

BROCHURE

Data Center cooling

Motor Starting and Protection Solutions



- Reduce the energy impact and redefine the efficiency standard in Data Center cooling with ABB.

Improving data center performance through efficient energy use, increased reliability and advanced maintenance.

Our best-in-class solutions and innovative product portfolio for motor starting and protection provide safety, operational performance, higher availability, easy installation, and energy efficiency to keep your cooling systems always running.

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Data Center cooling

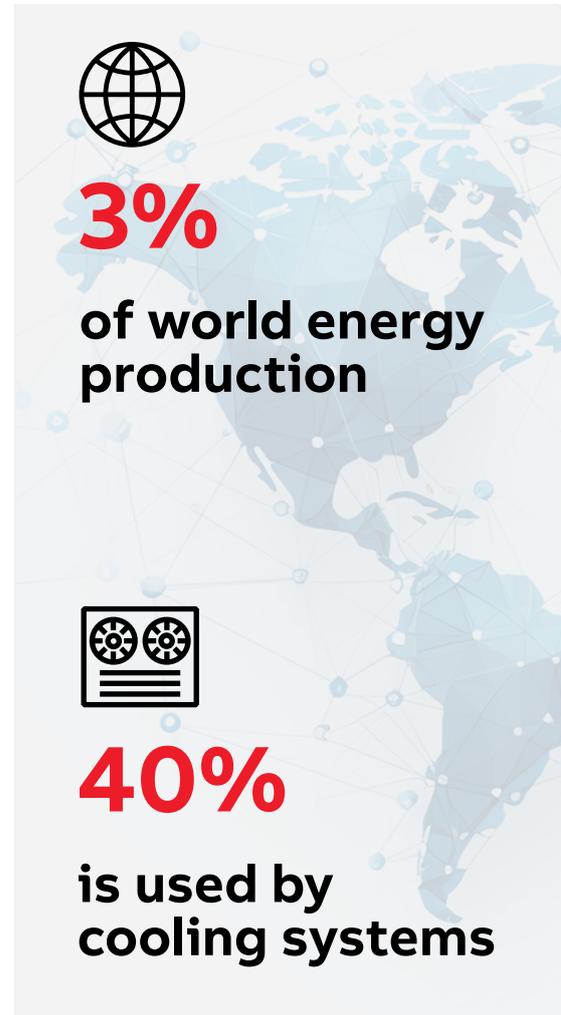
Data centers energy demand

Data centers already use around 3% of the world's energy production, and their energy demand is set to increase eightfold – to some 7000 TWh by 2030.*

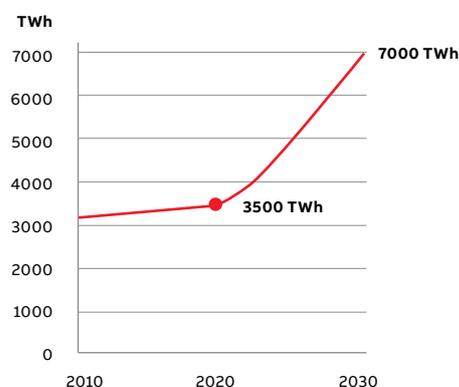
On average, 40% of this energy is used by cooling systems – chillers/compressors are the biggest single energy consumers – to ensure the facility remains operational 24/7. That is why there has never been a greater focus on improving data center power usage effectiveness (PUE) through the increased energy efficiency of the fans, pumps, and compressors that form the heart of data center cooling systems.



Solutions for Motor control and protection play a crucial role to increase energy efficiency while offering the appropriate level of reliability and availability required by data centers. ABB's solutions provide a comprehensive range of technologies and expertise that can help HVAC OEMs design and implement effective and efficient cooling solutions for data centers that address the challenges of high-power density, high ambient temperatures, improved energy efficiency and the need for redundancy and reliability.

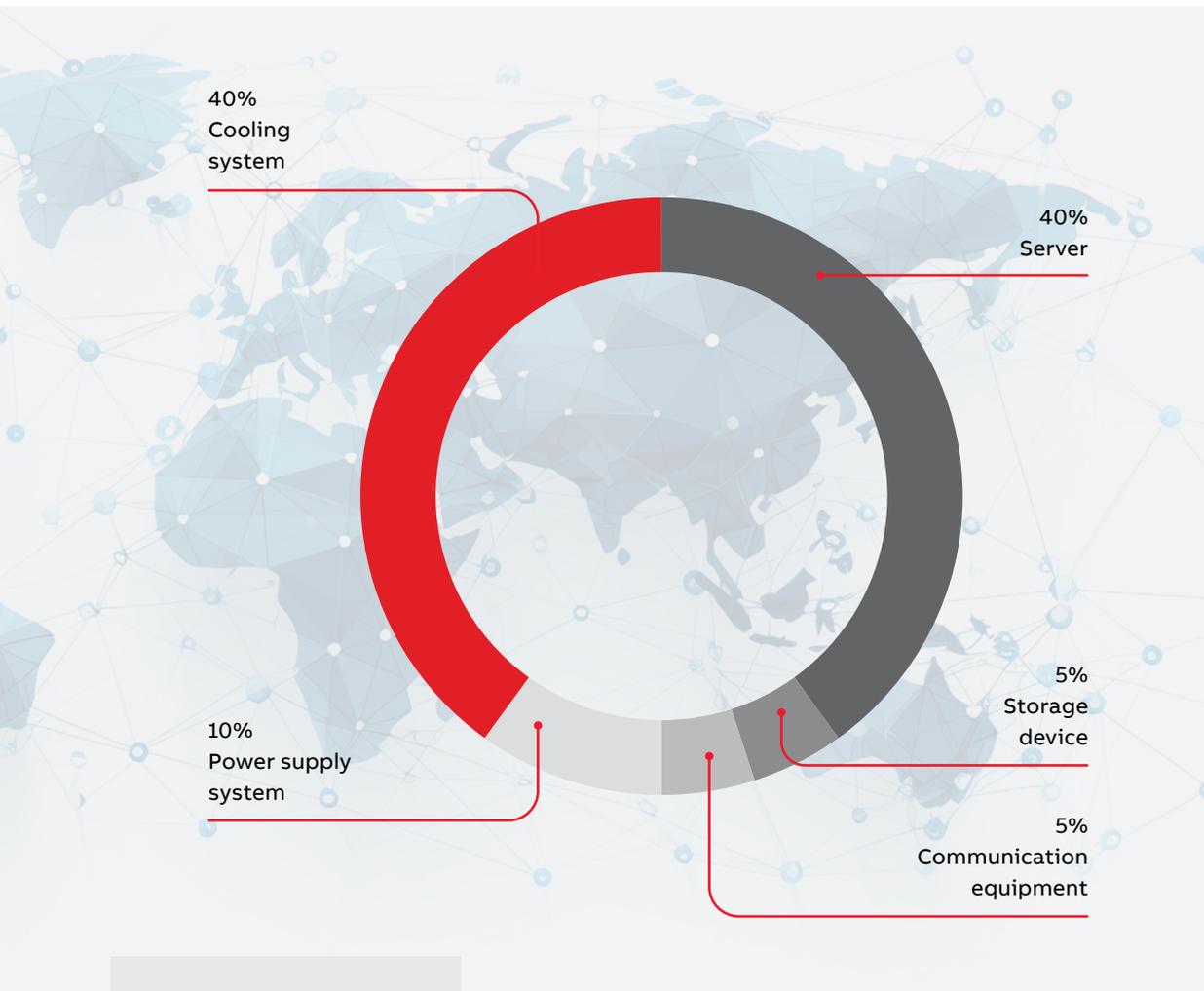


Data centers energy demand*



01 Data Center energy consumption

*ABB Energy efficiency in Data Center WP <https://ourworldindata.org/>



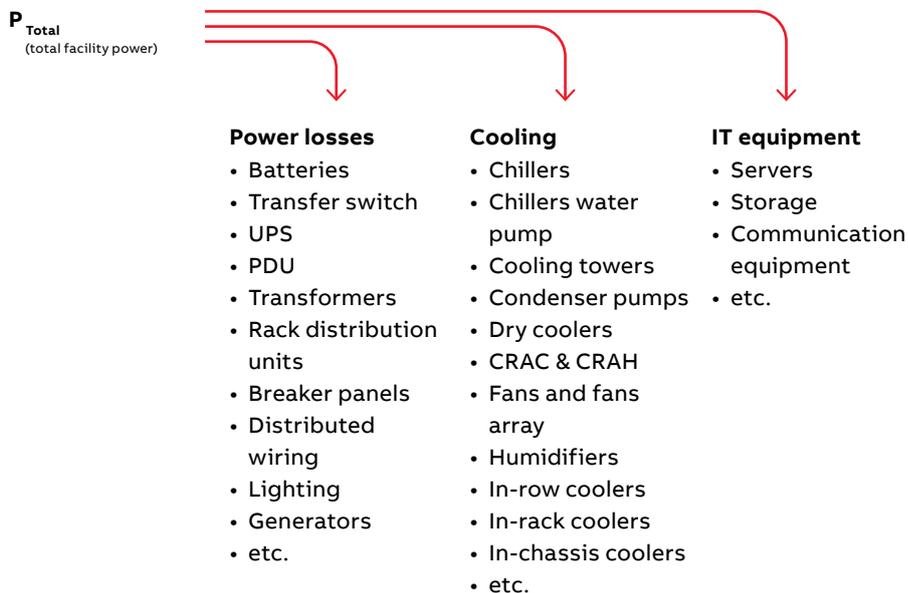
02 Typical data center energy use

$$PUE^* = \frac{\text{Power}_{\text{Total}}}{\text{Power}_{\text{IT load}}}$$

* Power usage effectiveness

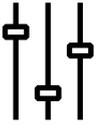
02

Typical data center energy use



Air and power quality for increased data center reliability

Maintaining an optimal computer room environment, as well as a clean power network, helps sustain a data center's continuous and efficient operation.



Cooling plant control

Cooling is required to maintain the indoor environment suitable for computing equipment operation.

