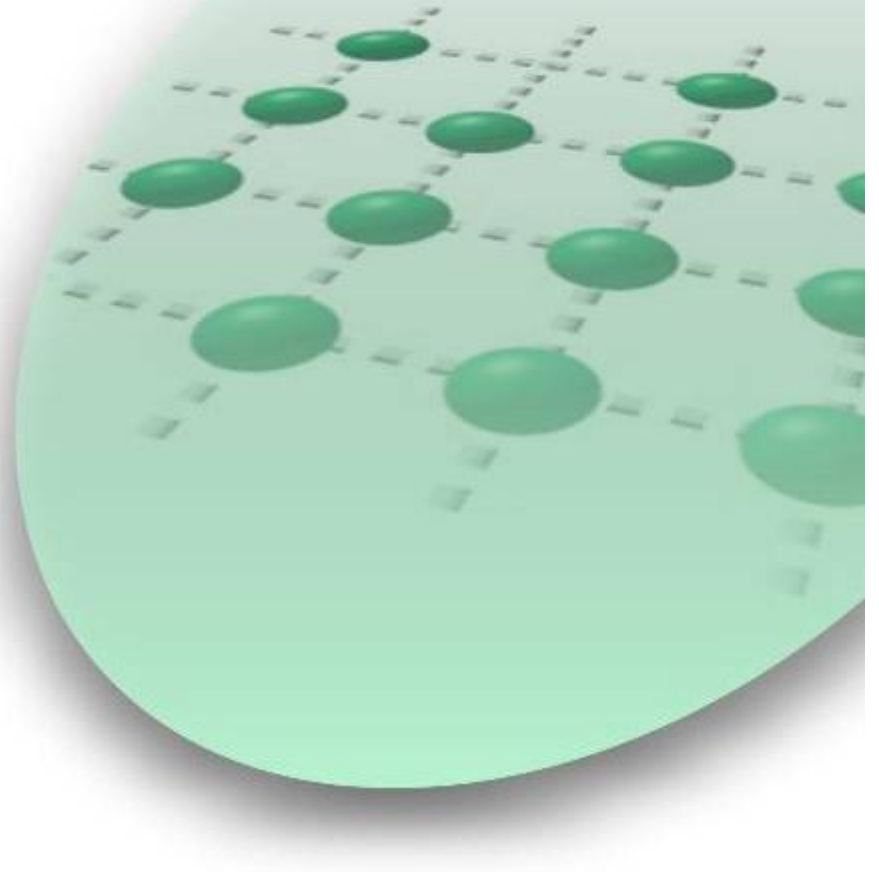
Micro and Lexium Magelis and Advantys

System User Guide

[source code]



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Merlin Gerin
Square D
Telemecanique

Schneider Electric
Building a New Electric World

Mar 2006

Table of Contents

Introduction

This document is intended to provide a quick introduction to the described System.
It is **not** intended to replace any specific product documentation. On the contrary, it offers additional information to the product documentation, for installing, configuring and starting up the system.

A detailed functional description or the specification for a specific user application is **not** part of this document. Nevertheless, the document outlines some typical applications where the system might be implemented.

Abbreviations

Expression	Signification
PLC	Programmable Logic Computer
HMI	Human Machine Interface
VVD	Variable Velocity Drive
PC	Personal Computer
AC	Alternating current
DC	Direct current
PS	Power supply
I/O	Input / Output
CB	Circuit Breaker
ESTOP	Emergency Stop
Micro	The product name of a Schneider Electric PLC
PL7	The product name of a Schneider Electric PLC programming software
Phaseo	The product name of a Schneider Electric power supply
Magelis	The product name of a Schneider Electric HMI Device
Lexium/Lexium05	The product name of a Schneider Electric VVD
Advantys	The product name of a Schneider Electric I/O-Platform

Application Example - Source Code

Introduction

Examples of the source code used to attain the system function as described in this document can be downloaded from our „Village“ website under **this** link.

Typical Applications

Introduction

Here you will find a list of the typical applications, and their market segments, where this system or subsystem can be applied:

Application	Description	Example
Packing machines	for the packaging industry, used for labelling, packing, filling and paletting of goods.	
Specialised Machines	For economical operation of special machines used in mounting, finishing, cutting etc. (e.g. food preparation, automatic assembly, woodworking)	
Conveyor System	For use in sorting systems e.g. "pick and place".	

System

Introduction

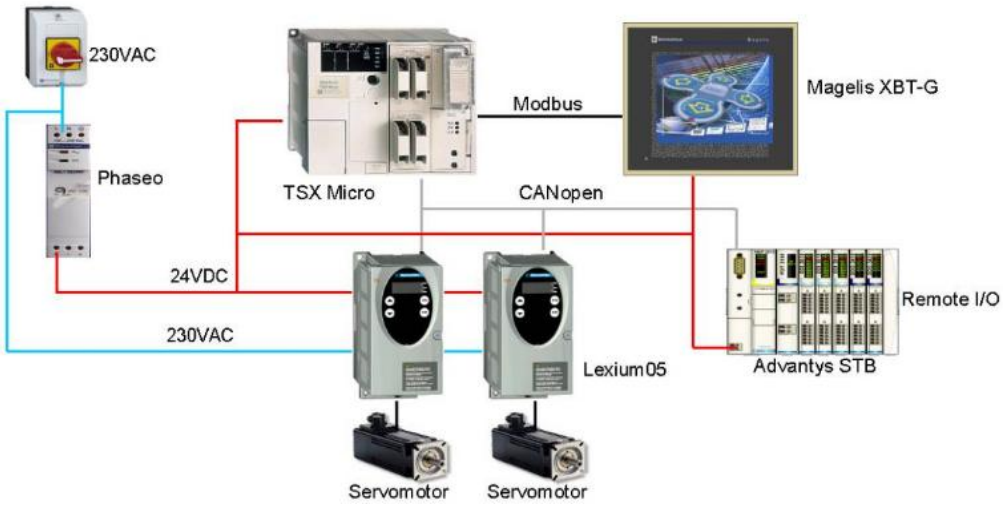
This chapter describes the system architecture, components, size and quantity of those components used in the system.

Architecture

General

The system consists of a PLC controlling two drive controllers each with a servomotor and a decentralised I/O platform. Control of the drives is via a full graphics touch screen. The field bus is CANopen, the control panel is connected via Modbus. For safety, a single mains switch is provided.

Layout



Components

Hardware:

- TSX Micro (PLC)
- Phaseo (Power Supply)
- Lexium05 (VVD)
- Advantys STB (Remote I/O)
- Magelis XBTG (HMI)
- Servomotor

Software:

- PL7 V4.4 (PLC)
- Advantys Configuration Software V1.20 (Remote I/O)
- Sycon V2.8 (CANopen)
- Vijeo-Designer V4.1.0 (HMI)
- PowerSuite V2.0 (Lexium05)

Quantities

For a stand alone application, only one of each component is required.

Dimensions

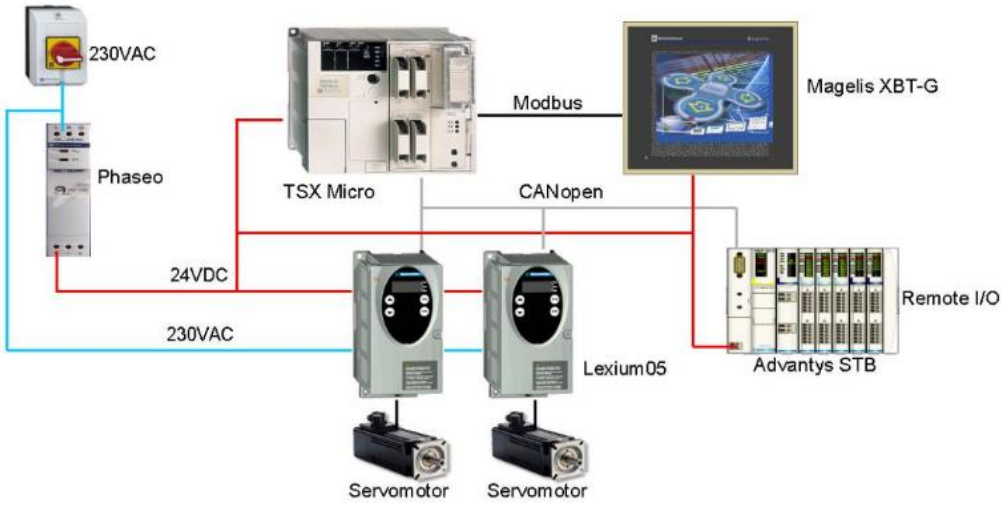
Due to the compact size of the components it is possible to contain the system in a single cabinet. The Magelis XBTN could be built into the front door of the cabinet

Installation

Introduction

This chapter describes the steps necessary to set up the hardware and configure the software for the described application.

Layout



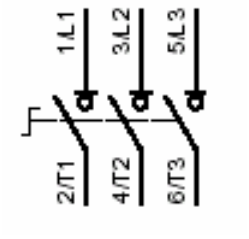
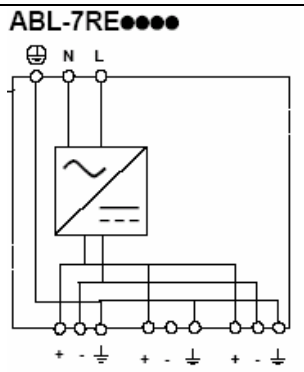
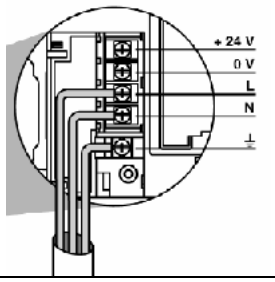
Function: PLC Program / HMI Usage
The User can control two Lexium05 drive controllers using the fully graphic Magelis touch panel. The Lexium05 units occupy addresses 80 and 81 on the CANopen bus.

After switching on, the Lexium05's can be put into „run" modus using the „power up" switch on the Magelis touch screen
.
There is an automatic mode and a manual mode. The key "AUTO" selects the automatic mode and starts a speed ramp.
Manual mode provides access to the state machine of the two drive controllers. The user can manually start and stop the two controllers. The speed and direction of the two controllers can be adjusted.

Hardware

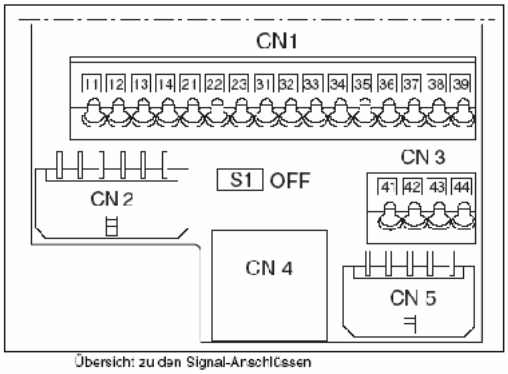
General

- The power supply and the Advantys need a DIN rail for mounting.
- Other devices can be mounted on the surface of the cabinet.
- 230VAC wiring between main switch, power supply and VVD.
- 24VDC wiring between power supply, PLC, HMI and control circuit of the VVD.
- Wiring of power and feedback cable between motor and VVD.

Mains Switch VCF-02GE		
Power Supply ABL7RE2403		
PLC Micro TSX3722101		
Drive Controller Lexium05 LXM05AD10M2		• Mains- and Motor connection 

Drive Controller
Lexium05
LXM05AD10M2

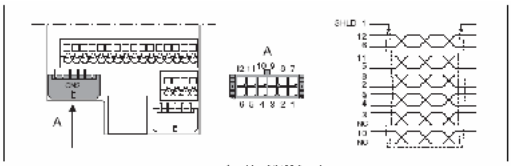
- Layout of the Signal contacts



Übersicht zu den Signal-Anschlüssen

Anschluss / Schalter	Belegung
CN1	Analoge Eingänge ±10V. Pin 11 bis 14
	CANopen, Pin 21-23
	Digitale Ein/Ausgänge, Pin 31-39
CN2	Motor Encoder (Hiperface Sensor)
CN3	24V Versorgung
CN4	PC, dezentrales Bedienterminal, MODBUS, CANopen; (RJ45)
CN5	ESIM A/B/I out, PULS/DIR in, Encoder A/B/I in
S1	Schalter für CANopen Abschlusswiderstand

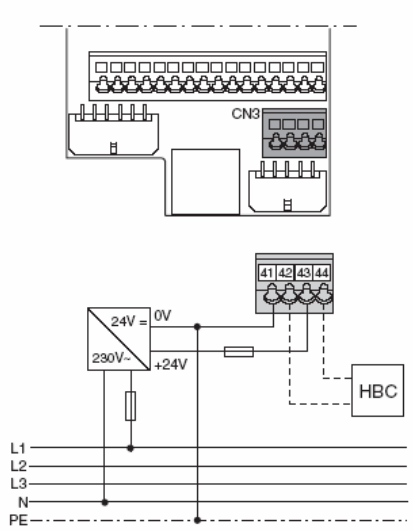
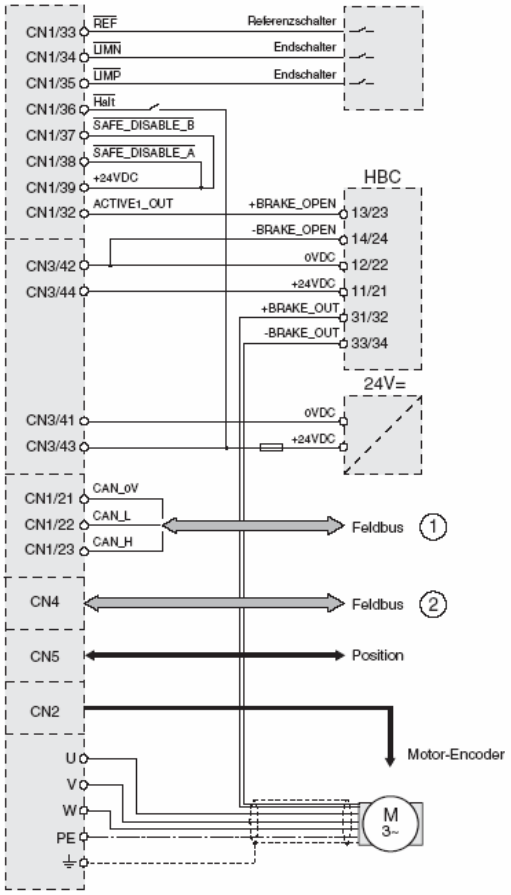
- Motor contacts



Anschlussbild Motorgeber

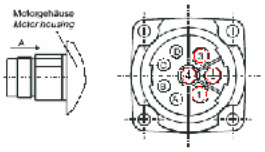
Pin	Signal	Motor Pin	Farbe 1)	Paar	Bedeutung	E/A
1	Schirmanschluss				Schirmanschluss	
12	SIN	8	weiß	1	Sinussignal	E
8	REFSIN	4	braun	1	Referenz für Sinussignal 2,5 V	A
11	COS	9	grün	2	Cosinussignal	E
5	REFCOS	5	gelb	2	Referenz für Cosinussignal 2,5 V	A
9	Data	6	grau	3	Einkabel-, Sonderfunktion	E/A
6	Data/	7	rosa	3	Einkabel-, Sonderfunktion, invertiert	E/A
10	EncGnd	11	blau	4	Bezugspotential Geber (Encoder) (0,5mm²)	A
			rot	4	nicht belegt (0,5mm²)	
2	EncU_5V	1	schwarz	5	Bezugspotential zu T_NTC	-
			violett	5	nicht belegt	
3	T_NTC	2	grau/rosa	6	Temperatursensor PTC	E
4	EncU+10V_SCT	10	rot/blau	6	10 V_{DC}-Versorgung für Geber, max. 150 mA	A
7	n.c.				nicht belegt	

