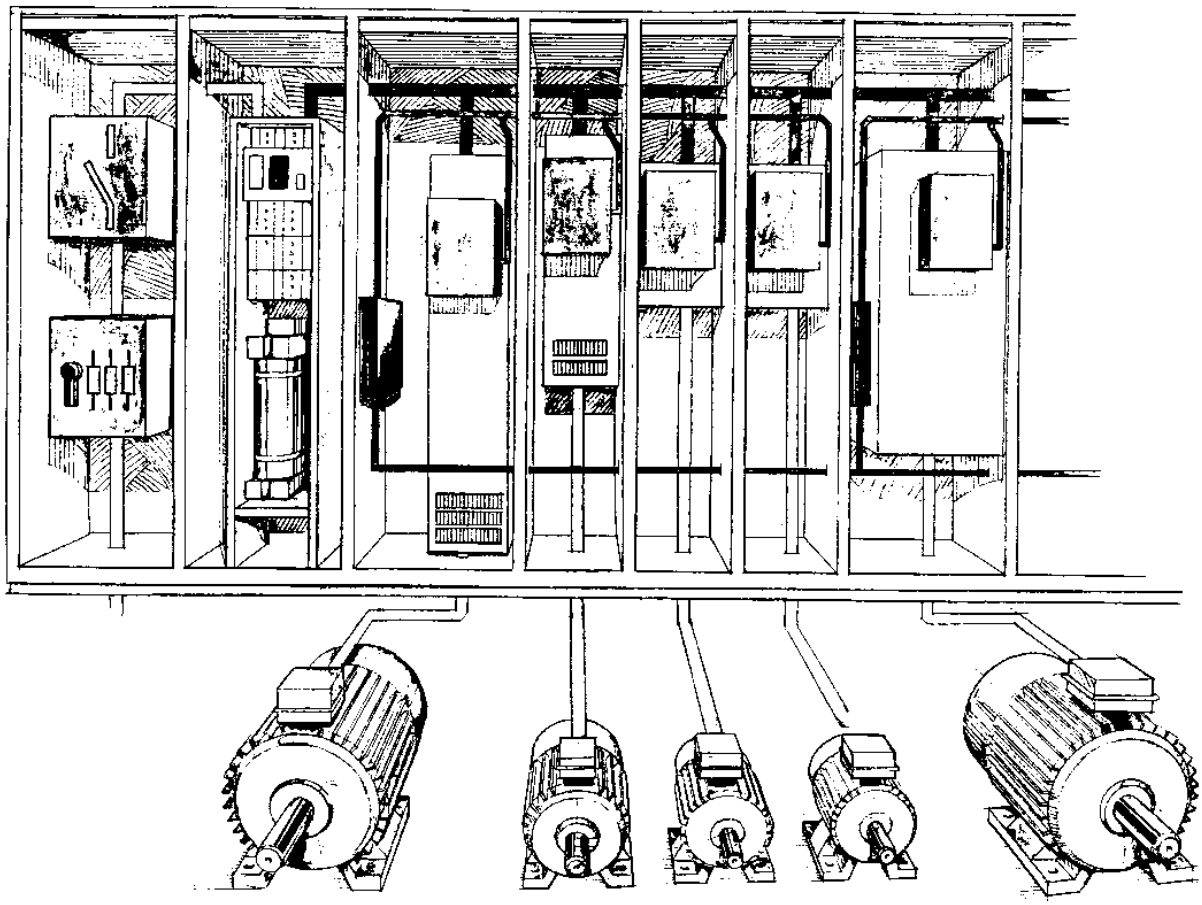
ACV 700

Hardware Manual

ACV 700 Frequency Converters



ACV 700 Frequency Converters

Hardware Manual

ACV 700

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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.

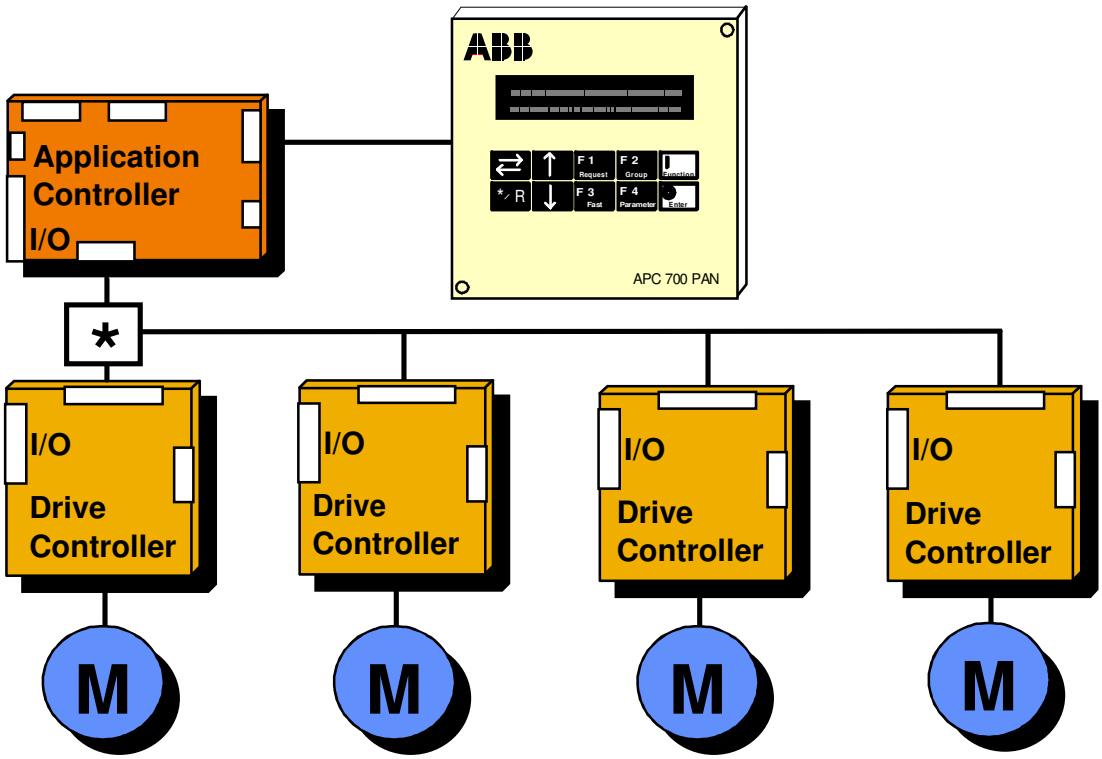
The APC is designed to give a flexible, compact and efficient system for controlling AC or DC drives. The APC is programmable by using function blocks.

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.



* Optic Distributor Board

Figure 1 - 1 Small drive system.

Large Drive System

In distributed multicontroller systems, several APCs are interconnected by Advant Fieldbus 100 (AF100). Common control functions can be distributed to separate nodes. No overriding automation system is used in this configuration, but one or several application controllers can communicate with external systems over communication boards.

A personal computer (PC) can be connected through one of the APCs and can be used for tool functions.

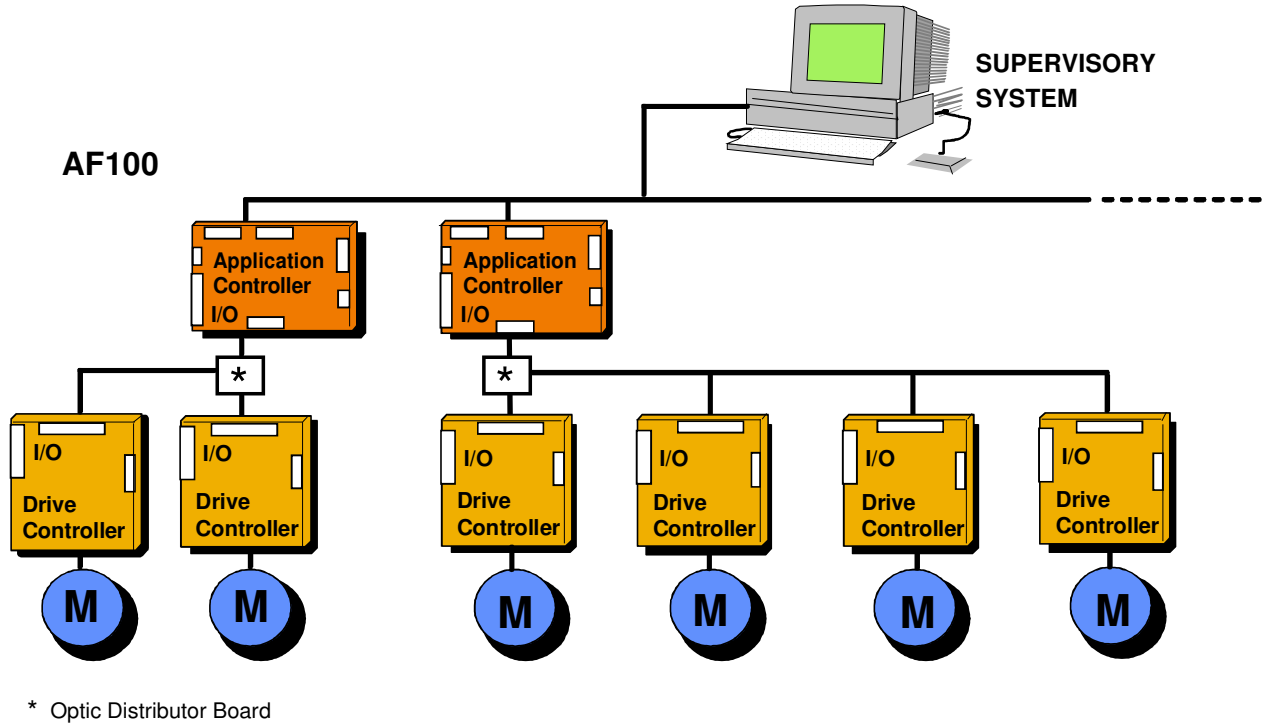


Figure 1 - 2 Large drive system.

Communication

APC can communicate with other systems via several different buses.

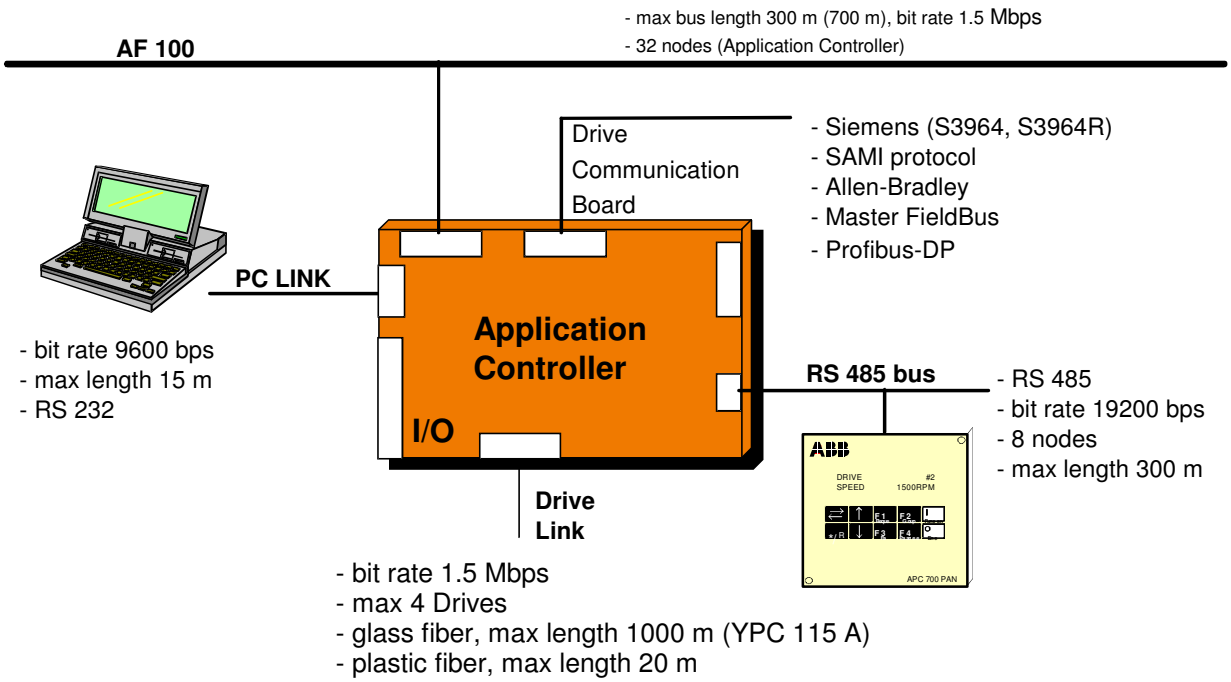


Figure 1 - 3 Communication.

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

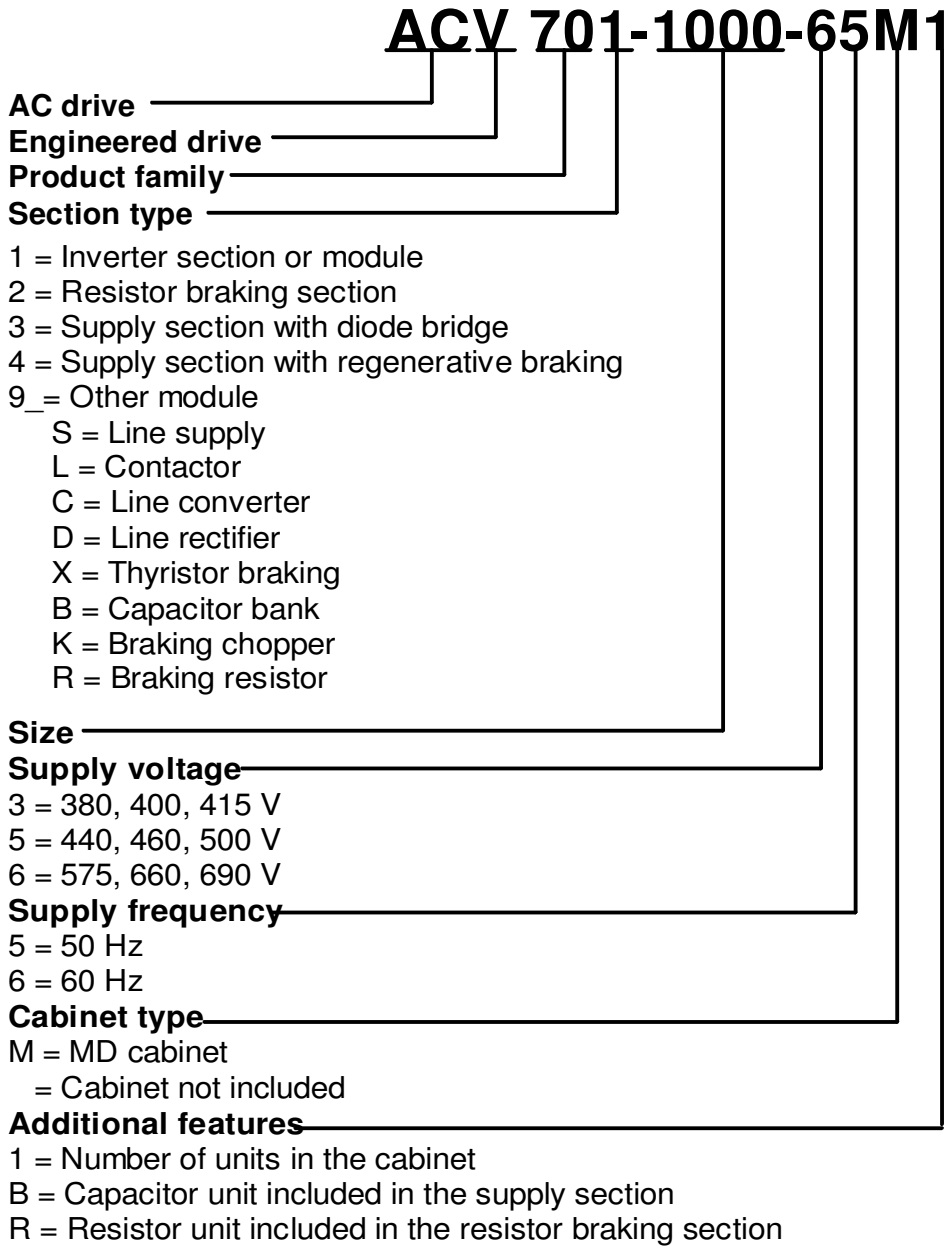


Figure 1 - 4 Type designation of the ACV 700.

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Chapter 2 - Control System

Common Drive Control, CDC

The concept of the control system is called Common Drive Control, CDC.

The standard control functions of the drive section, such as speed and torque control, are located in the Digital Drive Controller, DDC. The application dependent control functions are located in the Application Controller, APC.

Typical APC functions are section start and stop logic, internal and external interlocking, speed reference chain, load share control, drive-specific settings, logger functions, and system communication.

Function blocks can be combined to macro blocks, which can perform application specific tasks such as crane control, lever control, remote panel control, etc.

Each APC can control up to four DDCs. The APC is usually located in the drive section.

The APC communicates with other APCs and with the centralised operator control devices via the AF100 communication bus.

The APC and the DDC communicate via an optic fibre link. If the solution includes more than one DDC, an optic distributor board is needed.

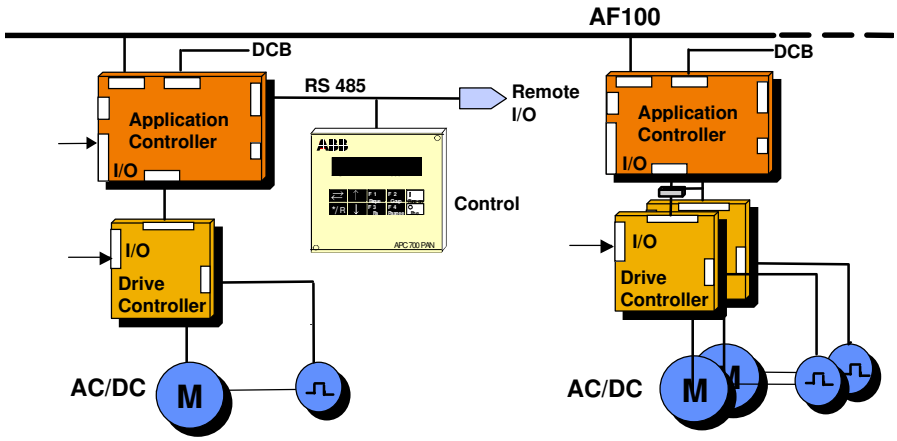


Figure 2 - 1 *Control system for ACV 700.*

Following electronic boards as standard or optional are included in the CDC (outside the DDC).