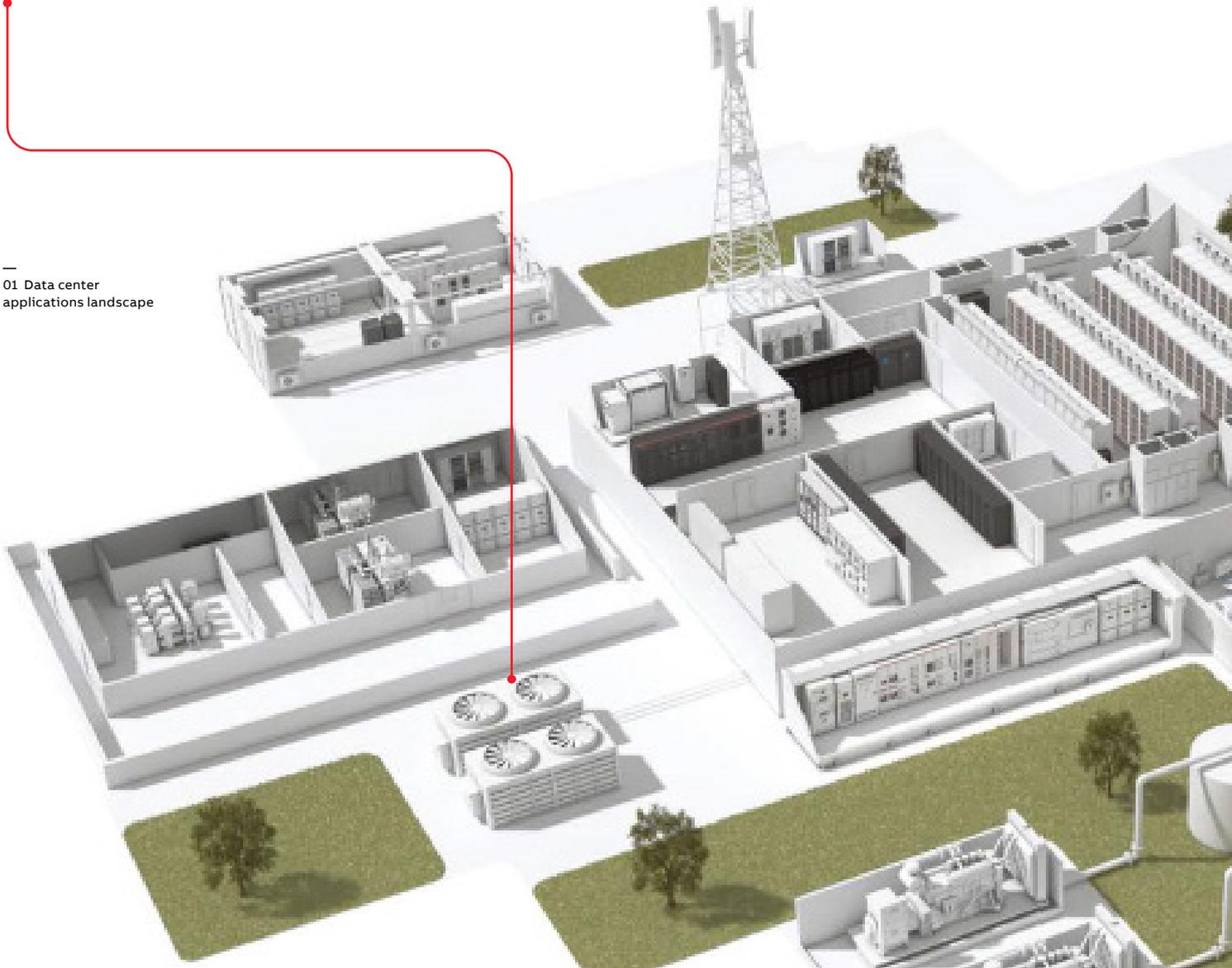
Applications

- central chillers including compressors
- circulation pumps
- condenser fans
- air handling units
- cooling towers

Requirements

- Reliable control of fans, pumps and compressors
- Equipment redundancy to ensure cooling process continuity
- Minimized harmonic disturbances to the electric network impacting system and equipment reliability
- Increased energy efficiency limiting heat dissipation and reducing temperature rise
- Condition monitoring for the powertrain components – motor starters, circuit breakers, changeover devices, drives, motors – for increased uptime

01 Data center applications landscape





Computer room environment

To ensure continuous data center operation, conditioned air of required temperature, humidity and cleanliness should be supplied to computer racks.

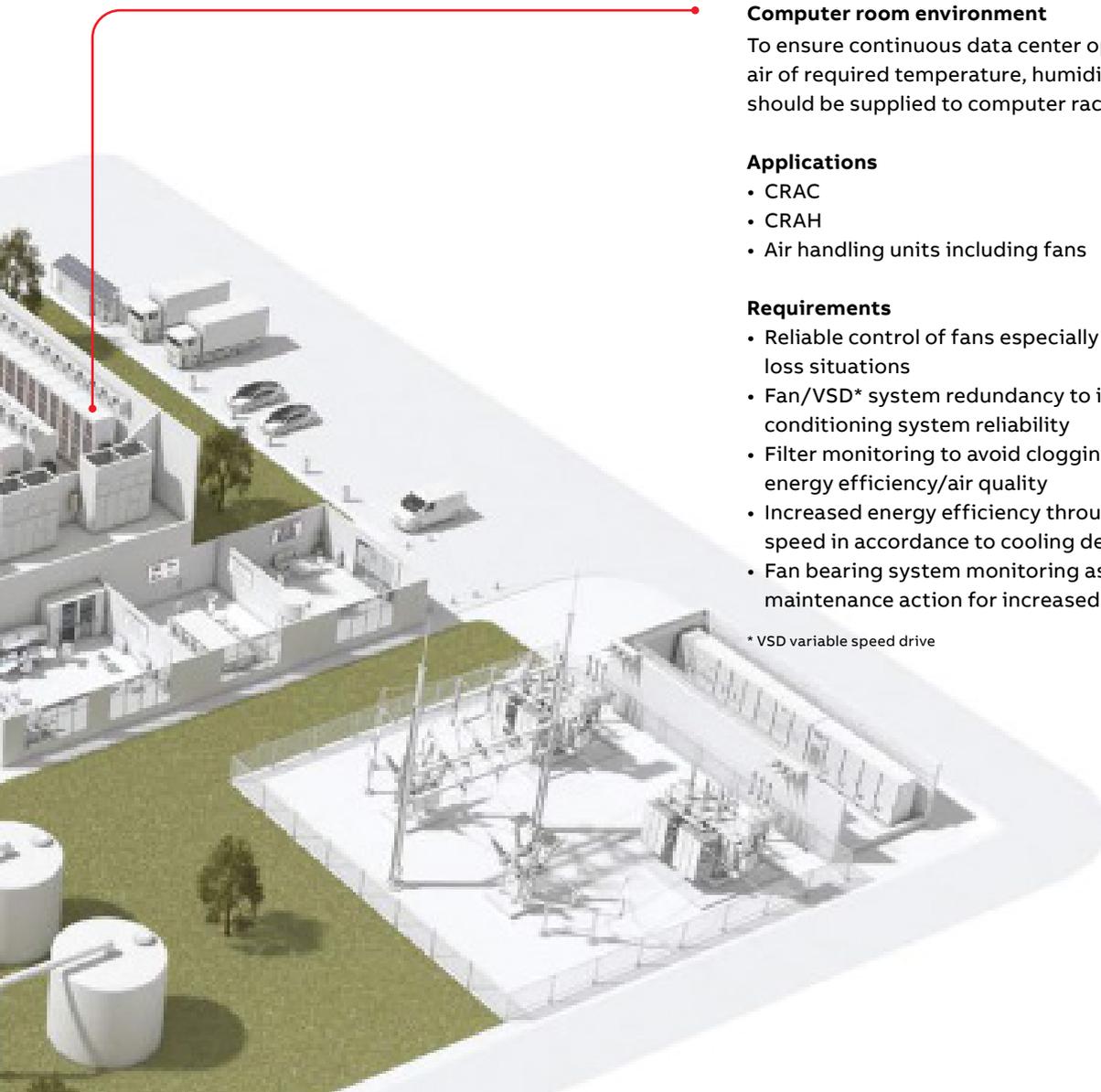
Applications

- CRAC
- CRAH
- Air handling units including fans

Requirements

- Reliable control of fans especially in communication loss situations
- Fan/VSD* system redundancy to increase air conditioning system reliability
- Filter monitoring to avoid clogging and drop in energy efficiency/air quality
- Increased energy efficiency through adjusting fan speed in accordance to cooling demand
- Fan bearing system monitoring as predictive maintenance action for increased uptime

* VSD variable speed drive



Critical data center applications

— 01 Fan arrays

— 02 CRAC units

— 03 Cooling towers and chillers



01



02

Fan arrays

Fan arrays are designed with smaller sized fans mounted to motors, either in a multi-motor to drive configuration, or 1:1 motor-drive configuration. Typically, direct drive plenum fans are used in a fan array to create parallel airflow paths.

These fans are commonly used in data centers where space is tight and maximum airflow is required for cooling computer servers and other critical units. They also ensure good redundancy - if one of the fans fails, the rest will keep running.

CRAC units

Computer Room AC units are self-contained cooling systems used in data centers.

The CRAC units have cooling coils and filters inside to remove dust from the rooms as well as a fan to circulate and distribute the air. Some can also humidify or dehumidify the air to control static electricity in the air.



03

Cooling towers and chillers

Located in the gray space of data centers, cooling towers and chillers are often overlooked as a way to boost efficiency.

Data centers that upgrade from an air-cooled condenser to a water-cooled HVAC system that uses mechanical chillers can reduce power consumption by up to 50%.

CRAH units

Computer Room Air Handler units are cooling systems similar to a CRAC system but they use chilled water instead of refrigerant. The chilled water is stored in a chiller and hot air transfers the heat to the water which then returns to the chiller.

Typical drawing of data center power system

With reference to the Data center system plus system design* shown in the diagram below, it is essential to ensure that the compressor, pump and fan motors of chillers and CRAC units are equipped with a reliable and efficient solution for motor starting and protection.

ABB recognizes that every application has unique requirements, and as such offers a range of tailored solutions to meet these needs. The available solutions include direct-on-line, soft starters, drives, digitally enabled devices with

predictive maintenance, and cloud monitoring. These solutions are designed to deliver optimal performance and efficiency while ensuring maximum reliability and uptime.

With ABB's solutions, you can enhance the productivity and performance of your HVAC system, reduce operational costs, and improve the overall efficiency of your data center. In addition, ABB offers solutions for power factor correction that can further enhance the performance of your HVAC system.

