TYRAK LCI
Converter control programs
CL1201XX

User's Manual

Edition 2

Reg. nr. 3ASD 4890 04C 1072

ABB Industrial
Systems

ASEA BROWN BOVERI

Contents **page**

Introduction

This description covers converter control programs used in Tyrak LCI large a.c. drive systems.

The CL12 control program is used to handle a 12-pulse series connected line converter.
The control program is executed in the Tyrak LCI converter control unit and communicates with the overriding drive control unit via dual channel opto serial link.

The converter control program includes following functions:

- Current and voltage measurement.
- EMF- calculation
- EMF reference calculation
- High utilisation control
- Optimal machine converter firing control
- Torque direction
- Armature current control.
- Speed dependant rate-of-change limiter
- Current commutating ability supervisor and limiter
- Firing angle limitation.
- Firing angle control
- Protective and monitoring functions.
- Diagnostic system and fault indication.
- Communication interface including I/O and an opto serial link communication.

The control program described in this manual are designated as follows, example: CL1201XX.

- CL12 represents the program functionality.
- 01 is a version index.
- XX is a revision index.

A change of version will result in new documentation.
A revision does not affect the documentation.

About this document

This User's Manual includes:
- Block diagram.
- Description of software functions.
- List of parameters.
- List of signals.
- Program Diagram (PD).

Program diagram, PD

The program is built up by a number of function modules. The program diagram (PD), describes all function modules in detail. The modules are executed in a predetermined order which is the same as the order of appearance in the program diagram. The lay-out of the program diagram is that all signals go from left to right.

Signals written with capital letters can be displayed on the operator's panel or on a terminal screen. Signal names within brackets, e.g. (IDMVF), can only be displayed on a terminal screen. Signal names written with lower case letters in the program diagram are internal (can not be read).

The program is all digital and therefore parts of the program (elements) are executed at different sample times. The sample times are as follows:

Ts	Sample time (ms)
I1	2.8 (60 Hz), 3.3 (50 Hz)
T1	10
T2	20
T3	40
T4	80
BG	background
INIT	at start up

Circuit diagram, CD

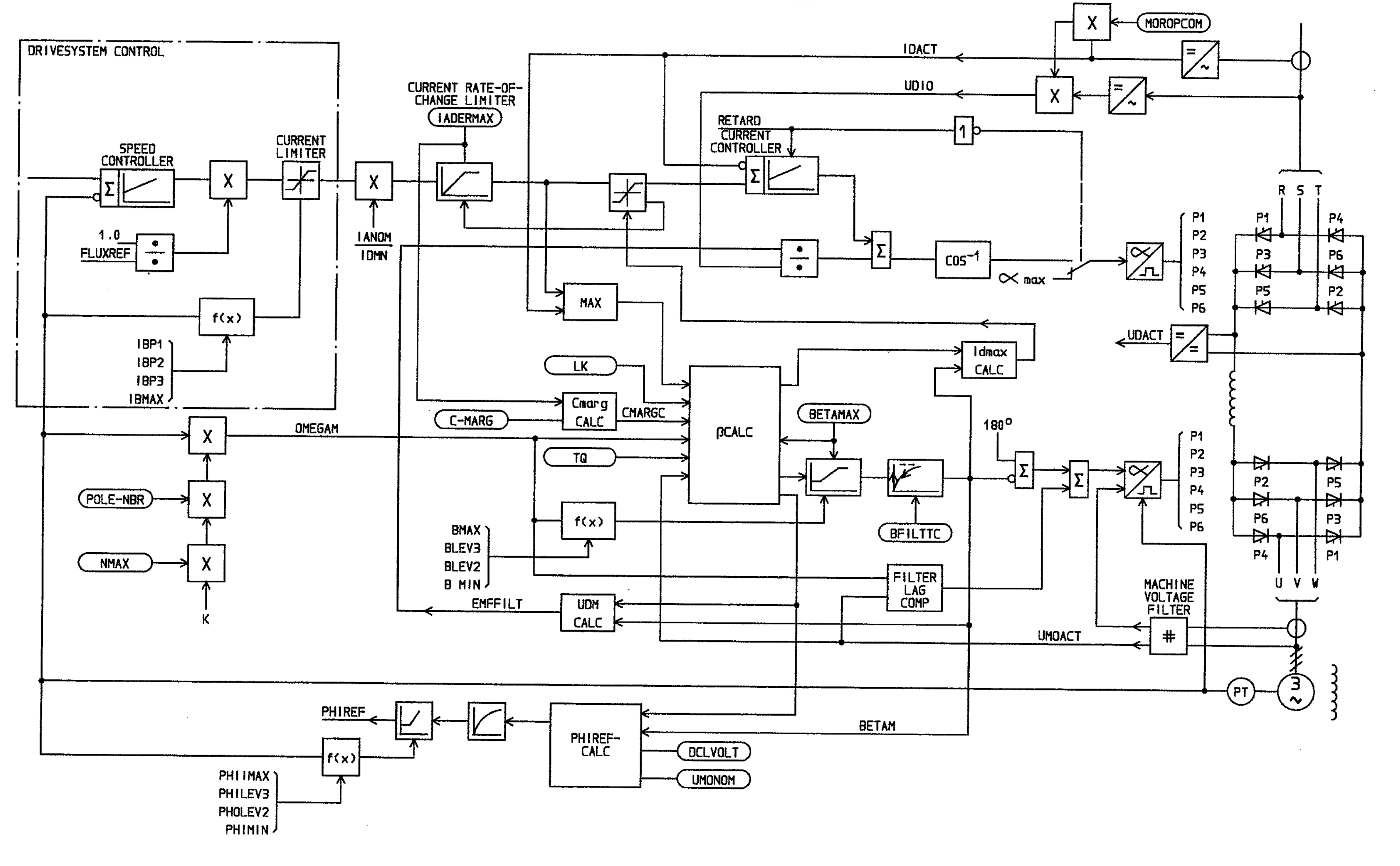
A circuit diagram is included in each delivery, showing the exact configuration of the hardware circuits.

The circuit diagram has a functional layout, with orders going from left to right and acknowledgement signals going in the opposite direction.

Block diagram

The block diagram describes the most essential parts of the program. The purpose of the diagram is to show the connection of the main modules and signals. The block diagram has a functional layout, with orders going left to right and acknowledgement signals going in the opposite direction.

LCI MACHINE CONVERTER CONTROL



Prepared	94 02 03	S SVENSSON	
Approved	94 02 03	H POURFALAH	
PROGRAM DIAGRAM			
ABB Drives	Resp dept ISY/DPT	3ASD 489306C468	Lang EN, Sheet 1, Cont 2

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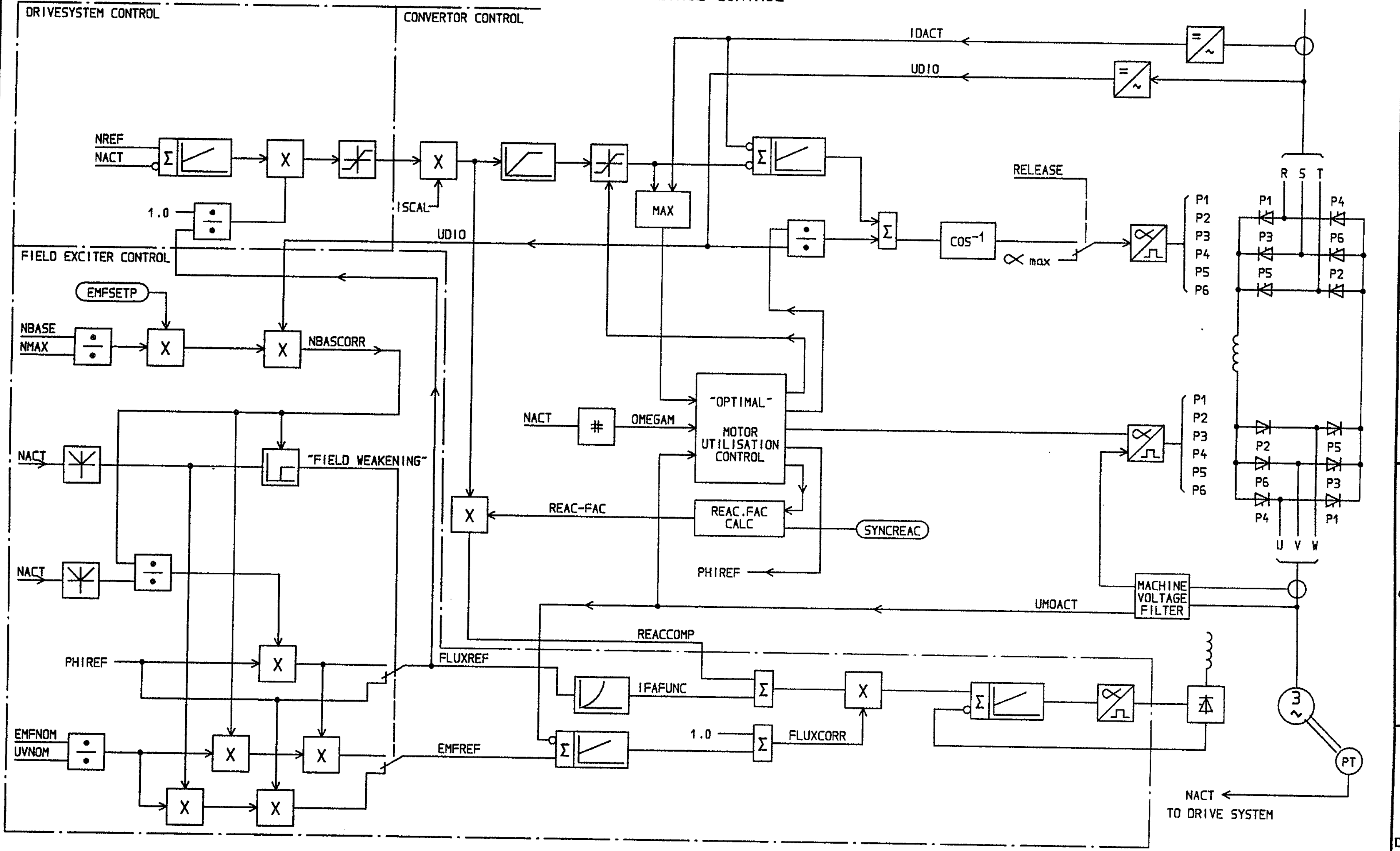
LCI MOTORVOLTAGE CONTROL



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Approved	94 02 03	H POURFALAH

PROGRAM DIAGRAM

ABB Drives

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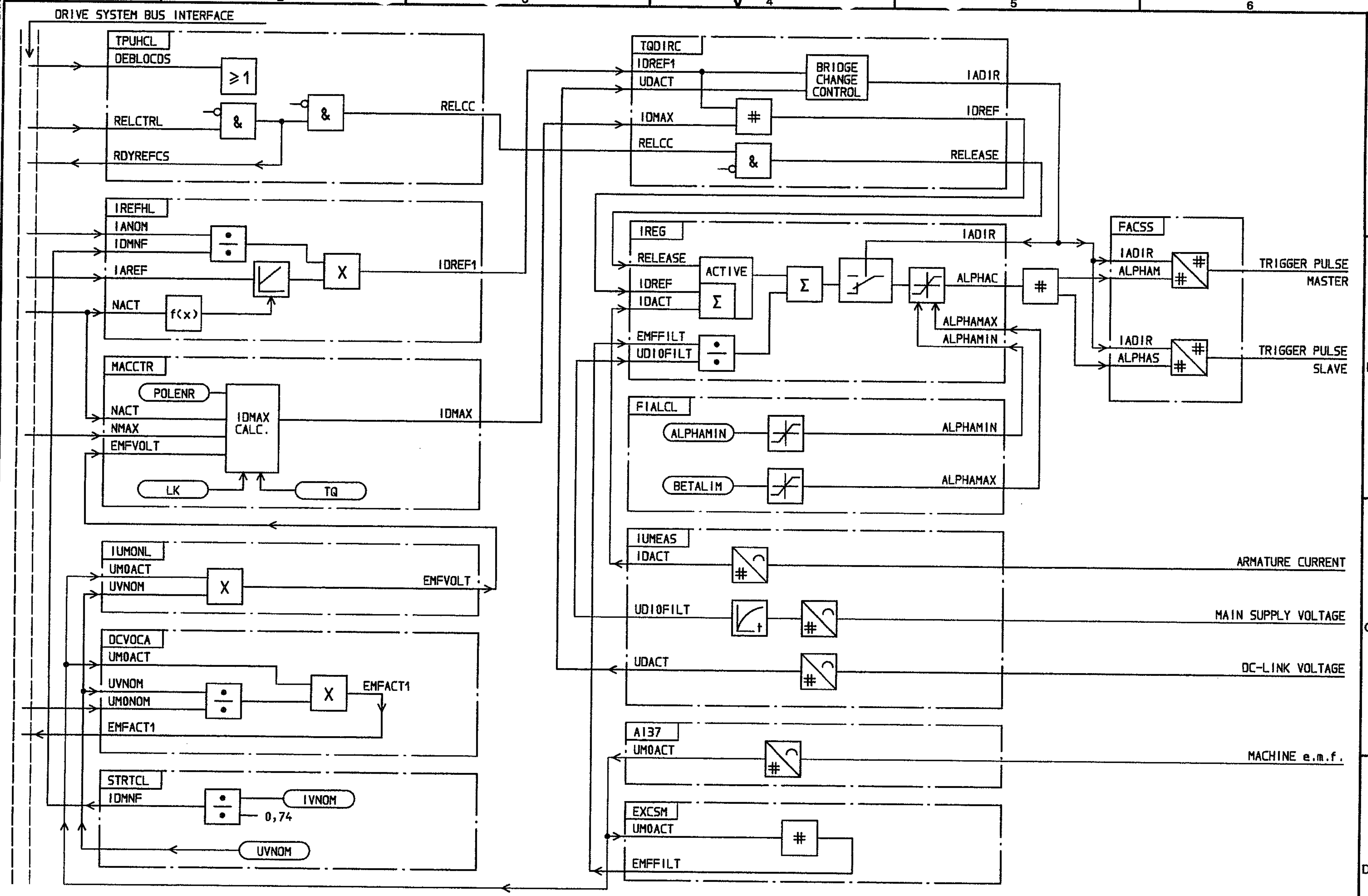

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SYMBOL ID /D:3ASD489306C468:4/0

Prepared	94 02 03	S SVENSSON	
Approved	94 02 03	H POURFALAH	
PROGRAM DIAGRAM			

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ABB Drives

Resp dept	ISY/DPT	Rev Ind	Lang EN
3ASD 489306C468			Sheet 4
			Cont 5

Current and voltage measurement

The current and voltage measurement function is handling the measurement of converter dc current, converter output voltage and the main network ac voltage.

EMF-feedback calculation

The DCVOCAXX function is a part of the automatic field weakening system. The main function is to rescale the motor e.m.f.feed back signal.

EMF-reference calculation

The e.m.f. control is performed by the control system of the field exciter where conventional field weakening etc. is performed. See description for field exciter program.

There are functions for improved motor utilisation via motor field control, which is implemented in the converter program, see section optimal utilisation control" below.

Optimal motor utilisation control

The purpose of this function is to operate the motor as optimal as possible, with respect to the power factor of the motor, requirement for control dynamics, power losses and also the reactive power consumption of the line converter. The method is specially developed for rolling mill applications where a wide field weakening range is common and where control dynamics is of utmost importance.

The function consists of two parts; BETA-calc and PHIREF-calc. Where BETA-calc is controlling the magnetisation of the motor and thus the motor voltage level.

The machine converter thyristor firing is controlled to the smallest value of the firing angle βm, signal BETAM, that gives a required commutation margin, parameter CMARG plus the percentage of the current rate of change. To change the ability to commutate current by increasing the firing angle βm is lowered and the power factor of the machine is increased. The motor voltage is kept at the highest possible level with respect to the requirements for the current control.

The action of these two functions can be easier to understand when we look at the formula for the motortype.

$$\text{Mmotor} = \frac{\text{Pmotor}}{\text{Wm}} = k\,\frac{\text{Umotor}}{\text{Wm}}\,\text{I x}\cos\varphi$$

Where $\frac{\text{Umotor}}{\text{Wm}}$ is controlled by PHIREF-calc

cosφ is controlled by BETA-calc

I is controlled by current control

K is a constant

The function BETA-calc is optimising the cosφ of the motor by controlling the firing angle βm (BETAM) and the function PHIREF-calc is optimising the cosφ by controlling the magnetic flux reference ϕ-ref (PHIREF).

The optimisation is activated for loads > 75% of nominal load.

The optimal utilisation control works closely together with the function IDMAX-calc described in section "Maximal motoring current limiter".

Figure 1 shows the speed and load variation of the motor magnetisation and emf.

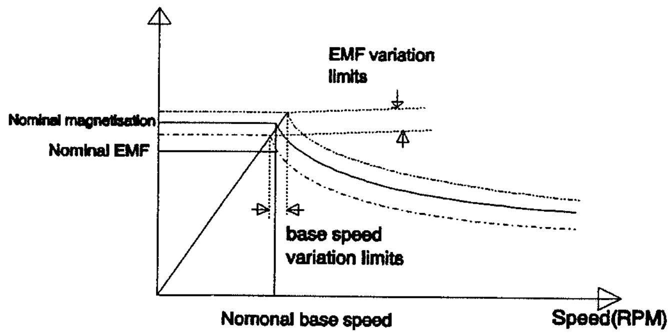


Figure 1, High utilisation control.

Adaptation of e.m.f. and base speed are made according to line voltage variations. This will give a constant relation between line voltage and motor e.m.f.. Reactive power consumption will be minimised.

Torque direction and mode change control

The control of Torque direction change over operation is a part of converter control system. The module contains following functions:

- Control of torque direction change over operation
- Mode change, forced to natural commutated machine converter
- Current reference limiter

The main function is to supervise and to control the torque direction change over procedure. In an LCI-drive is the torque direction determined by the sign of the dc-link voltage, signal UDVOLT (PD 324). The dc-link voltage is proportional to the cosine of the machine converter firing angle βm, signal BETAM (PD 364). Torque dir = sign (cos βm) where βm = 180° -ψm. (ψm is the firing delay angle of the machine converter).

When the current reference, signal IDREF, changes sign this is detected by a special level detector,(see below), and which output signal CONVDIR is activating the torque direction change over operation by the signal IREFCHS. This procedure is started by retarding the current control by the signal BRCHRET and blocking the thyristor firing of the line converter by the signal BRCHBLOC. When this is performed the machine converter firing angle βm is changed by a signal MOTOMODE, where "1" means motoring mode. When ψm is changed form a small value, generating mode (ψm<90°), to motoring mode (ψm>90°) the inversion of the dc-link voltage takes a certain time depending on the frequency of the motor voltage. This time is a necessary delay time until the new value of β m is transferred to a new "stationary" value of the dc-link voltage. The frequency varying delay time is calculated by a function TDEL-CALC. When the delay time is passed out the blocking signal BRCHBLOC is cleared the current control is released when the signal BRCHRET is cleared.

Torque direction

The level detector controlling bridge change is implemented with a special hysteresis function. The hysteresis to transient changes of current reference, signal IDREF, can be set by parameter ILEVBRCM. By integration of the reference this hysteresis to transients will be a function of the reference actual mean value. The steady state hysteresis will by this principle be zero. This principle will efficiently prevent unnecessary bridge changes due to transients, but at the same time allow for bridge change for small and steady reference changes.

At low speed of an LCI-drive, when the motor emf. is not high enough to commutate the machine converter, the dc-link is forced to zero with a pulse of short duration, signal PHASERET. At the same time as a new firing pattern of the machine converter is released. This mode of operation is named forced commutation and disabled at higher motor speeds, signal MODE2="1".

There is an internal current reference limiter controlled by the signal MOTOMODE. The purpose is to limit the regenerated current at braking to a safe value represented by the parameter IDBEMAX.

Armature current controller

The armature, or the main machine stator, current control consists of several parts, all implemented in software. The software realisation gives several advantages since problems related to electrical noise disappears and the inductance of the main circuitry can vary within a wide range without causing problems.

The control part of the current controller is represented by the converter model. The converter model is handling system gain calculation, current prediction and linearisation of current control at discontinuous current. This last task is very important since a linear current control over the full current range is needed for a fast and robust speed control, demanded in rolling mill applications.

The current predictor is "measuring" a current feedback before it actually can be measured. This is needed for a fast current control since the digitalisation of the current measuring and control is introducing a time delay.

The system gain calculation is a function that makes the tuning of the current control a setting of OMEGA_L and N_OMEGAL to a very simple matter, see the commissioning instruction. The real system gain is depending on the actual voltage level and for that reason the gain of the current controller is compensated for line voltage variations.

The current control also contains an automatic tuning function that is determining the characteristics of the main circuitry, which is presented as output signals, OMEGALT and NOMEGALT.

The converter mode is determining the mode of operation, continuous or discontinuous current control mode, and performed by the signal I_CONT ("1" means continuous current).

The signal I_CONT is adapting the characteristics of the current controller.

The current controller generates an output signal, DELTAUS, in order to minimise the deviation between current reference and the predicted current feedback. The gain of the controller is a product of the system gain and the setting of parameter IAGAIN.

The controller output, DELTAUS, is added to a signal EMFREL, that corresponds to the counter emf of the machine converter, to a form a control signal USREL that represents an internal voltage of the line converter. At continuous current mode the firing angle ALPHA_C is generated as an arc-cosine function by the signal USREL. By discontinuous current some more signals are influencing the firing angle ALPHA_C by the working principles is the same.

The current feedback is measured by current transformers of the a.c. side of the line converter.

The output from the current controller is the control angle to the firing pulse equipment. The current control contains also a firing delay angle limitation.

The output from the current controller, ALPHA_Control, is divided into two different delay angles, one for the master converter, ALPHA_Master, and one for the slave converter, ALPHA_Slave. Each delay angle controls a software trigger pulse generator. Master converter trigger pulses are available on the CPU board YPQ201, while slave trigger pulses are generated on a trigger pulse board, YPQ203.

If the slave converter network is phase displaced +/-30,+/-90 or +/-150 degrees relative to the master network, and the same delay angle is set to both master and slave converters, then the converter is a 12-pulse series converter. The harmonic current content in the line current will be reduced and the d.c. voltage ripple on the converter terminals will also be reduced.

Current rate-of-change limiter

In an LCI-drive there is no mechanical commutation to protect but an electrical, since the function of the machine converter is to be compared with the mechanical commutator.

The ability of the machine converter to commutate current depends highly on the magnitude of the firing angle, the signal BETAM (βm). The ability increases with an increasing firing angle, βm.

By the optimal firing control of the machine converter, the firing of the thyristors is performed at a firing angle that results in a commutation margin, the ability to commutate extra current, that is not less than a certain value, normally 30%.

The positive rate-of-change of the current reference IDREF1 is limited to a certain value since it means that the firing angle βm is not moved forward (increasing) more than a well defined value. A firing angle that is moved forward is lowering the commutation margin of the previous commutation (if β>30°). And since the rate-of-change limiter is also limiting the steps of the increasing firing angle βm it protects the commutation process of the machine converter.

The parameter settings that determine the rate-of-change is carefully determined at a system calculation and must not be changed without permission from ABB.

Maximal motoring current limiter

An LCI-drive is always operating with one converter in invertor mode. When the drive is motoring the line converter is rectifying the ac power of the supply line to dc-power to ac-power that is fed to the motor.

The inverting mode of operation is critical since the ability of the machine converter to invert current, e.g. to commutate current between the thyristor branches depends on both varying quantities, like frequency (ω m) and amplitude (U_{m0}) of the motor voltage and design parameters of both the motor commutation inductance (L_k) and thyristor turn off time (tq). But most important for the ability to invert the current is the firing angle βm of the machine converter. When the current is increased, the firing angle βm is automatically increased in order to create a safe commutation margin. But the firing angle βm can not be increased beyond 52 degrees and if this happens the current reference will automatically be limited to a signal value, IDMAX, corresponding to a value that the machine converter is able to invert. (IDMAX = f(β=52°, tq, L_k. U_{m0}, ω_m).

Firing angle limitation

The firing angle limitation (FIALCS) generates the limitation signals ALPHAMAX and ALPHAMIN for the delay angle ALPHA_C.

Firing angle control

The firing angle control (FACSS) is generating the firing pulses to the thyristors and it also handles the transferring of the release orders to forward and reverse converter bridge.

The trigger pulses are synchronised to the line voltages. For suppression of line disturbances, a high order digital filter is used. All trigger pulse generation is done completely in software. This principle will allow for maximum control angle range and precise and equidistant trigger pulses.

For series converters, synchronisation to line voltages is relative the master converter network. The slave converter will synchronise to the same voltage with a parameter offset; PHSHIFT, given by the actual phase displacement between master and slave networks. This will give excellent harmonic current reduction.

Protective and monitoring functions

Tripping

The protective and monitoring system comprises fault detection, sorting and combining the faults into categories, tripping the drive and reporting the situation to the fault indication and diagnostics system.

A fault situation is reported to the trip module. Depending on the fault category, a certain level of activity is ordered to the on/off sequence in the sequence control system.

Monitoring

The Run Check (RUNC) function supervises the communication between the converter and the drive control.

The Current and voltage monitor (IUMON) includes protections related to voltage and current signals Armature overvoltage.

- No armature voltage feedback (ARMNEMF).
- Armature overcurrent ARMOC
- Armature overvoltage ARMOV

The main supply monitor (MSMCS) includes protections related to the main supply:

- Main supply undervoltage (MSUV).
- Low supply voltage (LOWMAIN).
- Frequency fault (FREQFLT and FREQUSTA).
- Phase sequence fault (PHSEQFLT).

The trigger pulse amplifier monitor (TAMPM) includes protections related to the trigger pulse amplifier.

The differential current monitor supervises the input (line side) and the output(machine side) current (DIFCUR).

The function module TYTEMPXX contains an advanced thermal model for supervision of the thyristor crystal temperature, which is not to exceed 125 C. But with a fuseless converter, type YRTH, is the max thyristor temperature lowered, 100-105° in order to protect the thyristors at short circuit situation. The input signals are among others, ambient temperature inside the thyristor cubicle and the average value of current in the forward and reverse bridges. The thyristors' power dissipation consists of on-state power loss and switch losses, which are continuously calculated. The calculation of the switch losses are based upon actual delay angle and the level of main circuit voltage. If cooling air flow is stopped, the model will adapt to new heat transfer data, and give a warning signal.

For commissioning and test, a built-in load cycle simulator can be used. The simulator can be used as a field tool for testing whether the converter can handle a particular load or load profile.

Following functions are monitored:

- Thyristor high temperature in forward and reverse bridge (THYHTF and THYHTR).
- Thyristor overtemperature in forward and reverse bridge (THYOTF and THYOTR).

The hardware fault monitor (HWFMCS) collects signals for hardware and link faults.

The converter fan handling and monitor (CFHAMO) handles and distributes on-orders and acknowledgement signals for the converter fans. It also monitors the air pressure in the converter cubicle.

Diagnostic system and fault indication

Faulty operation is reported to the fault indication and diagnostic system from where the information about failures and possible measures is made available to the operating and servicing staff.

Fault information software signals

The software contains signals (variables) carrying information about the conditions in the system. Some of these signals are used by the system itself to take appropriate action, while others are reported to the operator's panel for displaying of the information.

Fault messages

Fault information e.g. tripping and warning signals are displayed on the operator's panel in legible text, see relevant pages of the circuit diagram.

System test

Commissioning and fault tracing are supported by built-in system test functions controlled from the overriding drive system computer. see the commissioning and the fault tracing instructions respectively for further details.

Communication

The communication between the external hardware involves the basic terminal and connection board YPQ202 and software modules for connection between external signals and the software.
In the basic I/O interface the following communication channels are available:

I/O type	No. of channels	Separation	Note
Digital input	8	Opto	
Digital output	5	Relay	
Analog input	4	Diff. ampl.	Resolution 0.05 percent
Analog output	2	Diff. ampl.	Resolution 0.05 percent

List of parameters:

Following is a list of all parameters in programs CL12.

How to read the table:

Parameter	Unit	Range	OPC	Term.	Parameter full name
1)	2)	3)	4)	5)	6)

1) Name of the parameter.
2) Unit for parameter on the operator's panel (OPC).
3) Range for parameter on the operator's panel.
4) Default value for the parameter as shown on the operator's panel.
5) Default value for parameter as shown on the terminal aid. Decimal number system.
6) Parameter name without abbreviation.

