

Motor Starting & Protection solutions for Air-cooled Chiller Systems in HVAC installations

IEC



Heating and cooling are more than a luxury in today's world, they are a necessity where we live and work in. Discover ABB's wide product portfolio for full-speed motor starting and protection to keep running your Air-cooled Chiller Systems with improved safety and operational performance.

What are Chiller Systems?

A Chiller System is a machine that removes heat from a liquid coolant via a vapor-compression or absorption refrigeration cycle. The role of Chiller Systems is the one of preserving the right temperature and humidity levels in buildings.

Why you need a Motor Starting & Protection solution for Chiller Systems

Since they are the responsible for the wellness of billion of people around the world it is crucial to find solutions that ensure their continuous operation. Discover our best-in-class solutions for full-speed motor starting and protection providing safety, operational performance, easy installation, and energy efficiency for your Chiller Systems.



Main benefits

Continuous Operation

Reduce chances of failure of chiller systems by **10%** and ensure their higher availability with reliable connections and coordinated products.



Energy-efficiency

Reduce energy consumption in the control circuit system by up to **80%**, thanks to our solutions that can be operated with less power supply, and to the AF technology that ensures less heat dissipation and a reduction in temperature rise.



Ease of installation

Reduce control panel assembly time by up to **50%** with our wide range of easy-to-use accessories and connection sets. This provides savings on labor costs, cuts the total cost of the installation, and reduces time to market.



Compact design

Save up to **35%** of the space in the control panel of a chiller system thanks to our solutions with the most compact design that easily fits into your application and allows you to reduce control panel dimensions and costs.

Air-cooled Chiller Systems

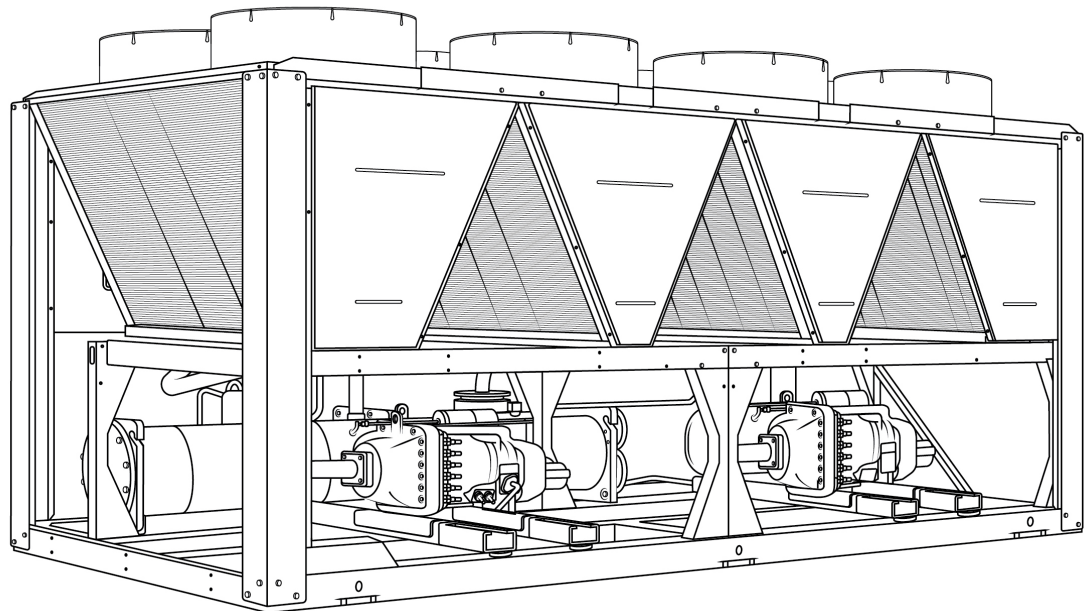
A **Chiller System** is a machine that removes heat from a liquid coolant via a vapor-compression or absorption refrigeration cycle. This liquid can then be circulated through an AHU to condition and circulate air.

Vapor compression chillers may use different types of compressors but the most common today are the hermetic scroll, semi-hermetic screw, or centrifugal compressors.

Chillers can then be divided into rooftop and basement chillers.

Rooftop chillers are usually “**Air-cooled**”, whereas basement chillers are usually “**Water-cooled**” but they both perform the same function: **to generate cold water for air conditioning by removing the unwanted heat from the building.**

Air-cooled Chiller System



Air-cooled Chiller System main components

- **Compressor:** The compressor provides the driving force for moving the refrigerant around the system.
- **Condenser:** The condenser is a configuration of horizontal pipes through which hot refrigerant runs.
- **Condenser Fans**
- **Expansion Valve**
- **Evaporator**
- **Filter Drier**
- **Control panel**
- **Temperature sensors**
- **Pressure Transducer /solenoid valves.**

Current rating and starter type

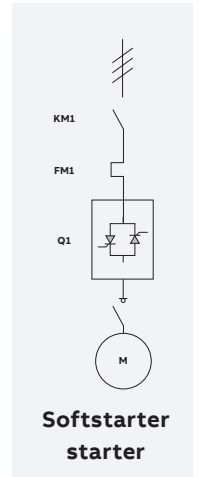
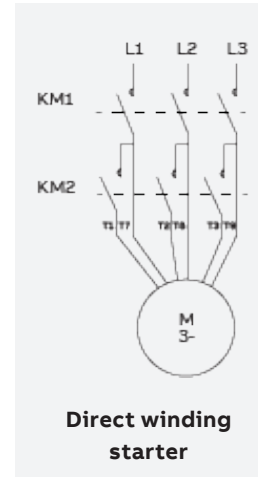
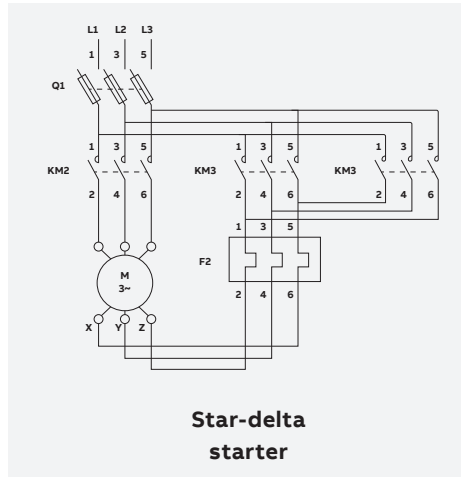
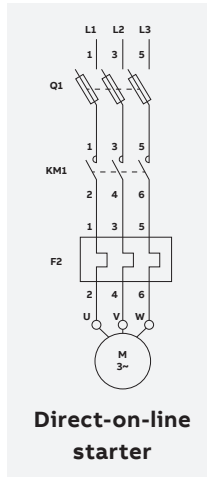
The choice of starter type in Air-cooled chiller systems, depends on the type of compressor and condenser fan.