* System plus system design comprises 2N redundancy capacity components and independent active distribution paths that serve the IT load and mechanical devices for continuous cooling

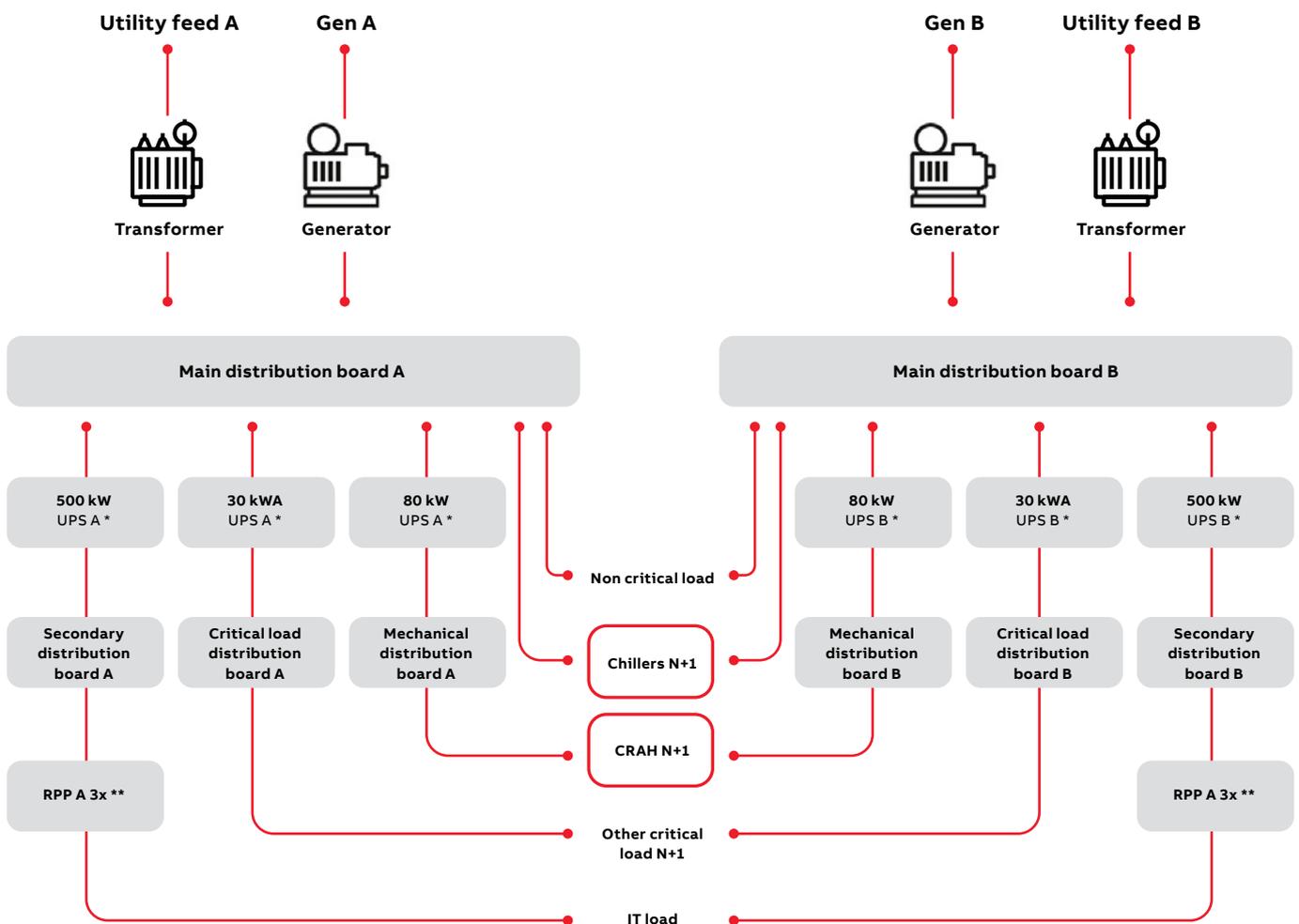


Fig 4 System plus system data center power distribution

* UPS uninterruptible power supply

** RPP remote power panel



ABB's solution for motor starting and protection of cooling system in data center

Key values

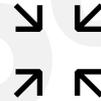
10%



Continuous operation

Reduce chances of failure of your chiller system by **10%** and ensure its higher availability with reliable connections and coordinated products from a reliable supplier.

35%



Compact control panels

Save up to **35%** of the space in the control panel of your 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.

80%



Energy-efficient system

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.

50%



Easy installation

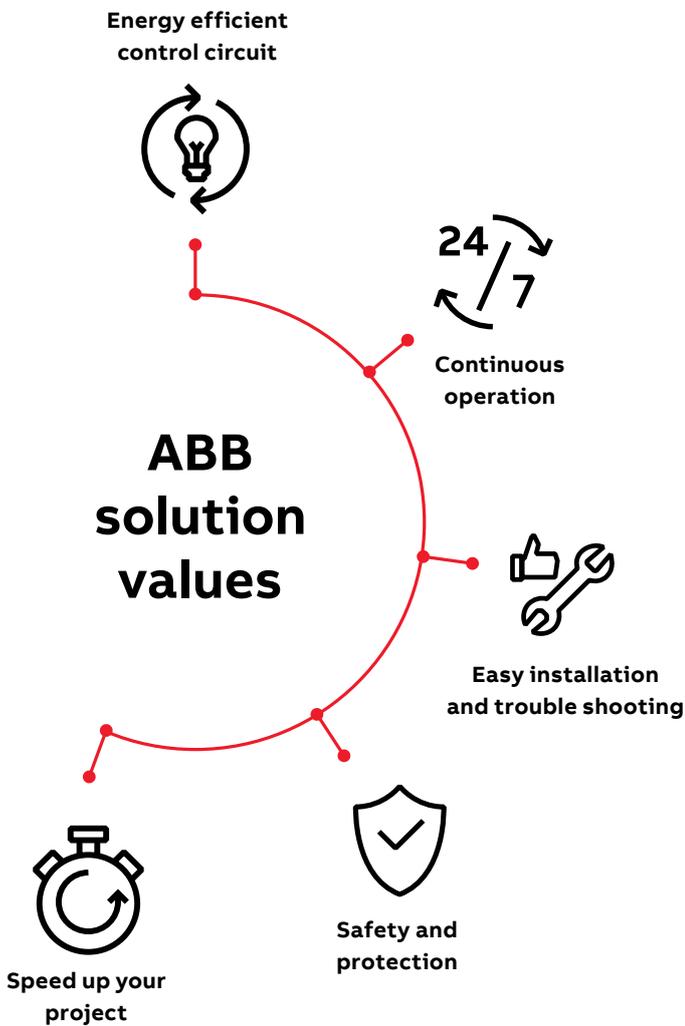
Reduce control panel assembly time by up to **50%** with our wide range of easy-to-use accessories and connection sets. This provides savings on labor costs, cuts the total cost of the installation, and reduces time to market.

ABB solution value proposition

Motor starting and protection for HVAC chiller system

Key challenges

- Higher availability of the chiller system especially for process/critical segments
- Easy installation and fast commissioning to accelerate production/assembly turnover
- Compact design of components due to limited space in the control panels
- Energy-efficient control panels

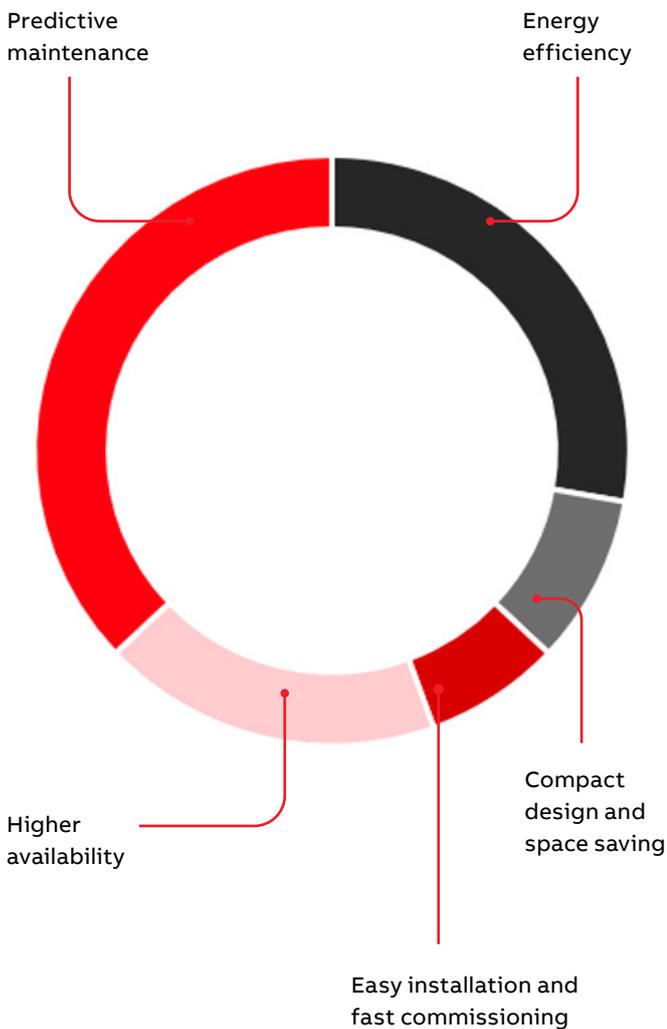


Overall savings using ABB solutions

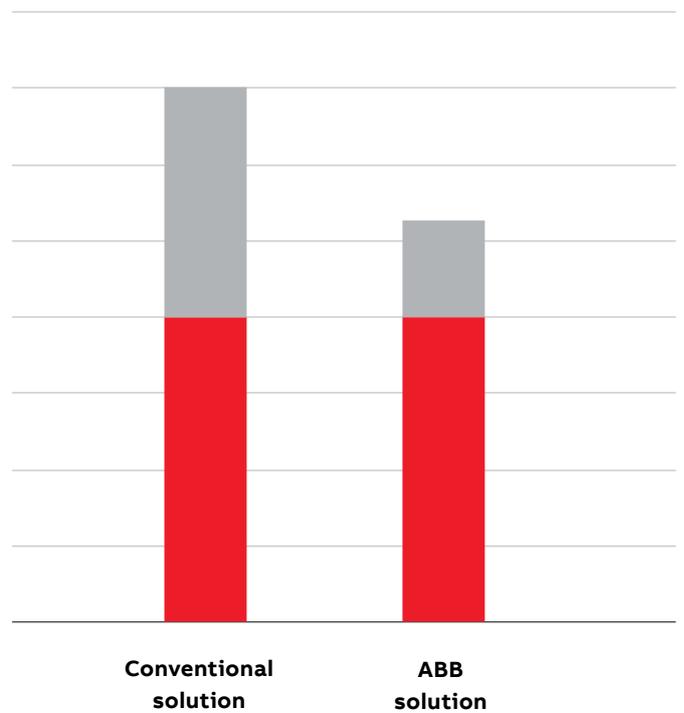
ABB Solutions provide evident values to answer most relevant challenges of HVAC systems, in particular in data center power scenario.

