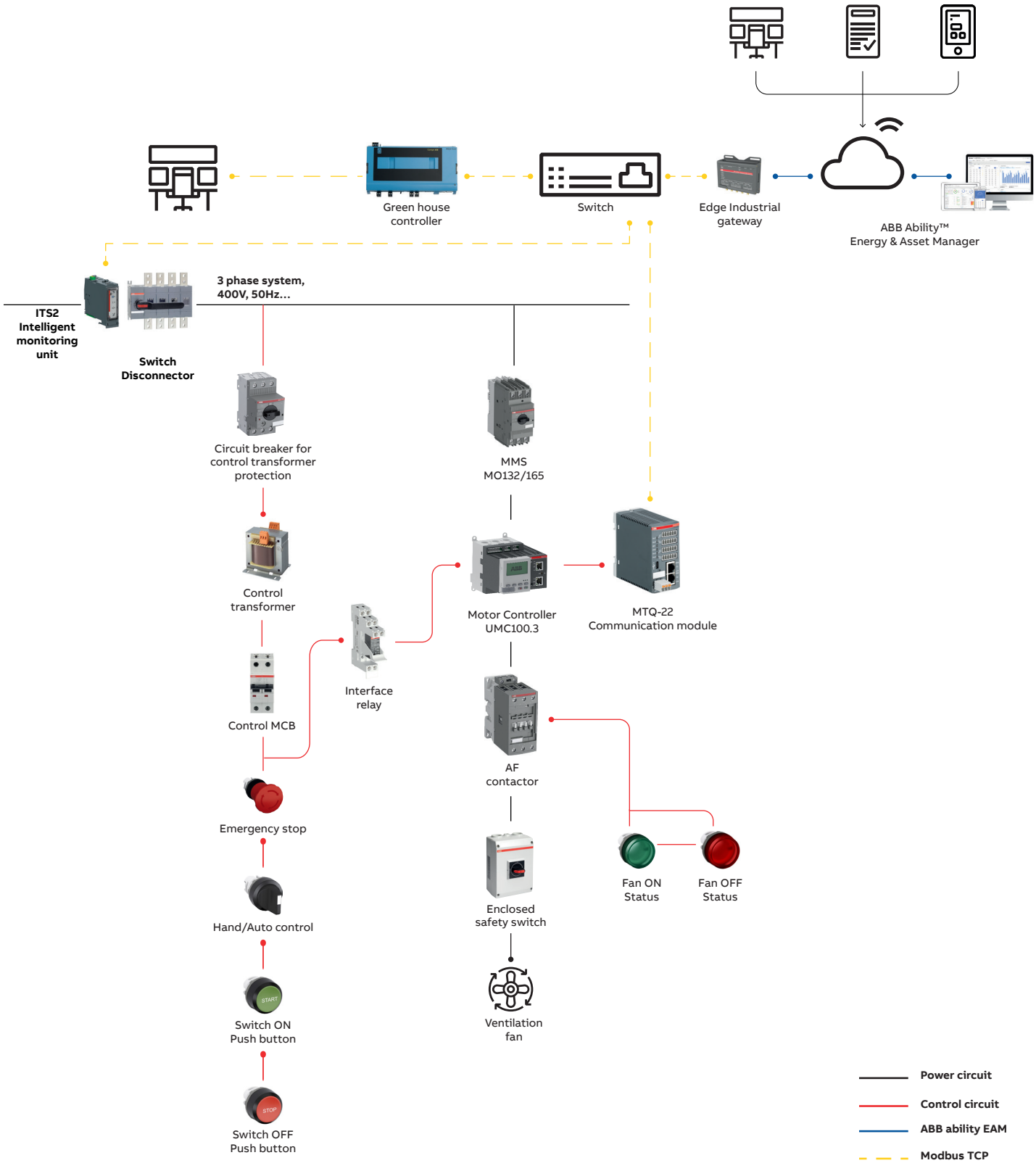
100% availability of fan measurement data as an aid to predictive maintenance

The ABB Ability™ Energy and Asset Manager web application provides easy and quick access to the data and enables a greenhouse climate controller to be connected



Digital offering with UMC100.3 for controlling and monitoring ventilation systems with cloud connectivity

For 0.06 kW to 500 kW motor ratings at 400V AC



Supporting communication protocols

Industrial Ethernet
- Ethernet/IP™
- Profinet IO
- Profinet (S2)
- Modbus TCP

Fieldbus
- Modbus RTU
- DeviceNet™
- Profibus DP

Note:

UMC100.3 supports ABB Ability through MTQ22 (Modbus TCP)