AI370X **(312)**

Parameter	Unit	Range	OPC	Term.	Parameter full name
AI37.1MO	Log	"0","1"	Not	"1"	Analog In 37.1 MOde
AI37.2MO	Log	"0","1"	Not	"1"	Analog In 37.2 MOde
AI37.3MO	Log	"0","1"	Not	"1"	Analog In 37.3 MOde
AI37.4MO	Log	"0","1"	Not	"1"	Analog In 37.4 MOde
AI37.1MU	No unit	±16.00	1.00	2048	Analog In 37.1 MUltiplier
AI37.2MU	No unit	±16.00	1.00	2048	Analog In 37.2 MUltiplier
AI37.3MU	No unit	±16.00	1.00	2048	Analog In 37.3 MUltiplier
AI37.4MU	No unit	±16.00	1.00	2048	Analog In 37.4 MUltiplier

AO310X **(386)**

Parameter	Unit	Range	OPC	Term.	Parameter full name
AAO31	Log	"0","1"	Not	"0"	Analog Out 31
AO31.1MO	No unit	0-32767	Not	1	Analog Out 31.1 MOde
AO31.2MO	No unit	0-32767	Not	1	Analog Out 31.2 MOde
AO31.1MU	No unit	0-32767	Not	128	Analog Out 31.1 MUltiplier
AO31.2MU	No unit	0-32767	Not	128	Analog Out 31.2 MUltiplier
AO31.1OF	No unit	±32767	Not	0	Analog Out 31.1 OFfset
AO31.2OF	No unit	±32767	Not	0	Analog Out 31.2 OFfset

AO370X **(387)**

Parameter	Unit	Range	OPC	Term.	Parameter full name
AO37.1MU	No unit	±256.00	1.00	128	Analog Out 37.1 MUltiplier
AO37.2MU	No unit	±256.00	1.00	128	Analog Out 37.2 MUltiplier
AO37.1OF	%	±100.00	0.00	0	Analog Out 37.1 OFfset
AO37.2OF	%	±100.00	0.00	0	Analog Out 37.2 OFfset

CFHAMO0X (341/342)

Parameter	Unit	Range	OPC	Term.	Parameter full name
APREDELT	msec	0-32767	5000	5000	Air PREssure DDELay Time
APRESVS	Log	"0","1"	"1"	"1"	Air PREssure SWitch Select
BLKSYS2	Log	"0","1"	"0"	"0"	BLocKing of SYStem 2
CC12S	Log	"0","1"	"0"	"0"	Converter Control 12pulse Select
CFANACKT	msec	0-32767	2000	2000	Converter ACKnowledge Time
FANSEL	Log	"0","1"	"1"	"1"	FANs (A or B as normal) SELect
RDFANAPP	Log	"0","1"	"0"	"0"	ReDundant FAN APPlication select
RESETRDF	Log	"0","1"	"0"	"0"	RESET ReDundant Fan fault

CSCREC0X (316)

Parameter	Unit	Range	OPC	Term.	Parameter full name
CCBRTOUD	No Unit	0-32767	Not	20	Conv. Com. Brodcast Receive Time OUt Delay
CCRNRFLT	No Unit	0-32767	Not	5	Conv. Com. Receive NumbeR of FauLT
CCRTOUTD	No Unit	0-32767	Not	20	Conv. Com.Receive Time OUT Delay

CSCTRA0X (388)

Parameter	Unit	Range	OPC	Term.	Parameter full name
CONVNR	No Unit	0-32767	0	0	CONVerter NumbeR

DI37CS0X (309)

Parameter	Unit	Range	OPC	Term.	Parameter full name
DI37.1IN	Log	"0","1"	Not	"0"	Digital In 37.1 INverse
DI37.2IN	Log	"0","1"	Not	"0"	Digital In 37.2 INverse
DI37.3IN	Log	"0","1"	Not	"0"	Digital In 37.3 INverse
DI37.4IN	Log	"0","1"	Not	"0"	Digital In 37.4 INverse
DI37.5IN	Log	"0","1"	Not	"0"	Digital In 37.5 INverse
DI37.6IN	Log	"0","1"	Not	"0"	Digital In 37.6 INverse
DI37.7IN	Log	"0","1"	Not	"0"	Digital In 37.7 INverse
DI37.8IN	Log	"0","1"	Not	"0"	Digital In 37.8 INverse

DO37CS0X (384)

Parameter	Unit	Range	OPC	Term.	Parameter full name
DO37.1IN	Log	"0","1"	Not	"0"	Digital Out 37.1 INverse
DO37.2IN	Log	"0","1"	Not	"0"	Digital Out 37.2 INverse
DO37.3IN	Log	"0","1"	Not	"0"	Digital Out 37.3 INverse
DO37.4IN	Log	"0","1"	Not	"0"	Digital Out 37.4 INverse
DO37.5IN	Log	"0","1"	Not	"0"	Digital Out 37.5 INverse

EXCSM0X (355)

Parameter	Unit	Range	OPC	Term.	Parameter full name
BETAHYST	No Unit	0-32767	Not	273	BETA HYSTeresis
DCLVOLT	VOLT	0-32767	350	350	DC Level VOLTage
EMFCORR1	%	0.00-200,00	100,00	16384	EMF CORRection 1
OPCSMARG	%	0,0-400,0	100,0	8192	OPtimal Control Safety MARGin
OPTMAGS	Log	"0","1"	"1"	"1"	OPtimal MAGnetisation Select
PHIFILTN	No Unit	0-32767	Not	5	PHI FILTer Number
PHILEV2	%	0,0-200,0	100,0	16384	PHI LEVel2
PHILEV3	%	0,0-200,0	100,0	16384	PHI LEVel3
PHIMAXR1	%	0,0-200,0	100,0	16384	PHI MAX Reference 1
PHIMAXR2	%	0,0-200,0	100,0	16384	PHI MAX Reference 2
PHIMAXR3	%	0,0-200,0	100,0	16384	PHI MAX Reference 3
PHIMAXR4	%	0,0-200,0	100,0	16384	PHI MAX Reference 4
PHIMAX	%	0,0-200,0	100,0	16384	PHI MAXimum
PHIMIN	%	0,0-200,0	100,0	16384	PHI MINimum
PHIREFI2	No Unit	0-32767	Not	16384	PHI REFerence 12
SYNCREAC	%	0,0-400,0	0,0	0	SYNCronous REACtance
SINFIMAX	No Unit	0-32767	Not	32767	SINe FIm0 MAX
UCTRLMCS	Log	"0","1"	Not	"0"	U(voltage) ConTRol Mode Select
UM0CORRF	No Unit	0-32767	Not	16384	UM0 CORRection Factor
UM0FILTN	No Unit	0-32767	Not	5	UM0 FILTer Number
UM0MAX	VOLT	0-32767	2000	2000	UM0 MAXimum

FACSS0X (366)

Parameter	Unit	Range	OPC	Term.	Parameter full name
FREQDIFF	HZ	0-32767	0.050	50	FREQuency difference
MSFLTDEL	No Unit	0-32767	Not	1	Main Supply FauLT Delay
SYNCDEL	No Unit	0-32767	20	20	SYNChronizarion DELay
TLAG	No unit	+/-32767	60	60	Time LAG
UV_LEVH	%	0-130	5	1260	Under_ Voltage LEVel Hysteresis

FIALCL0X (357)

Parameter	Unit	Range	OPC	Term.	Parameter full name
ALPHALIM	Deg	0,0-360,0	10,0	100	ALPHA LIMitation
BETACOM	Deg	0,0-360,0	30,0	300	BETA COMmissioning
BETALIM	Deg	0,0-360,0	30,0	300	BETA LIMitation

FLTLCS0X (396-399)

Parameter	Unit	Range	OPC	Term.	Parameter full name
FCLEAR	Log	"0","1"	"0"	"0"	Fault CLEARing

HWDICS0X (310)

Parameter	Unit	Range	OPC	Term.	Parameter full name
CURASYML	AMP	1000-3800	2376	20488	CURrent ASYMmetry Level
EFACDELT	sec	32767	0	0	Earth Fault AC DELay Time
EFDCDELT	sec	32767	0	0	Earth Fault DC DELay Time

HWFMCS0X (338)

Parameter	Unit	Range	OPC	Term.	Parameter full name
TRIP12S	Log	"0","1"	"0"	"0"	TRIP 12 Select.

IREFHL0X (353)

Parameter	Unit	Range	OPC	Term.	Parameter full name
CURRARL	%	0-100	100	32767	CURRent After Reversal Limit
IDDERMAX	%/MS	0,20-40,00	3,33	2727	ID(direct current) DERivative MAXimum
IDDERM	%/MS	0,20-40,00	3,33	2727	ID(direct current) DERivative Medium
IDDERMIN	%/MS	0,20-40,00	3,33	2727	ID(direct current) DERivative MINimum
IDREFCOM	%	±400,0	0,0	0	ID(direct current) REFerence COMmissioning
IDSTEP	%	±400,0	0,0	0	ID(direct current) STEP
IDTEST	Log	"0","1"	"0"	"0"	ID(direct current) TEST
NIDER1	%	0,0-100,0	50,0	16384	N(speed) DERivative 1
NIDER2	%	0,0-100,0	75,0	24575	N(speed) DERivative 2
NIDER3	%	0,0-100,0	90,0	29490	N(speed) DERivative 3
STEPTIME	No Unit	0-32767	24	24	STEP TIME

IREGS0X (365)

Parameter	Unit	Range	OPC	Term.	Parameter full name
IACON_TI	msec	4-1024	20	639	I(current)Armature CONtinuous
IADIS_TI	msec	4-1024	20	639	I(current)Armature DIScontinuous
IAGAIN	No Unit	0.00-32.00	0.35	358	I(current)Armature GAIN
LOWMAINL	%	0.0-307.7	100.0	10649	LOW MAINs Level
N_OMEGAL	No Unit	0-32767	3	3	Number of OMEGAL system gain parameter
OMEGA_L	No Unit	0-32767	4050	4050	OMEGA_L system gain parameter
SEQCTEST	Log	"0","1"	"0"	"0"	SEQuenCe TEST

IUMEASOX (324)

Parameter	Unit	Range	OPC	Term.	Parameter full name
AITESTV	No Unit	0-32767	0	0	Analog Input TEST Value
DIFCURL	%	0,0-400,0	0,0	0	DIFferential CURrent Level
IDGAIN	No Unit	0-32767	Not	4	ID(current) GAIN
ID1SCAL	%	0,00-200,00	100.00	16383	ID(d.c. current) 1 SCALing
ID2SCAL	%	0,00-200,00	100.00	16383	ID(d.c. current) 2 SCALing
MDROPCOM	%	0,0-100,0	0.0	0	Main voltage DROP COMpensation
TAOUDI0	msec	0-32767	100	100	TAO(time constant) UD(d.c. voltage) I0 (at no load)
UDI0SCAL	%	0,00-200,00	100.00	16383	UD(d.c. voltage) I0 (at no load) SCALing
UDSCAL	%	0.00-200.00	100.00	16383	UD(dc voltage) SCALing
VCSMARG	%	0.0-400.0	95.0	7782	Voltage Converter System MARGin

IUMONLOX (329)

Parameter	Unit	Range	OPC	Term.	Parameter full name
EMFOFFST	%	±400	-400	-32767	EMF monitoring OFFSeT
FREGTMHL	HZ	0,0-3276,7	3,0	30	FREquency Greater Than Min High Level
MLLADJ	No Unit	±32767	Not	29490	Min Low Level ADJust
NEMFDELT	msec	0-32767	20	20	No EMF DELay Time
OCURFL	AMP	0-32767	150	150	Over CURrent Forward Level
RELDELT	msec	0-32767	40	40	RELease DELay Time
UMOVL	VOLT	0-32767	1000	1000	U(voltage) Machine Over Voltage Level
UMOVHL	%	100,0-200,0	150,0	16384	U(voltage) Machine Over Voltage High Level
UMOVLL	%	0,0-100,0	97,5	31948	U(voltage) Machine Over Voltage Low Level

MACCTR0X (354)

Parameter	Unit	Range	OPC	Term.	Parameter full name
BETAGEN	Deg	0,0-360,0	150,0	13653	BETA GENerative
BETAMLEV	Deg	0,0-360,0	48,0	4369	BETA Machine LEVel
BETAMMAX	Deg	0,0-360,0	52,0	4733	BETA Machine MAXimum
BFILTTC	msec	0-32767	5000	5000	Beta FILter Time Constant
BLEV2	Deg	0,0-360,0	30,0	2730	Beta LEVel 2
BLEV3	Deg	0,0-360,0	35,0	3185	Beta LEVel 3
BMAX	Deg	0,0-360,0	40,0	3641	Beta MAXimum
BMIN	Deg	0,0-360,0	25,0	2275	Beta MINimum
CMARG	%	0-400	30	2457	Commutation MARGin
CONBETA	Deg	0,0-360,0	45,0	4096	CONstant BETA
IDACTCP	No Unit	±32767	Not	819	ID(current) ACTual ComPare
LK	No Unit	0-32767	210	210	LK (inductance)
MACC_TST	Log	"0","1"	"0"	"0"	MAChine Control TeST
NLEV1	%	0,0-100,0	50,0	16384	N(speed) LEVel 1
NLEV2	%	0,0-100,0	75,0	24507	N(speed) LEVel 2
NLEV3	%	0,0-100,0	90,0	29490	N(speed) LEVel 3
OPTBETAS	Log	"0","1"	"0"	"0"	OPTimal BETA Select
POLENR	No Unit	1-32767	2	2	POLE NumbeR (motor)
TQ	No Unit	0-32767	500	500	Thyristor TQ time
TSTIAMP	AMP	0-32767	500	500	TeST I(current) AMPere
TSTNRPM	RPM	0-32767	1500	1500	TeST N(speed) RPM
TSTUDV	VOLT	0-32767	500	500	TeST UD Voltage
TSTUVOLT	VOLT	0-32767	1500	1500	TeST UV(line) VOLT
VARBETAS	Log	"0","1"	"0"	"0"	VARiable BETA Select

MCTPUO0X (364)

Parameter	Unit	Range	OPC	Term.	Parameter full name
BLKPLS	Log	"0","1"	"0"	"0"	BLocK PuLse Select
TRIGGREL	Log	"0","1"	"1"	"1"	TRIGG RELease
UM0NOMP	No Unit	0-32767	Not	8192	UM0 NOMinal Parameter

MSMCS0X (330)

Parameter	Unit	Range	OPC	Term.	Parameter full name
ACKCDELT	sec	0-32767	15	15	ACKnowledgement main Contactor Delay Time
FREQUTS	Log	"0","1"	"1"	"1"	FREQuency Unstable Trip Select

RUNC0X (328)

Parameter	Unit	Range	OPC	Term.	Parameter full name
ESTALDSC	Log	"0","1"	"1"	"1"	ENable STALlsupervision Drive System Control.
MODELDSC	No unit	0-32767	5	5	MOnitoring DELay Drive System Control.

STRTCLOX (307)

Parameter	Unit	Range	OPC	Term.	Parameter full name
CONVMODE	No Unit	0-32767	2	2	Converter MODE selection
FREQDEV	HZ	0-32767	2	2	maximum FREQueny DEViation.
FREQNOM	HZ	0-32767	50	50	FREQuency NOMinal.
IVNOM	AMP	0-32767	5000	5000	IV(converter) NOMinal a.c current
LINEVOLT	VOLT	0-32767	1300	1300	LINE AC VOLTage.
LMAINS	No Unit	0-32767	222	222	L (Short circuit inductance per phase) MAINS Supply. (Unit mH/Phase
MCURM	Log	"0","1"	"1"	"1"	Machine CURrent Measurement
PHSHIFT	Deg	-32767-32767	-30	-30	PHase SHIFT
UVLEVEL	%	0-130	80	20164	Under Voltage LEVEL.
UVNOM	VOLT	0-32767	1300	1300	UV(converter) NOMinal a.c voltage

TAMPMOX (331)

Parameter	Unit	Range	OPC	Term.	Parameter full name
ETRIPUMO	Log	"0","1"	Not	"1"	Enable TRIgger PUlse MOnitoring
TAMPUVSE	Log	"0","1"	Not	"1"	Trigger pulse AMPlifier Under Voltage SElect

TESTCSOX (306)

Parameter	Unit	Range	OPC	Term.	Parameter full name
AOTEST	%	+/-100,0	0,0	0	Analog Output TEST
DOTEST	Log	"0","1"	"0"	"0"	Digital Output TEST

TRPCLOX (345)

Parameter	Unit	Range	OPC	Term.	Parameter full name
ARMNEMFS	Log	"0","1"	"1"	"1"	ARMature No EMF trip Select
AUTORESS	Log	"0","1"	"0"	"0"	AUTOmatic REStart Select
CFANOLTS	Log	"0","1"	"0"	"0"	Converter FAN OverLoad Trip Select
CURRASYS	Log	"0","1"	"1"	"1"	CURRent ASYmmetry trip Select
LOWMAINS	Log	"0","1"	"1"	"1"	LOW MAIN supply trip Select
MSFLTTS	Log	"0","1"	"0"	"0"	Main Supply FauLT Trip Select
MSOFFDEL	msec	0-32767	2000	2000	Main Supply OFF DELay
THYOTS	Log	"0","1"	"1"	"1"	THYristor OverTemperature tripSelect
CSCLNKS	Log	"0","1"	"1"	"1"	Converter Serial Communication LiNK fault Select
TRIPUFTS	Log	"0","1"	"1"	"1"	TRIgger Pulse Unit FaulT Select

TPUHCLOX (351)

Parameter	Unit	Range	OPC	Term.	Parameter full name
DEBLOCT	msec	0-32767	100	100	DEBLOCking Time
INTOKDEL	msec	0-32767		600	INiTialization handling OK DELay

TQDIRC0X (362)

Parameter	Unit	Range	OPC	Term.	Parameter full name
IDBRMAX	AMP	0-32767	30	30	ID(current) BReak MAXimum
ILEVBRCH	%	0,0-400,0	0,0	0	I(current) LEVel BRidge CHange
I0LEV	%	0-100	70	22937	I0(current) LEVel
I0MIN	%	0,0-400,0	0,5	40	I0(current) MINinum
LOCKBRCH	Log	"0","1"	"0"	"0"	LOCK BRidge CHange
LOCKDIR	Log	"0","1"	"1"	"1"	LOCK DIRection
MODE2DEL	msec	0-32767	Not	10	MODE 2 DELay
PULSEDEL	msec	0-32767	Not	5	PULSE DELay
TDELMAX	msec	0-32767	1000	1000	Time DELay MAXimum
TDELMIN	msec	0-32767	10	10	Time DELay MINimum
TPCIMC	Log	"0","1"	Not	"0"	Trigger Pulse Check In Machne Conver

TYTEMP3X (337)

Parameter	Unit	Range	OPC	Term.	Parameter full name
AMBTEMPS	Deg	0-3276.7	40.0	400	AMBient TEMPerature Set
CURSHF	No Unit	0.00-16.00	1.07	2191	CURrent SHaring Forward factor
CURSHR	No Unit	0.00-16.00	1.07	2191	CURrent SHaring Reverse factor
LCISEL	Log	"0","1"	"0"	"0"	LCI SELect
NOPFTHY	No Unit	1-32767	1	1	Number Of Parallel Forward THYristor
NOPRTHY	No Unit	1-32767	1	1	Number Of Parallel Reverse THYristor
PT100S	Log	"0","1"	"0"	"0"	PT100 Select
RATESEL	No Unit	0-32767	27	27	voltage RATE of thyristor SELect
THYHTLF	Deg	0.0-3276.7	115.0	1150	THYristor High Teperature Level Forward
THYHTLR	Deg	0.0-3276.7	115.0	1150	THYristor High Temperature Level Reverse
THYOTLF	Deg	0.0-3276.7	125.0	1250	THYristor Over Temperature Level Forward
THYOTLR	Deg	0.0-3276.7	125.0	1250	THYristor Over Temperature Level Reverse
YAP803S	Log	"0","1"		"0"	YAP 8-03 cooler Select
YAPXXXS	Log	"0","1"	"1"	"1"	YAP X-XX cooler Select
WE540S	Log	"0","1"		"0"	WE540 Select
YST14S	Log	"0","1"	"0"	"0"	YST14 select
YST35S	Log	"0","1"	"0"	"0"	YST35 Select
YST45S	Log	"0","1"	"1"	"1"	YST45 Select
YST60S	Log	"0","1"	"0"	"0"	YST60 Select

TYTEST1X (336)

Parameter	Unit	Range	OPC	Term.	Parameter full name
ALTWORKD	Log	"0","1"	"1"	"1"	ALTernate WORK Direction
COOLONT	Log	"0","1"	"1"	"1"	COOLing ON in Test mode
EXPFACT	%	0-400	100	8192	EXPansion FACTor
IDACCEL	%	0.0-400.0	150.0	12288	Id(current) at ACCELeration
IDIDLE	%	0.0-400.0	10.0	819	Id at IDLE interval
IDRETARD	%	0.0-400.0	150.0	12288	Id at RETARDation
IDTEFWD	Log	"0","1"	"1"	"1"	Id direction at TEmperature ForWarD
IDTETEST	%	0.0-400.0	50.0	4096	Id at TEmperature TEST
IDWORK	%	0.0-400.0	150.0	12288	Id at WORK interval
NCYCLES	No Unit	1-32767	2	2	Number of CYCLES
TACCEL	sec	0-32767	5	5	Time ACCEleration
TBASE	sec	0-32767	10	10	Work Time BASE
TESTON	Log	"0","1"	"0"	"0"	TEST ON
TESTTYPE	No Unit	0-32767	0	0	TEST TYPE
TIDLE	sec	0-32767	15	15	Time IDLE
TRETARD	sec	0-32767	5	5	Time for RETARDation to zero speed

List of signals:

Following is a list of all signals in programs CLX12. The signals are listed in the function module where they are generated.

Signal	Ts	Unit	Range	OPC	Signal full name	To module (Ts)
1)	2)	3)	4)	5)	6)	7)

1) Name of the signal.
2) Sample time level. * Stands for signals that can be connected to user defined input channels with different sample times.
3) Unit for signal. Engineering units.
4) Range for signal.
5) Signals available on the operator's panel (all are available on terminal).
6) Signal name without abbreviation.
7) A reference to which module the output signal goes. In parenthesis the sample time.

AO310X (386)

Signal	Ts	Unit	Range	OPC	Signal full name
AO31.T1	I1	No unit	±32767		Analogue Output 31 Testpoint1
AO31.T2	I1	No unit	±32767		Analogue Output 31 Testpoint2

AO370X (387)

Signal	Ts	Unit	Range	OPC	Signal full name
AO37.T1	T1	No unit	±32767		Analog Out 37.T1
AO37.T2	T2	No unit	±32767		Analog Out 37.T2

CFHAMO0X (341/342)

Signal	Ts	Unit	Range	OPC	Signal full name
ACKFAN	T4	Log	"0","1"	X	ACKnowledgement converter FAN
APREFLT	T4	Log	"0","1"	X	Air PREssure FauLT
APREFLT1	T4	Log	"0","1"		Air PREssure FauLT system 1
APREFLT2	T4	Log	"0","1"		Air PREssure FauLT system 2
APREIND	T4	Log	"0","1"	X	Air PREssure INDication
CFANAON	T4	Log	"0","1"	X	Converter FANs A ON
CFANBON	T4	Log	"0","1"	X	Converter FANs B ON
CFANNA	T4	Log	"0","1"	X	Converter FAN Not Acknowledged
CFANOL	T4	Log	"0","1"	X	Converter FAN Over Load
CFAN1ANA	T4	Log	"0","1"		Converter FAN system1 A Not Acknowledged
CFAN1AOL	T4	Log	"0","1"		Converter FAN system1 A Over Load
CFAN1BNA	T4	Log	"0","1"		Converter FAN system1 B Not Acknowledged
CFAN1BOL	T4	Log	"0","1"		Converter FAN system1 B Over Load
CFAN2ANA	T4	Log	"0","1"		Converter FAN system2 A Not Acknowledged
CFAN2AOL	T4	Log	"0","1"		Converter FAN system2 A Over Load
CFAN2BNA	T4	Log	"0","1"		Converter FAN system2 B Not Acknowledged
CFAN2BOL	T4	Log	"0","1"		Converter FAN system2 B Over Load
FANBSEL	T4	Log	"0","1"	X	FANs B SELected
RDFANAPP	T4	Log	"0","1"		ReDundant FAN APPlication
RDFANON	T4	Log	"0","1"	X	ReDundant FAN ON
RDFANONF	T4	Log	"0","1"		ReDundant FAN ON Fault
RDFANTRP	T4	Log	"0","1"	X	ReDundant FAN TRiP

CONNCL0X (304)

Signal	Unit	Range	OPC	Signal full name	To module
ACBRETRP	Log	"0","1"	X	AC BREaker TRiPped	HWDICS
ACKFAN1B	Log	"0","1"	X	ACKnowledment FAN 1B	CFHAMO
ACKFAN2B	Log	"0","1"	X	ACKnowledment FAN 2B	CFHAMO
ACKFANS	Log	"0","1"	X	ACKnowledment FAN Select	CFHAMO
ACKTAMPS	Log	"0","1"	X	ACK. Trigger pulse AMPlifier Select	TAMPM
ACKTPU	Log	"0","1"	X	ACKnowledment Trigger PUlses	TAMPM
ARMOCE	Log	"0","1"	X	ARMature Over Current External	HWDICS
EHFLTAC	Log	"0","1"	X	EartH FauLT AC	HWDICS
EHFLTDC	Log	"0","1"	X	EartH FauLT DC	HWDICS
ELDISC1	Log	"0","1"	X	ELectrical DISConnection 1	HWDICS
FLDCH	Log	"0","1"		FieLD CHange	CSCTRA
FLDOC	Log	"0","1"		FieLD Over Current	CSCTRA
FUSEF	Log	"0","1"	X	Fuse fault	TYTEMP,TRPC,FLTL
IFACT	No Unit	±32767		I(current) Field ACTual	CSCTRA
IFGTMIN	Log	"0","1"		I(current) Field Greater Than MINimum	CSCTRA
IFREVACK	Log	"0","1"		I(current) Field REVerse ACKnowledgement	CSCTRA
RETARD1	Log	"0","1"	X	RETARDation 1	TPUHAN
TAMBTEM1	VOLT	1.000	X	Thyristor AMBient TEMperature 1	TYTEMP
TAMBTEM2	VOLT	1.000	X	Thyristor AMBient TEMperature 1	TYTEMP
UM0ACT	%	400.0	X	UM0(machine voltage) ACTual	DCVOCA,IUMONL,
					EXCSM,MCTPUO

CSCREC0X (316)

Signal	Ts	Unit	Range	OPC	Signal full name
ACKMCONT	T4	Log	"0","1"	X	ACKnowledge Main CONTactor
CONVON	T4	Log	"0","1"	X	CONVerter ON
CSCLNK	T1	Log	"0","1"		Converter Serial Communication LiNK fault
DEBLOCDS	T4	Log	"0","1"	X	DEBLOC from Drive System
DRIVMODE	T1	No Unit	0-32767	X	DRIVe MODE
EMFCALC	T1	%	±400	X	Electro Motive Force CALCulated
EMFNOM	T1	VOLT	0-32767	X	Electro Motive Force NOMinal
EMFPOS	I1	Log	"0","1"	X	EMF POSitive
FANSON	T4	Log	"0","1"	X	FANS ON
FLDCH1	T1	Log	"0","1"	X	FieLD CHange 1
FLDEXCON	T4	Log	"0","1"	X	FieLD EXCiter ON
FRESET	T4	Log	"0","1"	X	Fault RESET
IALIMN1	T1	%	±400	X	IA (motor current) LIMit Negative
IALIMP1	T1	%	±400	X	IA (motor current) LIMit Positive
IANOM	T1	AMP	0-32767	X	IA (motor current) NOMinal
IAREF	I1	%	±400	X	IA (motor current) REFerence
MCONTON	T3	Log	"0","1"	X	Main CONTactor ON
NACT	T1	%	±100,00	X	N (speed) ACTual
NMAX	T1	RPM	0-32767	X	N (speed) MAXimum
RELCTRL	T1	Log	"0","1"	X	RELease ConTRoL
RESET2	T4	Log	"0","1"	X	RESET 2
STALLPB	T1	No Unit	0-32767	X	STALL Pulse B
TESTREF1	T1	%	±400	X	TEST REFerence
UANOM	T1	VOLT	0-32767	X	UA (motor voltage) NOMinal
UM0NOM	T1	VOLT	0-32767	X	UA (motor voltage) NOMinal

CSCTRA0X (388)

Signal	Ts	Unit	Range	OPC	Signal full name
CCTSEMT	T1	Log	"0","1"		Converter Communication Transmit SEMafor Time
CONVNR	Par	No Unit	0-32767		CONVerter NumbeR
HWFCSC	T1	Log	"0","1"		HardWare Fault Converter Serial Communication

DCVOCA0X (327)

Signal	Ts	Unit	Range	OPC	Signal full name
EMFACT	T2	%	0,0-400,0	X	EMF ACTual
EMFACT1	T1	%	0,0-400,0	X	EMF ACTual1

EXCSM0X (355)

Signal	Ts	Unit	Range	OPC	Signal full name
DELTAUDM	I1	No Unit	0-32767		DELTA UD(voltage) Machine
EMFCORR	T1	%	0,0-200,0	X	EMF CORRection
EMFFILT	T1	%	0,0-400,0	X	EMF FILTer
EXCSTP2	T1	No Unit	0-32767		EXcitation Control Synch. Machine Test Point 2
OPTMAGS		Log	"0","1"		OPTimal MAGnetisation Select
PHIREF	T1	%	0,0-200,0	X	PHI(flux) REFerence
UDMSVOLT	T2	VOLT	0-32767	X	UD(voltage) Machine VOLT
UM0REF	T1	No Unit	0-32767		UM0 REFerence

FACSS0X (366)

Signal	Ts	Unit	Range	OPC	Signal full name
BLOCK	I1	Log	"0","1"	X	BLOCKing
CURZERO	I1	Log	"0","1"	X	CURrent ZERO
FREQFLT1	I1	Log	"0","1"	X	FREQuency FauLT1
FREQFLT2	I1	Log	"0","1"	X	FREQuency FauLT2
HWF_203	I1	Log	"0","1"	X	HardWare Fault_203
INTHAOK	I1	Log	"0","1"	X	INiTialization HAndling OK
MSFLT1	I1	Log	"0","1"	X	MainS FauLT 1
MSUV1	I1	Log	"0","1"	X	Mains Supply Undervoltage 1
NCTRHOLD	I1	Log	"0","1"	X	N ConTRoller HOLD
PHSEQFLT	I1	Log	"0","1"	X	PHase Sequence FauLT
RETARD	I1	Log	"0","1"	X	RETARDation
TCYCLE	I1	No Unit	0-65536		Time CYCLE
TALPHA_M	I1	No Unit	0-32767		Time ALPHA_Master
TALPHA_S	I1	No Unit	0-32767		Time ALPHA_Slave
TRGTIM_M	I1	No Unit	0-32767		TRiGTIMe_Master
TRGTIM_S	I1	No Unit	0-32767		TRiGTIMe_Slave
VVECT_M	I1	No Unit	0-32767		VoltVECTor_Master
VVECT_S	I1	No Unit	0-32767		VoltVECTor_Slave

FIALCL0X (357)

Signal	Ts	Unit	Range	OPC	Signal full name
ALPHAMAX	T4	Deg	0,0-360,0	X	ALPHA MAXimum
ALPHAMIN	T4	Deg	0,0-360,0	X	ALPHA MINimum
ALPHATST	T4	No Unit	0-32767	Not	ALPHA TeST

HWDICS0X (310)

Signal	Ts	Unit	Range	OPC	Signal full name
ACKFAN1A	T4	Log	"0","1"	X	ACKnowledge FAN 1A
ACKFAN2A	T4	Log	"0","1"	X	ACKnowledge FAN 2A
APREIND1	T4	Log	"0","1"	X	Air PREsure INDication
APREIND2	T4	Log	"0","1"	X	Air PREsure INDication
ARMOCE1	T3	Log	"0","1"	X	ARMature OverCurrent External 1
CURRASYM	I1	Log	"0","1"	X	CURRent ASYMmetry
ETHFLTAC	T4	Log	"0","1"	X	EarTH FauLT AC
ETHFLTDC	T4	Log	"0","1"	X	EarTH FauLT DC
MSEF	I1	Log	"0","1"	X	Main Supply External Fault

HWFMCS0X (338)

Signal	Ts	Unit	Range	OPC	Signal full name
HWFLNKF	T4	Log	"0","1"	X	HardWare Fault or LiNK Fault.

