

“Application of SCADA to control and
supervision of simple technical
processes“

S: supervisory

C: control

A: and

D: data

A: acquisition

Contents

- 1) Introduction to SCADA
- 2) SCADA-Software „FIX 7“
- 3) Sample Plant
- 4) Realisation
- 5) Discussion and Summary

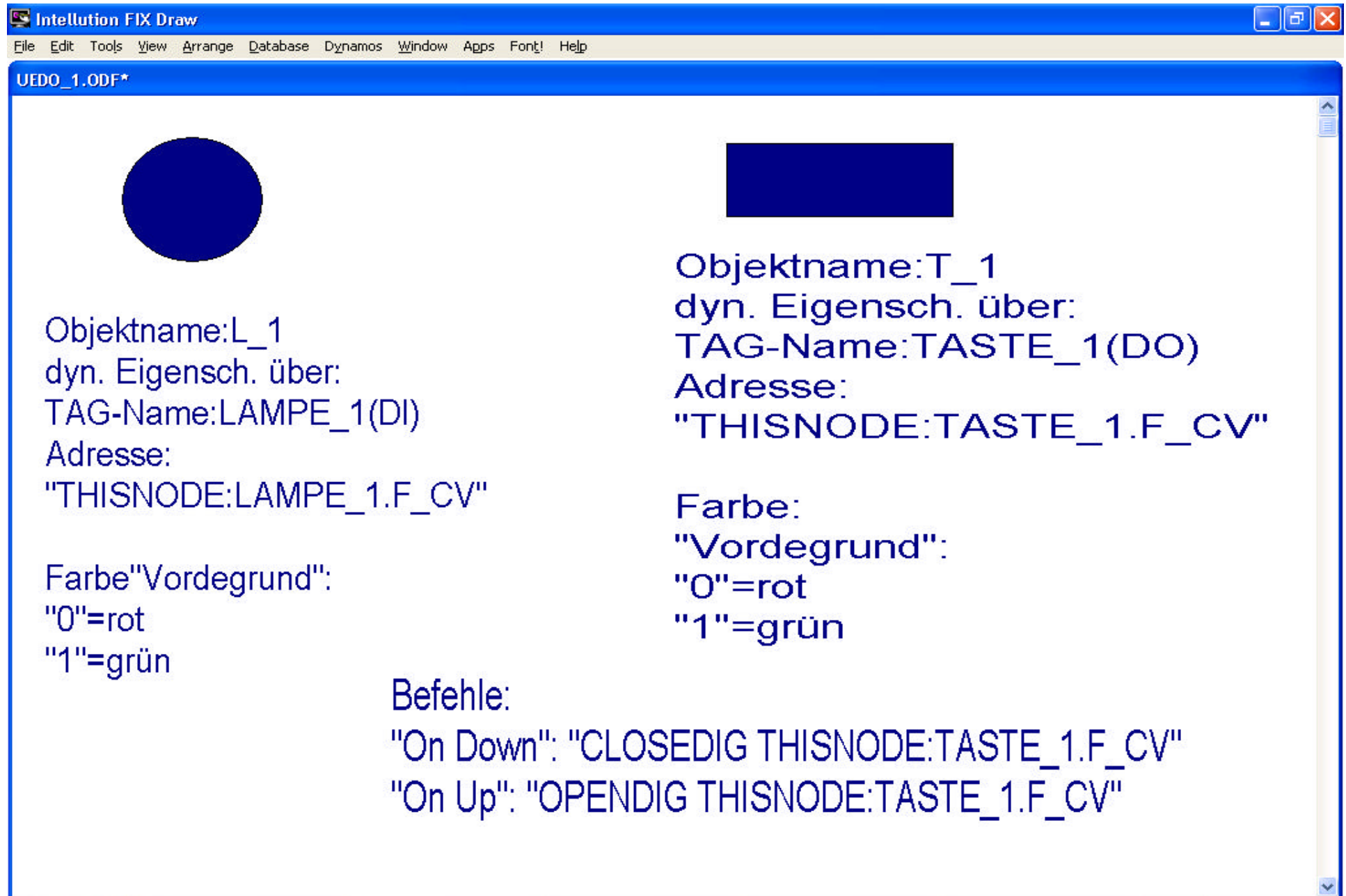
1) Introduction to SCADA

- Process Control
- Data Acquisition
- SCADA Software
- Interfaces
- OPC-Technology

2) SCADA-Software „FIX 7“

- Structure of FIX 7
- Examples

FIX 7: Draw



The screenshot shows the Intellution FIX Draw application window. The title bar reads "Intellution FIX Draw" and the menu bar includes "File", "Edit", "Tools", "View", "Arrange", "Database", "Dynamos", "Window", "Apps", "Font!", and "Help". The main window title is "UEDO_1.ODF*".

On the left side of the canvas, there is a red circle. Below it, the following properties are listed:

- Objektname:L_1
- dyn. Eigensch. über:
- TAG-Name:LAMPE_1(DI)
- Adresse:
"THISNODE:LAMPE_1.F_CV"
- Farbe"Vordegrund":
"0"=rot
"1"=grün

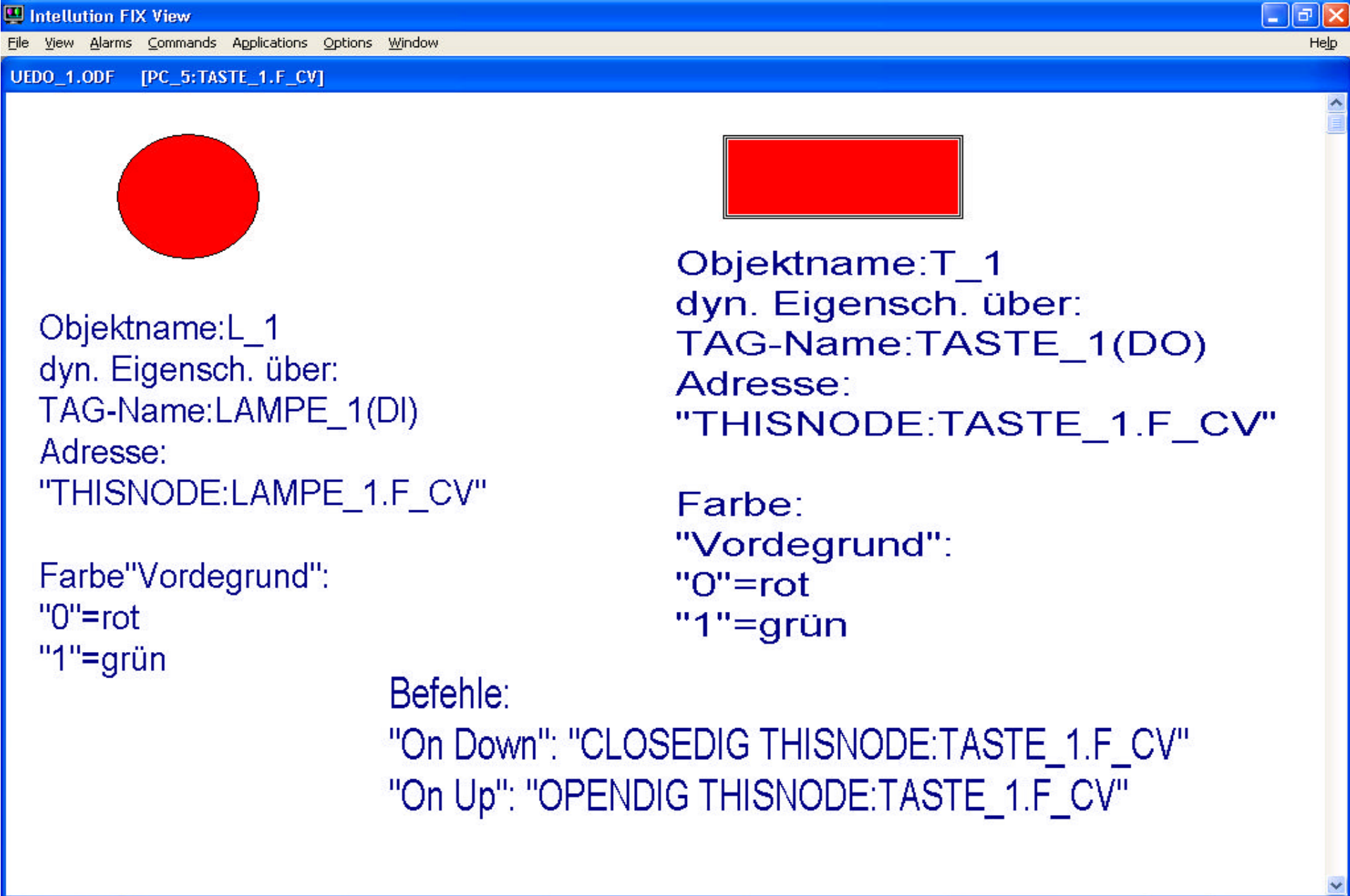
On the right side of the canvas, there is a green rectangle. Below it, the following properties are listed:

- Objektname:T_1
- dyn. Eigensch. über:
- TAG-Name:TASTE_1(DO)
- Adresse:
"THISNODE:TASTE_1.F_CV"
- Farbe:
"Vordegrund":
"0"=rot
"1"=grün

At the bottom of the right-side list, the following commands are listed:

- Befehle:
- "On Down": "CLOSEDIG THISNODE:TASTE_1.F_CV"
- "On Up": "OPENDIG THISNODE:TASTE_1.F_CV"

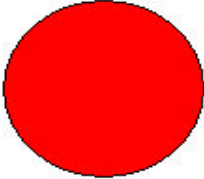
FIX 7: View



Intellution FIX View


File View Alarms Commands Applications Options Window Help

UEDO_1.ODF [PC_5:TASTE_1.F_CV]



Objektname:L_1
dyn. Eigensch. über:
TAG-Name:LAMPE_1(DI)
Adresse:
"THISNODE:LAMPE_1.F_CV"

Farbe"Vordegrund":
"0"=rot
"1"=grün



Objektname:T_1
dyn. Eigensch. über:
TAG-Name:TASTE_1(DO)
Adresse:
"THISNODE:TASTE_1.F_CV"