Features

- Flexible ventilation system control (remote or local)
- Advanced protection functions
- Status and fault diagnosis
- Monitoring of all electrical parameters
  - Voltage (V)
  - Current (A)
  - Power factor (Cos phi)
  - Active power (kW)
  - Reactive power (KVAR)
  - Total Harmonic distortion (THD)
  - Active energy (kWh)
  - Temperature
- Cloud connectivity - ABB Ability Energy & Asset Manager

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Bill of materials

Essential level Motor starting and protection solution for a Roof ventilation vent motor mounting system in a greenhouse

List of parameters considered when developing the bill of materials	
Standard	IEC
System Design	Main Voltage 400V AC, 3 phase, 50 Hz, control voltage -24V DC
Starter type	Roof ventilation vent motor : Mounting system with Direct-online starter and Electronic compact starter
Coordination type	Type-1
System Power	6 x Roof vent -0.55 kW (1.6 A)

Product	Part number	Description	Q.ty
Power circuit products			
MMS	1SAM360000R1010	MO132-10	1
MS116/132 SIGNAL/TRIP ALARM, 1NO/1NC	1SAM201903R1001	SK1-11	1
Electronic compact starter	1SAT122000R1011	HF2.4-DOL-24VDC	6
3P, 16A enclosed Disconnect Switch	1SCA022400R9910	OTP16T3M Safety switch	6
Control circuit products			
MCB for power supply protection	2CDS253001R0064	S203-C6	1
24V DC power supply	1SVR427054R0000	CP-T 24/5.0	1
MCB for DC power supply secondary side	2CDS252001R0064	S202-C6 Miniature Circuit Breaker - 2P - C - 6 A	1
Switch disconnector - 16A (Main incomer)	1SCA104811R1001	OT16F3	1
Pistol handle for OT switch	1SCA022380R8770	OHB45J6	1
Pistol handle mounting kit for OT	1SCA022559R5670	OHZX6	1
Command and signalling products			
PILOT LIGHT CL2 RED 24V AC / DC	1SFA619403R5021	CL2-502R	6
PILOT LIGHT CL2 GREEN 24V AC / DC	1SFA619403R5022	CL2-502G	6
PILOT LIGHT CL2 YELLOW 24V AC / DC	1SFA619403R5023	CL2-502Y	6
40MM TW-REL RED, 1 NC	1SFA619550R1041	CE4T-10R-01	6
SELECTR 2 POS. MAINT. BLACK 1NO	1SFA619200R1016	C2SS1-10B-10	6
COMPACT FLUSH PB MOM. RED, 1NC	1SFA619100R1041	CP1-10R-01	6
COMPACT FLUSH PB MOM. GREEN 1NO	1SFA619100R1012	CP1-10G-10	6
Interface relay 2 c/o	1SVR405601R1000	CR-P024DC2	6
Interface relay - socket	1SVR405650R1000	CR-PSS	6

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Key benefits of offered products

Reliable in all networks

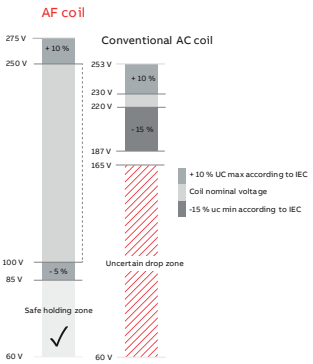
The electronic system within the AF contactor continuously monitors the current and voltage applied to the coil. The contatctor is safely operated in an always-optimized, hum-free condition.

Troubleshooting made easy

Separate thermal and magnetic trip indication makes troubleshooting a lot easier and faster and reduces downtime. This allows you to easily take action based on thermal or magnetic tripping.

Wide control voltage range

The AF contactor ensures steady operation in unstable networks and signifies a major advancement in motor control and power switching, with no threat of voltages sags, dips, or surges. Prevents stoppages caused by voltage fluctualtions.



AC & DC control voltage

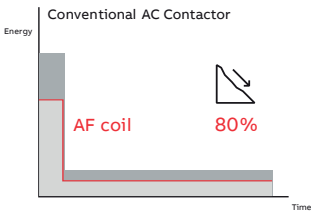
Thanks to AF technology, the same contactor can be used for both AC and DC control. This makes it easier to choose the type of contactor and reduces the number of parts to keep in stock.

Built-in Surge suppressor

Conventional contactor technology normally requires an external surge suppressor. With AF contactor technology, surges are handled by a built-in contactor and never reach the control circuit. One less product required and no need to worry about complications causing electronics near contactors to fail.