The ABB scalable motor starting solution provides complete flexibility in choosing the right starter solution for full-speed motor control of Air-cooled chiller systems.

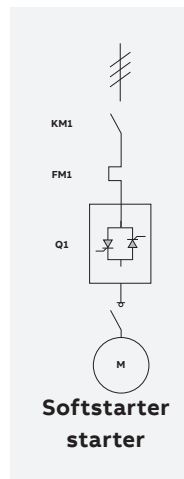
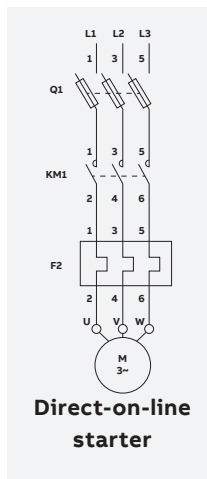
Recommended starter for Air-cooled chiller system with full speed motor control



Compressor



Fan condenser



Compressor & Fans electrical parameters

- Utilization category* (AC-3/3e & AC-8a/b)
- Locked Rotor Amps
- Rotor Load Amps
- Maximum operating current
- Starting torque depending on the compressor type.
- Acceleration time
- Advanced protection like Phase reversal, Under/over voltage, Thermistor motor protection etc.
- Ambient temperature
- Altitude

Main Protection functions

- Short-circuit protection
- Overload protection (with the adjustable current setting)
- Voltage level monitoring
- Phase loss & phase sequence for correct direction of the pump running
- Earth fault protection

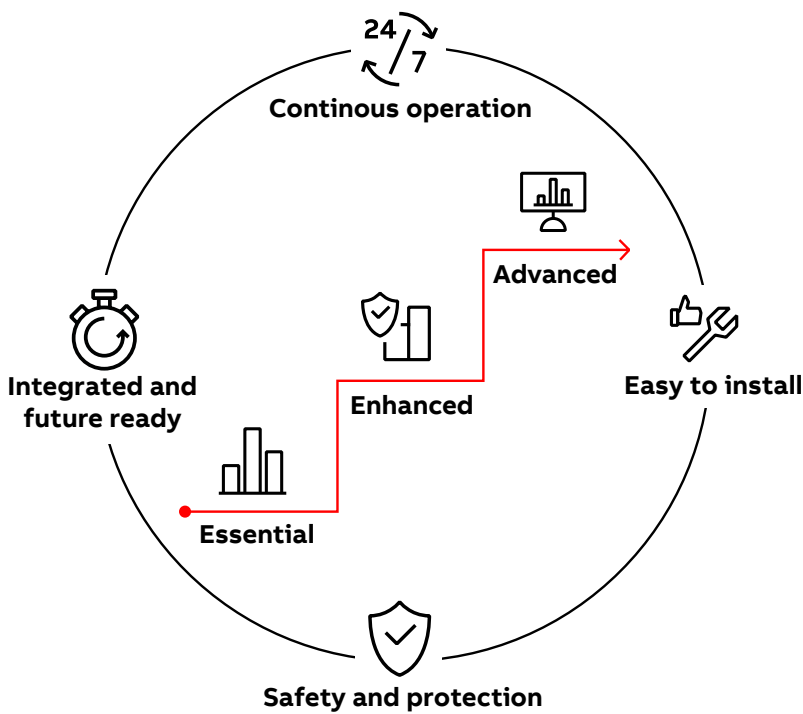
Other functions

- Thermistor motor protection for monitoring the winding temperature.
- Digital connectivity (control, energy measurements, etc...)



Motor Starting and Protection solutions for Air-cooled Chiller Systems in HVAC installations

Discover our Motor Starting and Protection solutions for Air-cooled Chiller Systems. They secure that the right temperature in buildings is always provided.



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 Air-cooled Chiller System in HVAC installations includes additional protection functions such as temperature monitoring, 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

