

APPLICATION NOTE

Advanced Control & Power Protection for Automated Car Washes



Are you looking to build or upgrade controls systems for an automated car wash? We can help you find the control and protection solution that's right for your car wash system.

What is an automated car wash?

Automated car washes rely on specialized machinery to effectively clean and maintain vehicles, minimizing the reliance on manual labor. The core components of this specialized machinery include pumps, conveyors, and fans, forming the essential framework for the car washing process. A car wash may appear simple, but the process reveals a complexity when delving into the electrified and automated applications.

Why you need advanced control & power protection solutions for an automated carwash

The car wash process is automated and controlled by a computerized system to ensure consistency and quality in the car washing process. Effective controls are imperative for customer and personnel safety. Protecting vehicle assets as they pass through the wash is of importance; therefore, precise controls enables operational efficiencies, reduces water usage, and provides process reliability.

Main benefits

Operational efficiency

Boost your car wash efficiency and safety with ABB Ability™ for precise controls, enhanced equipment protection, and remote maintenance access for increased uptime.



Flexible & customizable

ABB offers adaptable solutions for automated car washes, with versatile components and modular control solutions tailored to your organizational needs.



Cost savings

Cut operating costs with precise automated controls. Soft-starters and AF contactors decrease energy consumption, optimizing water and chemical usage per wash. This minimizes labor costs and enhances overall system efficiency.



Energy-efficient system

Elevate your starter panel's energy efficiency with AF contactor technology, ensuring an 80% reduction in coil consumption, lower heat dissipation, and decreased temperature rise, enabling higher installation density in the panel.



Automated car wash overview

A diverse range of car washes exists, each catering to the specific needs and preferences of both car wash owners and customers. There are often various ranges of automated car washing systems which are often categorized as standard and premium car wash processes. ABB's versatile product line adapts to the dynamic approaches of car wash technologies, providing innovative solutions that enhance the efficiency and precision of car wash operations.

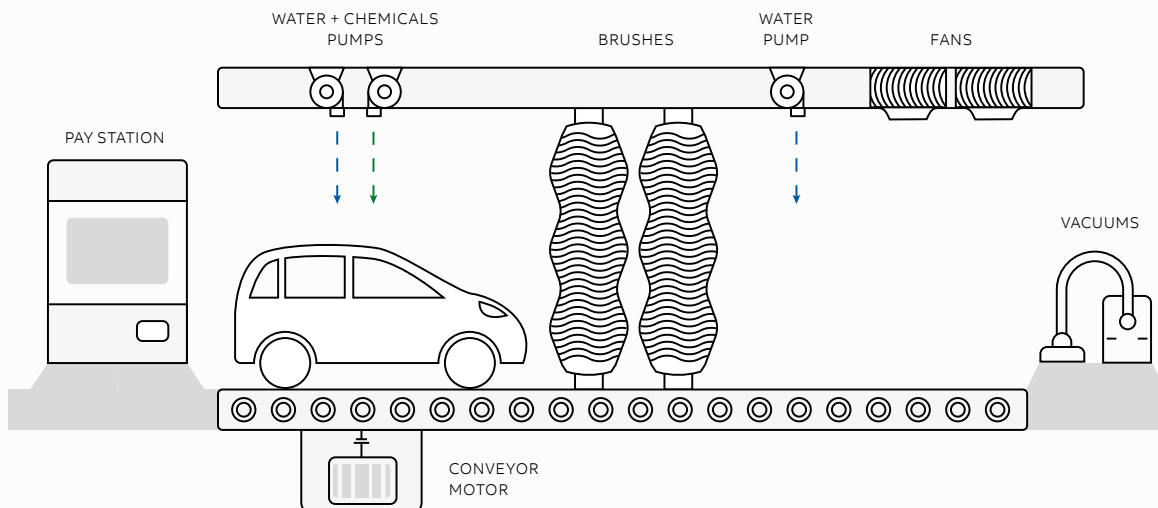
Standard process

- Car wash activated from pay station at the car wash entrance via payment or membership scan
- Conveyor motor is activated as the vehicle moves onto the track and proceeds to travel the vehicle through the wash
- Pumps spray water and wash chemicals onto the exterior of the vehicle
- Motors turn and move brushes around the vehicle
- Pumps spray more water over the vehicle
- High-powered fans dry the vehicle as it exits the conveyor track
- Customers have the option to vacuum the interior of the vehicle at bays at the car wash exit