IREFHL0X (353)

Signal	Ts	Unit	Range	OPC	Signal full name
IDCOM_ON	T3	Log	"0","1"	X	ID(direct current) COMmissioning ON
IDERINC1	T4	No Unit	±32767		I(current)DERivation INCremnt 1
IDERLIM	I1	Log	"0","1"	X	I(current)DERivation LIMitation
IDREF1	I1	%	±400,0	X	ID(direct current) REFerence 1
IDREFUL	I1	No Unit	±32767		ID(direct current) REFerence UnLimited
ISCALM	BG	%	+/-400,0	X	I(current) SCALe Machine

IREGS0X (365)

Signal	Ts	Unit	Range	OPC	Signal full name
ALPHA_C	I1	Deg	±360,0	X	ALPHA_Common
ALPHA_M	I1	Deg	±360,0	X	ALPHA_Master
ALPHA_S	I1	Deg	±360,0	X	ALPHA_Slave
ALPHILIM	I1	Log	"0","1"	X	ALPH In LIMit
AT_DONE	I1	Log	"0","1"	X	Auto Tuning DONE
DELTAUS	I1	%	0.0-100.0	X	DELTAUS
EMFREL	I1	%	0.0-100.0	X	EMFREL
I_CONT	I1	Log	"0"."1"	X	I(current) CONTinous
ID0	INIT	No Unit	0-32767		ID0
LOWMAIN1	T2	Log	"0"."1"	X	LOWMAINs 1
NOMEGALT	T2	No Unit	0-32767	X	Number of OMEGAL(system gain parameter) Tuning
OMEGALT	T2	No Unit	0-32767	X	OMEGAL(system gain parameter) Tuning
SEL12PS	BG	No Unit	0-32767	X	SELect 12 Pulse Serie
SEQMODE	I1	No Unit	0-32767	X	SEQuence MODE

IUMEASOX (324)

Signal	Ts	Unit	Range	OPC	Signal full name
AIERR33	T4	No Unit	32767	X	Analog Input ERRor 33
AITEST	T4	%	±400,0	X	Analog Input TESTsignal
AITESTON	T4	Log	"0","1"	X	Analog Input TEST ON
DIFCUR	I1	%	400,0	X	DIFferential CURrent
HWF10.33	T4	Log	"0","1"	X	HardWare Fault pos. 33
IAACT	T2	%	±400,0	X	IA(armature current)ACTual
IDACT	I1	%	±400,0	X	ID(d.c. current)ACTual
IDACTABS	I1	%	400,0	X	ID(d.c. current)ACTual ABSolut
IDAMP	T3	AMP	±32767	X	ID(d.c. current) AMPere
IDMV	T2	%	±400,0	X	ID(d.c. current)Mean Value
IDMVF	T2	No Unit	32767		ID(d.c. current)Mean Value Forward
IDMVR	T2	No Unit	32767		ID(d.c. current)Mean Value Reverse
UDACT	I1	%	±400,0	X	UD(d.c. voltage)ACTual value
UDI0	T2	%	±400,0	X	UD(d.c. voltage) I0 (at no load)
UDI03	I1	No Unit	0-32767		UD(d.c voltage) I0 (at no load)
UDI0C	T2	No Unit	0-32767		UD(dc voltage) I0 (no load) Correction
UDI0FILT	T2	%	±400,0	X	UD(d.c. voltage) I0 (at no load) FILTered
UDMV	T2	%	±400,0	X	UD(d.c. voltage)Mean Value
UDVOLT	T3	VOLT	±32767	X	UD(d.c.) Voltage
UVVOLT	T3	VOLT	±32767	X	UV(a.c.) Voltage in VOLT

IUMONLOX (329)

Signal	Ts	Unit	Range	OPC	Signal full name
ARMHV	T1	Log	"0","1"	X	ARMature High Voltage
ARMNEMF	T3	Log	"0","1"	X	ARMature No EMF
ARMOC	I1	Log	"0","1"	X	ARMature Over Current
ARMOCF	I1	Log	"0","1"	X	ARMature Over Current Forward
ARMOCNBR	I1	No Unit	0-32767	X	ARMature Over Current NumBeR
ARMOV	T2	Log	"0","1"	X	ARMature Over Voltage
ARMOV1	T1	Log	"0","1"	X	ARMature Over Voltage 1
EMFVOLT	T1	No Unit	±32767	Not	EMF VOLTage
FREGTMIN	T2	Log	"0","1"	X	FREquency Greater Than MIN
ISCALE	BG	%	0,0-100.0	X	I(current) SCALE factor
MSHV	I1	Log	"0","1"		Main Supply High Voltage
MSOV	I1	Log	"0","1"		Main Supply Over Voltage
NREFFOL	T2	Log	"0","1"	Not	N(speed) REFerence FOLlow
RETARMOV	T1	Log	"0","1"	X	RETARd Machine Over Voltage

MACCTROX (354)

Signal	Ts	Unit	Range	OPC	Signal full name
BETA	I1	Deg	0,0-360,0	X	BETA angle
BETACT1	T1	Deg	0,0-360,0	X	BETA calculated T1
BETAGEN	-	No Unit	0-32767		BETA angle GENerative
BETAMADV	I1	No Unit	0-32767		BETA Machine ADVance
BETAMLEV	-	No Unit	0-32767		BETA Machine LEVel
BETAMMAX	-	No Unit	0-32767		BETA Machine MAX
BETAMMI	T3	No Unit	0-32767		BETA Machine MIn
BETAMOT	I1	No Unit	0-32767		BETA MOTor
BFILTTC	-	No Unit	0-32767		Beta FILter Time Constan
CMARGC	T1	%	±400,0	X	Commutation MARGin Calculated
COSBCT1	T1	No Unit	0-32767		COS Beta Calculated T1
COSBETAC	I1	No Unit	0-32767		COS BETA Calculated
COSBMMAX	I1	No Unit	0-32767		COS Beta Machine MAX
COSBMOT	I1	No Unit	0-32767		COS Beta MOTor
COSGAMMA	I1	No Unit	0-32767		COS GAMMA
IDMAX	I1	AMP	0-32767	X	ID(current) MAX
MACCTP14	I1	No Unit	0-32767		MAChine Control Test Point 14
MACTP9T1	T1	No Unit	0-32767		MAChine Control Test Point 9 T1
MCCTEST	T4	Log	"0","1"	X	MaChine Control Test
NLEV1	-	No Unit	0-32767		N(speed) LEVel 1
NLEV2	-	No Unit	0-32767		N(speed) LEVel 2
NLEV3	-	No Unit	0-32767		N(speed) LEVel 3
OMEGAM	T1	No Unit	0,0-3276,7	X	OMEGA Machine
PAG	T4	No Unit	±32767		Power Air Gap
TSTUVOLT	-	No Unit	0-32767		Test U(voltage) VOLT
UM0VOLT	T1	VOLT	±32767	X	UM0 VOLT

MCTPUI0X (325)

Signal	Ts	Unit	Range	OPC	Signal full name
MARMOC	I1	Log	"0","1"	X	Machine ARMature Over Current
MPHASEF	T2	Log	"0","1"	X	Machine PHASE Fault
PHASERET	I1	Log	"0","1"	X	PHASE RETard
POWMUF	T2	Log	"0","1"		POWer Machine Undervoltage Fault

MCTPUO0X (364)

Signal	Ts	Unit	Range	OPC	Signal full name
COSBETAM	I1	No Unit	0-32767		COSe BETA Machine
FREQU	T2	No Unit	0-32767		FREQUency
REAC_FAC	I1	%	±400,0	X	REACtive FACtor

MSMCS0X (330)

Signal	Ts	Unit	Range	OPC	Signal full name
FREQFLT	T1	Log	"0","1"	X	FREQuency FauLT.
FREQUSTA	T4	Log	"0","1"	X	FREQuency UnSTable.
LOWMAIN	T1	Log	"0","1"	X	LOW voltage MAIN supply.
MSFLT	T4	Log	"0","1"	X	Main Supply FauLT.
MSFLTCS	T4	Log	"0","1"	X	Main Supply FauLT Converter System.
MSUV	I1	Log	"0","1"	X	Main Supply Under Voltage.
MSUVCS	T2	Log	"0","1"	X	Main Supply Under Voltage Converter System.

OPCHCS0X (303)

Signal	Ts	Unit	Range	OPC	Signal full name
LNK35	T4	Log	"0","1"		LiNK 35
LNK55	T4	Log	"0","1"		Link 55
RDYLOG	T4	Log	"0","1"		ReaDY LOGger
RESET1	T4	Log	"0","1"		RESET 1
S_AMP	BG	%	±100		Step test_AMPlitude
S_FUNO	BG	No Unit	1-6		Step test_FUnction module NO
S_TIME	BG	sec	0.0-99.9		Step test _TIME
S_TRIGG	BG	Log	"0","1"		Step test_TRIGG flag

RUNC0X (328)

Signal	Ts	Unit	Range	OPC	Signal full name
CPUSTLDS	T2	Log	"0","1"	X	CPU STaLled Drive System.
STALLPA	T1	No Unit	0-32767		STALL Pulse type A.

STRTCL0X (307)

Signal	Ts	Unit	Range	OPC	Signal full name
CONVMOD1	BG	No Unit	1-4		Converter MODe 1
DC_SHUNT	BG	Log	"0","1"		DC-SHUNT
IDMNF	BG	No Unit	0-32767		ID(converter current) nominal Forward direction
LINEVF	BG	No Unit	0-32767		LINE Voltage Factor.
UDI0NOM	BG	VOLT	0-32767	X	UD(DC-voltage)I0(at no load) NOMinal.
UVLEVF	BG	No Unit	0-32767		Under Voltage LEVel Factor.

TAMPM0X (331)

Signal	Ts	Unit	Range	OPC	Signal full name
ACKTPU1	T3	Log	"0","1"		ACKnowledge Trigger PUlse 1
TAMPUV	T2	Log	"0","1"	X	Trigger pulse AMPlifier Under Voltage
TAMPUV1	T2	Log	"0","1"	X	Trigger pulse AMPlifier Under Voltage 1
TRIPUFLT	T3	Log	"0","1"	X	TRIgger PUlses FauLT

TESTCS0X (306)

Signal	Ts	Unit	Range	OPC	Signal full name
AOTEST1	BG	%	+/-100,0	X	Analog Output TEST1
CCPULOAD	T4	%	0,0-100,0	X	Calculated CPU LOAD
DOTEST1	BG	Log	"0","1"	X	Digital Output TEST1

TPUHCL0X (351)

Signal	Ts	Unit	Range	OPC	Signal full name
BLOCKSE	T4	Log	"0","1"	X	BLOCK SEquence
DEBLOCK	T4	Log	"0","1"	X	DEBLOCK
RDYREFCS	I1	Log	"0","1"	X	ReaDY for REFerence Converter System
RELCC	I1	Log	"0","1"	X	RELease Converter Control

TQDIRC0X (362)

Signal	Ts	Unit	Range	OPC	Signal full name
BLOCK1	I1	Log	"0","1"	Not	BLOCK 1
BRCHBLOC	I1	Log	"0","1"	X	BRidge CHange BLOCk
BRCHRET	I1	Log	"0","1"	X	BRidge CHange REtard
CONVDIR	I1	Log	"0","1"	X	CONVortor DIRection
IABRLE2	I1	No Unit	0-32767	Not	IA(current) BRaking LEvel quadrant 2
IABRLE4	I1	No Unit	0-32767	Not	IA(current) BRaking LEvel quadrant 4
IADIR	INIT	No Unit	64	Not	IA(current) DIRection
IDBRLIML	BG	No Unit	0-32767	Not	ID(current) BRaking LIMit Level
IDMAX1	I1	%	0,0-400,0	X	ID(current) MAXimum 1
IDREF	I1	%	0,0-400,0	X	ID(current) REFerence
IDREFLIM	I1	Log	"0","1"	X	ID(current)REFerence LIMit
IREFCHS	I1	Log	"0","1"	Not	I(current) REFerence CHange Sign
I0PULSE	I1	Log	"0","1"	Not	I0(current) PULSE
MODE2	I1	Log	"0","1"	Not	MODE 2 in machine commutation
MOTOMODE	I1	Log	"0","1"	X	MOTOr MODE
POSROTAT	I1	Log	"0","1"	X	POSition ROTATion
RELEASE	I1	Log	"0","1"	X	RELEASE bridge control
REVISGON	I1	Log	"0","1"	X	REVerse IS Going On
TQDIR	I1	No Unit	64,128	Not	TorQue DIRection
TQDIRFWD	I1	Log	"0","1"	X	TorQue DIRection ForWarD
TQDIRREV	I1	Log	"0","1"	X	TorQue DIRection REVerse

TRPCL0X (345)

Signal	Ts	Unit	Range	OPC	Signal full name
ARMOC1	I1	Log	"0","1"	X	ARMature OverCurrent 1
FAULT1	T2	Log	"0","1"	Not	FAULT signal1
FAULT3	I1	Log	"0","1"	Not	FAULT signal3
FLTIND	I1	Log	"0","1"	Not	FauLT INDication
MSOFF_N	T1	Log	"0","1"	X	Main Supply OFF Not
TRIP1	T2	Log	"0","1"	X	TRIP 1
TRIP3	I1	Log	"0","1"	X	TRIP 3
TRIPPED	I1	Log	"0","1"	X	TRIPPED
TRIPWARN	T4	Log	"0","1"	X	TRIP WARNing

TYTEMP3X (337)

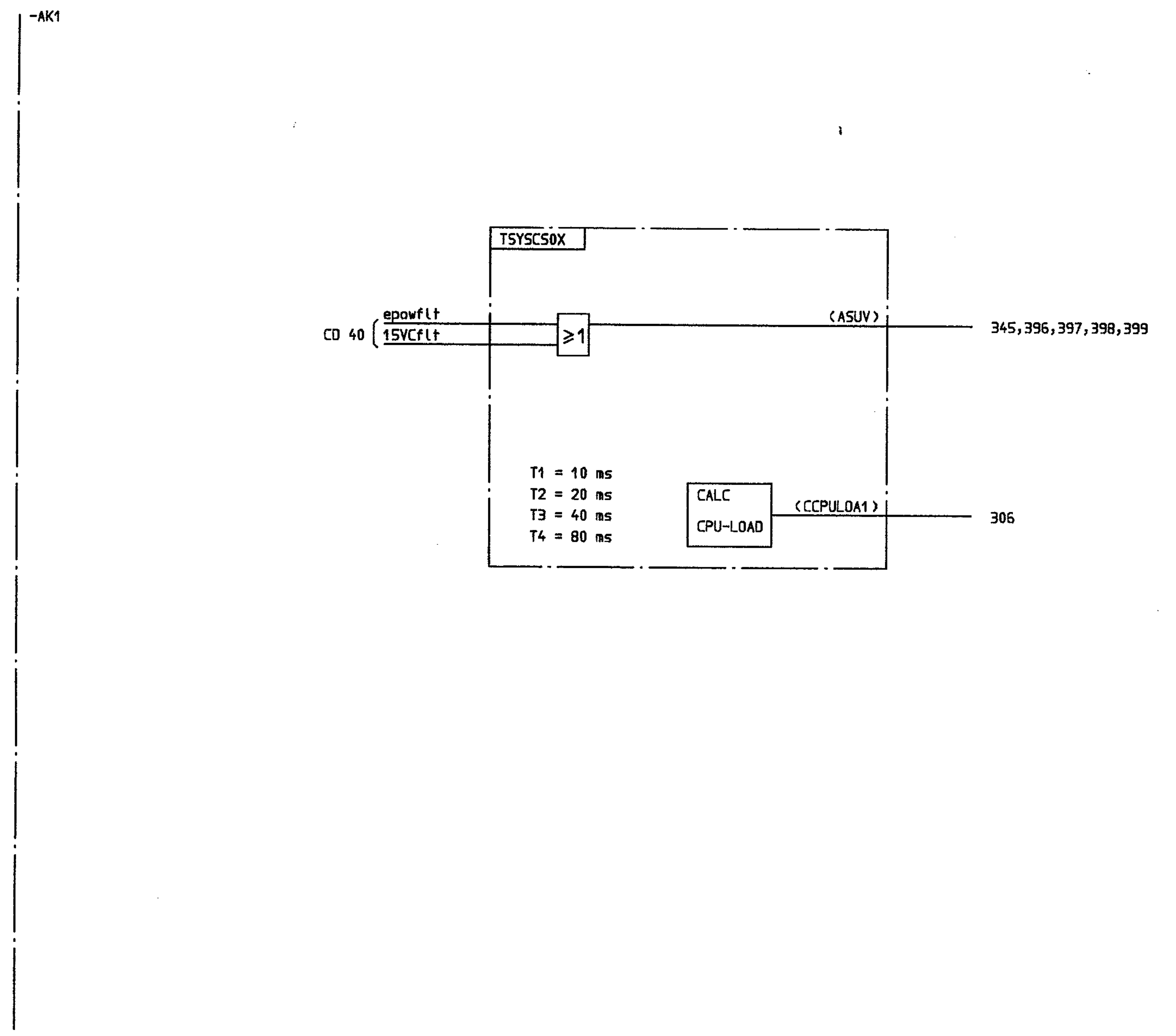
Signal	Ts	Unit	Range	OPC	Signal full name
AMBTEMP	T4	Deg	0.0-3276.7	X	AMBient TEMPerature
PLOSSF	T4	KW	0.0-3276.7	X	Power(total) LOSSes Forward
PLOSSR	T4	KW	0.0-3276.7	X	Power(total) LOSSes Reverse
SELNOTOK	INIT	Log	"0","1"		SELection NOT OK
THYHT	T4	Log	"0","1"	X	THYristor High Temperature
THYHTF	T4	Log	"0","1"	X	THYristor High Temperature Forward
THYHTR	T4	Log	"0","1"	X	THYristor High Temperature Reverse
THYOT	T4	Log	"0","1"	X	THYristor Over Temperature
THYOTF	T4	Log	"0","1"	X	THYristor Over Temperature Forward
THYOTR	T4	Log	"0","1"	X	THYristor Over Temperature Reverse
THYTEMP	T4	Deg	0.0-3276.7		TYHristor TEMPerature
TYTEMF	T4	Deg	0.0-3276.7	X	ThYristor TEMperature Forward
TYTEMR	T4	Deg	0.0-3276.7	X	ThYristor TEMperature Reverse

TYTEST1X (336)

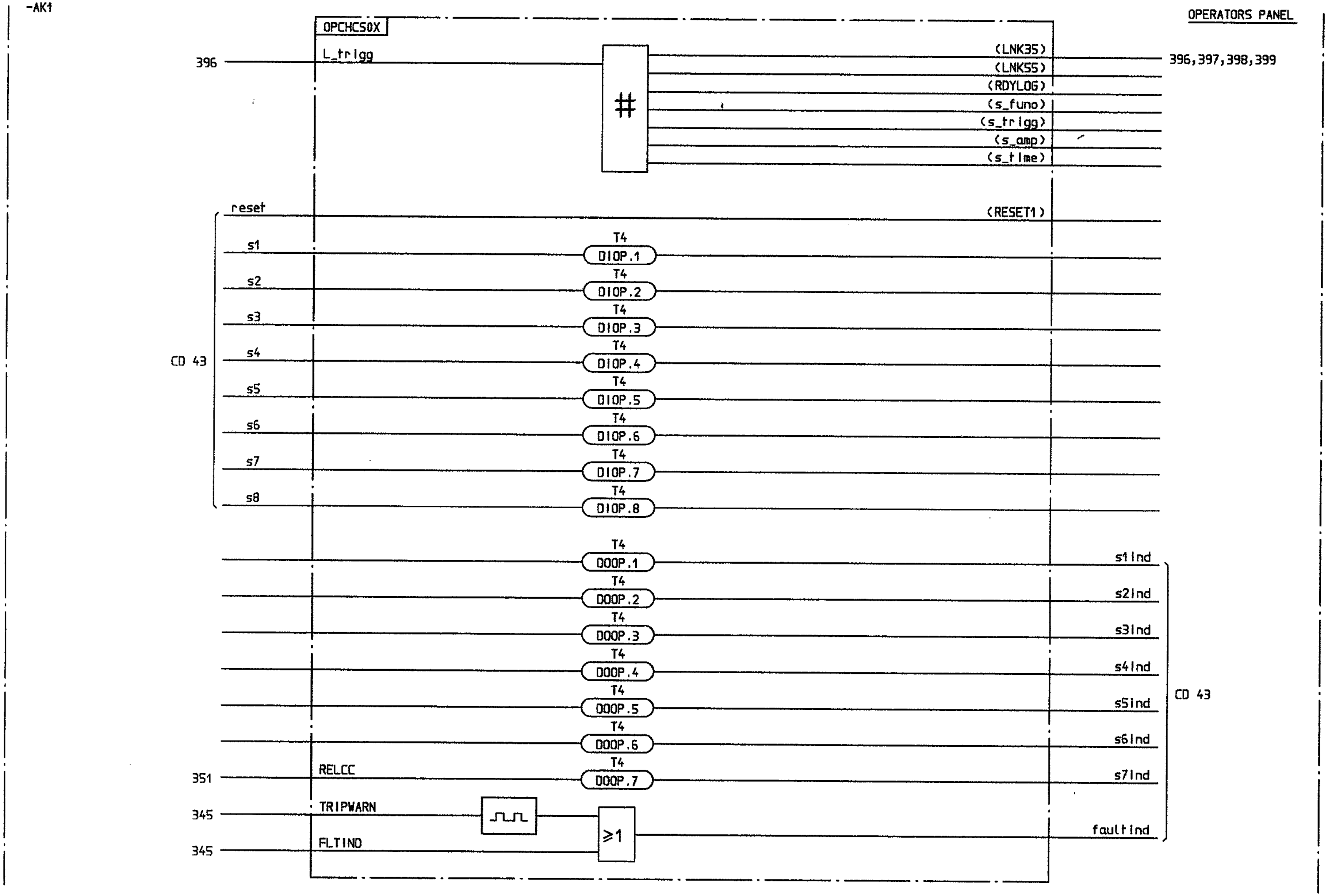
Signal	Ts	Unit	Range	OPC	Signal full name
COOLONT		Log	"0","1"		COOLing ON in Test mode
IADIRT	T4	No unit	0- ±32767		Ia DIRection at Test
IDMVFTST	T4	%	0-400		Id Minimum Value Forward TeST
IDMVRTST	T4	%	0-400		Id Minimum value Reverse TeST
TESTON		Log	"0","1"		TEST ON
THYTEST	T4	Log	"0","1"		THRistor TEST mode is activated

MODULE	PAGE	DESCRIPTION
AI37XX	312	BASIC ANALOG INPUT
AO31XX	386	BASIC ANALOG OUTPUT
AO37XX	387	BASIC ANALOG OUTPUT
CFHAMOXX	341/342	CONVERTOR FAN HANDLING AND MONITORING
CONNCLXX	304	CONNECTABLE INPUT SIGNALS
CSCRECXX	316	CONVERTOR SYSTEM SERIAL COMMUNICATION RECEIVE
CSCTRAXX	388	CONVERTOR SYSTEM SERIAL COMMUNICATION TRANSMIT
DCVOCAXX	327	DC-LINK VOLTAGE CALCULATION
DI37CSXX	309	BASIC DIGITAL INPUT
DO37CSXX	384	BASIC DIGITAL OUTPUT
EXCSCMXX	355	EXCITATION CONTROL SYNCHRON MACHINE
FACSSXX	366/367	FIRING ANGLE CONTROL
FIALCLXX	357	FIRING ANGLE LIMITATION
FLTLCLXX	396	LIST OF FAULT SIGNALS, ENGLISH
FLTLCLXX	397	LIST OF FAULT SIGNALS, SWEDISH
FLTLCLXX	398	LIST OF FAULT SIGNALS, GERMAN
FLTLCLXX	399	LIST OF FAULT SIGNALS, FRENCH
HWDICSXX	310	DIGITAL INPUT
HWDOCSXX	385	DIGITAL OUTPUT SEQUENCE
HWFMCSXX	338	HARDWARE FAULT MONITORING
IREFHLXX	353	CURRENT REFERNCE HANDLER
IREGSXX	365	CURRENT CONTROLLER
IUMEASXX	324	CURRENT AND VOLTAGE MEASURING
IUMONLXX	329	CURRENT AND VOLTAGE MONITORING
MACCTRXX	354	MACHINE CONVERTOR CONTROL
MCTPUIXX	325	MACHINE CONVERTOR TRIGGER PULSE INPUT
MCTPUOXX	364	MACHINE CONVERTOR TRIGGER PULSE OUTPUT
MSMCSXX	330	MAIN SUPPLY MONITOR
OPCHCSXX	303	OPERATORS PANEL
RUNCXX	328	RUN CHECK DRIVE SYSTEM CONTROL
STRTCLXX	307	START PARAMETERS
TAMPMXX	331	TRIGGER PULSE AMPLIFIER MONITOR
TESTCSXX	306	TEST SUPPORT
TPUHCLXX	351	TRIGGER PULSE HANDLING
TQDIRCXX	362	TORQUE DIRECTION CONTROL
TRIPCLXX	345	TRIP CONVERTOR CONTROL
TSYSCSXX	302	SYSTEM DEFINITION
TYTEMPXX	337	THYRISTOR TEMPERATURE MONITORING
TYTESTXX	336	THYRISTOR TEMPERATURE TEST

SYSTEM DEFINITION



Prepared	93 38	S SVENSSON	
Approved	93 38	H POURFALAH	
PROGRAM DIAGRAM			
PROGRAM CL1201XX			
ABB Industrial Systems	Resp dept DRI/DKK	3ASD 489306C320	Lang EN, Sheet 302, Cont 303



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PROGRAM DIAGRAM
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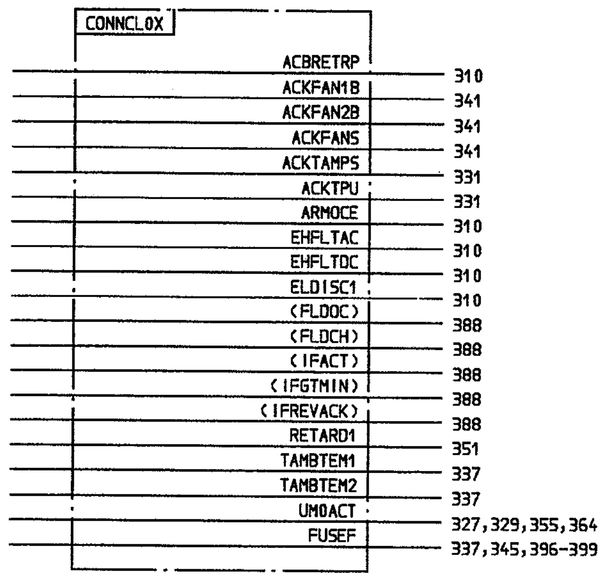
3ASD 489306C320

Lang EN
Sheet 303
Cont 304

CONNECTABLE INPUT SIGNALS

-AK1



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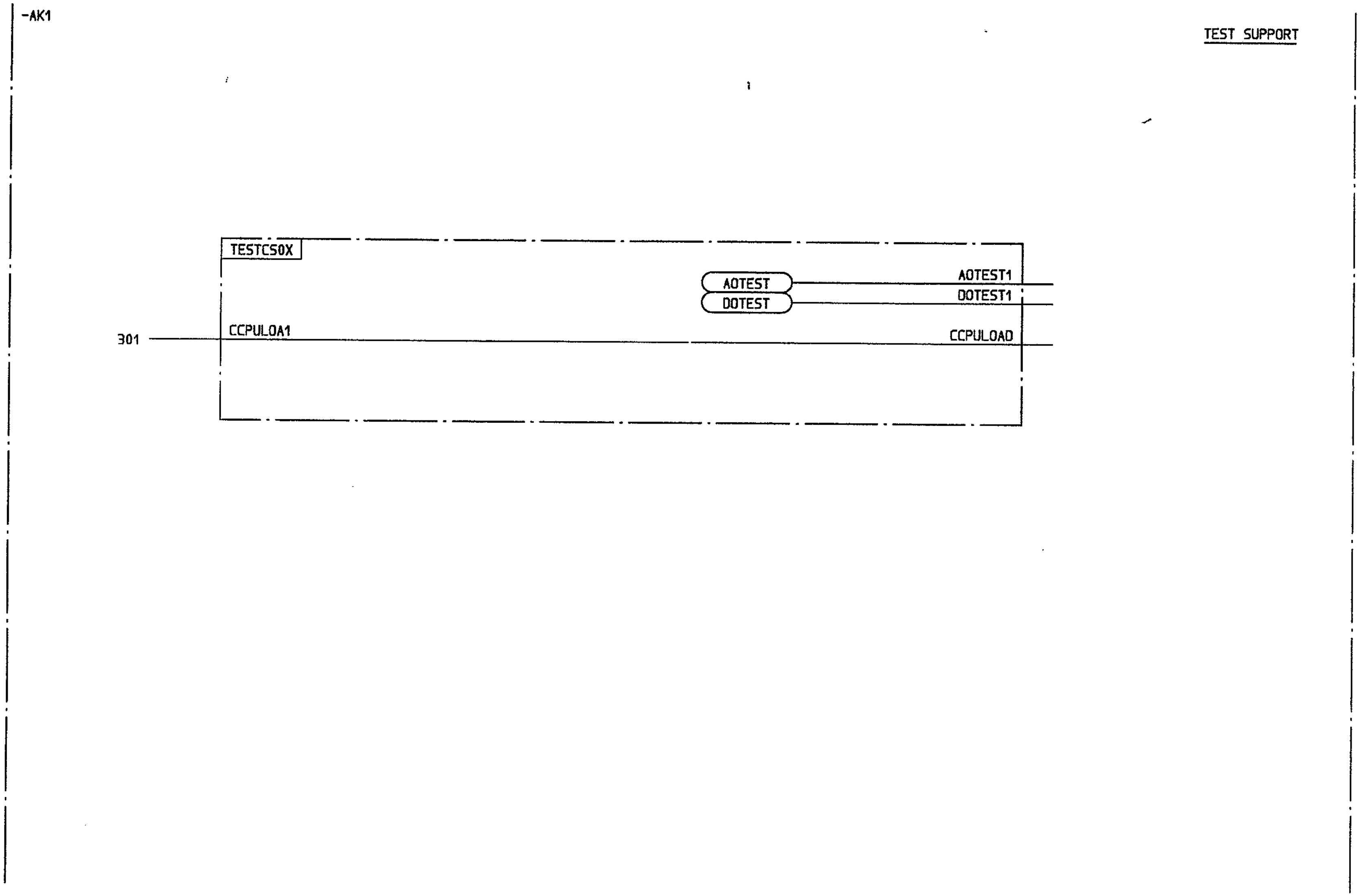
PROGRAM CL1201XX			
Rev Ind	Revision	Reg No	
Based on		Pol	
ABB Industrial Systems	Resp dept DRI/DKK	Rev Ind	Lang EN
3ASD 489306C320			Sheet 304
			Cont 306



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PROGRAM DIAGRAM
PROGRAM CL1201XX

