MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Amikon cover with selected official ABB reference pages

ACV 700 GTO / SNAT 617 CHC

SNAT617CHC

GTO CHOPPER CONTROL BOARD

OFFICIAL SOURCES

ABB 3AFY 58054411 R0225. Original identification, scope, safety context and GTO board reference pages.

ACV 700 Frequency Converters

Hardware Manual

ACV 700

Code: 3AFY 58054411 R0225

EFFECTIVE: 29.12.97

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Chapter 1 - System Description

Purpose of the Manual

This manual describes the ACV 700 drive system to the application engineers and other persons involved with ACV 700.

Drive Configuration

The drive has a multidrive configuration. It consists of a supply section including connection devices (main fuses and main contactor or circuit breaker), rectifier devices (a diode or thyristor bridge), capacitors for smoothing of the DC voltage, optional devices, if specified, and a number of drive sections.

The power range for the supply sections is 40 - 2500 kVA and the power range for the drive sections is 9 - 2500 kVA.

Depending on the required power and voltage, the drive sections are based on either an IGBT or GTO thyristor power stage.

The control system is implemented by using the Common Drive Control, CDC, and the Digital Drive Control, DDC. The basic part of the CDC is the Application Controller, the APC.

The APC is designed to give a flexible, compact and efficient system for controlling AC or DC drives. The APC is programmable by using function blocks.

The DDC performs the inverter control functions.

Programming can be done using two alternative tools, the Function Chart Editor, FCE or the AdvaBuild for Windows, the Drives version. Various drive configurations are possible using one or multiple APCs and their communication capabilities.

Small Drive System

In small systems one APC is connected to up to four Digital Drive Controllers (DDC). The drive configuration can be used in master/ follower applications when the master drive is of moderate complexity and the followers fairly simple. A consequence of multiplexing is that the performance of the drive controller interface decreases.

Figure 1 - 3 Communication.

Technical Specification

Mains Connection	
Voltage, 3 phase:	U_N = 400 V (380, 415 V) ± 10 % U_N = 500 V (440, 460 V) ± 10 % U_N = 690 V - 10 %, + 6 % (575, 660 V ± 10 %)
Frequency:	50 Hz or 60 Hz ± 3 %
Fundamental power factor	0.97 to 0.99
Total power factor:	0.93 to 0.95 (theoretical maximum)
Efficiency at Rated Power	**> 98 %**
Motor Connection	
Voltage, 3 phase:	0 - 105 %U_N
Frequency:	0 to ± 200 Hz
Frequency resolution:	0.01 Hz
Static speed control accuracy	
with pulse encoder feedback:	0.01 %
without feedback (motor slip):	0.5 - 3 %, can be reduced by slip compensation
Dynamic speed control accuracy:	0.2 - 0.3 % sec at 100 % load step
Load capacity	
Continuous:	Refer to tables in section 10, inverter sections
Overload:	Refer to tables in section 10, inverter sections
Switching frequency	
IGBT-inverters:	3 kHz max.
GTO-inverters:	800 Hz max.
Field weakening set point range	
Frequency:	10 - 200 Hz
Voltage:	0 - 105 %
Torque step rise time:	5 to 10 ms at 100 % torque reference step (vector control)
Acceleration time:	200 ms - 600 sec. / 100 Hz
Deceleration time:	200 ms - 600 sec. / 100 Hz
Enclosure	
Degree of protection:	IP21 (MD-cabinet) IP00 (module)
Paint colour:	light beige, NCS 1704-Y15R
Environmental limits	
Stationary use:	Ambient air temperature: + 5 to + 40 ° C (+ 45 ° C)
Storage:	Ambient air temperature: - 25 to + 55 ° C
Transportation:	Ambient air temperature: - 40 to + 70 ° C
Cooling method:	dry clean air, integral fan
Corrosion severity level of	
cooling air:	up to G1 as specified in ISA-S71.04
Relative humidity:	≤ 95 %, no condensation allowed
Altitude:	≤ 1000m ASL, 100 % load capacity

above 1000m derate power,
e.g. at 2000m ASL derate power to 92 %

Specified Electrical Environmental and Safety Parameters

Environmental Conditions

Operating air temperature	+5 °C to +40 °C, IEC 68
Storage air temperature	-25 °C to +55 °C, IEC 721
Transport air temperature	-40 °C to +70 °C, IEC 721

Electrical Conditions

Mains voltage variation VDE 0160 excluding short time overvoltage.

UN = 400 V (380 V, 415 V) ± 10 %
UN = 500 V (440 V, 460 V) ± 10 %
UN = 690 V - 10 %, 6 %(575 V, 660 V ± 10 %)

Safety

Degree of protection by enclosure IP 21 (optional IP 41), IEC 529

General	IEC 439-1
Clearances and creepage distances	IEC 664-1
Safety of machinery	IEC 204-1 (EN 60 204)

Documentation

Drawings	IEC 113-8
Symbols	IEC 617-1

Product Certification

Drive Products and Systems division of ABB Industry Oy has ISO 9001 certification.

