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ABB industrial drives

# ACS580MV Synchronized Bypass Unit

## Hardware manual



# List of related manuals in English

<b>Drive hardware manuals and guides</b>	<b>Code (English)</b>
<i>ACS580MV hardware manual</i>	<a href="#">2UBB004520</a>
<i>ACS580MV Engineering Guideline</i>	<a href="#">2UBB013672</a>
<i>ACS580MV Base frame &amp; TEU layout design</i>	<a href="#">2UBB020751</a>
<i>ACS580MV Wiring Diagram of system 0</i>	<a href="#">2UBB005084</a>
<i>ACS580MV Wiring Diagram of system 1</i>	<a href="#">2UBB005085</a>
<i>ACS580MV Wiring Diagram of system 2</i>	<a href="#">2UBB005086</a>
<i>ACS580MV Engineering Guideline for SBU</i>	<a href="#">2UBB005656</a>
<i>ACS580MV Wiring Diagram of SBU</i>	<a href="#">2UBB005212</a>
<i>ACS580MV Layout Design of Drive with SBU</i>	<a href="#">2UBB005536</a>
<i>ACS580MV Layout Design of Drive with SBM</i>	<a href="#">2UBB005537</a>

You can find manuals and other product documents in PDF format on the Internet. See <http://www.abb.com/motors&drives>. For manuals not available in the Document library, contact your local ABB representative.

For more information, please refer to ACS580 MV Hardware Manual which can be found by scanning the QR code below.








APP version (IOS/Android)

Web page version



# Hardware manual

## ACS580MV Synchronized Bypass Unit

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# Terms and trademarks

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## Terms

The following table lists the terms and abbreviations you should be familiar with when using the manual. Some of the terms and abbreviations used in the manual are unique to ABB and might differ from the normal usage.

Term / Abbreviation	Meaning
Bypass - drive	Short form for ACS580MV frequency converter with bypass function Unit.
Converter	Short form for frequency converter.
COU	Control unit Short form for control compartment of the drive.
Drive	Short form for ACS580MV frequency converter.
Drive system	The drive system includes all equipment used to convert electrical into mechanical power to give motion to the machine.
MAU	Marshalling unit
MB	Motor Breaker
MCB	Main Circuit Breaker The MCB is a major protection device of the drive system and connects / disconnects the main power supply to the drive. The MCB is controlled entirely by the drive.
MSS	Motor starting switch
PE	Protective Earth
PT	Potential Transformer
SBU	Synchronizing bypass unit
TEU	Terminal Unit Short form for terminal compartment of the drive.

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## Trademarks

Names that are believed to be trademarks of other companies and organizations are designated as such. The absence or presence of such a designation should however not be regarded as an offence of the legal status of any trademark. The following registrations and trademarks are used in this manual:

<b>Term / Abbreviation</b>	<b>Meaning</b>
Windows®	Registered trademark of Microsoft Corporation
Ethernet®	Registered trademark of Xerox Corporation
Profibus®	Registered trademark of Profibus International (P.I.)
Modbus®	Registered trademark of the Modbus IDA organization

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# 1

## Safety instructions

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### Contents of this chapter

This chapter contains the safety instructions which you must obey when you install, operate or do maintenance on the bypass - drive system. If you ignore the safety instructions, injury, death or damage can occur.

Safety instructions are used to highlight a potential hazard when working on the equipment. Safety instructions must be strictly followed! Non-compliance can jeopardize the safety of personnel, the equipment and the environment.



**DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.



**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.



**CAUTION** indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

The safety instructions are derived from the following standards:

- ISO 3864-2:2004 (E)

Graphical symbols – Safety colors and safety signs – Part 2: Design principles for product safety labels.

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- ANSI Z535.6

American National Standard for Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials.

## **User's responsibilities**

It is the responsibility of those in charge of the bypass - drive system to ensure that each person involved in the installation, operation or maintenance of the bypass - drive system has received the appropriate training and has thoroughly read and clearly understood the instructions in this manual and the relevant safety instructions.

## **General safety information**

To maintain safety and minimize hazards observe the following:

- Before the drive is energized, make sure that:
  - all foreign objects are removed from the bypass - drive system.
  - all internal and external covers are securely fastened and all doors are closed, locked and / or bolted.
  - the manual release of the door safety switches is in the locked position.
- Before starting to conduct maintenance on the bypass - drive system, make sure that:
  - the main and auxiliary power supply to the drive and bypass is switched off, locked out, and tagged out.
  - the bypass - drive is in non-operating state and after de-energizing.
  - safety ground connections are in place for both input and output of the drive.
  - MB and MSS connection are in right place.
  - appropriate personal protective equipment is provided and used when required.
  - everyone involved is informed.
- When working near the running drive protective earmuffs should be worn.
- Before work is carried out simultaneously on the bypass - drive and on other drive system equipment, make sure that,
  - the relevant safety codes and standards are observed.
  - all energy sources of the equipment are turned off.
  - lock-out and tag-out devices are in place.
  - barriers and appropriate covers are used on equipment which is still live.
  - everyone involved is informed.
- In case of fire in the drive room:
  - Observe the established rules and regulations for fire protection.
  - Only firemen with appropriate protective equipment are allowed to enter the bypass - drive room.



## Possible residual risks

The following risks can arise from a bypass - drive system and pose a hazard to people. These risks must therefore be taken into account by the system integrator and / or the plant owner when assessing the risks of the machinery.

- Electric power equipment generates electro-magnetic fields which can cause a hazard to people with metal implants and / or a pacemaker.
- Bypass - drive system components can move unintentionally when being commissioned, operated, or serviced due to, for example:
  - Operation of the equipment outside the scope of the specifications.
  - Incorrectly assembled or installed equipment.
  - Wrongly connected cables.
  - External influence on, or damage of the equipment.
  - Wrong parameter settings.
  - Software errors.
  - Faulty hardware.
- Hazardous touch voltages can be present on bypass - drive system components caused by, for example:
  - Operation of the equipment outside the scope of the specifications.
  - External influence on, or damage of the equipment.
  - Induced voltages by external equipment (e.g. induced voltage from a spinning rotor).
  - Condensation on equipment components, or pollution.
  - Faulty hardware.
- High temperatures, noise, particles, or gases can be emitted from bypass - drive system components caused by, for example:
  - Operation of the equipment outside the scope of the specifications.
  - External influence on, or damage of the equipment.
  - Wrong parameter settings.
  - Software errors.
  - Faulty hardware.
- Hazardous substances can be emitted from bypass - drive system components due to, for example:
  - Incorrect disposal of components.



## Safety labels

Safety labels are attached to the cabinet where necessary to alert personnel of potential hazards when working on the equipment. The instructions on the safety labels must always be followed, and the labels must be kept in a perfectly legible condition.



## General safety in installation, start-up and maintenance

These instructions are for all personnel that install the drive and do maintenance work on it:

- If you select an external source for the start command and it is on, the drive will start immediately after fault reset unless you configure the drive for pulse start. See the firmware manual.
- When the control location is not set to Local, the stop key on the control panel will not stop the drive.

## Electrical safety in installation, start-up and maintenance

### ■ Precautions before electrical work

These warnings are for all personnel who do work on the bypass - drive, motor cable or motor.



#### **DANGER**

High voltage!

Before starting to work on the bypass - drive, make sure:

- that the main and auxiliary power supply to the drive is switched off, locked out, and tagged out.
- that bypass - drive is in non-operating state and after de-energizing.
- that safety ground connections are in place.
- that personal protective equipment is provided and used when required.
- that everyone involved is informed.

Before energizing the bypass - drive system, make sure:

- that all foreign objects are removed from the bypass - drive system.
- that all internal and external covers are securely fastened and all doors are closed, locked and / or bolted.
- that the release dials of safety switches are in the locked position.



Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrician, do not do installation or maintenance work. Go through these steps before you begin any installation or maintenance work.

1. Clearly identify the work location.
2. Disconnect all possible voltage sources.
  - Open the main circuit breaker of the drive.
  - Wait until internal circuits are discharged completely and doors are unlocked (15 minutes).
  - Open the upstream disconnecter to disconnect the supply voltage from the input busbars.
  - Disconnect any external power sources from the control circuits before you do work on the control cables.
3. Protect any other energized parts in the work location against contact.
4. Take special precautions when close to bare conductors (e.g. when the protective plate between COU and TEU is removed).

## 16 Safety instructions

5. Measure that the installation is de-energized.
  - Use only instrumentation (e.g., meters, oscilloscopes, etc.) intended for high voltage measurements.
6. Always discharge equipment and verify that it is neither electrically alive nor thermally hot.
7. Always install temporary grounding as required by the local regulations for both input and output of the drive.
8. Ask for a permit to work from the person in control of the electrical installation work.

### ■ Additional instructions and notes

- Do not connect the drive to a voltage higher than what is on the rating plate.
- The MSS cable terminals of the bypass - drive system are at a dangerous voltage when the input power is on, regardless of whether the motor is running or not.
- External wiring can supply dangerous voltages to the terminals of relay outputs.

### ■ Grounding

- Always ground the bypass - drive, the motor and adjoining equipment according to the maintenance instructions in this manual. Assure that the drive is grounded on both sides, i.e. on supply and converter output side. This is necessary for the personnel safety. Proper grounding also reduces electromagnetic emission and interference.
- Make sure that the cross-section of the grounding conductors is sufficient. See the [ACS580MV Engineering Guideline](#). Obey the local regulations.







# Introduction to the manual

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## Contents of this chapter

This manual documents the operation and maintenance of the SBU feature which is in-line with ACS580MV medium voltage drive.

This manual and parts thereof must not be reproduced or copied, or disclosed to third parties, nor used for any unauthorized purpose without written permission from ABB Beijing Drive Systems Company Ltd.

The hardware and software described in this manual is provided under a license and may be used, copied, or disclosed only in accordance with the terms of such license.

## Applicable products

SBU cabinet covers system voltage ranging from 6kV-11kV.

## Contact information

Address:

ABB Beijing Drive Systems Company Ltd  
No.1, Block D, A-10 Jiuxianqiao Beilu  
Chaoyang District  
Beijing, 100015

Phone +86 10 5821 7788

Fax +86 10 5821 7618

E-mail [mvdrives.supportline@cn.abb.com](mailto:mvdrives.supportline@cn.abb.com)

Web [http:// www.abb.com/motors&drives](http://www.abb.com/motors&drives)

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## Equipment covered by the manual

For detailed information, see ACS580MV hardware manual.