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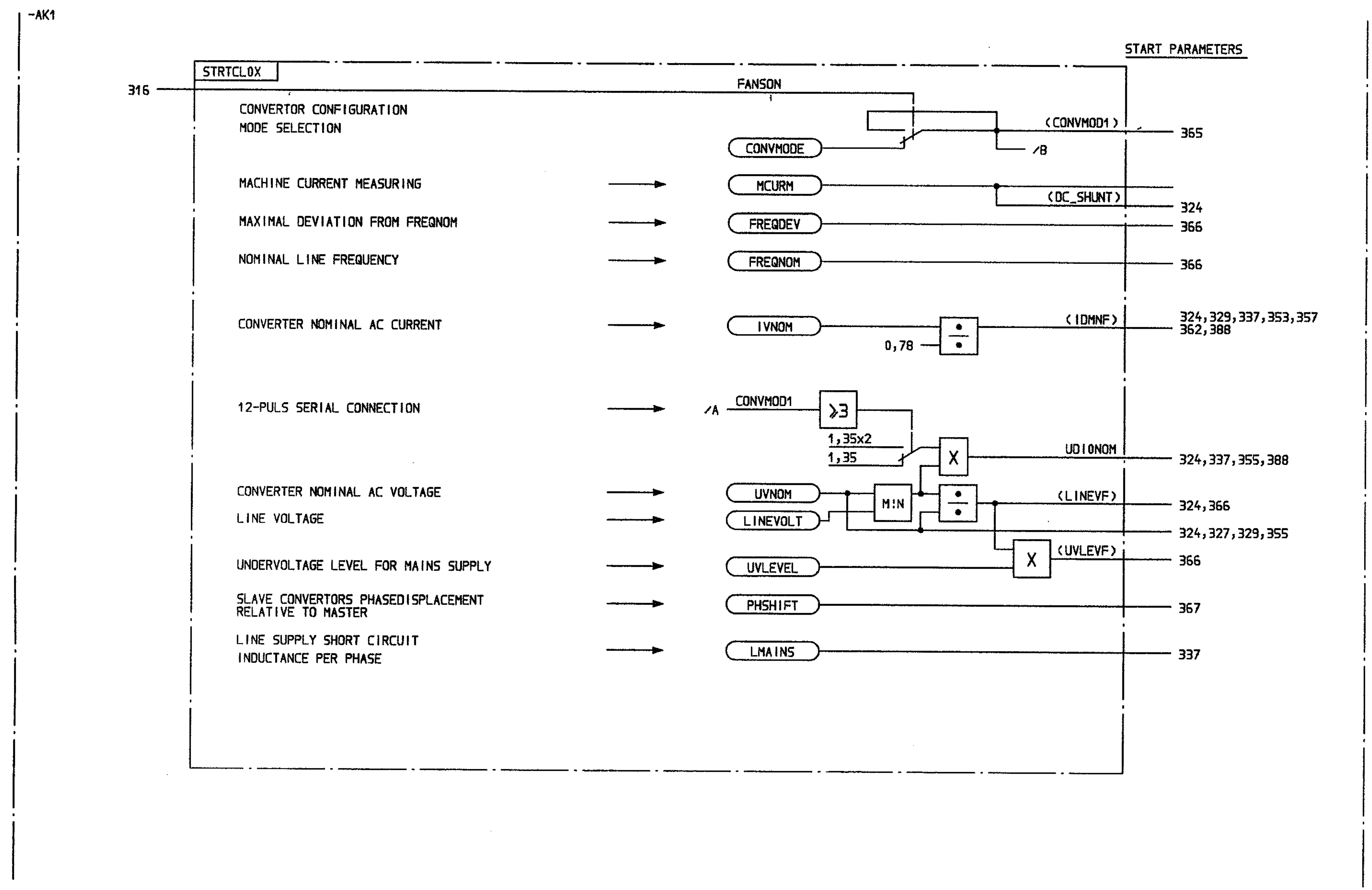
3ASD 489306C320

Lang EN
Sheet 306
Cont 307



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PROGRAM DIAGRAM PROGRAM CL1201XX	ABB Industrial Systems	Resp dept DRI/DKK
Rev ind	Revision	Reg No
Based on		Pa1
3ASD 489306C320	Lang EN	Sheet 307
Rev ind		Cont 309

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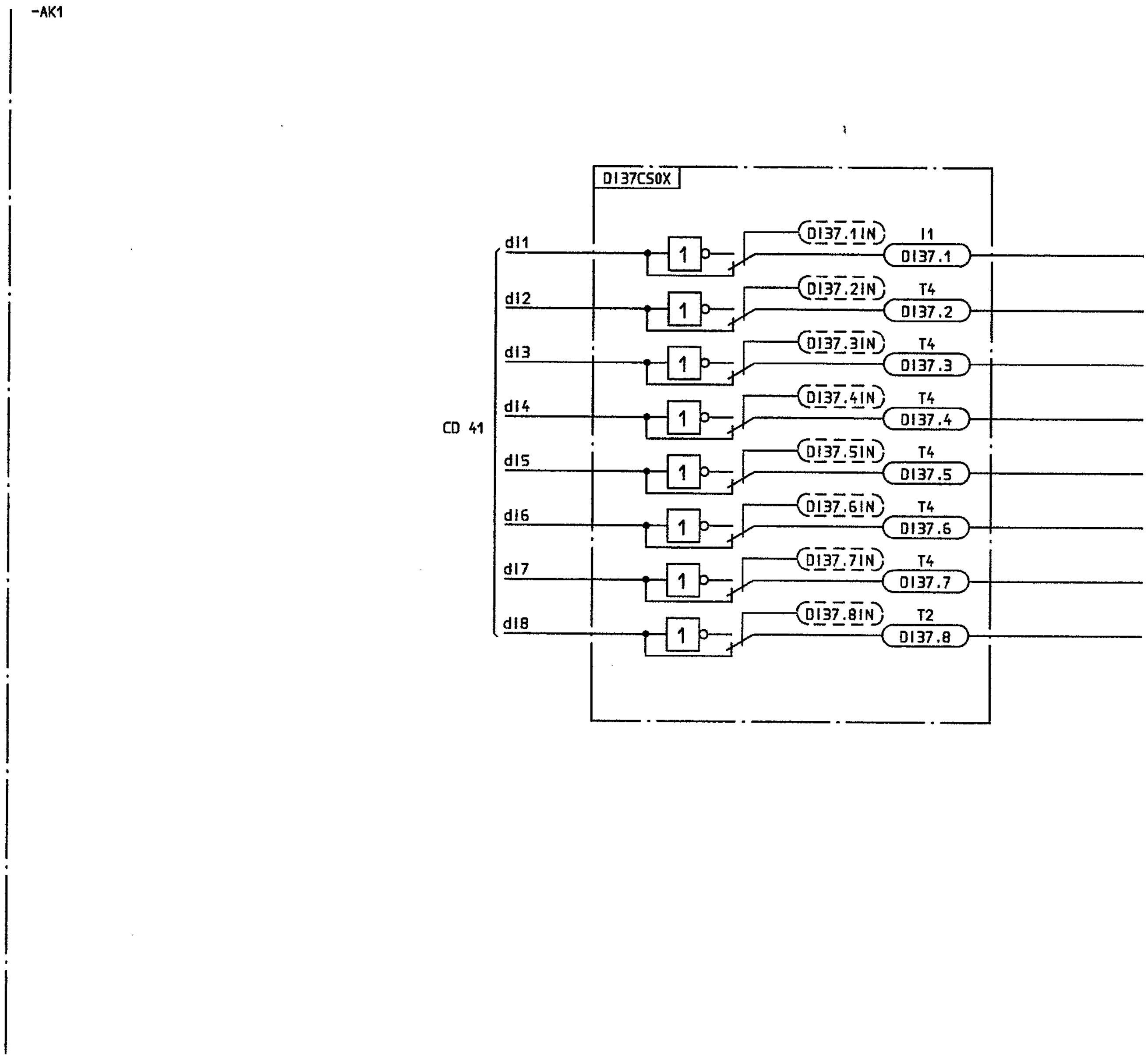
BASIC DIGITAL INPUT



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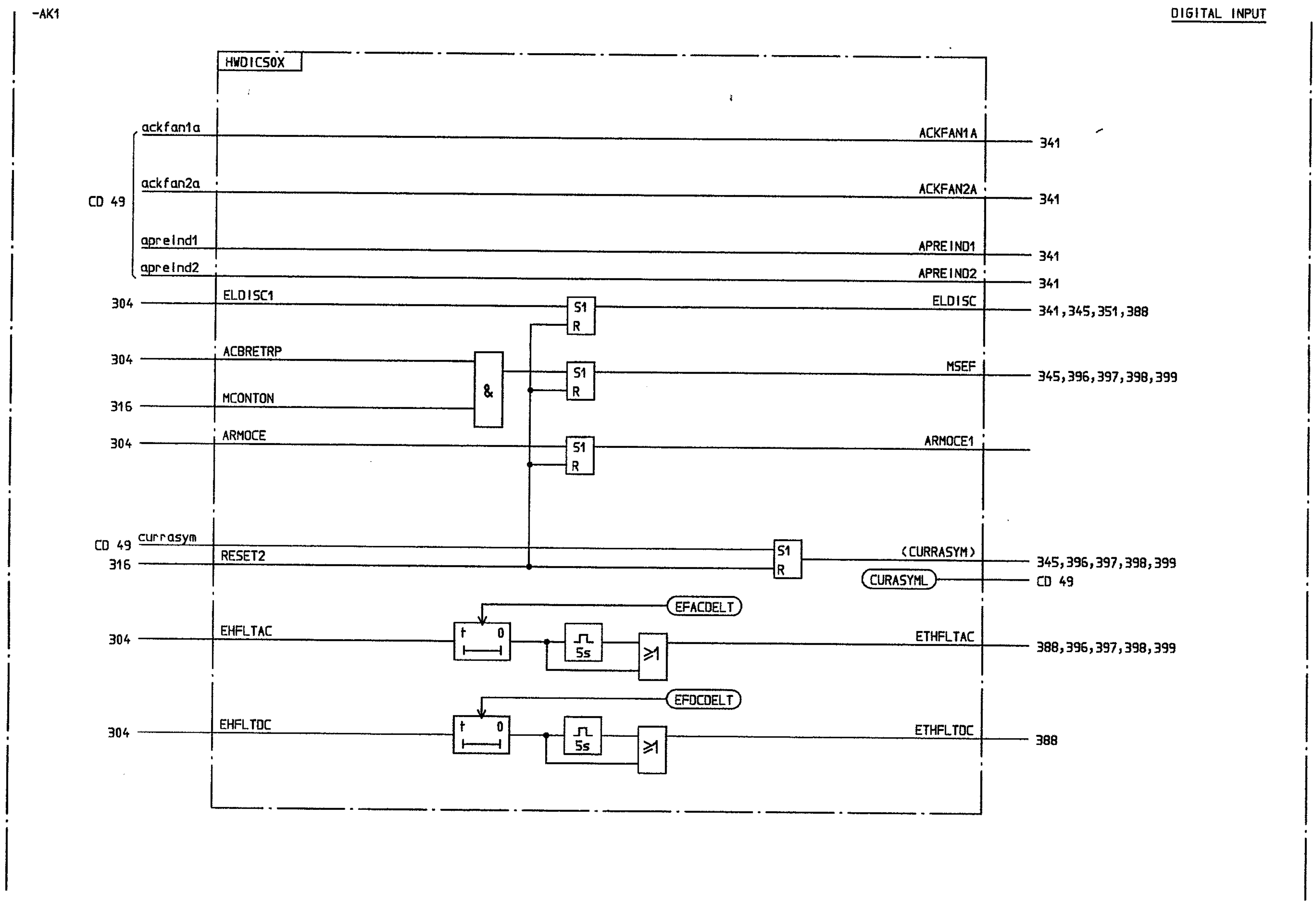
PROGRAM DIAGRAM			
PROGRAM CL1201XX			
Resp dept DRI/DKK	Rev Ind	Lang EN	
ABB Industrial Systems	3ASD 489306C320	Sheet 309	Cont 310

Rev Ind | Revision | Reg No
Based on | Pol



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PROGRAM CL1201XX			
Rev ind	Revision	Reg No	
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Resp dept	DRI/DKK	Rev ind	Lang EN
3ASD 489306C320			Sheet 310
			Cont 312

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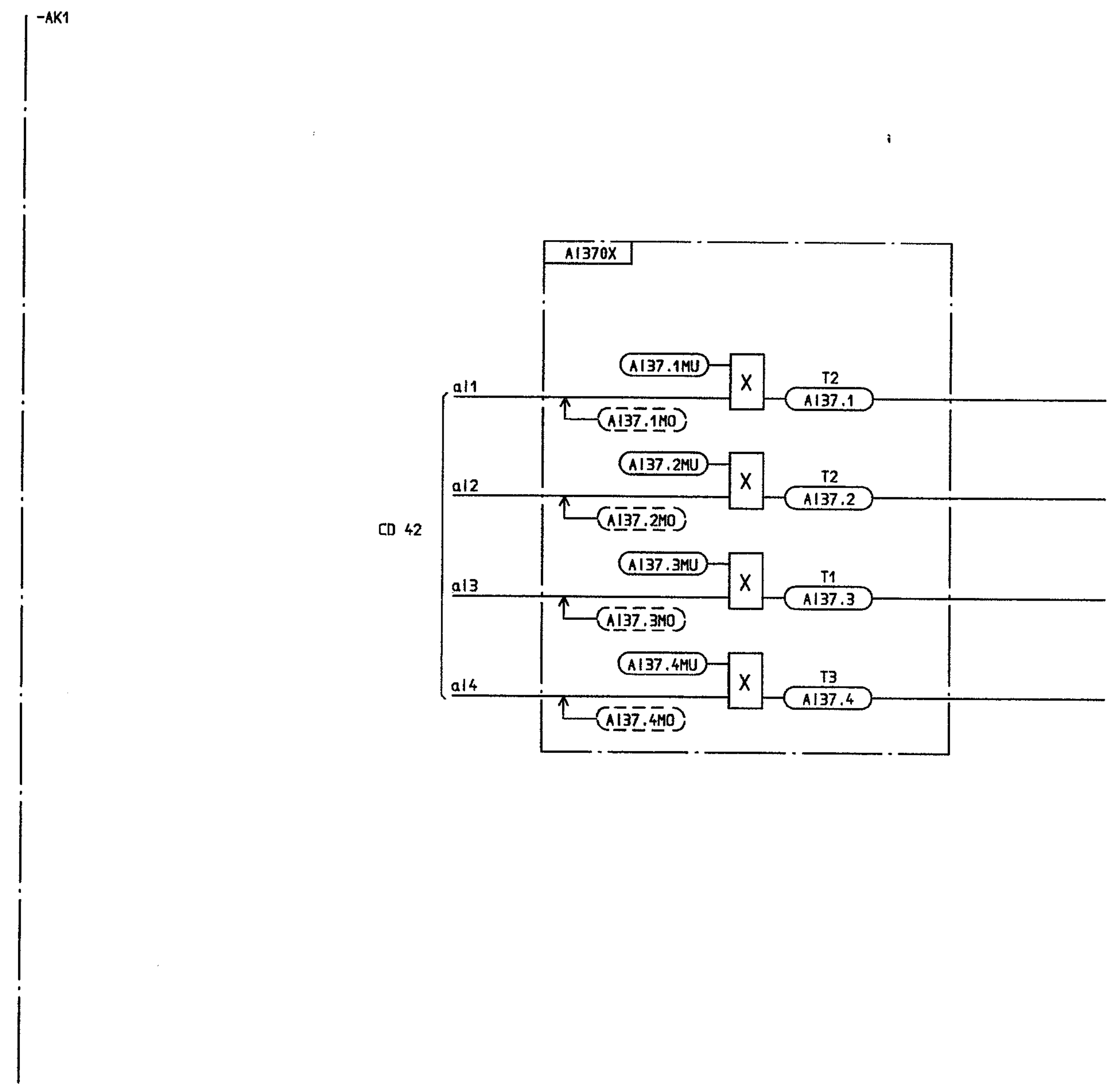
ANALOG INPUT
BASIC ANALOG INPUT



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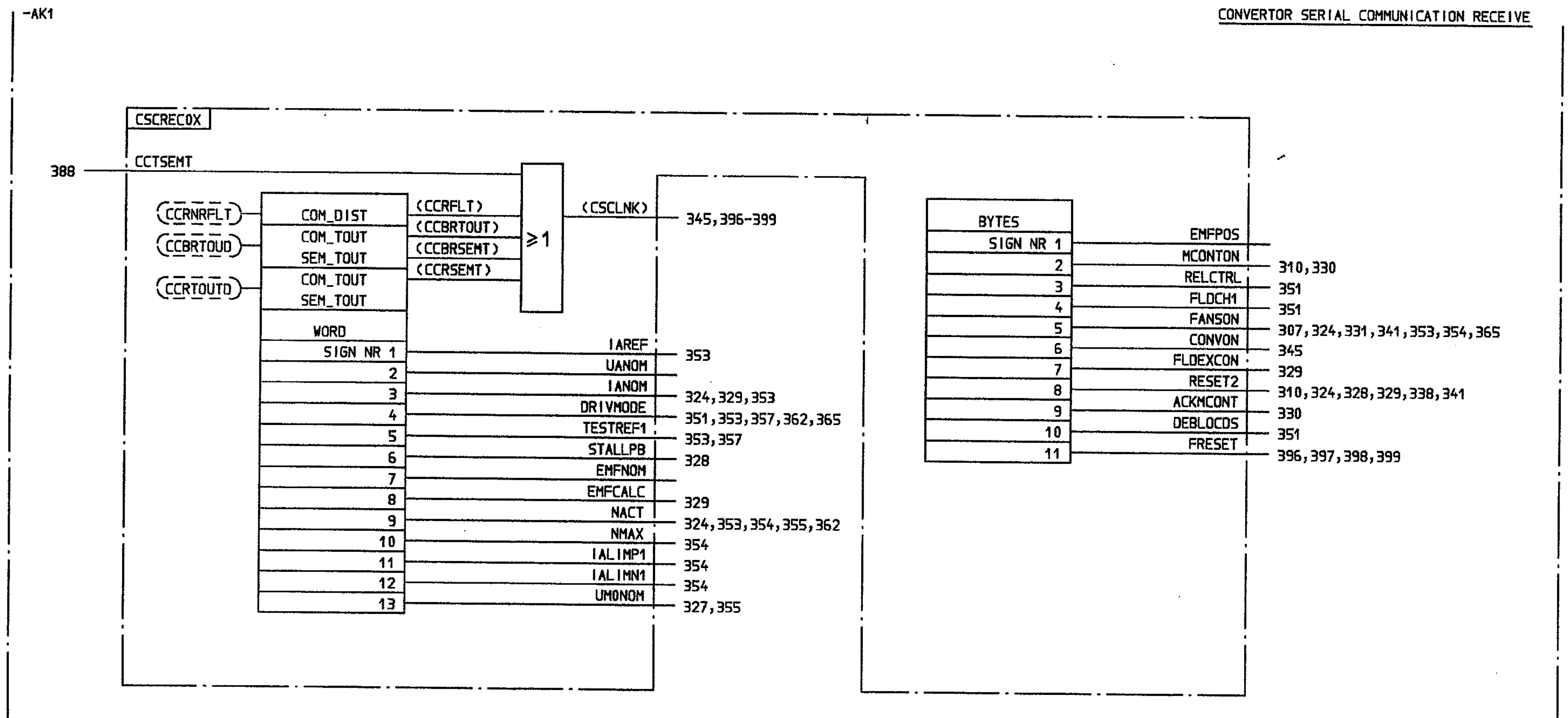
PROGRAM DIAGRAM			
PROGRAM CL1201XX			
ABB Industrial Systems	Resp dept DRI/DKK	Rev Ind	Lang EN
	3ASD 489306C320		Sheet 312
			Cont 316

CONVERTOR SERIAL COMMUNICATION RECEIVE



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Rev Ind	Revision	Reg No
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3ASD 489306C320 | Sheet 316 | Cont 324

SYMBOL ID /D:3ASD489306C320:316/0 94-10-04 14.13

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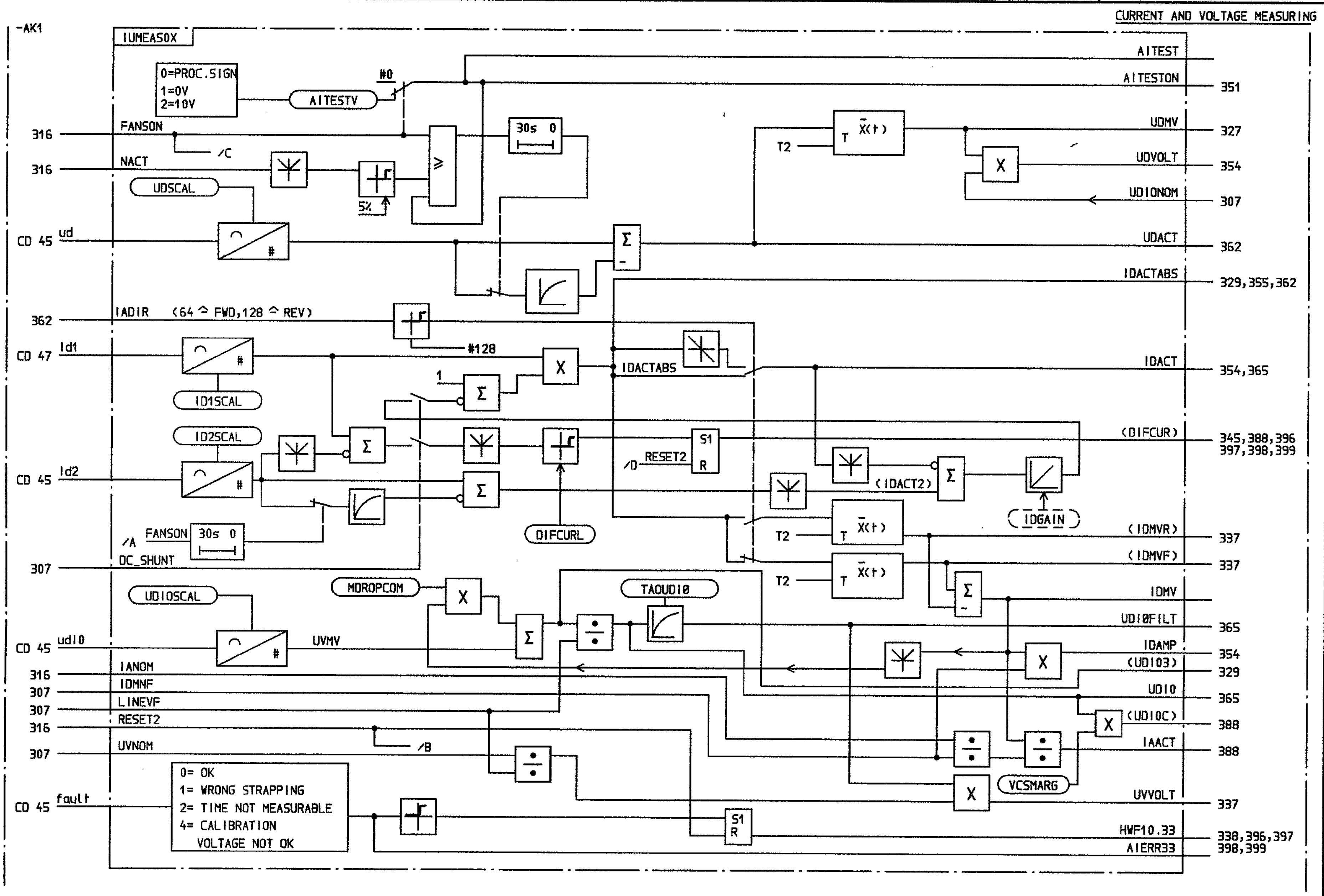

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PROGRAM DIAGRAM PROGRAM CL1201XX	ABB Industrial Systems	Resp dept DRI/DKK
	3ASD 489306C320	Lang EN Sheet 324 Cont 325

Rev ind | Revision | Reg No | Based on | Pcl

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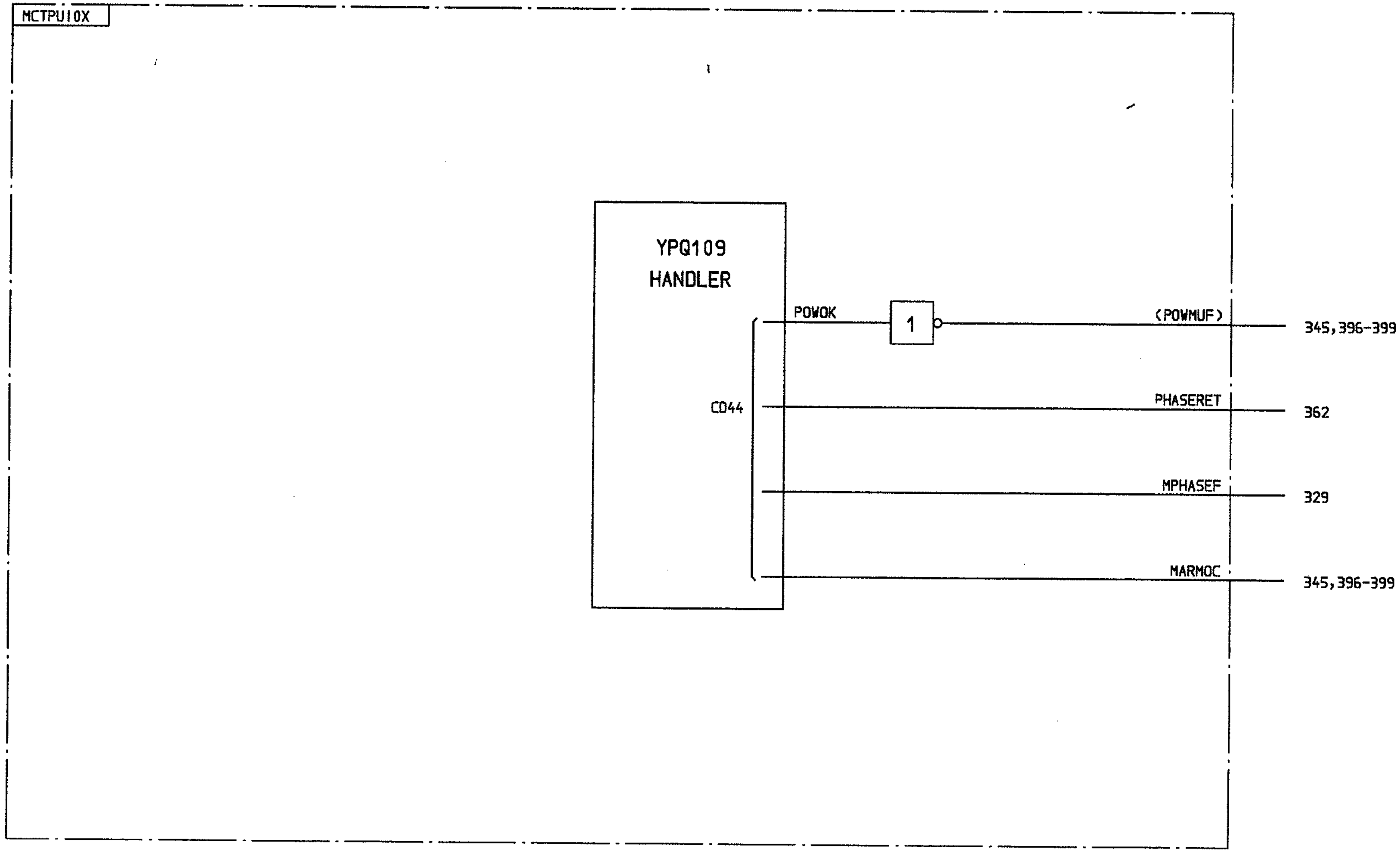
MACHINE CONVERTOR TRIGGER PULSE UNIT INPUTS



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Prepared	93 38	S SVENSSON	CONVERTOR CONTROL LCI
Approved	93 38	S-E BERGLUND	
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PROGRAM CL1201XX			3ASD 489306C320

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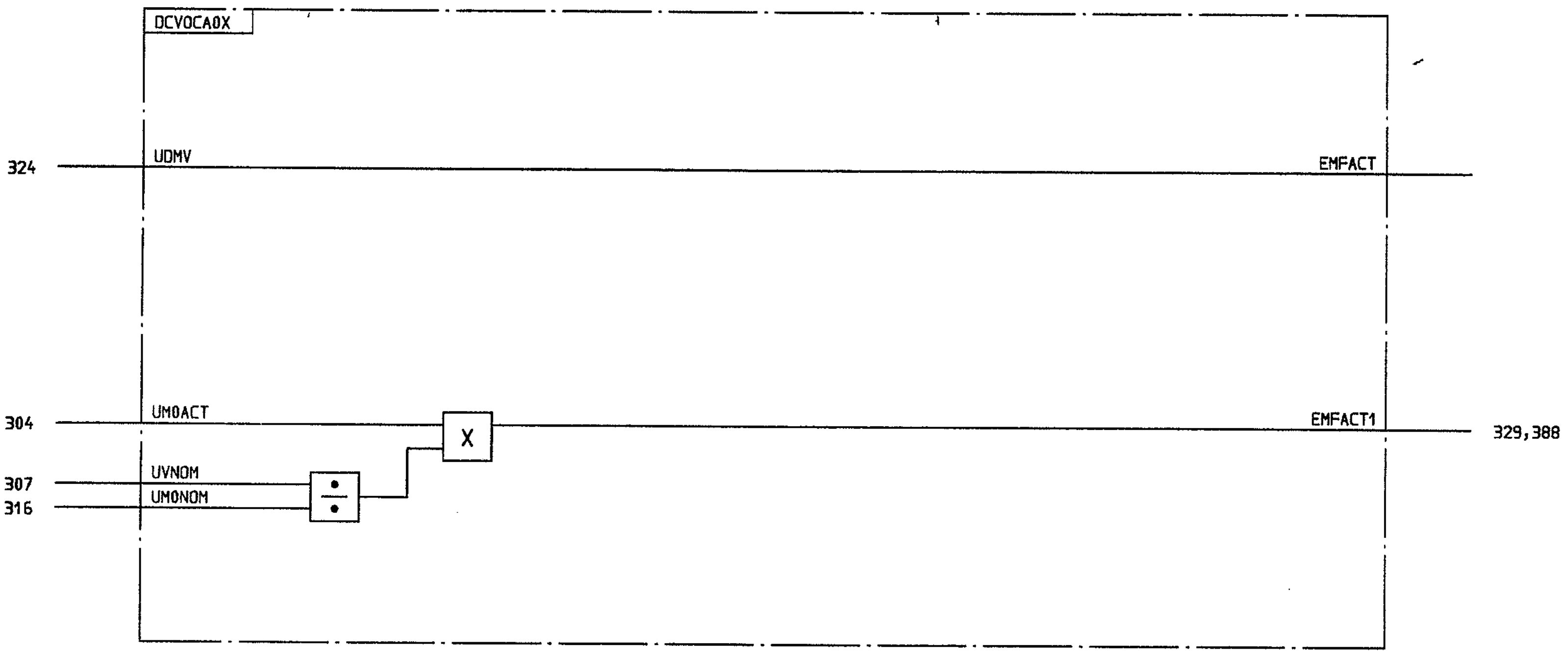
Lang EN | Sheet 325 | Cont 327

