

ABB Industrial drives

User's manual

ACS800 and ACS880 RSYC-01 synchronizing unit



List of related manuals

Drive firmware manuals	Code (English)
ACS800 standard control program 7.x firmware manual	3AFE64527592
ACS880 primary control program firmware manual	3AUA0000085967

You can find manuals and other product documents in PDF format on the Internet.
See section [Document library on the Internet](#) on the inside of the back cover.
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ACS800 and ACS880
RSYC-01 Synchronizing Unit

User's Manual

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Introduction to the manual

What this chapter contains

This chapter includes a description of the contents of the manual. In addition it contains information about the compatibility, safety and intended audience.

Compatibility

The manual is compatible with RSYC-01 Synchronizing Unit. The drive parameter data refers to ACS800 Standard Control Program.

Safety instructions

Follow all safety instructions delivered with the drive.

- Read the complete safety instructions before you install, commission, or use the drive. The complete safety instructions are given at the beginning of the drive *Hardware Manual*.
- Read the software function specific warnings and notes before changing the default settings of the function. For each function, the warnings and notes given in this manual in the section describing the related user-adjustable parameters.

Target audience

This manual is intended for the people who are responsible for installing, commissioning, using and troubleshooting the synchronization system with the RSYC unit. The reader is expected to have knowledge of electrical fundamentals, electrical wiring practices, electronic components, and electrical schematic symbols. The person in charge of testing and commissioning a system this complicated must be an experienced professional in the field of electrotechnics.

Related documents

A list of related manuals is printed on the inside of the front cover.

Description of operation and hardware

What this chapter contains

This chapter describes the operation of a synchronization application, shows a connection diagram and presents the RSYC unit.

Intended use of the RSYC unit

A drive equipped with the RSYC unit is designed for applications in which a large fixed-speed motor must be started to a weak supply line. Drive starts the motor smoothly (no high starting current as with the direct on line start) simultaneously generating a high torque. When the nominal speed (frequency) is reached, RSYC unit verifies the status of the supply line and the drive output and controls the switch-over contactors that shift the connection of motor from the drive to supply line.

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 (BUFOUT, 0 ... 10 V) indicates the synchronization status for the drive. When the BUFOUT signal reaches 5 volts, the supply line and the drive output voltages are synchronic, i.e. the phasing and frequency are the same.

The drive control program constantly corrects the drive frequency reference (set to 50 Hz) on basis of the BUFOUT signal by using the Trim function. When the synchronizing conditions are reached, i.e. the drive output and the supply line phasing's match and the frequencies are equal:

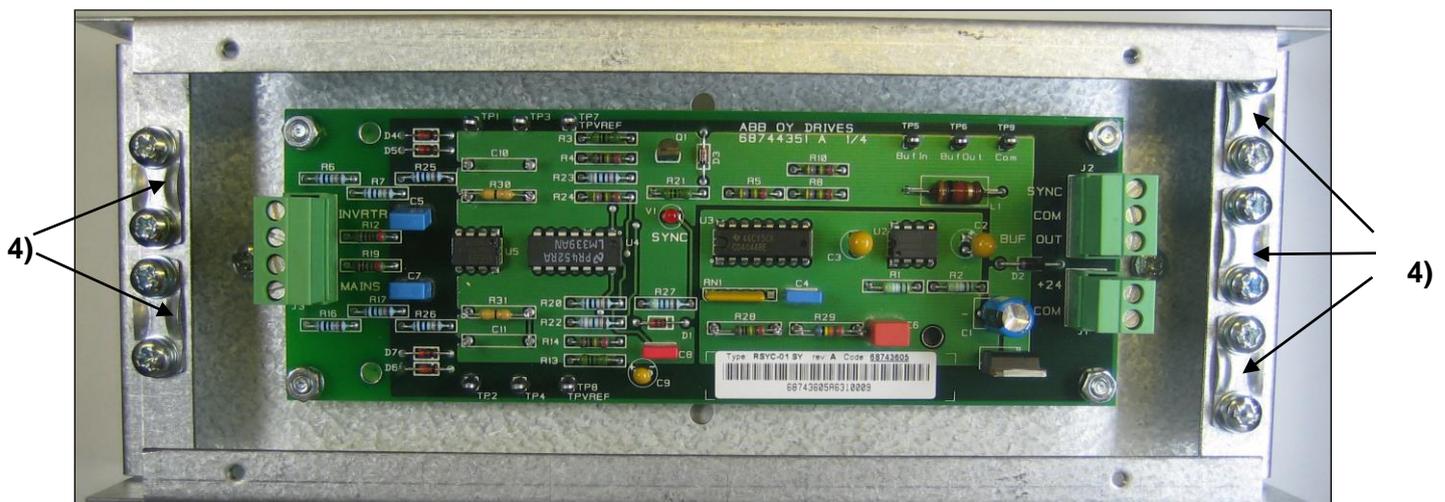
- BUFOUT signal reaches 5 volts indicating "synchronic" status for the drive application program.
 - RSYC unit gives a control pulse for the contactor control circuitry.
 - Drive control logic switches the inverter modulation (IGBT control pulses) off.
 - Contactor control circuit opens contactor K1, disconnecting the motor from drive.
 - Contactor control circuit closes contactor K2, connecting the motor to the supply line.
-

Overall view of the unit

RSYC-01 unit with cover



RSYC-01 unit without cover



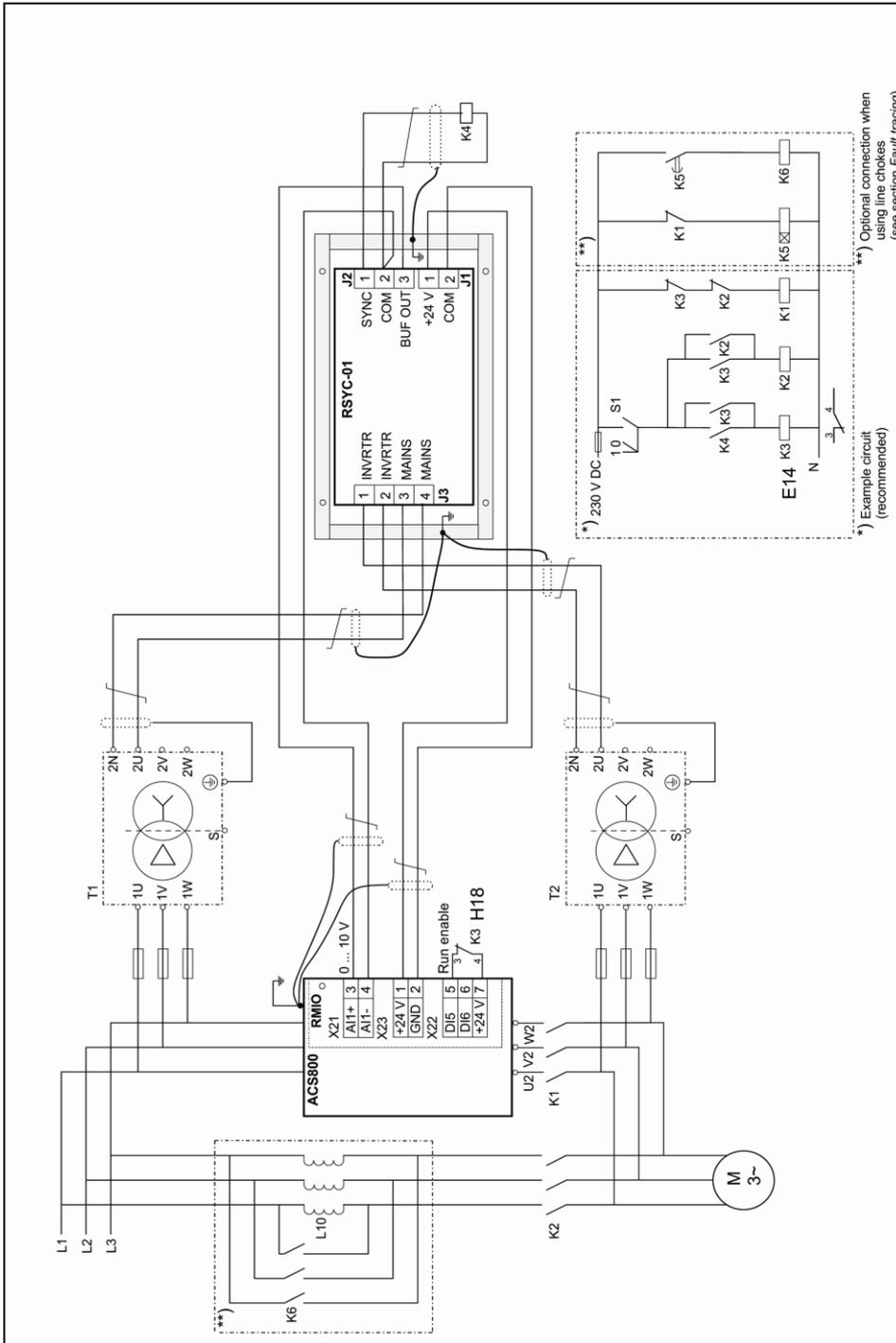
- 1) +24 V DC supply for the RSYC-01 unit
- 2) SYNC signal (K4) and BUF OUT signal
- 3) Inverter output (T2) and network supply (T1) measurement transformer signals
- 4) Cable screen clamps.