## Target groups and required qualifications

This manual is intended for people who have a thorough knowledge of the bypass- drive system and the industrial environment and have obtained the required qualification.

### ■ Related manuals

See [List of related manuals](#) on the inside of the front cover.

## User's responsibilities

It is the responsibility of those in charge of the bypass- drive to ensure that each person involved in the handling, installation, operation or maintenance of the bypass- drive has received the appropriate training and has thoroughly read and clearly understood the instructions in this manual and the relevant safety instructions.

## Intended equipment use

Those in charge of the bypass- drive must ensure that the bypass- drive is only used as specified in the contractual documents, operated under the conditions stipulated in the technical specifications and on the rating plate of the drive, and serviced in the intervals as specified by ABB.

Use of the bypass- drive outside the scope of the specifications is not permitted.

Intended equipment use also implies that only spare parts recommended and approved by ABB must be used.

Unauthorized modifications and constructional changes of the bypass- drive are not permitted.

## Cyber security disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

## Categorization by frame size and option code

Some instructions, technical data and dimension drawings which concern only certain frame sizes are marked with the symbol of the frame size (e.g. 6R6, 10R6). The frame size is not marked on the rating plate. To identify the frame size of your drive, see *ACS580MV catalogue*.

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# 3

## Function and hardware description

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### Contents of this chapter

This chapter provides information on the power equipment and cabinet design and briefly describes the operation principle of the bypass - drive.

### Function introduction

#### ■ SBU function Description

The synchronized bypass unit (SBU) control the transfer of a motor from the drive to a fixed frequency line. The unit supports the following synchronization method:

**Make - before - break (bumpless):** Need a decoupling choke is added between the converter and the motor. The transfer occurs without a power interruption to the motor.

The SBU is designed for use with ACS580MV medium voltage drive and can be equipped for the transfer of up to 8 motors. It provides all necessary hardware for the communication with the drive and the remote control place. Information on the project-specific communication method is provided on the electrical drawings.

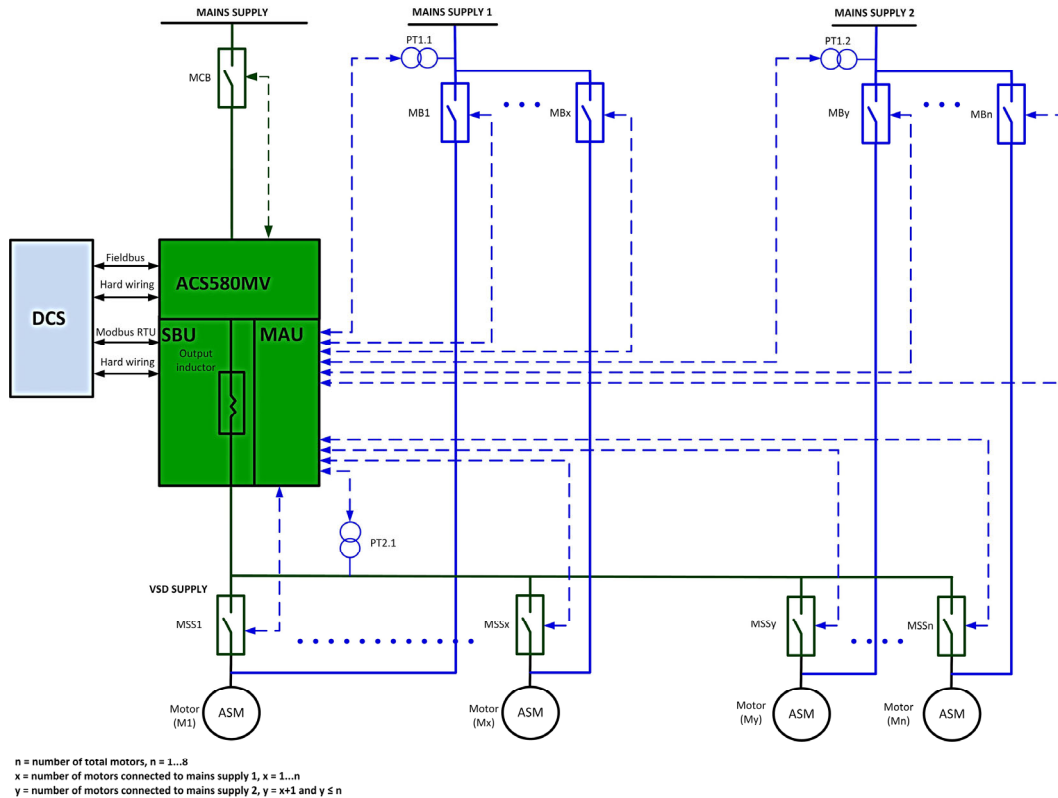
The interposing relays for the circuit breakers, which connect/disconnect the motor to the drive and the line, are mandatory for SBU functionality as well as the inputs for monitoring the position of these switches. Each motor requires its own set of circuit breakers:

- The motor starting switch (MSS) connects and disconnects the motor to and from a drive.
  - The motor breaker (MB) connects and disconnects the motor to and from the line.
-

The Motor Starting Switch (MSS) and Motor Breaker (MB) are not supplied. They must be rated according to the specification of ABB.

Equipment requirements: The output voltage of the drive and line voltage are measured by potential transformers (PT). The synchronizing device uses the measurements to determine the exact transfer instant of the motor to the line.

The PTs can be supplied either by ABB or customer, in case the PTs are supplied by customer, they must be rated according to the specification of ABB.



### System overview and single line diagram of SBU with multiple motors and two grids

#### Transfer sequence

The transfer of the motor to the line starts with the selection of the motor to be transferred. After the selection, bypass control checks the positions of the MSS and the MB.

When the motor start command is given, the corresponding MSS is closed, the motor is started by the drive and operated in speed control mode.

When the drive receives the synchronizing command, the motor is accelerated to a preset speed (frequency), and then gradually adjusted to around the detected line frequency, when magnitude, frequency and phase angle between drive output voltage and line voltage are within the required limit, SYNC conditions are achieved and the corresponding motor breaker is closed, which connects the motor to the line, and after a preset waiting time (fixed value in software, normally in the range of a few seconds) the corresponding motor starting switch is opened.

When the synchronizing sequence has finished, another motor can be transferred to the line supply.

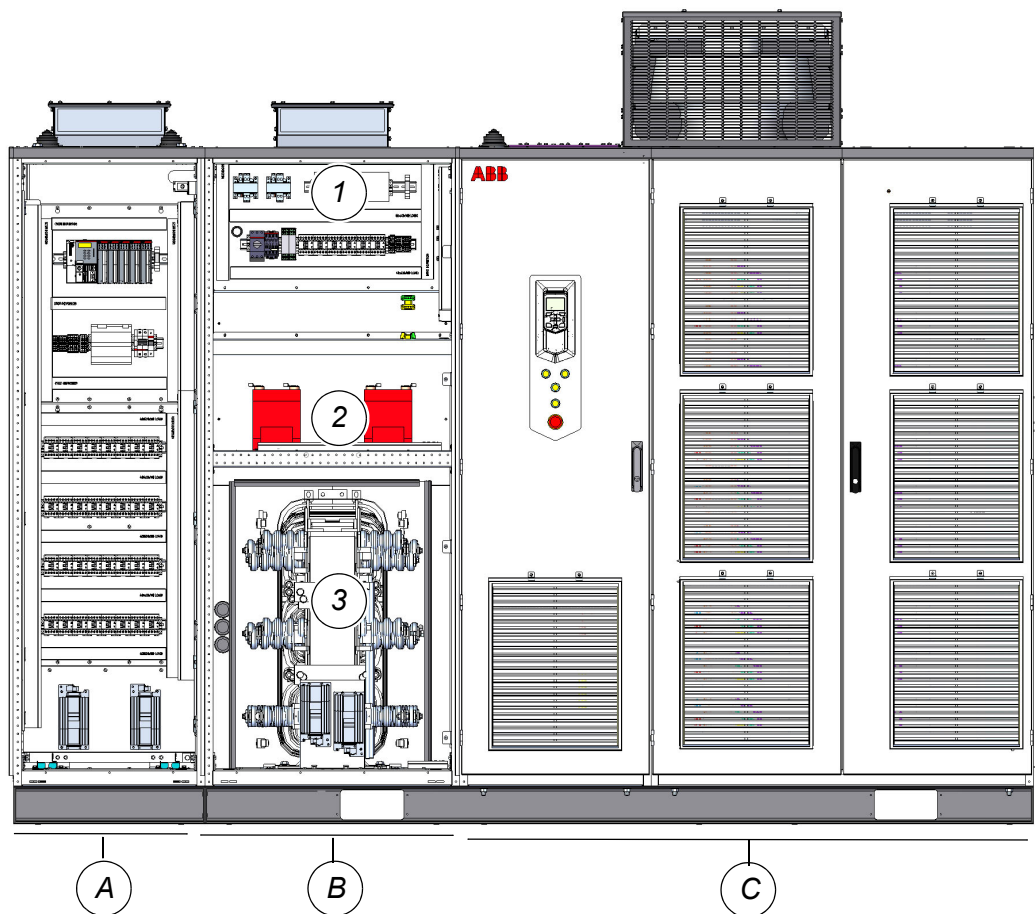
## Options

Following options are available:

- PT offering.
- Number of networks.
- One motor (SBU) / more than one motor (MAU).
- Space heater.
- HMI on MAU.

## Product overview

For information on the power and voltage range of your drive, see the *ACS580MV catalogue* and the Rating plate of the drive. For further information on the general drive characteristics, refer to the ACS580MV catalog.



Typical drive line-up

A	Marshalling unit (MAU)
B	Synchronizing bypass unit (SBU)
C	Drive unit
1	RSCY board
2	Potential Transformer (PT)
3	Output Choke

The dimensions and weight of the cabinet depend on the drive power.

## ■ Output Choke

As SBU of ACS580MV is taking the **Make - before - Break** (Bumpless) method, so an output choke at the VSD output is needed to limit the inrush current during the synchronizing period.

