APPLICATION NOTE

Motor Starting & Protection solutions for Ventilation System (UL)

Poultry and Livestock farming

Enhance the economic performance of your farm and ensure animal welfare with our Motor Starting & Protection solutions. A complete offering of coordinated products from a reliable supplier for safely starting and protecting ventilation systems in Poultry & Livestock farms.

What is a Ventilation System?
Poultry & Livestock farming needs dedicated ventilation control to ensure economic performance of the farm and animal welfare. By controlling the quality and temperature of the air, Ventilation Systems are now able to remove excess heat, moisture, dust, harmful gases, and odors from indoor farms, while diluting airborne disease organisms which could otherwise compromise animal welfare.

Why you need a Motor Starting & Protection solution for your Ventilation System
By safely starting, protecting and running the ventilation system, ABB Motor Starting and Protection solutions guarantee that the animals in Poultry & Livestock farms are provided with optimal air and hygiene conditions.

Main benefits

Continuous Operation
Even in simple electromechanical starter combinations, ABB solutions and coordinated products guarantee continuous operation of your ventilation system in any condition, while being reliable in all networks.

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

Compact control panels
Save space in the control panel with our AF contactors and reduced-width electronic compact starters. Discover our ready-made starter connection kits ensuring compact design and safe connections.

Ease of Installation
Cut control panel assembly time by up to 50% and achieve savings in labor costs, thereby reducing the total cost of the installation and time to market.

Poultry & Livestock farming

To ensure animal well-being in Livestock & Poultry farms you need to monitor and control many variables: Weight & Behaviour, Feed consumption, Water availability and consumption, Sound level, Body Temperature and Climate conditions.

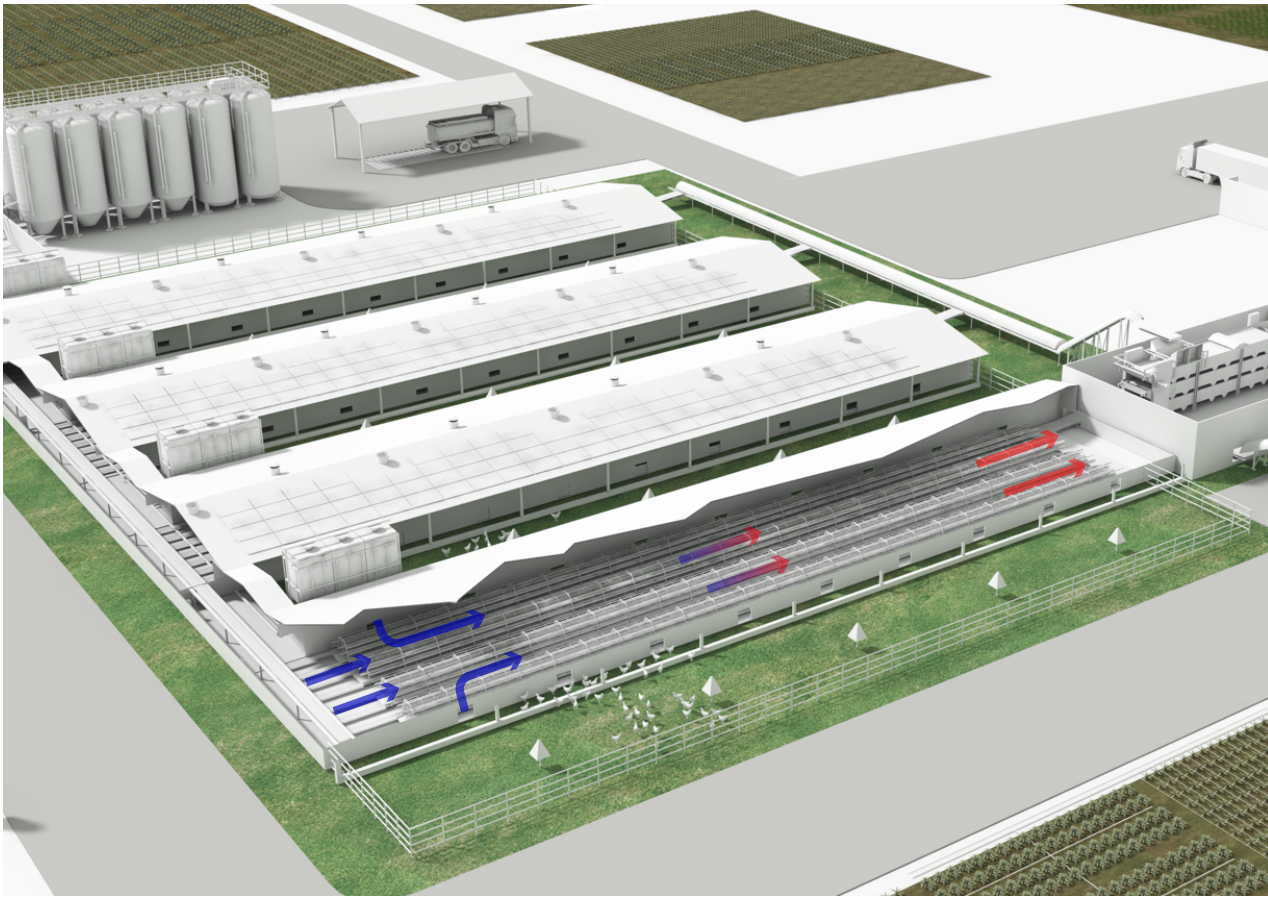
It is essential to monitor and control the climate conditions in Poultry & Livestock farms if you want to ensure animal welfare and the economic performance of your farm. The ventilation system ensures that good aeration and the right temperature are always provided. It removes excess heat, moisture, dust, harmful gases and odors from the farms while diluting airborne disease organisms.
The most important controllable variables in Poultry & Livestock farms are:

- **Water availability and consumption**
- **Climate conditions**
- **Feed consumption**
- **Sound level**
- **Weight & Behaviour**

Ventilation systems in Poultry & Livestock farming

A mechanical ventilation system consists of fans, openings, heaters, and controls. Fans and openings (inlet or outlet) control the amount of air exchanged in a mechanical ventilation system.
A typical mechanical ventilation system leverages on either an air supply system or an exhaust system.
The most commonly used ventilation system in Poultry & Livestock farms is the negative pressure system, which is exhaust-based.

The exhaust fan(s) create(s) a slight negative pressure or vacuum in the poultry house, which causes air to enter the structure through specifically designed inlets.
In this type of ventilation system, indoor air is continuously exhausted outside the building by fans installed on the walls.



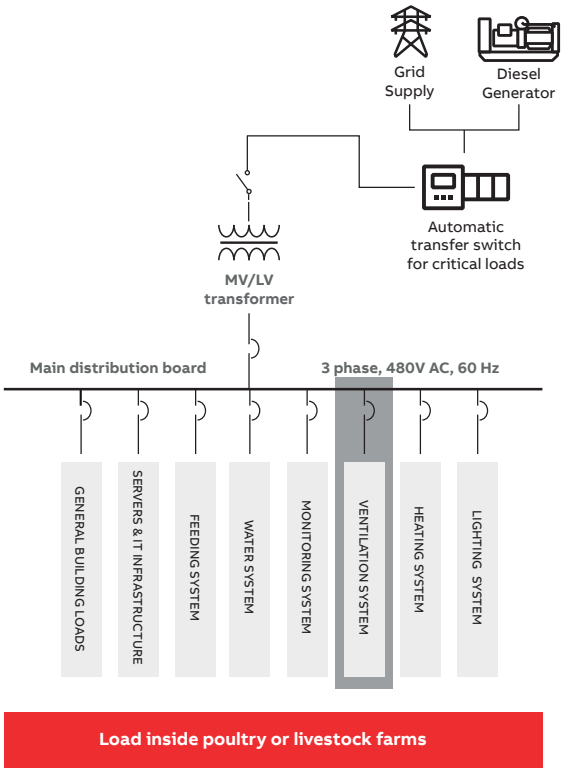
There are two commonly used negative pressure systems, depending on how the farms are designed:
1. Tunnel ventilation system
2. Roof inlet/ outlet ventilation system