Type Designation

Digital Drive Controller, DDC

The standard control functions of the drive section are located in the Digital Drive Controller DDC. DDC uses the TC-link protocol and includes torque and speed control loops, internal start/stop logic, power stage, motor and cable protection, internal fault diagnostics, and trend logging.

Board id	Type Designation	Name of the Board
A1	SNAT 603 CNT	Motor Control Board
A1.1	SNAT 609 TAI	Tacho & I/O Interface
A2	SNAT 7261 INT	Main Circuit Interface (IGBT)
A2	SNAT 607 MCI	Main Circuit Interface (GTO)
A2.1	SNAT XXXV SCL (IGBT) SNAT XXXX-VB SCL (GTO)	Matching Board (where xxx=output power from the converter type code and v=voltage class
A3	SAFT 11_ POW	Auxiliary Voltage Source (GTO)
A4...A6	SNAT xyz PTR	IGBT Protection Board (where xyz = output power from the converter type code) (IGBT)
A4...A6	SNAT 63_ PAC	Pulse Amplifier Board (GTO)
A7	SNAT 617 CHC	Chopper Control Board (GTO)
A8	SNAT 620 PCB	Parallel Connection Board for parallel inverters (GTO)
A9	SNAT 604 IFS	Inhibition of False Start Relay Board (IGBT)
A10	SNAT 602 TAC	Terminal Block Board

Following tables show which boards are included in each inverter.

IGBT Electronic Boards for 400V (380, 415V) Units										
Output Power→	9	16	25	50	70	100	150	215	270	330
Board↓										
SNAT 603 CNT	X	X	X	X	X	X	X	X	X	X
SNAT 609 TAI	X	X	X	X	X	X	X	X	X	X
SNAT 7261 INT	X	X	X	X	X	X	X	X	X	X
SNAT XXXV SCL	X	X	X	X	X	X	X	X	X	X
SNAT xyz PTR	X	X	X	X						
SNAT 604 IFS	X	X	X	X	X	X	X	X	X	X
SNAT 602 TAC	X	X	X	X	X	X	X	X	X	X

IGBT Electronic Boards for 500V (440, 460V) Units										
Power→	10	20	32	56	100	115	170	260	315	400
Board↓										
SNAT 603 CNT	X	X	X	X	X	X	X	X	X	X
SNAT 609 TAI	X	X	X	X	X	X	X	X	X	X
SNAT 7261 INT	X	X	X	X	X	X	X	X	X	X
SNAT xxxv SCL	X	X	X	X	X	X	X	X	X	X
SNAT xyz PTR	X	X	X	X						
SNAT 604 IFS	X	X	X	X	X	X	X	X	X	X
SNAT 602 TAC	X	X	X	X	X	X	X	X	X	X

GTO Electronic Boards for 400V (380, 415V) Units						
Output Power→	400	500	640	800	1210	1600
Board↓	R2	R3	R3	R4	2R3	2R4
SNAT 603 CNT	X	X	X	X	X M	X M
SNAT 609 TAI	X	X	X	X	X M	X M
SNAT 607 MCI	X	X	X	X	2X	2X
SNAT XXXX-VB SCL	X	X	X	X	2X	2X
SAFT 110 POW	X			X		2X
SAFT 111 POW		X	X	X	2X	2X
SNAT 632 PAC	3X					
SNAT 633 PAC		3X	3X		6X	
SNAT 634 PACC				3X		6X
SNAT 617 CHC	X	X	X	X	2X	2X
SNAT 620 PCB					XM	XM
SNAT 602 TAC	X	X	X	X	XM	XM

2X = 2 pc XM = 1 pc in Master

GTO Electronic Boards for 500V (440, 460V) Units						
Output Power→	500	630	790	1000	1510	2000
Board↓	R2	R3	R3	R4	2R3	2R4
SNAT 603 CNT	X	X	X	X	X M	X M
SNAT 609 TAI	X	X	X	X	X M	X M
SNAT 607 MCI	X	X	X	X	2X	2X
SNAT XXXX-VB SCL	X	X	X	X	2X	2X
SAFT 110 POW	X			X		2X
SAFT 111 POW		X	X	X	2X	2X
SNAT 632 PAC	3X					
SNAT 633 PAC		3X	3X		6X	
SNAT 634 PACC				3X		6X
SNAT 617 CHC	X	X	X	X	2X	2X
SNAT 620 PCB					XM	XM
SNAT 602 TAC	X	X	X	X	XM	XM