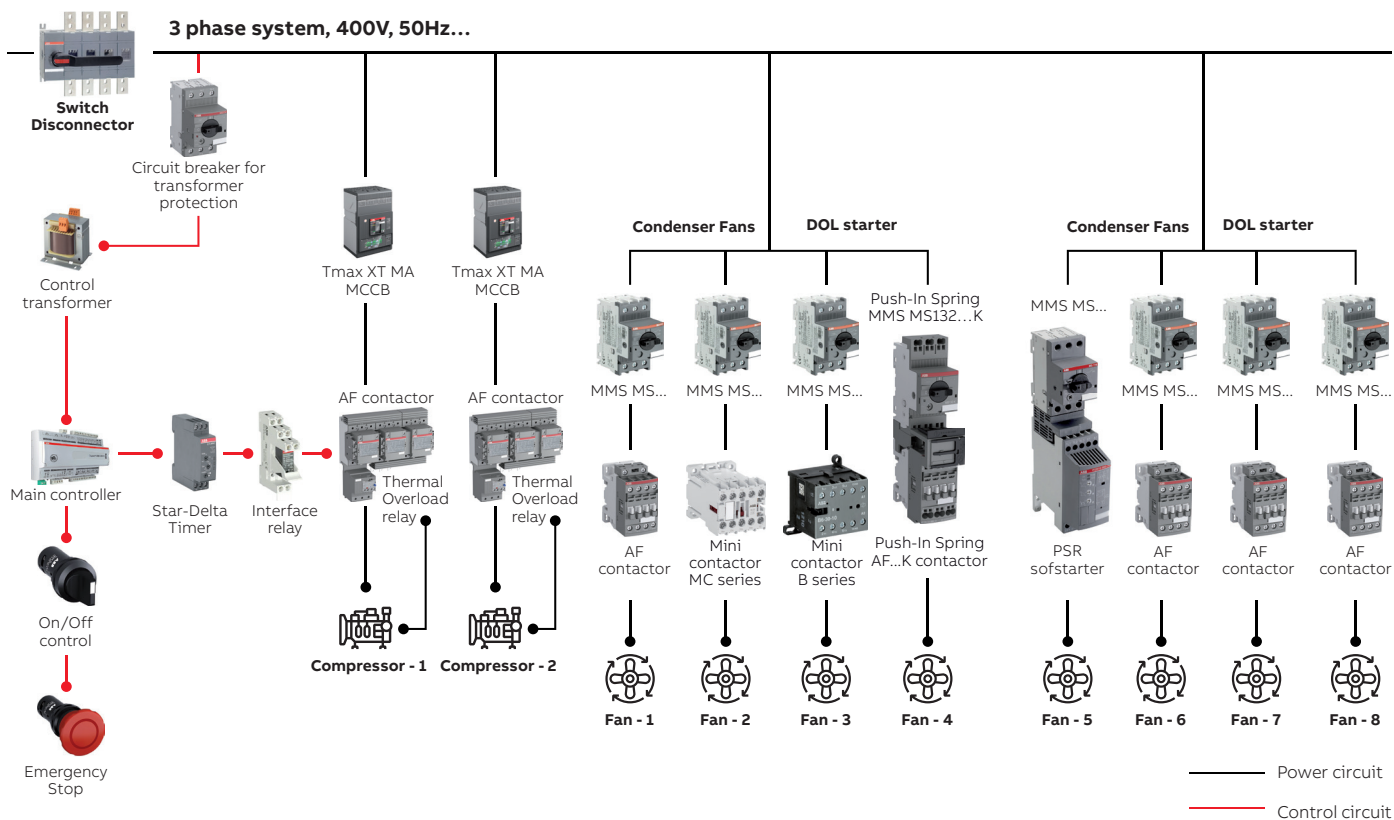
The Advanced solution for Air-cooled Chiller System includes integrated and future-ready motor protection, flexible motor control, fault diagnostics, maintenance schedules and supports all major communication protocols.

The table below provides an overview of the possible functions in our different solution offerings for Air-cooled Chiller Systems in HVAC installations.

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

The ABB Essential Solution for Air-cooled chiller system

Offerings for motor rating 0.06 up to 560 kW



Note:
MMS = Manual Motor Starter MO = Magnetic protection MS = Magnetic & Thermal protection

The table below provides an overview of the difference characteristics between the several combination products offered in the Essential

solution for Air-cooled chiller systems in HVAC installations.

Product combination	Motor rating support	Key differentiator
B Mini contactor	Up to 5.5 kW	For space saving
MMS + contactor (Push-In Spring)	Up to 18.5 kW	For a reliable connection, faster, and easier wiring and vibration proof
MMS + contactor (Screw version)	Up to 45 kW	For standard offerings
MMS + PSR (Softstarter)	Up to 45 kW	For smooth start and stop

APPLICATION FINDER

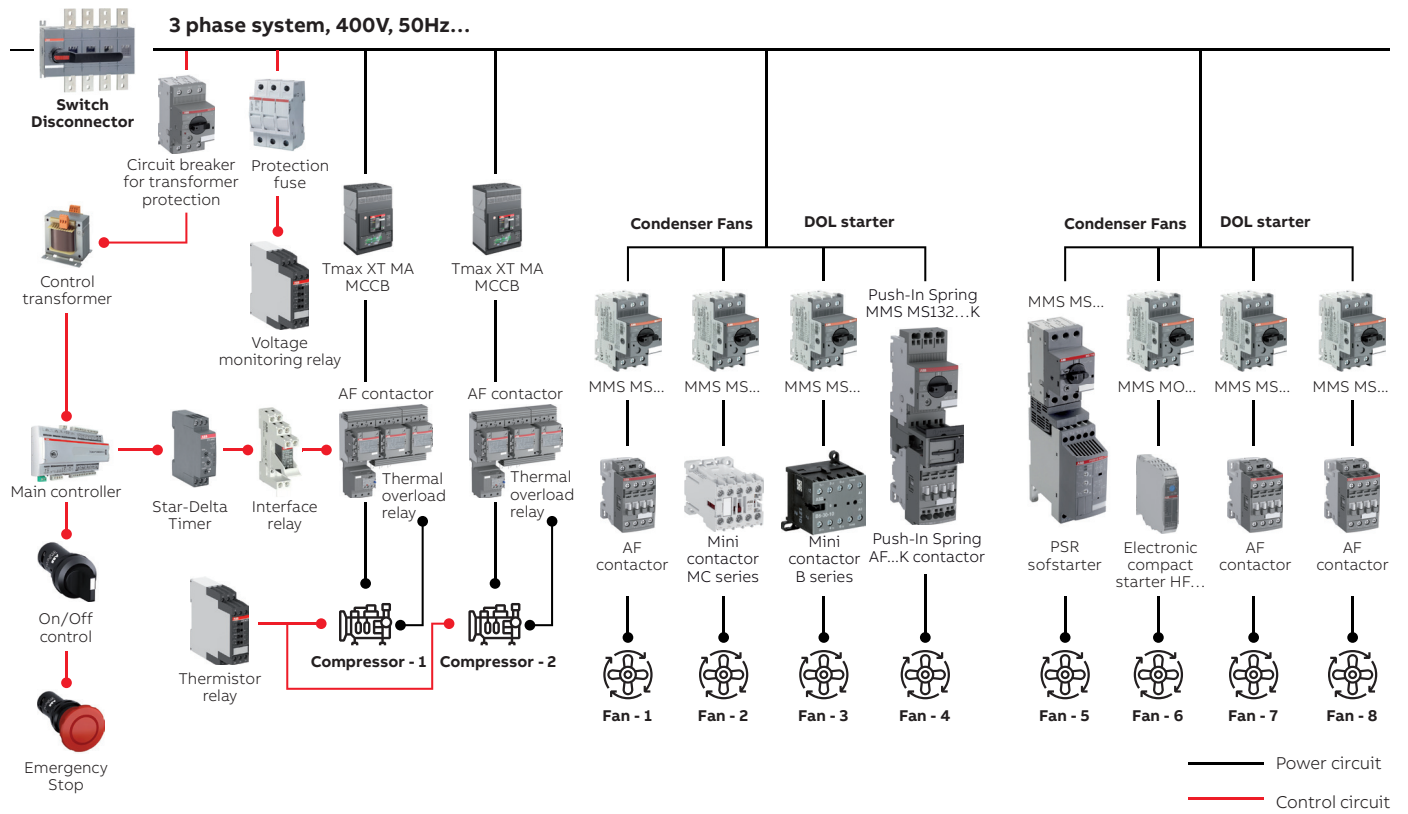
We've made it simpler for you to set up your project!
Click here to find the reference architecture that best fits your needs and download the Bill of Materials.