1) Angaben zur Farbe beziehen sich auf mitgelieferte Kabel

Drive Controller Lexium05 LXM05AD10M2	• 24V-power supply  Anschlussbild, 24V-Versorgung **Pin Signal Bedeutung** 41 0VDC Bezugspotential für 24V-Spannung 42 0VDC Bezugspotential für 24V-Spannung 43 +24VDC 24V-Versorgungsspannung 44 +24VDC 24V-Versorgungsspannung
Drive Controller Lexium05 LXM05AD10M2	• Wiring the Field bus, **NO protected STOP** 

AC - Synchronous-Servomotors
SER3683L5SSOAOO

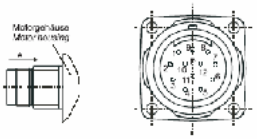
A



PIN	Belegung	
1	U	
2	PE	
3	W	
4	V	
A	Bremse	nicht belegt
B	Bremse	nicht belegt
C	nicht belegt	
D	nicht belegt	

Power cable
GEA2M0AAAA003

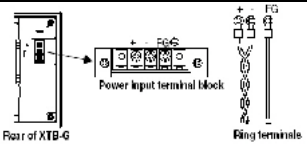
A

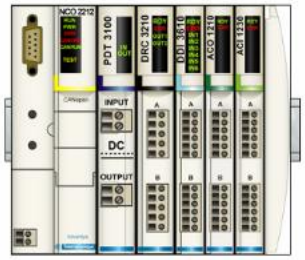
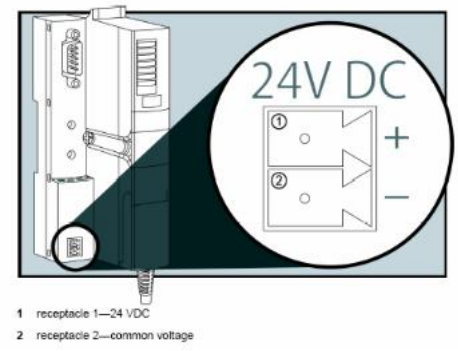
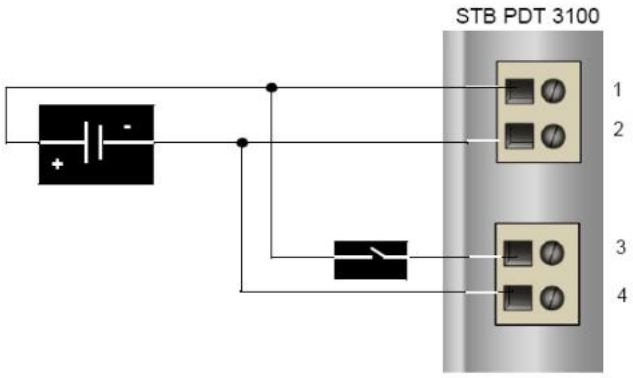


PIN	Belegung
1	Temperatursensor PTC/NTC
2	Temperatursensor PTC/NTC
3	nicht belegt
4	REF SIN
5	REF COS
6	Daten+ RS 485
7	Daten- RS 485
8	+ SIN
9	+ COS
10	U_A 7-12 V
11	GND
12	nicht belegt

Feedback cable
GEA2EAAAAA003

HMI
Magelis XBT-G2330



Advantys STB	
Advantys STB Power Supply	 1 receptacle 1—24 VDC 2 receptacle 2—common voltage  1 +24 VDC sensor bus power 2 -24 VDC sensor power return 3 +24 VDC actuator bus power 4 -24 VDC actuator power return

Software

General

The Software for the Micro PLC, the full graphics Magelis touch screen and the configuration software for the CANopen bus must all be installed.

The Front of the drive controller has a simple display and keypad for simple configuration. For more comfortable configuration, archiving and simulation possibilities, install the PowerSuite software.

To do this you need a PC with a Microsoft Windows 2000 or Windows XP operating system.

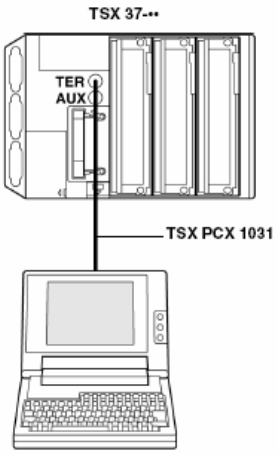
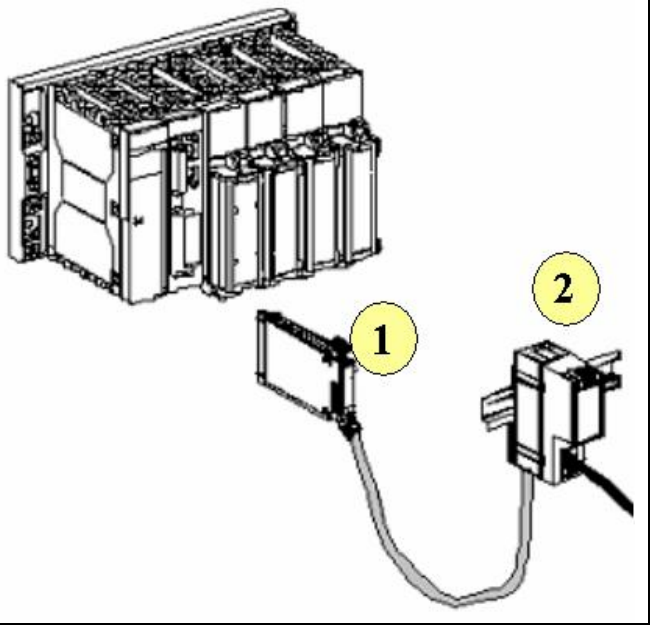
To start the software installation simply put the appropriate CDs in the CD drive of your PC – the installation starts automatically if you have set the “autostart” in Windows. If you have problems, check the product description of the particular software package.

Communication

General

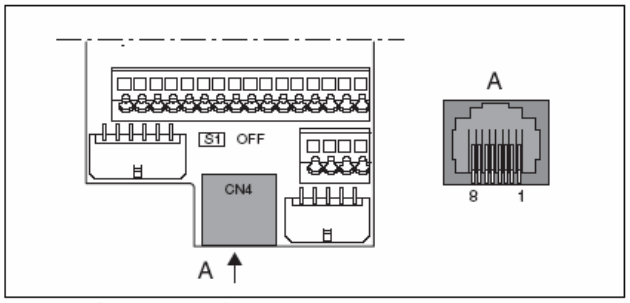
CANopen is used for the field bus communication between the Micro PLC, the Lexium05 drive controllers and the decentralised Advantys I/O platform.
The full graphics Magelis touch screen is connected to the Micro PLC with a Modbus protocol.

- Modbus cabel between PLC and HMI
- CANopen cabel between PLC, VVD and Advantys by using a CANopen adapter.

PLC Micro TSX3722101 Connecting the serial interface on the PC with PL7 and the Micro PLC using connecting cable TSX PCX 1031		
To connect the Micro to the CANopen cable you need: • TSX CPP 110 card in the PCMCIA Slot of the PLC (1) • The TAP is fixed to a railing (2)		

Drive Controller
Lexium05
LXM05AD10M2

CANopen using CN4



Anschlussbild CANopen an CN4

Pin	Signal	Bedeutung
1	CAN_H	Datenleitung
2	CAN_L	Datenleitung, invertiert
7	MOD+10V_OUT	10V Versorgung (andere Belegung als CANopen)
8	MOD_0V	Bezugspotential zu MOD+10V_OUT

HMI
Magelis XBT-G2330

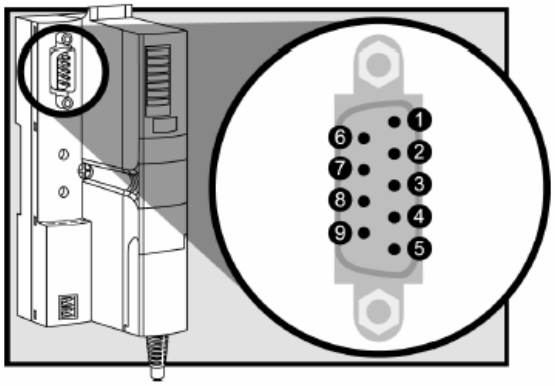
DC- Power cable

Comm. Cable to PLC incl. Adapter

Comm. cable to PC

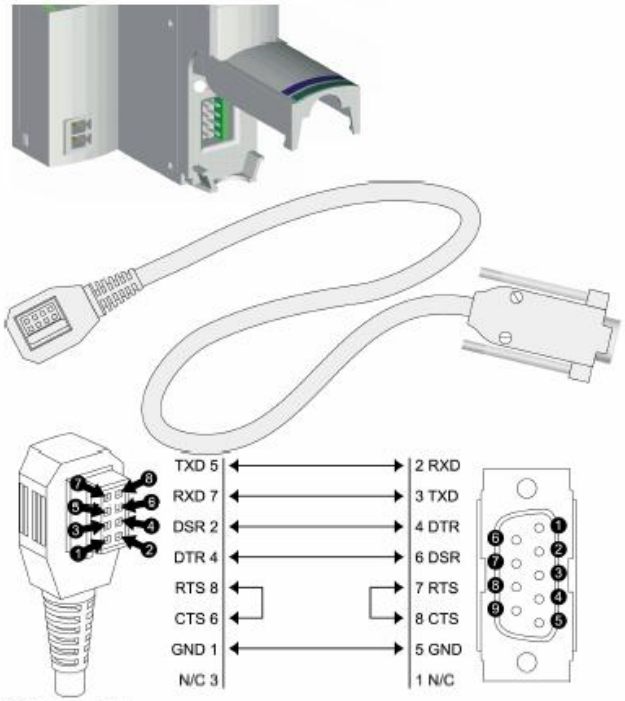
XBTZG915
XBTZG999

Advantys STB CANopen Connection



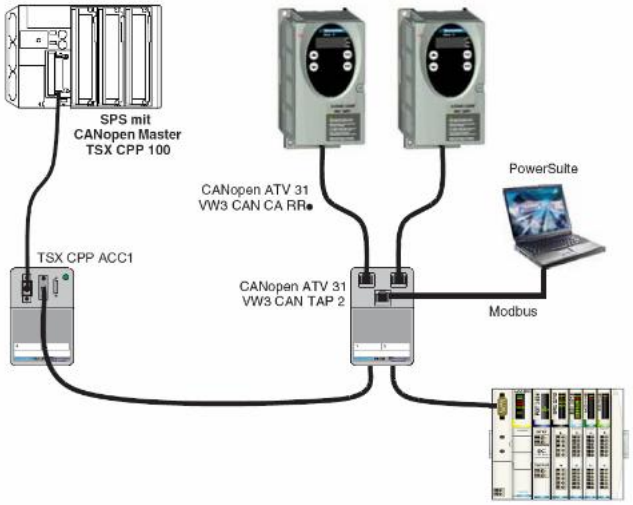
Pin	Signal	Description
1	Unused	Reserved
2	CAN_L	CAN-low bus line
3	CAN_GND	CAN ground
4	Unused	Reserved
5	CAN_SHLD	optional CAN shield
6	GND	optional ground
7	CAN_H	CAN-high bus line
8	Unused	Reserved
9	Unused	Reserved
Note: Pin numbers correspond to callouts in the figure above.		

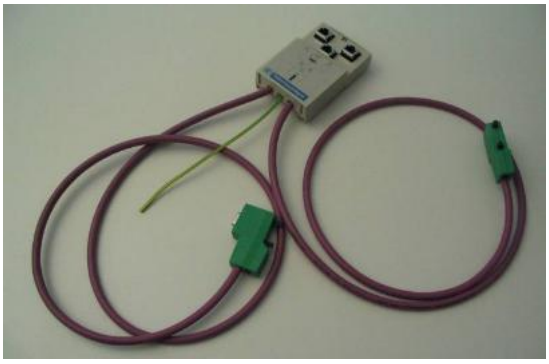
Advantys STB Programming Cable STB XCA 4002

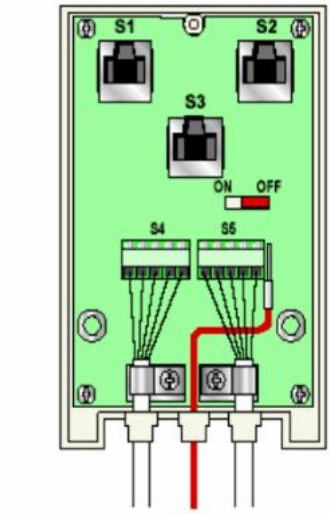


TXD transmit data
RXD receive data
DSR data set ready
DTR data terminal ready
RTS request to send
CTS clear to send
GND ground reference
N/C not connected

CANopen Adapter VW3CANTAP2

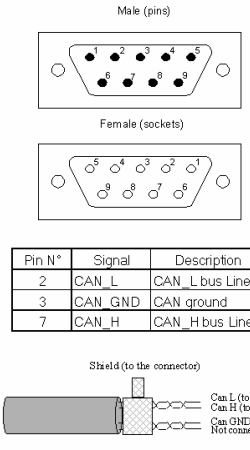






Pin	Signal	Description
1	GND	Ground
2	CAN_L	CAN_L bus line
3	SHLD	Optional shield
4	CAN_H	CAN_H bus line
5	(V+)	Optional supply (1)

Switch set to OFF

CANopen – Plug 103643 (incl. end-resistor for connection to TSXCPP110 Tap and Advantys) **CANopen – Cable DCA 701 (44170014 from Selectron) or UNITRONIC BUS CAN 2170261 (from LAPP)**		 Pin N° | Signal | Description 2 | CAN_L | CAN_L bus Line 3 | CAN_GND | CAN ground 7 | CAN_H | CAN_H bus Line

Implementation

Introduction

The implementation chapter describes all steps necessary to initialize, parameterize, program and to start-up the system.

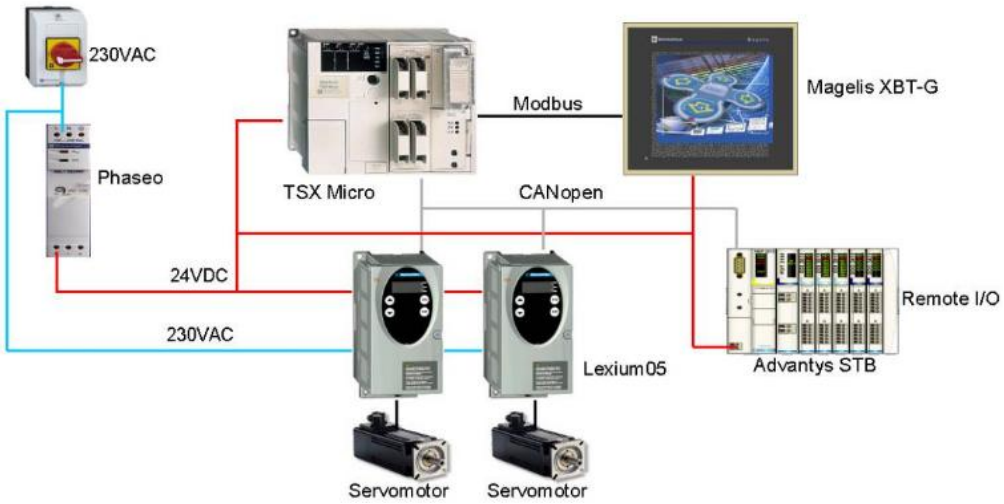
Function

1. After switching on the mains, the Lexium05 drive controllers can be put into “run” mode by pressing the “Power Up” key, for 2 seconds, on the Magelis screen.