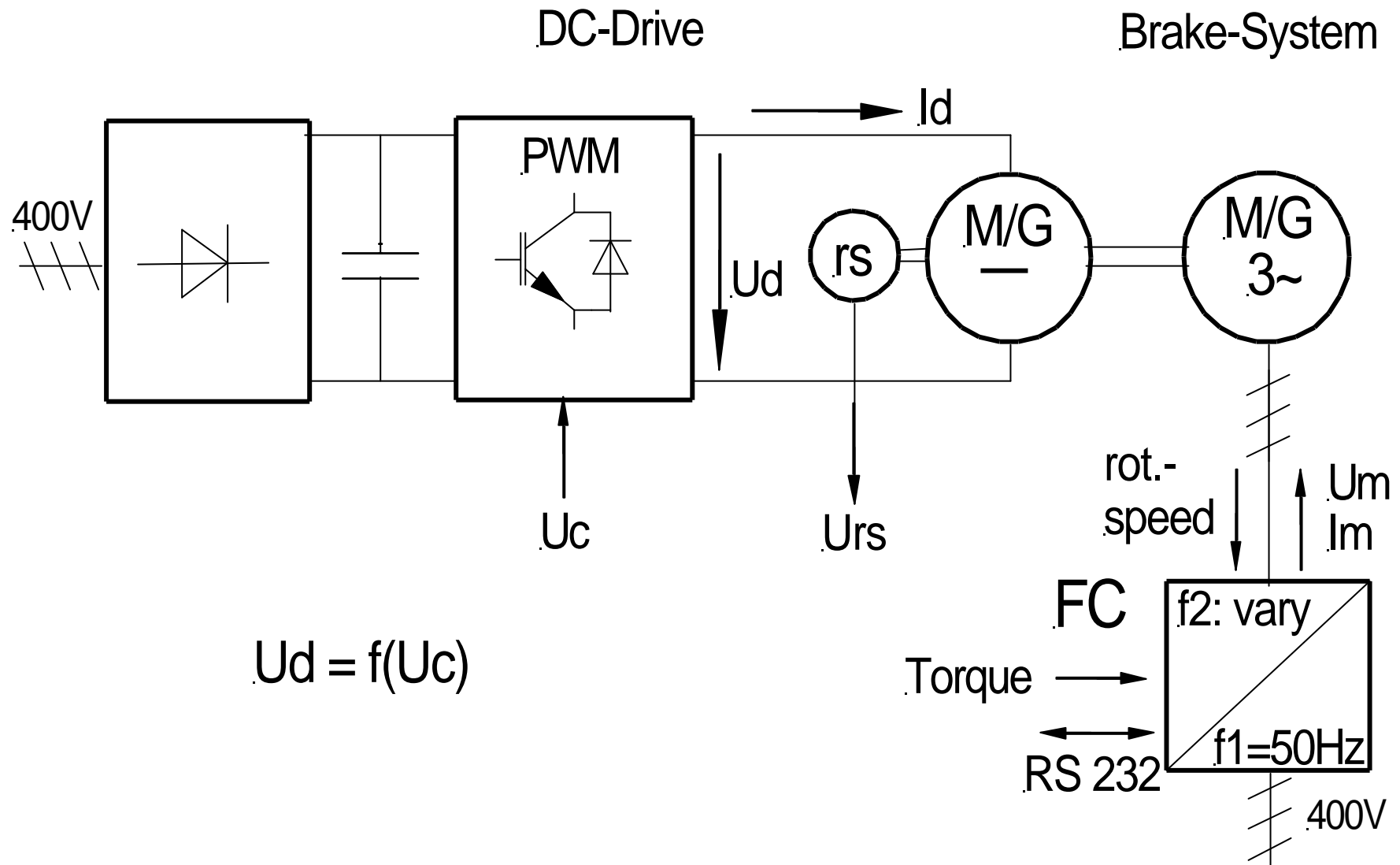
Farbe:
"Vordegrund":
"0"=rot
"1"=grün

Befehle:
"On Down": "CLOSEDIG THISNODE:TASTE_1.F_CV"
"On Up": "OPENDIG THISNODE:TASTE_1.F_CV"