DC-LINK VOLTAGE CALCULATION



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PROGRAM DIAGRAM
PROGRAM CL1201XX

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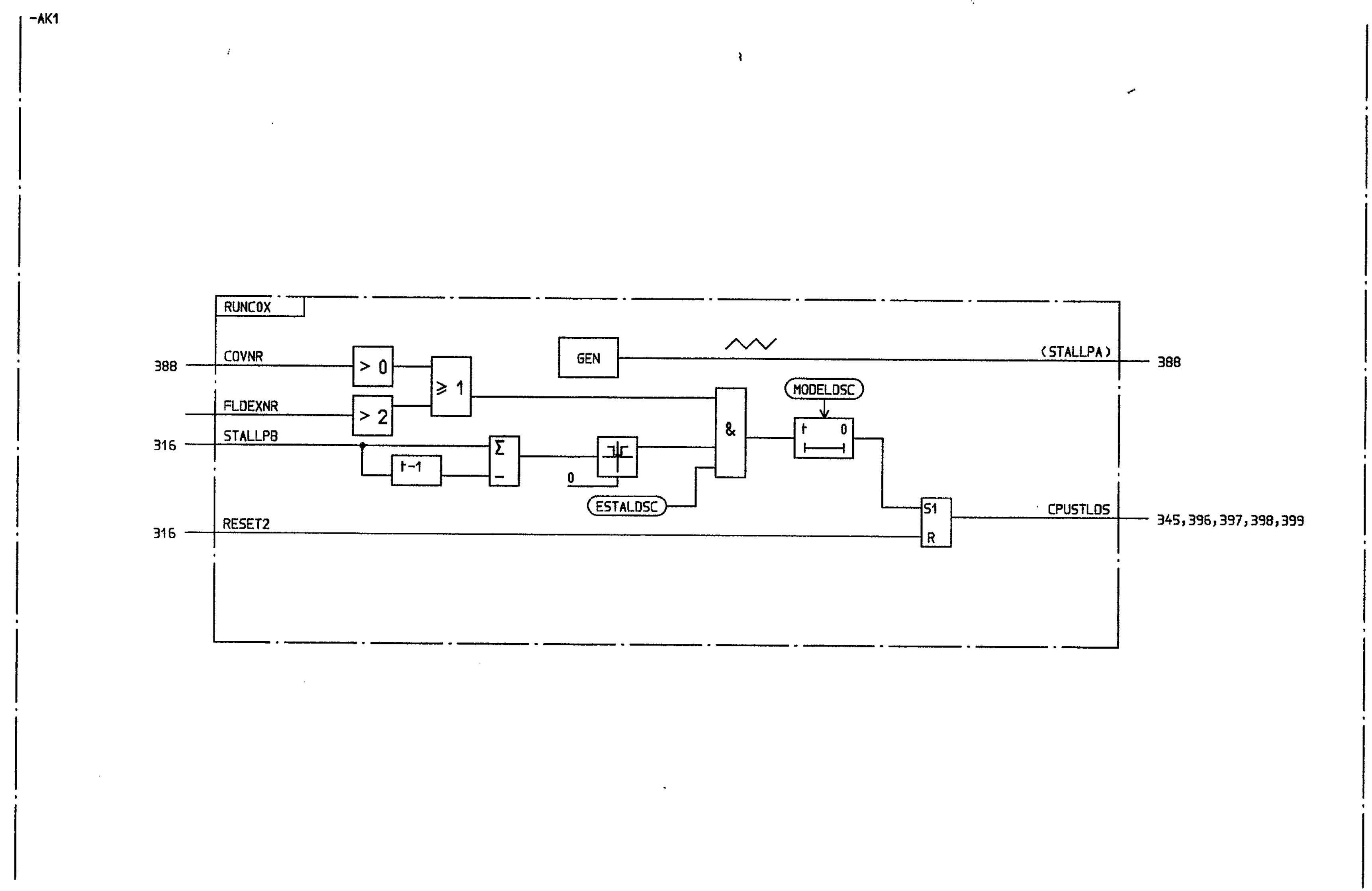
3ASD 489306C320

Lang EN
Sheet 327
Cont 328

Rev Ind | Revision | Reg No
Based on | Pcl

RUN CHECK DRIVE SYSTEM CONTROL



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Rev Ind / Revision / Reg No / Based on / Pol			Lang EN Sheet 328 Cont 329

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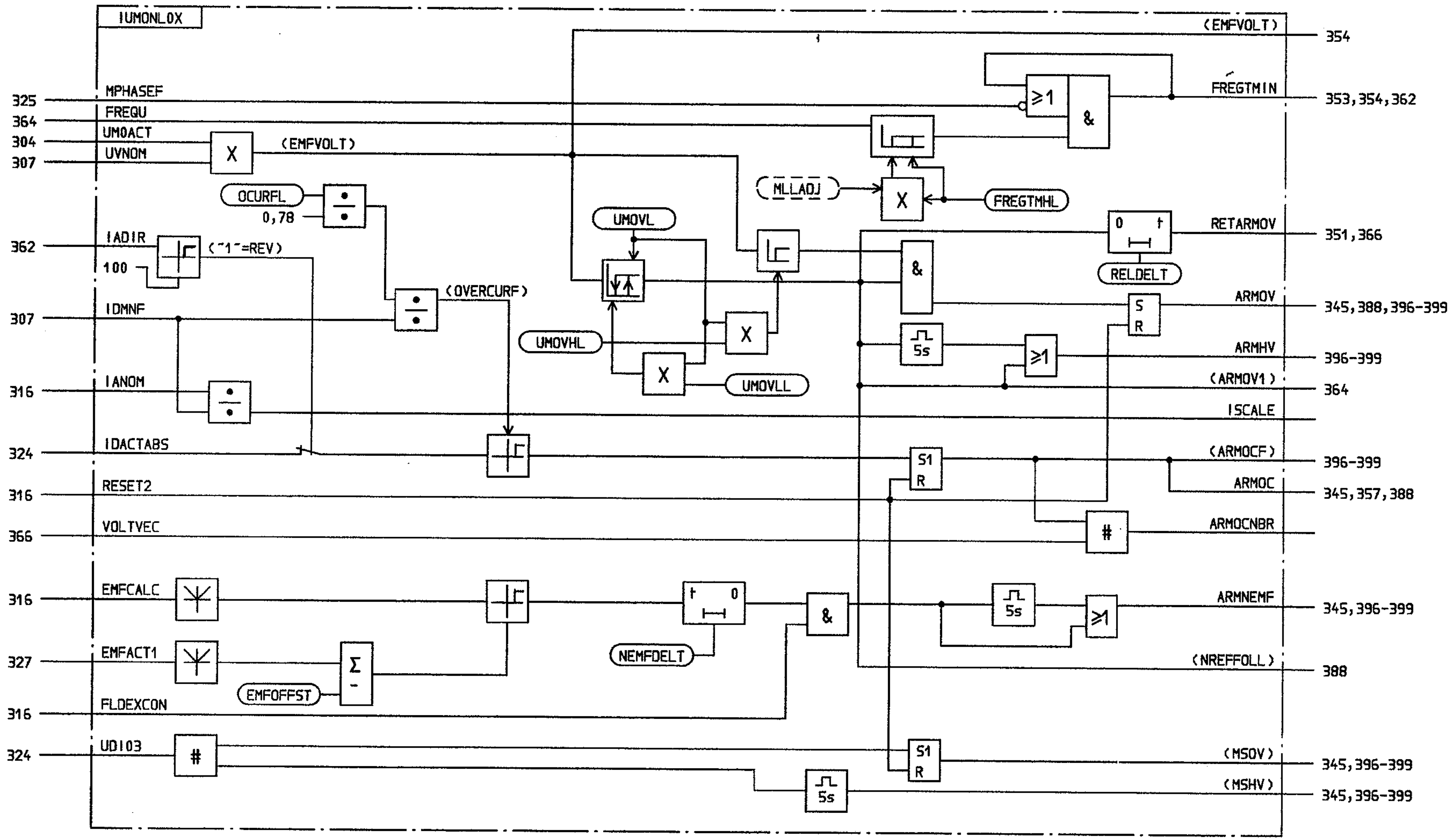
SYMBOL ID /0:3ASD489306C320:328/0 93-09-02 08.30

CURRENT AND VOLTAGE MONITOR



Prepared 93 38	S SVENSSON
Approved 93 38	S-E BERGLUND

PROGRAM DIAGRAM
PROGRAM CL1201XX

CONVERTOR CONTROL LCI

ABB Industrial Systems

Resp dept | Rev Ind | Rev Ind | Revision | Reg No | Based on | Pcl

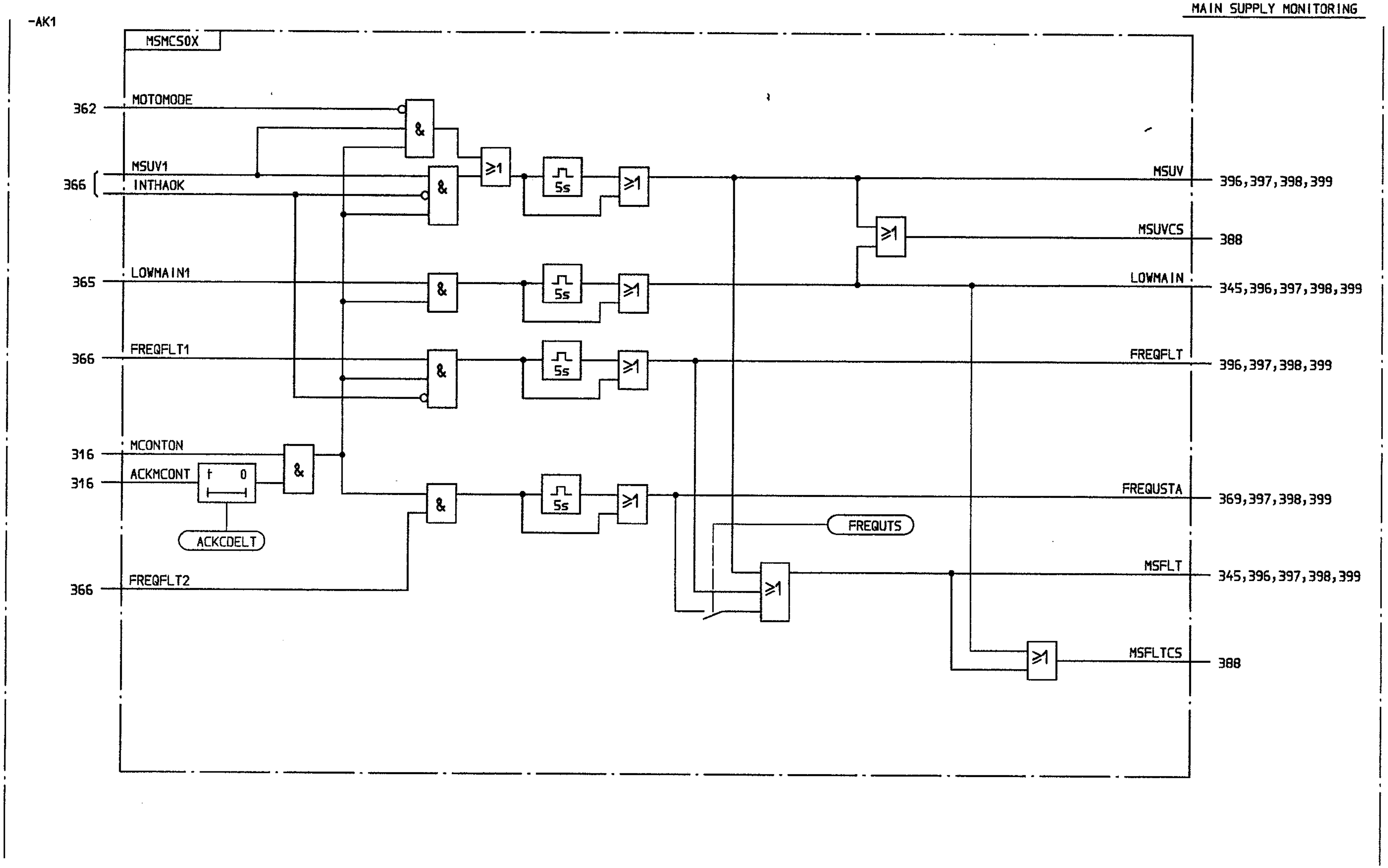
3ASD 489306C320

Lang EN
Sheet 329
Cont 330

DR/DKK

94-10-04 14.25

SYMBOL ID /D:3ASD489306C320:329/0



Prepared	93 38	S SVENSSON
Approved	93 38	H POURFALAH

PROGRAM DIAGRAM
PROGRAM CL1201XX

ABB Industrial Systems

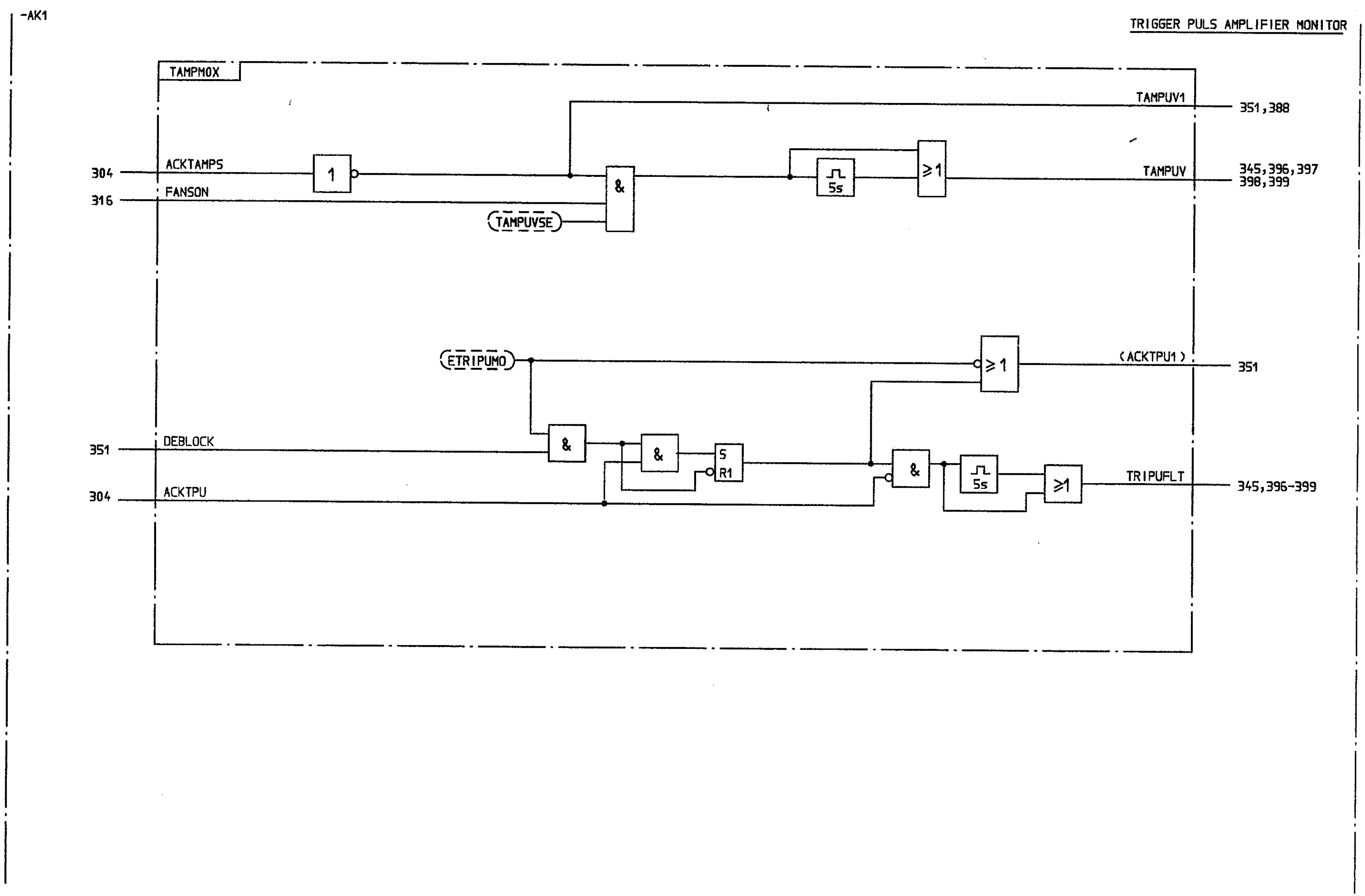
Resp dept DRI/DKK

3ASD 489306C320

Lang EN
Sheet 330
Cont 331

Rev ind | Revision | Reg No | Based on | Pol

SYMBOL ID /D:3ASD489306C320:330/0 93-09-02 10.32 DR/DKK



Prepared	93 38	S SVENSSON
Approved	93 38	H POURFALAH

PROGRAM DIAGRAM
PROGRAM CL1201XX

ABB Industrial Systems

Resp dept DRI/DKK

3ASD 489306C320

Lang EN
Sheet 331
Cont 336

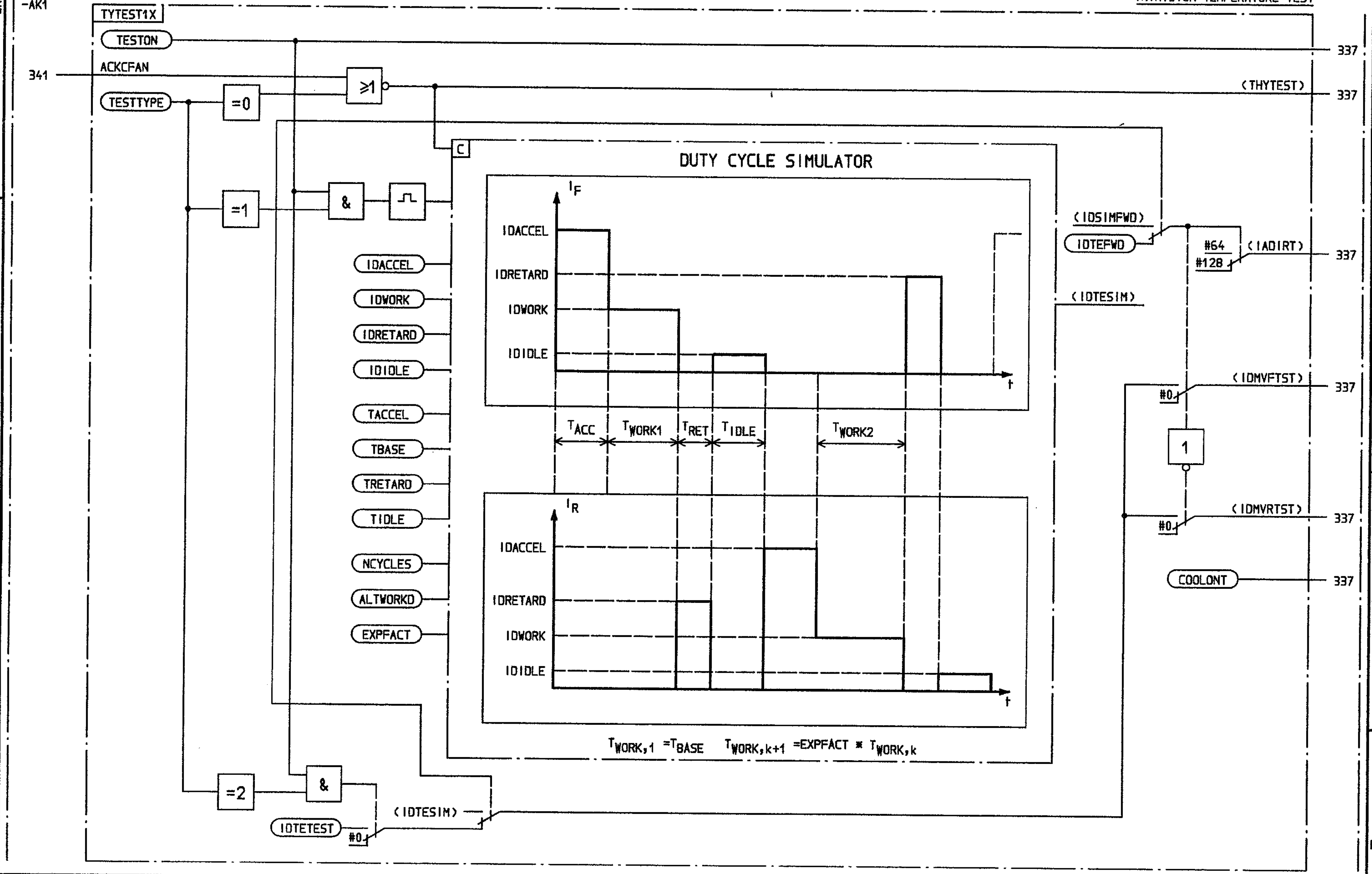
Rev Ind | Revision | Reg No | Pcl | Based on

SYMBOL ID /D:3ASD489306C320:331/0

93-09-02 10.33

DR/DKK

THYRISTOR TEMPERATURE TEST

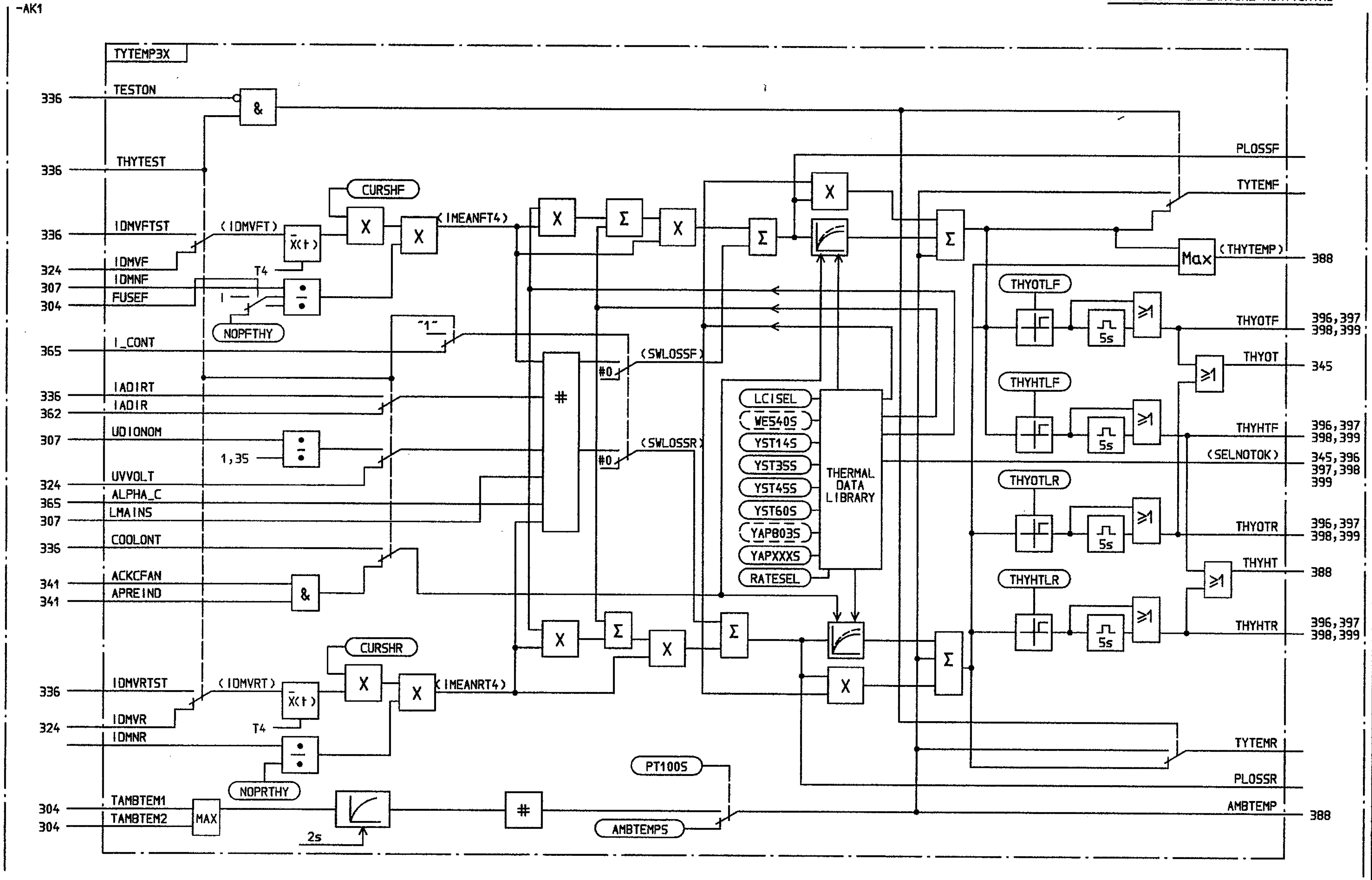


Prepared 93 38	S SVENSSON	
Approved 93 38	H POURFALAH	
PROGRAM DIAGRAM PROGRAM CL1201XX		
ABB Industrial Systems	Resp dept DRI/DKK	Lang EN
3ASD 489306C320	Rev ind	Sheet 336 Cont 337

Rev ind | Revision | Reg No
Based on | | Pcl

SYMBOL ID /D:3ASD489306C320:336/0 93-09-02 08.31 DR/DKK

THYRISTOR TEMPERATURE MONITORING



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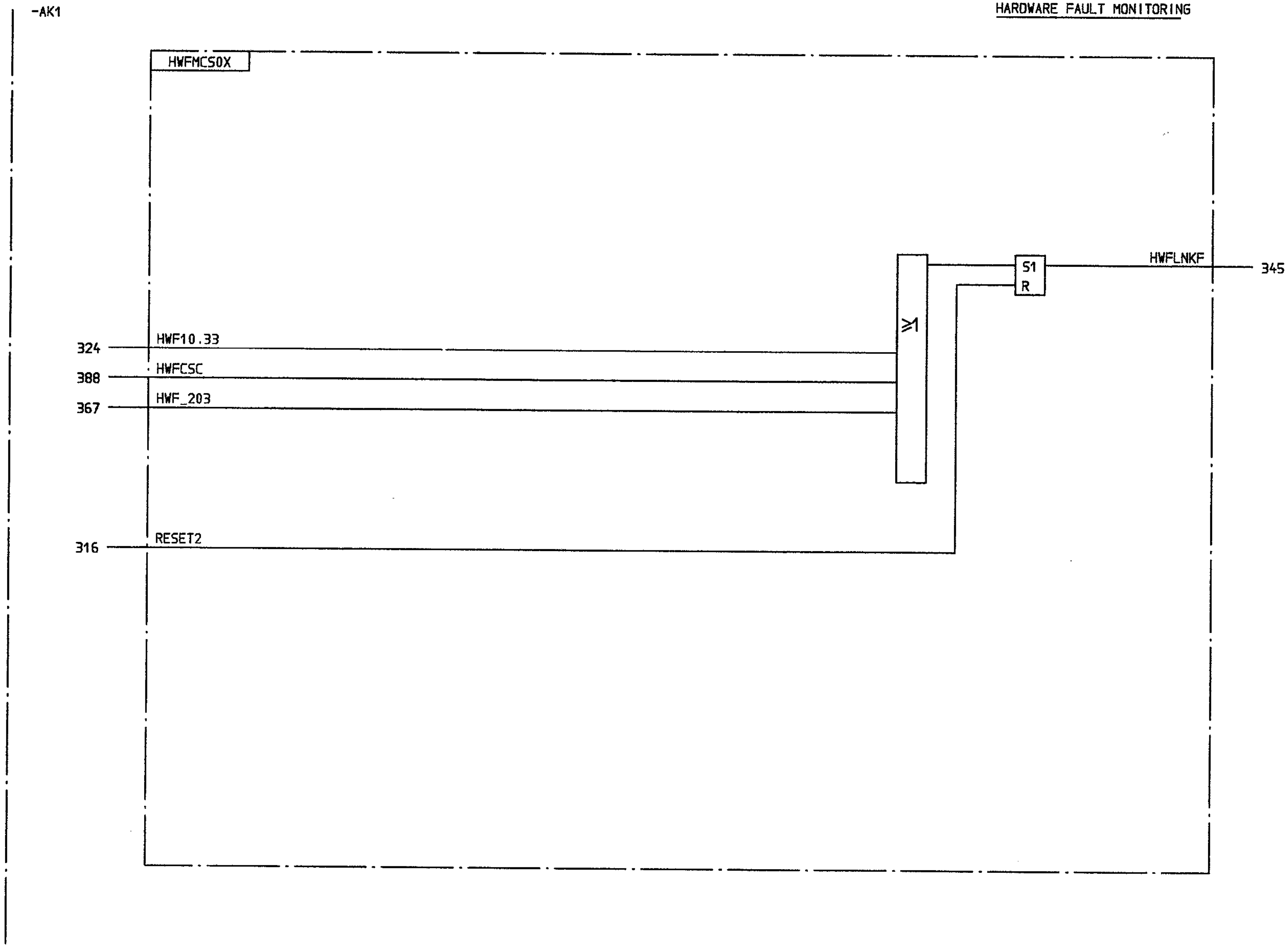
94-10-06 14.33

SYMBOL ID /D:3ASD489306C320:337/0

Prepared	93 38 S SVENSSON
Approved	93 38 H POURFALAH
	PROGRAM DIAGRAM PROGRAM CL1201XX
Resp dept	DRI/DKK
	ABB Industrial Systems
	3ASD 489306C320
Lang	EN
Sheet	337
Cont	338

Rev Ind | Revision | Reg No | Based on | Pc I

HARDWARE FAULT MONITORING



Prepared	93 38	S SVENSSON	
Approved	93 38	H POURFALAH	
PROGRAM DIAGRAM			
PROGRAM CL1201XX			
ABB Industrial Systems	Resp dept DRI/DKK	Rev Ind	Lang EN
	3ASD 489306C320		Sheet 338
			Cont 341