Premium process

- Car wash is selected from the pay station at the car wash entrance via payment or membership scan
- Working personnel may perform vehicle prep by soaking and/or scrubbing stubborn-to-clean spots
- Vehicle moves onto the conveyor track and locks into place before the conveyor motor is activated and proceeds through the wash
- Pumps spray water for pre-wash onto the exterior of the vehicle
- Pumps spray soap onto the exterior of the vehicle
- Motors turn and move rotary brushes around the vehicle, agitating and scrubbing away any dirt
- Pumps spray more water over the exterior vehicle to rinse away any remaining dirt
- Pumps spray wash chemicals and water on the undercarriage for underbody wash and rinse
- Pumps spray wash chemicals and water for wheel cleaning
- Pumps spray wax on the exterior of the vehicle and move rotary brushes over the exterior of the vehicle to buff it
- Pumps spray clear coat on the exterior of the vehicle
- Pumps spray spot-free rinse onto the exterior of the vehicle
- High-powered fans dry the vehicle as it exits the conveyor track
- Customers have the option to vacuum the interior of the vehicle at bays at the car wash exit

Tunnel car wash diagram



Components & functionalities



— The car wash process has numerous components which enable various functionalities. Understanding the carwash process provides visibility to the component design. From automated conveyor systems to chemical pumps and motorized brushes there is an abundance of technology which enables functionality within a car wash.

Power and control components & functionalities

| Function | Electrical Components | Functional Description |
|-------------------------|-------------------------|---------------------------------------|
| Controls | Circuit breaker | Overload and short circuit protection |
| Controls | Surge protection device | Prevent damage from electrical surge |
| Conveyor | Circuit breaker | Short circuit protection |
| Conveyor | Sensor | Prevent jams and overheating |
| Conveyor | Voltage regulator | Prevent damage to motor |
| Water + Chemical Pumps | Circuit breaker | Overload and short circuit protection |
| Water + Chemical Pumps | Sensor | Prevent dry runs and pressure issues |
| Water + Chemical Pumps | Sensor | Monitor volume disbursement |
| Brushes | Circuit breaker | Overload and short circuit protection |
| Brushes | Sensor | Prevent jams and overheating |
| Water Reclamation Pumps | Circuit breaker | Overload and short circuit protection |
| Water Reclamation Pumps | Sensor | Read water quality |
| Fans and Vacuums | Circuit breaker | Overload and short circuit protection |
| Fans and Vacuums | Surge protection device | Prevent damage from electrical surge |
| Fans and Vacuums | Sensor | Monitor electrical performance |
| Temperature Control | Circuit breaker | Overload and short circuit protection |