3) Sample Plant

- DC-Drive
- Brake-System
- Data Acquisition
- Requirements on SCADA

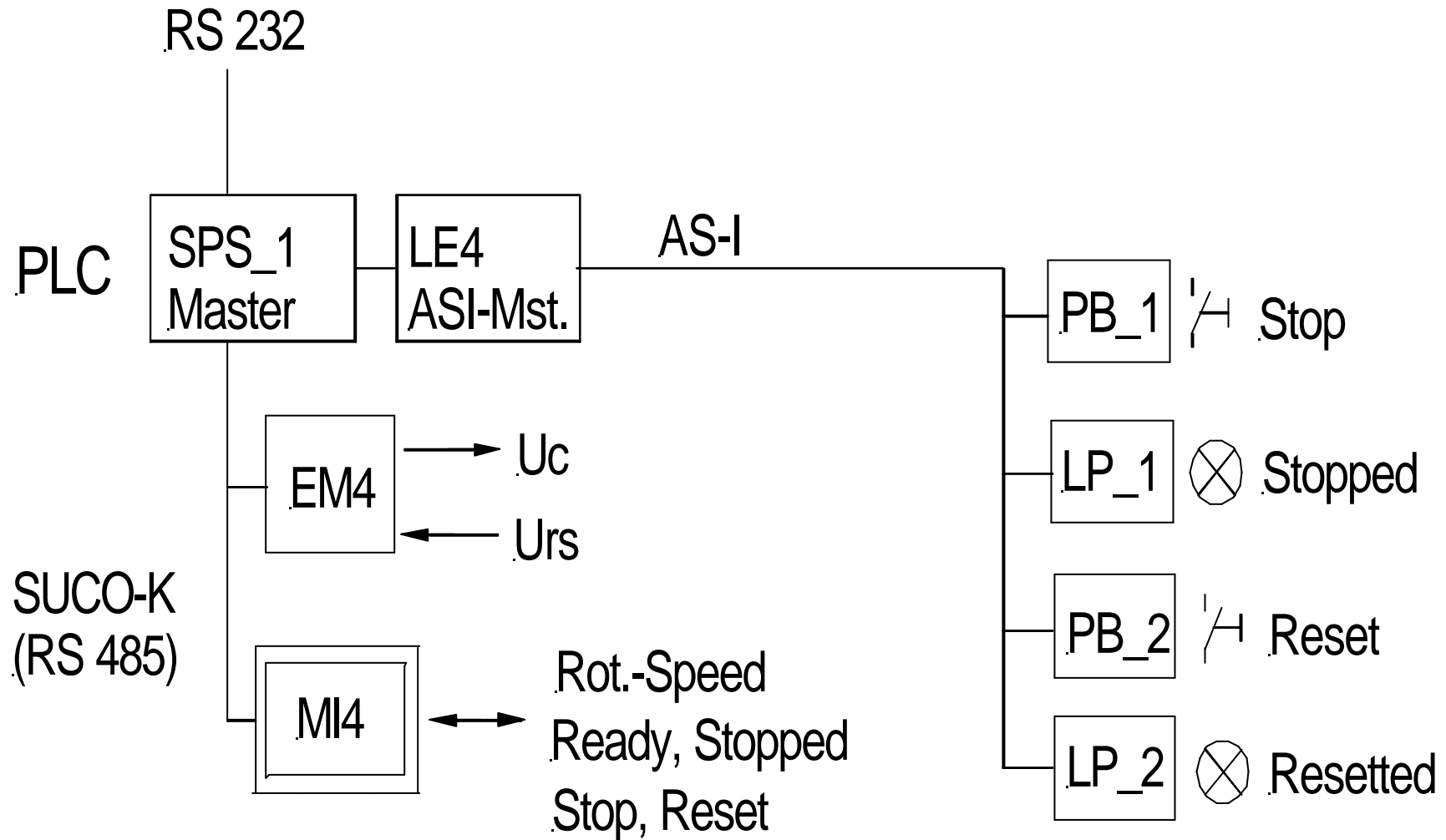
Overview of the technical Process



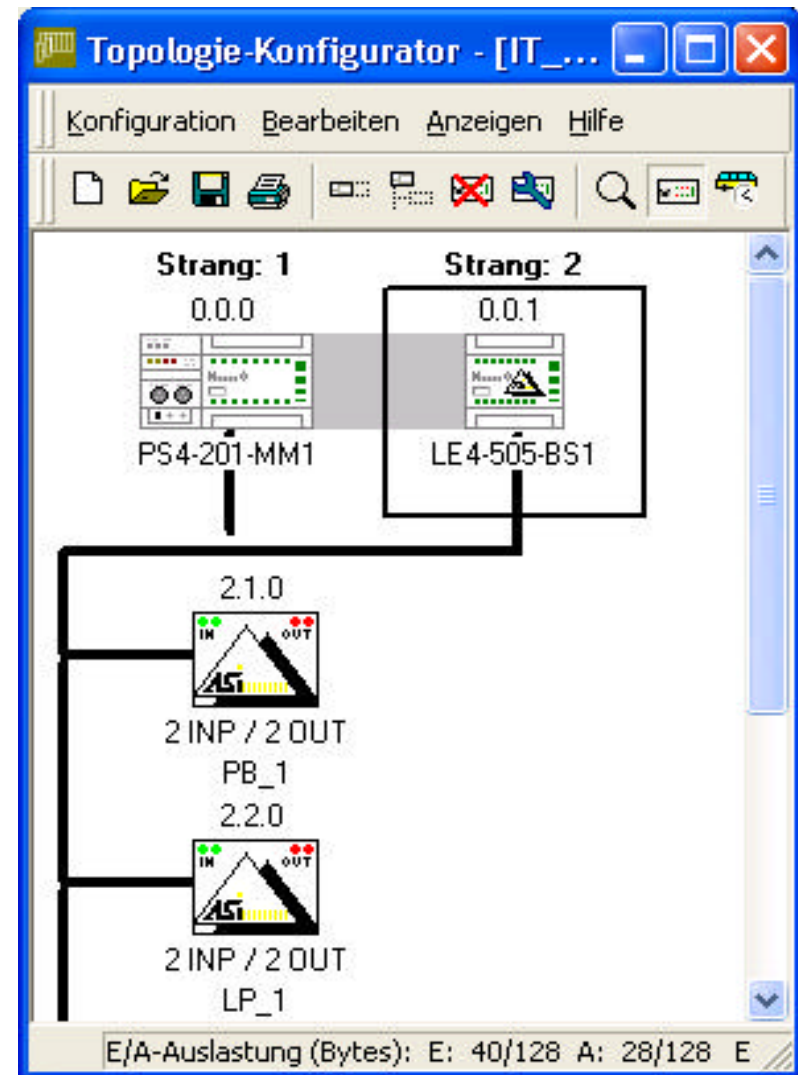
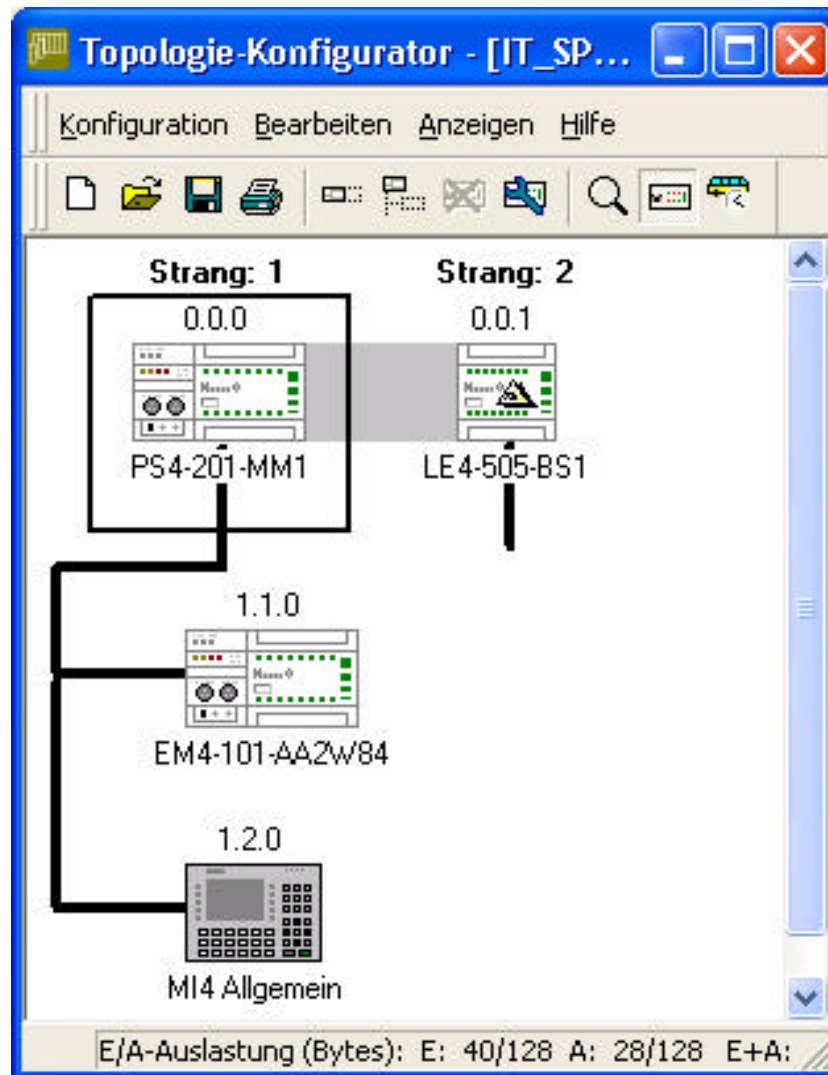
4) Realisation

- PLC-System
- OPC-Server
- OPC-Client
- FIX 7

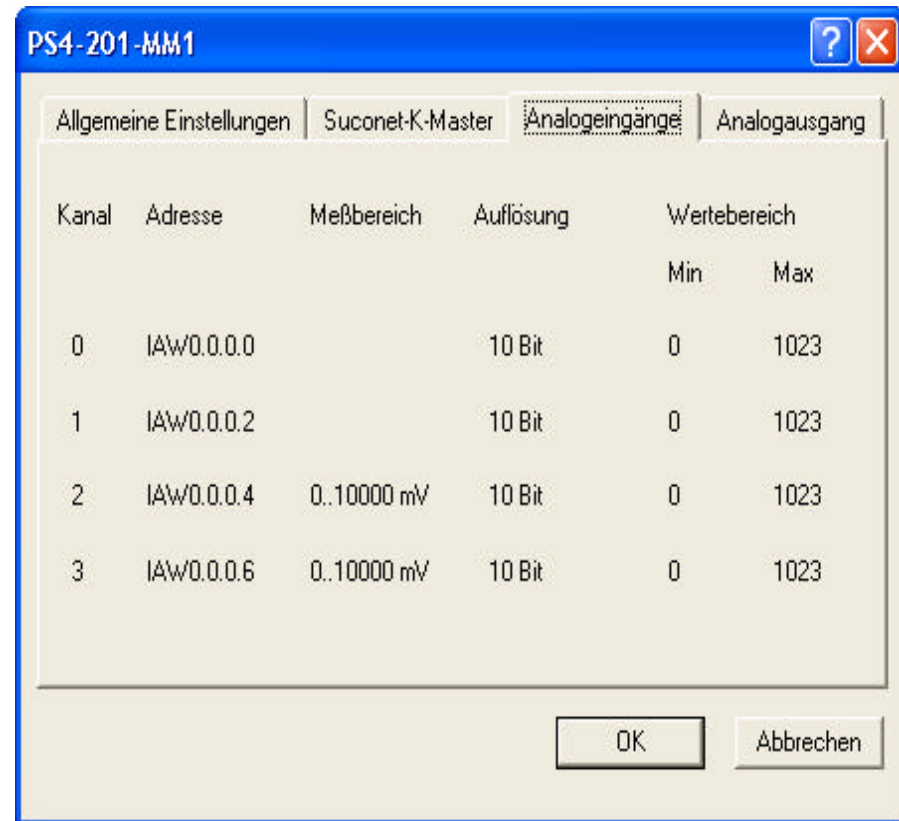
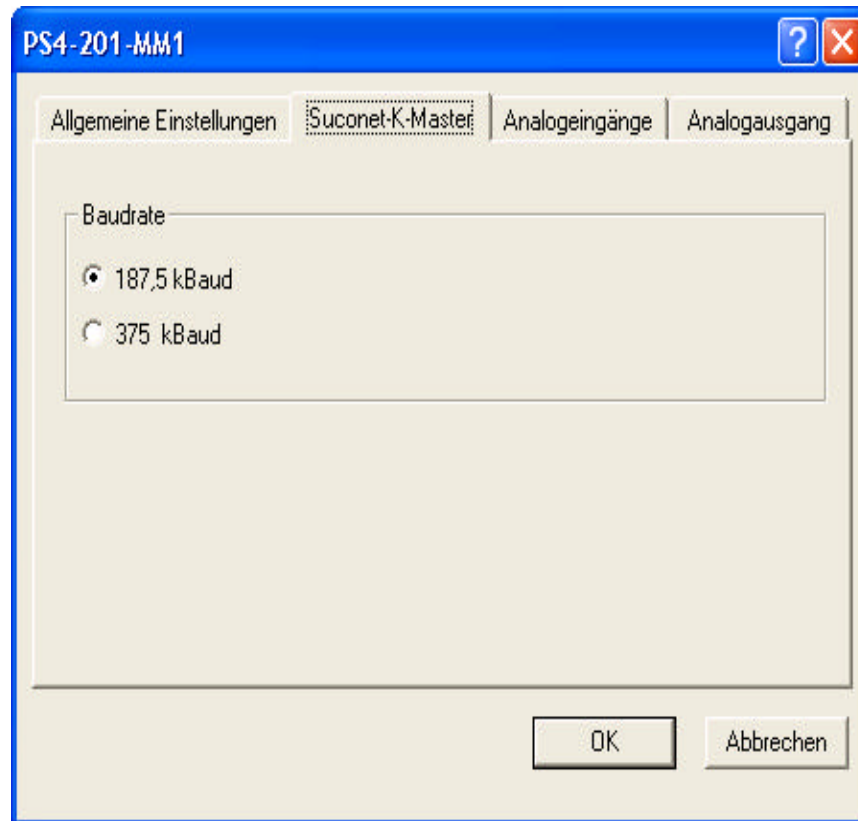
Structure of the PLC-System



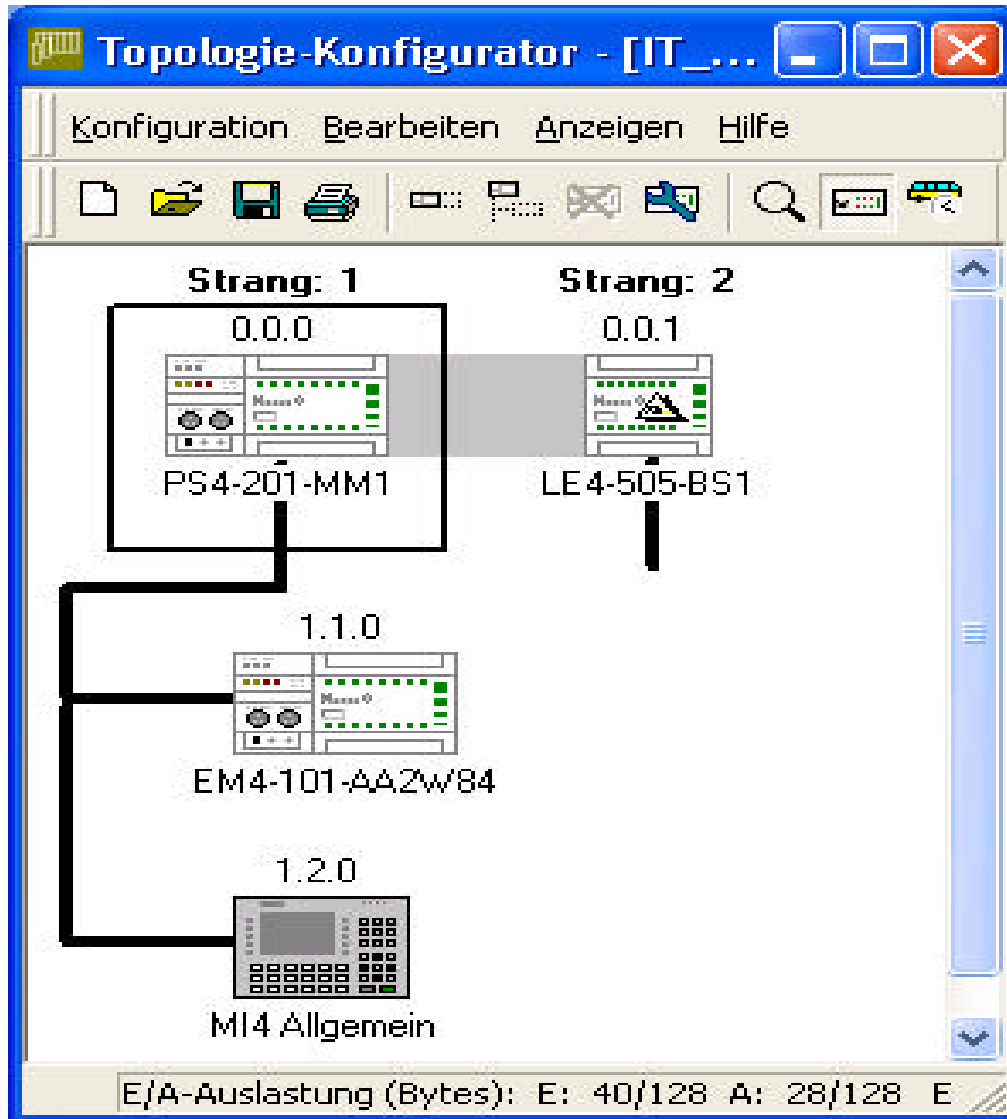
PLC-CONFIGURATION (total)



