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.
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 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**
- Direct-on-line starter
- Star-delta starter
- Direct winding starter
- Softstarter starter

**Fan condenser**
- Direct-on-line starter
- Softstarter starter

**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...)
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.

<table>
<thead>
<tr>
<th>Solution level</th>
<th>Basic protection functions</th>
<th>Monitoring of additional protection functions</th>
<th>Digital connectivity and cloud monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Enhanced</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Advanced</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
The ABB Essential Solution for Air-cooled chiller system
Offerings for motor rating 0.06 up to 560 kW

3 phase system, 400V, 50Hz...

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.

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

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

3 phase system, 400V, 50Hz...

- Switch Disconnect
- Circuit breaker for transformer protection
- Protection fuse

- Control transformer
- Star-Delta Timer
- Interface relay

- Main controller
- On/Off control
- Emergency Stop

- Compressor - 1
  - AF contactor
  - Thermal overload relay

- Compressor - 2
  - AF contactor
  - Thermal overload relay

- Condenser Fans
  - DOL starter
  - Push-In Spring
  - MMS MS...
  - AF contactor
  - MMS MS...

- Condenser Fans
  - DOL starter
  - MMS MS...
  - AF contactor
  - MMS MS...

- Fan - 1
- Fan - 2
- Fan - 3
- Fan - 4
- Fan - 5
- Fan - 6
- Fan - 7
- Fan - 8

- Power circuit
- Control circuit
The ABB Advanced Solution for Air-cooled chiller system
Offerings for motor rating 0.06 up to 1200* kW

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

* 1200kW for Softstarter connected in inside delta
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

APPLICATION FINDER

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Click here to find the reference architecture that best fits your needs and download the Bill of Materials.
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.
**ABB’s digital offerings**
Offering for Air-cooled chiller system from 0.15 up to 1200* kW

![Diagram of a chiller system with various components and connections]

- **Power circuit**
- **Control circuit**

**Supporting communication protocols**

**Fieldbus networks**
- Modbus RTU
- Profinet DP
- DeviceNet™

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

**Note:**
*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

<table>
<thead>
<tr>
<th>Standard</th>
<th>IEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Design</td>
<td>Main Voltage 400V AC, 3 phase, 50 Hz, control voltage -230V AC</td>
</tr>
<tr>
<td>Starter type</td>
<td>Compressor - Softstarter starter</td>
</tr>
<tr>
<td>Condenser fans</td>
<td>Direct-online starter with Push-In Spring solution</td>
</tr>
<tr>
<td>IEC - Co-ordination type</td>
<td>Type-2</td>
</tr>
<tr>
<td>System Power</td>
<td>1x Compressors -167kW (320 A FLA)</td>
</tr>
<tr>
<td></td>
<td>1x Compressors -141kW (270 A FLA)</td>
</tr>
<tr>
<td></td>
<td>12x Condensor fans - 1.5 kW (3.3A FLA)</td>
</tr>
<tr>
<td>Communication Protocol</td>
<td>Profinet IO</td>
</tr>
<tr>
<td>System Power</td>
<td>6 x Roof vent - 0.55 kW (1.6 A)</td>
</tr>
</tbody>
</table>