Type Designation	Name of the Board	Use
YPP 110A	Application Controller APC	Standard
SNAT 602 TAC	Terminal block board	Standard
APC 700 PAN	Door panel for the APC	Optional
APC 700 PPW	Power supply board for door panel	Optional
YPC 111A	Optic distributor board (TC link)	Optional
YPQ 110A	Extended I/O board	Optional
YPH 107A	Speed measurement board	Optional
YPH 108B (4 different)	Speed measurement board	Optional
DSTC 454	MFB Modem	Optional
DSTC 404	Short Distance Bus active termination board	Optional
DSTC 406	Short Distance Bus passive termination board	Optional
SNAT 605 SDB	Optic distributor board MFB	Optional
CI626	Bus administrator	Optional
YPC 111B	Optic distributor board (MFB)	Optional
YPK 112A	MB90 communication board	Optional
YPK 113A	UART communication board	Optional
YPK 114A	MFB communication board	Optional
YPK 117A	ModBus communication board	Optional
YPK 118A	ProfiBus-DP communication board	Optional
SNAT 606 CMT	PC board for DDCTool	Optional
YPC 115A	Optic distributor board DDCTool	Optional
YPQ 111A	Extended I/O board	Optional
YPT 111A	Extended I/O board	Optional
YPT 111B	Extended I/O board	Optional

CDC Board Rack

Code: 3AFE 61065938 Rack with 1 board slot
Code: 3AFE 61061118 Rack with 2 board slots
Code: 3AFE 61061126 Rack with 3 board slots
Code: 3AFE 61065911 Rack with 4 board slots
Code: 3AFE 61065920 Rack with 5 board slots

The CDC board rack is a metallic case in which all the CDC boards that use the parallel bus are installed. These boards are application controller YPP 110A, extended I/O board YPQ 110A or YPQ 111A and speed measurement board YPH 107A or YPH 108B.

The bus administrator CI626 does not need the parallel bus, however, it is installed in the CDC board rack.

The 64 pole flat bus cable is installed directly to the fixed flat cable connectors at the back side of the rack. The rack with only 1 board slot does not include the parallel bus.

Code: 3AFE 61061134 Incl. CDC board rack installation plate

Application Controller YPP 110 A

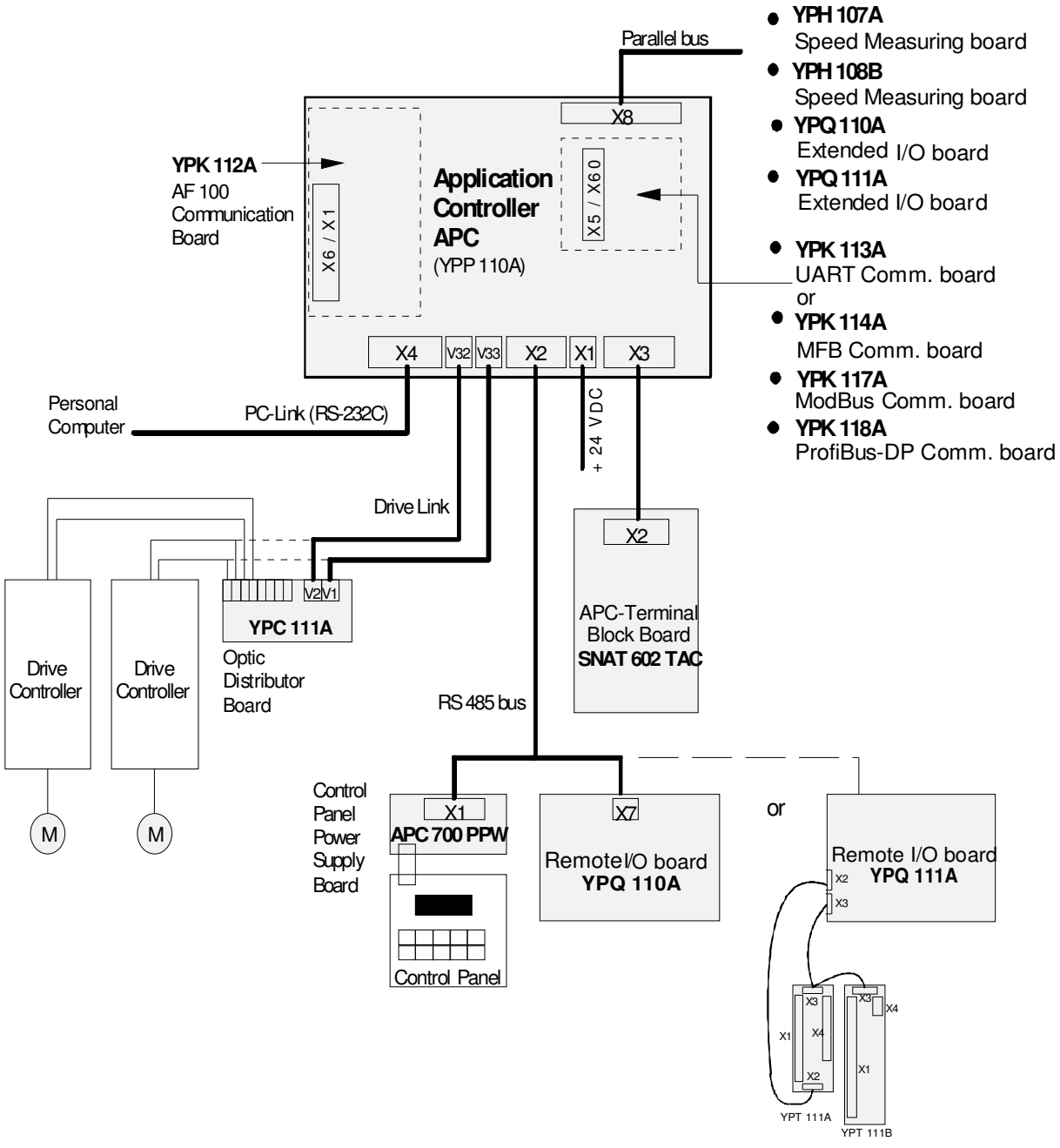


Figure 2 - 2 *Connections from the Application Controller APC. (61150935.drw)*

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

APC can be supplied with unstable + 24 VDC voltage (connector X1) that can vary in the range 19 - 30 VDC. Maximum input power consumption is 15 VA (0.63 A at 24 VDC). This power consumption includes 2 optional communication boards. APC can handle power supply failure with max. duration of 5 ms (i.e. voltage is below 19 V).

When the APC board is slid into the CDC board rack, a 64 pole parallel bus (connector X8) on APC slides into the CDC board rack bus connector.

AdvantFieldBus 100 (AF 100) is a high speed serial bus (connector X6), which is used for communication between APCs or between an APC and an overriding system such as ABB's MasterPiece 90. The communication board YPK 112A is used to connect the APC to the AF 100.

RS-485 bus, a 8 pole screw terminal connector X2, is a low speed serial bus, which is used to connect remote I/O devices and control panels to the APC. Also other APCs can be connected to each other via this bus. The bus has to be grounded at one point to the same ground as the APC. Maximum length of the bus is 300 m.

PC-Link, a standard 9 pole female D-connector X4, can be used to connect a personal computer to the APC. Physical interface is a standard non isolated RS-232C (V24) without any handshaking signals. Recommended maximum length of the cable between APC and PC is 5 m.

Drive link, an optic link, is used to connect the APC to an AC or a DC drive. Optical fibres are connected to receiver V32 and transmitter V33. Communication speed is 1.5 Mbps. Max. length of the fibre is 15 m with standard attenuation cable (Hewlett-Packard HFBR-R or equivalent) and 25 m with extra low attenuation cable (Hewlett-Packard HFBR-E or equivalent).

For standard I/O signals there is a 26-pole ribbon cable, connector X3, on APC. A separate terminal block board SNAT 602 TAC is always needed for field signal connections. The ribbon cable should be made as short as possible. Unshielded ribbon cable can be used provided that the cable is not longer than 2 m.

Optional extended I/O boards and speed measuring boards are connected to the parallel bus (connector X8) by sliding the boards into the CDC board rack. Total quantity of extended I/O-boards and speed measuring boards is four.

Jumper settings:

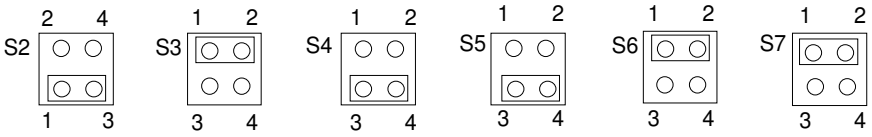


Figure 2 - 3 *Jumper settings on the application controller APC. These are factory settings and should not be changed. (apcjump.drw).*

APC-Terminal Block Board SNAT 602 TAC

Code: 3AFE 61001395

The same terminal block board SNAT 602 TAC is used for connecting I/O-signals either to APC or to the Tacho & I/O Interface SNAT 609 TAI on the drive DDC.

If the terminal block board should be connected to a SNAT 609 TAI, the signal names and connection terminals are different.
See: Chapter "**TAI-Terminal block board**".

Terminal block board is connected to the connector X3 on the APC, by a 26-pole ribbon cable. The ribbon cable should be made as short as possible. Unshielded ribbon cable can be used provided that the cable is not longer than 2 m.

Table 2 - 1 *Connections of the APC-terminal block board SNAT 602 TAC, when the board is connected to the APC.*

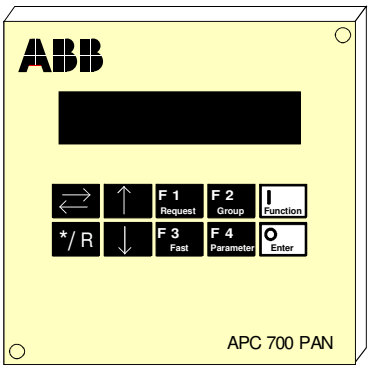
External Connections	Function
4 digital inputs	Isolated inputs, control voltage 220 VAC / 110 VAC / 24 VDC. Input 1 has 0.48 ms hardware filter (in APC), inputs 2 - 4 have 4.8 ms hardware filter (in APC). +24 VDC/20 mA control voltage outlet.
2 digital outputs	Programmable relay outputs, change over contacts. Max. voltage 250 VAC, max. current 8 A at 250 VAC.
2 analogue inputs	Differential inputs, resolution 12 bits, absolute accuracy ± 1 %. Input ranges -10 to +10 V or 0 to 20 mA (0 to +10 V, 0 to +1 V and 4 to 20 mA by software scaling). Input impedance is 380 kΩ for voltage inputs and 500 Ω for current inputs.
1 reference output	+ 10 V reference voltage, accuracy ± 1 %. Max. load current 10 mA.
1 emergency stop chain	220 VAC/110 VAC/24 VDC chain. +24 VDC/20 mA control voltage outlet.

Jumper settings on SNAT 602 TAC:

The jumper settings have no effect when the terminal block board is used with the APC.

Door Panel APC 700 PAN

Code: 3AFE 61041320 Bare panel
Code: 3AFE 61068171 Incl. APC 700 PPW board



The control panel provides the following information and functions:

- Status information (run, ready, fault messages)
- Operational control with 4 freely programmable pushbuttons
- Display of reference values (speed, torque)
- Display of actual values (speed, voltage, current)
- Display of fault logger contents
- Uploading, downloading, changing, displaying and saving the APC and DDC parameters.

It can be used to control up to four DDCs one by one, depending on the application program. Panel functions are freely programmable.

The 9 VDC external power is supplied by the door panel Power Supply Board APC 700 PPW.

Dimensions of the panel are (w x h x d) 125 x 120 x 20 mm.

Door Panel Power Supply Board APC 700 PPW

Code: 3AFE 61064770

The door panel power supply board is used to create the 9 VDC auxiliary voltage needed for the APC 700 PAN. The board is connected directly to the door panel phone jack type connector by means of a male/male connecting piece.

The board needs external 24 VDC power supply. Max. current is 200 mA.

A shielded signal cable from the APC is connected to connector X1. If the solution has several door panels with one APC, the signal cable can be distributed from connector X1 to connector X1 on the next power supply board. The external 24 VDC is also connected to this connector.

External Connections	Function
Power input	+ 24 VDC / Ima x = 200 mA to X1:1, common to X1:2.
Signal input	RS signal A to X1:3, RS signal B to X1:4.
Frame	Floating frame at X1:5, fixed frame at X1:6

Extended / Remote I/O Board YPQ 110A

Code: 3AFE 61061142 Incl. CDC board rack installation plate

The board is a general purpose I/O-board for connecting field signals to APC. It can be used as an extended or remote I/O-board.

When used as an extended I/O-board, it is slid into the CDC board rack and connector X1 is connected to connector X8 of the parallel bus.

The 24 VDC power supply for the board is delivered by the parallel bus flat cable. Power consumption is 12 VA (0.5 A at 24 VDC).

When the board is used as a remote I/O-board, connector X7 is connected to the RS-485 bus. This configuration needs an external 24 VDC power supply to connector X2.

Although the address for the board can be set to 0 - F (hex) with switch S1, the system software uses only addresses 1 - 4 (hex) for the extended I/O-board. Because of this, only four extended I/O-boards can be connected to one APC.

Field signals can be connected directly to the terminals of the board.

External Connections	Function
8 digital inputs	Opto isolated inputs, control voltage 110 VAC/24 VDC. Hardware delay 2 ms. Digital filter time constants from 0.5 ms to 128 ms in 0.5 ms steps. Input impedance 3 kΩ for 24 VDC and 13 kΩ for 110 VAC.
8 digital outputs	6 relay outputs, normally open contacts. Max. voltage 230 VAC, max. current 2 A at 230 VAC, min. switching time 20 ms. Two optoisolated transistor outputs. Max. voltage 60 VDC, max. current 100 mA, min. switching time 100 µs.
4 analogue inputs	Differential inputs, resolution 12 bits. Input ranges -10 to +10 V or -20 to +20 mA (0 to +10 V, 0 to +1 V and 0 / 4 to 20 mA by software scaling), Input impedance is 400 kΩ. Accuracy ± 0.1 % at ± 10 V and ± 0.4 % at ± 1 V. Hardware filter time constant 5 ms. Digital filter time constants from 5 ms to 32 s in 1 ms steps.
2 analogue outputs	Output voltage -10 to +10 V, output current -10 to +10 mA. Resolution 12 bits, accuracy ± 0.1 %.

3 reference outputs	+ 10 V voltage reference, accuracy +/- 1 mV. Max. load current 10 mA. - 10 V voltage reference, accuracy +/- 5 mV. Max. load current 10 mA. 5 mA current reference, accuracy +/- 0.05 mA. Max. load resistance 1 kΩ.

Extended / Remote I/O Board YPQ 111A

Code: 3AFE 6124 8285 Incl. CDC board rack installation plate

The board is a general purpose I/O-board for connecting field signals to APC. It can be used as an extended or remote I/O-board. The terminal board is always needed with the board because connection to the board is made with a ribbon cable.

When the board is used as an extended I/O-board, it is slid into the CDC board rack and a 64-pole parallel bus connector X1 on the YPQ 111A slides into the CDC board rack bus connector. APC board is connected in the same way with the connector X8 to the parallel bus.

The 24 VDC power supply for the board is delivered by the parallel bus flat cable. Power consumption is 5 VA (0.2 A at 24 VDC). Peak current with starting condition is 4 A.

When the board is used as a remote I/O-board, it can be mounted anywhere and it is connected to the YPP 110A via the low speed serial bus (RS-485). This configuration needs an external 24 VDC power supply and it is powered via the connection card.

Although the address for the board can be set to 0 - F (hex) with switch S1, the system software uses only addresses 1 - 4 (hex) for the extended I/O-board. Because of this, only 4 extended I/O-boards can be connected to one APC.

Field signals can be connected to the YPQ 111A board via the YPT 111A or YPT 111B connection card. If no extra qualities for inputs and outputs are needeed, YPQ 111A can be used with the connection card UT86-2X40C.

External connections	Function
16 digital inputs	Non isolated inputs, nominal input voltage 24 VDC (isolation in the connection cards YPT111A or YPT111B). Maximum input voltage 30 V. Input voltage levels: Low max. 6,2 V and high min. 17,4 V. Nominal input current is 20 mA. Hardware delay is 2 ms. Software filtering time constants from 1 ms to 128 ms in 1 ms steps. The isolation and in the case of YPT111B the level change from 115 Vac or 230 Vac to 24 VDC as well are done in the connection card.
8 digital outputs	Non isolated binary output channels with power fets, nominal voltage 24 V. Max. voltage 30 V. Max saturation voltage 0,3 V at 1 A. Max. current 1 A. Terminal board YPT111A or YPT111B is usually used with the output. The level cahnge from 24 V to 115/230 Vac can be done in the connection card YPT111B.
8 analogue inputs	Non isolated analog inputs, resolution 12 bits. Inputs ranges ± 10 V or ± 1 V. Input current is ± 20 mA. (The current to voltage conversion resistors are in the connection card YPT111A). Current mode is selected with the jumpers S1...S8 in YPT111A. Accuracy (voltage mode) [1] 0,35 %. Accuracy (current mode) 0,45 %.
4 analogue outputs	Non isolated analog output channels. Output voltage ± 10 VDC. Output current ± 20 mA. Maximum loop resistance 500 Ω. Resolution 12 bits. The current to voltage conversion resistor is in the connection card YPT111A. Voltage mode is selected with the jumpers S9...S12 in YPT111A) Resolution 12 bits. Accuracy (voltage mode) 0,35 %. Accuracy (current mode) 0,25 % I/O board.
3 reference outputs	Voltage reference + 10 VDC, accuracy 0,1%, output current 20 mA. Voltage reference - 10 VDC, accuracy 0,1%, output current 20 mA. Current reference 5 mA, number of channels 4, accuracy 1%.
Power supply	Nominal supply voltage 24 V (19...30 V). Power consumption 5 VA (0,2 A at 24 V). Peak current with starting condition 4 A.
Low speed serial bus	Type RS-485 (isolated). Isolation voltage 60 V. Speed 19200 baud. Maximum bus length 300 m.

Extended I/O Terminal Board YPT 111 A

Code: 3AFE 61205055
– profile module UM108 included

Code: 3AFE 61208976
– profile module not included

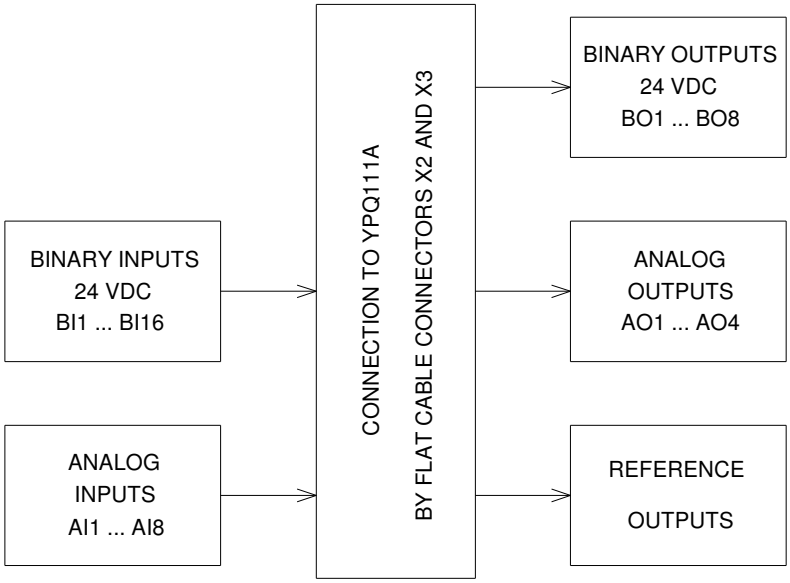


Figure 2 - 4 Block diagram of YPT 111A.