2. After “Power Up” the PLC is in manual mode. In this mode, the user has access to the state machine of the two drive controllers. The drive controllers can be manually stopped and started. The speed and direction of the drive controllers can be adjusted.

3. The drive controllers must first be stopped to switch to automatic mode. Automatic mode can be selected on the magelis touch screen with the key “AUTO”. This starts a speed regulation program, raising the speed from zero to 600rpm in 1 minute. The speed remains constant for 10 minutes and then is reduced to –600 rpm over a period of 2 minutes. After another 10 second period the speed is reduced to zero over a 1 minute period. After a 10 second wait, the program is re-started.

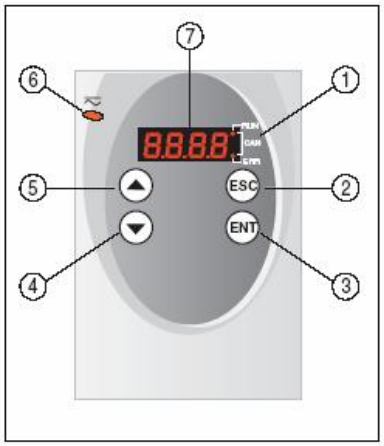
4. In the case of errors, an error number is displayed on the Magelis touch screen. The user can refer to the user manual for an explanation of the error.



Drive Controller Lexium 05

Introduction

This section describes how to initialise the Lexium05 drive controller.

After finishing the wiring the drive controller must be configured	
The parameters may be configured using the integrated HMI panel.	

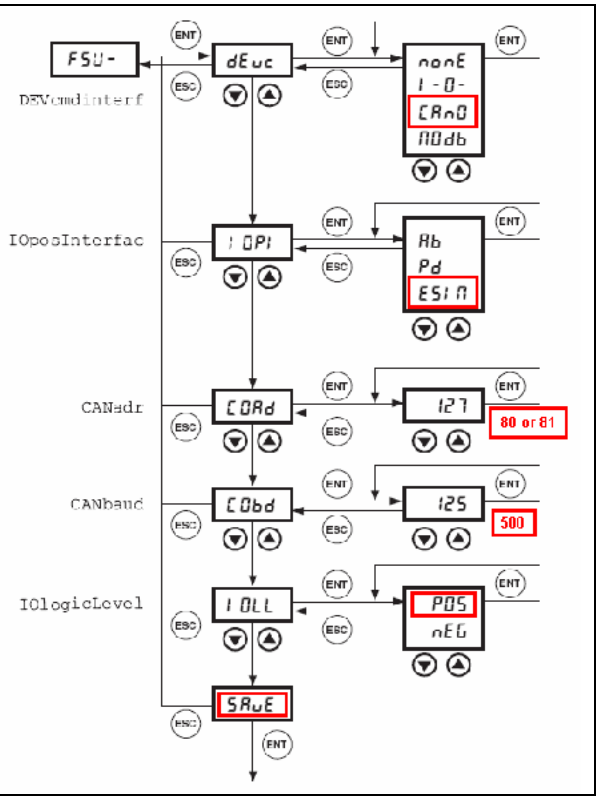
Pos	Bedeutung
1	LEDs für CANopen
2	ESC: - Verlassen eines Menüs oder Parameters - Rückkehr vom angezeigten zum letzten gespeicherten Wert
3	ENT: - Aufrufen eines Menüs oder Parameters - Speichern des angezeigten Werts
4	Pfeil ab: - Wechsel zum nächsten Menü oder Parameter - Verringern des angezeigten Wertes
5	Pfeil auf: - Wechsel zum vorherigen Menü oder Parameter - Erhöhen des angezeigten Wertes
6	Rote LED leuchtet: DC-Bus unter Spannung
7	7-Segmentanzeige, 4-stellig

All drive functions are blocked on first time power supply or on reloading of the factory setup using the Parameter `PARfactorySet`.

A „First-Setup" must done.

In this example the Addresses 80 and 81 are used and 500 KBaud is given as communication speed.

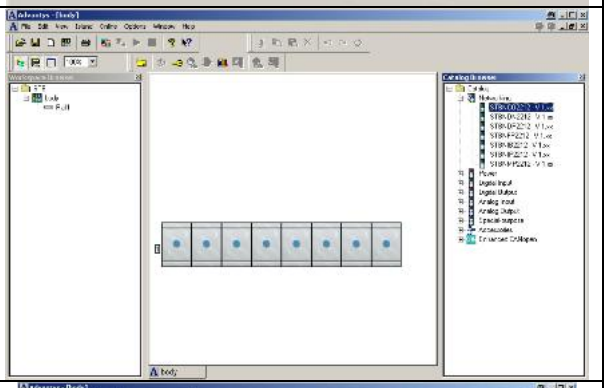
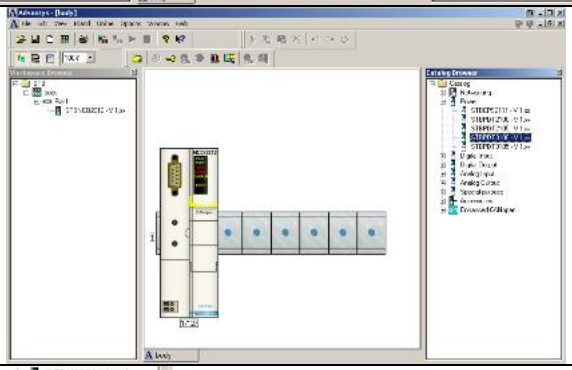
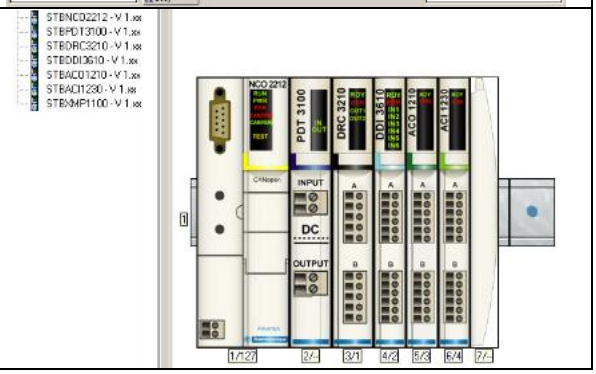
After first setup the drive controller should be shown in the status display as „**RDY**" (ready).

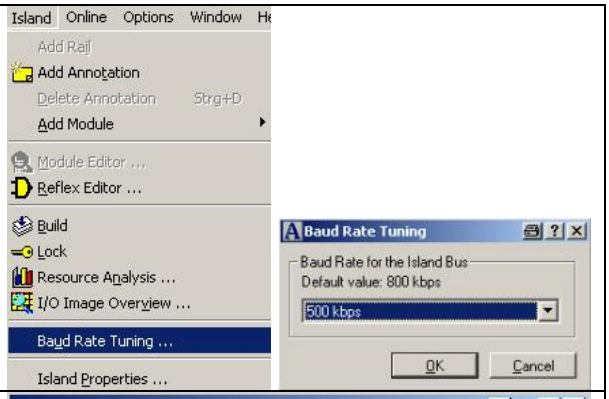
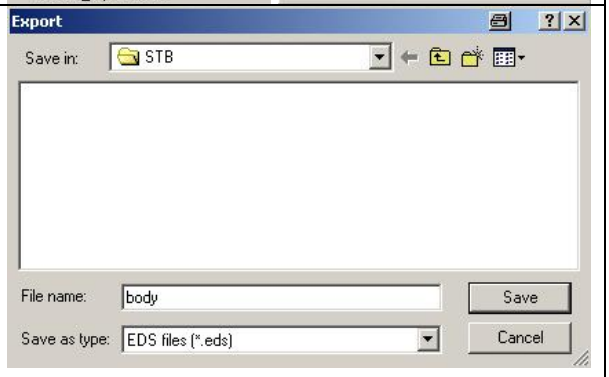
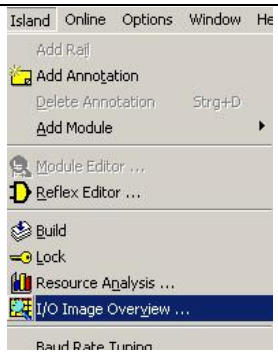
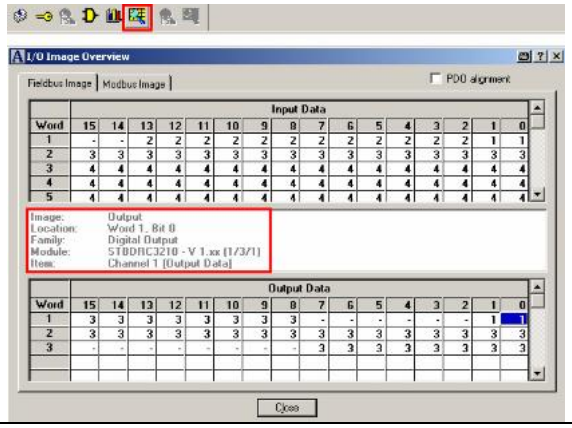


I/O Platform

Introduction

This section describes the configuration of the Advantys I/O platform using the Advantys configurations software .

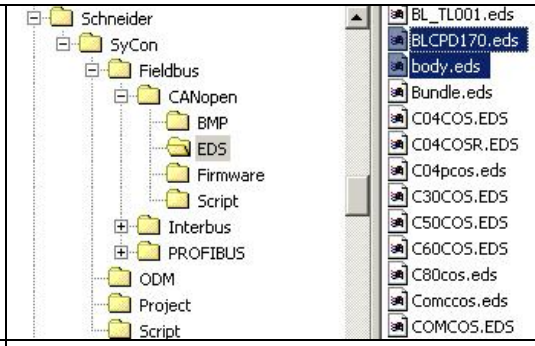
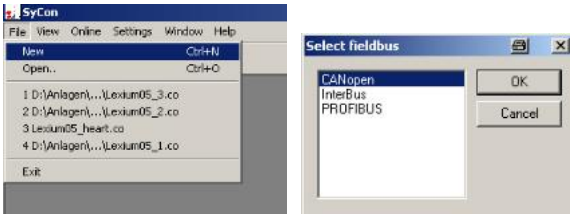
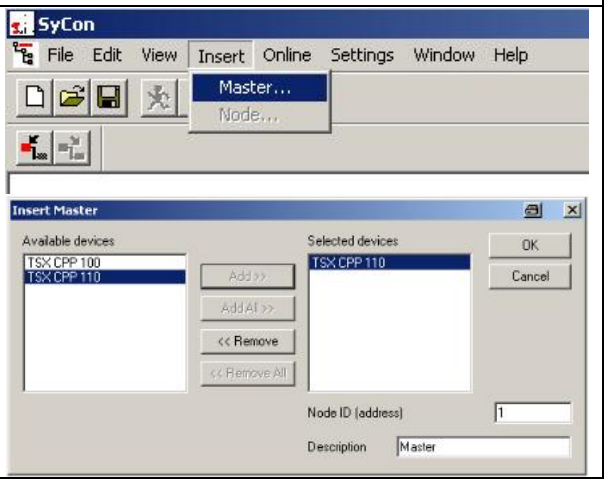
After starting up the Advantys configuration software, a new workspace must be created.	
You must provide a path, a Wordspace-Name and an Island-Name.	
Then Choose the network interface for CANopen STB NCO 2212	
Now add the other modules: STB PDT 3100 STB DRC 3210 STB DDI3610 STB ACO 1210 STB ACI 1230 Not forgetting the bus terminal. STB XMP 1100	
The screen should now show:	

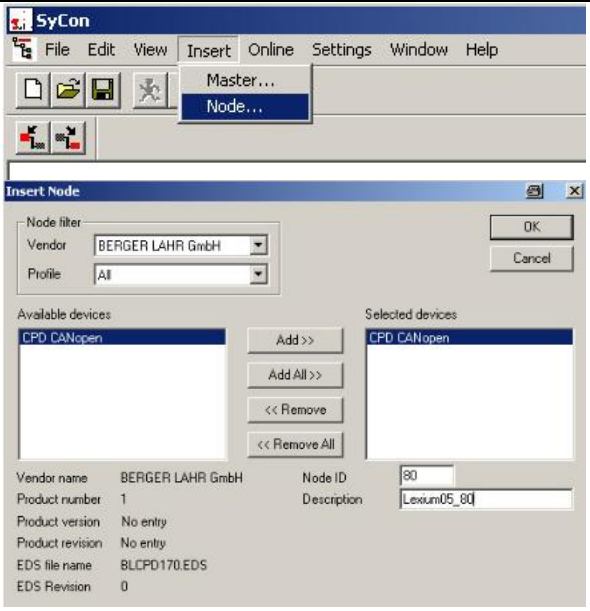
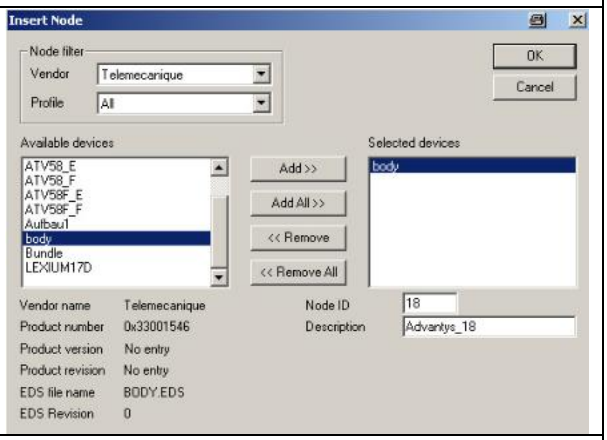
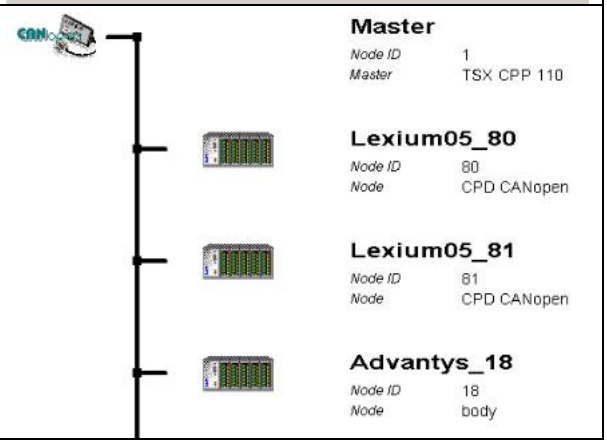
Via the Menu bar you can set the bus speed. Here, 500 kbps is used, as with the Lexium05 and later in the PLC.	
Next, you must create the EDS file. Use the menu “file” then “export”. The filename and folder can be chosen as required. Note the file type (EDS) is obligatory for future use and development. You can configure the I/O using the SYCON EDS files instead of the Advantys configuration software, however this requires extensive knowledge CANopen and is not part of this document	
Using the menu “Island” and then “I/O Definition” (or use the  icon in the toolbar) you can assign the I/O to memory. Click on the data to get a detailed description in the description window… Or simply print the project. The printout shows the details too.	 