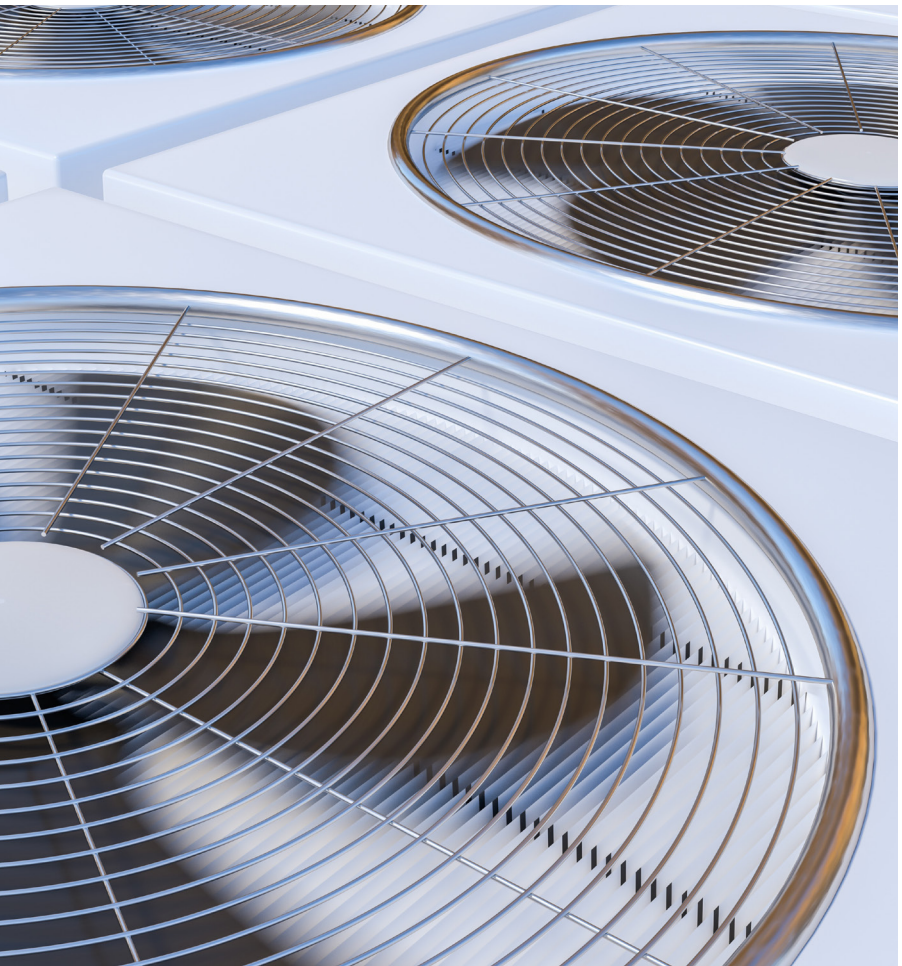
The **tunnel ventilation system** is the most widely used ventilation system in large-scale poultry and livestock farms. The tunnel system varies depending on its layout, orientation, capacity, how the shed is built and various other things.
Tunnel ventilation systems are rarely speed controlled since the on-off switching method using contactors is preferred. While this method is simple to understand and deploy, it is energy-intensive and minimum ventilation levels are difficult to control.

In **roof inlet/outlet systems (VSDs)** are used to control the fan speed in the inlet and outlet stacks employed for standard climate control. VSDs are the preferred choice for controlling ventilation in this equal pressure system since they enable the chickens to move feely between the house and the outside world.
In emergency situations, VSDs can enter the override mode, running fans to a chosen strategy and ignoring warnings and faults. This allows extended fan runtime in adverse conditions, enabling the layer houses to be safely evacuated.

Typical electrical distribution in Poultry & Livestock farms

The main distribution board supplies different sub-systems inside poultry and livestock farms. The figure below illustrates a typical electrical distribution system for Poultry & Livestock farms, from grid/ generator power sources (renewable energy sources can also be connected) to the main distribution board.





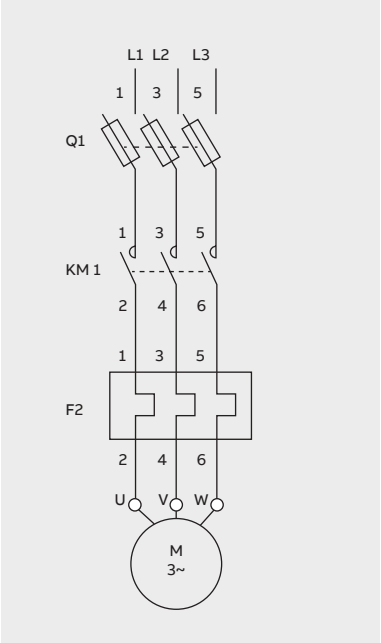
Fans

The most important components in a ventilation system are fans.
A fan is a powered machine that creates a flow of air. It consists of a rotating assembly of vanes or blades, generally made of wood, plastic or metal, which act on the air.
This rotating assembly of blades and hubs is known as an impeller, rotor, or runner. It is usually housed in some form of enclosure, or case, and is driven by an electric motor.
There are three main types of fans used for moving air: axial, centrifugal (radial), and cross-flow (tangential), but axial types are the most commonly used in Poultry & Livestock farms.

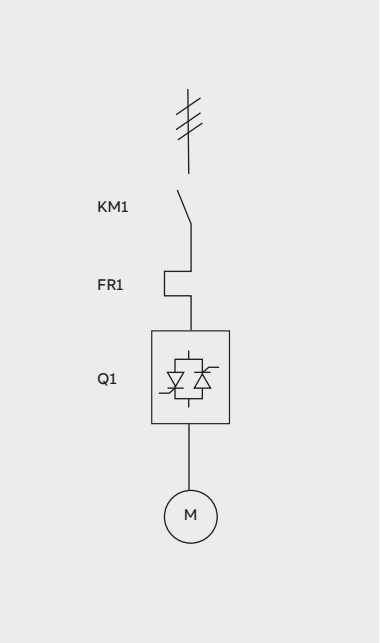
The ventilation system's typical **fan rating is below 40A**. If the rating is below 40A and the fans are designed for a full-speed running considering the constant airflow pressure inside the Poultry & Livestock farms, our recommended starter type is a Direct-on-line starter or Softstarter.

If an adjustable airflow pressure inside the farms is needed, then it is recommended to use a variable frequency drive to accurately control the speed of inlet and outlet fans.