Main components & functions

Primary Functional Requirements

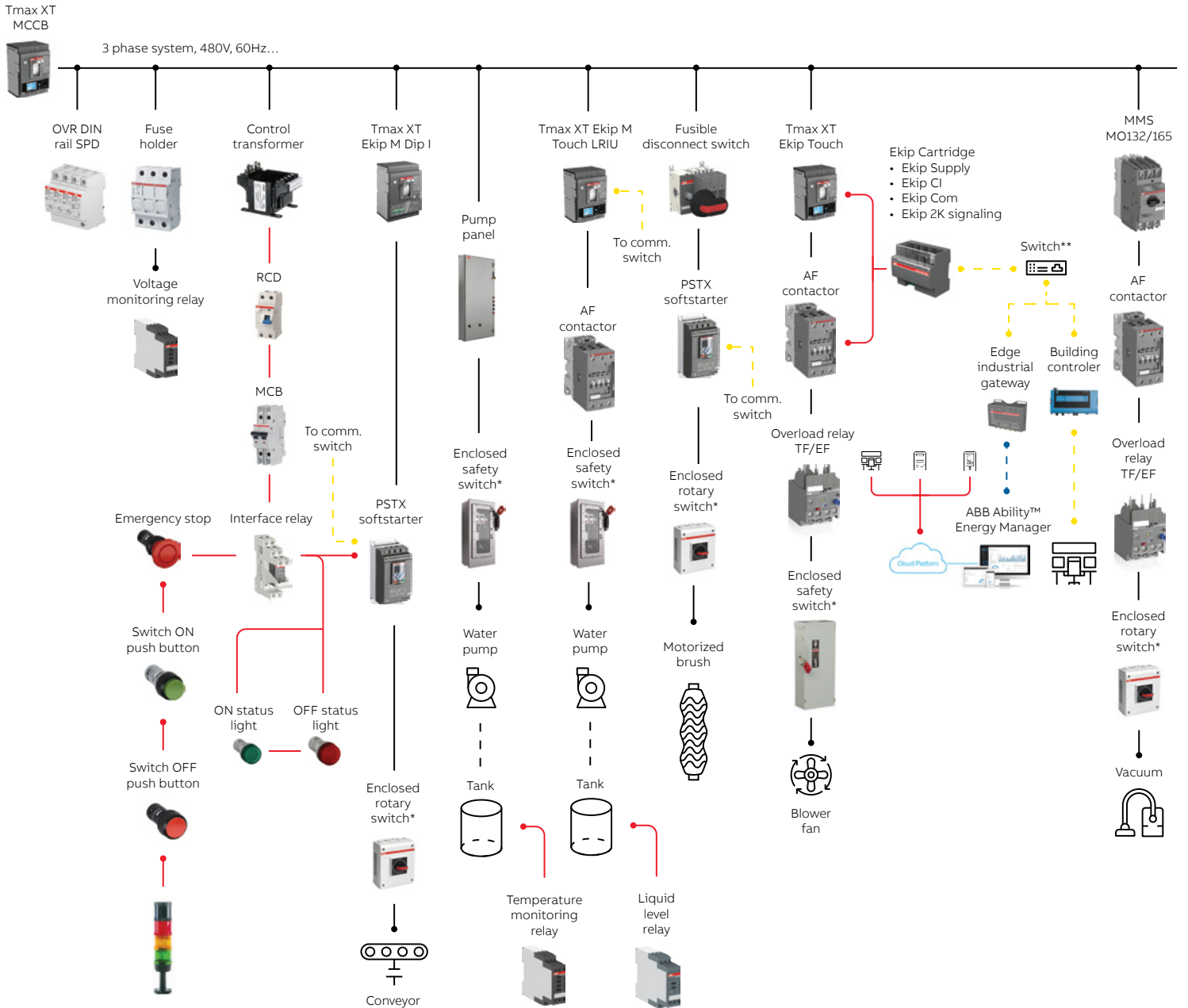
- Monitor motor performance to prevent overheating and other issues
- Monitor pumps to protect from dry runs and sudden pressure changes
- Voltage regulators and surge protectors to prevent damage to electronic control systems
- Circuit breakers for overload and short circuit protection, preventing equipment damage or fires
- Machine safety for users and service personnel
- Enclosure type to provide a degree of protection for the enclosed electrical equipment from the dirt, mud, water spray and chemicals

Secondary Optional Requirements

- Heaters for water systems to ensure water does not freeze and damage tanks or pipes allowing operations to continue without disruption
- Water purification systems for water reclamation
- Controls to notify car wash operators when chemical tanks are running low and need to be refilled
- Remote monitoring to allow for troubleshooting and maintenance
- A decentralized vacuum system to reduce energy consumption, minimize equipment wear, and shorten operating time



Control and power protection solutions for car washes



- ABB Ability EAM
- Modbus TCP or RTU
- Power Circuit
- Control Circuit

*The type of enclosed switch used depends on the application and environment.
 ** When using Modbus RTU a switch is not necessary.
 DISCLAIMER: This configuration is for a generic system and is not representative of existing manufacturers.