Saving for manufacturer with a number of chillers installed per year in the order of hundreds can be in the range of 100 thousands dollar and increase significantly depending on system parameters.

Contribution to overall saving



■ Initial investment
■ Operational cost



Motor starting and protection solutions for data center cooling systems

Enhanced and advanced solutions, whatever the extend of your operation





Enhanced solutions

Get robust protection with enhanced safety, control and monitoring. Enhanced solutions improve operation continuity of your installation and cut the control panel’s assembly time while increasing safety and protection level of your machinery and equipment.



Advanced solutions

Get ahead with smart data and predictive applications, to keep your plant running. Does the downtime of your application lead to financial losses or equipment damage? Maximize uptime with advanced solutions for motor protection and control.

Advanced solutions will allow you to detect problems earlier and prevent plant stand-stills with integrated protection functions as well as extensive diagnostic and status information.

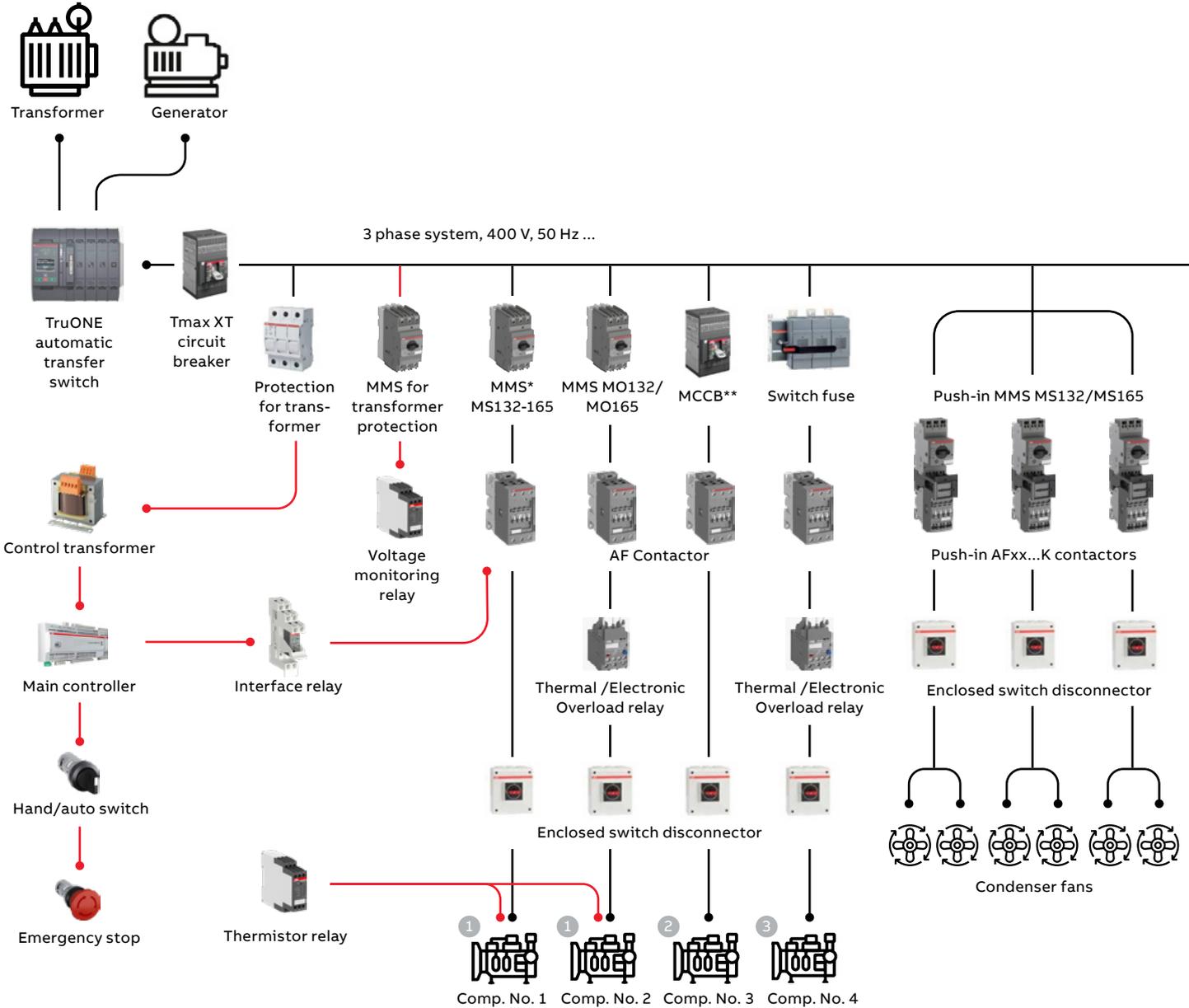
Get ahead with intelligent, predictive operations thanks to integrated data and advanced connectivity.

Possible functions in different level of solution offerings for the chiller system

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

Enhanced solution for motor starting

IEC version



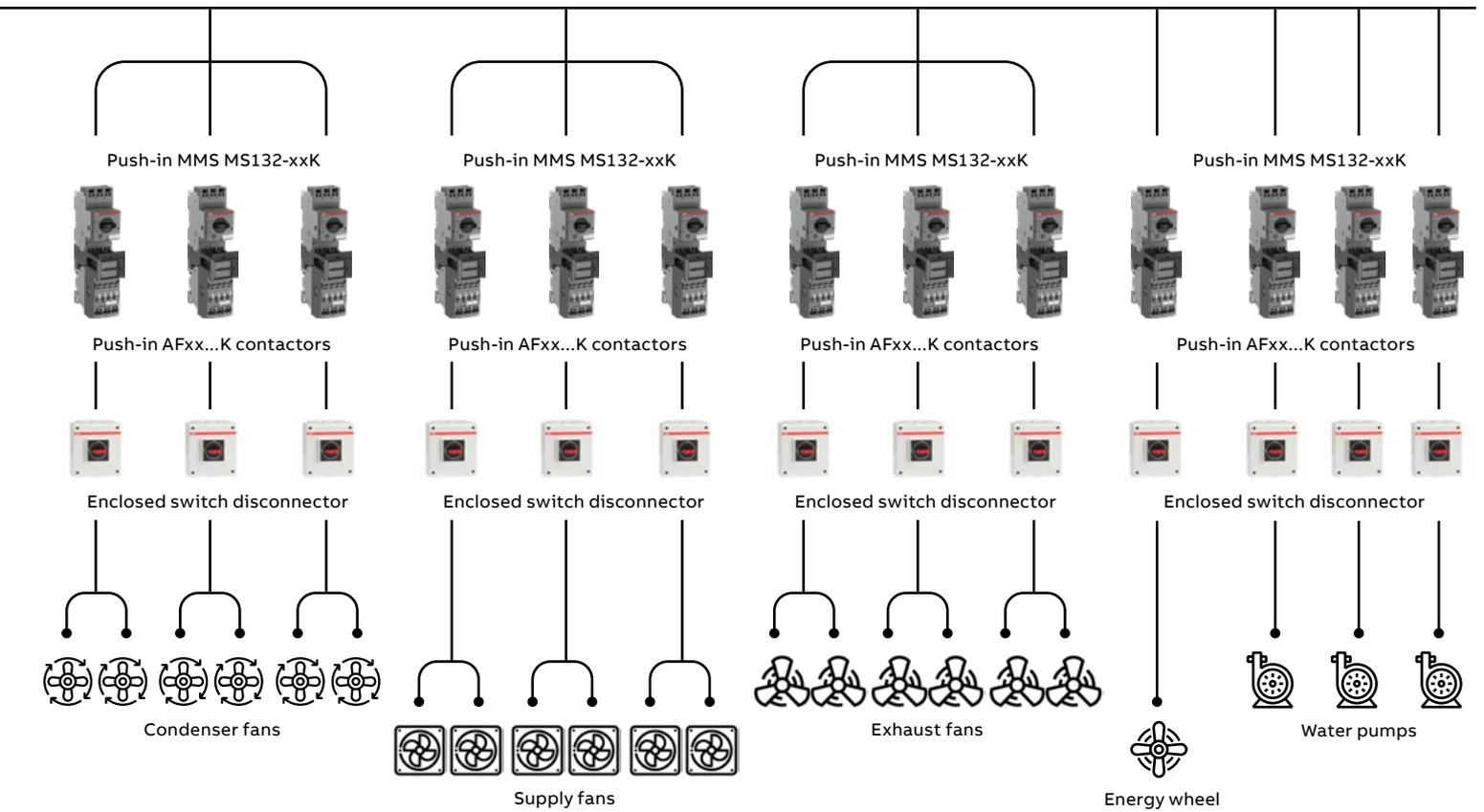
Power circuit
Control circuit

* MMS: manual motor starter
** MCCB: molded case circuit breaker

1 For motor rating up to 55 kw and rated voltage up to 690 V AC

2 For motor rating up to 900 kw and rated voltage up to 1000 V AC

3 For motor rating up to 800 kw and rated voltage up to 690 V AC



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.