The Extended I/O Terminal Board YPT111A is used together with the Extended I/O Board YPQ111A.

The Extended I/O Terminal YPT111A is connected to the Extended I/O Board YPQ111A with two 40-pin flat cables. Connection card YPT 111A is used for connecting the field instruments to YPQ111A.

There are two separated power supply inputs for 24 VDC in the I/O terminal board YPT111A:

+24V IN / BI	for binary inputs (X1: pins 1,3,5,7) and
+24V IN	for YPQ111A when it is used as remote I/O (X1: pins 9,11,13,15).

For chaining these voltage inputs from one YPT111A to another YPT111A or YPT111B there are 4 inputs for both the supplies. In the case of chaining one to three 24 VDC inputs will be used as outputs.

Pins 9, 11, 13 and 15 of connector X1 should never be used if the I/O board YPQ111A is used as local I/O. The YPQ111A is then connected to the Application Controller YPP110A via the parallel back plane I/O connector and not via the serial bus.

External connections	Function
16 digital inputs	Isolated inputs, nominal input voltage 24 VDC Maximum input voltage 30 V. Input voltage levels: Low max. 6,2 V and high min. 15,0 V. Binary inputs are originally hardware configured as PNP-type inputs in the assembling. That is done by connecting all the BI- and GND/BI pins in the connector X1 together with a removable comb.
8 digital outputs	Connections for binary output channels with no isolation. Nominal voltage 24 VDC (1A). Max. output voltage 30 VDC.
8 analogue inputs	Non isolated connections for analog inputs in the I/O board YPQ111A. Inputs voltage ± 10 VDC or ± 1 VDC. Input current is ± 20 mA. The YPT111A board has the current to voltage conversion resistors and the jumpers for mode selection. Current mode for each input is selected with the jumpers S1...S8. Each input has a transient suppression and filtering in the YPT111A as well.
4 analogue outputs	Non isolated connections for analog outputs of the I/O board YPQ111A.. Output voltage ± 10 VDC. Output current ± 20 mA. Maximum loop resistance 500 Ω. The YPT111A has the current to voltage conversion resistors and the jumpers for mode selection. Voltage mode for each output is selected with the jumpers S9...S12.
6 reference outputs	Voltage reference +10 VDC. Voltage reference -10VDC. 4 pcs current reference outputs 5 mA.

Extended I/O Terminal Board YPT 111B

Code: 3AFE61205136
- profile module UM108 included

Code: 3AFE61208984
- profile module not included

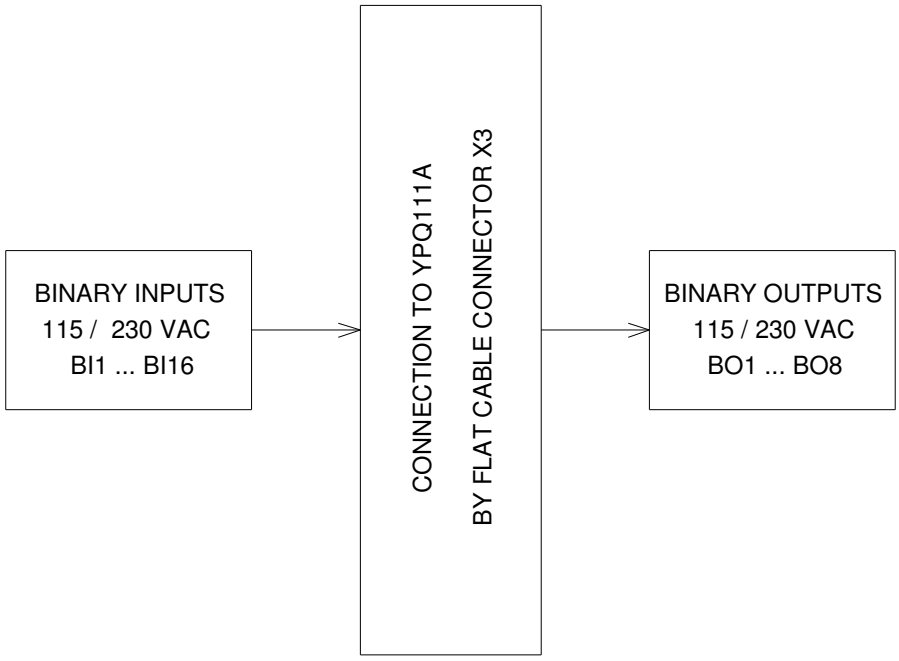


Figure 2 - 5 Block diagram of YPT 111B.

The Extended I/O Terminal Board YPT111B is used together with the Extended I/O Board YPQ111A.

The Extended I/O Terminal YPT111B is connected to the Extended I/O Board YPQ111A with two 40-pin flat cables. Connection card YPT111B is used for connecting the field instruments to YPQ111A.

If the binary output BO1 is used for system watchdog, the function of the BO1 relay can be disabled by not connecting the jumper S1. Normally the jumper should be always on 1

Power Supply

There are three separated power supply inputs for 24VDC on the extended I/O terminal board YPT 111B:

+24V IN / BI	for binary inputs (X4: pins 7,9,11),
+24V IN / BO	for binary outputs (X4: pins 1,3,5) and
+24V IN	for YPQ111A when it is used as remote I/O (X4: pins 13,15).

For chaining these voltage inputs from one YPT 111B to an other YPT 111B or YPT 111A, there are more than one input pin for each supply.

If the binary inputs and outputs do not need separated power supplies, +24 V OUT / BI and +24 V IN / BO can be connected together.

Pins 13 and 15 of connector X4 should never be used if the I/O board YPQ 111A is used as local I/O. The YPQ 111A is then connected to the Application Controller YPP 110A via the parallel back plane I/O connector and not via the serial bus.

External connections	Function
16 digital inputs	Connection with isolation for 16 binary inputs (115Vac/230Vac) Nominal input voltage 115 Vac or 230 Vac. Maximum input voltage 250 Vac. Input voltage levels: Low max. 30 Vac High min. 92 Vac
8 digital outputs	The YPT111B board has 8 relays for 115Vac/230Vac type binary outputs. Nominal output voltage 115 Vac or 230 Vac (1A) Maximum output voltage 250 Vac

Speed Measuring Board YPH 107A

Code: 3AFE 61061177 Incl. CDC board rack installation plate

The board is used for accurate speed measuring and positioning with a pulse tachometer.

It is installed in a CDC board rack by sliding the board into the rack. The parallel bus is connected to connector X1. The 24 VDC voltage

for the board is supplied by the bus. Power consumption is 7 VA (0.3 A at 24 VDC).

The board has one incremental encoder input with three optoisolated pulse channels (A, B and Z) for differential or single ended tachometers. Either current or voltage input can be used. Connector X4 is used for current input and connector X5 for voltage input.

Max. input frequency set by hardware is 100 kHz. Sample rate also limits the input frequency,

fmax = 2^{15} / ts (ts is the sample time)

Connector X3 is used for galvanically isolated synchronisation input.

Connector X9 is for two non-isolated analog outputs.

External Connections	Function
Digital synchronisation input 1 pc	Control voltage 24 V AC/DC or 110 V AC/DC. Input impedance 3 kΩ at 24 V and 13 kΩ at 110 V. Hardware delay 1ms or 10 ms, software adjustable.
Incremental encoder input 1 pc	3 optoisolated channels (A, B and Z), differential or single-ended tachometers. +/-13 mA current input or +/-24 V voltage input. Max. input frequency 300 kHz.
Analog outputs 2 pc	Output voltage +/-10 V, output current +/-10 mA. Resolution 12 bits, accuracy ± 1 %.

Different Types of Speed Measuring Board YPH 108B

YPH 108B/GP and YPH 108B/SP Types

There are two basic types of Speed Measuring Board YPH 108B: YPH 108B/GP and YPH 108B/SP.

The YPH108B/GP board provides two incremental encoder interfaces for speed and position measurement, two inputs for synchronization and two analog outputs.

The YPH108B/SP board provides the same features as the YPH108B/GP board and, in addition, it has 4 programmable 16-bit counters with load and hold registers, 4 digital inputs and 4 digital outputs. The counters and their registers can be configured in various ways to count external or internal pulses (i.e. length, angle, time, etc.) in applications where greater accuracy is needed.

The inputs of both boards can receive 5 V signals from single-ended pulse encoders as well as signals from differential pulse encoders. High frequency signals from single-ended encoders can, however,

suffer from timing delay if the pulse encoder cables are long and if the encoder has a low driving capacity. This is because the falling edges of the signals are not received separately. In such a case, use board types YPH 108B/GP/GPC and YPH 108B/SP/SPC, see below.

YPH 108B/GP/ GPC and YPH 108B/SP/ SPC Types

There are also Speed Measuring Boards YPH 108B/GP/GPC and YPH 108B/SP/SPC which functionally correspond to types YPH 108B/GP and YPH 108B/SP, respectively, but which are equipped with capacitors.

The inputs of these boards can receive signals from both single - ended and differential pulse encoders with equal timing accuracy provided that the capacitor input is used for 12 V and 24 V single ended signals. Note the jumper settings. The capacitor input cannot, however, be used for 5 V single-ended signals.

Speed Measuring Board YPH108B/ GP/GPC

Code: Incl. CDC board rack installation plate

3AFE 6115 6968 = YPH108B/GP
3AFE 6117 9372 = YPH108B/GPC

The Extended Speed Measuring Card is used to measure time and speed with up to two incremental encoders. The card is connected to the CDC system via the parallel back plane I/O connector. The card is powered with +24 VDC.

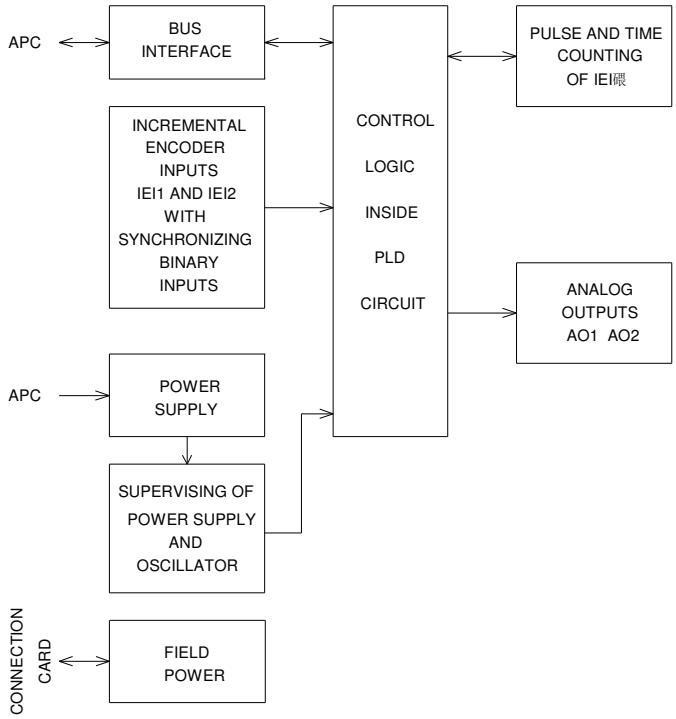


Figure 2 - 6 Block diagram of YPH 108B/GP.

Functional blocks:

- Interfaces for the 2 incremental encoders with 3 fast optochannels and a synchronizing binary input
- Pulse and time counter ASICs (IEI)
- PLD circuit for
  - control logic
  - status registers
  - configuration registers
- 2 analog outputs
- Crystal oscillator for the time base clock (32 Mhz).

Two incremental encoders can be connected to the card, each of them having 3 optoisolated fast input channels: CHA, CHB, CHZ and an optoisolated binary input for synchronizing.
The incremental encoder inputs can be connected to be either single-ended inputs or differential mode inputs. The input mode (encoder type) selection is made with the coding straps.

The incremental encoder input signals are filtered so that the maximum input frequency is 300 kHz.

There is software selectable filtering for the quadrature decoder inputs CHA and CHB to remove edge oscillation interferes.

Binary input signals for synchronizing have two software selectable filtering time constants 100 µs and 5 ms.

External connections	Function
Binary synchronisation input 2 pc	Control voltage 24 VDC. Input voltage levels: Low max. 7,2 V high min. 16,2 V. Nominal input current 32 mA. Filtering time 100 µs or 5 ms (software selectable).
Incremental encoder input 2 pc	3 optoisolated channels (A, B and Z), differential or single ended tachometers. Maximum input frequency 300 kHz. Nominal input voltage may be 24 VDC, 12 VDC or 5 VDC. Input voltage levels: Low max. 9 V 3.7 V 0,7 V High min. 16 V 8,3 V 3,4 V Incremental encoder power supply. Supply voltage 24 VDC (19 - 30 V), 12 VDC or 5 VDC. Maximum current 500 mA.
Analog outputs 2 pcs	Non isolated analog output channels. Output voltage +/-10 V, resolution 12 bits, accuracy ± 1 %.

Speed Measuring Board YPH 108B/ SP/SPC

Code: Incl. CDC board rack installation plate

3AFE 6115 6925 = YPH108B/SP
3AFE 6115 6917 = YPH108B/SPC

The Extended Speed Measuring Card is used to measure time and speed with up to two incremental encoders, binary inputs and hardware timing logic. The card is connected to the CDC system via the parallel back plane I/O connector. The card is powered with +24 VDC.

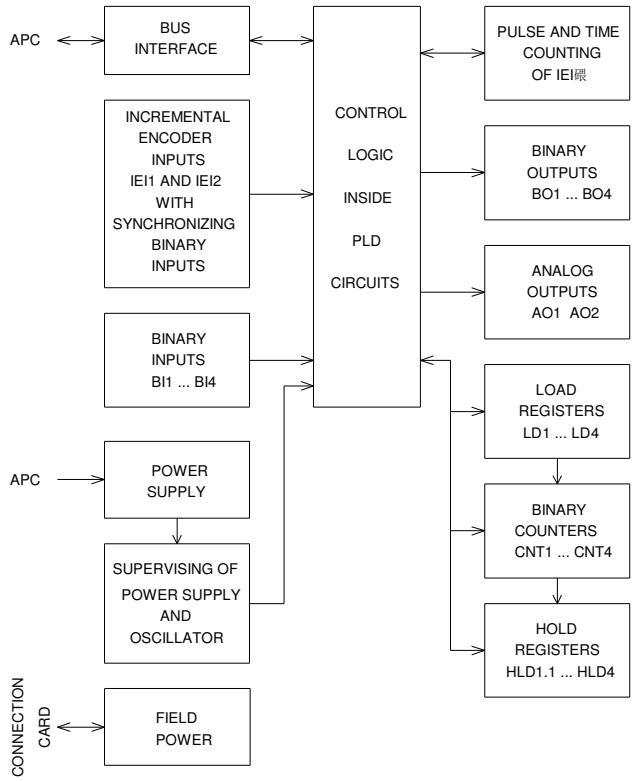


Figure 2 - 7 Block diagram of YPH 108B.

Typical applications:

- High speed (>5m/s) flying splice on coaters
- Timing of high accuracy cutting of paper, steel etc.
- General process interrupt synchronizing
- Synchronized speed difference measurements
- Web thickness computation based on consecutive measurements of diameter with simultaneous pulse trains of two transducers giving web speed and angular velocity related trains
- Time measurement from activation of binary input and delay setting of binary output

Functional blocks:

- Interfaces for the two incremental encoders with 3 fast optochannels and a synchronizing binary input
- Four optoisolated binary input channels with selectable filtering times for synchronization or for another way to measure time or speed with counters
- Pulse and time counter ASICs (IEI)
- PLD circuits for
  - control logic
  - hardware timing counters
  - output register of the binary inputs
  - status registers
  - configuration registers
- Four 16-bit counters
- Four optoisolated binary outputs (control registers in the PLD)
- Two analog outputs
- crystal oscillator for the time base clock (32 Mhz).

Two incremental encoders can be connected to the card, each having three optoisolated fast input channels: CHA, CHB, CHZ and an optoisolated binary input for synchronizing.

The incremental encoder inputs can be connected to be either single-ended inputs or differential mode inputs. The input mode (encoder type) selection is made with the coding straps.

The incremental encoder input signals are filtered so that the maximum input frequency is 300 kHz.

There is software selectable filtering for the quadrature decoder inputs CHA and CHB to remove edge oscillation interferes.

Binary input signals for synchronizing have two software selectable filtering time constants 100 µs and 5 ms.

External connections	Function
Digital synchronisation input 2 pc	Control voltage 24 VDC. Input voltage levels: Low max. 7,2 V high min. 16,2 V. Nominal input current 32 mA. Filtering time 100 µs or 5 ms (software selectable).
Incremental encoder input 2 pc	3 optoisolated channels (A, B and Z), differential or single ended tachometers. Maximum input frequency 300 kHz. Nominal input voltage may be 24 VDC, 12 VDC or 5 VDC. Input voltage levels: Low max. 9 V 3.7 V 0,7V High min. 16 V 8,3 V 3,4 V Incremental encoder power supply. Supply voltage 24 VDC (19 - 30 V), 12 VDC or 5 VDC. Maximum current 500 mA.
Binary inputs 4 pcs	High speed optoisolated binary inputs. Nominal input voltage 24 VDC. Input voltage levels: Low max. 7,2 V, high min 16,2 V. Nominal input current 32 mA. Filtering time 1 µs, 100 µs, 1 ms or 5 ms (software selectable). Power supply for binary inputs 24 VDC.
Binary outputs 4 pcs	Optoisolated binary outputs for 24 V/100 mA relay control in the card. Output voltage 30 VDC, output current 100 mA.
Analog outputs 2 pcs	Non-isolated analog output channels. Output voltage +/-10 V, resolution 12 bits, accuracy ± 1 %.
Inputs used in counter functions	Maximum frequency 1 Mhz. Minimum time for signal staying high 350 ns. Minimum time for signal to staying low 470 ns. Time base clock 32 Mhz ± 50 ppm.

Master FieldBus Modem DSTC 454

Code: 3AFE 61069569

A modem is needed to connect the drive system to the optic Master FieldBus. The optic fibres of the MFB are connected to connectors X1 (transmit) and X2 (receive) on the modem. The modem is connected to the Short Distance Bus interface (SDB) with a shielded, twisted pair cable. The communication uses RS485 protocol.
Max. length of the RS485 cable is 15 m.

The modem needs an external 230 VAC power supply.

Communication speed is 2 Mbps.

