Control systems

CNC 8 x 6   CNX 8 x 9

Operation manual

CONTENTS:

1. INTRODUCTION

1.1. Usage

Control systems of CNC836, CNC846 and CNC856 are the universal systems designed to control the cutters, lathes, drilling and boring machines and machine tools with maximum sicx controlled co-ordinates continuously. They allow the linear interpolation in six axes simultaneously, annular interpolation in any arbitrary plane given by the co-ordinating system of a machine, cutting of the single or multiple threads on a cylindrical or a conical surface, constant cutting speed, shift of the radius and distance corrections, displacement of co-ordinating system starting points and carrying out of firm drilling and threading cycles. Beside the control of machines themselves, they allow to adapt the part-programs i. e. inserting and removing of the part of the whole part-program from the system memory.

This system is designed for machines equipped with electric power units and it is possible to connect it to a machine with any arbitrary pitch of the feed screw. The pitch error and backlash may be compensated by the system.

Simple conception when maintaining all parameters being currently at modern CNC systems, low price and ability of adapting the machine controls to the requirements of our customers selectively make possible the modernization of old machines or the replacement of old NC as well as CNC systems.

Note:

The operation manual is the same for all the system types. The manual for the CNC836 type also is valid for the CNC846 and CNC856 types. Eventual differences between both system types are mentioned explicitly.

1.2. Basic technical parameters

The control system is a numeric electronic device consisting of two modules. Also the so-called machinery panel and manual panel may be connected to this control system optionally.

Control system

- motherboard with the 2 PENTIUM processors
- VGA plate to control colour or monochromatic screen
- plate to control the push-button board
- controller to control the disk, serial and parallel inputs
- power supply of 220 V/200 W
- display 9" (CNC836), 14" (CNC846), flat TFT 14" (CNC856), monochromatic or colo
- boards to control the co-ordinates
- external boards to control the two-value inputs of 24 V/0,1 A, 50 V/2A, 110 V
- of the panel and the cassette is performed by the serial cable

Machinery panel

- direct control of selectable functions in accordance with the interface program
- manual knob
- potentiometers for manual control

Manual portable panel

- control of the co-ordinates by means of push-button s
- manual wheel (knob)
- TOTAL STOP push-button

1.3. System parameters

- number of controlled co-ordinates and spindles in the position feed back of maximum 6
- linear interpolation in 6 co-ordinates simultaneously
- circular interpolation in a plane
- control of the spindle in the speed and position feed back, positioning, C axis
- single and multiple threading on the cylinders, the cones and the frontal surface
- constant cutting speed
- movement along the spiral
- incremental measurement by 0,001 mm increments
- compensation of the non-linearity of the feed screw
- Reversal play compensation
- arbitrary calculation of number of the pulses to the path increment with the accuracy of +/-0,0001
- output analogue signal (0 – 10 V 2 kOhm)
- two-value inputs of + 24 V (number of them depends on requirement)
- two-value outputs (number of them depends on requirement)
- possibility to use the adapting relays (number of them depends on requirement)
- capacity of the backing memory: CMOS up to 2 Mbytes, HARD DISK (e. g. 2 Gbytes)
- maximum length of the part-program and edition are limited by the capacity of the dynamic storage (e. g. 16 Mbytes)
- monitoring of the graphic path
- information on usage of the system time
- dialog graphics to create the part-programs
- optional floppy disk drive to be connected
- optional connection to the DNC network with the TRANS adapters
- possibility to control the asynchronous motors by means of the frequency converters
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1.4. Basic characteristics

PROGRAMMING (entry of the part-programs) is addressable in the whole program blocks with the variable block format. The path programming is incremental of absolute.

POSITION MEASUREMENT of the controlled co-ordinate is performed by means of the pulse rotary of linear sensor. Measurement of the spindle is performed by means of the pulse rotary sensor.

SPEED CONTROL of the feed is performed in the closed loop. The position feed back is closed through the microcomputer. The speed is scanned by means of the tacho generator which is a part of the drive unit speed loop (not included in the system). The start and alighting run transconductances are entered as a constant when adjusting the system with the machine.