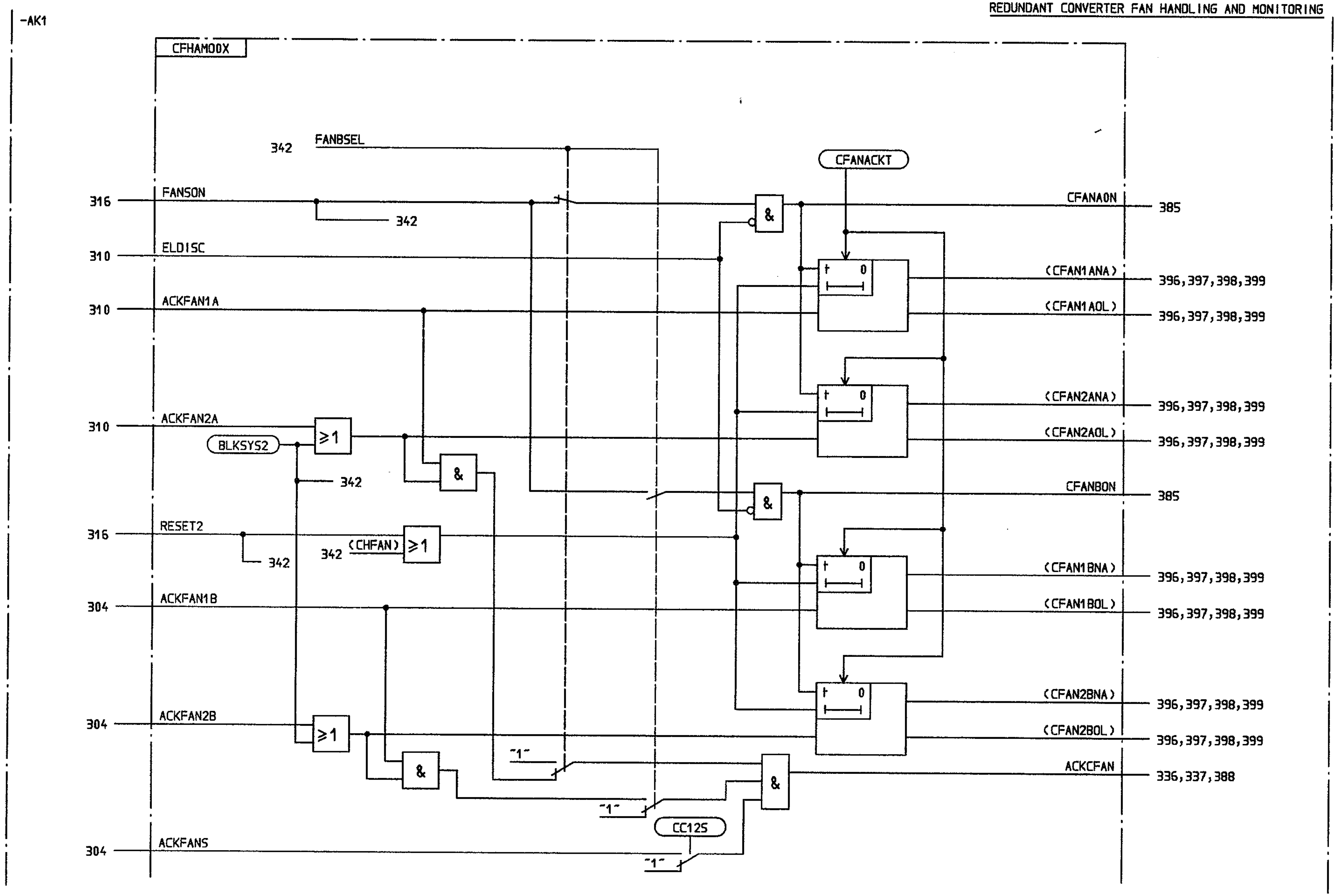
Rev Ind | Revision | Reg No
Based on | Pol

94-10-04 15.19

SYMBOL ID /D:3ASD489306C320:338/0

DR/DKK

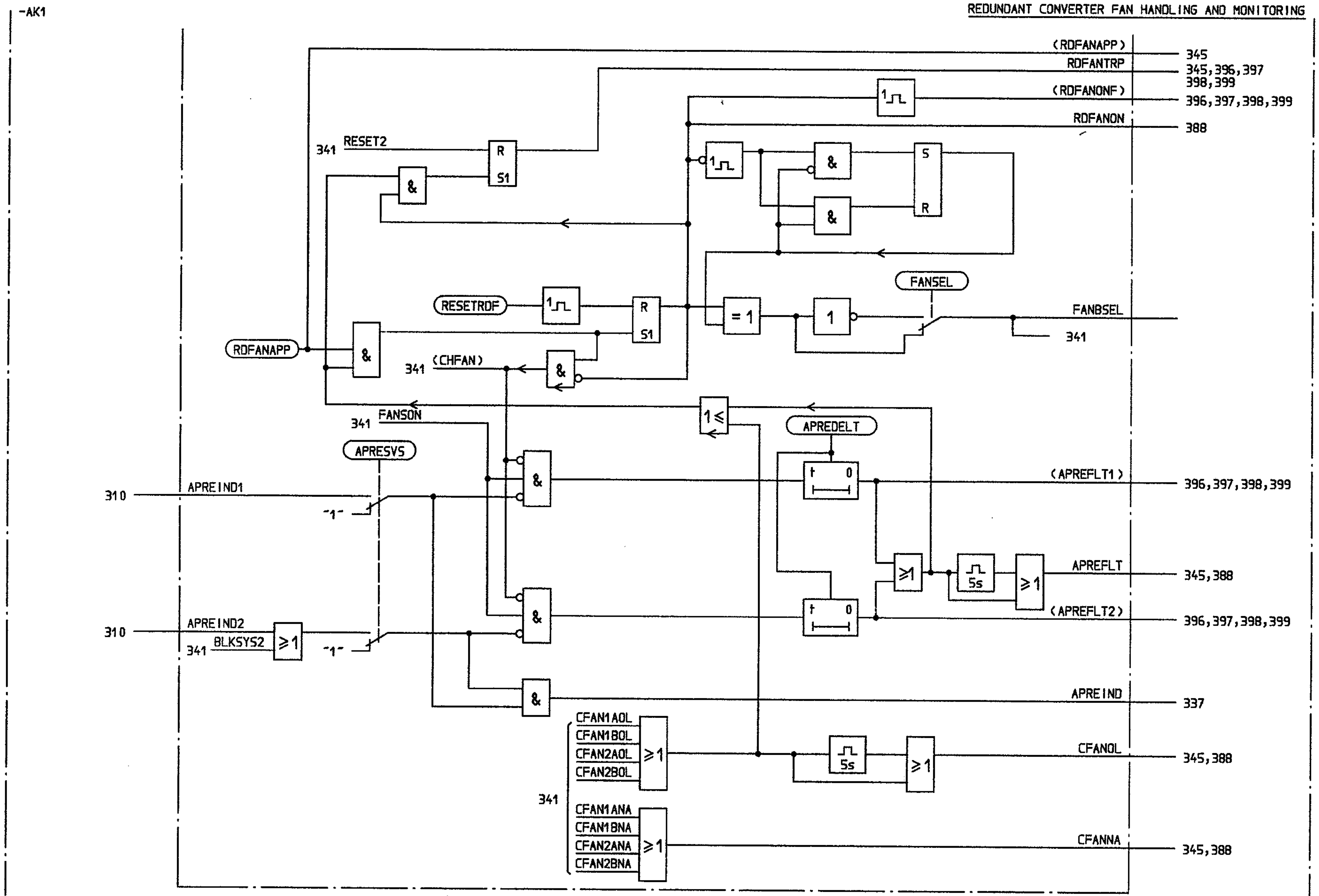
REDUNDANT CONVERTER FAN HANDLING AND MONITORING



Prepared	93 38 S SVENSSON
Approved	93 38 H POURFALAH
	PROGRAM DIAGRAM
	PROGRAM CL1201XX
ABB Industrial Systems	Resp dept DRI/DKK
	3ASD 489306C320
Lang	EN
Sheet	341
Cont	342

93-09-02 08.31 SYMBOL ID /D:3ASD489306C320:341/0

REDUNDANT CONVERTER FAN HANDLING AND MONITORING

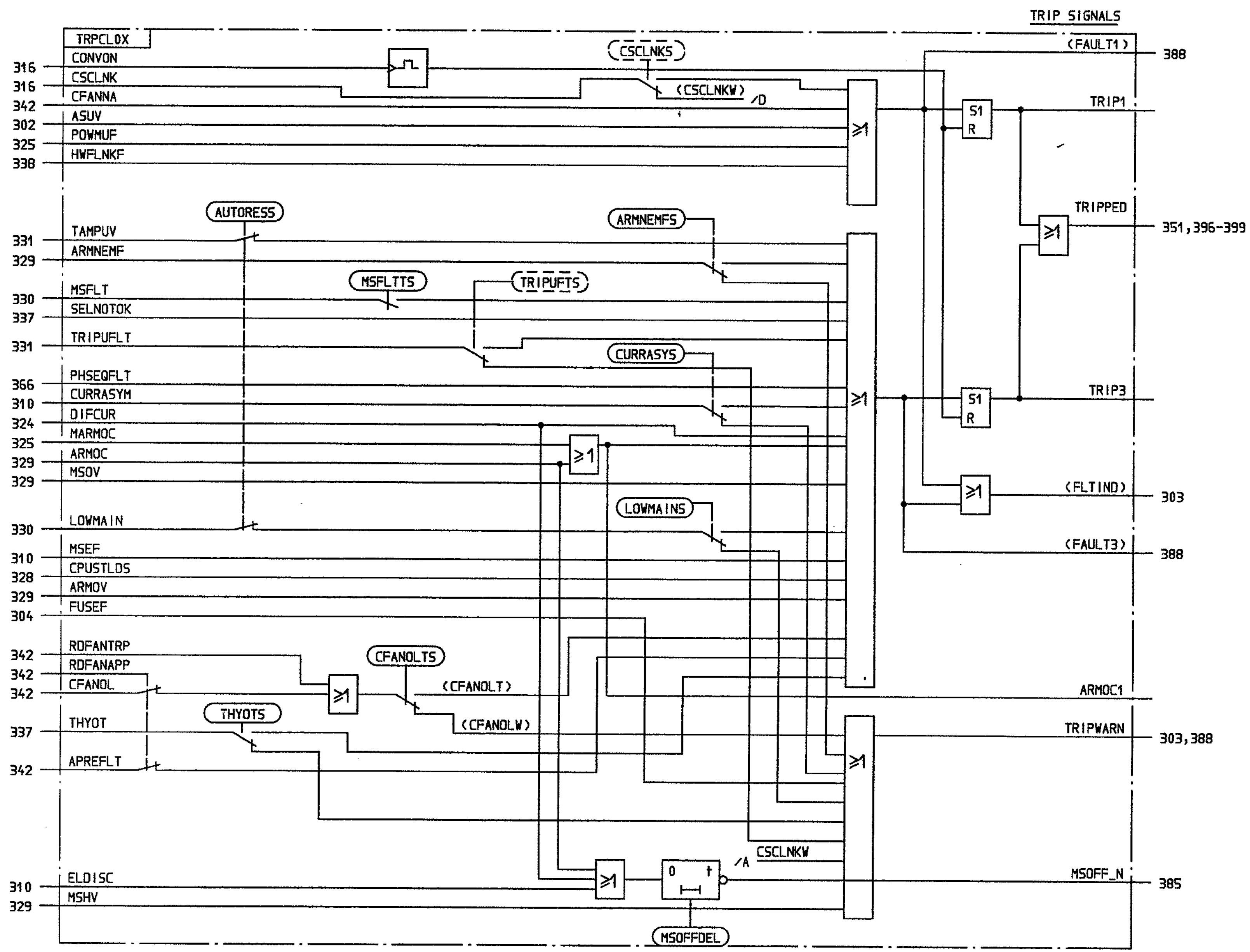


Prepared	93 38	S SVENSSON	
Approved	93 38	H POURFALAH	
PROGRAM DIAGRAM			
PROGRAM CL1201XX			
Resp dept	DRI/DKK	Rev ind	
ABB Industrial Systems	3ASD 489306C320	Lang EN	Sheet 342 Cont 345

Rev ind | Revision | Reg No | Based on | Pcl

SYMBOL ID /0:3ASD489306C320:342/0 93-09-02 08.31

DR/DKK



Prepared 93 38 S SVENSSON
Approved 93 38 H POURFALAH

PROGRAM DIAGRAM
PROGRAM CL1201XX

ABB Industrial Systems

Resp dept DRI/DKK

3ASD 489306C320

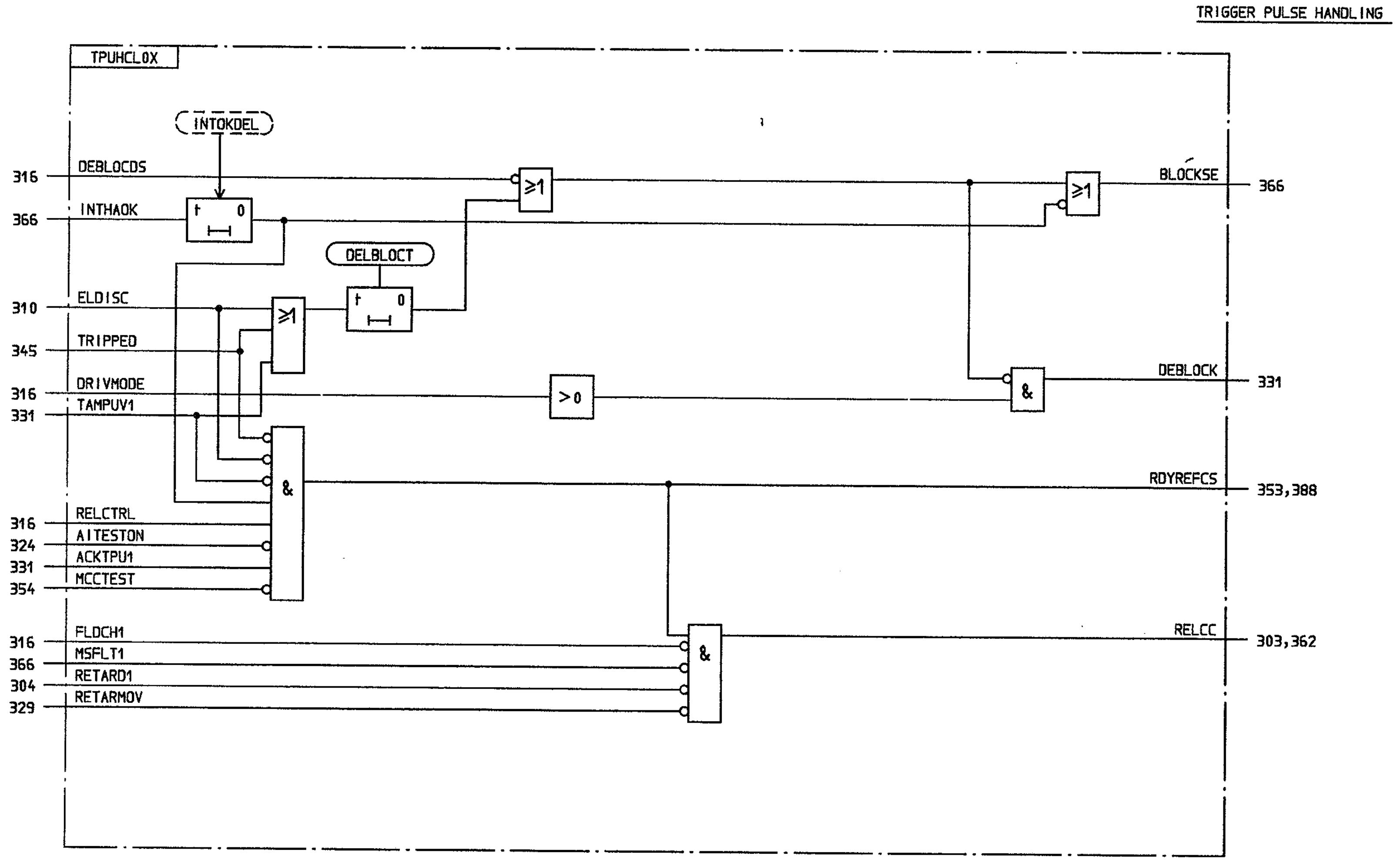
Lang EN
Sheet 345
Cont 351

Rev Ind | Revision | Reg No | Based on | Pol

DR/DKK

94-10-07 08.50

SYMBOL ID /D:3ASD489306C320:345/0



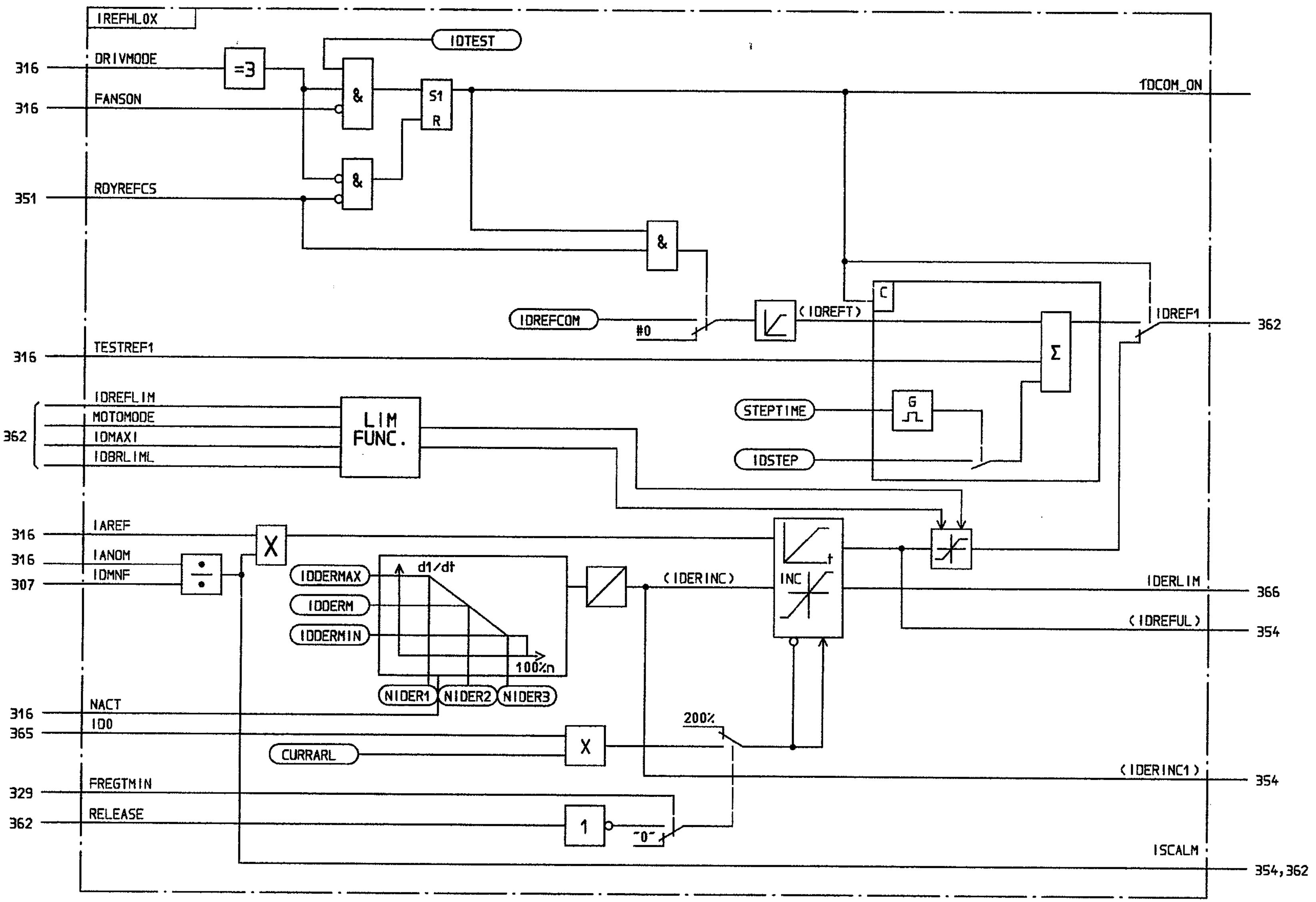
Prepared	93 38 S SVENSSON
Approved	93 38 H POURFALAH
	PROGRAM DIAGRAM
	PROGRAM CL1201XX
Resp dept	DRI/DKK
	ABB Industrial Systems
	3ASD 489306C320
Lang	EN
Sheet	351
Cont	353

Rev Ind | Revision | Reg No | Based on | Pol

DR/DKK

SYMBOL ID /D:3ASD489306C320:351/0 94-10-04 16.05

CURRENT REFERENCE HANDLER

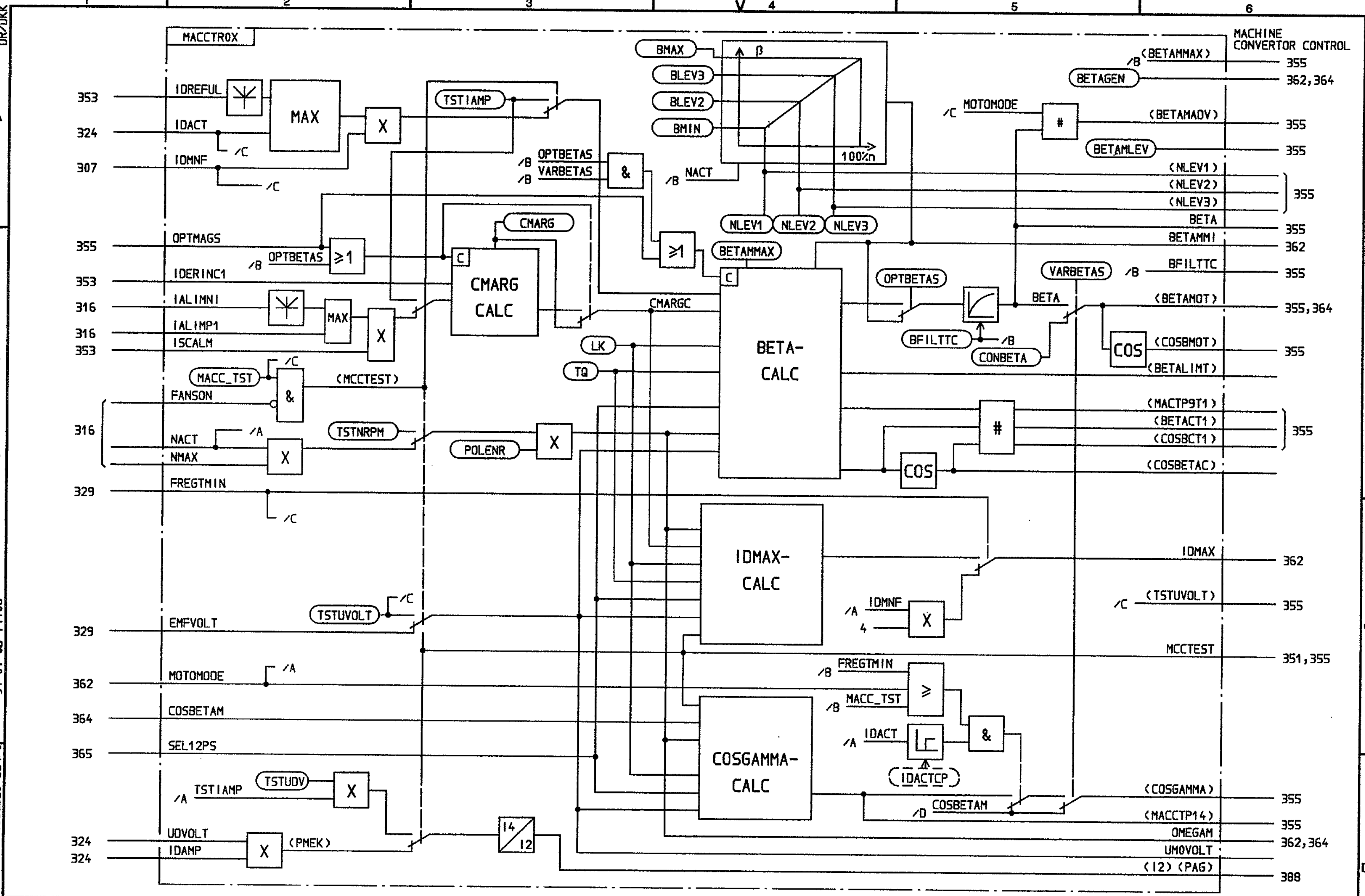


Prepared 93 38	S SVENSSON	CONVERTOR CONTROL LCI	Resp dept
Approved 93 38	S-E BERGLUND		Rev ind
PROGRAM DIAGRAM PROGRAM CL1201XX		ABB Industrial Systems	3ASD 489306C320
Rev ind / Revision / Reg No	Based on / Pol	Lang EN	Sheet 353 / Cont 354

DR/DKK

93-09-04 13.14

SYMBOL ID /0:3ASD489306C320:353/0



Prepared 93 38	S SVENSSON	CONVERTOR CONTROL LCI	
Approved 93 38	S-E BERGLUND		
PROGRAM DIAGRAM		Resp dept	Rev ind
PROGRAM CL1201XX		ABB Industrial Systems	3ASD 489306C320

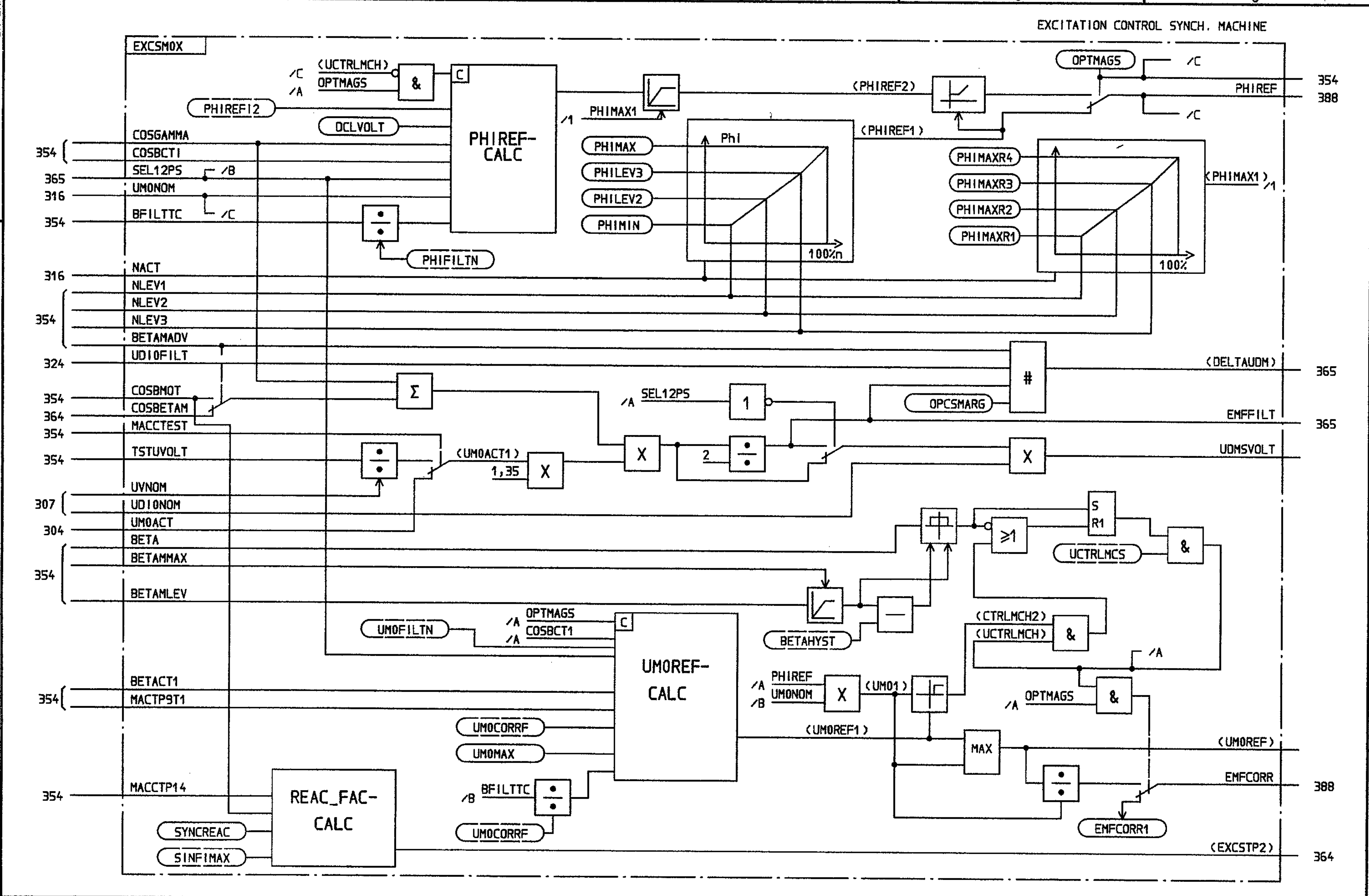
Rev ind | Revision | Reg No | Based on | Pcl

Lang EN
Sheet 354
Cont 355

DR/DKK

94-01-05 14.08

SYMBOL ID /D:3ASD489306C320:354/0

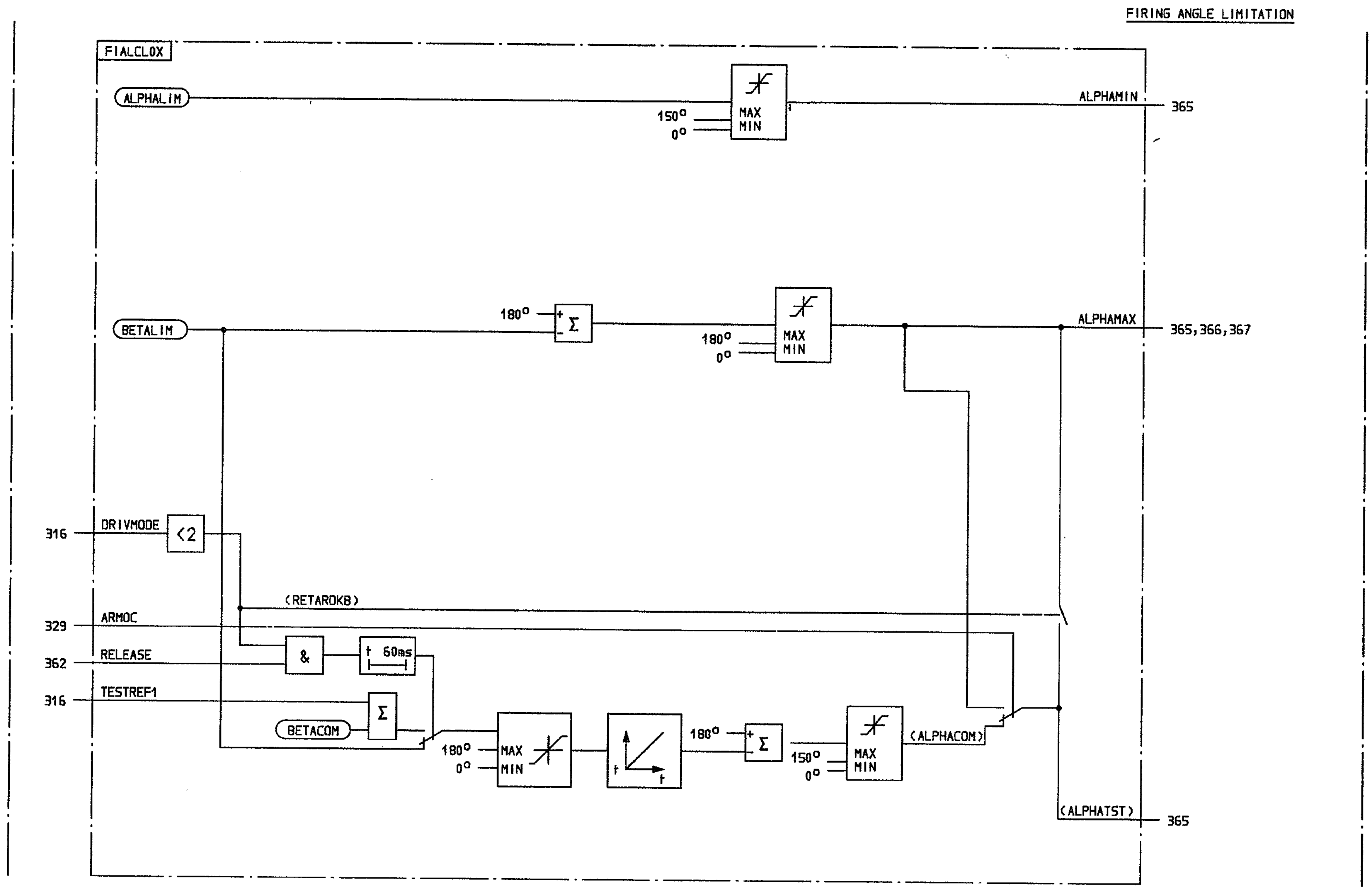


Prepared 93 38	S SVENSSON	CONVERTOR CONTROL LCI	
Approved 93 38	S-E BERGLUND		
PROGRAM DIAGRAM PROGRAM CL1201XX		ABB Industrial Systems	3ASD 489306C320
			Lang EN, Sheet 355, Cont 357