The ABB Enhanced Solution for Air-cooled chiller system

Offerings for motor rating 0.06 up to 560 kW

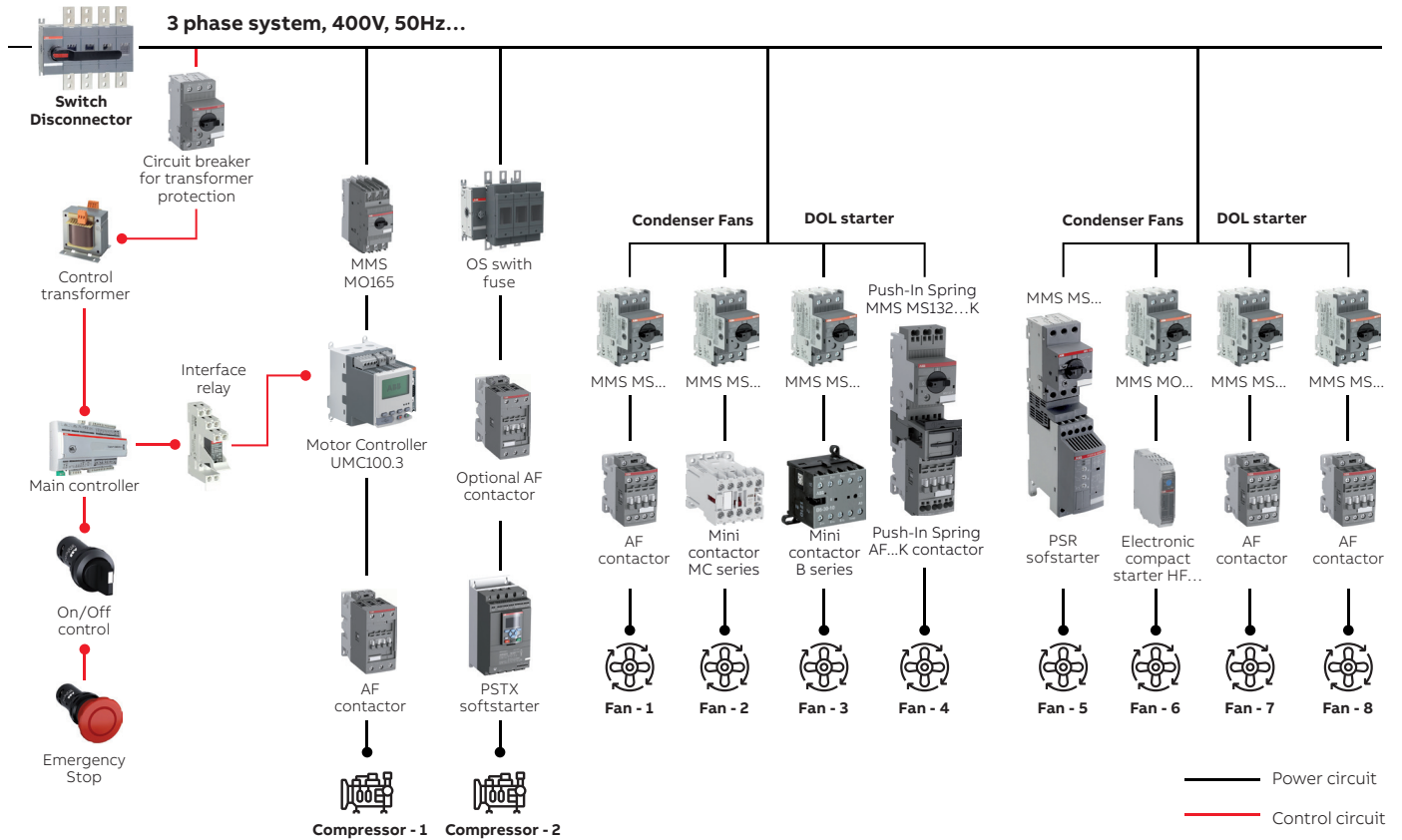




ADVANCED

The ABB Advanced Solution for Air-cooled chiller system

Offerings for motor rating 0.06 up to 1200* kW



* 1200kW for Softstarter connected in inside delta

Main features

- Flexible control either from remote or local
- Advanced protection functions embedded
- Status and fault diagnosis through keypad and communication
- Monitoring of all important electrical parameters
- Supports all the major communication protocols.