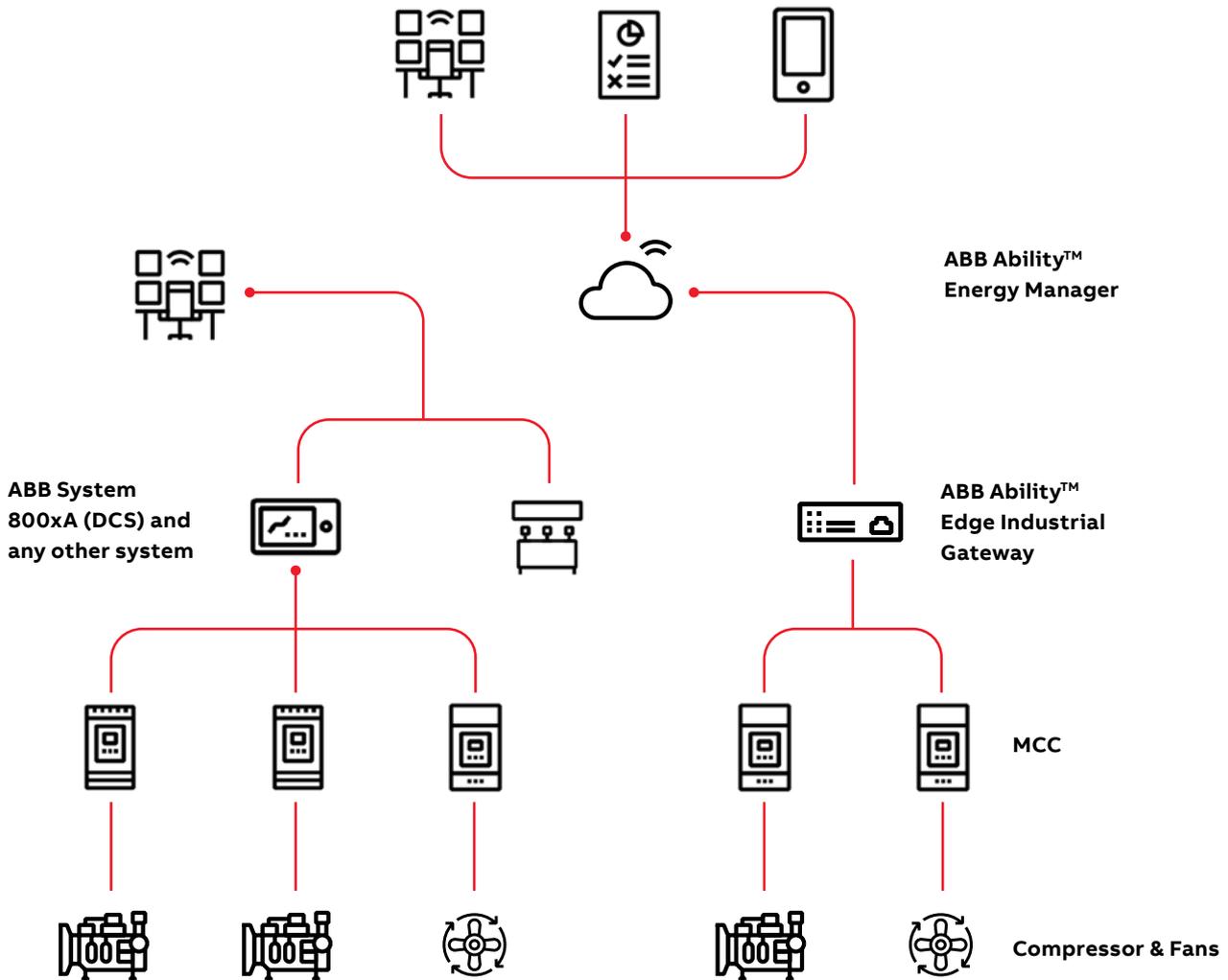
Flexible remote control and monitoring of chiller system

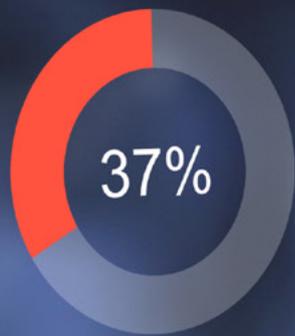


100% availability of chiller system measurement data as an aid to predictive maintenance

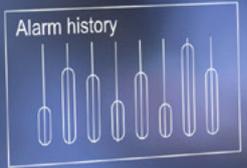


ABB Ability™ Energy Manager ensuring that data are always quickly available via the web applications, allowing easy monitoring when no SCADA or control system are available.