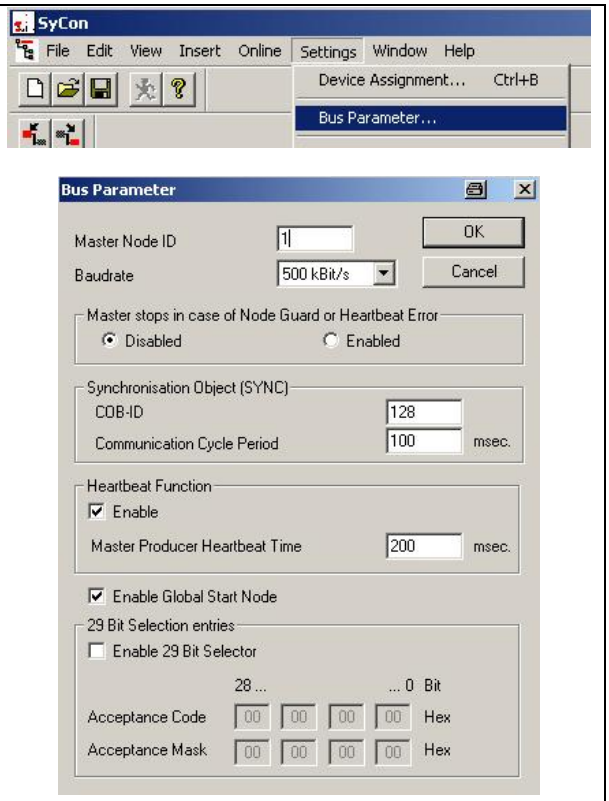
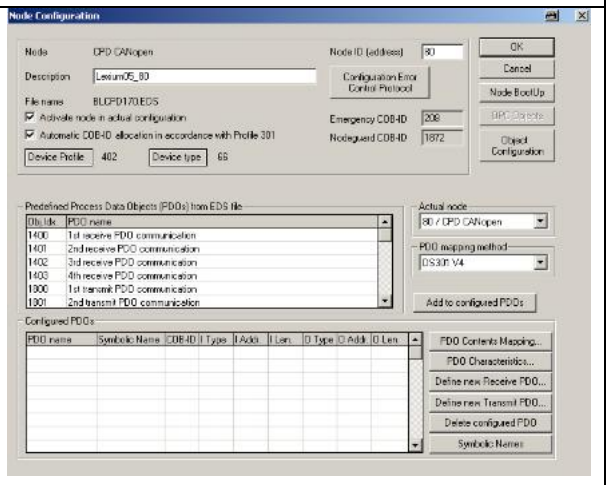
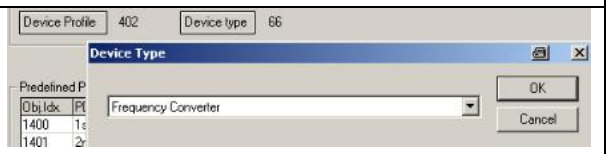
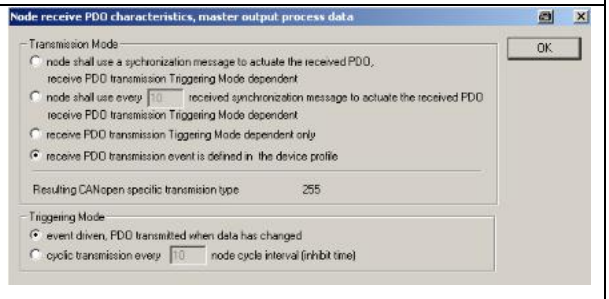
CANopen

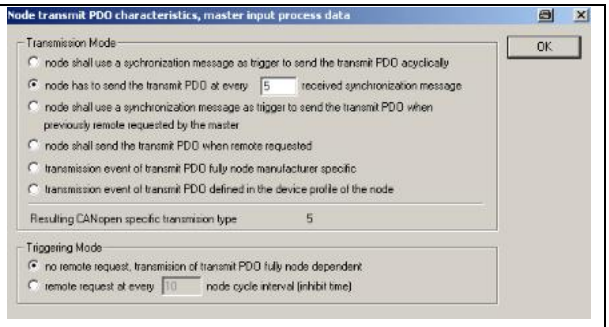
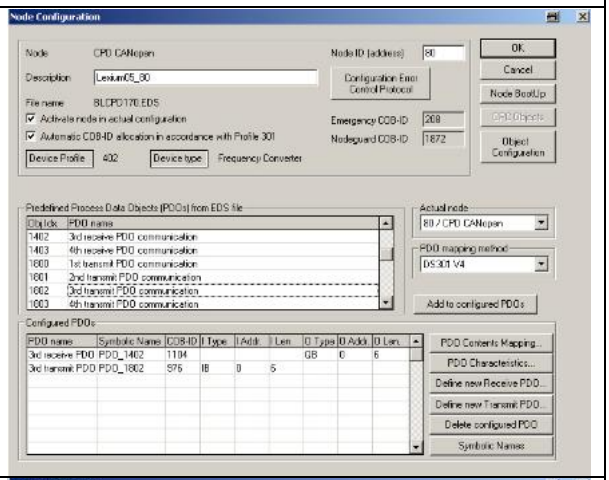
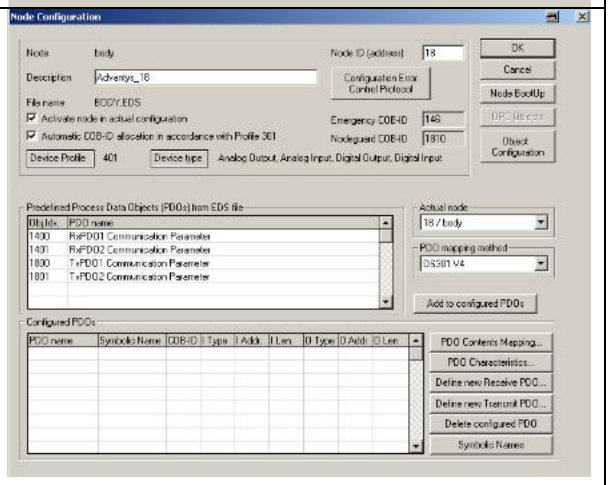
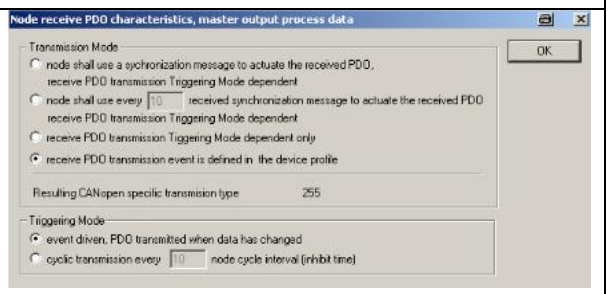
Introduction

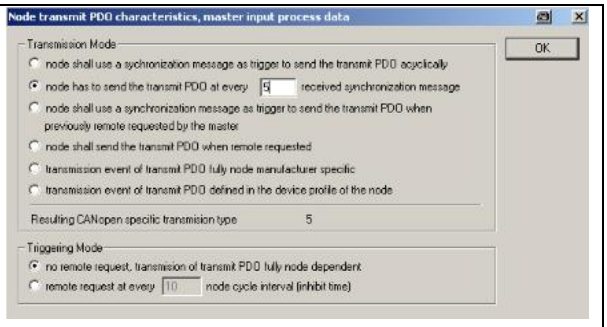
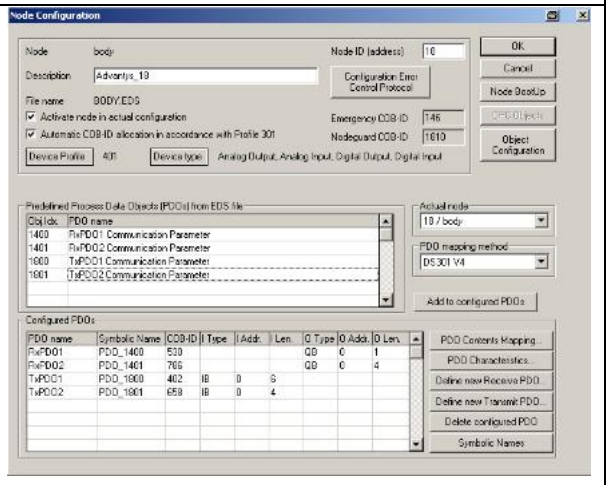
This section shows you how to use the SYCON software to configure the CANopen bus

Before starting the SYCON software, you must copy the Lexium05 and Advantys EDS files into the EDS folder.	
SYCON is used to describe the CANopen configuration. It contains all the information that the PLC programming software, will require later. After starting SYCON, a new project is created	
Use the menu “insert” and add the “master” TSX CPP 110 by selecting it in the list of devices. You may change the account and description.	

Insert a Node using the menu bar selections. After inputting the address and description, select the manufacturer and click on “add” to add it to the chosen devices Here the addresses 80 and 81 are used. See configuring the Lexium05. Now do the same for the second Lexium.	
The next node is the Advantys (Address 18).	
You should now have a screen showing:	

Next, set the baud rate. For this, select the master Using the menu “Setup”, then “Busparameter”. When the busparameter dialog opens, select 500kBits/s as communication speed and click on “OK”.	
A doubleclick on the first Lexium node opens the dialog for the node configuration. A list of the PDOs is displayed. For our application the 3rd. PDO is required. This PDO is the parameter for the speed control.	
First , set the device type to “Frequency Converter”.	
After a double click on “3rd receive PDO comm..” the following dialog appears. Click “OK” to accept the setup.	

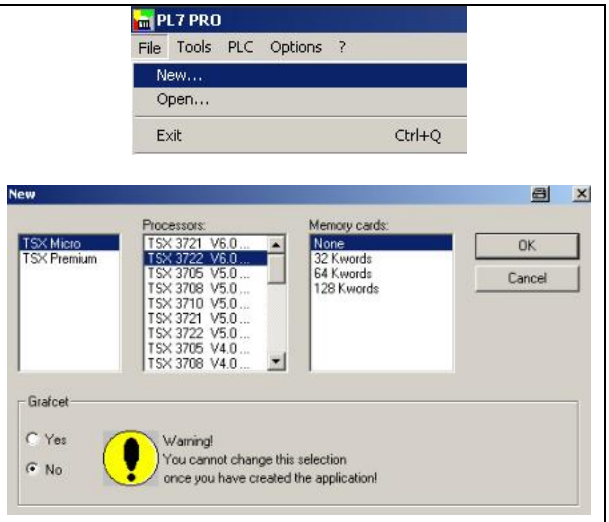
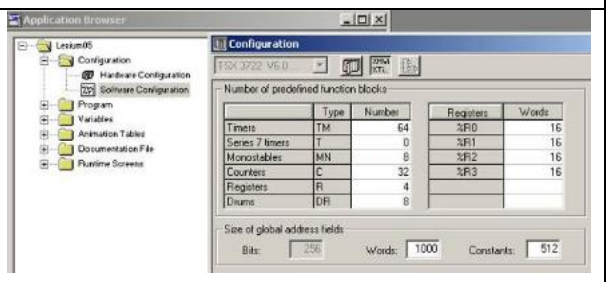
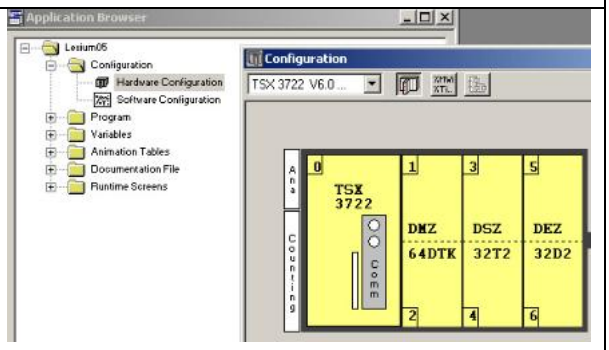
After a doublclick on "3rd transmit PDO comm.." the following dialog appears, click "OK" and accept the setup.	
The Parameter setup for the first Lexium05 is now complete and the following window is displayed. Now repeat these steps for the second Lexium05.	
A doubleclick on the Advantys node displays the node configuration dialog. Select each PDO, one after the other.	
PDOs: "RxPDO1 Comm..." "RxPDO2 Comm..." "TxPDO1 Comm..." have the setup as shown:	

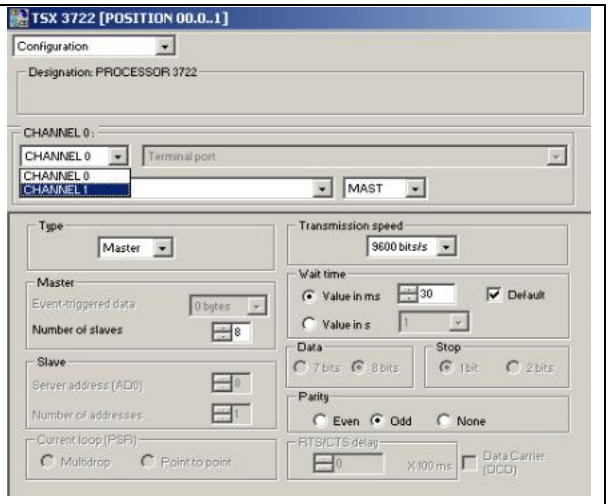
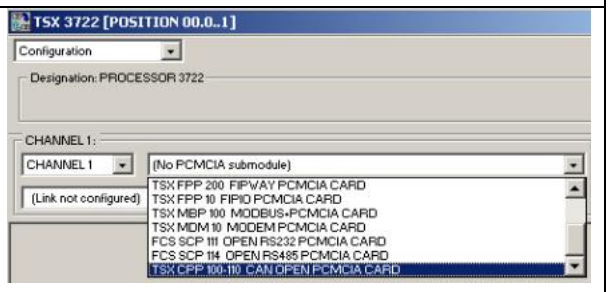
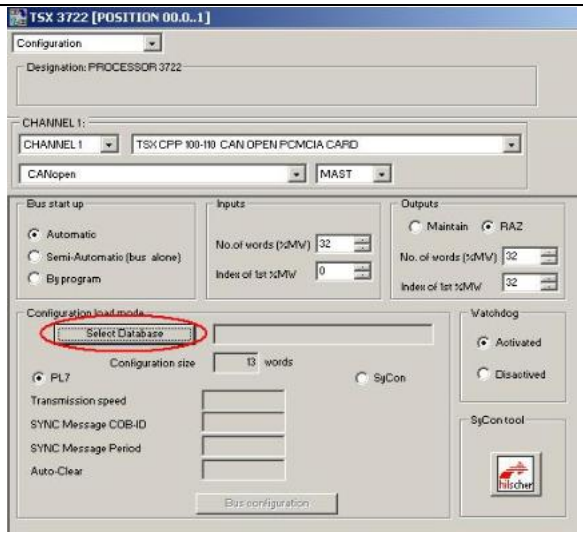
And PDO “TxPDO2 Com...” has the following setup:	
The Parameter setup for Advantys is now complete And the following dialog is displayed: Now save the project as xxx.co. Now you are ready to start on the PLC program.	