Note:

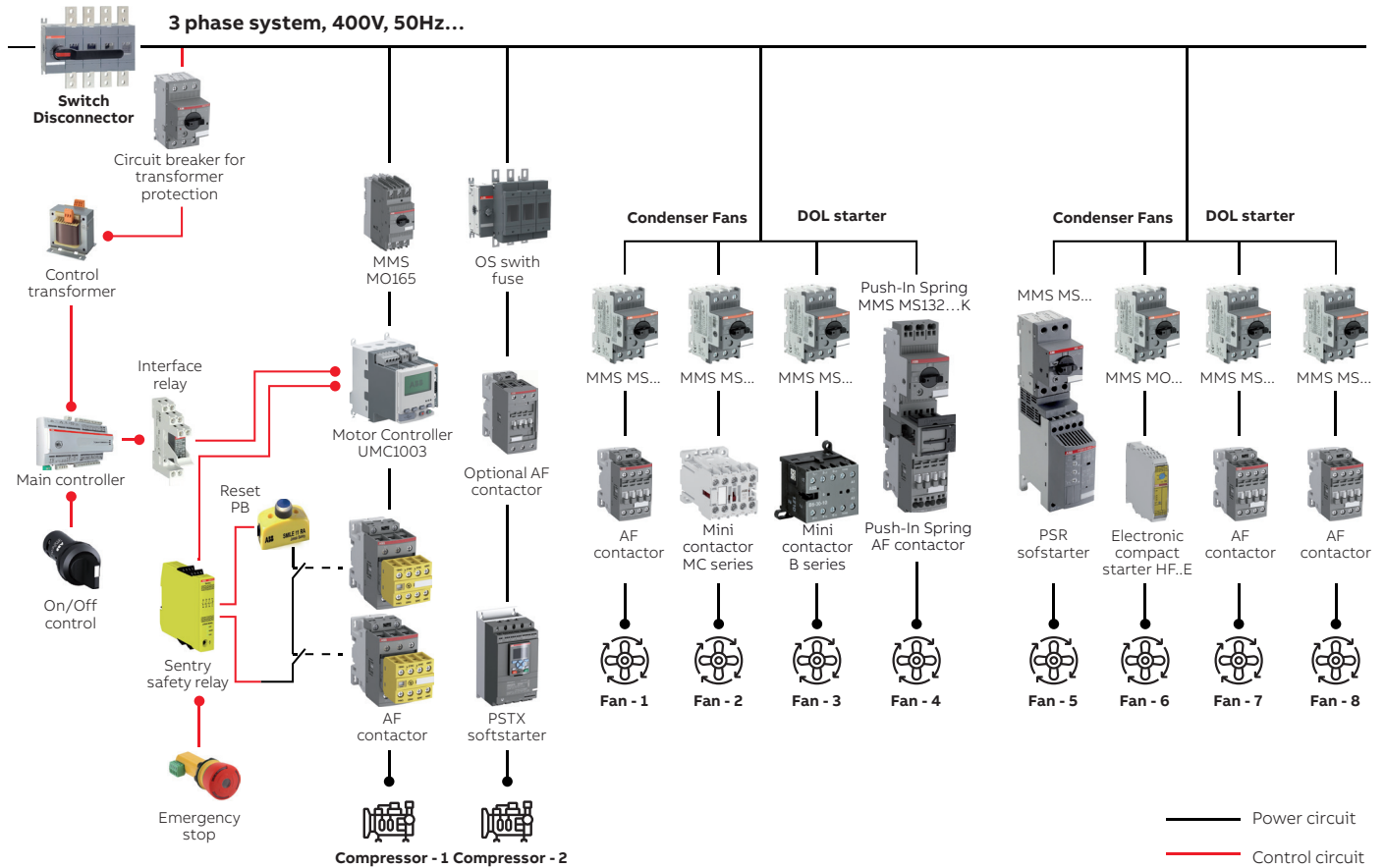
MMS = Manual Motor Starter MO = Magnetic protection MS = Magnetic & Thermal protection



ADVANCED

The ABB Advanced Solution for Air-cooled chiller system with safety functions

Offerings for motor rating 0.06 up to 1200* kW



Main features

- In compliance with main safety standards (EN ISO 13849 and EN 62061), to guarantee the safe use of machinery and equipment.
- Contactors status guaranteed with factory mounted auxiliary contact blocks.
- Easy safety chain identification thanks to the yellow housing.
- Simplified calculation of installation safety level with safety values available in FSDT and Sistema tools.

Note:

* 1200kW for Softstarter connected in inside delta

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Digital offering

Our digital offering for Advanced motor starting solutions will help you digitally connect your chiller systems and monitor them with 100% data availability.