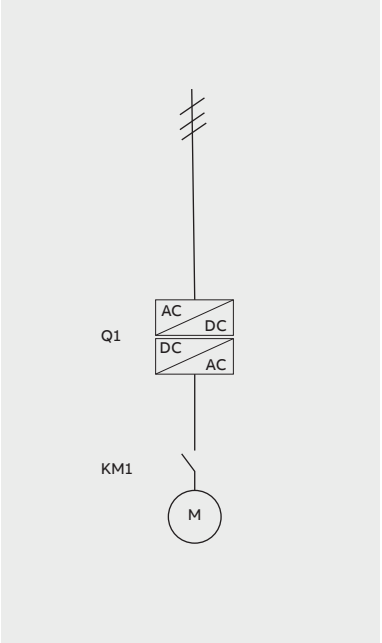
Recommended starter for ventilation fan control



Direct-on-line starter



Softstarter starter



VFD starter

Design data requirements for fans

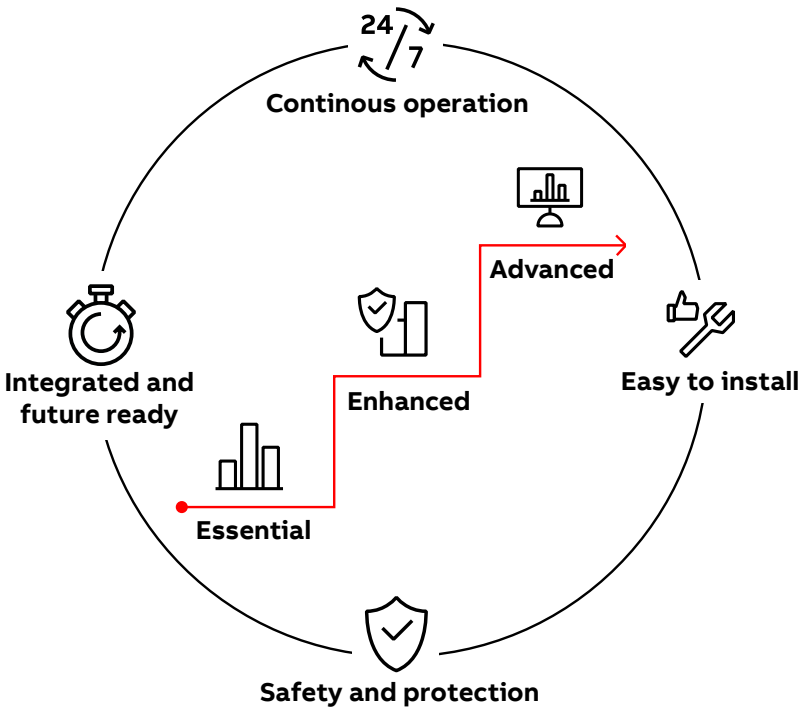
Main functions
- Short-circuit protection
- Overload protection (with adjustable current setting)
- Voltage level monitoring
- Phase loss & phase sequence – for correct management of fan operation
- Ground fault protection

Other functions
- Temperature monitoring in house
- Thermistor protection relay for monitoring winding temperature (based on fan design)
- Locked Rotor Protection - in the case of a jammed fan
- Digital connectivity (control, energy measurements, etc...)
- Safety relays (if required, based on design)

Fan starter panel design parameters
- Motor rated voltage
- Motor rated current
- Utilization category (AC-3/3e)
- Maximum operating current
- Number of switching cycles (ON/OFF)
- 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)

Motor Starting and Protection solutions for Ventilation Systems in Poultry & Livestock farms

Discover our Motor Starting and Protection solutions for Ventilation Systems. They always ensure the right amount of air is provided for animal welfare.



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 Poultry & Livestock farms includes additional protection functions like temperature monitoring, the 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.

The table below provides an overview of the possible functions in different solution offerings for ventilation systems in Poultry & Livestock farms.

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

Advanced Solution | Get ahead with smart data and predictive applications to keep your system 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.

ESSENTIAL

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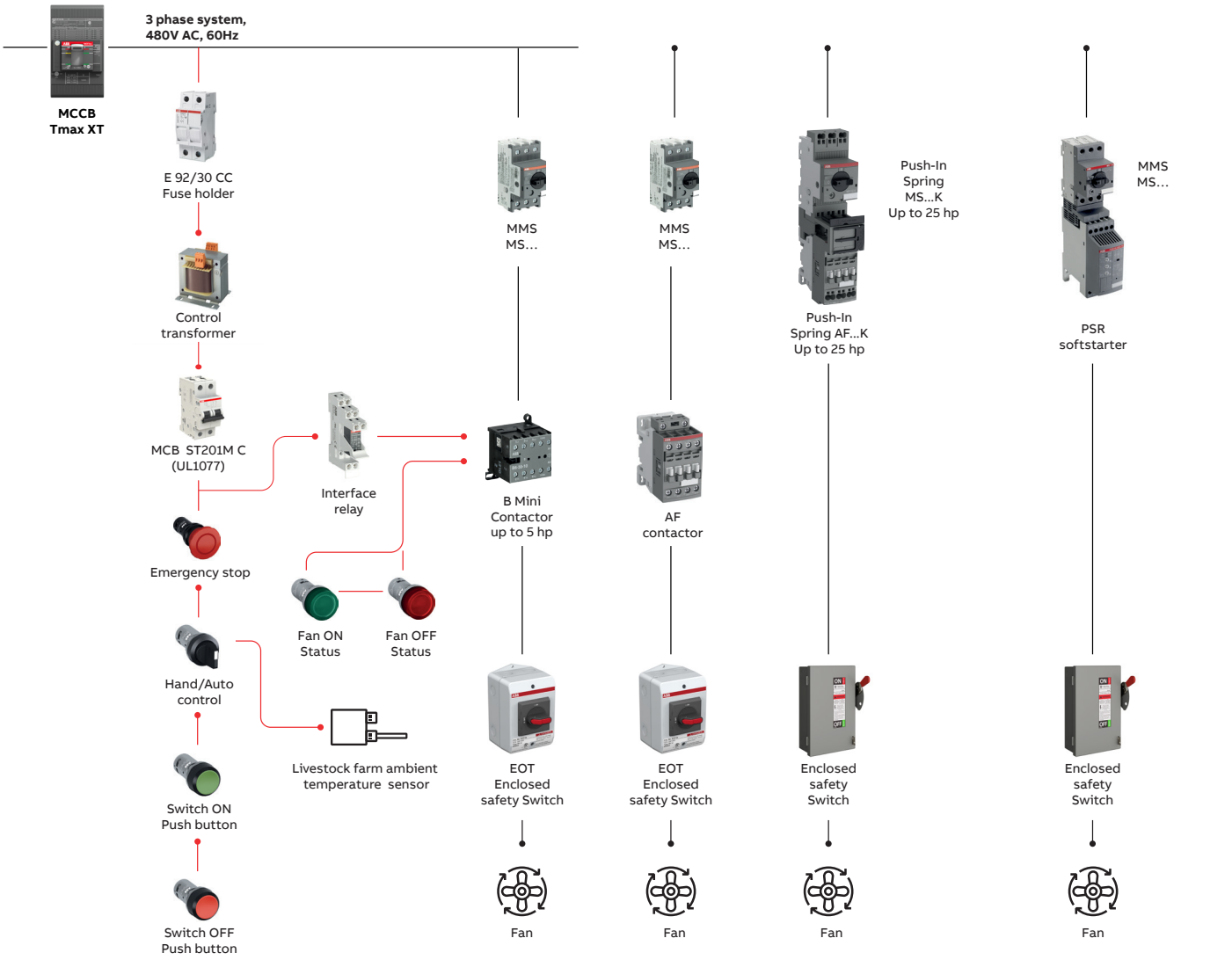
ABB's Essential Solution for starting a fan

Fuseless protection with MMS
for motor rating 3/4 hp up to 60 hp

Softstarter with MMS
for motor rating
2 hp up to 75 hp



*The enclosed safety switch will be close to the motor in case the fan needs maintenance to isolate the power supply and to ensure safety for a person working close to that pump.