PLC-MASTER-CONFIGURATION



MI4-CONFIGURATION



MI4 Allgemein

Teilnehmernummer: 2

Suconet-K-Adresse: 3

Empfangsdaten (max. 78 Bytes): 20

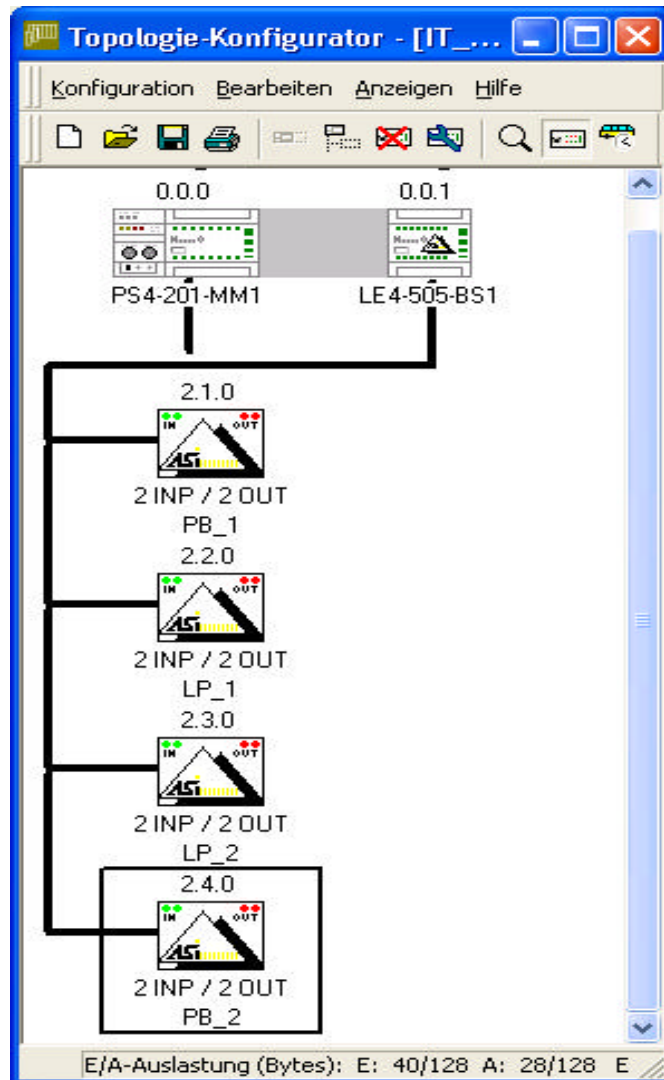
Sendedaten (max. 78 Bytes): 20

Summe Daten (max. 156 Bytes): 40

CRC

OK Abbrechen

ASI-SLAVE CONFIGURATION (Line 2)



2 INP / 2 OUT

Teilnehmernummer: 1

Benennung: PB_1

Spezifische Angaben

Hersteller:

IO-Code: 3 ID-Code: A

Eingänge: 0 1 2 3
X X

Ausgänge: X X

Anlaufparameter:

Übernehmen Beenden

PLC: PROGRAM-EDITOR

The screenshot displays the POE-Editor software interface for editing a PLC program. The window title is "POE-Editor - IT_W_MI4.poe - Programm". The menu bar includes "Datei", "Bearbeiten", "Ansicht", "Einfügen", "Online", "Extras", "Fenster", and "Hilfe". The toolbar contains various icons for file operations, editing, and execution. Below the toolbar is a keyboard shortcut bar with labels like "LD", "LDN", "ST", "STN", "S", "R", "CAL", "CAL C", "CAL CN", "F", "JMP", "JMP C", "JMP CN", "RET", "RET C", "RET CN".

The main editing area is titled "IT_W_MI4.poe - Programm" and is split into two panes. The left pane shows the variable declaration section:

```
VAR
  (*PLC*)
  S_0 AT %IO.0.0.0.0 : BOOL ; (*Control ready*)
  S_1 AT %IO.0.0.0.1 : BOOL ; (*PLC_STOP*)
  S_2 AT %IO.0.0.0.2 : BOOL ; (*PLC_RESET*)
  S_3 AT %IO.0.0.0.3 : BOOL ; (*PLC Set-Value*)

  Q_0 AT %QO.0.0.0.0 : BOOL ; (*Control ready*)
  Q_1 AT %QO.0.0.0.1 : BOOL ; (*Stop_PLC*)
  Q_2 AT %QO.0.0.0.2 : BOOL ; (*Stop from FIX*)
  Q_3 AT %QO.0.0.0.3 : BOOL ; (*PLC Set-Val.*)
  Q_4 AT %QO.0.0.0.4 : BOOL ; (*ready for rem.*)
  Q_5 AT %QO.0.0.0.5 : BOOL ; (*remote Set-Val*)

  ANA_OUT AT %QAWO.0.0.0 : UINT; (*Display PLC*)
```