An output choke can be used to make a VSD soft-starter line friendly and motor friendly during startup and synchronization. Such a soft starter would ensure that a minimized inrush current flows in on the line side and a smooth transfer from VSD operation to DOL operation occurs on the motor side (no transient torques and no speed oscillation).

## ■ PT

The synchronization PTs can provide supply voltage and VSD output voltage, since voltage magnitude and phase angle are required for synchronization, the PT on the main supply must measure the same phases as the PT measures on the converter output.

Two pieces of PT can be provided either by customer, or provided by ABB as an option. In case PT is provided by ABB, the SBU only supports single grid.

## ■ Space heater

To prevent condensation being produced inside the cabinet, the cabinet can be equipped with a space heater for both SBU and MAU cabinet. The SBU space heaters are controlled on and off together with the ACS580MV heating cable, while the space heaters in MAU are always running.

## ■ RSYC- 01 unit

### Overall view of the unit



*RSYC - 01 unit*

### Operation

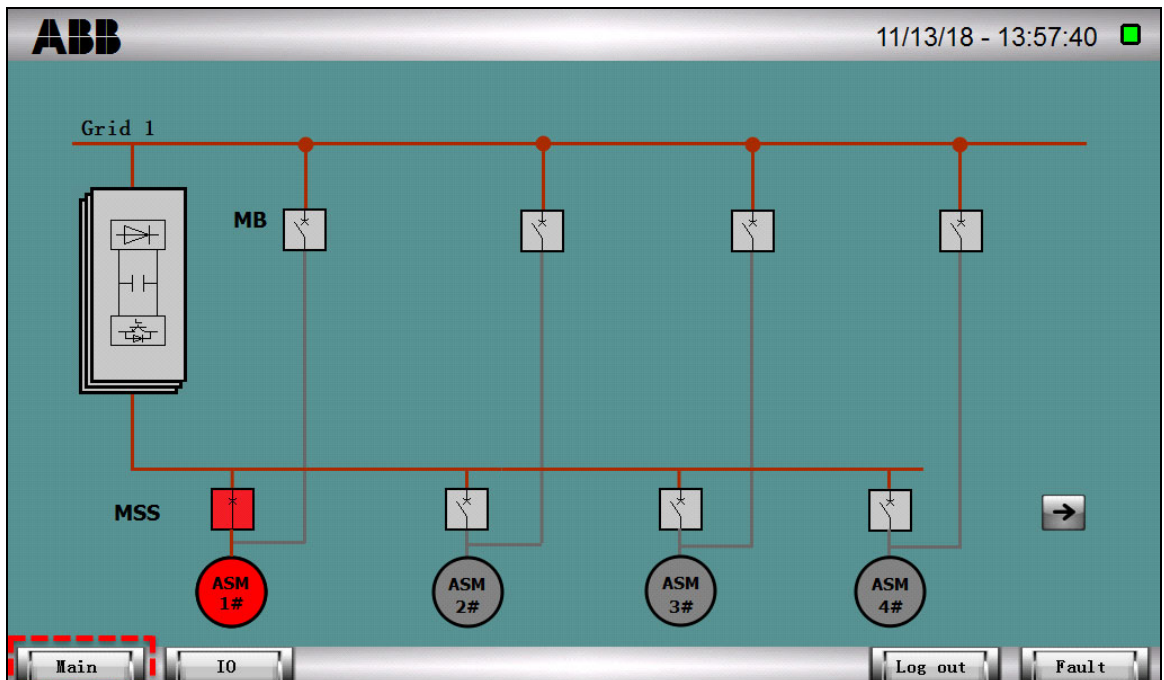
The RSYC unit monitors two voltage signals, one measured from the supply line and other from the drive output. The signals indicate the phase shift and frequency.

The unit output signal indicates the synchronization status for the drive. When the signal reaches specific voltages, the supply line and the drive output voltages are synchronic, i.e. the phasing and frequency are the same.

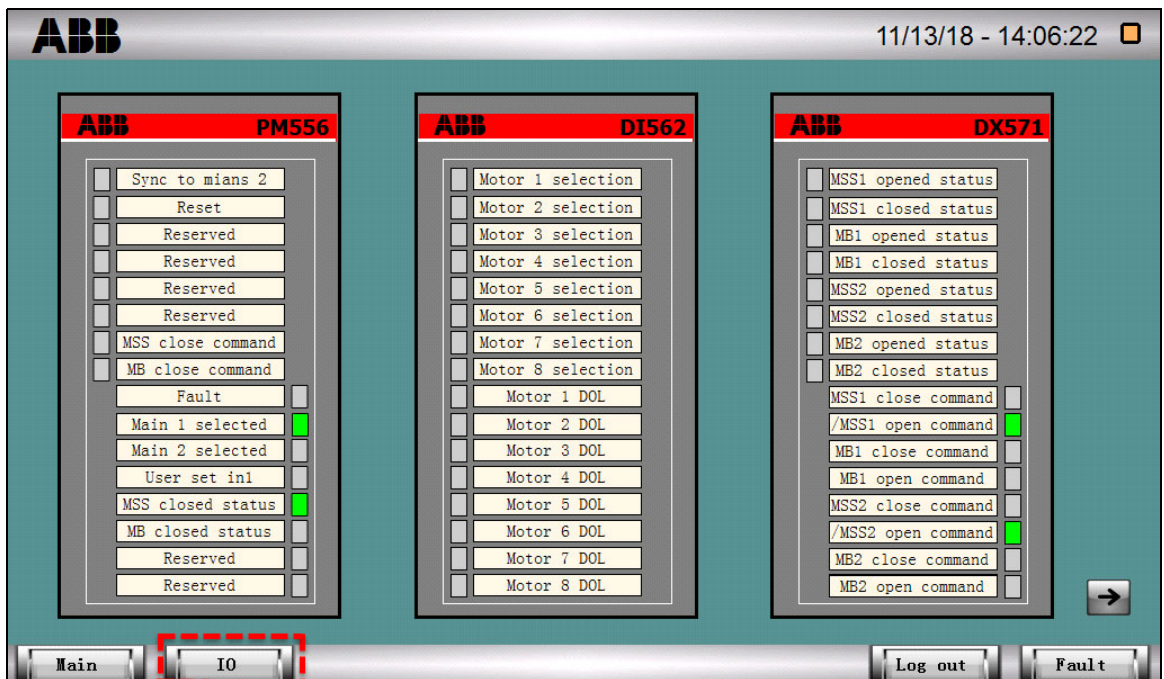
## ■ HMI

HMI is an option and mounted on MAU. It can display all MSS and MB status (in Main page), IO status (in IO page), active fault (in Fault page).

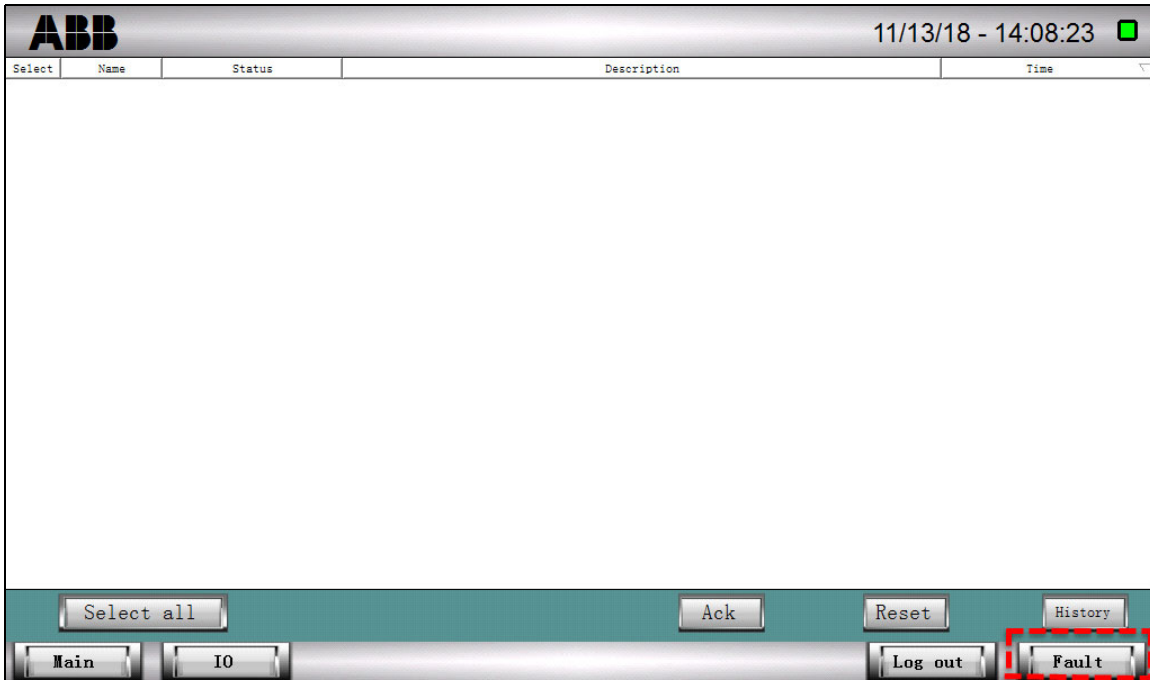
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HMI display Main page



HMI display IO page



*HMI display Fault page*

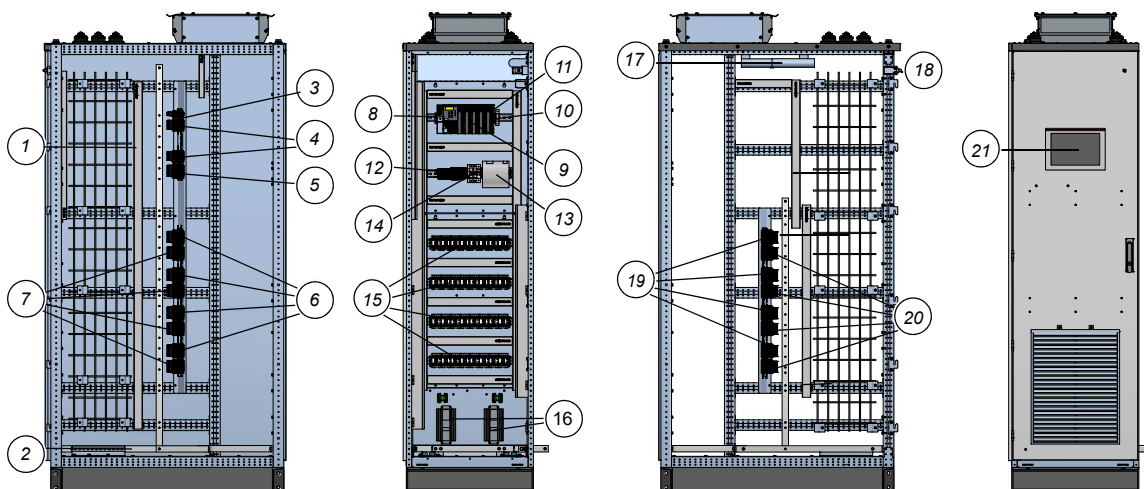
If the parameter setting of marshalling PLC control source is “Panel”, motor selection and MB DOL command are coming from HMI in *Control* page.