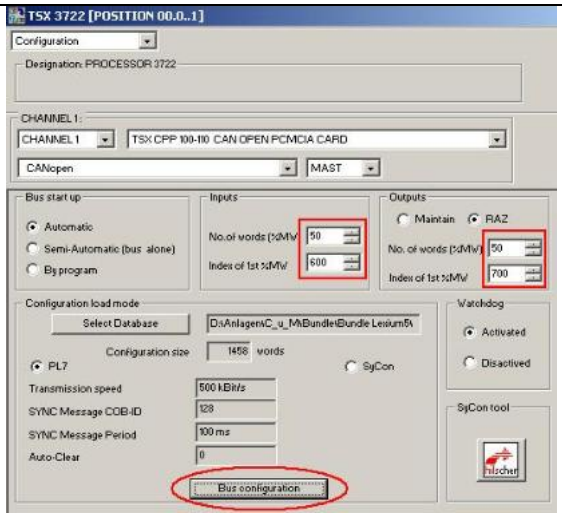
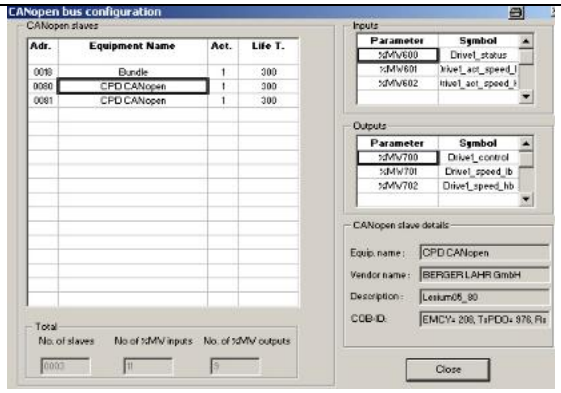
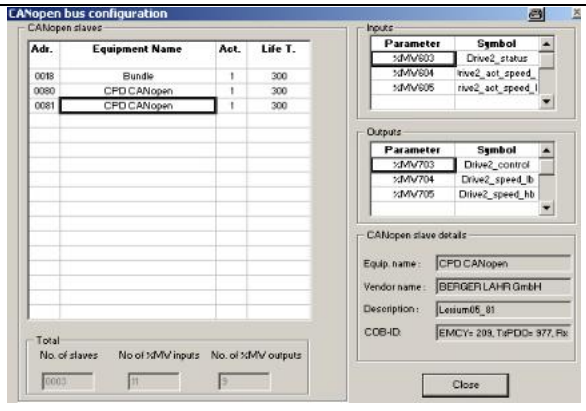
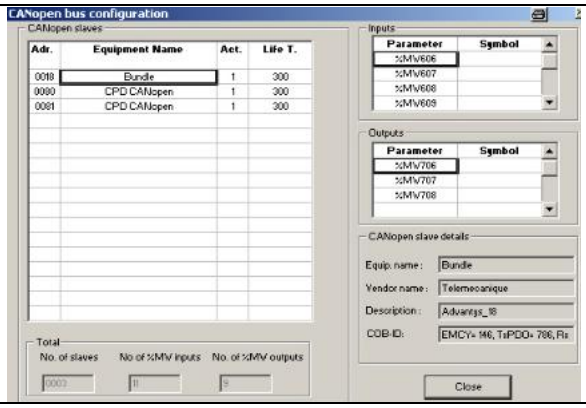
PLC

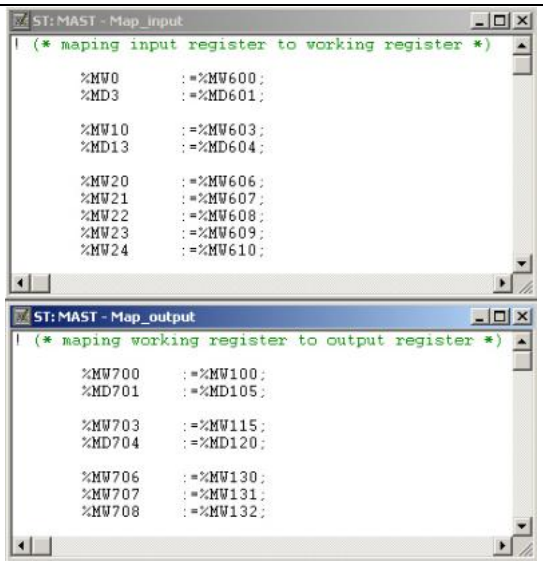
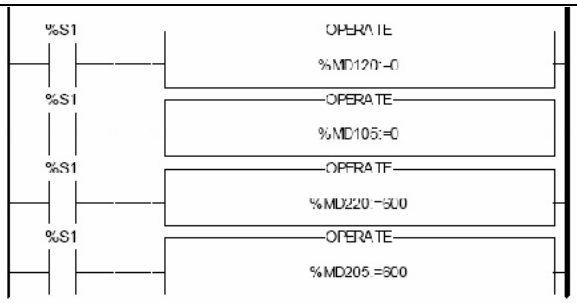
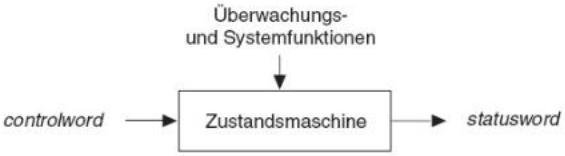
Introduction

The PLC section describes the steps necessary to create the PLC logic. For this we use the PL7 software.

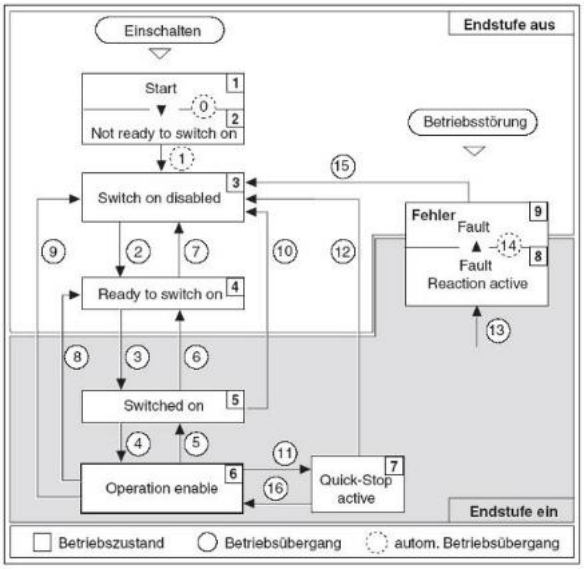
Start PL7 and create a new project. Make sure you select the correct PLC.	
Increase the number of words in the configurator.	
Configure the I/O modules. Doubleclick to choose the modules required.	

In “Hardware Configuration” click on the PCMCIA-Slot “COMM” . The configuration dialog for the communication appears. Select “Channel 1” .	
As Type select the CANopen-card TSX CPP 100-110.	
In the same dialog you can setup the bus start up behaviour, I/O behaviour and the task in which the bus runs – select MAST. Using the Button “Select Database” select the configuration file you created with SYCON (xxx.co).	

CANopen requires 11 Input Words and 9 Output Words. Reserve 50 input and 50 output words. The inputs start at %MW600 The outputs start at %MW700 (These can be setup at another memory location). Clicking on "Bus configuration" opens a dialog with the bus details.	
Here the details for the first Lexium05. The addresses and symbol names are shown on the right.	
Here the details for the second Lexium05.	
Here the details for the Advantys. The data transfer with the Advantys is not handled in this application. As example, in the section "Auto_island" an on/off pulse is written to the output relay.	

For easier handling the I/Os are copied to a working register. Note: this is not mandatory.	
The sections “Bus_startup” and “System_bits” define the behavour on start up of the PLC. The section “Init” sets the nominal values for the rpm to 0 and 600.	
The interaction between the operating modes and changing of mode are defined in the state machine of the **Lexium05** (equivalent to CANopen DSP402). The operating modes are changed using the `controlword`, the actual status is shown in the `statusword`.	

For the Lexium05 the operating modes are shown in rectangles numbered **1** to **9,** changes of mode in circles numbered **0** to **16**.



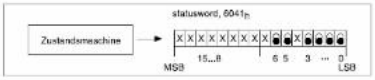
Description of the operating modi.

Zustand	Betriebszustand	Aktion der Zustandmaschine
1	Start	24V wird eingeschaltet Geräteelektronik wird initialisiert
2	Not ready to switch on	Endstufe ist nicht einschaltbereit
3	Switch on disabled	Einschalten der Endstufe ist gesperrt
4	Ready to switch on	Endstufe ist einschaltbereit
5	Switched on	Endstufe wird eingeschaltet, Motor-phasen, Erdung, Zero clamp werden geprüft. Bremse wird geöffnet (nach Übergang 4 -> 5) bzw. geschlossen (nach Über-gang 6 -> 5). Keine Betriebsart aktiv
6	Operation enable	Gerät arbeitet in der eingestellten Betriebsart
7	Quick Stop active	Quick-Stop wird ausgeführt
8 9	Fault Reaction activ Fault	Fehler erkannt, Fehlerreaktion wird - wenn möglich - aktiviert

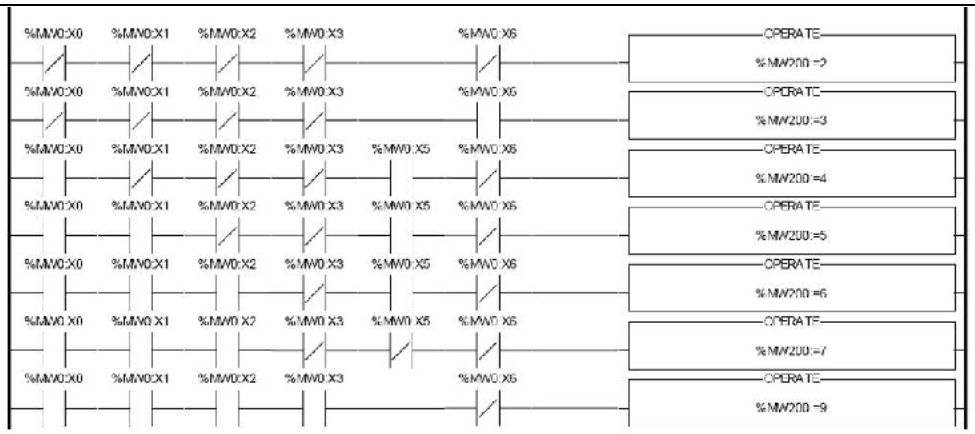
Conditions of standard operating modes are indicated with Bits 0 to 3, 5 and 6 in the `statusword`.

The Statusword is read via the CANopen Bus and evaluated in the PLC section „Operation_mode“.

The operating mode is written in %MW200 (%MW201for the second Lexium05).



statusword (6041_h) Zustand	Bit 6, Switch on disable	Bit 5, Quick Stop	Bit 3, Fault	Bit 2, Operation enable	Bit 1, Switch on	Bit 0, Ready to switch on
2: Not ready to switch on	0	X	0	0	0	0
3: Switch on disabled	1	X	0	0	0	0
4: Ready to switch on	0	1	0	0	0	1
5: Switched on	0	1	0	0	1	1
6: Operation enable	0	1	0	1	1	1
7: Quick Stop activ	0	0	0	1	1	1
9: Fault	0	X	1	1	1	1



Change of operating mode is caused by either reacting to a direct command or control signal. A command is passed using the `controlword`.

The mode changes 0, 1 and 14 are automated and cannot be influenced with a command.

Mode changes using command are listed in the table here:

Übergang	Zustand von -> nach	Kommando	Reaktion	Bedingung
2	3 -> 4	Shutdown	keine Reaktion	Motor und Encoder sind angeschlossen, Zwischenkreisspannung aktiv, erste Inbetriebnahme erfolgt, Signal ENABLE_DISABLE ist TRUE
3	4 -> 5	Switch On	Endstufe einschalten	ENABLE Signal ist TRUE (I/O Betrieb) bzw. Feldbus liefert switch on Kommando
4	5 -> 6	Enable Operation	Vorgegebenen Fahrauftrag ausführen	ENABLE Signal ist TRUE (I/O Betrieb) bzw. Feldbus liefert operation enable Kommando
5	6 -> 5	Disable Operation	Fahrauftrag abbrechen	ENABLE Signal ist FALSE (I/O-Betrieb) bzw. Feldbus liefert switch off Kommando
6	5 -> 4	Shutdown	Endstufe ausschalten	ENABLE Signal ist FALSE (I/O-Betrieb) bzw. Feldbus liefert switch off Kommando
7	4 -> 3	Disable Voltage	Keine Reaktion	Zwischenkreisspannung ist nicht aktiv, Signal ENABLE_DISABLE ist FALSE oder schwerwiegender Fehler (Klasse 2 / 4)
8	6 -> 4	Shutdown	Endstufe sofort ausschalten, kein Quick Stop	
9	6 -> 3	Disable Voltage	Endstufe sofort ausschalten, kein Quick Stop	
10	5 -> 3	Disable Voltage	Endstufe sofort ausschalten, kein Quick Stop	
11	6 -> 7	Quick Stop	„Quick Stop"-Halt ausführen	nur bei Fehlerklasse 1
12	7 -> 3	Disable voltage	Endstufe sofort ausschalten, auch wenn Quick Stop noch aktiv	
15	9 -> 3	Fault Reset	Fehler quittieren, um Zustand „Fault" zu verlassen	nur bei Fehlerklasse 2: anzeigende Flanke des Eingangssignals FAULT_RESET (I/O-Betrieb) oder Feldbus liefert Kommando fault_reset
16	7 -> 6	Enable Operation	Aus dem Zustand „Quick Stop" eingestellten Fahrauftrag weiterführen	Anzeigende Flanke des Eingangssignals ENABLE_RESET (I/O-Betrieb) oder Feldbus liefert Kommando fault_reset

The operating modi are set in the `controlword`
Bits 0 to 3 and Bit 7 are used for a change of modus.