Specifications of electrical quantities

| Function | Rating | Units |
|---|---------|-------|
| Main Power | | |
| System rated power | 192 | kW |
| AC main supply | 277/480 | V |
| AC main overcurrent protection device | 400 | A |
| Short circuit current | 42 | kA |
| Controls | | |
| Control circuit voltage | 120 | V |
| Conveyor | | |
| Motor power | ≤20 | HP |
| Motor voltage | 277/480 | V |
| Motor overcurrent protection device | 50 | A |
| Brushes | | |
| Motor power | 2 | HP |
| Motor voltage | 277/480 | V |
| Motor overcurrent protection device | 60 | A |
| Fans and Vacuums | | |
| Centralized vacuum motor circuit power | ≤20 | HP |
| Vacuum motor circuit voltage | 277/480 | V |
| Fan motor power | 20 | HP |
| Fan motor overcurrent protection device | 50 | A |
| Fan motor voltage | 277/480 | V |
| Water + Chemical Pumps | | |
| Motor power | ≤20 | HP |
| Motor voltage | 277/480 | V |
| Motor overcurrent protection device | 50 | A |
| Water Reclamation Pumps | | |
| Motor power | ≤10 | HP |
| Motor voltage | 277/480 | V |
| Motor overcurrent protection device | 30 | A |

*This is for a hypothetical example. Main power short circuit current is generally 20-65 kA.



Bill of materials

| Product | Part Number | Description | Quantity | Comment |
|--------------------------|-----------------------|--|----------|---|
| Main power | | | | |
| Main power supply | XT5SU340APFF000XXX | XT5S 400A Ekip Touch LSI In=400 3p UL/CSA | 1 | |
| Surge protection device | OVRT23N40550PU | OVR Type 2 40 kA I _{max} 550V U _c pluggable UL 1449 | 1 | Aux. contact option available |
| Fuse holder | E93/32 | E90 fuse holder 3p 32A | 1 | |
| Voltage monitoring relay | 1SVR750488R8300 | CM-MPN.62S 3-phase monitoring relay 2c/o, 0,0.1-30s, 3 x 450-720VAC | 1 | |
| Control transformer | 9T58K2810 | Control transformer, 0.5KVA, 240X480V-120/240V | 1 | |
| Controls | | | | |
| RCD | F202 A-25/0.03 110V | Residual Current Circuit Breaker 2P Type A 30 mA | 1 | |
| MCB | SU202M-K6 | UL489 MCB 2P K 6A | 1 | |
| Interface relay | 1SVR405521R7200 | Spring terminal, standard contact, pluggable PCB relay, 220-240 V AC/DC | 1 | |
| E-Stop | MPEP4-1020 | Emergency stop button, gold-plated, pull release | 1 | |
| Switch ON push button | MP1-10G | Pushbutton, momentary, non-illuminated, flush, green | 1 | |
| Switch OFF push button | MP1-10R | Pushbutton, momentary, non-illuminated, flush, red | 1 | |
| ON status light | CL2-502G | Panel-mounted indicator pilot light, 24 V AC/DC, LED, green | 1 | More can be added |
| OFF status light | CL2-502R | Panel-mounted indicator pilot light, 24 V AC/DC, LED, red | 1 | More can be added |
| Stack light | KT701011, KL70(R/G/Y) | Light tower assembly with red, green, and yellow status lights | 1 | |
| Conveyor | | | | |
| Circuit breaker | XT2HU3060JFF000XXX | XXT2H 125A Ekip Dip I In=60A 3P UL/CSA | 1 | |
| Soft-starter | PSTX30-600-70 | PSTX30 soft-starter | 1 | Has communications capability Enclosed version available |
| Communication module | AB-MODBUS-TCP-2 | PSTX AnyBus, ModBus TCP, Port | 1 | |
| Enclosed rotary switch | EOT560N3PAP-SBA | 3-pole, 30 HP at 3-phase 480 V 30HP, 60A, plastic enclosure, NEMA 4/4X | 1 | |
| Brushes | | | | |
| Fusible disconnect | OS60GJ03 | Fusible switch, front-operated, 3-pole, Class J, 60 A | 1 | |
| Soft-starter | PSTX30-600-70 | PSTX30 soft-starter | 1 | Has communications capability Enclosed version available |
| Communication module | AB-MODBUS-TCP-2 | PSTX AnyBus, ModBus TCP, Port | 1 | |
| Enclosed rotary switch | EOT560N3PAP-SBA | 3-pole, 30 HP at 3-phase 480 V 30HP, 60A, plastic enclosure, NEMA 4/4X | 1 | |
| Fans | | | | |
| Circuit breaker | XT2HU3060PFF000XXX | XT2H 125A Ekip Touch LSI In=60A 3p UL/CSA | 1 | |
| AF contactor | AF40-30-00-11 | Contacto, 3-pole, 40 HP 600 V AC - RS | 1 | |
| Overload relay | EF45-45 | EF45-45 Electronic Overload Relay 15-45 A | 1 | |
| Enclosed safety switch | THN3362SS316VW | Disconnect switch, 60A, 600V, 3P, non-fusible, NEMA 4X stainless steel 316 | 1 | |
| Ekip cartridge | KXTGCART4 | Ekip cartridge, 4 slots | 1 | Needed for communications capability |
| Power supply module | ZEAPWRS | Ekip power supply, 110-240V AC/DC, Tmax XT | 1 | |
| Communications module | KXTTCOMEMBTCP | Ekip communications module, Modbus TCP, Tmax XT | 1 | |
| Signaling module | ZE2AK1 | Ekip signaling 2K-1 module, Tmax XT | 1 | |