Rev Ind | Revision | Reg No | Based on | Pcl | Resp dept | Rev Ind

SYMBOL ID /D:3ASD489306C320:355/0 94-02-08 16.08

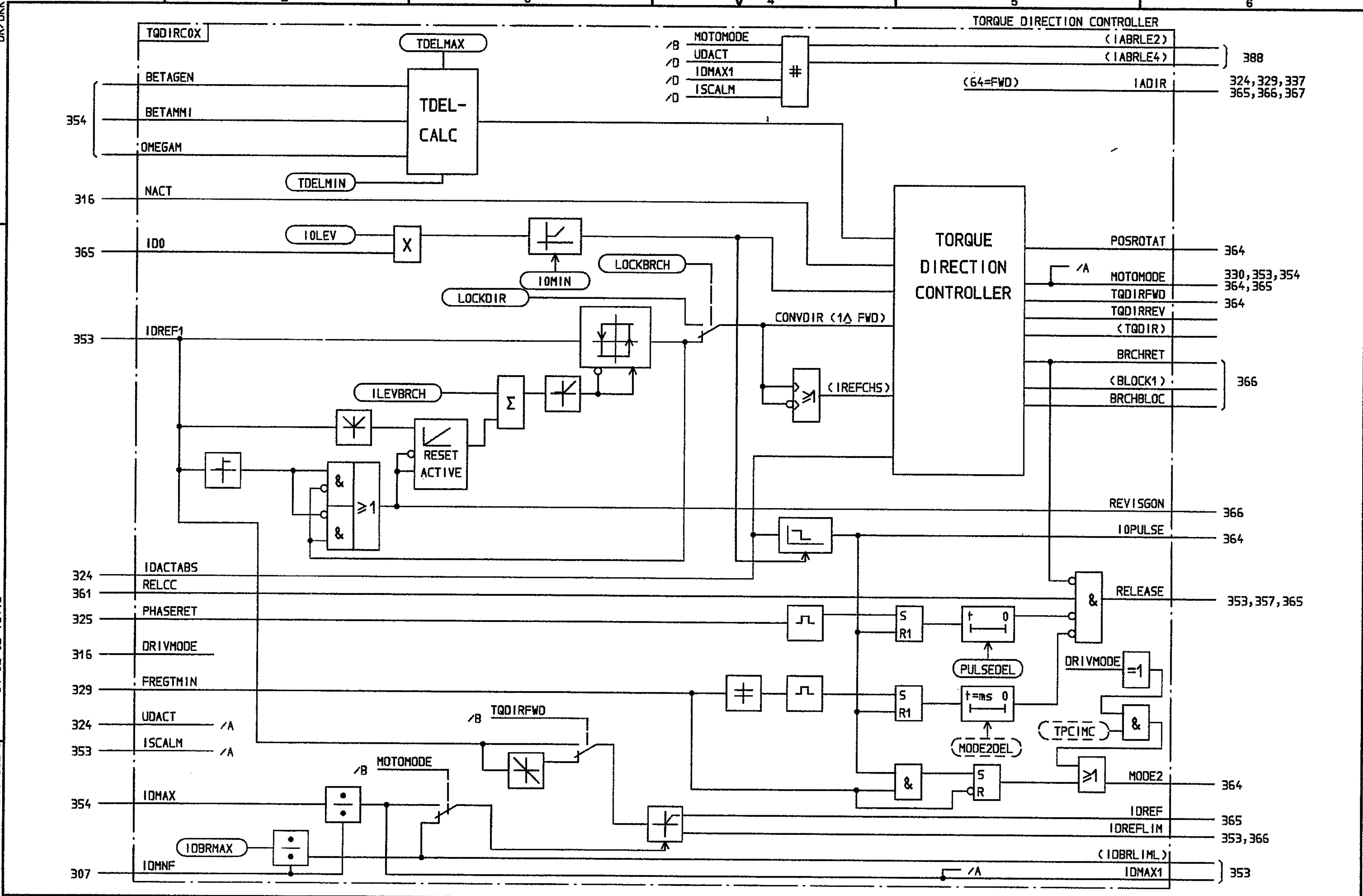
DR/DKK



Prepared 93 38 S SVENSSON	CONVERTOR CONTROL LCI	Resp dept	Rev Ind
Approved 93 38 S-E BERGLUND			Lang EN
PROGRAM DIAGRAM PROGRAM CL1201XX	ABB Industrial Systems	3ASD 489306C320	Sheet 357 Cont 362

Rev Ind | Revision | Reg No | Based on | Pcl

94-01-05 15.15
SYMBOL ID /D:3ASD489306C320:357/0
DR/DKK



Prepared 93 38	S SVENSSON	CONVERTOR CONTROL LCI	
Approved 93 38	S-E BERGLUND		
PROGRAM DIAGRAM PROGRAM CL1201XX		ABB Industrial Systems	3ASD 489306C320
			Lang EN Sheet 362 Cont 364

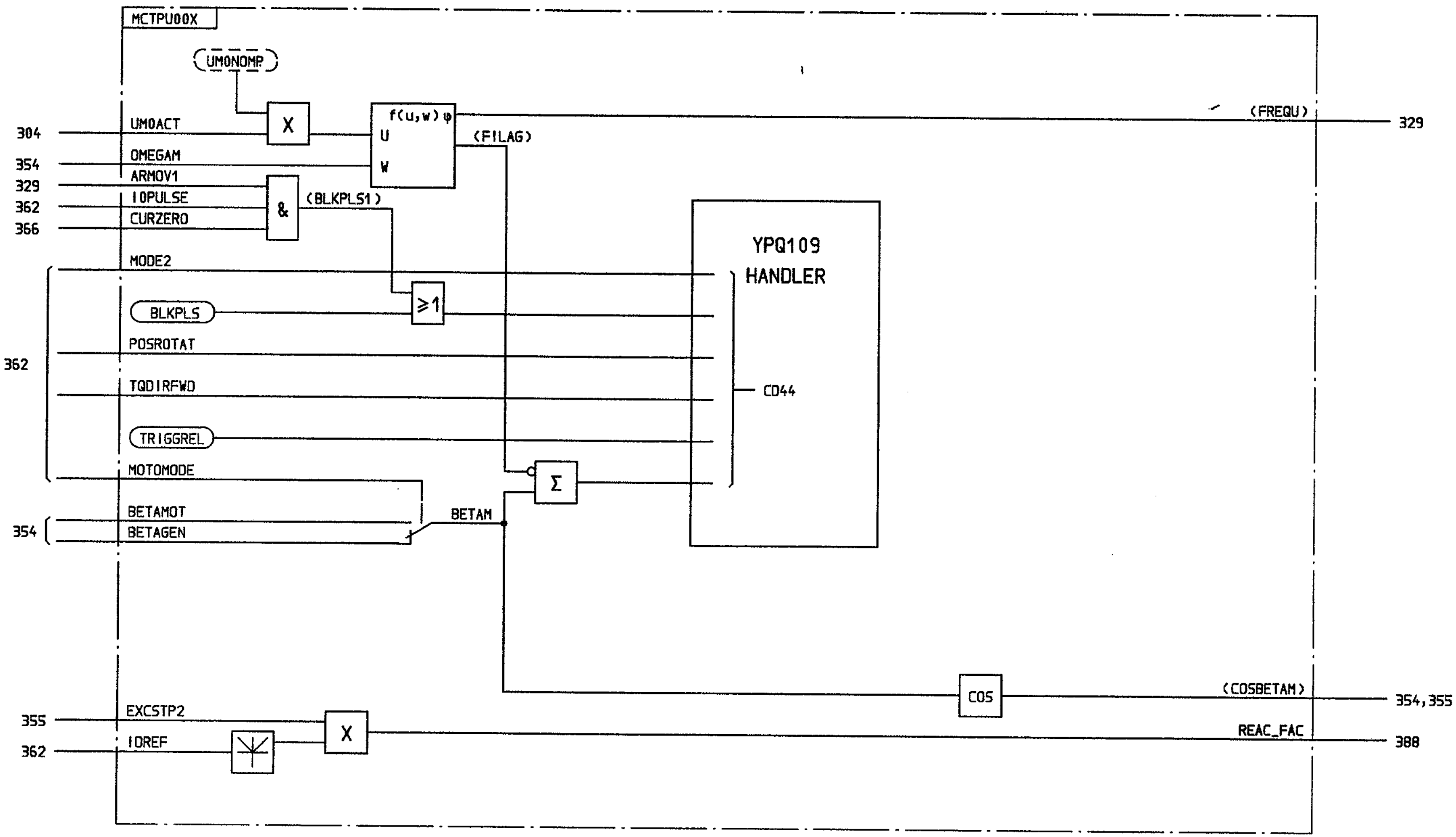
Rev Ind | Revision | Reg No | Pol | Based on | Resp dept | Rev Ind

94-02-08 16.15

SYMBOL ID /D:3ASD489306C320:362/0

DR/DKK

MACHINE CONVERTOR TRIGGER PULSE UNIT OUTPUTS



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94-02-08 12.54

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SYMBOL ID /D:3ASD489306C320:364/0

Prepared	93 38	S SVENSSON	CONVERTOR CONTROL LCI
Approved	93 38	S-E BERGLUND	
PROGRAM DIAGRAM			
PROGRAM CL1201XX			

Rev Ind | Revision | Reg No | Based on | PcI

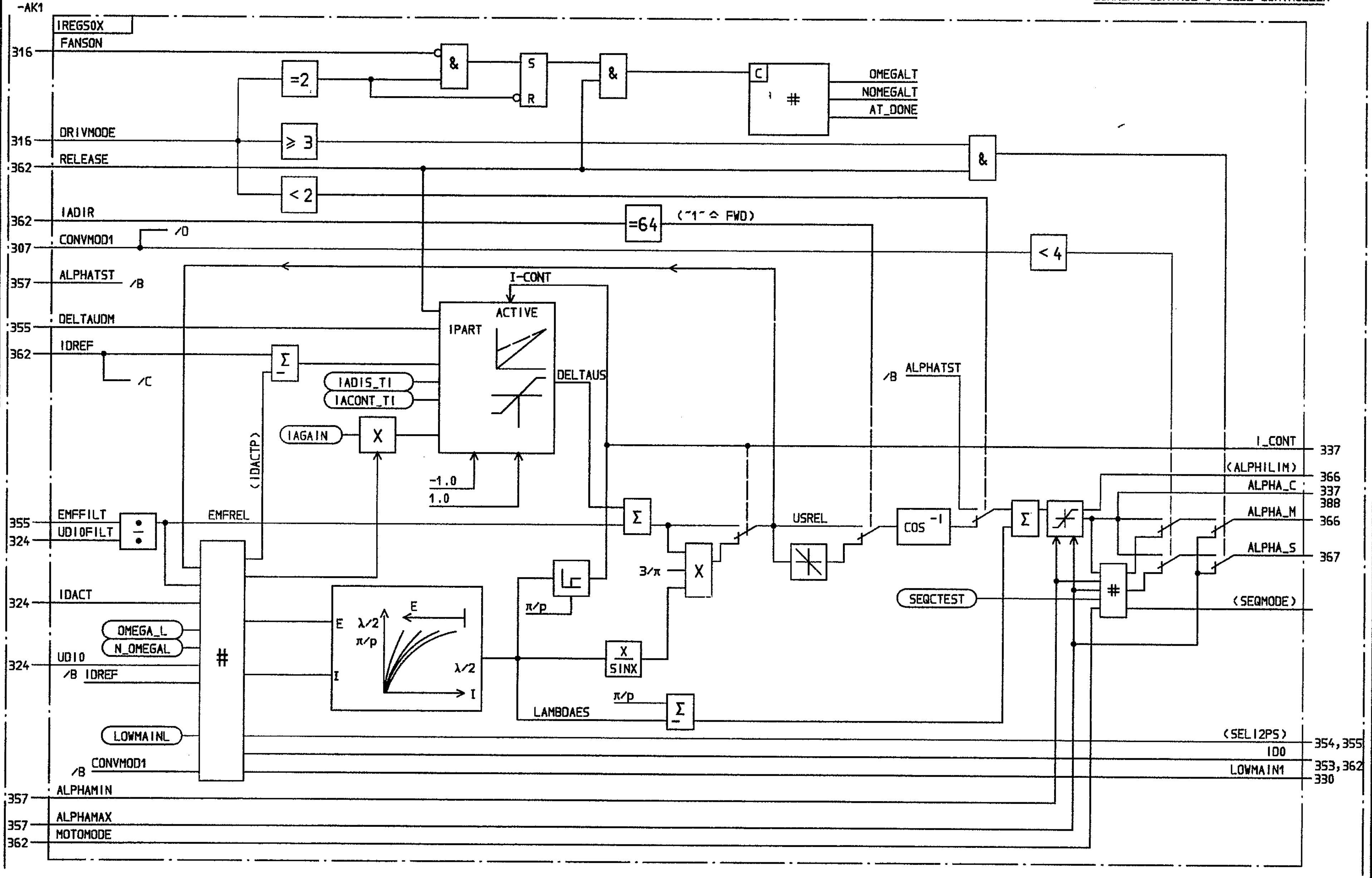
ABB Industrial Systems

Resp dept | Rev Ind

3ASD 489306C320

Lang EN | Sheet 364 | Cont 365

CURRENT CONTROL 6-PULSE CONTROLLER



Prepared	93 38 S SVENSSON
Approved	93 38 H POURFALAH
	PROGRAM DIAGRAM
	PROGRAM CL1201XX
Resp dept	DRI/DKK
Lang	EN
Sheet	365
Cont	366

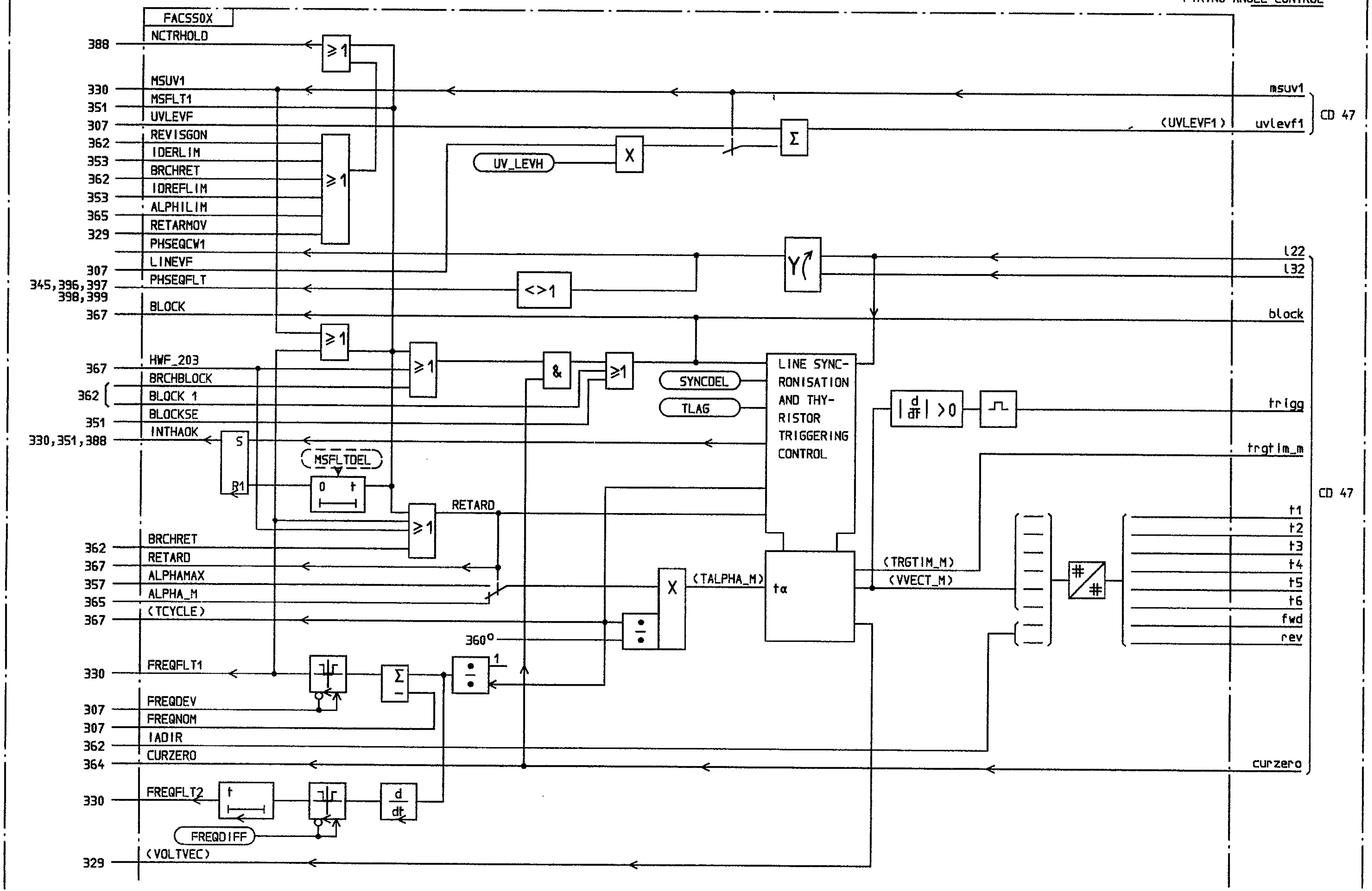
ABB Industrial Systems

3ASD 489306C320

DR/DKK

SYMBOL ID /D:3ASD489306C320:365/0 93-10-04 13.30

FIRING ANGLE CONTROL



Prepared	93 38 S SVENSSON
Approved	93 38 H POURFALAH

PROGRAM DIAGRAM
PROGRAM CL1201XX

ABB Industrial Systems

Resp dept DRI/DKK

3ASD 489306C320

Lang EN
Sheet 366
Cont 367

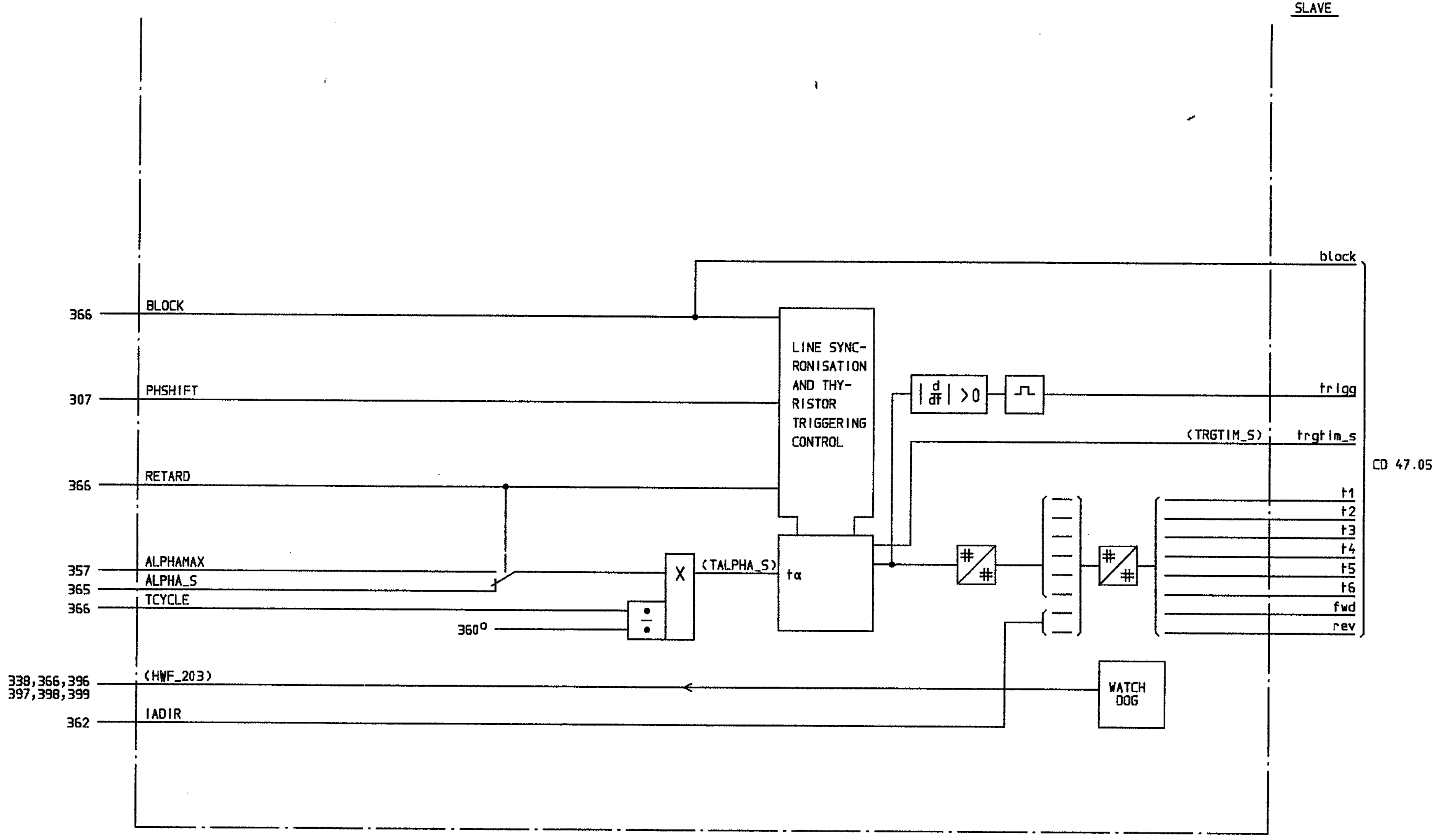
Rev ind | Revision | Reg No | Based on | Pol

DR/DKK

SYMBOL ID /D:3ASD489306C320:366/0

94-10-04 16.06

FIRING ANGLE CONTROL
SLAVE



Prepared	93 38	S SVENSSON
Approved	93 38	H POURFALAH

PROGRAM DIAGRAM
PROGRAM CL1201XX

ABB Industrial Systems

Resp dept DRI/DKK
3ASD 489306C320
Lang EN
Sheet 367
Cont 384

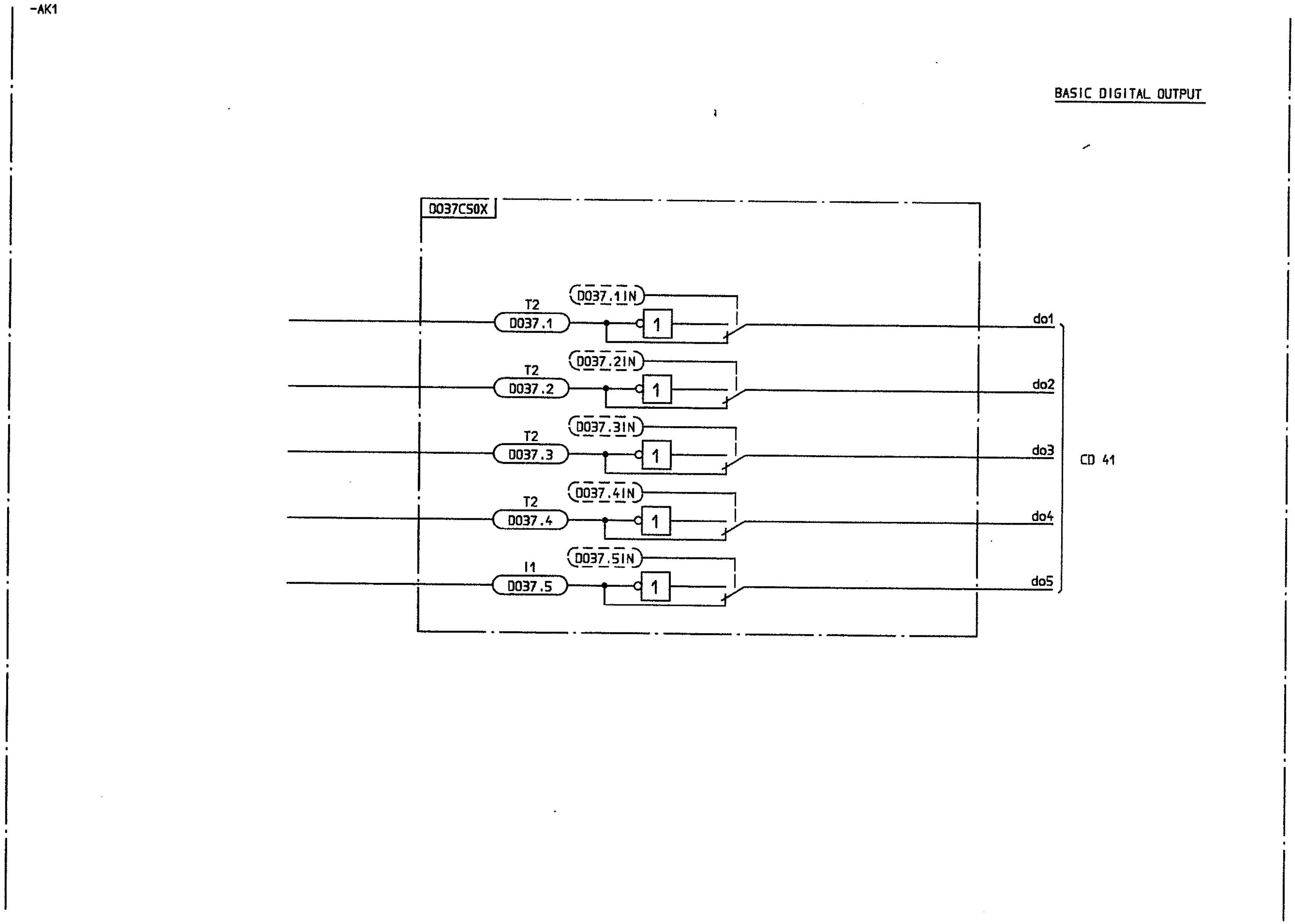
Rev ind | Revision | Reg No | Based on | Pol

DR/DKK

SYMBOL ID /D:3ASD489306C320:367/0

93-10-04 13.40

BASIC DIGITAL OUTPUT



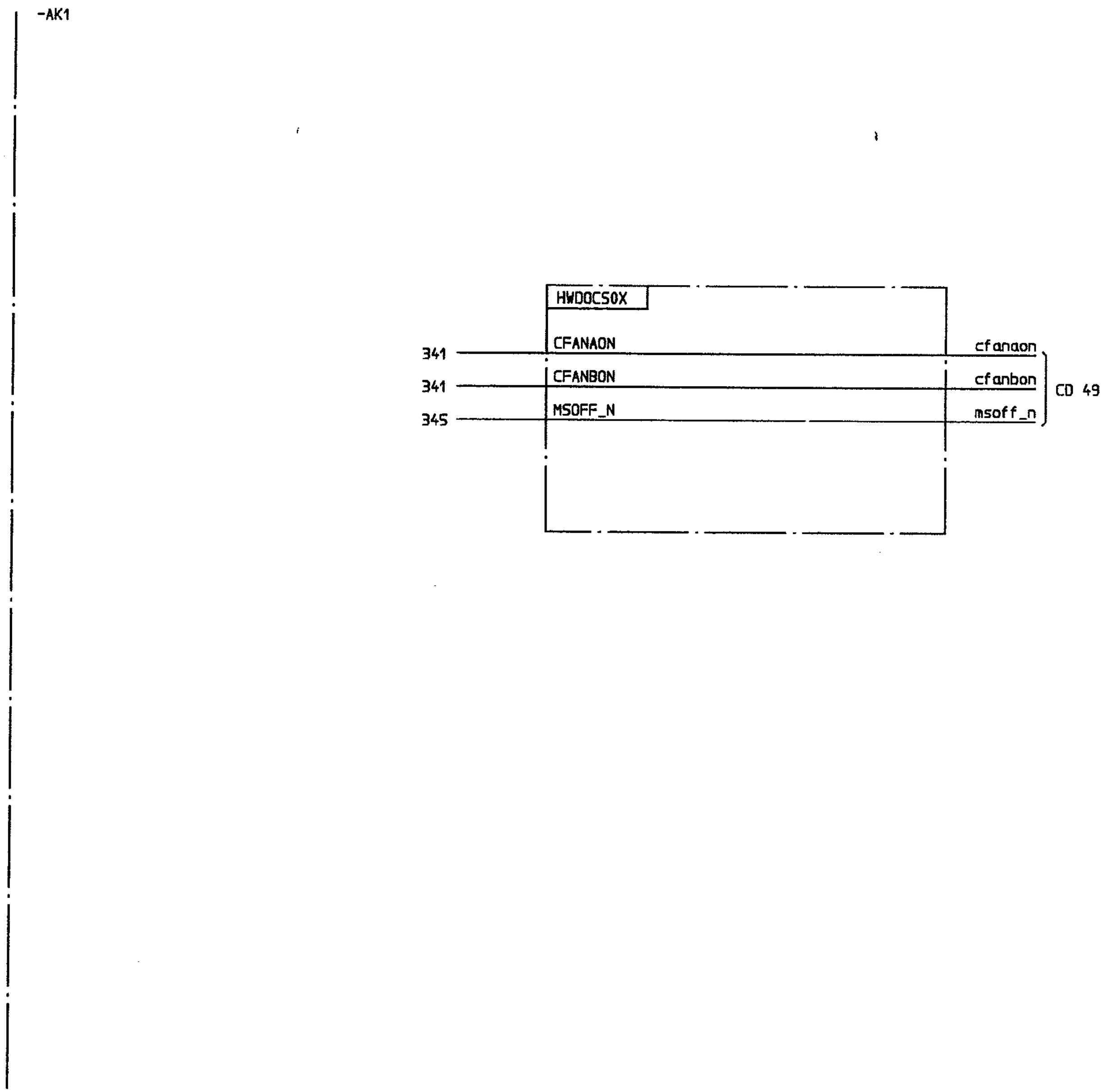
Prepared	93 38	S SVENSSON	
Approved	93 38	H POURFALAH	
PROGRAM DIAGRAM PROGRAM CL1201XX			
Rev Ind	Revision	Reg No	
Based on		Po I	
Resp dept	DRI/DKK	Rev Ind	Lang EN
ABB Industrial Systems	3ASD 489306C320		Sheet 384 Cont 385