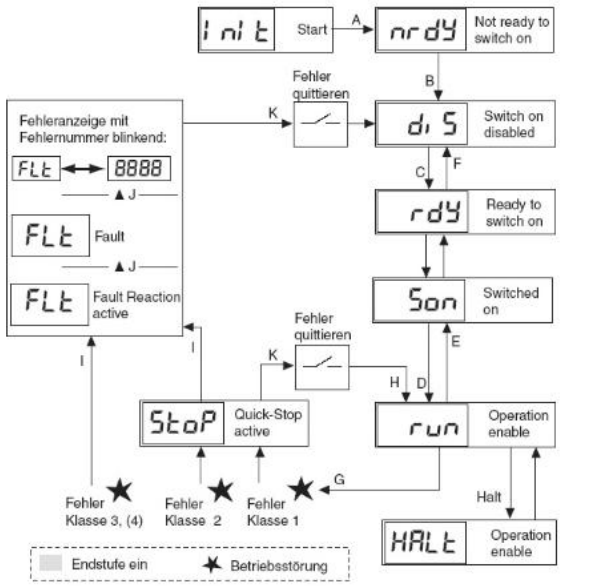
The bit value „X" indicates this field has no influence for the given mode change.

controlword Kommando	Übergänge	Zustandswechsel auf	Bit 7, Reset Fault	Bit 3, Enable operation	Bit 2, Quick Stop	Bit 1, Disable Voltage	Bit 0, Switch On
Shutdown	2, 6, 8	4: Ready to switch on	X	X	1	1	0
Switch on	3	5: Switched on	X	X	1	1	1
Disable Voltage	7, 9, 10, 12	3: Switch on disabled	X	X	X	0	X
Quick-Stop	7, 10 11	3: Switch on disabled 7: Quick Stop activ	X	X	0	1	X
Disable operation	5	5: Switched on	X	0	1	1	1
Enable operation	4,16	6: Operation enable	X	1	1	1	1
Fault reset	15	3: Switch on disabled	0->1	X	X	X	X

After switching on, the Lexium05 should automatically be in mode 4 (`rdy`)
i.e. "Ready to switch on"

This is indicated on the status display of the Lexium05.

Anzeige	Betriebszustand
InIt	Initialisierung der Geräteelektronik (INITialize)
nrdy	Endstufe ist nicht einschaltbereit (Not ReaDY to switch on)
dIS	Einschalten der Endstufe ist gesperrt (switch on DISabled)
rdy	Endstufe ist einschaltbereit, Motor steht still (ReaDY to switch on)
Son	Endstufe ist eingeschaltet (Switch ON)
run	Gerät arbeitet in der eingestellten Betriebsart (RUN)
StoP	Quick-Stop wird ausgeführt (STOP)
FLt	Fehler erkannt und Fehlerreaktion aktiviert (FauLT)
8888 blinkend	Anzeige der Fehlernummer abwechselnd mit FLt oder StOP

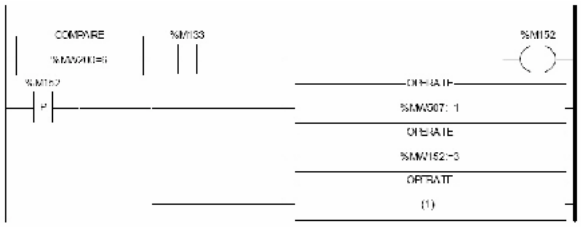
Betriebsübergang (Zustandwechsel)		Zustandsmaschine
A	Systemtest und -Initialisierung bei stehendem Motor	
B	Sensorik, Überwachung läuft, Parameterbearbeitung freigegeben	
C	Reaktion auf Überwachungssignale Prüfen von SAFE-DISABLE; Motorgeber OK Aufbau der DC-Bus Spannung	
D	Endstufe einschalten mit ENABLE	
E	Endstufe abschalten	
F	Motorgeber inaktiv/defekt, DC-Bus Unterspannung	
G	Fehlerklasse 1-Störung aufgetreten, z. B. durch HALT, LIMP oder LIMN	
H	Betrieb wieder aufnehmen nach Fehlerklasse 1-Störung	
I	Fehlerklasse 2: Quick-Stop, dann Endstufe aus Fehlerklasse 3/4: Endstufe aus	
J	Übergang nach Fehlerreaktion	
K	Fehler mit Aktivflanke an FAULT_RESET quittieren	
Halt	Anhalten des Motors bei akiver Endstufe. (Wird nach DS402 nicht als Betriebszustand gewertet.)	

To put the drive controller into operating mode 6 (run) “Operation enable” press the “Power Up” button on the Magelis touch screen. This activates the PLC Sections “Powerup_drive1” “Powerup_drive2” .

```
(*Drive 1  Adr.80 *)
IF %MW0:X1 AND %MW212=7 THEN (* Step7 *)
%MW100:X3:=TRUE;     (*Enable operation*)
%MW212:=8;           (*next step*)
END_IF;

IF %MW0:X0 AND %MW212=6 THEN (* Step6 *)
%MW100:X0:=TRUE;     (*Switch on*)
%MW212:=7;           (*next step*)
END_IF;

IF(%M108 OR %M130)AND %MW212=5 AND %MW213>=2 THEN (* Step5 *)
%MW100:X2:=TRUE;     (*Quick Stop*)
%MW212:=6;           (*next step*)
END_IF;

IF(%M108 OR %M130)AND %MW212=4 AND %MW213>=2 THEN (* Step4 *)
%MW100:X1:=TRUE;     (*Disable Voltage*)
%MW100:X8:=FALSE;    (*Halt*)
%MW212:=5;           (*next step*)
%MW213:=0;
END_IF;

IF(%M108 OR %M130)AND %MW212=3 AND %MW213>=2 THEN (* Step3 *)
%MW100:X7:=FALSE;    (*Reset fault*)
%MW212:=4;           (*next step*)
END_IF;

IF(%M108 OR %M130)AND %MW212=2 AND %MW213>=2 THEN (* Step2 *)
%MW100:X7:=TRUE;     (*Reset fault*)
%MW213:=0;           (*100ms counter*)
%MW212:=3;           (*next step*)
END_IF;

IF(%M108 OR %M130)AND %MW212=1 AND %MW213>=2 THEN (* Step1 *)
%MW100:X1:=FALSE;    (*Disable Voltage*)
%MW100:X2:=FALSE;    (*Quick Stop*)
%MW100:X8:=FALSE;    (*Halt*)
%MW212:=2;           (*next step*)
%MW213:=0;
END_IF;

IF(RE %M108 OR RE %M130)AND %MW216<>6 THEN (* Step0 *)
%MW100:X0:=FALSE;    (*Switch on*)
%MW100:X3:=FALSE;    (*Enable operation*)
%MW213:=0;
%MW212:=1;           (*next step*)
END_IF;
```

In this Application the **speed mode** is used (see PDO 3).
As the Lexium05 is in the wrong operating modus on re-start, the speed mode must be activated.
To do this the Lexium05 need modus 6 (Operation enabled).

Next, using the function WRITE_VAR a “03” (=speed mode) is written in the operations modi Register 6060:0_{hex} of the Lexium. CANopen uses the datatype SDO for this.



List of rung references:

(1):WRITE_VAR(ADR#0.1.SYS,'SDO',16#00006060,80,%MW152:1,%MW504:4)

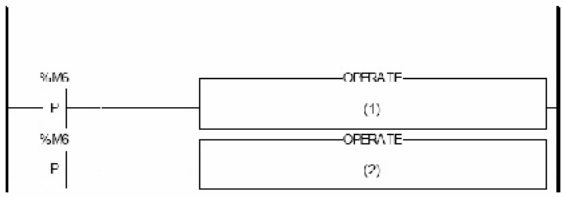
Function parameters.

```
WRITE_VAR(ADR#0.1.SYS,'SDO',16#00006060,80,%MW152:1,%MW504:4)
                                  Assignment of standard objects
   Parameters:                          Variables:          Values:
Address                            :                    : ADR#0.1.SYS
Type of Object                     :                    : 'SDO'
Object index (pf) and sub-index (PF) :                  : 16#00006060
Slave adress                       :                    : 80
Data to Write                      : %MW152:1
Report                             : %MW504:4
```

The CANopen Address of the Lexium05 is written in the Slave Address. For the first Lexium this is 80, for the second 81.
The “03” (=speed mode) is written in %MW152 and the amount of data to be transferred (here, 1) is written in %MW507 (%MW504+3) .

The same is also done for the second Lexium using the defined addresses for it.

The error registers 603F:0_{hex} in the Lexiums are cyclically read using the function Funktion READ_VAR.



List of rung references:

(1):READ_VAR(ADR#0.1.SYS,'SDO',16#0000603F,00,%MW154:2,%MW500:4)

(2):READ_VAR(ADR#0.1.SYS,'SDO',16#0000603F,81,%MW155:2,%MW512:4)

Function parameters:

READ_VAR(ADR#0.1.SYS,'SDO',16#0000603F,80,%MW154:2,%MW508:4)

Read standard objects

Parameters:	Variables:	Values:
Address	:	: ADR#0.1.SYS
Type of Object	:	: 'SDO'
Object index (pf) and sub-index (PF)	:	: 16#0000603F
Slave adress	:	: 80
Reception Zone	: %MW154:2	
Report	: %MW508:4	

READ_VAR(ADR#0.1.SYS,'SDO',16#0000603F,81,%MW155:2,%MW512:4)

Read standard objects

Parameters:	Variables:	Values:
Address	:	: ADR#0.1.SYS
Type of Object	:	: 'SDO'
Object index (pf) and sub-index (PF)	:	: 16#0000603F
Slave adress	:	: 81
Reception Zone	: %MW155:2	
Report	: %MW512:4	

If the mode “AUTO” is selected on the Magelis touch screen, the PLC starts a speed ramp, passing the nominal value to the Lexium. The motor turns.

```
IF RE %M116 OR FE %M116 THEN
%MW210:=0;
%MD105:=0;
END_IF;
(* 100ms counter *)
IF RE %M5 AND %M106 THEN
%MW210:=%MW210+1;
END_IF;

(* velocity ramp *)
IF %M116 AND RE %M5 THEN
IF %MW210<=600 THEN
%MD105:=%MD105+1;(* Acceleration up to 600rpm in 1 min *)
ELSIF %MW210>=700 AND %MW210<1900 THEN
%MD105:=%MD105-1;(* 10s at 600rpm, then negativ acceleration to -600rpm in 2 min *)
ELSIF %MW210>=2000 AND %MW210<2600 THEN (* braking until drive stops *)
%MD105:=%MD105+1;
ELSIF %MW210>2700 THEN
%MW210:=0;(* 10s stop *)
END_IF;
END_IF;
```

Alternatively you can start the drive in manual mode.
Here, any inputs on the Magelis are passed directly on to the Lexium.

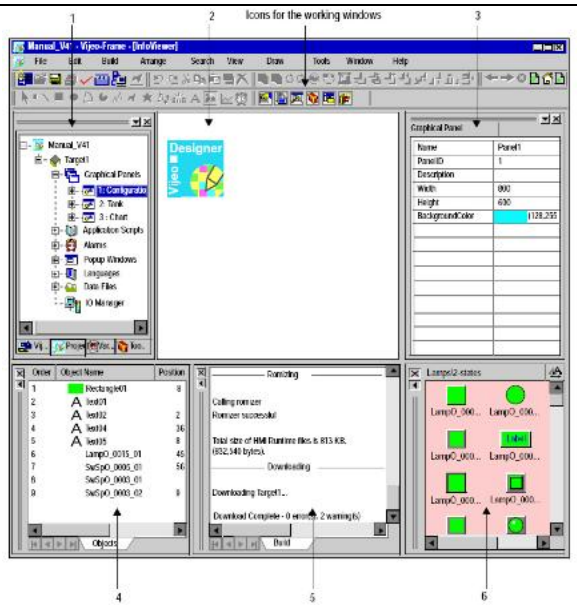
HMI

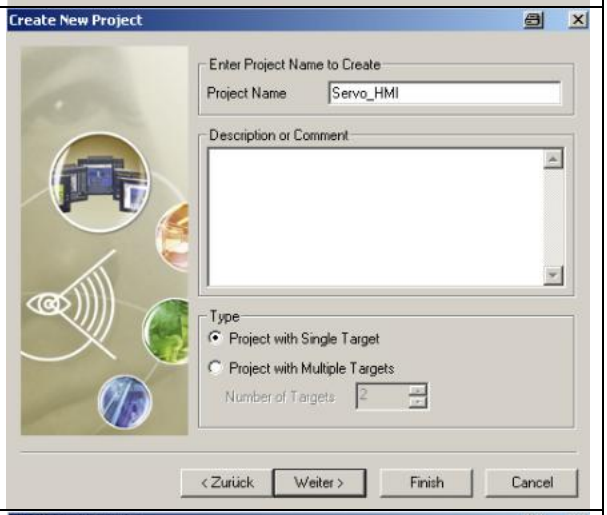
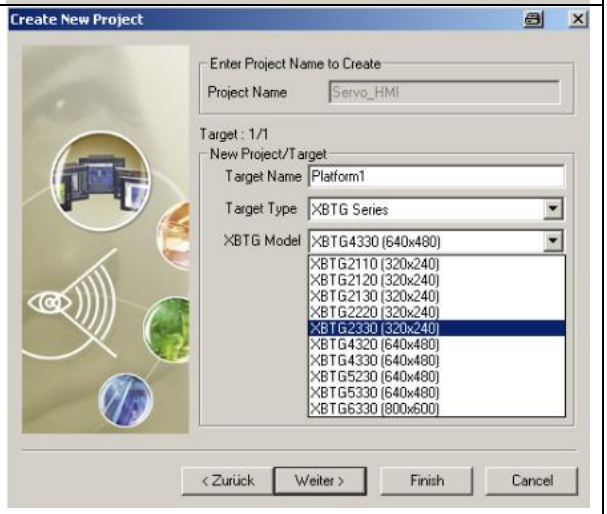
Einführung

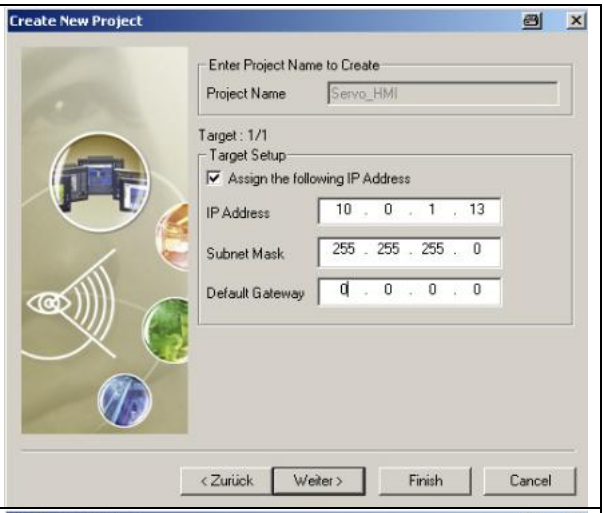
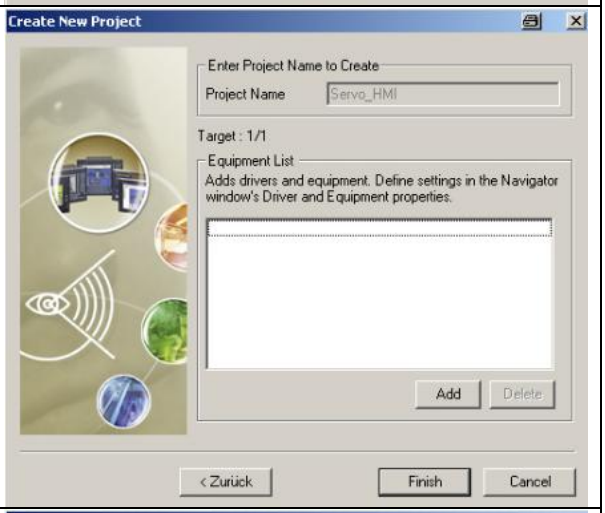
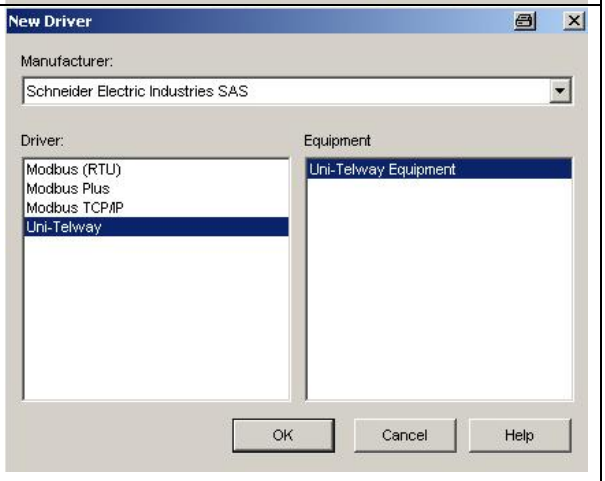
This section describes the steps needed to create the Magelis images. For this we use Vijeo Designer.