Connection diagram

What this chapter contains

This chapter describes the connections to ACS800 and ACS880 drives with the RSYC unit.

Connecting to ACS800



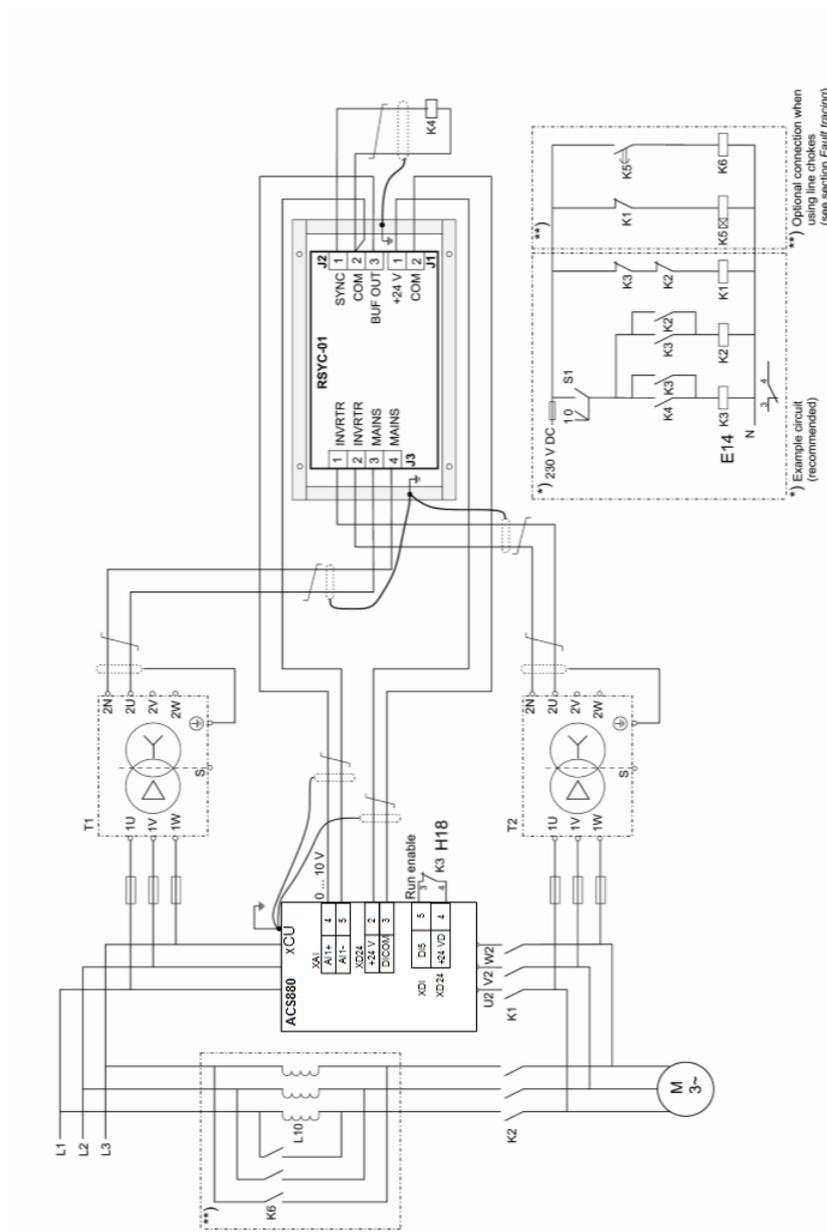
T1 – Supply line voltage measurement as 10 ... 120 V AC signal (3-phase potential measuring transformer with static shield)

T2 – Motor voltage measurement as 10 ... 120 V AC signal (3-phase potential measuring transformer with static shield)

RMIO board connections

RMIO board terminal	Name	Description
X21		
3	AI1+	Synchronization status indication
4	AI1-	
X22		
5	D15	Run enable
6	D16	Not in use
7	+24 V	24 V for run enable
X23		
1	+24 V	Power supply for RSYC
2	GND	

Connecting to ACS880



T1 – Supply line voltage measurement as 10 ... 120 V AC signal (3-phase potential measuring transformer with static shield)

T2 – Motor voltage measurement as 10 ... 120 V AC signal (3-phase potential measuring transformer with static shield)

xCU board connections

xCU board terminal	Name	Description
XAI		
4	AI1+	Synchronization status indication
5	AI1-	
XD24		
4	+24 VD	24 V for run enable
XDI		
5	DI5	Run enable
XD24		
2	+24 VD	Power supply for RSYC
3	DICOM	

Terminals/connections of the RSYC unit

Terminal	Name	Description
J1		
1	+24 V	Synchronizing unit power supply from the Motor Control and I/O board (RMIO) via terminal X23.
2	COM	
J2		
1	SYNC	Output 0/24 V control pulse for external contactor control circuitry
2	COM	
		COM
3	BUFOUT	
J3		
1	INVRTR	Motor voltage measurement
2		
3	MAINS	Supply line voltage measurement
4		

16 Connection diagram



Mechanical installation

What this chapter contains

This chapter contains mounting rail instructions and contents of the RSYC kit.

Delivery check / contents of the RSYC kit

The RSYC kit contains:

- RSYC unit
- two synchronizing transformers
- 8 meters of cable for RSYC connections
- this manual.