The right pane shows the main program logic:

```
(*Set Control_Voltage*)
LD S_0 (*Control ready*)
ST M_00
ST Q_0 (*SHOW_READY*)
ST PLC_READY

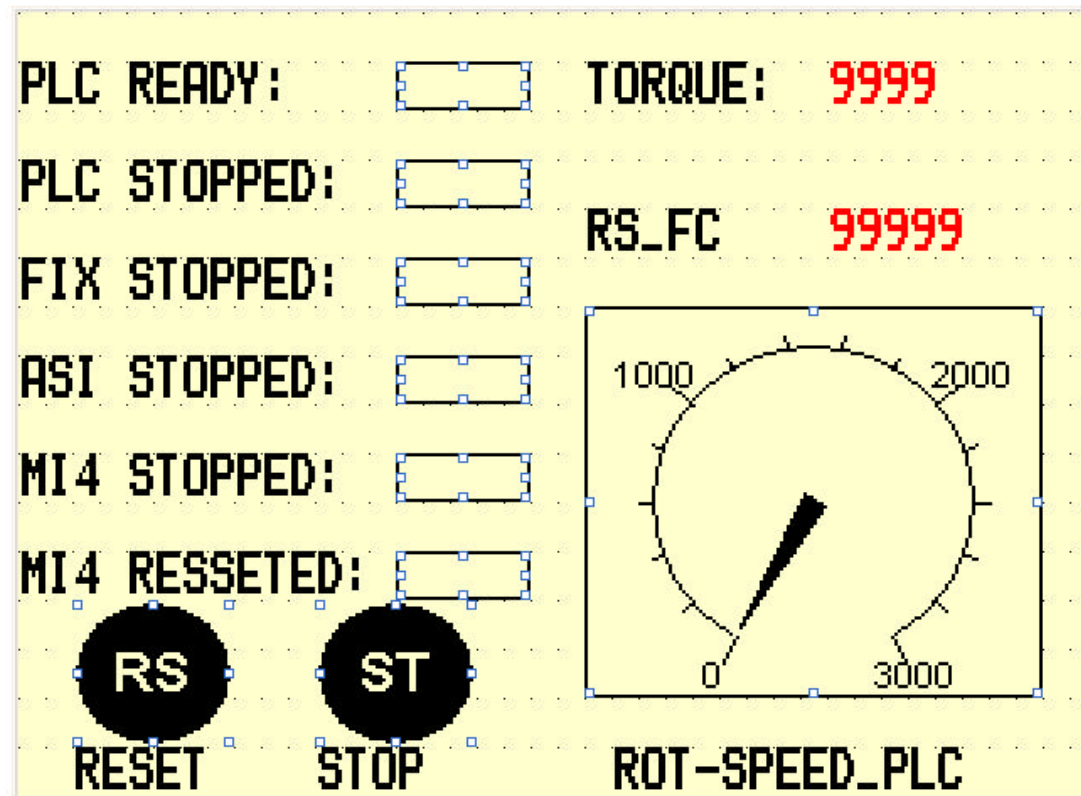
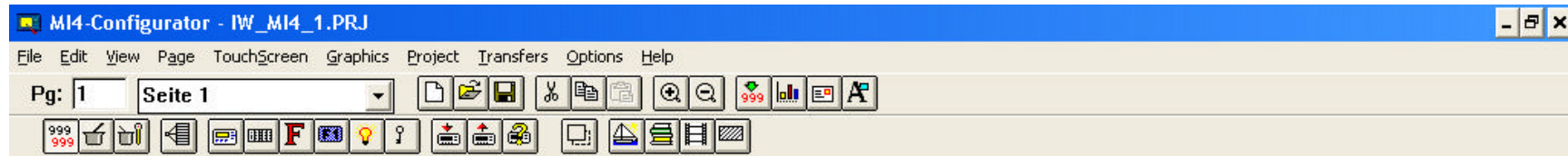
LD M_00 (*READY*)
JMPC P_1 (*Control ready*)

LD M_00
ST M_07 (*ready for remote Contr.*)
ST Q_4

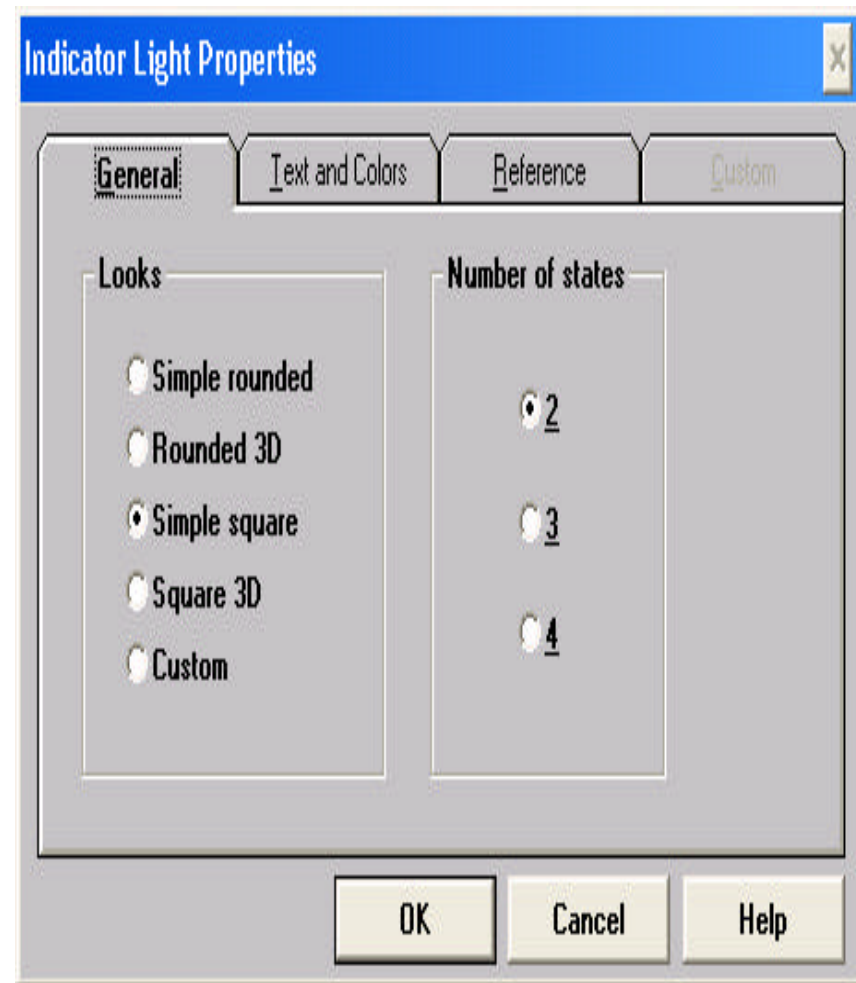
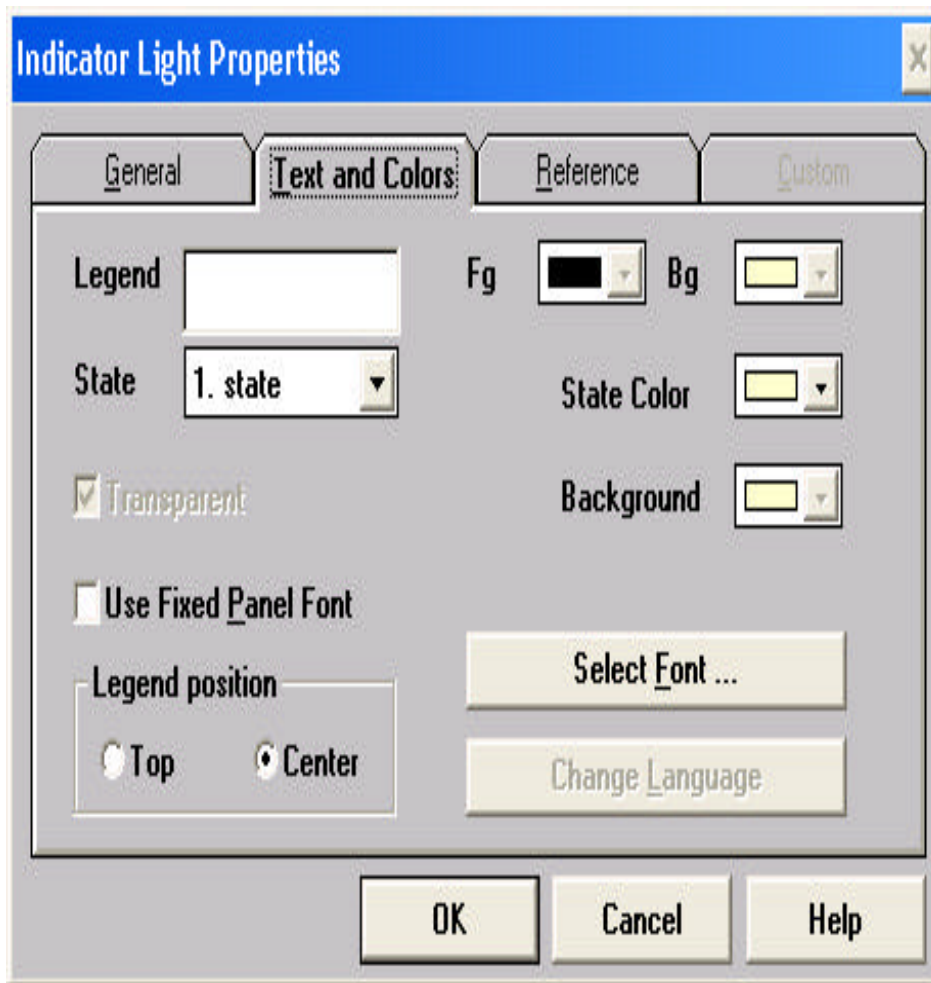
LD 2046 (*For Stop:UCPLC=5,0V; UC=
ST UCPLC
JMP P_10 (*Program-End*)
```

At the bottom, there is a status bar with a "Fehlerprotokoll" (Error Log) section containing "Suchen/Ersetzen", "Nicht deklarierte Variablen", and "Querverweisliste". The status bar also shows "Bereit", "P54_200", "AWL", and page numbers "1" and "1".

MI4-Configurator



Properties of the Indicator Lights



Address of the Indicator Light

SUCONET K Define Field ver. 3.12

PLC Reference

Data Type	Offset
Internal Relay	23

Data Format	Bit Index	PLC Address
BIT	1	M23.1

Low Priority High Priority

OK
Cancel
Delete
Help

Properties of the Gauge

Gauge Properties

General Layout Colors

Title

Minimum

Maximum

Decimal point

Reference

PLC ...