Compressor



Cooling tower



Expansion device



Brine level



Water level

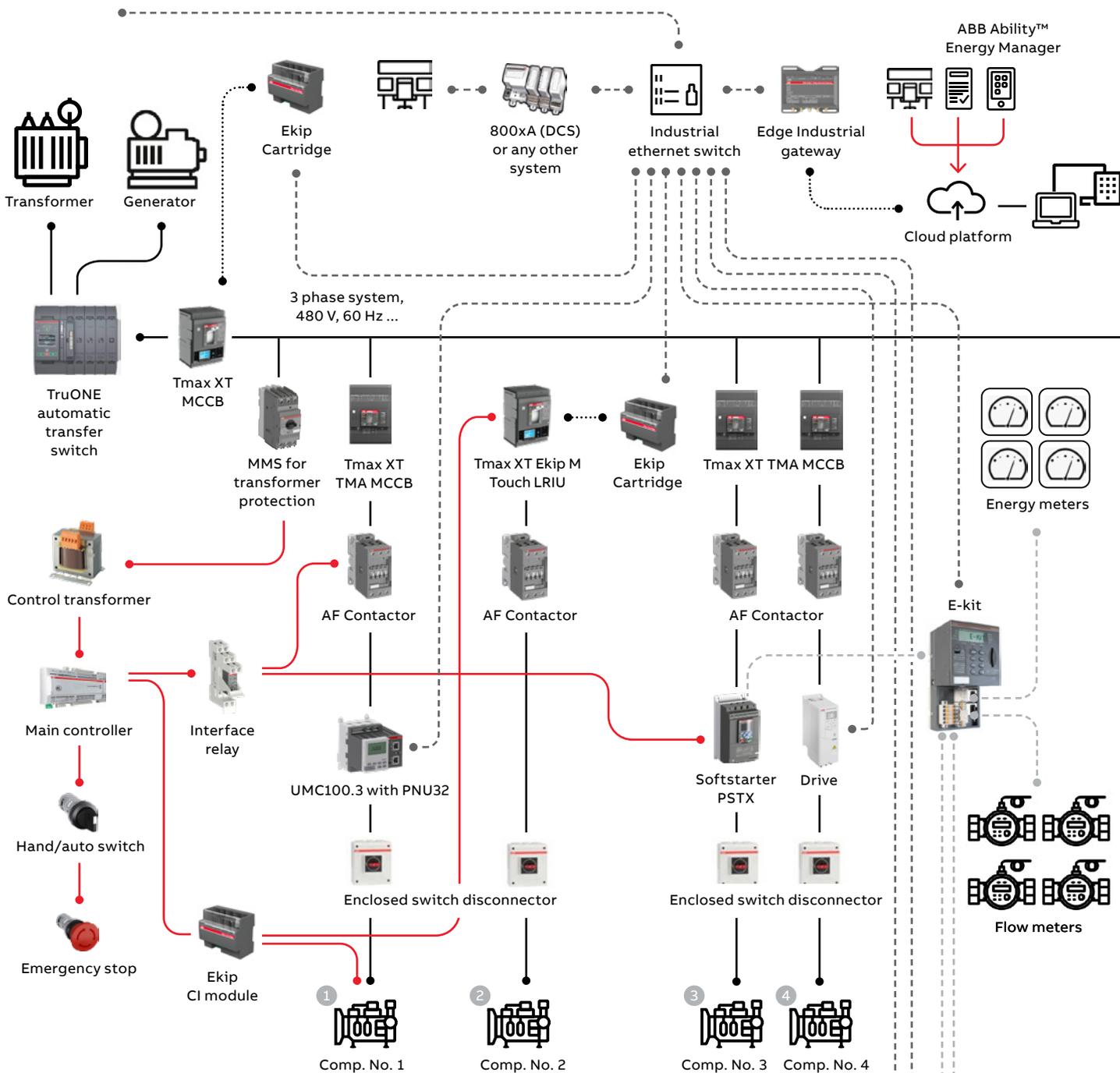


Advanced solution for motor starting and control

IEC version



- Power circuit
- Control circuit
- ABB Ability EAM
- Modbus TCP
- Modbus RTU

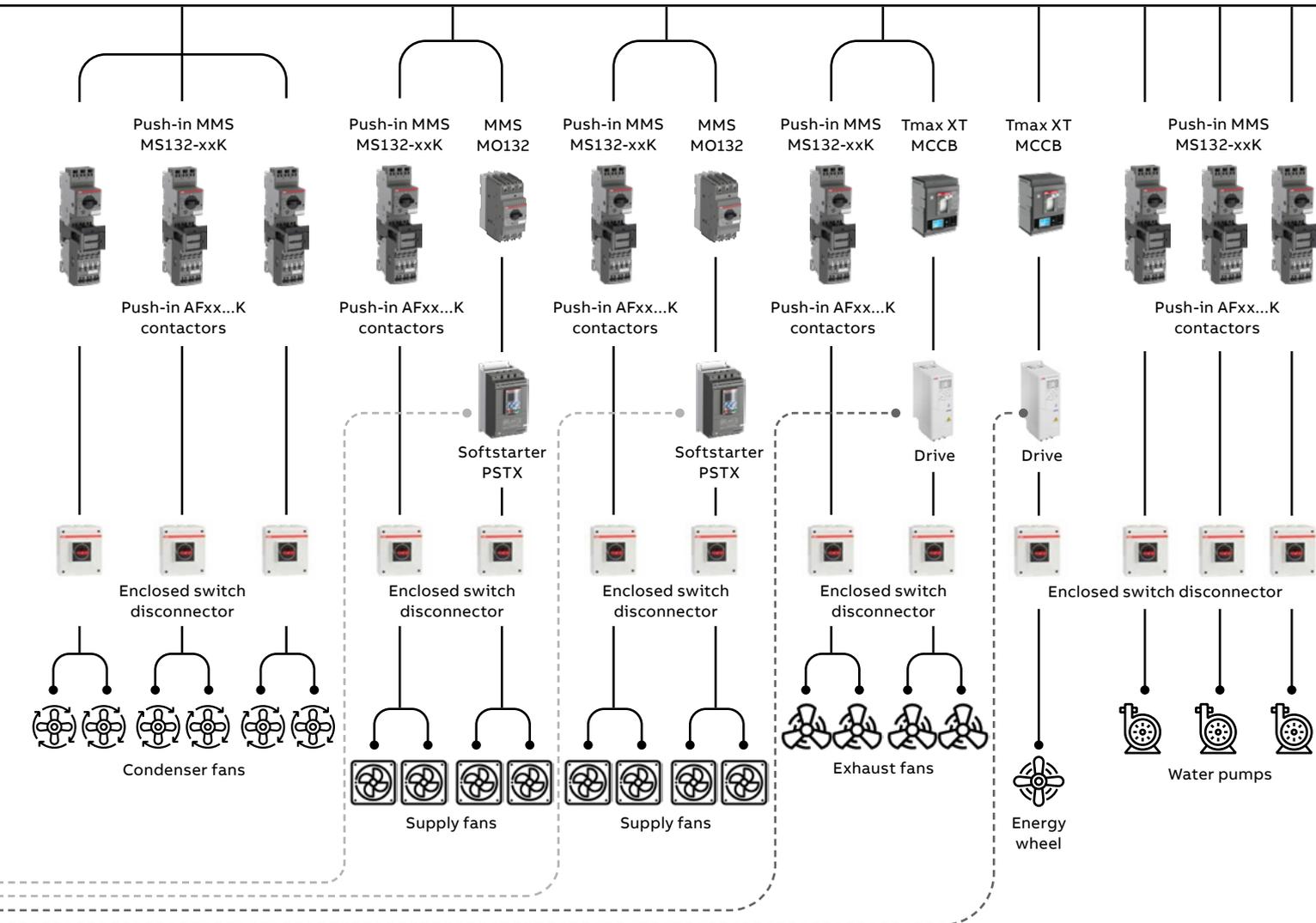
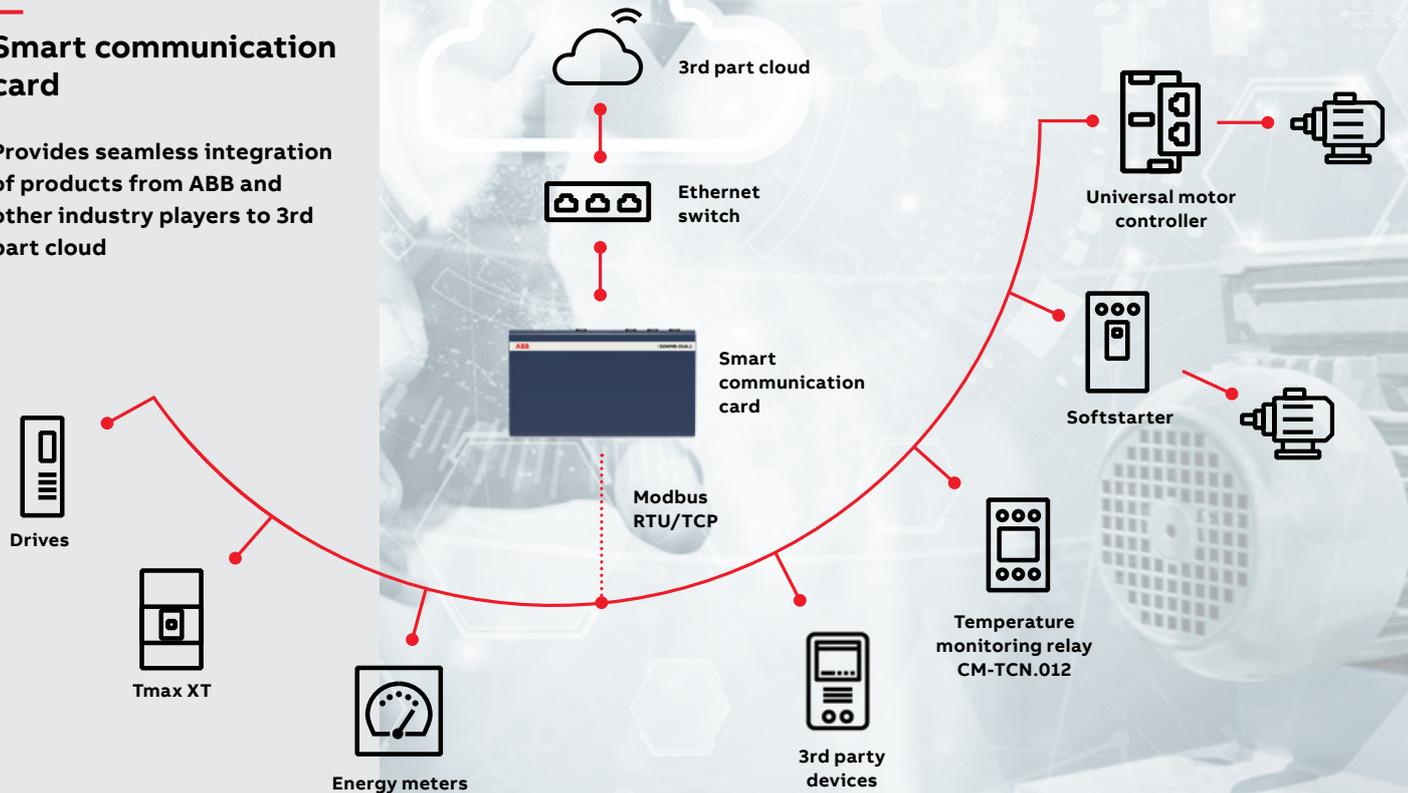


- 1 for motor rating up to 900 kW and rated voltage up to 690 V AC*
- 2 for motor rating up to 900 kW and rated voltage up to 1000 V AC
- 3 for motor rating up to 1200 kW and rated voltage up to 690 V AC
- 4 4 up to 1100 A max output current at 400 V AC, ACH580-04-880A-4 combined with Tmax XT7H 1000 V AC

* up to 1000 V AC in case of MCCB protective device with type 2 coordination

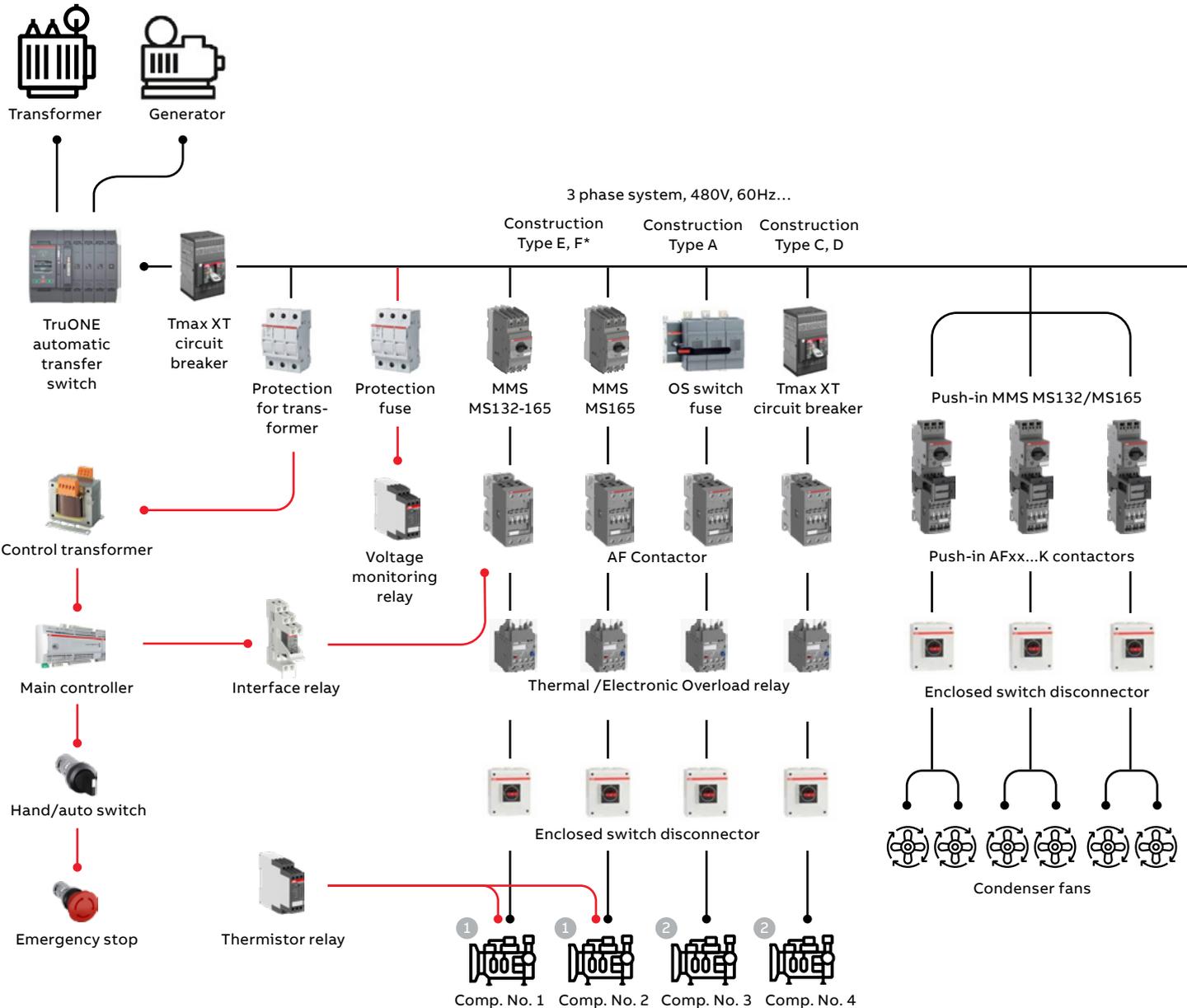
Smart communication card

Provides seamless integration of products from ABB and other industry players to 3rd part cloud



Enhanced solution for motor starting and control

UL version



—●— Power circuit
 —●— Control circuit

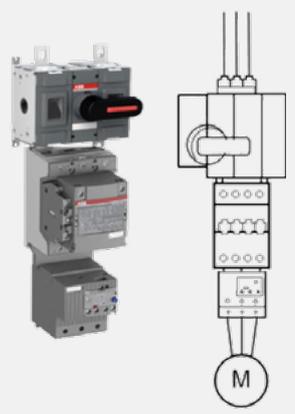
- ① For motor rated power up to 60 hp and rated voltage up to 600 V AC
- ② For motor rated power up to 700 hp** and rated voltage up to 600 V AC

* type E available for MMS with embedded overload protection
 ** 200hp if thermal overload protection

UL Coordinated solutions

Type A

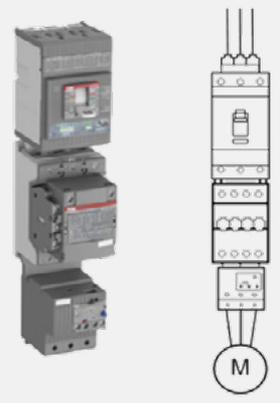
Disconnect switch, fuses, contactor and overload relay