**Advanced level BOM with Softstarter**

<table>
<thead>
<tr>
<th>Product</th>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Products for power circuit (Compressors)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuse - High Speed</td>
<td>Bussmann 170M68113D</td>
<td>High Speed 900A</td>
</tr>
<tr>
<td>Switch fuse unit</td>
<td>1SCA022825R2830</td>
<td>OS630D03P</td>
</tr>
<tr>
<td>Softstarter</td>
<td>1SFA898115R7000</td>
<td>PSTX370-600-70</td>
</tr>
<tr>
<td>Contactor - line side</td>
<td>1SFL607002R1311</td>
<td>AF370-30-11-13</td>
</tr>
<tr>
<td>Fuse - High speed Bussmann</td>
<td>Bussmann 170M6812D</td>
<td>High Speed 800A</td>
</tr>
<tr>
<td>Fuse holder</td>
<td>1SCA022825R2830</td>
<td>OS630D03P</td>
</tr>
<tr>
<td>Softstarter</td>
<td>1SFA898114R7000</td>
<td>PSTX300-600-70</td>
</tr>
<tr>
<td>Contactor - line side</td>
<td>1SFL587002R1311</td>
<td>AF305-300-11-13</td>
</tr>
<tr>
<td><strong>Products for power circuit (Condenser fans)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMS for condenser fan</td>
<td>1SAM350010R1008</td>
<td>MS132-4.0K Push in Spring version</td>
</tr>
<tr>
<td>Contactor condenser fan</td>
<td>1SBL237005R1300</td>
<td>AF26-30-00K-13 100-250V50/60HZ-DC Contactor</td>
</tr>
<tr>
<td>side Auxiliary contact block INO+ 1NC</td>
<td>1SBN010134R1011</td>
<td>CAL4-11K</td>
</tr>
<tr>
<td>Connecting links</td>
<td>1SBN082324T1000</td>
<td>BEA38-4K</td>
</tr>
<tr>
<td>Busbar system (grouping 3 fans)</td>
<td>1SAM301903R1013</td>
<td>PS1-3-1-65K</td>
</tr>
<tr>
<td><strong>Products for control Circuit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circuit Breaker for Transformer Protection</td>
<td>1SAM340000R1008</td>
<td>MS132-4.0T</td>
</tr>
<tr>
<td>Control transformer 1000VA in single phase 400V</td>
<td>2CSM236913R8001</td>
<td>TM-C 1000/115-230</td>
</tr>
<tr>
<td>MCB for Transformer secondary side</td>
<td>2CD5252001R0064</td>
<td>S202-C6 Miniature Circuit Breaker - 2P - C - 6 A</td>
</tr>
<tr>
<td>Switch disconnector - 800A (Main incoming)</td>
<td>1SCA022711R1921</td>
<td>OTB800E04P</td>
</tr>
<tr>
<td>Cylon HVAC controller</td>
<td>2CQG201001R1021</td>
<td>CBXi-8R8</td>
</tr>
<tr>
<td>Cylon Extension module</td>
<td>2CQG200706R1021</td>
<td>FLX-8R8</td>
</tr>
<tr>
<td>Cyclon 20V DC power supply</td>
<td>2CQG205601R1021</td>
<td>FLX-P524</td>
</tr>
<tr>
<td><strong>Products for command and signalling</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modular range - 2 position selector switch operator</td>
<td>1SFA611200R1006</td>
<td>M25S1-10B</td>
</tr>
<tr>
<td>Modular range - Emerg. Stop push button operator</td>
<td>1SFA611523R1001</td>
<td>MPET4-10R</td>
</tr>
<tr>
<td>Holder</td>
<td>1SFA611605R1100</td>
<td>MCBH-00</td>
</tr>
<tr>
<td>Contact block - NO</td>
<td>1SFA611610R1001</td>
<td>MCB-10</td>
</tr>
<tr>
<td>Contact block - NC</td>
<td>1SFA611611R1010</td>
<td>MCB-01</td>
</tr>
<tr>
<td>Interface relay 4 c/o</td>
<td>1SVR405613R3100</td>
<td>CR-M230AC4L</td>
</tr>
<tr>
<td>Interface relay - socket</td>
<td>1SVR405651R3000</td>
<td>CR-M45S</td>
</tr>
<tr>
<td><strong>Products for Communication</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profinet (2-port) for softstarter (PSTX)</td>
<td>1SFA899300R1010</td>
<td>AB-PROFINET-IO-2</td>
</tr>
</tbody>
</table>

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**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.

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.

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.

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.

**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°C and lowest is -25°C. The PT100 measurement must have an accuracy of +/-3°C with 3 wires measuring if the 3 connecting cables have the same resistance.

**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.

**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.

**Flexible soft logic possible with UMC100.3**

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

**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.

**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.

**Detachable keypad**

Coated PCBA

**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.
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:
ABB Ability™ Energy and Asset Manager is a state-of-the-art cloud solution that integrates energy and asset management in a single intuitive dashboard.

Temperature monitoring relay: [WEB PAGE][CATALOG]

Tmax XT: [WEB PAGE][CATALOG]

Switch Fuse Units & Switch Disconnectors: [WEB PAGE][CATALOG]

Safety relays: [WEB PAGE][CATALOG]

System pro M compact - MCB: [WEB PAGE][CATALOG]

Pilot devices: [WEB PAGE][CATALOG]