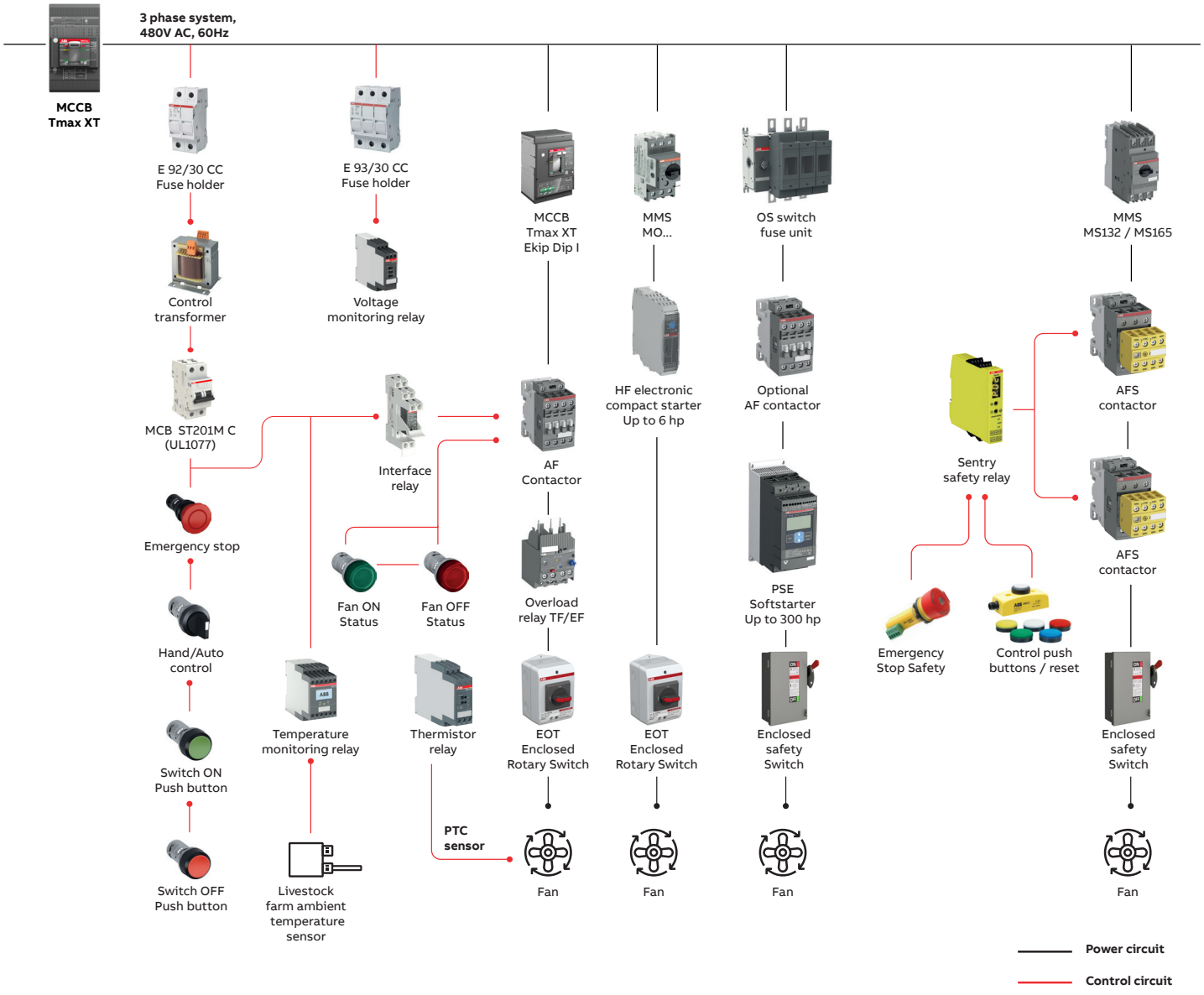
The table below provides an overview of the difference between the combination products offered in the Essential Solution for Ventilation systems in Poultry & Livestock farms.

Product combination	Motor rating supports	Key Diffentiator
B Mini contactor	up to 5 hp	For efficient and spacing saving
Contactor + MMS (Push-In Spring)	up to 25 hp	For reliable connection, faster, and easier wiring and vibration proof
Contactor + MMS (Screw version)	up to 60 hp	For standard offerings
PSR + MMS (Softstarter)	up to 75 hp	For Smooth start and stop

Notes:
MMS - Manual Motor starter

ENHANCED

ABB's Enhanced Solution for starting a fan



ADVANCED

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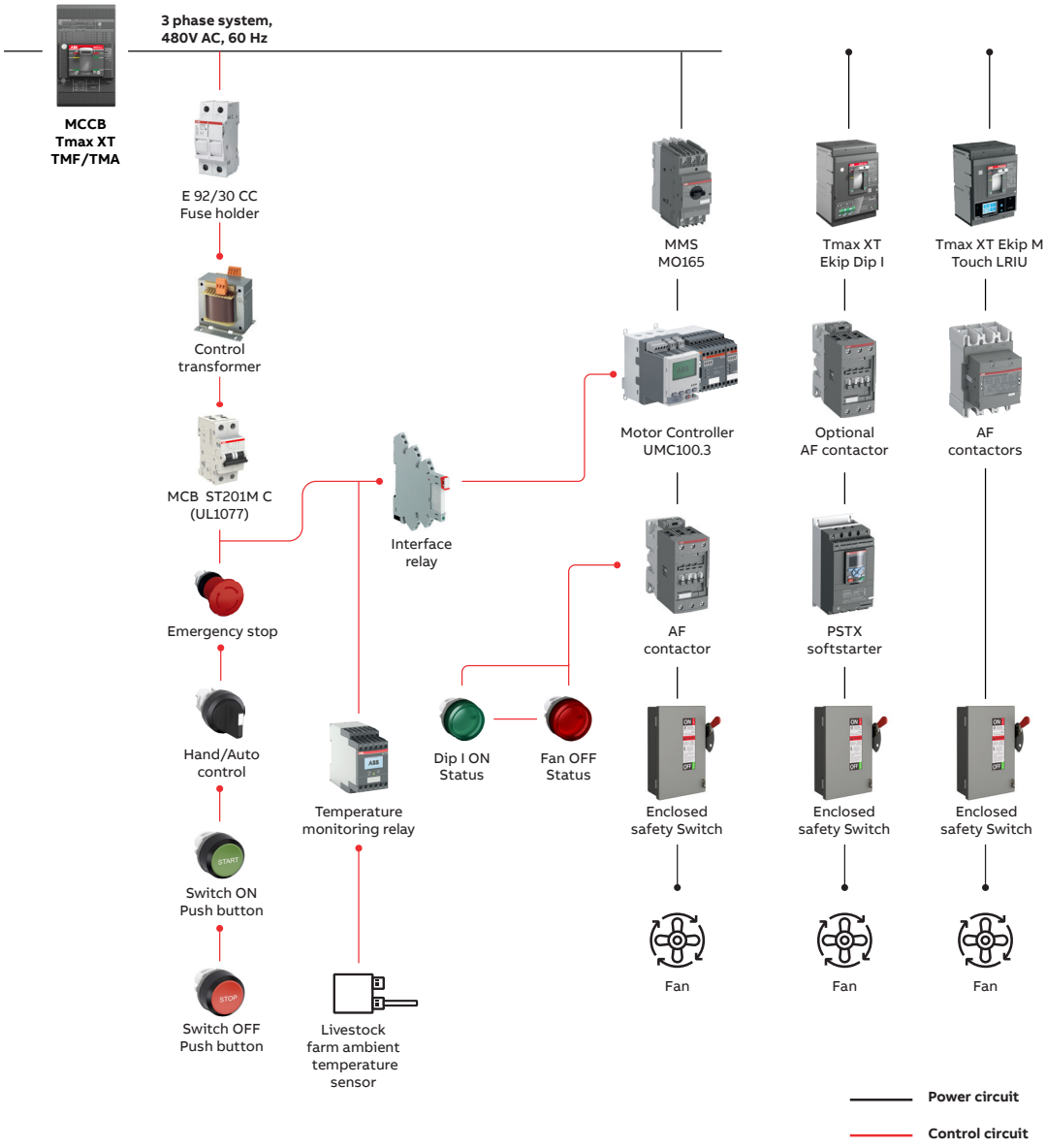
ABB's Advanced Solution for control and monitoring a fan

(for motor rating up to 1800 hp at 480V AC)