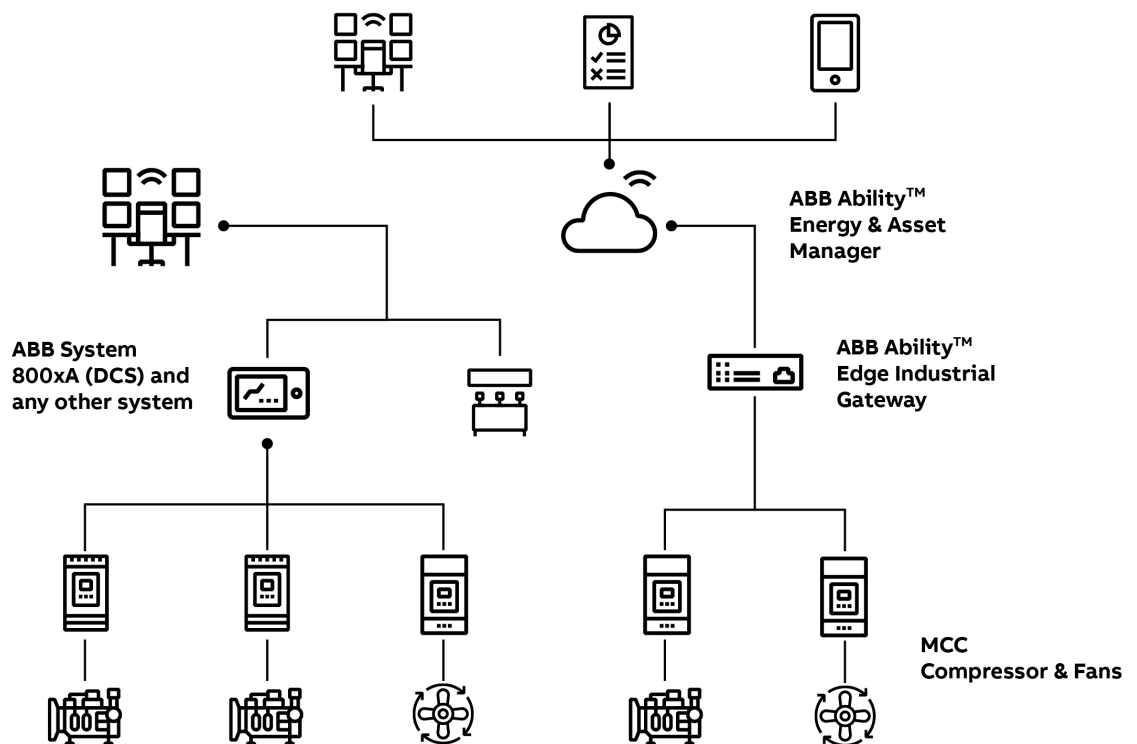
Flexible remote control and monitoring of chiller system



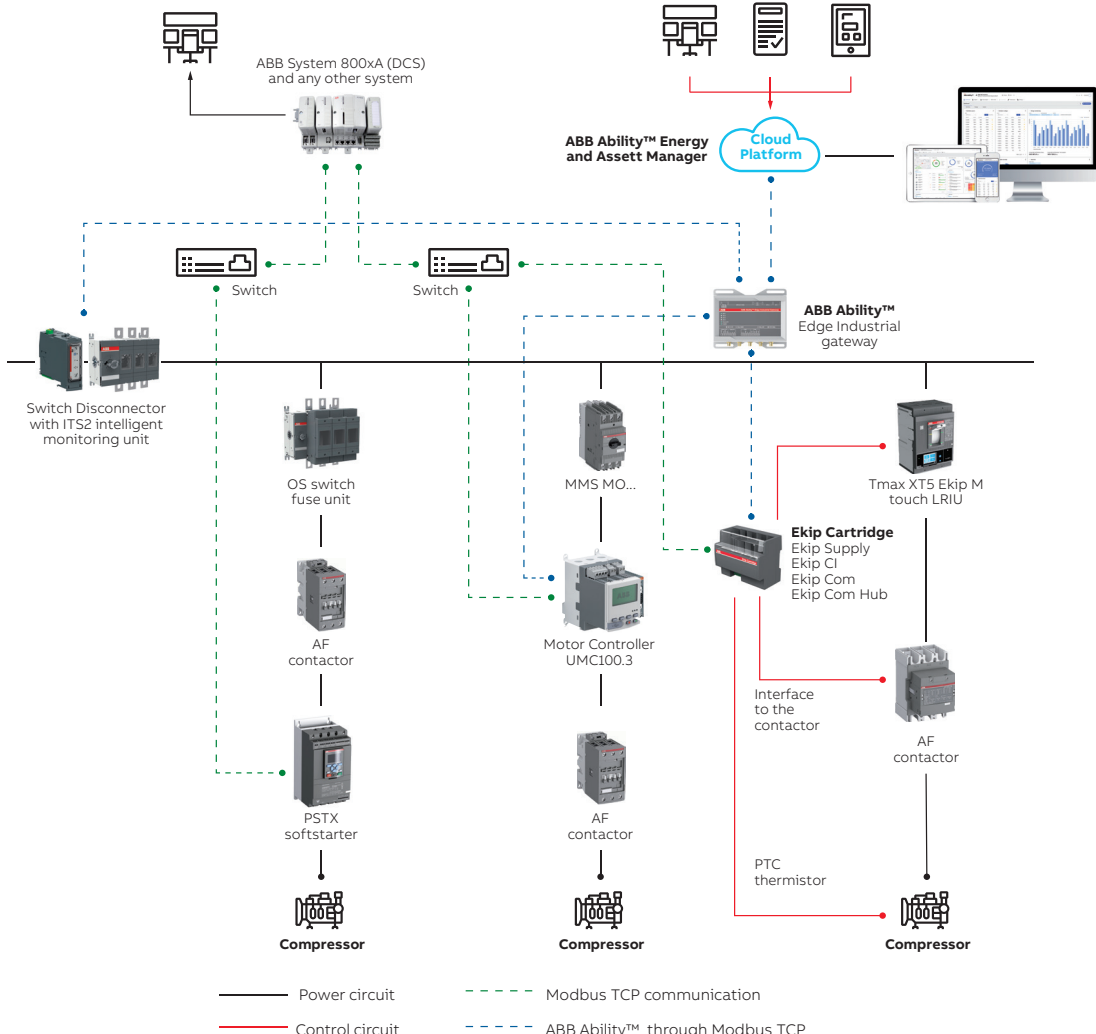
100% availability of chiller system measurement data as an aid to predictive maintenance



ABB Ability™ Energy and Asset Manager ensuring that data are always quickly available via the web applications, allowing easy monitoring when no SCADA or control system are available.