Scaling

Y = / X +

Scale

Number of labels

Number of major ticks

Number of minor ticks

Start

End

Gauge Properties

General **Layout** Colors

Title x position %

Title y position %

Labels position %

Ticks length %

Ticks position

Gauge

Start angle °

Angle range °

Diameter %

Center x position %

Center y position %

Needle

Type

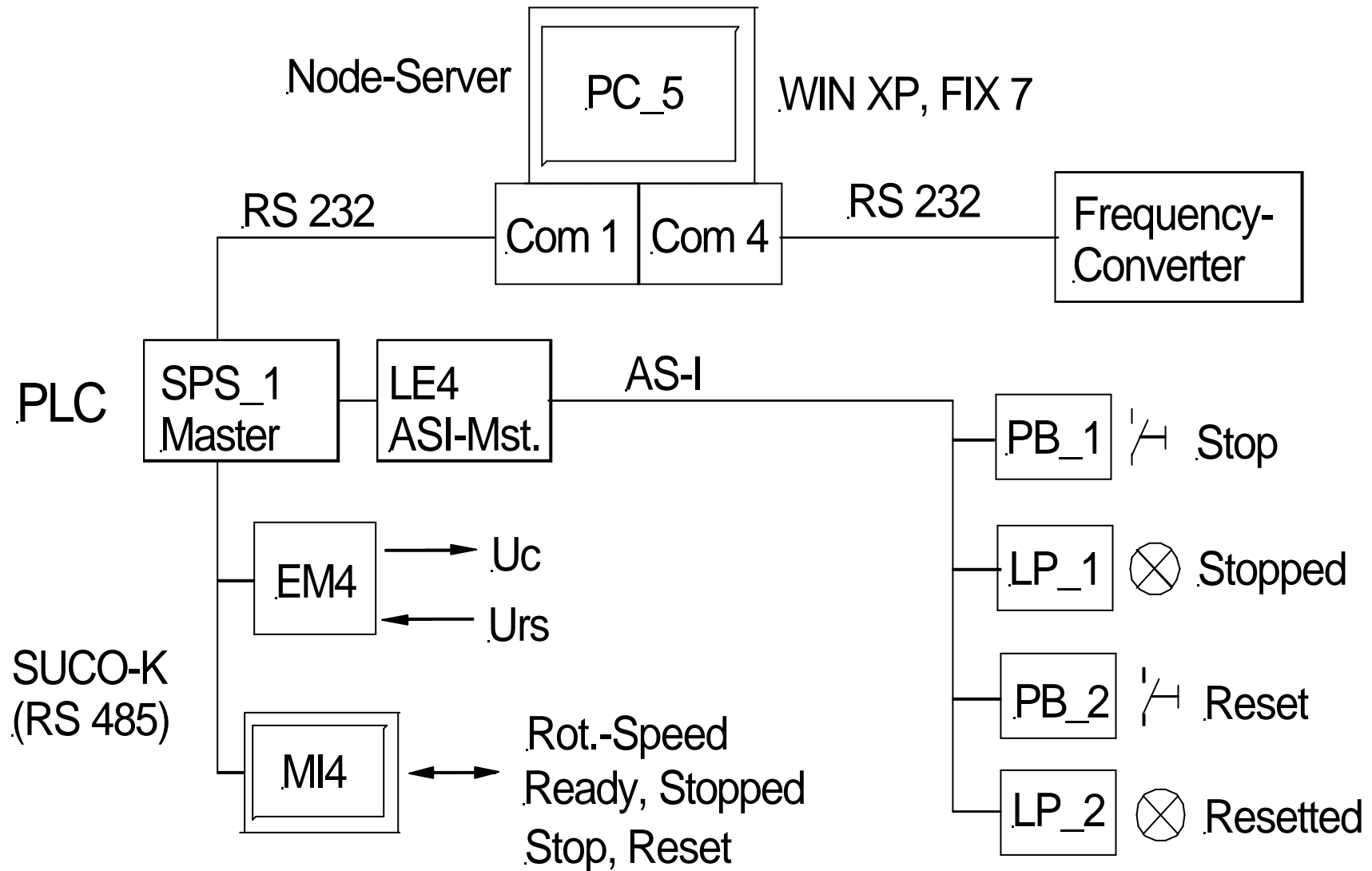
Front length %

Tail length %

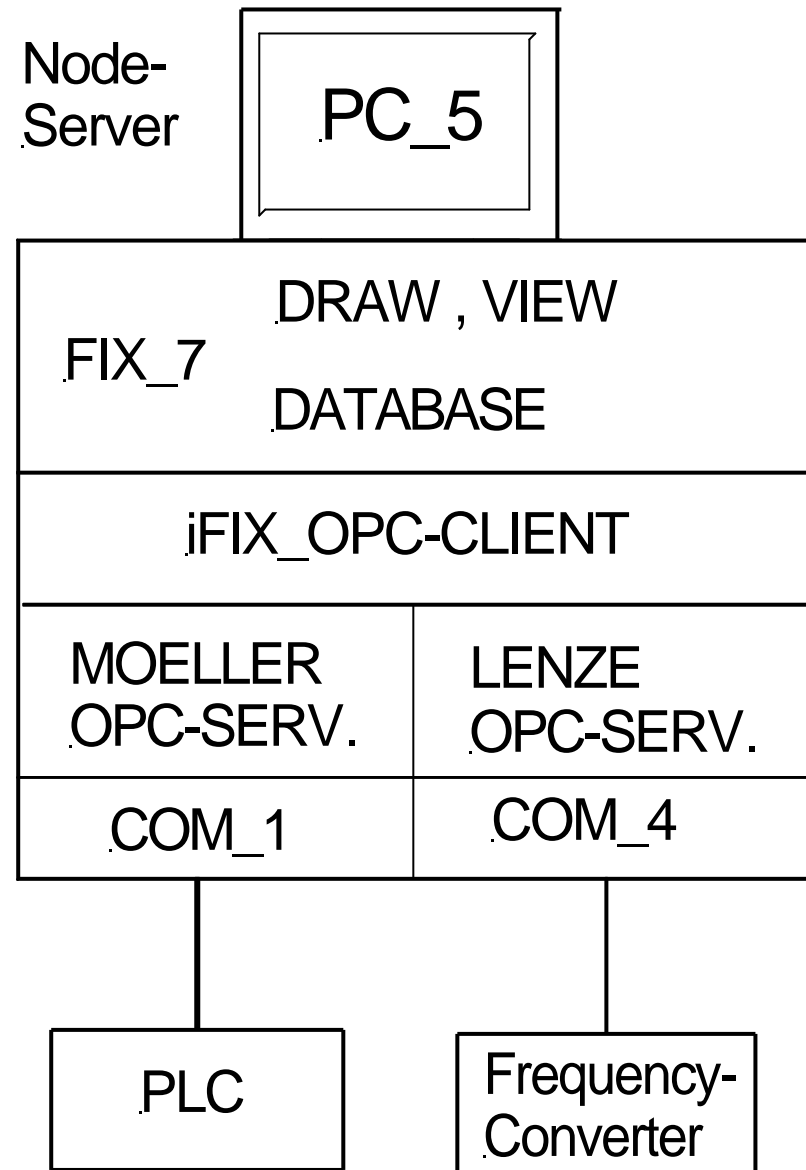