Connector	Modem signal	Electrical data
X1	Transmit	Optic fibre
X2	Receive	Optic fibre
D	DATA	RS485
DN	DATA-N	RS485
C	CLOCK	RS485
CN	CLOCK-N	RS485
R	R	RS485
RN	R-N	RS485

Short Distance Bus Termination DSTC 404 and DSTC 406

Code: 3AFE 10013011 DSTC 404, active termination
Code: 3AFE 61069585 DSTC 406, passive termination

If the Short Distance Bus is short, i.e. about 1 m long, no termination is necessary.

When the Short Distance Bus is several meters long, the bus cable needs termination. One end of the bus shall have active termination and the other end shall have passive termination. If several SDB interface boards are connected to the same bus, the SDBs in the middle of the bus shall have no termination.

The termination board is connected parallel to the modem's SDB connector. If the active termination is used, the DSTC 404 takes the 5 VDC power supply directly from the modem's SDB connector. The SDB interface SNAT 605 SDB can be strapped to have active, passive or no termination.

Short Distance Bus Interface SNAT 605 SDB

Code: 3AFE 61046925 Incl. metal box

The Short Distance Bus interface (SDB) is needed to convert the RS485 communication to optical form. The SDB board has four pairs of optic channels to be connected to communication boards YPK114A.

If the solution needs more than four optic channels supplied by the SDB, the RS485 bus can be connected parallel to several SDB boards, or an optic distributor board YPC111B can be used.
The board needs an external 24 VDC power supply. Power consumption is 2.9 VA (120 mA at 24 VDC).

Dimensions including the box are (h x w x d) 195 x 40 x 72 mm.

Connector X2	Short Distance Bus Signal	Electrical Data
1	Shield	GND
2	Shield	GND
3	T1	GND
4	DATA	RS485
5	DATA-N	RS485
6	CLOCK	RS485
7	CLOCK-N	RS485
8	R	RS485
9	R-N	RS485
10	VCC	+5 V

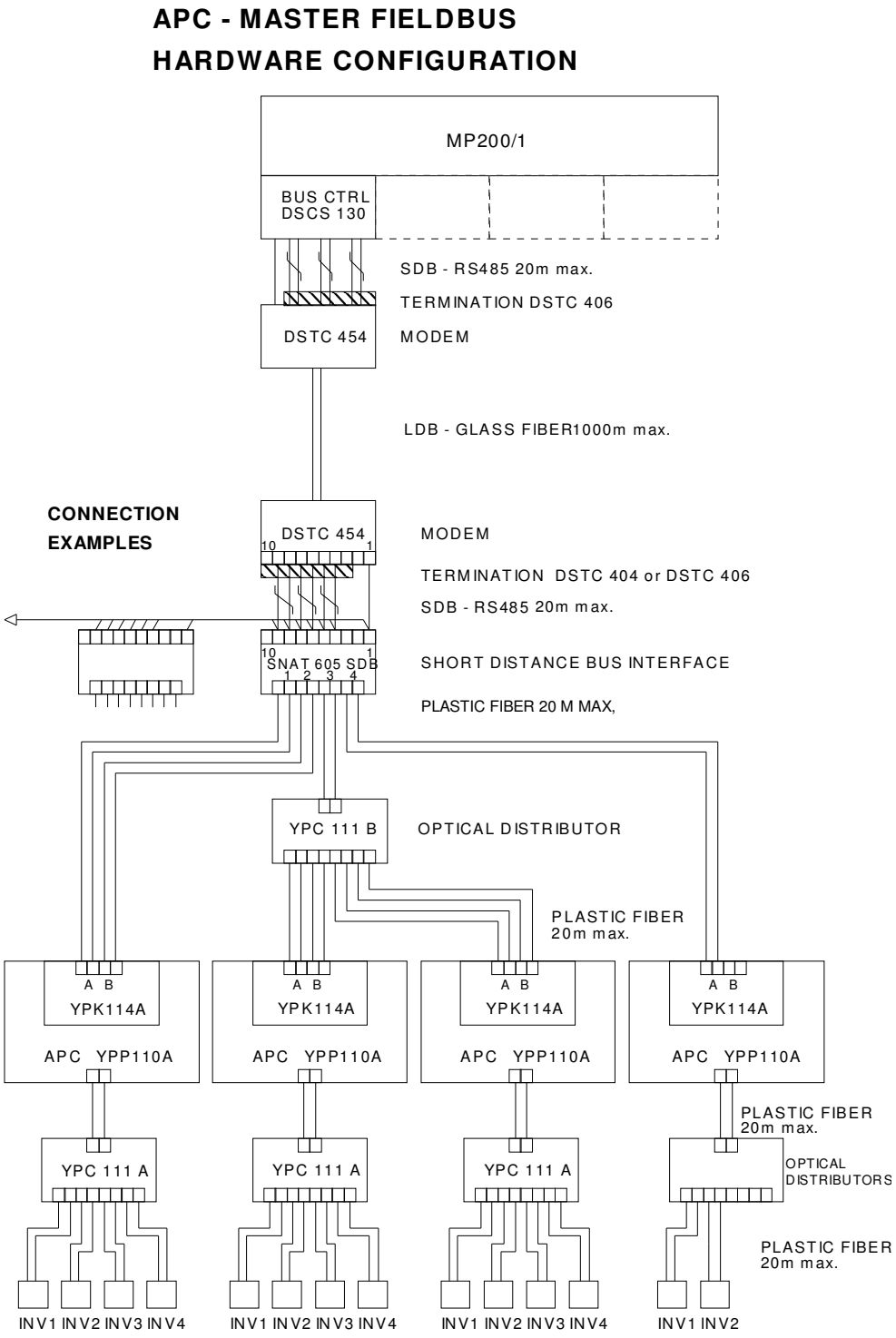


Figure 2 - 8 APC-Master Fieldbus hardware connection examples.

Optic Distributor Board YPC 111B

Code: 3AFE 61048880 Incl. metal box

If more than four optic channels provided by one SDB is needed, an optic distributor board YPC 111B must be added. It distributes one optic channel (2 fibres) into four equal channels (two fibres each).

The board needs an external 24 VDC power supply that can vary in the range 19 - 30 VDC. Power consumption is 1.9 VA (80 mA at 24 VDC).

If more channels are needed, it is possible to stack several of these distributor boards. One of the outlet channels can be connected to inlet channel of another optic distributor board.

Max. length of the fibre is 15 m with standard attenuation cable (Hewlett-Packard HFBR-R or equivalent) and 25 m with extra low attenuation cable (Hewlett-Packard HFBR-E or equivalent).

MFB Communication Board YPK 114A

Code: 3AFE 61039929

This board is used for communication between the APC and a Short Distance Bus interface SNAT 605 SDB in a Master FieldBus configuration. It is connected to the APC by plugging the board connector X60 to connector X5 on APC and is then fixed with three M3 screws. It does not need an external power supply.

It is connected to the SNAT 605 SDB or to the optical distributor YPC111B with one or two pairs of optical fibres. If the number of inverters after the APC is 1 or 2, one pair of optical fibres is sufficient. If the APC controls three or four inverters, two pairs of optical fibres is needed.

MB 90 / AF 100 Communication Board YPK 112A

Code: 3AFE 10006171

This board is a MB 90 / AF 100 compatible high speed serial bus interface for the APC. It is connected to the APC by plugging the board connector X1 to connector X6 on APC and is then fixed with four M3 screws. It does not need an external power supply.

The bus is a coaxial cable and it is connected to connector X2 with a BNC-connector. If the bus cable does not end to the board, a T-connector has to be put between the connector X2 and the bus cable connector.

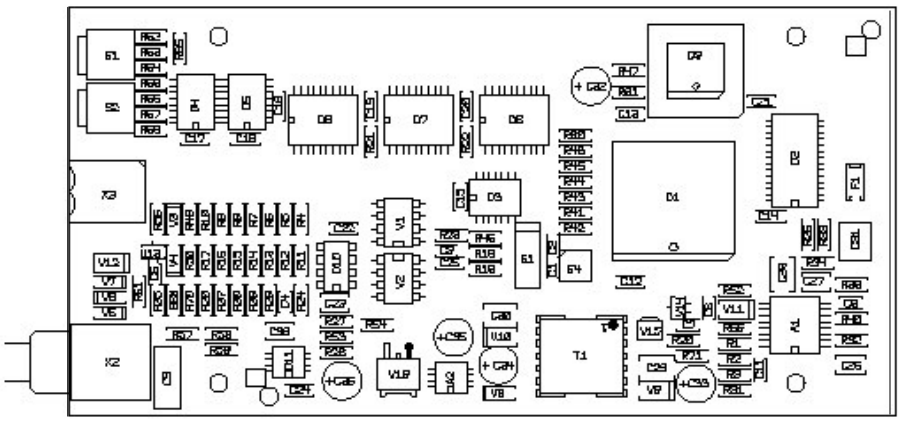


Figure 2 - 9 *Layout of the YPK 112A Communication board.*

Bus Administrator CI626

Code: 3AFE 61061240 Incl. CDC board rack installation plate

The MasterBus 90 relies on a centralised bus master function. APC stations are not able to act as the bus master, i.e. they do not contain the bus administrator functions. The CI626 bus administrator board is also compatible with the AF100 bus.

If the solution does not include a MasterPiece 90, a stand-alone bus administrator, CI626, is needed.

Although the bus administrator CI626 can be installed in a CDC board rack, it does not use the parallel bus.

The CI626 has two coaxial cable connectors. Either one can be used in single cable bus solution. If two bus cables are required, both connectors are used instead of distributing one cable.

The bus must have a coaxial 75 ohm termination in both ends of the bus. If only one bus cable is used, the cable must be led from one of the CI626's terminals to the other one and terminated there with 75 ohm coaxial resistor.

The board needs an external 24 VDC power supply. Power consumption is 11W.

UART Communication Board YPK 113A

Code: 3AFE 61002774

The board is used as a general purpose UART communication board between the APC and external control devices including following protocols: SAMI protocol, Allen-Bradley DF1 and Siemens S3964/S3964R. It is connected to the APC by plugging the board connector X1 to connector X5 on the APC and is then fixed with three M3 screws. It does not need external power supply (except for current loop).

Connector X2 is a 9-pole D-connector and it is used for RS232. Connector X3 is a screw terminal connector and it is used for current loop (20 mA) connection.

Bit rate is selectable up to 19200 bit/s.

ModBus Communication Board YPK 117A

Code: 3AFE 61163280

The board is used for communication between the APC and external control devices supporting Modbus RTU protocol. It is connected to the APC by plugging the board connector X1 to connector X5 on APC and is then fixed with three M3 screws. It does not need external power supply (except for current loop).

Connector X2 is a 9-pole D-connector and it is used for RS232. Connector X3 is a screw terminal connector, and it is used for current loop (20 mA) connection.

The Modbus protocol is a master-slave protocol, which provides for one master and up to 247 slaves. Usually the number of slaves is between 1 to 16.

Only the master initiates a transaction. Transactions are either a query/response type or a broadcast/no response type (all slaves are addressed). A transaction comprises a single query and a single response message or a single broadcast message.

Usually RS485 or current loop hardware is used for connection between master and slave equipment. A separate RS232/RS485-converter is needed for channel 1 of the YPK 117A. The current loop is recommended only for point-to-point connection. In this case, channel 2 of the YPK 117A is used and the signal converter RS232/current loop is connected to the remote equipment.

The Modbus protocol specifies two transmission modes: ASCII-mode and RTU-mode. However, the YPK 117A includes only the protocol's RTU-mode. Maximum bit rate is selectable up to 19.2 kbits.

Only one channel at a time can be used for Modbus. The other channel can be used for troubleshooting with the monitor program.

YPK 117A Connectors

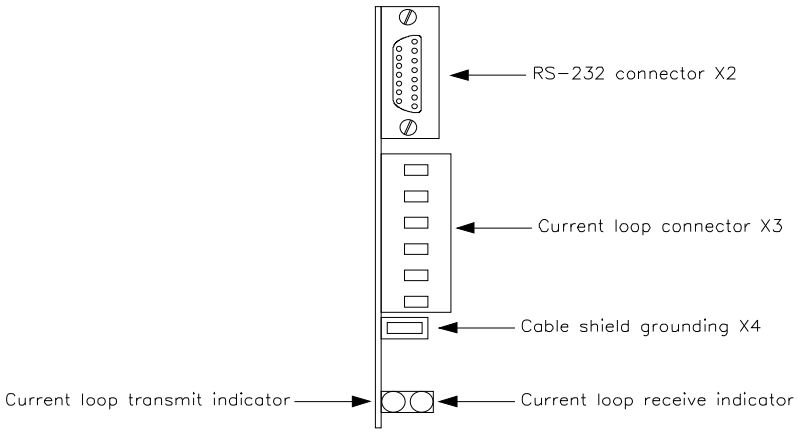


Fig. 2 - 10 Connectors of YPK 117A board.

ProfiBus-DP Communication Board YPK 118A

Code: 3AFE 61347089

YPK 118 Profibus-DP is an optional serial communication board at the APC2, enabling a PLC or PC (Master station) to control frequency converters or DC drives through the Profibus-DP communication channel. The YPK 118A board is the same as SNAT 7700 PRI but contains a different EPROM.

Communication is based on the Profibus-DP protocol, specified in DIN 19245, part 3, PROFIDRIVE, Profibus profile for adjustable speed drives. With SNAT 7700 PRI board you can use the Profibus-DP protocol up to 1.5 MBaud.

Via Profibus-DP, the PLC and the frequency converters or DC drives can exchange reference and feedback data sets. You can send control and reference values from PLC to the converter and read status and actual values from the converter to the PLC. In the control word you can send, for example, start/stop, direction, reference selection and fault reset commands.

As the controlling PLC (Master station), Siemens SIMATIC S5/S7 and other PLCs with a Profibus-DP master can be used.

Up to 31 slave stations can be connected to the Profibus-DP without bus repeaters and up to 127 slaves if bus repeaters are used.

YPK 118A Connectors

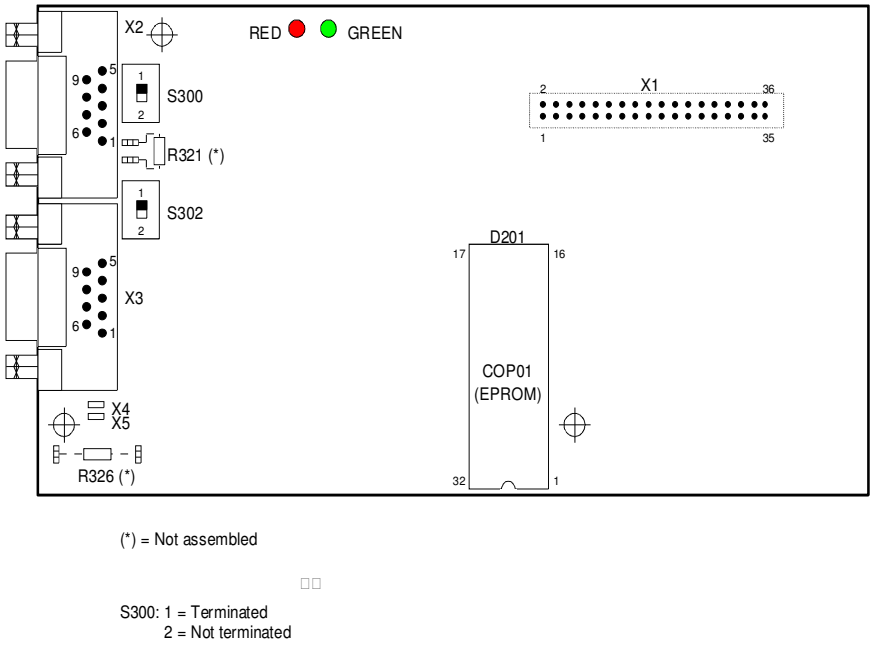


Figure 2 - 11 *Layout of the YPK 118A Communication Board.*

Legend:

X1:	iSBX bus connector
X2, X3:	D-connectors for Profibus communication
S300:	Bus termination selection
S302:	Connects X2 and X3 i.e. bus chaining
D201:	EPROM-circuit containing APC2 Profibus-DP software. (The label text is e.g. YPK 118 D201 Rev:A 96-09-02)
Red led :	The led is on when communication between the master and the Profibus interface (slave) is OK. The led starts blinking if communication fails.
Green led:	Indicates that the Profibus interface has just received or sent a message

Bus Termination

Profibus is based on RS-485 differential (balanced) data transmission over a single twisted pair line. In order to guarantee reliable communication at high transfer rates the bus cable must be correctly terminated.

The switch S300 on the YPK 118 card is used to control termination.

Table 2 - 2 Switch positions

Switch S300	Function
Position 1	Termination
Position 2	No termination

The bus must be terminated at both ends. All other stations connected to the bus must not be terminated.

If SNAT 7710 PRA Profibus Adapter is disconnected from the Profibus Interface (PRI), termination is not possible.

When separate bus repeaters are used, the bus is usually terminated at the repeater. (See the repeater installation instructions.)

Table 2 - 3 Signals of Profibus Adapter Connector X1

Connector X1		Description
1	A+	Data, positive
2	B-	Data, negative
3	GND	Bus ground
4	A+	Data, positive
5	B-	Data, negative
6	GND	Bus ground
7	SH	Cable shield
8	SH	Cable shield

Note.
The markings used in the bus terminal made by Siemens:
A = Data, negative
B = Data, positive

Transfer Rate and Cable Length

The transmission rate is dependent on the cable length. Long cables give a low transmission speed. If more than 31 frequency stations must be connected to the bus, it is necessary to insert a repeater.

Table 2 - 4 Electrical characteristics

Parameter	Cable A PROFIBUS-DP	Cable B DIN 19 245 Part 1
Impedance	135-165 Ohm (3-20 MHz)	100-130 Ohm (f > 100 kHz)
Capacitance	< 30 pF/m	< 60 pF/m
Damping ratio	< 110 Ohm/km	-
Conductor area	> 0,34 mm²	> 0.22 mm²

Table 2 - 5 shows the maximum cable lengths for different transfer rates.

Note. The maximum baud rate specified in DIN 19245 is 500 kbit/s.

Table 2 - 5 Maximum cable lengths

Baudrate (kbit/s)	**9.6**	**19.2**	**93.75**	**187.5**	**500**	**1500**
Length Cable A	1200 m	1200 m	1200 m	1000 m	400 m	200 m
Length Cable B	1200 m	1200 m	1200 m	600 m	200 m	-

DDCTool Link

The DDCTool-link runs at 1,5Mbits/s using the HDLC protocol. The link needs an external board **SNAT 606 CMT or SNAT 608 CMT**, referred to as the DDCTool board, or a combinaton of **SNAT 621 PCA** and **SNAT 622 CMT**, referred to as the PCMCIA board. The DDCTool-program is installed in a PC/AT compatible PC.

Normally this is enough to control the drive, but if several drives are to be controlled by one PC, optical distributor **YPC 111 A** must be used. The model YPC 111 A is used with plastic fibres and the model YPC 115 A is used with glass fibres. Because SNAT 609 TAI board includes receiver/transceiver circuit **V10**/**V11** for plastic fibres only, the glass fibres can be only used for connections between distributors and the PC.