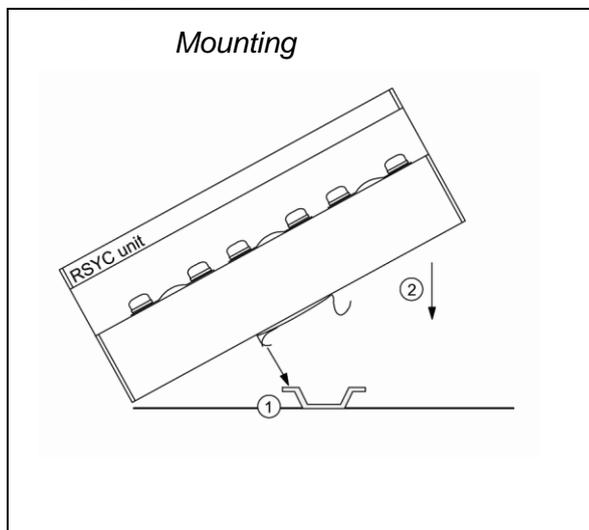
Note: Following items are not included but must be acquired separately:

- switch-over contactors
- relays of the contactor control circuit
- cable between transformer T1 and main circuit (and fuses for the cable)
- cable between transformer T2 and main circuit (and fuses for the cable).



Mounting the RSYC unit

Mount the unit by snapping the feet onto a 7.5 × 35 mm mounting rail (1) (2).



Electrical installation

What this chapter contains

This chapter contains a reference to the connection diagram and a list of items to consider in the electrical installation.

Connection diagram

See [Connection diagram](#) on page 11.

Considerations

Follow the cabling recommendations of the drive Hardware Manual.

Leave at least 0.5 m space between the unit and the power cables and drive module. If 0.5 m is impossible, install as far as possible.

Use shielded twisted-pair cables between the transformers and the RSYC unit. Ground the shields with as short pigtailed as possible. Cut and insulate any unused conductors at both ends of the cables. See Connection diagram.

Use shielded twisted-pair cables between the RSYC unit and the drive. Ground the shields at the drive module end according to the instructions given in the drive *Hardware Manual*.

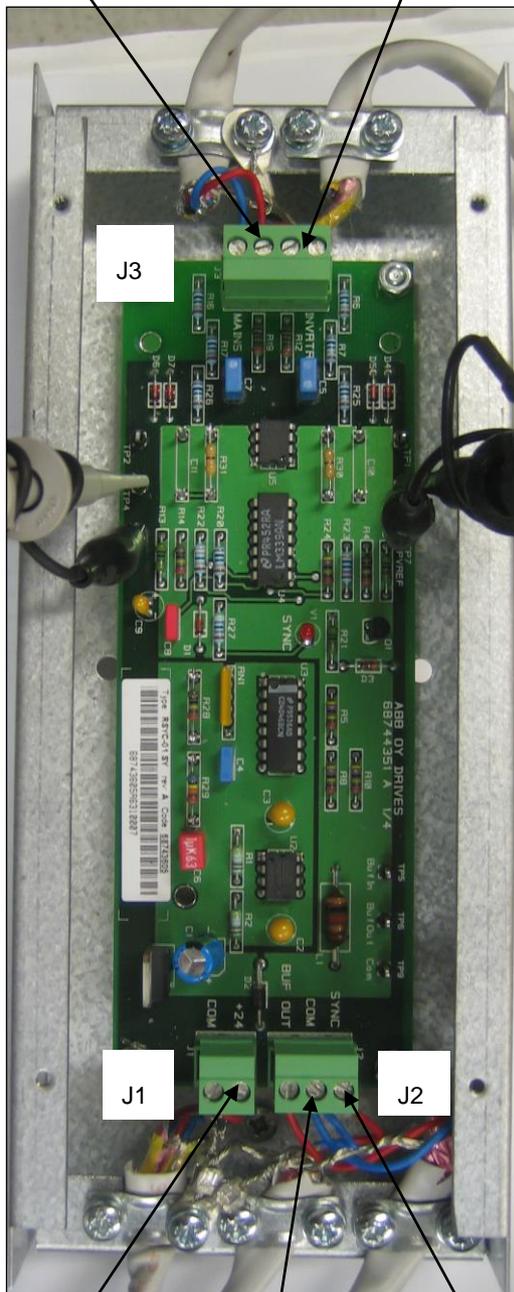
Use shielded twisted-pair cables between the unit and the contactor control circuitry. Ground the shields with as short pigtailed as possible.

Dimension selects the cable in between the main circuit and the synchronizing transformers according to the main circuit voltage. Protect the cable with fuses if necessary.

Cable clamping and grounding example

To network supply measurement transformer

To inverter output supply measurement transformer



+24 V DC supply

BUF OUT signal

SYNC signal

Start-up for ACS800

What this chapter contains

This chapter contains the instructions for setting the ACS800 drive parameters and for checking the system.

ACS800 parameter settings

The table below instructs the parameter settings of the ACS800 drive with ACS800 Standard Control Program for starting a four-pole motor (50 Hz). With these settings, the trim control can affect ± 20 rpm to final speed reference (1% of the defined maximum speed limit). It is recommended to use the panel as an external control signal interface start-up. You can later change to I/O or fieldbus control if needed. Note that analogue input AI1 and digital input DI5 are reserved for the synchronization application.

Before starting, ensure that the contactor control circuit connection at terminal J2 of the RSYC unit is disconnected.

For the use of control panel, see *ACS800 Standard Control Program 7.x Firmware Manual* (3AFE64527592 [English]).

	Setting	Parameter value	Additional information
	Selecting control location and signal sources		
<input type="checkbox"/>	Select external control location EXT2 into use.	11.02 EXT1/EXT2 SELECT = EXT2	Trim function can be used only with % reference (REF2). REF2 can be given from various interfaces. Here, control panel (KEYPAD) will be used.
<input type="checkbox"/>	Define control panel for source of control commands for external control location EXT2.	10.02 EXT2 STRT/STP/DIR = KEYPAD	
<input type="checkbox"/>	Define control panel for source of speed reference for external control location EXT2.	11.06 EXT REF2 SELECT = KEYPAD	
<input type="checkbox"/>	Fix rotation direction of motor to forward.	10.03 REF DIRECTION = FORWARD	Change of direction is disabled.
<input type="checkbox"/>	Deactivate constant speed selections.	12.01 CONST SPEED SEL = Inactive	
<input type="checkbox"/>	Set digital input DI5 to source for run enable signal.	16.01 RUN ENABLE = DI5	See section Connecting to ACS800 on page 12.
<input type="checkbox"/>	Define maximum and minimum	20.01 MINIMUM SPEED =	Maximum speed must be higher than motor nominal speed. 2000 is suitable