Base circle %

Angle °

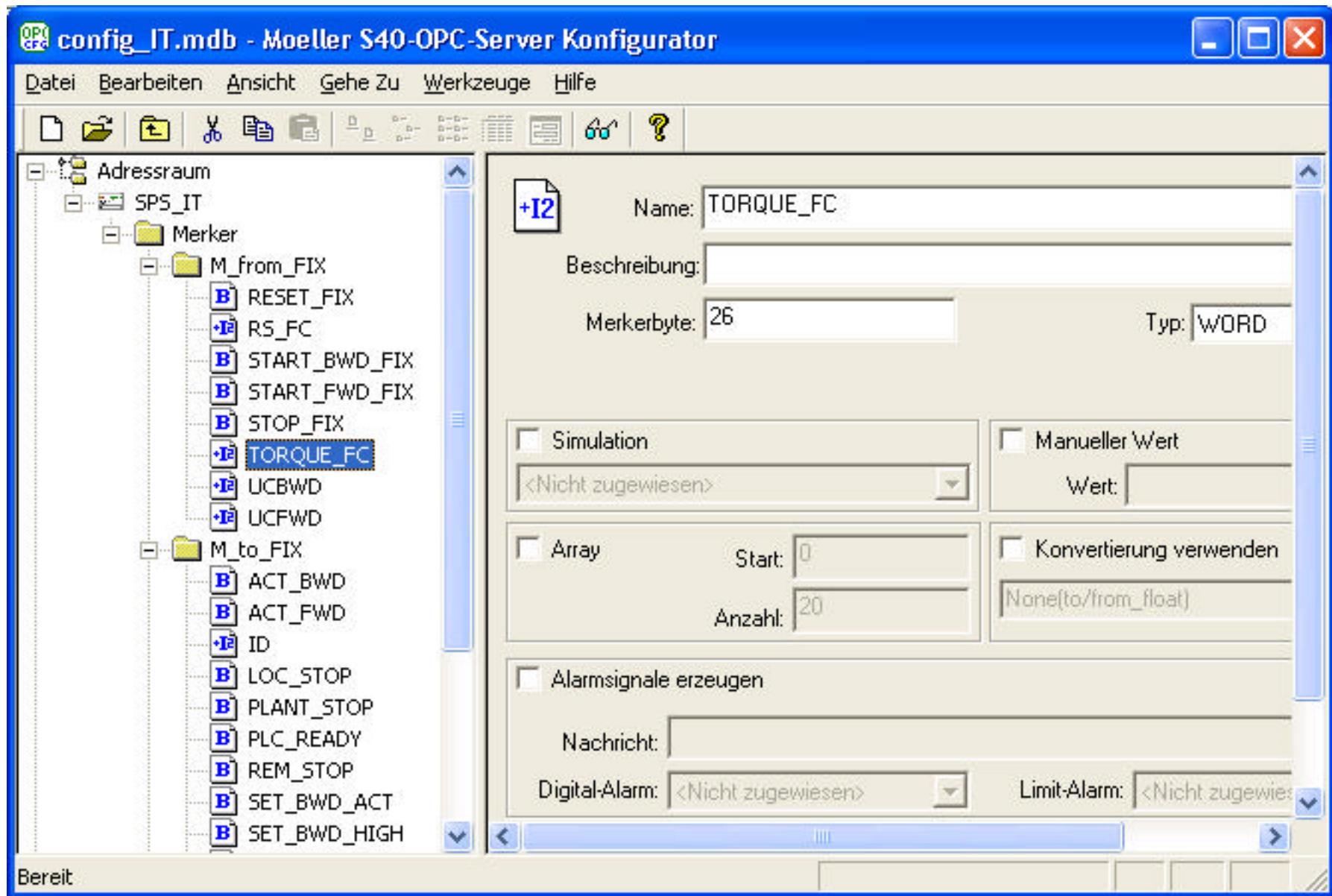
Architecture of the SCADA-System



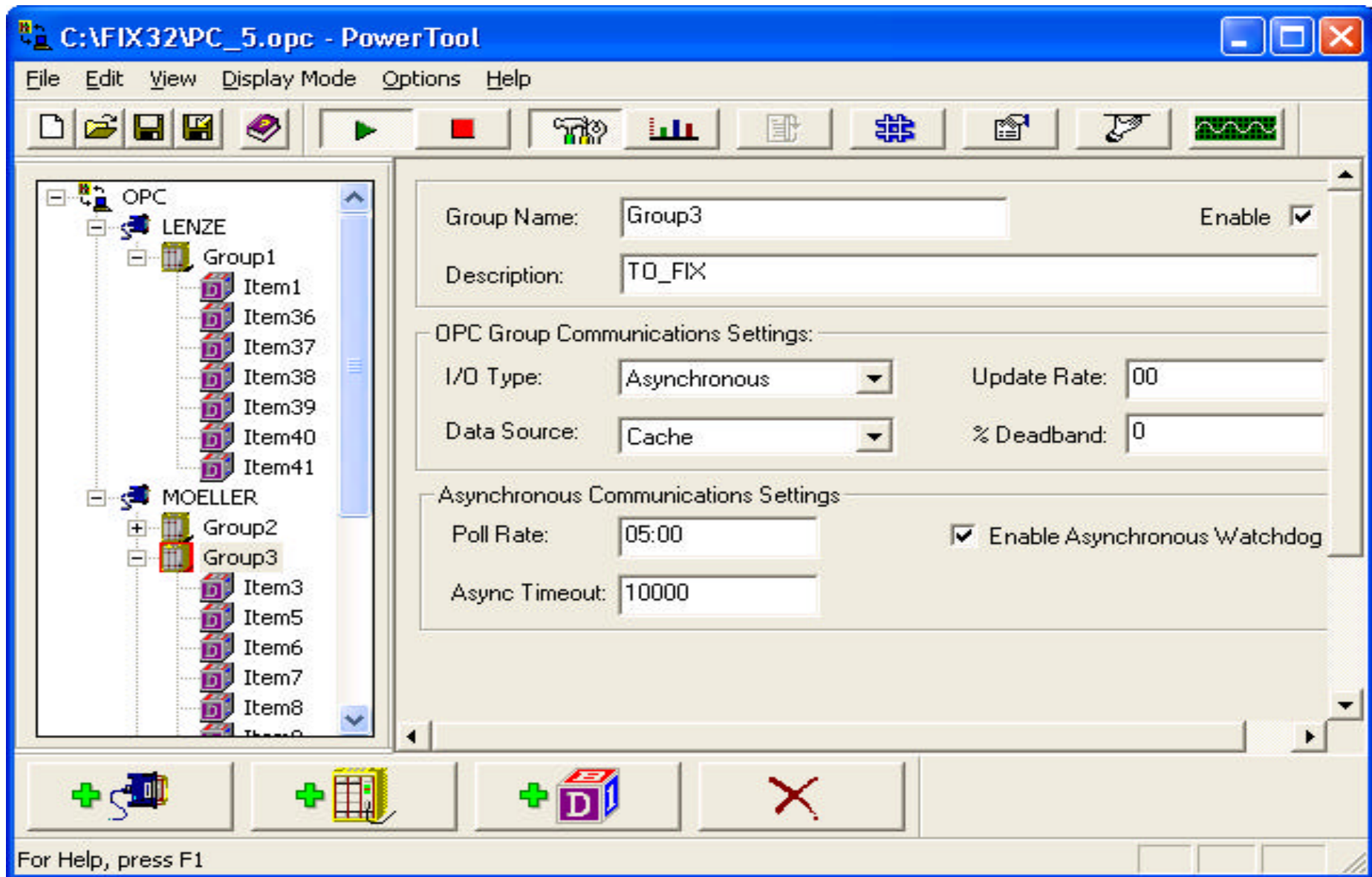
Overview of the Software-Tools



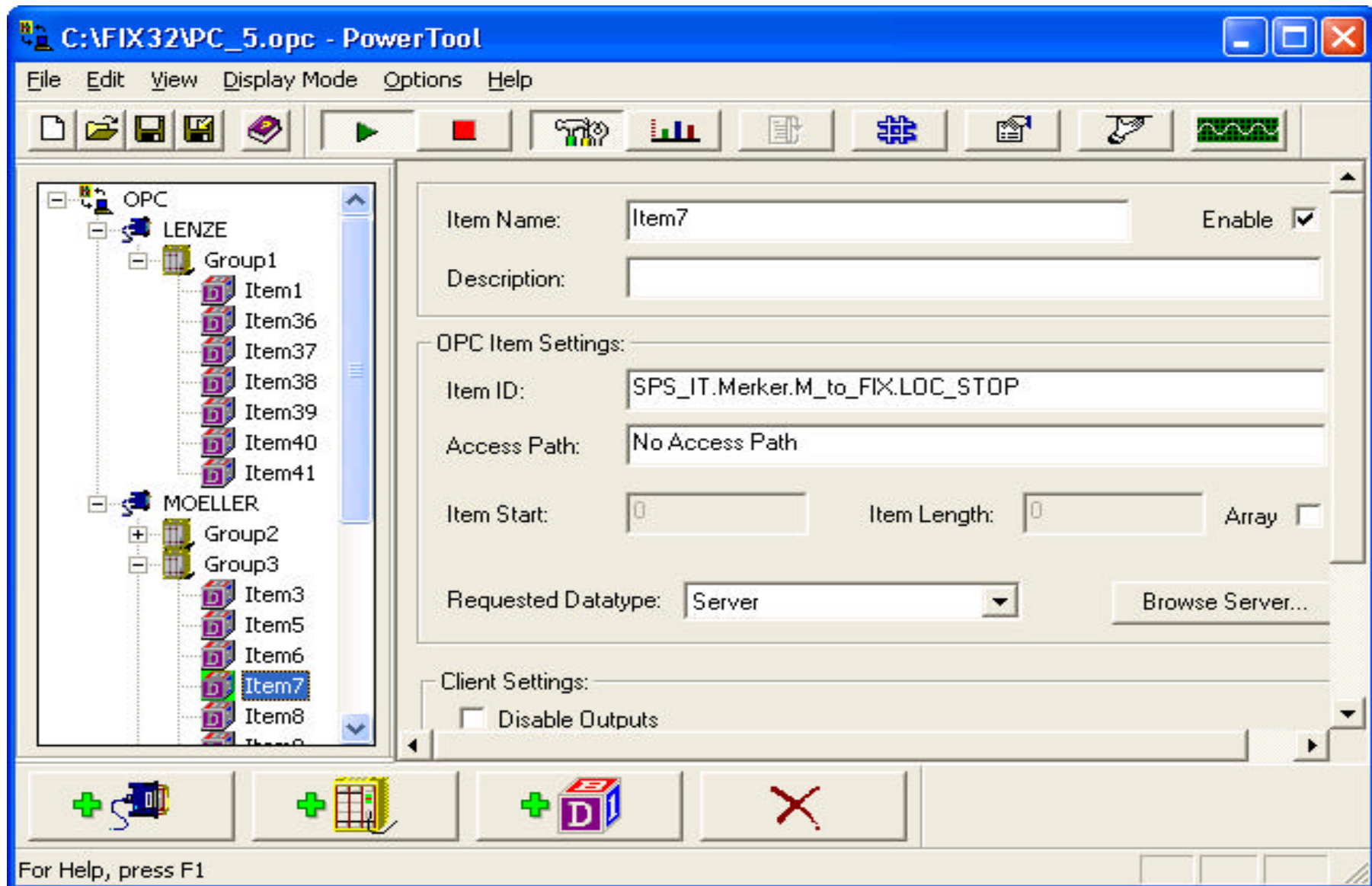
OPC-SERVER „MOELLER“



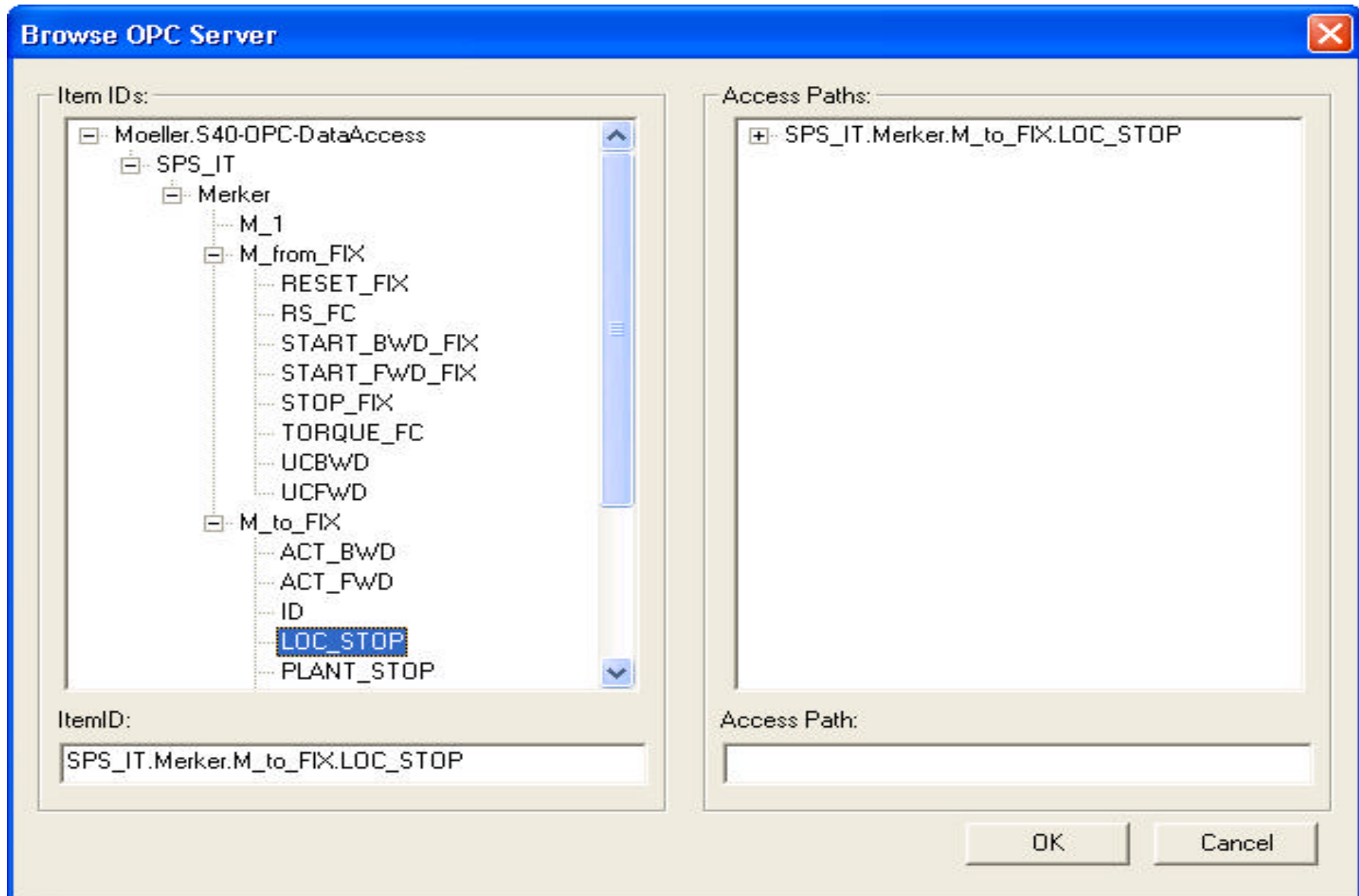
OPC-CLIENT „INTELLUTION“



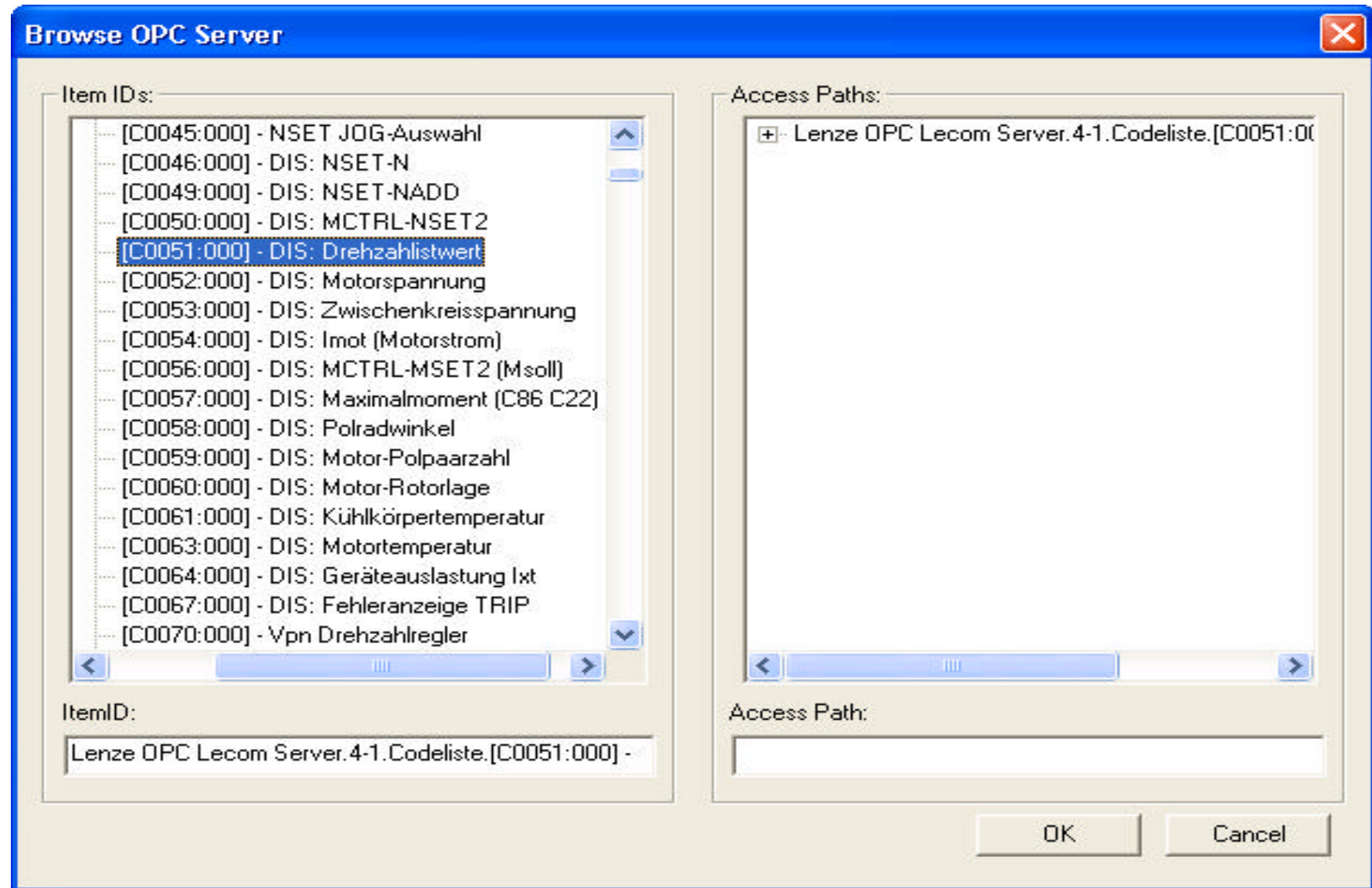
OPC-CLIENT: Item ID



iFIX-OPC-CLIENT: BROWSER (Moeller)



iFIX-OPC-CLIENT: BROWSER (Lenze)