*HMI display Control page*



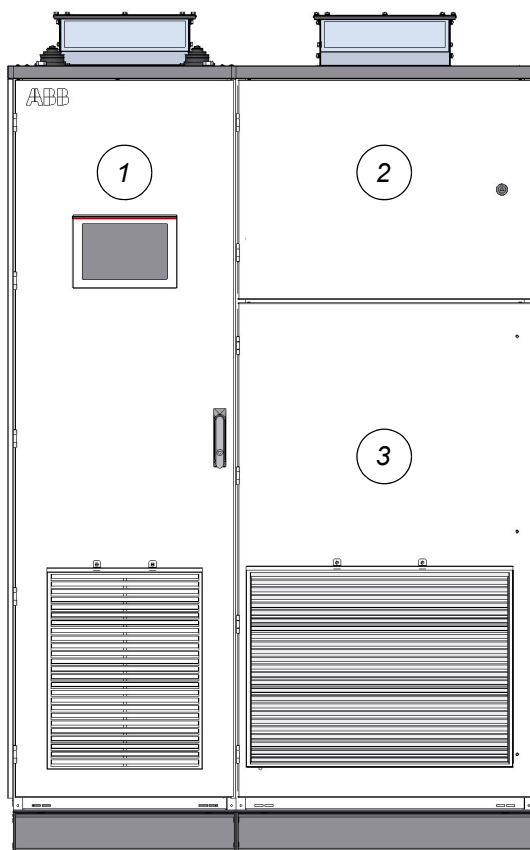
■ MAU (Marshalling unit) layout



<b>Left wall</b>	
1	Cable duct
2	Ground bus bar
3	230VAC auxiliary power supply
4	Motor 1-8 selection
5	Main control signal
6	Motor 1-4 feedback signal
7	Motor 1-4 control signal
<b>Front</b>	
8	Processor Module PM556
9	Digital Input Module DI562
10	Digital Input/Output Module DX571
11	Customer interface, FAULT signal
12	24V+ distributor with fuse/ 24V- distributor/ PE terminal
13	24VDC power supply
14	Protection switch for power supply/ Protection switch for lamp
15	Motor MB/MSS close/open command
16	Space heater
<b>Right wall</b>	
17	Lamp
18	Limit switch
19	Motor 5-8 feedback signal
20	Motor 5-8 control signal
21	HMI CP610

## Doorlock

All doors and removable cover plates of the Marshalling and the SBU cabinet are either lockable or bolted.



1	Door of Marshalling cabinet: lockable
2	Top Door of SBU cabinet: lockable
3	Bottom Door of SBU cabinet: bolted

### Door locks

## Cooling system

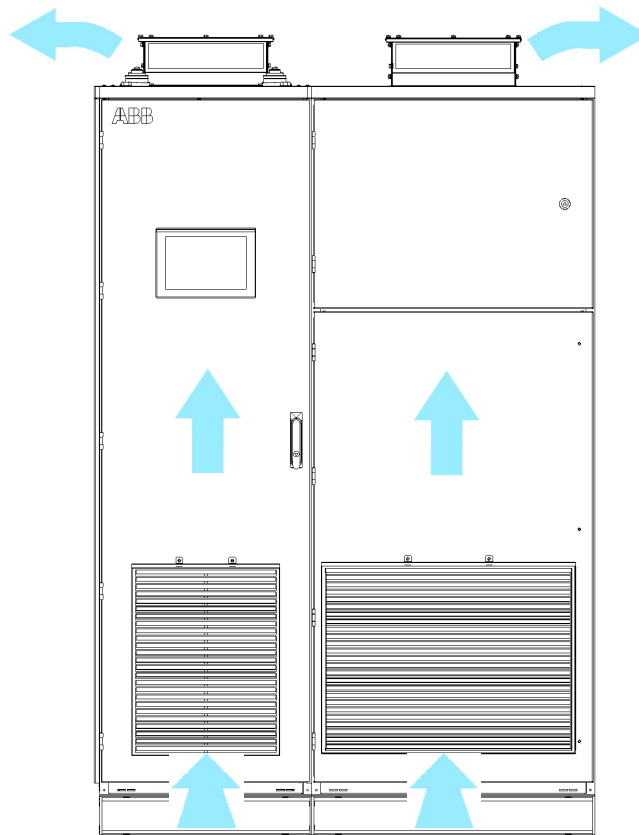
The MAU is natural air cooling and the SBU has a fan on the top of the output choke in the cabinet.

### ■ Function

The fan in the SBU cabinet is switched on and off together with the fans in drive and Transformer Unit (TRU).

■ **Air flow inside MAU and SBU**

The air enters the MAU and SBU through the louvered panels at the front, passes the electrical parts and then exits through the outlet of the roof of the cabinet.



*Air flow through the MAU and SBU*





# 4

## Control system and interfaces

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### Contents of this chapter

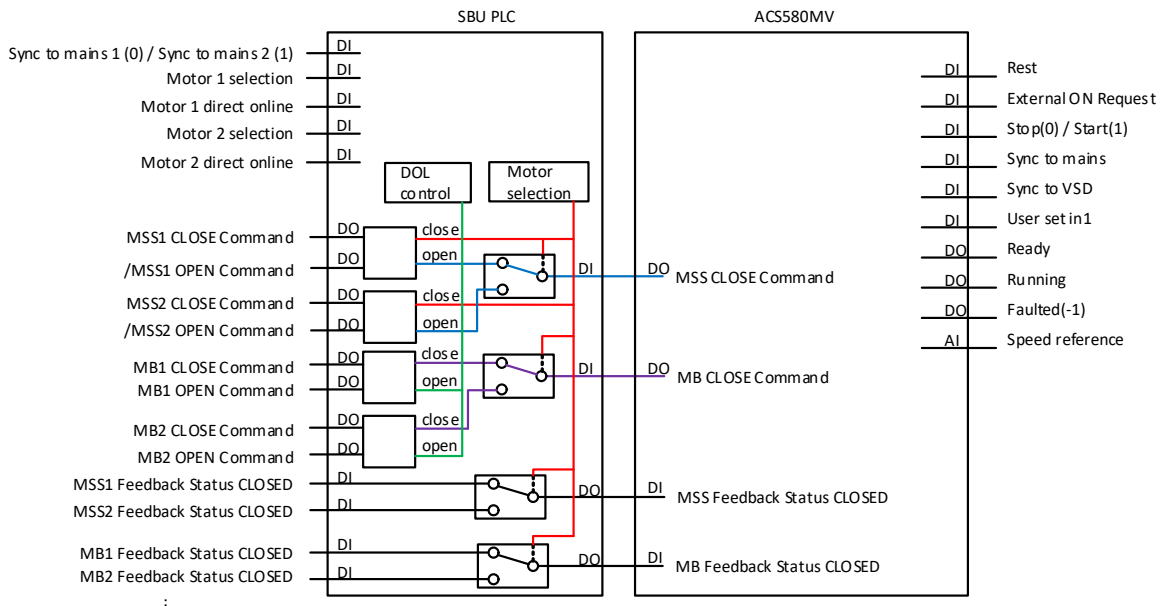
This chapter contains an overview of the control system, the default I/O connection diagram, descriptions of the terminals and contains references to related manuals and documentation.

### Main components

The control compartment incorporates the hardware for the control, monitoring and protection functions of the bypass - drive, and the communication interfaces to the local control panel and to the remote control devices. Depending on the control concept of the bypass - drive system, the remote control devices include a higher-level control system and / or remote operator stations.

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**Control block diagram**



*Control system block diagram*

SBU PLC will be used if the number of motors is more than one. It is located in MAU and comprises six I/O devices. The number of PLC I/O modules depends on the number of motors to be synchronized.

Customer interface and wiring connection between SBU PLC and ACS580MV for two motors' synchronized bypass are listed as below.

## I/O interfaces

### ■ Customer control and process I/Os

This chapter provides an overview of the hardwired I/Os. For details refer to ACS580MV Engineering Guideline and ACS580MV Catalog.

#### Customer control signals

##### X101 Digital inputs

1	motor 1 selection	connect contact from customer, 24VDC, 5mA
2		
3	motor 2 selection	
4		
5	motor 3 selection	
6		
7	motor 4 selection	
8		

##### X102 Digital inputs

1	motor 5 selection	connect contact from customer, 24VDC, 5mA
2		
3	motor 6 selection	
4		
5	motor 7 selection	
6		
7	motor 8 selection	
8		

##### X106

1	Sync to mains 1(0) /	connect contact from customer, 24VDC, 5mA
2	Sync to mains 2(1)	
3	reset	
4		
7	fault	Floating contact to customer isolation rated voltage 400VAC maximum making current: 15A thermal current: I <sub>th</sub> = 8A rated operational voltage: U <sub>e</sub> = 250V rated operational current: DC-12: I <sub>e</sub> = 8A(24V) U <sub>min</sub> = 5V, I <sub>min</sub> = 5mA(AgNi), 2mA(AgNi/Au)
8		

**Signals to and from motor starter and motor breaker switches**

<b>Connection</b>	<b>Terminal</b>	<b>Control voltage</b>
Status signals from MSS 1 and MB 1	-X110	24V(DC)
Control signals to MSS 1 and MB 1	-X111	
Status signals from MSS 2 and MB 2	-X120*	24V(DC)
Control signals to MSS 2 and MB 2	-X121*	
Status signals from MSS 3 and MB 3	-X130*	24V(DC)
Control signals to MSS 3 and MB 3	-X131*	
Status signals from MSS 4 and MB 4	-X140*	24V(DC)
Control signals to MSS 4 and MB 4	-X141*	
Status signals from MSS 5 and MB 5	-X150*	24V(DC)
Control signals to MSS 5 and MB 5	-X151*	
Status signals from MSS 6 and MB 6	-X160*	24V(DC)
Control signals to MSS 6 and MB 6	-X161*	
Status signals from MSS 7 and MB 7	-X170*	24V(DC)
Control signals to MSS 7 and MB 7	-X171*	
Status signals from MSS 8 and MB 8	-X180*	24V(DC)
Control signals to MSS 8 and MB 8	-X181*	

\* *Presence depends on number of motors*

### ■ **Communication interfaces**

See the [ACS580MV primary control program firmware manual](#) and the [ACS580MV hardware manual](#).