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	Setting	Parameter value	Additional information
	limits for the motor speed.	0.00 rpm 20.02 MAXIMUM SPEED = 2000.00 rpm	value for a 4-pole, 50 Hz motor.
<input type="checkbox"/>	Define the stop mode for the run enable function.	21.07 RUN ENABLE FUNC = COAST STOP	The drive will cut off output voltage immediately after run enable is switched Off.
Settings of PID controller used by Trim function, Parameter group 40 PID CONTROL			
<input type="checkbox"/>	Activate error value inversion.	40.05 ERROR VALUE INV = YES	RSYC unit feature.
<input type="checkbox"/>	Activate ACT1 for PID controller.	40.06 ACTUAL VALUE SEL = ACT1	-
<input type="checkbox"/>	Select analogue input AI1 for actual signal for PID controller.	40.07 ACTUAL1 INPUT SEL = AI1	BUF OUT signal from RSYC unit, 0 ... 10 V. <ul style="list-style-type: none"> • Below 5 V = supply line frequency exceeds drive output frequency. • 5 V = Supply line frequency and drive output frequency are equal and phases match. • Above 5 V = supply line frequency is lower than drive output frequency
<input type="checkbox"/>	Set minimum value for ACT1.	40.09 ACT1 MINIMUM = 0.00%	-
<input type="checkbox"/>	Set maximum value for ACT1.	40.10 ACT1 MAXIMUM = 100.00%	-
<input type="checkbox"/>	Deactivate integration term of PID controller.	40.13 PID INTEGRATION = OFF	-
<input type="checkbox"/>	Activate Trim function and define trimming relative to maximum speed.	40.14 TRIM MODE = DIRECT	PID controller output is relative to maximum speed limit (Par. 20.02).
<input type="checkbox"/>	Select parameter 40.16 for the source of the trim reference.	40.15 TRIM REF SEL = PAR 40.16	
<input type="checkbox"/>	Set trim reference to 50%.	40.16 TRIM REFERENCE = 50.00%	Trim reference is equal to actual signal when the synchronization conditions are valid i.e. when AI1= 5 V. See parameter 40.07 above.
<input type="checkbox"/>	Define the maximum effect of trim (that is added to the drive reference)	40.17 TRIM RANGE ADJUST = 1.00%	-

	Setting	Parameter value	Additional information
	Macro selection and motor control mode		
<input type="checkbox"/>	Select factory macro.	99.02 APPLICATION MACRO = FACTORY	Other macros except PID CNTRL are also possible (PID cannot be used as the PID controller is reserved for Trim function).
<input type="checkbox"/>	Select motor control mode.	99.04 MOTOR CTRL MODE = DTC	-
<input type="checkbox"/>	Define the motor parameters.	99.05 ...99.10	See <i>ACS800 Standard Control Program 7.x Firmware Manual</i> (3AFE64527592 [English]).

Checking the operation of the RSYC unit



WARNING! Read and follow the instructions in the drive *Hardware Manual*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

Ensure that the drive is disconnected from the supply line and all other precautions described in the safety instructions have been taken into consideration.

Note: Before starting, make sure that the contactor control circuit connection at terminal J2 of the RSYC unit is disconnected.

For the use of control panel, see *ACS800 Standard Control Program 7.x Firmware Manual* (3AFE64527592 [English]).

	Action	Additional information
<input type="checkbox"/>	Check the unit visually.	-
<input type="checkbox"/>	Set drive parameters according to instructions. However, switch Trim function off (parameter 40.14 = OFF) for the time being.	See ACS800 parameter settings on page 21.
<input type="checkbox"/>	Shift control panel to local control mode.	Use LOC/REM key. Letter L on first row of display indicates local control.
<input type="checkbox"/>	Select following actual values to panel display: 01.02 SPEED, 01.03 FREQUENCY, 01.18 AI1 [V].	AI1 is the 0 ... 10 V DC status signal from the unit.
<input type="checkbox"/>	Start drive and increase speed reference until output frequency is as close to 50 Hz as possible. Write down actual speed and speed reference at 50 Hz output frequency.	The difference between the speed reference and the actual speed depends on the slip which, in turn, depends on the motor load.
<input type="checkbox"/>	Drop speed so that output frequency is 45 ... 47 Hz. Ensure that AI1 is 8 ... 10 V DC.	-
<input type="checkbox"/>	Increase speed reference so that output frequency is 52 ... 55 Hz. Ensure that AI1 is 0 ... 1 V DC.	-
<input type="checkbox"/>	Stop the drive.	-

Checking the trim function and synchronization

This check makes sure that the trim function affects the speed control of the drive in the correct manner. Finding a right value for trim range adjustment (parameter 40.17) is essential for stable control and fast synchronization. Then the system reaches the synchronization with decreasing oscillations around 50 Hz and actual signal for Trim function (AI1) settles to approximately 5 V DC.

For the use of control panel, see *ACS800 Standard Control Program 7.x Firmware Manual* (3AFE64527592 [English]).

Reserve at hand the value of the speed reference and actual speed that were equivalent to 50 Hz output frequency (defined in the previous section) [Checking the operation of the RSYC unit](#) on page 24.

	Actions	Information
<input type="checkbox"/>	Set drive parameters according to instructions. However, switch Trim function off (parameter 40.14 = OFF) for the time being.	See ACS800 parameter settings on page 21.
<input type="checkbox"/>	Use LOC/REM key to select remote control. The drive is now ready to be controlled externally with the control panel.	Letter R on first row of display indicates remote control mode of panel.
<input type="checkbox"/>	Start drive.	-
<input type="checkbox"/>	Set speed reference to value that was equivalent to 50 Hz output frequency.	-
<input type="checkbox"/>	Check output frequency from display. If it is not 50 Hz adjust the reference in small steps so that output frequency from display shows 50 Hz. Write down this value again.	-
<input type="checkbox"/>	Stop drive.	-
<input type="checkbox"/>	Set trim function on (parameter 40.14 TRIM MODE = DIRECT).	The speed reference and output frequency will now be affected by Trim function slightly.
<input type="checkbox"/>	Start drive and monitor panel and RSYC status LED. The following indicates successful Trim control loop: <ul style="list-style-type: none"> - Drive accelerates to speed reference which was defined above. - Output frequency starts oscillating around 50 Hz. - AI1 is 2.5 V ... 7 V. - RSYC LED blinks the first time after 5 ... 20 seconds. - LED starts blinking in shorter time intervals and finally LED illuminates steady for several seconds. 	-
<input type="checkbox"/>	Increase 40.17 TRIM RANGE ADJUST slightly (e.g. 1 ... 5%) if faster synchronization is required.	Excessive value may lead to unstable control.
<input type="checkbox"/>	Stop drive.	

Final check

	Action	Additional information
<input type="checkbox"/>	Connect the contactor control circuit cable (J2/SYNC) to RSYC unit.	-
<input type="checkbox"/>	Test the system and verify the operation.	-

The system synchronizes in less than 15 seconds and remains in the synchronization status for tens of seconds when it is properly installed and commissioned.

Disabling the synchronization

To disable synchronization function:

- Change the external control location in the drive application program from EXT2 to EXT1 (parameter 11.02) or switch the drive to local control mode by the LOC/REM key of the control panel.
- Turn operating switch S1 in the contactor control circuit to the OFF position.

Resetting the system

The relay logic can be reset to initiate another synchronizing cycle by turning the operating switch S1 of the contactor control circuit to the OFF position and then to ON again (1-0-1).

Start-up for ACS880

What this chapter contains

This chapter contains the instructions for setting the ACS880 drive parameters and for checking the system.

ACS880 parameter settings

The table below instructs the parameter settings of the ACS880 drive with ACS880 primary control program for starting a four-pole motor (50 Hz). With these settings, the trim control can affect ± 20 rpm to final speed reference (1% of the defined maximum speed limit).

It is recommended to use the control panel as an external control signal interface for start-up. You can later change to I/O or fieldbus control if needed. Note that analogue input AI1 and digital input DI5 are reserved for the synchronization application.