2X = 2 pc XM = 1 pc in Master

GTO Electronic Boards for 690V (575, 660V) Units													
Output Power→	40	100	160	260	315	420	500	630	800	1040	1370	2000	2500
Board↓	RG1	RG1	RG1	RG1	RG1	RG1	RG2	RG2	RG3	RG3	RG4	2RG3	2RG4
SNAT 603 CNT	X	X	X	X	X	X	X	X	X	X	X	XM	XM
SNAT 609 TAI	X	X	X	X	X	X	X	X	X	X	X	XM	XM
SNAT 607 MCI	X	X	X	X	X	X	X	X	X	X	X	2X	2X
SNAT XXXX-VB SCL	X	X	X	X	X	X	X	X	X	X	X	2X	2X
SAFT 112 POW	X	X	X	X	X	X	X	X			X		2X
SAFT 113 POW									X	X	X	2X	2X
SNAT 630 PAC	3X	3X	3X	3X									
SNAT 631 PAC					3X	3X							
SNAT 632 PAC							3X	3X					
SNAT 633 PAC									3X	3X		6X	
SNAT 634 PACC											3X		6X
SNAT 617 CHC	X	X	X	X	X	X	X	X	X	X	X	2X	2X
SNAT 620 PCB												XM	XM
SNAT 602 TAC	X	X	X	X	X	X	X	X	X	X	X	XM	XM

2X = 2 pc XM = 1 pc in Master

The control program of the ACV 700 is stored in two EPROM memory circuits and the control parameters are stored in one EEPROM memory circuit. The circuits are mounted on the SNAT 603 CNT Motor Control Board. The structure of the drive's control section is as follows:

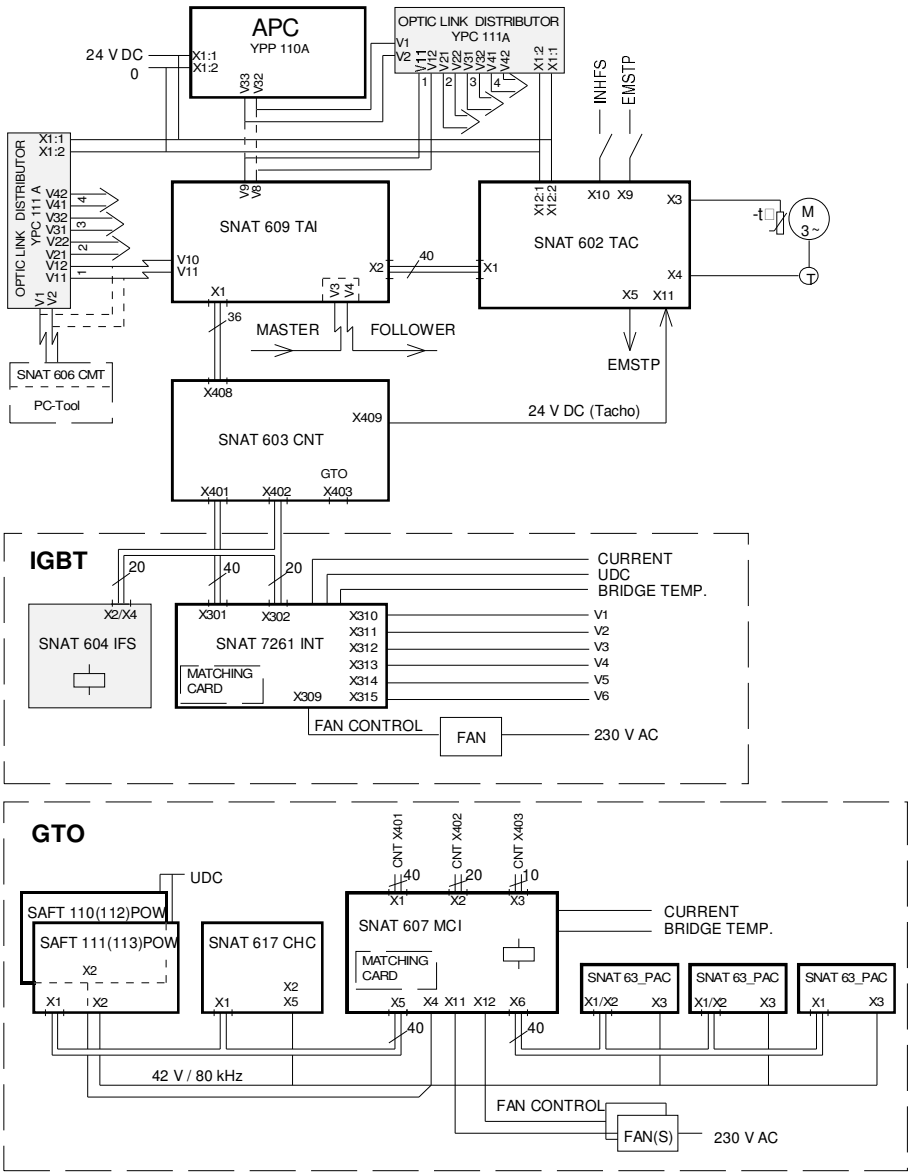


Figure 2 - 15 Drive system control boards (61038361.drw).