Notes:
1800 hp for Softstarter connected in inside delta

ADVANCED

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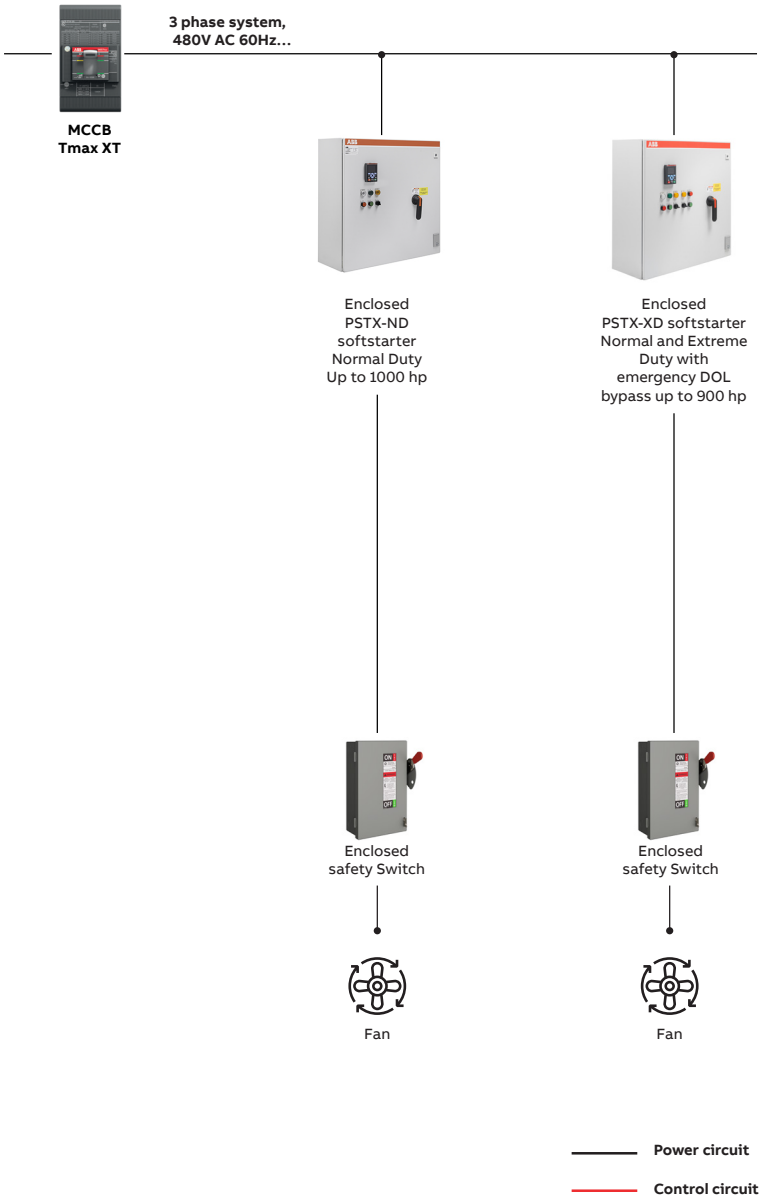
ABB's advanced enclosed solution for control and monitoring a fan
(for motor rating up to 1000 hp at 440/480V AC)



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Features

- UL 508A
- Operational voltage: 480 V AC
- Rated operational HP: 20 – 1000HP
- UL 3-wire service entrance rating up to 700HP
- NEMA Type: 12, 3R and 4 enclosure
- Operational voltage: 480 V AC
- AC-3 Rated Bypass for Emergency Starting in PSTX-XD version
- Door mounted HMI and pilot devices include

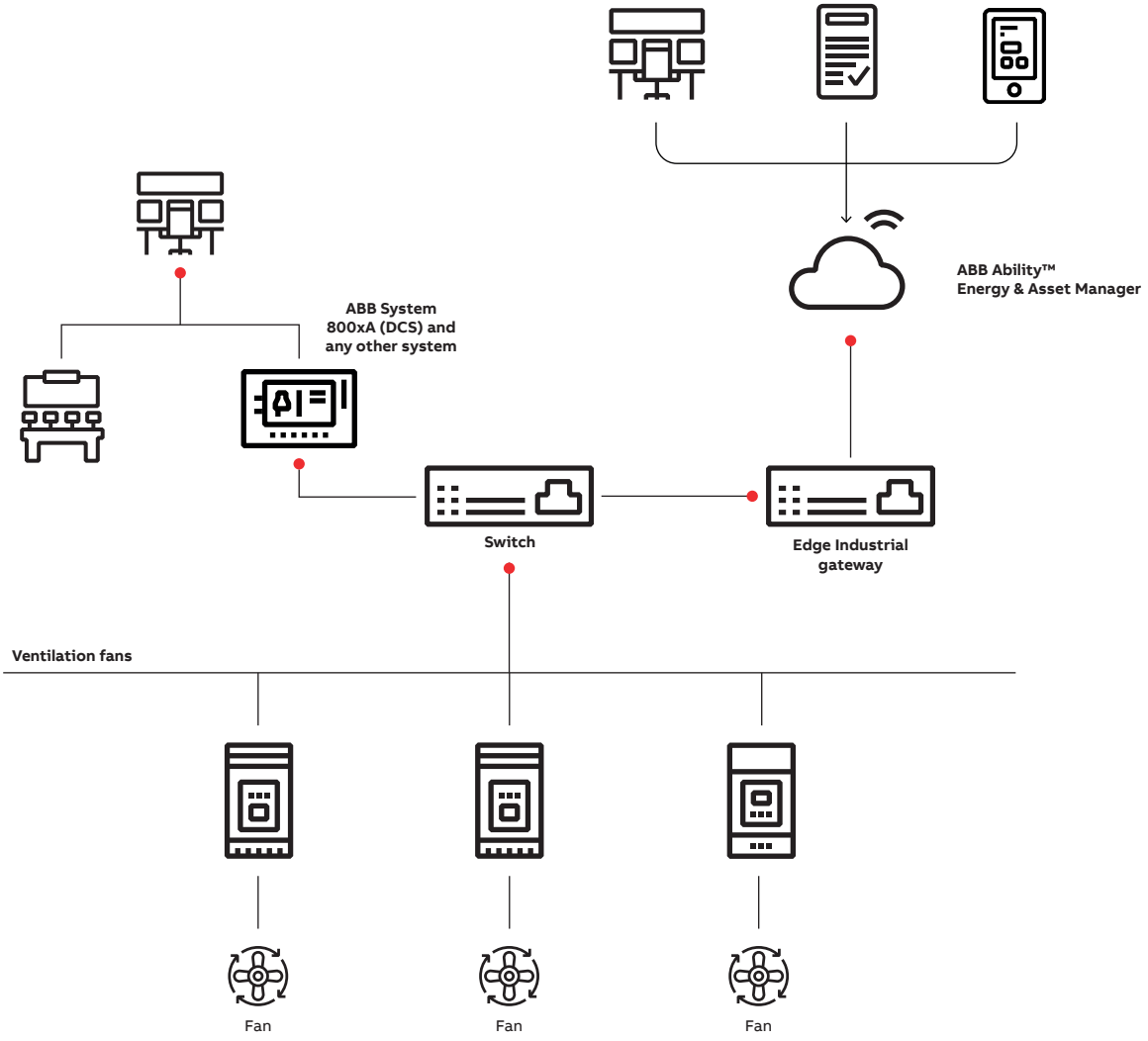
Digital offering

A smart ventilation system in poultry and livestock farming guarantees fresh air quality inside the farms and removes harmful gases, without any manual supervision of the ventilation system. ABB's Advanced starter solution provides complete control and monitoring of all the important parameters to optimize animal welfare and maintain healthy poultry and livestock farms.