RAPID TRAVERSE is introduced by means of the function G00. The rapid traverse sizes and the start and alighting run transconductances are entered as a constant when adjusting the system with the machine.

CORRECTION is selected by means of the relevant G function. The correction size is programmable by the D function. In one programming block, the radius correction as well as tool length correction may be programmed.

FIXED CYCLES are selected by the functions G81 up to G 89 in accordance with the ISO recommendations.

SUBPROGRAMS AND MACRO CYCLES allow to compensate the repeating part-program sections. Calling the macro cycle or part-program is performed by the relevant G function, macro cycle No. and subprogram No. by means of the L function and number of retries by means of the Q function.

MANUAL FEED CONTROL may be performed by the independent push-button s for every co-ordinate and direction.

MANUAL FEED CONTROL BY POTENTIOMETERS is delivered against a separate order. It is possible to combine even several co-ordinates arbitrarily which may run simultaneously and every of them with other speed. The speed is proportional to the potentiometer slight turning.

CONTROL IN THE JOG MODE is a travel by pre-selected increment in the range from 0,001 up to 500 mm.

CONTROL OF THE CO-ORDINATES may be performed by a hand-wheel (knob, hand-crank).

COPYING – when travelling in the so-called control co-ordinate, the controlled co-ordinate is operated depending on the copying probe deviation (linear position sensor).

2. WORK CONDITIONS

Correct and trouble-free operation of the systems CNC836, 846 and 856 may be guaranteed when meeting the following work conditions only:

a) the work environment of the system modules shall be normal in accordance with the CSN 330300 without any influences of aggressive gases or vapours, ambient temperature range may be $+ 5^o$ up to 48° C without any auxiliary thermal radiation, relative humidity of maximum 70 %, and the work environment without any conductive dust.

b) building-in of the system into the equipment located in the environment which is active in accordance with CSN 330300 and CSN 332310 is allowed in that case only when the building- in method may guarantee the environment for the built-in modules in accordance with the Section a). With respect to especially difficult and expensive cleaning of the internal module parts it is necessary , when locating it in the dusty environment in accordance with CSN 332310, to assure the increased protection mode and careful filtration of the cooling air mainly in those points, where the extraordinary fine dust occurs. In the dusty environment where conductive dust occurs, the enhanced protection mode and careful filtration of the cooling air are necessary to avoid possible deterioration of the electric circuit by conductive dust sediments among the electric connections.

c) air pressure shall be in the range from 85 up to 110 kPa.

d) location and fastening of the control system shall be so that no mechanical impacts or vibration will be transferred to it and it may not be exposed to the direct sun light. To reach the optimum activity and maximum average period among the defects it is recommended to maintain the temperature range from $+ 15^o$ C up to $+ 38^o$ C and relative humidity from 40 up to 70 %.

3. ABBREVIATIONS USED

In this chapter some terms and abbreviations used in this chapter are explained:

WINDOW – part of the screen framed

SOFTWARE PUSH-BUTTON – push-button figure displayed in the MENU window. They are controlled by the push-button s F1 up to F6 located below the screen.

ADDRESS – the address is an alphabetical character (no digits) which is understood by the system . List of all addresses is mentioned in this manual in detail.

CURRENT ITEM – pressed-down push-button (address) and address value.

FILE – the file is a basic information set of a certain type stored in any recording device (memory). In the files, data are stored which are mainly part-programs, macro cycles, correction tables, starting point displacement, parameter tables and machinery constants. In the files, system parameters and help texts as well as further auxiliary information are stored.

STRING – the string consists of 1 up to 50 arbitrary characters following each other. This term is used to edit when searching the entered group of characters in the part-program for instance.

CANUL – is the abbreviation of CENTRAL CANCELLING, in the manual text also the abbreviation CA is used. The symbol // on the push-button is used to select the central cancelling mode.

AUT – mode of automatic part-program run.

BB – Abbreviation of BLOCK-BY-BLOCK (AUT mode modification).

TRANS – auxiliary device to simulate the periphery devices at NC and CNC systems (MEFI product). It is used in the DNC network.

TOC – abbreviation for the knob mode (hand-wheel).

POT – abbreviation for the potentiometers mode.