Offering for Air-cooled chiller system from 0.15 up to 1200* kW



1

52

- Modbus RTU
- Profibus DP
- DeviceNet™

5

- Modbus TCP
- Profinet
- Ethernet/IP™
- EtherCAT
- BACnet IP
- BACnet MS/TP
- IEC 61850

*UMC100.3 supports ABB ability through MTQ22 (Modbus TCP)

Bill of materials

Advanced level Motor starting and protection solution for Air-cooled chiller system with 2 compressor and 12 condenser fans

List of parameters that were taken into consideration for the development of the bill of materials		
Standard	IEC	
System Design	Main Voltage 400V AC, 3 phase, 50 Hz, control votlage -230V AC	
Starter type	Compressor	Softstarter starter
	Condenser fans	Dirct-online starter with Push-In Spring solution
IEC - Co-ordination type	Type-2	
System Power	1x Compressors -167kW (320 A FLA)	
	1x Compressors -141kW (270 A FLA)	
	12x Condensor fans - 1.5 kW (3.3A FLA)	
Communication Protocol	Profinet IO	
System Power	6 x Roof vent -0.55 kW (1.6 A)	

Advanced level BOM with Softstarter

Product	Part number	Description	Q.ty
Products for power circuit (Compressors)			
Fuse - High Speed	Bussmann 170M6813D	High Speed 900A	3
Switch fuse unit	1SCA022825R2830	OS630D03P	1
Softstarter	1SFA898115R7000	PSTX370-600-70	1
Contactor - line side	1SFL607002R1311	AF370-30-11-13	1
Fuse - High speed Bussmann	Bussmann 170M6812D	High Speed 800A	3
Fuse holder	1SCA022825R2830	OS630D03P	1
Softstarter	1SFA898114R7000	PSTX300-600-70	1
Contactor - line side	1SFL587002R1311	AF305-300-11-13	1
Products for power circuit (Condenser fans)			
MMS for condenser fan	1SAM350010R1008	MS132-4.0K Push in Spring version	12
Contactor condenser fan	1SBL237005R1300	AF26-30-00K-13 100-250V50/60HZ-DC Contactor	12
side Auxiliary contact block 1NO+ 1NC	1SBN010134R1011	CAL4-11K	12
Connecting links	1SBN082324T1000	BEA38-4K1	12
Busbar system (grouping 3 fans)	1SAM301903R1013	PS1-3-1-65K	4
Products for control Circuit			
Circuit Breaker for Transformer Protection	1SAM340000R1008	MS132-4.0T	1
Control transformer 1000VA in single phase 400V	2CSM236913R0801	TM-C 1000/115-230	1
MCB for Transformer secondary side	2CDS252001R0064	S202-C6 Miniature Circuit Breaker - 2P - C - 6 A	1
Switch disconnecter - 800A (Main incomer)	1SCA022719R2110	OT800E04P	1
Cylon HVAC controller	2CQG201001R1021	CBXi-8R8	1
Cylon Extension module	2CQG200706R1021	FLX-8R8	1
Cyclon 20V DC power supply	2CQG205601R1021	FLX-PS24	1
Products for command and signalling			
Modular range - 2 position selector switch operator	1SFA611200R1006	M2SS1-10B	1
Modular range - Emerg. Stop push button operator	1SFA611523R1001	MPET4-10R	1
Holder	1SFA611605R1100	MCBH-00	2
Contact block - NO	1SFA611610R1001	MCB-10	2
Contact block - NC	1SFA611610R1010	MCB-01	2
Interface relay 4 c/o	1SVR405613R3100	CR-M230AC4L	1
Interface relay - socket	1SVR405651R3000	CR-M4SS	1
Products for Communication			
Profinet (2-port) for softstarter (PSTX)	1SFA899300R1010	AB-PROFINET-IO-2	2

APPLICATION FINDER

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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 contactor is safely operated in an always-optimized condition and hum free.



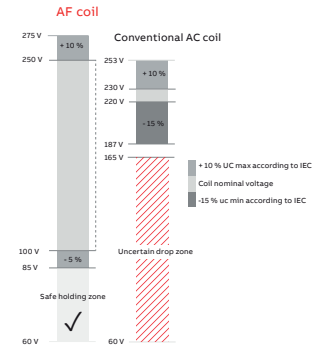
Troubleshooting made easy

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



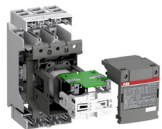
Wide control voltage

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. So, it prevents stoppages caused by voltage fluctuations.



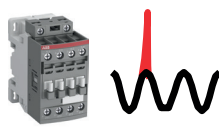
AC & DC control voltage

Thanks to the AF technology the same contactor can be used for AC and DC control. This means easier choice of contactor type, reduced number of parts to keep in stock.



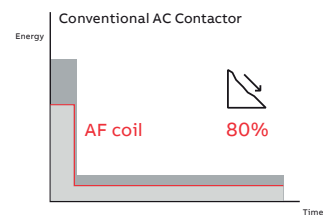
Built-in Surge suppressor

Conventional contactor technology normally requires an external surge suppressor. With the AF contactor technology, surges are handled by a built-in contactor and never reach the control circuit. One less product and one less complication to worry about causing electronics near contactors to fail.



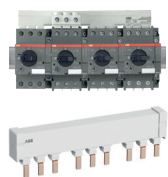
Reduced coil consumption

Thanks to the AF contactor's 80% coil consumption reduction, there is less heat dissipation and a reduction in temperature rise. So, installation density in the panel can be increased. Also, reduction of the control transformer rating, reduction in the size of control panel and a reduction in cost.