Digitalization allows flexible remote control of ventilation fans

100% availability of measurement data of the ventilation fans to detect problems early and help in predictive maintenance

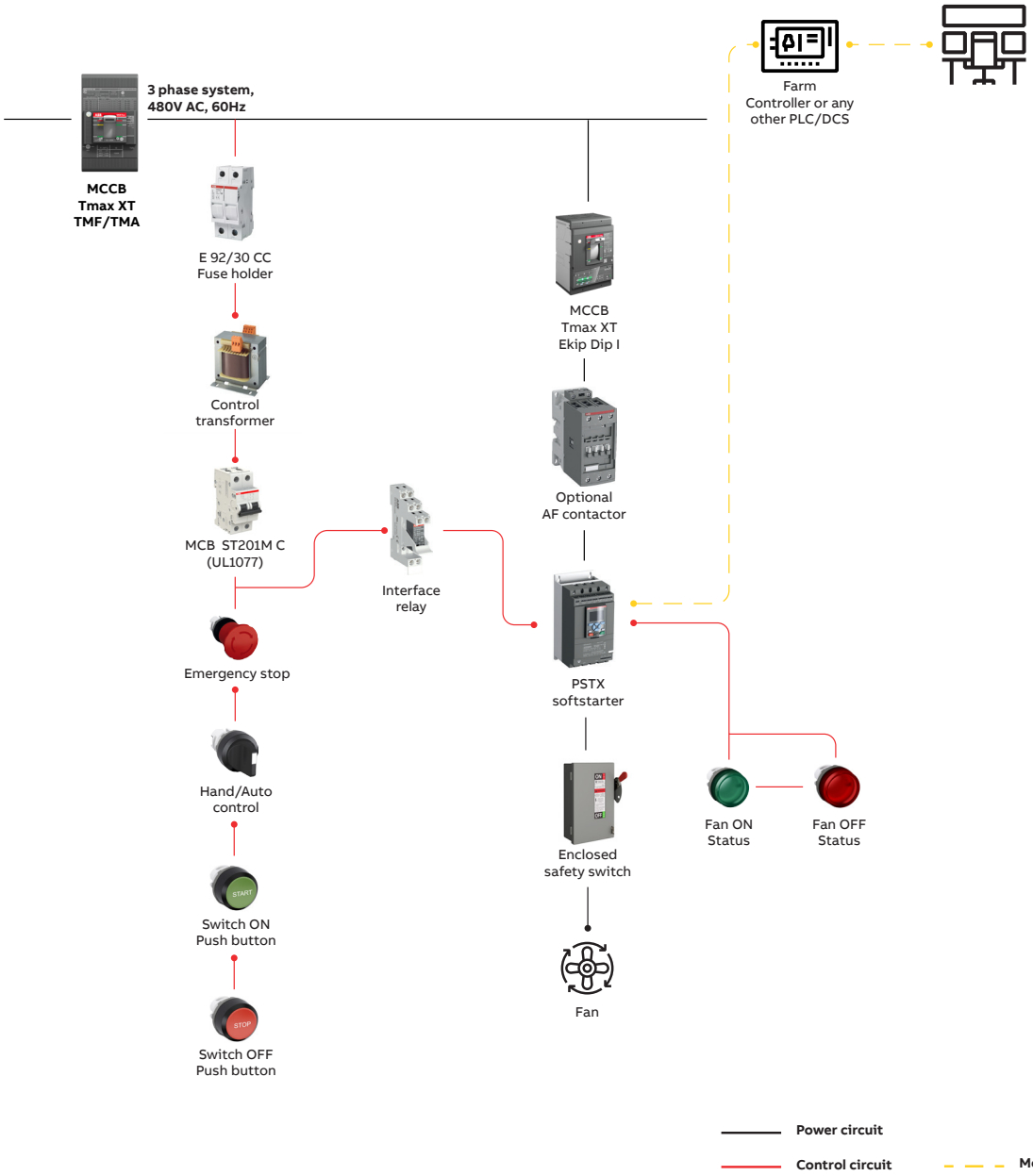
Cloud connectivity through ABB Ability™ Energy and Asset Manager, with data always quickly available on the web applications



1st scenario:

Digital offering with softstarter for control and monitor the fan

For motor rating up to 1800 hp at 480V AC



Supporting communication protocols

Industrial Ethernet

- Ethernet/IP™ (2-port)
- Modbus TCP (2-port)Profinet (2-port)
- EtherCAT
- BACnet MS/TP

Fieldbus

- Modbus RTU
- DeviceNet™
- Profibus DP

Notes:
*1800hp for Softstarter connected in inside delta

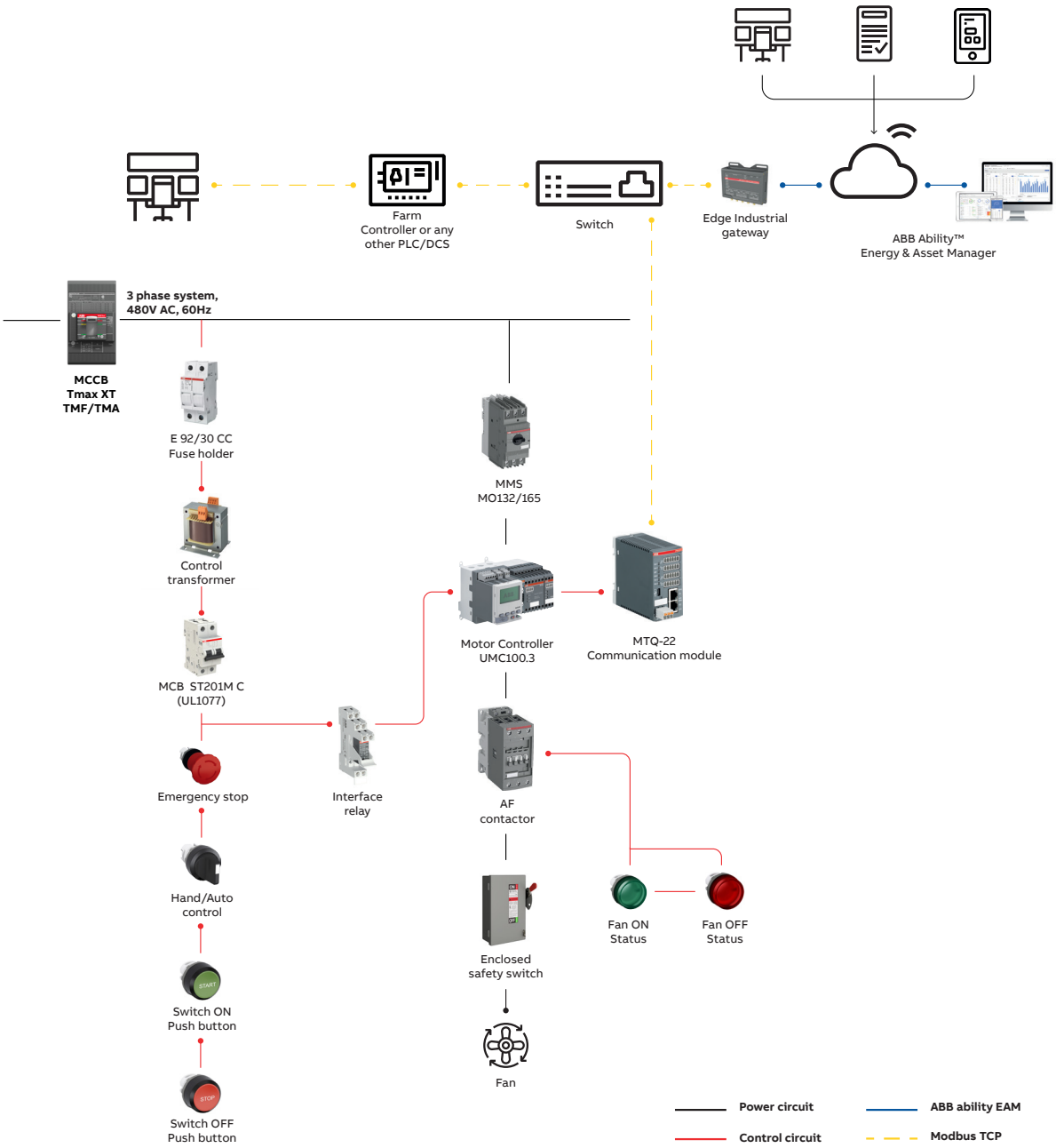
Features

- Flexible ventilation fan 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)
  - Apparent power (kVArh)
  - Main frequency (Hz)
  - Total Harmonics distortion (THD)
  - Consumed Energy in kWh
  - Motor temperature