# 5

## Transportation

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### Contents of this chapter

This chapter provides information and instructions for transportation of the bypass - drive.

### Safety

The bypass - drive must only be handled by personnel who are skilled and experienced in unpacking and transporting heavy equipment.

All work must be carried out by qualified personnel according to the site and equipment requirements and in compliance with the local regulations.

### Lifting and transportation

#### ■ Dimensions and weights

Choose the load capacity according to the following table, for center of gravity see the [ACS580MV Base frame & TEU layout design](#).



Type	Depth (mm)	Height (mm)	SBU+Drive		Marshalling+SBU+Drive	
			Width (mm)	Weight (kg)	Width (mm)	Weight (mm)
6/6.3R1	1100	2571	2615	1800	3215	2060
6/6.3R2	1100	2571	2615	1850	3215	2110
6/6.3R3	1100	2571	2615	1900	3215	2160
6/6.3R4	1100	2571	2615	2050	3215	2310
6/6.3R5	1100	2571	2615	2050	3215	2310
6/6.3R6	1100	2571	2615	2150	3215	2410
6/6.3R7	1300	2571	3815	3250	4415	3540
6/6.3R8	1300	2571	3815	3450	4415	3740
6/6.3R9	1300	2571	3815	3700	4415	3990
6.6R1	1100	2571	2615	1850	3215	2110
6.6R2	1100	2571	2615	1900	3215	2160
6.6R3	1100	2571	2615	1950	3215	2210
6.6R4	1100	2571	2615	2100	3215	2360
6.6R5	1100	2571	2615	2150	3215	2410
6.6R6	1100	2571	2615	2250	3215	2510
6.6R7	1300	2571	4215	3750	4815	4040
6.6R8	1300	2571	4215	3900	4815	4190
6.6R9	1300	2571	4215	4300	4815	4590
10R1	1100	2571	2615	1900	3215	2160
10R2	1100	2571	2615	1950	3215	2210
10R3 A/B/C	1100	2571	2615	2000	3215	2260
10R3 D	1100	2571	2615	2050	3215	2310
10R4	1100	2571	3015	2300	3615	2560
10R5	1100	2571	3015	2350	3615	2610
10R6	1100	2571	3015	2450	3615	2710
10R7	1300	2571	4615	4350	5215	4640
10R8	1300	2571	4615	4500	5215	4790
10R9	1300	2571	4615	4900	5215	5190
10.5/11R1	1100	2571	2615	1950	3215	2210
10.5/11R2	1100	2571	2615	2000	3215	2260
10.5/11R3	1100	2571	2615	2050	3215	2310
10.5/11R4	1100	2571	3015	2350	3615	2610
10.5/11R5	1100	2571	3015	2400	3615	2660
10.5/11R6	1100	2571	3015	2500	3615	2760
10.5/11R7	1300	2571	5415	4950	6015	5240
10.5/11R8	1300	2571	5415	5200	6015	5490
10.5/11R9	1300	2571	5415	5600	6015	5890

See [ACS580MV hardware manual](#) for others information about transportation, storage and disposal.

# 6

## Mechanical installation

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### Contents of this chapter

This chapter describes the mechanical installation procedure of air outlet. See [ACS580MV hardware manual](#) for others information of mechanical installation.

### Safety

All installation work must be carried out by qualified personnel according to the site and equipment requirements and in compliance with the local regulations.

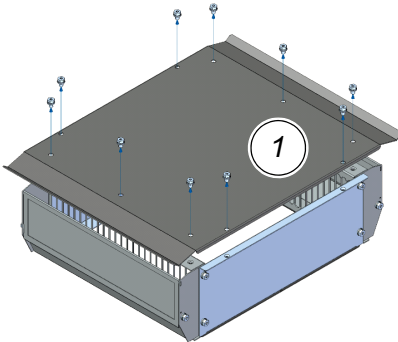
#### ■ Installing air outlet

In case the air outlet need to be installed in the field.

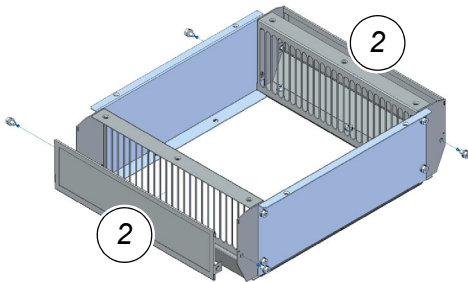


### Installation

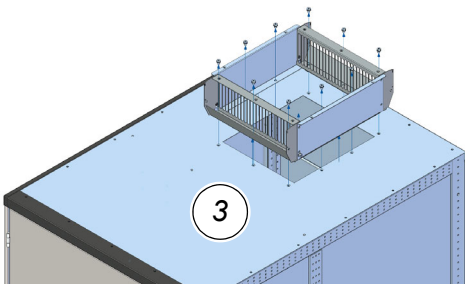
1. Remove 10 hex-head combination screws (M6X10) on the top cover plate (1). Lift the top cover plate and pull it away from the air outlet.



2. Remove the 4 hex-head combination screws (M6X10) on the sides, remove the stainless-steel mesh (2).



3. Assemble the air outlet on the cabinet roof plate (3) with 10 hex-head combination screws (M6X10).



4. Re-assemble stainless-steel mesh and top cover plate in reverse order of removal.



## 7

# Electrical installation

---

## Contents of this chapter

This chapter gives instructions on the installation of the power cables and wiring of control and auxiliary power.

For information on the power cables, see the *ACS580MV hardware manual*.

## Safety



**WARNING** Hazardous voltage!

Improper work could lead to life-threatening injury or death.

The electrical installation must be carried out by qualified personnel according to the site and equipment requirements, and the relevant electrical codes.

When the electrical installation is completed, the main and auxiliary power supply to the drive must not be switched on without the consent of the ABB commissioning personnel.

Take appropriate measures to prevent main and auxiliary power supply from being switched on during installation.



## Overview of installation work

The electrical installation includes the following wire and cable connections:

- Power cables, ground cables.
  - Auxiliary power, control and serial communication cables.
  - Power supply and signal cables for fans in transformer unit.
-

## Cable requirements

For information on the requirements for power cables and the ground cable see the [ACS580MV Engineering Guideline](#).

For information on the requirements for the auxiliary power cable and the control cables, see table below.

## Parallel routing of power cables

Cables between drive and motor can be laid in parallel. The number of cables laid in parallel is limited by the number of entry holes of the entry plate.

For information on the supply voltages, see Rating label of the bypass - drive system.

## Terminal sizes for auxiliary and control connections

### SBU

Customer I/O terminal		
Terminal	wire cross-section (mm <sup>2</sup> )	
	Solid wire	Flexible wire
X107:1	0.75...4 mm <sup>2</sup>	
X107:2		
X108:1		
X108:2		
X109:1		
X109:2		
X110:5		
X110:6		
X110:9		
X110:10		
X111:1	1.5...4 mm <sup>2</sup>	
X111:2		
X111:3		
X111:4		
X111:5		
X111:6		
X111:7		
X111:8		
X111:9		
X111:10		



**MAU**

Customer I/O terminal		
Terminal	Wire cross-section (mm <sup>2</sup> )	
	Solid wire	Flexible wire
X101:1	0.75...2.5 mm <sup>2</sup>	
X101:2		
X101:3		
X101:4		
X101:5		
X101:6		
X101:7		
X101:8		
X102:1		
X102:2		
X102:3		
X102:4		
X102:5		
X102:6		
X102:7		
X102:8	0.75...2.5 mm <sup>2</sup>	
X106:1		
X106:2		
X106:3		
X106:4		
X106:7		
X106:8		
X110:1		
X110:2		
X110:3		
X110:4		
X110:5		
X110:6		
X110:7		
X110:8		
X110:9		
X110:10		



Customer I/O terminal		
Terminal	Wire cross-section (mm <sup>2</sup> )	
	Solid wire	Flexible wire
X100:L	1.5...2.5 mm <sup>2</sup>	
X100:N		
X100:PE		
X111:1		
X111:2		
X111:3		
X111:4		
X111:5		
X111:6		
X111:7		
X111:8		
X111:9		
X111:10		

## Ground cable and cable shield connections

The cabinet is equipped with ground buses (marked PE, Protective Earth) for grounding the armor and shields of the cables, and for the connection of the ground cable.