Busbar connectors for group mounting

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



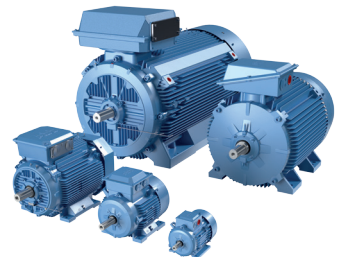
Easy to connect

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 IE3 / IE4 motors

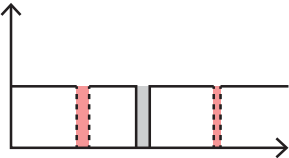
ABB's portfolio matches the latest requirements for IE3 and IE4 motor applications, including the latest utilization categories AC-3 upgrade and AC-3e creation for contactors and motor starters. ABB has validated coordination solutions for AC-3 and AC-3e applications. The results of these tests can be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



Limp mode

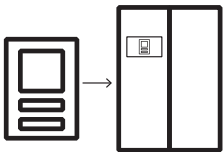
Do only planned stops for increased productivity.

- Keep running with one shorted thyristor
- Do service when you have time
- Protections and main features are still functioning



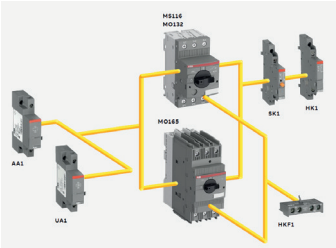
Detachable keypad

Control your process and softstarter safely Detachable keypad makes safe installation possible and comes without need of buying any accessory which will also reduce the costs 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 softstarter

Keep your motor running reliable even in cold and humid environments.

- Remove condensation in idle motors.
- Prevent freezing of the motor.
- Perfect for humid 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 maximum trip temperature is 250° and lowest is -25°. The PT100 measurement must have an accuracy of +/-3° with 3 wires measuring if the 3 connecting cables have the same resistance.



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.

Motor	Rated power	Rated voltage	Motor rated power	Rated short-circuit current	Coordination type
ABB	250 V AC	400 V AC	0.05 kW	1.5 kA	ABB Type 1
ABB	250 V AC	400 V AC	0.12 kW	2.5 kA	ABB Type 2
ABB	250 V AC	400 V AC	0.25 kW	5.0 kA	ABB Type 3
ABB	250 V AC	400 V AC	0.50 kW	10.0 kA	ABB Type 4
ABB	250 V AC	400 V AC	1.00 kW	20.0 kA	ABB Type 5

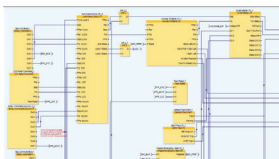
Coated PCBA

Longer lifetime and increased reliability of Softstarter, which reduces risk of unwanted stops. For PSE and PSTX this is standard so no risk of ordering 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 digital input conditions.

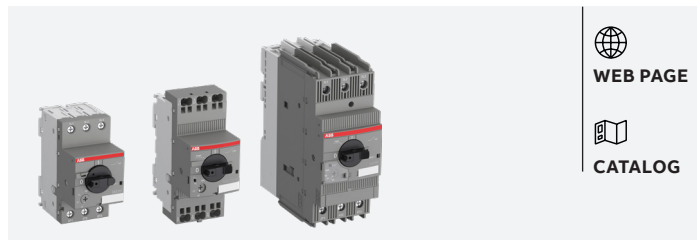


Product offering

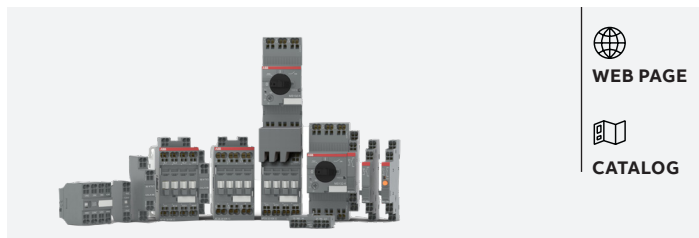
Contactors:



Manual motor starters:



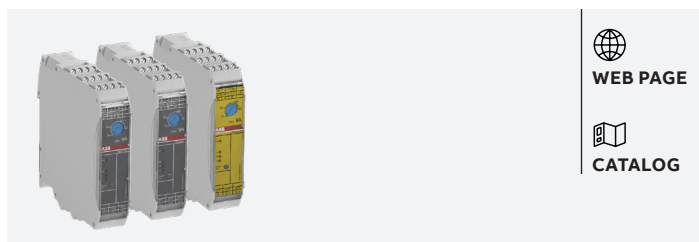
Push-In Spring Motor Starting solution:



Softstarters:



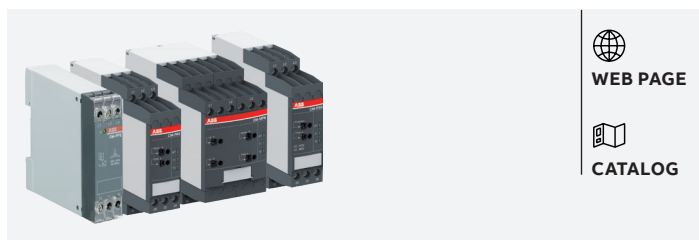
Electronic compact starter:



UMC100.3 Intelligent Motor controller:



Three phase monitoring relays:



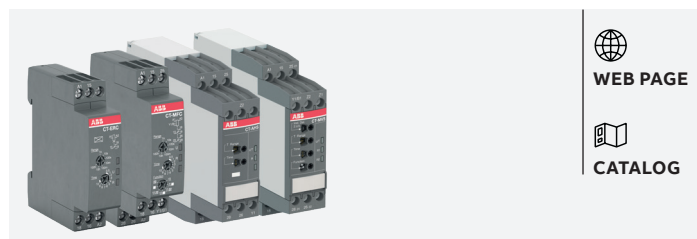
Pluggable Interface Relays:




Primary switched mode power supplies:





Time relays:



Temperature monitoring relay:




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CATALOG

Tmax XT:




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Switch Fuse Units & Switch Disconnectors:




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CATALOG

Safety relays:




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System pro M compact - MCB:




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Pilot devices:




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Find the reference architecture tailored to your needs and speed up your project thanks to our new Application Finder Tool!




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