DR/DKK

93-10-04 13.41

SYMBOL ID /D:3ASD489306C320:384/0

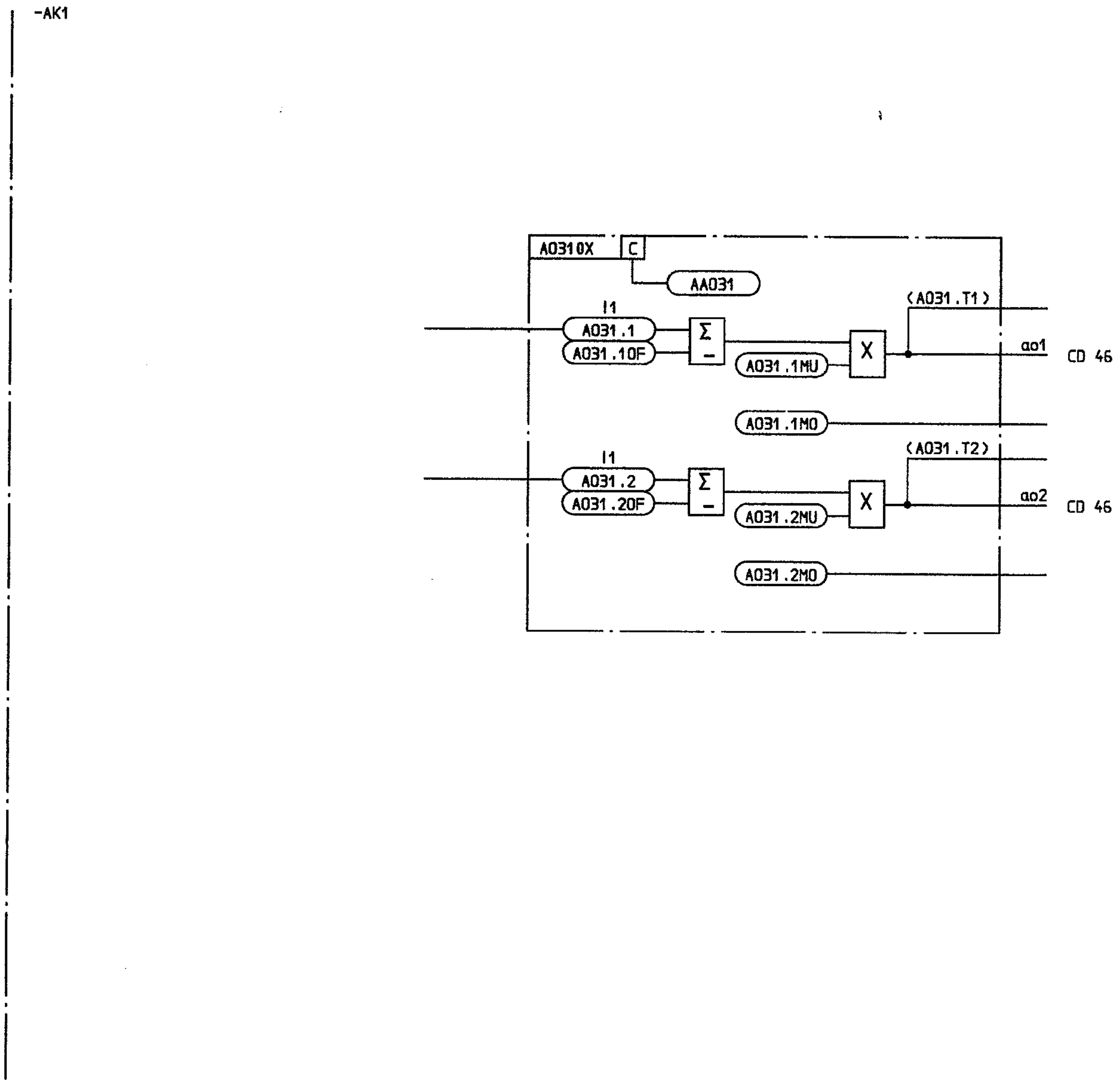
DIGITAL OUT SEQUENCE CONTROL



Prepared	93 38 S SVENSSON
Approved	93 38 H POURFALAH
	PROGRAM DIAGRAM
	PROGRAM CL1201XX
	ABB Industrial Systems
Resp dept	DRI/OKK
	3ASD 489306C320
Lang	EN
Sheet	385
Cont	386

SYMBOL ID /D:3ASD489306C320:385/0 93-10-04 13.58 DR/DKK

BASIC ANALOG OUTPUT



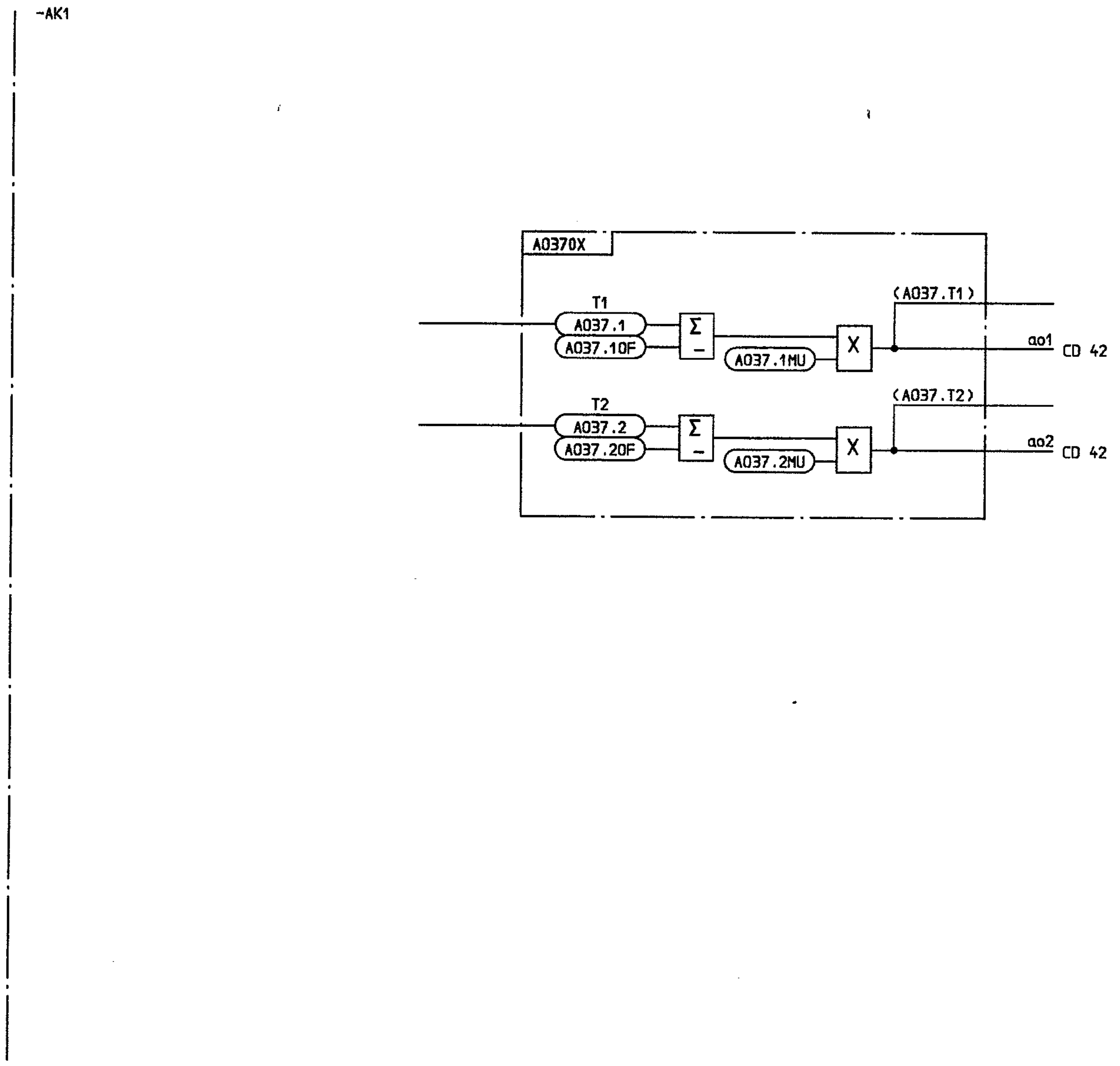
Prepared	93 38	S SVENSSON	
Approved	93 38	H POURFALAH	
	PROGRAM DIAGRAM		
	PROGRAM CL1201XX		
Resp dept	DRI/DKK	Rev Ind	
ABB Industrial Systems	3ASD 489306C320	Lang	EN
		Sheet	386
		Cont	387

Rev Ind | Revision | Reg No | Based on | Pcl

SYMBOL ID /D:3ASD489306C320:386/0 94-01-10 10.59

DR/DKK

BASIC ANALOG OUTPUT



Prepared	93 38	S SVENSSON
Approved	93 38	H POURFALAH

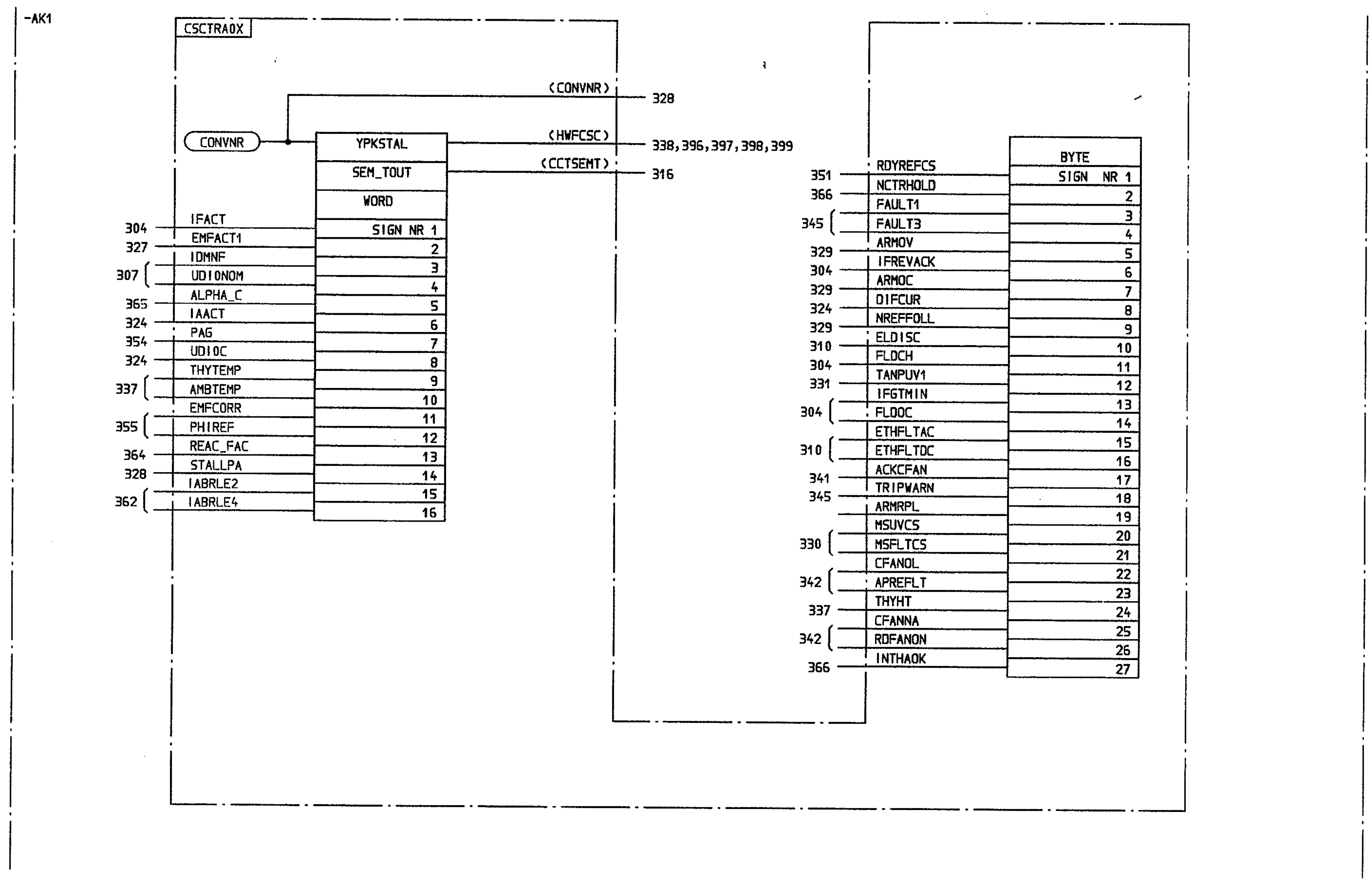
PROGRAM DIAGRAM
PROGRAM CL1201XX

ABB Industrial Systems

Resp dept DRI/DKK
3ASD 489306C320
Lang EN
Sheet 387
Cont 388

Rev ind | Revision | Reg No
Based on | Pcl

CONVERTOR SERIAL COMMUNICATION TRANSMIT



Prepared	93 38	S SVENSSON	
Approved	93 38	H POURFALAH	
PROGRAM DIAGRAM			
PROGRAM CL1201XX			
Resp dept	DRI/DKK	Rev Ind	Lang EN
ABB Industrial Systems	3ASD 489306C320		Sheet 388
			Cont 396

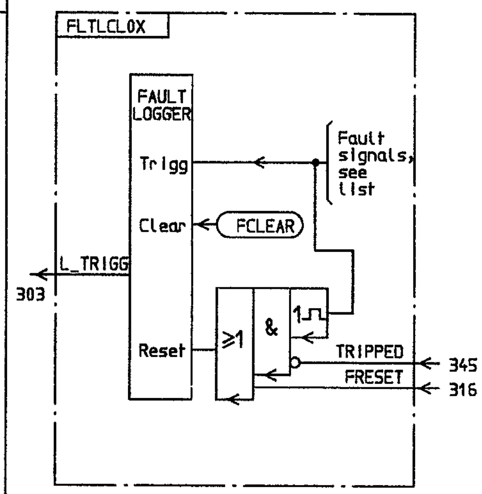
Rev Ind | Revision | Reg No
Based on | | Pol

LIST OF FAULT SIGNALS

TEXT OF FAULT	SIGNAL NAME	SHEET
AC BREAKER IS TRIPPED	MSEF	..310
CONVERTOR DIFF. CURRENT	DIFCUR	..324
DC CURRENT ASYMMETRY	CURRASYM	..310
DRIVE CONTROL IS STOPPED	CPUSTLDS	..328
EARTH FAULT AC VOLTAGE	ETHFLTAC	..310
ERROR IN PHASE SEQUENCE	PHSEQFLT	..366
FAULT IN AI UNIT POS33	HWF10.33	..324
FAULT IN MAIN SUPPLY	MSFLT	..330
FAULT IN YPQ203	HWF_203	..367
FREQ MEASURE NOT STABLE	FREQUSTA	..330
FREQUENCY FAULT MAINS	FREQFLT	..330
FUSE FAULT	FUSEF	..304
HIGH TEMP THYRISTOR FWD	THYHTF	..337
HIGH TEMP THYRISTOR REV	THYHTR	..337
INCORRECT THERMAL DATA	SELNOTOK	..337
LOW VOLTAGE MAINS SUPPLY	LOWMAIN	..330
MACHINE HIGH VOLTAGE	ARMHV	..329
MACHINE OVERVOLTAGE	ARMOV	..329
MAIN SUPPLY HIGH VOLTAGE	MSHV	..329
MAIN SUPPLY OVERVOLTAGE	MSOV	..329
NO ACKN THY FAN 1A	CFAN1ANA	..341
NO ACKN THY FAN 2A	CFAN2ANA	..341
NO ACKN. THY FAN 1B	CFAN1BNA	..341
NO ACKN. THY FAN 2B	CFAN2BNA	..341
NO EMF FEEDBACK	ARMNEMF	..329

TEXT OF FAULT	SIGNAL NAME	SHEET
OVERCURR ARMATURE FWD	ARMOCF	..329
OVERCURR MACHINE	MARMOC	..325
OVERLOAD THY FAN 1A	CFAN1AOL	..341
OVERLOAD THY FAN 2A	CFAN2AOL	..341
OVERLOAD THY FAN 1B	CFAN1BOL	..341
OVERLOAD THY FAN 2B	CFAN2BOL	..341
OVERTEMP THYRISTOR FWD	THYOTF	..337
OVERTEMP THYRISTOR REV	THYOTR	..337
PRESSURE FAULT1 THY AIR	APREFLT1	..342
PRESSURE FAULT2 THY AIR	APREFLT2	..342
REDUNDANT FAN STARTED	RDFANONF	..342
REDUNDANT FAN TRIPPED	RDFANTRP	..342
SERIAL COMBOARD FAULT	HWFCSC	..388
TRANSM FAULT SERIAL BUS	CSCLNK	..316
TRIGGER PULSE FAULT	TRIPUFLT	..331
UNDERVOLT TRIG PULSE AMP	TAMPUV	..331
UNDERVOLTAGE COMPUTER	ASUV	..302
UNDERVOLTAGE MAINS SUPPL	MSUV	..330
UNDERVOLTAGE MACC UNIT	POWMUF	..325

TEXT OF FAULT	SIGNAL NAME	SHEET



Prepared 93 38	S SVENSSON	CONVERTOR CONTROL LCI
Approved 93 38	S-E BERGLUND	ABB Industrial Systems
PROGRAM DIAGRAM		3ASD 489306C320
PROGRAM CL1201XX		Lang EN, Sheet 396, Cont 397

SYMBOL ID /D:3ASD489306C320:396/0

94-10-04 16.17

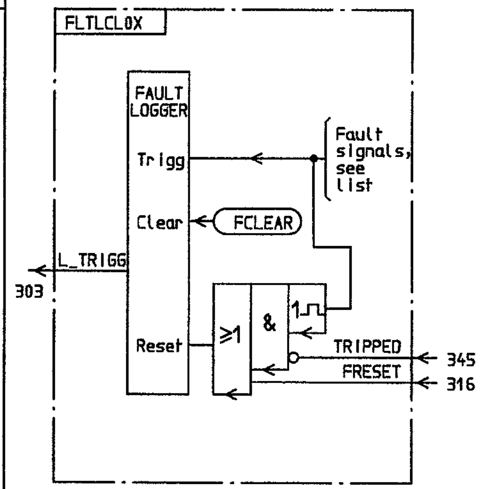
DR/DKK

FELSIGNALLISTA

FELTEXT	SIGNAL NAMN	BLAD
ANALOG INENHET POS33	HWF10.33	..324
DRIVSYSTEMDATORN STANNAT	CPUSTLOS	..328
DIFF. STRÖMRIKTARE	DIFCUR	..324
EMK-SIGNAL SAKNAS	ARMNEMF	..329
FEL FASFÖLJD HUVUDMATN	PHSEQFLT	..366
FEL I YPQ203	HWF_203	..367
FREKVENSFEL HUVUDMATNING	FREQFLT	..330
FREQ MÄT EJ STABIL	FREQUSTA	..330
HUVUDMATN FEL	MSFLT	..330
HÖG SPÄNNING MASKIN	ARMHV	..329
HÖGSPÄNNING NÄT	MSHV	..329
HÖG TEMP TYRISTORER FRAM	THYHTF	..337
HÖG TEMP THYRISTOR BACK	THYHTR	..337
JORDFEL VÄXELSPÄNNING	ETHFLTAC	..310
KYLLUFTFEL1 TY	APREFLT1	..342
KYLLUFTFEL2 TY	APREFLT2	..342
LS-STRÖM ASYMMETRI	CURRASYM	..310
LÅG SPÄNNING HUVUDMATN	LOWMAIN	..330
SERIE COMKORT FEL	HWFCSC	..388
START REDUNDANT TY-FLKT	RDFANONF	..342
STYRPULS FEL	TRIPUFLT	..331
SÄKRING FEL	FUSEF	..304

FELTEXT	SIGNAL NAMN	BLAD
TERM DATA EJ KORREKTA	SELNOTOK	..337
TRIPP REDUNDANT TY-FLKT	RDFANTRP	..342
TY-FLÄKT 1 STARTAR EJ	CFAN1ANA	..341
TY-FLÄKT 2 STARTAR EJ	CFAN2ANA	..341
TY-FLÄKT 1B STARTARES	CFAN1BNA	..341
TY-FLÄKT 2B STARTARES	CFAN2BNA	..341
UNDERSPÄNNING DATORENHET	ASUV	..302
UNDERSPÄNNING HUVUDMATN	MSUV	..330
UNDERSPÄNNING MACC ENHET	POWMVF	..325
UNDERSP TRIGG PULS FÖRST	TAMPUV	..331
VS BRYTARE UTLÖST	MSEF	..310
ÖVERFEL SERIE BUS	CSCLNK	..316
ÖVERLAST TY-FLÄKT 1	CFAN1AOL	..341
ÖVERLAST TY-FLÄKT 2	CFAN2AOL	..341
ÖVERLAST TY-FLÄKT 1B	CFAN1BOL	..341
ÖVERLAST TY-FLÄKT 1B	CFAN2BOL	..341
ÖVERSPÄNNING NÄT	MSOV	..329
ÖVERSPÄNNING ROTOR	ARMOV	..329
ÖVERSTRÖM ROTOR FRAMRIKT	ARMOCF	..329
ÖVERTEMP TYRISTOR FRAM	THYOTF	..337
ÖVERSTRÖM MASKIN	MARMOC	..325
ÖVERTEMP THYRISTOR BACK	THYOTR	..337

FELTEXT	SIGNAL NAMN	BLAD



DR/DKK

94-10-04 16.24

SYMBOL ID /D:3ASD489306C320:397/0

Prepared	93 38	S SVENSSON	CONVERTOR CONTROL LCI
Approved	93 38	S-E BERGLUND	
PROGRAM DIAGRAM	PROGRAM CL1201XX		ABB Industrial Systems
Rev ind	Revision	Reg No	
Based on		Pol	
Resp dept	Rev ind	Lang EN	
3ASD 489306C320		Sheet 397	Cont 398

STÖRMELDELISTE

STÖRMELDETEXT	NAME	BLATT
ANALOG EINGANG POS33	HWF10.33	..324
DIFF. STROM OMRICHTER	DIFCUR	..324
ERDSLUSS DREHSPANNUNG	ETHFLTAC	..310
FALSCHE FASENLAGE	PHSEQFLT	..366
FALSCHE TERM DATEN	SELNOTOK	..337
FEHLER SERIE CON EINH	HWFCSC	..388
FREKVENZFEHLER HAUPTNETZ	FREQFLT	..330
FREKV. MESSUNG INSTABIL	FREQUSTA	..330
GLEICHSTROM ASSYMETRIE	CURRASYM	..310
HALT IN ANTRIEBRECHNER	CPUSTLDS	..328
HAUPT NETZ FEHLER	MSFLT	..330
HAUPT SCHELTER AUSGELOST	MSEF	..310
KEINE EMK-RUCKMELDUNG	ARMNEMF	..329
KEIN RUCKM. LUFTER1	CFAN1BNA	..341
KEIN RUCKM. LUFTER2	CFAN2BNA	..341
KEIN RUCKM. LUFTER 1B	CFAN1BNA	..341
KEIN RUCKM. LUFTER 2B	CFAN2BNA	..341
HOCH SPANNUNG MASCHINE	ARMHV	..329
HOCH SPANNUNG NETZ	MSHV	..329

STÖRMELDETEXT	NAME	BLATT
NIEDRIG SP HAUPTNETZ	LOWMAIN	..330
REDUNDANT LUFTER LEUFT	RDFANONF	..342
REDUNDANT LUFTER AUSG	RDFANTRP	..342
SICHERUNG FEHLER	FUSEF	..304
THYRIST. TEMP HOCH VORW	THYHTF	..337
THYRIST. TEMP HOCH RUCKW	THYHTR	..337
TY KUHL LUFTFEHLER 1	APREFLT1	..342
TY KUHL LUFTFEHLER 2	APREFLT2	..342
UBERFEHLER SERIE COM	CSCLNK	..316
UBERLAST LUFTER 1A	CFAN1AOL	..341
UBERLAST LUFTER 2A	CFAN2AOL	..341
UBERLAST LUFTER 1B	CFAN1BOL	..341
UBERLAST LUFTER 2B	CFAN2BOL	..341
UNTERSPANNUNG	MSUV	..330
UBERSPANNUNG NETZ	MSOV	..329
UNTERSPANNUNG RECHNER	ASUV	..302
UNTERSPANNING MACC EIN	POWMUF	..325
UNTERSP ZUNDIMP VERST	TAMPUV	..331
UBERSPANNUNG MASCHINE	ARMOV	..329
UBERSTROM ANKER VORW	ARMOCF	..329
UBERSTROM MASCHINE	MARMOC	..325
UBERTEMP TYRISTOR VORW	THYOTF	..337
UBERTEMP TYRISTOR RUCKW	THYOTR	..337
YPQ203 EINENHET	HWF_203	..367
ZUNDIMP FEHLER	TRIPUFLT	..331

STÖRMELDETEXT	NAME	BLATT

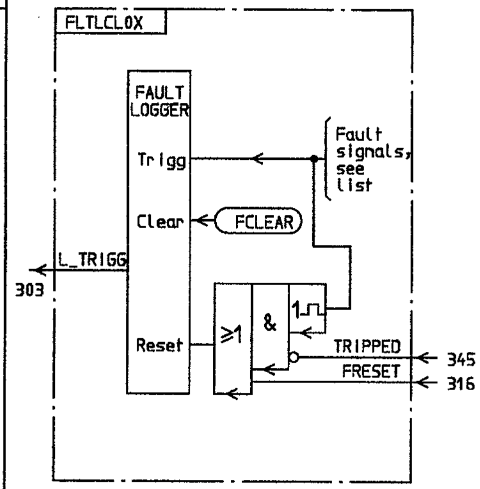


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ABB Industrial Systems

Resp dept | 3ASD 489306C320

Rev ind | Revision | Reg No | Pol | Based on

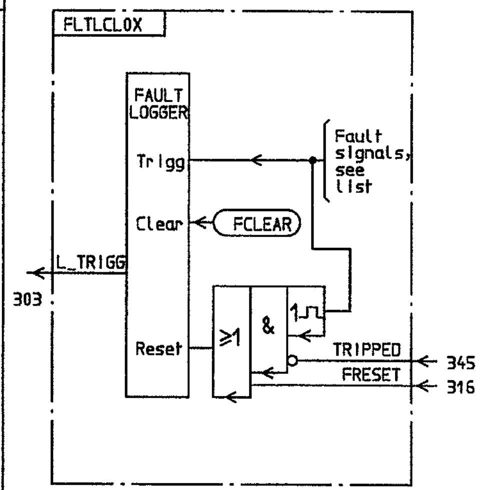
Lang EN | Sheet 398 | Cont 399

LISTES DES SIGNAUX DE DEFAUTS

TEXTES DEFAUTS	NOHS SIGNAUX	PAGE
ACQ IMPULS DEFAULT	TRIPUFLT	..331
ASSYMETRIE COUR DC	CURRASYM	..310
CHAMP TOURNANT INCORRECT	PHSEQFLT	..366
COMP DRIVE ARRETE	CPUSTLDS	..328
DEFAUT BUS COM SERIE	CSCLNK	..316
DEFAUT CARACT TERMIQUE	SELNOTOK	..337
DEFAUT FREQUENCE RESEAU	FREQFLT	..330
DEFAUT FUSIBLE	FUSEF	..304
DEFAUT1 PRESS AIR THY	APREFLT1	..342
DEFAUT2 PRESS AIR THY	APREFLT2	..342
DEFAUT RESEAU	MSFLT	..330
DEFAUT SERIE COM MODULE	HWFCSC	..388
DEFAUT TERRE AC	ETHFLTAC	..310
DEMARAGE RED UNDANT VENT	RDFANONF	..342
DIFF COURANT CONVERTOR	DIFCUR	..324
DISS AC DECLENCHE	MSEF	..310
ENTREE ANL POS33	HWF10.33	..324
FREQ RESEAU PAS STABLE	FREQUSTA	..330

TEXTES DEFAUTS	NOHS SIGNAUX	PAGE
MIN TENSION AMPL INPULS	TAMPUV	..331
MIN TENSION COMPUTER	ASUV	..302
MIN TENSION RESEAU	MSUV	..330
MIN TENSION MACC EXIT	POWMUF	..325
PAS ACQ VENT THY1	CFAN1ANA	..341
PAS ACQ VENT THY2	CFAN2ANA	..341
PAS ACQ VENT THY 1B	CFAN1BNA	..341
PAS ACQ VENT THY 2B	CFAN2BNA	..341
PAS SIGNAL FEM	ARMNEMF	..329
REDUNDANT VENT DECLENCHE	RDFANTRP	..342
RESEAU ELEVE	MSHV	..329
SURCHARGE VENT THY 1A	CFAN1AOL	..341
SURCHARGE VENT THY 2A	CFAN2AOL	..341
SURCHARGE VENT THY 1B	CFAN1BOL	..341
SURCHARGE VENT THY 2B	CFAN2BOL	..341
SURTEMP THYRISTOR FWD	THYOTF	..337
SURTEMP THYRISTOR REV	THYOTR	..337
SURTENSION MACHINE	ARMOV	..329
SURTENSION RESEAU	MSOV	..329
SURCOURRANT ARM FWD	ARMOCF	..329
SURCURRANT MACHINE	MARMOC	..325
TEMP THYRISTOR FWD ELEVE	THYHTF	..337
TEMP THYRISTOR REV ELEVE	THYHTR	..337
TENSION RESEAU BAS	LOWMAIN	..330
YPQ203 COMP	HWF_203	..367
TENSION ELEVEE MACHINE	ARMHV	..329

TEXTES DEFAUTS	NOHS SIGNAUX	PAGE



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Rev ind / Revision / Reg No / Based on / Pcl		Lang EN	Sheet 399 Cont –