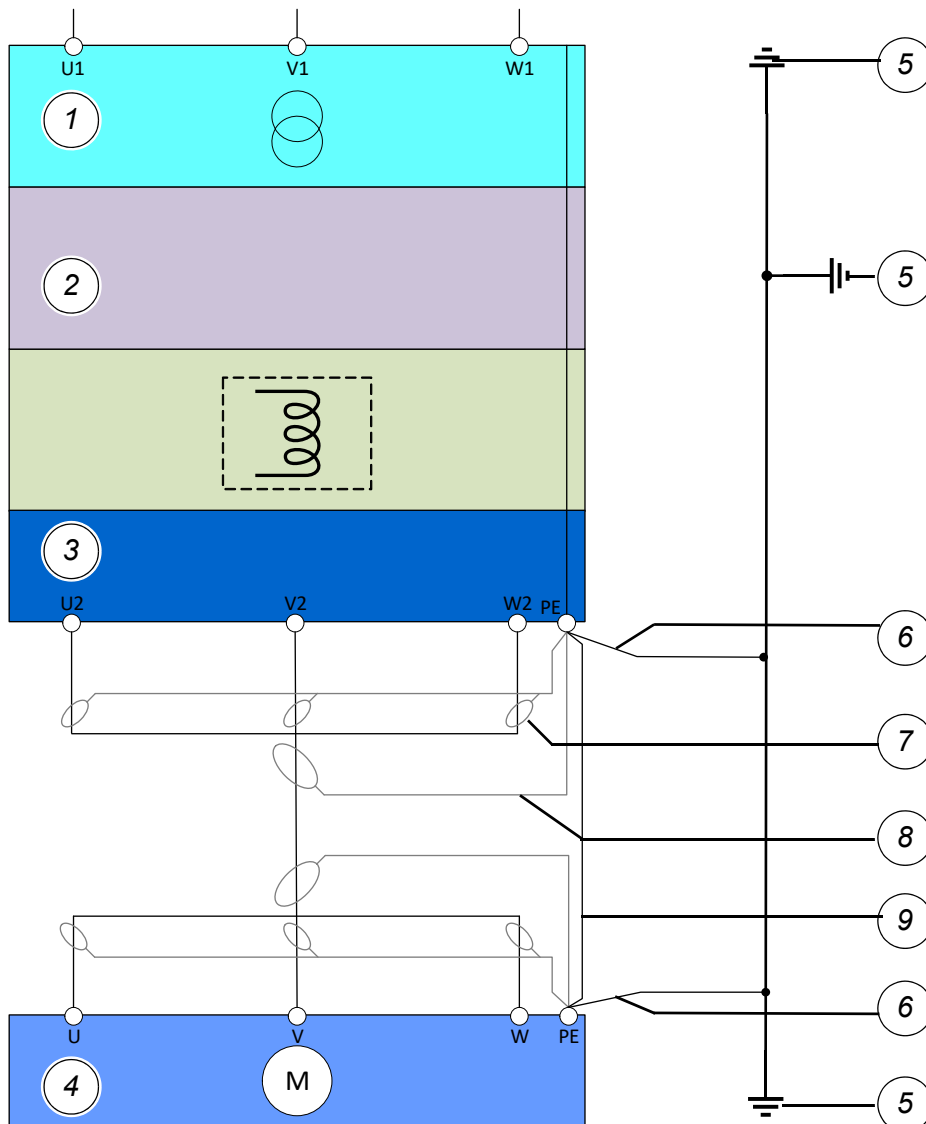
To identify the ground buses, see [ACS580MV Wiring Diagram of SBU](#).

### ■ Grounding of the bypass - drive system

Grounding of the bypass - drive system must be in line with the [ACS580MV Engineering Guideline](#)







1	Input transformer (TRU)
2	Drive
3	SBU / SBU+MAU
4	Motor
5	Earth electrode
6	Ground cable
7	Cable screen
8	Cable shield
9	Equipotential bonding conductor

*Grounding bypass - drive system and integrated transformer*

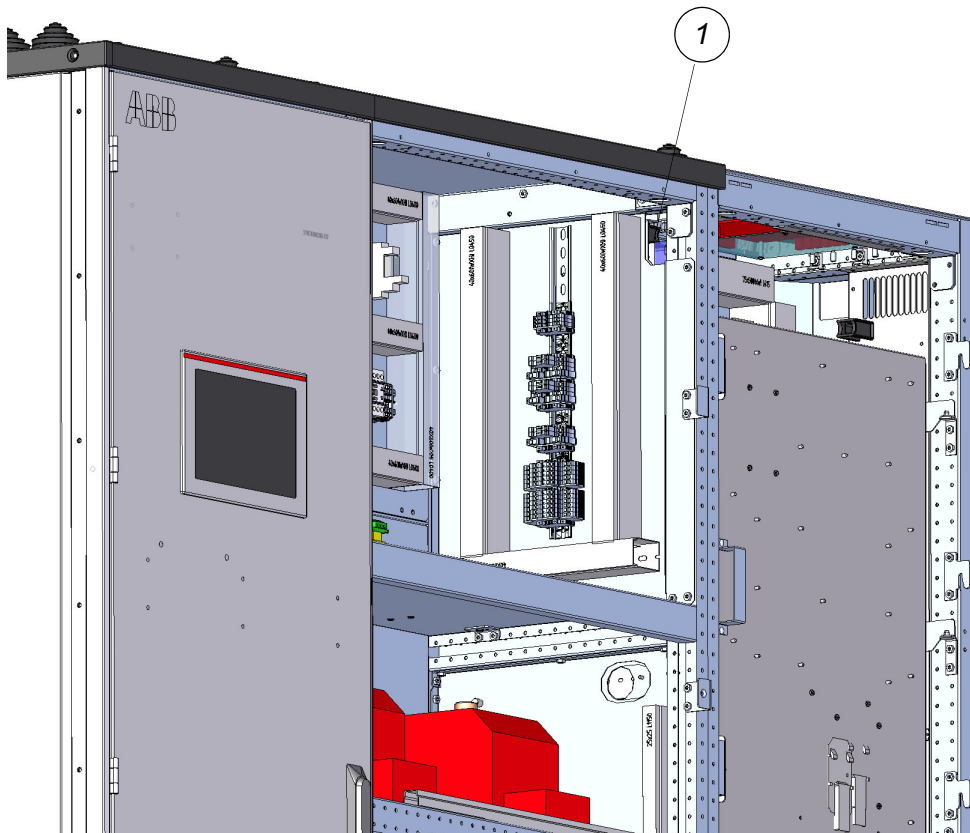
## Cable entries for external connections

For detailed information, see [ACS580MV hardware manual](#).



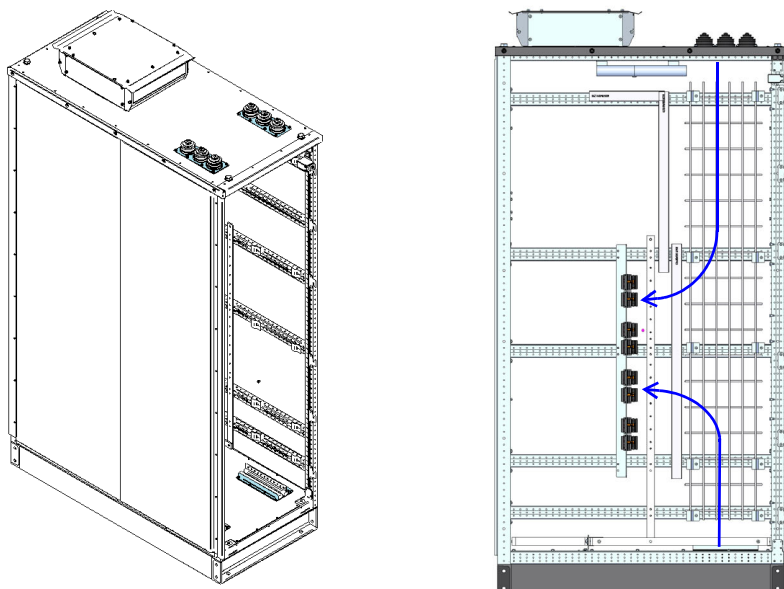
### ■ Control and auxiliary cable entry in SBU

Cable entry can be from bottom or top in COU to SBU through the hole (1) between COU and SBU.



### ■ Control and auxiliary cable entry in MAU

Cable entry can be from bottom or top in MAU.



*Terminals on right cabinet wall*

Further information, see [ACS580MV Wiring Diagram](#).



# Installation checklist

---

## Contents of this chapter

This chapter contains an installation checklist which you must complete before commissioning can take place.

---

## Safety



### DANGER

High voltage!

Obey the instructions in chapter [Safety instructions](#). If you ignore them, injury or death, or damage to the equipment can occur.

Before starting to work on the drive, make sure:

- that the main and auxiliary power supply to the drive is switched off, locked out, and tagged out.
- that bypass - drive is in non-operating state and after de-energizing.
- that safety ground connections are in place for both input and output terminals of converter.
- that personal protective equipment is provided and used when required.
- that everyone involved is informed.

Before energizing the drive, make sure:

- that all foreign objects are removed from the drive.
- that all internal and external covers are securely fastened and all doors are closed, locked and / or bolted.
- that the release dials of safety switches are in the locked position.



**WARNING!** Obey the instructions in chapter [Safety instructions](#). If you ignore them, injury or death, or damage to the equipment can occur.

## Checklist

Do the steps in section [Precautions before electrical work](#) on page 15 before you start the work. Go through the checklist together with another person.

### ***Mechanical installation***

1. Ambient operating conditions meet the specifications given in chapter ACS580MV hardware manual.
2. Drive installed according to the instructions in this manual (Chapters [Mechanical installation](#) and [Electrical installation](#)).
3. Drive securely fastened to the floor.
4. Fan units installed.

5. Visual inspection:
- no badly affixed or damaged components
  - no foreign objects inside cabinet
  - no dirt, dust and humidity inside cabinet

### **Electrical installation**

1. Types and cross-sections of control cables suitable for the signal type and signal level
2. Types and cross-sections of power cables selected according to the [ACS580MV Engineering Guideline](#)
3. Pulse encoder cable screens connected to **screen grounding point** and not connected directly to the pulse encoder interface (only applicable for drives with pulse encoder interface)
4. Internal cabling to integrated transformer (power, auxiliary, control and heater cables) made according to the instructions in ACS580MV hardware manual
5. Cable entry made according to the instructions in this manual (Chapter [Electrical installation](#))
6. All control cable screens and conductors are connected according to the instructions in this manual (Chapter [Electrical installation](#)), appropriately labeled, and the customer-side connections are completed
7. Heating cable (if supplied) installed according to wiring diagram.
8. Ground cable of drive securely connected at both ends
9. Input and motor cables not connected at both ends (cables must be meggered before connection, drive optional - recommended in case of long storage time, humid environment or visible transportation damages)

### **Door interlocking**

1. Door locks tested and in operation
2. The manual release of the door safety switch(es) is in the **locked** position.

### **Main circuit breaker (MCB)**

1. Type of MCB selected as per [ACS580MV Engineering Guideline](#)
-

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- 2. High voltage connections completed
- 3. MCB ready to be tested with drive
- 4. MCB interposing relay settings tested
- 5. Safety devices checked and in operation

**Motor breaker (MB)**

- 1. Type of MB selected as per [ACS580MV Engineering Guideline for SBU](#)
- 2. High voltage connections completed
- 3. MB ready to be tested with bypass – drive
- 4. MB interposing relay settings tested
- 5. Safety devices checked and in operation

**Main starting switch (MSS)**

- 1. Type of MSS selected as per [ACS580MV Engineering Guideline for SBU](#)
  - 2. High voltage connections completed
  - 3. MSS ready to be tested with bypass – drive
  - 4. MSS interposing relay settings tested
  - 5. Safety devices checked and in operation
-

## Motor

1. Motor installed, aligned and alignment protocol available
2. Motor decoupled from driven load
3. Ground connection completed
4. Customer side motor protection set and ready (e.g. winding temperature, vibration)
5. Motor auxiliaries (e.g. bearing lubrication, heater cooling) ready

## Insulation tests

1. All power cables to drive, and from drive to motor are meggered, and measured values are within the required limits.
2. Test report of the megger test available   
**Note:** If the test is carried out by the commissioning engineer of the drive, an additional day per drive motor combination needs to be reserved. After the test, the feeder cables can be connected, except at the drive end. The test must comply with the specification.
3. Optional insulation tests of the drive are completed and documented. Insulation tests of the drive recommended in case: long storage time (>4 months), humid environment or visible damages due to transportation/installation.