Note: Before starting, make sure the contactor control circuit connection at terminal J2 of the RSYC unit is disconnected.

Refer to *ACX-AP-x assistant control panels user's manual* (3AUA0000085685 [English]).

	Setting	Parameter value	Additional information
	Selecting control location and signal sources		
<input type="checkbox"/>	Select the source for external control location.	19.11 Ext1/Ext2 selection = EXT2	The trim function can be used from external control location Ext1 or Ext2.
<input type="checkbox"/>	Select the source of control commands for external control location EXT2.	20.06 Ext2 commands = Control panel	
<input type="checkbox"/>	Select the speed reference source for external control location EXT2.	22.12 Speed ref2 source = Control panel (ref saved)	
<input type="checkbox"/>	Fix the motor rotation in the forward direction.	20.24 Negative speed enable = Not selected	Direction change is disabled.
<input type="checkbox"/>	Connect process PID to additive speed reference	22.15 Speed additive 1 source = P.40.5	-
<input type="checkbox"/>	Deactivate constant speed selections.	22.22 Constant speed sel1= Not selected	-
<input type="checkbox"/>	Select the source of the run enable signal.	20.12 Run enable 1 source = DI5	See section Connecting to ACS880 on page 14.

28 Start-up for ACS880

	Setting	Parameter value	Additional information
<input type="checkbox"/>	Define the minimum and maximum allowed motor speed.	30.11 Minimum speed = 0 rpm 30.12 Maximum speed = 2000 rpm	Maximum speed must be higher than motor nominal speed. For example, 2000 rpm is a suitable value for the 4-pole, 50 Hz motor.
<input type="checkbox"/>	Select the way the motor should stop when a stop command is received.	21.03 Stop mode = Coast	The drive will cut off the output voltage immediately after run enable is switched Off.
Settings of PID controller used by Trim function, Parameter group 40 Process PID set 1			
<input type="checkbox"/>	Activate error value inversion.	40.31 Set 1 deviation inversion = Inverted (Fbk – Ref)	RSYC unit feature.
<input type="checkbox"/>	Define the analog input scaling.	12.19 AI1 scaled at AI1 min = 0 12.20 AI1 scaled at AI1 max = 100	-
<input type="checkbox"/>	Configure the basic PID controller settings.	40.07 Set 1 PID operation mode = On when drive running 40.15 Set1 output scaling = 100 40.52 Set1 trim selection = Speed	-
<input type="checkbox"/>	Select the process actual value for the process PID controller.	40.10 Set 1 feedback function = In1	-
<input type="checkbox"/>	Select the source of process feedback.	40.08 Set 1 feedback 1 source = AI1 scaled	<p>BUF OUT signal from RSYC unit, 0 ... 10 V.</p> <ul style="list-style-type: none"> Below 5 V = supply line frequency is lower than drive output frequency. 5 V = supply line frequency and drive output frequency are equal and phases match. Above 5 V = supply line frequency is more than drive output frequency
<input type="checkbox"/>	Define the minimum limit for the process PID controller output.	40.36 Set 1 output min = -100.0	-
<input type="checkbox"/>	Define the maximum limit for the process PID controller output.	40.37 Set 1 output max = 100.0	-
<input type="checkbox"/>	Disable the integration term of PID controller.	40.33 Set 1 integration time = 0.0 s	-
<input type="checkbox"/>	Activate the Trim function and define trimming relative to maximum speed.	40.51 Set 1 trim mode = Direct	PID controller output is relative to maximum speed limit defined in parameter 30.12 Maximum speed.

	Setting	Parameter value	Additional information
<input type="checkbox"/>	Set trim reference to 50%.	40.21 Set 1 internal setpoint 1 = 50.00	Trim reference is equal to actual signal when the synchronization conditions are valid i.e. when AI1= 5 V.
<input type="checkbox"/>	Select Set 1 trim source to PID output.	40.56 Set 1 trim source = PID output	Trim function uses Process PID as input.
<input type="checkbox"/>	Define the maximum effect of trim (that is added to the drive reference)	40.55 Set 1 trim adjust = 0.010	0.010 = 1.0 %
Macro selection and motor control mode			
<input type="checkbox"/>	Select factory macro.	96.05 Macro active = Factory	Other macros except PID CTRL are also possible (PID cannot be used as the PID controller is reserved for Trim function).
<input type="checkbox"/>	Select motor control mode.	99.04 Motor control mode = DTC	-
<input type="checkbox"/>	Define the motor parameters.	99.06 ...99.11	See ACS880 Primary control program Firmware manual (3AUA0000085967) [English]).

Checking the operation of the RSYC unit



WARNING! Read and follow the instructions in the drive *Hardware Manual*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

Ensure that the drive is disconnected from the supply line and all other precautions described in the safety instructions have been taken into consideration.

Note: Before starting, make sure the contactor control circuit connection at terminal J2 of the RSYC unit is disconnected.

Refer to *ACX-AP-x assistant control panels user's manual* (3AUA0000085685 [English]).

	Action	Additional information
<input type="checkbox"/>	Check the unit visually.	-
<input type="checkbox"/>	Set drive parameters according to instructions. However, switch Trim function Off (parameter 40.51 Set 1 trim mode = Off) for the time being.	See ACS880 parameter settings on page 27
<input type="checkbox"/>	Shift control panel to local control mode.	-
<input type="checkbox"/>	Select following actual values to panel display: 01.02 Motor speed estimated 01.06 Output frequency 12.11 AI1 actual value.	AI1 is the 0 ... 10 V DC status signal from the unit.
<input type="checkbox"/>	Start the drive and increase the speed reference until the output frequency is close to 50 Hz as possible. Write down the actual speed and speed reference at 50 Hz output frequency.	The difference between the speed reference and the actual speed depends on the slip, which in turn depends on the motor load.
<input type="checkbox"/>	Drop the speed so that output frequency is 45 ... 47 Hz. Make sure that AI1 is 8 ... 10 V DC.	-
<input type="checkbox"/>	Increase the speed reference so that output frequency is 52 ... 55 Hz. Make sure that AI1 is 0 ... 2 V DC.	-
<input type="checkbox"/>	Stop the drive.	-

Checking the trim function and synchronization

This check makes sure that the trim function affects the speed control of the drive in the correct manner. Finding the correct value for trim range adjustment (parameter 40.55 Set 1 trim adjust) is essential for stable control and fast synchronization. The system then reaches synchronization with decreasing oscillations around 50 Hz and the actual signal for Trim function (AI1) settles to approximately 5 VDC.

Refer to *ACX-AP-x assistant control panels user's manual* (3AUA0000085685 [English]).

Reserve at hand the value of the speed reference and actual speed that were equivalent to 50 Hz output frequency, defined in the section [Checking the operation of the RSYC unit](#) on page 30.