2nd scenario:

Digital offering with UMC100.3 for control and monitor the fan with cloud connectivity

For motor rating up to 850A at 480V 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)

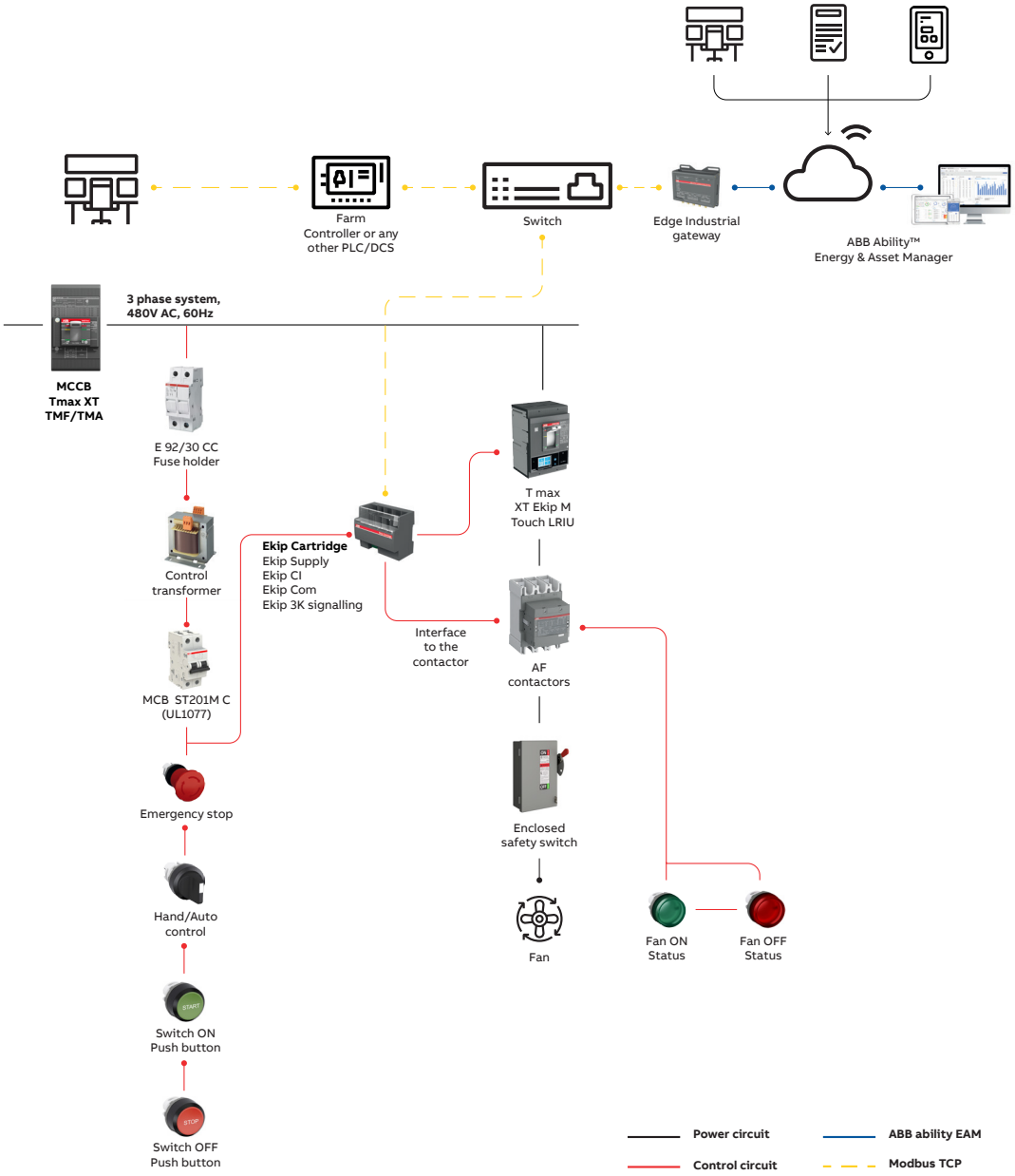
Features

- Flexible ventilation fan 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 Harmonics distortion (THD)
  - Active energy (kWh)
  - Temperature
- Cloud connectivity - ABB Ability Energy & Asset Manager

3rd scenario:

Digital offering with Tmax XT MCCB for control and monitor the fan with cloud connectivity

For motor rating up to 1200A at 480V AC



Supporting communication protocols

Fieldbus networks

- Modbus RTU
- Profibus DP
- DeviceNet™

Ethernet networks

- Modbus TCP
- Profinet
- Ethernet/IP™
- IEC 61850

Features

- Flexible ventilation fan 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)
  - Apparent power (kVA)
  - Reactive power (KVAR)
  - Total Harmonics distortion (THD)
  - Active energy (kWh)
  - Reactive energy (kVARh)
  - Temperature (with Ekip 3T)
- Cloud connectivity - ABB Ability Energy & Asset Manager

Key benefits of offered products

Reliable in all networks

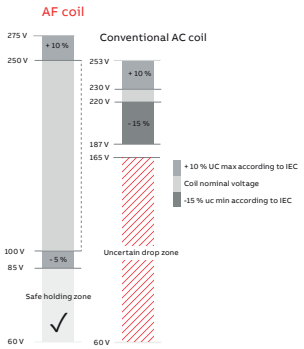
The electronic system within the **AF contactor** continuously monitors the current and voltage applied to the coil. The contactor is safely operated in an always-optimized, hum-free condition.

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 voltage sags, dips, or surges.
Prevents stoppages caused by voltage fluctuations.



AC & DC control voltage

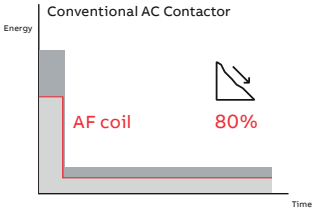
Thanks to **AF technology**, the same contactor can be used for both AC and DC control. This makes it easier to choose the type of contactor and reduces the number of parts to keep in stock.

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.

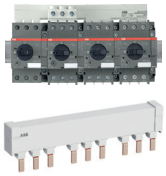
Reduced coil consumption

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.

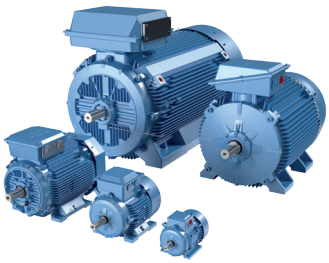


Easy to connect

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.

Ready for Premium efficiency / super premium efficiency.

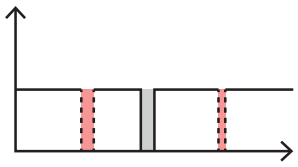
ABB's portfolio matches the latest requirements for **NEMA** premium efficiency and super premium efficiency single-speed motor applications. ABB offers motor protection and control equipment that has been validated for use with Premium Efficiency/Super Premium Efficiency motors. The results of these tests can be found in ABB's motor co-ordination tables.



Limp mode in softstarters

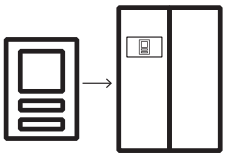
Plan stops for increased productivity.