## Power supply

1. Medium voltage available for start-up of drive
2. Low voltage auxiliary power available for start-up of drive

## Miscellaneous

1. Sufficient number and correct type of spare parts available
  2. Cooling of drive room ready for load run of drive
  3. Optional equipment ready
-

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4. Drive room properly dust filtered (dust filters at air inlet), see [ACS580MV Engineering Guideline](#)



9

# Operation

---

## Contents of this chapter

This chapter contains the start-up procedure of the drive. The default device designations (if any) are given in brackets after the name, for example “main switch-disconnector (Q1)”. The same device designations are also used in the [ACS580MV Wiring Diagram of SBU](#), typically.

## Operating conditions

The operating conditions for the drive are according to IEC 60721-3-3 'Stationary use at weather-protected locations' (unless indicated otherwise). For details see [Technical data](#).

## Safety

The drive must only be operated by qualified and authorized personnel, i.e. personnel who are familiar with the operation of the bypass - drive system and the hazards involved.



## Overview

The chapter outlines the local operation of the bypass - drive. For additional details on using the local control panel see User's Manual "[ACS-AP-X assistant control panels user's manual](#)".

Control of the drive via a PLC or a higher-level control system is not described in this chapter. If the drive is controlled from remote, see the appropriate manuals for information.

The panel messages and parameter settings used in this chapter are typical examples to illustrate the related instructions and display functions and may therefore differ from the actual messages and parameter settings in the drive.

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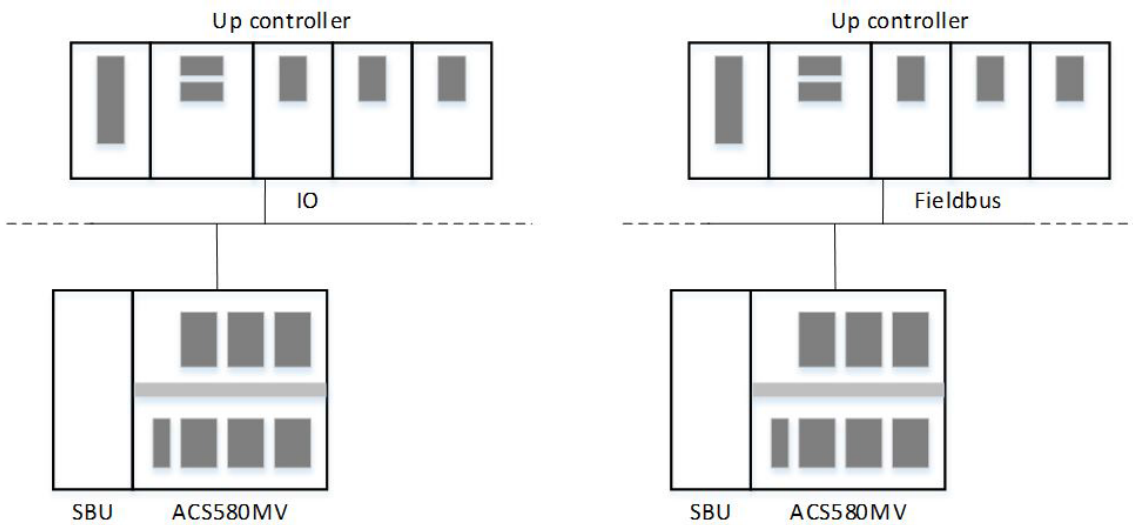
## Overview on bypass - drive status and sequences

The following section lists the main operating states of the bypass – drive and the related indications on the local control panel when the bypass - drive is put into operation, when it is stopped (see [Start sequence of SBU](#) ) or when a fault condition has occurred.

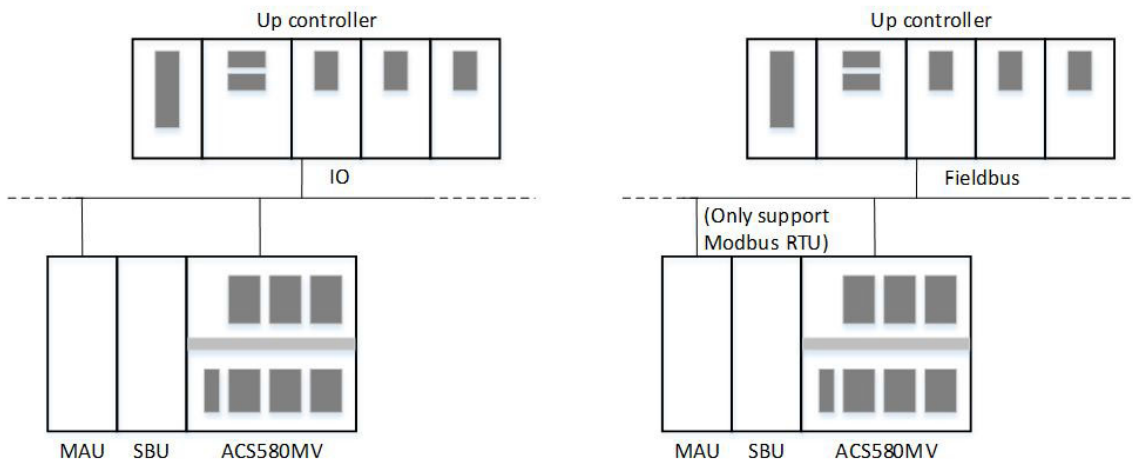
For information on other status messages, such as fault status messages in particular, see the [ACS580MV primary control program firmware manual](#).

### ■ Start sequence of SBU

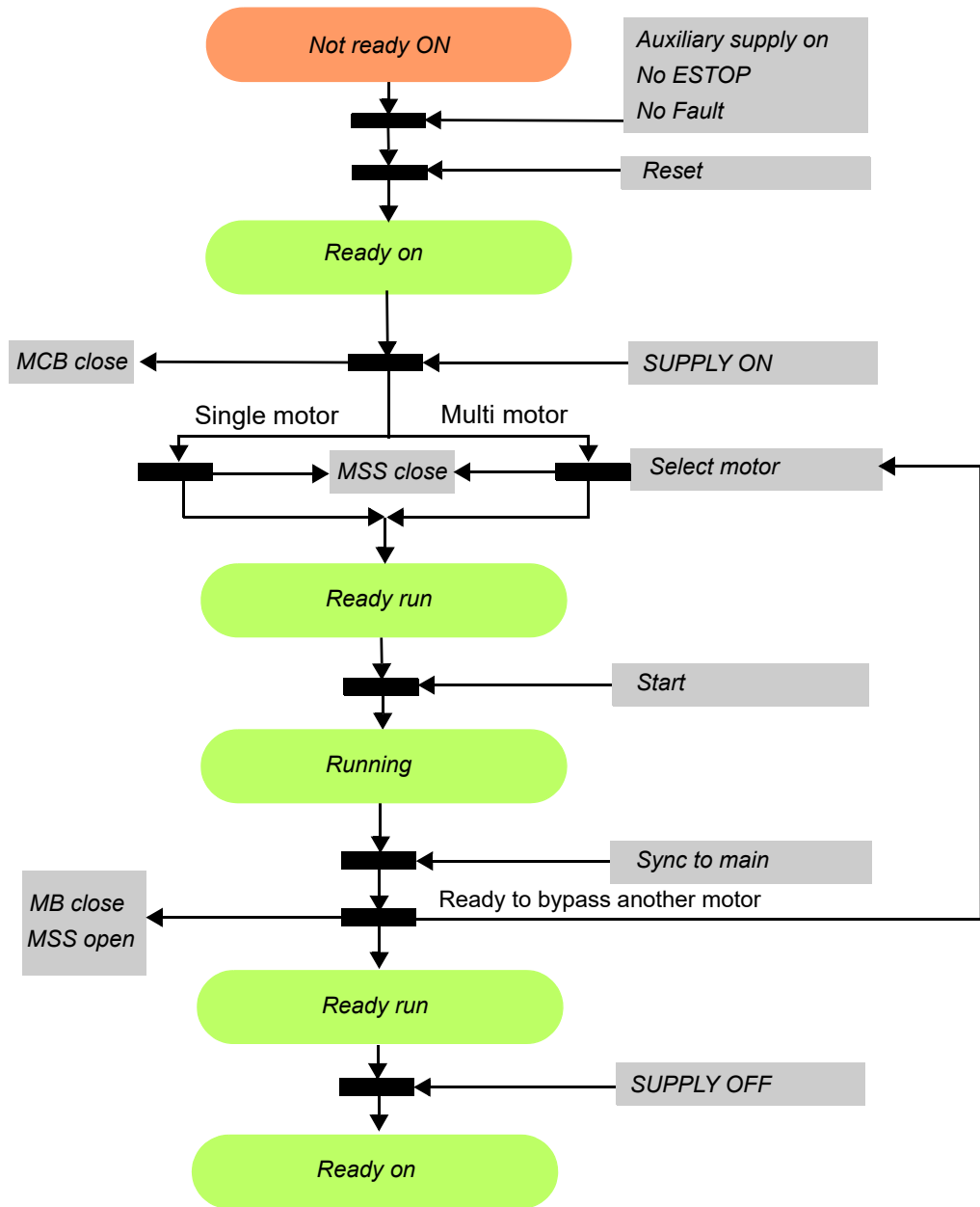
For single motor, the drive can be configured to receive all of its control information through the IOs or fieldbus.