	Actions	Information
<input type="checkbox"/>	Set drive parameters according to instructions. However, switch Trim function off (parameter 40.51 Set 1 trim mode = Direct) for the time being.	See ACS880 parameter settings on page 27.
<input type="checkbox"/>	Use LOC/REM key to select remote control. The drive is now ready to be controlled externally with the control panel.	-
<input type="checkbox"/>	Start drive.	-
<input type="checkbox"/>	Set speed reference to value that was equivalent to 50 Hz output frequency.	-
<input type="checkbox"/>	Check output frequency from display. If it is not 50 Hz adjust the reference in small steps so that output frequency from display shows 50 Hz. Write down this value again.	-
<input type="checkbox"/>	Stop drive.	-
<input type="checkbox"/>	Set trim function on (parameter 40.51 Set 1 trim mode = Direct).	The speed reference and output frequency will now be affected by Trim function slightly.
<input type="checkbox"/>	Start drive and monitor panel and RSYC status LED. The following indicates successful Trim control loop: <ul style="list-style-type: none"> • Drive accelerates to speed reference which was defined above. • Output frequency starts oscillating around 50 Hz. • AI1 is 2.5 V ... 7 V. • RSYC LED blinks the first time after 5 ... 20 seconds. • LED starts blinking in shorter time intervals and finally LED illuminates steady for several seconds. 	-
<input type="checkbox"/>	Increase 40.55 Set 1 trim adjust slightly (e.g. 0.01 ... 0.05) if faster synchronization is required.	Excessive value may lead to unstable control.
<input type="checkbox"/>	Stop drive.	

Final check

	Action	Additional information
<input type="checkbox"/>	Connect the contactor control circuit cable (J2/SYNC) to RSYC unit.	-
<input type="checkbox"/>	Test the system and verify the operation.	-

The system synchronizes in less than 15 seconds and remains in the synchronization status for tens of seconds when it is properly installed and commissioned.

Disabling the synchronization

To disable synchronization function:

- Change the external control location in the drive application program from EXT2 to EXT1 (parameter 19.11 Ex1/Ext2 selection) or switch the drive to local control mode with the LOC/REM key on the control panel.
- Turn operating switch S1 in the contactor control circuit to the OFF position.

Resetting the system

The relay logic can be reset to initiate another synchronizing cycle by turning the operating switch S1 of the contactor control circuit to the OFF position and then to ON again (1-0-1).

Fault tracing

What this chapter contains

This chapter lists the possible causes and corrective active actions.

Troubleshooting hints

Trouble	Cause	What to do
Unit operates illogically despite all connections and parameters are correct.	The board is affected by radiated interference. BUF OUT signal is not stable and as a consequence synchronization is not possible.	<p>Ensure all cables that connect to the RSYC unit are shielded and shields are properly grounded.</p> <p>Install an additional metal shield between the emission source and the unit.</p> <p>Change location of the unit, i.e. arrange more space between the emission source (drive module or motor cables) unit.</p>
BUF OUT signal from RSYC board is constantly low i.e.0 ... 1 V DC.	Signals from synchronizing transformers are cross-connected at the RSYC unit.	Check and correct connections.
Drive output frequency remains too close to 50 Hz and occasional short synchronization pulses take place.	<p>Too small value for parameter 40.17 TRIM RANGE ADJUST (ACS800) and 40.55 Set 1 trim adjust (ACS880).</p> <p>Drive cannot control the speed (and output frequency) loosely enough.</p>	Increase the value of parameter 40.17 (in ACS800) and 40.55 (in ACS880).
The speed control is unstable.	<p>Too large value for parameter 40.17 TRIM RANGE ADJUST (ACS800) and 40.55 Set 1 trim adjust (ACS880).</p> <p>This causes the control to overcompensate.</p>	Decrease the value of parameter 40.17 (in ACS800) and 40.55 (in ACS880).

34 Fault tracing

Trouble	Cause	What to do
Excessive motor current peak at synchronization.	Rotor decelerates too fast and phase difference between stator and motor fluxes increase too much.	Make contactors operate faster if possible. Contactors can operate simultaneously.
		Connect a serial inductor (3 phase choke) to the motor AC input during switching of change-over contactors. Equip the choke with a by-pass contactor (the choke does not need to be dimensioned according to continuous current, only the contactor). The choke must not saturate through. See Connection diagram on page 11.
	Motor flux decreases too much during the operation of change-over contactors. High current is needed to re-magnetize the motor.	Check and correct the transformer connection.
	Supply line (motor) and drive output are 180° out of phase due to wrong connection of the synchronization transformer.	Check and correct the transformer connection.
	Supply line and drive output are 180° out of phase since the phasing between motor and supply line differs from the phasing between motor and drive output.	Check and change the connections.

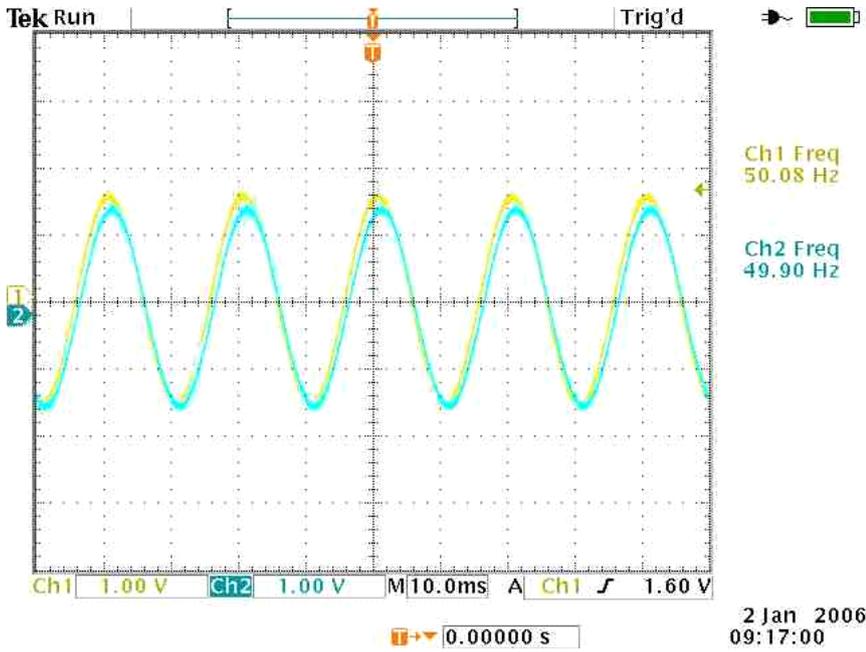
Measuring with an oscilloscope

Checking the supply line (MAINS) and inverter output (INVRTR) signals from the board may be the only way to see what is actually happening if there is no SYNC signal. There is a potential interference risk as it is possible that the probes pick-up the interference and conduct it to the board circuits. All loops should be kept as small as possible and measuring circuits should be routed as far away from the drive and other cables as possible. The following figure shows the measuring points TP3 – TPVREF and TP4 - TPVREF.