FIX 7: Database

Database Builder

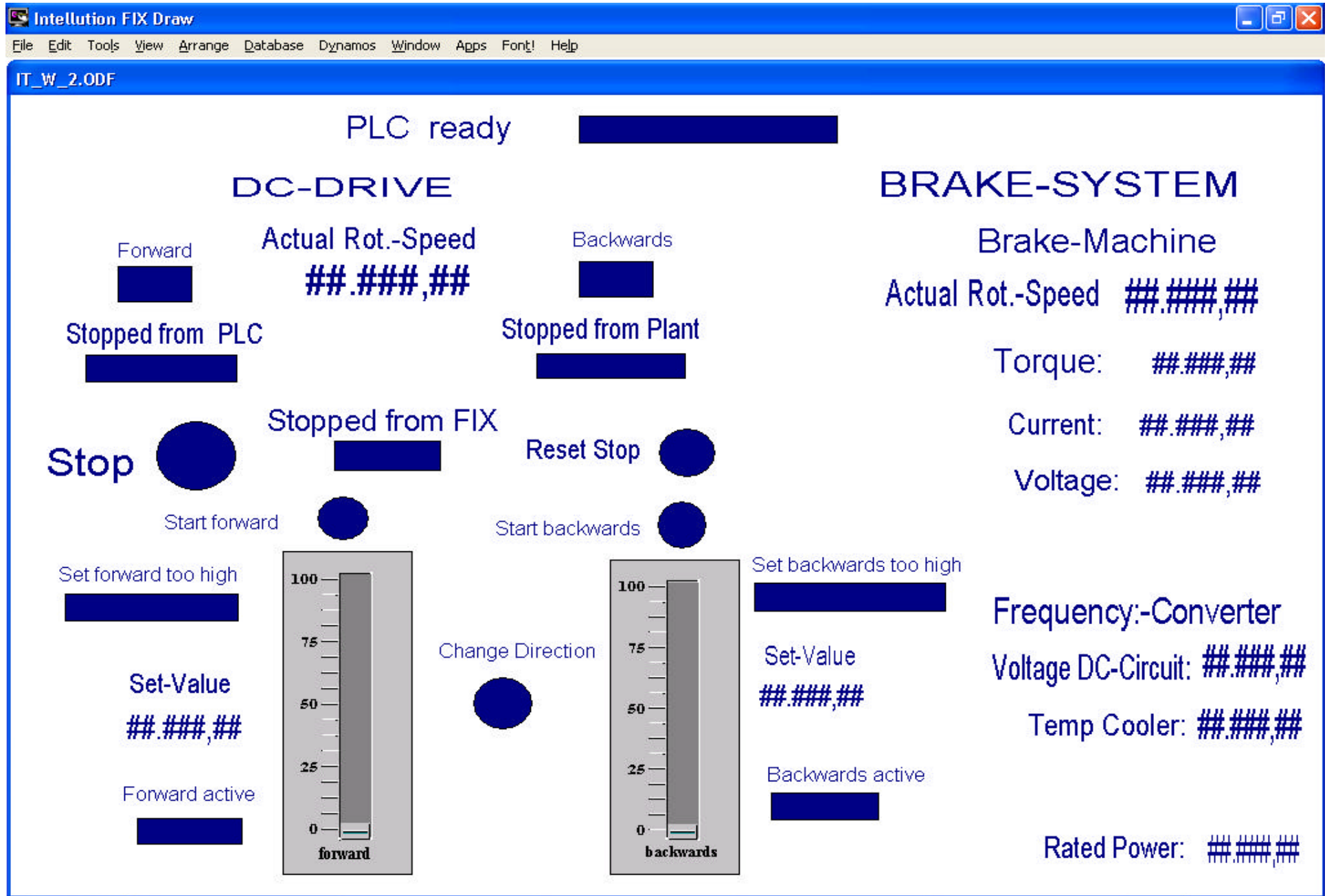
Database Edit Blocks Sort Query Display Options Drivers Font! Help

Database Builder - PC_5

FC_IMOT

	Tag Name	Type	De	Scan	I/O Dev	I/O Addr	Curr Value	Scan Stat	Curr Moc
1	FC_IMOT	AI		0,30	OPC	LENZE;Group1;Lenze OPC Lecom Server.4-1.Codelis	2,50	ON	AUTO
2	FC_RS	AI		0,30	OPC	LENZE;Group1;Lenze OPC Lecom Server.4-1.Codelis	0,00	ON	AUTO
3	FC_TEMP_COOLER	AI		0,50	OPC	LENZE;Group1;Lenze OPC Lecom Server.4-1.Codelis	46,00	ON	AUTO
4	FC_TORQUE	AI		0,30	OPC	LENZE;Group1;Lenze OPC Lecom Server.4-1.Codelis	0	ON	AUTO
5	FC_VOLT_MOT	AI		0,30	OPC	LENZE;Group1;Lenze OPC Lecom Server.4-1.Codelis	24,00	ON	AUTO
6	FC_VOLT_ZK	AI		0,30	OPC	LENZE;Group1;Lenze OPC Lecom Server.4-1.Codelis	579,00	ON	AUTO
7	LEN_1	AI		0,10	OPC	LENZE;Group1;Lenze OPC Lecom Server.4-1.Codelis	1,70	ON	AUTO
8	URS	AI		0,50	OPC	MOELLER;Group3;SPS_IT.Merker.M_to_FIX.URS;No	0,00	ON	AUTO
9	RS_FC	AO		----	OPC	MOELLER;Group5;SPS_IT.Merker.M_from_FIX.RS_F	0	ON	AUTO
10	TORQUE_FC	AO		----	OPC	MOELLER;Group5;SPS_IT.Merker.M_from_FIX.TORC	0	ON	AUTO
11	UCBWD	AO		----	OPC	MOELLER;Group5;SPS_IT.Merker.M_from_FIX.UCBV	0,00	ON	AUTO
12	UCFWD	AO		----	OPC	MOELLER;Group5;SPS_IT.Merker.M_from_FIX.UCFV	0,00	ON	AUTO
13	ACT_BWD	DI		0,50	OPC	MOELLER;Group3;SPS_IT.Merker.M_to_FIX.ACT_BV	CLOSE	ON	AUTO
14	ACT_FWD	DI		0,50	OPC	MOELLER;Group3;SPS_IT.Merker.M_to_FIX.ACT_FV	OPEN	ON	AUTO
15	LOC_STOP	DI		0,10	OPC	MOELLER;Group3;SPS_IT.Merker.M_to_FIX.LOC_ST	OPEN	ON	AUTO
16	PLANT_STOP	DI		0,10	OPC	MOELLER;Group3;SPS_IT.Merker.M_to_FIX.PLANT_	OPEN	ON	AUTO
17	PLC_READY	DI		0,10	OPC	MOELLER;Group3;SPS_IT.Merker.M_to_FIX.PLC_RE	CLOSE	ON	AUTO
18	REM_STOP	DI		0,10	OPC	MOELLER;Group3;SPS_IT.Merker.M_to_FIX.REM_S	OPEN	ON	AUTO
19	SET_BWD_ACT	DI		0,10	OPC	MOELLER;Group3;SPS_IT.Merker.M_to_FIX.SET_BV	OPEN	ON	AUTO
20	SET_BWD_HIGH	DI		0,10	OPC	MOELLER;Group3;SPS_IT.Merker.M_to_FIX.SET_BV	OPEN	ON	AUTO
21	SET_FWD_ACT	DI		0,10	OPC	MOELLER;Group3;SPS_IT.Merker.M_to_FIX.SET_FV	CLOSE	ON	AUTO
22	SET_FWD_HIGH	DI		0,10	OPC	MOELLER;Group3;SPS_IT.Merker.M_to_FIX.SET_FV	OPEN	ON	AUTO

FIX 7: Draw



FIX 7: View

The screenshot displays the 'Intellution FIX View' software interface. The window title is 'Intellution FIX View' and the menu bar includes 'File', 'View', 'Alarms', 'Commands', 'Applications', 'Options', 'Window', and 'Help'. The active file is 'IT_W_2.ODF [PC_5:START_FWD_FIX.F_CV]'. The main display area is divided into several sections:

- PLC ready:** Indicated by a green bar.
- DC-DRIVE:**
 - Forward:** Indicated by a green bar.
 - Actual Rot.-Speed:** 1.807,00
 - Backwards:** Indicated by a white bar.
 - Stopped from PLC:** Indicated by a white bar.
 - Stopped from Plant:** Indicated by a white bar.
 - Stopped from FIX:** Indicated by a white bar.
 - Reset Stop:** Indicated by a white circle.
 - Start forward:** Indicated by a white circle.
 - Start backwards:** Indicated by a white circle.
 - Set forward too high:** Indicated by a white bar.
 - Set-Value:** 90,59
 - Forward active:** Indicated by a green bar.
 - Change Direction:** Indicated by a white circle.
 - forward:** A vertical scale from 0 to 100 with a marker at approximately 85.
- BRAKE-SYSTEM:**
 - Brake-Machine:**
 - Actual Rot.-Speed:** 1.787,00
 - Torque:** -6,00
 - Current:** 2,60
 - Voltage:** 141,00
 - Frequency:-Converter:**
 - Set-Value:** 20,81
 - Backwards active:** Indicated by a white bar.
 - backwards:** A vertical scale from 0 to 100 with a marker at approximately 15.
 - Set backwards too high:** Indicated by a white bar.
 - Voltage DC-Circuit:** 577,00
 - Temp Cooler:** 38,00
 - Rated Power:** 1,70

5) Summary and Conclusion