Feeder circuit conductors

Type C & D

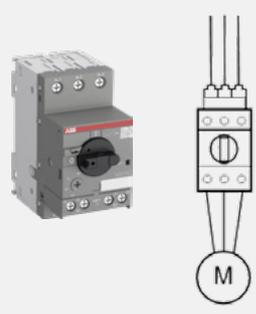
Thermal magnetic (C) or magnetic (D) circuit breaker, contactors and overload relay



Feeder circuit conductors

Type E

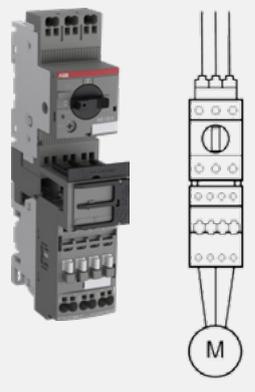
Manual motor starter



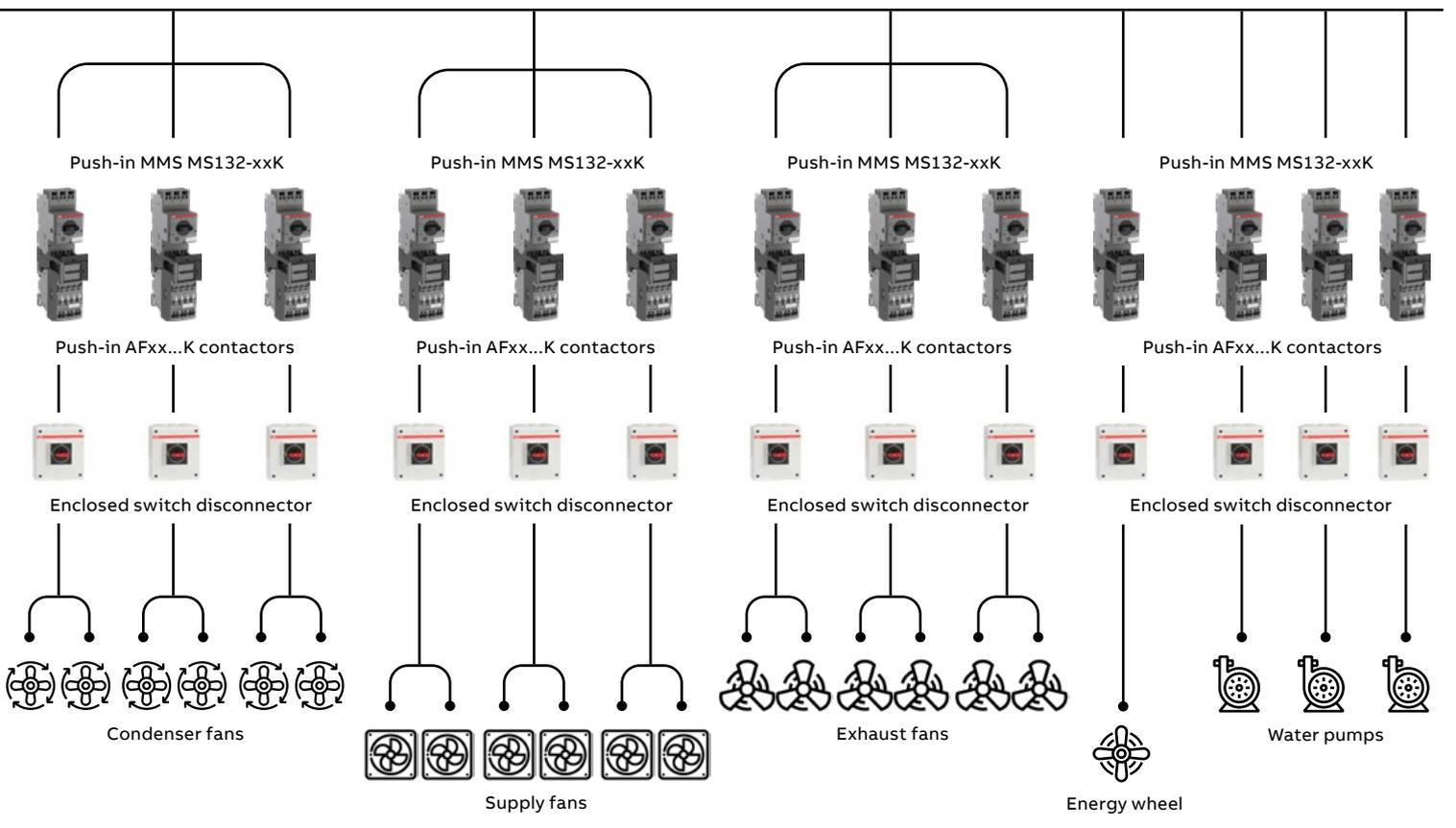
Feeder circuit conductors

Type F

Manual motor starter and contactor



Feeder circuit conductors

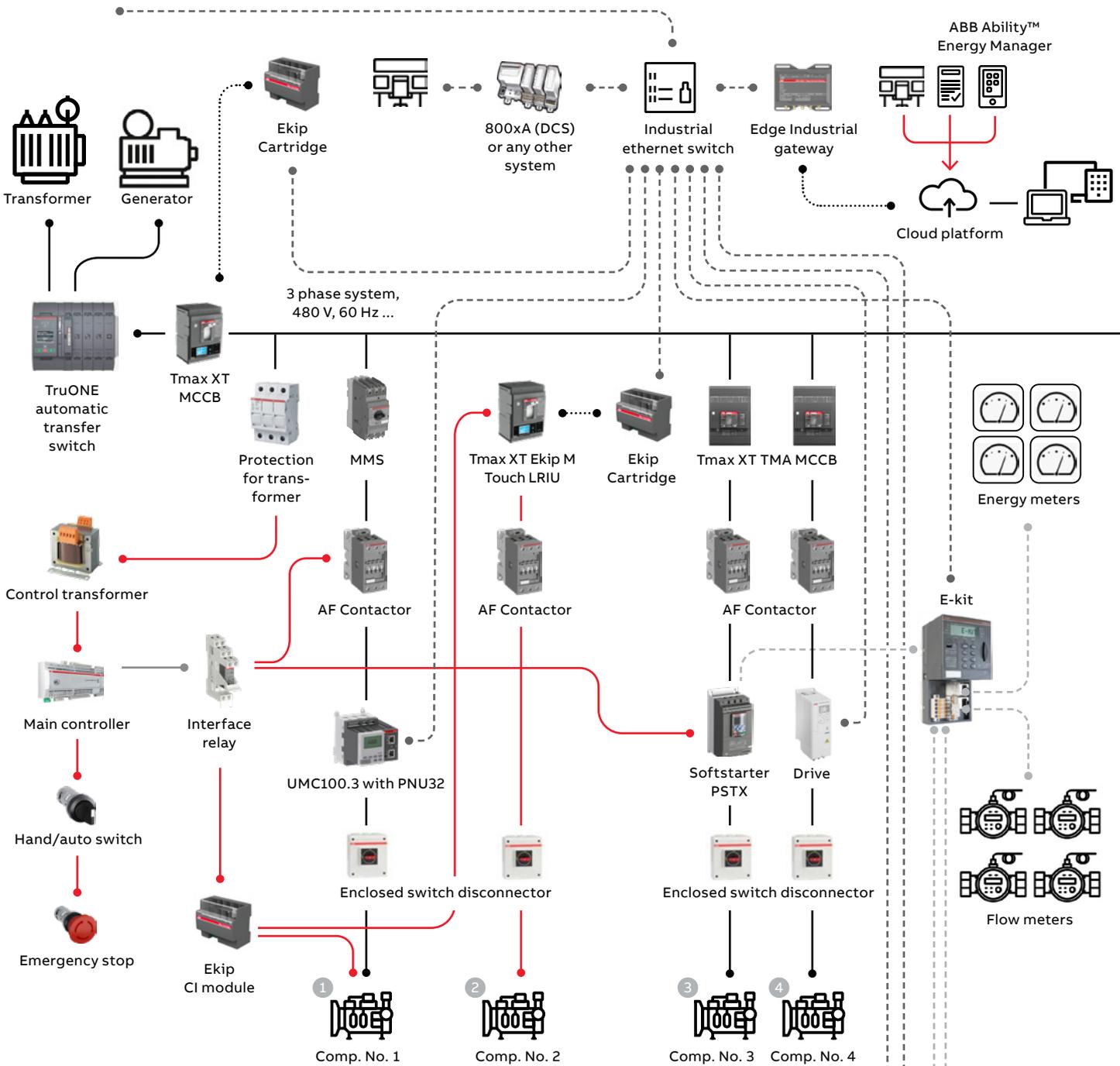


Advanced solution for motor starting and control

UL version

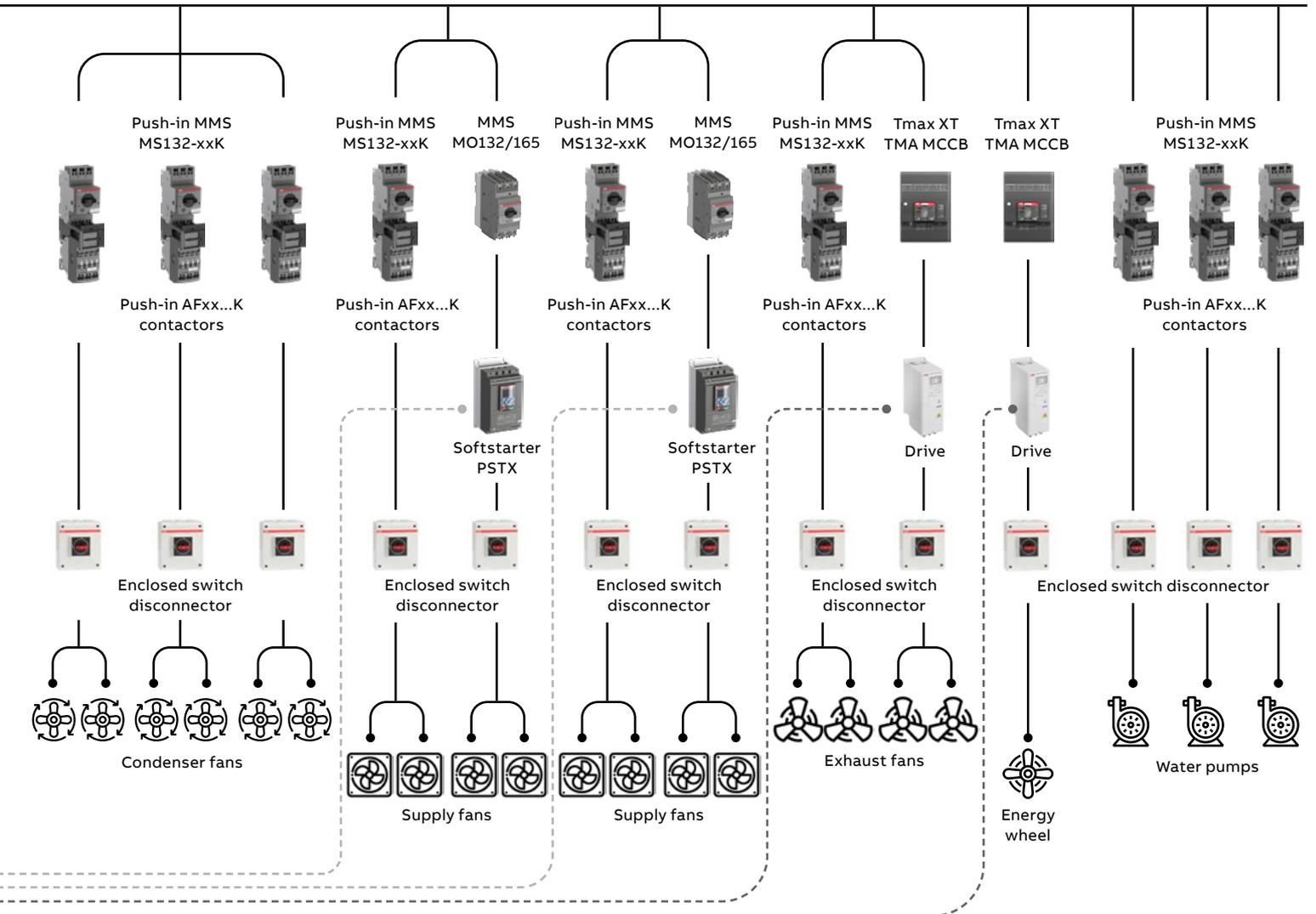


- Power circuit
- Control circuit
- ABB Ability EAM
- Modbus TCP
- Modbus RTU



- 1 UL508 listed up to 600 V AC, rated motor currents up to 850 A with external current transformer CT4L / CT5L
- 2 for motor rating up to 900 hp, rated voltage up to 600 V AC
- 3 for motor rating up to 1000 hp, rated voltage up to 600 V AC
- 4 up to 1020 A max output current at 480 V AC

01 Controlling and monitoring of cooling systems in a data center building



Product offering

Controllers, contactors, softstarters and drives all play a vital role in keeping control in data center cooling systems. Choosing the right product features for such a demanding sector as data centers is essential in ensuring reliable and efficient operation while minimizing risks.



UMC100.3
Intelligent motor controller



Contactors



Softstarters



Tmax XT



TruONE®



Drives



Manual motor starters



Temperature monitoring relays



Push-in Spring Motor Starting solution



Electronic compact starter



Three phase monitoring relays



Pluggable Interface relays



Primary switched mode power supplies



Time relays



Switch Fuse Units & Switch Disconnectors



Enclosed Bypass OT switch (IEC)



Pilot devices



Enclosed rotary switch (EOT series)



BACnet Building Control - ABB Cylon (Building and Home Automation Solutions)

Solutions offering



Motor Starting and Protection Solutions for HVAC chiller systems



Applications for OEM/ Machine Builders



Containerized power distribution in Data Centers IEC



Containerized power distribution in Data Centers UL



Selected Optimized Coordination



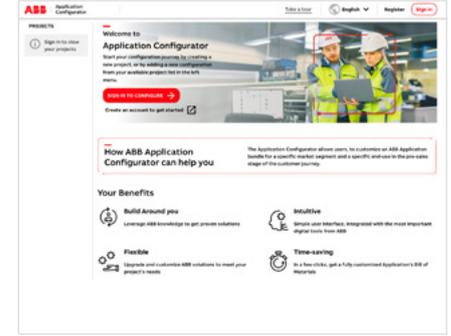
ABB Ability™ Energy Manager



TruONE ATS OEM and Panel Builder UL Solution Guide



Motor Starting & Protection solutions for Ventilation Systems (UL) Poultry and Livestock farming

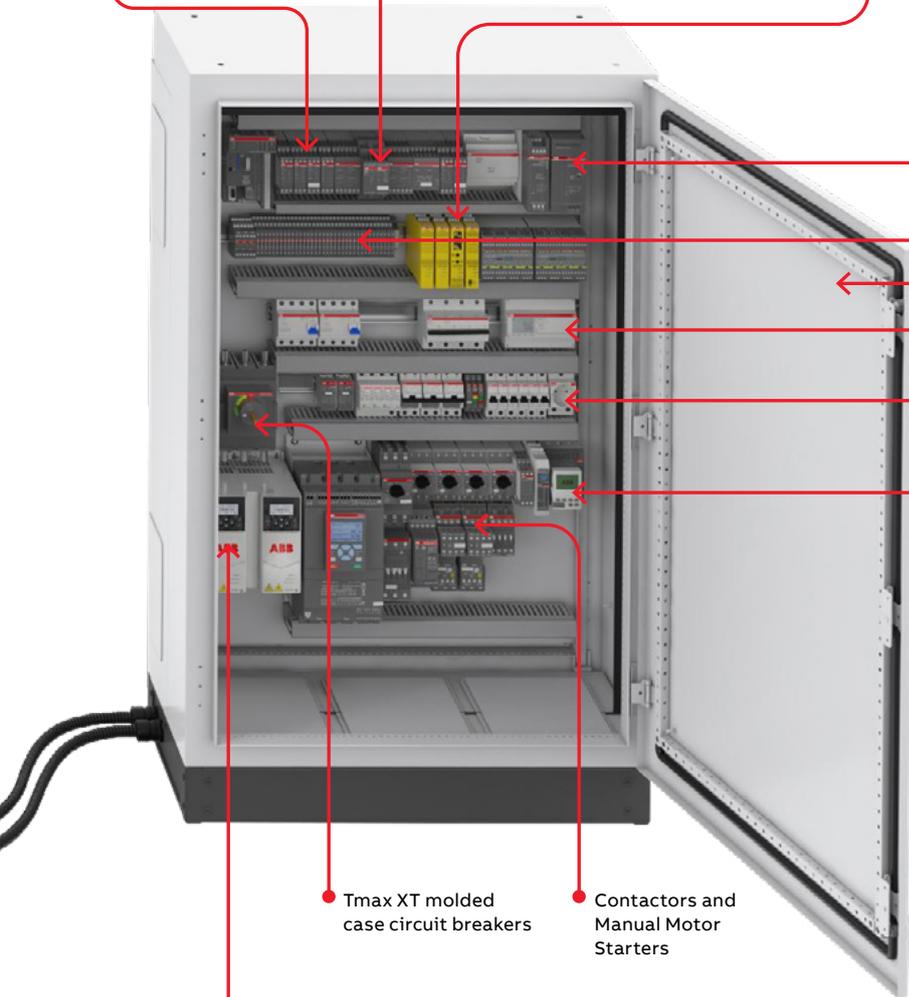


Application Configurator

To discover more

Complete solution for electrical control panel for cooling in data center

Measuring and monitoring relays



Tmax XT molded case circuit breakers

Contactors and Manual Motor Starters

Motor Controllers:

- UMC100.3
- HF range

Softstarters and Drives

ABB drives provide flexibility to help you optimize your processes and control, as well as increasing reliability and reducing downtime. You also get premium service and expertise, anywhere on the globe. ABB's softstarters increase a motor's lifetime by protecting it from electrical stresses. With everything that you need in one unit, from bypass contactor to overload protection, a single softstarter makes for a compact and complete starting solution.



Time relays