Bill of materials

| Product | Part Number | Description | Quantity | Comment |
|-------------------------------|--------------------|---|----------|--|
| Water + Chemical Pumps | | | | |
| Pump panel | 341L014CAA1AA | CR341 pumping panel, 25 HP, NEMA 3R, narrow, size 2, class H, 60 A | 1 | |
| Circuit breaker | XT2HU3060WFF000XXX | XT2H 125A Ekip M Touch LRIU In=60A 3p UL/CSA | 1 | Has communications capability |
| Enclosed safety switch | THN3362SS316VW | Disconnect switch, non-fusible, 60 A, 600 V AC, 3-Pole, NEMA 4X stainless steel 316 | 2 | |
| AF contactor | AF40-30-00-11 | Contactora, 3-pole, 40 HP 600 V AC - RS | 1 | |
| Temperature monitoring relay | 1SVR740740R9100 | CM-TCS.21P Temperature monitoring relay, -50-50°C, 24 V AC/DC | 1 | |
| Liquid level relay | 1SVR730850R0100 | CM-ENS.11S Liquid level monitoring relay 1 c/o, 5-100 kOhm | 7 | May be less depending on wash complexity |
| Pump alternating switch relay | 1SVR508180R0100 | CT-PAC.22 Time relay, Alternating 2 n/o, 24-48 VDC/24-240 VAC | 0 | May be used for water reclamation |
| Communications | | | | |
| Edge industrial gateway | 1SDA115508R1 | ABB Ability™ edge industrial gateway | 1 | |
| ABB Ability™ Energy Manager | N/A | ABB Ability™ energy manager | 1 | Purchase through ABB Ability Marketplace |
| Vacuum | | | | |
| Manual motor starter | MO165-54 | MMS, magnetic-only, 3-pole, 600 V, 54 A | 1 | |
| AF contactor | AF40-30-00-11 | Contactora, 3-pole, 40 HP 600 V AC - RS | 1 | |
| Overload relay | EF45-45 | EF45-45 Electronic Overload Relay 15-45 A | 1 | |
| Enclosed rotary switch | EOT560N3PAP-SBA | 3-pole, 30 HP at 3-phase 480 V 30HP, 60A, plastic enclosure, NEMA 4/4X | 1 | |



Product offering

Tmax XT



Miniature circuit breakers



Softstarters



AF contactors



Measuring & monitoring relays



Control transformer



Disconnect switches



Assorted pilot devices



Product offering

Surge protection devices



Fuse holders



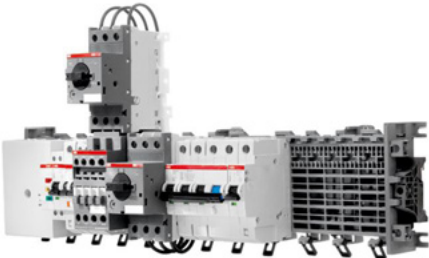
ABB Ability™ Edge Industrial Gateway



ABB Ability™ Energy Manager



SMISLINE TP



Residual current devices



Discover more

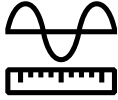


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