The YPC 111 A/115 A has one connection for either the DDCTool board or the PCMCIA, and four connections for ACV 700s or lower level optical distributors. Optical distributors can be connected to a tree or chain form. The height of the tree/length of the chain depends on the number of ACV700s in the system. It is possible to connect up to 249 ACV 700s to one PC.
The difference between ACV 700s in the link is made by parameter **DDC_TOOL_ADDRESS (2302)** (1 - 249, address 250 is used in the single drive application.

The following functions can be performed by using the DDCTool:
- local control of the DDC
- setting parameters
- control data and fault logger
- monitoring of the DDC´s actual values etc.

More information about the DDCTool is given in the "DDCTool User's Manual".

PC Board SNAT 606 CMT or SNAT 608 CMT for the DDCTool

Code: 3AFE 61010793 PC board only
Code: 3AFE 61041508 Complete DDCTool package

The SNAT 606 CMT or SNAT 608 CMT board for the DDCTool is slid in a free board slot in a personal computer. One pair of optical fibres are led from the SNAT 606/608 CMT board to the SNAT 609 TAI board.

If the distance between the SNAT 606/608 CMT board and the SNAT 609 TAI is less than 15 m with standard attenuation cable, the fibres can be plastic. If the distance is longer, for up to 25 m an extra low attenuation cable can be used. For longer distances glass fibres must be used.

The SNAT 606/608 CMT has connectors for both plastic and glass fibres.

The **SNAT 606 CMT** board uses I/O address range **600H**...**701H**. If you have other option boards which use these I/O addresses, you should try to reconfigure them because SNAT 606 CMT can only use these I/O addresses.

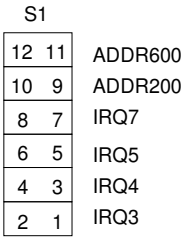


Figure 2 - 12 Jumpers of SNAT 606 CMT on S1.

On **SNAT 608 CMT**, the beginning of the I/O address range is selected by one jumper on S1 pins **9-10**...**19-20**. Six settings are possible. The board reserves eight I/O addresses from the beginning of the selected I/O address range. If you change the default I/O address range setting (**19-20**) then you must write down the I/O address you selected. It is needed when you start to use the DDCTool program (see Chapter *Installing the DDCTool Software* and *Appendix 1* in the DDCTool User's Manual).

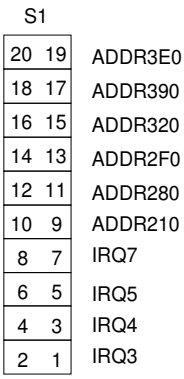


Figure 2 - 13 Jumpers of SNAT 608 CMT on S1.

When you have selected the correct settings of the S1 jumpers, you can install the DDCTool board into your PC. Follow carefully the instructions in your PC manual for installation of option boards.

If you do not know how to install option boards into your PC, consult a service technician.

Unplug the power cord of the PC. Open the cover of the PC. Insert the DDCTool board into a vacant bus slot (ISA-bus) of the PC. Close the cover of the PC.

Optic Distributor Board YPC 111A

Code: 3AFE 61004955 Incl. metal box

This board is used to distribute the TC link information from the APC to up to four inverters. It can also be used with the DDCTool.

The board needs an external 24 VDC power supply that can vary in the range 19 - 30 VDC. Power consumption is 1.9 VA (80 mA at 24 VDC).

Max. length of the fibre is 15 m with standard attenuation cable (Hewlett-Packard HFBR-R or equivalent) and 25 m with extra low attenuation cable (Hewlett-Packard HFBR-E or equivalent).

Dimensions of the metal box are (w x h x d) 155 x 40 x 72 mm.

External connections	Function
Power input	+ 24 VDC to X1:1, common to X1:2.
Signal input	Optical fibre from APC to V1, Optical fibre to APC from V2.
Signal outputs 4 pairs	Optical fibres to drives from Vx. Optical fibres from drives to Vx (x = drive number 1 to 4).

Optic Distributor for DDCTool YPC 115 A

Code: 3AFE 61037454 Incl. metal box

The optic link can be divided into several drives by using optic distributors YPC 111A for plastic fibre and YPC 115A for glass fibre.

Since the SNAT 609 TAI board has only plastic fibre connectors and if glass fibre must be used due to the distance, a YPC 115A must be used near the TAI board, even if the optic link is not distributed to other drives.

The board needs an external 24 VDC power supply that can vary in the range 19 - 30 VDC. Power consumption is 1.9 VA (80 mA at 24 VDC).

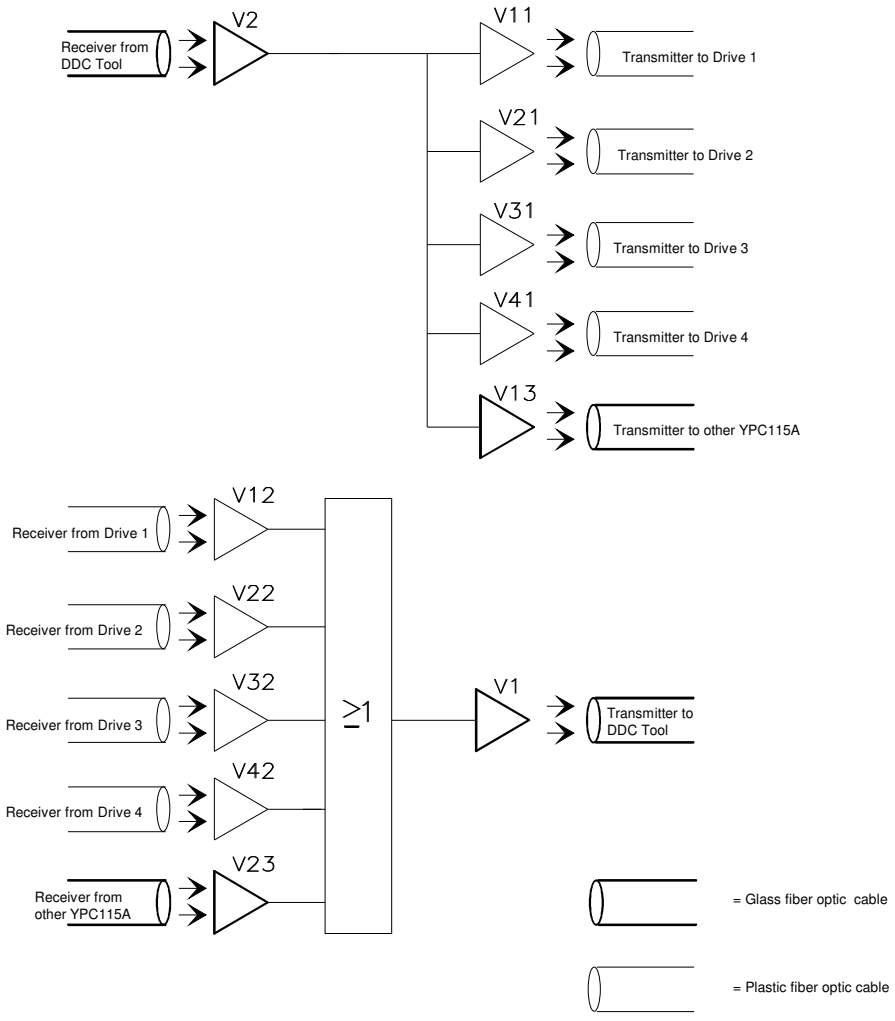


Figure 2 - 14 Description of YPC115A Optic Distributor (pakk115.drw)

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:

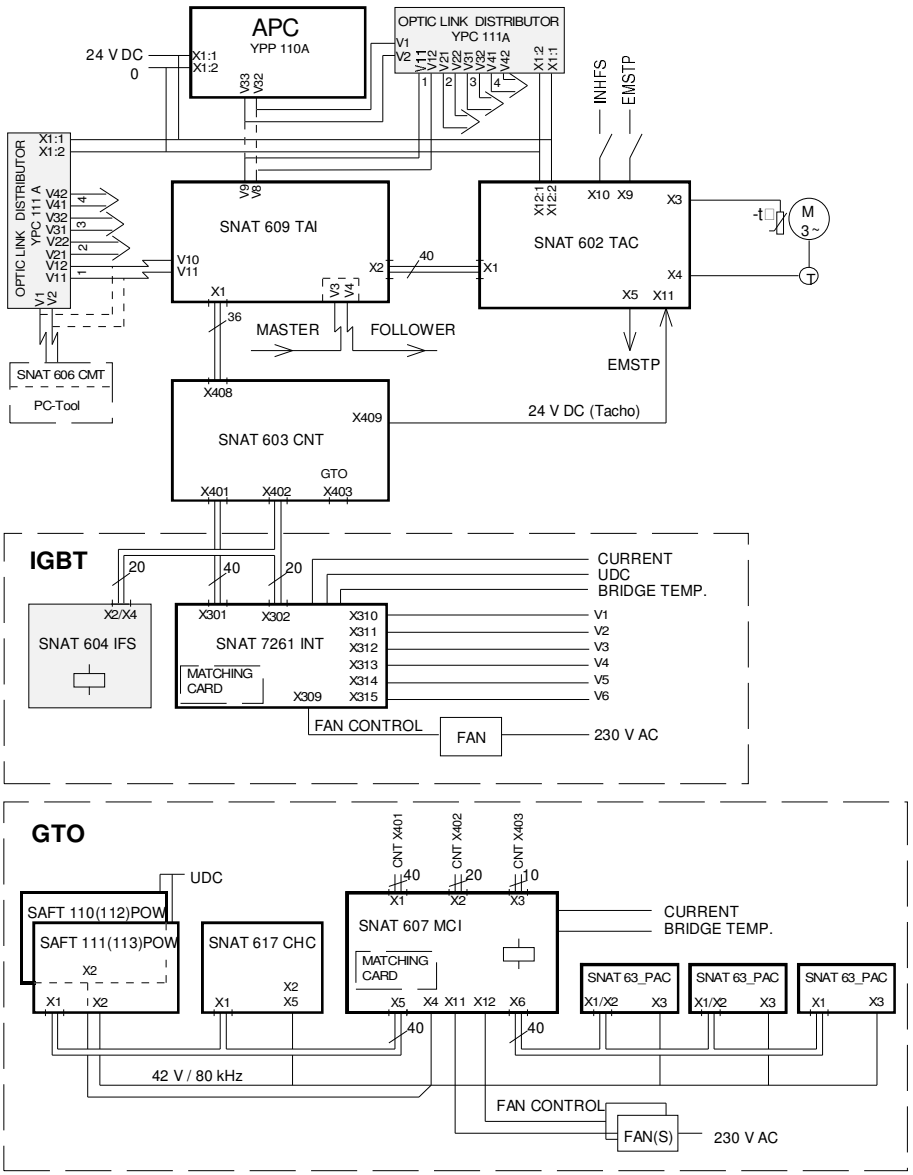


Figure 2 - 15 Drive system control boards (61038361.drw).

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

inverters. The board is connected to the TAI-board with a 64-pole flat cable.

When used with an IGBT power stage inverter, it is also connected to SNAT 7261 INT with 20-pole and 40-pole flat cables. When used with a GTO power stage inverter, it is also connected to SNAT 607 MCI with 10-pole, 20-pole and 40-pole flat cables.

Tacho & I/O Interface SNAT 609 TAI

This board includes the I/O-circuits for SNAT 603 CNT. The I/O-signals are led to SNAT 603 CNT with a 36-pole flat cable. Field I/O-signals and tachometer signals are connected to SNAT 602 TAC and then led to SNAT 609 TAI with a 40-pole flat cable.

Connection to the APC is through a fibre optic link.

Jumper settings:

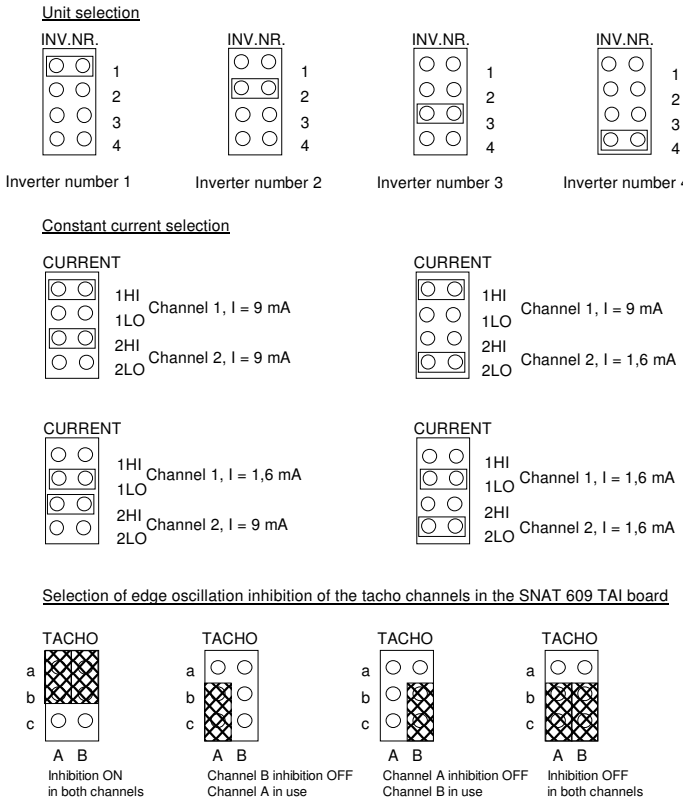


Figure 2 - 16 Jumper settings for the SNAT 609 TAI. (601jump.drw).

Main Circuit Interface SNAT 7261 INT (IGBT)

The board is a main circuit interface for IGBT power stage inverters. The board includes the following functions: IGBT drives, power supply, fan control, current and voltage measurement, matching and motor control and connections, temperature measurement and fault detection.

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.

3 digital outputs	Programmable relay outputs, change-over contacts. Max. voltage 250 VAC, max. current 8 A at 250 VAC.
2 analogue inputs	Input ranges -10 to +10 V, 0 to 20 mA (0 to +2 V, 0 to + 10 V and 4 to 20 mA by software scaling). Input impedance 800 kΩ. Constant current sources 1.6 mA and 9.1 mA for Pt100 or PTC. Resolution 12 bits, accuracy ± 1.0 %.
2 analogue outputs	Output ranges -10 ... +10 V, 0 ... 20 mA. Resolution 8 bits.
1 pulse encoder input	Differential or single ended tachometers. (+ 5 V / + 12 V / + 24 V). 3 channels A, B and Z. +12 V and +24 V control voltage outlets.
1 emergency stop input	220 VAC/ 110 VAC/ 24 VDC. +24 VDC/ 20 mA control voltage outlet. Linking to other groups.
1 emergency stop output	Relay output, change-over contacts. Max. voltage 250 VAC, max. current 8 A at 250 VAC.
1 inhibition of false start input	220 VAC. Linking to other groups.
1 inhibition of false start output	Relay output 1 A for 220 VAC signal lamp. Linking to other groups.

Jumper settings:

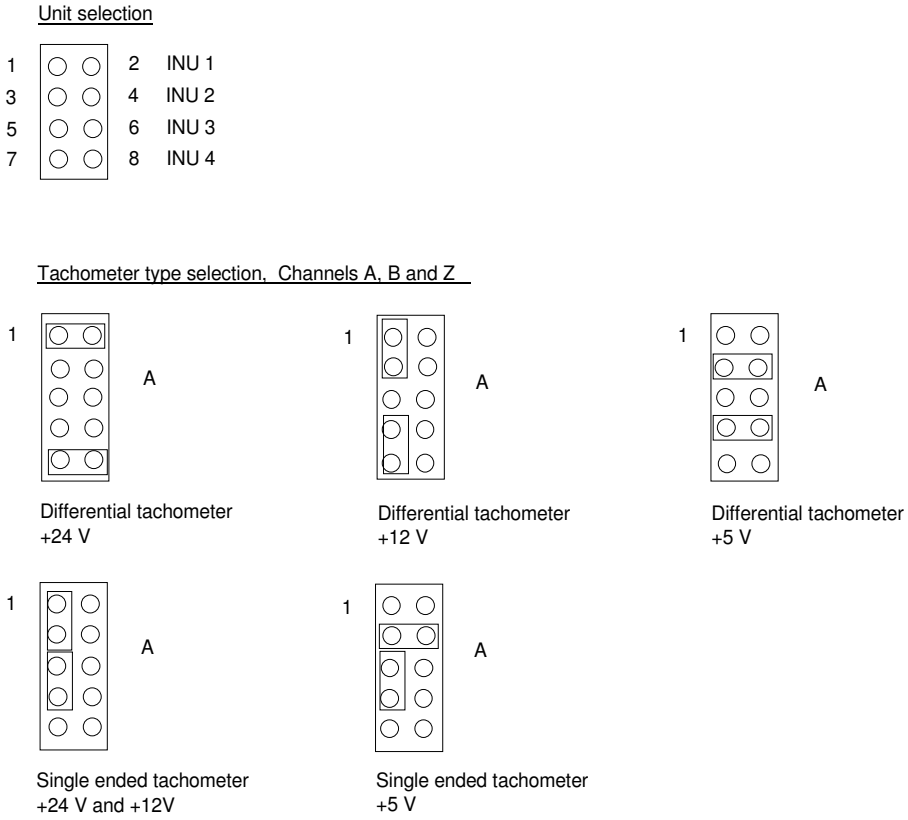


Figure 2 - 17 *Jumper settings for the Terminal Block Board SNAT 602 TAC (602jump.drw).*

Chapter 3 - Supply Sections

General

The Supply Section includes connection devices (main fuses and main contactor or breaker), and a rectifying device (diode or thyristor bridge), a DC-choke and a required number of capacitor bank units.

Optional devices such as voltage and current measurement, earth fault protection, etc. may also be included.

If the rectifier unit is a diode bridge and braking is required, a braking chopper and a braking resistor are included in the supply section.

Depending on the rectifier type and its power and voltage, the supply section may consist of up to four different units (SAFUL, SAFUX SAFUB and SAFUM). These units contain connection, rectifying and smoothing devices.

If the power is ≤1000 kVA (both diode and thyristor bridge), the supply section consists of different modules mounted on wheels.

If the power is ≥1000 kVA (400 V), ≥1250 kVA (500 V) and ≥ 1600 kVA (690 V), the connection devices and the thyristor bridge are mounted into the cubicle separately. The diode bridge and the capacitor bank are modules mounted on wheels.

Diode Supply Sections

Depending on the power, the diode rectifier supply section may include up to four units. In power range from 40 to 160 kVA (400 V), from 50 to 200 kVA (500 V) and at 160 kVA (690 V) they are complete supply section units (S). Other sections consist of contactor unit (L), rectifier unit (C) and required number (0 - 2) of capacitor bank units (B).