Choose ABB as your partner for all your low voltage timing control needs to leverage our wide variety of product options. From economic to high-end solutions – the range offers maximum value. On-delay, off-delay and a range of other functions cover all requirements.



Jokab Safety products

ABB delivers machine safety solutions for single machines or entire production lines. Machine safety is used to help protect both man and machine from harm by using safety devices and controls. ABB's Jokab Safety offers an extensive range of innovative products and solutions for machine safety systems to help protect both personnel and equipment.



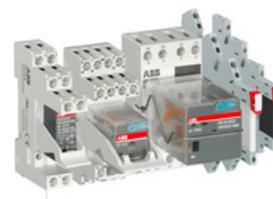
Power Supplies

Choose ABB as your power supply partner and leverage our wide variety of product options. From economic to high-end solutions, the CP range offers maximum value. Their excellent reliability in daily use is well proven even under the toughest of conditions.



Interface relays and optocouplers

ABB offers a complete range of interface relays and optocouplers for increased flexibility and choice. This portfolio includes pluggable relays for easy interchangeability and optocouplers for an extended electrical life. The portfolio includes electromechanical relays and optocouplers - the electromechanical relays operate using an electromagnetic field, whereas optocouplers use light.



SR1, IS2 automation boards

ABB's range of automation & multipurpose boards is extremely versatile and used in industrial automation applications but also in segments like Food & Beverage, Solar, Oil & Gas etc. Thanks to high degrees in protection (IP) and mechanical strength (IK) automation & multipurpose boards can be used even in harsh environments. International approvals and certifications are available for the whole range.



Network analyzers, multimeters and energy meters

ABB's Network Analyzers and Multimeters range of System pro M compact® includes a comprehensive offer of front panel and DIN-Rail devices designed to monitor when, where, and how power and energy are consumed by measuring and analyzing in real-time the main electrical parameters of the network and the power quality KPIs. Customers can also benefit from scalable solutions for energy and asset management thanks to the connection of M4M power meters with ABB Ability™ Energy and Asset Manager cloud-computing platform.



Modular DIN Rail components

System pro M compact® is a complete assortment of first-class quality products such as miniature circuit breakers, residual current devices, surge protection devices, control, signaling, measuring, and smart accessories. Using the full System pro M compact® from ABB will unleash a world of advantages for protection as well as smart and efficient solutions.





—

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Electrification Business
Low Voltage Products and Systems

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ABB STOTZ-KONTAKT GmbH
Electrification Business
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Protection & Connection
721 61 Västerås
Sweden

**You can find the address of your local sales organization
on the ABB homepage**

<https://new.abb.com/low-voltage/products/motor-protection>



<https://abb.com/lowvoltage>

Additional information

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