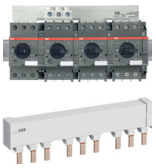
Reduced coil consumption

Thanks to AF technology contactor coil consumption is reduced by 80%, thus less heat dissipation and reduced temperature rise. This allows increased installation density in the panel, reduced control transformer rating, reduced control panel footprint and cost savings.



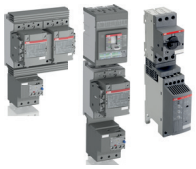
Busbar connectors for group assembly

Three-phase busbars ensure rapid, safe connection and are therefore a cost-effective solution. In addition, up to 5 manual motor starters can be fitted next to each other with optional spacing for auxiliary contacts.



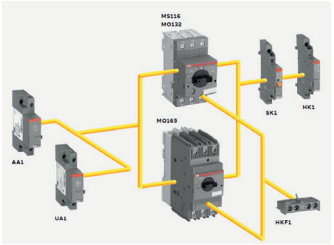
Easy to connect

Save wiring time and avoid mistakes by using a connecting link between ABB manual motor starters and soft starters or contactors. This creates harmonious and compact starter combinations that are easy to mount.



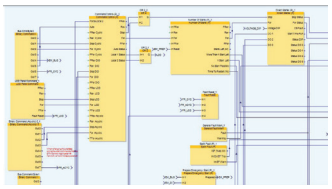
Harmonized range of accessories

MMS up to 80 A share the same main accessories like auxiliary contacts, signaling contacts, shunt trips and undervoltage releases.
This significantly reduces the part list and makes selection of the right accessories easy.



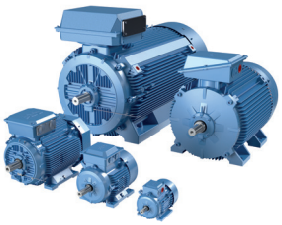
Flexible soft logic possible with UMC100.3

Flexible in creating the soft logic for switching ON the motor based on digital input conditions.



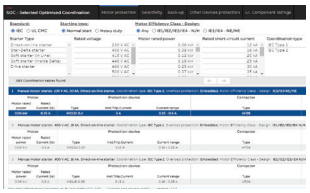
Ready for IE3 / IE4 motors

The ABB portfolio matches the latest requirements for IE3 and IE4 motor applications, including the most recent AC-3 upgrade and AC-3e utilization categories created for contactors and motor starters. ABB has validated coordination solutions for AC-3 and AC-3e applications. The results of these tests can be found in the ABB motor co-ordination tables.



Tested Co-ordination tables

ABB offers coordinated products to ensure the highest availability and protection for the installation. More than 1,800 tested and validated coordination tables are available in the SOC tool, so you can quickly and easily choose the right ABB solution.



Product offering

Contactors:

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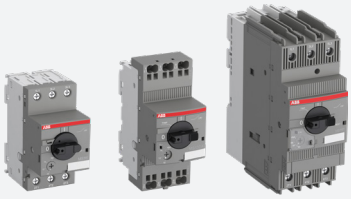
Manual motor starters:



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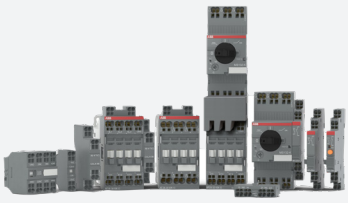
Push-In Spring Motor Starting solution:



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Softstarters:

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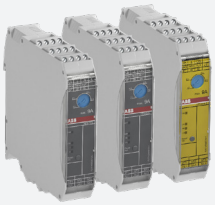
Electronic compact starter:



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UMC100.3 Intelligent Motor controller:

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Three phase monitoring relays:

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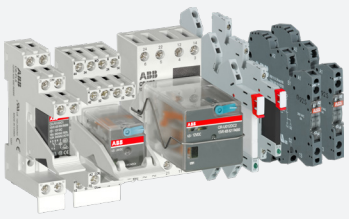
Pluggable Interface Relays:



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Primary switched mode power supplies:

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Time relays:

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Temperature monitoring relay:

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Tmax XT:

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Switch Fuse Units & Switch Disconnectors:

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Safety relays:

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System pro M compact - MCB:

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Pilot devices:

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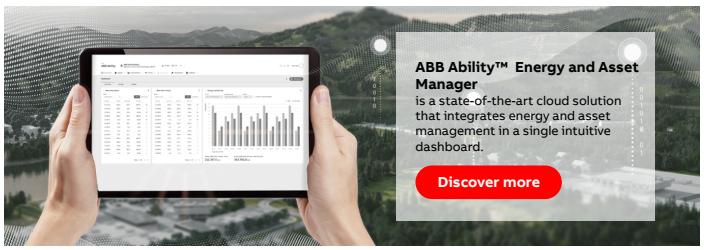

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