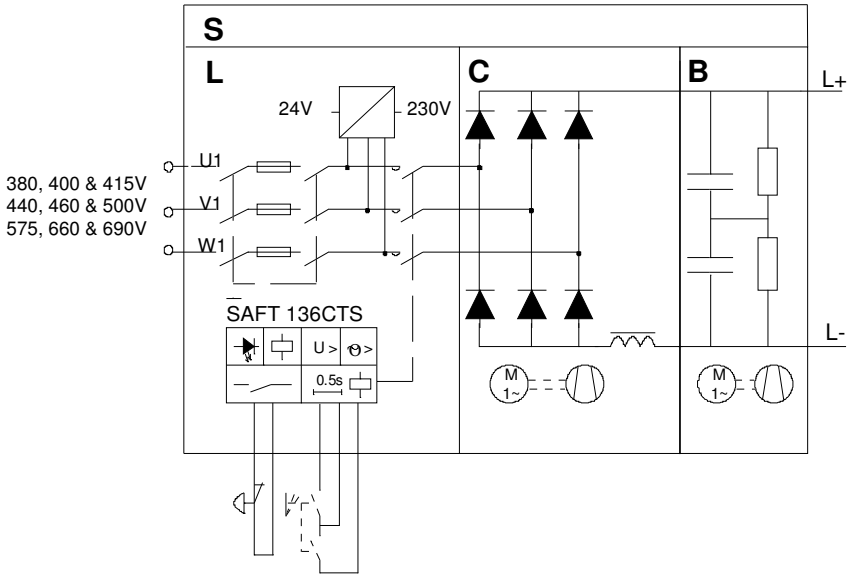


Figure 3 - 1 *Block diagram of the diode supply section 61133607.drw)*

Type Designation	Motoring Power [kW]	Cooling Air Flow [l/s]	Heat Loss [kW]	Cubicle Width [mm]	Weight [kg]
400 V (380, 415V)					
ACV 703-0040-3-M	36	40	0.30	400	140
ACV 703-0063-3-M	58	90	0.48	400	140
ACV 703-0100-3-M	93	90	0.76	400	160
ACV 703-0160-3-M	149	90	1.22	400	200
ACV 703-0250-3-M	232	170	2.50	800	270
ACV 703-0400-3-M	366	170	4.50	800	470
ACV 703-0630-3-M	587	270	7.80	800+600	530
ACV 703-1000-3-M	933	400	10.00	600+600+600+600	1090
ACV 703-1600-3-M	1490	690	14.40	600+600+600+800	1250
ACV 703-0630-3-MB	587	270	8.80	800+600	590
ACV 703-1000-3-MB	933	400	11.60	600+600+600+800	1250
ACV 703-1600-3-MB	1490	690	17.50	600+600+600+800+600	1380
500 V (440, 460V)					
ACV 703-0050-5-M	46	40	0.29	400	140
ACV 703-0080-5-M	73	40	0.46	400	140
ACV 703-0125-5-M	116	90	0.72	400	160
ACV 703-0200-5-M	186	90	1.15	400	200
ACV 703-0315-5-M	290	270	2.50	800	270
ACV 703-0500-5-M	458	270	4.50	600+600	410
ACV 703-0800-5-M	734	270	7.80	800+600	530
ACV 703-1250-5-M	1160	400	10.00	600+600+600+600	1090
ACV 703-2000-5-M	1860	770	14.40	600+600+600+800	1250
ACV 703-0500-5-MB	458	270	5.30	600+600	470
ACV 703-0800-5-MB	734	270	9.10	800+600	590
ACV 703-1250-5-MB	1160	400	12.00	600+600+600+800	1250
ACV 703-2000-5-MB	1860	770	18.40	600+600+600+800+600	1380
690 V (575, 660V)					
ACV 703-0160-6-MB	149	90	0.70	400	200
ACV 703-0250-6-MB	233	90	1.15	800	270
ACV 703-0400-6-MB	373	270	3.10	600+600	430
ACV 703-0630-6-MB	587	270	5.50	600+600	510
ACV 703-1000-6-MB	933	270	9.40	800+800	590
ACV 703-1600-6-MB	1490	400	12.50	600+600+600+800	1250
ACV 703-2500-6-MB	2330	770	19.40	600+600+600+800+600	1380

Following table shows the modules used in the ACV 703 diode incomer sections.

Type Designation **400V** (380, 415V)	**ACV 709S**	**SAFUL**	**SAFUC**	**SAFUD**	**SAFUB**
ACV 703-0040-3M	0040-3				
ACV 703-0063-3M	0063-3				
ACV 703-0100-3M	0100-3				
ACV 703-0160-3M	0160-3				
ACV 703-0250-3M		250F415	500F500		
ACV 703-0400-3M		400F415	500F500		
ACV 703-0630-3M		630F415	800F500		
ACV 703-0630-3MB		630F415	800F500		400F415
ACV 703-1000-3M			1250F500		
ACV 703-1000-3MB			1250F500		630F415
ACV 703-1600-3M			2000F500		
ACV 703-1600-3MB			2000F500		2x630F415
500V (440, 460V)	ACV 709S	SAFUL	SAFUC	SAFUD	SAFUB
ACV 703-0050-5M	0050-5				
ACV 703-0080-5M	0080-5				
ACV 703-0125-5M	0125-5				
ACV 703-0200-5M	0200-5				
ACV 703-0315-5M		315F500	500F500		
ACV 703-0500-5M		500F500	500F500		
ACV 703-0500-5MB		500F500	500F500		315F500
ACV 703-0800-5M		800F500	800F500		
ACV 703-0800-5MB		800F500	800F500		500F500
ACV 703-1250-5M			1250F500		
ACV 703-1250-5MB			1250F500		800F500
ACV 703-2000-5M			2000F500		
ACV 703-2000-5MB			2000F500		2x800F500
690V (575, 660V)	SAFUS	SAFUL	SAFUC	SAFUD	SAFUB
ACV 703-0160-6MB	160F660				
ACV 703-0250-6MB		250F660		250F660	
ACV 703-0400-6MB		400F660	400F660		250F660
ACV 703-0630-6MB		630F660	630F660		400F660
ACV 703-1000-6MB		1000F660	1000F660		630F660
ACV 703-1600-6MB			1600F660		1000F660
ACV 703-2500-6MB			2500F660		2x1000F660

Regenerative Supply Sections

Depending on the power, the regenerative supply section may include from two to five units. The regenerative supply section consists of the contactor / breaker unit, the thyristor braking unit (X), and a required number (0 - 2) of capacitor bank units (B). The large sections also include a separate DC-choke unit (M).

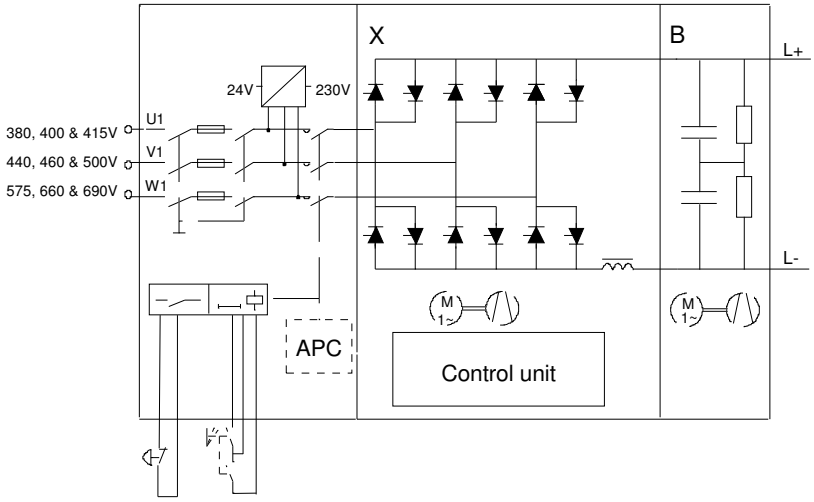


Figure 3 - 2 *Block diagram of the regenerative supply section (61133615.drw).*

Type Designation	**Motoring Power [kW]**	**Regen. Power [kVA]**	**Cooling Air Flow [l/s]**	**Heat Loss [kW]**	**Cubicle Width [mm]**	**Weight [kg]**
400 V (380, 415 V)						
ACV 704-0250-3-M	225	200	250	2.50	600+600+600	460
ACV 704-0400-3-M	360	320	250	4.50	600+600+600	480
ACV 704-0630-3-M	570	500	290	7.80	600+600+600	560
ACV 704-1000-3-M	900	810	1000	10.00	600+600+800+400	1090
ACV 704-1600-3-M	1440	1300	1290	14.40	600+600+800+600	1250
ACV 704-0630-3-MB	570	500	290	8.80	800+600+400	620
ACV 704-1000-3-MB	900	810	1000	11.60	600+600+800+800	1250
ACV 704-1600-3-MB	1440	1300	1290	17.50	600+600+800+800+400	1410
500 V (440, 460 V)						
ACV 704-0315-5-M	283	252	290	2.50	600+600+600	460
ACV 704-0500-5-M	450	400	290	4.50	600+600+600	500
ACV 704-0800-5-M	720	640	290	7.80	600+600+600	560
ACV 704-1250-5-M	1120	1010	1000	10.00	600+600+800+400	1090
ACV 704-2000-5-M	1800	1620	1370	14.40	600+600+800+600	1250
ACV 704-0500-5-MB	450	400	290	5.30	600+600+800	560
ACV 704-0800-5-MB	720	640	290	9.10	600+600+600+400	620
ACV 704-1250-5-MB	1120	1010	1000	12.00	600+600+800+800	1250
ACV 704-2000-5-MB	1800	1620	1370	18.40	600+600+800+800+400	1410
690 V (575, 660 V)						
ACV 704-0400-6-MB	360	320	290	3.10	600+600+800	460
ACV 704-0630-6-MB	570	510	290	5.50	600+600+800	560
ACV 704-1000-6-MB	900	800	290	9.40	600+600+600+400	620
ACV 704-1600-6-MB	1440	1300	1000	12.50	600+600+800+800	1250
ACV 704-2500-6-MB	2230	1980	1370	19.40	600+600+800+800+400	1410

Following table shows the modules used in the ACV 704 thyristor incomer sections.

Type Designation **400 V** (380, 415 V)	**Contactor / Breaker Unit**	**SAFUX**	**SAFUB**	**SAFUM**
ACV 704-0250-3M ACV 704-0400-3M	always	315F500 500F500		

ACV 704-0630-3M	consist	800F500		
ACV 704-0630-3MB	of	800F500	400F415	
ACV 704-1000-3M	discrete	2000F/A500		2000F660
ACV 704-1000-3MB	components	2000F/A500	630F415	2000F660
ACV 704-1600-3M		2000F/A500		2500F660
ACV 704-1600-3MB		2000F/A500	2x630F415	2500F660
500 V (440, 460 V)				
ACV 704-0315-5M		315F500		
ACV 704-0500-5M		500F500		
ACV 704-0500-5MB	always	500F500	315F500	
ACV 704-0800-5M	consist	800F500		
ACV 704-0800-5MB	of	800F500	500F500	
ACV 704-1250-5M	discrete	2000F/A500		2000F660
ACV 704-1250-5MB	components	2000F/A500	800F500	2000F660
ACV 704-2000-5M		2000F/A500		2500F660
ACV 704-2000-5MB		2000F/A500	2x800F500	2500F660
690 V (575, 660 V)				
ACV 704-0400-6MB	always	400F660	250F660	
ACV 704-0630-6MB	consist	630F660	400F660	
ACV 704-1000-6MB	of	1000F660	630F660	
ACV 704-1600-6MB	discrete	2500F/A660	1000F660	2000F660
ACV 704-2500-6MB	components	2500F/A660	2x1000F660	2500F660

Resistor Braking Sections

A standard supply section can brake only by using losses of the ACV 700 and the motor. The braking power can be increased by means of a Resistor Braking Section. The Resistor Braking Section is composed of the Braking Chopper Unit (K) and the Braking Resistor Unit (R), if specified. R in the type designation indicates that the resistor unit is included in the resistor braking section.

The Braking Chopper Unit is protected against short circuit by fuses. The fuses should be of UR-type. The nominal voltage for the fuses should be 660 V for 500 V chopper, and 1000 V for 690 V chopper.

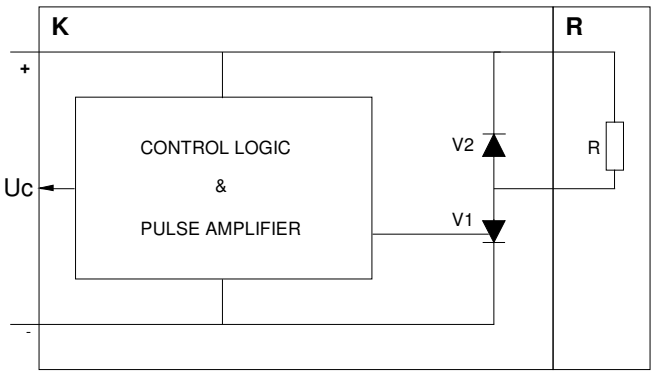


Figure 3 - 3 *Block diagram of the Resistor Braking Section (61133623.drw)*

Resistor Braking Sections						
Type Designation	**SAFUK**	**SAFUR**	**Resistance [Ω]**	**Maximum Braking Power [kW]**	**Fuse [A]**	**Cubicle Width [mm]**

400 V (380, 415 V)				380V	400V	415V		
ACV 702-0063-3-MR	80F500	63F380	4.00	63	63	63	100	400
ACV 702-0100-3-MR	125F500	100F380	2.67	100	100	100	160	400
ACV 702-0160-3-MR	200F500	160F380	1.78	160	160	160	250	400
ACV 702-0063-3-M	80F500	-	4.00(1	63(1	63(1	63(1	100	400
ACV 702-0100-3-M	125F500	-	2.67(1	100(1	100(1	100(1	160	400
ACV 702-0160-3-M	200F500	-	1.78(1	160(1	160(1	160(1	250	400
500 V (440, 460 V)				440V	460V	500V		
ACV 702-0080-5-MR	80F500	80F500	6.00	70	75	80	100	400
ACV 702-0125-5-MR	125F500	125F500	4.00	110	115	125	160	400
ACV 702-0200-5-MR	200F500	200F500	2.67	175	180	200	250	400
ACV 702-0080-5-M	80F500	-	6.00(1	70(1	75(1	80(1	100	400
ACV 702-0125-5-M	125F500	-	4.00(1	110(1	115(1	125(1	160	400
ACV 702-0200-5-M	200F500	-	2.67(1	175(1	180(1	200(1	250	400
690 V (575, 660 V)				575V	660V	690V		
ACV 702-0100-6-MR	100F660	2x63F380	8.00	90	100	110	100	400
ACV 702-0160-6-MR	160F660	2x100F380	5.33	140	160	165	160	400
ACV 702-0250-6-MR	250F660	2x160F380	3.56	210	250	260	250	400+400
ACV 702-0100-6-M	100F660	-	8.00(1	90(1	100(1	110(1	100	400
ACV 702-0160-6-M	160F660	-	5.33(1	140(1	160(1	165(1	160	400
ACV 702-0250-6-M	250F660	-	3.56(1	210(1	250(1	260(1	250	400

(1 With suitable braking resistor

Description of the Supply Units

Line Supply Unit (S)

The Line Supply Unit (S) includes equipment for connecting the drive to the mains: disconnector, fuses, main contactor, auxiliary voltage supply, and auxiliary contactor and charging resistors. The contactor unit control and supervision card SAFT 136 CTS controls the contactor.

A diode bridge and a DC-choke are also included.

	Unit Dimensions (without cubicle)				
Type Designation	**Power [kVA]**	**Width [mm]**	**Depth [mm]**	**Height [mm]**	**Weight [kg]**
400 V (380, 415V)					
ACV 709S-0040-3	40	290	380	1030	56
ACV 709S-0063-3	63	290	380	1030	62
ACV 709S-0100-3	100	290	380	1030	84
ACV 709S-0160-3	160	340	485	1515	125
500 V (440, 460V)					
ACV 709S-0050-5	50	290	380	1030	56
ACV 709S-0080-5	80	290	380	1030	62
ACV 709S-0125-5	125	290	380	1030	84
ACV 709S-0200-5	200	340	485	1515	125
690 V (575, 660V)					
SAFUS 160F660	160	340	485	1515	125

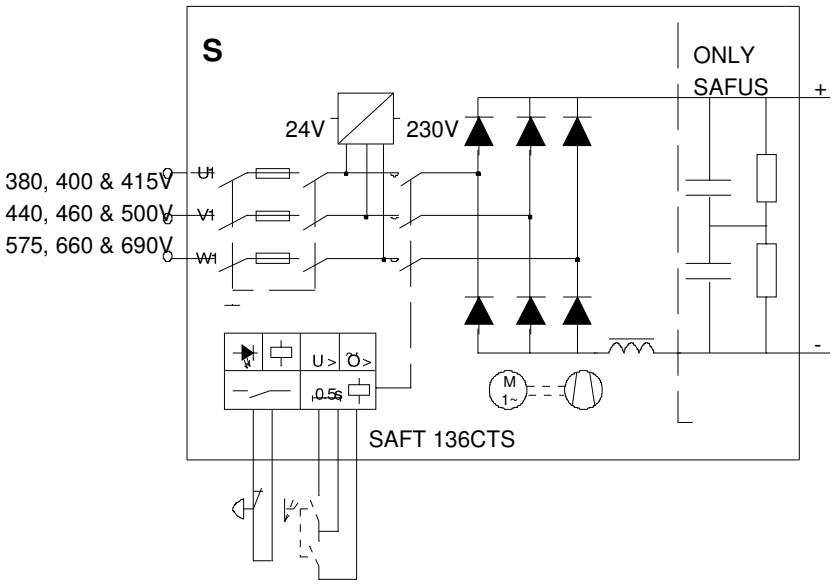


Figure 3 - 4 *Block diagram of the Line Supply Unit (S).(61134085.drw)*

Contactor Unit (L)

The Contactor Unit (L) includes equipment for connecting the drive to the distributing mains: disconnector, fuses, main contactor, auxiliary voltage supply, and auxiliary contactor and charging resistors. The contactor unit control and supervision card SAFT 136 CTS controls the charging and main contactor.