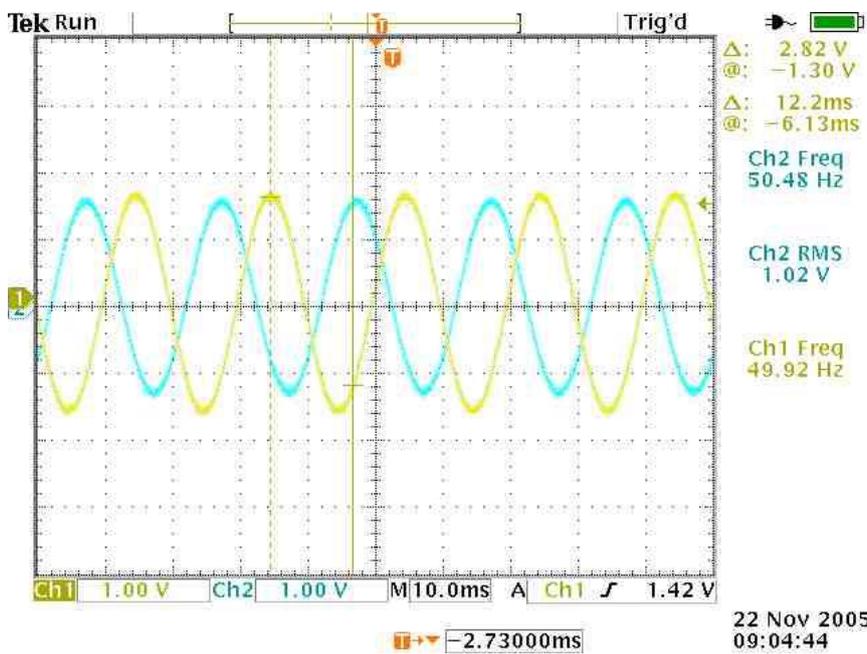


36 Fault tracing

When the signals are in synchronization, the oscilloscope shows the following waveforms.



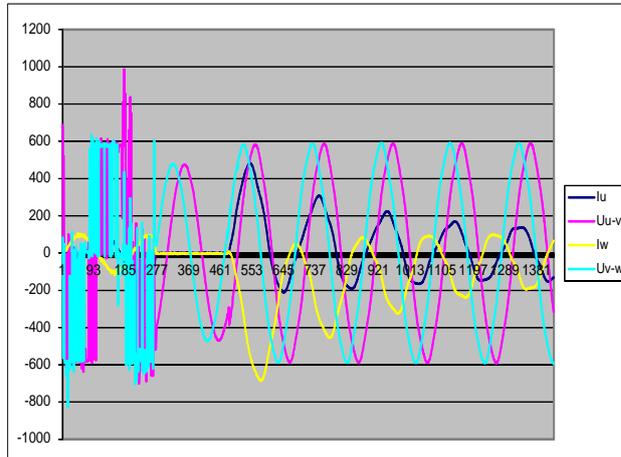
When there is a phase difference, the waveforms are as shown in the graphic below.



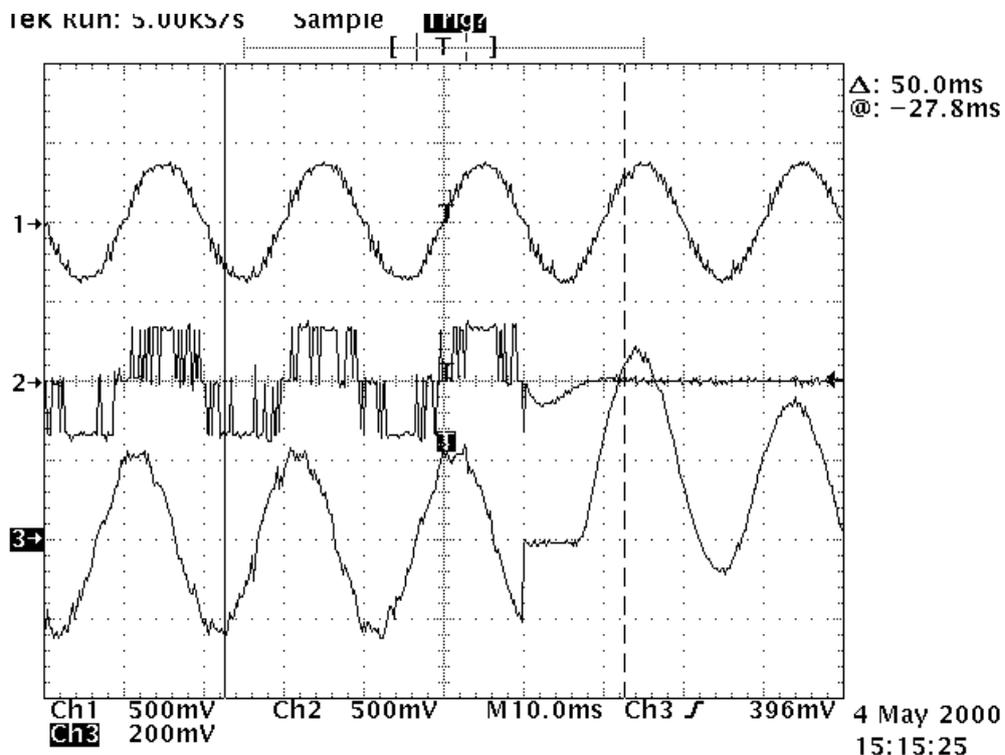
When the frequencies are different, the signals move relative to each other. If the “speed” is low enough, the board may generate a SYNC pulse.

Miscellaneous measurement graphs

The graph below shows the measurements of the voltages (U_{u-v} and U_{v-w}) and phase currents (I_u and I_w) when synchronizing to the network.



The graph below shows the drive output voltage, network voltage and one phase current.



Technical data

RSYC power supply voltage	24 V DC (-5 ... +5%)
RSYC power consumption	25 ... 35 mA
Signal cable type	JAMAK by NK Cables
Signal cable size	2 × (2+1) × 0.5 mm ²
Signal cable use	Connection of the RSYC unit to the drive, transformers and control relays
Synchronization accuracy	-21 ... +21°
Transformer cable size	Max. cross-section = 4 mm ²
Transformer cable use	Connection between the measuring transformers and main circuit (at drive output and input).
Mounting rail	7.5 × 35 mm (EN50022)

Measuring transformer	e.g. 3AFE58125130, 690/43.3 V, 3 VA, 45 ... 65 Hz
Primary voltage	690 V AC 45 ... 65 Hz
Secondary voltage	43,3 V AC 45 ... 65 Hz
Power	3 VA
Winding connection	Dyn 11
Winding separation	Static screen