- Keep running even when one thyristor has shorted.
- Service your plant when you have the time.
- Protections and main features continue to function.



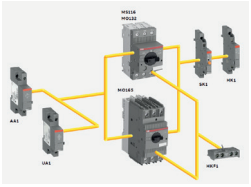
Detachable keypad

Control your process and **softstarter** safely with detachable keypad that makes safe installation possible and there is no need to buy accessories, thus cost savings for the customer.



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.



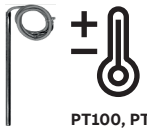
Motor heating option in softstarters

Keep your motor running reliably even in cold and damp environments.

- Removes condensation from idle motors.
- Prevents the motor from freezing."
- Perfect for damp installations and cold environments.

PT100 input for motor protection

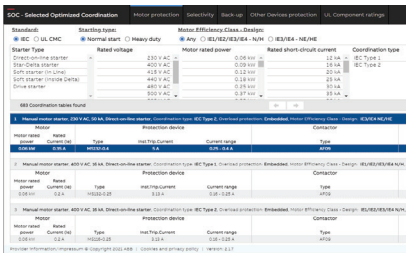
The **Softstarter** has a 3-wire PT100 input. The trip temperature is set by the user. The highest trip temperature is 250° while the lowest is -25°. PT100 measurement accuracy must be +/- 3° with 3 wires measuring if the 3 connecting cables have the same resistance.



PT100, PTC

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.

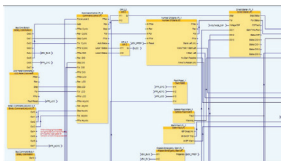


Coated PCBA

Longer lifetime and enhanced reliability for your **Softstarter**, thereby reducing the risk of unwanted stops. This is a standard feature for **PSE and PSTX**, so there is no risk of ordering a a unit without coated PCBAs and no additional cost.

Flexible soft logic possible with UMC100.3

Flexible in creating the soft logic for switching ON the motor based on temperature monitoring input.



Bill of material

Motor starting and protection for ventilation system - Enhanced level

List of parameters that were taken into consideration for the development of the bill of materials	
Standard	UL
System Design	Main Voltage 480 V AC, 3 phase, 60 Hz, 65kA, control votlage -120V AC
Starter type	Ventilation fan: Direct-online starter with standard screw solution
UL - CMC Type	Type-D
System Power	1x fan -5 hP (7.6 A FLA)

Product notes	Part Number	US product code	Description	Quantity
Products for Power Circuit				
Motor circuit protector	1SDA074884R1	XT2HU3015MFF000XXX	XT2H 125 MA 15	1
Contactor	1SBL137001R1310	AF09-30-10-13	AF09-30-10-13 100-250V50/60HZ-DC Contactor	1
PI SIDE MNT AUX 1NO1NC AF09K-96K/NF	1SBN010120R1011	CAL4-11	CAL4-11 1NO + 1NC side auxilary block	1
Thermal overload relay	1SAZ721201R1040	TF42-7.6	TF42-7.6 current range 5.7 - 7.6A	1
3P, 16A enclosed Disconnect Switch	1SCA022792R2700	EOT16U3P3-S	EOT16U3M1-S	1
Products for control Circuit				
3P, 25A TMF MCCB for main incomer	1SDA074791R1	XT2HU3025AFF000XXX	XT2H 125 TMF 25 - 400	1
E90 CLASS CC FH 2P 30A	2CSM299912R1801	E92/30CC	E 92/30 CC Fuse holder	1
Fuse,type CC,600V,2A	Not provided by ABB. Example: Bussmann KTK-R-2, LP-CC-2			2
480:120 1 ph, 200VA.	9T58K2806	9T58K2806	Single-phase, fully-encapsulated design 200VA input voltage 240x480 Volts & output voltage 120 / 240V	1
ST201M-C2NA Miniature Circuit Breaker C-Char., 10kA, 2A, 1P+NA	2CDS271335R0024	ST201M-C2NA	ST201M-C2NA Miniature Circuit Breaker - 2P - C - 2 A	1
CM-MPS.53S three-phase MON.	1SVR750487R8300	1SVR750487R8300	CM-MPN.52S Three-phase monitoring relay 2c/o, 0,0.1-30s, L1-L2-L3=3x350-580VAC	1
E90 CLASS CC FH 3P 30A for voltage monitoring relay	2CSM299932R1801	E93/30CC	E93/30CC	1
Fuse,type CC,600V,1A	Not Available in ABB			3
CM-MSS.13S thermistor relay	1SVR730740R0300	1SVR730740R0300	CM-TCS.13S Temperature monitoring relay Temp.-range 0...+200°C, 24-240VAC/DC	1
Products for command and signalling				
PILOT LIGHT CL2 RED 110-130V AC	1SFA619403R5131	CL2-513R	CL2-513R	1
PILOT LIGHT CL2 GREEN 110-130V AC	1SFA619403R5132	CL2-513G	CL2-513G	1
PILOT LIGHT CL2 YELLOW 110-130V AC	1SFA619403R5133	CL2-513Y	CL2-513Y	1
40MM TW-REL RED, 1 NC	1SFA619550R1041	CE4T-10R-01	CE4T-10R-01	1
SELECTR 2 POS. MAINT. BLACK 1NO	1SFA619200R1016	C2SS1-10B-10	C2SS1-10B-10	1
COMPACT FLUSH PB MOM. RED, 1NC	1SFA619100R1041	CP1-10R-01	CP1-10R-01	1
COMPACT FLUSH PB MOM. GREEN 1NO	1SFA619100R1012	CP1-10G-10	CP1-10G-10	1
Interface relay 4 c/o	1SVR405601R2000	1SVR405601R2000	CR-P120AC2	1
Interface relay - socket	1SVR405650R1000	1SVR405650R1000	CR-PSS	1
Accessories for pilot devices	SK615550-44	SK 615 550-44	Legend plate "Start", 22mm	1
Accessories for pilot devices	SK615552-31	SK 615 552-31	Legend plate "Stop", 22mm	1
Accessories for pilot devices	SK615552-21	SK 615 552-21	Legend plate "Off", 22mm	1
Accessories for pilot devices	SK615552-22	SK 615 552-22	Legend plate "On", 22mm	1
Accessories for pilot devices	CA6-1026	Not in SAPT	Legend plate, black on yellow aluminum, "Emergency stop"	1

Note: Feeder circuit breaker rating my change if additional loads are connected

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Product offering

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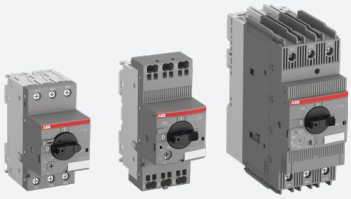
Manual motor starters:



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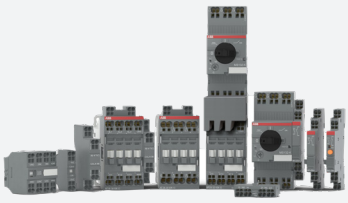
Push-In Spring Motor Starting solution:



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Softstarters:

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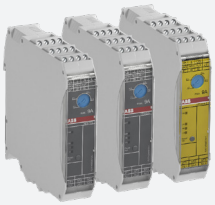
Electronic compact starter:



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UMC100.3 Intelligent Motor controller:

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Three phase monitoring relays:

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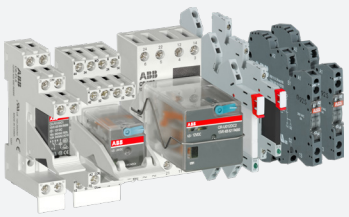
Pluggable Interface Relays:



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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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Enclosed safety switch:

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Enclosed Rotary switch (EOT series):

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Enclosed Softstarter solution (only for US market):

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