For multi motors, up controller needs to send control command to drives and marshalling PLC through IOs or fieldbus (marshalling PLC just support fieldbus of Modbus RTU). If “Panel” is selected, motor selection and MB DOL command can come from HMI.



The start sequence is shown as below.





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## Maintenance

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### Contents of this chapter

This chapter contains instructions for component replacements, for more information, see *ACS580MV hardware manual*.



## Safety



### DANGER

High voltage!

Obey the instructions in chapter [Safety instructions](#). If you ignore them, injury or death, or damage to the equipment can occur.

Before starting to work on the drive, make sure:

- that the main and auxiliary power supply to the drive is switched off, locked out, and tagged out.
- that bypass - drive is in non-operating state and after de-energizing.
- that safety ground connections are in place for both input and output terminals of converter.
- that personal protective equipment is provided and used when required.
- that everyone involved is informed.

Before energizing the drive, make sure:

- that all foreign objects are removed from the drive.
- that all internal and external covers are securely fastened and all doors are closed, locked and / or bolted.
- that the release dials of safety switches are in the locked position.

### NOTICE

Foreign matter and particularly metallic dust can cause failure and damage when the drive is energized.

Ensure that foreign matter cannot enter the cabinet:

- Close the doors and cover openings completely when the work is discontinued.
- Retrieve any foreign matter accidentally dropped into the cabinet.

### NOTICE

All maintenance tasks that are listed in the maintenance schedule, but are not described in detail in this manual, may only be carried out by ABB.

Call ABB service if such a task is due.



## Preparation for maintenance work

This part must be in line with the *ACS580MV hardware manual*. MB and MSS status must be checked before maintenance.

For further information, see *ACS580MV hardware manual* and must be in line with it.

## Shutting down the drive for maintenance



### DANGER

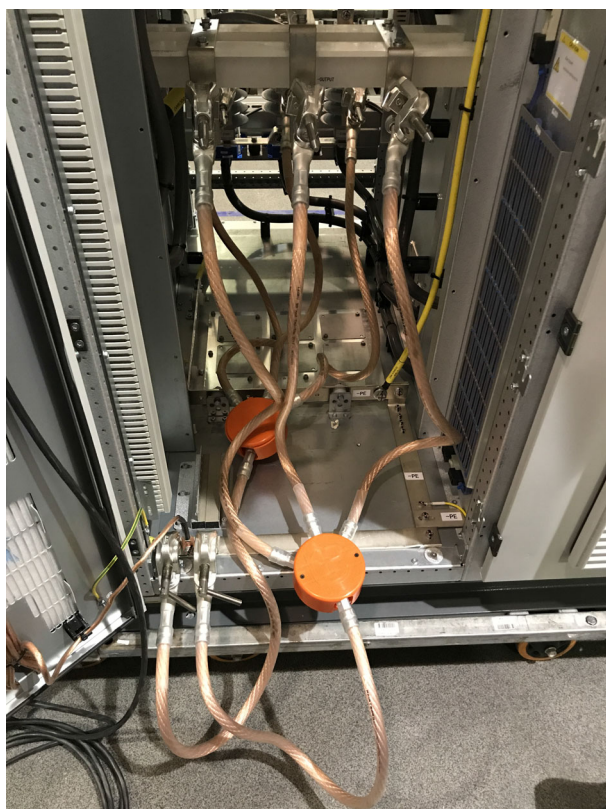
Hazardous voltages!

For work in the medium voltage circuit of the drive the connection of grounding equipment at the appropriate locations is a must. The grounding equipment ensures that hazardous voltages cannot be fed into the drive neither from the main power supply nor the motor.

### ■ Connecting a grounding set

Before starting to work on the drive, you must ground the three input and three output terminals in the terminal unit (TEU). Always ground the drive on both sides, i.e. on supply and motor side. Grounding on motor side is needed to avoid induced voltage from a spinning rotor or malfunction of MSS.

For this purpose, two grounding harnesses are needed.



### WARNING

MSS cannot connect to ground in case of MB is closed.

Grounding of MSS on the motor side would lead to a direct short circuit when MB is closed. This could result in death, serious injury, or severe damage to the system.

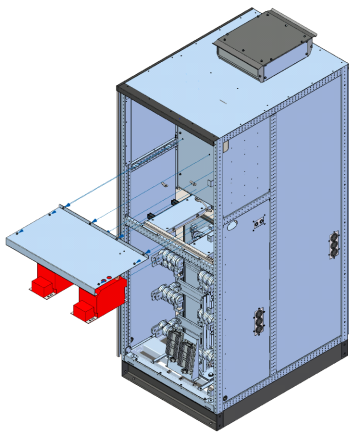
- Grounding harness is mandatory when converter is in maintenance.
- An isolator at the output of converter is recommended for safety purpose.



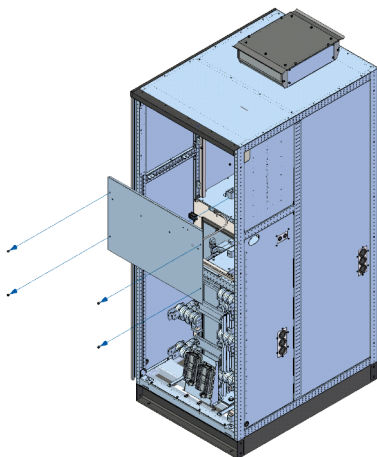
## Replacing cooling fan in SBU

### ■ Procedure

1. Stop, de-energize and ground the drive following the steps in section *Shutting down the drive for maintenance* before you start the work.
2. Switch off the motor starter of the fan unit to isolate the fan unit from the auxiliary power supply. To identify the motor starter, see the [ACS580MV Wiring Diagram of SBU](#).
3. Disconnect the wires on the PT, remove the screws that fix the PT, move out the PT from cabinet.
4. Remove 2 safety blocks on the middle plate, remove the eight hex-head combination screws (M6x12) that attach the horizontal plate, move out the horizontal plate.



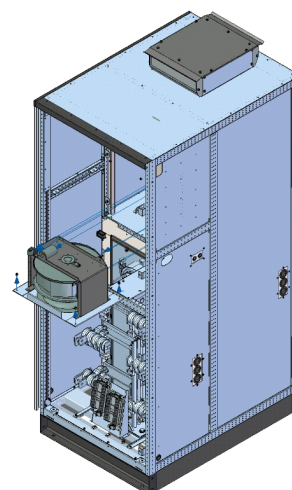
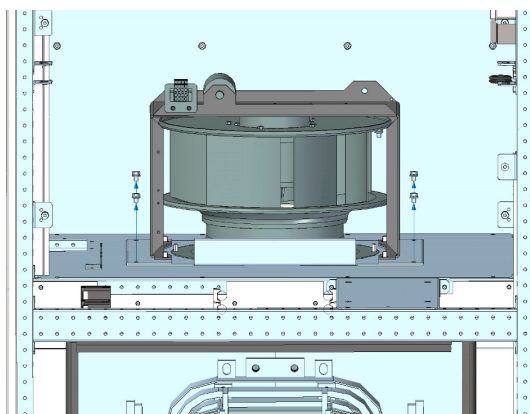
5. Remove the four hex-head combination screws (M6x12) that attach the vertical plate, move out the vertical plate.



6. Disconnect the wires on the fan kit, remove the screws that fix the fan kit, move out the fan kit from cabinet.







7. Proceed in reverse order as previously described to reinstall the new fan kit.

**Maintenance schedule**

The recommended intervals for maintenance and component replacement are based on the normal operating conditions of the drive. The drive should be checked at least every two years by qualified personnel whose recommendations should be followed. Depending on the actual condition of the drive, the maintenance work can be carried out before or after the recommended interval.

	Years from start-up																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<b>Air cooling</b>																				
- Air filters <sup>1</sup>	I	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
- Cooling fan (continuous operation) <sup>2</sup>	I	I	P	I	R	I	P	I	R	I	P	I	R	I	P	I	R	I	P	I

**R Replacement of the component**

**I** Inspection (visual inspection; corrective measures, repair and/or replacement of component if needed)


**P** Performance of on-site work (for example, commissioning, tests, measurements)

**1** Air filters can be replaced or cleaned when necessary, depending on the condition of the filter. Replacement is mandatory when required according to maintenance schedule.

**2** It is recommended to replace the device after four years of operation.







# 11

## Technical data

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For the technical specifications of the bypass - drive, e.g. ratings sizes and technical requirements see the following documents:

For technical data, drive types and options refer to ACS580MV Catalog.

For mechanical layout, dimensions and required free space see [ACS580MV Base frame & TEU layout design](#).

For motor and cable selection and for the technical requirements for the protection and control of the medium voltage supply refer to [ACS580MV Engineering Guideline](#).

The list of available general documents is provided in [List of related manuals](#) on the inside of the front cover of this manual.

### SBU technical data

Items	
Power loss of main and control components	see <a href="#">ACS580MV Engineering Guideline for SBU</a>
Dimension an weight	see <a href="#">Transportation</a>
Time for synchronization from rated speed	≤ 20 s
Inrush current	120% motor nominal current
Max Grid numbers	2
Max motor numbers	8
Standard compliance	IEC 61800-5-1, IEC 61800-4, IEC 61800-3
DV/DT	< 1 kV/us for ACS580MV; < 500 V/us for ACS580MV with SBU
Voltage drop over SBU output choke	< 300 V

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# Further information

## Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to [www.abb.com/searchchannels](http://www.abb.com/searchchannels).

## Product training

For information on ABB product training, navigate to [www.abb.com/drives](http://www.abb.com/drives) and select *Training courses*.

## Document library on the Internet

You can find manuals and other product documents in PDF format on the Internet. Go to [www.abb.com/drives](http://www.abb.com/drives) and select *Document Library*. You can browse the library or enter selection criteria, for example a document code, in the search field.



**[www.abb.com/drives](http://www.abb.com/drives)**

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