Dimension drawing

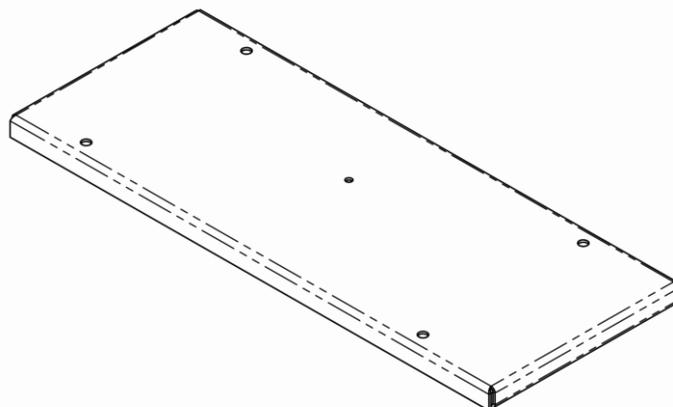
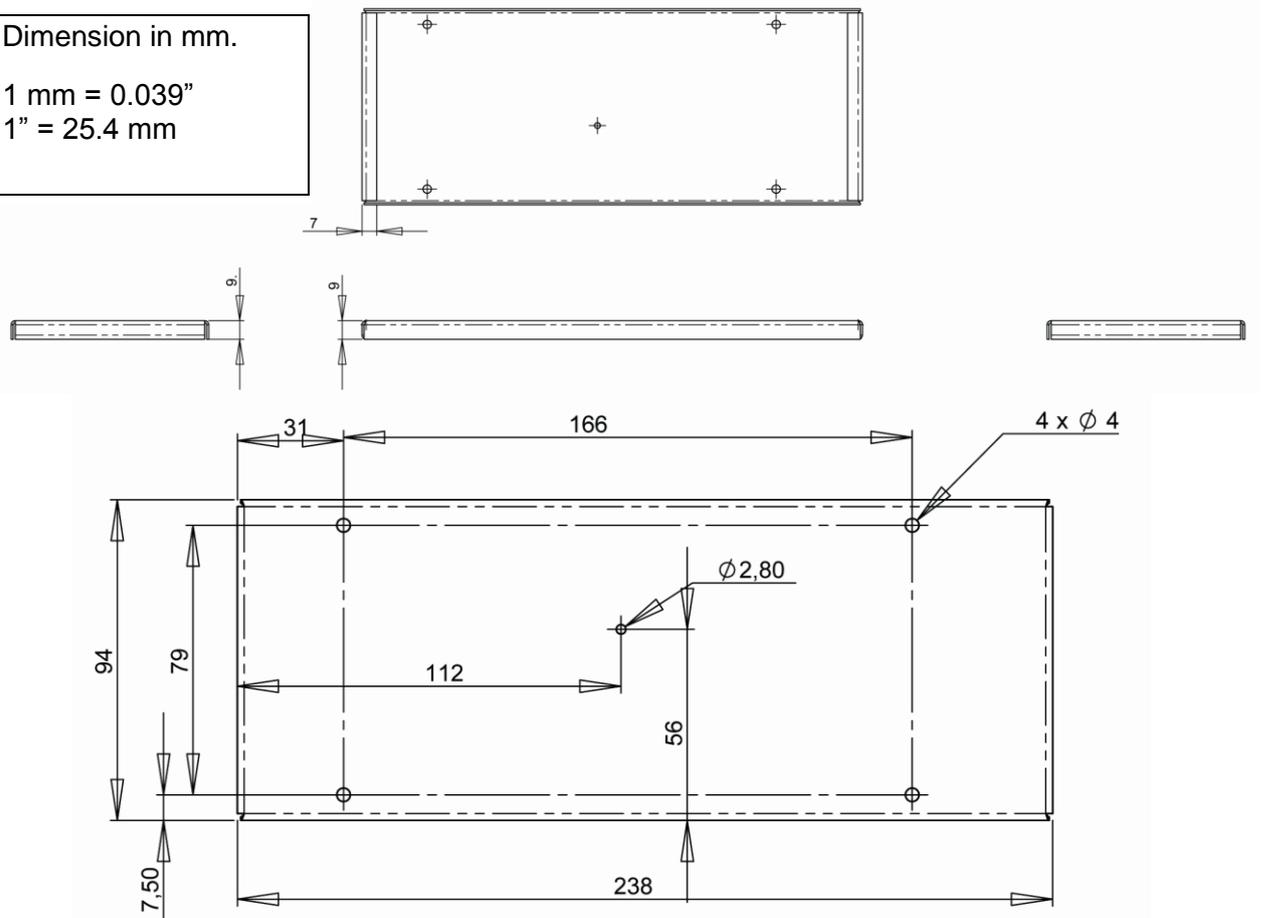
Cover of the RSYC enclosure

The dimensions are given in millimetres.

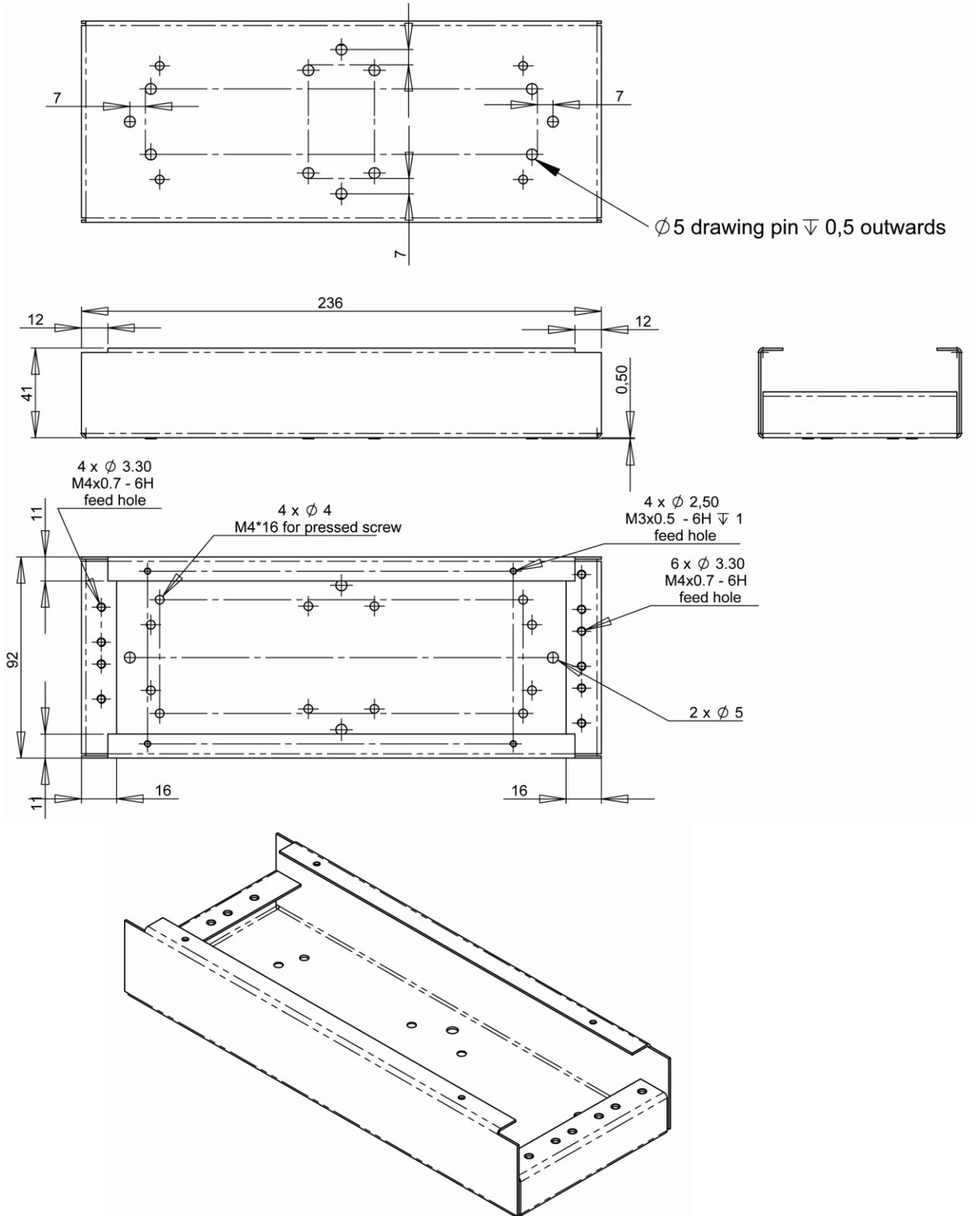
Dimension in mm.

1 mm = 0.039"

1" = 25.4 mm



RSYC enclosure body



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.

Product training

For information on ABB product training, navigate to www.abb.com/drives and select *Training courses*.

Providing feedback on ABB Drives manuals

Your comments on our manuals are welcome. Go to www.abb.com/drives and select *Document Library – Manuals feedback form (LV AC drives)*.

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