Motor Control Board SNAT 603 CNT

Motor Control Board SNAT 603 CNT contains the DDC program and is stored in two EPROM circuits. Both vector and scalar controls are included in the DDC program. The parameters are stored in one EEPROM circuit. The board is used for both IGBT and GTO

Connection to Motor Control SNAT 603 CNT with a 40-pole ribbon cable. Connection to Inhibition of False Start SNAT 604 IFS with a 20-pole ribbon cable. Connections to IGBT Protection Boards SNAT XYZ PTR (XYZ=output power of the inverter unit) with 2-pole cables or connection to the protection circuits of the IGBTs with two- or three-pole cables.

Main Circuit Interface SNAT 607 MCI (GTO)

The board is a main circuit interface for GTO-power stage inverters. The board includes the following functions: 42 V at 80 Hz output for the pulse amplifiers, fan control, current and voltage measurement, matching and motor control and connections, temperature measurement, fault detection and prevention of unexpected start-up.

Connection to Motor Control board SNAT 603 CNT with a 40-pole ribbon cable, 20-pole ribbon cable and with a 10-pole ribbon cable. Connections to Chopper SAFT 125 CHC or SNAT 617 CHC and Auxiliary Voltage Source SAFT 11_ POW with a 40-pole ribbon cable. Connections to Pulse Amplifiers SNAT 63_ PAC with a 40-pole ribbon cable.

Matching Board SNAT xyzv SCL

Functions:
- Voltage scaling for the converter type coding.
- Current scaling for the converter type coding and for motor control board.
- Inverter type coding for voltage and current measurement information for the motor control board.

Connected to and mounted on the Main Circuit Interface SNAT 7261 INT or SNAT 607 MCI.

Type designation:
- Each converter size has its own matching board type where xyz is the output power from the converter type code and v is the voltage class (I.e. 400 V is 3 and 500 V is 5).

Auxiliary Power Board SAFT 11_ POW (GTO)

For GTO power stage inverters.

Functions:
- The power is supplied to the board from the intermediate DC circuit through the main circuit interface board.
- The power supply board supplies stabilised and filtered ±14 V, +5 V to the main circuit interface board and 42 V, 80 kHz for the pulse amplifiers.
- The board is at the main circuit potential.

Connection to the Main Circuit Interface SNAT 607 MCI.

Protection Board SNAT xyz PTR (IGBT)

For IGBT-power stage inverters to protect the IGBTs.

Connections:
- Connection to SNAT 7261 INT.
- Connection onto the IGBT module.

Pulse Amplifier Board SNAT 63_ PAC (GTO)

For GTO-power stage inverters.

- The pulse amplifier board (one board per phase) gives the turn-on and turn-off pulses to the GTOs in the order determined by the main circuit interface board.
- Connection to the Main Circuit Interface Board, SNAT 607 MCI with a 40-pole ribbon cable.

Chopper Control Board SNAT 617 CHC (GTO)

For GTO-power stage inverters.

The board contains the control/supervision logic of the GTO in the chopper.

Connection to the Main Circuit Interface Board SNAT 607 MCI and to the Power Supply Board SAFT 11_ POW with a 40-pole ribbon cable.

Parallel Connection Board SNAT 620 PCB (GTO)

The board is used to match two parallel connected GTO power stage inverters to each other.

Inhibition of False Start Relay Board SNAT 604 IFS (IGBT)

The board is used for relay secured inhibition of false start for IGBT-power stage inverters.

Connection to the Motor Control Board SNAT 603 CNT and Main Circuit Interface Board SNAT 7261 INT with a 20-pole ribbon cable.

TAI-Terminal Block Board SNAT 602 TAC

The board is used for connecting the field I/O-signals to the Tacho & I/O board.

If the SNAT 602 TAC should be connected to the APC, see Chapter "**APC Terminal Block Board, SNAT 602 TAC**".

- Connection to the Tacho & I/O Interface Board SNAT 609 TAI with a 40-pole ribbon cable.
- Connection to the Inhibition of False Start Board SNAT 604 IFS (IGBT power stage).
- Connection to Motor Control Board SNAT 603 CNT.

External Connections	Function
3 digital inputs	Isolated inputs, control voltage 220 VAC/110 VAC/ 24 VDC. +24 VDC/20 mA control voltage outlets.