MAN – abbreviation for manual mode

RUP – abbreviation for the manual pre-selection mode

4. SYSTEM SWITCHING ON

The operation of the numeric systems CNC836/846/856 may be performed by the skilled person trained in the area of electric safety in accordance with the CSN 34 3100. This operator is allowed to handle the control elements on the system panel of the floppy disk drive. Any other handling procedures with the system are forbidden to be performed by the operator.

Activation and deactivation of the system is conducted concurrently with the turning on and the turning off of the machine. Usually the system is powered through the machine power box. After turning the power on and loading up of the operation system, the control program is loaded into the memory of the system. After some seconds the introduction picture with the text CNC836/846/856 and the number of the system version is indicated on the displaying panel. During this time, the system conducts internal tests as well as introduces communication between the panel and the cassettes. After elapsing of this time, the system conducts central cancellation automatically.

4.1. Configuration file CNC836.KNF

After turning on, certain parameters of the system are adjusted in accordance with the configuration file CNC836.KNF (Note: do not confuse this with the file of of the machinery constants TAB0.REK). **The same file name i. e. CNC836.KNF are used by the systems CNC846 and CNC856 too.** Changes in this file may be performed by the service worker or trained persons only. The basic setting up is performed together with the system installation and it shall not be changed. When changing it is necessary to follow the required syntax otherwise the system does not work correctly. Rules for changes in this file and comments to the individual parameters as well as current condition for the relevant version are mentioned in this file directly. The changes may be performed by means of the system editor (see below). **Changes in this file is applied after every new turning on of the system only.**

Overview of the parameters in the configuration file CNC836.KNF:
-   path to the implicit directory with the part programs (usually CMOS memory)
-   path to the directory on the floppy disk
-   path to the directory on the HARD DISK (C:\SYST\PROG) or EPROM DISK (A:\PROG)
-   type of the push-button board used
-   co-ordinate name (approved names X, Y, Z, U, V, W, A, B, C)
-   screen type (colour or monochromatic)
-   requirements to file printout in directories regarding to alphabet, date or by combined manner
-   filter for file name with the part programs
-   filter for file name with the corrections
-   filter for file name with the starting point displacement
-   filter for file name with parameters
-   filter for machinery constant files
-   file name for system editor
-   name of the system table of corrections
-   name of the system table with the starting point displacement
-   name for system table with parameters
-   name of the system table of machinery constants
-   constants to set the sensitivity and hysteresis of potentiometers of % F and % S.

- parameters of the serial channels
- connection to the DNC network
- machine type (mill, lathe)
- conversion program
- system word for lathes
- version No.
- memory population
- setting the grey colour

Detailed commentary to the configuration file is stated in the Appendix A2.

4.4. System memories

Control systems of the series CNC836/846/856 are delivered optionally with two basic memory kinds as follows:

1) with hard disk
2) optionally with the flash disk too

The basic board (motherboard) is populated with the dynamic memory with the capacity given by the number and size of the DIMM modules. Normally delivered size is 256 Mbyte. The size of this memory influences the maximum length of one part program which is to be edited and run in the system. The maximum length of one part program is equal to approximately one half of the memory populated. For this case, it is approximately 128 MByte.

The system control program is loaded into the dynamic memory after switching on the system either from the flash disk or from the hard disk depending on which memory from the above mentioned memories of the system is populated.

To backup the files with the part programs, the tables and other system files, the system is populated either by the flash disk or by the hard disk.
the D:\PROG sub-directory.

The system populated by the hard disk is marked as follows:

A – Floppy disk
It is accessible only if the system consists of the floppy disk. Connection of the floppy disk drive is stated in the configuration file CNC836.KNF.

B – Hard disk
The hard disk has the C:\SYST directory consisting of system program (corresponding with A:\ with the system with the EPRM board), C:\SYST\PROG sub-directory consisting of model shapes of tables (corresponding with A:\PROG with the systems with the EPRM card), C:\CMOS consisting of all backup data i. e. part programs, tables, machine constants (corresponding with D:\CMOS with the systems with the EPRM board).

Free capacity of the selected memory (A, B) is indicated in the format of file printout on the selected device (see below).