	Unit Dimensions (without cubicle)				
Type Designation	**Power [kVA]**	**Width [mm]**	**Depth [mm]**	**Height [mm]**	**Weight [kg]**
400V (380, 415V)					
SAFUL 250F415	250	445	485	1700	75
SAFUL 400F415	400	445	485	1800	100
SAFUL 630F415	630	744	500	1800	195
SAFUL 1000F415	1000	1)	1)	1)	1)
SAFUL 1600F415	1600	1)	1)	1)	1)
500V (440, 460V)					
SAFUL 315F500	315	445	485	1700	75
SAFUL 500F500	500	445	485	1800	100
SAFUL 800F500	800	744	500	1800	195
SAFUL 1250F500	1250	1)	1)	1)	1)
SAFUL 2000F500	2000	1)	1)	1)	1)
690V (575, 660V)					
SAFUL 250F660	250	445	485	1700	75
SAFUL 400F660	400	445	485	1700	75
SAFUL 630F660	630	445	485	1800	100
SAFUL 1000F660	1000	744	500	1800	195
SAFUL 1600F660	1600	1)	1)	1)	1)
SAFUL 2500F660	2500	1)	1)	1)	1)

1) Not a module

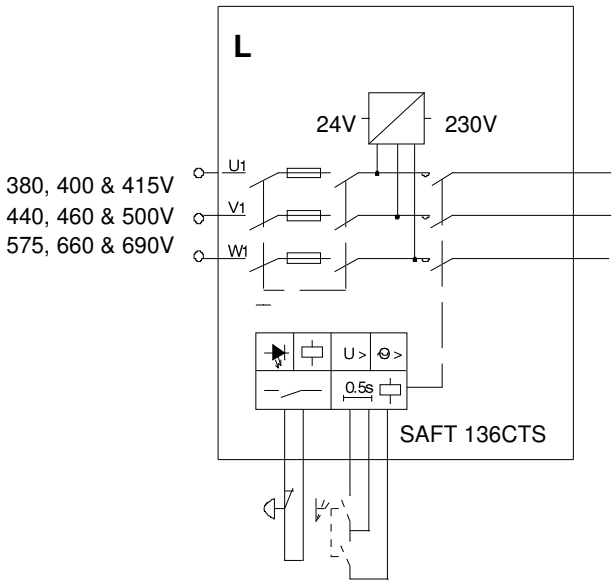


Figure 3 - 5 *Block diagram of the Contactor Unit (L). (61134239.drw)*

Line Converter Unit (C)

The Line Converter Unit (C) and the electrical mains form the d.c. source of the frequency converter. The d.c. source is connected to the intermediate circuit through a d.c. choke. The diode bridge is equipped with single-side cooled press-pack diodes for the 250 - 400 kVA power range. Larger units have double-side cooled press-pack diodes.

The Line Converter Units (C) can be used either in 6-pulse or 12-pulse configuration. Twelve-pulse configuration consists of a pair of 6-pulse units (supply or line converter unit) with a 30° phase difference at the input generated by means of a special transformer or by means of two separate transformers.

Six-Pulse Diode Rectifier

	Unit Dimensions (without cubicle)				
Type Designation	**Power [kVA]**	**Width [mm]**	**Depth [mm]**	**Height [mm]**	**Weight [kg]**
500 V (440, 460 V) 1)					
SAFUC 500F500	500	230	498	1770	112
SAFUC 800F500	800	230	498	1770	112
SAFUC 1250F500	1250	270	498	1770	135
SAFUC 2000F500	2000	400	575	1770	320
690 V (575, 660 V)					
SAFUC 250F660	250	230	583	1825	92
SAFUC 400F660	400	230	498	1770	105
SAFUC 630F660	630	270	498	1770	135
SAFUC 1000F660	1000	270	498	1770	135
SAFUC 1600F660	1600	270	498	1770	135
SAFUC 2500F660	2500	400	575	1770	340

1) 500 V units are also used in 400 V sections.

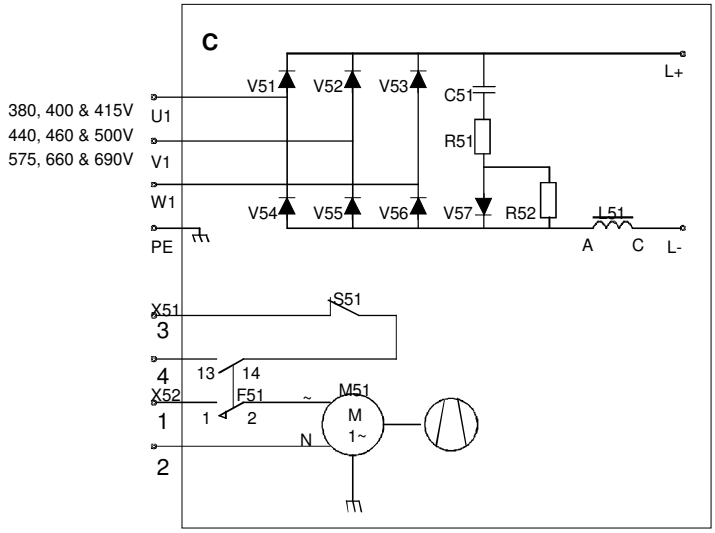


Figure 3 - 6 *Block diagram of the Line Converter Unit (C) (61134247.drw).*

Twelve-Pulse Diode Rectifier

Benefits of a 12-pulse Line Converter Unit compared to a 6-pulse Line Converter Unit:

- Reduced harmonics, e.g. the fifth and seventh harmonics are not present.
- Compared to the 6-pulse, the power output is doubled by using the same diodes in a 12-pulse connection.

			Unit Dimensions (without cubicle)		
Type Designation (rectifier id)	**Rectifier Power [kVA]**	**Width [mm]**	**Depth [mm]**	**Height [mm]**	**Weight [kg]**
400 V (380, 415 V)					
2xACV 709S-0063-3	2x63	2x290	380	1030	2x62
2xACV 709S-0100-3	2x100	2x290	380	1030	2x84
2xACV 709S-0160-3	2x160	2x340	485	1515	2x125
500 V (440, 460 V)					
2xACV 709S-0080-5	2x80	2x290	380	1030	2x62
2xACV 709S-0125-5	2x125	2x290	380	1030	2x84
2xSAFUC 500F500	2x500	2x230	498	1770	2x112
2xSAFUC 800F500	2x800	2x230	498	1770	2x112
2xSAFUC 1250F500	2x1250	2x270	498	1770	2x135
690 V (575, 660 V)					
2xSAFUC 250F660	2x250	2x230	583	1825	2x92
2xSAFUC 400F660	2x400	2x230	498	1770	2x105
2xSAFUC 630F660	2x630	2x270	498	1770	2x135
2xSAFUC 1000F660	2x1000	2x270	498	1770	2x135
2xSAFUC 1600F660	2x1600	2x270	498	1770	2x135

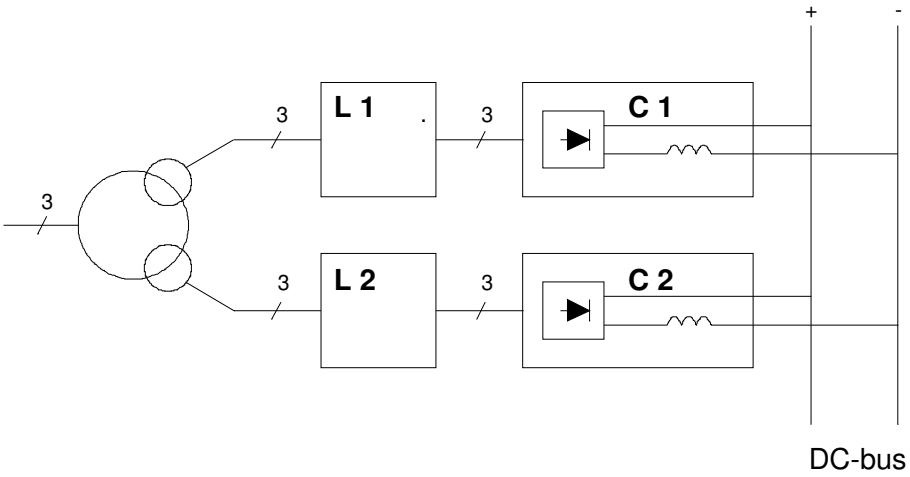


Figure 3 - 7 *Block diagram of the 12-pulse Line Converter Unit (61135537.drw).*

Thyristor Braking Unit (X)

The Thyristor Braking Unit (X) includes two anti-parallel 6-pulse thyristor bridges with control circuits. Modules up to 800 kVA at 500 V and 1000 kVA at 690 V include a d.c. choke. The larger SAFUX units are to be equipped with SAFUM DC-Choke Unit (M). The Thyristor Braking Unit is used to implement regenerative braking and it then replaces the Line Converter Unit (C).

		Unit Dimensions (without cubicle)			
Type Designation	**Power [kVA]**	**Width [mm]**	**Depth [mm]**	**Height [mm]**	**Weight [kg]**
500 V (440,460 V) 2)					
SAFUX 315F500	315	400	492	1770	160
SAFUX 500F500	500	400	492	1770	160
SAFUX 800F500	800	400	492	1770	175
SAFUX 2000F/A500	2000	1)	1)	1)	1)
690 V (575, 660 V)					
SAFUX 400F660	400	400	492	1770	160
SAFUX 630F660	630	400	492	1770	190
SAFUX 1000F660	1000	400	492	1770	190
SAFUX 2500F/A660	2500	1)	1)	1)	1)

1) Not supplied as a module
2) 500 V units are also used in 400 V sections

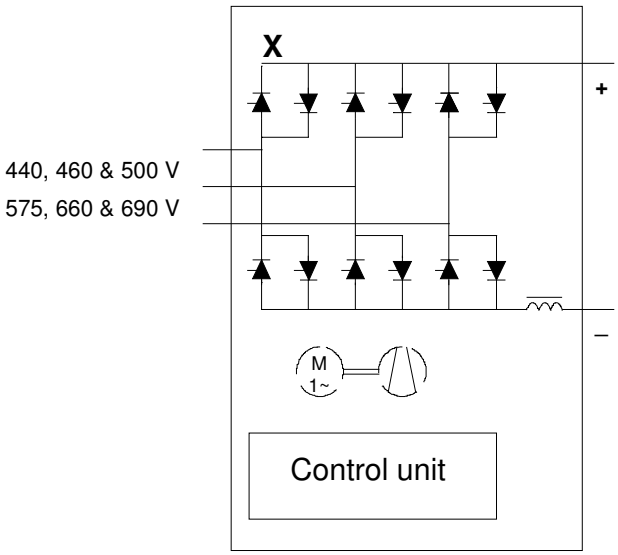


Figure 3 - 8 *Block diagram of the Thyristor Braking Unit (X) (61135758.drw).*

DC-Choke Unit (M)

Type Designation	Unit Dimensions (without cubicle) Width [mm]	Depth [mm]	Height [mm]	Weight [kg]
690 V (575, 660V) 1)				
SAFUM 2000F660	400	575	1750	290
SAFUM2500F660	400	575	1750	310

1) 690 V units are also used in 400 V and 500 V sections

Capacitor Bank Unit (B)

The Capacitor Bank Unit (B) includes 3.3 mF/350V or 4.7 mF/350V electrolytic capacitors connected in series and in parallel, balancing resistors and a supervision card SAFT 132 CBS. At ratings over 400 kVA, capacitors have specific fuses. The Capacitor Bank Unit (B) is designed to smooth the d.c. voltage after rectification and inversion of the motor voltage.

If the drive sections are of the IGBT-type (capacitors included), the capacitor bank unit is not needed in the supply section.

Type Designation	Unit Dimensions (without cubicle) Width [mm]	Depth [mm]	Height [mm]	Weight [kg]
400 V (380, 415 V)				
SAFUB 250F415	240	501	1825	60
SAFUB 400F415	240	501	1825	70
SAFUB 630F415	240	501	1825	81
500 V (440, 460 V)				
SAFUB 315F500	240	501	1825	60
SAFUB 500F500	240	501	1825	70
SAFUB 800F500	240	501	1825	90
690 V (575, 660 V)				
SAFUB 250F660	240	501	1825	60
SAFUB 400F660	240	501	1825	70

SAFUB 630F660	240	501	1825	81
SAFUB 1000F660	240	501	1825	90

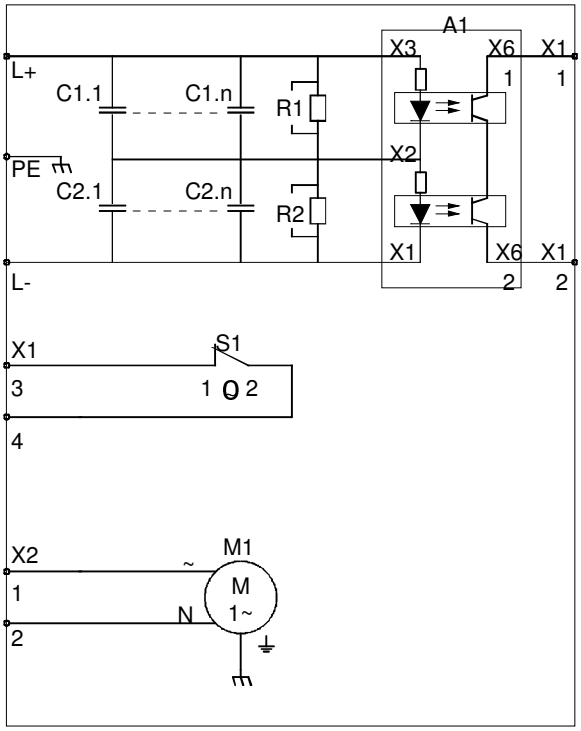


Figure 3 - 9 *Block diagram of the Capacitor Bank Unit (B) (61135774.drw).*

Braking Chopper Unit (K)

The Braking Chopper Unit (K) is controlled with its internal control board, SAFT 135 BCC or SAFT 195 BCC.

	Unit Dimensions (without cubicle)				
Type Designation	**Power [kVA]**	**Width [mm]**	**Depth [mm]**	**Height [mm]**	**Weight [kg]**
500 V (440, 460 V)					
SAFUK 80F500	80	180	270	280	6
SAFUK 125F500	125	180	270	280	6
SAFUK 200F500	200	180	270	280	6
690 V (575, 660 V)					
SAFUK 100F660	100	180	270	280	6
SAFUK 160F660	160	180	270	280	6
SAFUK 250F660	250	180	270	280	6

Braking Resistor Unit (R)

	Unit Dimensions (without cubicle)				
Type Designation	**Power [kW]**	**Width [mm]**	**Depth [mm]**	**Height [mm]**	**Weight [kg]**
400 V (380,415 V)					

SAFUR 63F380	63	300	345	600	5
SAFUR 100F380	100	300	345	600	5
SAFUR 160F380	160	300	345	1320	10
500V (440, 460 V)					
SAFUR 80F500	80	300	345	600	5
SAFUR 125F500	125	300	345	1320	10
SAFUR 200F500	200	300	345	1320	10

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Chapter 4 - Drive Sections

The drive sections of the ACV 700 are based either on IGBT or GTO power stage.

In the power range 9 - 400 kVA (400 V) and 10 - 500 kVA (500 V) the inverters are based on IGBT power stage.

In the power range 500 - 600 kVA (400 V), 630 - 2000 kVA (500 V) and 40 - 2500 kVA (690 V) the inverters are based on GTO power stage.

The connection to the DC-bus is different for IGBT and GTO power stage because the IGBT units contain the DC-capacitors. The IGBT units are therefore connected with cables via a special switch fuse to the DC-bus.

This switch fuse has three positions. Position "0" means power off. In position "C" the capacitors in the drive units are charged through the resistors R1 and R2. Position "1" means power on. The resistors mounted on the switch fuse will limit the charging current.

In the GTO units the switch fuse has only two positions: "0" means power off and "1" means power on.

IGBT Power Stage

The main parts of the inverter unit are:

- IGBT-modules
- clamping circuits
- heat sink
- mechanics
- fan
- current transducers and measurement circuits
- DC-capacitors and discharging resistors
- control unit (DDC)

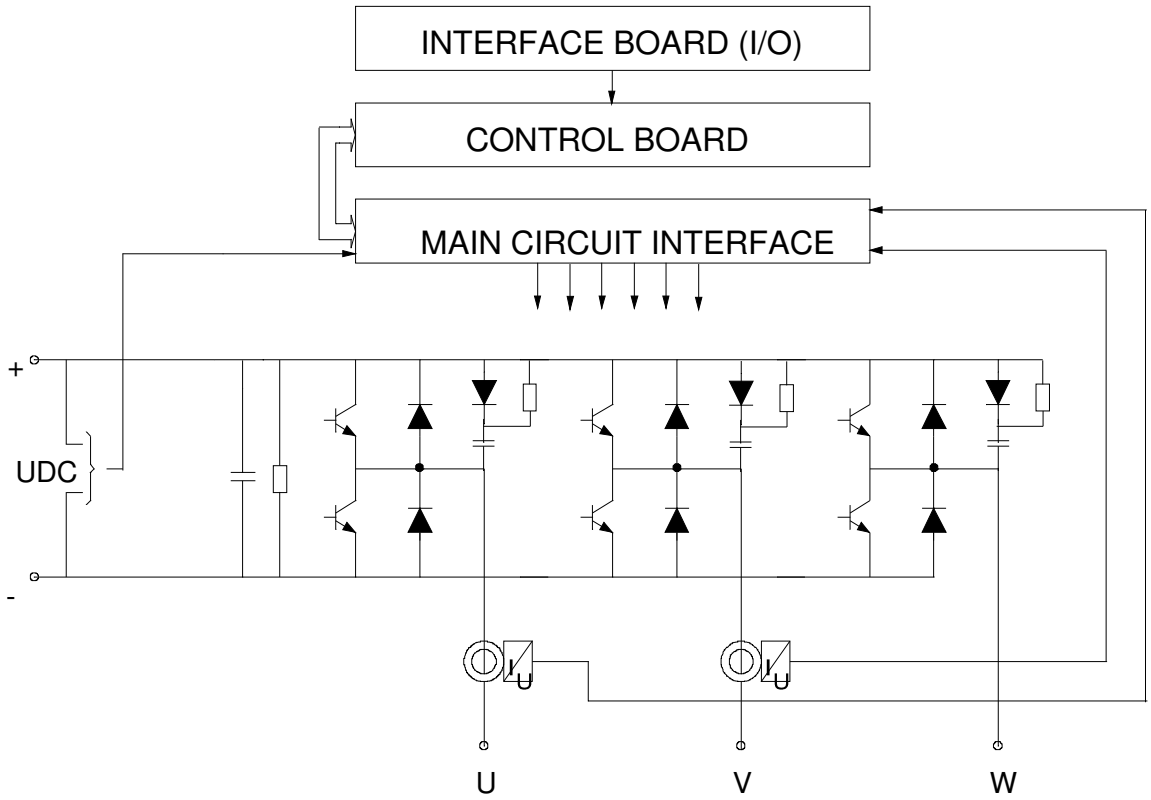

Figure 4 - 1 *Block diagram of the IGBT inverter (61135961.drw).*

		Unit Dimensions (without cubicle)			
Type Designation	**Frame Size**	**Width [mm]**	**Depth [mm]**	**Height [mm]**	**Weight [kg]**
400 V (380, 415 V)					
ACV 701-0009-3	R4	300	310	507	20
ACV 701-0016-3	R4	300	310	507	20
ACV 701-0025-3	R4	300	310	507	20
ACV 701-0050-3	R5	350	322	603	30
ACV 701-0070-3	R7	336	415	1039	69
ACV 701-0100-3	R7	336	415	1039	69
ACV 701-0150-3	R7	336	415	1039	69
ACV 701-0215-3	R9	409	445	1700	120
ACV 701-0270-3	R9	409	445	1700	120
ACV 701-0330-3	R9	409	445	1700	120
500V (440, 460V)					
ACV 701-0010-5	R4	300	310	507	20
ACV 701-0020-5	R4	300	310	507	20
ACV 701-0032-5	R4	300	310	507	20
ACV 701-0056-5	R5	350	322	603	30
ACV 701-0100-5	R7	336	415	1039	69
ACV 701-0115-5	R7	336	415	1039	69
ACV 701-0170-5	R7	336	415	1039	69
ACV 701-0260-5	R9	409	445	1700	120
ACV 701-0315-5	R9	409	445	1700	120
ACV 701-0400-5	R9	409	445	1700	120