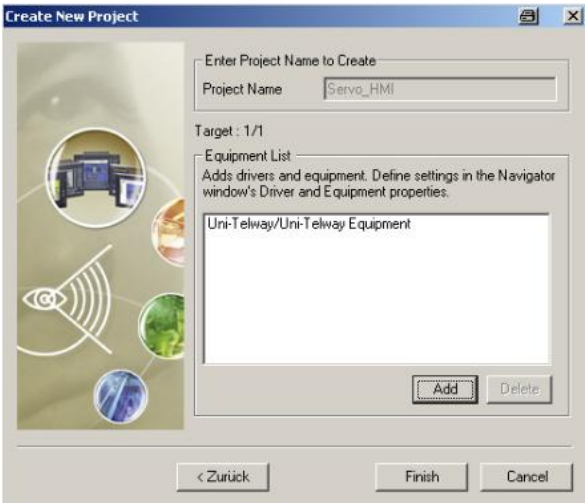
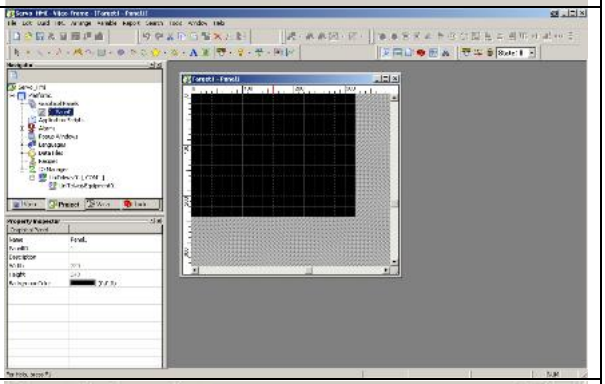
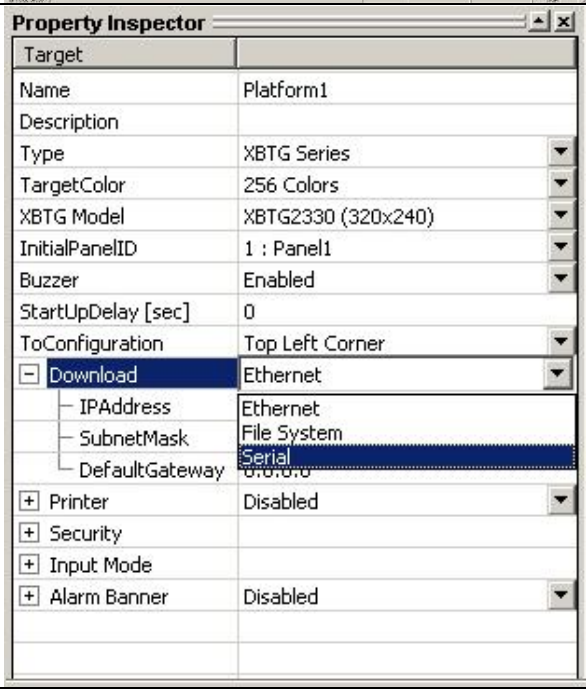
The Setup of the HMI is done as follows:

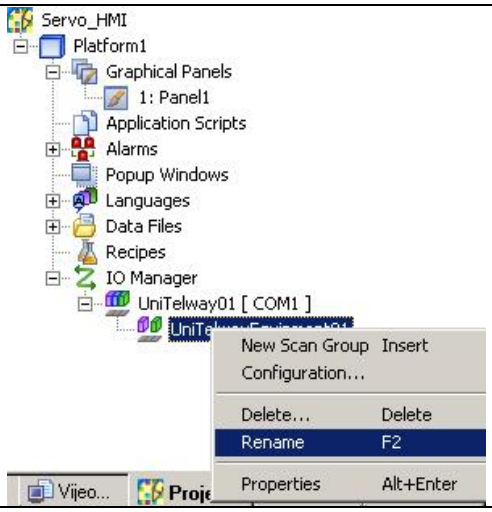
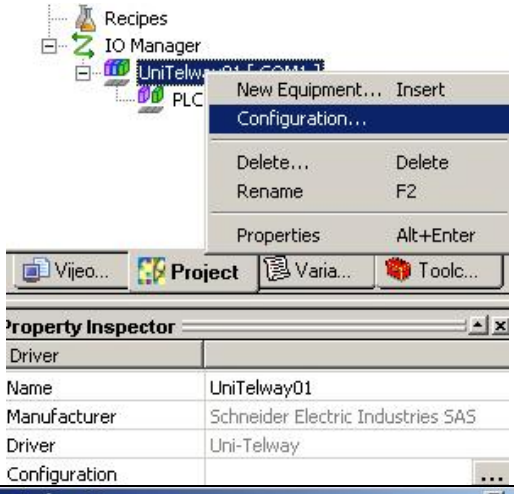
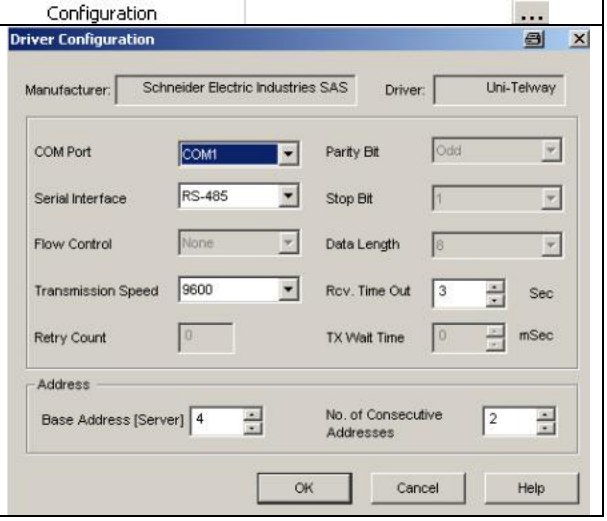
- Create a new project
- Give the project a name
- Specify the hardware
- Select new driver
- New screen
- Setup download
- Configure the Modbus connection
- Configure driver / Configure device
- Create new variables
- Create new screen
- Example of a numerical display
- Characteristics dialog
- Animation setup
- Check projekt
- Download Projekt

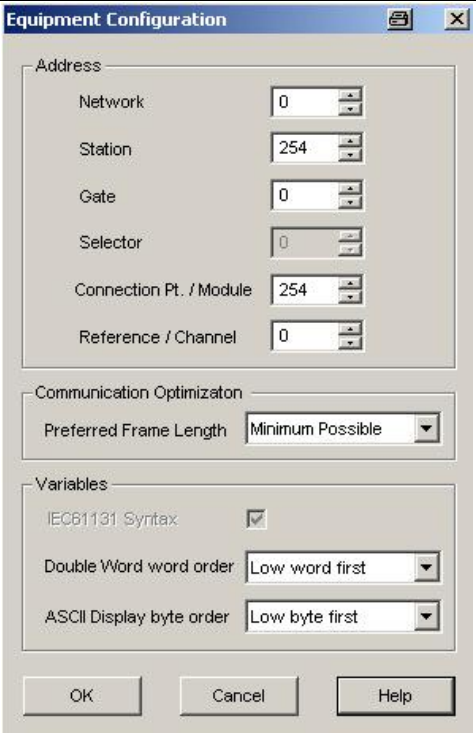
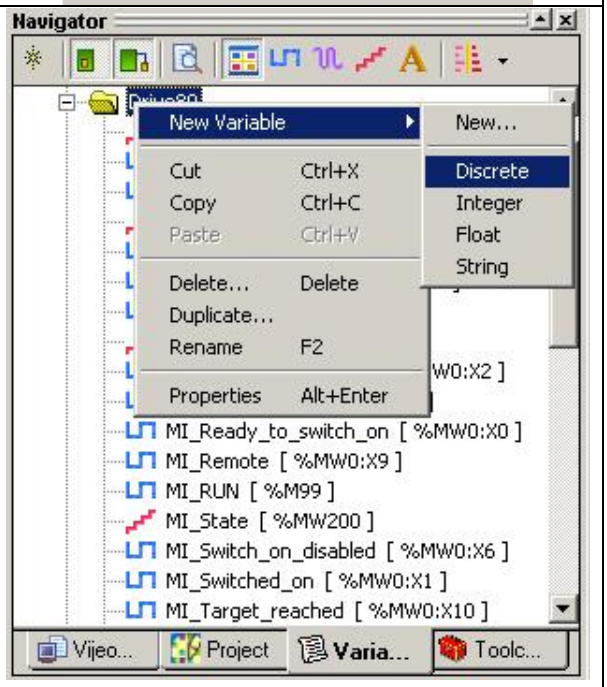
The Vijeo Designer has the following components: 1 – Navigator 2 - Info-Display 3 – Inspector 4 – Data list 5 – Feedback Zone 6 – Toolbox	

After Starting Vijeo Designer, select **Create New Project**	
Input a **Project Name** e.g. Servo_HMI	
Select the target device Targetname: “Platform1” Targettype: “XBT –G Series XBTG Model: “XBT-G2330”	

Input the ethernet addresses for the target device.	
Use **Add** to select a new driver	
Manufacturer: "Schneider Electric Industries SAS" **Driver**: "Uni-Telway" **Equipment**: " Uni-Telway Equipment"	

The new driver has now been added	
Neu Project Window	
Select the Download setup For the connection between the PC and Magelis. As an alternative, you could select the ethernet connection.	

Rename the communications device to **PLC**	
Configure the Uni-Telway driver I/O Manager – UniTelway01 – „Configuration..”	
Drive Configuration	

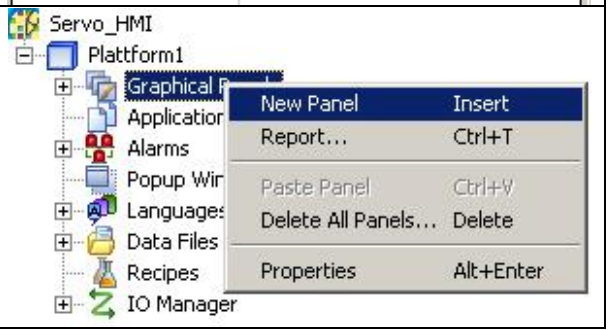
Equipment Configuration of the communications device	
Create a **New Variable**	

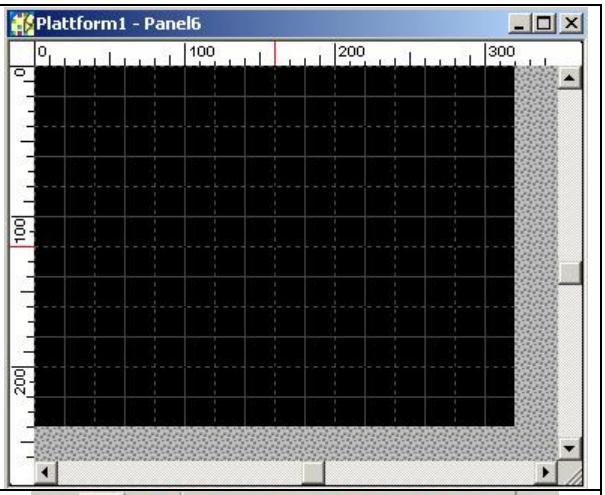
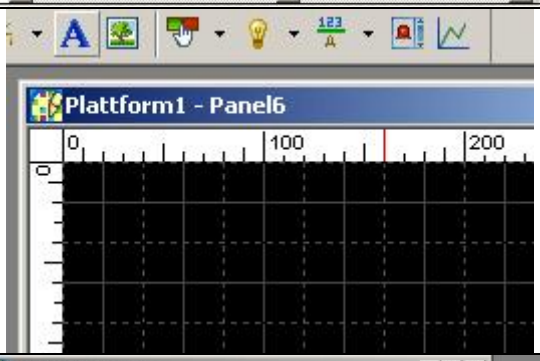
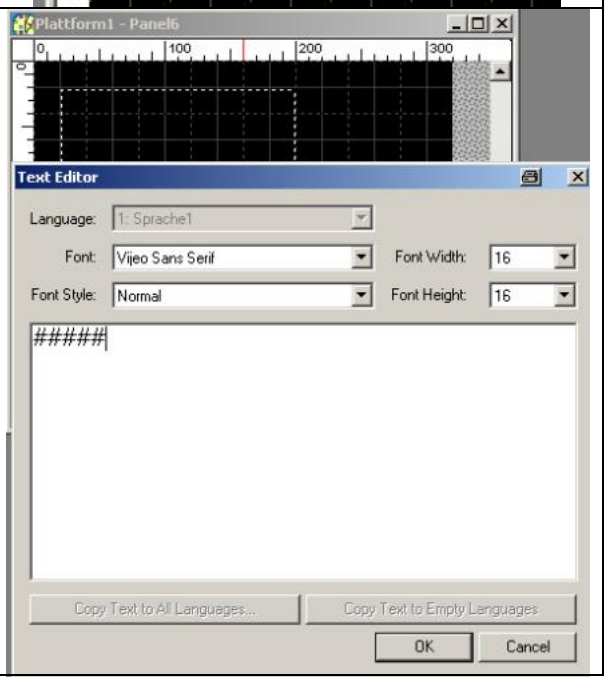
Setup the

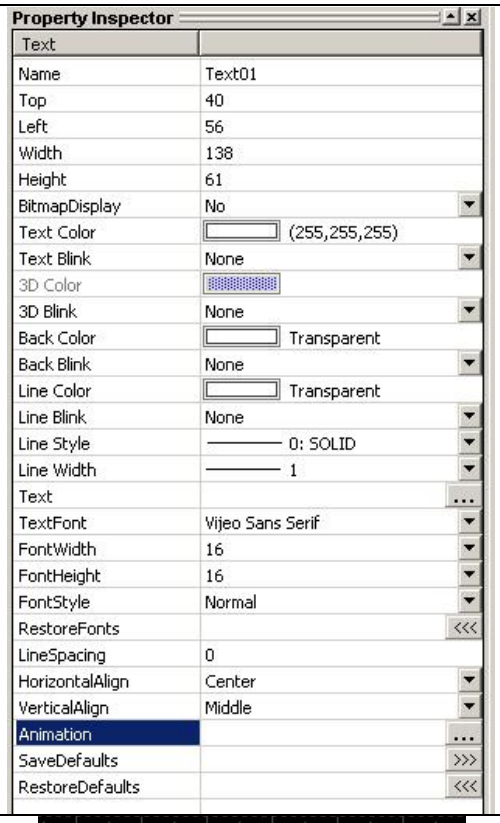
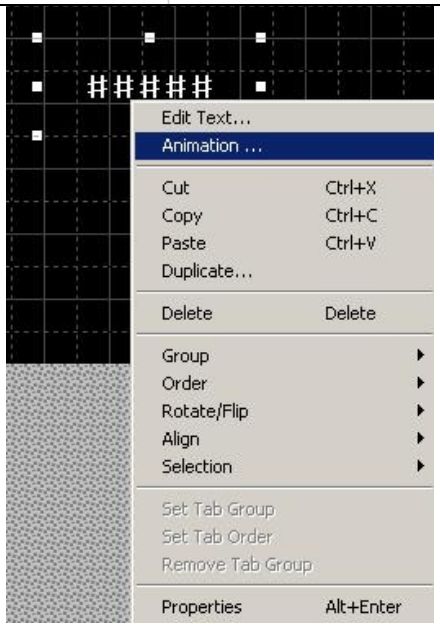
Variable Properties:

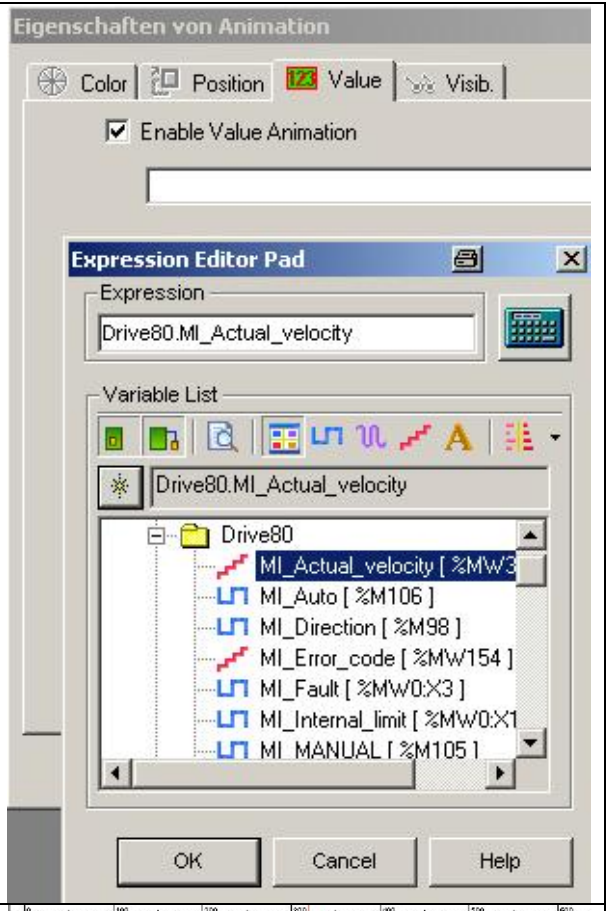
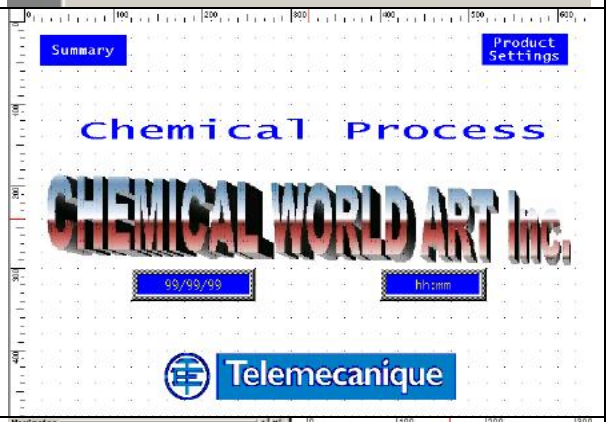
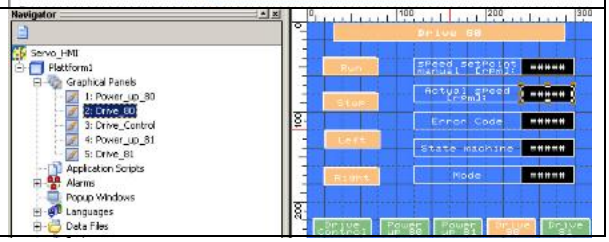
- Variable Name
- DataType
- Data Source – External – PLC
- Device Address in the PLC

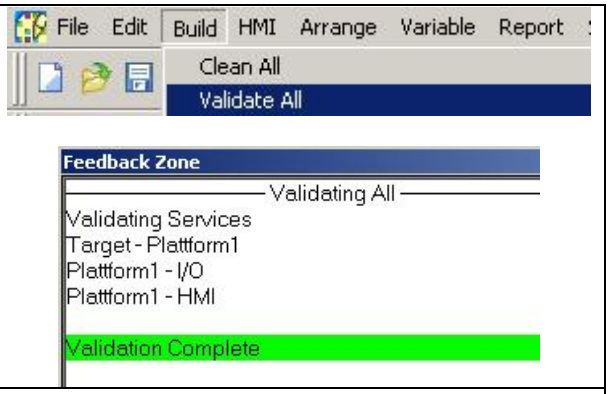
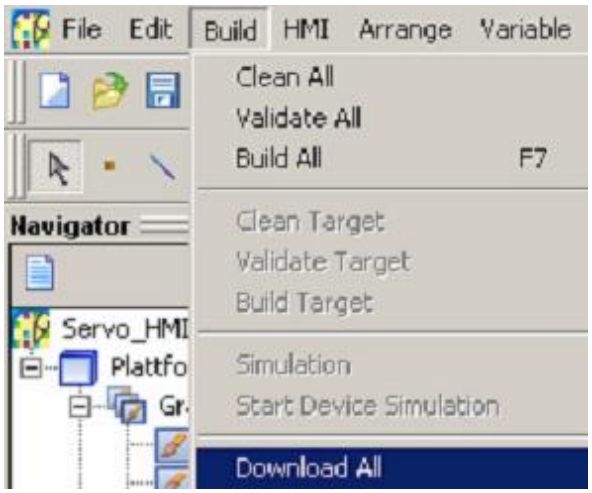
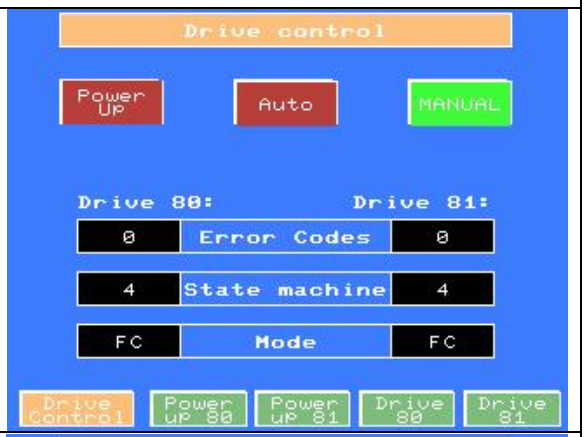
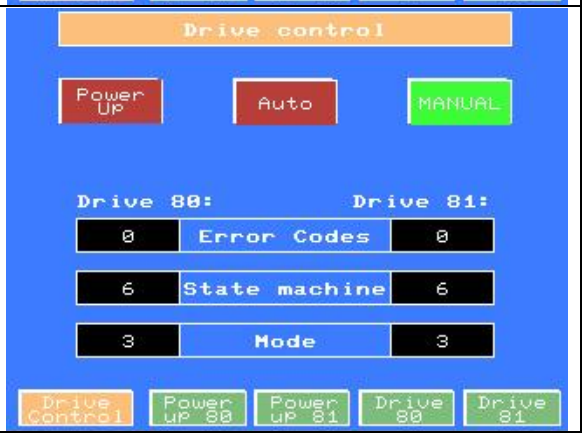
Create a **New Panel**

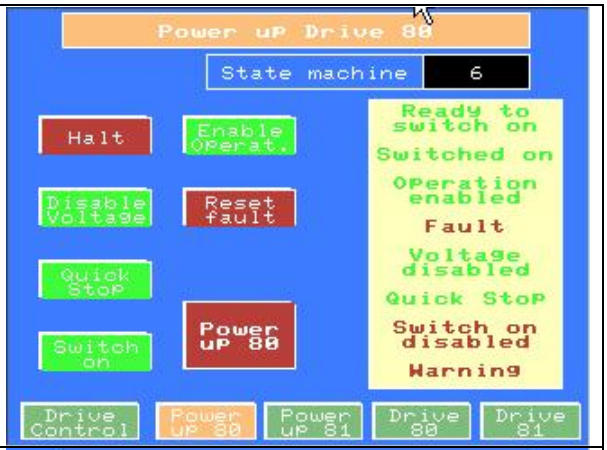


Empty panel	
Example: Insert Text Select the tool in the tool bar The toolbar with the different tool icons is above the panel.	
Example: altering text Define the font size, font type, font style…. and type in the text.	

Property Inspector : Text attributes such as postion, size, colour can be changed here.	
Click on the text element in the panel window. Now with a right mouse click and select the menu **Animation..** , you can animate the object. You can do this in the property inspector too.	

Animation Attributes: • Colour • Position • Value • Visible After activating the animation, you can select how the animation is to be displayed.	
Some examples of texts, text fields and graphics.	
The final screen with all the attributes for the animation and events.	

With **Validate All** you can analyse your project. The **feedback zone** gives you the results of the analysis. You can obtain the project analysis using **Build All** too.	
Downloading the project to the Magelis (HMI) Select the project in the **Navigator**. Using either a right mouse click on the project name or the menu **Build** , Select **Download All** to transfer the project to HMI. The transfer is done using the selected method (serial or ethernet). The Vijeo Designer package comes with a serial cable	
The screen **Drive control** is the start screen. Use the buttons to display other screeens. In the case of a power cut and restart the Lexium05 is indicated in status „4“ (ready to switch on) and operating mode „FC“ (Mode = -4).	
For the power up to work, the **Power Up** button must be pressed for at least 2 seconds. The status changes to "6" (Operation enable) and the operating mode to Speed (Mode = 3). Selecting "Auto" invokes a speed program.	

The screen **Power up Drive 80 (or 81**) displays the state machine. Here you can set the bits of the control word and check the bits in the status word.	
On the screen **Drive 80 (or 81)**, provided the button **manual** was pressed, you can manually control the drive using run and stop and regulate the direction and revolutions per minute.	

Devices

Introduction	The Devices section describes the different steps needed to initialise and parameterise the device logic/behaviour to attain the specified system functionality.
General	Not available

Addendum

Detailed Component List

Type / Software		Revision/Version
ABL7RE2403 VCF02GE XALK174G	POWER SUPPLY 240VAC 1PH 24VDC 3A EMERGENCY ON/OFF MAINS SWITCH HOUSING BEST.M.PILZ SWITCH RT,1S 2Ö	
TSX3722101 TSXDMZ64DTK TSXDEZ32D2 TSXDSZ32T2 TSXPCX1031 TSXCPP110	MODICON TSX MICRO:TSX37-22, DIGITAL I/O-MODULE 32In/32Out DIG.INPUT MODULE,32In(24V)SCHR DIG. OUTPUT MODULE 32Out COMMUNICATION CABLE MULTIFUNCTIONAL CANopen PC-Card Type III	
• STBPDT3100 • STBNCO2212 • STBXCA4002 • STBXBA3000 • STBXBA2200 • STBDRC3210 • STBACI1230 • STBDDI3610 • STBXMP1100 • STBACO1210 • STBXTS2100 • STBXBA1000 • STBXBA2000 • STBXTS1100 • STBXTS1110 • STBXTS1120 • STBXTS1130	Power Supply. 24VDC PDM STD. BUS connector CANOPEN NIM STD. Configuration Cable RS232 SUBD/HE13 2M SOCKETI/O TYP3 27MM SOCKET PDM 18MM MODULE 2A RELAIS C 24VDC / 2A MODULE E2KAN. 12BIT ISOLATED 0...20MA MODULE 6E 24VDC SINK 2 WIRE 0.1MS FIX. S BUS TERMINAL MODULE ISLAND BUS MODULE 2CHAN. 12BIT 0...20MA PLUG I/O 6 CONNECT. FEDERZUGKL. (20ST) SOCKET I/O TYPE1 13.5MM SOCKET I/O TYPE2 18MM PLUG I/O 6CONNECT. SCREW. (20ST) PLUG I/O 5CONNECT. SCREW. (20ST) PLUG NIM 2CONNECT. SCREW. (10ST) PLUG PDM 2 CONNECT. SCREW. (10 ST)	
XBTG2330 XBTZG915 XBTZG999	Colour TFT LCD 256 Colours 5,7 Inch Programming Cable Cable adapter	
LXM05AD10M2 GEA2M0AAAA003 GEA2EAAAAA003	Lexium05 230V/1F 750W Motor cable – 3m Geber cable – 3m	
TLXCDPL7PP44M STBSPU1000 VJDSPULFUCDV10M SYCSPULFUCD28M ???	Software PL7 Pro V4.4 M Software ADVANTYS Incl. Cable RS232 Software Vijeo Designer Field bus Configurator SyCon V2.8 PowerSuite	V4.4 V1.2 V4.1 V2.8 V2.0

Component Features

Components

PLC Micro TSX3722101

I/O :	max. 256 digital I/Os max. 32 analog I/Os
Program Memory :	up to 128 KBytes
Data Memoryr :	up to 35 KBytes
Networks :	CANopen (via PCMCIA)
Expert modules :	Counters, Emergency off (not used)
Programming :	PL7-Micro (4 Languages IEC1131-3)

Motor Control Lexium05 LXM05AD10M2

Performance output	from 0,75 kW (Model Size 1)
Voltage	230 V ~, 1-phasig
Fieldbus Interface	CANopen
Signal Interface	2 analog +/- 10 V Inputs and 8 digital I/Os
RS 422-Interface	for Pulse-/Direction – or A/B-Signal inputs or Encoder simulation

Servo motor SER3683L5S

Performance	0,6 kW
RPM	12000 min^{-1}
Nominal torque	0,48 Nm
Torsion max.	3,0 Nm
Voltage max.	230 V ~

Phaseo Power Supply Unit ABL7RE2403

Input Voltage	100…240 V ~, single phase, 50/60 Hz
Ouput Voltage	24 V =
Output power	3,0 A

Components Contd.

Magelis full graphics Touch Panel XBTG2330

Display type	LCD-TFT 256 Colours
Display Dimensions	5,7" (320x240)
Protocol	Unitelway , Modbus, Modbus TCP/IP
Connections	RS232C/RS485 , Ethernet 10BaseT
Voltage	24 V = external

PL7 MICRO Programming software TLXCDPL7PP44M

Programming with Instruction List, Contact Plan and Structured Text
Access to all application elements using the navigator
Simplified hard- and software-configuration using special editors
Two types of application: Mono-task or Multi-task
Structuring of the Master- and Fast-task in sections
Selection of a different programming language in each section
Simple testing using automatically assembled animation tables

Vijeo Designer VJDSPULFUCDV10M

The user friendly configurations software, Vijeo Designer, allows for simple and fast development of projekts using configuration windows. Vijeo Designer allows the processing of process data using the touch panel XBT G and Java-Script.

Some of the features:
- Navigator,
- Library of animated graphical objects,
- Online-Help,
- Error Report Display,
- Object Attributes Display,
- Variablelists.

Contact

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