TYPE 400 V (380, 415 V)	Nominal Current (A)	Short Overload (A)	Nominal Motor (kW)	OVERLOAD CAPACITY (A) 1) DUTY CLASS 2 Cont.	DUTY CLASS 2 150% 1 min	DUTY CLASS 3 Cont.	DUTY CLASS 3 150% 2 min	DUTY CLASS 3 200% 10 s	DUTY CLASS 4 Cont.	DUTY CLASS 4 125% 2 h	DUTY CLASS 4 200% 10 S
ACV 701-0009-3M	13	19	5.5	13	19	10	14	19	10	12	19
ACV 701-0016-3M	24	27	11.0	18	27	14	20	27	14	17	27
ACV 701-0025-3M	38	47	18.5	31	47	24	35	47	24	29	47
ACV 701-0050-3M	76	93	37.0	62	93	47	70	93	47	58	93
ACV 701-0070-3M	112	129	55.0	86	129	65	97	129	65	81	129
ACV 701-0100-3M	147	168	75.0	112	168	84	126	168	84	105	168
ACV 701-0150-3M	215	265	110.0	177	265	133	199	265	133	166	265
ACV 701-0215-3M	315	390	160.0	260	390	195	293	390	195	244	390
ACV 701-0270-3M	395	475	200.0	317	475	238	356	475	238	297	475
ACV 701-0330-3M	480	590	250.0	393	590	295	443	590	295	369	590

1) The time between two consecutive load peaks should be at least 10 minutes

TYPE 400 V (380, 415 V)	Dimensions Cubicle Width (mm)	Dimensions Weight (kg)	Frame Size	Auxil. Current (A)	COOLING Air Flow (dm^3/s)	COOLING Heat loss (kW)
ACV 701-0009-3M	400[2,3)]	100-145	R4	0.4	113	0.14
ACV 701-0016-3M	400[2,3)]	100-145	R4	0.4	113	0.24
ACV 701-0025-3M	400[3)]	100-145	R4	0.4	113	0.38
ACV 701-0050-3M	400[3)]	125-160	R5	0.5	142	0.75
ACV 701-0070-3M	400	180	R7	1.0	165	1.05
ACV 701-0100-3M	400	180	R7	1.0	165	1.50
ACV 701-0150-3M	400	180	R7	1.0	165	2.25
ACV 701-0215-3M	800,[4)]	265	R9	1.9	365	3.23
ACV 701-0270-3M	800,[4)]	265	R9	1.9	365	4.05
ACV 701-0330-3M	800,[4)]	265	R9	1.9	365	4.95

2) 600 mm, if 3 units in one cabinet
3) 600 mm, if 2 units in one cabinet
4) 600 mm, if the application controller APC is not in the same cabinet

TYPE 500 V (440, 460 V)	Nominal Current (A)	Short Overload (A)	Nominal Motor (kW)	OVERLOAD CAPACITY (A) 1) DUTY CLASS 2 Cont.	DUTY CLASS 2 150% 1 min	DUTY CLASS 3 Cont.	DUTY CLASS 3 150% 2 min	DUTY CLASS 3 200% 10 s	DUTY CLASS 4 Cont.	DUTY CLASS 4 125% 2 h	DUTY CLASS 4 200% 10 S
ACV 701-0010-5M	13	19	7.5	13	19	10	14	19	10	12	19
ACV 701-0020-5M	24	27	15.0	18	27	14	20	27	14	17	27
ACV 701-0032-5M	38	47	22.0	31	47	24	35	47	24	29	47
ACV 701-0056-5M	65	87	37.0	58	87	44	65	87	44	54	87
ACV 701-0100-5M	112	126	75.0	84	126	63	95	126	63	79	126
ACV 701-0115-5M	135	168	90.0	112	168	84	126	168	84	105	168
ACV 701-0170-5M	200	246	132.0	164	246	123	185	246	123	154	246
ACV 701-0260-5M	300	360	200.0	240	360	180	270	360	180	225	360
ACV 701-0315-5M	365	450	250.0	300	450	225	338	450	225	281	450
ACV 701-0400-5M	460	545	315.0	363	545	273	409	545	273	341	545

1) The time between two consecutive load peaks should be at least 10 minutes

TYPE 500 V (440, 460 V)	Dimensions Cubicle Width (mm)	 Weight (kg)	Frame Size	Auxil. Current (A)	COOLING Air Flow (dm^3/s)	 Heat loss (kW)
ACV 701-0010-5M	400,[2,3)]	100-145	R4	0.4	113	0.15
ACV 701-0020-5M	400,[3)]	100-125	R4	0.4	113	0.30
ACV 701-0032-5M	400,[3)]	100-125	R4	0.4	113	0.48
ACV 701-0056-5M	400,[3)]	125-160	R5	0.5	142	0.84
ACV 701-0100-5M	400	180	R7	1.0	165	1.50
ACV 701-0115-5M	400	180	R7	1.0	165	1.73
ACV 701-0170-5M	400	180	R7	1.0	165	2.55
ACV 701-0260-5M	800,[4)]	265	R9	1.9	365	3.90
ACV 701-0315-5M	800,[4)]	265	R9	1.9	365	4.73
ACV 701-0400-5M	800,[4)]	265	R9	1.9	365	6.00

2) 600 mm, if 3 units in one cabinet
3) 600 mm, if 2 units in one cabinet
4) 600 mm, if the application controller APC is not in the same cabinet

GTO Power Stage

The units are like SAMI STAR modules except the control system, dimensioning of GTOs and current transducers.

The main parts of the inverter unit are:

- GTOs
- snubber diodes
- heat sink
- mechanics
- fan
- chopper
- current transducers and measurement circuits
- control unit (DDC)

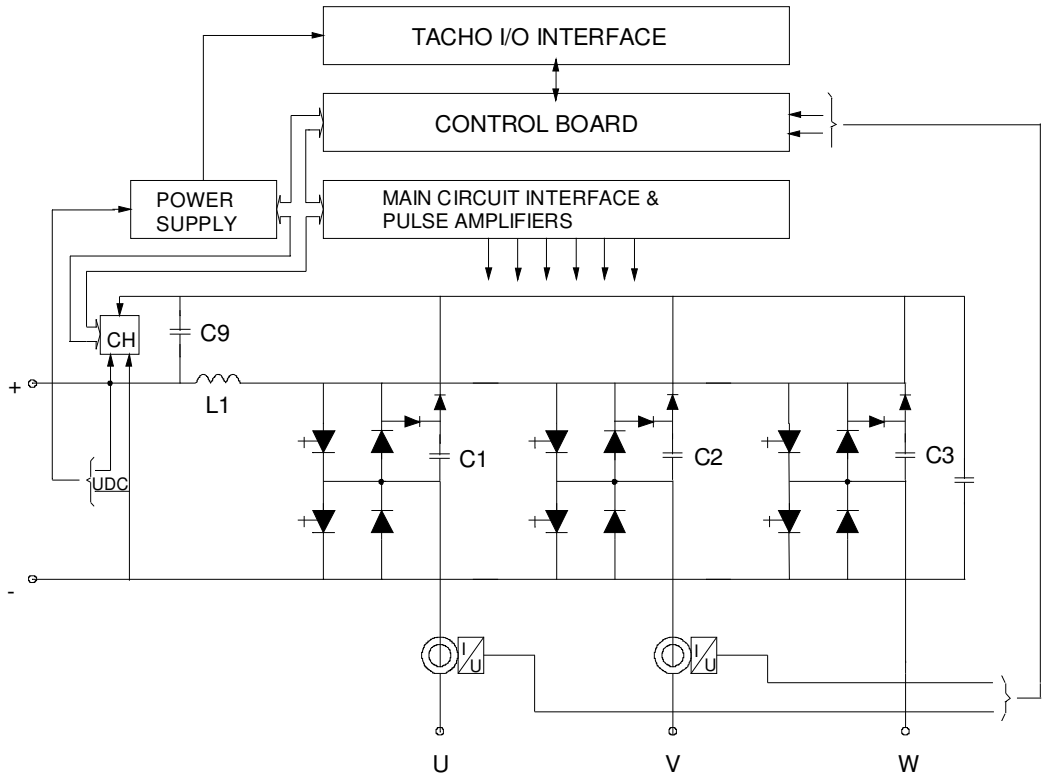

Figure 4 - 2 *Block diagram of the GTO inverter (61135952.drw).*

Type Designation	Frame Size	Unit Dimensions (without cubicle) Width [mm]	Depth [mm]	Height [mm]	Weight [kg]
400 V (380, 415 V)					
ACV 701-0400-3	RG2	450	565	1495	143
ACV 701-0500-3	RG3	550	565	1690	215
ACV 701-0640-3	RG3	550	565	1690	215
ACV 701-0800-3	RG4	748	583	1780	290
ACV 701-1210-3	2xRG3	2x550	415	1039	2x215
ACV 701-1600-3	2xRG4	2x748	583	1780	2x290
500 V (440, 460 V)					
ACV 701-0500-5	RG2	450	565	1495	143
ACV 701-0630-5	RG3	550	565	1690	215
ACV 701-0790-5	RG3	550	565	1690	215
ACV 701-1000-5	RG4	748	583	1780	290
ACV 701-1510-5	2xRG3	2x550	415	1039	2x215
ACV 701-2000-5	2xRG4	2x748	583	1780	2x290
690 V (575, 660 V)					
ACV 701-0040-6	RG1	350	485	1480	103
ACV 701-0100-6	RG1	350	485	1480	103
ACV 701-0160-6	RG1	350	480	1480	103
ACV 701-0260-6	RG1	350	480	1480	103
ACV 701-0315-6	RG1	350	480	1480	103
ACV 701-0420-6	RG1	350	480	1480	103
ACV 701-0500-6	RG2	450	565	1495	143
ACV 701-0630-6	RG2	450	565	1495	143
ACV 701-0800-6	RG3	550	565	1690	215
ACV 701-1040-6	RG3	550	565	1690	215
ACV 701-1370-6	RG4	748	583	1780	290
ACV 701-2000-6	2xRG3	2x550	565	1495	2x215
ACV 701-2500-6	2xRG4	2x748	583	1780	2x290

				OVERLOAD CAPACITY (A) 1)							
	Nominal	Short	Nominal	DC 2		DUTY CLASS 3			DUTY CLASS 4		
TYPE 400 V (380, 415 V)	Current (A)	Overload (A)	Motor (kW)	Cont.	150% 1 min	Cont.	150% 2 min	200% 10 s	Cont.	125% 2 h	200% 10 S
ACV 701-0400-3M	610	610	315		N/A		N/A	N/A		N/A	N/A
ACV 701-0500-3M	730	920	400	613	920	460	690	920	460	575	920
ACV 701-0640-3M	920	920	500		N/A		N/A	N/A		N/A	N/A
ACV 701-0800-3M	1150	1265	630	843	1265	633	949	1265	633	791	1265
ACV 701-1210-3M	1740	1740	900		N/A		N/A	N/A		N/A	N/A
ACV 701-1600-3M	2300	2300			N/A		N/A	N/A		N/A	N/A

1) The time between two consecutive load peaks should be at least 10 minutes

	Dimensions		Frame	Auxil.	COOLING	
TYPE 400 V (380, 415 V)	Cubicle Width (mm)	Weight (kg)	Size	Current (A)	Air Flow (dm^3/s)	Heat loss (kW)
ACV 701-0400-3M	600+400	300	RG2	3.5	480	6.00
ACV 701-0500-3M	600+400	450	RG3	3.5	520	7.50
ACV 701-0640-3M	600+400	450	RG3	3.5	520	9.60
ACV 701-0800-3M	800+600	550	RG4	7.0	1000	12.0
ACV 701-1210-3M	2x(600+400)	900	2xRG3	7.0	1040	18.0
ACV 701-1600-3M	2x(800+600)	1150	2xRG4	14.0	2000	24.0

TYPE 500 V (440, 460 V)	Nominal Current (A)	Short Overload (A)	Nominal Motor (kW)	OVERLOAD CAPACITY (A) 1) DC 2 Cont.	DC 2 150% 1 min	DUTY CLASS 3 Cont.	DUTY CLASS 3 150% 2 min	DUTY CLASS 3 200% 10 s	DUTY CLASS 4 Cont.	DUTY CLASS 4 125% 2 h	DUTY CLASS 4 200% 10 S
ACV 701-0500-5M	610	610	400		N/A		N/A	N/A		N/A	N/A
ACV 701-0630-5M	730	920	500	613	920	460	690	920	460	575	920
ACV 701-0790-5M	920	920	630		N/A		N/A	N/A		N/A	N/A
ACV 701-1000-5M	1150	1265	800	843	1265	633	949	1265	633	791	1265
ACV 701-1510-5M	1740	1740			N/A		N/A	N/A		N/A	N/A
ACV 701-2000-5M	2300	2300			N/A		N/A	N/A		N/A	N/A

1) The time between two consecutive load peaks should be at least 10 minutes

TYPE 500 V (440, 460 V)	Dimensions Cubicle Width (mm)	Dimensions Weight (kg)	Frame Size	Auxil. Current (A)	COOLING Air Flow (dm^3/s)	COOLING Heat loss (kW)
ACV 701-0500-5M	600+400	300	RG2	3.5	480	7.50
ACV 701-0630-5M	600+400	450	RG2	3.5	520	9.50
ACV 701-0790-5M	600+400	450	RG3	3.5	520	11.9
ACV 701-1000-5M	800+600	550	RG4	7.0	1000	15.0
ACV 701-1510-5M	2x(600+400)	900	2xRG3	7.0	1040	22.7
ACV 701-2000-5M	2x(800+600)	1150	2xRG4	14.0	2000	30.0

TYPE 690 V (575, 660 V)	Nominal Current (A)	Short Overload (A)	Nominal Motor (kW)	OVERLOAD CAPACITY (A) 1) DC 2 Cont.	DC 2 150% 1 min	DUTY CLASS 3 Cont.	DUTY CLASS 3 150% 2 min	DUTY CLASS 3 200% 10 s	DUTY CLASS 4 Cont.	DUTY CLASS 4 125% 2 h	DUTY CLASS 4 200% 10 S
ACV 701-0040-6M	35	53	37	35	53	27	40	53	27	33	53
ACV 701-0100-6M	88	132	75	88	132	66	99	132	66	83	132
ACV 701-0160-6M	140	210	132	140	210	105	158	210	105	131	210
ACV 701-0260-6M	220	220	200		N/A		N/A	N/A		N/A	N/A
ACV 701-0315-6M	275	350	250	233	350	175	263	350	175	219	350
ACV 701-0420-6M	350	350	315		N/A		N/A	N/A		N/A	N/A
ACV 701-0500-6M	440	580	400	387	580	290	435	580	290	363	580
ACV 701-0630-6M	580	580	500		N/A		N/A	N/A		N/A	N/A
ACV 701-0800-6M	670	870	630	580	570	435	653	870	435	544	870
ACV 701-1040-6M	870	870	800		N/A		N/A	N/A		N/A	N/A
ACV 701-1370-6M	1200	1200	1000		N/A		N/A	N/A		N/A	N/A
ACV 701-2000-6M	1650	1650			N/A		N/A	N/A		N/A	N/A
ACV 701-2500-6M	2190	2190			N/A		N/A	N/A		N/A	N/A

1) The time between two consecutive load peaks should be at least 10 minutes

TYPE 690 V (575, 660 V)	Dimensions Cubicle Width (mm)	Dimensions Weight (kg)	Frame Size	Auxil. Current (A)	COOLING Air Flow (dm^3/s)	COOLING Heat loss (kW)
ACV 701-0040-6M	600	190	RG1	0.8	180	0.60
ACV 701-0100-6M	600	190	RG1	0.8	180	1.50
ACV 701-0160-6M	600	205	RG1	0.8	180	2.40
ACV 701-0260-6M	600	205	RG1	0.8	180	3.90
ACV 701-0315-6M	600	205	RG1	1.4	280	4.70
ACV 701-0420-6M	600	205	RG1	1.4	280	6.30
ACV 701-0500-6M	600+400	300	RG2	3.5	480	7.50
ACV 701-0630-6M	600+400	300	RG2	3.5	480	9.50
ACV 701-0800-6M	600+400	450	RG2	3.5	520	12.0
ACV 701-1040-6M	600+400	450	RG3	3.5	520	15.6
ACV 701-1370-6M	800+600	550	RG4	7.0	1000	20.6
ACV 701-2000-6M	2x(600+400)	900	2xRG3	7.0	1040	30.0
ACV 701-2500-6M	2x(800+600)	1150	2xRG4	14.0	2000	38.0

Parallel-Connected Inverter Units

Control of the parallel-connected inverter units is based on a master/slave principle. The parallel-connected construction is possible with the largest GTO-inverter types only.

The interface board and the control board are in the master unit. The external connection are the same as in a single ACV 701 inverter. The master drive requires a SNAT 620 PCB parallel connection board.

Parallel connection requires a special motor with two identical and separate stator windings.

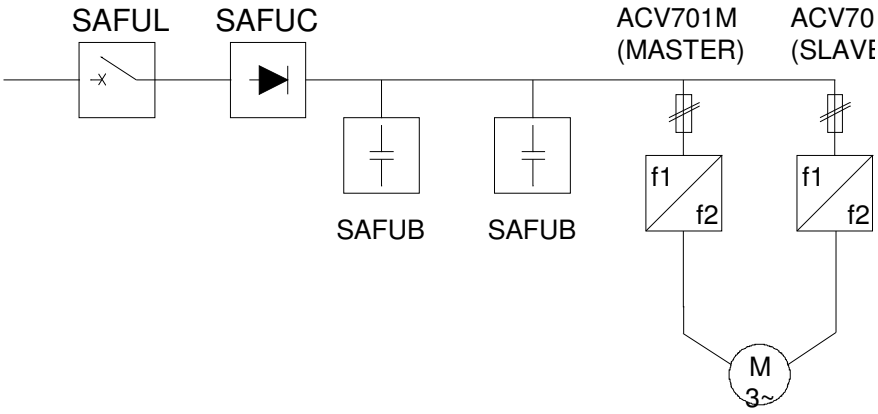

Figure 4 - 3 *Block diagram of parallel-connected inverter units (61135979.drw).*